AGNICO EAGLE

MELIADINE GOLD PROJECT

2018 Annual Report

Prepared for:
Nunavut Water Board
Nunavut Impact Review Board
Fisheries and Oceans Canada
Crown-Indigenous Relations and Northern Affairs Canada
Kivalliq Inuit Association

Prepared by:
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ABBREVIATION

ABA	Acid base accounting
AEMP	Aquatic Ecosystem Monitoring Program
ARD	Acid Rock Drainage
AWAR	All Weather Access Road
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CSM	Conceptual Site Model
CWS	Canada-Wide Standard
DFO	Department of Fisheries and Oceans Canada
ECCC	Environment and Climate Changes Canada
EEM	Environmental Effect Monitoring
El.	Elevation
ERT	Emergency Response Team
FEIS	Final Environmental Impact Statement
F/T	Freeze/Thaw
GN	Government of Nunavut
HCMP	Habitat Compensation Monitoring Plan
HHRA	Human Risk Assessment
KHTO	Kangiqliniq Hunter Trapping Organization
KIA	Kivalliq Inuit Association
LSA	Local Study Area
LSM	Learning Management System
LOM	Life of Mine
Masl.	Meters above sea level
MDL	Method Detection Limit
MPA	Maximum Potential Acidity
MDMER	Metal and Diamond Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NF	Near-Field
NP	Neutralization Potential
NPAG	Non-Potentially Acid Generating
NPR	Net Potential Ratio
NWB	Nunavut Water Board
OMS	Operation, Maintenance and Surveillance
PAG	Potentially Acid Generating
PAHs	Polycyclic Aromatic Hydrocarbons
PHC	Petroleum Hydrocarbon
QAQC	Quality Assurance Quality Control
RDP	Relative Percent Difference
RIME	Research Institute in Mine and Environment
RSA	Regional Study Area
RSF	Rock Storage Facility
SWTP	Saline Water Treatment Plant
TDS	Total Dissolved Solids

TMS	Training Management System
TS	Total Sulphur
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
RIME	Research Institute of Mine and Environment
RSF	Rock Storage Facility
S	Total Sulphur
Sta.	Station
STP	Sewage Treatment Plan
VECs	Valued Ecosystem Components
WSLRA	Wildlife Screening Level Risk Assessment
WTP	Water Treatment Plan
W/D	Wet/Dry

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Comment
1	2019/03/31	All	All	This has been reviewed by Environmental Staff and will be incorporated into training for all mine staff on behalf of the Mine Manager and Senior Management

Prepared By: Meliadine Environment Department

Approved By: 

Nancy Duquet Harvey
Environmental Superintendent

SECTION 1. INTRODUCTION

As required by water license 2AM-MEL1631 Part B Item 2 The Licensee shall file an annual report with the Board no later than March 31st in the year following the calendar year being reported. The annual report shall be developed in accordance with Schedule B.

And

As required by water license 2BB-MEL-1424 Part B Item 6 The Licensee shall file an Annual Report on the Appurtenant Undertaking with the Board no later than March 31st of the year following the calendar year being reported,

The Meliadine Gold Project operated by Agnico Eagle Mines Limited - Meliadine Division (Agnico Eagle) is located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson's Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8''N, 92°13'6.42''W), on Inuit owned land. The project components include the 28 km All Weather Access Road (AWAR) between Rankin Inlet and Meliadine, the Itivia fuel farm and laydown area, and the mine site.

These various components and activities associated with the project require a number of different authorizations, leases and permits from regulatory agencies including the Nunavut Water Board (NWB), Environment and Climate Change Canada (ECCC), Metal and Diamond Mining Effluent Regulations (MDMER); Department of Fisheries and Oceans Canada (DFO), Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC); Kivalliq Inuit Association (KIA) and the Nunavut Impact Review Board (NIRB).

This report is written to address all of the 2018 annual reporting requirements of the project under these authorizations:

- NWB Type A water license 2AM-MEL1631;
- NWB Type B Water License 2BB-MEL1424;
- NIRB Project Certificate No. 6;
- KIA Permit KVCA07Q08;
- KIA Permit KVCA11Q01;
- KIA Production Lease KVPL11D01; and
- The Meliadine IIBA:

Reporting requirements for the MDMER have been submitted directly to ECCC; results are presented herein to comply with the NWB Type A Water License.

SECTION 2. SUMMARY OF ACTIVITIES

2.1 2018 ACTIVITIES

2.1.1 Exploration activities

As required by water license 2BB-MEL-1424 Part B Item 6i: A summary of drilling/trenching activities and progressive reclamation of drill/trench sites;

No trenches were dug in 2018 under this water licence and 19 holes were drilled. The contractor for the drilling was Sarliaq Orbit Garant and it was conducted using a diamond drill between March and August 2018. Activities included both on ice and on land drilling. Drill sites reclamation included the removal of remaining material and drill casings at each site once drilling was completed. Casings were cut at ground level when they could not be removed.

Table 2.1: Drill site locations 2018:

Hole Number	Latitude	Longitude
M18-2439	63° 1' 5.618" N	92° 17' 50.569" W
M18-2440	63° 1' 7.649" N	92° 18' 14.296" W
M18-2442	63° 2' 11.860" N	92° 20' 51.739" W
M18-2443	63° 2' 40.320" N	92° 21' 31.229" W
M18-2444	63° 2' 42.304" N	92° 21' 29.876" W
M18-2445	63° 2' 56.984" N	92° 20' 49.698" W
M18-2446	63° 2' 26.221" N	92° 20' 21.397" W
M18-2447	63° 1' 7.055" N	92° 18' 14.424" W
M18-2448	63° 1' 19.583" N	92° 18' 44.248" W
M18-2451	63° 1' 4.768" N	92° 18' 4.166" W
M18-2453	63° 2' 40.139" N	92° 21' 25.681" W
M18-2456	63° 2' 42.962" N	92° 21' 38.261" W
M18-2457	63° 2' 40.274" N	92° 21' 21.150" W
M18-2458	63° 0' 10.073" N	92° 10' 9.140" W
M18-2460	63° 0' 15.191" N	92° 11' 2.295" W
M18-2461	63° 0' 7.677" N	92° 9' 44.180" W
M18-2464	63° 0' 6.476" N	92° 9' 29.181" W
M18-2495	63° 5' 50.976" N	92° 12' 55.262" W
M18-2496	63° 5' 54.137" N	92° 13' 58.006" W

2.1.2 Construction activities

In 2018 Meliadine was in the active construction stage, with production expected to commence in 2019. Construction activities are summarized in table 2.2 below:

Table 2.2: Summary of the construction, undertaken in 2018:

Activity	Status as of Dec 31, 2018
Effluent Water Treatment Plant Diffusor into Meliadine Lake	Completed Completed
Construction of CP-1 and CP-5 Jetties (pumping stations)	Completed
Construction of permanent Landfarm	Completed
Construction of permanent Landfill	Completed
Emulsion Plant construction Commissioning and construction of the service road to the Emulsion Plant	Completed Completed
Start multi-year construction of Permanent Power Plant	Completed
Start multi-year construction of Process Plant	To be completed 2019
Start multi-year construction of Paste Plant	To be completed 2019
Start multi-year construction of multi-services building	Completed
Construction of ventilation and emergency egress East intake West exhaust	 Completed To be completed in 2019
Construction of Channels 1 and 5	Completed 2017-2018
Construction of Channels 7 and 8	To be completed in 2019
Construction of Berm 1	To be completed in 2019
Construction of Berms 2 and 3	Completed
Construction of CP-3 Pond	Completed
Construction of CP-4 Pond	To be completed 2019
Construction of CP-3 Channel	Completed
Construction of CP-4 Channel	To be completed 2019
Construction of Ore Pad 2 (OP-2)	To be completed 2019
Installation of Culverts 1, 2, 3, 4, 13, 15, 16 and 18	Completed
Installation of Culverts 7, 8, 10, 11, 14 and 19	To be completed in 2019
Construction of gazboy	Completed
Construction of Meliadine site fuel farm storage facilities	Completed
Installation of Telecommunication Tower	Completed
Portal ramp advancement	Completed
Construction of Portal 2	Completed
Construction of the Rankin Inlet Bypass road	Completed
Fuel farm and laydown area [Itivia]	Completed

2.1.3 Mining Activities

In 2018, the Meliadine Gold Project was still in the construction phase, developing the underground in preparation to operate the Tiriganiaq underground mine. A total of 688,069 tonnes of waste was

excavated, 3,134 tonnes was used as underground rockfill and the rest was used for construction purposes. A total of 39,216 tonnes of marginal and 60,846 tonnes of ore was excavated and stored at the surface ore pad 1 and 2.

Figure 2.1 2018 Meliadine Site

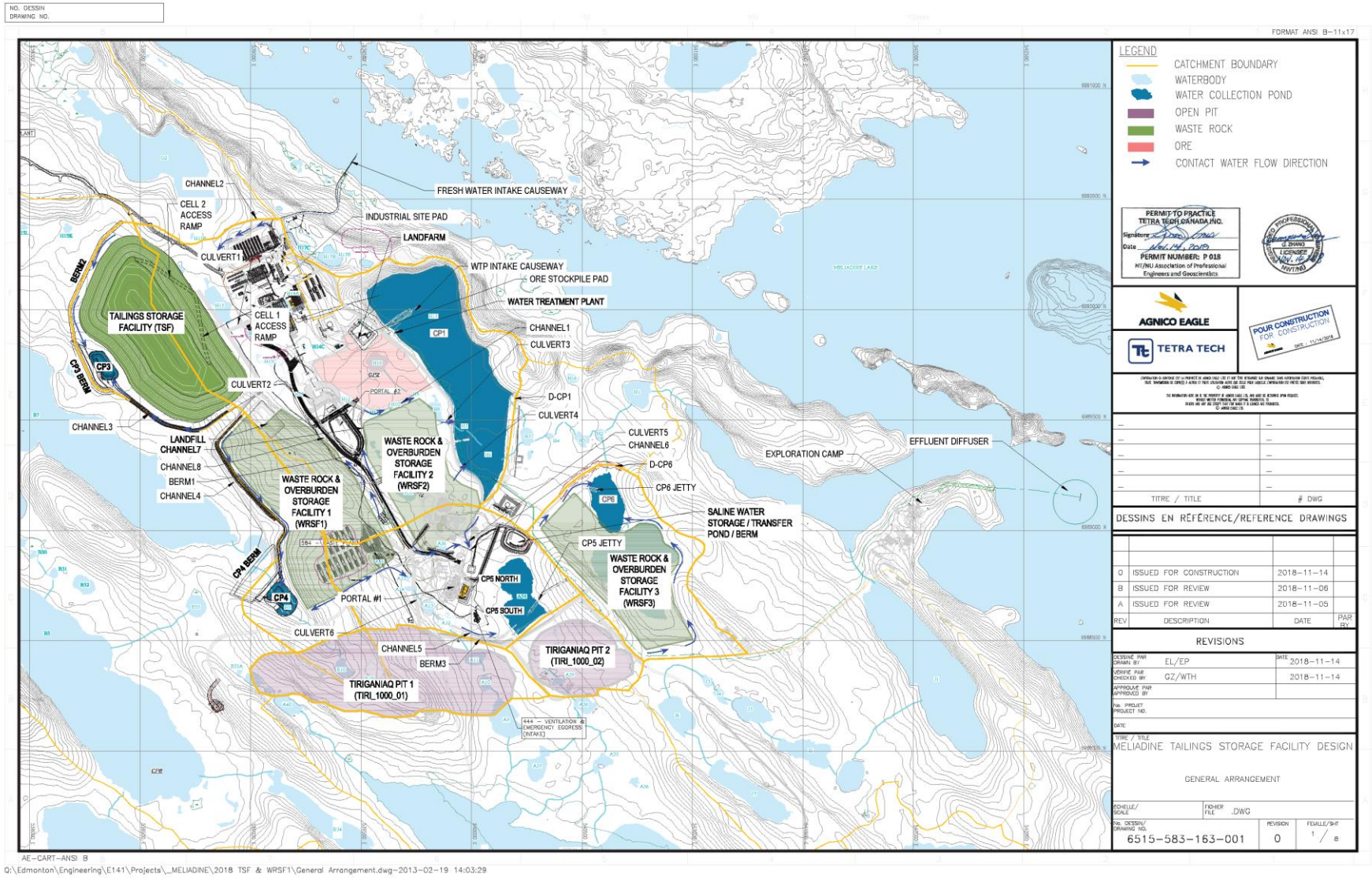


Figure 2.2 2018 Meliadine Site Sampling Locations

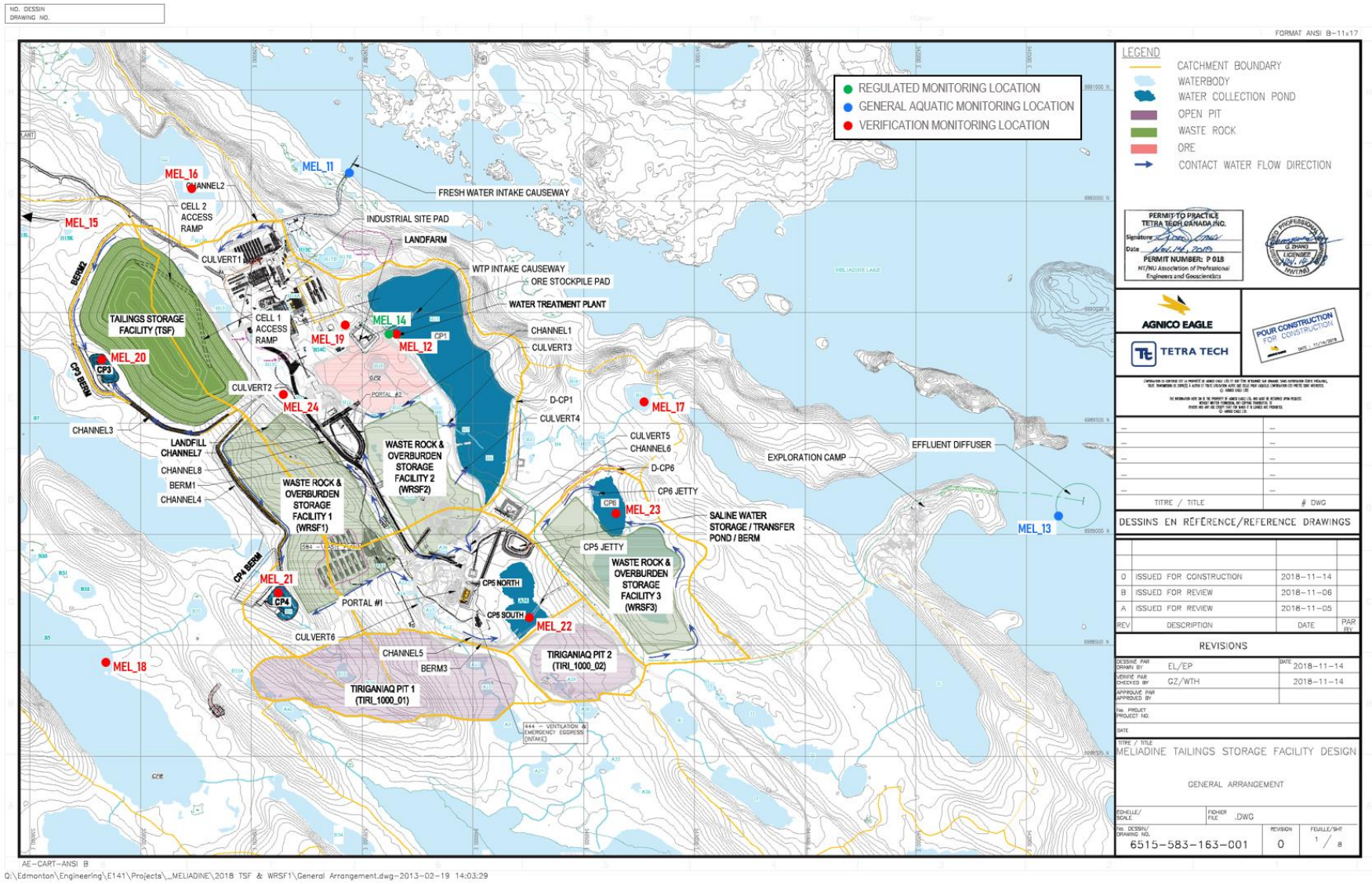
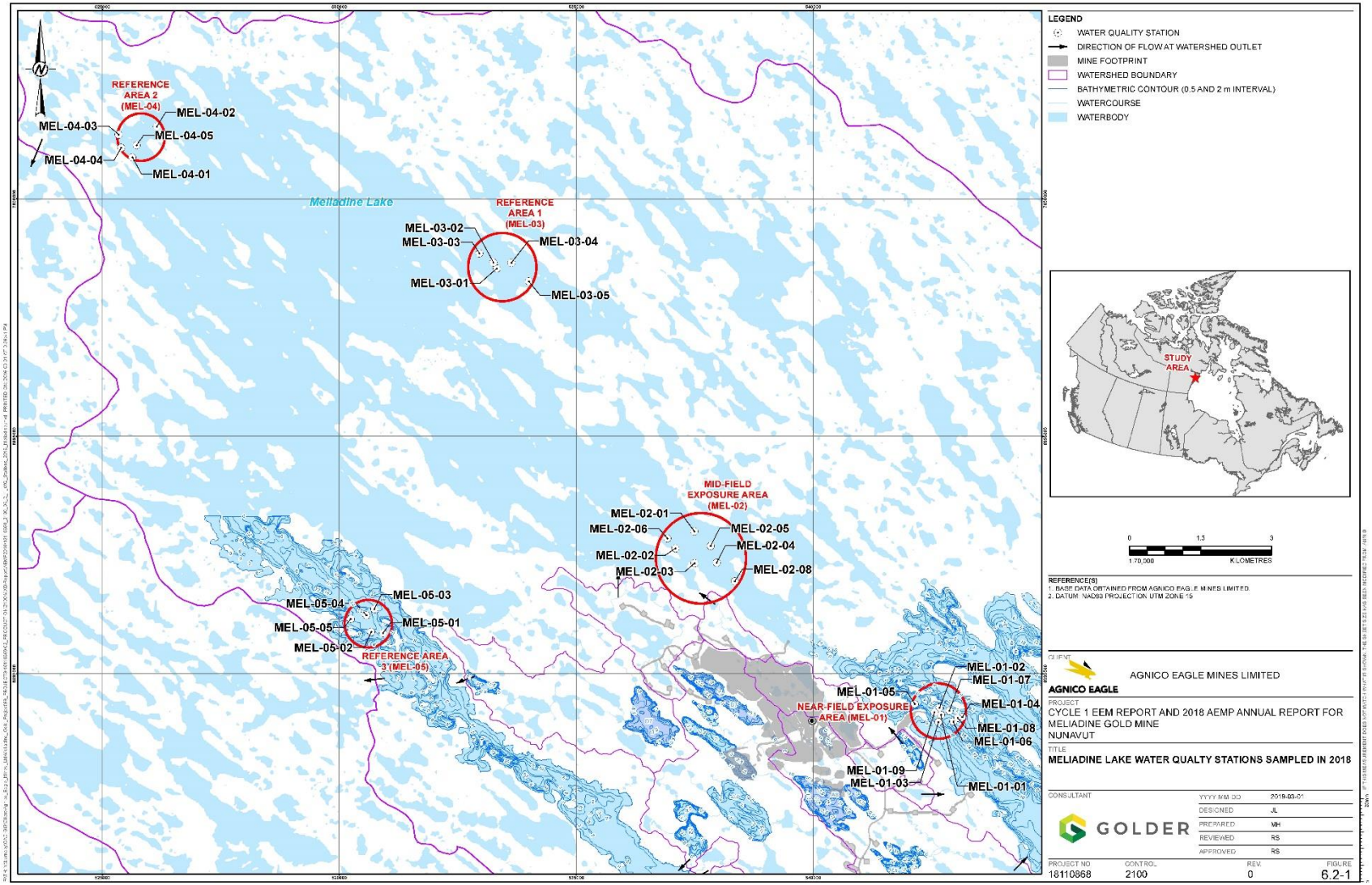


Figure 1.3 EEM Receiving Environment Sampling Locations



2.2 2019 MINE WORK PLAN

The 2019 Mine Plan for the Meliadine Gold Project, prepared for the Kivalliq Inuit Association as required by Production Lease KVPL11D01 was submitted to the KIA on January 22nd, 2019 and outlines the activities planned for the project throughout the 2019 year.

In 2019 the Meliadine gold mine will begin the operation phase of the project by mining the underground Tiriganiaq deposit. A total of 1 858 000 tonnes of rock will be extracted from the mine over the year. The mine plan consists of hauling 678 000 tonnes of waste rock, 135 000 tonnes of marginal ore and 1 045 000 tonnes of ore to the surface. Furthermore, approximately 380 000 tonnes of tailings will be returned underground, along with 60 000 tonnes of waste rock which will be used as rockfill. Waste rock and overburden will be trucked to the waste rock storage facilities (WRSFs) until the end of mine operation, with distribution according to an operation schedule. In 2019, 962 543 tonnes of solid tailings will be generated from the Mill. 380 517 tonnes of solid tailings will be used as underground backfill and 582 026 tonnes will be placed in the dry stacked Tailings Storage Facility (TSF).

Environmental monitoring (wildlife, aquatic effects, groundwater, noise and air) will continue through 2019 in support of all operational undertakings at the Meliadine site as required by the NWB Type A Water License 2AM-MEL1631, NWB Type B Water License 2BB-MEL1424, NIRB Amended Project Certificate No.006, and MDMER regulations.

In 2019, Agnico Eagle is planning to conduct the following construction projects that will be undertaken near the main mine site area and also on municipal and territorial leased land:

- Construction of Pond CP4 and associated infrastructure (Berm CP4, Channel 4);
- Finalize Portal 2 backfilling activities and associated water management structures;
- Complete construction of the Industrial Pad;
- Complete construction of Ore Storage Pad 2;
- Complete construction of Saline Pond 2;
- Finalize existing site roads;
- Finalize construction of the Paste Plant and;
- Construction and operation of the Saline Water Discharge tank at Itivia.

2.3 QUARRIES

In 2018, no material was taken from the quarries under permit KVCA11Q01. The total amount of material taken to date under this permit is 413,747 m^3 and the maximum allowed quantity to be taken is 650,000 m^3.

In 2018, 62,879 m^3 was taken from quarries under permit KVCA07Q08 for a total of 403,639 m^3. The maximum allowed quantity is 690,000 m^3.

As required under condition 16 for permit KVCA11Q01 and KVCA07Q08, monthly reports and payments were completed in 2018.

SECTION 3. WATER MANAGEMENT ACTIVITIES

3.1 WATER MOVEMENT

3.1.1 Fresh water obtained from Meliadine Lake

***As required by water license 2AM-MEA1631, Schedule B, Item 2: Monthly and annual volume of fresh Water obtained from Meliadine Lake*.**

Monthly and annual volume of fresh Water obtained from Meliadine Lake (MEL-11 and A-8) under License type A.

A total of 29,255 m³ of freshwater was withdrawn from Meliadine Lake in 2018, or approximately 47% of the maximum allowed (62,000 m³) under the License and indicated in Table 3.1.

Table 3.1: Volume of Fresh Water, withdrawn from Meliadine Lake and A8 in 2018

	January	February	March	April	May	June	July	August	September	October	November	December	**2018 Total**
Water withdrawn, m³	1,601	1,634	2,002	1,872	2,409	2,608	2,662	2,771	3,054	3,096	2,855	2,691	**29,255**

As required by Water License 2BB-MEL1424 Part B, Item 6a The Licensee shall obtain the daily, monthly and annual quantities in cubic meters of all freshwater obtained from Meliadine Lake at Monitoring Station MEL-1 and MEL-2;

Monthly and annual volumes of fresh Water obtained from Meliadine Lake (MEL-1 and MEL-2) under License type B.

Daily freshwater consumption details from Meliadine Lake (MEL-1 and MEL-2) under License type B can be found in Appendix A-1.

The monthly and annual water usage volumes are summarized in Table 3.2 below; a total of 20,651 m³ or 19% of the authorized amount (290 m³/ day ~ 106,000 m³/ year) was consumed in 2018.

Table 3.2 Monthly and annual quantities of freshwater in m^3, obtained from Meliadine lake at monitoring stations MEL-1 and MEL-2 in 2018.

	January	February	March	April	May	June	July	August	September	October	November	December	**2018 Total**
Water withdrawn, m^3	1,196	1,095	1,837	2,138	2,364	2,017	1,710	1,685	1,581	1,758	2,120	1,150	**20,651**

3.1.2 Fresh water obtained from Meliadine River.

As required by Water License 2AM-MEL1631 Schedule B, Item 4: Monthly and annual volume of fresh Water obtained from Meliadine River for road dust suppression activities.

In 2018, no water was obtained from the Meliadine River for road dust suppression activities; instead, water (240 m^3) was withdrawn from small ponds, proximal to the All-Weather Access Road (AWAR) as indicated in Table 3.3.

Table 3.3 Monthly and annual quantities of freshwater in m^3, obtained for road dust suppression activities.

	January	February	March	April	May	June	July	August	September	October	November	December	**2018 Total**
Water obtained, m^3	-	-	-	-	-	-	70	90	80	-	-	-	**240**

As required by Water License 2AM-MEL1631 Schedule B, Item 3: Monthly and annual volume of fresh Water transferred to Meliadine Lake as a result of dewatering activities.

No dewatering activities where water was transferred to Meliadine Lake took place in 2018.

3.1.3 Mine Water pumped from underground

As required by Water License 2BB-MEL1424 Part B, Item 6b The Licensee shall obtain the daily, monthly and annual quantities, in cubic meters, of Mine water pumped from the underground;

And

As required by Water License 2BB-MEL1424 Part B, Item 6j: Report all artesian flow occurrences

The daily, monthly, and annual flow volume quantities, in cubic meters (m^3), of mine water pumped from underground to surface during 2018 is summarized in Appendix A-2. There was no occurrences of artesian flow in 2018. The monthly and annual volumes of mine water pumped from the underground is summarized in Table 3.4 below with the water discharged from CP-1 to Meliadine Lake reported in Table 3.5.

Table 3.4 2018 Monthly and Annual flow volumes of underground mine water pumped to surface

	January	February	March	April	May	June	July	August	September	October	November	December	**2018 Total**
Water pumped, m^3	-	-	-	-	-	2,417	10,337	7,711	9,615	3,453	3,346	891	**37,766**

3.1.4 Water discharged from CP-1 to Meliadine Lake

Table 3.5 2018 Monthly and Annual volumes of water discharged from CP-1 to Meliadine lake

	January	February	March	April	May	June	July	August	September	October	November	December	**2018 Total**
Water pumped, m^3	-	-	-	-	-	134,272	352,551	153,066	2,632	-	-	-	**642,521**

3.2 WATER BALANCE WATER QUALITY MODEL REPORTING SUMMARY

As required by Water License 2AM-MEL1631 Schedule B, Item 5: Summary of reporting results for the Water Balance and Water Quality model as required in Part E Items 11-12.

Water Quantity

The Meliadine water balance model was updated in January 2019 to provide a forecast of monthly inflows, outflows, and cumulative volumes for the 2019 calendar year in CP1, CP3, CP5, Saline Pond, Underground Mine, and P-Area (P1, P2, and P3). The update to the model occurred prior to Agnico Eagle receiving

ministry approval for saline effluent discharge to sea at the Meliadine site (reference). As such, the framework of the model does not account for saline water originating from the underground mine that will be removed from the site via discharge to Melvin Bay. The model is undergoing further revision to account for these and other changes to the water management strategies in place, and an update will be provided with the 2019 Annual Report.

None of the forecasted monthly cumulative volumes (end of months volume) in each containment facility exceed their respective operational maximum storage capacities. A summary of the reporting results of the water balance forecast are in Table 3.6. The numbers in brackets represent the maximum capacity for each pond.

Table 3.6 Summary of water balance model predictions generated in the January 2019 model update

	Maximum Capacity	January	February	March	April	May	June	July	August	September	October	November	December
CP1 m³	742,075	112,247	119,396	126,734	131,650	136,730	235,124	262,240	314,478	365,790	390,387	398,064	405,745
CP3 m³	28,000	-	-	-	-	-	25,454	25,454	25,454	25,454	25,454	25,454	25,454
CP5 m³	46,674	21,482	21,482	21,482	21,482	21,482	10,000	10,000	10,000	13,591	16,965	16,965	16,965
SP1 m³	32,686	13,743	13,743	13,743	13,743	13,743	24,628	22,920	23,451	22,715	22,851	22,851	22,851
Underground m³	129,213	6,760	4,184	1,931	1,931	1,931	2,098	3,283	9,184	14,374	16,000	17,170	17,170
P-Area m³	33,909	12,368	12,368	12,368	12,368	12,368	21,866	20,975	23,309	25,780	27,707	27,707	27,707

Water Quality

The water quality model was updated in January 2019 to provide a forecast of monthly average TDS concentrations for the 2019 calendar year in CP1, CP3, CP5, Saline Pond, Underground Mine, and P-Area (P1, P2, and P3). This update was generated by means of a mass balance applied to the water balance model update. As such, the water quality results are limited to the framework of the model and therefore do not account for saline water originating from the underground mine that will be removed from the site via discharge to Melvin Bay.

The presented TDS concentrations are the result of overly-conservative assumptions applied to the model update. As such, both the water balance and water quality model are undergoing revision in 2019 to address these deficiencies. Reporting results of the water quality forecast are presented in Table 3.7.

More information regarding the TDS concentration results presented can be found in Section 7.3 of the 2019 Water Management Plan

Table 3.7 Summary of water quality model predictions generated in the January 2019 model update.

	January	February	March	April	May	June	July	August	September	October	November	December
CP1 mg/L	1,970	1,879	1,797	1,746	1,710	1,805	2,330	2,786	3,027	3,175	3,223	3,171
CP3 mg/L	-	-	-	-	-	4,873	5,159	5,441	5,460	5,387	5,350	5,350
CP5 mg/L	12,200	12,200	12,200	12,200	12,200	5,593	4,334	5,706	5,630	6,914	7,950	7,950
Saline Pond 1 mg/L	14,809	13,903	13,903	13,903	13,903	20,261	19,989	19,071	18,078	17,786	17,737	17,737
Underground mg/L	55,798	55,791	56,058	55,800	55,800	55,800	55,800	55,800	55,800	55,800	55,800	55,800
P-Area mg/L	20,523	20,760	20,996	21,240	21,485	32,828	136,951	167,754	193,116	143,667	91,735	92,205

3.3 ADDITIONAL INFORMATION

As required by Water License 2AM-MEL1631 Schedule B, Item 23: ***Any other details on Water use or Waste Disposal requested by the Board by November 1st of the year being reported.***

And

As required by water license 2BB-MEL-1424 Part B Item 6n: Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported

No additional information was requested in 2018.

SECTION 4. WASTE ROCK MANAGEMENT ACTIVITIES

4.1 GEOTECHNICAL MONITORING

As required by water license 2AM-MEL1631 Part I, Item 15: ***The Licensee shall submit to the Board as part of the Annual Report required by Part B, Item 2, a Geotechnical Engineer's Inspection Report. The Report shall include a cover letter from the Licensee outlining an implementation plan addressing each of the Geotechnical Engineer's recommendations.***

And

As required by water license 2AM-MEA1631, Schedule B, Item 1:

a. An overview of methods and frequency used to monitor deformations, seepage and geothermal responses;

The performance of the permanent dikes (D-CP1 and D-CP5) is assessed according to the guidelines provided in the Operation, Maintenance and Surveillance (OMS) manual for the facilities. This program consists of both documented visual inspections and geotechnical instrumentation monitoring. In 2018, visual inspections were conducted according to the following schedule:

- Bi-daily (every two days) - Conducted during freshet by a qualified engineer or technician;
- Weekly - Conducted during open water season by a qualified engineer or technician;
- Monthly – Conducted during open water season by the Agnico Eagle Geotechnical Engineer; and
- Annual – Conducted by a third party consulting engineer (Golder Associates Ltd.) during open water season.

All visual inspections are documented and include observations of cracking, settlement, seepage and deformation in addition to photographs. Any areas of movement are marked both physically on the dikes themselves by spray painting the locations and on plan drawings of the facilities in order to track changes in conditions.

In addition to the monthly documented visual inspection (during open water), a review of the operational performance and assessment of the geotechnical monitoring instrumentation is conducted every month by the Geotechnical Engineer. The schedule of collecting monitoring data in 2018 generally followed the OMS guidelines and is summarized in Table 4.1.

Table 4.1: Summary of 2018 Permanent Dike Geotechnical Monitoring Program

Instrumentation	Frequency of Data Collection
Thermistors	Bi-daily (freshet); Weekly (Open water); Monthly (Ice)
Survey Monuments	Monthly
Upstream Water/Ice Elevations	Daily (Open water); Monthly (Ice)

In addition to the permanent dikes, a geotechnical inspection and instrumentation monitoring program for the P-Area berms was also implemented by Agnico Eagle in 2018. Documented monthly inspections by the Agnico Eagle Geotechnical Engineer were conducted twice during open water season using the same

format and evaluation criteria as for the permanent dikes and the infrastructure in this area was also evaluated during the annual geotechnical inspection. Thermistor data was obtained and evaluated twice per week (freshet), weekly (remainder of open water) and monthly (winter). Water elevations were recorded daily throughout open water season.
The performance of all other water management and earthworks structures were assessed in 2018 during the Annual Geotechnical Inspection conducted by Golder Associates Ltd. The results of this inspection is available in Appendix B.

b. A comparison of measured versus predicted performance;

Based on the visual inspections and geotechnical monitoring data, the permanent water retention dikes (D-CP1 and D-CP5) are generally performing as expected, with no significant geotechnical concerns identified in 2018. Deformation, seepage and geothermal response will continue to be monitored as per the OMS guidelines throughout 2019. No significant geotechnical concerns were noted with any other water management or earthworks infrastructure during the annual inspection. The results of this inspection and detailed analysis is available in Appendix B.

c. A discussion of any unanticipated observations including changes in risk and mitigation measures implemented to reduce risk;

During dewatering activities in CP1 during the 2018 open water season, it was observed that the former H6 basin (immediately next to D-CP1) is at a higher elevation than the former H17 basin (at Jetty 1). Therefore, the maximum operating level for end of October (as per design and OMS requirements) could be achieved at the jetty but not near the dike. To connect the two systems and drain water away from the dike foundation towards the jetty, a small trench was mechanically excavated between the former H6 and former H17 basins on September 3 and 4, 2018.

d. As-built drawings of all mitigation works undertaken;

The as-built drawing of the trench between the former H6 and former H17 basins within the CP1 catchment area is located in Appendix B-3.

e. Any changes in the design and/or as-built condition and respective consequences of any changes to safety, water balance and water quality;

As-built condition was evaluated during the Annual Geotechnical Inspection (refer to Appendix B). Any deviations from design and the potential impact of those deviations are discussed during the construction record (as-built) reporting completed by the Design Engineer and submitted for review as per regulatory requirements.

In November 2017, Agnico Eagle determined that a reverse osmosis (RO) treatment system was required to manage TDS levels in water being transferred from CP5 to CP1. This requirement was due to an increasing trend of CP5 (MEL-22) TDS levels from 2016 (mean TDS = 2,579 mg/L; n = 19) to 2017 (mean TDS = 4,706 mg/L; n = 13). The RO system was procured in Q1 of 2018 and installed approximately 50 metres to the northeast of CP5 as a means to manage the increased TDS levels prior to moving water from CP5 to CP1, and eventually Meliadine Lake. Commissioning of the RO plant was completed on June

13, 2018, and the first transfer of treated CP5 water to CP1 took place on June 14, 2018. The RO system will continue to be used at CP5 for as long as TDS levels require treatment prior to transferring to CP1.

Although not a change to the design or as-built condition, the OMS for D-CP1 and D-CP5 was modified to reflect the actual as-built conditions of the Jetty 5 pumping station. The original version of the document had assumed that the invert of the lowest intake pipe had been installed to design elevation. During pumping activities from CP5 to CP1 however, it was observed that the elevation of the lowest intake pipe had been installed above the design elevation and that the maximum operating level before/after freshet was unachievable. Discussions with the Design Engineer (Tetra Tech) led to a revision of the OMS and increased maximum operating final elevation level for D-CP5 by 0.3 m.

f. Data collected from instrumentation used to monitor earthworks and an interpretation of that data;

4.1.1 Thermistors in the vicinity of the project

Thermistor cables have been installed to monitor natural ground temperatures in the vicinity of the Project. Data are presented in Appendix B along with plan views of thermistor installation locations. Several of these thermistors have stopped working over the last several years, mainly due to damage as construction of mine facilities expands into the areas where these thermistors have been installed. Readings taken in 2018 in the remaining operational thermistors are generally consistent with previous trends. There were some erroneous readings that have been removed from the plots for GT09-07, GT09-08, GT11-02, GT14-03, and GT14-27. These thermistors showed large jumps in temperature for one set of readings, which then returned to be in line with previous temperatures when they were read the next month. Most of the erroneous readings were on 6 September 2018. Thermistor GT14-03 also had erroneous readings on 19 June 2018 and GT14-27 had erroneous readings on 25 May 2018 and was then reported to be damaged.

Priorities and frequencies for reading these thermistors are summarized in AEM (2015c) and are based on the development sequence for the mine. Thermistors located in close proximity to the process plant and other mine infrastructure have the highest priority and are read more often. Thermistors located in the Tiriganiaq open pit area are given the next priority. The thermistors installed to monitor the deep permafrost are given the lowest priority as the conditions within the deep permafrost do not fluctuate seasonally, so fewer readings are required.

4.1.2 Thermistors in the P-area

DP1B thermistor (DP1B-1 and DP1B-2) data shows a maximum depth of temperatures above 0℃ of 2.8m (elevation 68.0 m) recorded on 30 September 2018. The nodes within the dike foundation remained below -1℃ during 2018.

DP2A thermistor (DP2A-1) data shows a maximum depth of temperatures above 0℃ of 3.6 m (66.04 m) recorded on 30 September 2018. The nodes within the dike foundation remained below -1℃ in 2018.

DP3A thermistor data (DP3A-1, DP3A-2, and DP3A-3) shows the maximum depth of temperatures above 0℃ varies between the three instruments. The data indicates that the greatest depth of 0℃ was measured at the central thermistor (DP3A-2 at station 0+150); this thermistor recorded temperatures

greater than 0℃ to its full depth (4.5 m) for four readings during the month of September 2018. Thermistors DP3A-1 (station 0+050) and DP3A-3 (station 0+250) identify a maximum depth of 0℃ measured at 4.4 m (elevation 64.67 m), and 2.7 m (elevation 66.37 m), respectively. The data from DP3-3 on 17 September 2018 is considered erroneous based on the readings collected before and after. The nodes within the dike foundation remained below 0℃ at DP3A-3, but temperatures rose above 0℃ to a depth of approximately 1.4m into the foundation below DP3A-1. Data from thermistor DP3A-2 shows that temperatures above 0℃ extend into the foundation from 19 July to 4 November 2018

In general, all thermistors showed all beads at or below 0℃ by 4 November 2018. The exception is thermistor DP1B-1 in which the last recording provided was for 30 September 2018; node 4 of this thermistor located within the dike fills remained at 1.0℃. This may be an erroneous reading as the nodes within the dike above and below node 4 showed consistent temperatures near 0℃.

4.1.3 Thermistors at D-CP1

The horizontal ground temperature cable plots (Appendix C2) were indicating a warming trend in the base of the key trench in 2017. They cooled over the winter with most of the nodes approaching temperatures near -10 °C in early June 2018. Temperatures measured from early June to late August 2018 showed a warming trend of about 2 to 3 °C, indicating influence of ambient temperatures and/or ponded water within CP1. Winter readings were not collected between January and June 2018 for three of the instruments, HGTC-1, HGTC-3, and HGTC-5. All horizontal ground temperature cable nodes at the base of the key trench have remained frozen based on the data provided. Some of the nodes that are located on the downstream slope of the key trench and along the foundation of the dike below the downstream slope had temperatures that rose above 0 °C, particularly HGTC-5 which has beads that extend below and possibly downstream of the rockfill shell. These nodes have less cover and are therefore more influenced by ambient temperatures Maximum temperatures may not have been reached as of the last readings provided for 1 September 2018.

Vertical ground temperature cable plots (Appendix C2) indicate that the dike and foundation remained below 0 °C after November 2017 throughout the winter until about April/June of 2018. The maximum depth of 0 °C temperature readings ranged from approximately 1.2 m to 2.7 m in the summer and early fall of 2018. The final readings received (1 September 2018) identified the greatest depth of 0 °C temperature readings at 2.7 m observed in VGTC-01, located upstream of the liner and key trench. The maximum depth of 0 °C temperature readings may not have been reached as of the last readings on 1 September 2018. The maximum depth of 0 °C temperature readings in 2017 was equal to the depths measured in 2018 or 0.5 m lower, with the exception of VGTC-05 which had a maximum depth of 0 °C 1.2 m lower than what was measured in 2018. All the vertical thermistors indicate that the foundation and the lower 1 to 2 m of the dike (both upstream and downstream of the liner) remained below 0 °C during the reporting period.

D-CP1 survey monitoring points M-1 to M-6 indicate a range of total vertical displacement between 29 and 40 mm between the baseline survey using the total station on 19 September 2017 to the last reading received for the reporting period on 13 August 2018. The range of total vertical displacement from the last reading in 2017 on 25 October to the last reading received for 2018 on 13 August was 18 to 25 mm. The maximum vertical displacement was observed at survey marker M-6 (station 1+510) and the minimum

vertical displacement was observed at survey marker M-2 (station 1+230). The OMS manual indicates that total vertical settlement less than 120 mm is an acceptable (green) condition.

4.1.4 Thermistors at D-CP5

The horizontal ground temperature cable plots initially indicated a warming trend after installation in the spring 2017. Beginning in January 2018, the data began showing a cooling trend. The cooling trend continued until about April 2018 and then started to warm as ambient temperatures increased. All thermistor nodes within the key trench remained at or below 0 °C throughout the reporting period (April 2017 to September 2018) and ranged from -3 to -10 °C. Maximum temperatures may not have been reached by the last readings on 1 September 2018.

Vertical ground temperature cables VGTC-01 and VGTC-02 are located upstream of the liner and key trench in D-CP5. The data from these instruments indicates that the upstream dike fills were below 0 °C from October 2017 until April 2018. The maximum depth of temperatures above 0 °C extended approximately 3.5 m to near the interface between the base of the dike fills and original ground at VGTC-01 and 3.0 m at VGTC-02. The depth of 0 °C temperatures appeared to be stabilizing in September but may not have reached the maximum depth. In 2017, the maximum depth of 0 °C temperature readings was 4 m at VGTC-01 and 3.5 m at VGTC-02. Up to the last reading on 1 September 2018, the foundation below the dike remained below -1 °C and -2 °C at the location of VGTC-01 and VGTC-02, respectively.

D-CP5 survey monitoring points M-1 and M-2 indicate total vertical displacement of approximately 20 mm between the baseline survey using the total station on 19 September 2017 to the last reading received for the reporting period on 21 July 2018. The range of total vertical displacement from the last reading in 2017 on 25 October to the last reading received for 2018 on 21 July was 9 to 12 mm. M-3 indicated a total vertical displacement of about 40 mm as of 25 October 2017. No additional readings were recorded for M-3 as it was reported as being destroyed. The OMS manual indicates that total settlement of less than 100 mm is an acceptable (green) condition

The 2018 Annual Geotechnical Inspection (Golder Associates Ltd., 2019) in Appendix B presents the complete instrumentation data

g. A summary of maintenance work undertaken as a result of settlement or deformation of dikes and dams; and berms

No maintenance work was undertaken in 2018 on any dikes, dams or berms.

h. The daily, monthly and annual flow volumes of any watercourse diverted during Construction activities

In September 2018, lake B8 and B9 were dewatered during three days for an average of 3,278 m³/day for a total of 9,834m³ which was transferred to CP-1 trough H13 and channel 1.

i. The daily, monthly and annual quantities of Seepage from dikes, dams and other structures in cubic metres.

Four seepages from dikes were visually observed along the dikes, downstream at DCP-1, DCP-5, DP-1 and DP-3 in 2018 and were captured by excavated trenches. The quantity of seepage is estimated from

flowmeter data; water, collected from trenches downstream from DCP-1 and DCP-5 dikes is metered and pumped back respectively to CP-1 and CP-5 while water, collected from trenches downstream from DP1 and DP3 dikes is metered and pumped back into P-Area ponds. The daily , monthly and annual quantities of seepage are provided in Appendix A-3

Table 4.2 Volumes of seepage, pumped from the trenches downstream from DCP1, DCP5, DP-1 and DP-3

	January	February	March	April	May	June	July	August	September	October	November	December	**2018 Total**
Pumped from DCP1, m³	0	0	0	0	0	10,704	533	0	0	0	0	0	**11,237**
Pumped from DCP5, m³	0	0	0	0	0	21,550	0	0	0	0	0	0	**21,550**
Pumped from DP-1, m³	0	0	0	0	0	432	806	8,050	0	0	0	0	**9,288**
Pumped from DP-3, m³	0	0	0	0	0	0	9,856	16,718	18,230	4,378	0	0	**49,182**
Total pumped m³	0	0	0	0	0	32,686	11,195	24,768	18,230	4,378	0	0	**91,257**

4.2 GEOCHEMICAL MONITORING

In accordance with Water License 2AM-MEL1631 Schedule B, Item 6: ***Geochemical monitoring results including:***

a. Operational acid/base accounting and paste pH test work used for waste rock designation (PAG and NPAG rock);

The acid/base accounting and paste pH test work used for waste rock designation is in the report located in Appendix C-1 and summarized below.

b. As-built volumes of waste rock used in construction and sent to the Waste Rock Storage Facilities with estimated balance of acid generation to acid neutralization capacity in a given sample as well as metal toxicity;

All of the waste rock was used for construction in 2018 as the Waste Rock Storage Facilities were not built yet.

c. All monitoring data with respect to geochemical analyses on site and related to roads, quarries, and the All Weather Access Road;

All data (mine site and quarries) can be found in the report located in Appendix C-1.

d. Leaching observations and tests on pit slope and dike exposure;

No leaching observations were found on dike exposure and no pit slope are present on site yet.

e. Any geochemical outcomes or observations that could imply or lead to environmental impact;

No environmental impact implied, as all test are NPAG, and within project predictions for no metal leaching impact.

f. Geochemical data associated with tailings solids, tailings supernatant, cyanide leach residue, and bleed from the cyanide destruction process including an interpretation of the data;

No tailings were produced in 2018.

g. Results related to the road quarries and the All Weather Private Access Road.

All results related to the road quarries and the All Weather Private Access Road can be found in the report located in Appendix C-1.

In 2018 Agnico Eagle conducted geochemical testing on waste rock material from underground development and surface material from approved quarries and eskers. Representative samples of this material were analyzed for Acid Rock Drainage (ARD) and metal leaching at the accredited third-party laboratory (SGS). Geochemical sampling program at Meliadine is comprised of two parts: mine development waste rock and quarry material.

4.2.1 Mine development waste rock

ARD Potential

Neutralization Potential

Neutralization potential (NP) is expected to be primarily provided by calcite and dolomite, with some ankerite (Golder 2014). As a result, carbonate analysis alone would likely be appropriate for determining NP, although both methods were used (i.e. titration and direct carbonate analysis). Complete results are provided in Appendix C-1. Golder (2014) indicated that NP from carbonate analysis (NP-Ca) was the more conservative method to determine buffering capacity of the rock and this was used as input into the ARD calculation. The relationship was checked in 2018, and the relationship generally held, especially at low NP values and therefore the continued used of NP-Ca was considered conservative for estimating ARD potential.

Acid Potential

Project prediction studies indicated that the main sulphide minerals in the waste rock was pyrite, but also included arsenopyrite, lesser pyrrhotite, and chalcopyrite (Golder 2014). As a result, the main consideration for acid potential (AP) is the presence of sulphide minerals at Meliadine.

Project prediction studies were confirmed in 2018 sampling with acid-base accounting testing showing that sulphur is primarily present in the sulphide form. Sulphur ranged from below detection 0.01% to a maximum of 1.6%, with a median of 0.18%.

ARD Assessment

The potential for ARD was assessed using NP-Ca/AP ratios (or neutralization potential ratios, (NPR). AP was calculated from total sulphur. Ratios below 2 were used to indicate potential for ARD (PAG or potentially ARD generating), whereas ratios above 2 indicate low potential for ARD (NPAG).

The classification of all Meliadine waste rock samples from underground since testing began in 2017 are provided in Appendix C-1. As predicted by Golder (2014), the majority of operational muck samples collected to date were NPAG. Samples from 2017 have also been included for ease of comparison to historical results. The one exception was a sedimentary sample with an NPR of 1.8. This sample is not considered a risk as there is excess buffering in all other samples collected and it is only marginally below the NPAG criterion. Given the carbonate mineralogy of the Meliadine samples, the threshold for a sample to produce ARD is likely closer to an NPR of one and this sample is unlikely to produce ARD even without the buffering of any other samples.

Metal Leaching

Metal leaching was predicted by Golder (2014) to be low enough that management of waste rock to inhibit leaching was not required. However, based on project screening studies, arsenic was determined to be the main element of interest and analysis of this element (and all regulated elements) were part of operational monitoring since mining began. A statistical summary for arsenic with complete element composition results is provided in Appendix C-1. To ensure arsenic concentrations were within project predictions, results have been compiled and compared against average and maximum arsenic concentrations reported by Golder (2014). Solid phase arsenic concentrations mainly fall within or below the average concentration, with no samples exceeding the maximum concentration reported by Golder (2014).

4.2.2 Quarry Material

ARD Potential

The potential for ARD from Quarry samples collected in 2018 was assessed by the same approach described above for waste rock, whereby NP was provided by carbonate (NP-Ca) and AP was estimated based on total sulphur. Complete results are provided in Appendix C-1. NP-Ca ranged from 2 to 44 kg $CaCO_3$/t, with a median of 9.2 kg $CaCO_3$/t. Total sulphur ranged from near detection limits of 0.01% to a 0.1%, with a median of 0.02%. These are relatively low sulphur numbers as typically any rock with less than 0.1% sulphur will not generate acidity regardless of the carbonate content as other rock components such as alkaline silicates (e.g. feldspars) can neutralize the small amount of acid produced. The potential for quarry material to produce ARD was based on NPR ratios, but also a sulphur limit of 0.1%, meaning that any samples with 0.1% or less sulphur would be NPAG regardless of the NPR ratio. Based on the two criteria, none of the quarry samples collected were PAG. The 0.1% sulphur criterion affected 4 out of 30 samples.

Metal Leaching

The same approach taken for waste rock was applied to quarry samples in terms of comparing against project prediction studies. All regulated elements were analysed in solid samples and are included in

Appendix C-1. Arsenic concentrations ranged from a minimum of 0.58 mg/kg to a maximum of 58 mg/kg, with a median of 5.3 mg/kg. These values are relatively low compared to waste rock and were within project prediction studies as the maximum value reported by Golder (2010) was 121 mg/kg. A statistical summary of all results since sampling began in 2017 are provided in Appendix C-1.

Based on geochemical characterization results obtained to date for the waste rock and quarry samples, there is low risk for ARD or metal leaching from the materials. Results are within project prediction studies for the project. Sampling will continue in 2019, with results reviewed internally as soon as they are available and provided with the 2019 annual report.

The complete Geochemical report is in Appendix C-1

Table 4.3. Summary of ARD Guidelines used to classify Meliadine Waste

Initial Screening Criteria	ARD Potential
NPR< 1	Likely Acid Generating (PAG)
1 < NPR < 2	Uncertain
2 < NPR	Acid Consuming Non Potentially Acid Generating (NPAG)

4.3 WASTE ROCK VOLUME

In accordance with Water License 2BB-MEL-1424 Part B Item 6c An estimate of the current volume of waste rock and ore stockpiled on site;

Table 4.4. 2018 Excavated volumes (Tonnes)

	Ore	Marginal	Waste	Total
January	0	0	61,771	61,771
February	0	0	58,324	58,324
March	582	0	64,462	65,044
April	578	0	62,153	62,731
May	4,229	2,802	60,386	67,417
June	6,147	6,870	53,761	66,778
July	3,514	2,226	39,587	45,327
August	3,017	1,970	49,303	54,289
September	8,273	9,963	46,520	64,756
October	5,345	9,055	58,321	72,721
November	9,080	1,699	68,970	79,749
December	20,080	4,633	64,510	89,224
TOTAL	**60,846**	**39,216**	**688,069**	**788,132**

4.4 TAILINGS STORAGE FACILITY

4.4.1 Tailings Storage Facility Capacity*

As required by Water License 2AM-MEL1631 Schedule B, Item 7: ***An update on the remaining capacity of the Tailings Storage Facility.***

In 2018, no tailings was sent to the tailings storage facility so the remaining capacity according to further construction is still 10.9Mt as stated in the Mine Waste Management Plan.

4.4.2 Tailings Freezeback and Capping Thickness

As required by Water License 2AM-MEL1631 Schedule B, Item 16: ***A summary of on-going field trials to determine effective capping thickness for the Tailings Storage Facility and Waste Rock Storage Facilities for the purpose of long term environmental protection.***

In 2018 no on-going field trials to determine effective capping thickness for the Tailings Storage Facility and Waste Rock Storage Facilities occurred as production has not started yet.

* TSF- Tailings Storage Facility

SECTION 5. WASTE MANAGEMENT ACTIVITIES

5.1 LANDFILL MONITORING, WASTE ROCK STORAGE FACILITY

As required by Water License 2AM-MEL1631 Schedule B, Item 8*: Summary of quantities and analysis of Seepage and runoff monitoring from the Landfill, Landfarm, Waste Rock Storage Facilities, Borrow pits and Quarries.*

Landfill and Landfarm were commissioned in November 2017. No seepage was observed from either facilities in 2018. Monitoring and inspection will continue on a regular frequency.

The Waste Rock Storage Facility infrastructures approved under water license 2AM-MEL1631 has not been built yet.

No seepage was observed around operating quarries and borrow pits located on site and along the AWAR as per regular inspections completed by the Environment Department.

5.2 GENERAL WASTE DISPOSAL ACTIVITY

As required by Water License 2AM-MEL1631 Schedule B, Item 9: A summary report of all general waste disposal activities including monthly and annual quantities in cubic metres of waste generated and locations of disposal.

All waste, produced at Meliadine, falls into 4 major categories:

1) Hazardous waste;
2) General (dry, non-hazardous) waste;
3) Food waste; and
4) Contaminated soil.

Hazardous waste, such as waste coolant, used oil filters, waste grease, used batteries, sewage sludge etc. is segregated according to material type, stored in sea containers, and shipped south during the sealift season. All hazardous waste on site was shipped by Nunavut Sealink and Supply Inc., to Qikiqtaaluq Environmental Services facility in Quebec, via Port of Bécancour.

In 2018 a total of 3,274 tonnes of hazardous waste was shipped south in 50 sea containers; documentation for the transfer of hazardous waste can be found in Appendix D-1.

General waste, such as glass, concrete, wood and ash was landfilled on-site and off-site. Type A landfill was commissioned in November 2017 with the volume of landfilled waste being estimated through periodic surveys. An estimated 5,868 m³ of waste was placed into Type A landfill during 2018. Monthly volumes are indicated in table 5.1. In September 2018, the landfill was expended to contain an extra 11,000 m³

(landfill stage 2). In 2018, some activities occurred in Landfarm A to remediate the soils. The material was screened, windrowed and nutrient amendment was done. Sampling and follow up will be done in 2019. The recycling wood option with the community is something Agnico Eagle will investigate in the future to lower the amount of material sent to the landfill.

Food waste, including food packaging, was incinerated to avoid landfilling the material, and attracting the wildlife. Produced ash was landfilled. Monthly quantities can be found in table 5.1

Contaminated soil was placed into landfarm A for treatment. Type A landfram was commissioned in November 2017 with an estimated 2,853 m³ of contaminated soil being placed there in 2018 mainly from the clean up of the fuel farm and exploration genset spills that occurred in 2017.

In 2018 a total of 1,676.4 tonnes of material was shipped south for recycling, including scrap metal, waste oil, batteries and electronic waste.

The incinerator approved under Water License 2AM-MEL1631 was commissioned at the end of November 2017; the incinerator test were undertaken in 2018.

Table 5.1. 2018 Volume of waste transferred to the incinerator, landfill and the landfarm

Month	Volume of waste send to incinerator (m³)	Volume of waste send to landfill (m³)	Volume of contaminated soil placed in Landfarm A (m³)
January	378	578	4
February	352.8	578	0
March	352.8	577	0
April	365.4	548	15
May	352.8	548	1,620
June	315	549	300
July	340.2	548	3
August	327.6	548	0
September	315	549	882
October	340.2	282	27.5
November	352.8	281	1
December	340.2	282	1
Total	**4,132.8**	**5,868**	**2,853.5**

5.3 INCINERATOR

As per Water License 2AM-MEL1631 Schedule B, Item 10: ***Report of Incinerator test results including the materials burned and the efficiency of the Incinerator as they relate to water and the deposit of waste into water.***

Agnico Eagle hired Consulair to sample the atmospheric emissions at the outflow of the incinerator. As can be observed in Table 5.2, the applicable standards for dioxins and furans (PCDD/F) were met for all tests, as well as the applicable standard for mercury (Hg). The standards originate from the "Environmental Guideline for the Burning and Incineration of Solid Waste" emitted by the Department of Environment of the Government of Nunavut based on the Canadian Council of Ministers of the Environment (CCME) Canada - Wide Standards for Dioxins and Furans and Mercury Emissions. The complete report can be found in Appendix E-1.

Agnico Eagle also proceeded with incinerator Ash testing. Unfortunately, analyses were requested for acid extractable instead of metals leachate Agnico Eagle followed up with the laboratory to see if re-analysis were available but unfortunately, the samples were disposed by the lab. A sample was taken early February 2019 and the analysis request was modified to ensure proper analyses is performed from now on. The results from this sample were significantly lower than the guideline for industrial waste discharge and are provided in the table 5.3. A sample will be taken every quarter to ensure compliance with the guideline in 2019.

Table 5.2. 2018 Stack Testing Mercury and Dioxine and Furane Results

Applicable Standards		
Contaminants	Test Results	Standards
Mercury (Hg)	0.23 µg / Rm³ @ 11 % v/v O_2	20 µg / Rm³ @ 11 % v/v O_2
Dioxins ans Furans (PCDD/F)	0.042 ng / Rm³ @ 11 % v/v O_2	0.08 ng TEQ / Rm³ @ 11 % v/v O_2

Table 5.3. 2018 Incinerator Ash Monitoring

Parameters	**Units**	2018/02/23	2018/03/17	2018/04/14	2018/05/13	2018/09/15	2018/10/15	**Guideline for Industrial Waste Discharge (mg/L)***	2019/02/10 (results are in mg/L)
Arsenic	mg/g	0.0027	0.007	0.0054	0.0051	0.00016	0.015	2.5	<0.2
Barium	mg/g	0.056	0.051	0.048	0.052	0.012	0.084	100	0.7
Cadmium	mg/g	0.000039	0.00017	0.000052	0.00001	0.000012	0.00004	0.5	<0.05
Chromium	mg/g	0.014	0.02	0.027	0.036	0.0022	0.033	5	3.3
Lead	mg/g	0.0061	0.0078	0.0032	0.0039	0.0013	0.0057	5	<0.1
Selenium	mg/g	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	1	<0.1
Silver	mg/g	0.00014	0.00047	0.0014	0.00031	<0.00002	22	5	<0.01
Vanadium	mg/g	0.0023	0.0041	0.0035	0.0038	0.0034	46	NA	NA
Zinc	mg/g	0.33	0.24	0.33	0.19	0.0051	2500	5	<0.1
Mercury	mg/g	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.1	<0.001

Footnotes: * Government of Nunavut Environmental Guideline for Industrial Waste Discharges (D of SD, 2011).

5.4 ADDITIONAL INFORMATION

As required by Water License 2AM-MEL1631 Schedule B, Item 23: ***Any other details on Water use or Waste Disposal requested by the Board by November 1st of the year being reported.***

And

As required by water license 2BB-MEL-1424 Part B Item 6n: Any other details on water use or waste disposal requested by the Board by November 1 of the year being reported

The Board did not request any additional details on waste disposal in 2018.

SECTION 6. SPILL MANAGEMENT

As per Water License 2AM-MEL1631 Schedule B, Item 11 ***A list and description of all unauthorized discharges including volumes, spill report line identification number and summaries of follow-up action taken.***

And

As required by water license 2BB-MEL-1424 Part B Item 6f: A list of unauthorized discharges and a summary of follow-up actions taken

In 2018, a total of 22 reportable spills including 7 license exceedances (grey shade) occurred at Meliadine compared to 14 in 2017. All spills were reported to the 24-hour spill reporting line as required by the Government of Nunavut's, Environmental Protection Act, paragraph 5.1(a), the conditions under the Nunavut Water Board License 2AM-MEL1631 Water Licence, part H, item 8(b) or the conditions under the Nunavut Water Board License 2BB-MEL1424, Part H, item 4. For all reportable spills, a follow up report was submitted 30 days or less following the event as required under the Nunavut Water Board License 2AM-MEL1631 Water Licence, part H, item 8(c).

All reportable spills/exceedances are summarize in table 6.1. Complete reports and follow up reports can be found in Appendix F-3.

Table 6.1. 2018 Reportable spills or limit exceedances

Date of spill/exceedance	Hazardous Material	Quantity for spills or analyses results for exceedance	Location	Cause of the spill
January 31st, 2018	Sewage	~500L	Lift station	Equipment failure
February 2nd, 2018	Sewage	~120,000L	Retention tank	Human error
February 18th, 2018	Diesel fuel	2,578L	Genset Fuel tank	Human error
May 27th, 2018	TSS	500 mg/L	Itivia area	Freshet
June 3rd, 2018	TSS	420 mg/L	Itivia area	Freshet
June 8th, 2018	Hydraulic oil	N/A	Near Lake B8	Equipment failure
June 10th, 2018	TSS	160 mg/L	Itivia area	Freshet
June 12th, 2018	Sewage	~3,000L	Lift station	Ground thaw
June 17th, 2018	TSS	670 mg/L	Itivia area	Freshet
June 20th, 2018	TSS	260 mg/L	Itivia area	Freshet
July 8th, 2018	Sewage sludge	~200L	Sewage Treatment Plant	Equipment failure
July 11th, 2018	Hydraulic oil	~5L	Itivia area	Equipment failure
July 20th, 2018	Treated sewage	~3000L	Road between explo camp and main camp	Human error
July 23rd, 2018	Treated effluent	4.39 mg/L (Aluminum)	CP-1 discharge (MEL-14)	Assumed to be a laboratory error
August 2nd, 2018	Treated sewage	1600L	Retention tank	Human error
August 19th, 2018	Treated effluent	1430 mg/L (TDS)	CP-1 discharge (MEL-14)	Equipment failure/Human error
August 25th, 2018	Sewage	~200L	Retention tank	Equipment failure

September 20th, 2018	Treated sewage sludge	100L	Old landfarm area	Human error
October 4th, 2018	Diesel fuel	844L	Refueling station	Human error
October 30th, 2018	Sewage	~1000L	Retention tank	Equipment failure
November 17th, 2018	Treated sewage water	100L	Retention tank	Weather
December 11th, 2018	Boiler system water	200L	Main camp area	Equipment failure

A risk assessment for spills has been initiated; AEM has identified and rectified deficiencies related to fuel spills. In areas of higher risk for spills, such as the fuel dispensing system at Itivia, a lined secondary containment was put in place to lower the risk of spills causing an offsite impact. Another example of AEM lowering the risk of exceedances is that all treated effluent from the Exploration camp STP is trucked to CP1 – a containment system. The risk assessment process is ongoing as new systems are commissioned.

AEM has noted that although the number of spills has increased in 2018, the severity has decreased which confirms procedures have improved. In addition, an improved training program has led to an increased understanding of spill reporting and an overall level of improved general awareness with regards to spills and spill reporting. Based on this, it is believed that more spills are being reported on site by employees.

To prevent and ensure all spills are reported internally, spill prevention training was provided to employees in 2018. Training activities include the following:

- All employees and contractors must participate in an induction session online prior to the arrival at the mine site, which includes a training section on spill management (prevention, reporting and cleaning).

- Every employee and contractor who operates a vehicle on site must participate in training on vehicle operation. Spill management is a component of this training session.

- Department toolbox meetings were completed in 2018 regarding environmental situations including spills prevention. The presentation and the attendance sheets can be found in Appendix F-1.

- A mock spill exercise was completed on August 4th, 2018 at the Itivia tank farm. The mock scenario involved a broken fuel line fitting at the onshore receiving manifold during refueling (from offshore ship) at the fuel storage tanks at Itivia. Agnico Eagle's Environmental staff lead the exercise, which included AEM emergency response (ERT) members, Orbit Garant Environmental/health representative, safety, AEM warehouse staff, AEM Site Service/KHTO vice president and AEM community relations personnel. AEM environmental technician documented the spill actions as well as acted as the "Control Room" responder. The exercise was used to gain experience on spill intervention and awareness of spill management gear. Overall, the reaction of participants was satisfactory and lessons learned from the event will ensure a more efficient future response, if needed. Mock scenario complete report can be found in Appendix F-2.

Table 6.2. 2018 Non-reportable spills

Date of spill	Hazardous Material	Quantity (l)	Location	Cause of the spill	Describe immediate corrective actions
January 13, 2018	Engine Oil	10	Industrial Pad	Hose or seal broken	Contaminated snow picked up and disposed of adequately.
January 21, 2018	Anti-Freeze	2	Explo Parking Lot	Mechanical leak	Contaminated snow was removed.
January 22, 2018	Sewage	50	Portal	Shut off valve was left open	Spill was contained and contaminated soil picked up and disposed of appropriately.
February 3, 2018	Hydraulic Oil	8	Esker	Mechanical leak	Spill was contained and contaminated snow picked up and disposed of appropriately.
February 12, 2018	Hydraulic Oil	4	Fuel Farm Tank 32	Mechanical leak	Used absorbent to clean the oil, shoveled the contaminated snow and brought into the landfarm.
February 12, 2018	Hydraulic Oil	4	Fuel Farm Tank 30	Mechanical leak	Used absorbent to clean the oil, shoveled the contaminated snow and brought into the landfarm.
February 21, 2018	Engine Oil	3	Exploration Camp	Mechanical leak	Spill was contained and contaminated snow picked up and disposed of appropriately.
February 21, 2018	Hydraulic Oil	2	Industrial Pad	Mechanical leak	Contaminated snow picked up and disposed of adequately.
March 3, 2018	Steering Fluid	6	Site Roads	Broken Hose	Contaminated snow picked up and disposed of appropriately.
March 4, 2018	Steering Fluid	1	Industrial Pad	Leaking hose	Contaminated snow picked up and disposed of appropriately.
March 6, 2018	Engine Oil	3	AWAR	Engine fail	Contaminated snow picked up and disposed of appropriately.
March 8, 2018	Diesel Exhaust Fluid	3	Warehouse yard	Mechanical leak	spill pads were put in place and the snow picked up and disposed of appropriately.
March 11, 2018	Oil	1	Audit & Knight yard	Frozen hose	They did some modification on the unit so that the issue was resolved.
March 13, 2018	Grey Water	40	Camp	Hose left unsecured	Spill was contained and contaminated soil picked up and disposed of appropriately.

March 14, 2018	Hydraulic Oil	7	Industrial Pad	Hydraulic hose failure	Spill was contained and contaminated soil picked up and disposed of appropriately.
March 26, 2018	Torqueless (non-contaminant)	10	Drill SH:84	Product transfer	Material has been cleaned with a vacuum.
March 30, 2018	Coffee	0	Camp	Coffee poured outside	Contaminated snow picked up and disposed of adequately.
March 31, 2018	Steering Fluid	0	Explo Camp parking lot	Leaking hose	scooped up snow fluid and put in pail and disposed of appropriately.
April 7, 2018	contaminated water with glycol	4	New camp	Radiator blew up	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
April 8, 2018	Waste oil	10	FRONT DOME 2	Leaking hose	They put the spill pad under the equipment ,they fix the problem and move the equipment , they clean all the waste oil and put it in the hazmat.
April 13, 2018	Hydraulic oil	19	Construction Pad	The valve manifold cap seal has blown	Replace the seal and contaminated material picked up and disposed of appropriately.
April 21, 2018	Engine Oil	1	Other	Pump leak	Contaminated snow picked up and disposed of adequately.
April 22, 2018	Hydraulic Oil	10	Industrial Pad	Broken O'ring	Spill was contained and contaminated soil picked up and disposed of appropriately.
April 25, 2018	Hydraulic Oil	2	Maintenance Shop	Mechanical leak	Spill was contained and contaminated soil picked up and disposed of appropriately.
April 26, 2018	Hydraulic Oil	8	Industrial Pad	Broken Hose	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
May 5, 2018	Differential oil gear case	3	Batch plant	Gear case oil leak	Remove contaminated snow and ice put it in 2 x 5 gallons pale and disposed of appropriately.
May 5, 2018	Hydraulic oil leak	1	Dion Parking lot	Leaking hose	We shoveled material into a bucket and brought the contaminated material to the landfarm.
May 6, 2018	Hydraulic Oil	10	South Side of A&K Dome	Mechanical leak	Chipped contaminated ice and put into land farm.
May 12, 2018	Diesel	10	DCP1 Road Side	Fuel Tank leak	Contaminated material picked up and disposed of appropriately.

May 20, 2018	Other - unknown oil type	30	Maintenance Shop	Equipment failure	Contaminated soil picked up and disposed of in the landfarm.
May 22, 2018	Diesel	5	Itivia Area	Mechanical leak	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
May 22, 2018	Hydraulic Oil	1	Orbit Yard - Explo Camp	Broken oil tank	They cleaned the oily sport with matting.
May 27, 2018	Fuel	5	SH:84 Surface Drill 2	Leaking hose	Contaminated material picked up and disposed of appropriately.
May 28, 2018	Waste Oil	60	In front of MSB building	Leaking Tote	Contaminated material picked up and disposed of appropriately.
June 1, 2018	Oil	2	By pass road culvert installation	Leaking hose	1 cu ft of contaminated material was recovered and properly disposed of.
June 6, 2018	Coolant	1	North side of construction office	Mechanical leak	Contaminated soil picked up and disposed of in the landfarm.
June 9, 2018	Diesel Fuel	3	Other	Mechanical leak	Install booms in water puddles- soak up material with rags.
June 14, 2018	Diesel	95	Industrial Pad	Overfilling	Contaminated soil picked up and disposed of in the landfarm.
June 14, 2018	Diesel	25	Industrial Pad	Overfilling	Contaminated soil picked up and disposed of in the landfarm.
June 15, 2018	Diesel	3	Process Plant	Leaking tank	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
June 18, 2018	Diesel Fuel	5	Itivia	Broken seal	Contaminated soil picked up and disposed of in the landfarm.
June 18, 2018	Hydraulic Oil	10	Industrial Pad	Mechanical leak	Contaminated soil picked up and disposed of in the landfarm.
June 30, 2018	Oil	3	Site road	Broken oil pan	Install matting tow equipment to the garage, spill been cleaned.
July 4, 2018	Hydraulic Oil	20	Industrial Pad	Leaking hose	Contained the spill and disposed of absorbent pads.
July 4, 2018	Hydraulic Oil	8	Ouest side portal 2	Hose failure.	Installed a new hose and contaminated material picked up and disposed of appropriately.
July 4, 2018	Hydraulic Oil	10	Hydraulic Oil	Hose failure.	Installed new hose and contaminated material picked up and disposed of appropriately.

July 9, 2018	Gasoline	2	Electrical laydown	Leaking tank	used spill pads to soak up fuel and then removed berm and disposed of soil used for berm to landfarm (~4 m3).
July 11, 2018	Hydraulic Oil	5	Other	Leaking hose	Spill was contained and contaminated soil picked up and disposed of appropriately.
July 17, 2018	Hydraulic	10	375 RP3	leaking hose	Contaminated soil picked up and disposed of in the landfarm.
July 26, 2018	Diesel	1	Industrial Pad	Leaking tank	Spill was contained and contaminated soil picked up and disposed of appropriately.
July 31, 2018	Diesel	20	Itivia Area	leaking tank	Grave was scooped with a loader and was brought to the landfarm.
August 4, 2018	Diesel	5	Industrial Pad	Fuel nozzle issue	Spill was contained and contaminated soil picked up and disposed of appropriately.
August 13, 2018	Hydraulic fluid	58	Entrance 375 West	Broken Hose	Spill was contained and contaminated soil picked up and disposed of appropriately.
August 17, 2018	Hydraulic fluid	40	FW2-425-E	Broken Hose	Spill was contained and contaminated soil picked up and disposed of appropriately.
August 20, 2018	Hydraulic Oil	2	Other	Broken O'ring	Spill was contained and contaminated soil picked up and disposed of appropriately.
August 24, 2018	Transmission oil	15	In front of MSB door	Filter casing failed	pick up oil with dedicated absorbent pads brought to HAZMAT.
August 28, 2018	Diesel	2	Site Roads	Left over in piping	Spill was contained and contaminated soil picked up and disposed of appropriately.
September 21, 2018	Transmission Oil	2	WASTE PAD Portal 1	Leaking hose	used spill kit to clean and contain the spill with another operator.
September 24, 2018	Engine Oil	1	Industrial Pad	Mechanical leak	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
October 4, 2018	Hydraulic Oil	5	Transfer Pad	Mechanical leak	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
October 4, 2018	Diesel	50	Other	Tank overflow	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
October 6, 2018	Engine Oil	60	Industrial Pad	Oil Filter came loose	Spill was contained and contaminated soil picked up and disposed of in the landfarm.

October 7, 2018	Coolant	4	Site Roads	Broken radiator	Spill was contained and contaminated soil picked up and disposed of appropriately.
October 24, 2018	Hydraulic Oil	30	Industrial Pad	Broken Hose	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
October 24, 2018	Antifreeze	10	In front of MSB	Mechanical leak	Spill was contained and contaminated soil picked up and disposed of appropriately.
October 25, 2018	Other	1	Ore Storage	Leaking hose	Spill was contained and contaminated soil picked up and disposed of appropriately.
October 29, 2018	Diesel	40	Paste Plant Bore Hole	Fuel transfer	Spill was contained and contaminated soil picked up and disposed of appropriately.
November 2, 2018	Windshield washer fluid	1	Site Roads	tank overflow	Contaminated snow picked up and disposed of adequately.
November 9, 2018	Antifreeze	3	parking area warehouse office Itivia Site	Mechanical leak	Warehouse clerk removed contaminated snow into drum.
November 16, 2018	Diesel	50	Gas boy	Fuel cap improperly screwed	Spill was contained and contaminated soil picked up and disposed of appropriately.
November 17, 2018	Diesel	25	Tiriganiaq Esker	Frozen trigger valve on nozzle	Spill was contained and contaminated soil picked up and disposed of in the landfarm.
November 19, 2018	Coolant	11	In front of MSB door #5	Coolant leaked from the radiator	Picked up the coolant with dedicated absorbent pads.
December 6, 2018	0w/40	12	M182506	Cracked Hydraulic Cooler	Absorbent pads were put down and contaminated snow picked up and disposed of appropriately.
December 7, 2018	0W/40	10	M182506	Hydraulic hose connection failed	Hose was changed. Material picked up and disposed of properly.
December 15, 2018	Diesel	40	Vent Raise	Frozen trigger valve on nozzle	Contaminated snow picked up and disposed of adequately.
December 28, 2018	Waste Oil	5	Explo Laydown	Leaking tote	Spill was contained and contaminated soil picked up and disposed of in the landfarm,
December 31, 2018	Hydraulic oil	20	Batch Plant	Loose hydraulic hose	Spill was contained and contaminated soil picked up and disposed of in the landfarm.

SECTION 7. MONITORING

As required by Water License 2AM-MEL1631 Schedule B, Item 14:
The results of monitoring related to the Environmental Management and Protection including:

a. Aquatic Effects Monitoring Program;

Refer to section 7.1, all results can be found in Appendix G-1.

b. Metal and Diamond Mining Effluent Regulation (MDMER) Monitoring;

Refer to section 7.2, all results can be found in Appendices H-1 and H-2.

c. Mine site Water quality monitoring, including groundwater monitoring; and

Refer to section 7.3, all results can be found in Appendix H-3.

d. Visual AWAR Water quality monitoring

Refer to section 7.4.

and

As required by Water License 2BB-MEL-1424 Part B Item 6d: ***Tabular summary of all data generated under the Monitoring Program,***

Sampling is no longer required from the water Licence 2BB-MEL-1424, explanation is provided in section 7.3.1.

7.1 AQUATIC ECOSYSTEM MONITORING PROGRAM (AEMP)

Volume 7 of the FEIS for the Meliadine Gold Project (Mine) predicted inputs of nutrients, metals, and major ions to Meliadine and Peninsula Lakes. It was predicted that these inputs would result in minor changes to water and sediment quality in Meliadine Lake, and that any corresponding effects on fish and fish habitat would be negligible (Agnico Eagle 2014). The component sections of the annual AEMP report are designed to characterize changes in measures related to contaminant and nutrient input, and related responses in phytoplankton, benthos, and fish. The purpose of the integrated summary is to synthesize the results for each component to evaluate the overall direction of change to the aquatic ecosystem. The objective of the synthesis is to:

- integrate AEMP findings from all components
- determine the strength of support for each impact hypothesis and effects on the ecosystem
- support decision making for management responses

The integrated summary is part of the overall objective of the AEMP to assess potential mine-related effects on the aquatic ecosystem and to meet regulatory requirements outlined in the Type A Water

License (2AM-MEL1631) and MDMER, while also meeting commitments made during the environmental permitting process. The specific objectives of the AEMP are to:

- determine the short- and long-term effects of the Project on the aquatic receiving environment
- evaluate the accuracy of predictions made in the FEIS, including the final significance statements regarding impact to the aquatic ecosystem
- assess the efficacy of planned mitigation incorporated into the Project design
- collect data required to identify the need for potential additional mitigation of Project effects within a management response framework

The 2018 AEMP program consisted of water quality, sediment quality, benthic invertebrate community, and a phytoplankton targeted study in Meliadine Lake, and water quality monitoring in selected peninsula lakes. The 2018 fish health survey was implemented to meet EEM sampling requirements and was not intended to meet the specific requirements of the Mine's AEMP fish health component (Section 10.1). However, the 2018 fish health results are discussed as part of this integrated summary to evaluate potential mine-related effects on biological components. The next AEMP fish health and fish tissue chemistry program is scheduled for 2021.

The results of the 2018 AEMP study in Meliadine Lake and the peninsula lakes (water quality and phytoplankton only) were evaluated in the context of the key questions proposed for each core component in the AEMP Design Plan (Golder 2016). The key questions and a summary of the results for each component are presented in Table 12.2-3 and discussed below. The results of the effluent chemistry and toxicity testing program are also discussed in the context of the results of the AEMP components, where relevant.

7.1.1 Peninsula Lakes Summary and Conclusions

Changes in some water quality parameters over time were observed in Lakes A8, B7, and D7. However, all parameter concentrations were less than their respective water quality guidelines, were within normal ranges, and aligned with FEIS predictions. The water quality dataset for the peninsula lakes for the pre-construction and construction phase was limited, and potential factors accounting for temporal trends were not identified in this report. A phytoplankton targeted study was also conducted in the peninsula Lakes in 2018, with collection of chlorophyll α data. No findings of significance were identified as part of the 2018 phytoplankton study of the peninsula lakes.

7.1.2 Meliadine Lake Summary

Potential mine-related changes in water quality in Meliadine Lake were observed in the Near-field area in 2018 for specific conductivity, TDS, hardness, several major ions, and a number of total metals; concentrations exceeded the upper bound of their respective normal range and increased in the Near-field and relative to reference areas over time. Water Licence exceedances in the effluent were observed for TDS and total aluminum. However, the exceedance of total aluminum WL limit occurred only in one sample, with other effluent samples noticeably lower in concentration, suggesting that the measured

value may be anomalous. In addition, although total aluminum concentrations were higher in the Near-field area, there was no indication of declining concentrations with distance from the diffuser. Concentrations of a few metals in bottom sediments exceeded the upper bound of their respective normal range, but exceedances were marginal and sediment metal concentrations in the Near-field area did not increase relative to the reference areas over time. Concentrations of water quality parameters were less than it's guidelines.

The 2018 AEMP results indicated that the benthic community was not measurably affected by potential Mine-related changes in water or sediment quality in Meliadine Lake. Lower density and BCI values were observed in the Near-field area (relative to pooled reference areas), but values were within the normal range. Therefore, differences among these areas may be attributed to pre-discharge differences in sediment composition and natural spatial variation. Effects on fish health were not observed in 2018, with the exception of an effect on female condition in the Near-field area relative to Reference Area 1. The magnitude of effect on female condition did not exceed the 10% critical effect size and a similar difference was not observed in supporting energy storage endpoints. No other effects on fish health were reported in 2018. The comprehensive AEMP fish health program was not conducted in 2018 as it is scheduled in 20121 and as such an evaluation of fish tissue was not conducted.

Low Action Levels for toxicological impairment or nutrient enrichment were not triggered by the 2018 AEMP results.

7.1.3 Meliadine Lake Conclusions

The results of the water quality monitoring program suggest a Mine-related effect on water quality in the Near-field and Mid-field areas. Baseline (pre-2015) and pre-construction and construction phase (2015 to 2017) water quality data were evaluated as part of the normal range screening (Appendix 6B). The assessment indicated a change in major ion concentrations in the Near-field area, and a potential change in the Mid-field area compared to the 2015 to 2017 data, relative to pre-2015 data collected periodically between 1995 and 2013 in Meliadine Lake. This evaluation, in combination with the qualitative temporal analysis conducted as part of the 2018 AEMP water quality program (Section 6.4.5), suggest a potential pre-construction effect on water quality, as well as a potential effect on water quality for selected parameters during treated mine effluent discharge in 2018. However, the changes in water quality in Meliadine Lake were within the conditions predicted by FEIS. Mine-related effects on sediment quality were not observed in 2018.

Observed changes in key water quality parameters in 2018 did not translate into effects in the biological components in 2018, with respect to major ions and total metals. However, the nutrient enrichment effect observed in prior AEMP monitoring years continued to be observed in some biological components in 2018. A phytoplankton targeted study was conducted as part of the 2018 AEMP monitoring program; this program is not a formal component under the AEMP Design Plan (Golder 2016) but was planned as a targeted study prior to 2019 to evaluate the usefulness of plankton monitoring for future monitoring. Higher chlorophyll α concentrations and phytoplankton biomass, and unique phytoplankton community structure were observed in the Near-field area (relative to Mid-field and reference areas), indicating potential nutrient enrichment originating from the exploration camp STP discharge. Chlorophyll α and phytoplankton biomass were within the ranges observed during the pre-construction phase of the Mine,

suggesting that nutrient enrichment may have begun prior to the discharge of treated mine effluent from MEL-14.
Mine-related effects on the benthic invertebrate community were not observed in 2018. However in 2016, mean density fell outside of the upper bound of the normal range in the Near-field area, potentially due to the influence of exploration camp STP discharge. Total phosphorus loadings approximately doubled in sewage effluent in 2016 (corresponding to an increase in Mine population), and held steady in 2017, prior to declining in 2018 (Section 2.6.2). Total Phosphorus (TP) loadings did not correspond to observed spatial or temporal TP water quality trends in the Near-field area but median TP concentrations were slightly elevated in 2016 and 2017, relative to 2015 and 2018. An effect on female condition factor observed during the fish health program also aligns with potential nutrient enrichment in the Near-field area.

Overall, nutrient enrichment in Meliadine Lake may have begun in 2016 with expansion of the Mine population and increased STP nutrient loading into the lake. Effects observed in phytoplankton, benthos and fish biological components are consistent with mild nutrient enrichment. Although effects in benthos were not observed in 2018, effects on phytoplankton were evident in the Near-field area despite a reduction in sewage TP loadings; TP loadings in 2018 were lower relative to 2016/2017 loadings and relative to baseline (i.e., 2013 and 2015). Additionally in 2018, a stimulatory effect on freshwater algae growth (*Pseudokirchneriella subcapitata*) was observed during sublethal toxicity testing with effluent; this further supports the potential for nutrient enrichment in Meliadine Lake as a result of Mine effluent discharge. Lastly, increased major ion and some total metal concentrations in lake water in the Near-field area were observed, and are indicative of a Mine-related effect.

Similar to nutrient enrichment, major ion concentrations and increases in selected total metal concentrations were observed in the Near-field area during pre-construction and continued to increase during the construction phase. It is likely that the exploration camp STP discharge contributed to increases in these parameters. However, concentrations are within the range of FEIS predictions and have not translated into increased concentrations in the sediment, or effects on biological components. Future AEMP monitoring programs will continue to monitor for spatial and temporal trends.
The complete AEMP/EEM cycle 1 report can be found in Appendix G-1.

7.2 MDMER AND EEM SAMPLING

This section relates to the monitoring programs conducted under the Metal and Diamond Mining Effluent Regulations (MDMER) and its Environmental Effects Monitoring (EEM) Studies. Reporting requirements for MDMER have been submitted directly to Environment and Climate Change Canada; results are presented herein to comply with the NWB Type A Water License A list of the sampling location GPS coordinates can be found in table 7.1. Certificates of Analysis for EEM are included in Appendix H1.

Table 7.1 MDMER and EEM GPS coordinates

Station ID	GPS coordinates
MEL-14 (Effluent characterization)	63˚2'15.5"N 92˚13'06.3"W
MEL-13 (Water Quality Monitoring Exposure Area)	63˚01'44.6"N 92˚09'14.6"W
MEL-03-01 (Water Quality Monitoring Reference Area)	63˚06'52.2"N 92˚20'23.6"W

Discharge of treated effluent from CP-1 to Meliadine Lake started June 21st and ended September 3rd 2018. A total of 642,521 m^3 of water was discharged. As requested in Schedule 6 of the Metal and Diamond Mining Effluent Regulations, monthly mean concentrations, pH range and volume of effluent (generated) can be found in Appendix H-2. Monitoring results for MDMER discharge are in the table 7.2 below. No exceedance occurred in 2018 for the MDMER and EEM sampling

Table 7.2 2018 Effluent characterization results

		As	Cu	Cn	Pb	Ni	Zn	TSS	Ra 226	pH
Date	units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
	Limits for grab samples	1.00	0.60	2.00	0.40	1.00	1.00	30	1.11	
24/06		0.00205	0.00225	<0.0005	0.0003	0.0031	0.0075	5	<0.005	7.59
01/07		0.00110	0.00129	<0.0005	<0.0002	0.0025	0.0054	10	<0.005	7.11
10/07		0.00117	0.00139	<0.0005	<0.0002	0.0025	0.0055	5	<0.005	7.51
15/07		0.00129	0.00130	<0.0005	<0.0002	0.0022	<0.005	9	<0.005	7.32
23/07		0.00178	0.00207	<0.0005	<0.0002	0.0025	0.0086	21	0.007	7.34
29/07		0.00185	0.00104	<0.0005	<0.0002	0.0023	<0.005	8	<0.005	7.00
05/08		0.00210	0.00112	<0.0005	<0.0002	0.0028	<0.005	8	<0.005	7.26
13/08		0.00222	0.00850	<0.0005	0.00022	0.003	0.0085	10	<0.005	7.37
19/08		0.00295	0.00099	<0.0005	<0.0002	0.0034	0.0067	11	0.008	7.18
26/08		0.00028	<0.0005	<0.0005	<0.0002	<0.001	<0.005	1	<0.005	6.80
03/09		0.00237	0.00062	<0.0005	<0.0002	0.0027	<0.005	14	<0.005	7.08

Table 7.3 Monthly Mean Concentrations, pH Range and Volume of Effluent (Generated)

Month	As (mg/L)	Cu (mg/L)	Cn (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	TSS (mg/L)	Ra 226 (Bq/L)
Limits	0.50	0.30	1.00	0.20	0.50	0.50	15.00	0.37
January	ND	ND	ND	ND	ND	ND	ND	ND
February	ND	ND	ND	ND	ND	ND	ND	ND
March	ND	ND	ND	ND	ND	ND	ND	ND
April	ND	ND	ND	ND	ND	ND	ND	ND
May	ND	ND	ND	ND	ND	ND	ND	ND
June	0.00205	0.00225	0.00025	0.0003	0.0031	0.0075	5	0.0025
July	0.001438	0.001418	0.0025	0.000146	0.0024	0.0049	10.6	0.0034
August	0.001888	0.002715	0.0025	0.00013	0.002425	0.00505	7.375	0.003875
September	0.00237	0.00062	0.0025	0.0001	0.0027	0.0025	14	0.0025
October	ND	ND	ND	ND	ND	ND	ND	ND
November	ND	ND	ND	ND	ND	ND	ND	ND
December	ND	ND	ND	ND	ND	ND	ND	ND

ND: No discharge

7.3 MINE SITE WATER QUALITY

As required by Water License 2AM-MEL Schedule B-13: The results and interpretation of the Monitoring Program in accordance with Part D and Part I and Schedule I.

7.3.1 ***Licensed Water Sampling Stations***

Below is the monitoring stations from water Licence 2AM-MEL1631 and 2BB-MEL-1424. All sampling results can be found in Appendix G-3. For each station a summary is provided and for stations with sufficient data, an interpretation of the data is given. Also, for all stations regulated by MDMER or Licence limits, a graph with critical parameters was added. All monitoring stations results can be found in Appendix H-3.

7.3.1.1 ***MEL-1 Raw water supply intake at Meliadine Lake***

MEL-1 is the raw water supply intake at Meliadine Lake for the exploration camp. No sampling is required only volume as provided in section 4.

7.3.1.2 ***MEL-2 Raw water supply intake at Pump, A8 or other Lakes***

MEL-2 is the raw water supply intake at A8 or other lakes. No sampling is required only volume as provided in section 4.

7.3.1.3 ***MEL-5 Bermed Fuel Containment Facilities***

MEL-5 was the point of discharge for the bermed fuel containment facilities for the exploration camp. It was decommissioned so no sampling is required anymore.

7.3.1.4 ***MEL-6 Landfarm Treatment Facility***

MEL-6 is the effluent from the Landfarm Treatment Facility prior to release. The landfarm is not decommissioned yet but no water was released since 2016 as the water is transferred to the landfarm oil separator system and treated before being discharged in CP-1.

7.3.1.5 ***MEL-7 Effluent from Exploration camp STP***

MEL-7 is the final effluent discharge from the biodisk at the exploration camp. Since November 2017, the treated water from the exploration STP is trucked to CP-1. Monitoring for this station still occurs to ensure the efficiency of the treatment system but no discharge occurs anymore directly to Meliadine Lake.

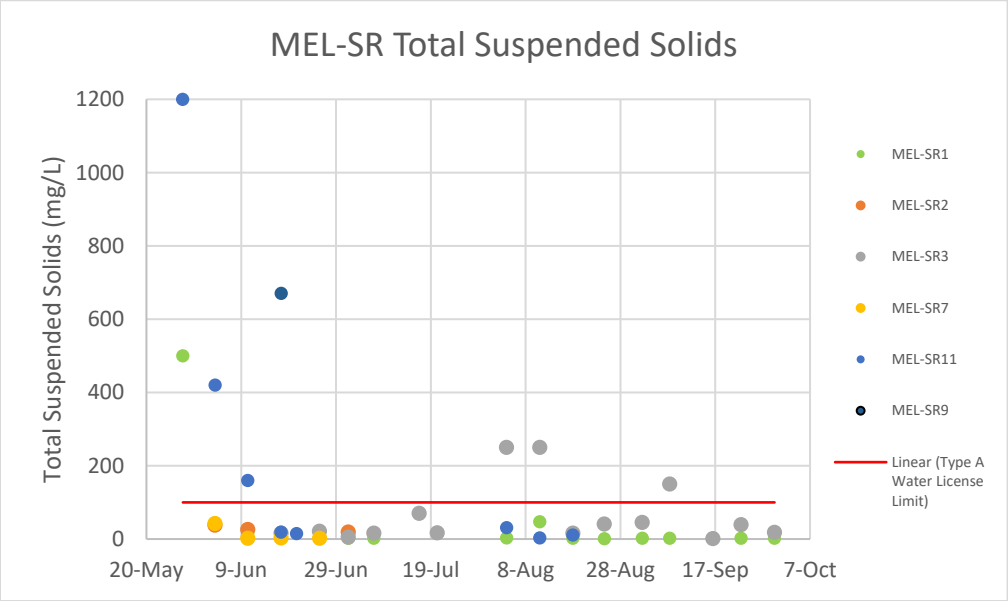
7.3.1.6 ***MEL-8 Point of discharge or runoff from the Non-Hazardous Waste Landfill***

MEL-8 was the point of discharge from the non-hazardous waste landfill for the exploration camp. It was decommissioned so no sampling is required anymore.

7.3.1.7 ***MEL-SR-1-TBD***

MEL-SR-TBD are surface runoff – runoff downstream of construction areas at Meliadine Site and Itivia Site, seeps in contact with roads, earthworks and any runoff and/or discharge from borrow pits and quarries. These are regulated monitoring stations in the water licence which includes discharge limits that must be achieved to maintain compliance.

Figure 7.1 TSS results for MEL-SR samples



In 2018, a few TSS exceedances occurred at the Itivia laydown area during freshet. A sediment trap has been built to minimize additional TSS flow and this area will be further investigated in 2019. Silt fences and straw logs have also been installed upstream and downstream of the site and were inspected weekly. A third party consultant has inspected the area to recommend improvements to mitigate and reduce erosion and sediment control. The snow management plan has been revised and some work is planned to improve the TSS management in 2019.

However, it's important to note that sampling also occurred upstream of Agnico Eagle Lease showing the upstream contribution of TSS prior to arriving on Agnico Eagle site exceeded licence requirements. It is believed that the majority of the TSS that was observed downstream of Agnico Eagle Lease was a result of sediment generated upstream of the lease boundary. Monitoring of the area will be done during freshet and a reassessment will be done to see if other stakeholders need to be included in this project. Samples were also taken from the shore in the bay (MEL-SR-03) as a background sample to allow for comparison in between the surface runoff and the bay itself.

7.3.1.8 ***MEL-11 Water Intake***

MEL-11 is the water intake from Meliadine Lake. It is an aquatic monitoring location which is subject to compliance assessment to confirm that sampling is carried out using established protocols, including quality assurance/quality control provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

7.3.1.9 ***MEL-12 Water treatment plant (Pre-treatment)***

MEL-12 is sampled in the effluent water treatment plant (EWTP) (pre-treatment) sampling port with the water coming from CP1. The sample is not taken directly in the pond. It is a verification monitoring program location which is to be carried out for operational and management purposes by the Licensee.

Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.1 ***MEL-03-01 Reference area in Meliadine Lake (MDMER reference station)***

MEL-03-01 is sampled in Meliadine Lake. It is also the MDMER reference station for final discharge. It is a general aquatic monitoring location which is subject to compliance assessment to confirm sampling is carried out using established protocols, including quality assurance/quality control provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB. Figure 7.2 to 7.4 below show the analytical trends of interest for MEL-03-01 for 2018

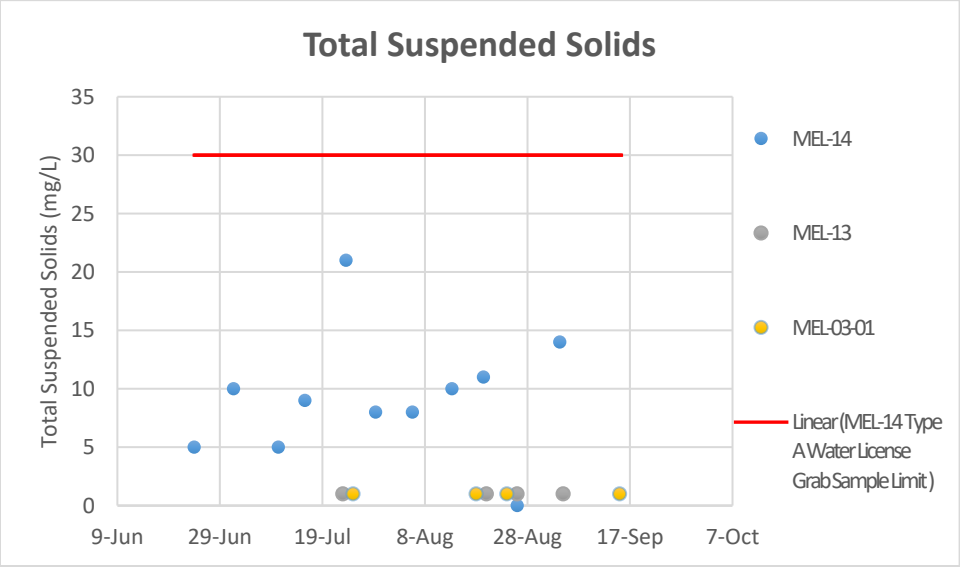
7.3.1.2 ***MEL-13 Mixing Zone in Meliadine Lake (MDMER exposure station)***

MEL-13 is sampled in the mixing zone in Meliadine Lake. It is also the MDMER exposure station for final discharge. It is a general aquatic monitoring location which is subject to compliance assessment to confirm sampling is carried out using established protocols, including quality assurance/quality control provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB. Figure 7.2 to 7.4 below show the analytical trends of interest for MEL-13 for 2018

7.3.1.3 ***MEL-14 Water treatment plant (Post-treatment)***

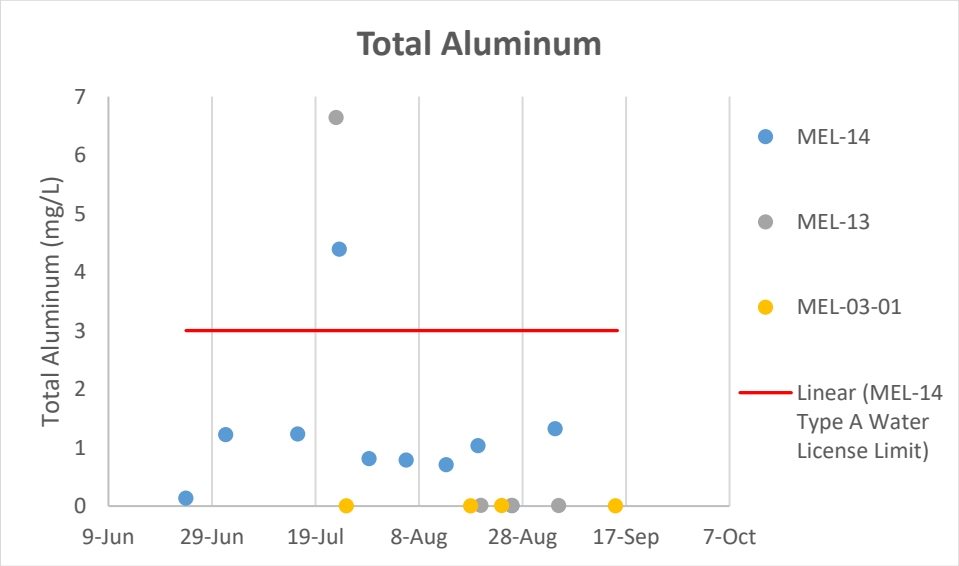
MEL-14 water originates from CP-1 and is sampled in the effluent water treatment plant (EWTP) (post-treatment) prior to the water being discharged to the environment. It is a regulated monitoring station in the water licence and in the MDMER regulation. It includes discharge limits that must be achieved to maintain compliance. Figure 7.2 to 7.4 below show the analytical trends of interest for MEL-14 for 2018.

Figure 7.2 TSS results for MEL-03-01, MEL-13 and MEL-14 samples



In 2018, the TSS results for MEL-14 were stable with no significant increase or decrease of concentration. The yearly average concentration was 9.27 mg/L and the highest result was 21 mg/L. No exceedance occurred in 2018 for this parameter with all daily and monthly results within permitted limits. For MEL-13, all TSS results were 1 mg/L and for MEL-03-01, all results were below the detection limit of 1 mg/L.

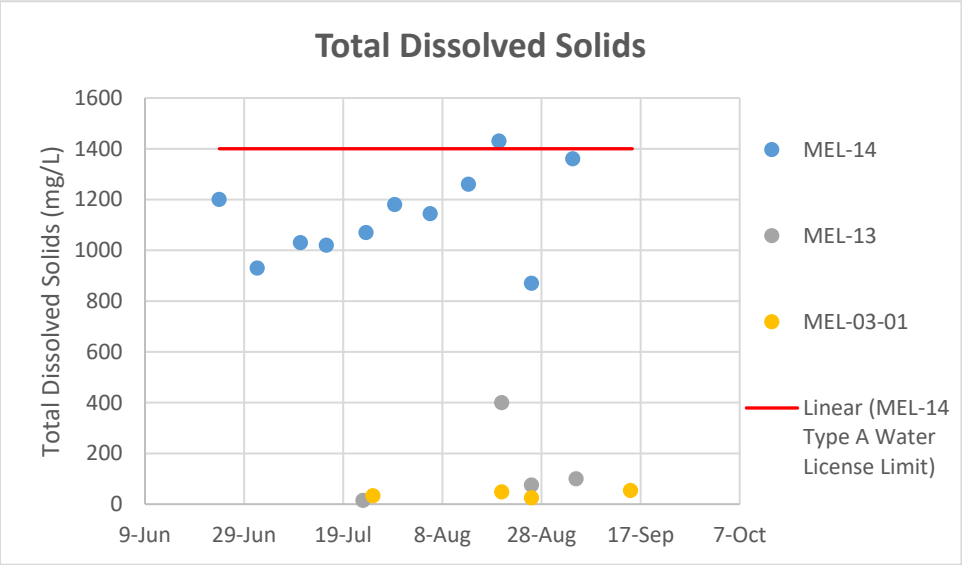
Figure 7.3 Aluminum results for MEL-03-01, MEL-13 and MEL-14 samples



In 2018, the aluminum results for MEL-14 were stable with no significant increase or decrease of concentration except for one sample. On July 23rd, a sample from the final discharge point (MEL-14) was collected and sent for analysis. The results were received and the total Aluminum concentration exceeded those outlined in the 2AM-MEL-1631 Type A Water Licence Part F Item 3. The result was 4.39 mg/L, which exceeds the Licence limit of 3 mg/L. The result for dissolved aluminum for the same sample is 0.0994 mg/L. The exceedance for final effluent discharge for total aluminum concentration is assumed to be a laboratory error. When the exceeded criteria was observed, the lab was requested to re-analyze the sample to determine if the reported concentration was a result of laboratory error; however, the sample had been disposed of and re-analysis was not possible at the date of the request. A uncharacteristically high result (6.64 mg/L) for the same parameter was obtain the same day for a sample taken in Meliadine Lake (MEL-13) which is more than 600 times the average of the other sampling results for the same location.

The average concentration for aluminum at MEL-14 in 2018 was 1.1 mg/L and the highest result was 4.39 mg/L. The average concentration for aluminum at MEL-13 in 2018 was 1.67 mg/L (due to the uncharacteristically high result of 6.64 mg/L. The average concentration for aluminum at MEL-03-01 in 2018 was 0.004 mg/L and the highest result was 0.007 mg/L

Figure 7.4 TDS results for MEL-03-01, MEL-13 and MEL-14 samples



In 2018, the TDS results for MEL-14 increased progressively during summer as expected. The dry and windy conditions amplified the evaporation process which increased the TDS concentration. The stratification between saline and freshwater likely also affected the TDS concentration as pumping occurred. On August 19th a sample from the final discharge point (MEL-14) was collected and sent for analysis. The results were received and the total dissolve solid (TDS) concentration exceeded those outlined in the 2AM-MEL-1631 Type A Water Licence Part F Item 3. The result was 1430 mg/L, which exceeds the Licence limit of 1400 mg/L. A duplicate was taken that day and the result was 1400 mg/L.

The average concentration for TDS at MEL-14 in 2018 was 1135 mg/L and the highest result was 1430 mg/L. For MEL-13 the average concentration in 2018 was 148 mg/L and the highest result was 400 mg/L. The average concentration at MEL-03-01 in 2018 was 40 mg/L and the highest result was 54 mg/L.

All exceedances mentioned above were reported to the 24-hour spill reporting line as required by the Government of Nunavut's, Environmental Protection Act, paragraph 5.1(a), the conditions under the Nunavut Water Board License 2AM-MEL1631 Water Licence, part H, item 8(b).

The Environment Department at Meliadine implemented in 2018 a data management system for laboratory results. The system should mitigate delays with reporting criteria exceedances and improve the timing for requests that may be made if re-analysis is required at the laboratory.

7.3.1.4 ***MEL-15 Local Lake E3***

MEL-15 is sampled in lake E3 located west of the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.5 ***MEL-16 Local Lake G2***

MEL-16 is sampled in lake G2 located north west from the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.6 ***MEL-17 Local Pond H1***

MEL-17 is sampled in lake H1 located east from the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.7 ***MEL-18 Local Lake B5***

MEL-18 is sampled in lake B5 located south-west from the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.8 ***MEL-19 CP-2***

MEL-19 is sampled in CP-2 (collection pond) which is the collection of the natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee. No water accumulate in this area in 2018, therefor no sample was taken.

7.3.1.9 ***MEL-20 CP-3***

MEL-20 is sampled in lake B28 and will be sampled in CP-3 (collection pond) once construction is completed. CP-3 will be the collection of drainage from dry stacked tailings located west of the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.10 ***MEL-21 CP-4***

MEL-21 is sampled in lake B8 and will be sampled in CP-4 (collection pond) once construction is completed. CP-4 will consist of the drainage collection from the Waste Rock Storage Facility (WRSF1) located west of the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.11 ***MEL-22 CP-5***

MEL-22 is sampled in CP-5 (collection pond) which consists of the drainage from WRSF1 and WRSF 2. CP-5 previously was lake A54 and is located south of the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.12 ***MEL-23 CP-6***

MEL-23 is sampled in lake H19 and will be sampled in CP-6 (collection pond) once construction is completed. CP-6 will consist of the drainage from WRSF3 located east of the mine site. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

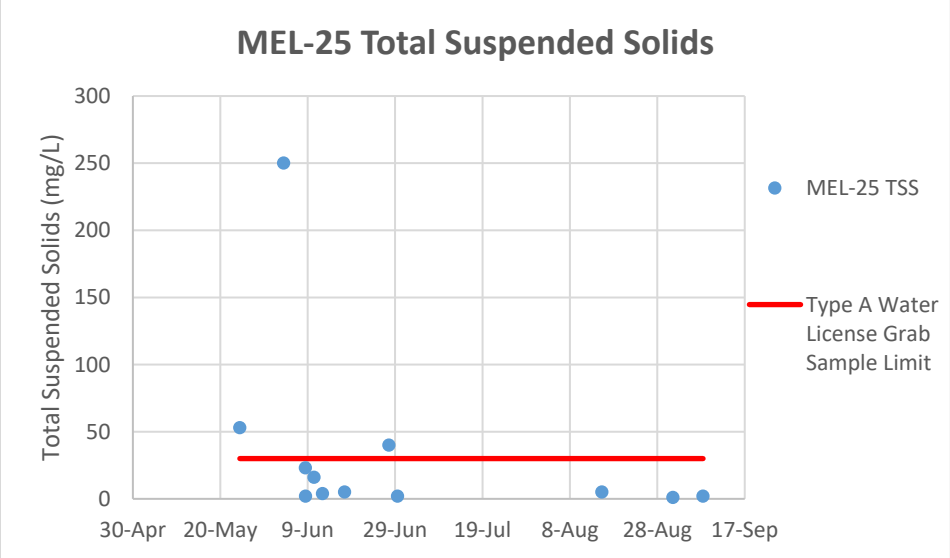
7.3.1.13 ***MEL-24 Seepage from the landfill***

MEL-24 is seepage from the landfill between the landfill and Pond H3. The natural depression at this location can also drain water not related to seepage from the landfill. It is a verification monitoring location which is sampled for operational and management purposes by Licensee. Monitoring parameters may vary between locations. Monitoring parameters and locations are internal for Licensee.

7.3.1.14 ***MEL-25 Secondary Containment at the Itivia Fuel Storage Facility***

MEL-25 is sampled from the secondary containment area at the Itivia Site Fuel Storage and Containment Facility. It is a regulated monitoring station in the water licence. It includes discharge limits that must be achieved to maintain compliance.

Figure 7.5 TSS results for MEL-25 samples



Two notices for discharge from MEL-25 were sent in 2018 to the appropriate agencies. The first notice was sent on May 24th pending water quality. Due to high TSS results, the discharge was postponed until the maximum average concentration respected for the License requirement was achieved. A total of 2,205 m³ was discharged using a filtration bag for TSS removal. Another notice was sent on August 20th once again pending on water quality. All results met license criteria due to an internal misunderstanding, the water was trucked and discharge in CP-1.

7.3.2 Underground sampling

Water samples collected in 2018 in the underground mine include those taken from DDHs intersecting the fractured rock groundwater network and sumps.

DDH water samples were collected and analyzed for a full suite of water quality parameters to provide a representation of the background “non-contact” groundwater quality, which is the primary contributor of water received by the underground mine. Additional to these samples was the collection of 6 monthly water samples from unique DDHs located in lower elevation zones of the mine within the cryopeg. These samples were analyzed for fish toxicity, measuring LC50 of Gasterosteus aculeatus (Threespine stickleback).

Sump water samples were collected monthly for water quality analysis from level 75 and level 125 of the underground mine. These samples represent a combination of the contact water generated by the underground mine, including groundwater, make-up water, drilling water, and freshet inflow.

Underground mine sampling is a verification monitoring program carried out for operational and management purposes by the Licensee.

The Saline Water Treatment Plant (SWTP) treats water from the underground and was commissioned during the 4th quarter of 2018. Monitoring stations (SWTP-IN and SWTP-OUT) exist at the inlet and outlet to the SWTP. This is a verification monitoring program carried out for operational and management purposes by the Licensee.

7.3.3 QAQC Sampling

The objective of quality assurance and quality control (QA/QC) is to assure that the chemical data collected are representative of the material being sampled, are of known quality, are properly documented, and are scientifically defensible. Data quality was assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of accredited laboratories, and by staffing the program with experienced technicians.

All analytical chemistry analyses are performed by an accredited laboratory. In most cases, these analyses will be performed by Maxxam, an accredited facility located in Ottawa, Ontario. Agnico Eagle may also require the services of other laboratories, such as Maxxam in Edmonton, AB, SGS in Lakefield, ON and H2Lab in Val d’Or, QC. All data from these labs undergoes a rigorous internal QA/QC process, including the use of spiked samples and duplicate samples.

All sublethal toxicity tests were performed by Aquatox in Ontario. Testing was conducted as stipulated in the corresponding Environment Canada Biological Test Methods. QA/QC measures implemented by the lab, including the use of reference toxicants, met the acceptable limits.

Field blanks are treated as a normal sample. They are used to identify errors or contamination in sample collection and analysis. Duplicate field water quality samples are collected simultaneously in the field and used to assess sampling variability and sample homogeneity.

- MDMER and EEM monitoring programs consisted of: 3 duplicate samples and 3 field blanks which were collected from a total of 24 samples, representing 12.5% of samples taken;
- STP monitoring program consisted of: 8 duplicate samples and 8 field blanks which were collected from a total of 54 sampling events, representing 14.8% of samples taken; and
- Surface water monitoring programs consisted of: 24 duplicate samples and 11 field blanks which were collected during the year.

Analytical precision is a measurement of the variability associated with duplicate analyses of the same sample in the laboratory. Duplicate results were assessed using the relative percent difference (RPD) between measurements. The equation used to calculate RPD is:

RPD = (A-B)/ ((A+B)/2)*100; where: A = field sample; B = duplicate sample.

Large variations in RPD values are often observed between duplicate samples when the concentrations of analytes are low and approaching the method detection limit. Consequently, a RPD of 20% for concentrations of field and duplicates samples that both exceed 10x the method detection limit (MDL) is considered notable. The analytical precision of one QA/QC sampling event is characterized as:

- High, when less than 10% of the parameters have variations that are notable;
- Medium, when 10 to 30% of the parameters have variations that are notable;
- Low, when more than 30% of the parameters have variations that are notable.

For field measurements, the following equipment is used:

- Hach Meter (turbidity);
- Oakton PCS35 Meter (pH and conductivity); and
- Eureka Mantha 20+ Meter (pH, dissolved oxygen, temperature and conductivity).

QA/QC methods and results for specific field programs are discussed separately in their respective reports.

7.4 SEEPAGE

As required by Water License 2AM-MEL1631 Schedule B, Item 8*: Summary of quantities and analysis of Seepage and runoff monitoring from the Landfill, Landfarm, Waste Rock Storage Facilities, Borrow pits and Quarries.

In 2018, no seepage was observed from the landfill or the landfarm. The Tailing Storage Facility and the Waste Rock Storage Facility are not built yet and no seepage was observed from borrow pits or quarries

7.5 VISUAL AWAR WATER QUALITY MONITORING

Pre-freshet and freshet inspections were conducted at crossings along the AWAR and the Bypass road at Itivia in 2018. These inspections are conducted to document potential hazards like blockages impeding free flow of water resulting in ponding, washing out of roads and unintentional rerouting of flow, detecting the presence/absence of flow, erosional concerns and turbidity plumes. The clearing of the Char River, Meliadine River and M5 crossing started on May 4th. No issues were observed during the inspections conducted on May 17th, 27th and June 1st and 3rd, 2018. Starting June 6th, some straw logs were installed on the downstream side of the road at km 24 and 28 to prevent TSS migration. Inspections occurred daily from June 9th to June 14th and straw logs were added at km 19 and 22. A sample was taken on June 10th to monitor the water near the Itivia by-pass road. The TSS result was very low, 2 mg/L.

Weekly inspections were also conducted along the AWAR throughout the year. During the freshet and open water season, any visual turbidity plumes or erosion along the AWAR, culverts or bridges are documented by Environmental Technicians. No issue was raised in 2018

7.6 BLAST MONITORING

During the 2017 surface blasting campaign, the mine utilized an Instantel Minimate Pro4 seismograph to record blast vibration. This device was tested in 2018, but due to a technical issue, the device was required to be sent south for repair and calibration. Agnico Eagle then rented two (2) Nomis Mini Supergraph II from Geophysique GPR International Inc. which arrived on site in December 2018. Hence no blast monitoring was able to be completed during 2018 as all blasts were already performed. In 2018, 13 surface blasts occurred (5 at Itivia and 8 at mine site). At Itivia's quarry, blast size were conducted according to the seismograph monitoring conducted in 2017 where no exceedance were recorded. All blast conducted in 2018 used less powder and the blast were smaller in size. For the mine site blast, monitoring started in January 2019. As of March 2019, the average peak particle velocity (mm/s) for Meliadine lake is 3.2, for Lake B5 1.8 and for Lake B7 2.0. These readings are taken from the shore closest to the blast for each lake which is very conservative regarding the exact peak particle velocity in a spawning bed. The average pressure (kPa) for Meliadine lake is 4.14, for Lake B5 2.41 and for Lake B7 2.60. Monitoring for surface and underground blast will continue in 2019 and a monitoring report will be included in the 2019 annual report

7.7 NOISE MONITORING

The objective of the noise monitoring program at Meliadine is to measure noise levels at four previously determined monitoring locations over at least two 24 h periods. In 2018 Agnico Eagle conducted two successful rounds of monitoring for stations NPOR006 and NPOR017, and one successful round of monitoring for NPOR008 and NPOR014. However, high winds (both measured and audible) and frequent bird calls in close proximity to the noise meter substantially reduced the quality of the data for comparison to FEIS predictions.

A summary of the available noise monitoring results is provided in Table 7.3. For station NPOR006 and NPOR017, insufficient valid data was available after initial and/or secondary filtering to calculate 24-h or night-time L_{eq} values. For station NPOR008, only a night-time L_{eq} could be calculated after initial filtering, and the data exceeded the design target of 40 dBA. However, sound recordings were dominated by wind and wave action, and no human-associated activities were audible, so a secondary filtering was not

performed. The calculated L_{eq} value is not considered comparable to FEIS predictions or design targets, which assume limited background noise. Similarly for NPOR014, the measured 24-h and night-time L_{eq} values exceeded noise monitoring criteria and the design target, respectively, but no mine-related activity is ongoing in this area, and sound recordings were dominated by wind, waves, and near-continuous bird calls for significant portions of the dataset.

Table 7.4 Summary of noise monitoring results in 2018

Location	Monitoring Start	Monitoring End	Noise Monitoring Criterion - $L_{eq(24\ h)}$ (dBA)	FEIS Prediction - $L_{eq(24\ h)}$ (dBA)	Measured $L_{eq(24\ h)}$ (dBA)	Measured $L_{eq\ (nighttime)}$ (dBA)
NPOR006	08/22 11:08	08/22 21:44	45	39.8	NA	NA
	09/04 11:38	09/07 16:37	45	39.8	NA	NA
NPOR008	08/28 17:42	08/29 5:53	45	41.7	NA	*64.5**
NPOR014	08/25 16:26	08/28 16:27	45	44.7	*63.5**	*49.9**
NPOR017	08/10 12:07	08/12 23:59	45	43.4	NA	NA
	09/09 10:11	09/09 21:50	45	43.4	NA	NA

"NA" indicates insufficient valid data was available after filtering. *No mine activity is audible at these remote sites, so measured values are assumed representative of baseline; no filtering on the basis of sound recordings was performed.

Overall, a very limited dataset was available for calculation of 24-h and night-time L_{eq} values in 2018. This was generally due to a tendency towards sub-optimal weather conditions, and subsequent filtration of the data. The data collected in 2018 suggests that measured background sound levels in this area may regularly exceed those assumed during the FEIS (35 dBA), likely due to predominant high winds and wave action on the shore of Meliadine Lake. Particular care will be taken in the future to ensure monitoring is conducted when wind speeds are at their lowest, to reduce the significant wind and wave noises contributing to background sounds. Timing monitoring events earlier in the season may also help reduce the frequency of bird calls which were especially dominant in recordings this year, and which consistently contributed to recorded sound peaks. Continued use of a far-field reference station such as NPOR014 will be considered, in order to better define background noise levels in this area.

The following actions were planned for 2018 and responses of Agnico are indicated:

- Additional efforts will be made to conduct monitoring at NPOR006 while the cabin is unoccupied.
    - Attempts were made to fulfill this objective, but the cabin at NPOR006 is regularly occupied and was in use at the time of noise surveys. Agnico will conduct reconnaissance at nearby station NPOR005 (according to the Noise Abatement and Monitoring Plan) in 2019 to determine occupancy rates, and will conduct monitoring at this station if feasible.

The following actions are planned for 2019:

- Noise monitoring surveys will be conducted earlier in the ice-free season when wind speeds and animal interference (bird calls) are minimized.

- Weather data will be reviewed during or immediately following noise monitoring events to estimate the proportion of usable data and the need for supplemental monitoring.
- Reconnaissance and monitoring (if feasible based on occupancy) will be conducted at NPOR005, since high occupancy rates at NPOR006 tend to interfere with assessments of mine-related noise in this location. Monitoring will also be conducted at NPOR006.
- Monitoring will focus on NPOR005, NPOR006, NPOR008 and NPOR017. Since activities at the Discovery Pit are not ongoing, monitoring is not required at NPOR014. However, data will be collected at this station if time and weather conditions permit.

The complete Noise report can be found in Appendix H-4.

7.8 AIR

7.8.1 Air Quality monitoring

Through ambient air quality monitoring program, Agnico Eagle aims to measure airborne particulates, dustfall, and the gaseous compounds (NO_2 and SO_2) using a combination of active and passive sampling methods. In accordance with the Air Quality Monitoring Plan, monitoring in 2018 included analysis of dustfall in seven locations, as well as NO_2 and SO_2 in two locations, over one month averaging periods throughout the year. Active sampling of total suspended particulates (TSP), $PM_{2.5}$, and PM_{10} began in December 2018. Available results for all parameters were compared to regulatory guidelines and Final Environmental Impact Statement (FEIS) predictions, and spatial and temporal trends were assessed.

Dustfall results are compared to Alberta's Ambient Air Quality Guidelines (June, 2016) for recreational and industrial areas, for context. In 2018, 2 of 36 samples exceeded the recreational area guideline (DF-3, 25 m from the All Weather Access Road), but no samples exceeded the industrial area guideline. Results indicate very low rates of dustfall overall, despite elevated traffic compared to FEIS predictions. No quantitative predictions were made for dustfall in the FEIS.

Suspended particulates (TSP, $PM_{2.5}$, and PM_{10}) were analyzed in two locations using Partisol air samplers beginning in December, 2018. All available results were below regulatory guidelines (Government of Nunavut Ambient Air Quality Standards/CCME Canadian Ambient Air Quality Standards /BC Ambient Air Quality Objectives) and were below maximum concentrations predicted in the FEIS.

Calculated annual average concentrations of NO_2 and SO_2 were well below the Government of Nunavut Ambient Air Quality Standards, and were below FEIS maximum predicted values. This was the second full year of monitoring for gaseous compounds, and no clear spatial or temporal trends were observed. As described in the Air Quality Monitoring Plan, a permanent weather station was installed at the Meliadine site, and daily averages for wind speed, direction, temperature, solar radiation, and rainfall are provided.

Since monitoring results in 2018 were within applicable air quality criteria and FEIS predictions, no additional adaptive management measures are planned.

Air quality monitoring discussion for the AWAR is provided in section 10.3. As for onsite air monitoring, during landfill activities such as topping and capping, visual monitoring will occur and if deemed necessary, water will be applied as a mitigation measure for dust. Snowpack survey is planned to be conducted during the 2018-2019 winter. Early 2019, as agreed with a senior engineer from the GN, samples for diesel exhaust particulate underground were completed as an indicator for both acrolein and aldehyde and all samples came back well below the occupational exposure limits. This is a good indication of low concentrations of all other contaminants associated with underground work. Samples will be collected for aldehydes in 2019. Acrolein is very unlikely to be present therefore it is deemed unnecessary to sample for it unless there is some indicator that it may be present in the mine.

The air monitoring full report can be found in Appendix H-5.

7.8.2 Greenhouse Gas Emissions

Estimated greenhouse gas emissions for the Meliadine site as reported to Environment Canada's Greenhouse Gas Emissions Reporting Program in 2018 was 62.05 kt/yr of CO_2e, which is lower than the FEIS maximum predicted emission rate of 304 kt/yr of CO_2e. Estimated GHG emissions from the additional marine operations at Rankin Inlet was approximately 13 kt/yr of CO_2e in 2018 (included in the 2018 total). The estimated greenhouse gas emissions for the Meliadine in 2018 is higher than the value obtained in 2017 (39.48 kt/yr of CO_2e) due to the increased activities on site. This amount is based on the amount of fuel consumed from the project reserves and therefore only project-related traffic is calculated. The amount of fuel oil, diesel, gasoline, explosives and propane are calculated and adjusted with emission factors to transfer in tonnes of CO_2, CH_4 and N_2O. These are combined to give the amount in kt/yr of CO_2e. A Greenhouse Gas Reduction Plan was submitted to the NIRB in 2019 including:

- An estimate of the Project's GHG baseline emissions;
- A description of monitoring measures to be undertaken, including the methods, frequency, parameters, and a description the analysis; and
- A description of reduction initiatives planned and taken, to reduce project-related GHG emissions over the Project lifecycle.

The Greenhouse Gas Reduction Plan can be found in Appendix I-1.

7.8.3 Climate

A permanent weather station was installed at the Meliadine site. The station records monthly data for the average, maximum and minimum temperature, the average and maximum wind speed and the total, daily average and maximum precipitation which can be found in table 7.4.

Table 7.5 2018 Monthly climate data

Date	Temperature Average	Temperature Max	Temperature Min	Wind Speed Average	Wind Speed Max	Total Precipitation	Daily Average Precipitation	Max Daily Precipitation
	°C	°C	°C	m/s	m/s	mm	mm	mm
January	-28.8	-14.6	-37.0	17.4	68.0	7.9	0.25	3.0
February	-35.2	-16.9	-46.8	15.3	58.7	10.6	0.38	3.8
March	-21.6	-4.2	-36.4	17.6	67.7	13.2	0.43	4.6
April	-17.3	1.8	-33.7	20.1	72.0	8.8	0.29	2.8
May	-9.4	1.7	-23.2	22.7	73.6	38	1.23	8.6
June	3.6	17.1	-8.4	16.6	62.4	28.4	0.95	20
July	13.0	27.5	-0.1	15.6	66.9	15.8	0.51	6
August	9.7	20.7	2.0	23.3	88.7	52.8	1.70	16
September	2.2	13.4	-5.8	18.2	70.3	19	0.63	5.4
October	-6.9	2.9	-27.1	17.5	66.5	24.6	0.79	6.8
November	-21.8	-1.0	-37.9	16.8	54.8	19.6	0.65	9.2
December	-24.6	-7.2	-38.4	15.4	61.0	8.6	0.28	2.2

7.9 WILDLIFE MONITORING

All Meliadine employees and contractors are required to report wildlife sightings. All supervisors ask their employees to report wildlife sightings; wildlife logs are posted throughout the Meliadine camp and are easily accessible to employees to facilitate wildlife reporting after work shifts. All observations, problematic interactions, wildlife surveys conducted weekly along the AWAR, caribou migration, operation shut downs related to caribou migration, aerial observations when helicopters are active, onsite audits (i.e for wildlife attractants) conducted by third parties, and mitigation actions taken following problematic issues are reported in the monthly report to the Government of Nunavut, the Kangiqliniq Hunters and Trappers Organization and Kivalliq Inuit Association. Department toolbox meetings were completed in 2018 for environmental subjects including wildlife and caribou migration. The presentation and the attendance sheets can be found in Appendix F1

7.9.1 TEMMP

In 2018, Agnico Eagle retained Golder Associates to undertake the wildlife and vegetation monitoring programs, in accordance with the Terrestrial Ecosystem Monitoring and Management Plan (TEMMP). The purpose of this report is to summarize the 2018 data collected from wildlife and vegetation monitoring programs, and to describe natural variation and potential mine-related changes in wildlife populations within and adjacent to the Mine. The 2018 report describes monitoring objectives and methodology, 2018 annual results, mitigation activities, and management recommendations based on 2018 monitoring results. Below is a summary of the monitoring/findings from the 2018 TEMMP. Full text of the 2018 annual TEMMP report can be found in Appendix H-6.

Incorporation of Inuit Quajimajatuquangit

When possible, field programs in 2018 were guided by Inuit Qaujimajatuqangit (IQ), including the assistance of local field assistants.

Direct Habitat Loss

In 2018, a total area of 484 ha has been altered due to Project construction, representing 29% of the Predicted Project footprint (1,682 ha). Of the total project impacted habitat, 343 ha is vegetated heath types (36% of the predicted impacts), 95 ha is wetland riparian types (22% of the predicted impacts) and 6 ha of un-vegetated sand community (75% of predicted impacts).

The project has altered 46 ha of unvegetated areas, representing 16% of the Predicted Project footprint. Of these, 40 ha (14% of the predicted project footprint) are associated with waterbodies and watercourses

Indirect Habitat Loss

Indirect habitat loss for caribou and wildlife habitat (soils and vegetation) was not assessed in 2018.

Wildlife Observations

Between 4 January and 27 November there were incidental observations of 13 different species and over 214 observations of approximately 7,187 individual animals.

Wildlife Track Surveys

On-site wildlife track surveys were conducted on November 3rd and 23rd and on December 8th, 15th and 25th. All observations were limited to arctic fox and hare tracks - no caribou tracks were observed. A predatory mammal observation report was completed for wolf tracks which were observed on the main camp site on April 10th and for two polar bears observed on November 10th.

Nest Relocation

In July, an active Common Redpoll nest was observed within an active construction zone. A Damage or Danger Permit was issued under the Environment Canada Migratory Birds Regulations (MBR), which authorized the relocation of the migratory birds, eggs (3) and nest. The nest and eggs were successfully relocated, allowing the birds to fledge.

Incidents and Mortalities

A gosling was found deceased near the Meliadine Lake gen set area. It is believed to have died on the lake of unknown causes and was brought to shore through wave action. A total of 22 arctic foxes were trapped and dispatched by GN DoE officers in 2018

Wildlife Deterrents

Bird deterrent canons were initially deployed on P1 and P3 dykes on June 21, 2018. Shortly after deployment, a deterrent canon was moved to the landfarm at the request of the NIRB. Concerns were raised about the canons impacts on caribou and other wildlife at which point canons were removed on July 2nd. Other deterrent (snow owls and predatory birds kites) will be monitored in 2019. No wildlife deterrents were used to deter caribou in 2018.

Barren-ground Caribou

Caribou Advisory

Mass migration through the Project and AWAR took place between 5 July and 22 July 2018. The caribou work suspension protocol (complete work stoppage) was in effect for periods from 8 July to 17 July. Closure and restrictions on AWAR took place on 7-20 July. There was a complete work stoppage for 191 hours and restricted duties for 93 hours in 2018 (Mine and AWAR).

Caribou Behavior

Caribou behavior observations were completed on seven groups of caribou in 2018. Observations showed no obvious behavioral response to mine activity.

Hunter Harvest

A Memorandum of Understanding (M.O.U.) was recently signed with the Rankin Inlet KHTO and involved the hunter harvest studies.

Birds

Shoreline Surveys

All waterbodies within 200 m of mining related infrastructure (excluding the AWAR) were surveyed on foot by trained biologists to locate and identify nesting waterbirds from June 12th to 18th. A total of eight different species were observed. No fledglings were observed, all observations were nesting adults, and eggs observed in nests. In total, 56 adult birds were recorded with 27 eggs observed among eight different species. Waterbodies within 200 m of the AWAR were not completed due to time constraints.

Point Counts

Avian point count locations were chosen to be within 1 km on either side of the AWAR (2 km in total) with the first point counts occurring at 50 m from the road on either side, with subsequent plots spaced 100 m from the preceding plot. A total of 6 transects were completed for a total of 72 point count surveys. The survey method is described in more detail in the TEMMP (Golder 2015).

In total, seven passerine (i.e. songbird) species were recorded on the point count surveys. The most abundant species was horned lark (*Eremophila alpestris*) and the least abundant species was American robin (*Turdis migratorius*).

PRISM

Agnico Eagle contributed to the Environment and Climate Change Canada (ECCC) PRISM surveys in 2018 and will continue to do so every three years. For the 2018 surveys, a representative from ECCC, Golder biologists, and two local assistants completed PRISM surveys at the Project at randomly chosen locations (by ECCC). Observers recorded the species encountered, estimated their breeding status, and recorded habitat conditions. A total of ten PRISM survey plots were surveyed with a total of fourteen bird species observed. The most common bird species observed in the plots were Lapland longspur (*Calcarius lapponicus*), savannah sparrow (*Passerculus sandwichensis*) and horned lark (n=6). No species-at-risk were observed on survey plots. Breeding evidence of three species of shorebirds was found during the surveys. Due to the late spring in 2018, and the relatively early timing of the field work, no actively nesting songbirds were found during PRISM surveys.

Soil and Vegetation Monitoring

Invasive Plant surveys were completed along the AWAR and Project footprint. Two occurrences of common dandelion were recorded along the AWAR. Common dandelion was not observed in the Project footprint or ship loading areas.
Soil and vegetation contamination (metals and dust) will be monitored in 2019.

Environmental Variables

The max annual temperature of 27.5°C was recorded on July 11, 2018 and the minimum annual temperature -46.8°C was recorded on February 19, 2018. Snowmelt began June 9, 2018 when the average daily air temperature exceeded 0°C. Environmental variables will continue to be monitored on an on-going basis.

7.9.2 Marine Environment

A Marine Mammal and Seabirds Observation (MMSO) report was completed for all observations done during the 2017 and 2018 sealift season. The purpose of the MMSO program is to mitigate interactions between marine mammals and seabirds and Project vessels and to collect information on marine wildlife presence. This report provides an interpretation and discussion of the MMSO data collected in 2017 and 2018 by the shipping contractor Transport Desgagnés.

In 2018 the marine mammal observations were conducted from the Acadia Desgagnés. Marine mammal observations were reported between 26 June to 24 July 2018. There were no marine mammals observed in 2018. A maximum of 12 seabird species were recorded during moving and stationary platform surveys in 2018 (June to October). The density of seabirds reported was generally low, although densities estimated from 2018 moving platform data were significantly higher than in 2017. No marine mammal-vessel interactions or birds-vessel interactions (e.g., strikes) were recorded in 2018. The complete report can be found in appendix H-7.

7.10 ARCHAEOLOGY

In 2018, Agnico Eagle requested Golder to provide updated information in years that changes have occurred to the Meliadine Gold Project (Project) footprint. In 2018, a Nunavut Archaeologist Permit was issued to Golder. The assessment focussed on examining expansion to the Meliadine East Esker borrow pit located north of Lake H17, as well as baseline studies for potential infrastructure under consideration. No issues were raised, recommendations were made to continue avoidance by 30 meters buffer for some sites. The memo from the assessment can be found in appendix H-8.

7.11 VEGETATION

On June 1, 2018 Agnico Eagle Mines and the University of Saskatchewan were successful in receiving a Natural Sciences and Engineering Research Council (NSERC) Collaborative Research and Development grant. The grant entitled “Tundra Restoration: Niche construction in early successional plant-soil systems” will support on-site and laboratory research from June 2018 to June 2022. The primary objective of this research is to address Term and Condition no. 41 of the Project Certificate for the Meliadine site: “Prior to the commencement of operations, the Proponent shall develop a progressive re-vegetation program for disturbed areas that are no longer required for operations, such program to incorporate measures for the

use of test plots, reseeding and replanting of native plants as necessary." The specific objective is the characterization of initial and realized niches of biological soil crusts and tundra vascular plants across a chronosequence of naturally recolonized drilling waste dumps. This work was completed during the 2018 summer.

A total of 25 drilling waste sites were examined across a range of ecotypes including low-lying hummock-hollow complexes dominated by sedges, upland hummock-hollow complexes dominated by heath and upland lichen-heath often with frost boil features. Following delineation of each drilling waste site, a transect was placed along the long axis of the waste site and three survey plots (1 m^2) were placed at the center of this transect. In addition, at each site a control transect was placed at least 10 m from the edge of the drilling waste and three adjacent 1 m^2 plots were placed in undisturbed vegetation of the same type, slope and aspect as the disturbed area. The percent cover of all vegetation species present was estimated by eye and the drilling waste and organic matter depth was measured in the center of each plot.

It was found that natural revegetation of drilling wastes is occurring at the Meliadine site. The community composition between drilling wastes and the paired undisturbed tundra was similar 20-25 years post disturbance and species richness recovered within 6 years. Due to the different life history characteristics of tundra plants, individual species responses to disturbance were observed. While sedges and mosses may recover more rapidly on these drilling wastes, dwarf shrubs and lichens may require longer to recover. These trends in natural recovery are important for guiding future restoration efforts and techniques. Specifically, targeting sedge and moss species for transplanting and/or seeding of disturbed substrates may be a highly effective strategy for initiating the development of early successional tundra communities.

Based on the findings, suggestions to improve and/or maintain the relatively rapid natural revegetation of the drilling wastes was provided: i) Placement of drilling wastes on the landscape that allow for remnant patches or islands of intact tundra throughout the disturbed area; ii) Apply drilling wastes in thin layers to allow for vegetative establishment; and iii) Promote establishment of bryophyte communities in the early stages of revegetation to support long-term ecosystem recovery.

Given the findings of this study it is suggested that active restoration of the drilling wastes is likely not required for the recovery of the tundra plant communities, if the timeline for recovery is ~20 years. Therefore, in the on-going work to develop tundra restoration techniques, it is suggested to develop active restoration trials at other disturbed areas on the Meliadine site during the 2019 summer.

The complete report can be found in Appendix I-1. More information regarding the vegetation can be found in the TEMMP report in Appendix H-6

SECTION 8. CLOSURE

8.1 PROGRESSIVE RECLAMATION

8.1.1 Mine Site

As required by Water License 2AM-MEL1631 Schedule B, Item 15: ***A summary of any progressive closure and reclamation work undertaken including photographic records of site conditions before and after completion of operations, and an outline of any work anticipated for the next year, including any changes to implementation and scheduling.***

And

As required by Water License 2BB-MEL1424 Part B, Item 6k: A description of all progressive and/or final reclamation work undertaken, including photographic records of site conditions before, during and after completion of operations;

Construction was underway at Meliadine in 2018, no progressive closure or reclamation work was undertaken during the year on the mine site.

8.1.2 AWAR

No progressive closure or reclamation work was undertaken during the year on the AWAR.

8.1.3 Quarries

In 2018, reclamation work occured at the Itivia quarry. Agnico Eagle proceeded to the reclamation according to the quarry conditions by removing all equipment and material, stabilizing and gently sloping the walls. Once the reclamation work was completed, a GN Regional Lands Administrator and a Hamlet foreman inspected the quarry and confirmed that they were satisfied with the current state of the Itivia quarry site. No other reclamation occurred in 2018.

8.2 RECLAMATION COSTS

As required by Water License 2AM-MEL1631 Schedule B, Item 17: ***An updated estimate of the current restoration liability based on project development monitoring, results of restoration research and any changes or modifications to the Appurtenant Undertaking.***

And

As required by Water License 2BB-MEL-1424 Part B Item 6h: An updated estimate of the current Meliadine West Gold Project restoration and liability, as required under Part B, Item 3, based upon the results of the restoration research, project development monitoring, and any modifications to the site plan;

A permanent closure and reclamation financial security cost estimate was prepared in March 2014 using the RECLAIM model, version 7.0. According to that estimate, the closure and

reclamation of all Project facilities amounted to $47,449,337. This estimate was included in the Preliminary Closure and Reclamation Plan (April 2015) prepared as part of the Type A Water License application. In negotiations between CIRNAC, Agnico Eagle and KIA the quantum of security was increased to $49,555,000.

On July 1, 2017, the Production Lease KVPL11D01 between KIA and Agnico Eagle came into effect; the security was confirmed at $49,555,000. Agnico Eagle posted a Reclamation Security Deposit, equal to 50% of this estimate ($24,777,500) with KIA.

In 2019 , an Interim Closure and Reclamation Plan will be prepared in accordance with the Mine Site Reclamation Guidelines for the Northwest Territories, 2007 and consistent with the CIRNAC Mine Site Reclamation Policy for Nunavut, 2002. An updated reclamation cost estimate, using the CIRNAC RECLAIM Reclamation Cost Estimating Model (Version 7.0 or the most current version at the time the updated reclamation cost estimate is submitted to the Board) will also be completed in 2019.

SECTION 9. STUDIES/REVISIONS/MODIFICATIONS

9.1 SUMMARY OF STUDIES

As required by Water License 2AM-MEL1631 Schedule B, Item 18: ***A summary of any studies requested by the Board that relate to Water use, Waste disposal or Reclamation, and a brief description of any future studies planned.***

And

As required by Water License 2BB-MEL1424 Part B, Item 6l summary of any specific studies or reports requested by the Board, and a brief description of any future studies planned or proposed;

No studies were requested by the NWB in 2018.

However, Agnico Eagle in partnership with the University of Saskatchewan started a tundra revegetation/restoration study in the summer of 2018. Both past mineral exploration drilling and proposed operations have and will impact the tundra environment at Meladine; with over 3000 drilling sites in the regional area and further drilling and mine site development expected, there is a strong need for site-specific tundra restoration techniques. Seeding and fertilization is commonly used in many revegetation efforts.

With the objective to eventually discharge excess groundwater effluent into Melvin Bay, Golder was retained by Agnico Eagle to conduct marine environmental reconnaissance surveys in Melvin Bay to establish appropriate reference areas and collect preliminary baseline data on physical properties of the water column, water and sediment quality, benthic substrate, benthic communities and marine mammal occurrence.

9.2 SUMMARY OF REVISIONS

As required by Water License 2AM-MEL1631 Schedule B, Item 19: ***Where applicable, revisions will be completed as Addendums, with an indication of where changes have been made, for Plans, Reports, and Manuals.***

And

As required by Water License 2BB-MEL-1424 Part B Item 6g: Any revisions to the Spill Contingency Plan, Site Water Management Plan, Used Water Management Plan, Waste Management Plan, Waste Rock and Ore Storage Plan, Landfill and Landfarm Management Plans, Abandonment and Restoration Plan, as required by Part B, Item 12, submitted in the form of an Addendum;

The following monitoring and management plans were created or updated and are include in Appendix I-1:

- Analysis of Risk of Temporary Closure
- Greenhouse Gas Reduction Plan
- Natural Recovery of Tundra Vegetation Following Exploration Drilling at Meliadine

- Shipping Management Plan
- Wildlife Protection and Response Plan
- Oil Pollution Emergency Plan
- Environmental Management and Protection Plan
- Landfill Waste Management Plan
- Landfarm Management Plan
- Freshet Action Plan (appended to Water Management Plan)
- Incineration Management Plan
- Mine Waste Management Plan
- QAQC plan
- Road Management Plan
- Dust Management Plan
- Sediment and Erosion Management Plan
- Spill Contingency Plan
- Groundwater management Plan
- Water Management Plan
- Water Quality and Flow Monitoring Plan

9.3 MODIFICATIONS

As required by Water License 2AM-MEL1631 Schedule B, Item 12: ***A summary of modifications and/or major maintenance work carried out on all water and waste related structures and facilities.***

And

As required by Water License 2BB-MEL-1424 Part B Item 6e: ***A summary of modification and/or major maintenance work carried out on the Water Supply Facilities, Bulk Fuel Storage Facility, Bermed Fuel Containment Facilities, and Wastewater Treatment Facility, including all associated structures, and an outline of any work anticipated for the next year***

No modifications and/or major maintenance work was carried out on water supply facilities and waste related structures and facilities. However, Agnico Eagle requested in 2018 the approval from the Nunavut Water Board (NWB) to keep the snow cell as a temporary structure until the decommissioning of the P-area is completed which was approved.

SECTION 10. OTHERS

10.1 ACTIVE PERMITS

Below is the list of all active permits and authorizations for Meliadine

Table 10.1: List of all active permits and authorizations for Meliadine

Issued By	ID	Description	Issue	Expiry
KIA	KVPL11D01	Production lease	2017/06/30	2029/06/30
KIA	KVCA07Q08	Tiriganiaq/Westmeg/Meliadine quarry permit	2016/09/12	2021/09/12
KIA	KVCA11Q01	Exploration road quarries	2015/08/31	2021/04/19
KIA	KVRW11F02	Exploration road right-of-way	2012/04/19	2027/06/29
KIA	n/a	Water Compensation Agreement	2016/02/11	2031/03/31
NWB	2BB-MEL1424	Bulk Sampling and exploration drilling water license	2009/07/31	2024/07/21
NWB	2AM-MEL1631	Mining undertaking water license	2016/04/01	2031/03/31
NIRB	006	Project certificate	2015/02/26	N/A
NIRB	16QN071	Screening decision (Itivia Quarry)		
GN-NAD	102631	Land lease, laydown Itivia		2021/07/01
GN-CGS	01-600-18	Quarry permit - site D	2017/03/22	2019/05/01
GN-CGS	01-600-21	Quarry permit - site D	2017/05/01	2019/08/01
GN-CGS	L-51809T	Right-of-Way permit AWAR on Municipal land	2017/06/01	2027/05/31
GN-CGS	L-51808T	Right-of-Way Lease Bypass Road km 2-7	2017/06/01	2027/05/31
GN-NAD	102893	Right-of-way lease bypass road km 1-2	2017/07/01	2027/07/01
GN-ENV	2018-058	Wildlife Research Permit	2018/10/01	2019/09/30

10.2 INSPECTIONS

As required by Water License 2AM-MEL1631 Schedule B, Item 21: ***A summary of actions taken to address concerns or deficiencies listed in the inspection reports and/or compliance reports filed by an Inspector.***

Table 10.2: Inspections and site visits by regulators

Month	Authority	Topic	Feedback/Outcome
Feb 2nd and 5th	CIRNAC, KIA, ECCC	Spill follow up from the exploration camp sewage treatment plant	Lab results were requested and provided by Agico Eagle
May 22nd	CIRNAC	Inspection of the Itivia site and bypass road construction	Inspection report with observations, no non-compliance
May 25th	CIRNAC	Inspection of the Itivia site and surface water management	Observations, no non-compliance
June 6th, 7th and 8th	CIRNAC	Inspection for activities at site related to the Nunavut Water Board Water Licence No. 2AM-MEL1631 and 2BB-MEL1424.	Inspection report requesting a response regarding two failures to comply. Response was sent to the inspector.
July 11	CIRNAC	Inspection of the bypass road and Itivia site	Observations, no non-compliance
July 18th	TC	Inspection of the Itivia site and audit emergency spill response equipment, training and regulatory compliance.	The OPEP document was emailed to Philip Levesque at Transport Canada and a hard copy was placed at the Itivia site office, as requested
August 17th	NIRB	Inspection of the Meliadine and Itivia sites, to assess compliance with NIRB project certificate 006	Inspection report with comments and recommendations, comments were addressed, no non-compliance
September 11th	KIA	General overview of the site	No deficiencies
September 19th	TC, TDG	Site inspection and document validations	All requested documents were provided, no non-compliance
September 20th, 21st	CIRNAC and ECCC	Inspection for activities at site related to the Nunavut Water Board Water Licence No. 2AM-MEL1631 and 2BB-MEL1424.	Inspection report with observations, observations were addressed, no non-compliance

10.3 AWAR

The traffic volume to date exceeds what was expected and stated in the FEIS. As a result, there has been an increased emphasis put on safety when travelling on the road. This includes required radio communication when approaching “blind hills” and when smaller vehicles such as pickups are approaching larger vehicles including road maintenance equipment, transport trucks, buses, etc. In addition, AEM requires smaller vehicles to pull over when large vehicles are approaching. Speeding on the AWAR is not tolerated. As a result, in 2018, there were no safety issues brought forward to Meliadine management. A meeting was held in Rankin Inlet with the community regarding the safety rules on the AWAR and this will be done every year to increase awareness.

Agnico Eagle would also like to clarify that the proposed ATV/snowmobile detour trail is being considered however, it is still in the planning phase. In 2018, there were 1944 users of the AWAR for traditional activities recorded which correspond to 8 % of the 24,870 total users of the AWAR.

In 2018 actual traffic exceeded predicted under Road Management Plan (RMP) and FEIS by 94% and 84% respectively. Construction at Meliadine is underway, which involves large movement of material, fuel and personnel.

Despite higher than anticipated traffic volume, no exceedances of Alberta’s Ambient Air Quality Guidelines (June 2016) for industrial areas occurred for any sample location. These results indicate low rates of dustfall overall, as discussed in Air Quality Monitoring Report in Appendix H-5.
In 2018, water, Dust Stop and calcium chloride were used as dust suppressants on the AWAR. AEM visually monitored the road to study the effectiveness of the products and observed better results with the usage of calcium chloride. Dust Stop required special equipment for application that was not available at the time the dust suppression was required. Agnico notes that there were no quantitative predictions made in the FEIS however, it is AEM’s intent to continue applying dust suppressant (calcium chloride or other products) on the AWAR and on roads associated with vehicular traffic related to the mine site including applicable roads in Rankin Inlet. Dust suppressant was applied to the entire length of the AWAR beginning on July 30, 2018. AEM interprets these results as a positive effect of the use of calcium chloride as a dust suppressant. The daily log for AWAR users can be found in Appendix J-1.

As requested by the NIRB, Agnico Eagle and the Hamlet met on February 20th to discuss about the signage, dust suppression and the plan for working together in 2019.

The Hamlet feels at this time that the signs are sufficient on the road, there are signs on the bypass road indicating it’s a private road. The roads under the control of the Hamlet will have signs put up by the Hamlet if they feel it is appropriate. Agnico Eagle is looking at the possibility to add signs, one at the gatehouse to inform if the AWAR is open or close and also signs with emergency numbers.

With the bypass road being built and used, the Hamlet feels that the traffic/dust issues that previously occurred should be mitigated. They did indicate that they still expect to get dust complaints but since Agnico Eagle will be using the bypass road the complaints should be less and the dust being generated from the road around Nipissar Lake will be there responsibility. A discussion occurred around the dust suppression on the bypass road. Agnico Eagle indicated that Calcium Chloride could not be used because community members were concerned for potential impact on Nipissar Lake. The Hamlet

indicated that they would have more concerns regarding dust on the Bypass road than getting calcium chloride in Nipissar Lake because of the distance in between the Bypass road and Nipissar Lake. The Hamlet has purchased some dust control equipment and at this point they do not feel they need any assistance from AEM. That may change if they have issues with their equipment. AEM has agreed to provide support if they can. At this point the Hamlet does not require assistance.

Table 10.3: Project-related and non project-related vehicles counts on AWAR

Month	Project related-vehicles on AWAR	Non project-related vehicles on AWAR	Total traffic
January	1146	10	1156
February	1203	0	1203
March	940	4	944
April	946	5	951
May	1361	8	1369
June	2159	239	2398
July	2653	593	3246
August	3449	435	3884
September	3023	388	3411
October	2612	207	2819
November	1942	55	1997
December	1492	0	1405
Total	22926	1944	24870

Table 10.4 Estimated versus predicted traffic on the All-Weather Access Road in 2018

Month	**Actual traffic**	**Predicted traffic (RMP)**	**Predicted traffic (FEIS)**
January	1156	845	1178
February	1203	764	1064
March	944	851	1178
April	951	810	1140
May	1369	851	1178
June	2398	1528	1062
July	3246	1572	1087
August	3884	1580	1099
September	3411	1524	1056
October	2819	845	1178
November	1997	822	1140
December	1405	839	1178
Total 2018	24870	12831	13538

10.4 MARITIME TRANSPORTATION

In 2018, 2 marine-based fuel transfers occurred at Rankin Inlet related to the Meliadine project. The first one occurred from July 27th to July 29th and the second one between October 10th and 18th. Both events occurred when the Melvin Bay was free of ice and the weather was not a risk to the activity The shipping related to the Meliadine project, including the boats and dates, can be found in table 10-5. No incident was reported during the 2018 maritime transportation.

Table 10.5 2018 ship related to the Meliadine project

		ETA	ETD
NORDIKA DESGAGNÉS	Bécancour	14/06	19/06
	Rankin Inlet	01/07	18/07
	Bécancour	26/07	
HHL New York	Bécancour	26/06	06/07
	Rankin Inlet	14/07	26/07
	Bécancour	03/08	
ACADIA DESGAGNÉS	Bécancour	10/07	14/07
	Rankin Inlet	25/07	26/07
	Bécancour	11/08	
NORDIKA DESGAGNÉS	Bécancour	24/07	30/07
	Rankin Inlet	07/08	09/08
	Bécancour	27/08	
HHL New York	Bécancour	02/08	11/08
	Rankin Inlet	19/08	22/08
	Bécancour	09/09	
NORDIKA DESGAGNÉS	Bécancour	27/08	02/09
	Rankin Inlet	11/09	14/09
	Bécancour	28/09	
ACADIA DESGAGNÉS	Bécancour	30/08	03/09
	Rankin Inlet	13/09	19/09
	Bécancour	28/09	
HHL New York	Bécancour	10/09	18/09
	Rankin Inlet	26/09	30/09
	Bécancour	16/10	
NORDIKA DESGAGNÉS	Bécancour	28/09	04/10
	Rankin Inlet	12/10	19/10
	Bécancour	27/10	
MIENA DESGAGNÉS	Bécancour	10/10	16/10
	Rankin inlet	24/10	27/10
	Bécancour	10/11	

SECTION 11. PUBLIC CONSULTATION

As required by Water License 2AM-MEL1631 Schedule B, Item 22: ***A summary of public consultation and participation with local organizations and the residents of the nearby communities, including a schedule of upcoming community events and information sessions.***

And

As required by Water License 2BB-MEL1424 Part B, Item 6m: A summary of public consultation/participation, describing consultation with local organizations and residents of the nearby communities, if any were conducted;

11.1 COMMUNITY MEETINGS IN CHESTERFIELD INLET

Agnico Eagle conducted its annual community meeting in Chesterfield Inlet on September 17, 2018, in which Hamlet representatives and Chesterfield Inlet HTO were involved. Agnico Eagle collected the following concerns and Inuit Quajimajatunqangit from the meeting:

- Migration patterns of the caribou herds were being affected by the noise of the barges
- There are less seals than in the past, possibly due to shipping traffic
- Concerned about oil spills and the clean-up protocol
- Concerned about compensation (ex. wildlife fatality) and distribution of benefits from the mine

In order to continue to address these concerns, the following outcomes were decided upon:

- The shipping company Desgagnes will share environmental logs with the Hamlet and Chesterfield Inlet HTO
- Possibility of having a wildlife monitor on board from Chesterfield to Baker Lake
- More detailed information on number of barge trips to be provided

Additionally, as part of the Inuit Workforce Barriers Study (IWBS), interviews were conducted with Elders in Kivalliq communities. In Chesterfield, Elders voiced similar concerns about environmental and marine life impact as listed above.

11.2 COMMUNITY MEETINGS IN RANKIN INLET

Agnico held a community meeting in Rankin Inlet on June 13th, 2018 focusing on the AWAR and included discussions on safety rules, procedures to access road, wildlife and road closure. Additionally, Agnico Eagle held a meeting specifically on the diffuser project on March 18th, 2018.

In 2018, Agnico Eagle started its work towards International Cyanide Management Code (ICMC) certification. As part of that work, Agnico Eagle held a community meeting on August 30th, 2018 on cyanide use, management and transportation.

More details regarding Community meetings can be found in in the Appendix K-1.

11.3 MEETINGS WITH RANKIN KHTO

In 2018, four (4) meetings were held with the Rankin Inlet KHTO. General topics included wildlife monitoring and sediment control, however the focus in 2018 was working to establish a funding agreement with the KHTO. This funding agreement is intended to develop a collaboration that results in the capacity building of KHTO staff to undertake research, monitoring and analysis of wildlife, through the development and implementation of hands-on skill development and theory-based training. Additionally, it creates a Wildlife Coordinator position within the KHTO which participates in monitoring activities at the Projects. The funding agreement is expected to be finalized in 2019.

The Hunter Harvest Agreement is incorporated into the funding agreement with the KHTO. A work plan is expected to be established in 2019.

11.4 COMMUNITY LIAISON COMMITTEE MEETINGS

In 2018, Agnico Eagle continued to attend meetings with the Meliadine Community Liaison Committee in Rankin Inlet, which was established to inform stakeholders on the activities at the mine and to consult them on specific issues and projects.

The Community Liaison Committee's objective is to favour dialogue and exchange between Agnico Eagle and its local stakeholders such that all parties gain a better understanding of the issues associated with mining activities and provides a venue for stakeholders to provide advice to Management for solutions. The Committee is currently facilitated and chaired by the Hamlet of Rankin Inlet as a specific working group of the hamlet, and does sometimes include representation from various groups and organizations, however Agnico Eagle will look at establishing its own Community Liaison Committee in 2019 to ensure that groups such as Elders, youth, Hunters and Trappers Organizations, RCMP, etc. are regularly consulted on the operations. Agnico Eagle would continue to participate in the hamlet's working group.

Meetings are scheduled quarterly in both English and Inuktitut, with the understanding that the minimum number of meetings is two (2) annually. In 2018, three (3) Community Liaison Committee meetings were held.

11.5 ELDERS

In 2018, as part of the Inuit Workforce Barriers Study (IWBS), interviews were conducted with Elders in Kivalliq communities on a variety of topics. Feedback was incorporated into the recommendations of the IWBS.

11.6 SITE TOURS FOR RANKIN INLET RESIDENTS

Each year, Agnico Eagle offers a variety of ways for the residents of Rankin Inlet, as well as various other groups or individuals from the Kivalliq, to visit Meliadine site. The list below outlines the major visits to the site during 2018:

- Agnico Eagle invited residents of Rankin Inlet to come on a site tour. On October 20, 2018, Agnico Eagle organized the regular tour for residents with five (5) buses from Rankin Inlet. Concurrently, Agnico Eagle held a contest and a group of residents were invited to do an underground tour additional to the regular site visit.
- On November 9, 2018, Agnico Eagle also welcomed a group of high school students on site to do a tour and receive a presentation on job opportunities.

More details on site visits in 2018 are summarized in the Appendix K-1.

11.7 COMMUNITY ENGAGEMENT INITIATIVES

Community initiatives that Agnico Eagle participated in during 2018 are summarized in the Appendix K-1.

11.8 COMMUNITY COORDINATORS PROGRAM

The Community Coordinators program consists of full or part-time Agnico Eagle Coordinators in all Hamlets in the Kivalliq Region, including in Agnico Eagle's offices in the communities of Rankin Inlet and Baker Lake.

The objective of the community-based Agnico Eagle Coordinators is to provide a point of contact in each community to facilitate communications, provide services, and coordinate activities in the following areas:

- Support to the HR department by:
    - Assisting HR and other Agnico Eagle departments to locate employees or potential employees as required;
    - Contact employees in advance of their shift departure times;
- Support to the Recruitment team by guiding interested individuals in the application process outlined by the Labour Pool Process;
- Provide advice and assistance to Agnico Eagle to organize and hold information sessions in the community on Agnico Eagle projects and initiatives, including those Labour Pool and business opportunities initiatives outlined in the Meliadine IIBA;
- Provide updates to the Hamlet Council on Agnico Eagle activities; and
- Distribute Agnico Eagle information and promotional materials.

The increase of community involvement requirements for Agnico Eagle to achieve recruitment goals and the obligations for the NIRB and IIBA renders the Community Coordinators essential for Agnico Eagle's Nunavut operations.

11.9 COMMUNICATION

In 2018, Agnico Eagle launched a facebook page for Meliadine which acts as another method with which it can inform the Kivalliq communities of important information, including road closures, recruitment information, and public meetings. This additional medium of communication was suggested by multiple stakeholder groups, including the Kivalliq Socio-Economic Monitoring Committee.

SECTION 12. SOCIO ECONOMIC

The Socio-Economic Monitoring Report (SEMR) is the annual report on the SEMP. It is a comprehensive socio-economic monitoring report that contains Project-level data (data collected by Agnico Eagle at each Project site or regionally) and community-level data (data provided by or in communities), including those data that are mandated by the Project Certificate. It is reviewed by both the SEMWG and the KvSEMC prior to its submission, to allow for those groups to provide insight or data. It is submitted to NIRB on or by June 30 annually as per the SEMWG Terms of Reference. The 2017 SEMR was submitted to NIRB on July 4, 2018 and can be found in Appendix M-1.

The section below represents a subset of Agnico Eagle's socio-economic reporting, related primarily to employment and training. For the full report on the Project's socio-economic monitoring, including those monitoring requirements of Agnico Eagle's Project Certificates for the Meliadine Project, please refer to the 2018 Agnico Eagle Kivalliq Projects Socio-Economic Monitoring Report, which will be submitted to NIRB on or by June 30, 2019.

Reports can also be viewed on the Socio-Economic Monitoring Committee website www.nunavutsemc.com or on Agnico Eagle's website http://aemnunavut.ca/media/documents/.

12.1 WORKFORCE

Agnico Eagle calculates the workforce based on headcount (snapshot of active employees taken at the end of the year, which includes full-time and part-time employees) and full-time equivalents (number of full-time positions based on hours worked, where one full time position is equivalent to 2,184 hours worked in a year).

The number of active Agnico Eagle employees working at Meliadine on December 31, 2018 was 488, of which 62 employees were Inuit employees. (The respective full-time equivalencies were 363 Agnico Eagle employees in total, with 45 full-time (FTE) Inuit Agnico Eagle employees).

The number of contractors employed at the project is only calculated using full-time equivalents (FTEs) due to the cyclical nature of contractor work. Therefore, during 2018 there were 736 full time equivalent (FTE) contractor positions.

Taken together, there were 1,224 active employees (Agnico Eagle permanent, temporary, on-call, students and contractors), working full- and part-time jobs, at the end of 2018.

Agnico Eagle defines job statuses as follows:

- Permanent employee: an employee whose current job is not specifically tied to a short-term project and the position is expected to be required throughout the life of mine (LOM).

- Temporary employee: an employee whose current job will not continue beyond a specified period of time.

- On-call employee: an employee who has an undefined contract and is called upon when the need arises. It is expected that on-call employees will move to temporary or permanent positions as they become available.

12.1.1 Employment Demographics for Nunavut Based Employees

The following tables shows the employment demographics for community of hire by headcount and full-time equivalents.

Table 12.1: Home communities of Agnico Eagle Inuit employees (by headcount)

Community of Hire	2017 Agnico Eagle headcount	2018 Agnico Eagle headcount
Arviat	2	5
Baker Lake	1	5
Naujaat	0	2
Rankin Inlet	14	31
Chesterfield Inlet	1	2
Whale Cove	0	1
Coral Harbour	3	7
Outside of Kivalliq	3	9
Total	**24**	**62**

Table 12.2: Home communities of Agnico Eagle Inuit employees by FTE

Community of Hire	2017 Agnico Eagle FTE	2018 Agnico Eagle FTE
Arviat	1	3
Baker Lake	1	4
Naujaat	0	1
Rankin Inlet	11	23
Chesterfield Inlet	0	2
Whale Cove	0	0
Coral Harbour	1	5
Outside of Kivalliq	1	7
Total	**15**	**45**

Agnico Eagle pays for the transportation of all Kivalliq-based employees from their home community to the mine for each work rotation. For employees coming from Arviat, Chesterfield Inlet, Rankin Inlet and/or Whale Cove, Agnico Eagle has a service contract with Calm Air to transport employees by charter plane to Rankin Inlet. For employees coming from Coral Harbour and/or Naujaat, a commercial ticket is bought from their home communities to the Rankin Inlet airport. All employees are then driven by bus to site. For all other employees not located in the Kivalliq region, transportation is provided from Mirabel and Val-d'Or via a charter flight operated by Nolinor Aviation.

12.1.2 **Employee retention**

Based on Agnico Eagle's past experience and testimonies of former employees, it was noted that many Inuit have never had full time work in their home communities, where full time employment opportunities are potentially limited. Many such individuals want a job, but working away from home for two weeks at a time in a structured industrial environment is a change that many have difficulty adapting to.

Exit interviews support this assumption and the following provides the most common reasons given for voluntary terminations and turnover rates:

- Found another job
- Conflict with employee
- Does not like the job
- No babysitter
- Family situation

Agnico Eagle developed a new approach and has rolled out new initiatives with a focus on providing information, skills, and education to job applicants to ensure that they are better informed about what working life is like at a remote mine site, and to be better prepared to adapt, cope, and be successful in employment. The result is the development and implementation of a Labour Pool Program that consists of a linked series of activities, including:

- Community-based information sessions
- Community-based Work Readiness training
- E-learning for mandatory training
- Site Readiness training at Meadowbank
- On-Call Contract Program (optional)
- Employment with Agnico Eagle or contractors

The Labour Pool Program consists of a suite of activities that provide future employees with information, skills, and education for working life and conditions in a remote, fly in/fly out, industrial workplace. The On-Call Contract Program allows new employees opportunities to experience and adapt to a new work environment by practicing camp life for short periods of time.

Supervisors have commented that due to the suite of Labour Pool activities, on-call employees are better prepared to cope with the mine employment environment. The On-Call Program allows participants to discuss employment and upward mobility opportunities, gain a variety of employment experiences and decide if the mining work life is for them. The program also allows Agnico Eagle to assess employees to ensure proper placement within the Company.

Employee Turnover = (# of terminations / (Average # of employees for the year))

In 2018, Agnico Eagle Meliadine had a total turnover of 13%. Non-Inuit turnover was 10% and Inuit turnover was 30%.

12.1.3 Summer Student Employment Program

Agnico Eagle offers two summer employment programs that are accessible to students. Firstly, Agnico Eagle's company-wide policy offers a summer employment program to the children of all Agnico employees (both Inuit and non-Inuit) that are undertaking postsecondary education. Secondly, in 2018 Agnico Eagle also offered the Inuit Summer Employment Opportunities postings, which is targeted to Inuit students in high school or post-secondary and tries to match students to positions in their areas of interest. In 2018, Agnico Eagle had one (1) Inuk employee hired through this posting. Agnico Eagle will continue to offer both programs in 2019 and continue to work in collaboration with the KIA to encourage Kivalliq applicants to apply for the programs.

As per Agnico Eagle policies, students must be 18 years or over to work at the Operation, and over 16 years old to work in the offices in Baker Lake or Rankin Inlet.

12.2 TRAINING

Agnico Eagle's Training Management System (TMS) and the Learning Management System (LMS) tracks and reports on training activities. The list of training provided can be found in Appendix L-1.

12.2.1 Pre-employment training

The Labour Pool Process (formerly 'Labour Pool Initiative'), implemented in 2014 and revised in 2015, is based on an agreement between Agnico Eagle and the KIA through the IIBAs to offer pre-employment opportunities to Inuit from all Kivalliq communities.

The goal of the program is to pre-qualify candidates from Kivalliq communities through 5 steps: employment information sessions, online application (facilitated by Employment Information Sessions), the Work Readiness Program, mandatory trainings (more details provided below), and the Labour Pool List (facilitated by the Labour Pool Coordinator).

All applicants that have the minimal requirements to be hired (must be at least 18 years old and have a clean record of employment with Agnico Eagle) are required to complete mandatory training by e-learning as well as participate in the 5-day Work Readiness and Site Readiness training programs. The objective is to create a pool of candidates ready to work that Agnico Eagle and its contractors can draw future employees from.

Figure 12.1 Labour Pool Process



12.2.2 **Work Readiness Training Program**

Agnico Eagle continues to utilize the Work Readiness Training program that was developed as a pre-employment initiative. In 2018, the Work Readiness Training was delivered in collaboration between Aglu Consulting and Training and Northern College. The Work Readiness program is the first step of the Labour Pool Process for those individuals who have applied online who do not have work experience relevant to the positions for which Agnico Eagle hires.

The objective of the program is for Inuit applicants to be better prepared for the work environment in an industrial setting. Graduates of the program are eligible to continue the Labour Pool Process and attend the mandatory trainings given on-site. The program provides coaching on a range of issues including: awareness of employers' unspoken expectations, communication in the workplace, and problem-solving skills for resolving workplace issues.

The program was implemented in April 2013. The program is delivered over a five-day period at the community level and is scheduled throughout the year. In 2018, the program was delivered by a visiting instructor in all seven Kivalliq communities resulting in 183 participants from various communities, from which 85% successfully completed the program.

In 2018, Agnico Eagle partnered with PMC Renewal and the Nunavummi Disabilities Makinnasuaqtiit Society (NDMS); two organizations that delivered Work Readiness program across the Kivalliq through contracts with the GN's Department of Family Services. Agnico Eagle now considers those who have completed this program as an equivalent to the Work Readiness program for those who are interested in gaining employment with Agnico Eagle.

12.2.3 **Mandatory Training (Site Readiness)**

Participants that have successfully completed the Work Readiness Program will be retained for the Mandatory Training Program (called "Site Readiness") and then will become part of the Labour Pool.

The Mandatory Training Program is a five-day training provided at the Meadowbank site. Throughout the week, participants are enrolled in diverse activities such as mandatory training sessions, site visits, job initiation, information sessions on training and career opportunities, as well as interviews and discussions on employment opportunities with a Human Resource representative to assess career ambitions and identify work interest.

Afterwards, candidates wanting to work for the Camp Department are given short term on-call assignments. All other applicants become part of the Labour Pool list until a job opportunity matching their interest and competencies becomes available.

In 2018, 142 candidates successfully completed the Mandatory Training.

12.2.4 **Training Hours**

The following categories of training are available:

- Mandatory: Mandatory training related to compliance with the Nunavut Mine Act, as well as training that is mandated according to AEM Health and Safety policies. Many of these training sessions are offered via e-learning prior to employee's arrival on site.

- General: Training activities required at a departmental level and covers many employees working in different departments. General training includes training on light duty equipment as well as enterprise software systems and cross-cultural training.

- Specific: Focused on developing individual competencies related to a specific position. This training qualifies individual workers for promotion following their progression through the Career Path. These training programs are provided by in classroom (theory) learning as well as practical (one-on-one) learning.

- Emergency Response Training (ERT).

The following table provides the training hours provided to Agnico Eagle employees at Meliadine (excluding contractors) in 2018:

Table 12.3: Training hours provided to Agnico Eagle employees at Meliadine

Type of Training	Inuit	Non-Inuit	Total
Mandatory	482	4,364	4,846
General	248	1,949	2,197
Specific	2,321	4,891	7,212
ERT	100	1,640	1,740
Total	**3,151**	**12,844**	**15,995**

12.3 TRAINING PROGRAMS

12.3.1 E-learning

Before coming to an Agnico Eagle site for the first time, newly hired employees must complete their Mandatory Training online, which consists of six (6) modules: General Induction, WHMIS, Fire Suppression, Job Hazard Analysis and Work Card, Spill Response, and Occupational Health and Safety (Personal Protective Equipment, Ladder Safety, Surface Standard Operating Procedure). The General Induction chapter provides general information about Agnico Eagle and working life at the mines. The e-learning training material has been translated into English, French, and Inuktitut.

As per the requirement of the IIBAs, in 2017 two new e-learning lessons were developed and added to the General Induction. The Inuit Impact and Benefit Awareness module (IIBA) provides general awareness on: Agnico's Commitment to Indigenous People, history of the Nunavut Agreement and the different Inuit organization branches, what an IIBA is and why the sites have one, and a high level overview of the benefits and impact mitigation provided through the IIBAs. The Archaeology module informs workers on how to identify potential archaeological sites (ex. fox traps, tent circles, hunting blinds) and what to do if a worker finds one when working in the tundra. An objective of these lessons is also to

give each employee and contractor employee cross-cultural context before arriving on one of Agnico's sites.

In 2018, three (3) e-learning lessons have been updated: Process Plant Induction, Chemical Awareness and General Induction. The e-learning WHMIS, which is now WHMIS 2015, has been modified according to meet the new WHMIS standards.

12.3.2 **Cross-Cultural**

Implemented first at Meadowbank, the Cross Cultural Training Program is a 5 hour in-class training course. This course allows employees from different cultures and backgrounds to understand each other's culture in order to improve understanding and communication at the workplace.

The program was revisited with the assistance of the Nunavut Literacy Council in 2013, and a revised program was initiated in 2014. This program is mandatory for all Agnico Eagle employees and contractors who will be on site for six months or more. The training is in English, Inuktitut and French, and is offered at Meliadine.

In 2018, Meliadine had 17 sessions.

12.3.3 **Career Paths**

The Career Path Program was designed in 2012 at Meadowbank, with the intention of supporting upward mobility of Inuit employees at Agnico Eagle's Project sites. This program identifies the incremental steps that any employee is required to complete to advance in their chosen career of interest.

The objective is to have only internal promotions of employees, with external candidates being hired only as an entry level position to feed the trainee programs at the base.

In 2018, the Career Path system was developed in five (5) areas of activity at Meliadine: Mine underground (Meliadine only), Field services, Assay lab, Process plant and Maintenance.

12.3.4 **Apprenticeship Program**

The Apprenticeship Program combines on-the-job learning and in-school technical instruction to allow Inuit employees the opportunity to be educated and trained in the trade of their choice. By the end of the program, the apprentice is able to challenge their Certificate of Qualification (COQ) to become a Journeyperson and will also have the opportunity to challenge their Red Seal Exams. Currently, we offer trades (8) for: cook, carpenter, millwright, electrician, heavy duty equipment technician, welder, housing maintainer and plumber.

As of the end of 2018, there were 4 apprentices and pre-apprentices at Meliadine.

12.4 GENERAL SOCIO-ECONOMIC PROVISIONS

12.4.1 Housing and Home Ownership

Agnico Eagle has shared financial literacy materials from its Work Readiness Program as well as details on Agnico's direct rental deduction program with the Nuanvut Housing Corporation in October 2017. Agnico Eagle will reach out again to NHC in 2019 with the intention to collaborate on the topic of home ownership and affordable housing options. Nunavut Housing Corporation is also invited to participate in the Kivalliq Socio-Economic Monitoring Committee.

12.4.2 Labour Force

Agnico Eagle submitted the latest staff schedule on May 2, 2018, and will submit an updated version in 2019. Agnico Eagle also submitted the IIBA-required Labour Market Analysis (LMA) to NIRB in March 2019.

12.4.3 Training and Development

Agnico Eagle works with training organizations and government departments regularly through the Kivalliq Socio-Economic Monitoring Committee, through the IIBA with the Kivalliq Inuit Association, through the Memorandum of Understanding with the Government of Nunavut, and through one-on-one partnerships and collaboration with organizations such as the Hamlet of Arviat, the Nunavut Literacy Council, Nunavut Arctic College, Aglu Consulting, and more.

The listing of formal certificates and licenses was sent to NIRB on November 7, 2018. There have not been any updates since the last submission.

Appendix A-1

Daily volume of fresh Water obtained from Meliadine Lake (MEL-1 and MEL-2)

Fresh water from Meliadine Lake in 2018

Date	Type A	Type B	**Total**
1-Jan-2018	22.0	29.3	**51.3**
2-Jan-2018	27.0	23.0	**50.0**
3-Jan-2018	18.0	29.9	**47.9**
4-Jan-2018	25.0	25.1	**50.1**
5-Jan-2018	38.0	31.8	**69.8**
6-Jan-2018	48.0	54.4	**102.4**
7-Jan-2018	42.0	47.9	**89.9**
8-Jan-2018	52.0	42.6	**94.6**
9-Jan-2018	34.0	29.3	**63.3**
10-Jan-2018	56.0	23.6	**79.6**
11-Jan-2018	48.0	21.5	**69.5**
12-Jan-2018	47.0	61.4	**108.4**
13-Jan-2018	67.0	30.4	**97.4**
14-Jan-2018	72.0	30.1	**102.1**
15-Jan-2018	48.0	37.3	**85.3**
16-Jan-2018	67.0	49.2	**116.2**
17-Jan-2018	62.0	61.5	**123.5**
18-Jan-2018	69.0	40.2	**109.2**
19-Jan-2018	64.0	25.9	**89.9**
20-Jan-2018	66.0	48.2	**114.2**
21-Jan-2018	61.0	57.5	**118.5**
22-Jan-2018	60.0	32.9	**92.9**
23-Jan-2018	59.0	32.4	**91.4**
24-Jan-2018	70.0	46.9	**116.9**
25-Jan-2018	58.0	23.4	**81.4**
26-Jan-2018	53.0	54.8	**107.8**
27-Jan-2018	48.0	35.1	**83.1**
28-Jan-2018	56.0	57.9	**113.9**
29-Jan-2018	55.8	38.6	**94.4**
30-Jan-2018	50.4	43.0	**93.4**
31-Jan-2018	58.2	31.4	**89.7**
Total Jan	1601.5	1196.3	**2797.8**

Date	Type A	Type B	**Total**
1-Feb-2018	65.5	64.5	**129.9**
2-Feb-2018	48.0	38.5	**86.5**
3-Feb-2018	50.0	34.3	**84.3**
4-Feb-2018	54.5	37.1	**91.5**
5-Feb-2018	51.0	40.0	**91.0**
6-Feb-2018	58.0	28.7	**86.7**
7-Feb-2018	68.0	37.2	**105.2**
8-Feb-2018	57.0	34.8	**91.8**
9-Feb-2018	55.0	36.5	**91.5**
10-Feb-2018	56.0	33.0	**89.0**
11-Feb-2018	63.0	35.6	**98.6**
12-Feb-2018	62.0	38.5	**100.5**
13-Feb-2018	59.0	33.6	**92.6**
14-Feb-2018	63.0	54.4	**117.4**
15-Feb-2018	63.0	49.7	**112.7**
16-Feb-2018	67.0	35.1	**102.1**
17-Feb-2018	65.0	29.6	**94.6**
18-Feb-2018	54.0	48.5	**102.5**
19-Feb-2018	62.0	45.0	**107.0**
20-Feb-2018	56.0	42.9	**98.9**
21-Feb-2018	54.0	29.5	**83.5**
22-Feb-2018	67.0	35.4	**102.4**
23-Feb-2018	62.0	32.8	**94.8**
24-Feb-2018	51.0	32.6	**83.6**
25-Feb-2018	57.0	39.7	**96.7**
26-Feb-2018	53.0	29.8	**82.8**
27-Feb-2018	53.0	49.8	**102.8**
28-Feb-2018	60.0	48.0	**108.0**
Total Feb	1633.9	1094.9	**2728.8**

Date	Type A	Type B	**Total**
1-Mar-2018	68.0	26.6	**94.6**
2-Mar-2018	63.0	46.2	**109.2**
3-Mar-2018	67.0	36.2	**103.2**
4-Mar-2018	49.0	62.5	**111.5**
5-Mar-2018	62.0	34.6	**96.6**
6-Mar-2018	51.0	27.8	**78.8**
7-Mar-2018	55.0	42.5	**97.5**
8-Mar-2018	57.0	85.1	**142.1**
9-Mar-2018	54.6	32.8	**87.4**
10-Mar-2018	53.0	75.4	**128.4**
11-Mar-2018	54.0	54.1	**108.1**
12-Mar-2018	54.0	66.4	**120.4**
13-Mar-2018	71.0	63.9	**134.9**
14-Mar-2018	63.0	81.4	**144.4**
15-Mar-2018	63.0	67.2	**130.2**
16-Mar-2018	68.0	65.8	**133.8**
17-Mar-2018	67.0	101.7	**168.7**
18-Mar-2018	68.0	69.6	**137.6**
19-Mar-2018	78.0	90.3	**168.3**
20-Mar-2018	73.4	66.0	**139.3**
21-Mar-2018	73.0	95.1	**168.1**
22-Mar-2018	79.7	71.5	**151.2**
23-Mar-2018	72.6	115.1	**187.7**
24-Mar-2018	73.7	51.2	**124.9**
25-Mar-2018	89.0	70.8	**159.8**
26-Mar-2018	70.2	58.5	**128.7**
27-Mar-2018	71.7	36.5	**108.1**
28-Mar-2018	73.0	37.1	**110.1**
29-Mar-2018	77.9	32.7	**110.6**
30-Mar-2018	41.0	40.3	**81.3**
31-Mar-2018	41.0	32.2	**73.2**
Total March	2001.6	1837.2	**3838.8**
Total Q1	5237.0	4128.4	**9365.3**

Date	Type A	Type B	**Total**
1-Apr-18	62.5	60.3	**122.8**
2-Apr-18	63.0	58.4	**121.4**
3-Apr-18	62.0	49.4	**111.4**
4-Apr-18	67.0	49.6	**116.6**
5-Apr-18	64.0	65.4	**129.4**
6-Apr-18	108.5	33.2	**141.7**
7-Apr-18	59.0	42.5	**101.5**
8-Apr-18	54.0	36.9	**90.9**
9-Apr-18	60.0	64.7	**124.7**
10-Apr-18	62.0	31.7	**93.7**
11-Apr-18	64.0	61.0	**125.0**
12-Apr-18	68.0	79.0	**147.0**
13-Apr-18	59.0	337.5	**396.5**
14-Apr-18	60.0	62.3	**122.3**
15-Apr-18	54.0	46.6	**100.6**
16-Apr-18	55.0	65.6	**120.6**
17-Apr-18	54.0	84.0	**138.0**
18-Apr-18	57.0	50.9	**107.9**

Date	Type A	Type B	**Total**
1-May-18	69.0	74.5	**143.5**
2-May-18	65.0	66.7	**131.7**
3-May-18	66.0	99.3	**165.3**
4-May-18	64.0	43.5	**107.5**
5-May-18	63.0	66.8	**129.8**
6-May-18	60.0	101.1	**161.1**
7-May-18	65.0	76.0	**141.0**
8-May-18	64.0	31.6	**95.6**
9-May-18	88.0	61.5	**149.5**
10-May-18	77.0	40.2	**117.2**
11-May-18	67.0	50.0	**117.0**
12-May-18	72.0	45.4	**117.4**
13-May-18	65.7	77.4	**143.1**
14-May-18	75.0	43.0	**118.0**
15-May-18	81.0	51.4	**132.4**
16-May-18	73.9	88.2	**162.2**
17-May-18	122.0	50.7	**172.7**
18-May-18	50.0	74.6	**124.6**

Date	Type A	Type B	**Total**
1-Jun-18	85.0	106.0	**191.0**
2-Jun-18	74.0	94.7	**168.7**
3-Jun-18	89.0	80.3	**169.3**
4-Jun-18	96.5	51.9	**148.4**
5-Jun-18	79.5	98.4	**177.9**
6-Jun-18	87.5	82.6	**170.1**
7-Jun-18	81.5	64.0	**145.5**
8-Jun-18	84.0	86.6	**170.6**
9-Jun-18	81.0	59.8	**140.8**
10-Jun-18	85.0	54.8	**139.8**
11-Jun-18	90.0	61.1	**151.1**
12-Jun-18	87.0	44.4	**131.4**
13-Jun-18	87.0	46.7	**133.7**
14-Jun-18	100.0	31.0	**131.0**
15-Jun-18	75.0	97.0	**172.0**
16-Jun-18	76.0	42.5	**118.5**
17-Jun-18	71.7	133.5	**205.2**
18-Jun-18	95.1	103.7	**198.8**

Fresh water from Meliadine Lake in 2018

19-Apr-18	56.0	72.6	**128.6**	19-May-18	85.0	36.7	**121.7**	19-Jun-18	175.5	-26.8	**148.7**
20-Apr-18	60.0	52.9	**112.9**	20-May-18	120.2	67.8	**188.0**	20-Jun-18	97.4	53.7	**151.1**
21-Apr-18	60.0	54.6	**114.6**	21-May-18	58.0	102.5	**160.5**	21-Jun-18	102.1	49.0	**151.1**
22-Apr-18	60.0	111.2	**171.2**	22-May-18	97.0	110.0	**207.0**	22-Jun-18	74.5	90.2	**164.7**
23-Apr-18	57.0	66.8	**123.8**	23-May-18	85.0	99.8	**184.8**	23-Jun-18	78.5	93.2	**171.7**
24-Apr-18	59.0	46.5	**105.5**	24-May-18	87.0	91.9	**178.9**	24-Jun-18	102.7	106.0	**208.7**
25-Apr-18	61.0	95.0	**156.0**	25-May-18	88.0	116.8	**204.8**	25-Jun-18	72.4	39.6	**112.0**
26-Apr-18	75.0	61.7	**136.7**	26-May-18	79.0	107.6	**186.6**	26-Jun-18	86.4	55.9	**142.3**
27-Apr-18	66.0	82.8	**148.8**	27-May-18	86.0	106.6	**192.6**	27-Jun-18	83.3	65.9	**149.2**
28-Apr-18	59.0	87.9	**146.9**	28-May-18	89.0	101.3	**190.3**	28-Jun-18	85.0	26.1	**111.1**
29-Apr-18	65.0	78.4	**143.4**	29-May-18	86.0	122.4	**208.4**	29-Jun-18	80.3	61.2	**141.5**
30-Apr-18	61.0	48.8	**109.8**	30-May-18	79.0	105.9	**184.9**	30-Jun-18	45.3	63.9	**109.2**
				31-May-18	82.0	52.6	**134.6**				
Total April	1872.0	2138.1	**4010.1**	Total May	2408.8	2363.8	**4772.5**	Total June	2608.2	2016.8	**4625.0**
								Total Q2	6889.0	6518.6	**13407.6**

Date	Type A	Type B	**Total**	Date	Type A	Type B	**Total**	Date	Type A	Type B	**Total**
1-Jul-18	74.3	45.2	**119.5**	1-Aug-18	118.0	34.5	**152.5**	1-Sep-18	105.3	51.6	**156.8**
2-Jul-18	94.3	59.1	**153.4**	2-Aug-18	85.2	34.1	**119.3**	2-Sep-18	98.3	54.2	**152.5**
3-Jul-18	100.5	37.2	**137.7**	3-Aug-18	72.9	38.1	**111.0**	3-Sep-18	119.3	43.1	**162.4**
4-Jul-18	133.5	93.5	**227.0**	4-Aug-18	82.7	44.8	**127.4**	4-Sep-18	110.1	54.6	**164.7**
5-Jul-18	95.5	54.0	**149.5**	5-Aug-18	112.7	44.8	**157.5**	5-Sep-18	132.0	49.9	**181.9**
6-Jul-18	86.8	35.2	**121.9**	6-Aug-18	86.6	62.7	**149.3**	6-Sep-18	111.1	31.9	**143.0**
7-Jul-18	93.0	40.9	**133.9**	7-Aug-18	81.5	61.7	**143.1**	7-Sep-18	110.0	35.9	**145.9**
8-Jul-18	63.0	21.8	**84.8**	8-Aug-18	78.0	38.0	**116.0**	8-Sep-18	93.7	24.6	**118.3**
9-Jul-18	81.0	23.7	**104.7**	9-Aug-18	105.5	54.2	**159.7**	9-Sep-18	91.0	57.5	**148.5**
10-Jul-18	78.9	40.8	**119.7**	10-Aug-18	74.0	40.3	**114.3**	10-Sep-18	82.0	42.6	**124.6**
11-Jul-18	79.4	42.4	**121.8**	11-Aug-18	77.0	64.0	**141.0**	11-Sep-18	103.4	50.1	**153.5**
12-Jul-18	102.2	59.2	**161.4**	12-Aug-18	60.0	83.7	**143.7**	12-Sep-18	105.6	38.0	**143.6**
13-Jul-18	60.0	26.4	**86.4**	13-Aug-18	92.0	59.2	**151.2**	13-Sep-18	89.8	58.1	**147.9**
14-Jul-18	93.5	67.6	**161.1**	14-Aug-18	92.0	54.6	**146.6**	14-Sep-18	86.5	82.7	**169.2**
15-Jul-18	61.0	26.4	**87.4**	15-Aug-18	92.2	66.5	**158.7**	15-Sep-18	96.0	41.2	**137.2**
16-Jul-18	88.0	39.9	**127.9**	16-Aug-18	88.2	63.5	**151.7**	16-Sep-18	95.0	48.7	**143.7**
17-Jul-18	73.0	25.5	**98.5**	17-Aug-18	94.5	44.1	**138.6**	17-Sep-18	90.5	64.3	**154.8**
18-Jul-18	91.1	57.0	**148.1**	18-Aug-18	90.0	57.1	**147.1**	18-Sep-18	88.0	51.2	**139.2**
19-Jul-18	92.5	83.4	**175.9**	19-Aug-18	54.0	59.2	**113.2**	19-Sep-18	91.0	53.4	**144.4**
20-Jul-18	89.5	50.3	**139.8**	20-Aug-18	126.5	57.1	**183.6**	20-Sep-18	130.0	72.5	**202.5**
21-Jul-18	94.0	93.5	**187.5**	21-Aug-18	84.0	66.6	**150.6**	21-Sep-18	84.0	46.0	**130.0**
22-Jul-18	87.5	130.3	**217.8**	22-Aug-18	90.5	59.8	**150.3**	22-Sep-18	121.0	62.0	**183.0**
23-Jul-18	74.0	74.4	**148.4**	23-Aug-18	91.5	53.7	**145.2**	23-Sep-18	135.0	61.2	**196.2**
24-Jul-18	91.0	48.2	**139.2**	24-Aug-18	87.5	56.5	**144.0**	24-Sep-18	96.5	52.7	**149.2**
25-Jul-18	86.5	65.3	**151.8**	25-Aug-18	86.0	44.3	**130.3**	25-Sep-18	133.0	54.8	**187.8**
26-Jul-18	94.0	82.7	**176.7**	26-Aug-18	75.0	69.6	**144.6**	26-Sep-18	91.0	57.3	**148.3**
27-Jul-18	76.7	79.2	**155.9**	27-Aug-18	89.0	60.3	**149.3**	27-Sep-18	93.0	52.4	**145.4**
28-Jul-18	78.0	56.6	**134.6**	28-Aug-18	115.5	56.9	**172.4**	28-Sep-18	95.2	58.5	**153.7**
29-Jul-18	72.3	42.0	**114.3**	29-Aug-18	76.5	70.3	**146.8**	29-Sep-18	93.5	59.4	**152.9**
30-Jul-18	83.0	50.4	**133.4**	30-Aug-18	107.5	37.1	**144.6**	30-Sep-18	83.8	70.8	**154.6**
31-Jul-18	94.5	58.8	**153.3**	31-Aug-18	104.8	47.8	**152.6**				
Total July	2662.4	1710.6	**4373.0**	Total Aug	2771.1	1684.9	**4456.0**	Total Sept	3054.5	1581.2	**4635.7**
								Total Q3	8487.9	4976.8	**13464.7**

Date	Type A	Type B	**Total**	Date	Type A	Type B	**Total**	Date	Type A	Type B	**Total**

Fresh water from Meliadine Lake in 2018

1-Oct-18	103.0	69.7	**172.7**	1-Nov-18	93.00	61.1	**154.1**	1-Dec-18	94.00	52.78	**146.8**
2-Oct-18	118.9	65.6	**184.5**	2-Nov-18	95.00	31.6	**126.6**	2-Dec-18	87.00	72.46	**159.5**
3-Oct-18	101.3	59.1	**160.4**	3-Nov-18	95.00	85.3	**180.3**	3-Dec-18	85.00	32.17	**117.2**
4-Oct-18	81.2	38.5	**119.7**	4-Nov-18	121.00	68.2	**189.2**	4-Dec-18	98.00	35.21	**133.2**
5-Oct-18	91.3	58.9	**150.2**	5-Nov-18	97.00	82.0	**179.0**	5-Dec-18	74.00	36.76	**110.8**
6-Oct-18	99.2	51.9	**151.1**	6-Nov-18	134.00	108.5	**242.5**	6-Dec-18	90.00	82.22	**172.2**
7-Oct-18	112.0	48.5	**160.5**	7-Nov-18	106.00	78.5	**184.5**	7-Dec-18	77.00	58.24	**135.2**
8-Oct-18	96.0	52.1	**148.1**	8-Nov-18	87.00	86.1	**173.1**	8-Dec-18	112.00	50.71	**162.7**
9-Oct-18	97.0	42.0	**139.0**	9-Nov-18	90.00	70.0	**160.0**	9-Dec-18	86.00	49.59	**135.6**
10-Oct-18	119.4	58.2	**177.5**	10-Nov-18	85.00	71.4	**156.4**	10-Dec-18	90.00	38.39	**128.4**
11-Oct-18	113.0	40.3	**153.3**	11-Nov-18	77.00	62.8	**139.8**	11-Dec-18	96.00	34.92	**130.9**
12-Oct-18	92.0	48.5	**140.5**	12-Nov-18	98.00	85.3	**183.3**	12-Dec-18	89.00	43.18	**132.2**
13-Oct-18	103.0	42.4	**145.4**	13-Nov-18	79.00	89.6	**168.6**	13-Dec-18	104.00	44.64	**148.6**
14-Oct-18	102.0	51.8	**153.8**	14-Nov-18	90.00	61.6	**151.6**	14-Dec-18	88.00	52.00	**140.0**
15-Oct-18	91.0	36.7	**127.7**	15-Nov-18	100.00	68.2	**168.2**	15-Dec-18	94.00	51.26	**145.3**
16-Oct-18	71.0	48.7	**119.7**	16-Nov-18	84.00	69.4	**153.4**	16-Dec-18	76.00	40.64	**116.6**
17-Oct-18	105.0	40.9	**145.9**	17-Nov-18	93.00	94.4	**187.4**	17-Dec-18	95.00	33.56	**128.6**
18-Oct-18	109.0	43.9	**152.9**	18-Nov-18	99.00	74.5	**173.5**	18-Dec-18	93.00	19.65	**112.7**
19-Oct-18	94.0	61.6	**155.6**	19-Nov-18	90.00	88.7	**178.7**	19-Dec-18	128.00	46.25	**174.3**
20-Oct-18	85.0	37.1	**122.1**	20-Nov-18	103.00	67.9	**170.9**	20-Dec-18	122.00	22.68	**144.7**
21-Oct-18	83.0	68.1	**151.1**	21-Nov-18	93.00	98.6	**191.6**	21-Dec-18	82.00	25.61	**107.6**
22-Oct-18	102.0	84.5	**186.5**	22-Nov-18	103.00	54.7	**157.7**	22-Dec-18	76.00	18.35	**94.4**
23-Oct-18	102.0	74.1	**176.1**	23-Nov-18	96.00	58.4	**154.4**	23-Dec-18	71.00	24.24	**95.2**
24-Oct-18	106.0	82.1	**188.1**	24-Nov-18	86.00	77.5	**163.5**	24-Dec-18	71.00	20.74	**91.7**
25-Oct-18	111.0	62.4	**173.4**	25-Nov-18	95.00	47.4	**142.4**	25-Dec-18	76.00	19.67	**95.7**
26-Oct-18	101.0	74.2	**175.2**	26-Nov-18	100.00	45.4	**145.4**	26-Dec-18	74.00	23.94	**97.9**
27-Oct-18	103.0	64.0	**167.0**	27-Nov-18	96.00	56.5	**152.5**	27-Dec-18	67.00	15.76	**82.8**
28-Oct-18	95.0	31.0	**126.0**	28-Nov-18	93.00	38.7	**131.7**	28-Dec-18	66.00	29.70	**95.7**
29-Oct-18	110.0	70.8	**180.8**	29-Nov-18	91.00	62.5	**153.5**	29-Dec-18	67.00	13.29	**80.3**
30-Oct-18	93.0	67.7	**160.7**	30-Nov-18	86.00	74.8	**160.8**	30-Dec-18	77.00	40.48	**117.5**
31-Oct-18	106.0	83.0	**189.0**					31-Dec-18	86.00	21.14	**107.1**
Total Oct	3096.2	1758.0	**4854.2**	Total Nov	2855.0	2119.7	**4974.7**	Total Dec	2691.0	1150.2	**3841.2**
								Total Q4	8642.2	5027.9	**13670.1**

Appendix A-2

Daily quantities, in cubic meters, of Mine water pumped from the underground

2018 Underground water volume

Date	UDG to Surface (m3)	Date	UDG to Surface (m3)	Date	UDG to Surface (m3)
1-Jan-2018	0.0	1-Feb-2018	0.0	1-Mar-2018	0.0
2-Jan-2018	0.0	2-Feb-2018	0.0	2-Mar-2018	0.0
3-Jan-2018	0.0	3-Feb-2018	0.0	3-Mar-2018	0.0
4-Jan-2018	0.0	4-Feb-2018	0.0	4-Mar-2018	0.0
5-Jan-2018	0.0	5-Feb-2018	0.0	5-Mar-2018	0.0
6-Jan-2018	0.0	6-Feb-2018	0.0	6-Mar-2018	0.0
7-Jan-2018	0.0	7-Feb-2018	0.0	7-Mar-2018	0.0
8-Jan-2018	0.0	8-Feb-2018	0.0	8-Mar-2018	0.0
9-Jan-2018	0.0	9-Feb-2018	0.0	9-Mar-2018	0.0
10-Jan-2018	0.0	10-Feb-2018	0.0	10-Mar-2018	0.0
11-Jan-2018	0.0	11-Feb-2018	0.0	11-Mar-2018	0.0
12-Jan-2018	0.0	12-Feb-2018	0.0	12-Mar-2018	0.0
13-Jan-2018	0.0	13-Feb-2018	0.0	13-Mar-2018	0.0
14-Jan-2018	0.0	14-Feb-2018	0.0	14-Mar-2018	0.0
15-Jan-2018	0.0	15-Feb-2018	0.0	15-Mar-2018	0.0
16-Jan-2018	0.0	16-Feb-2018	0.0	16-Mar-2018	0.0
17-Jan-2018	0.0	17-Feb-2018	0.0	17-Mar-2018	0.0
18-Jan-2018	0.0	18-Feb-2018	0.0	18-Mar-2018	0.0
19-Jan-2018	0.0	19-Feb-2018	0.0	19-Mar-2018	0.0
20-Jan-2018	0.0	20-Feb-2018	0.0	20-Mar-2018	0.0
21-Jan-2018	0.0	21-Feb-2018	0.0	21-Mar-2018	0.0
22-Jan-2018	0.0	22-Feb-2018	0.0	22-Mar-2018	0.0
23-Jan-2018	0.0	23-Feb-2018	0.0	23-Mar-2018	0.0
24-Jan-2018	0.0	24-Feb-2018	0.0	24-Mar-2018	0.0
25-Jan-2018	0.0	25-Feb-2018	0.0	25-Mar-2018	0.0
26-Jan-2018	0.0	26-Feb-2018	0.0	26-Mar-2018	0.0
27-Jan-2018	0.0	27-Feb-2018	0.0	27-Mar-2018	0.0
28-Jan-2018	0.0	28-Feb-2018	0.0	28-Mar-2018	0.0
29-Jan-2018	0.0			29-Mar-2018	0.0
30-Jan-2018	0.0			30-Mar-2018	0.0
31-Jan-2018	0.0			31-Mar-2018	0.0
Total Jan	0.0	Total Feb	0.0	Total March	0.0
				Total Q1	0.0

Date	UDG to Surface (m3)	Date	UDG to Surface (m3)	Date	UDG to Surface (m3)
1-Apr-2018	0.0	1-May-2018	0.0	1-Jun-2018	0.0
2-Apr-2018	0.0	2-May-2018	0.0	2-Jun-2018	0.0
3-Apr-2018	0.0	3-May-2018	0.0	3-Jun-2018	0.0
4-Apr-2018	0.0	4-May-2018	0.0	4-Jun-2018	0.0
5-Apr-2018	0.0	5-May-2018	0.0	5-Jun-2018	0.0
6-Apr-2018	0.0	6-May-2018	0.0	6-Jun-2018	0.0
7-Apr-2018	0.0	7-May-2018	0.0	7-Jun-2018	0.0
8-Apr-2018	0.0	8-May-2018	0.0	8-Jun-2018	0.0
9-Apr-2018	0.0	9-May-2018	0.0	9-Jun-2018	0.0
10-Apr-2018	0.0	10-May-2018	0.0	10-Jun-2018	0.0
11-Apr-2018	0.0	11-May-2018	0.0	11-Jun-2018	0.0
12-Apr-2018	0.0	12-May-2018	0.0	12-Jun-2018	0.0
13-Apr-2018	0.0	13-May-2018	0.0	13-Jun-2018	1.7
14-Apr-2018	0.0	14-May-2018	0.0	14-Jun-2018	0.0
15-Apr-2018	0.0	15-May-2018	0.0	15-Jun-2018	85.5
16-Apr-2018	0.0	16-May-2018	0.0	16-Jun-2018	101.0
17-Apr-2018	0.0	17-May-2018	0.0	17-Jun-2018	94.7
18-Apr-2018	0.0	18-May-2018	0.0	18-Jun-2018	184.5
19-Apr-2018	0.0	19-May-2018	0.0	19-Jun-2018	154.8
20-Apr-2018	0.0	20-May-2018	0.0	20-Jun-2018	103.9
21-Apr-2018	0.0	21-May-2018	0.0	21-Jun-2018	98.1
22-Apr-2018	0.0	22-May-2018	0.0	22-Jun-2018	98.7
23-Apr-2018	0.0	23-May-2018	0.0	23-Jun-2018	80.9
24-Apr-2018	0.0	24-May-2018	0.0	24-Jun-2018	65.8
25-Apr-2018	0.0	25-May-2018	0.0	25-Jun-2018	145.8
26-Apr-2018	0.0	26-May-2018	0.0	26-Jun-2018	0.0
27-Apr-2018	0.0	27-May-2018	0.0	27-Jun-2018	149.3
28-Apr-2018	0.0	28-May-2018	0.0	28-Jun-2018	34.6
29-Apr-2018	0.0	29-May-2018	0.0	29-Jun-2018	0.0
30-Apr-2018	0.0	30-May-2018	0.0	30-Jun-2018	1018.1
		31-May-2018	0.0		
Total April	0.0	Total May	0.0	Total June	2417.3
				Total Q2	2417.3

Date	UDG to Surface (m3)	Date	UDG to Surface (m3)	Date	UDG to Surface (m3)
1-Jul-2018	686.2	1-Aug-2018	822.1	1-Sep-2018	58.1
2-Jul-2018	5.0	2-Aug-2018	1014.2	2-Sep-2018	61.6
3-Jul-2018	15.9	3-Aug-2018	766.5	3-Sep-2018	0.0
4-Jul-2018	74.7	4-Aug-2018	0.0	4-Sep-2018	0.0
5-Jul-2018	27.2	5-Aug-2018	874.2	5-Sep-2018	0.0
6-Jul-2018	26.5	6-Aug-2018	678.0	6-Sep-2018	0.0
7-Jul-2018	206.6	7-Aug-2018	666.5	7-Sep-2018	0.0
8-Jul-2018	0.0	8-Aug-2018	0.0	8-Sep-2018	0.0
9-Jul-2018	48.7	9-Aug-2018	0.0	9-Sep-2018	0.0
10-Jul-2018	352.8	10-Aug-2018	0.0	10-Sep-2018	0.0
11-Jul-2018	47.6	11-Aug-2018	0.0	11-Sep-2018	0.0
12-Jul-2018	303.3	12-Aug-2018	213.7	12-Sep-2018	0.0
13-Jul-2018	0.0	13-Aug-2018	39.8	13-Sep-2018	0.0
14-Jul-2018	360.6	14-Aug-2018	760.4	14-Sep-2018	437.5
15-Jul-2018	400.6	15-Aug-2018	752.6	15-Sep-2018	0.0
16-Jul-2018	560.9	16-Aug-2018	0.0	16-Sep-2018	1631.2
17-Jul-2018	666.9	17-Aug-2018	1062.9	17-Sep-2018	783.6
18-Jul-2018	685.7	18-Aug-2018	21.0	18-Sep-2018	0.0
19-Jul-2018	382.1	19-Aug-2018	0.0	19-Sep-2018	0.0
20-Jul-2018	680.7	20-Aug-2018	0.0	20-Sep-2018	0.0
21-Jul-2018	586.0	21-Aug-2018	2.4	21-Sep-2018	2641.3
22-Jul-2018	270.3	22-Aug-2018	31.0	22-Sep-2018	1804.2
23-Jul-2018	363.0	23-Aug-2018	0.0	23-Sep-2018	318.0
24-Jul-2018	0.0	24-Aug-2018	5.8	24-Sep-2018	376.0
25-Jul-2018	0.0	25-Aug-2018	0.0	25-Sep-2018	376.0
26-Jul-2018	1187.1	26-Aug-2018	0.0	26-Sep-2018	376.0
27-Jul-2018	61.7	27-Aug-2018	0.0	27-Sep-2018	376.0
28-Jul-2018	358.6	28-Aug-2018	0.0	28-Sep-2018	376.0
29-Jul-2018	0.0	29-Aug-2018	0.0	29-Sep-2018	0.0
30-Jul-2018	0.0	30-Aug-2018	0.0	30-Sep-2018	0.0
31-Jul-2018	1978.7	31-Aug-2018	0.0		
Total July	10337.2	Total Aug	7711.1	Total Sept	9615.6
				Total Q3	27663.9

Date	UDG to Surface (m3)	Date	UDG to Surface (m3)	Date	UDG to Surface (m3)
1-Oct-2018	0.0	1-Nov-2018	478.0	1-Dec-2018	0.0
2-Oct-2018	0.0	2-Nov-2018	478.0	2-Dec-2018	0.0
3-Oct-2018	0.0	3-Nov-2018	478.0	3-Dec-2018	0.0
4-Oct-2018	0.0	4-Nov-2018	478.0	4-Dec-2018	131.4
5-Oct-2018	0.0	5-Nov-2018	478.0	5-Dec-2018	0.0
6-Oct-2018	0.0	6-Nov-2018	478.0	6-Dec-2018	0.0
7-Oct-2018	0.0	7-Nov-2018	478.0	7-Dec-2018	61.0
8-Oct-2018	0.0	8-Nov-2018	0.0	8-Dec-2018	80.6
9-Oct-2018	0.0	9-Nov-2018	0.0	9-Dec-2018	8.4
10-Oct-2018	0.0	10-Nov-2018	0.0	10-Dec-2018	35.8
11-Oct-2018	0.0	11-Nov-2018	0.0	11-Dec-2018	72.6
12-Oct-2018	0.0	12-Nov-2018	0.0	12-Dec-2018	45.2
13-Oct-2018	0.0	13-Nov-2018	0.0	13-Dec-2018	48.4
14-Oct-2018	0.0	14-Nov-2018	0.0	14-Dec-2018	48.0
15-Oct-2018	0.0	15-Nov-2018	0.0	15-Dec-2018	0.0
16-Oct-2018	0.0	16-Nov-2018	0.0	16-Dec-2018	0.0
17-Oct-2018	0.0	17-Nov-2018	0.0	17-Dec-2018	60.0
18-Oct-2018	0.0	18-Nov-2018	0.0	18-Dec-2018	85.0
19-Oct-2018	0.0	19-Nov-2018	0.0	19-Dec-2018	53.0
20-Oct-2018	0.0	20-Nov-2018	0.0	20-Dec-2018	24.0
21-Oct-2018	0.0	21-Nov-2018	0.0	21-Dec-2018	0.0
22-Oct-2018	0.0	22-Nov-2018	0.0	22-Dec-2018	0.0
23-Oct-2018	0.0	23-Nov-2018	0.0	23-Dec-2018	0.0
24-Oct-2018	0.0	24-Nov-2018	0.0	24-Dec-2018	0.0
25-Oct-2018	0.0	25-Nov-2018	0.0	25-Dec-2018	0.0
26-Oct-2018	0.0	26-Nov-2018	0.0	26-Dec-2018	0.0
27-Oct-2018	2099.8	27-Nov-2018	0.0	27-Dec-2018	0.0
28-Oct-2018	0.0	28-Nov-2018	0.0	28-Dec-2018	41.4
29-Oct-2018	1354.1	29-Nov-2018	0.0	29-Dec-2018	27.3
30-Oct-2018	0.0	30-Nov-2018	0.0	30-Dec-2018	36.8
31-Oct-2018	0.0			31-Dec-2018	32.3
Total Oct	3453.9	Total Nov	3346.0	Total Dec	891.2
				Total Q4	7691.1

Appendix A-3

Daily quantities of Seepage from dikes, dams and other structures in cubic meters

Daily Water Withdrawals at Meliadine in 2018

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Jan-2018	0	0	0	0	**0**
2-Jan-2018	0	0	0	0	**0**
3-Jan-2018	0	0	0	0	**0**
4-Jan-2018	0	0	0	0	**0**
5-Jan-2018	0	0	0	0	**0**
6-Jan-2018	0	0	0	0	**0**
7-Jan-2018	0	0	0	0	**0**
8-Jan-2018	0	0	0	0	**0**
9-Jan-2018	0	0	0	0	**0**
10-Jan-2018	0	0	0	0	**0**
11-Jan-2018	0	0	0	0	**0**
12-Jan-2018	0	0	0	0	**0**
13-Jan-2018	0	0	0	0	**0**
14-Jan-2018	0	0	0	0	**0**
15-Jan-2018	0	0	0	0	**0**
16-Jan-2018	0	0	0	0	**0**
17-Jan-2018	0	0	0	0	**0**
18-Jan-2018	0	0	0	0	**0**
19-Jan-2018	0	0	0	0	**0**
20-Jan-2018	0	0	0	0	**0**
21-Jan-2018	0	0	0	0	**0**
22-Jan-2018	0	0	0	0	**0**
23-Jan-2018	0	0	0	0	**0**
24-Jan-2018	0	0	0	0	**0**
25-Jan-2018	0	0	0	0	**0**
26-Jan-2018	0	0	0	0	**0**
27-Jan-2018	0	0	0	0	**0**
28-Jan-2018	0	0	0	0	**0**
29-Jan-2018	0	0	0	0	**0**
30-Jan-2018	0	0	0	0	**0**
31-Jan-2018	0	0	0	0	**0**
Total Jan	0	0	0	0	**0**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Feb-2018	0	0	0	0	**0**
2-Feb-2018	0	0	0	0	**0**
3-Feb-2018	0	0	0	0	**0**
4-Feb-2018	0	0	0	0	**0**
5-Feb-2018	0	0	0	0	**0**
6-Feb-2018	0	0	0	0	**0**
7-Feb-2018	0	0	0	0	**0**
8-Feb-2018	0	0	0	0	**0**
9-Feb-2018	0	0	0	0	**0**
10-Feb-2018	0	0	0	0	**0**
11-Feb-2018	0	0	0	0	**0**
12-Feb-2018	0	0	0	0	**0**
13-Feb-2018	0	0	0	0	**0**
14-Feb-2018	0	0	0	0	**0**
15-Feb-2018	0	0	0	0	**0**
16-Feb-2018	0	0	0	0	**0**
17-Feb-2018	0	0	0	0	**0**
18-Feb-2018	0	0	0	0	**0**
19-Feb-2018	0	0	0	0	**0**
20-Feb-2018	0	0	0	0	**0**
21-Feb-2018	0	0	0	0	**0**
22-Feb-2018	0	0	0	0	**0**
23-Feb-2018	0	0	0	0	**0**
24-Feb-2018	0	0	0	0	**0**
25-Feb-2018	0	0	0	0	**0**
26-Feb-2018	0	0	0	0	**0**
27-Feb-2018	0	0	0	0	**0**
28-Feb-2018	0	0	0	0	**0**
Total Feb	0	0	0	0	**0**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Mar-2018	0	0	0	0	**0**
2-Mar-2018	0	0	0	0	**0**
3-Mar-2018	0	0	0	0	**0**
4-Mar-2018	0	0	0	0	**0**
5-Mar-2018	0	0	0	0	**0**
6-Mar-2018	0	0	0	0	**0**
7-Mar-2018	0	0	0	0	**0**
8-Mar-2018	0	0	0	0	**0**
9-Mar-2018	0	0	0	0	**0**
10-Mar-2018	0	0	0	0	**0**
11-Mar-2018	0	0	0	0	**0**
12-Mar-2018	0	0	0	0	**0**
13-Mar-2018	0	0	0	0	**0**
14-Mar-2018	0	0	0	0	**0**
15-Mar-2018	0	0	0	0	**0**
16-Mar-2018	0	0	0	0	**0**
17-Mar-2018	0	0	0	0	**0**
18-Mar-2018	0	0	0	0	**0**
19-Mar-2018	0	0	0	0	**0**
20-Mar-2018	0	0	0	0	**0**
21-Mar-2018	0	0	0	0	**0**
22-Mar-2018	0	0	0	0	**0**
23-Mar-2018	0	0	0	0	**0**
24-Mar-2018	0	0	0	0	**0**
25-Mar-2018	0	0	0	0	**0**
26-Mar-2018	0	0	0	0	**0**
27-Mar-2018	0	0	0	0	**0**
28-Mar-2018	0	0	0	0	**0**
29-Mar-2018	0	0	0	0	**0**
30-Mar-2018	0	0	0	0	**0**
31-Mar-2018	0	0	0	0	**0**
Total March	0	0	0	0	**0**
Total Q1	0	0	0	0	**0**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Apr-18	0	0	0	0	**0**
2-Apr-18	0	0	0	0	**0**
3-Apr-18	0	0	0	0	**0**
4-Apr-18	0	0	0	0	**0**
5-Apr-18	0	0	0	0	**0**
6-Apr-18	0	0	0	0	**0**
7-Apr-18	0	0	0	0	**0**
8-Apr-18	0	0	0	0	**0**
9-Apr-18	0	0	0	0	**0**
10-Apr-18	0	0	0	0	**0**
11-Apr-18	0	0	0	0	**0**
12-Apr-18	0	0	0	0	**0**
13-Apr-18	0	0	0	0	**0**
14-Apr-18	0	0	0	0	**0**
15-Apr-18	0	0	0	0	**0**
16-Apr-18	0	0	0	0	**0**
17-Apr-18	0	0	0	0	**0**
18-Apr-18	0	0	0	0	**0**
19-Apr-18	0	0	0	0	**0**
20-Apr-18	0	0	0	0	**0**
21-Apr-18	0	0	0	0	**0**
22-Apr-18	0	0	0	0	**0**
23-Apr-18	0	0	0	0	**0**
24-Apr-18	0	0	0	0	**0**
25-Apr-18	0	0	0	0	**0**
26-Apr-18	0	0	0	0	**0**
27-Apr-18	0	0	0	0	**0**
28-Apr-18	0	0	0	0	**0**
29-Apr-18	0	0	0	0	**0**
30-Apr-18	0	0	0	0	**0**
Total April	0	0	0	0	**0**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-May-18	0	0	0	0	**0**
2-May-18	0	0	0	0	**0**
3-May-18	0	0	0	0	**0**
4-May-18	0	0	0	0	**0**
5-May-18	0	0	0	0	**0**
6-May-18	0	0	0	0	**0**
7-May-18	0	0	0	0	**0**
8-May-18	0	0	0	0	**0**
9-May-18	0	0	0	0	**0**
10-May-18	0	0	0	0	**0**
11-May-18	0	0	0	0	**0**
12-May-18	0	0	0	0	**0**
13-May-18	0	0	0	0	**0**
14-May-18	0	0	0	0	**0**
15-May-18	0	0	0	0	**0**
16-May-18	0	0	0	0	**0**
17-May-18	0	0	0	0	**0**
18-May-18	0	0	0	0	**0**
19-May-18	0	0	0	0	**0**
20-May-18	0	0	0	0	**0**
21-May-18	0	0	0	0	**0**
22-May-18	0	0	0	0	**0**
23-May-18	0	0	0	0	**0**
24-May-18	0	0	0	0	**0**
25-May-18	0	0	0	0	**0**
26-May-18	0	0	0	0	**0**
27-May-18	0	0	0	0	**0**
28-May-18	0	0	0	0	**0**
29-May-18	0	0	0	0	**0**
30-May-18	0	0	0	0	**0**
31-May-18	0	0	0	0	**0**
Total May	0	0		0	**0**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Jun-18	0	0	0	0	**0**
2-Jun-18	0	0	0	0	**0**
3-Jun-18	0	0	0	0	**0**
4-Jun-18	0	0	0	0	**0**
5-Jun-18	0	5425	0	0	**5425**
6-Jun-18	0	5600	0	0	**5600**
7-Jun-18	0	3325	0	0	**3325**
8-Jun-18	0	432	0	0	**432**
9-Jun-18	486	1152	0	0	**1638**
10-Jun-18	1296	720	0	0	**2016**
11-Jun-18	1296	1152	0	0	**2448**
12-Jun-18	945	1152	0	0	**2097**
13-Jun-18	351	1152	0	0	**1503**
14-Jun-18	432	1152	192	0	**1776**
15-Jun-18	324	288	168	0	**780**
16-Jun-18	0	0	0	0	**0**
17-Jun-18	540	0	0	0	**540**
18-Jun-18	972	0	0	0	**972**
19-Jun-18	918	0	0	0	**918**
20-Jun-18	552	0	0	0	**552**
21-Jun-18	1296	0	0	0	**1296**
22-Jun-18	1296	0	0	0	**1296**
23-Jun-18	0	0	0	0	**0**
24-Jun-18	0	0	0	0	**0**
25-Jun-18	0	0	0	0	**0**
26-Jun-18	0	0	0	0	**0**
27-Jun-18	0	0	0	0	**0**
28-Jun-18	0	0	72	0	**72**
29-Jun-18	0	0	0	0	**0**
30-Jun-18	0	0	0	0	**0**
Total June	10704	21550	432	0	**32686**
Total Q2	10704	21550	432	0	**32686**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Jul-18	0	0	0	0	**0**
2-Jul-18	0	0	419	0	**419**
3-Jul-18	0	0	0	0	**0**
4-Jul-18	303	0	0	0	**303**
5-Jul-18	0	0	0	0	**0**
6-Jul-18	0	0	0	0	**0**
7-Jul-18	0	0	0	0	**0**
8-Jul-18	0	0	0	0	**0**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Aug-18	0	0	0	619	**619**
2-Aug-18	0	0	0	619	**619**
3-Aug-18	0	0	0	619	**619**
4-Aug-18	0	0	0	619	**619**
5-Aug-18	0	0	0	619	**619**
6-Aug-18	0	0	0	0	**0**
7-Aug-18	0	0	0	0	**0**
8-Aug-18	0	0	619	619	**1238**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Sep-18	0	0	0	619	**619**
2-Sep-18	0	0	0	0	**0**
3-Sep-18	0	0	0	0	**0**
4-Sep-18	0	0	0	0	**0**
5-Sep-18	0	0	0	0	**0**
6-Sep-18	0	0	0	0	**0**
7-Sep-18	0	0	0	0	**0**
8-Sep-18	0	0	0	0	**0**

Daily Water Withdrawals at Meliadine in 2018

9-Jul-18	92	0	155	129	**376**	9-Aug-18	0	0	619	619	**1238**	9-Sep-18	0	0	0	0	**0**
10-Jul-18	133	0	155	129	**417**	10-Aug-18	0	0	619	619	**1238**	10-Sep-18	0	0	0	0	**0**
11-Jul-18	0	0	26	0	**26**	11-Aug-18	0	0	619	619	**1238**	11-Sep-18	0	0	0	619	**619**
12-Jul-18	0	0	0	0	**0**	12-Aug-18	0	0	619	619	**1238**	12-Sep-18	0	0	0	619	**619**
13-Jul-18	0	0	0	0	**0**	13-Aug-18	0	0	619	619	**1238**	13-Sep-18	0	0	0	619	**619**
14-Jul-18	0	0	0	0	**0**	14-Aug-18	0	0	619	619	**1238**	14-Sep-18	0	0	0	619	**619**
15-Jul-18	2	0	26	155	**183**	15-Aug-18	0	0	619	619	**1238**	15-Sep-18	0	0	0	619	**619**
16-Jul-18	2	0	26	155	**183**	16-Aug-18	0	0	619	619	**1238**	16-Sep-18	0	0	0	619	**619**
17-Jul-18	0	0	0	619	**619**	17-Aug-18	0	0	619	619	**1238**	17-Sep-18	0	0	0	619	**619**
18-Jul-18	0	0	0	619	**619**	18-Aug-18	0	0	619	619	**1238**	18-Sep-18	0	0	0	1094	**1094**
19-Jul-18	0	0	0	619	**619**	19-Aug-18	0	0	619	619	**1238**	19-Sep-18	0	0	0	1094	**1094**
20-Jul-18	0	0	0	619	**619**	20-Aug-18	0	0	619	619	**1238**	20-Sep-18	0	0	0	1094	**1094**
21-Jul-18	0	0	0	619	**619**	21-Aug-18	0	0	0	619	**619**	21-Sep-18	0	0	0	619	**619**
22-Jul-18	0	0	0	619	**619**	22-Aug-18	0	0	0	619	**619**	22-Sep-18	0	0	0	619	**619**
23-Jul-18	0	0	0	619	**619**	23-Aug-18	0	0	0	619	**619**	23-Sep-18	0	0	0	1094	**1094**
24-Jul-18	0	0	0	619	**619**	24-Aug-18	0	0	0	619	**619**	24-Sep-18	0	0	0	1094	**1094**
25-Jul-18	0	0	0	619	**619**	25-Aug-18	0	0	0	619	**619**	25-Sep-18	0	0	0	1094	**1094**
26-Jul-18	0	0	0	619	**619**	26-Aug-18	0	0	0	619	**619**	26-Sep-18	0	0	0	1094	**1094**
27-Jul-18	0	0	0	619	**619**	27-Aug-18	0	0	0	619	**619**	27-Sep-18	0	0	0	1094	**1094**
28-Jul-18	0	0	0	619	**619**	28-Aug-18	0	0	0	619	**619**	28-Sep-18	0	0	0	1094	**1094**
29-Jul-18	0	0	0	619	**619**	29-Aug-18	0	0	0	619	**619**	29-Sep-18	0	0	0	1094	**1094**
30-Jul-18	0	0	0	619	**619**	30-Aug-18	0	0	0	0	**0**	30-Sep-18	0	0	0	1094	**1094**
31-Jul-18	0	0	0	619	**619**	31-Aug-18	0	0	0	0	**0**						
Total July	533	0	806	9856	**11195**	Total Aug	0	0	8050	16718	**24768**	Total Sept	0	0	0	18230	**18230**
												Total Q3	533	0	8856	44804	**54193**

Date	DCP-1	DCP-5	DP-1	DP-3	**Total**	Date	DCP-1	DCP-5	DP-1	DP-3	**Total**	Date	DCP-1	DCP-5	DP-1	DP-3	**Total**
1-Oct-18	0	0	0	1094	**1094**	1-Nov-18	0	0	0	0	**0**	1-Dec-18	0	0	0	0	**0**
2-Oct-18	0	0	0	1094	**1094**	2-Nov-18	0	0	0	0	**0**	2-Dec-18	0	0	0	0	**0**
3-Oct-18	0	0	0	1094	**1094**	3-Nov-18	0	0	0	0	**0**	3-Dec-18	0	0	0	0	**0**
4-Oct-18	0	0	0	1094	**1094**	4-Nov-18	0	0	0	0	**0**	4-Dec-18	0	0	0	0	**0**
5-Oct-18	0	0	0	0	**0**	5-Nov-18	0	0	0	0	**0**	5-Dec-18	0	0	0	0	**0**
6-Oct-18	0	0	0	0	**0**	6-Nov-18	0	0	0	0	**0**	6-Dec-18	0	0	0	0	**0**
7-Oct-18	0	0	0	0	**0**	7-Nov-18	0	0	0	0	**0**	7-Dec-18	0	0	0	0	**0**
8-Oct-18	0	0	0	0	**0**	8-Nov-18	0	0	0	0	**0**	8-Dec-18	0	0	0	0	**0**
9-Oct-18	0	0	0	0	**0**	9-Nov-18	0	0	0	0	**0**	9-Dec-18	0	0	0	0	**0**
10-Oct-18	0	0	0	0	**0**	10-Nov-18	0	0	0	0	**0**	10-Dec-18	0	0	0	0	**0**
11-Oct-18	0	0	0	0	**0**	11-Nov-18	0	0	0	0	**0**	11-Dec-18	0	0	0	0	**0**
12-Oct-18	0	0	0	0	**0**	12-Nov-18	0	0	0	0	**0**	12-Dec-18	0	0	0	0	**0**
13-Oct-18	0	0	0	0	**0**	13-Nov-18	0	0	0	0	**0**	13-Dec-18	0	0	0	0	**0**
14-Oct-18	0	0	0	0	**0**	14-Nov-18	0	0	0	0	**0**	14-Dec-18	0	0	0	0	**0**
15-Oct-18	0	0	0	0	**0**	15-Nov-18	0	0	0	0	**0**	15-Dec-18	0	0	0	0	**0**
16-Oct-18	0	0	0	0	**0**	16-Nov-18	0	0	0	0	**0**	16-Dec-18	0	0	0	0	**0**
17-Oct-18	0	0	0	0	**0**	17-Nov-18	0	0	0	0	**0**	17-Dec-18	0	0	0	0	**0**
18-Oct-18	0	0	0	0	**0**	18-Nov-18	0	0	0	0	**0**	18-Dec-18	0	0	0	0	**0**
19-Oct-18	0	0	0	0	**0**	19-Nov-18	0	0	0	0	**0**	19-Dec-18	0	0	0	0	**0**
20-Oct-18	0	0	0	0	**0**	20-Nov-18	0	0	0	0	**0**	20-Dec-18	0	0	0	0	**0**
21-Oct-18	0	0	0	0	**0**	21-Nov-18	0	0	0	0	**0**	21-Dec-18	0	0	0	0	**0**
22-Oct-18	0	0	0	0	**0**	22-Nov-18	0	0	0	0	**0**	22-Dec-18	0	0	0	0	**0**
23-Oct-18	0	0	0	0	**0**	23-Nov-18	0	0	0	0	**0**	23-Dec-18	0	0	0	0	**0**
24-Oct-18	0	0	0	0	**0**	24-Nov-18	0	0	0	0	**0**	24-Dec-18	0	0	0	0	**0**
25-Oct-18	0	0	0	0	**0**	25-Nov-18	0	0	0	0	**0**	25-Dec-18	0	0	0	0	**0**
26-Oct-18	0	0	0	0	**0**	26-Nov-18	0	0	0	0	**0**	26-Dec-18	0	0	0	0	**0**
27-Oct-18	0	0	0	0	**0**	27-Nov-18	0	0	0	0	**0**	27-Dec-18	0	0	0	0	**0**
28-Oct-18	0	0	0	0	**0**	28-Nov-18	0	0	0	0	**0**	28-Dec-18	0	0	0	0	**0**
29-Oct-18	0	0	0	0	**0**	29-Nov-18	0	0	0	0	**0**	29-Dec-18	0	0	0	0	**0**
30-Oct-18	0	0	0	0	**0**	30-Nov-18	0	0	0	0	**0**	30-Dec-18	0	0	0	0	**0**
31-Oct-18	0	0	0	0	**0**							31-Dec-18	0	0	0	0	**0**
Total Oct	0	0	0	4378	**4378**	Total Nov	0	0	0	0	**0**	Total Dec	0	0	0	0	**0**
												Total Q4	0	0	0	4378	**4378**

Appendix B-1

Annual geotechnical inspection report

REPORT

2018 Annual Geotechnical Inspection

Meliadine Gold Project, Rankin Inlet, Nunavut

Submitted to:

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19 February 2019

Distribution List

Electronic Copy - Agnico Eagle Mines Limited

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Executive Summary

Agnico Eagle Mines Limited (AEM) retained Golder Associates Ltd. (Golder) to conduct the 2018 annual geotechnical inspection of the Meliadine Gold Project to comply with the requirements of AEM's Water Licence Permit No. 2AM-MEL1631. The inspection was conducted between 10 and 14 of September 2018 and covered the geotechnical aspects for the water management infrastructure, roads, waste facilities, underground portals, infrastructure pads, fuel storage facilities, in the following areas:

- main site
- exploration camp site
- all-weather access road (AWAR)
- Itivia site and by-pass road

This report describes the geotechnical aspects of the areas inspected, presents general observations, recommendations, and provides comments on instrumentation data, where available. In addition, a description of the geophysical and permafrost conditions for the site is provided.

Infrastructure for the mine is progressively being built, including some of the water management collection ponds, associated dikes, the tailings storage facility, open pits, waste rock storage facilities, diversion berms and channels. The inspection was carried out in accordance with the requirements of the Water Licence, for the facilities in existence at the time of the inspection.

The inspection occurred when there was no snow or ice on the lakes or land, following the freshet, and when surface water flows were generally low. Peak surface water flows typically occur during the freshet (May and June). During the inspection the weather was generally clear with some periods of rain. Daily temperatures varied between 0°C and 8°C. Water levels were considered to be normal for this period of the year, and the flow observed at water crossings was low.

AEM's environmental department monitors the water levels and quality in the collection ponds and collects instrumentation data.

The results of the 2018 annual geotechnical inspection carried out at the Project site, along the AWAR, at the Itivia site, and along the Itivia by-pass road indicate that the infrastructure was generally in good condition and performing as designed.

The following presents a summary of the recommendations from the 2018 geotechnical inspection for the infrastructure in each of the areas inspected. The recommendations have been grouped based on the type of recommendation and have also been given a rating of High (L), Medium (M), or Low (L) priority.

The following recommendations are related to surveillance and monitoring:

The recommendations for surveillance and monitoring don't currently require a maintenance action but may warrant future maintenance if conditions worsen.

Main Site

- Geotechnical inspections should be carried out and documented for D-CP1 and D-CP5 following the schedule developed in the OMS manual. In addition, instrumentation should be monitored, and the data should be plotted and reviewed, following the schedule developed in the OMS manual. These activities were completed by AEM in 2018; however, not quite to the schedule in the OMS. The OMS manual indicates that daily inspections should be completed and documented using the same form as the weekly inspection, which were not completed in 2018. The OMS manual does not indicate if there is seasonal variability to the frequency of documented inspections. It may be acceptable to seasonally vary the frequency of inspections, but this should be reviewed with the Engineer of Record (EoR) for the dikes and the OMS manual should be updated, as required. The OMS manual should be reviewed and updated annually and is next due for review in June 2019. (H)
- If the P-Area dikes will continue to be used, they should be added to the OMS manual that was developed for D-CP1 and D-CP5. Geotechnical inspections and instrumentation monitoring should be carried out and documented following the schedule developed in the OMS manual. (H)
- Implement a road and culvert monitoring program for site roads, as is done for the AWAR, which is tied to a maintenance program. (M)
- Conduct inspections along Itivia by-pass road, as per the Road Management Plan (AEM 2015b), now that the road is complete. (M)
- Monitor the cracking adjacent to Channel 5. If cracking gets worse, recontouring and/or compacting the areas of cracking to close the cracks will reduce the potential for water to infiltrate into the cracks leading to warming of the permafrost and additional thaw settlement and cracking. (M)
- Monitor the cracking observed in the D-CP1 downstream sump berms and adjacent to the downstream collection channel. Recontouring and/or compacting the areas of cracking to close the cracks will reduce the potential for water to infiltrate into the cracks leading to warming of the permafrost and additional thaw settlement and cracking. (M)
- Ponding upstream of Berm 3 should be monitored to determine how much and how often ponding occurs and if Berm 3 can perform as required with the ponding. (M)
- The Berm 3 cover materials may be susceptible to erosion. This should be monitored, and if there is erosion, consideration should be given to placing coarser material on Berm 3 to reduce the potential for erosion. (M)

Exploration Site

- The cracks in fuel storage pad should be monitored; however, they are not considered to be a geotechnical concern. (L)

All-weather Access Road

- Continue to monitor culverts and hydraulic effectiveness to assess if current culverts provide adequate capacity and if any changes are required. Evaluate if any culverts need to be installed at a lower elevation to reduce ponding, and downstream erosion. (M)
- Monitor areas that have ponding, but no culverts and consider installing culverts to manage water. (M)
- Conduct inspections and document observations and recommendations as laid out in the Road Management Plan (AEM 2015b). Road inspections were completed and documented in 2018, but documentation indicates that the frequency of the inspections did not quite meet what is laid out in the Road Management Plan. (H)

Itivia Site and By-pass Road

- The locations of some of the culverts through the Itivia by-pass road do not correlate with the design drawings (Tetra Tech 2017e) due to changes made during construction. The culvert locations should be referenced to the as-built report and drawings during the 2019 annual geotechnical inspection. (M)
- The as-built report should confirm culvert sizes, locations, and invert elevations have been constructed to the design. The as-built report should also confirm that safety berms have been constructed where required based on road fill height and confirm that road slopes have been constructed to the design. (M)
- The section of the road and safety berm that is constructed with esker material may be susceptible to erosion. This should be monitored and maintenance completed as required. (L)
- Ponding of water along the road should be monitored and if it is impacting the condition of the road, mitigation measures should be implemented, such as, lowering the culverts or ditching or placing fill to direct water to the culvert inlets. (M)

The following recommendations are related to operational procedures:

Main Site

- Water volumes within containment ponds should be managed to the levels defined in the OMS manual, including maintaining the water level below the elevation defined for the end of October in the OMS manual over the winter to promote freezing of the dikes. (H)
- The D-CP1 sump and downstream collection channel should be emptied in the fall/early winter to refreeze the ground around these facilities. During the open water season, keeping the water level in the downstream channel and sump low will reduce the potential for thaw of the ground around the channel and sump and associated settlement. (M)
- Consider adding data loggers to thermistors for easier collection of data, especially in the winter when access may be more limited. (L)
- Where possible, try not to allow seepage water from DP3-A to pond against the Saline Pond berm to avoid permafrost degradation. (M)

- Monitor slopes above Portal No. 2 for rockfill instability during backfill placement. (H)
- Snow management around Portal No. 1 and 2 may be advisable prior to freshet to reduce inflows to the underground. (L)

Exploration Site

- Minimize the amount of water contained within the exploration landfarm until it is decommissioned and remediated. (M)

The following recommendations relate to maintenance or repairs that are required:

Main Site

- Cracks and areas of settlement in the containment pond dikes should be filled and/or recontoured to close the cracks and reduce the potential for infiltration and erosion. (M)
- Ponding of water adjacent to roads should be avoided. Disturbed areas from road construction should be recontoured to promote drainage away from the road and consideration should be given to installing culverts if ponding occurs in naturally low areas. This was most notable along the Emulsion Plant and Wesmeg Borrow access roads. (M)
- If the Wesmeg Borrow access road is blocking drainage near Lake B33A that is leading to ponding adjacent to the road, a culvert should be installed to allow drainage so that there isn't permafrost degradation and settlement. (M)
- Consider adding a crushed surface material to the Emulsion Plant and storage area pads if trafficability continues to be an issue. (M)
- Survey monitoring plate M-3 on D-CP5 should be replaced. (M)
- Where erosion is occurring on slopes of pads, the existing materials should be regraded and compacted, and a coarser material should be placed to further reduce erosion potential. Higher priority should be given to areas where erosion is encroaching on sea containers or other facilities placed close to the slope. The most significant pad erosion was observed at the north side of the main camp/industrial pad and the Emulsion Plant pad. (M)
- The cracking and sloughing along Channel 1 should be assessed to determine if the channel is too steep and riprap is sloughing over geotextile or if it is caused by thermal degradation of permafrost adjacent to the channel. If possible, the channel should be kept empty through the winter to promote freezing of the permafrost around the channel. (M)
- Where access is feasible, removal of snow from the water collection pond dikes (temporary and permanent) is recommended to reduce the insulating effects of the snow, thereby allowing the temperature of the core material in the dikes and the foundations to drop as low as possible. Snow removal is more important if thermistor data is indicating that the dike and/or foundation temperatures are warmer than expected. (M)

- Make sure thermistors in the water management dikes are well marked so they can be located and maintained during the winter and are not damaged during snow removal operations. (H)
- The slopes of the Operation Landfill should be monitored, particularly the northeast corner where water was observed to be ponding downstream and there was some possible sloughing on the slope. Regrading and compacting the slope in this area will reduce the potential for erosion. (M)
- Consider adding rockfill material to cover the till berm in P1, to protect the till and maintain its integrity if this berm is required for water management. (L)
- The Wesmeg Borrow Area should be recontoured and either capped with a coarser material or revegetated to reduce erosion. (M)
- A coarser rockfill layer should be placed over the decommissioned exploration landfill to reduce erosion and cracking. (M)
- Snow management around and above Portal No. 1 and 2 may be advisable, especially prior to freshet, to reduce the potential for larger surface water inflows entering the underground. (L)

Exploration Camp Site

- Repair surface erosion along south slope of exploration camp pad. Grade surface to reduce channelization of surface water flows and therefore reduce the potential for the erosion to reoccur. In this area, a coarser surfacing layer could be placed to help reduce the potential for future erosion. (L)
- The exploration camp access road should be regraded and consideration given to placing some coarser rockfill on the slopes where there is erosion. (M)
- The culverts through the exploration camp access road should be cleared of material. Large boulders should be removed from above culverts to prevent potential damage to the culverts and appropriately sized riprap should be added to the road fills around he culverts for erosion protection where there isn't any. (M)
- The diffuser access road could be regraded to close up the cracks and reduce the potential for future cracking. (L)

All-weather Access Road

- The kilometre markings on the AWAR culverts should be checked and replaced with accurate numbers. At the time of the 2018 site visit, AEM indicated that new markers had been ordered, but had not arrived. (M)
- Specific recommendations for the AWAR culverts and bridges are summarized in Table 9.

Itivia Site and By-pass Road

- Cover material should be re-established over the liner that has been exposed on the south containment berm of the Itivia fuel storage facility to protect the liner. (M)
- The culverts should be cleared of all materials prior to freshet. (H)

The following recommendations relate to future construction:

- Road and pad materials should be compacted to reduce the potential of the material being eroded, and if necessary a coarser, well graded, cover material should be placed to further reduce erosion potential.
- When culverts are installed, ensure bedding material surrounding culverts is of a suitable gradation (e.g., sandy) and compacted. Large boulders should not be placed in direct contact with the culverts within the road fills; however, the slopes of the road around the outlets of the culverts should be armoured with appropriately sized material (e.g., cobbles) to reduce erosion.

Study Limitations

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Itivia Fuel Storage, Laydown, and By-Pass Road Photographs

1.0 INTRODUCTION

Agnico Eagle Mines Limited (AEM) is developing the Meliadine Gold Project (the Project). It is located approximately 25 km north of Rankin Inlet, in the Kivalliq Region of Nunavut. A series of open pits as well as underground development will be used to extract gold.

AEM retained Golder Associates Ltd. (Golder) to conduct the 2018 annual geotechnical inspection for the Project, pursuant to the requirements of the Type A Water Licence Permit No.2AM-MEL1631 (Nunavut Water Board 2016).

Under Part I, Item 14 (page 21) and Schedule I, Item 1 (page 39) of the Water Licence, AEM is required to undertake an annual geotechnical inspection of its facilities between the months of July and September. The inspection is to be carried out by a geotechnical engineer, and to be in accordance with the Canadian Dam Association (CDA) *Dam Safety Guidelines* (CDA 2013), where applicable. The inspection occurred between 10 and 14 September 2018, and was conducted by Allison Isidoro, a geotechnical engineer, holding professional registration in Nunavut, and employed by Golder.

Construction of the infrastructure for the Project has commenced and will continue in stages as development and mining progresses. The following structures were inspected:

- main site including
  - P-Area temporary collection ponds (P1, P2, and P3) and associated dikes (DP1-A, DP1-B, DP2-A, DP3-A)
  - permanent water collection ponds CP1 and CP5 and their associated dikes (D-CP1 and D-CP5) and jetties
  - diversion Berm 3
  - diversion channels 2, 3, and 5, and partially completed diversion channel 1 (including Culvert 16)
  - saline pond
  - site roads
    - main site pad area roads, including culverts 2, 3, and 4
    - Tiriganiaq Esker access road
    - Wesmeg access road, Wesmeg Borrow and vent raise
    - magazine storage access road
    - main site water intake access road
    - emulsion plant pad access road, including Culvert 13
    - CP4 access road
    - landfill access road, future TSF area, including Culvert 1

- pads
  - main camp pad
  - industrial pad
  - east ventilation raise pad
  - temporary cyanide storage pad
  - effluent water treatment plant pad
  - explosives (ANFO plant) pad and magazine storage
  - emulsion plant pad
- ore and waste rock storage areas
- landfarm
- exploration and operations landfills
- underground Portals No. 1 and No. 2
- industrial fuel storage and mine site fuel storage

- exploration camp site including
  - site pad and diffuser access road
  - genset storage area
  - fresh water intake
  - access road
  - landfarm
  - fuel storage
- all-weather access road (AWAR)
- Itivia site
  - fuel storage
  - bypass road

The facilities at the main mine site and exploration camp areas that had been constructed at the time of the 2018 inspection are shown in Figure 1. At the time of the inspection, the P-Area had been completed in addition to permanent water management pond dikes D-CP1 and D-CP5. Diversion Channels 2, 3, and 5 were complete and Channel 1 was partially complete. Berm 3 was constructed. Berm 2 was under construction and was not inspected. Some site service roads were in place with the associated culverts and ditches constructed to manage water around infrastructure and roads. Construction of the industrial pad and infrastructure was ongoing. Underground Portal No. 1 was operational. Underground development was occurring, with associated waste rock and ore being hauled to the surface and placed in stockpiles. The culvert over the entrance to underground Portal No. 2 was being backfilled and the drift was being advanced. The operations landfill and landfarm facilities had been constructed. The effluent water treatment plant and associated intake had been constructed. The fresh water intake pump and associated pipeline were in place and an access road had been constructed to within a few metres of the lake. The pipeline was running along the toe of the road. The mine site and industrial site fuel storage facilities had been constructed. The saline water pond had been constructed and was storing water. The emulsion plant and access road had been constructed.

The exploration camp site was the first area of the Project to be developed. The exploration site was inspected, including the site pad, fresh water intake, diffuser access, landfarm, fuel storage, and access road.

Many other aspects of the future development for the Project had not been constructed at the time of the visit including: the water management collection ponds (CP3, CP4, and CP6) and associated dike (D-CP6) and thermal Berms for CP3 and CP4, tailings storage facility, open pits, waste rock storage facilities, ore storage facilities, Diversion Berm 1, several diversion channels (4, 6, 7, and 8). Diversion Berm 2 was partially completed and Ore Storage Pad 2 (OP2) was under construction at the time of the inspection. The final layout of the main site, including water management structures, is shown on Figure 2. A modification was made to the plan for CP3 and CP4 in 2018 to excavate to create storage for these ponds along with construction of thermal berms on the downstream sides of the ponds. This modification was made after the 2018 Water Management Plan (AEM 2018) was issued so Figure 2 still shows dikes D-CP3 and D-CP4 which are no longer planned. This modification will be incorporated into the 2019 Water Management Plan.

The AWAR connecting Rankin Inlet to the Project provides one-way traffic access (with pull-outs to allow vehicles to pass) and was in use.

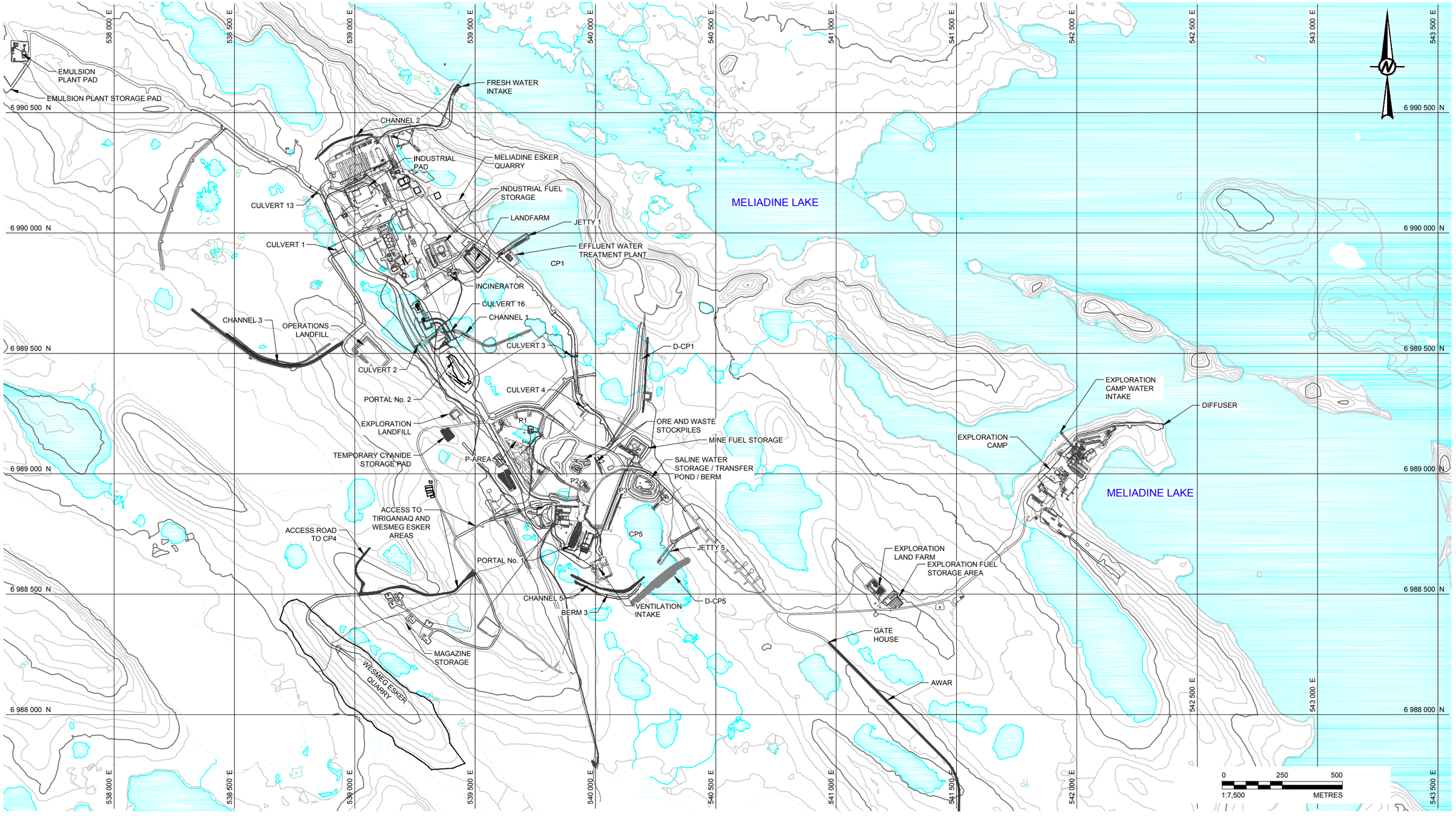
The Itivia shipping and fuel storage site in Rankin Inlet was complete. The Itivia bypass road was completed the week of the inspection.

Where applicable, the inspection was performed consistent with the principles set out by the CDA (2013). The inspection consisted of visually observing each of the facilities listed above; taking photographs to document the conditions at the time of the inspection (Appendix A, Appendix B, and Appendix D); reviewing instrumentation data (Appendix C), inspection reports, and other relevant files and reports (listed in the reference section of this report); communication with AEM on-site staff (Ms. Jennifer Pyliuk, Mr. Jeffrey Pratt, and Mr. Daniel Gorton); and preparation of this report to document the inspection.

The inspection occurred when there was no snow or ice on the lakes or land, following the freshet, and when surface water flows were generally low. Peak surface water flows typically occur during the freshet (May and June). During the inspection, the weather was generally clear with some periods of rain. Daily temperatures varied between 0°C and 8°C. Water levels were considered to be normal for this period of the year, and the flow observed at water crossings was low.

The site water management plan (AEM 2018) provides a summary of the water management infrastructure and the overall water management approach.

This report describes the geotechnical aspects of the areas inspected and presents general observations and recommendations. In addition, a description of the geophysical and permafrost conditions for the site is provided.



LEGEND

- WATER BODY
- EXISTING GROUND CONTOURS

NOTE(S)

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE IS NOTED.
2. COORDINATE SYSTEM UTM15 NAD83.
3. CONTOUR INTERVAL EVERY 2m.

REFERENCE

1. GENERAL ARRANGEMENT SURVEY PROVIDED BY AGNICO EAGLE MINES LTD. RECEIVED 13 DECEMBER 2018.

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
MELIADINE GOLD PROJECT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-14
DESIGNED	ACI
PREPARED	JK
REVIEWED	FE
APPROVED	ACI

TITLE
GENERAL SITE PLAN LAYOUT (SEPTEMBER 2018)

PROJECT NO.	PHASE/DOC#	REV.	FIGURE
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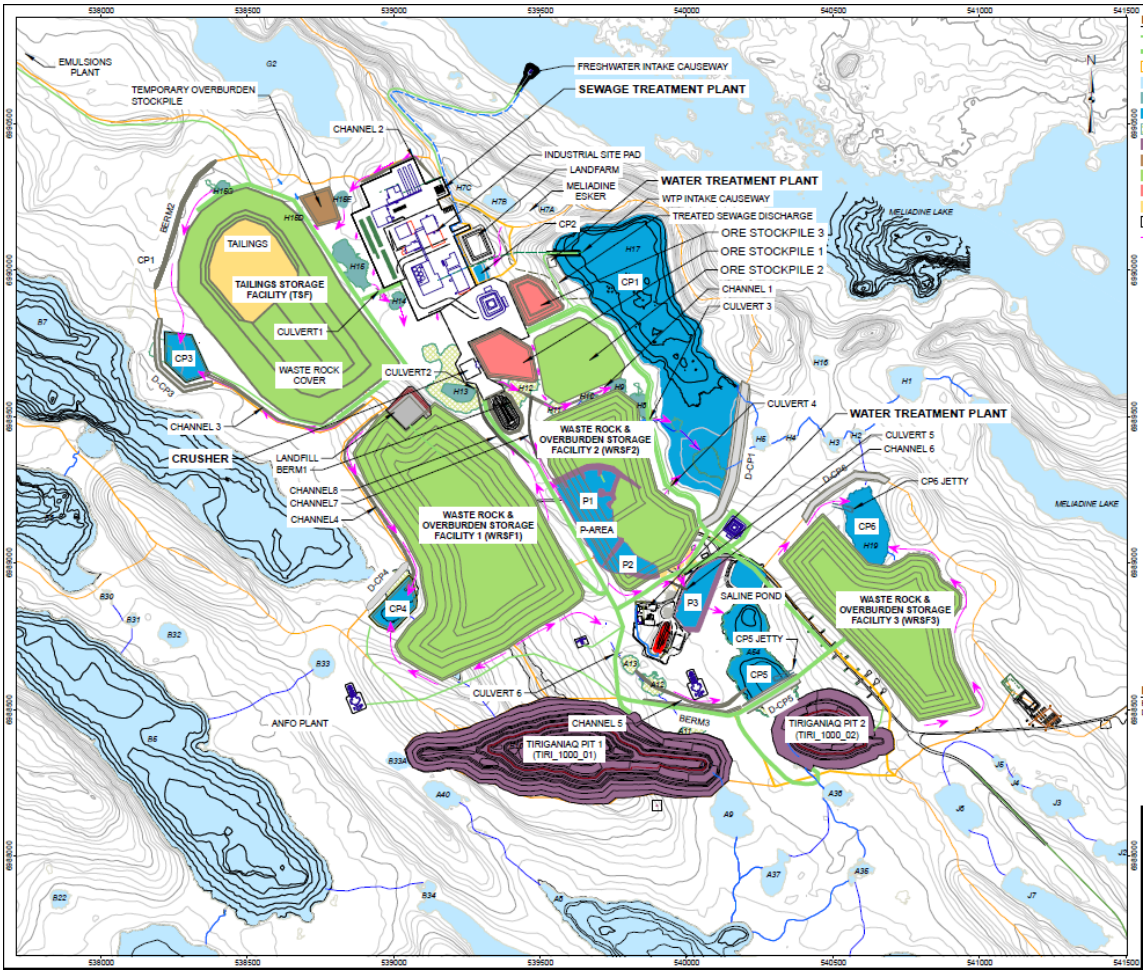
0 25 mm

Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Proje\d99_PROJECTS\1810571902_PRODUCTION\3000\DWG\ | File Name: 1810571-3000-002-001.dwg



Source: AEM 2018.
Figure 2: Main Site General Layout and Water Management Infrastructure

1.1 Scope Limitations

The scope of the inspection is limited to observation of the geotechnical aspects of each of the facilities listed above and review of the associated instrumentation data. The inspection did not include other assessments such as structural, mechanical, or environmental.

For additional information related to the limitations of this scope, reference should be made to the Study Limitations at the beginning of this report.

2.0 GEOPHYSICAL AND PERMAFROST CONDITIONS

The Project is located in the Kivalliq Region, near the northern border of the southern Arctic terrestrial eco-zone, and within the Arctic tundra climate region. It is located within the Churchill geological province, which forms part of the northern Canadian Shield.

The landscape is dominated by features characteristic of glaciated terrain and exposed bedrock. Primarily underlain by Precambrian granitic bedrock, the terrain consists of broadly rolling uplands and lowlands. The Project is located at an approximate elevation of 60 metres above sea level (masl) with a maximum topographic relief of 20 m. There are numerous small lakes, wetlands, and creeks, indicating poorly drained conditions. The upland areas are generally well drained. A series of low relief ridges composed of glacial deposits oriented northwest–southeast control the regional surface drainage pattern. Periodic ice blockages at outlets of small lakes and wetlands occur during the freshet, these can temporarily increase the downstream flood peak discharges and affect the flood characteristics. High flows are observed during the freshet, while low flows and dry stream channels are typical in late summer.

Soils are typically Cryosols. Glacial moraine deposits are predominant, ranging in thickness from veneers (less than 2 m) to blankets (2 to 5 m) to hummocky deposits (5 to 15 m). Glaciofluvial deposits are also present, with the most prominent being a network of sinuous eskers. Lacustrine deposits occur in association with the numerous lakes. Near the coast of Hudson Bay, finer textured marine sediments cover the ground surface.

The Project is located in a zone of continuous permafrost and has an annual average air temperature of -10.4°C, based on climate data from Rankin Inlet. Within the permafrost there are intervening taliks (areas of unfrozen ground) and thaw bulbs induced by lakes. The permafrost in the region is considered to be “cold” (i.e., has an average annual surface temperature and zero amplitude temperature of less than -4°C). The depth of permafrost and of the active layer varies based on the proximity to lakes, soil thickness, vegetation, climate conditions, and slope direction. Based on thermal studies and measurements of ground temperatures, the depth of permafrost is generally between 360 to 495 metres below ground surface (mbgs). The depth of the active layer ranges from about 1 mbgs in areas with shallow surficial soils, up to about 3 mbgs adjacent to the lakes (AEM 2014b). The typical permafrost ground temperatures at the depths of zero annual amplitude are in the range of -5.0°C to -7.5°C in the areas away from lakes and streams, and generally are reached at a depth of 15 to 35 mbgs. The geothermal gradient ranges from 0.012°C/m to 0.02°C/m (Golder 2014). The ground ice content in the region is expected to be between 0% and 10% (dry permafrost) based on the regional scale compilation data and the Canada Permafrost Map published by Natural Resources Canada (NRC 1993). However, areas of local higher ground ice content occur and are generally associated with low lying areas of poor drainage.

Taliks may occur where lake depths are greater than about 1 to 2.3 m. The presence and extent of each talik is influenced by the geometry (size and shape) of the lake. As the depth and size of lakes increase, the extent of the talik increases. Formation of an open-talik, which penetrates through the permafrost, would be expected for lakes that exceed a critical depth and size. It is anticipated that open-taliks exists below Meliadine Lake, Lake B7, and Lake D7 based on their depth and geometry (Golder 2013).

The salinity of groundwater also influences the temperature at which the groundwater freezes. Testing has indicated that the salinity of the groundwater in the Project area generally increases with depth. Test results on two deep groundwater samples collected below the base of the permafrost as part of the baseline study indicated salinity level leads to a freezing point depression of about 3.2°C (AEM 2014a, Volume 7, Appendix 7.2-A).

Thermistor cables have been installed to monitor natural ground temperatures in the vicinity of the Project. Data are presented in Appendix C along with plan views of thermistor installation locations (Figure C1 and C2). Several of these thermistors have stopped working over the last several years, mainly due to damage as construction of mine facilities expands into the areas where these thermistors have been installed. Readings taken in 2018 in the remaining operational thermistors are generally consistent with previous trends. There were some erroneous readings that have been removed from the plots for GT09-07, GT09-08, GT11-02, GT14-03, and GT14-27. These thermistors showed large jumps in temperature for one set of readings, which then returned to be in line with previous temperatures when they were read the next month. Most of the erroneous readings were on 6 September 2018. Thermistor GT14-03 also had erroneous readings on 19 June 2018 and GT14-27 had erroneous readings on 25 May 2018 and was then reported to be damaged.

Priorities and frequencies for reading these thermistors are summarized in AEM (2015c) and are based on the development sequence for the mine. Thermistors located in close proximity to the process plant and other mine infrastructure have the highest priority and are read more often. Thermistors located in the Tiriganiaq open pit area are given the next priority. The thermistors installed to monitor the deep permafrost are given the lowest priority as the conditions within the deep permafrost do not fluctuate seasonally, so fewer readings are required.

3.0 P-AREA TEMPORARY DIKES AND COLLECTION PONDS

During the winter of 2016, it was recognized by AEM personnel, as an interim measure to manage an emergency situation, that temporary water collection ponds were required to collect and manage surface runoff water near underground Portal No. 1 and the waste rock storage area (AEM 2016a). The concern related to the potential that surface runoff water from the ore and waste rock stockpiles could contain elevated chloride and ammonia concentrations, above the permitted discharge criteria standards per the Metal Mining Effluent Regulations under the Fisheries Act and/or Canadian Council of Ministers of the Environment guidelines for the protection of aquatic life.

Therefore, prior to the 2016 freshet, four temporary containment dikes (referred to as DP1-A, DP1-B, DP2-A, and DP3-A) were constructed between 25 March and 10 May 2016 to create three temporary ponds (P1, P2, and P3) to manage the runoff near Portal No.1 and from the waste rock storage area (Figure 3). Representatives from Tetra Tech EBA were on site during the majority of dike construction to provide geotechnical assistance, monitor the construction, and prepare the construction record report (Tetra Tech EBA 2016c).

The collection ponds are referred to collectively as the P-Area. The dikes do not completely enclose the ponds. Portions of the pond boundaries are associated with natural areas of higher ground, the ore and waste stockpile area, and/or existing roads. These roads were not built as water containment structures. Similarly, the stockpiles of ore and waste are granular in nature and do not function as water containment structures on a year-round basis.

In general, the P-Area receives direct precipitation, runoff from the site roads immediately surrounding the area and runoff and pore water from the ore and waste rock stockpiles near Portal No. 1. Water from underground is also pumped to the P-Area, typically via the Saline Pond. Pipelines and associated pumping systems exist to allow water to be transferred from P2 and P3 to P1. Five evaporator units have been installed within P1, including two new evaporators installed since the 2017 inspection. The new evaporators were installed on the east berm of the snow melt pond and on a jetty constructed off the north slope of DP1-A. A pumping station within P1 connects to the evaporators.

In accordance with the CDA (2013), dam classification is assigned based on an assessment of the consequence of failure, evaluated on the basis of potential incremental losses of life, environmental and cultural values, and third party infrastructure and economics. The class is determined by the highest potential consequence ranking. Although these dikes are less than 2.5 m in height (to the top of the water retaining element, the frozen core), and therefore do not meet the definition of a dam (CDA 2013), A consequence classification of significant was initially assigned to these structures in 2016 for the purpose of operation and monitoring. This classification was based on the following: failure of the dikes would not be anticipated to cause any loss of life, loss to cultural values, nor loss to third party infrastructure and economics. The environmental consequence, if any, to downstream fish-bearing lakes, which is Lake A8 for this particular situation, would be expected to be short term, with restoration or compensation in kind highly possible. Since dikes: DCP-1 and DCP-5, and Berm 3 have been constructed, any potential breach or seepage from the P-Area dikes would be expected to report to either CP1 or CP5, and therefore, the associated potential short-term environmental risk to Lake A8 has been eliminated. Based on the containment of a potential failure these structures are no longer considered as dams in accordance with the CDA classification (CDA 2013). However, as these structures serve a purpose for the mine operation, AEM have been regularly managing water within the ponds, and visually monitoring the containment structures associated with the P-Area.

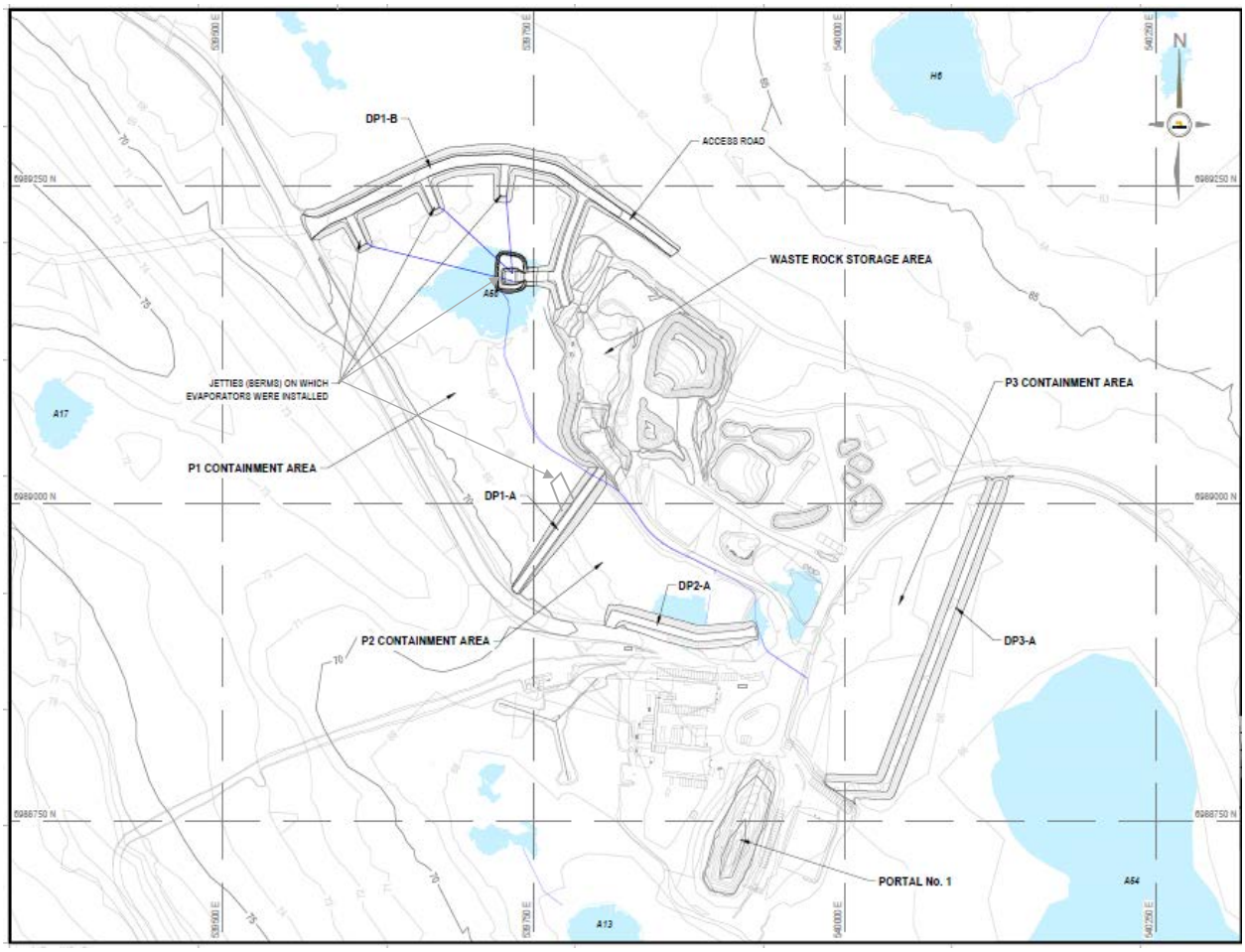
The central zone of each of the four P-Area containment dikes was intended to be constructed of saturated crushed (30 mm minus) material that was to freeze and become a frozen core, thereby forming the water-retaining element of each dike. Due to construction delays, temperatures became too warm to freeze the core part way through the construction, so the central cores were not frozen to the planned elevations and in some cases not frozen at all during construction. The thermal conditions of the cores of the dikes during operation is further discussed in Section 3.2. The following is a summary of the frozen cores that were completed during construction:

- DP1-A minimum saturated and frozen core elevation was 67.9 masl at the time of construction
- DP1-B entire core unsaturated
- DP2-A entire core unsaturated
- DP3-A saturated core elevation varied along the length of the dike, with a minimum elevation of 65.7 masl at the time of construction

Transition material (200 mm minus) was placed on the upstream and downstream sides of the core, with additional coarser grained rockfill placed further upstream and downstream and above the core. The upstream and downstream slopes are approximately 2 horizontal to 1 vertical. The maximum height of the core of any of the dikes is approximately 2.5 m, and the maximum height of the entire dike (core and thermal cover) is 4 m. Figure 4 shows a typical section through one of the dikes (DP3-A).

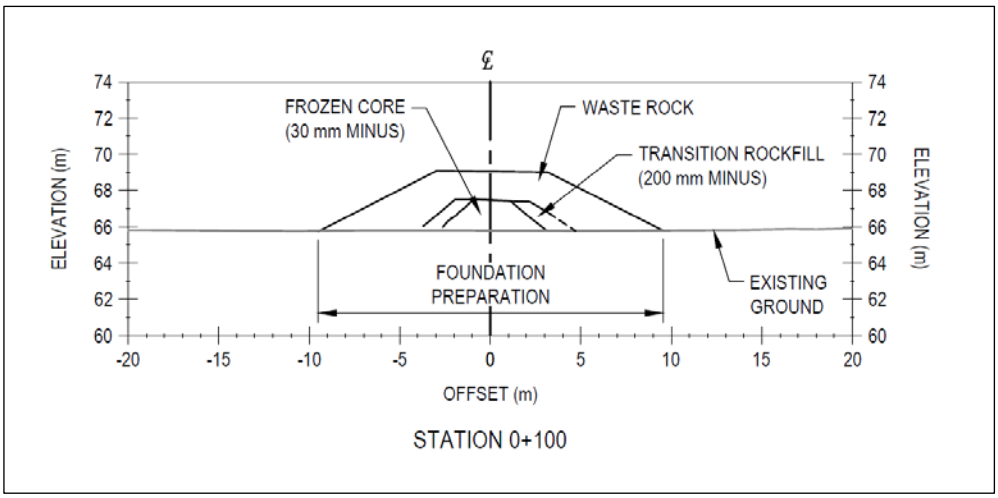
Temporary single bead thermistor cables were installed at selected locations at the crest of the frozen core to monitor the initial thermal conditions at these locations. These instruments functioned for a few months after installation. Six new vertical thermistors were installed in 2017. Their locations are shown in Figure C3 (Appendix C). Additional information regarding the thermal conditions and monitoring of the dikes is provided in Section 3.2 and thermistor data is provided in Appendix C.

Appendix A1 contains a summary of photographs of the temporary dikes and collection ponds from the 2018 inspection.



Source: Tetra Tech EBA 2016c.

Figure 3: P-Area and Dikes DP1-A, DP1-B, DP2-A, DP3-A



Source: Tetra Tech EBA 2016c.

Figure 4: Typical Section through Temporary P-Area Dike DP3-A

There are no spillways in the dikes. Water levels within each pond are controlled through pumping and the use of the evaporators installed within P1. P1 was subdivided into two areas by an internal berm constructed after the completion of P1. Details regarding the internal divider berm are not included within the P-Area construction record report, nor is its location shown on the drawings. As the divider berm is internal, the lack of information is not a concern.

A lined pond was constructed in the northwest corner of P1 in May 2017 to contain contaminated snow from a fuel spill at the exploration camp fuel farm. The snow melt water was treated with an oil water separator in September 2017 and the clean water was pumped to CP1. The snow and rain that collects in the snow melt pond has continued to be treated. The snow melt pond will be decommissioned.

The P-Area area temporary dikes and collection ponds are intended to be an interim measure during development of the site to manage the runoff water until permanent water management dikes and collection ponds are constructed and operating to the design and the saline water treatment plant is operational. As the project advances, the P-Area will become covered by waste rock and soil as Waste Rock Storage Facility 2 is developed.

Table 1 provides a summary of key information regarding the construction of each dike and thermistor installation locations.

Table 1: Summary of Key Dike Information and Thermistor Locations

Dike Structure	Minimum Elevation of Core	Minimum Saturated Elevation of Core [(a)]	Minimum Dike Rockfill Crest Elevation	Maximum Pond Operating Elevation [(b)]	Thermistor Location
DP1-A	68.9 m	67.9 m	70.3 m	68.5 m	no instrumentation
DP1-B	68.9 m	none	70.5 m	68.5 m	DCP1B-1: Stn 0+150 DCP1B-2: Stn 0+220
DP2-A	67.9 m	none	69.5 m	67.25 m	DCP2A-1: Stn 0+090
DP3-A	67.4 m	65.7 m	69.0 m	66.35 m	DCP3A-1: Stn 0+050 DCP3A-2: Stn 0+150 DCP3A-3: Stn 0+250

(a) At the time of construction.

(b) Water level associated with a 24-hour duration extreme rainfall event with a return period of 1:100 years, which would bring the elevation to within 300 mm of the top of the core. (File: 20160530 P1_P2_P3 Water Balance for 2016.xlsm, P1-Area Water Balance, Tetra Tech 2016c).

Stn = Station (distance) along centreline of each dike from the starting reference point.

3.1 Visual Observations

The inspection involved walking along the crest of the dikes (DP1-A, DP1-B, DP2-A, and DP3-A), examining the condition of the upstream and downstream slopes of the dikes for visual signs of deformation and instability, cracking, and uneven surfaces. Due to ponded water and saturated conditions it was not possible to walk along the downstream toes of DP1-B and DP3-A. Each pond contained water at the time of the site visit, so it was not possible to walk the upstream toe of the dikes. Seepage occurrences and/or indications of seepage were noted along the downstream toes. A photographic record of the inspection, with annotations added, where appropriate, is included in Appendix A1 (Photograph 1 through 37).

At the time of the inspection, the following general observations were made:

- Overall, the dikes appear stable, with no significant geotechnical concerns identified.
- The dikes do not completely enclose the ponds. The ore and waste stockpile area and existing roads form a portion of the pond boundaries. Neither the stockpiles nor the roads function as water containment structures, on a year-round basis. Collectively, the ponds and the associated dikes appear to capture the majority of the surface water runoff from the area of concern.
- The P1 divider berm appears to have been constructed of till with some rockfill on the downstream slope, as shown in Photograph 22 (Appendix A1).
- Water was ponded in the seepage collection channels and sumps constructed downstream of DP1-B and DP3-A and water was being actively pumped back into the ponds from the downstream collection systems at the time of the site visit. Water in the collection channels was clear. Seepage from DP1-B was slightly less than in 2017 and the water level in the seepage collection channel was also slightly lower. The ground between the downstream dike toes and the seepage collection channels was saturated at DP1-B and DP3-A and water was ponded along the toe, over the tundra at DP3-A which was more substantial than in 2017 (e.g., Photographs 13 through 16 and Photographs 30, 35, and 36, Appendix A1). Due to the ponded water and saturated tundra, it was not possible to walk directly along the toes of DP1-B and DP3-A.
- As noted in previous annual inspection reports (Golder 2017 and 2018), the rockfill used as thermal cover above the core and on the upstream and downstream slopes of the dikes was of variable grain size, particularly for DP2-A and DP3-A (e.g., Photograph 24 and Photograph 36 Appendix A1). Finer rockfill was observed on the crest of DP3-A (e.g., Photographs 32 and 34, Appendix A1). The crest of DCP1-B was also observed to have a cap of finer material which may have been placed or may be due to traffic on the dike crest.
- There was some minor erosion and/or sloughing on the slopes (e.g., Photograph 10), particularly where cables are laid along the slope and where water has been pumped into the pond. Cracks and periodic small depressions were observed in selected areas of DP1-A (e.g., Photographs 3 and 4, Appendix A1), DP1-B evaporator jetty 2 (e.g., Photograph 12, Appendix A1), DP2-A (e.g., Photograph 26 and 27, Appendix A1), and DP3-A (e.g., Photographs 31 and 33, Appendix A1). The cracks observed in the DP1-B jetty 2 and the east end of DP2-A were the most substantial and had increased in size since the 2017 inspection; these areas should be the priority for remediation and ongoing monitoring.

- Circular cracks with settlement (vertical displacement or slump) and small circular voids were observed during the 2016 inspection along the upstream slope of DP2-A, near Stn 0+40. The observed settlement and cracking may have been associated with 1) thawing of the foundation soils, in particular, if the soils were ice-rich, and/or 2) melting of snow or ice that may have been entrapped within the transition and rockfill material at the time of construction. At the time of the 2017 inspection, fine rockfill was observed to have been used to remediate the slope in the area of the settlement. There were no additional signs of instability in the immediate vicinity of this area; however, there was some minor slumping observed along the upstream crest near Stn. 0+60 (Photograph 26).
- Water levels within each pond are measured daily during the open water season, and the pond levels were generally maintained below the maximum design water elevation except for P3, which was above the design maximum pond elevation for most of June and July 2018 and P2 which rose above the maximum elevation for a few days at the end of July and beginning of September 2018.

3.2 Geotechnical Instrumentation and Monitoring Data

Single bead thermistors were installed by Tetra Tech EBA at the crest of the core (30 mm minus) material, at selected stations along each dike during construction. These thermistors stopped working in August 2016 (a few months after installation).

Six vertical thermistors were installed in the P-Area dikes on 30 September and 2 November 2017. Two were installed in DP1-B, one was installed in DP2-A, and three were installed in DP3-A (Figure C3, Appendix C2). The thermistors were read by AEM staff after installation and throughout 2018. After the completion of installation, the instruments were read between 23 and 25 times through to 4 November 2018. The instruments were typically read 2 times per week during freshet, weekly through the rest of the open water season and then approximately monthly through the winter. Updated plots of the thermistor data are provided in Appendix C2.

Initially after installation of the instruments, the data indicated that the dikes, and the foundation materials directly below the dikes, were at or below 0°C by late October to early November 2017. All instrument nodes remained at or below 0˚C throughout the winter until early June 2018 when temperatures rose above 0˚C. Although the cores of the P-Area dikes were not constructed to the saturated frozen condition intended, it appears that following the initial construction and first summer of operation, the temperatures within the cores of the dikes have been below zero for most of the year, as indicated by the thermistor data (Appendix C). It is likely that portions of the core have become saturated due to seepage through the dikes that freezes in the winter. The performance of the dikes, as frozen core structures, is more important during the freshet, when water levels tend to rise within the ponds. In the fall, when temperatures within the core tend to be the warmest or thawed, water levels within the facilities tend to be lower, and therefore less seepage through them is anticipated.

The complete set of data received by Golder represents a range for one seasonal cycle (14 months from September 2017 to November 2018). As discussed in Section 2.0, the salinity of the groundwater at the Project site can result in freezing point depression of up to 3.2˚C at depth. The salinity of the groundwater increases with depth so the freezing point depression near surface is expected to be less, but frozen conditions may not occur at 0˚C. The review of the data provided in the following bullets represent the thermal conditions for 2018:

- DP1B thermistor (DP1B-1 and DP1B-2) data shows a maximum depth of temperatures above 0˚C of 2.8 m (elevation 68.0 m) recorded on 30 September 2018. The nodes within the dike foundation remained below -1˚C during 2018.

- DP2A thermistor (DP2A-1) data shows a maximum depth of temperatures above 0˚C of 3.6 m (66.04 m) recorded on 30 September 2018. The nodes within the dike foundation remained below -1˚C in 2018.
- DP3A thermistor data (DP3A-1, DP3A-2, and DP3A-3) shows the maximum depth of temperatures above 0˚C varies between the three instruments. The data indicates that the greatest depth of 0˚C was measured at the central thermistor (DP3A-2 at station 0+150); this thermistor recorded temperatures greater than 0˚C to its full depth (4.5 m) for four readings during the month of September 2018. Thermistors DP3A-1 (station 0+050) and DP3A-3 (station 0+250) identify a maximum depth of 0˚C measured at 4.4 m (elevation 64.67 m), and 2.7 m (elevation 66.37 m), respectively. The data from DP3-3 on 17 September 2018 is considered erroneous based on the readings collected before and after. The nodes within the dike foundation remained below 0˚C at DP3A-3, but temperatures rose above 0˚C to a depth of approximately 1.4 m into the foundation below DP3A-1. Data from thermistor DP3A-2 shows that temperatures above 0˚C extend into the foundation from 19 July to 4 November 2018.
- In general, all thermistors showed all beads at or below 0˚C by 4 November 2018. The exception is thermistor DP1B-1 in which the last recording provided was for 30 September 2018; node 4 of this thermistor located within the dike fills remained at 1.0˚C. This may be an erroneous reading as the nodes within the dike above and below node 4 showed consistent temperatures near 0˚C.

Table 2 provides a summary of the key thermal observations at the P-Area thermistors in 2018.

Table 2: Summary of P-Are Dike Instrumentation

Dike Structure	Instrument Name	Instrument Location	Maximum Depth of 0 C Temperature (m)	Minimum Elevation of 0˚C Temperature (m)
DP1-B	DP1B-1 DP1B-2	Station 0+150 Station 0+220	2.8 2.8	68.05 68.05
DP2-A	DP2A-1	Station 0+090	3.6	66.04
DP3-A	DP3A-1 DP3A-2 DP3A-3	Station 0+050 Station 0+150 Station 0+250	4.4 > 4.5 2.7	64.67 64.67 66.37

In 2018, AEM staff performed the following monitoring activities:

- Recorded the daily volumes of water pumped from underground to the P-Area.
- Recorded the daily volumes of water transferred between the ponds.
- Measured and recorded water elevations within each pond during the open water season on a graph with the maximum allowable pond elevation.
- Performed daily inspections of pond and seepage water condition (e.g., frozen or thawed, clear or cloudy) at water management facilities during the freshet (11 May to 14 June 2018).

- Collected samples from the P-Area approximately every one to two weeks for water quality analysis from 10 June to 8 September 2018
- Geotechnical inspections were completed and documented twice for each of the P-Area dikes, one in July and one in September. The inspections included observations of cracking, sloughing, and seepage, and included photographs. AEM prepared visual tracking sheets for each dike by adding sketches of the locations of their observations to plan drawings of the dikes. The observations made by AEM were consistent with the observations from the 2018 annual inspection.

The information collected is contained within various spreadsheets and reports, which were provided to Golder for review.

An operation, maintenance, and surveillance (OMS) manual, including an emergency response plan and emergency preparedness plan, has been prepared for D-CP1 and D-CP5 (AEM 2018) but it does not include the P-Area dike structures.

3.3 Recommendations

The following recommendations are provided regarding the temporary dikes and ponds, for the period of their operation:

- Cracks with settlement (vertical displacement or slump) and small circular voids evident along the dikes should continue to be monitored. If the dikes continue to be used, consideration for filling in the cracks, with additional fine rockfill or granular fill, regrading, and re-compacting the slopes and crests may be warranted. This work could reduce the potential for infiltration into the dikes that could lead to thermal degradation of the frozen core and foundation and could also lead to further instability of the jetty and dike thermal cover materials that could result in material sloughing into the pond. The slumping and cracking along DP2-A and the jetty for Evaporator #2 was more substantial than observed in 2017; there was more settlement observed at the crest of DP2-A and the cracks in the dike and jetty were wider and deeper than in 2017. These areas should be monitored closely as there is the potential for the jetty or dike to slump into the P1 or P2, respectively. A failure of the evaporator jetty or upstream slope of DP2-A are not a risk to a release of water from the ponds but a failure could affect operations and would require repair. There was no cracking or substantial slope movement observed on the downstream slopes of the dikes that would be a concern for potential release of water from the ponds.
- The thermistor data available provides just over one year of monitoring and indicates that the dikes are not fully functioning as frozen core dams through the summer and early fall. DP3-A was fully thawed and the data for the other P-Area dikes indicates only the lower 0.5 to 1 m of the dikes remained below 0°C through the summer and early fall. To maintain the thermal integrity of the frozen cores of the dikes, the following should be implemented:
  - The water levels in the ponds should be reduced as much as possible in the winter to promote freezing of the dam cores. This would also increase the capacity within the ponds to manage water during the freshet, if necessary. The water levels should also be maintained as low as possible in the summer to reduce thermal warming due to water over the upstream toe of the dikes.

  - Where access is feasible, removal of snow from the water collection pond dikes is recommended to reduce the insulating effects of the snow, thereby allowing the temperatures of the core materials in the dikes and the foundations to drop as low as possible with the potential that temperatures could get cold enough to maintain frozen conditions throughout the following summer. Snow removal is more important if thermistor data indicates that temperatures within the dikes and/or foundation are warmer than expected.

- Make sure each thermistor cable is well marked so they can be located and maintained during the winter and are not damaged during snow removal operations. Consider adding data loggers to record the temperatures to facilitate data collection, particularly in the winter.
- Consider adding rockfill material to cover the till berm in P1, to protect the till and maintain its integrity if this berm is required for water management.
- If the P-Area ponds and associated dikes continue to be used by AEM, then it is recommended that they are added to the OMS manual for D-CP1 and D-CP5.
- AEM personnel should continue to conduct geotechnical inspections and document visual observations such as, cracking, slumping, and/or seepage. Thermistor data should continue to be collected, plotted and reviewed, and pond water levels should continue to be measured and tracked. Inspection reports should continue to be prepared for documentation. It is recommended that the frequency of visual geotechnical inspections be conducted weekly during freshet and monthly during the open water period.
- Continue to collect and pump back seepage water, as deemed necessary, in areas where seepage could impact downstream areas.

4.0 PERMANENT WATER COLLECTION POND DIKES, JETTIES, BERMS, AND CHANNELS

The permanent water management facilities for the Meliadine Gold Project will be constructed as the Project develops. This section presents a summary of the permanent water collection ponds and associated dikes, berms, and channels that had been constructed prior to the 2018 inspection, including Collection Pond 1 (CP1) and its associated dike (D-CP1), Collection Pond 5 (CP5) and its associated dike (D-CP5), Berm 3, Channel 1 (partially complete), Channel 2, Channel 3 (partially complete), Channel 5, and the saline pond.

The following subsections provide a description of the structures, visual observations, a summary of geotechnical instrumentation (if any exists), followed by recommendations.

4.1 Water Collection Ponds and Associated Dikes

At the time of the site visit in September 2018, two of the permanent water collection pond dikes had been constructed, D-CP1 and D-CP5. These dikes were constructed between October 2016 and July 2017. Both dikes are composed of rockfill and transition shells with a geomembrane liner anchored into a key trench within the permafrost foundation (soil or bedrock).

D-CP1 is approximately 600 m long with a maximum height of 6.6 m (Tetra Tech 2017g) and is located northeast of the P-Area, as shown in Figure 1. It is oriented approximately south–north with a slight inflection 200 m from the south abutment. D-CP1 was constructed across the outlets of lakes H6 and H17, which combine to form CP1. The CDA (2013) dam consequence classification for D-CP1 is *Significant* (Tetra Tech 2016a). A downstream collection sump and two channels were constructed approximately 5 m downstream of the D-CP1 toe to collect surface run-off and any possible dike seepage for pump back to CP1. CP1 is the final water management facility on site, and water from various parts of the site will be pumped to CP1 for treatment and discharge to Meliadine Lake.

D-CP5 is approximately 300 m long with a maximum height of 3.3 m (Tetra Tech 2017f) and is located southeast of the P-Area, as shown in Figure 1. It is oriented approximately southwest–northeast and was constructed across the south portion of Lake A54 such that the northern portion of the lake now forms CP5. The CDA (2013) dam consequence classification for D-CP5 is *Significant* (Tetra Tech 2016b). A small collection sump is located in a natural depression downstream of D-CP5 to collect surface run-off and any possible seepage through the dike for pump back to CP5. CP5 will be used seasonally for temporary water storage with active pumping to CP1.

4.1.1 Visual Observations

The inspection involved walking along the crests and toes of the dikes and examining the condition of the slopes of the dikes for visual signs of deformation and instability, cracking, and uneven surfaces. There was water in CP1 and CP5 at the time of the site visit, so it was not possible to walk along the upstream toes of the dikes. A photographic record of the inspection, with annotations added where appropriate, is included in Appendix A2.

Dike D-CP1

At the time of the inspection of D-CP1, the following general observations were made:

- Overall, the dike appeared stable, with no significant geotechnical concerns identified.
- Minor cracking and small settlement was observed along significant portions of the upstream slope and crest (e.g., Photographs 4 and 5 and Photographs 9 and 10, Appendix A2). The largest cracks were up to 2 to 3 cm wide. The cracking was generally in about the same condition to what was observed in 2017 with minor increases in the width and depth of some cracks.
- There was some cracking on the downstream crest near Stn 1+145 (Photograph 19). The cracks were wider and deeper than observed in 2017.
- There was no seepage observed from the downstream toe.
- The downstream collection channel appeared to be consistently graded to the downstream collection sump. The channel was generally dry, with only a very small amount of water ponded in the channel from approximately Stn 1+250 to the pond (Photographs 21, Appendix A2).
- Minor cracking was observed in the crests of the downstream collection sump berms that was similar to what was observed in 2017 (e.g., Photograph 26, Appendix A2).
- Jetty 1 was in good condition, no signs of instability (Photographs 27 to 29, Appendix A2). Some erosion marks on the slope due to wave erosion from historic high water levels.

Dike D-CP5

At the time of the inspection of D-CP5, the following general observations were made:

- Overall, the dike appeared stable, with no significant geotechnical concerns identified.
- Minor cracking was observed in a few locations on the upstream and downstream sides of the dike crest in the area between Stn.1+170 and 1+185 (e.g., Photographs 34, 35, 40, and 41, Appendix A2). The cracking on the downstream crest near Stn. 1+180 was similar to 2017. The rest of the cracking was not observed in 2017.
- There are two small holes near ground temperature cable VGTC-2 (Stn. 1+180) where there were failed drilling attempts during instrumentation installation.
- There were no signs of seepage from the downstream toe.
- There was a small pond of water in a low area downstream of the dike near Stn 1+170 with a pump in place but there was no active pumping at the time of the inspection (Photographs 42, Appendix A2). This water is likely due to surface runoff collecting in naturally low topography as D-CP5 was constructed across the southern portion of Lake A54.
- Jetty 5 is the causeway for the pump back station for CP5. Jetty 5 appeared stable with no significant geotechnical concerns identified (Photographs 43 and 45, Appendix A2).

Construction of D-CP1 and D-CP5 was completed in July 2017, and the dikes were transitioned from AEM's construction team to its engineering team at the end of 2017. AEM's engineering team conducted visual geotechnical inspections of the dikes between 14 June and 1 September 2018. Twelve inspections were completed and documented for both D-CP1 and D-CP5. The initial four inspections were completed within one week in June (14 to 21 June 2018). The remainder of the inspections were conducted approximately weekly from 5 July to 1 September, except for one missed inspection in mid-August. The inspections included observations of cracking and settlement, pond elevation, pumping activities and generally included photographs. AEM prepared visual tracking sheets for each dike by adding sketches of the locations of their observations to plan drawings of the dikes. No seepage was observed at either dike. The observations made by AEM staff were consistent with the observations during the 2018 annual inspection. Cracks and locations of settlement were also marked with spray paint in the field to monitor changes.

AEM noted that a channel had been constructed to connect the low areas of H17 and H6 so that water within the H6 area close to the dike could be drawn down further.

4.1.2 Geotechnical Instrumentation and Monitoring

Horizontal and vertical thermistors were installed in D-CP1 and D-CP5 between March and July 2017, as shown in Figures C4 to C7 in Appendix C. Plots of the thermistor data are provided in Appendix C. Thermistor data was provided up to 1 September 2018. As discussed in Section 2.0, the salinity of the groundwater at the Project site can result in freezing point depression of up to 3.2˚C at depth. The salinity of the groundwater increases with depth so the freezing point depression near surface is expected to be less, but frozen conditions may not occur at 0˚C.

Dike DCP-1

There were five horizontal thermistors installed in D-CP1 above the liner parallel to the key trench and five vertical thermistors installed upstream and downstream of the key trench. The locations of these instruments are summarized in Table 2. Horizontal thermistor data was provided from 21 March 2017 to 1 September 2018 and vertical thermistor data was provided from initial readings (varies between May and July 2017) to 1 September 2018.

There were also six settlement survey monuments installed over the liner crest in the central area of the dike as shown in Figures C4 and C5 in Appendix C2.

Table 3: Summary of D-CP1 Thermistor Locations

Instrument	Horizontal or Vertical (H or V)	Location	Additional Details
HGTC-1	H	Stn. 1+513 to 1+562	
HGTC-2	H	Stn. 1+254 to 1+304	
HGTC-3	H	Stn. 1+343 to 1+394	
HGTC-4	H	Stn. 1+432 to 1+482	
HGTC-5	H	Stn. 1+117 to 1+158	
VGTC-1	V	1+278	upstream of the liner and key trench
VGTC-2	V	1+280	downstream of the liner and key trench
VGTC-3	V	1+461	upstream of the liner and key trench
VGTC-4	V	1+460	downstream of the liner and key trench
VGTC-5	V	1+300	along slope upstream of the Phase 2 liner

Stn = Station (distance) along centreline of each dike from the starting reference point.

The following observations were made regarding the instrumentation readings collected for D-CP1:

- The horizontal ground temperature cable plots (Appendix C2) were indicating a warming trend in the base of the key trench in 2017. They cooled over the winter with most of the nodes approaching temperatures near -10˚C in early June 2018. Temperatures measured from early June to late August 2018 showed a warming trend of about 2 to 3˚C, indicating influence of ambient temperatures and/or ponded water within CP1. Winter readings were not collected between January and June 2018 for three of the instruments, HGTC-1, HGTC-3, and HGTC-5. All horizontal ground temperature cable nodes at the base of the key trench have remained frozen based on the data provided. Some of the nodes that are located on the downstream slope of the key trench and along the foundation of the dike below the downstream slope had temperatures that rose above 0˚C, particularly HGTC-5 which has beads that extend below and possibly downstream of the rockfill shell. These nodes have less cover and are therefore more influenced by ambient temperatures. Maximum temperatures may not have been reached as of the last readings provided for 1 September 2018.
- Vertical ground temperature cable plots (Appendix C2) indicate that the dike and foundation remained below 0˚C after November 2017 throughout the winter until about April/June of 2018. The maximum depth of 0˚C temperature readings ranged from approximately 1.2 m to 2.7 m in the summer and early fall of 2018. The final readings received (1 September 2018) identified the greatest depth of 0˚C temperature readings at 2.7 m observed in VGTC-01, located upstream of the liner and key trench. The maximum depth of 0˚C temperature readings may not have been reached as of the last readings on 1 September 2018. The maximum depth of 0˚C temperature readings in 2017 was equal to the depths measured in 2018 or 0.5 m lower, with the exception of VGTC-05 which had a maximum depth of 0˚C 1.2 m lower than what was measured in 2018. All the vertical thermistors indicate that the foundation and the lower 1 to 2 m of the dike (both upstream and downstream of the liner) remained below 0˚C during the reporting period.

- D-CP1 survey monitoring points M-1 to M-6 indicate a range of total vertical displacement between 29 and 40 mm between the baseline survey using the total station on 19 September 2017 to the last reading received for the reporting period on 13 August 2018. The range of total vertical displacement from the last reading in 2017 on 25 October to the last reading received for 2018 on 13 August was 18 to 25 mm. The maximum vertical displacement was observed at survey marker M-6 (station 1+510) and the minimum vertical displacement was observed at survey marker M-2 (station 1+230). The OMS manual indicates that total vertical settlement less than 120 mm is an acceptable (green) condition.

Dike D-CP5

Two horizontal thermistors are installed in the key trench approximately 250 mm above the liner along most of the length of the trench. Three vertical thermistors were installed upstream and downstream of the key trench and liner. The locations of these instruments are summarized in Table 4. There were also three settlement survey monuments installed over the liner crest in the central area of the dike as shown in Figures C6 and C7 in Appendix C2. Data provided for the horizontal thermistors is from April 2017 to September 2018. Data for the Vertical thermistors is from June 2017 to September 2018.

Table 4: Summary of D-CP5 Thermistor Locations

Instrument	Horizontal or Vertical (H or V)	Location	Additional Details
HGTC-1	H	Stn. 0+052 to 0+202	
HGTC-2	H	Stn. 0+164 to 0+304	
VGTC-1	V	Stn. 0+181	upstream of the liner and key trench
VGTC-2	V	Stn. 0+185	upstream of the liner and key trench
VGTC-3	V	Stn. 0+185	downstream of the liner and key trench

Stn = Station (distance) along centreline of each dike from the starting reference point.

The following observations were made regarding the instrumentation readings collected for D-CP5:

- The horizontal ground temperature cable plots initially indicated a warming trend after installation in the spring 2017. Beginning in January 2018, the data began showing a cooling trend. The cooling trend continued until about April 2018 and then started to warm as ambient temperatures increased. All thermistor nodes within the key trench remained at or below 0˚C throughout the reporting period (April 2017 to September 2018) and ranged from -3 to -10˚C. Maximum temperatures may not have been reached by the last readings on 1 September 2018.

- Vertical ground temperature cables VGTC-01 and VGTC-02 are located upstream of the liner and key trench in D-CP5. The data from these instruments indicates that the upstream dike fills were below 0˚C from October 2017 until April 2018. The maximum depth of temperatures above 0˚C extended approximately 3.5 m to near the interface between the base of the dike fills and original ground at VGTC-01 and 3.0 m at VGTC-02. The depth of 0˚C temperatures appeared to be stabilizing in September but may not have reached the maximum depth. In 2017, the maximum depth of 0˚C temperature readings was 4 m at VGTC-01 and 3.5 m at VGTC-02. Up to the last reading on 1 September 2018, the foundation below the dike remained below -1˚C and -2˚C at the location of VGTC-01 and VGTC-02, respectively.
- D-CP5 survey monitoring points M-1 and M-2 indicate total vertical displacement of approximately 20 mm between the baseline survey using the total station on 19 September 2017 to the last reading received for the reporting period on 21 July 2018. The range of total vertical displacement from the last reading in 2017 on 25 October to the last reading received for 2018 on 21 July was 9 to 12 mm. M-3 indicated a total vertical displacement of about 40 mm as of 25 October 2017. No additional readings were recorded for M-3 as it was reported as being destroyed. The OMS manual indicates that total settlement of less than 100 mm is an acceptable (green) condition.

AEM provided Golder with plots that are used to document the pond levels in CP1 and CP5. Pond elevations were taken from twice a day to once every one to three days from 25 May to 11 September 2018. The plots included the maximum allowable pond levels for pre-freshet, open water, pre-winter, and during a flood. The pond elevation in CP5 was above the maximum operating pond level from the start of monitoring on 5 June until 20 June 2018.

An operation, maintenance, and surveillance (OMS) manual, including an emergency response plan and emergency preparedness plan, was prepared for D-CP1 and D-CP5 (AEM 2018).

4.1.3 Recommendations

The following recommendations are provided regarding D-CP1 and D-CP5:

- Water volumes within containment ponds should be managed to the levels defined in the OMS, including maintaining the water level below the elevation defined for the end of October in the OMS Manual over the winter to promote freezing of the dikes.
- The D-CP1 sump and downstream collection channel should be emptied in the fall/early winter to refreeze the ground around these facilities. During the open water season, keeping the water level in the downstream channel and sump low will also reduce the potential for thaw of the ground and associated settlement.
- The open cracks and depressions observed in the dike crests should be filled with fine rockfill or sand to reduce the potential for infiltration into the dike that could lead to propagation of the cracks and cause additional thermal warming. These areas should be monitored following repair works to determine if these cracks and depressions reappear.

- The pipe ramp constructed out of sand upstream of D-CP1 near Stn. 1+140 is susceptible to erosion, and some erosion was observed since the 2017 inspection. It is recommended that the pipe ramp be covered with a coarser rockfill to protect it from erosion.
- Monitor the cracking observed in the D-CP1 downstream sump berms. Recontouring and/or compacting the areas of cracking to close the cracks will reduce the potential for water to infiltrate into the cracks that could lead to propagation of the cracks and warming of the permafrost and additional thaw settlement.
- Geotechnical inspections of the dikes should be conducted and documented following the schedule developed in the OMS Manual. Inspections were conducted in 2018 from June to September that generally met the requirements for weekly and monthly inspections laid out in the OMS Manual. Monthly routine inspections were conducted by Ms. Jennifer Pyliuk M.Eng., P.Eng., and weekly inspections were conducted by technicians from the engineering department. There were no inspections conducted from January to May 2018 due to snow cover. The OMS Manual indicates that daily inspections should be completed and documented using the same form as the weekly inspection, which were not completed in 2018. The OMS Manual does not indicate if there is seasonal variability to the frequency of documented inspections. It may be acceptable to seasonally vary the frequency of inspections, but this should be reviewed with the Engineer of Record (EoR) for the dikes and the OMS Manual should be updated, as required.
- It is a good practice to review the OMS Manual on an annual basis (e.g., the names and contact numbers for key personnel). The current OMS Manual is dated June 2018, so should be reviewed and updated as necessary around June 2019.
- The ground temperature cables and survey monitoring points should continue to be monitored following the schedule and procedures developed in the OMS Manual. The ground temperatures should be monitored to determine if the foundation remains frozen. Fluctuations of the temperature within the active layer in the dikes are expected; however, the foundation is designed to be maintained frozen.
- Where access is feasible, snow should be removed from the dike crests and slopes in the winter as this can help to reduce the insulating effects of the snow, thereby allowing the temperatures of the dike and foundation to drop as low as possible. Snow removal is more important if thermistor readings indicate warmer temperatures than expected.
- Survey marker M-3 on D-CP5 should be replaced, if possible, to continue monitoring liner settlement in this area of the dike.

4.2 Saline Pond

The saline pond is located east of DP3-A and was constructed during the third quarter of 2016. The saline pond was constructed to manage excess underground saline water before a long-term saline water disposal/treatment plan was finalized. During 2018, water was transferred from the saline pond to the P-Area for evaporation. At the time of the inspection, the permanent Saline Water Treatment Plant (SWTP) was under construction. AEM is planning to have the SWTP operational in 2019.

The saline pond was largely constructed by excavation within permafrost overburden and bedrock. A small berm approximately 1 to 2 m high was constructed around the excavation with a till core and rockfill cover to promote permafrost development in the original ground below the berm and keep surface water from the surrounding area from draining into the pond. The pond is designed to maintain the maximum pond elevation under the inflow design flood (1-in-100-year precipitation event) below original ground and below the level of CP5 to minimize the potential for seepage out of the saline pond.

4.2.1 Visual Observations

The inspection involved walking along the crest of the saline pond perimeter berm, examining the condition of the berm for visual signs of deformation and instability, cracking, uneven surfaces, and seepage. A selection of photos from the inspection are included in Appendix A2.

At the time of the inspection of the saline pond, the following general observations were made:

- Overall, the pond and perimeter berm appeared stable, with no significant geotechnical concerns identified.
- There was water in the pond at the time of the site visit that was well below the top of the bedrock excavation (Photograph 46, Appendix A2).
- Water was ponded between DP3-A and the northwest perimeter of the Saline Pond (Photograph 50, Appendix A2). There was more water ponded than in 2017.
- Cracking and settlement were observed in the perimeter berm in several locations on the upstream and downstream crest (Photograph 46, 47 and 48, Appendix A2). Cracking on the northwest perimeter berm had increased slightly from 2017. Cracking observed on the southwest and southeast sections of the perimeter berm were not observed in 2017.
- There is an area near the upstream toe of the northwest perimeter berm that appears to have settled. This area was observed in 2017 and did not appear to have changed substantially at the time of the 2018 inspection (Photograph 49, Appendix A2). Seepage water from DP3-A has been observed to pond against the north side of the Saline Pond berm and may seep into the berm. During the 2017 inspection, AEM also indicated that there is a fault in this area and surface water sometimes seeps into the pond through the northwest section of the perimeter berm (downstream of DP3-A). This seepage could be causing thawing of the permafrost in the foundation resulting in settlement and cracking within the berm.
- There was no seepage into the Saline Pond observed during the inspection.

4.2.2 Recommendations

The following recommendations are provided regarding the saline pond for the time it is in operation:

- Consideration for filling in the cracks with fine rockfill, recontouring, and re-compacting the slopes and crests may be warranted to reduce the potential for infiltration into the berms that may increase the cracking and settlement.
- Monitor the downstream side of the perimeter berm for ponding water and consider diverting it or pumping it so it does not seep into the saline pond and warm the foundation below the berm.

4.3 Diversion Channels and Berms

Diversion Channel 1, 2, 3, and 5 were inspected and Berm 3. The channels were constructed by excavating a trench, placing woven geotextile to line the excavation, and then placement of riprap (coarser rocks) over the fabric to line the channels.

Channel 1 is designed to move water from Pond H13 to CP1 and extends from Culvert 2 to Pond H9 along the north and east sides of Portal #2. Channel 1 had been completed from Lake H9 to just west of Culvert 16. Channel 1 will be approximately 493 m long when it is complete with a base width of 3 m.

Channel 2 is located along the northern end of the main mine site industrial pad and is approximately 270 m long with a base width of 1 m. During construction and operation, contact water from the plant site area will naturally flow or be diverted into Channel 2, which in turn will flow into ponds H15E, H15, H14, H13, H12, H9, H8, and eventually into CP1.

Channel 3 is designed to direct seepage and run-off water from the future tailings storage facility (TSF) into future collection pond CP3. Channel 3 is located northwest of the operational landfill and runs along the southwestern boundary of the TSF. Most of Channel 3 had been constructed at the time of the site visit, except for a small section at the outlet end near future CP3. Channel 3 will be approximately 619 m long when complete with a base width of 1 to 2 m.

Channel 5 and Berm 3 are located west of CP5 and are designed to divert water from the pond A12 catchment area into CP5 so that this water does not flow into Tiriganiaq Pit 1. A selection of photos from the inspection are included in Appendix A2 (Photographs 67 through 76). Channel 5 is the main water diversion structure; Berm 3 is only required to temporarily retain water under an extreme rainfall event when the water level in CP5 is temporarily high (Tetra Tech 2016d). Channel 5 is approximately 429 m long with a base width of approximately 3 m. Berm 3 is approximately 315 m long with a maximum height of about 2.8 m. Berm 3 consists of a till core, a foundation key trench backfilled with till, and a cover layer constructed out of 600 mm minus esker material. The design specified run-of-mine rockfill for the cover; however, this material was not available at the time of construction.

4.3.1 Visual Observations

Channel 1 and Culvert 16

The inspection of Channel 1 involved walking along the southern boundary of the channel from the western extent to the outlet at the east, with periodic crossing to the northern boundary where feasible. A selection of photographs from the inspection are included in Appendix A2 (Photographs 51 to 56). There was water ponded in several locations along the channel, likely coinciding with the ponds that it was constructed through (H9 to H12). There was water ponded upstream of the inlets to Culvert 16 as the inverts of the culverts were elevated. If the channel invert remains below the invert of the lowest culvert, water will have to pond in the area prior to flowing through the culverts. There was cracking and some settlement along the edges of the channel (e.g., Photograph 52). The movement may be slumping of the riprap over the fabric or may be due to thaw settlement in the permafrost within the edges of the channel.

Channel 2

Channel 2 was inspected by walking from the start of the channel at east end to the outlet at the west end. A selection of photos from the inspection are included in Appendix A2 (Photographs 57 through 62). The slope of the channel base is not consistent and some pooling of water and deposition of sediment in lower areas was observed which is consistent with previous observations. Ponded water may infiltrate into the channel base but is not expected to be substantial. No geotechnical concerns associated with Channel 2 were identified.

Channel 3

Channel 3 was inspected by walking from the start of the channel at the east end to the northwest end. Most of the construction of Channel 3 had been recently completed at the time of the inspection, except the northwest section (Photograph 66). A selection of photos from the inspection are included in Appendix A2 (Photographs 63 through 66). The access road to the future location of CP3 runs along the western boundary of Channel 3 (Photograph 64 and 65). Water was ponded in the northwestern section of the channel which is the lowest elevation and close to the outlet to CP3. No geotechnical concerns associated with Channel 3 were identified.

Channel 5

Channel 5 was inspected by walking the southern crest from near the northwestern end of the channel to the outlet near CP5. A selection of photos from the inspection are included in Appendix A2 (Photographs 67 to 71). Overall Channel 5 appeared stable, with no significant geotechnical concerns identified. There was some cracking observed adjacent to Channel 5 (Photographs 67 and 71, Appendix A2). The most substantial cracking was observed at the northwestern end of the channel where lakes H12 and H13 were located. Water was ponded within the channel in this area (Photograph 71). There was some shallow ponding of water in the channel near the outlet to CP5 and near station 0+220.

Berm 3

Berm 3 was inspected by walking along the crest and slopes examining the condition of the berm for visual signs of deformation and instability, cracking, or uneven surfaces. A selection of photos from the inspection are included in Appendix A2 (Photographs 72 to 78).

- Overall, Berm 3 appeared stable with no significant geotechnical concerns identified.
- Water was ponding near the upstream toe of Berm 3 near station 0+100 (Photograph 74, Appendix A2).
- Erosion and minor cracking observed on upstream and downstream slopes (e.g., Photographs 76 to 78).
- Water was ponded over the tundra in some areas downstream of the dam, but there was no seepage observed from the downstream slope.

4.3.2 Recommendations

The following recommendations are provided regarding the diversion channels and Berm 3:

- Monitor the cracking adjacent to Channel 1 and Channel 5. Re-contouring and/or compacting the areas of cracking to close the cracks will reduce the potential for water to infiltrate into the cracks, and reduce the potential for warming of the permafrost and additional thaw settlement and cracking. Check as-built slopes of Channel 1 in the areas of cracking to confirm constructed to design (3H:1V), or as otherwise approved by the design engineer; steeper slopes may be the cause of the movement. Reducing the amount and duration of water ponding in Channel 5 will help reduce thermal degradation of the surrounding permafrost and cracking.
- If the bottom of Channel 1 remains below the inlets for Culvert 16, consider lowering the invert of the lowest culvert or adjust the invert of the channel, if possible, so that water will not need to pond in the channel before flowing through the culverts.
- According to the design for Channel 5 and Berm 3 (Tetra Tech EBA 2016d), Channel 5 is supposed to be able to handle run-off flows except for an extreme rain event and Berm 3 is only intended to temporarily retain water when the water level in CP5 is high due to an extreme rain event. However, at the time of the 2017 site visit, water had overflowed Channel 5 and was ponded against Berm 3. There was water ponded against Berm 3 during the 2018 inspection as well, but a much smaller amount. Ponding upstream of Berm 3 should be monitored to determine how much and how often ponding occurs and if Berm 3 can perform as required with the ponding.
- The Berm 3 cover materials are susceptible to erosion and some minor erosion was observed during the 2018 inspection. Erosion of the slopes should be monitored and consideration should be given to placing coarser material on Berm 3 to reduce the potential for erosion if it becomes substantial.

5.0 SITE ROADS, CULVERTS, AND TIRIGANIAQ ESKER AND WESMEG BORROW AREA

This section summarizes the observations made during the 2018 geotechnical inspection regarding the main site roads and associated culverts, and the Tiriganiaq Esker and Wesmeg Borrow Area roads and facilities. Appendix A3 contains selected photographs taken during the inspection. The following is a list of the roads, water management structures, and facilities inspected:

- landfill access road and to future TSF area, including Culvert 1 (Photographs 1 to 3, Appendix A3)
- main site pad area roads, including Culverts 2, 3 and 4 (Photographs 4 to 12, Appendix A3)
- main site water intake access road (Photographs 13 to 16, Appendix A3)
- emulsion plant pad access road and Culvert 13 (Photographs 17 to 22, Appendix A3)
- Tiriganiaq Esker access road (Photographs 23 and 24, Appendix A3)
- magazine storage area and access road (Photograph 25, Appendix A3)
- Wesmeg access road, Wesmeg Borrow area and vent raise (Photographs 26 to 31, Appendix A3)
- CP4 access road (Photograph 32, Appendix A3)

5.1 Visual Observations

5.1.1 Site Roads and Culverts

At the time of the site visit, the site roads were generally in good condition. As the site is in active construction, roads were in various stages of construction/operation. The roads appeared to generally be of adequate width with pull outs where required to allow vehicles to safely pass. The heights of the road fills were such that berms were not required. Many of the roads appeared to have been constructed using a combination of sand and gravel obtained from esker borrow areas, rockfill, and crushed aggregate. Normal maintenance of the roads should be anticipated. No geotechnical concerns were identified during the inspection.

There were four permanent water management culverts in place through road fills at the time of the site visit: Culverts 1, 2, 3, and 4. A summary of the culverts inspected, general observations, and any recommendations is provided in Table 5.

Table 5: Summary of Site Culverts Inspected

Access Road	Culvert No.	Culvert Description	Visual Observations
Operation Landfill Access Road (and future TSF)	1	2 × 1000 mm CSP	Culverts were in good condition (Photographs 2 and 3, Appendix A3). There was a small pool of water below the upstream ends of the culverts, but no flow through the culverts. The inlets of the culverts were elevated above the ground upstream which will allow some water to pond against the road prior to flowing through the culverts. Culverts appeared to have a sufficient thickness and appropriately sized cover material.
Service Road on west side of Portal #2 and Crusher Ramp	2	4 × 1200 mm CSP	Culverts were in good condition (Photographs 6 and 7, Appendix A3). There was some water ponded in the area around the downstream ends of the culverts, but no water flowing through the culverts at the time of the site visit. Culverts appeared to have appropriately sized cover material.
Service road on west side of CP1	3	3 × 600 mm CSP	Culverts were in good condition (Photographs 8 and 9, Appendix A3). The downstream ends of the culverts were partially submerged in a small pool of water within CP1, but there was no flow through the culverts at the time of the site visit. Culverts appeared to have appropriately sized cover material.
	4	1 × 600 mm CSP	Small amount of damage to upstream end of the culvert (Photographs 10 to 12, Appendix A3), which isn't expected to substantially reduce flow capacity and had not changed from 2017. No flow through the culvert. Culvert appeared to have appropriately sized cover material.

Note: 1 × 600 mm = the number of culverts × the diameter of the culvert.

CSP = corrugated steel pipe.

5.1.2 New Emulsion Plant and Access Road

The emulsion access road was constructed in 2017. The following are some of the general observations:

- The road appeared to generally be of adequate width and had pull outs to allow vehicles to safely pass. The height of the road fill was such that berms were not required.
- The road appeared to have been constructed using esker sand and gravel material, which may be susceptible to erosion. The surface of the road was in variable condition. The northern section, past the laydown area, had a fairly rough surface. The road fills were thicker south of the laydown area and the road surface was smoother. There were straw logs in place in a few locations adjacent to the road, for sediment control. AEM representative indicated that water was flowing over the road during the freshet and straw logs were placed to capture suspended solids.
- A culvert was installed through the road near the laydown area, but there was no flow at the time of the site visit. Straw logs had been placed to control erosion and suspended solids in the flow.
- There was some minor cracking observed in the crest of the road in a couple of locations.
- During construction, some areas of the tundra adjacent to the road were stripped and water was ponded along the road in several of these areas during the 2018 inspection. Ponded water can cause degradation of permafrost leading to settlement and additional road maintenance.
- Culvert 13 was installed at the south end of the road near H15E. There was some minor damage to the outlet of the right culvert (looking downstream).

5.1.3 Wesmeg Borrow and Tiriganiaq Esker Area Facilities

The magazine storage, Wesmeg Borrow, and vent raise areas were inspected, as well as, the access roads to these facilities. A selection of photographs taken during the inspection are provided in Appendix 3 (Photographs 23 through 32).

The Wesmeg access road was constructed by borrowing material on either side of the road leaving disturbed trenches along the edges of the road. During the 2018 inspection, there was an area adjacent to the Wesmeg access road, northeast of the magazine storage area, that was disturbed, and water was ponded against the road (Photograph 27, Appendix A3). There was a large pond of water against the road where it crosses low topography north of Lake B33A (Photographs 28, Appendix A3). The design report for the Wesmeg Road (Tetra Tech EBA 2016e) indicates that a culvert was planned for this location.

The following are some of the general observations:

- The magazine storage area and blast guard berms were inspected and there were no signs of erosion or cracking (Photograph 25, Appendix A3). No geotechnical concerns associated with the magazine storage area were identified.

- Cracking and erosion were observed in the materials stockpiled at the Wesmeg Borrow area (Photograph 29, Appendix A3). Straw logs had been placed downstream to control the sediment. There are no geotechnical concerns with the erosion, but remediation of the area is required for longer term sediment control. Rehabilitation of the Wesmeg esker has been scheduled by AEM to be completed after construction of the vent raise.
- A small rockfill pad had been constructed at the Wesmeg vent raise with a low area and a berm on the west side (Photograph 30, Appendix A3). Two steel pipes were installed through the access road to the pad for water management (Photograph 31, Appendix A3). There was no flow at the time of the site visit.

5.2 Recommendations

The following are recommendations for the site roads and culverts and the Tiriganiaq and Wesmeg Borrow areas:

- Consider lowering the lower culvert at Culvert #1 so that water won't pond against the road prior to flowing through the culverts.
- The culvert planned for where the Wesmeg Borrow access road crosses low topography, north of Lake B33A, should be installed if the road is blocking natural drainage that is causing more water to pond that could lead to permafrost degradation and settlement or cracking in the road.
- The Wesmeg Borrow area should be recontoured and either capped with a coarser material or some other form of reclamation to protect against erosion.
- Culverts should be installed in areas of the emulsion plant road where water was flowing over the road in 2018.
- If erosion occurs in the esker sand material used to construct the emulsion plant road, rockfill should be placed to cap the road and reduce erosion. Placement of a gravel road capping may also be beneficial to improve the road surface, particularly over the northern section of the road.
- It is recommended that the disturbed areas adjacent to the Emulsion Plant and Wesmeg Borrow access roads be regraded so that water does not pond adjacent to the road and thaw the permafrost around and under the road which could lead to settlement.
- Regular monitoring and maintenance of the roads should be conducted.

6.0 TEMPORARY ORE AND WASTE STOCKPILES

The ore and waste rock storage area is located east of the P-Area. The rock and ore (high grade and low grade) piles are relatively small during the development stage of the mine. A selection of photographs from the inspection are provided in Appendix A4 (Photographs 1 through 9).

Ore and waste materials removed from the underground development are transported to surface and placed in stockpiles. The majority of waste rock is crushed into various sizes for use in construction. There were also stockpiles of crushed materials in this area. Berms were in place around the top benches of the piles and there was a small pond of water observed in the middle of the bench of the Waste Rock Pile (Photograph 5, Appendix A4). Some cracking was observed in one area of one of the high grade ore stockpiles that looked to be shallow slumping of material on the slope likely due the slope being locally over steepened. There was no active placement on this pile and material had been placed to block access on the ramp so there is no concern with the cracking (Photograph 4, Appendix A4). If placement was to restart on this pile, the slope in the area of cracking should be resloped to be consistent with the slopes around the remainder of the pile.

No geotechnical concerns related to the stability of the stockpiles were identified.

7.0 OTHER MELIADINE FACILITIES

This section contains the observations and recommendations from the 2018 geotechnical inspection of other Meliadine facilities including: the landfarm, underground Portal No. 1, underground Portal No. 2, exploration landfill, operations landfill, fuel storage areas, and industrial and mine site pads. A general description of each facility and the visual observations from the 2018 inspection are provided in Section 7.1 and recommendations for the facilities are provided in Section 7.2.

A selection of photos from the inspection are included in Appendix A5. Photograph 1 provides a Google Earth Image overview of the mine facilities.

7.1 Visual Observations

7.1.1 Landfarm

The new landfarm is located at the southeast corner of the industrial pad area and west of the water treatment plant (Photograph 1, Appendix A5) and replaces the exploration landfarm (Section 8.1.3) which will be decommissioned. The landfarm was constructed in 2017 and includes perimeter containment berms constructed mainly out of esker sand and gravel material, 30 mm minus liner bedding, geomembrane liner with geotextile placed above and below, 30 mm minus liner cover and 200 mm minus rockfill final cover. There is a sump located in the southeast corner of the facility. The slopes of the berms appeared to be approximately 2.5 horizontal to 1 vertical as per the design (Tetra Tech 2017b). There were no signs of erosion, cracking, or settlement. No geotechnical concerns were identified.

At the time of the 2018 site visit, AEM had set up a lined temporary screening area on the west side of the landfarm. Large cobbles and boulders were being screen out for use elsewhere on site and the fine material was being placed back in the landfarm.

A selection of photos from the inspection are included in Appendix A5 (Photographs 2 through 11).

7.1.2 Underground Portal No. 1

Underground Portal No. 1 is located southwest of P3 (Photograph 1, Appendix A5). At the time of the inspection, Portal No. 1 had been constructed and was in use. A selection of photos from the inspection are included in Appendix A5 (Photographs 12 through 15).

A small excavation and corrugated culvert are used to connect the underground ramp to surface. Portal No. 1 was observed from the surface only, with observation of the small bedrock cut face above the culvert. A rockfill berm was also in place around the perimeter of the portal excavation. The toe of the rockfill perimeter berm was close to the crest of the rock face in some locations and there was evidence of ravelling of rockfill into the cut; however, the corrugated culvert protects the access to the portal, so there is no safety concern. There was some minor erosion observed on the surface of the backfill material adjacent to the portal (Photograph 12, Appendix A5). The condition of the portal area was similar to 2017 and there were no other geotechnical concerns identified at the time of the inspection.

7.1.3 Underground Portal No. 2

Underground Portal No. 2 is located northwest of the P-Area, on the west side of the access road from Portal No. 1 to the main camp site (industrial pad) (Photograph 1, Appendix A5). Waste rock was being removed from the portal. At the time of the inspection, backfill was in progress around the sides of the corrugated steel culvert forming the entrance to Portal No. 2. A selection of photos from the inspection are included in Appendix A5 (Photographs 16 through 20).

A small excavation and corrugated culvert are used to connect the underground ramp to surface. Portal No. 2 was observed from the surface only, with observation of the small bedrock cut face and perimeter berm. Rock bolts and mesh were in place over most of the rockfill cut. There was some evidence of ravelling of rockfill into the excavation; however, the catch berms appeared to generally be sufficient to allow safe backfill placement round the culvert. The slopes above active backfill placement should be regularly monitored for potential rock fall hazards. The culvert protects access to the portal during operations. Water was observed ponding in some areas around the perimeter of the portal (outside the perimeter berm). AEM indicated that water management facilities will be constructed once the backfill is complete.

7.1.4 Exploration Landfill

The exploration landfill is located southwest of Portal No. 2 and northwest of the P-Area (Photograph 1, Appendix A5) and is within the future Waste Rock Storage Area 1 (WRSA1) footprint. The exploration landfill had been decommissioned and the new operation landfill was in use.

The exploration landfill is located on gently sloping ground and is contained on three sides by berms and by high ground on the fourth (south) side. The berms appeared to be constructed with esker materials that contained substantial amounts of sand and gravel. The slopes appeared to be approximately 2.5 horizontal to 1 vertical. It appeared that esker material had been used to cover the top of the landfill as part of decommissioning. Some wood debris was still evident protruding through the cover. A selection of photos from the inspection are included in Appendix A5 (Photographs 21 through 26).

Cracking was observed on the downstream slopes of the containment berms, similar to the 2017 inspection. The cracking appeared to be largely due to translational slumping of the berm materials on the slope (e.g., Photographs 22 and 24, Appendix A5). There was water ponded in a small depression adjacent to the access road and south side of the landfill, but there was no ponded water on the surface of the landfill and no seepage observed.

7.1.5 Operation Landfill

The operation landfill is located northwest of Portal No. 2 and within the northeast corner of the future Waste Rock Storage Facility 1 footprint (Photograph 1, Appendix A5). The operation landfill was constructed in 2017. At the time of the 2018 site visit, a substantial portion of the original operation landfill was full and an expansion had been constructed on the south side of the original landfill. A selection of photos from the inspection are included in Appendix A5 (Photographs 27 through 34).

The operation landfill is located on sloping ground and is contained by perimeter berms. The berms and floor were constructed with esker materials that contained substantial amounts of sand and gravel. The slopes appeared to match the design of approximately 2.5 horizontal to 1 vertical for the exterior slopes and 2 horizontal to 1 vertical for interior slopes. The slopes of the expansion portion of the operation landfill appeared to be steeper than the original berms. The berm crests and slopes were in good condition, except for the toe of the northeast corn of the facility where water was observed to be ponding on the tundra downstream and there was some erosion and potentially slumping on the slope (Photograph 30, Appendix A5). The sand and gravel material may be susceptible to erosion. If erosion is observed, a coarser rockfill layer should be placed over the exterior slopes and berm crests to protect against erosion. As WRSF1 is constructed, the landfill will become surrounded by rockfill.

7.1.6 Fuel Storage Containment Areas

There are two fuel storage areas at the main mine site, the mine site fuel area and the industrial fuel storage area. The mine site fuel storage is located south of the west end of D-CP1 and north of the saline pond and the Industrial fuel storage area is located northwest of the landfarm (Photograph 1, Appendix A5). The fuel storage areas are lined perimeter berm facilities to provide secondary containment for the fuel tanks. The floors of the facilities are graded to a drainage sump to collect surface runoff water.

The mine site fuel storage area was constructed in 2017. There are two tanks: 3 million litres and 250,000 litres contained in the facility. The industrial site fuel storage area was constructed in 2017 and 2018. There are two tanks: 6 million litres and 250,000 litres contained in the facility.

The interiors of the facilities are lined with HDPE liner with non-woven geotextile placed above and below. The dike slopes appeared to be approximately 2 horizontal to 1 vertical, as per the design (Tetra Tech and WSP Canada Inc. 2017). There were minor signs of sloughing in the liner cover materials, but no other geotechnical concerns identified. There was no ponded water or seepage observed. A selection of photos from the inspection are included in Appendix A5 (Photographs 35 through 40).

7.1.7 Main Site Pads

At the time of the 2018 inspection, the northern portion of the industrial pad was mainly complete, but the southern portion of the industrial pad was under construction. Various facilities were also under construction on the pads. In addition to the main industrial pad there are several other smaller pads that have been constructed for various mine site facilities that were inspected, such as, the effluent water treatment plant pad, incinerator pad, east air intake pad, temporary cyanide storage pad and emulsion plant and storage area pads.

Inspection of the pads involved walking along crests and toes, examining the condition of the slopes for visual signs of erosion and instability, cracking, or uneven surfaces. A selection of the photographs taken during the inspection are provided in Appendix A5 (Photographs 41 through 58).

The pads on site have been constructed using a combination of rockfill and esker sand and gravel obtained from borrow areas. A surface layer of crushed aggregate was observed in some areas (e.g., Photographs 43 and 47, Appendix A5). The height of the pad varies, based on topography. The slopes of the edges of the pad ranged from approximately 2.5 to 3 horizontal to 1 vertical, and appeared stable.

Normal maintenance of the surface of the pads, in particular areas with heavier traffic (e.g., roads), should be anticipated, as well as maintenance of slopes, particularly where pads have been constructed with esker materials that are more prone to erosion.

The following is a summary of the key observations from the pad inspections:

- Similar to the 2017 inspection, during the 2018 inspection, there was visual evidence of erosion of the north slopes of the industrial pad (Photographs 41 and 42, Appendix A5). The erosion had increased from 2017. There was also some erosion and cracking observed at the crests and on the slopes of some of the other pads that was not observed in 2017 (e.g., incinerator and emulsion plant pads Photographs 47 and 54, Appendix A5).
- There was a relatively large pond of water located west of the industrial fuel storage area (Photograph 46, Appendix A5). The slopes around the ponded water appeared to be approximately 3H:1V and there was no instability observed. AEM has scheduled this area to be filled and graded with fill materials as part of finalizing the Industrial Pad construction during 2019.
- A pipe berm on the south side of the effluent water treatment plant pad had been constructed out of sand that is susceptible to erosion (Photograph 50, Appendix A5).
- There was an area of the emulsion storage pad (located near the emulsion plant pad), that had large ruts from where a loader had gotten stuck (Photograph 58, Appendix A5). The surface of the pad appeared to be finer esker material, no rockfill surfacing material had been placed. This surface will likely continue to cause trafficking issues during periods of high precipitation. The emulsion plant pad surface was in better condition, likely due to recent grader work, but was also observed to have finer material at surface that may cause trafficking issues during high precipitation. There was some ditching in place around the south and eastern perimeters of the emulsion plant pad to help with water management.

7.2 Recommendations

The following are recommendations for the Meliadine Mine site facilities summarized in Section 7.1:

- The slopes of the operation landfill should be monitored, particularly the northeast corner where water was observed to be ponded and there appeared to be some slumping on the berm slope. Recontouring of the slope in this area will reduce the potential for future erosion.
- The north slopes of the industrial pad should be recontoured and a coarser surfacing layer should be placed on the slopes where erosion is substantial.
- A coarser rockfill cover should be placed over the pipe berm constructed out of sand on the south side of the effluent water treatment plant to protect against erosion.
- AEM indicated that ground control engineers routinely conducted and documented inspections of the rock slopes surrounding Portal No. 2 during backfill placement around the culvert at the entrance to the portal. Monitoring of the slopes, including loose rockfill material above the slopes should continue during backfill placement around the culvert.

- Snow management around and above Portal No. 1 and 2 may be advisable, especially prior to freshet, to reduce the potential for larger surface water inflows entering the underground.
- Where erosion occurs on the slopes of the various site pads, coarser rockfill should be placed over the slopes and crests to reduce the potential for further erosion.
- A gravel or rockfill surfacing layer may be required at the emulsion plant and storage pads if trafficking issues continue.
- The exploration landfill will eventually be covered by WRSA1, so the cracking and erosion on the slopes is not a substantial concern. Placement of a coarser rockfill layer over the decommissioned exploration landfill could be considered to reduce cracking and erosion in the short term.

8.0 EXPLORATION CAMP AND ACCESS ROAD

The exploration camp site was the first area of the project that was developed and at the time of the site visit it was still being used. The new camp and office facilities at the main mine site had been constructed and were in use; however, due to the number of people on site the exploration camp and office facilities were still being used.

The exploration site was inspected including the site pad, genset containment facility, fresh water intake, diffuser access, landfarm, fuel storage, and access road. The following sections provide a summary of the observations and recommendations relating to the exploration camp and access road.

A general description of each facility and the visual observations from the 2018 inspection are provided in Section 8.1. Recommendations for the facilities are provided in Section 8.2.

8.1 Visual Observations

8.1.1 Exploration Camp Pad, Water Intake, and Diffuser Access

The exploration camp site is located on a peninsula on the west shore of Meliadine Lake. The exploration pad has primarily been constructed with esker sand and gravel material; however, small localized portions of the slopes contain coarser grained particles. The thickness of the pad varies based on topography; however, it is generally relatively thin. The slopes appeared to be approximately 2 to 2.5 horizontal to 1 vertical. During the 2018 inspection, the slopes generally appeared stable and in a similar condition to 2017. There was some surface erosion on southeast side of the exploration camp pad that was in a similar condition to what was observed in 2017 (Photograph 3, Appendix A6). Sand had been used to cover some cables on the south side of the pad that is susceptible to erosion (Photographs 4, Appendix A6). At the time of the inspection, an excavator was removing contaminated material from a fuel spill on the south side of the camp (Photograph 5, Appendix A6). There was some disturbance to the tundra observed on the south side of the exploration camp that may have been due to boat access to the lake (Photograph 9, Appendix A6). Trafficking over the tundra directly should be avoided. A new genset containment facility was under construction at the time of the site visit at the northeast end of the site (Photographs 10 and 11, Appendix A6). The containment berms appeared to have been constructed out of esker materials that could be susceptible to erosion, but otherwise the berms were in good condition. The facility appeared to be lined and there was a drain in one corner of the facility. There were no other geotechnical issues identified for the exploration camp pad. A selection of photos from the inspection are included in Appendix A6 (Photographs 1 through 11).

A short access road extends to the north from the exploration camp pad to the edge of Meliadine Lake, to provide vehicle access to the fresh water intake pump house and pipeline. No geotechnical concerns were identified. A selection of photographs from the water intake access inspection are included in Appendix A6 (Photographs 12 through 15).

The diffuser access road starts at the water intake access road and runs east to Meliadine Lake. The road appeared to have been constructed with esker materials and there was cracking along the edges of the road along most of its length. Cracking was observed along more of the road than in 2017 and some of the cracks observed in 2017 were wider. The cracking is not a significant concern and no other geotechnical issues were identified. A selection of photographs from the diffuser access inspection are included in Appendix A6 (Photographs 16 through 21).

8.1.2 Exploration Camp Access Road

At the time of the site visit, the exploration road was generally in good condition and appeared to have been constructed with esker materials. There was some erosion observed on the slopes of the road (e.g., Photographs 28 and 29, Appendix A6) that had increased from 2017. There were four culverts installed through the road, and observations from the inspection are summarized in Table 6. A selection of photographs from the diffuser access inspection are included in Appendix A6 (Photographs 22 through 37).

Table 6: Exploration Camp Access Road Culvert Summary

Culvert Location	Culvert Description	Comments/Recommendations
North side of camp	1 × 450 mm HDPE corrugated	Upstream end of culvert appears to have been buried within the exploration camp pad (Photographs 22, Appendix A6). No flow.
North side of camp	1 × 450 mm HDPE corrugated	Upstream end of culvert appears to have been buried within the exploration camp pad (Photographs 23, Appendix A6). No flow.
North side of camp	1 × 600 mm CSP	Culvert in good condition, no obstructions, no flow, minor amount of water pooled in base of culvert and on ground downstream of outlet. Esker material surrounding culvert. Upstream and downstream slopes are not armoured. (Photographs 24 and 25, Appendix A6).
West of camp near Lake J1	1 × 600 mm HDPE corrugated	Some deformation of haunch of culvert under road. Minor flow. Upstream inlet to culvert armoured with rockfill and outlet partially armoured. (Photographs 30 and 31, Appendix A6).
West of camp near Lake J1	1 × 600 mm HDPE corrugated	Culvert in good condition. Upstream inlet to culvert armoured with rockfill that extends into culvert. Downstream end of culvert partially blocked with material that should be cleared out. (Photographs 32 and 33, Appendix A6).

Note: 1 ×__ mm = the number of culverts × the diameter of the culvert.

CSP = corrugated steel pipe.

8.1.3 Fuel Storage Area and Landfarm

The fuel storage area, landfarm, and core storage pad are located along the north side of the exploration camp access road, approximately 0.9 km west of the camp. A selection of photos from the inspection are included in Appendix A6 (Photographs 38 through 48).

The exploration bulk fuel storage tanks contain jet fuel and diesel. At the exploration camp, there is a small tank with gasoline. All tanks are double lined and self-contained. The tanks are located on raised pads, constructed with esker sand and gravel. There is no liner or berm surrounding the tanks. The exploration fuel storage pad was generally in good condition; however, some minor cracking was observed along the east crest due to settlement (e.g., Photograph 39, Appendix A6). The cracking is not a significant geotechnical concern.

The exploration landfarm consists of an above-ground bermed containment area, which appears to have been constructed of esker sand and gravel, with a 60 millimetre HDPE geomembrane liner and nonwoven geotextile beneath the liner. The liner surface has been covered with a layer of sand and gravel. Contaminated soils have been placed within the bermed area. There was no water ponding within the facility, but there was damp soil indicating that water sometimes ponds, as was observed during the 2017 inspection. It is understood that water samples are periodically collected and, if necessary, the water is treated prior to discharge. There was no seepage or ponded water downstream of the containment berms observed at the time of the inspection; however, there were some indications of minor erosion on the slopes that could be due to previous seepage. Vegetation had grown over most of the downstream slopes of the berms.

It is understood that AEM intends to decommission the exploration landfarm now that the new landfarm at the main site is operational (Section 7.1.1). When the exploration landfarm is decommissioned, it is anticipated that some cleanup of the foundation soil, and containment berms material will be necessary. Until such time that the exploration landfarm is decommissioned, AEM should try to minimize the amount of water contained within the exploration landfarm.

The core storage pad is located north of the landfarm. The pad slopes generally looked stable; however, there were some fairly large cracks along the east crest (e.g., Photograph 49, Appendix A6).

8.2 Recommendations

The following are recommendations for the exploration camp and access road:

- The south side of the exploration camp pad should be regraded to manage surface water to reduce channelization of the flow that leads to erosion. The slope should also be regraded where erosion has occurred and a coarser surfacing layer could also be placed to help reduce the potential for future erosion.
- The diffuser access road could be regraded to close up the cracks and reduce the potential for future cracking.
- The culverts through the exploration camp access road should be cleared of material.
- The exploration camp access road should be regraded and consideration given to placing some coarser rockfill on the slopes where there is erosion.
- The cracks in fuel storage pad should be monitored; however, they are not considered to be a geotechnical concern.

9.0 ALL-WEATHER ACCESS ROAD (AWAR) AND ASSOCIATED WATER MANAGEMENT STRUCTURES

The All Weather Access Road (AWAR) construction activities began during the winter of 2012, and construction was completed by the end of October 2013 to connect the hamlet of Rankin Inlet to the Project. Appendix B contains photographs taken during the inspection. The road is approximately 23.8 km long, with three bridge crossings and culverts installed at a total of 19 locations. The road has two-way traffic and is approximately 6.5 m wide with pull outs approximately every 400 m ±50 m to facilitate vehicles passing.

The AWAR is used by AEM and also provides unrestricted all-terrain vehicle (ATV) access for the public, if it is safe to do so. The AWAR is used to transport building materials, construction/mining equipment, fuel, reagents, supplies, workers, and contractors to the Project.

The road design is based on a general sub-base composed of rockfill or sand and gravel from esker sources and crushed granular surfacing with a combined minimum thickness of 500 mm. The road design varied based on the relative susceptibility to freeze and thaw induced settlement of the foundation soils. The thickness of the road fill material was generally increased, to a minimum of 1.3 m, in areas where potentially thaw-sensitive soils were identified. Along portions of the road where thaw-sensitive soils were identified, a geotextile material was incorporated into the road design to limit damage to the road should the foundation material thaw.

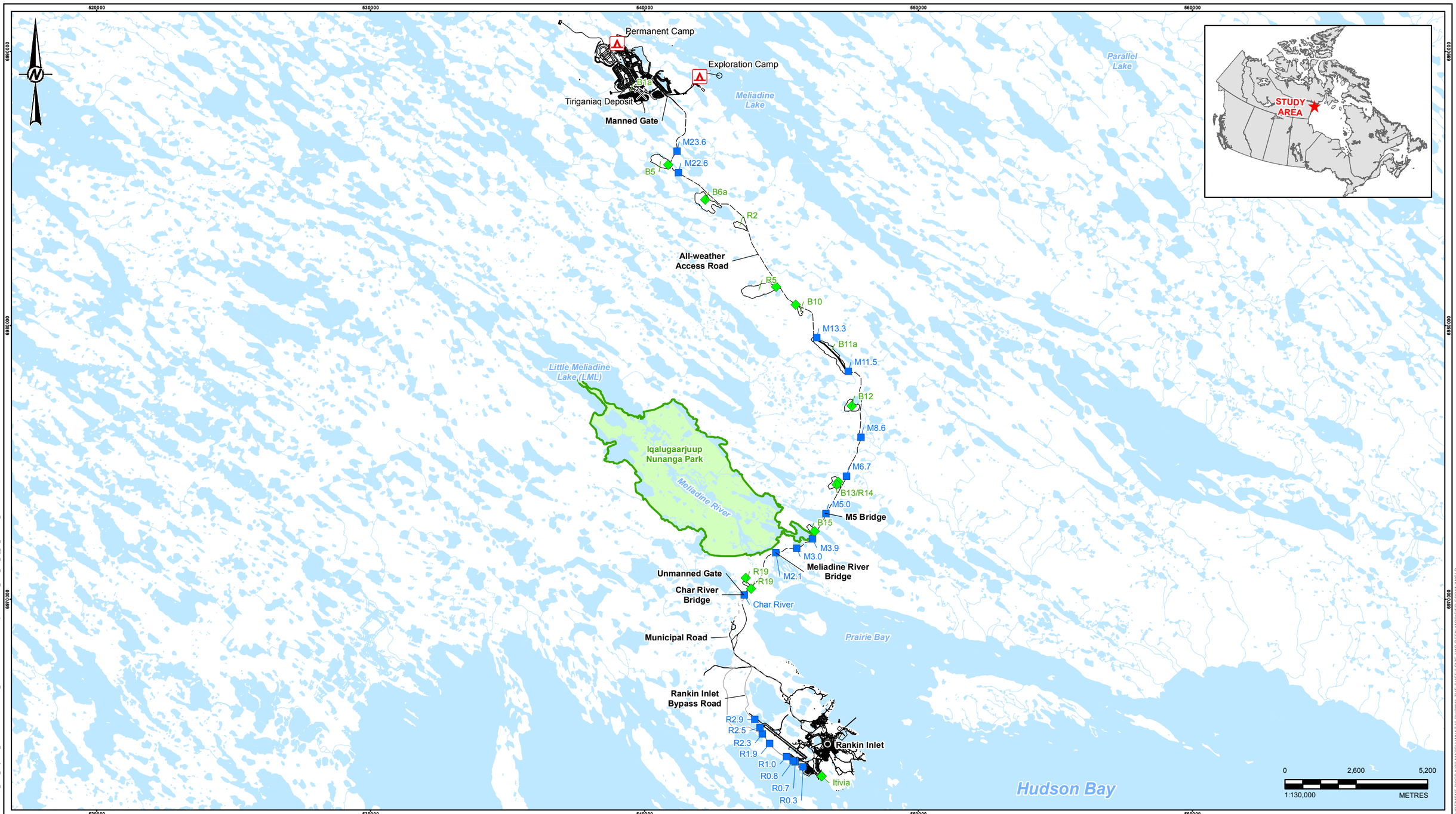
No evidence of thermal degradation of the permafrost was observed on the road during the inspection. It should be noted that visual evidence may not necessarily be observed due to the regular road maintenance performed by AEM. During the inspection, water levels were considered to be normal to low and flow velocities at the crossings were considered to be low.

9.1 Observations and Recommendations

The culverts were generally observed to be in good condition, at the time of the inspection. Most culverts were unobstructed with no signs of substantial damage to the culverts. All bridges and their embankments were in good geotechnical condition at the time of the inspection. A structural and/or mechanical assessment of the bridges was not conducted and is beyond the scope of this geotechnical inspection.

A photographic record of the inspected culverts and bridges is provided in Appendix B. Figure 5 shows the location of the primary water management structures along the road (e.g., M3.9). However, additional culverts have been added that are not shown in Figure 5.

Table 7 lists the locations of water management structures: culverts and bridges that have been installed along the AWAR. The location of the culverts and bridges are listed, based on distance from the Friendship Centre in Rankin Inlet, with the gate house at Meliadine being 29 km. Size and number of culverts is provided in Table 7, along with specific observations and photos at the time of the inspection, and any recommendations. It was observed during the 2017 inspection that flags with kilometre markings had been installed at the culvert locations; however, the distance markers on the culverts did not match with the location along the AWAR. During the 2018 inspection, AEM indicated that new distance markers had been ordered.



LEGEND

- CAMP
- PROPOSED MINE SITE
- QUARRY/BORROW PIT LOCATION
- WATERCOURSE CROSSING
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
MELIADINE GOLD PROJECT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-14
DESIGNED	FE
PREPARED	CDB
REVIEWED	FE
APPROVED	ACI

TITLE
MELIADINE ALL WEATHER ACCESS ROAD WITH QUARRIES AND WATERCOURSE CROSSINGS

PROJECT NO.	CONTROL	REV.	FIGURE
18105719	3000/002	0	5

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Table 7: 2018 Inspection Record of Water Management Structures along the All-Weather Access Road

Station (distance from Friendship Centre)	Water Management Structure Description	Conditions, Observations, and Recommendations (at time of inspection)
KM 6.0	Char River Bridge	Good condition, stable embankments and abutments. Left abutment downstream, sand and gravel, with potential for erosion. Recommendation: Monitor finer grained material on left abutment to determine if armouring should be added.
KM 6.2	3 CSP culverts: 2 × 1,300 mm 1 × 700 mm	The culverts are vertically offset with the 700 mm culvert elevated above the 1,300 mm culverts. Some minor erosion observed between the culverts on the downstream side. All clear and in good condition. Small flow in the lower 1,300 mm culvert. Recommendation: Monitor to determine if armouring should be added.
KM 7.0	3 CSP culverts: 2 × 1,000 mm 1 × 700 mm	The culverts are vertically offset with the 700 mm culvert elevated above the 1,000 mm culverts. The 700 mm culvert had a dent in side. Ponded water observed in the lower culvert. Small amount of water ponded upstream. Sandy soil around culverts, potential for erosion causing turbidity. Recommendation: Consider adding armouring around culverts to reduce potential for erosion.
KM 7.1	3 CSP culverts: 2 × 1,000 mm 1 × 700 mm	Vertically offset. 700 mm culvert is elevated. Water ponded in the lower culvert on the right side when looking downstream, minor deformation of culverts under the road, no substantial reduction of cross-sectional area. Minor flow in lower 1,000 mm culvert. The culverts and riprap appear in good condition.
KM 7.4	3 CSP culverts: 1 × 900 mm 1 × 700 mm 1 × 1,000 mm	Vertically offset. 700 mm culvert is elevated. Damaged, partially crushed inlet of the 900 mm culvert, but not expected to substantially reduce flow capacity. Erosion potential due to finer grained soils around 700 mm culvert at the inlet and outlet. 1,000 mm clear, low flow/ponding water. Recommendation: Consider extending 700 mm culvert and armour around it to reduce erosion.
KM 8.0	Meliadine River Bridge	Right abutment, downstream slope has exposed esker sand and gravel. Recommendation: Monitor right abutment to determine if armouring should be added.
KM 9.1	2 × 1,000 mm CSP culverts	Minor deformation of both culverts under the road. No flow, water ponded below the inlets. Design was for 5 culverts. No specific mention of capacity issues at this location in AEM inspections.
KM 9.5	1 × 1,300 mm CSP culvert.	Water ponded on upstream side of culvert/road with very low flow due to elevated inlet of CSP. CSP in good condition. Design was for 4 culverts. No specific mention of capacity issues at this location in AEM inspections.
KM 10.5	M-5 Bridge	Good condition, stable embankment and abutments of the bridge. Potential small erosion/settlement of rock embankment on the bridge's right abutment identified during previous annual inspections shows no signs of change. Exposed geotextile at base of downstream end of left abutment that could be due to erosion. Gabion damaged on downstream of Left (north) Abutment. Recommendation: Replace damaged gabion. Continue to monitor for erosion and/or settlement.
KM 12.1	4 CSP culverts: 2 × 1,300 mm 1 × 900 mm 1 × 700 mm	Vertically offset. 700 mm and 900 mm culverts are elevated. Some small dents and bending of haunches in 700 mm and one of the 1,300 mm culverts. Minor flow through the lowest of the 1,300 mm culverts. Embankment slope is generally in good condition.
KM 12.6	no culverts	Area of poor drainage. Flow along west side of road, suspect seepage under the road to east side. Some erosion along toe of road. Recommendation: Monitor this area and if erosion increases or ponding and seepage cause permafrost degradation and settlement of the road fills, a culvert should be installed in this location.
KM 13.5	5 CSP culverts: 3 × 1,300 mm 2 × 900 mm	Vertically offset, 900 mm culverts are elevated above 1,300 mm culverts. Good condition, no flow, minor dents and deflection in haunch.

Station (distance from Friendship Centre)	Water Management Structure Description	Conditions, Observations, and Recommendations (at time of inspection)
KM 14.7	Access road to B12 quarry, 500 mm HDPE corrugated culvert	No flow, small amount of water ponded against AWAR and quarry access road, below inlet of culvert. Minor dents observed in culvert. Small erosion at outlet. Culvert and embankments are generally in good condition.
KM 16.3	3 CSP culverts: 1 × 1,300 mm 1 × 700 mm 1 × 1,000 mm	Vertically offset, 1,300 mm culvert is the lowest, then the 1,000 mm culvert and the 700 mm culvert is the highest. No flow in the 700 mm and 1,000 mm culverts, good condition. Small flow in 1,300 mm culvert, good condition, small erosion visible at outlet. Outlets are all elevated increasing erosion potential. Drainage appears to be connected to M13.3 area (KM18.1 and 18.15), survey required to confirm. Recommendation: Monitor to assess if hydraulic capacity is adequate and if erosion is an issue. Consider installing culverts at lower elevations to improve water management.
KM 18.1	2 CSP culverts: 1 × 900 mm, 1 × 1,000 mm	Vertically offset culverts. The 900 mm culvert is elevated above 1,000 mm culvert. Lower culvert has some flow, minor dent on upstream end. Upper culvert is in good condition. Upper culvert is high on the embankment and has thin cover on the upstream side. Note for flow to occur in upper culvert, the road near KM18.15 would be nearly flooded. Culvert outlet is high, therefore potential for erosion of the embankment during high flow periods exists. Trench exists along upstream toe of road connecting the culverts at KM 18.1 to KM18.15. Recommendation: Monitor cover over upper culvert. If cover thickness is reduced, additional material should be placed to protect the culvert. Consider lowering upper culvert to allow flow with less ponding adjacent to road and less potential for erosion.
KM 18.15	1 × 600 mm CSP culvert.	Ponding on the upstream side. Additional ponding adjacent to road required before reaching the culvert inlet. Culvert outlet elevated, potential for erosion of toe of road embankment. Flow may initially occur through the road fill beneath the culvert. Trench exists along upstream toe of road connecting the culverts at KM 18.1 to KM18.15. Recommendation: Continue to monitor hydraulic capacity. If water management challenges observed, consider installing an additional culvert at this location, at a lower elevation.
KM 19.5	No culverts	Ponding on west side of road, reportedly the water ponds here year-round and can reach as high as half way up the embankment. Inspection reports by AEM note straw logs were placed at KM 19, so there may have been some flow over the road in this area. Recommendation: Consider installation of a culvert at this location.
KM 21.2 to 21.5	No culverts	Water ponded on west side of road near KM 21.2. Water reportedly flowed over the road near KM 21.5 during the 2017 freshet. Straw logs were placed on east side of road embankment to control suspended solids in flow. Recommendation: Install culverts in this area.
KM 21.7	2 × 160 mm steel pipes, used as culverts	Vertically offset steel pipes, clear, no flow. Water ponded upstream, erosion mark from higher water level evident in road embankment. Water reportedly flowed over the road at this location during freshet. AEM personnel report that the road was excavated to allow the water to drain. Capacity of pipes may be inadequate, or pipes could have been frozen (blocked) causing water to backup. Straw logs were observed on west side of road. Recommendation: Consider installation of larger diameter culvert(s). Make sure culverts are clear prior to freshet.
KM 22.3	2 × 160 mm steel pipes, used as culverts	Vertically offset, clear, no flow. Inlets are elevated above ponded water. Recommendation: Consider lowering culverts to reduce ponding upstream.
KM 22.7	No culverts	Water ponded on the east side of the road, signs of wet ground observed on west side of road indicating possible seepage under the road. Recommendation: Consider installing a culvert to manage water in this area.
KM 25.8	1 × 600 mm HDPE corrugated culvert	No flow, minor amount of gravel in base of culvert, some dents on upstream inlet to culvert. Inlet is partially blocked by road fill. Sandy soil around inlet and outlet. Some sediment erosion and deposition evident on downstream side of culvert. Some erosion of slope of road visible in this area. AEM inspection reports noted ponding of water at or over the road in this area during the freshet. Recommendation: Clear culvert inlet of road fill material. Consider adding armouring around culverts. Consider adding additional culverts if water management continues to be an issue during freshet.

Station (distance from Friendship Centre)	Water Management Structure Description	Conditions, Observations, and Recommendations (at time of inspection)
KM 26.2	2 × 160 mm steel pipes, used as culverts	Vertically offset, lower pipe bent upwards, unable to see through, upper pipe is clear. The inlets are elevated close to the road surface. Very thin road fill cover over inlets. Some sediment deposition downstream is evident. Water ponded along road below upstream inverts of pipes. AEM inspection reports noted ponding of water at or over the road in this area during the freshet. Recommendation: Lower pipe should be replaced. Consider adding additional culverts if water management continues to be an issue during freshet.
KM 26.5	3 × 700 mm CSP culverts	Equal elevation, some sediment buildup, no flow, small dents, no blockages.
KM 26.8	2 × 160 mm steel pipes, used as culverts	Vertically offset, no flow. Inlet of the lower culvert was completely covered by new road fill. Some erosion evident at downstream ends. Recommendation: Inlet of the lower culvert should be cleared and extended or culvert should be replaced.
KM 27.1	3 CSP culverts: 1 × 900 mm 1 × 700 mm 1 × 1,000 mm (southernmost)	Vertically offset, middle culvert (700 mm) elevated above adjacent culverts. Clear, minor flow in lowest culvert, some small dents in 900 mm and 1,000 mm culverts. Some sloughing of riprap near culvert inlets. Recommendation: Monitor riprap and add more protection if more erosion occurs.
KM 28.7	No culverts	Ponded water on east side of road. AEM notes that water ponds against road for most of open water season and road surface is often soft, indicating signs of seepage through road. This year water flowed over the road at this location during freshet. Recommendation: Install a culvert at this location.
KM 29.6	1 × 500 mm HDPE corrugated culvert	No flow, some small dents, small erosion evident upstream, water ponded upstream. Inlet is partially blocked by road fill and riprap. Recommendation: Clear the culvert inlet and consider lowering culvert to reduce ponding adjacent to road.

1 ×__ mm = the number of culverts × the diameter of the culvert.

CSP = corrugated steel pipe; AWAR = all-weather access road.

AEM has implemented a watercourse crossing inspection and maintenance program (AEM 2015b), which includes:

- a regular inspection program to identify issues relating to watercourse crossings, such as structural integrity and hydraulic function
- an event-based inspection program to track the impacts of larger storm events on watercourse crossings
- a culvert location inspection program to ensure that culverts have been installed in the correct location with respect to watercourses and that the culvert capacity is adequate, for hydraulic conditions

A total of 20 inspections were conducted and documented by AEM's environment and site services departments in 2018. Inspections were carried out more frequently during freshet (May and June). There was no record of inspections carried out in February, July, August, September or December. AEM indicated that the site services department conducts weekly inspections, but reporting is not always completed.

Prior to spring freshet, the culverts and bridges were inspected to assess their condition and ability to accommodate rapid spring thaws. The visual inspections are intended to identify any structural issues, blockages, ponding against or over the road, required maintenance, damage, bed erosion, or scour. The inspections include photos of key observations and are documented and filed for future reference.

Road maintenance and snow management are carried out, as deemed necessary. Steaming of culverts, is included as a maintenance activity. AEM indicated that they re-capped the AWAR and applied calcium spray for dust control through the spring and summer. Six new pull outs were also added along the AWAR in 2018.

Records of the inspections carried out by the environmental and site services teams were provided to Golder for review. The following are some of the key observations related to geotechnical stability that were documented in the inspection reports:

- Road was typically noted to be in good condition from January to March.
- Snow clearing was noted to have been pushed properly so as not to disturb the tundra.
- 4 May 2018 – Started clearing Char River crossing. Meliadine River and M5 water crossing along with culverts to be cleared.
- 9, 17, and 27 May 2018 – Culverts North of KM 8.6 need to be cleared. All bridges along the AWAR are clear. Culverts south of KM 8.6 are cleared.
- 1 June 2018 – Most of the culverts along the AWAR are snow covered and should be cleared by 6 June 2018. High temperatures are expected following 6 June 2018 and culverts should be clear to prevent erosion of road.
- 6 June 2018 – Flow across the AWAR at KM 24 is beginning to wash out the road. Straw logs are being installed at downstream side of road to control sediments. KM 28 has developed a pond adjacent to the road that has begun to flow and poses wash-out hazards. Straw logs are being placed.
- 9 June 2018 – Straw log set-ups were installed along the AWAR at KM 22 and KM 19. The AWAR will continue to be inspected, and problematic water crossings reported/addressed.
- 10 to 13 June 2018 – Culverts currently being cleared to prevent flow across road. Straw logs have been installed where flow across road is ongoing at locations not containing culverts where no culverts exist.
- 14 June, 13 and 20 October, 12 November 2018 – No issues.

10.0 ITIVIA FUEL STORAGE SITE AND BYPASS ROAD

The Itivia site is located south of Rankin Inlet on the north shore of Melvin Bay (Figure 6). It is used for bulk fuel storage and provides a laydown area for transfer of materials to the Meliadine Mine. To minimize impacts on Rankin Inlet, AEM constructed a bypass road to divert traffic travelling to and from the Itivia site and the Project site around Rankin Inlet. The following sections provide a summary of the observations and recommendations relating to the fuel storage site bypass road. The Itivia site and bypass road were constructed in 2017 and 2018.

10.1 Visual Observations

10.1.1 Fuel Storage and Laydown Area

The inspection involved walking along the crests and toes of the containment berms and examining the condition of the pad slopes for visual signs of deformation and instability, cracking, uneven surfaces or seepage. A selection of the photos taken during the site visit are provided in Appendix D (Photographs 1 through 11).

The laydown pad areas had been constructed with rockfill and crushed aggregate materials and the slopes appeared to range from about 2 to 3 horizontal to 1 vertical (Photographs 3 through 6, Appendix D). There is a rock cut face between the fuel storage facility and the upper laydown area above at the northwest corner of the fuel storage facility (Photograph 7 and 8, Appendix D). There were no geotechnical concerns identified.

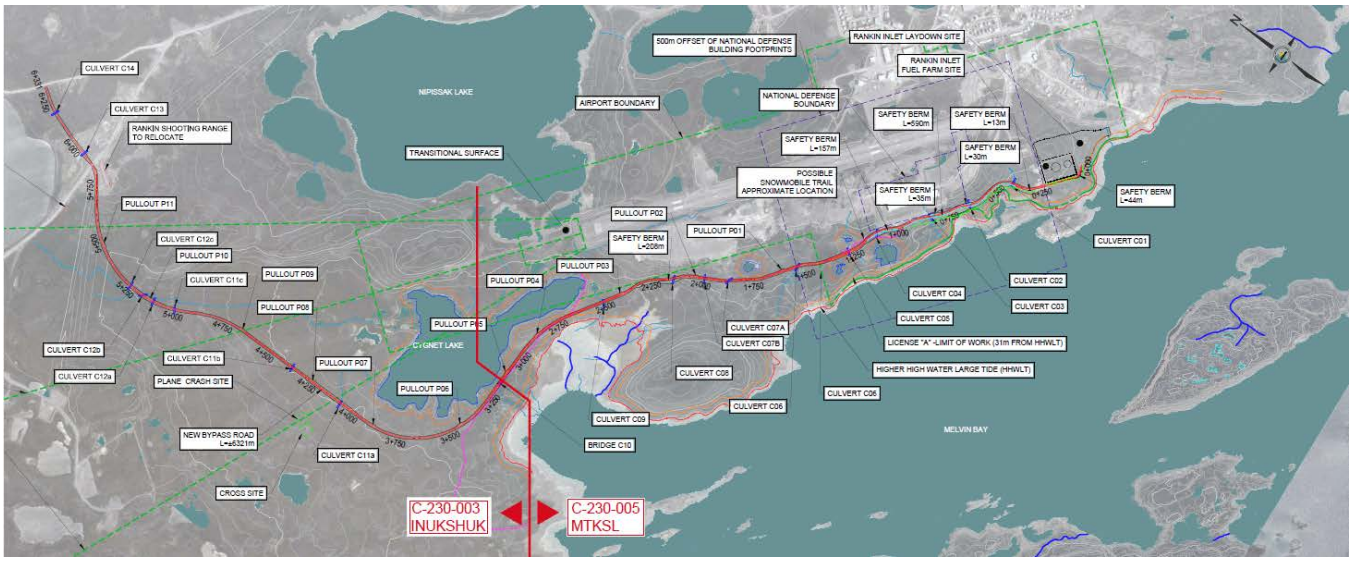
The fuel storage area has two tanks (20 million and 13.5 million litres) within a bermed secondary containment facility. The raised base and perimeter berms of the secondary containment were constructed out of rockfill with liner bedding and transition layers and an HDPE liner.

The perimeter berms for the secondary fuel containment were generally in good condition. The liner was exposed due to minor sloughing of the liner cover material in a few locations on the south containment berm (Photographs 9 and 10, Appendix D). There was a shallow pond of water over the base of the containment facility south of the tanks (Photograph 11, Appendix D). A pumper truck was working on removing this water, taking it back to the Project site for treatment, at the time of the site visit. The pad areas for the laydown were constructed with rockfill and crushed materials and the slopes were in good condition, no signs of erosion, cracking or instability.

Two 900 mm corrugated steel culverts are installed across the access road into the Itivia site (Photographs 1 and 2, Appendix D). Some damage was observed on the outlet ends of the culverts. There was some water ponding on the upstream side of the culverts and a small flow through the lower culvert. Crush material had been placed at the outlets of the culverts with straw logs and rip rap placed in a semi-circle around the outlets for water management. There were no geotechnical concerns identified.

10.1.2 Bypass Road

The Itivia bypass road is a 6.3 km gravel road that was constructed to divert traffic from the Itivia fuel storage and laydown area to the Project site around Rankin Inlet (Figure 6). The road is designed to be 6.5 m wide for most of its length with pull outs to allow two-way traffic. Two sections are designed to be 8 m to allow two-way traffic without pullouts. A total of 19 culvert crossings were constructed along the length of the road. The road was constructed in 2017 and 2018 and was completed during the week of the 2018 inspection. The eastern portion of the road was constructed using blast rock from the Itivia Quarry, but the majority of the road was constructed using esker materials.



Source: Tetra Tech 2017e.
Figure 6: Itivia Bypass Road Alignment

The inspection of the Itivia Bypass Road was completed 14 September 2018 beginning at the Rankin Inlet Fuel Farm and advancing up station along the road alignment to the intersection with the AWAR. The inspection involved driving along the road and examining the condition of each of the culverts as well as examining the road surface and slopes for visual signs of erosion, deformation, instability, or cracking. Observations of ponded water were also noted. At the time of the inspection construction was generally complete. Construction activities observed during the inspection were limited to compaction of the road surfacing materials with a smooth drum vibratory roller.

The southeast corner of the Itivia fuel storage facility was marked as kilometre 0 and approximate culvert locations along the road were measured using the truck odometer. Some culvert locations measured during the inspection do not correlate with the design stationing in the construction drawings. At the time of compiling this inspection report, an as-built report was being prepared by AEM and had not yet been issued for the Itivia Bypass Road. Some of the culvert locations may have been adjusted during construction and AEM indicated that Culvert 08 was not installed based on topography in the area where it was planned. All culverts were inspected and generally appear to have been installed per the configurations detailed in the design report documents (Tetra Tech 2017a, d and e). Time was limited to complete the inspection, so dimensions of the culverts could not be confirmed in the field and are reported based on the design report documentation.

The as-built report should confirm culvert sizes and locations, confirm that safety berms have been constructed where required based on road fill height, and confirm that road slopes have been constructed to the design.

In general, the road was in very good condition as construction had just been completed. There were no signs of cracking or settlement. The majority of the road was constructed using esker materials which may be susceptible to erosion and some sections of the road appeared to have relatively steep embankment slopes in consideration of the materials used for construction. Some sections of the road were high enough that they required safety berms, which were constructed using large boulders along the eastern section and with esker materials along the remainder of the road. As per the design layout, the lower culverts were installed below grade. Riprap was placed at the inlet and outlets of culverts, per the design, with the exception of C7b, which is missing riprap at the outlet. AEM indicated that placement of this riprap is planned for 2019. The culverts should be monitored for potential erosion of rip rap materials placed upstream into the culverts.

Table 8 presents a summary of the culvert inspections completed.

Table 8: Itivia Bypass Road Culvert Inspection Summary

Approximate Distance from SE corner of Fuel Farm [(a)]	Culvert Design Identification	Water Management Structure Description	Observations	Photographs (Appendix D2)
0.35 km	C01	2 x 1,000 CSP culverts	Design configuration A. No water flowing through culverts. Potential for erosion of riprap placed upstream into the lower culvert. Road constructed out of blast rock. Large boulders placed on south crest of road as safety berm. Recommendation: Monitor for erosion of riprap into lower culvert.	12
0.6 km	C02	2 x 700 mm CSP culverts	Design configuration A. No water flowing through culverts. Some large boulders partially blocking the outlet of the lower culvert. Some larger rocks above the culverts that may be locally over steepened and have the potential to fall and damage or block the culverts. Road constructed out of blast rock. Large boulders placed on south crest of road as safety berm. Recommendation: Remove riprap that is partially blocking lower culvert.	13
0.8 km	C03	2 x 1,000 mm 1 x 700 mm	Design configuration B. No water flowing through culverts. Channel erosion in tundra observed upstream of culverts. Road constructed out of blast rock. Large boulders placed on south crest of road as safety berm. Recommendation: Monitor erosion channel upstream of culverts. Not expected to be an issue, but if erosion continues, consider armouring the channel.	14 to 16
1.0 km	C04	2 x 1,000 mm	Design configuration A. Some cobbles observed in front of the lower culvert inlet that may erode into the culvert. Road constructed out of blast rock. Large boulders placed on south crest of road as safety berm. Recommendation: Remove riprap that is in front of the lower culvert.	17 and 18
1.2 km	C05	2 x 1,000 mm	Design configuration D. No water flowing through culverts, inlets and outlets armoured with smaller material than culverts C01 to C04. Some rockfill in front of inlets could erode into the culverts. Road and safety berm on south crest of road constructed out of esker materials. Recommendation: Remove riprap from in front of culvert inverts. Monitor erosion of safety berm.	19 and 20
1.5 km	C06	2 x 800 mm	Design configuration D. Culvert inlets installed above surrounding natural ground. Ponded water against toe of road north of the culvert inlets, a small berm has been constructed between the ponded water and the culvert inlet location. No water flowing through the culverts. Some rockfill in front of inlets could erode into the culverts. Road constructed out of esker materials. Recommendations: Remove riprap from in front of culvert invert. Monitor ponding of water, consider ditching to drain water to culvert inlets or add additional culvert where water is ponding.	21 to 23
1.6 km	C06-1	1 x 800 mm	AEM indicated this was an additional culvert installed based on the conditions observed in the field. Road constructed out of esker materials.	24 and 25
1.8 km	C07a	2 x 800 mm	Design configuration D. Ponded water observed at the inlets around the culverts and against the toe of the road embankment. Small flow through the east culvert. Culvert inlets installed over rockfill base raised above surrounding natural ground. Road constructed out of esker materials. Recommendation: Monitor ponding of water upstream of inlets and consider lowering culverts to reduce ponding.	26 and 27
1.9 km	C07b	2 x 1,000 mm	Design configuration D. No water flowing through the culverts, inlets and outlets are clear. Road constructed out of esker materials. Safety berm constructed on south crest of road. No armouring placed at outlet. Recommendation: Monitor potential erosion of safety berm. Place riprap to armour outlet.	28 and 29
2.4 km	C09	2 x 1,000 mm	Construction drawings identify C09 to be design configuration A. Culverts observed at this location are in design configuration D. No water flowing through culverts. Ponded water observed around the inlets and against the toe of the road embankment to the south. Road constructed out of esker material. Recommendation: Monitor ponding upstream of inlets and consider adding or relocating culvert(s) to reduce ponding.	30 and 31
3.1 km	C10	5 x 1,200 mm 1 x 1,000	Design configuration per Tetra Tech 2017d. Some damage to culvert inlets and deformation under road observed. Some water flow observed flowing into embedded culvert. Ponded water observed along the toe of the road embankment to the north of the culvert inlets. Road constructed out of esker material. Recommendation: Repair damaged culvert inlets and remove riprap that is partially blocking inlets.	32 to 34

Approximate Distance from SE corner of Fuel Farm [(a)]	Culvert Design Identification	Water Management Structure Description	Observations	Photographs (Appendix D2)
4.0 km	C11a	2 x 1,200 mm	Design configuration D. Culverts are constructed over riprap and inverts are raised above surrounding tundra. Some flow observed through both culverts. Shallow ponding of water over tundra upstream of the inlets and against the toe of the road embankment. Water mark visible along toe of road embankment. Road constructed out of esker material. Recommendation: Monitor ponding upstream of inlets and adjacent to road to determine if water should be ditched to inlets of culverts or if additional culverts required.	35 and 36
4.3 km	C11b	2 x 1,000 mm	Design configuration D. Culverts are constructed over riprap and inverts are raised above surrounding tundra. Some flow through the north culvert. Water ponded over tundra on both sides of culverts. Shallow ponded water at about KM 4.6 with channel running along toe of road embankment back to culvert C11b. Road constructed out of esker material. Recommendation: Monitor water ponding near KM 4.6 and flow along toe of road to determine if additional culvert required.	37 and 38
4.8 km	C11b-1	1 x 1,000 mm	AEM indicated this was an additional culvert installed based on the conditions observed in the field. Culvert is constructed over riprap and invert is raised above surrounding tundra. Small natural drainage path observed upstream and downstream of culvert. Water observed within drainage downstream of outlets. Small amount of water ponded in culvert, but no flow. Shallow ponded water at the toe of the road embankment to the south of the culvert. Road constructed out of esker material.	39 and 40
4.9 km	C11c	2 x 1,200 mm	Design configuration D. Culverts are constructed over riprap and inverts are raised above surrounding tundra. No flow through culverts. Shallow ponded water observed upstream and downstream of the culverts. Road constructed out of esker materials.	41 and 42
5.0 km	C12a	2 x 1,200 mm	Design configuration D. Culverts are constructed over riprap and inverts are raised above surrounding tundra. Ponded water observed over tundra upstream and downstream of the culverts. No flow through culverts. Road embankment looks steeper on east side compared to west side. Road constructed out of esker materials. Recommendation: Confirm road embankment slopes from as-built survey.	43 and 44
5.1 km	C12b	2 x 1,000 mm	Design configuration D. Culverts are constructed over riprap and inverts are raised above surrounding tundra. Water ponded upstream and downstream of the culverts and along the toe of the embankment. Road constructed out of esker materials. Recommendation: Monitor ponding upstream of culverts and adjacent to road and the condition of the road to determine if mitigation is required. Ditching or placement of fill material along the toe of the road to promote flow to the inlets of culverts, culverts could be lowered, or additional culverts could be added.	45 and 46
6.2 km	C13	2 x 800 mm	Design configuration D. Culverts are constructed over riprap and inverts are raised above surrounding tundra. Relatively large pond of water upstream and downstream of the culverts; road constructed through natural pond. Road constructed out of esker materials. Recommendation: Monitor ponding upstream and downstream of culverts and road condition to determine if mitigation required. Culverts could be lowered and/or material could be placed along toe of road to keep water away from road foundation.	47 and 48
6.3 km	C14	3 x 800 mm	Design configuration D. Culverts are constructed over riprap and inverts are raised above surrounding tundra. Water ponded upstream and downstream of the culverts. Road constructed out of esker materials. Recommendation: Monitor ponding upstream and downstream of culverts and road condition to determine if mitigation required. Culverts could be lowered and/or material could be placed along toe of road to keep water away from road foundation.	49 and 50

Notes: Dimensions, names, and alignment stations presented in the table are taken from the Tetra Tech design report and associated construction drawings, including amendments (Tetra Tech 2017a, d, and e).

1 ×__ mm = the number of culverts × the diameter of the culvert.

(a) Distances measured with truck odometer.

CSP = corrugated steel pipe; AWAR = all-weather access road.

10.2 Recommendations

The following are recommendations for the Itivia fuel storage area and by-pass road:

- The damaged outlets of the culverts through the entrance to the Itivia fuel storage area should be fixed.
- Cover material should be re-established over the liner that has been exposed on the south containment berm of the Itivia fuel storage facility to protect the liner.
- The locations and layouts of some of the culverts through the Itivia by-pass road do not correlate with the design drawings (Tetra Tech 2017e) and Figure 6. The discrepancy is due to modifications to the locations and layouts during construction based on site observations and conditions. The culvert locations should be referenced to the as-built report and drawings during the 2019 annual geotechnical inspection.
- The as-built report should confirm culvert sizes, locations, and invert elevations have been constructed to the design. The as-built report should also confirm that safety berms have been constructed where required based on road fill height and confirm that road slopes have been constructed to the design.
- The section of the road that is constructed with esker material may be susceptible to erosion. This should be monitored and maintenance completed as required. Coarser material can be placed for erosion protection if erosion occurs in some areas.

11.0 SUMMARY AND RECOMMENDATIONS

The results of the 2018 annual geotechnical inspection carried out at the Project site, along the AWAR, at the Itivia site, and along the Itivia by-pass road indicate that the infrastructure was generally in good condition and performing as designed.

The following presents a summary of the recommendations from the 2018 geotechnical inspection for the infrastructure in each of the areas inspected. The recommendations have been grouped based on the type of recommendation and have also been given a rating of High (L), Medium (M), or Low (L) priority.

The following recommendations are related to surveillance and monitoring:

The recommendations for surveillance and monitoring don't currently require a maintenance action but may warrant future maintenance if conditions worsen.

Main Site

- Geotechnical inspections should be carried out and documented for D-CP1 and D-CP5 following the schedule developed in the OMS manual. In addition, instrumentation should be monitored, and the data should be plotted and reviewed, following the schedule developed in the OMS manual. These activities were completed by AEM in 2018; however, not quite to the schedule in the OMS. The OMS manual indicates that daily inspections should be completed and documented using the same form as the weekly inspection, which were not completed in 2018. The OMS manual does not indicate if there is seasonal variability to the frequency of documented inspections. It may be acceptable to seasonally vary the frequency of inspections, but this should be reviewed with the Engineer of Record (EoR) for the dikes and the OMS manual should be updated, as required. The OMS manual should be reviewed and updated annually and is next due for review in June 2019. (H)
- If the P-Area dikes will continue to be used, they should be added to the OMS manual that was developed for D-CP1 and D-CP5. Geotechnical inspections and instrumentation monitoring should be carried out and documented following the schedule developed in the OMS manual. (H)
- Implement a road and culvert monitoring program for site roads, as is done for the AWAR, which is tied to a maintenance program. (M)
- Conduct inspections along Itivia by-pass road, as per the Road Management Plan (AEM 2015b), now that the road is complete. (M)
- Monitor the cracking adjacent to Channel 5. If cracking gets worse, recontouring and/or compacting the areas of cracking to close the cracks will reduce the potential for water to infiltrate into the cracks leading to warming of the permafrost and additional thaw settlement and cracking. (M)
- Monitor the cracking observed in the D-CP1 downstream sump berms and adjacent to the downstream collection channel. Recontouring and/or compacting the areas of cracking to close the cracks will reduce the potential for water to infiltrate into the cracks leading to warming of the permafrost and additional thaw settlement and cracking. (M)

- Ponding upstream of Berm 3 should be monitored to determine how much and how often ponding occurs and if Berm 3 can perform as required with the ponding. (M)
- The Berm 3 cover materials may be susceptible to erosion. This should be monitored, and if there is erosion, consideration should be given to placing coarser material on Berm 3 to reduce the potential for erosion. (M)

Exploration Site

- The cracks in fuel storage pad should be monitored; however, they are not considered to be a geotechnical concern. (L)

All-weather Access Road

- Continue to monitor culverts and hydraulic effectiveness to assess if current culverts provide adequate capacity and if any changes are required. Evaluate if any culverts need to be installed at a lower elevation to reduce ponding, and downstream erosion. (M)
- Monitor areas that have ponding, but no culverts and consider installing culverts to manage water. (M)
- Conduct inspections and document observations and recommendations as laid out in the Road Management Plan (AEM 2015b). Road inspections were completed and documented in 2018, but documentation indicates that the frequency of the inspections did not quite meet what is laid out in the Road Management Plan. (H)

Itivia Site and By-pass Road

- The locations of some of the culverts through the Itivia by-pass road do not correlate with the design drawings (Tetra Tech 2017e) due to changes made during construction. The culvert locations should be referenced to the as-built report and drawings during the 2019 annual geotechnical inspection. (M)
- The as-built report should confirm culvert sizes, locations, and invert elevations have been constructed to the design. The as-built report should also confirm that safety berms have been constructed where required based on road fill height and confirm that road slopes have been constructed to the design. (M)
- The section of the road and safety berm that is constructed with esker material may be susceptible to erosion. This should be monitored and maintenance completed as required. (L)
- Ponding of water along the road should be monitored and if it is impacting the condition of the road, mitigation measures should be implemented, such as, lowering the culverts or ditching or placing fill to direct water to the culvert inlets. (M)

The following recommendations are related to operational procedures:

Main Site

- Water volumes within containment ponds should be managed to the levels defined in the OMS manual, including maintaining the water level below the elevation defined for the end of October in the OMS manual over the winter to promote freezing of the dikes. (H)
- The D-CP1 sump and downstream collection channel should be emptied in the fall/early winter to refreeze the ground around these facilities. During the open water season, keeping the water level in the downstream channel and sump low will reduce the potential for thaw of the ground around the channel and sump and associated settlement. (M)
- Consider adding data loggers to thermistors for easier collection of data, especially in the winter when access may be more limited. (L)
- Where possible, try not to allow seepage water from DP3-A to pond against the Saline Pond berm to avoid permafrost degradation. (M)
- Monitor slopes above Portal No. 2 for rockfill instability during backfill placement. (H)
- Snow management around Portal No. 1 and 2 may be advisable prior to freshet to reduce inflows to the underground. (L)

Exploration Site

- Minimize the amount of water contained within the exploration landfarm until it is decommissioned and remediated. (M)

The following recommendations relate to maintenance or repairs that are required:

Main Site

- Cracks and areas of settlement in the containment pond dikes should be filled and/or recontoured to close the cracks and reduce the potential for infiltration and erosion. (M)
- Ponding of water adjacent to roads should be avoided. Disturbed areas from road construction should be recontoured to promote drainage away from the road and consideration should be given to installing culverts if ponding occurs in naturally low areas. This was most notable along the Emulsion Plant and Wesmeg Borrow access roads. (M)
- If the Wesmeg Borrow access road is blocking drainage near Lake B33A that is leading to ponding adjacent to the road, a culvert should be installed to allow drainage so that there isn’t permafrost degradation and settlement. (M)
- Consider adding a crushed surface material to the Emulsion Plant and storage area pads if trafficability continues to be an issue. (M)
- Survey monitoring plate M-3 on D-CP5 should be replaced. (M)

- Where erosion is occurring on slopes of pads, the existing materials should be regraded and compacted, and a coarser material should be placed to further reduce erosion potential. Higher priority should be given to areas where erosion is encroaching on sea containers or other facilities placed close to the slope. The most significant pad erosion was observed at the north side of the main camp/industrial pad and the Emulsion Plant pad. (M)
- The cracking and sloughing along Channel 1 should be assessed to determine if the channel is too steep and riprap is sloughing over geotextile or if it is caused by thermal degradation of permafrost adjacent to the channel. If possible, the channel should be kept empty through the winter to promote freezing of the permafrost around the channel. (M)
- Where access is feasible, removal of snow from the water collection pond dikes (temporary and permanent) is recommended to reduce the insulating effects of the snow, thereby allowing the temperature of the core material in the dikes and the foundations to drop as low as possible. Snow removal is more important if thermistor data is indicating that the dike and/or foundation temperatures are warmer than expected. (M)
- Make sure thermistors in the water management dikes are well marked so they can be located and maintained during the winter and are not damaged during snow removal operations. (H)
- The slopes of the Operation Landfill should be monitored, particularly the northeast corner where water was observed to be ponding downstream and there was some possible sloughing on the slope. Regrading and compacting the slope in this area will reduce the potential for erosion. (M)
- Consider adding rockfill material to cover the till berm in P1, to protect the till and maintain its integrity if this berm is required for water management. (L)
- The Wesmeg Borrow Area should be recontoured and either capped with a coarser material or revegetated to reduce erosion. (M)
- A coarser rockfill layer should be placed over the decommissioned exploration landfill to reduce erosion and cracking. (M)
- Snow management around and above Portal No. 1 and 2 may be advisable, especially prior to freshet, to reduce the potential for larger surface water inflows entering the underground. (L)

Exploration Camp Site

- Repair surface erosion along south slope of exploration camp pad. Grade surface to reduce channelization of surface water flows and therefore reduce the potential for the erosion to reoccur. In this area, a coarser surfacing layer could be placed to help reduce the potential for future erosion. (L)
- The exploration camp access road should be regraded and consideration given to placing some coarser rockfill on the slopes where there is erosion. (M)
- The culverts through the exploration camp access road should be cleared of material. Large boulders should be removed from above culverts to prevent potential damage to the culverts and appropriately sized riprap should be added to the road fills around he culverts for erosion protection where there isn't any. (M)

- The diffuser access road could be regraded to close up the cracks and reduce the potential for future cracking. (L)

All-weather Access Road

- The kilometre markings on the AWAR culverts should be checked and replaced with accurate numbers. At the time of the 2018 site visit, AEM indicated that new markers had been ordered, but had not arrived. (M)
- Specific recommendations for the AWAR culverts and bridges are summarized in Table 9.

Itivia Site and By-pass Road

- Cover material should be re-established over the liner that has been exposed on the south containment berm of the Itivia fuel storage facility to protect the liner. (M)
- The culverts should be cleared of all materials prior to freshet. (H)

The following recommendations relate to future construction:

- Road and pad materials should be compacted to reduce the potential of the material being eroded, and if necessary a coarser, well graded, cover material should be placed to further reduce erosion potential.
- When culverts are installed, ensure bedding material surrounding culverts is of a suitable gradation (e.g., sandy) and compacted. Large boulders should not be placed in direct contact with the culverts within the road fills; however, the slopes of the road around the outlets of the culverts should be armoured with appropriately sized material (e.g., cobbles) to reduce erosion.

Table 9: Recommendations for All-Weather Access Road

Station (distance from Friendship Centre in Rankin Inlet)	Water Management Structure Description	Recommendations
KM 6.0	Char River Bridge	Monitor for potential erosion of sand and gravel on left abutment downstream to determine if armouring should be added. No substantial erosion noted to date.
KM 6.2	3 CSP cuverts: 2 × 1,300 mm 1 × 700 mm	Monitor erosion between culverts to determine if armouring should be added.
KM 7.0	3 CSP culverts: 2 × 1000 mm 1 × 700 mm	Potential for erosion of sandy soil around culverts. Monitor to determine if armouring should be added.
KM 7.4	3 CSP culverts: 1 × 900 mm 1 × 700 mm 1 × 1000 mm	Erosion potential due to sandy soils around 700 mm culvert. Consider extending and adding armouring.
KM 8.0	Meliadine River Bridge	Right abutment, downstream slope has exposed esker sand and gravel. Monitor to determine if armouring should be added.
KM 10.5	M-5 Bridge	Potential small erosion/settlement of rock embankment on the bridge's right abutment identified during 2016 inspection shows no signs of change. Continue to monitor. Exposed geotextile at base of downstream end of left abutment that could be due to erosion, so should be monitored.
KM 12.6	no culverts	Area of poor drainage. Flow along road edge, suspect seepage under the road. Some erosion along toe of road. Monitor and consider installing a culvert to manage water and/or rockfill to protect road.
KM 16.3	3 CSP culverts: 1 × 1,300 mm 1 × 700 mm 1 × 1,000 mm	Outlets are all elevated increasing erosion potential. Monitor to assess if hydraulic capacity is adequate and if erosion is an issue. Consider installing culverts at lower elevations to improve water management.
KM 18.1	2 CSP culverts: 1 × 900 mm, 1 × 1,000 mm	Consider adding cover over upper culvert on upstream side. Upper culvert outlet is high, therefore water has to pond close to road surface for culvert to pass flows. Elevation of culvert leads to potential for erosion during high flow periods. Assess if hydraulic capacity is adequate.
KM 18.15	1 × 600 mm CSP culvert	Invert and outlet are both elevated, increasing erosion potential. Some erosion of road slope and toe visible. Assess if hydraulic capacity is adequate. If water management challenges observed, consider installing an additional culvert at this location, at a lower elevation.
KM 19.5 (approx.)	No culverts	Ponding on west side of road and AEM reports water flowing over the road at KM 19. Consider installation of a culvert at this area.
KM 21.5	No culverts	AEM reported that water flowed over road at this location during freshet. Consider adding a culvert to manage water.
KM 21.7	2 × 160 mm steel pipes, used as culverts	High water level evident near road surface. AEM indicate road was excavated to release flow. Consider marking pipe location and cleaning out, prior to freshet. Monitor for signs of erosion and adequacy of hydraulic capacity. Add additional culvert in this area if required.
KM 22.7	No culverts	Water ponded on the east side of the road, signs of wet ground observed on west side of road indicating possible seepage under the road. Consider installing a culvert.
KM 25.8	1 × 600 mm HDPE corrugated culvert	Culvert is partially blocked by road fill. Sandy soil around inlet and outlet and some sediment erosion. AEM inspection reports noted ponding of water at or over the road in this area during the freshet. Clean out culvert. Consider adding additional culverts if water management continues to be an issue during freshet. Also consider adding armour around culvert and on road slopes.
KM 26.2	2 × 160 mm steel pipes, used as culverts	Lower pipe bent upwards and should be replaced. Some sediment deposition downstream is evident. Water ponded along road below upstream inverts of pipes. AEM inspection reports noted ponding of water at or over the road in this area during the freshet. Lower pipe should be replaced. Consider adding additional or larger culverts if water management continues to be an issue during freshet.
KM 26.8	3 × 700 mm CSP culverts	Clear inlet of lower culvert of road fill material and extend.
KM 28.7	Seepage	Ponded water on east side of road. AEM notes that water ponds against road for most of open water season and road surface often is moist, indicating signs of seepage through road. Consider installation of a culvert.
KM 29.6	1 × 500 mm HDPE corrugated culvert	Clear culvert of road fil material.

1 ×__ mm = the number of culverts × the diameter of the culvert.

CSP = corrugated steel pipe.

12.0 CLOSURE

The reader is referred to the Study Limitations section, which precedes the text and forms an integral part of this report.

This report was prepared to summarize the findings of the 2018 geotechnical inspection conducted between 10 and 14 September 2018, to comply with the requirements of AEM's Type A Water Licence No. 2AM-MEL1631, Part I, Item 14 (page 21) and Schedule I, Item 1 (page 39).

We trust the information provided within is sufficient for your current needs. Should you require additional information or further clarification, please contact us.

Signature Page

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PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature
Date 20 feb 2019
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

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APPENDIX A

Mine Site Inspection Photographs

APPENDIX A-1

P-Area Ponds



Photograph 1: Overview of P-Area, Google Earth Image (August 2017)



Photograph 2: DP1-A, Looking Northeast from the Road (12 September 2018)



Photograph 3: DP1-A, North Slope Looking Southwest, Minor Slumping that was not observed during 2017 inspection (12 September 2018)



Photograph 4: DP1-A, Cracking Observed on Crest, Similar Condition to 2017 (12 September 2018)



Photograph 5: DP1-A, South Slope, Looking Southwest (12 September 2018)



Photograph 6: Pond 1 from DP1-B, Looking Southeast (12 September 2018)



Photograph 7: Snow Melt Management Pond, Looking South (12 September 2018)



Photograph 8: Snow Melt Management Pond, East Berm Downstream Slope, Looking North (12 September 2018)



Photograph 9: Snow Melt Management Pond, South Berm, Looking West (12 September 2018)



Photograph 10: DP1-B, Upstream Slope from Jetty 2 Looking East toward Snow Melt Management Pond, Minor Erosion on Slope (12 September 2018)



Photograph 11: DP1-B, Downstream Slope, Looking East. Orange Delineator on Crest Marks Thermistor Location (12 September 2018)



Photograph 12: DP1-B, Cracking on Crest of Jetty 2 has Increased Slightly from 2017. No cracking observed at Jetty 3 or Jetty 4 during inspection (12 September 2018)



Photograph 13: DP1-B, Downstream Slope near Station 0+300, Looking West. Minor Seepage from Downstream Toe, Similar to 2017, Entering Collection Channel to Right of Photograph (12 September 2018)



Photograph 14: DP1-B, Run-off and Seepage Collection Channel Downstream of Dike, Looking East. Seepage in Channel was Clear and at a Similar Level to 2017 (12 September 2018)



Photograph 15: DP1-B, Clear Seepage Visible from Dike Toe near Station 0+190. Less Seepage at This Location than in 2017 (12 September 2018)



Photograph 16: DP1-B, Downstream Channel and Sump near Station 0+120, Looking East. Slightly Lower Water Level at Sump Location than in 2017 (12 September 2018)



Photograph 17: DP1-B, Upstream Slope near Station 0+330, looking South. Evaporator #4 Jetty and Pump Barge in Background (12 September 2018)



Photograph 18: DP1-B, Upstream Slope looking West near Station 0+320. Evaporator #2 Jetty in Background (12 September 2018)



Photograph 19: DP1-B, Crest looking Northwest near Station 0+320 (12 September 2018)



Photograph 20: DP1-B, Evaporator #4 Jetty and Pump Barge Looking West (12 September 2018)



Photograph 21: Overview of P1 and Evaporator #4 Jetty and Pump Barge looking West from Near Station 0+400 of DP1-B. Evaporator #1 in Operation (12 September 2018)



Photograph 22: P1 Till Dividing Berm, Looking West (12 September 2018)



Photograph 23: DP2-A, West End of Dike, Looking East (12 September 2018)



Photograph 24: DP2-A, Upstream Slope near Station 0+025, Looking East (12 September 2018)



Photograph 25: DP2-A, Downstream Slope near Station 0+70, Looking East. Mine Access Road runs along Downstream Toe of Dike (12 September 2018)



Photograph 26: DP2-A, Upstream Slope near Station 0+65, Signs of Minor Slumping at Crest, Looking West. Signs of Slumping at Crest were not Observed in 2017 (12 September 2018)



Photograph 27: DP2-A, Cracking near Station 0+100, looking West. (12 September 2018)



Photograph 28: DP2-A, Cracking near Station 0+100, looking East. The Length of the Cracking in This Area of the Dike was Similar to 2017, but the Cracks were Wider and Deeper (12 September 2018)



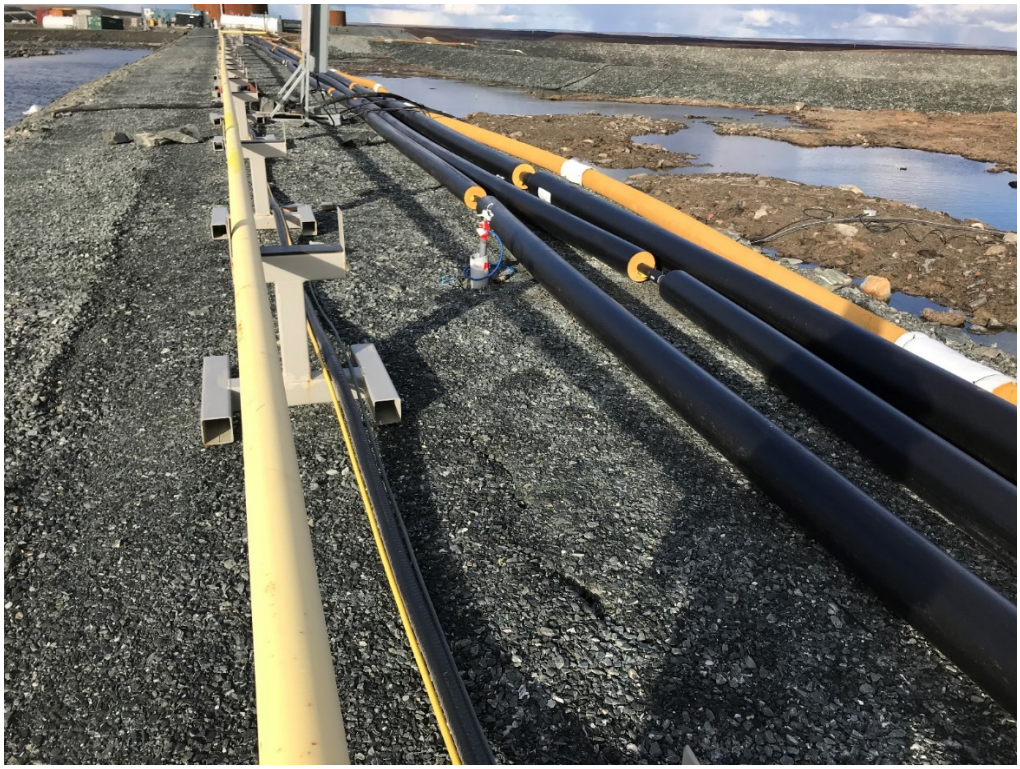
Photograph 29: DP2-A, Upstream Side Looking West from Near Station 0+110 (12 September 2018)



Photograph 30: DP3-A, Downstream Slope and Seepage Collection Channel, Looking Southwest near Station 0+300. More Water Ponded Downstream than in 2017 (12 September 2018)



Photograph 31: DP3-A, Upstream Slope and Pond 3, Looking Southwest near Station 0+300 (12 September 2018)



Photograph 32: DP3-A, Cracking on the Crest near Station 0+150, Looking Southwest. Cracking was Slightly Wider and Deeper than in 2017 (12 September 2018)



Photograph 33: DP3-A, Cracking on the Upstream Slope near Station 0+150 that was not Observed in 2017 (12 September 2018)



Photograph 34: DP3-A, Upstream Slope and Crest Looking Northeast near Station 0+150 (12 September 2018)



Photograph 35: View Northeast of the Saline Pond from near Station 0+150 of DP3-A. Clear Seepage Water Ponded in Downstream Collection Channel and Along Dike Toe. More Ponded Water than in 2017 (12 September 2018)



Photograph 36: DP3-A Downstream Slope and Seepage Collection Channel, looking Northeast near Station 0+40. More Ponded Water Downstream than in 2017 (12 September 2018)



Photograph 37: DP3-A, Looking Northeast at Pond 3 from near Station 0+000 (12 September 2018)

APPENDIX A-2

Permanent Water Management Facilities



Photograph 1: D-CP1, Overview of D-CP1, Google Earth Image (20 August 2017)



Photograph 2: D-CP1, Water Pipeline Ramp Upstream of Dike Near Station 1+140, Looking South. Some Minor Erosion Observed that was not Observed in 2017 (12 September 2018)



Photograph 3: D-CP1, Upstream Slope Near Station 1+140, Looking Northeast (12 September 2018)



Photograph 4: D-CP1, Cracking on Upstream Bench Crest Near Station 1+150, Looking Northeast. Length of Cracking had Increased Slightly from 2017 Observations and Minor Increase in the Widths of the Cracks (12 September 2018)



Photograph 5: D-CP1, Upstream Slope near Station 1+230, Looking North (12 September 2018)



Photograph 6: D-CP1, Upstream Slope near Station 1+290, Looking South (12 September 2018)



Photograph 7: D-CP1, Upstream Slope and Crest Near Station 1+350, Looking North (12 September 2018)



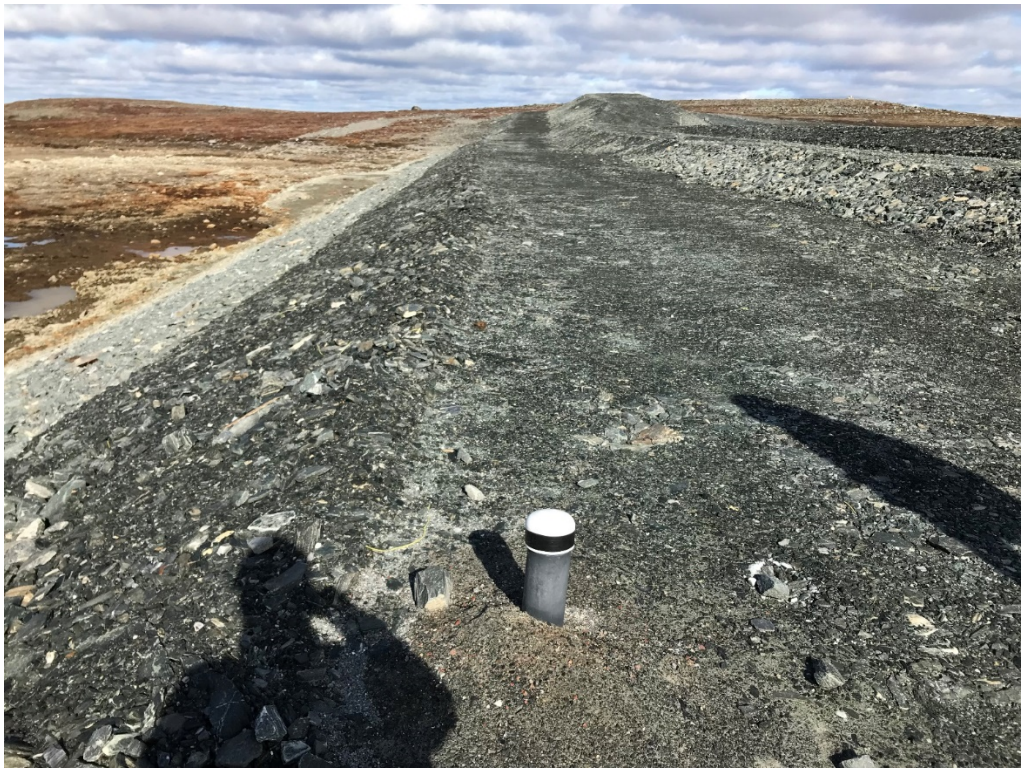
Photograph 8: D-CP1, Upstream Bench Crest Near Station 1+400, Looking North (12 September 2018)



Photograph 9: D-CP1, Cracking on Upstream Bench Crest Near Station 1+450, Looking North. Similar Condition to 2017 (12 September 2018)



Photograph 10: D-CP1, Upstream Slope Near Station 1+450, Looking South (12 September 2018)



Photograph 11: D-CP1, VGTC-03 on Upstream Bench, Station 1+460, Looking North (12 September 2018)



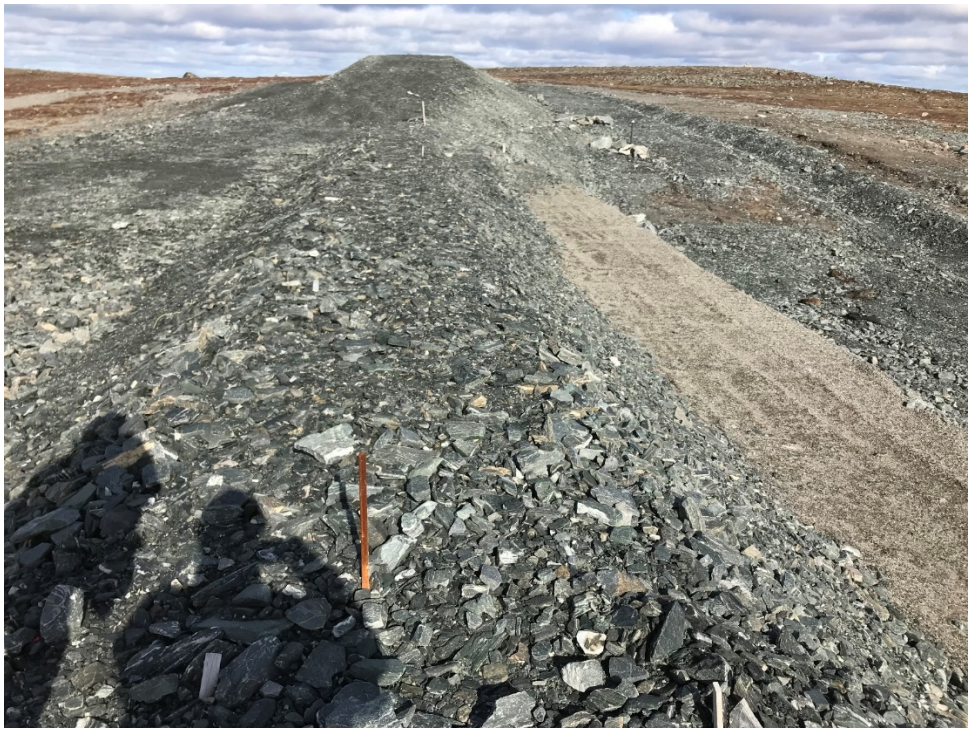
Photograph 12: D-CP1, Upstream Slope and Crest Near Station 1+540, Looking South (12 September 2018)



Photograph 13: D-CP1, Upstream Bench Crest Near Station 1+575, Looking South (12 September 2018)



Photograph 14: D-CP1, Crest Looking South Near Station 1+575, Looking South (12 September 2018)



Photograph 15: D-CP1, Crest Looking North Near Station 1+510 (12 September 2018)



Photograph 16: D-CP1, Crest Looking South Near Station 1+420 (12 September 2018)



Photograph 17: D-CP1, Downstream Slope and Crest Looking South Near Station 1+250 (12 September 2018)



Photograph 18: D-CP1, Crest Overview Looking Northeast Near Station 1+160 (12 September 2018)



Photograph 19: D-CP1, Cracking on Downstream Bench Near Station 1+145, Looking Northeast. Cracks are Wider and Deeper Than in 2017 (12 September 2018)



Photograph 20: D-CP1, Downstream Slope and Seepage Collection Channel Looking South, Near Station 1+550 (12 September 2018)



Photograph 21: D-CP1, Downstream Slope Looking Northwest, Near Station 1+250 (12 September 2018)



Photograph 22: D-CP1, Downstream Slope Looking Southwest, Near Station 1+210 (12 September 2018)



Photograph 23: D-CP1, Downstream Sump Looking Northeast Near Station 1+220 (12 September 2018)



Photograph 24: D-CP1, Downstream Sump Looking Southeast Near Station 1+240 (12 September 2018)



Photograph 25: D-CP1, Downstream Sump and Downstream Slope Looking South Near Station 1+240 (12 September 2018)



Photograph 26: D-CP1, Cracking/Slumping in North Side of Downstream Sump, Looking East. Similar Condition to 2017 (12 September 2018)



Photograph 27: CP1 Jetty 1, Southeast Slope Overview, Looking North (13 September 2018)



Photograph 28: CP1 Jetty 1, Northwest Slope, Looking Northeast (13 September 2018)



Photograph 29: Jetty 1, Southeast Slope, Looking Southwest (13 September 2018)



Photograph 30: General overview of D-CP5, Berm 3, Channel 5, and the Saline Pond, Google Earth Image (August 2017



Photograph 31: D-CP5, Upstream Bench at Southwest Abutment Looking Northeast Near Station 1+025 (12 September 2018)



Photograph 32: D-CP5, Upstream Slope, Looking South Near Station 1+170 (12 September 2018)



Photograph 33: D-CP5, Upstream Crest Looking Southwest Near Station 1+170 (12 September 2018)



Photograph 34: D-CP5, Cracking on Upstream Bench Looking Northeast Near Station 1+180. This Cracking was not Observed in 2017 (12 September 2018)



Photograph 35: D-CP5, Cracking on Upstream Bench Looking Northeast Near Station 1+185. This Cracking was not Observed in 2017 (12 September 2018)



Photograph 36: D-CP5, Upstream Crest Looking Southwest Near Station 1+250 (12 September 2018)



Photograph 37: D-CP5, Upstream Crest Looking Southwest Near Station 1+300 (12 September 2018)



Photograph 38: D-CP5, Downstream Slope and Crest Overview Looking Southwest Near Station 1+275 (12 September 2018)



Photograph 39: D-CP5, Crest Overview Looking Southwest Near Station 1+250 (12 September 2018)



Photograph 40: D-CP5, Downstream Bench Cracking looking Northeast Near Station 1+180. Similar Condition to 2017 (12 September 2018)



Photograph 41: D-CP5, Cracking in Downstream Slope Looking Southwest Near Station 1+175. This Cracking was not Observed in 2017 (12 September 2018)



Photograph 42: D-CP5, Downstream Slope and Pump Location Looking Northeast Near Station 1+170 (12 September 2018)



Photograph 43: CP5, Jetty 5 and Pumping Station. South Slope of Jetty, Looking West (12 September 2018)



Photograph 44: CP5, Jetty 5 Pipeline and Pumping Station. North Slope of Jetty, Looking West (12 September 2018)



Photograph 45: CP5, Jetty 5 Intake and Southwest Toe Looking Southeast (12 September 2018)



Photograph 46: Saline Pond, Looking Southeast (12 September 2018)



Photograph 46: Saline Pond, Cracking in Northwest Perimeter Berm Looking Southeast. Cracking and Slumping have Increased Slightly from 2017 (12 September 2018)



Photograph 47: Saline Pond, Southwest Perimeter Berm Looking Northwest, Cracking Along Downstream Crest. This Cracking was not Observed in 2017 (12 September 2018)



Photograph 48: Saline Pond, Southeast Perimeter Berm Cracking in Upstream Crest, Looking Northwest. This Cracking was not Observed in 2017 (12 September 2018)



Photograph 49: Saline Pond, Area of Possible Settlement Identified During 2017 Inspection, Near Toe of Northwest Perimeter Berm, Looking Southwest. No Visible Change from 2017 (12 September 2018)



Photograph 50: Saline Pond, Downstream Slope of the Northwest Perimeter Berm and Water Ponded Between Saline Pond and DP3-A (12 September 2018)



Photograph 51: Channel 1, Outlet of Channel at East End, Looking Northeast towards CP1 (13 September 2018)



Photograph 52: Channel 1, Small Slump and Crack along the South Slope Crest About 30 m West from Outlet of Channel (13 September 2018)



Photograph 53: Channel 1, Looking Upstream Northwest Towards Culvert 16 (13 September 2018)



Photograph 54: Channel 1, Outlets of Culvert 16 Looking Southwest (13 September 2018)



Photograph 55: Channel 1, Inlets of Culvert 16 and Pond Area H12. Construction Was Not Complete in This Area at the Time of the Site Visit (13 September 2018)



Photograph 56: Channel 1, Inlets of Culvert 16, Looking Northeast (13 September 2018)



Photograph 57: Channel 2, Unlined Extension of East End of Channel 2, Looking Northwest (11 September 2018)



Photograph 58: Channel 2, Start of Lined Channel at East End, Looking Northwest (11 September 2018)



Photograph 59: Channel 2, Eastern End, Looking Northwest (11 September 2018)



Photograph 60: Channel 2, Western Section, Looking East (11 September 2018)



Photograph 61: Channel 2, West End Near Outlet, Looking West. Some Water Ponded in Base of Channel (11 September 2018)



Photograph 62: Channel 2, Outlet of Channel at West End, Looking West (11 September 2018)



Photograph 63: Channel 3, Beginning of Alignment at Station 0+000 Looking Southwest (13 September 2018)



Photograph 64: Channel 3, Near Station 0+140 Looking West (13 September 2018)



Photograph 65: Channel 3, Extent of Completed Channel Looking East (13 September 2018)



Photograph 66: Channel 3, Alignment of Remaining Construction Looking West from the West end of the Completed Channel (13 September 2018)



Photograph 67: Channel 5, Looking Northeast from Near Station 0+250 (12 September 2018)



Photograph 68: Channel 5, Looking West from Near Station 0+250



Photograph 69: Channel 5, Looking West Near Station 0+220 (12 September 2018)



Photograph 70: Channel 5, Looking West Near Station 0+145. Less Water Ponded in this Area Compared to 2017 (12 September 2018)



Photograph 71: Channel 5, Water Ponded in Channel and Cracking Along South Slope of Trench Near Station 0+050, Looking Southwest. This Cracking was Not Observed in 2017 but Access to This Area was Limited due to Water Levels and Saturated Conditions in the Tundra (12 September 2018)



Photograph 72: Berm 3, Upstream Slope and Crest Near Abutment with D-CP5, Looking Northwest (12 September 2018)



Photograph 73: Berm 3, Downstream Slope and Crest Near Abutment with D-CP5, Looking Northwest (12 September 2018)



Photograph 74: Berm 3, Upstream Slope and Crest Near Station 0+060, Looking Southeast (12 September 2018)



Photograph 75: Berm 3, Downstream Slope and Crest Near Station 0+060, Looking Southeast (12 September 2018)



Photograph 76: Berm 3, Upstream Slope, Some Cracking Near Station 0+280, Looking North. This Cracking was Not Observed in 2017 (12 September 2018)



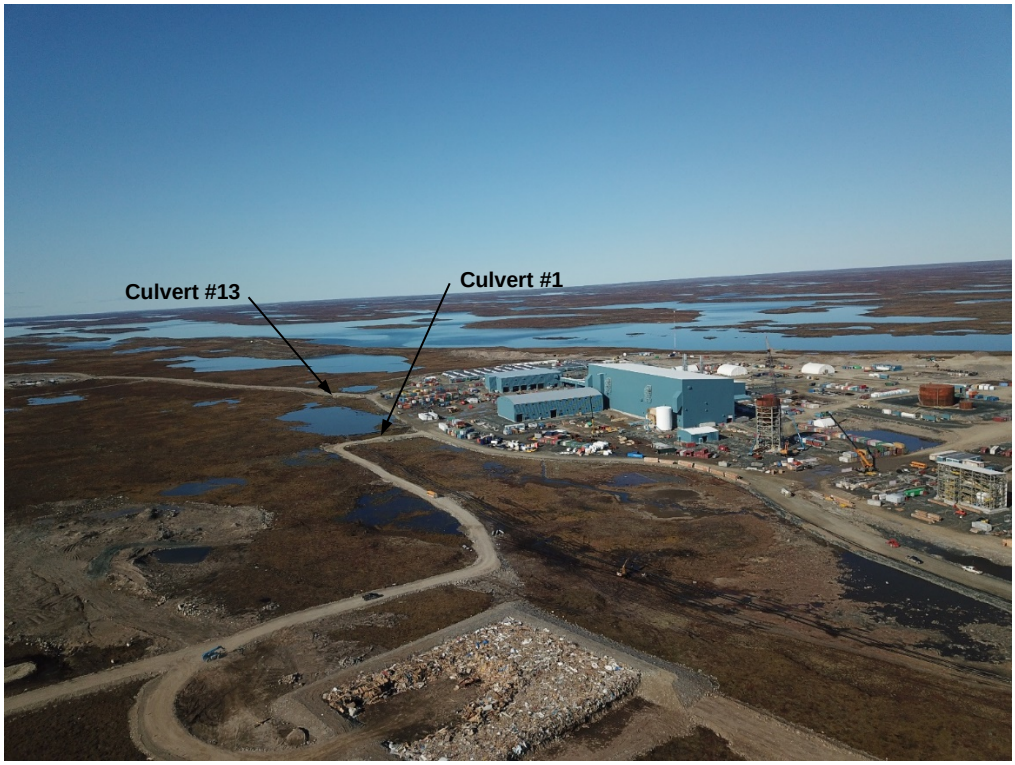
Photograph 77: Berm 3, Downstream Slope, Some Cracking Near Station 0+280, Looking North. Cracking was not Observed in 2017 (12 September 2018)



Photograph 78: Berm 3, Upstream Slope, Erosion at Toe and Along Slope from Previous High Water Mark, Near Station 0+230, Looking Northwest (12 September 2018)

APPENDIX A-3

Site Roads, Culverts, and Tiriganiaq and Wesmeg Areas



Photograph 1: Overview of Location of Culvert #1 (AEM Drone Photo 1 September 2018)



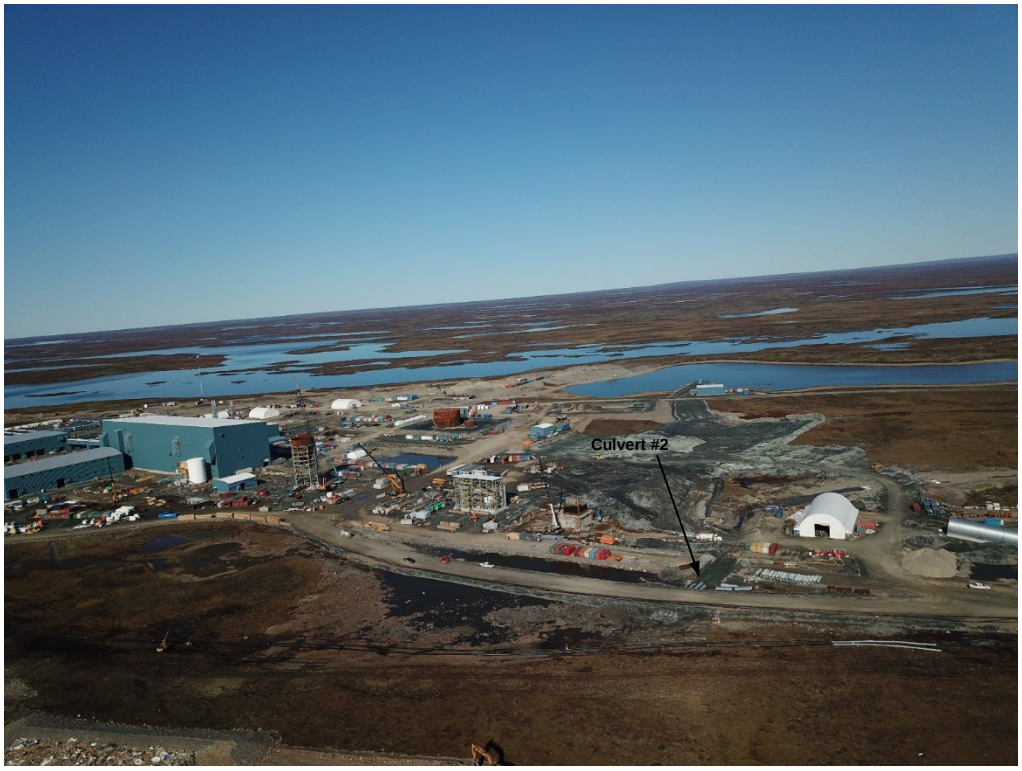
Photograph 2: Culvert #1, Upstream Ends of Culverts, Looking Northeast (11 September 2018)



Photograph 3: Culvert #1, Downstream Ends of Culverts, Looking Northeast (11 September 2018)



Photograph 4: Overview Showing Locations of Culverts #2, 3 and 4, Google Earth Image (August 2017)



Photograph 5: Areal Photo of Main Site, Service Road and Culvert #2 Shown in Foreground (AEM Drone Photo 1 September 2018)



Photograph 6: Culvert #2, Upstream Ends of Culverts, Looking Northeast (12 September 2018)



Photograph 7: Culvert #2, Downstream Ends of Culverts, Looking Southeast. Temporary Culvert in background. Culvert #2 to be Extended and Will Connect with Channel #1 (12 September 2018)



Photograph 8: Culvert #3, Upstream Ends of Culverts, Looking North. Service Road on Right (12 September 2018)



Photograph 9: Culvert #3, Downstream Ends of Culverts into CP1, Looking Northeast (12 September 2018)



Photograph 10: Culvert #4, Upstream End of Culvert, Looking North (12 September 2018)



Photograph 11: Culvert #4, Damage to Upstream End of Culvert. Similar to 2017 (12 September 2018)



Photograph 12: Culvert #4, Downstream End of Culvert into CP1, Looking Northwest (12 September 2018)



Photograph 13: Site Road, South of Culvert #4, Looking South (12 September 2018)



Photograph 14: Main Camp Water Intake, Access Road, Looking Southeast (11 September 2018)



Photograph 15: Main Camp Water Intake, Access Road, Looking Southwest (11 September 2018)



Photograph 16: Main Camp Water Intake, Pump Shack, Looking Northwest (11 September 2018)



Photograph 17: Emulsion Plant Access Road, Culvert #13, Upstream Ends Near H15E (14 September 2018)



Photograph 18: Emulsion Plant Access Road, Downstream Ends of Culvert #13 Near H15E (14 September 2018)



Photograph 19: Emulsion Plant Access Road, Looking Northwest from South End of Road Near Culvert #13 (14 September 2018)



Photograph 20: Emulsion Plant Access Road, Looking Southeast from Mid-Point of Road Near Emulsion Esker. Disturbed Tundra on East Side of Road that Could Pond Water and Cause Thermal Degradation of the Permafrost. (14 September 2018)



Photograph 21: Emulsion Plant Access Road, Looking Southeast from Near Dino Access Gate, Some Minor Cracking in Road Crest (14 September 2018)



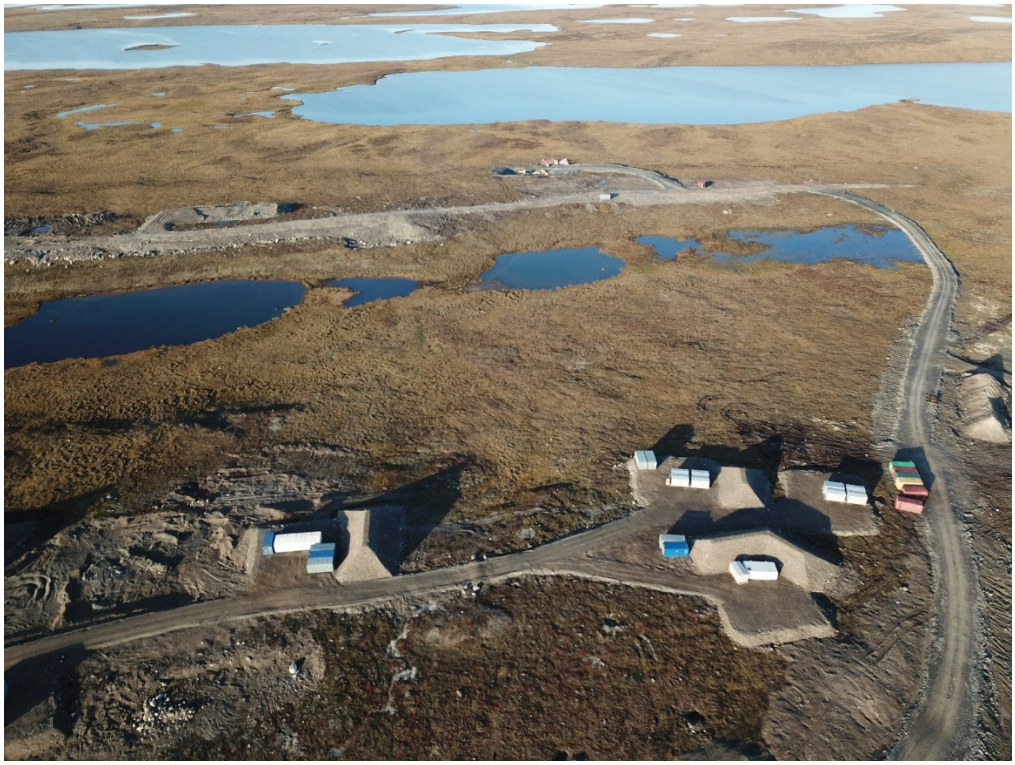
Photograph 22: Emulsion Plant Access Road, Looking Southeast Approximately Half Way Between Access Gate and Emulsion Plant Pad. Water is Ponding Adjacent to the Road Which Could Lead to Permafrost Degradation if Left (14 September 2018)



Photograph 23: Tiriganiaq Access Road, Looking West. Steel Pipes Through Road Fills in Foreground. These Pipes may be for Cable Conduits (11 September 2018)



Photograph 24: Tiriganiaq Access Road, Looking East (11 September 2018)



Photograph 25: Overview of Magazine Storage Area, Wesmeg Access Road, Vent Raise, and Borrow Area (AEM Drone Photo 1 September 2018)



Photograph 26: Wesmeg Access Road, Looking West from Near Tiriganiaq Esker (11 September 2018)



Photograph 27: Wesmeg Access Road Near Magazine Storage Area. Ponding Water and Disturbed Tundra (11 September 2018)



Photograph 28: Wesmeg Access Road, Water Ponded on South Side of Road (Lake B33A), Looking East (11 September 2018)



Photograph 29: Wesmeg Borrow, Erosion Along Western Toe, Looking North (11 September 2018)



Photograph 30: Wesmeg Vent Raise Area (11 September 2018)



Photograph 31: Wesmeg Vent Raise, Steel Pipe Culverts Through Entrance to Vent Raise (11 September 2018)



Photograph 32: Overview of Access Road to CP4 (AEM Drone Photo 1 September 2018)



Photograph 33: Access Road to CP4 (11 September 2018)

APPENDIX A-4

Temporary Ore and Waste Rock Storage Area



Photograph 1: Overview of Ore and Waste Rock Storage Area (AEM Drone Photo 1 September 2018)



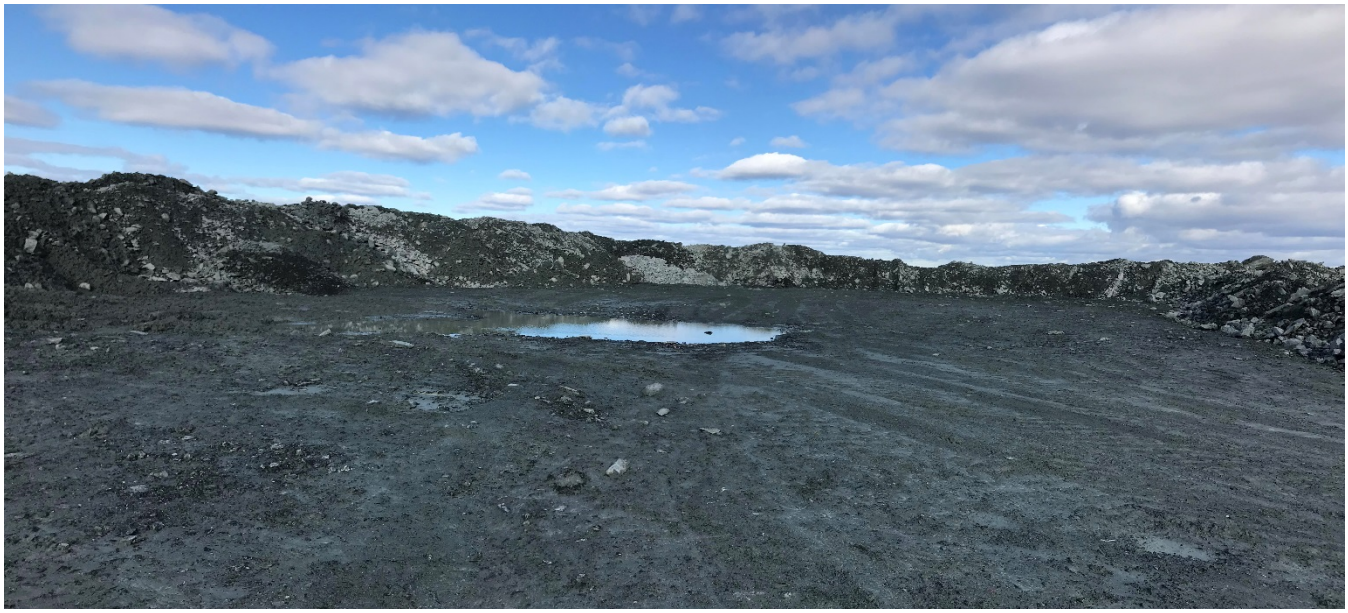
Photograph 2: South Slope of Low Grade Ore Stockpile, Looking North (14 September 2018)



Photograph 3: View of Low and High Grade Ore Stockpiles, Looking North (14 September 2018)



Photograph 4: Cracking in the High Grade Stockpile, Similar to 2017 (14 September 2018)



Photograph 5: View of Top Bench of Waste Rock Pile, Safety Berms in Place, Small Pond of Water (14 September 2018)



Photograph 6: View Down Ramp from Top of Waste Rock Pile (14 September 2018)



Photograph 7: View of Low and High Grade Ore Stockpiles, Looking Southeast (14 September 2018)



Photograph 8: View of Waste Rock Stockpile, Looking South (14 September 2018)



Photograph 9: View of Crushed Ore Stockpiles, Looking Southwest (14 September 2018)

APPENDIX A-5

Other Mine Facilities



Photograph 1: Overview of Mine Facilities (Google Earth Image 2017)



Photograph 2: Landfarm, West Slope, Looking South (11 September 2018)



Photograph 3: Landfarm, Crest of West Side, Looking Southeast (11 September 2018)



Photograph 4: Landfarm, Liner Exposed on East Side, Looking Southeast (11 September 2018)



Photograph 5: Landfarm, View from Southwest corner Looking North. Material is being Excavated Hauled to Screener then Finer Material Returned to Landfarm (11 September 2018)



Photograph 6: Landfarm, South Slope, Looking East (11 September 2018)



Photograph 7: Landfarm, East Slope, Looking South (11 September 2018)



Photograph 8: Landfarm, North Slope, Looking West (11 September 2018)



Photograph 9: Landfarm Screening Area, South Slope Looking East (11 September 2018)



Photograph 10: Landfarm Screening Area, West Side, Looking North (11 September 2018)



Photograph 11: View of Landfarm Screening Area from Northwest Corner (11 September 2018)



Photograph 12: Portal No. 1, View Down East Side, Looking South. Minor Erosion on Surface of Backfill (12 September 2018)



Photograph 13: Portal No. 1, View Down West Side, Looking South (12 September 2018)



Photograph 14: Portal No. 1, Looking North (12 September 2018)



Photograph 15: Portal No. 1, Excavation Around Portal, Looking West (12 September 2018)



Photograph 16: Portal No. 2, East Side, Looking South (11 September 2018)



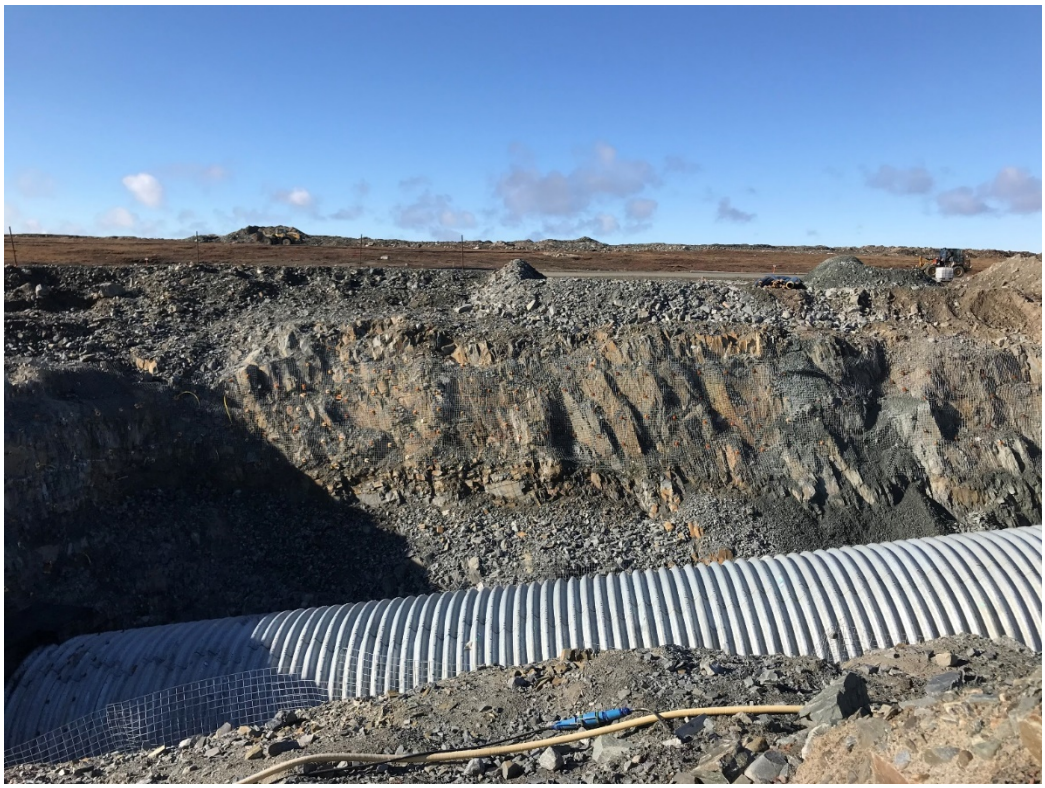
Photograph 17: Portal No. 2, West Side, Backfill Placement In Progress, Looking South (11 September 2018)



Photograph 18: Portal No. 2, Looking North (11 September 2018)



Photograph 19: Portal No. 2, South Perimeter Berm, Looking West (13 September 2018)



Photograph 20: Portal No. 2, West Cut Slope with Rock Bolts and Mesh, Looking West (13 September 2018)



Photograph 21: Exploration Landfill, View from Southwest Corner, Looking North (13 September 2018)



Photograph 22: Exploration Landfill, Cracking on Downstream Slope at the Northwest Corner (13 September 2018)



Photograph 23: Exploration Landfill, View of North Slope looking East (13 September 2018)



Photograph 24: Exploration Landfill, Cracking on North Slope (13 September 2018)



Photograph 25: Exploration Landfill, View of Slope from Northeast Corner, Looking South (13 September 2018)



Photograph 26: Exploration Landfill, View of Top of Landfill from Northeast Corner, Looking South (13 September 2018)



Photograph 27: Operations Landfill, Overview of Original Landfill and Expansion, Looking Southwest (AEM Drone Photo 1 September 2018)



Photograph 28: Operations Landfill, View from Northeast Corner, Looking South (13 September 2018)



Photograph 29: Operations Landfill, Downstream Slope of North Berm, Looking Northeast (13 September 2018)



Photograph 30: Operations Landfill, North and East Slopes from Northeast Corner, Looking South. Some Water Ponded at Toe of Slope (13 September 2018)



Photograph 31: Operations Landfill, View of Southwest Berm, Looking Northwest (13 September 2018)



Photograph 32: Operations Landfill Expansion, View of South and East Sides, Looking West (13 September 2018)



Photograph 33: Operations Landfill Expansion, View from Southeast Corner, Looking West (13 September 2018)



Photograph 34: Operations Landfill Expansion, Northeast Slope from the Southeast Corner of the New Landfill Expansion. Slopes of New Expansion are Steeper than Original Landfill Slopes (13 September 2018)



Photograph 35: Mine Site Fuel Storage, Northeast and Northwest Containment Berm Slopes, Looking South from North Corner (12 September 2018)



Photograph 36: Mine Site Fuel Storage, Slope of Southeast Containment Berm, Looking Northeast (12 September 2018)



Photograph 37: Mine Site Fuel Storage, Overview of Interior of Facility from South Corner. Southwest Containment Berm to left of Photograph (12 September 2018)



Photograph 38: Industrial Fuel Storage, Overview of Interior of Facility, Looking West (11 September 2018)



Photograph 39: Industrial Fuel Storage, Overview of Exterior Slopes of Facility, Looking North (11 September 2018)



Photograph 40: Industrial Fuel Storage, West Berm Crest and Slope, Looking North (11 September 2018)



Photograph 41: Erosion of North Slope of Main Camp/Industrial Pad, Looking East. (11 September 2018)



Photograph 42: Erosion of North Slope of Main Camp/Industrial Pad, Looking Southwest. (11 September 2018)



Photograph 43: Crest of Northwest Slope of Main Camp/Industrial Pad, Looking North. (11 September 2018)



Photograph 44: Slope Along East Side of Main Camp, Looking Southwest. (11 September 2018)



Photograph 45: Slope Between Main Camp and Multi Service Building, Looking West. (11 September 2018)



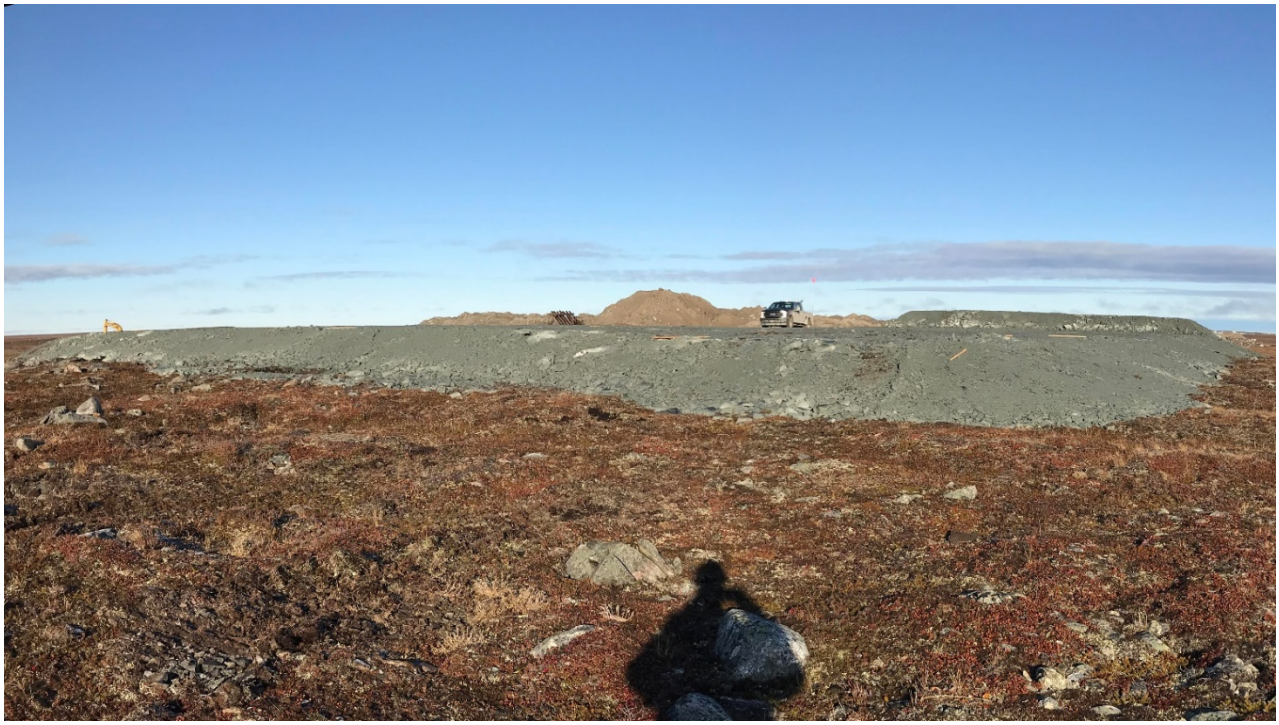
Photograph 46: Water Ponded West of Industrial Fuel Storage and South of Process Plant, Looking North (11 September 2018)



Photograph 47: South Slope of Incinerator Pad, Erosion of Esker Material on Slope, Crushed Material Placed as Pad Surface, Looking East. Placement of Rockfill for Construction of Ore Storage Pad 2 In Progress to South. (11 September 2018)



Photograph 48: South Slope of East Vent Raise Pad, Looking Northeast. (12 September 2018)



Photograph 49: Temporary Cyanide Storage Pad, Looking Northwest. (13 September 2018)



Photograph 50: Effluent Water Treatment Plant South Slope, Looking East. Pipe Berm Constructed With Erodible Esker Sand to Right of Photo. (13 September 2018)



Photograph 51: Effluent Water Treatment Plant East Slope, Looking South. (13 September 2018)



Photograph 52: Emulsion Plant Pad, Overview Looking Northeast from Emulsion Storage Pad (14 September 2018)



Photograph 53: Emulsion Plant Pad, Erosion and Cracking on East Slope, Looking North. (14 September 2018)



Photograph 54: Emulsion Plant Pad, Erosion and Cracking on East Slope, Looking South. (14 September 2018)



Photograph 55: Emulsion Plant Pad, North end of East Slope, Looking South. Coarser Material and No Erosion (14 September 2018)



Photograph 56: Emulsion Plant Pad, Drainage Ditch Along North Side. (14 September 2018)



Photograph 57: Emulsion Plant Storage Pad, Overview Looking Southwest from Emulsion Plant Pad. (14 September 2018)



Photograph 58: Emulsion Plant Storage Pad, Cracking in Crest and Rut Marks in Middle of Pad From Loader, Looking Southeast. (14 September 2018)

APPENDIX A-6

Exploration Camp



Photograph 1: Overview of Exploration Camp, access road, landfarm and fuel storage. Google Earth Image (August 2017)



Photograph 2: Exploration Camp Pad, North Slope, looking West, near Fresh Water Intake Access Road (10 September 2018)



Photograph 3: Exploration Camp Pad, Erosion on Southeast Slope in Foreground of Photograph. New Genset Facility in Background (10 September 2018)



Photograph 4: Exploration Camp Pad, Sand Placed Over Cables (10 September 2018)



Photograph 5: Exploration Camp Pad, South Slope Looking Northeast, Excavator Removing Contaminated Soil from Fuel Spill (10 September 2018)



Photograph 6: Exploration Camp Pad, South Slope Looking North. Water Treatment Discharge (10 September 2018)



Photograph 7: Exploration Camp Pad, Looking West at Slope on South Side of Camp Trailers (10 September 2018)



Photograph 8: Exploration Camp Pad, Looking North at Fuel Storage Near Helicopter Pad (10 September 2018)



Photograph 9: Exploration Camp Pad, Looking Southwest, Disturbance of Tundra (10 September 2018)



Photograph 10: Exploration Camp Pad, Genset Relocation, Looking Southwest at Berm Containment (10 September 2018)



Photograph 11: Exploration Camp Pad, Genset Relocation, Interior Containment and Sump (10 September 2018)



Photograph 12: Exploration Camp Fresh Water Intake, Looking North (10 September 2018)



Photograph 13: Exploration Camp Fresh Water Intake, Looking Northeast (10 September 2018)



Photograph 14: Exploration Camp Fresh Water Intake Access Road, Pipeline Crossing, Looking Southwest (10 September 2018)



Photograph 15: Exploration Camp Fresh Water Intake, Looking West (10 September 2018)



Photograph 16: Exploration Camp Diffuser Access Road Adjacent to Camp Trailers, Looking Northeast (10 September 2018)



Photograph 17: Exploration Camp Diffuser Access Road Adjacent to Camp Trailers, Looking West (10 September 2018)



Photograph 18: Exploration Camp Diffuser Access Road, Cracking on South Side of Road, Looking West (10 September 2018)



Photograph 19: Exploration Camp Diffuser Access Road, Minor Cracking on North Side of Road, Looking East (10 September 2018)



Photograph 20: Exploration Camp Diffuser Entering Meliadine Lake, Looking North (10 September 2018)



Photograph 21: Exploration Camp Diffuser Access Adjacent to Meliadine Lake, Looking South (10 September 2018)



Photograph 22: Exploration Camp Access Road, Downstream End of Culvert on North Side of Camp, not exposed on upstream (10 September 2018)



Photograph 23: Exploration Camp Access Road, Downstream End of Culvert on North Side of Camp, not exposed on upstream (10 September 2018)



Photograph 24: Exploration Camp Access Road, Downstream End of Culvert on North Side of Camp (10 September 2018)



Photograph 25: Exploration Camp Access Road, Upstream End of Culvert on North Side of Camp (10 September 2018)



Photograph 26: Exploration Camp Access Road, Downstream Ends of Steel Pipes on Northwest Side of Camp, not exposed on upstream (10 September 2018)



Photograph 27: Exploration Camp Access Road, North Side of Road near Camp, Looking East (10 September 2018)



Photograph 28: Exploration Camp Access Road, approximately 250 m West of Camp, Erosion on Crest and Slope of Road, Looking North (10 September 2018)



Photograph 29: Exploration Camp Access Road, approximately 250 m West of Camp, Erosion on Slope of Road, Looking North (10 September 2018)



Photograph 30: Exploration Camp Access Road, Downstream End of Culvert through Road, Looking East (10 September 2018)



Photograph 31: Exploration Camp Access Road, Upstream End of Culvert through Road, Looking East (10 September 2018)



Photograph 32: Exploration Camp Access Road, Downstream End of Culvert through Road, Looking North (10 September 2018)



Photograph 33: Exploration Camp Access Road, Upstream End of Culvert through Road, Looking South (10 September 2018)



Photograph 34: Exploration Camp Access Road, North Side of Road Approximately 500 m West of Camp, Looking Northeast (10 September 2018)



Photograph 35: Exploration Camp Access Road, South Side of Road Approximately 550 m West of Camp, Looking Southwest (10 September 2018)



Photograph 36: Exploration Camp Access Road, North Side of Road Looking Southwest from the Fuel Storage Area (10 September 2018)



Photograph 37: Exploration Camp Access Road, South Side of Road near Intersection with AWAR Looking Northeast (10 September 2018)



Photograph 38: Exploration Camp Fuel Storage, Looking Northwest along Northeast side of Fuel Storage Area (10 September 2018)



Photograph 39: Exploration Camp Fuel Storage, Minor Cracking in Fuel Storage Area Pad (10 September 2018)



Photograph 40: Exploration Camp Fuel Storage, Looking Southwest along Northwest side of Fuel Storage Area (10 September 2018)



Photograph 41: Exploration Camp Fuel Storage, Looking North at South side of Fuel Storage Area (10 September 2018)



Photograph 42: Exploration Camp Landfarm, Downstream Face of West Slope, Looking Southeast (10 September 2018)



Photograph 43: Exploration Camp Landfarm, Downstream Face at Northwest Corner, Looking Southeast (10 September 2018)



Photograph 44: Exploration Camp Landfarm, North Slope and Crest, Looking Northeast (10 September 2018)



Photograph 45: Exploration Camp Landfarm, West Slope Crest, Looking Southeast (10 September 2018)



Photograph 46: Exploration Camp Landfarm, East Slope and Crest, Looking Southeast (10 September 2018)



Photograph 47: Exploration Camp Landfarm, South Slope Crest, Looking Southeast. Fuel Storage in Background (10 September 2018)



Photograph 48: Exploration Camp Landfarm, Downstream Face of South Slope, Looking Northeast (10 September 2018)



Photograph 49: Exploration Camp Cracking in Core Storage Pad. (10 September 2018)

APPENDIX B

All Weather Access Road Photographs



Photograph 1: Char River Bridge at KM6.0 Looking South (13 September 2018)



Photograph 2: Char River Bridge, Left (north) Abutment Armouring from the Upstream Side of the Right (south) Abutment (13 September 2018)

Photographs 1 to 5 were taken at KM6.0 of the Char River Bridge. Some finer grained material observed on downstream side of Left (north) Abutment, should be monitored for signs of erosion.



Photograph 3: Char River Bridge, right (south) abutment armouring, from the upstream side (13 September 2018)



Photograph 4: Char River Bridge, right (south) abutment, upstream side taken from the upstream side of the left (north) abutment (13 September 2018)



Photograph 5: Char River Bridge, downstream side of left (north) abutment, taken from the downstream side of the right (south) abutment. Finer grained material observed over coarse rockfill. (13 September 2018)



Photograph 6: At KM6.2, Downstream ends of 3 CSP culverts. Lower two culverts are 1300 mm ø, upper culvert is 700 mm ø. All are in good condition. Small erosion between culverts, consider adding armouring (13 September 2018)

Photographs 6 to 8 were taken at KM6.2 where there are 3 CSP culverts. The culverts are in good condition. Some minor erosion on the embankment between the culverts, consider additional armouring.



Photograph 7: Upstream to downstream view of 3 CSP culverts at KM6.2 (13 September 2018)



Photograph 8: Road over 3 CSP culverts at KM6.2 (13 September 2018)



Photographs 9 to 12 were taken at KM7.0 where there are 3 CSP culverts. There is minor damage to the upstream ends of two of the culverts. Some exposed sand on embankments, additional armoring should be considered.

Photograph 9: At KM7.0, downstream ends of 3 CSP culverts. Lower two culverts are 1000 mm ø, upper culvert is 700 mm ø. All are in good condition. Water ponded in lower culvert at the time of inspection (13 September 2018)



Photograph 10: Upstream ends of 3 CSP culverts at KM7.0. Minor damage to the upper and lower right culverts. Some exposed sand around the culvert inlets, additional armouring should be considered (13 September 2018)



Photograph 11: Downstream embankment and road over 3 CSP culverts at KM7.0 (13 September 2018)



Photograph 12: Upstream embankment and road over 3 CSP culverts at KM7.1 (13 September 2018)



Photographs 13 to 16 were taken at KM7.1 where there are 3 CSP culverts. The culverts and riprap appear to be in good condition.

Photograph 13: At KM7.1, downstream ends of 3 CSP culverts. Lower two culverts are 1000 mm ø, upper culvert is 700 mm ø. All are in good condition. Small flow through lower culvert at time of inspection. Riprap in good condition (13 September 2018)



Photograph 14: Upstream ends of 3 CSP culverts at KM7.1 (13 September 2018)



Photograph 15: Upstream embankment and road over 3 CSP culverts at KM7.1, looking south (13 September 2018)



Photograph 16: Downstream embankment and road over 3 CSP culverts at KM7.1, looking north (13 September 2018)



Photograph 17: At KM7.4, upstream ends of 3 CSP culverts. Lower two culverts are 900 mm ø (left) and 1000 mm ø (right), and the upper culvert is 700 mm ø. Inlet of the 900 mm has been damaged, (13 September 2018)



Photograph 18: Downstream ends of 3 CSP culverts at KM7.4 (13 September 2018). Consider extending the upper culvert to reduce erosion of the embankment.

Photographs 17 to 22 were taken at KM7.4 where there are 3 CSP culverts. The inlet of one of the culverts has been partially crushed, possibly by boulders rolling down the embankment. Finer grained material surrounds the inlet and outlet which should be monitored for signs of erosion. Also extending the outlet of the upper culvert should be considered to reduce the chance of erosion.



Photograph 19: Damaged upstream end of 900 mm culvert at KM7.4, similar to what was observed in 2017. It appears the damage may have been caused by boulders that rolled down the slope (13 September 2018)



Photograph 20: Downstream embankment and road over 3 CSP culverts at KM7.4, looking south (13 September 2018)



Photograph 21: Upstream embankment and road over 3 CSP culverts at KM7.4, looking south (13 September 2018)



Photograph 22: Road surface north of 3 CSP culverts at KM 7.4 looking north (13 September 2018)



Photograph 23: Meliadine River Bridge at KM8.0, looking southwest (13 September 2018)



Photograph 24: Left (northeast) Abutment of the Meliadine River Bridge at KM8.0 from the downstream side of Right (southwest) Abutment (13 September 2018)

Photographs 23 to 30 of the Meliadine River Bridge were taken at KM8.0. Riprap and embankments are in good condition. Some finer grained material observed under the abutments which should be monitored for signs of erosion.



Photograph 25: Meliadine River Bridge at KM8.0. Left (northeast) Abutment from the upstream (13 September 2018)



Photograph 26: Meliadine River Bridge at KM8.0. Right (southwest) Abutment from the downstream side (13 September 2018)



Photograph 27: Meliadine River Bridge at KM8.0. Right (southwest) Abutment, from the upstream side (13 September 2018).



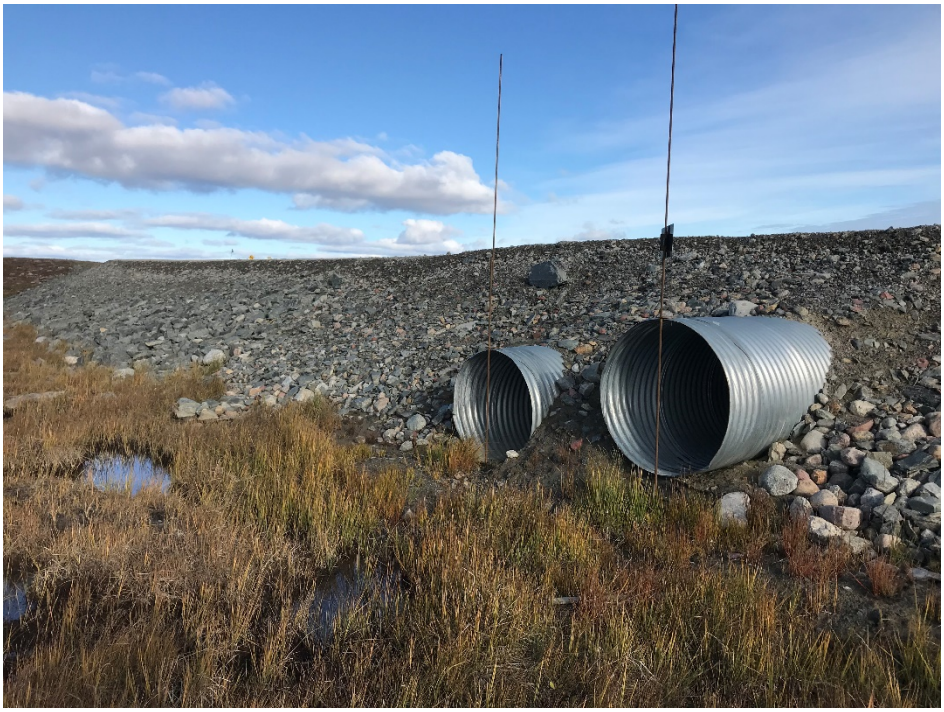
Photograph 28: Meliadine River Bridge at KM8.0. Embankment for the Right (southwest) Abutment, from the upstream side. The far abutment in the photo is the Left (northeast) Abutment. Riprap is in good condition (13 September 2018)



Photograph 29: Meliadine River Bridge at KM8.0 view of Right (southwest) Abutment, photo taken from the Left (northeast) Abutment. Finer grained material on abutment was observed in 2017; grass has grown on this material since 2017, no substantial erosion observed. Continue to monitor. (13 September 2018)



Photograph 30: Road leading northeast from Meliadine River Bridge at KM8.0. (13 September 2018)



Photograph 31: At KM9.1, upstream ends of two 1000 mm ø CSP culverts (13 September 2018)



Photograph 32: Downstream ends of two 1000 mm ø CSP culverts at KM9.1, (13 September 2018)

Photographs 31 to 35 were taken at KM9.1 where there are 2 CSP culverts, each 1000 mm in diameter. There is some minor deformation in the culverts under the road, no flow, water ponded below inverts.



Photograph 33: View through lower CSP culvert at KM9.1 from downstream to upstream. No observable change in deformation of culvert when compared to 2017 inspection (13 September 2018)



Photograph 34: Upstream embankment and road surface over two CSP culverts at KM9.1, looking southwest (13 September 2018)



Photograph 35: Road surface and slope north of KM9.1, looking northeast (13 September 2018)



Photograph 36: At KM9.5, upstream end of a single 1300 mm ø CSP. Culvert inlet is elevated, allowing water to pond upstream. (13 September 2018)

Photographs 36 to 39 were taken at KM9.5 where there is a single CSP culvert. It is generally in good condition, there is a small deformation of the culvert under the road. The culvert inlet is elevated resulting in water ponding on the upstream side of the road. The ponded water extends approximately 100 m north and 50 m south of the culvert location.



Photograph 37: Downstream end of a single 1300 mm CSP culvert at KM9.5 (13 September 2018)



Photograph 38: View through 1300 mm Diameter CSP Culvert at KM9.5 from the downstream end. Slight deformation of culvert under the road (13 September 2018)



Photograph 39: Road surface looking north from single CSP culvert at KM9.5 (13 September 2018)



Photograph 40: M-5 Bridge at KM10.5, photo of Left (north) Abutment, downstream side taken from the Right (south) Abutment (13 September 2018)

Photographs 40 to 47 taken of M-5 Bridge, at KM10.5. The bridge abutments are generally in good condition. No change to area previously noted as possible erosion. There is a damaged gabion on the downstream side of the Left (north) Abutment that should be replaced.



Photograph 41: M-5 Bridge at KM10.5, photo of damaged gabion on the downstream side of the Left (north) Abutment that should be replaced. (13 September 2018)



Photograph 42: M-5 Bridge at KM10.5, photo of the upstream side of the Left (north) Abutment (13 September 2018)



Photograph 43: M-5 Bridge at KM10.5, photo of the bridge and the Left (north) Abutment from the upstream side of the Right (south) Abutment (13 September 2018)



Photograph 44: M-5 Bridge at KM10.5 Right (south) Abutment, downstream side (13 September 2018)



Photograph 45: M-5 Bridge at KM10.5 Right (south) Abutment, upstream side. Previously noted as area of possible erosion, no obvious change since 2016/2017, material may have been placed in this way during construction (13 September 2018)



Photograph 46: M-5 Bridge deck at KM10.5, looking south. Speed limit sign was knocked down at time of inspection (13 September 2018)



Photograph 47: Road leading north from M-5 Bridge at KM10.5 (13 September 2018)



Photograph 48: Upstream ends of four CSP culverts at KM12.1. From left to right the diameters are 900 mm, 1300 mm, 700 mm, 1300 mm. Small dent in inlet of uppermost culvert (13 September 2018)

Photos 48 to 52 were taken along AWAR at KM12.1 where there are four CSP culverts. The embankments are generally in good condition. There is deformation of the culverts visible under the road.



Photograph 49: Downstream ends of four CSP culverts at KM12.1. Small flow observed through the lowest culvert (second from right in the photograph). Visible deformation of the culverts under the road (13 September 2018)



Photograph 50: Downstream ends of four CSP culverts at KM12.1, looking north along the embankment (13 September 2018)



Photograph 51: Upstream ends of four CSP culverts at KM12.1 looking south along the embankment (13 September 2018)



Photograph 52: Road leading north from four CSP Culverts at KM12.1 (13 September 2018)



Photos 53 and 54 were taken along AWAR at KM12.6. At this location flow is visible along the road. No culvert is present and water seeps under the road.

Photograph 53: West side of AWAR at KM12.6 where water flows along the side of the road and seeps under the road from west to east (13 September 2018)



Photograph 54: AWAR KM 12.6, ponded water on the east side of the road where it is seeping out of the road fills (13 September 2018)



Photos 55 to 58 were taken along AWAR at KM13.5. Five CSP culverts are installed at this location, three of 1300 mm ø and two of 900 mm ø. The inverts of the 900 mm culverts are elevated higher than the inverts of the 1300 mm culverts. Minor deformation of the culverts noted under the road, embankments are generally in good condition.

Photograph 55: At KM13.5, upstream ends of 5 CSP Culverts (3×1300 mm Ø; 2×900mm Ø). The 900 mm culverts are vertically elevated. Minor deformation of the culverts under the road (13 September 2018)



Photograph 56: Downstream ends of 5 CSP culverts at KM13.5 (13 September 2018)



Photograph 57: View of the embankment and road over upstream ends of 5 CSP culverts at KM13.5 looking south (13 September 2018)



Photograph 58: View of the road leading north from 5 CSP culverts at KM13.5 (13 September 2018)



Photographs 59 to 62 were taken at KM14.7 on the AWAR at intersection with access road to B12 Quarry. There is a single corrugated HDPE culvert under the B12 access road. The culvert and road embankments are generally in good condition.

Photograph 59: At KM14.7, access road to B12 Quarry. View of intersection of B12 Quarry access road with AWAR looking east. (13 September 2018)



Photograph 60: View through culvert under B12 Quarry access road at KM14.7 of AWAR, no flow, small amount of ponded water within culvert (13 September 2018)



Photograph 61: Upstream end of culvert through B12 Quarry access road at KM14.7 of AWAR (13 September 2018)



Photograph 62: Looking north at AWAR from B12 Quarry access road at KM 14.7 (13 September 2018)



Photographs 63 to 66 were taken at KM16.3 where there are 3 CSP culverts. Some minor deformation of one culvert and erosion visible at the outlet of the lowest culvert.

Photograph 63: At KM16.3, upstream ends of 3 CSP culverts, looking south (13 September 2018)



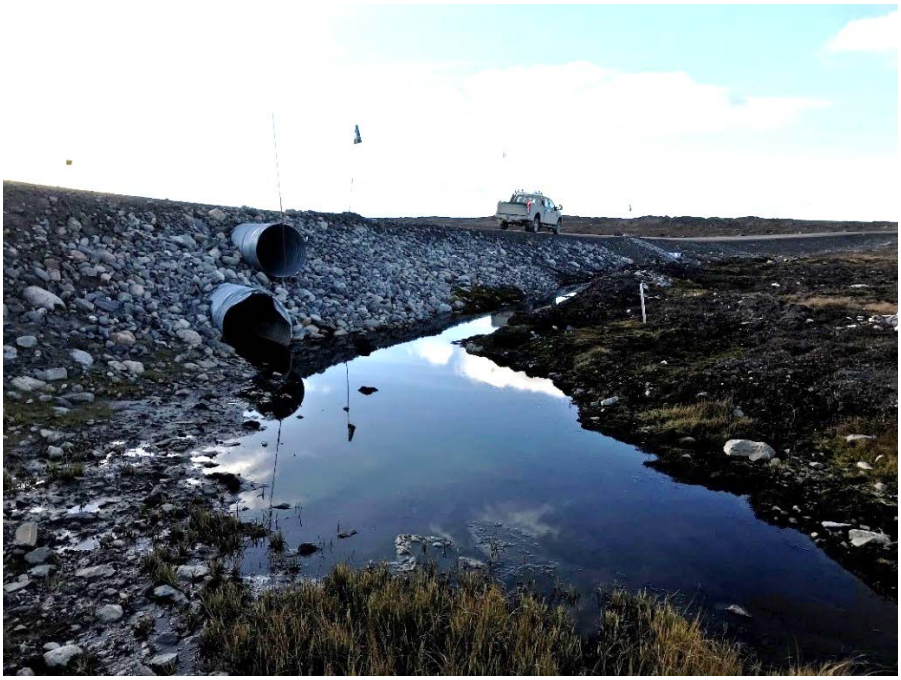
Photograph 64: AWAR surface over downstream ends of 3 CSP culverts at KM 16.3 (13 September 2018)



Photograph 65: Downstream ends of three CSP culverts at KM16.3. Diameters of the culverts from left to right are: 1000 mm, 700 mm, and 1300 mm Ø. Small flow in 1300 Ø culvert and minor deformation. Some erosion visible at outlet of 1300 mm culvert (13 September 2018)



Photograph 66: AWAR looking north from KM16.3 (13 September 2018)



Photograph 67: At KM18.1, upstream ends of two CSP culverts. Upper culvert is 900 mm Ø and the lower is 1000 mm Ø. Cover over upper (900 mm Ø) culvert is thin on upstream side (13 September 2018)



Photograph 68: Damage to the inlet of the lower (1000 mm Ø) CSP culvert at KM18.1. View north along the AWAR road embankment, slope looks good, but water ponded along road. Culvert at KM18.15 visible in background (13 September 2018)

Photographs 67 to 70 were taken at KM18.1. There are 2 vertically offset, CSP culverts the upper culvert is 900 mm ø and the lower culvert is 1000 mm ø. Note that the road near KM18.1 would need to almost be flooded to reach inlet of 900 mm ø culvert. If water management in this area is a problem, suggest lowering the culvert or installing another culvert at a lower elevation. Some damage was observed on the inlet of the lower culvert, embankment is generally in good condition. A ditch on the upstream side hydraulically connects the culverts at KM18.1 to culvert at KM18.15.



Photograph 69: Downstream ends of two CSP culverts at KM 18.1 (13 September 2018)



Photograph 70: View north at slope of AWAR road embankment from the downstream ends of the culverts at KM 18.1 (13 September 2018)



Photographs 71 to 75 were taken at KM18.15 where there is a single 600 mm ø CSP culvert, the inlet of which is hydraulically connected to the inlets of the CSP culverts at KM18.1 by a ditch. The inlet of the culvert is elevated above some ponded water. Culvert and embankment are in good condition.

Photograph 71: Upstream end of a 600 mm Ø CSP Culvert at KM18.15. Water ponding below inlet. (13 September 2018)



Photograph 72: Downstream end of 600 mm Ø CSP culvert at KM18.15 and view of AWAR slope, looking south (13 September 2018)



Photograph 73: Closer view of downstream end of 600 mm Ø CSP culvert at KM18.15 (13 September 2018)



Photograph 74: View of AWAR surface and slope over culverts at KM18.15 and KM 18.1, looking south (13 September 2018)



Photograph 75: AWAR surface looking north from KM18.15 (13 September 2018)



Photograph 76: Water ponding on the west side of the road at KM19.5, looking south. Installation of a culvert should be considered (14 September 2018)

Photographs 76 and 77 were taken at KM19.5 water is ponding on the west side of the AWAR, reportedly the water ponds here year-round and can reach as high as half way up the embankment. Installation of a culvert at this location should be considered.



Photograph 77: East side of AWAR at KM19.5 where water is ponding on the west side, looking south (14 September 2018)



Photograph 78: At KM21.2 where water is ponding on the west side of the AWAR, looking north (14 September 2018)

Photographs 78 to 80 were taken at KM21.2 where water is ponding on the west side of the AWAR. There are no culverts present at this location. Water flowed over the road at this location during freshet. A straw log has been placed on the east side of the road to manage erosion. It is recommended that a culvert be installed at this location.



Photograph 79: View of the east side of the AWAR at KM21.2 where water is ponding on the west side of the road, looking south. (14 September 2018)



Photograph 80: At KM21.5, a straw log on east side of the road. Water reportedly flows over the road during spring freshet at this location. (14 September 2018)



Photographs 81 to 84 were taken at KM21.7. There are two 170 mm outside ø pipes, vertically offset. Mine personnel reports that the road was excavated at this location this spring to allow water to drain. The capacity of the pipes may be inadequate, or pipes could have been frozen/blocked causing water to backup. Installation of larger diameter culvert should be considered at this location.

Photograph 81: At KM21.7, view of the upstream ends of two steel pipes, each with an outside diameter of 170 mm. Water is ponded year-round at this location. Mine personnel reported that during freshet it was necessary to excavate the road at this location to let the water drain (14 September 2018)



Photograph 82: At KM21.7, view of the upstream ends of two steel pipes, looking north (14 September 2018).



Photograph 83: Downstream ends of two 170 mm Ø steel pipes at KM21.7 (14 September 2018)



Photograph 84: Straw logs placed on west side of the road, south of the steel pipes at KM21.7 (14 September 2018)



Photographs 85 to 88 were taken at KM22.3. There are two 160 mm ø steel pipes that are vertically offset. Both pipes were clear with no flow. Water is ponding on the upstream (west) side of the road. Inverts of culverts are elevated above the ponded water. Consider lowering the culverts to reduce ponding.

Photograph 85: At KM22.3, upstream ends of two 160 mm Ø steel pipes that are vertically offset. Water is ponded on the upstream side (14 September 2018)



Photograph 86: Upstream ends of two steel pipes at KM22.3, looking north (14 September 2018)



Photograph 87: Downstream ends of two steel culverts at KM22.3 looking south (14 September 2018)



Photograph 88: View of the road north from KM22.3 (14 September 2018)



Photographs 89 and 90 were taken at KM22.7 where water is ponded on the east side of the road. Wet soil was observed on the west side of the road indicating seepage through the road. There is no culvert at this location. Consider installation of culvert.

Photograph 89: Ponded water on the east side of the AWAR near KM22.7. No culvert at this location (14 September 2018)



Photograph 90: East side of the AWAR at KM22.7, looking north. Wet soil observed near toe of embankment. (14 September 2018)



Photographs 91 through 93 were taken at KM25.8 where there is a single HDPE corrugated 600 mm ø culvert. Some damage and granular material partially blocking the inlet of the culvert. Culvert should be cleaned out to re-establish capacity.

Photograph 91: Damaged upstream end of corrugated 600 mm Ø HDPE culvert at KM25.8. Inlet is partially blocked and should be cleaned out. (14 September 2018)



Photograph 92: Downstream end of corrugated 600 mm Ø HDPE culvert at KM25.8 (14 September 2018)



Photograph 93: Road over single corrugated HDPE culvert at KM25.8, looking south (14 September 2018)



Photograph 94: Upstream ends of two 160 mm Ø steel pipes at KM26.2. The lower pipe is bent upwards and should be replaced. The inlets are elevated close to road surface and nearly covered by road fill, consider lowering and extending (14 September 2018)

Photographs 94 and 95 were taken at KM26.2 where there are 2 vertically offset, 160 mm ø steel pipes. The lower pipe is bent upwards. The Inlets are elevated close to the road surface elevation and are nearly covered by road fill. Replacing the bent pipe and lowering and extending the inlets should be considered.



Photograph 95: Downstream ends of two steel pipes at KM26.2 (14 September 2018)



Photograph 96: Upstream ends of three 700mm Ø CSP culverts at KM26.5. Minor sediment buildup in the bottom of the culverts shouldn't substantially influence flows, monitor. (14 September 2018)

Photographs 96 through 100 are at KM26.5 where there are three 700mm ø CSP culverts installed at about equal elevation. Small dents in culverts, minor deformation observed under the road. Minor sediment buildup observed in the culverts, riprap and embankments are in good condition.



Photograph 97: Downstream ends of three CSP culverts at KM26.5. Riprap and embankments are in good condition (14 September 2018).



Photograph 98: At KM26.5, road surface and embankment over culverts, looking south (14 September 2018).



Photograph 99: At KM26.5, road and embankment over culverts, looking south (14 September 2018).



Photograph 100: View of AWAR looking north from KM26.5 (14 September 2018).



Photographs 101 through 104 are at KM26.8 where there are two 160mm ø steel pipes installed, vertically offset. The inlet of the lower pipe was covered by new road fill placed in 2018. The culvert should be extended or replaced. There is some erosion evident below the outlets of both pipes.

Photograph 101: At KM26.8, upstream ends of two vertically offset 160mm Ø steel pipes. The inlet of the lower pipe has been covered during placement of new road fill, should be extended. (14 September 2018).



Photograph 102: Downstream ends of two 160mm Ø steel pipes at KM26.8. Some minor erosion of the road embankment evident beneath the outlets of both pipes (14 September 2018).



Photograph 103: At KM26.8, water ponded on west side of road north of culverts. Water is not against road, but should be monitored during higher water levels to assess if larger culverts needed. (14 September 2018).



Photograph 104: View of road surface and embankment looking south from KM26.8 (14 September 2018).



Photographs 105 through 108 are at KM27.1 where there are 3 CSP culverts installed: 900 mm, 700 mm, and 1000 mm ø. Some minor sloughing of riprap observed around the culvert inlets. Some erosion/deposition observed under culvert outlets. Otherwise embankment slope is generally in good condition.

Photograph 105: At KM 27.1, upstream ends of three CSP culverts. Some minor sloughing of riprap observed around culvert inlets. (14 September 2018)



Photograph 106: Downstream ends of three CSP culverts at KM27.1. From left to right, 1000 mm, 700 mm, and 900 mm ø. (14 September 2018)



Photograph 107: Downstream outlets of three CSP culverts at KM27.1, some minor erosion/deposition evident under outlets. Monitor and add rip-rap if further erosion occurs. (14 September 2018).



Photograph 108: Road looking north from KM27.1. (14 September 2018)



Photographs 109 and 110 are at KM28.7 where water is ponding on the east side of the AWAR. Mine personnel report that water flowed over the road in the spring. Consider installing culvert.

Photograph 109: At KM28.7 where water is ponding on the east side of the AWAR. Mine personnel report that water flowed over the road in the spring. Consider installing a culvert at this location (14 September 2018).



Photograph 110: Wet ground and some ponded water on the west side of the AWAR at KM28.7 (14 September 2018).



Photographs 111 through 114 are at KM29.6 where a single 500 mm ø corrugated HDPE culvert is installed. Ponding water observed on the west side of road. Culvert inlet is partially blocked by road fill and riprap and is elevated above level of ponded water. Move riprap from in front of inlet and recommend lowering culvert invert to reduce ponding adjacent to road.

Photograph 111: At KM29.6, upstream end of single 500 mm Ø corrugated HDPE culvert. Inlet to the culvert is partially blocked by riprap and road fill and is elevated above ponded water at this location. Remove riprap, clean out culvert and recommend lowering invert. (14 September 2018).



Photograph 112: View of water ponded upstream of 500mm Ø corrugated HDPE culvert at KM29.6 (14 September 2018).



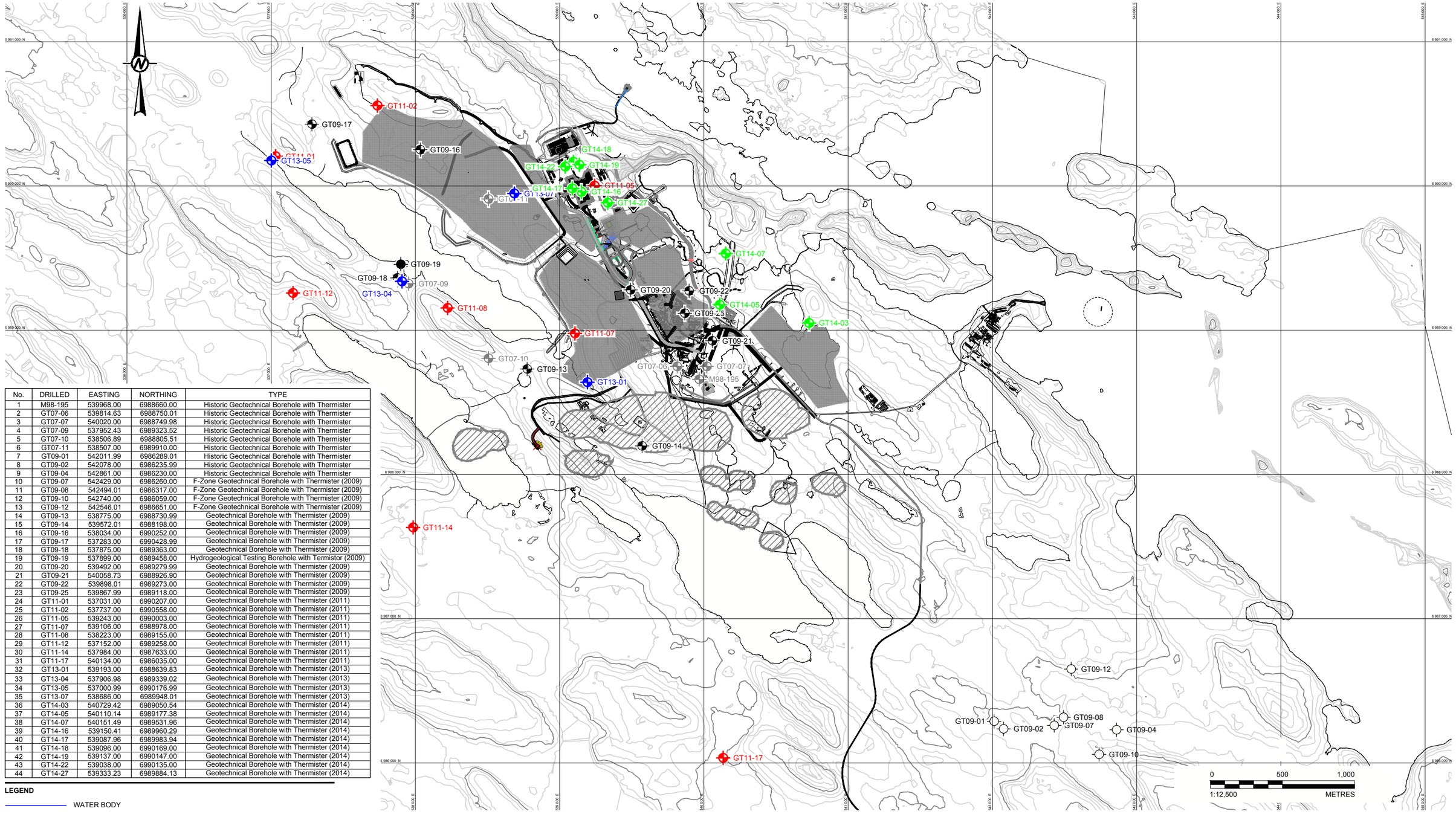
Photograph 113: Downstream end of 500 mm Ø corrugated HDPE culvert at KM29.6 (14 September 2018).



Photograph 114: AWAR embankment and road over culvert at KM29.6, looking south (14 September 2018).

APPENDIX C

Instrumentation



No.	DRILLED	EASTING	NORTHING	TYPE
1	M98-195	539968.00	6988660.00	Historic Geotechnical Borehole with Thermister
2	GT07-06	539814.63	6988750.01	Historic Geotechnical Borehole with Thermister
3	GT07-07	540020.00	6988749.98	Historic Geotechnical Borehole with Thermister
4	GT07-09	537952.43	6989323.52	Historic Geotechnical Borehole with Thermister
5	GT07-10	538506.89	6988805.51	Historic Geotechnical Borehole with Thermister
6	GT07-11	538507.00	6989910.00	Historic Geotechnical Borehole with Thermister
7	GT09-01	542011.99	6986289.01	Historic Geotechnical Borehole with Thermister
8	GT09-02	542078.00	6986235.99	Historic Geotechnical Borehole with Thermister
9	GT09-04	542861.00	6986230.00	Historic Geotechnical Borehole with Thermister
10	GT09-07	542429.00	6986260.00	F-Zone Geotechnical Borehole with Thermister (2009)
11	GT09-08	542494.01	6986317.00	F-Zone Geotechnical Borehole with Thermister (2009)
12	GT09-10	542740.00	6986059.00	F-Zone Geotechnical Borehole with Thermister (2009)
13	GT09-12	542546.01	6986651.00	F-Zone Geotechnical Borehole with Thermister (2009)
14	GT09-13	538775.00	6988730.99	Geotechnical Borehole with Thermister (2009)
15	GT09-14	539572.01	6988198.00	Geotechnical Borehole with Thermister (2009)
16	GT09-16	538034.00	6990252.00	Geotechnical Borehole with Thermister (2009)
17	GT09-17	537283.00	6990428.99	Geotechnical Borehole with Thermister (2009)
18	GT09-18	537875.00	6989363.00	Geotechnical Borehole with Thermister (2009)
19	GT09-19	537899.00	6989458.00	Hydrogeological Testing Borehole with Termistor (2009)
20	GT09-20	539492.00	6989279.99	Geotechnical Borehole with Thermister (2009)
21	GT09-21	540058.73	6988926.90	Geotechnical Borehole with Thermister (2009)
22	GT09-22	539898.01	6989273.00	Geotechnical Borehole with Thermister (2009)
23	GT09-25	539867.99	6989118.00	Geotechnical Borehole with Thermister (2009)
24	GT11-01	537031.00	6990207.00	Geotechnical Borehole with Thermister (2011)
25	GT11-02	537737.00	6990558.00	Geotechnical Borehole with Thermister (2011)
26	GT11-05	539243.00	6990003.00	Geotechnical Borehole with Thermister (2011)
27	GT11-07	539106.00	6988978.00	Geotechnical Borehole with Thermister (2011)
28	GT11-08	538223.00	6989155.00	Geotechnical Borehole with Thermister (2011)
29	GT11-12	537152.00	6989258.00	Geotechnical Borehole with Thermister (2011)
30	GT11-14	537984.00	6987633.00	Geotechnical Borehole with Thermister (2011)
31	GT11-17	540134.00	6986035.00	Geotechnical Borehole with Thermister (2011)
32	GT13-01	539193.00	6988639.83	Geotechnical Borehole with Thermister (2013)
33	GT13-04	537906.98	6989339.02	Geotechnical Borehole with Thermister (2013)
34	GT13-05	537000.99	6990176.99	Geotechnical Borehole with Thermister (2013)
35	GT13-07	538686.00	6989948.01	Geotechnical Borehole with Thermister (2013)
36	GT14-03	540729.42	6989050.54	Geotechnical Borehole with Thermister (2014)
37	GT14-05	540110.14	6989177.38	Geotechnical Borehole with Thermister (2014)
38	GT14-07	540151.49	6989531.96	Geotechnical Borehole with Thermister (2014)
39	GT14-16	539150.41	6989960.29	Geotechnical Borehole with Thermister (2014)
40	GT14-17	539087.96	6989983.94	Geotechnical Borehole with Thermister (2014)
41	GT14-18	539096.00	6990169.00	Geotechnical Borehole with Thermister (2014)
42	GT14-19	539137.00	6990147.00	Geotechnical Borehole with Thermister (2014)
43	GT14-22	539038.00	6990135.00	Geotechnical Borehole with Thermister (2014)
44	GT14-27	539333.23	6989884.13	Geotechnical Borehole with Thermister (2014)

LEGEND

- WATER BODY
- EXISTING GROUND CONTOURS
- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2014)
- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2013)
- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2011)
- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- HYDROGEOLOGICAL TESTING BOREHOLE WITH THERMISTOR (2009)
- HISTORIC GEOTECHNICAL BOREHOLE WITH THERMISTOR
- F-ZONE GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)

NOTE(S)

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE IS NOTED.
2. COORDINATE SYSTEM UTM15 NAD83.
3. CONTOUR INTERVAL EVERY 2m.

REFERENCE

1. GENERAL ARRANGEMENT PROVIDED BY HAMEL ARPENTAGE, AUGUST 22 2016. FILE NAME: SK - MELIADINE GENERAL.DWG
2. SITE INFRASTRUCTURE PROVIDED BY AGNICO EAGLE MINES , 20 FEBRUARY, 2018. FILE NAME: 65-000-210-200-2_R2.dwg

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
MELIADINE GOLD PROJECT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-14
DESIGNED	ACI
PREPARED	AD
REVIEWED	FE
APPROVED	ACI

TITLE
LOCATION OF BOREHOLES WITH THERMISTORS

PROJECT NO.	PHASE/DOC#	REV.	FIGURE
18105719	3000/002	0	C-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm

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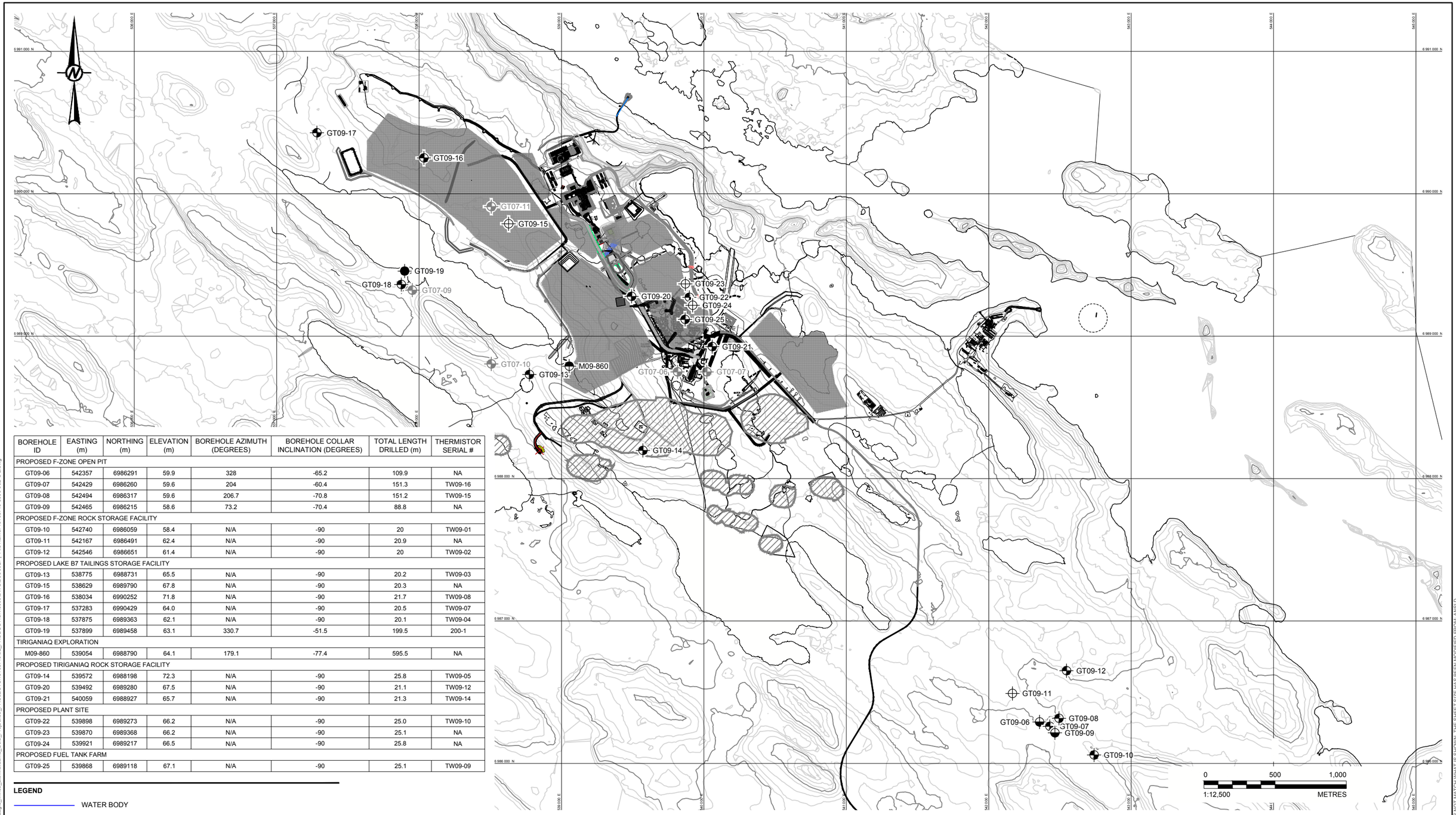

BOREHOLE ID	EASTING (m)	NORTHING (m)	ELEVATION (m)	BOREHOLE AZIMUTH (DEGREES)	BOREHOLE COLLAR INCLINATION (DEGREES)	TOTAL LENGTH DRILLED (m)	THERMISTOR SERIAL #
PROPOSED F-ZONE OPEN PIT							
GT09-06	542357	6986291	59.9	328	-65.2	109.9	NA
GT09-07	542429	6986260	59.6	204	-60.4	151.3	TW09-16
GT09-08	542494	6986317	59.6	206.7	-70.8	151.2	TW09-15
GT09-09	542465	6986215	58.6	73.2	-70.4	88.8	NA
PROPOSED F-ZONE ROCK STORAGE FACILITY							
GT09-10	542740	6986059	58.4	N/A	-90	20	TW09-01
GT09-11	542167	6986491	62.4	N/A	-90	20.9	NA
GT09-12	542546	6986651	61.4	N/A	-90	20	TW09-02
PROPOSED LAKE B7 TAILINGS STORAGE FACILITY							
GT09-13	538775	6988731	65.5	N/A	-90	20.2	TW09-03
GT09-15	538629	6989790	67.8	N/A	-90	20.3	NA
GT09-16	538034	6990252	71.8	N/A	-90	21.7	TW09-08
GT09-17	537283	6990429	64.0	N/A	-90	20.5	TW09-07
GT09-18	537875	6989363	62.1	N/A	-90	20.1	TW09-04
GT09-19	537899	6989458	63.1	330.7	-51.5	199.5	200-1
TIRIGANIAQ EXPLORATION							
M09-860	539054	6988790	64.1	179.1	-77.4	595.5	NA
PROPOSED TIRIGANIAQ ROCK STORAGE FACILITY							
GT09-14	539572	6988198	72.3	N/A	-90	25.8	TW09-05
GT09-20	539492	6989280	67.5	N/A	-90	21.1	TW09-12
GT09-21	540059	6988927	65.7	N/A	-90	21.3	TW09-14
PROPOSED PLANT SITE							
GT09-22	539898	6989273	66.2	N/A	-90	25.0	TW09-10
GT09-23	539870	6989368	66.2	N/A	-90	25.1	NA
GT09-24	539921	6989217	66.5	N/A	-90	25.8	NA
PROPOSED FUEL TANK FARM							
GT09-25	539868	6989118	67.1	N/A	-90	25.1	TW09-09

LEGEND

- WATER BODY
- EXISTING GROUND CONTOURS
- GEOTECHNICAL BOREHOLE (2009)
- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- F-ZONE OPEN PIT GEOTECHNICAL BOREHOLE
- F-ZONE OPEN PIT GEOTECHNICAL BOREHOLE WITH THERMISTOR
- HISTORICAL GEOTECHNICAL BOREHOLE
- HYDROGEOLOGICAL TESTING BOREHOLE
- HYDROGEOLOGICAL TESTING BOREHOLE WITH THERMISTOR

NOTE(S)

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE IS NOTED.
2. COORDINATE SYSTEM UTM15 NAD83.
3. CONTOUR INTERVAL EVERY 2m.

REFERENCE

1. GENERAL ARRANGEMENT PROVIDED BY HAMEL ARPENTAGE, AUGUST 22 2016. FILE NAME: SK - MELIADINE GENERAL.DWG
2. SITE INFRASTRUCTURE PROVIDED BY AGNICO EAGLE MINES , 20 FEBRUARY, 2018. FILE NAME: 65-000-210-200-2_R2.dwg

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
MELIADINE GOLD PROJECT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-14
DESIGNED	ACI
PREPARED	AD
REVIEWED	FE
APPROVED	ACI

TITLE
2009 SUMMER GEOTECHNICAL FIELD PROGRAM BOREHOLE LOCATIONS

PROJECT NO.	PHASE/DOC#	REV.	FIGURE
18105719	3000/002	0	C-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 25 mm

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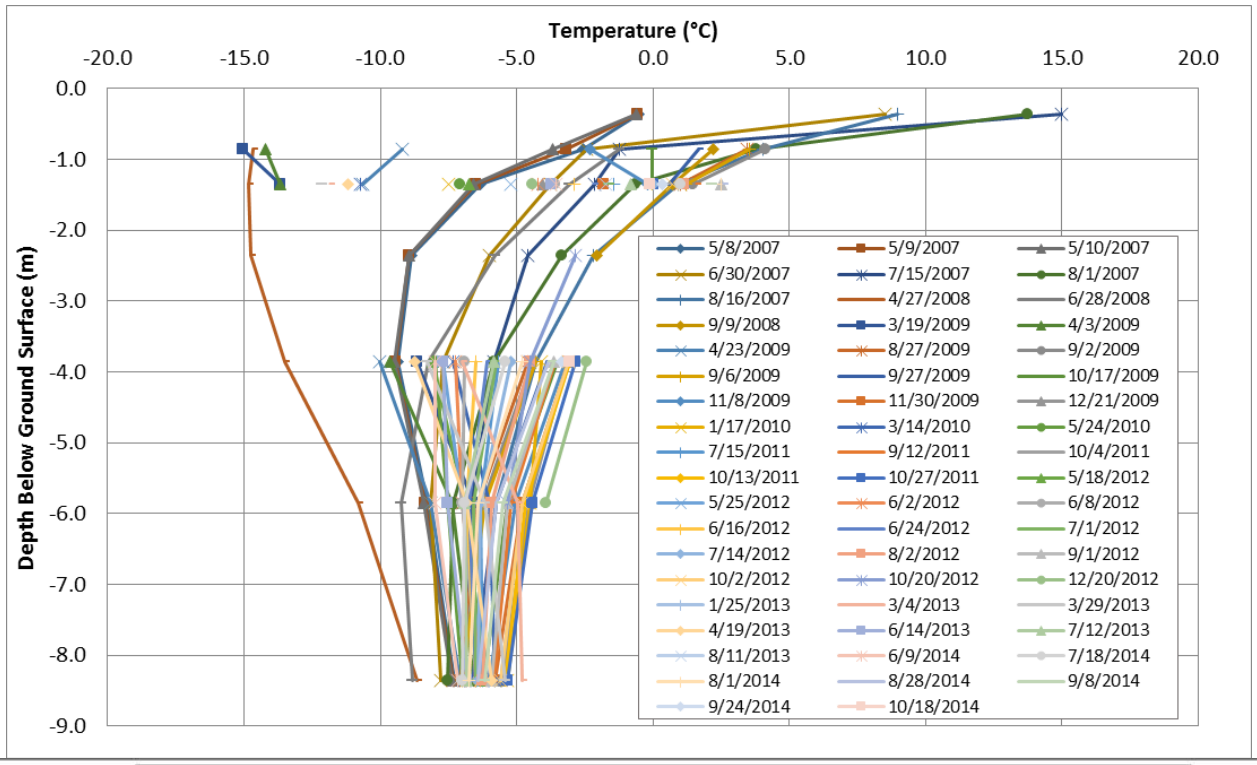
GT07-06


Temperature (°C)
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
Depth Below Ground Surface (m)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
5/8/2007
5/9/2007
5/10/2007
6/30/2007
7/15/2007
8/1/2007
8/16/2007
4/27/2008
6/28/2008
9/9/2008
3/19/2009
4/3/2009
4/23/2009
8/27/2009
9/2/2009
9/6/2009
9/27/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
7/15/2011
9/12/2011
10/4/2011
10/13/2011
10/27/2011
5/18/2012
5/25/2012
6/2/2012
6/8/2012
6/16/2012
6/24/2012
7/1/2012
7/14/2012
8/2/2012
9/1/2012
10/2/2012
10/20/2012
12/20/2012
1/25/2013
3/4/2013
3/29/2013
4/19/2013
6/14/2013
7/12/2013
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6/9/2014
7/18/2014
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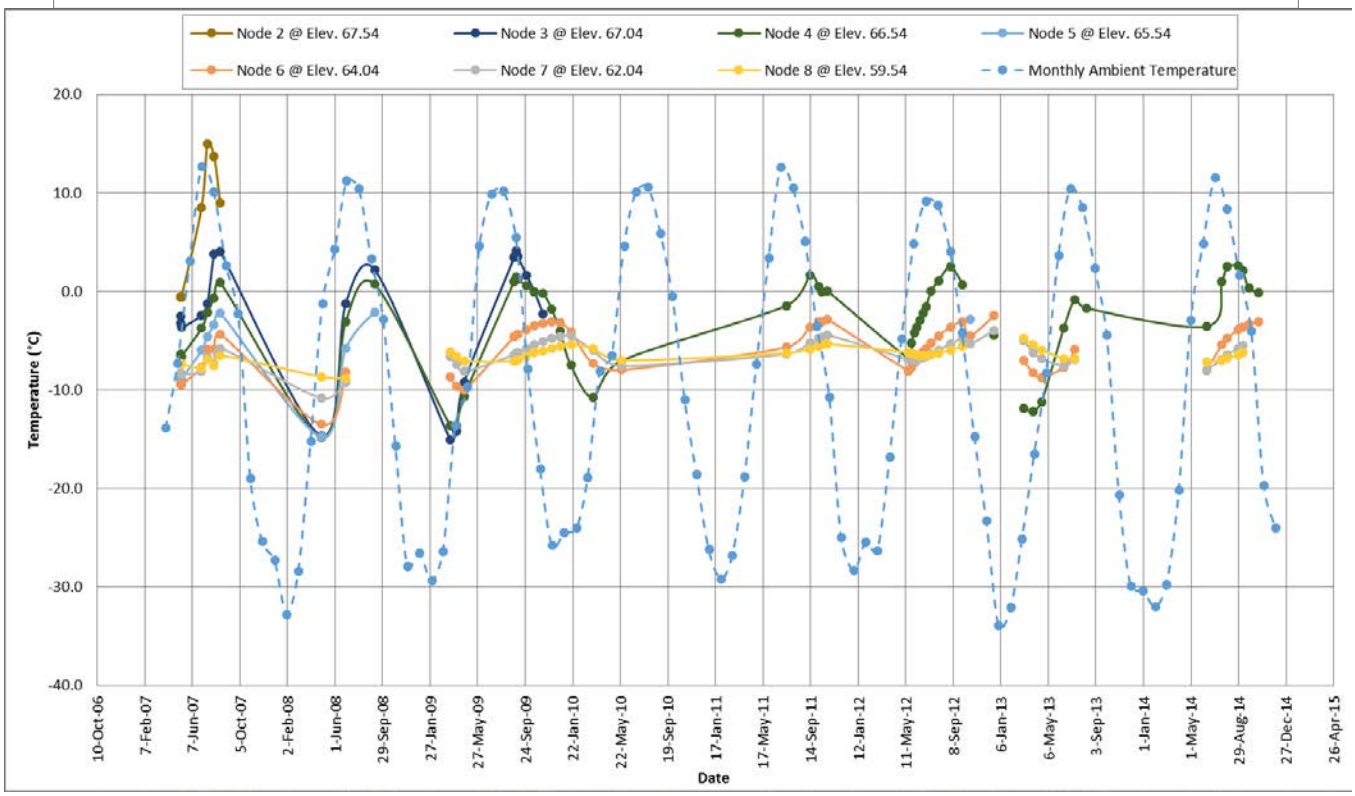
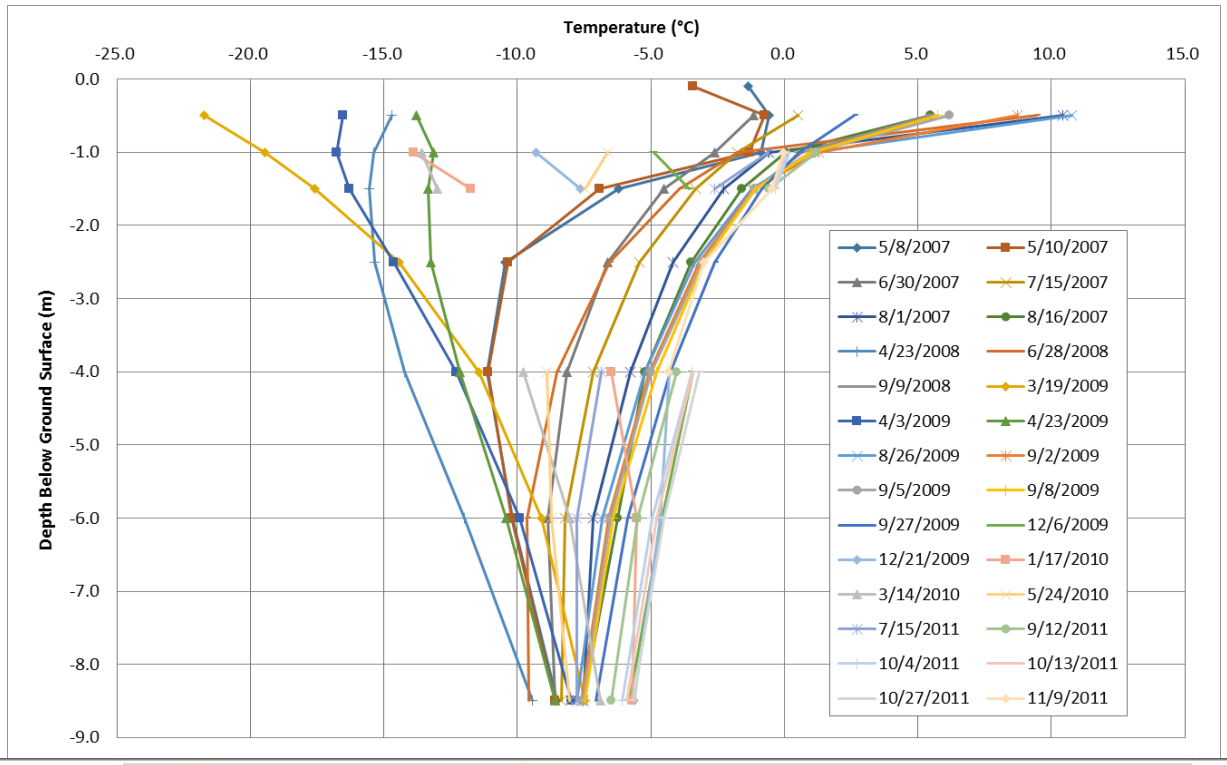
8/28/2014
9/8/2014
9/24/2014
10/18/2014


Node 2 @ Elev. 67.54
Node 3 @ Elev. 67.04
Node 4 @ Elev. 66.54
Node 5 @ Elev. 65.54
Node 6 @ Elev. 64.04
Node 7 @ Elev. 62.04
Node 8 @ Elev. 59.54
Monthly Ambient Temperature
Temperature (°C)
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
10-Oct-06
7-Feb-07
7-Jun-07
5-Oct-07
2-Feb-08
1-Jun-08
29-Sep-08
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
8-Sep-12
6-Jan-13
6-May-13
3-Sep-13
1-Jan-14
1-May-14
29-Aug-14
27-Dec-14
26-Apr-15
Date

GT07-07


Temperature (°C)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Depth Below Ground Surface (m)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
5/8/2007
5/10/2007
6/30/2007
7/15/2007
8/1/2007
8/16/2007
4/23/2008
6/28/2008
9/9/2008
3/19/2009
4/3/2009
4/23/2009
8/26/2009
9/2/2009
9/5/2009
9/8/2009
9/27/2009
12/6/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
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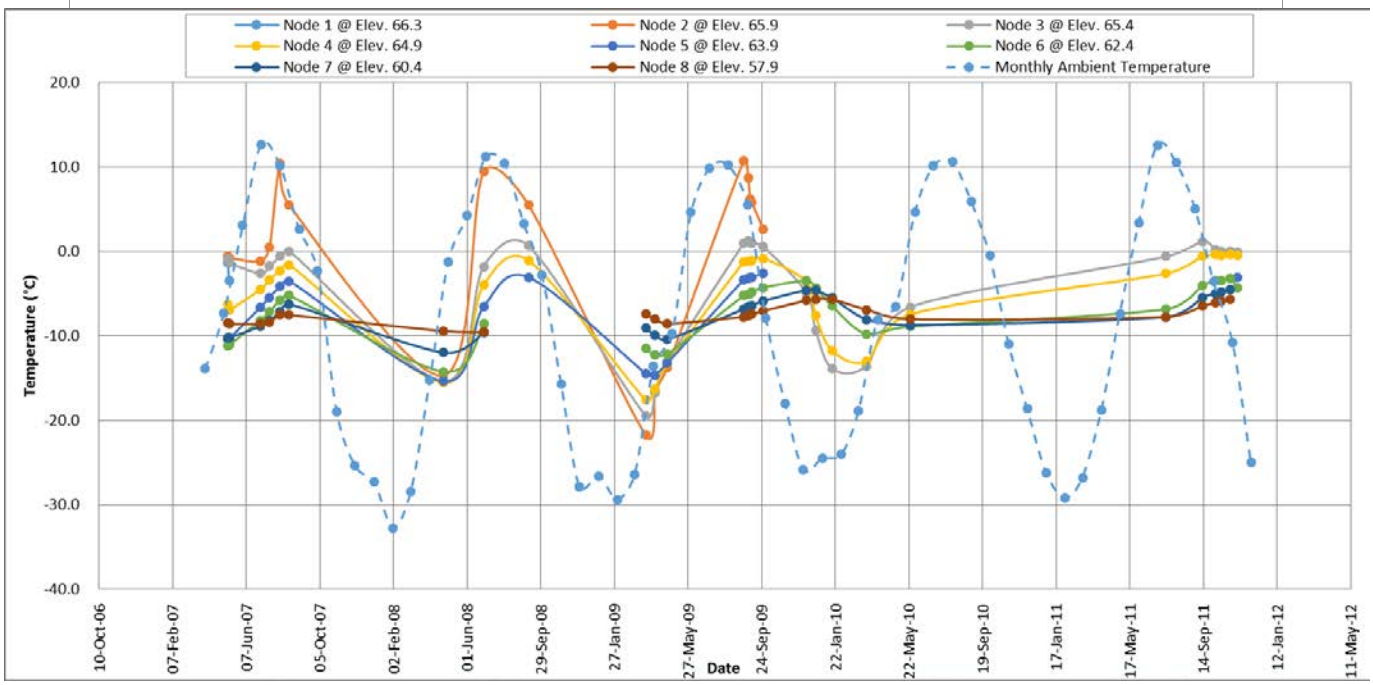
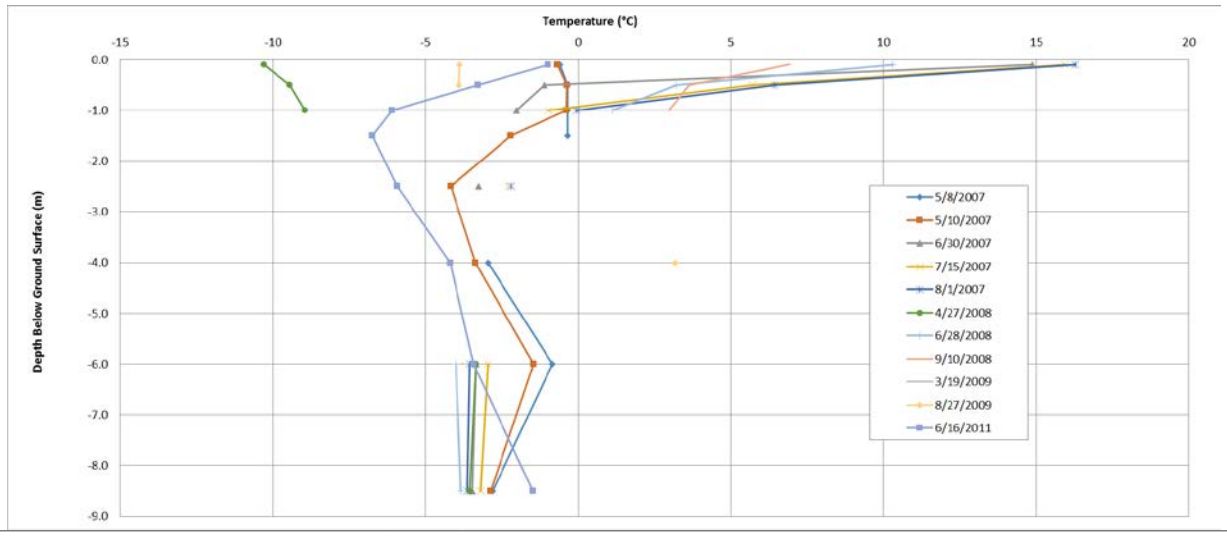
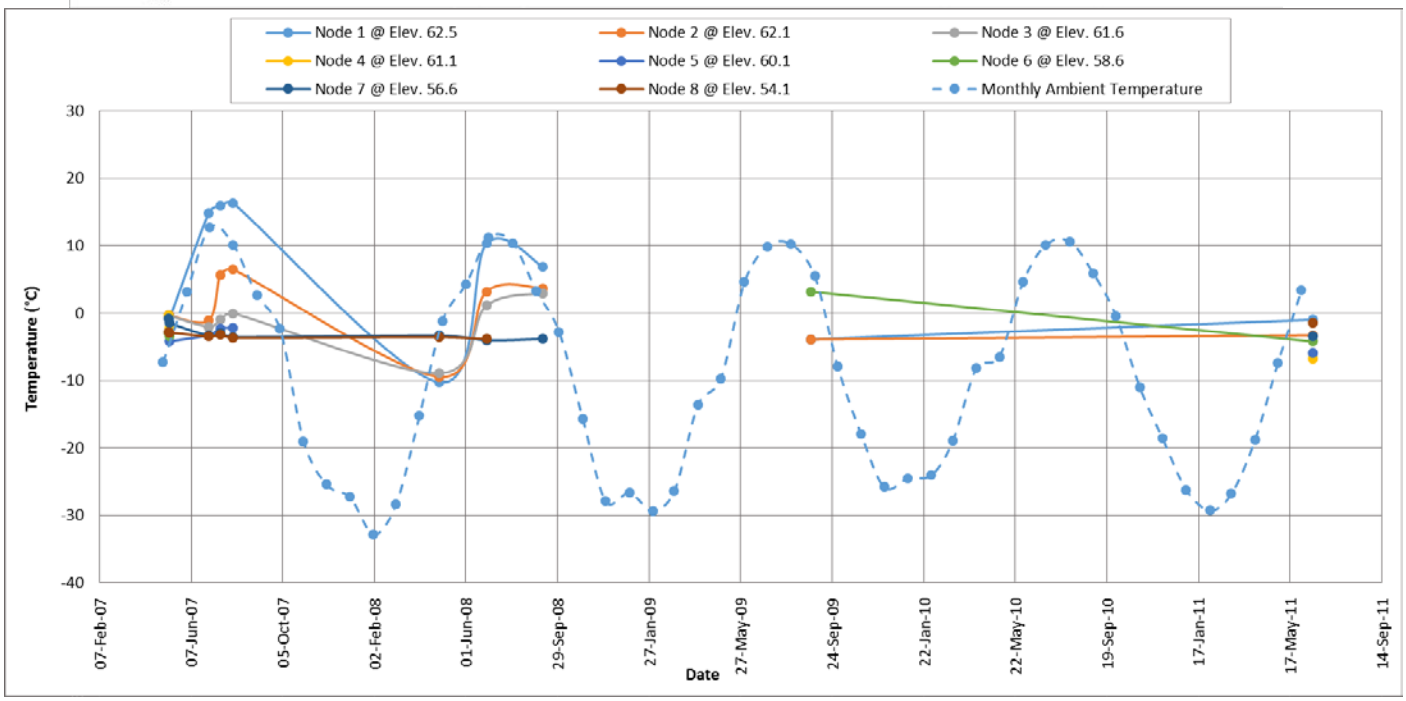
9/12/2011
10/4/2011
10/13/2011
10/27/2011
11/9/2011

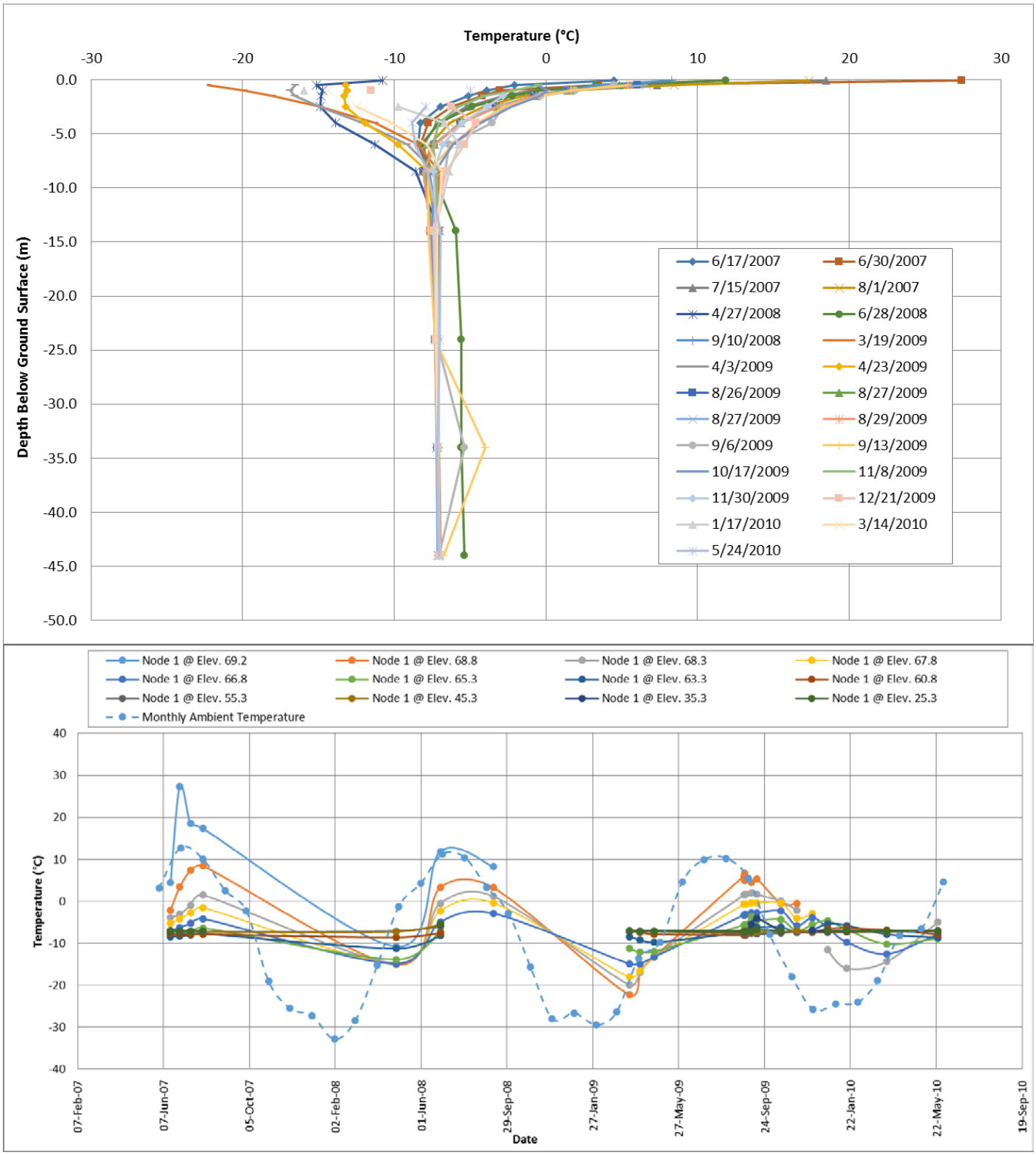

Node 1 @ Elev. 66.3
Node 2 @ Elev. 65.9
Node 3 @ Elev. 65.4
Node 4 @ Elev. 64.9
Node 5 @ Elev. 63.9
Node 6 @ Elev. 62.4
Node 7 @ Elev. 60.4
Node 8 @ Elev. 57.9
Monthly Ambient Temperature
Temperature (°C)
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
10-Oct-06
07-Feb-07
07-Jun-07
05-Oct-07
02-Feb-08
01-Jun-08
29-Sep-08
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
Date

GT07-09

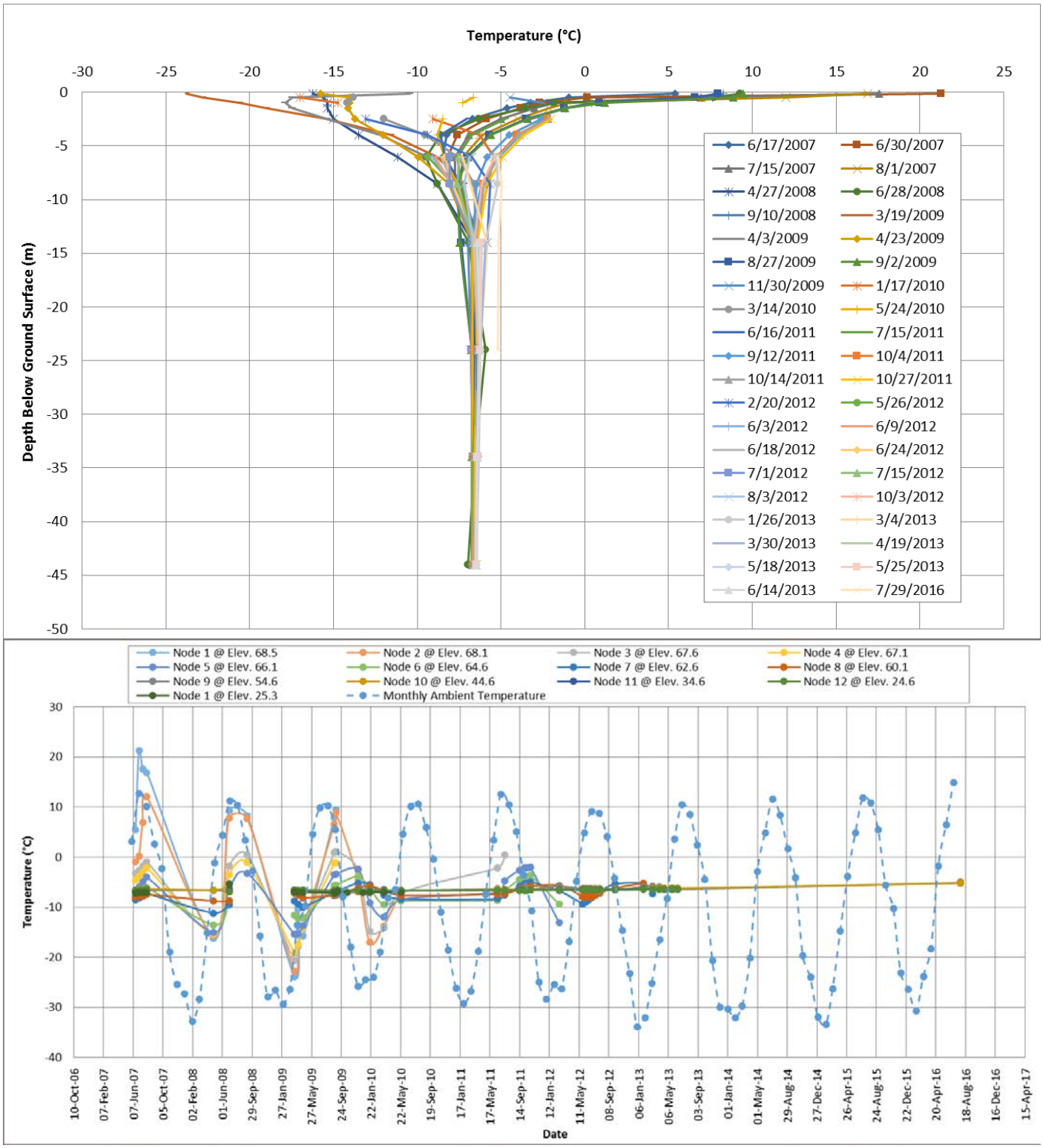

Temperature (°C)
-15
-10
-5
0
5
10
15
20
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
Depth Below Ground Surface (m)
5/8/2007
5/10/2007
6/30/2007
7/15/2007
8/1/2007
4/27/2008
6/28/2008
9/10/2008
3/19/2009
8/27/2009
6/16/2011


Node 1 @ Elev. 62.5
Node 2 @ Elev. 62.1
Node 3 @ Elev. 61.6
Node 4 @ Elev. 61.1
Node 5 @ Elev. 60.1
Node 6 @ Elev. 58.6
Node 7 @ Elev. 56.6
Node 8 @ Elev. 54.1
Monthly Ambient Temperature
30
20
10
0
-10
-20
-30
-40
Temperature (°C)
07-Feb-07
07-Jun-07
05-Oct-07
02-Feb-08
01-Jun-08
29-Sep-08
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
Date

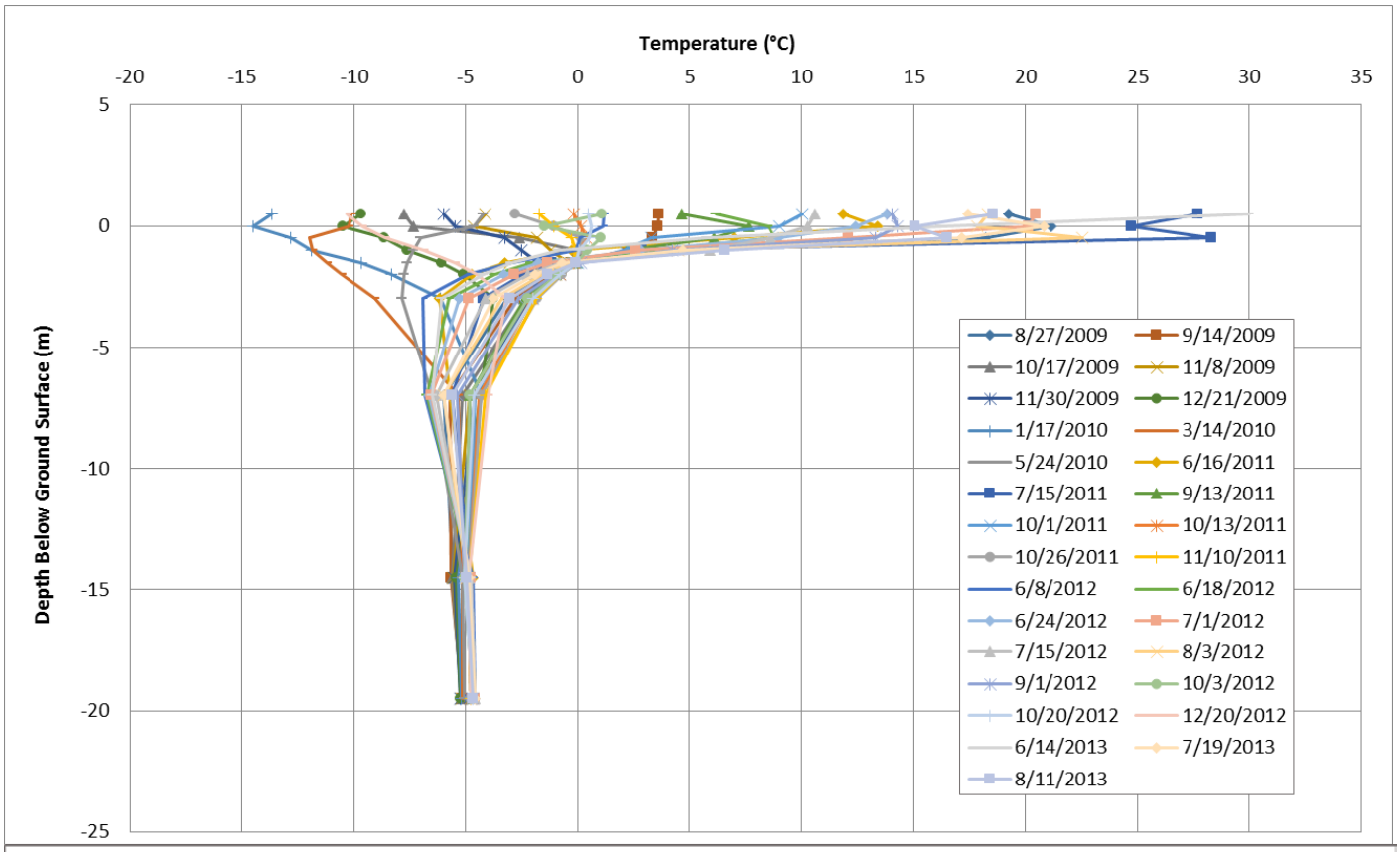
GT07-10


Temperature (°C)
-30
-20
-10
0
10
20
30
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
-45.0
-50.0
Depth Below Ground Surface (m)
6/17/2007
6/30/2007
7/15/2007
8/1/2007
4/27/2008
6/28/2008
9/10/2008
3/19/2009
4/3/2009
4/23/2009
8/26/2009
8/27/2009
8/27/2009
8/29/2009
9/6/2009
9/13/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
Node 1 @ Elev. 69.2
Node 1 @ Elev. 68.8
Node 1 @ Elev. 68.3
Node 1 @ Elev. 67.8
Node 1 @ Elev. 66.8
Node 1 @ Elev. 65.3
Node 1 @ Elev. 63.3
Node 1 @ Elev. 60.8
Node 1 @ Elev. 55.3
Node 1 @ Elev. 45.3
Node 1 @ Elev. 35.3
Node 1 @ Elev. 25.3
Monthly Ambient Temperature
40
30
20
10
0
-10
-20
-30
-40
Temperature (°C)
07-Feb-07
07-Jun-07
05-Oct-07
02-Feb-08
01-Jun-08
29-Sep-08
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
Date

GT07-11


Temperature (°C)
Depth Below Ground Surface (m)
6/17/2007
6/30/2007
7/15/2007
8/1/2007
4/27/2008
6/28/2008
9/10/2008
3/19/2009
4/3/2009
4/23/2009
8/27/2009
9/2/2009
11/30/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/15/2011
9/12/2011
10/4/2011
10/14/2011
10/27/2011
2/20/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
10/3/2012
1/26/2013
3/4/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/29/2016
Node 1 @ Elev. 68.5
Node 2 @ Elev. 68.1
Node 3 @ Elev. 67.6
Node 4 @ Elev. 67.1
Node 5 @ Elev. 66.1
Node 6 @ Elev. 64.6
Node 7 @ Elev. 62.6
Node 8 @ Elev. 60.1
Node 9 @ Elev. 54.6
Node 10 @ Elev. 44.6
Node 11 @ Elev. 34.6
Node 12 @ Elev. 24.6
Node 1 @ Elev. 25.3
Monthly Ambient Temperature
Temperature (°C)
Date

GT09-01


Temperature (°C)
-20
-15
-10
-5
0
5
10
15
20
25
30
35
Depth Below Ground Surface (m)
5
0
-5
-10
-15
-20
-25
8/27/2009
9/14/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/15/2011
9/13/2011
10/1/2011
10/13/2011
10/26/2011
11/10/2011
6/8/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
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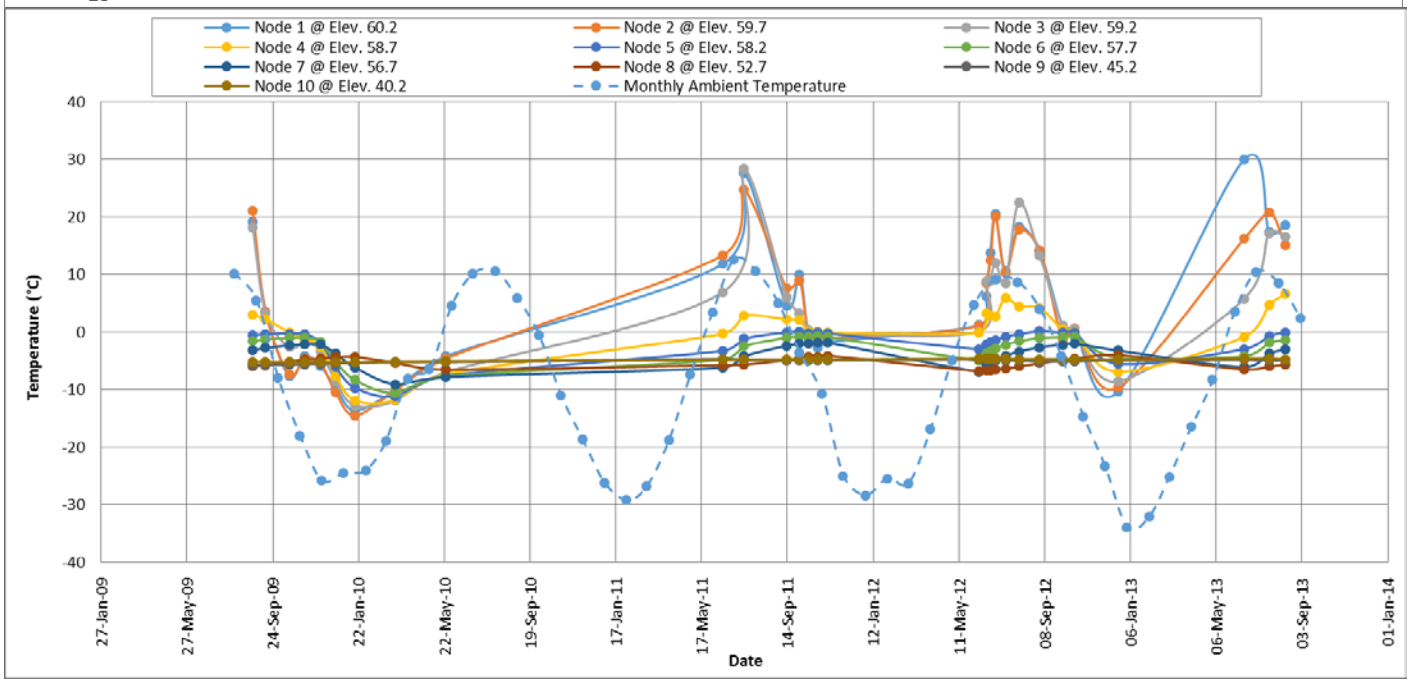
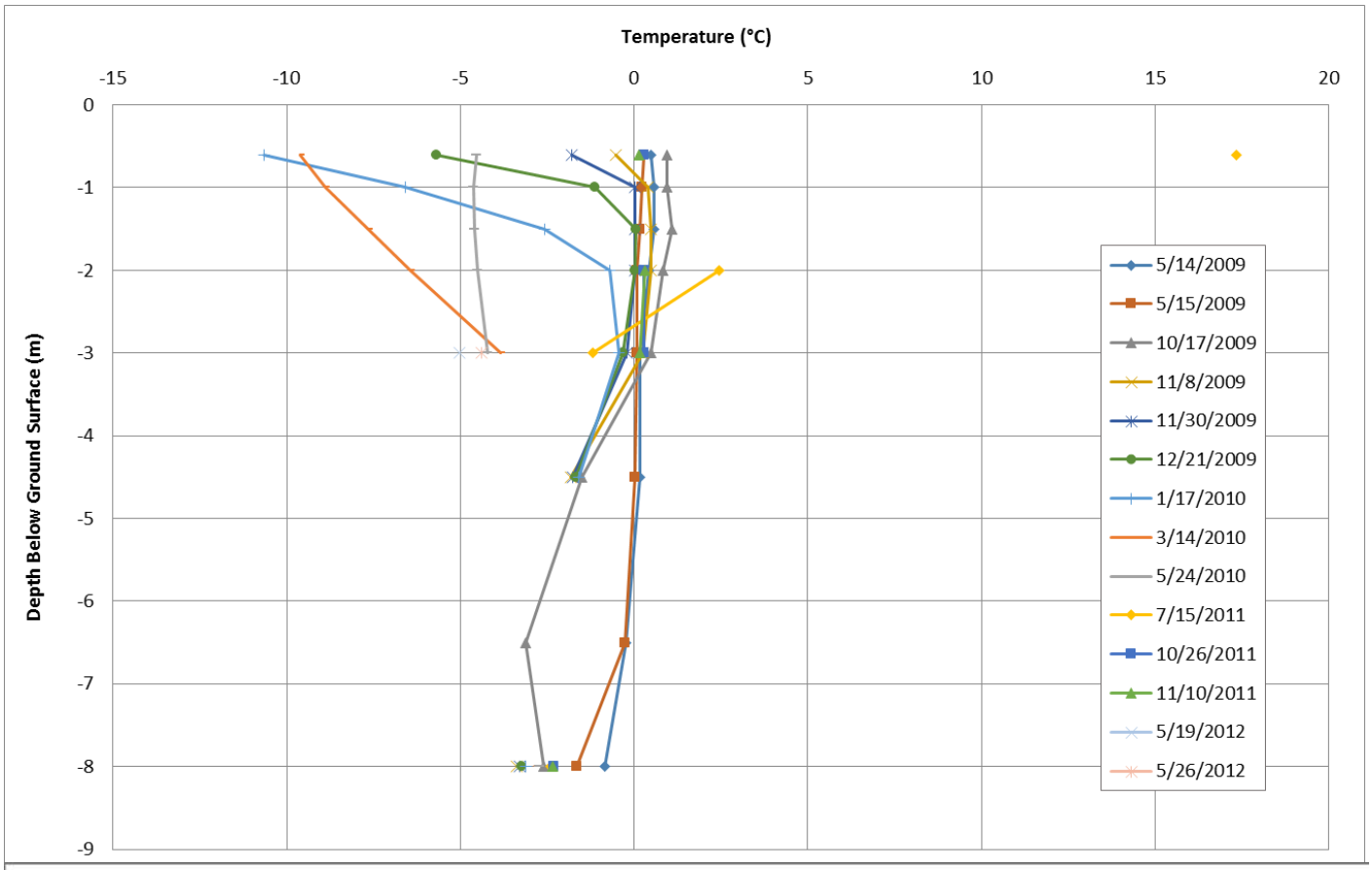
7/19/2013
8/11/2013


Node 1 @ Elev. 60.2
Node 2 @ Elev. 59.7
Node 3 @ Elev. 59.2
Node 4 @ Elev. 58.7
Node 5 @ Elev. 58.2
Node 6 @ Elev. 57.7
Node 7 @ Elev. 56.7
Node 8 @ Elev. 52.7
Node 9 @ Elev. 45.2
Node 10 @ Elev. 40.2
Monthly Ambient Temperature
Temperature (°C)
40
30
20
10
0
-10
-20
-30
-40
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
Date

GT09-02


Temperature (°C)
-15
-10
-5
0
5
10
15
20
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
Depth Below Ground Surface (m)
5/14/2009
5/15/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
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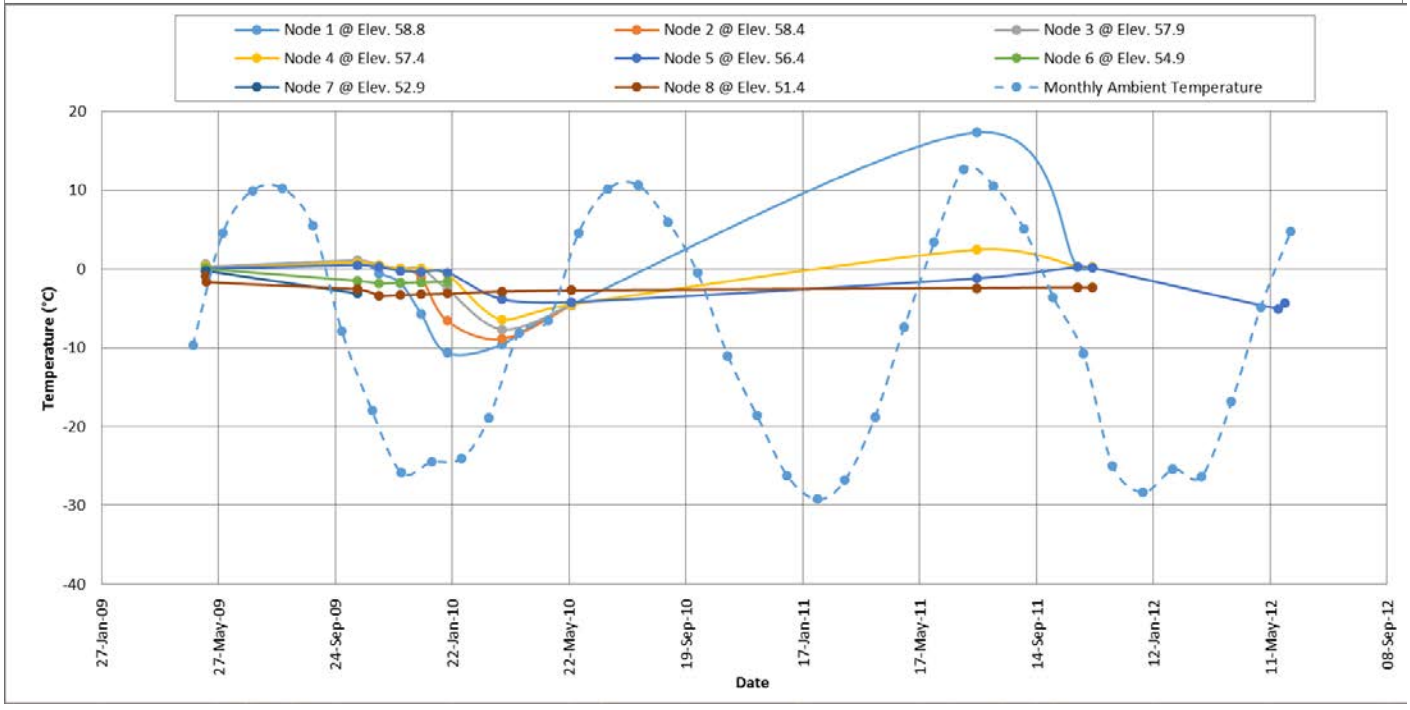
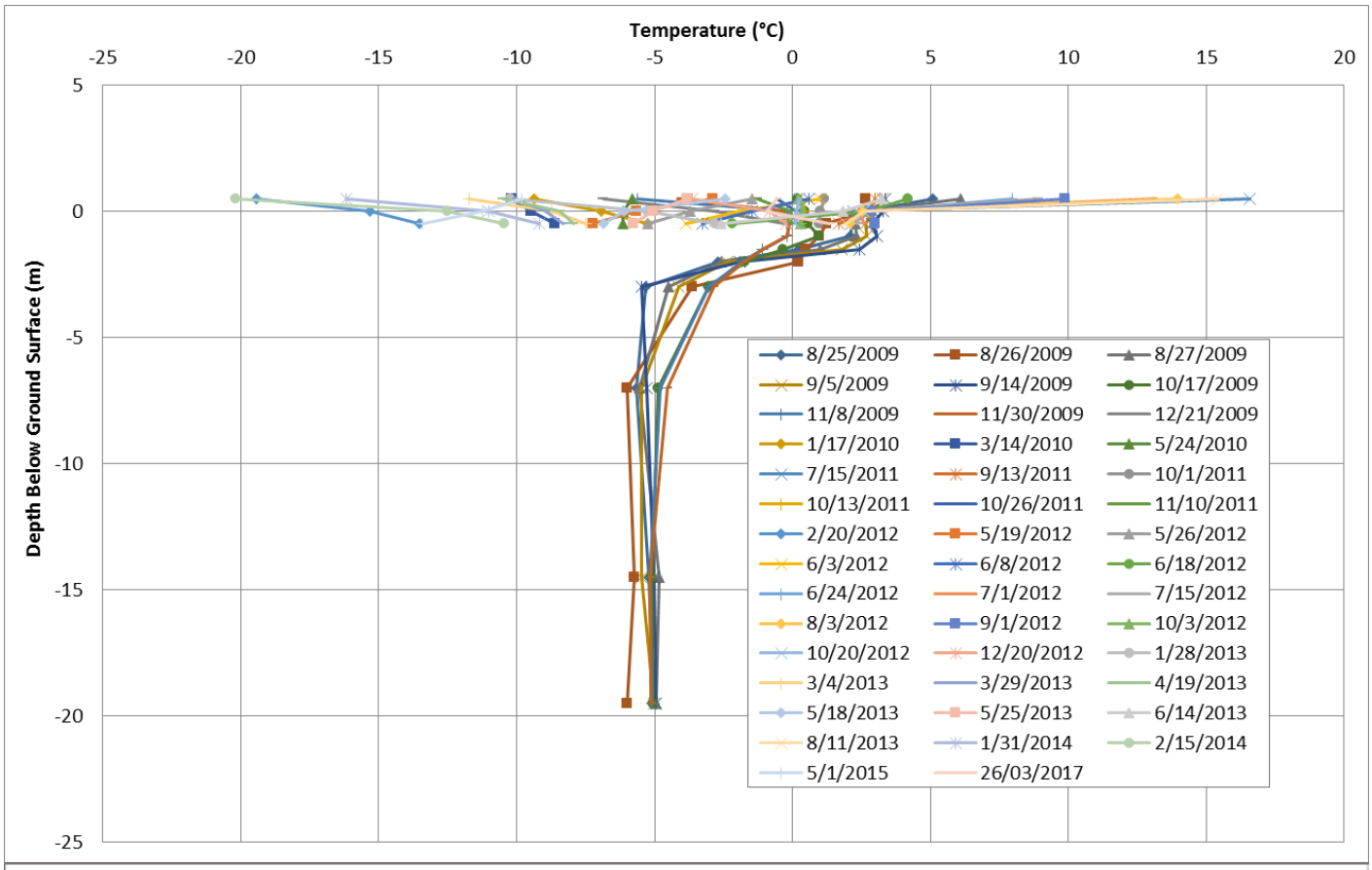
5/19/2012
5/26/2012


Node 1 @ Elev. 58.8
Node 2 @ Elev. 58.4
Node 3 @ Elev. 57.9
Node 4 @ Elev. 57.4
Node 5 @ Elev. 56.4
Node 6 @ Elev. 54.9
Node 7 @ Elev. 52.9
Node 8 @ Elev. 51.4
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
Date

GT09-04


Temperature (°C)
-25
-20
-15
-10
-5
0
5
10
15
20
Depth Below Ground Surface (m)
5
0
-5
-10
-15
-20
-25
8/25/2009
8/26/2009
8/27/2009
9/5/2009
9/14/2009
10/17/2009
11/8/2009
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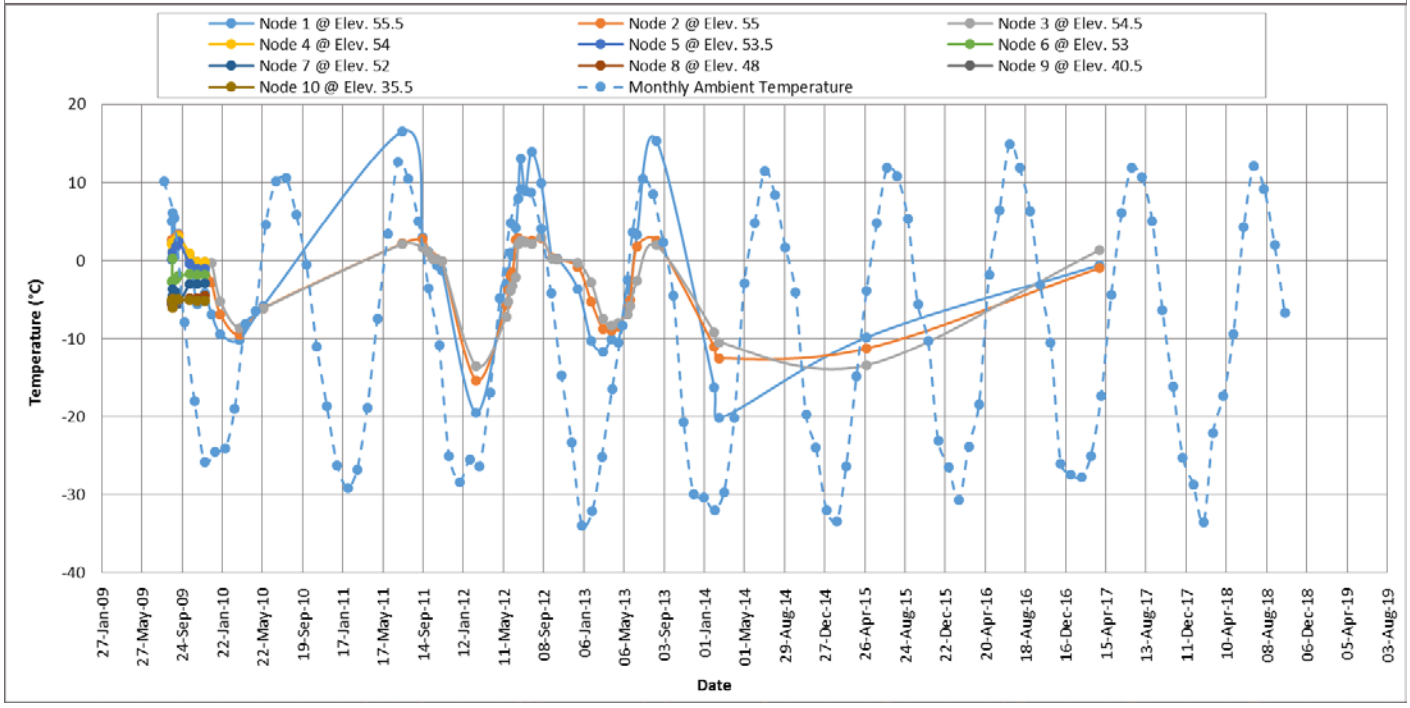
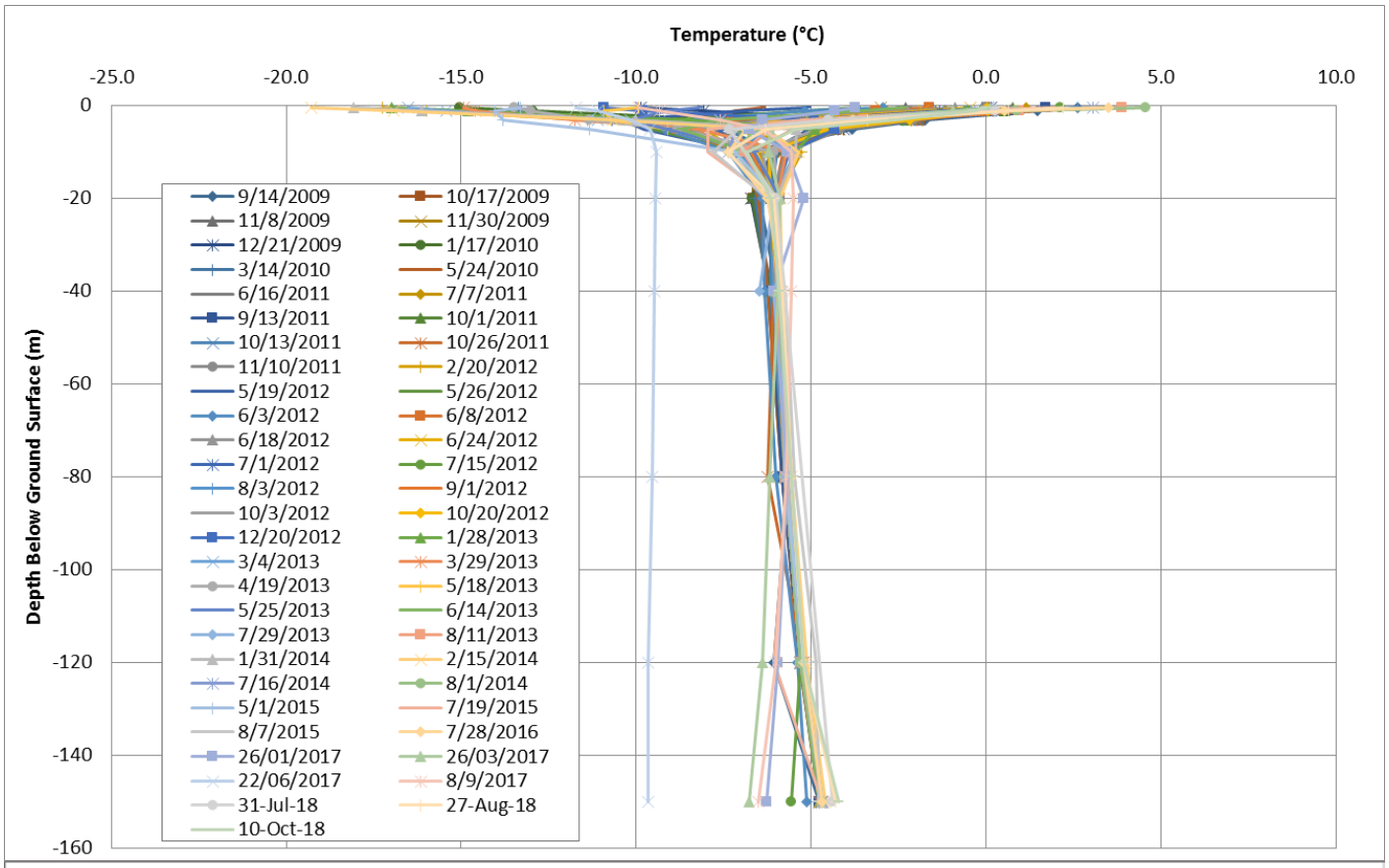
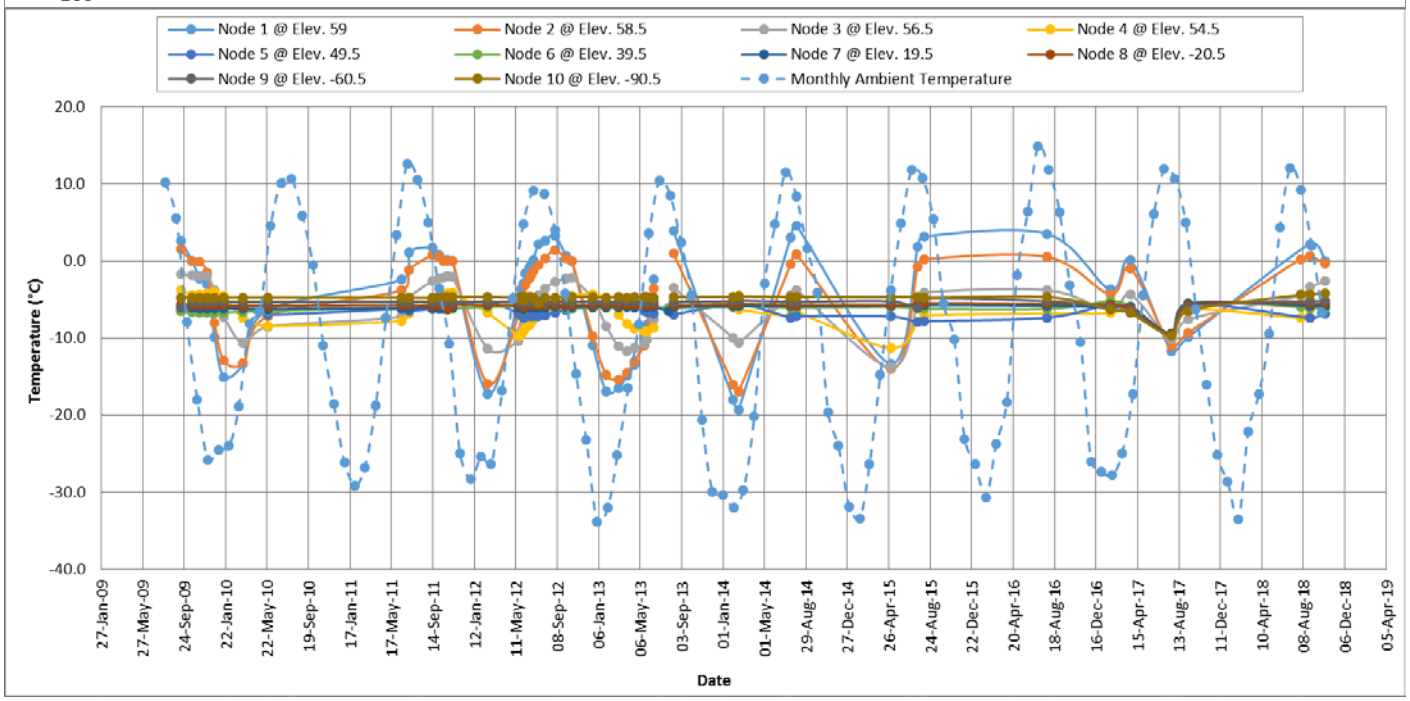
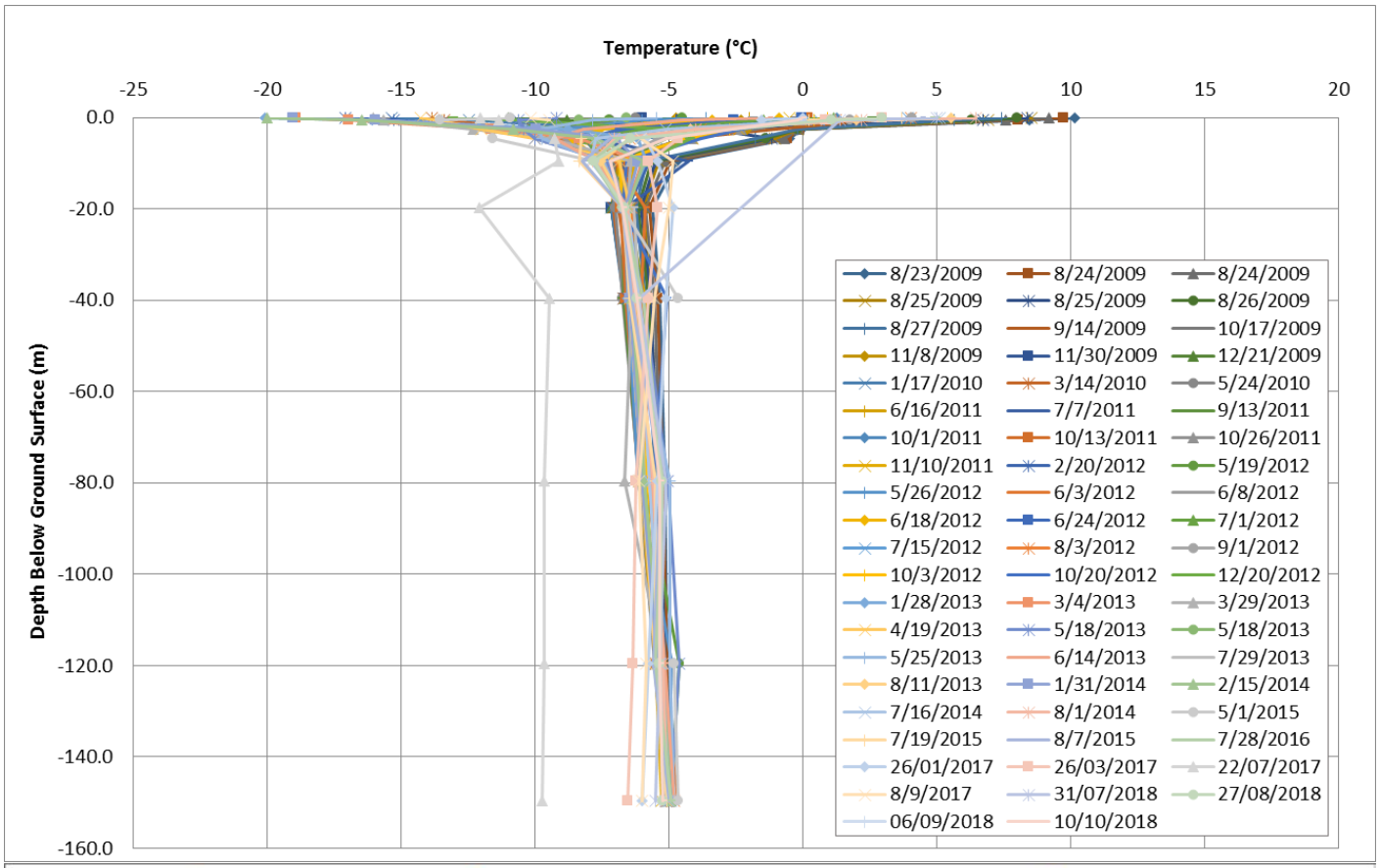

Node 1 @ Elev. 55.5
Node 2 @ Elev. 55
Node 3 @ Elev. 54.5
Node 4 @ Elev. 54
Node 5 @ Elev. 53.5
Node 6 @ Elev. 53
Node 7 @ Elev. 52
Node 8 @ Elev. 48
Node 9 @ Elev. 40.5
Node 10 @ Elev. 35.5
Monthly Ambient Temperature
Temperature (°C)
20
10
0
-10
-20
-30
-40
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
03-Aug-19
Date

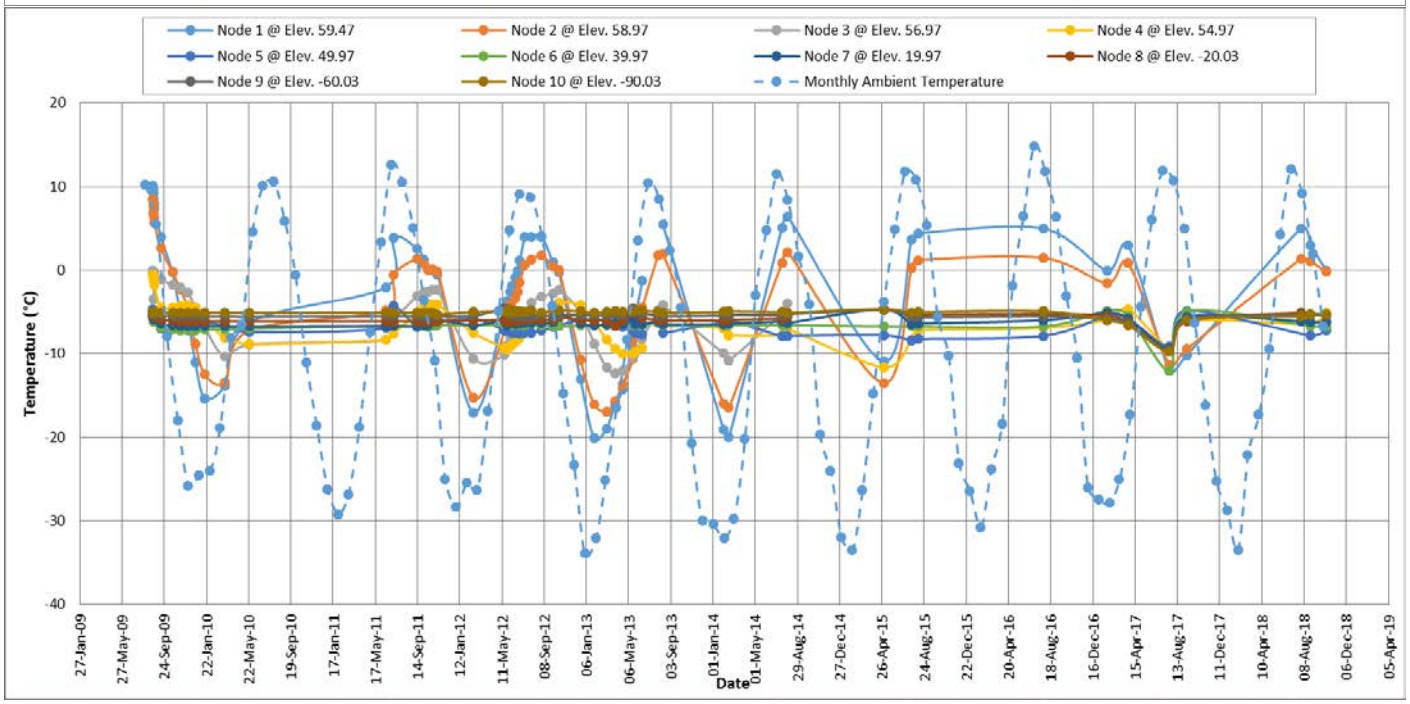
GT09-07


Temperature (°C)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
0
-20
-40
-60
-80
-100
-120
-140
-160
Depth Below Ground Surface (m)
9/14/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/13/2011
10/1/2011
10/13/2011
10/26/2011
11/10/2011
2/20/2012
5/19/2012
5/26/2012
6/3/2012
6/8/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/28/2013
3/4/2013
3/29/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/29/2013
8/11/2013
1/31/2014
2/15/2014
7/16/2014
8/1/2014
5/1/2015
7/19/2015
8/7/2015
7/28/2016
26/01/2017
26/03/2017
22/06/2017
8/9/2017
31-Jul-18
27-Aug-18
10-Oct-18

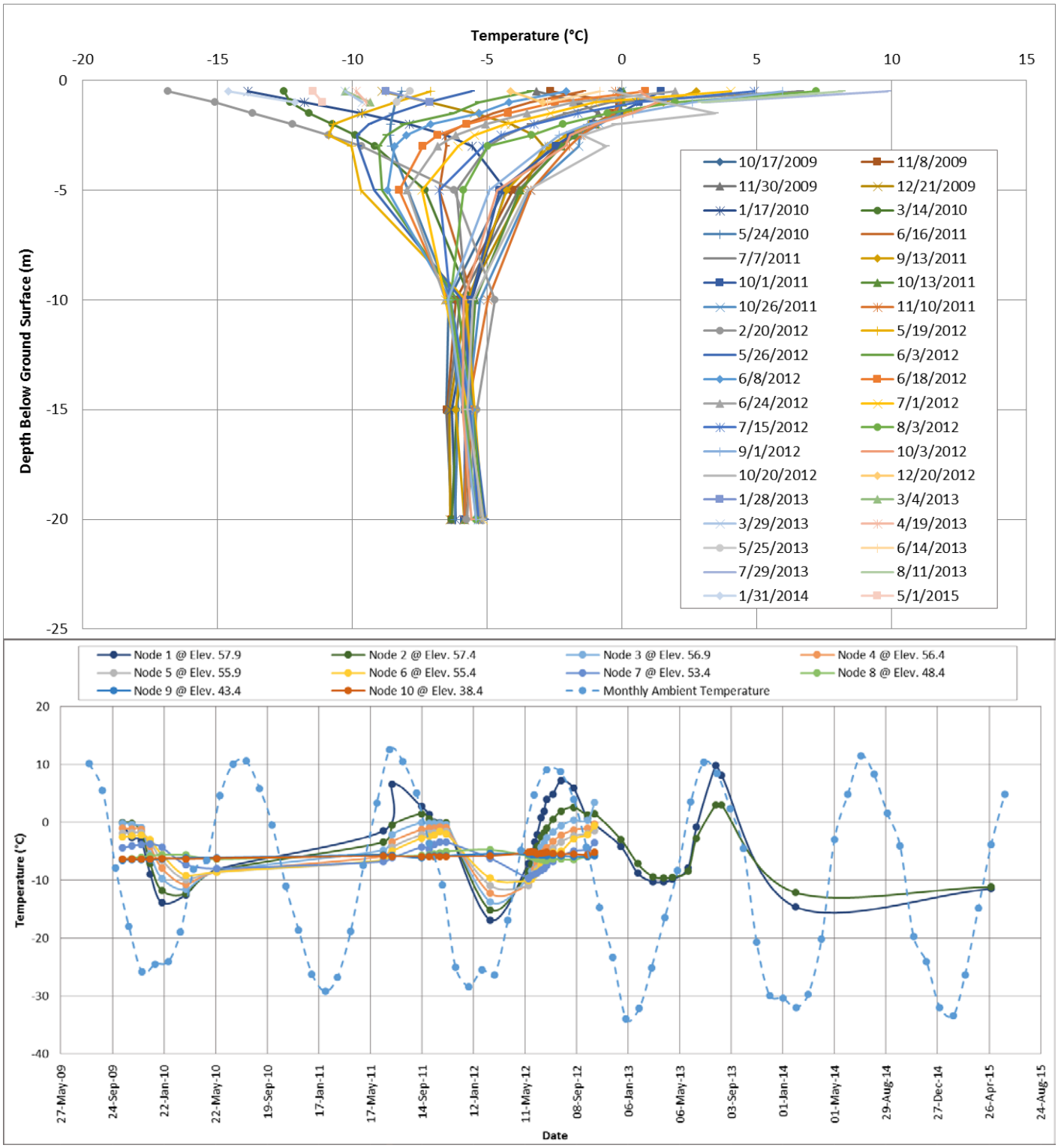

Node 1 @ Elev. 59
Node 2 @ Elev. 58.5
Node 3 @ Elev. 56.5
Node 4 @ Elev. 54.5
Node 5 @ Elev. 49.5
Node 6 @ Elev. 39.5
Node 7 @ Elev. 19.5
Node 8 @ Elev. -20.5
Node 9 @ Elev. -60.5
Node 10 @ Elev. -90.5
Monthly Ambient Temperature
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Temperature (°C)
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
Date

GT09-08

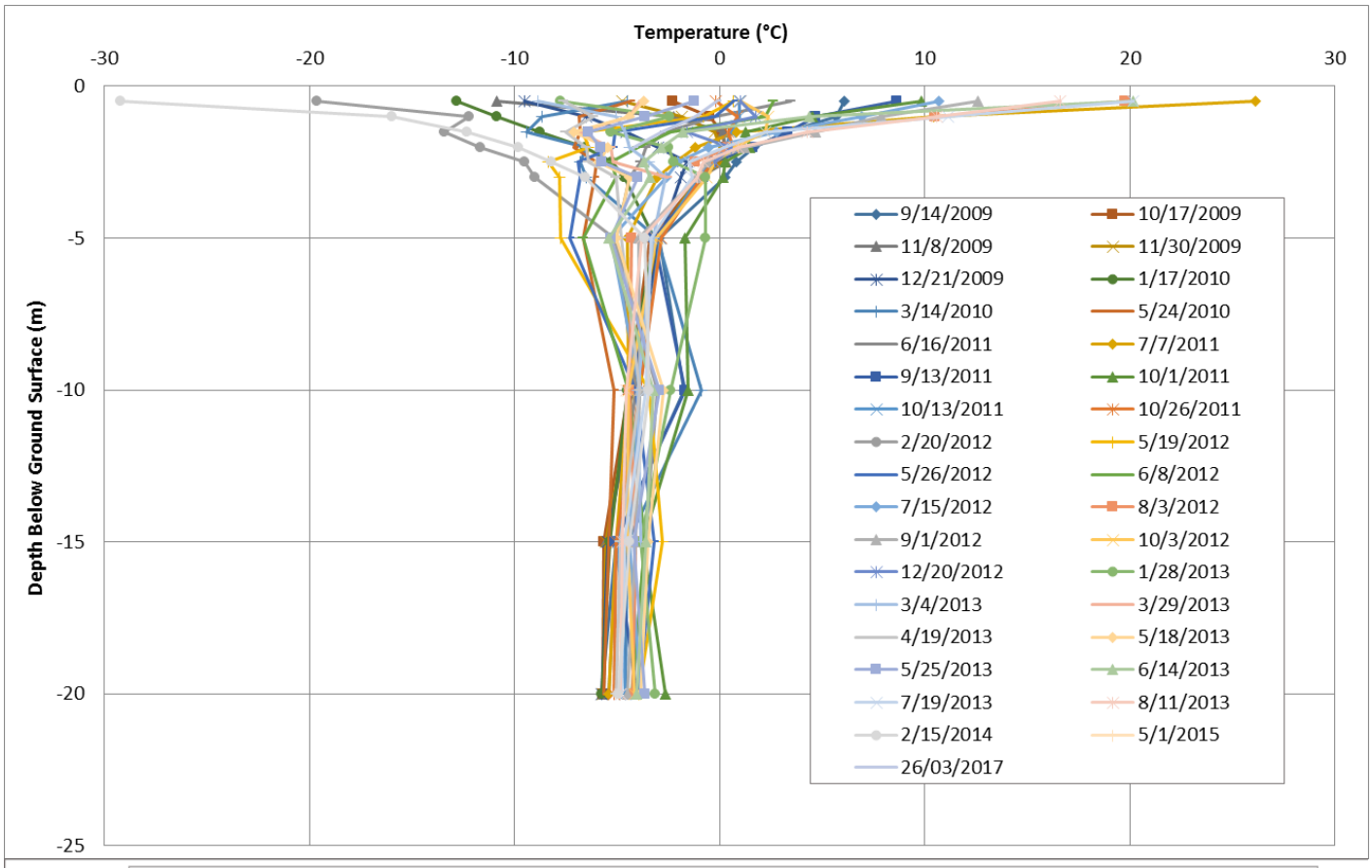

Temperature (°C)
-25
-20
-15
-10
-5
0
5
10
15
20
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
Depth Below Ground Surface (m)
8/23/2009
8/24/2009
8/24/2009
8/25/2009
8/25/2009
8/26/2009
8/27/2009
9/14/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/13/2011
10/1/2011
10/13/2011
10/26/2011
11/10/2011
2/20/2012
5/19/2012
5/26/2012
6/3/2012
6/8/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/28/2013
3/4/2013
3/29/2013
4/19/2013
5/18/2013
5/18/2013
5/25/2013
6/14/2013
7/29/2013
8/11/2013
1/31/2014
2/15/2014
7/16/2014
8/1/2014
5/1/2015
7/19/2015
8/7/2015
7/28/2016
26/01/2017
26/03/2017
22/07/2017
8/9/2017
31/07/2018
27/08/2018
06/09/2018
10/10/2018

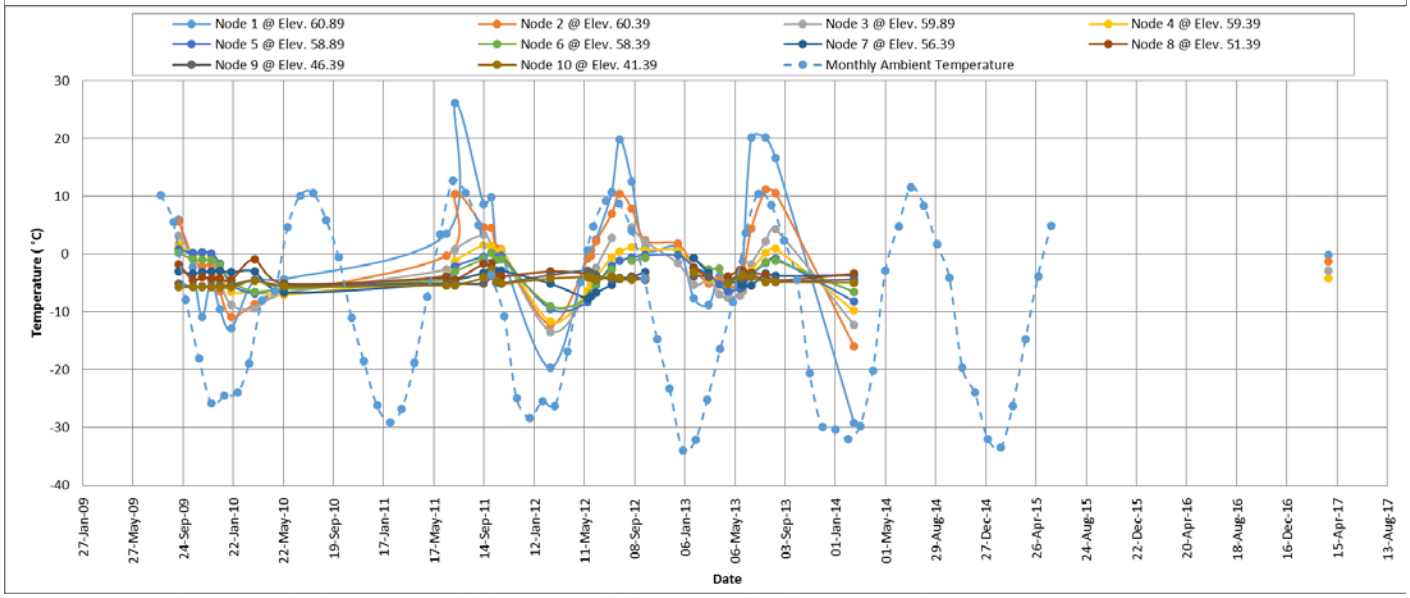

Node 1 @ Elev. 59.47
Node 2 @ Elev. 58.97
Node 3 @ Elev. 56.97
Node 4 @ Elev. 54.97
Node 5 @ Elev. 49.97
Node 6 @ Elev. 39.97
Node 7 @ Elev. 19.97
Node 8 @ Elev. -20.03
Node 9 @ Elev. -60.03
Node 10 @ Elev. -90.03
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
Date

GT09-10

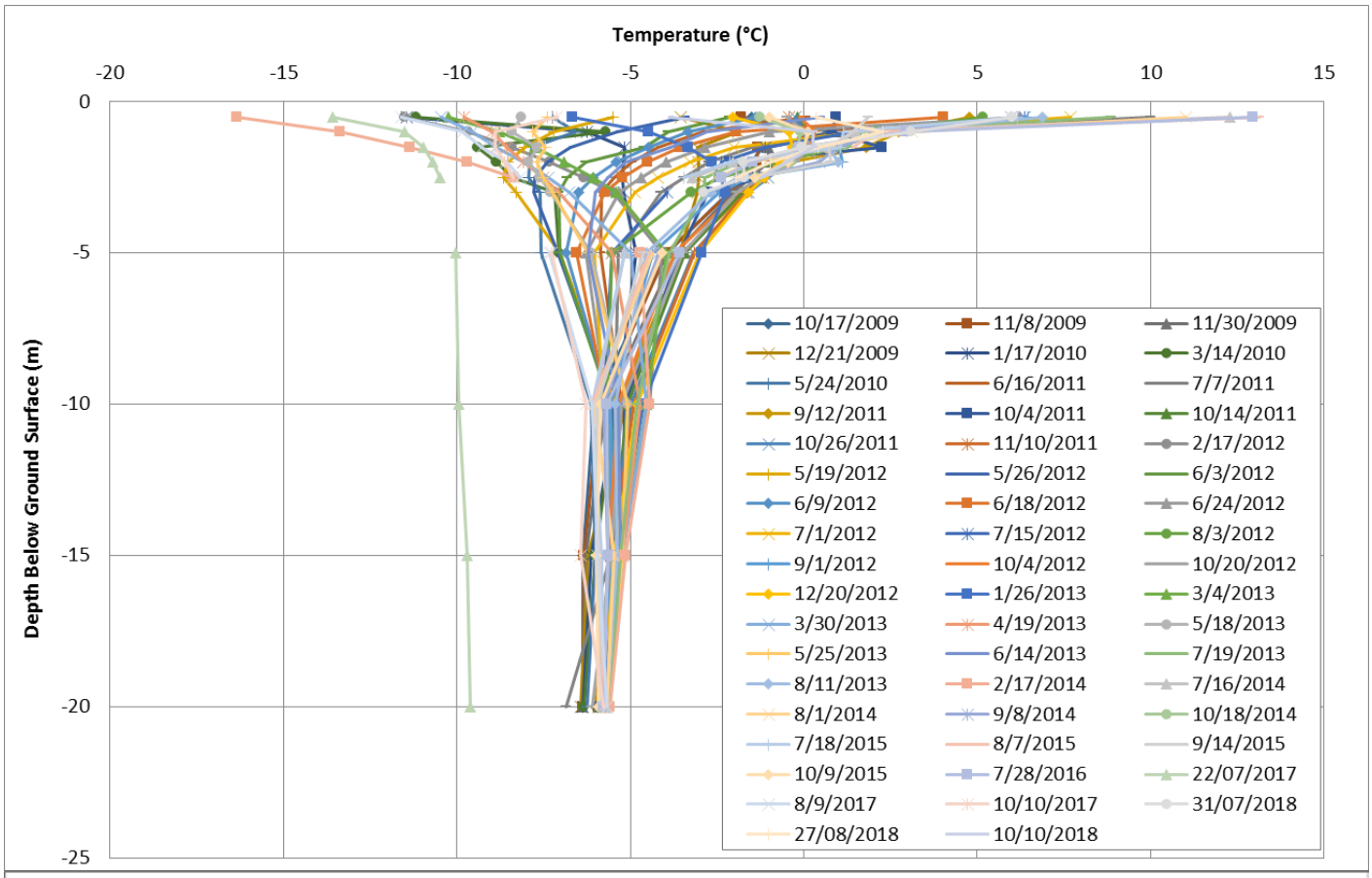

Temperature (°C)
-20
-15
-10
-5
0
5
10
15
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/13/2011
10/1/2011
10/13/2011
10/26/2011
11/10/2011
2/20/2012
5/19/2012
5/26/2012
6/3/2012
6/8/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/28/2013
3/4/2013
3/29/2013
4/19/2013
5/25/2013
6/14/2013
7/29/2013
8/11/2013
1/31/2014
5/1/2015
Node 1 @ Elev. 57.9
Node 2 @ Elev. 57.4
Node 3 @ Elev. 56.9
Node 4 @ Elev. 56.4
Node 5 @ Elev. 55.9
Node 6 @ Elev. 55.4
Node 7 @ Elev. 53.4
Node 8 @ Elev. 48.4
Node 9 @ Elev. 43.4
Node 10 @ Elev. 38.4
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
Date

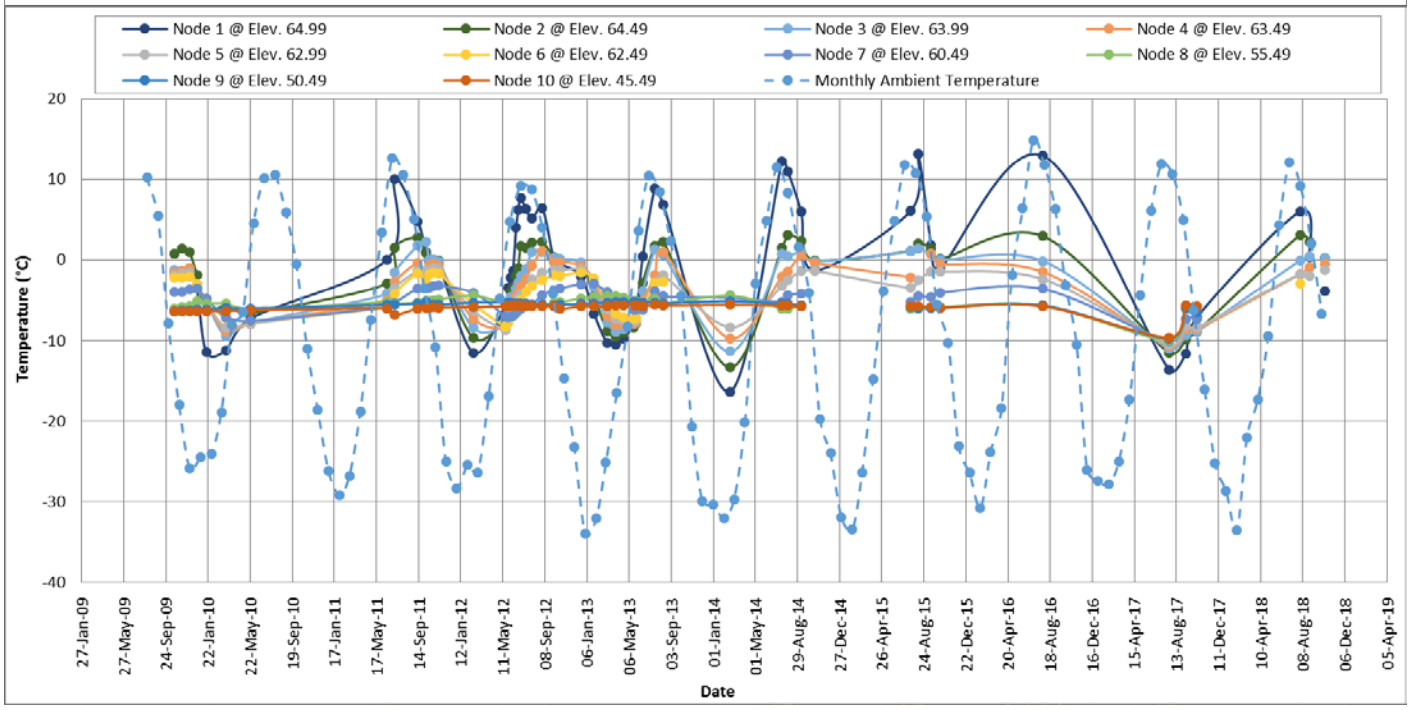
GT09-12


Temperature (°C)
-30
-20
-10
0
10
20
30
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
9/14/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/13/2011
10/1/2011
10/13/2011
10/26/2011
2/20/2012
5/19/2012
5/26/2012
6/8/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
12/20/2012
1/28/2013
3/4/2013
3/29/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
2/15/2014
5/1/2015
26/03/2017

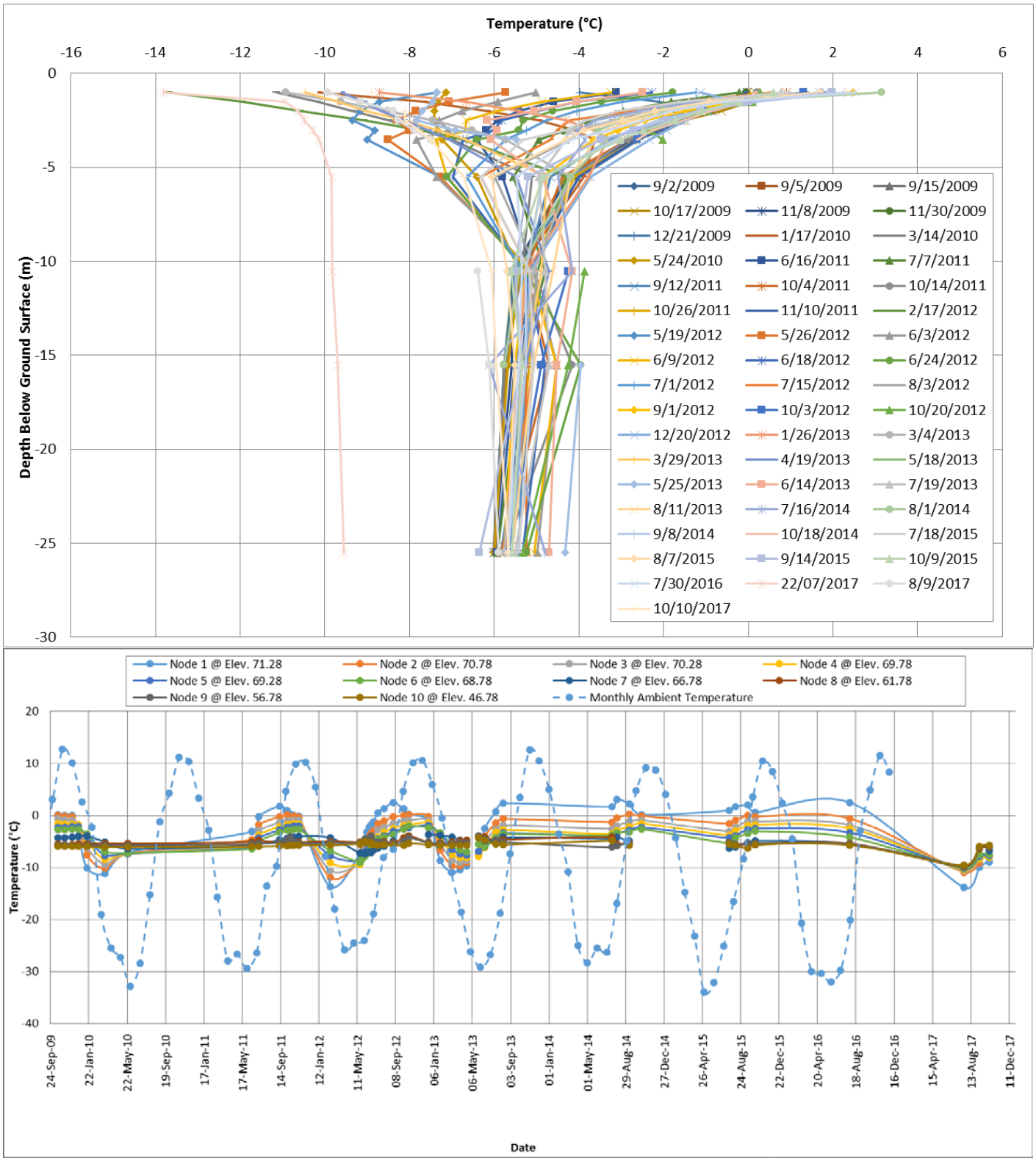

Node 1 @ Elev. 60.89
Node 2 @ Elev. 60.39
Node 3 @ Elev. 59.89
Node 4 @ Elev. 59.39
Node 5 @ Elev. 58.89
Node 6 @ Elev. 58.39
Node 7 @ Elev. 56.39
Node 8 @ Elev. 51.39
Node 9 @ Elev. 46.39
Node 10 @ Elev. 41.39
Monthly Ambient Temperature
Temperature (°C)
30
20
10
0
-10
-20
-30
-40
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
Date

GT09-13

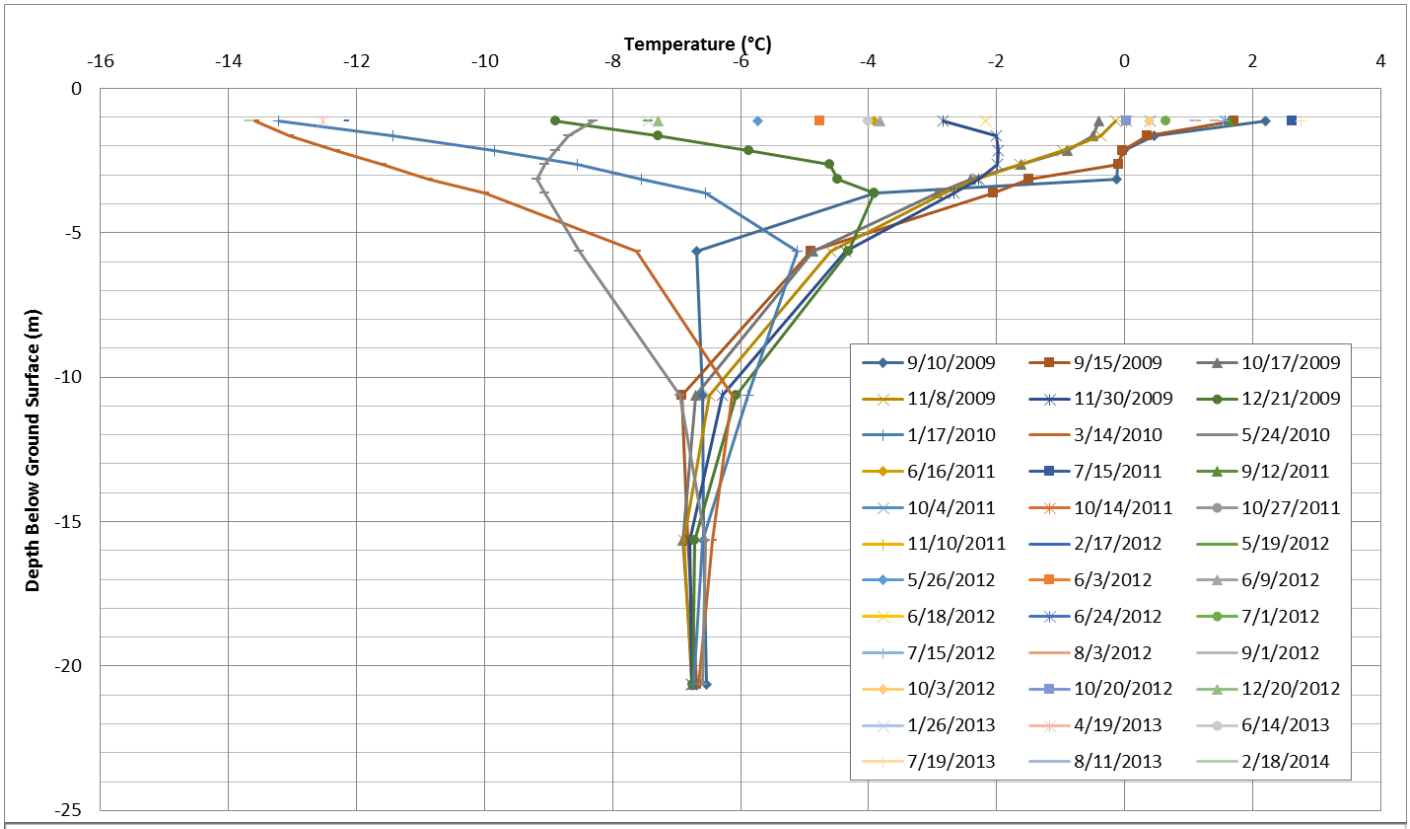

Temperature (°C)
-20
-15
-10
-5
0
5
10
15
0
-5
-10
-15
-20
-25
Depth Below Ground Surface (m)
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/12/2011
10/4/2011
10/14/2011
10/26/2011
11/10/2011
2/17/2012
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/4/2012
10/20/2012
12/20/2012
1/26/2013
3/4/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
2/17/2014
7/16/2014
8/1/2014
9/8/2014
10/18/2014
7/18/2015
8/7/2015
9/14/2015
10/9/2015
7/28/2016
22/07/2017
8/9/2017
10/10/2017
31/07/2018
27/08/2018
10/10/2018


Node 1 @ Elev. 64.99
Node 2 @ Elev. 64.49
Node 3 @ Elev. 63.99
Node 4 @ Elev. 63.49
Node 5 @ Elev. 62.99
Node 6 @ Elev. 62.49
Node 7 @ Elev. 60.49
Node 8 @ Elev. 55.49
Node 9 @ Elev. 50.49
Node 10 @ Elev. 45.49
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
Date

GT09-14


Temperature (°C)
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
0
-5
-10
-15
-20
-25
-30
Depth Below Ground Surface (m)
9/2/2009
9/5/2009
9/15/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/12/2011
10/4/2011
10/14/2011
10/26/2011
11/10/2011
2/17/2012
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/26/2013
3/4/2013
3/29/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
7/16/2014
8/1/2014
9/8/2014
10/18/2014
7/18/2015
8/7/2015
9/14/2015
10/9/2015
7/30/2016
22/07/2017
8/9/2017
10/10/2017
Node 1 @ Elev. 71.28
Node 2 @ Elev. 70.78
Node 3 @ Elev. 70.28
Node 4 @ Elev. 69.78
Node 5 @ Elev. 69.28
Node 6 @ Elev. 68.78
Node 7 @ Elev. 66.78
Node 8 @ Elev. 61.78
Node 9 @ Elev. 56.78
Node 10 @ Elev. 46.78
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
Date

GT09-16


Temperature (°C)
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
9/10/2009
9/15/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/15/2011
9/12/2011
10/4/2011
10/14/2011
10/27/2011
11/10/2011
2/17/2012
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
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12/20/2012
1/26/2013
4/19/2013
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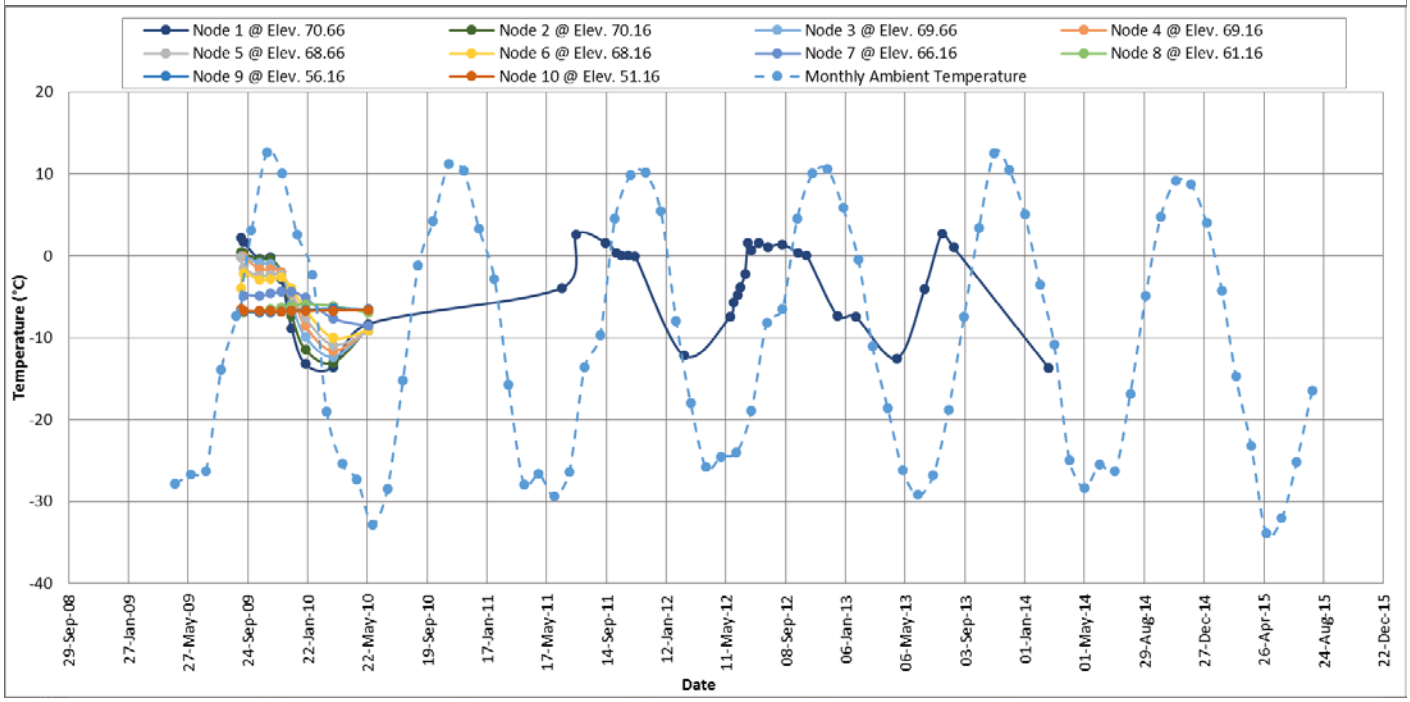
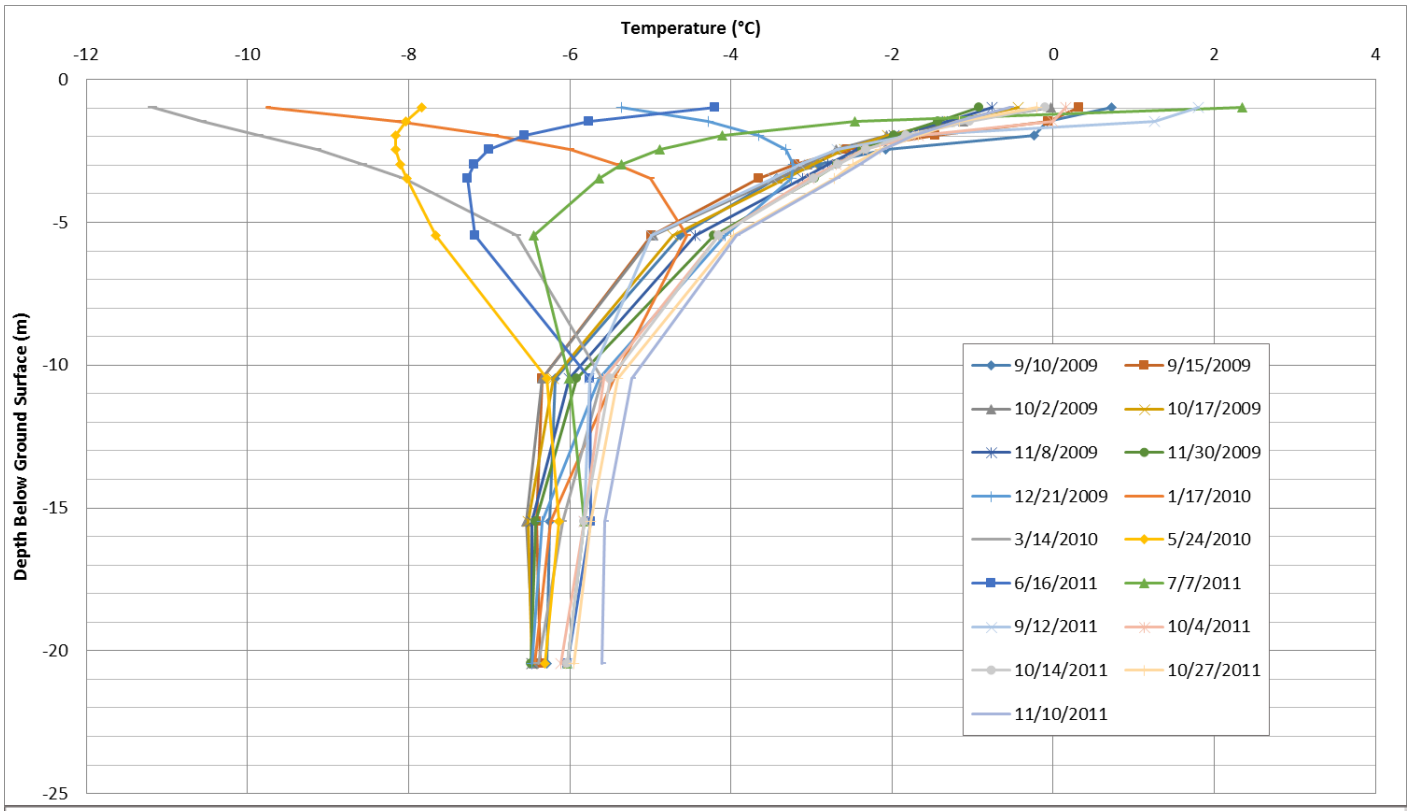
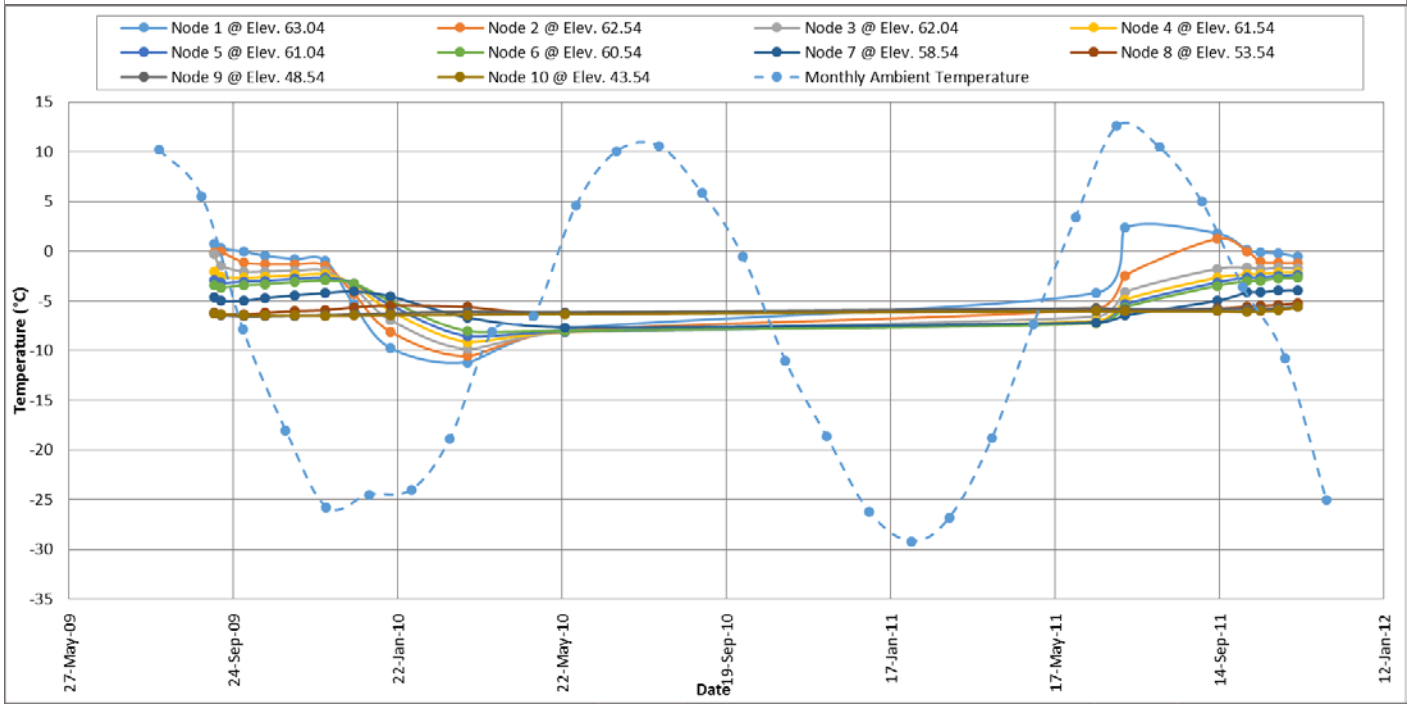
7/19/2013
8/11/2013
2/18/2014

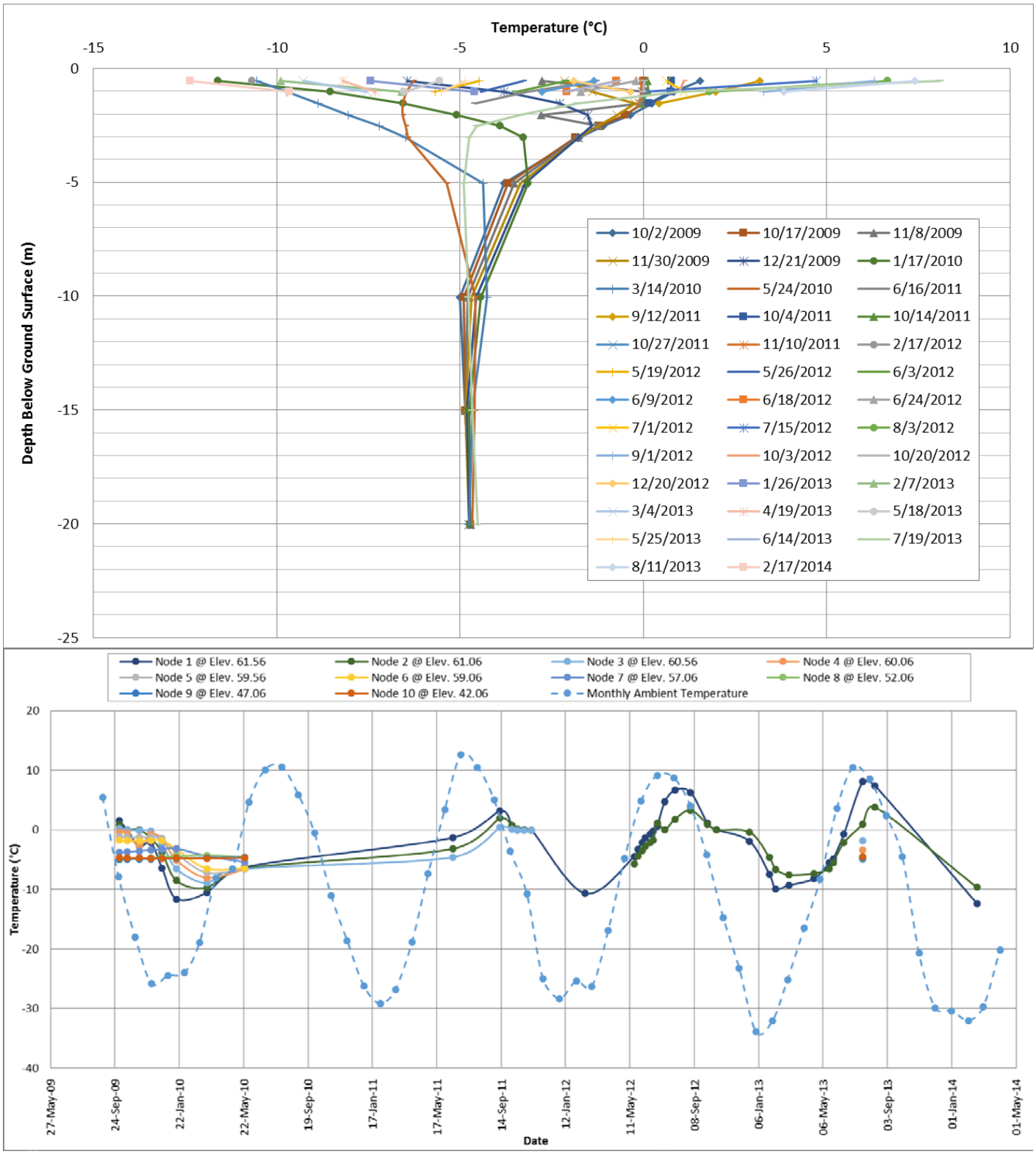

Node 1 @ Elev. 70.66
Node 2 @ Elev. 70.16
Node 3 @ Elev. 69.66
Node 4 @ Elev. 69.16
Node 5 @ Elev. 68.66
Node 6 @ Elev. 68.16
Node 7 @ Elev. 66.16
Node 8 @ Elev. 61.16
Node 9 @ Elev. 56.16
Node 10 @ Elev. 51.16
Monthly Ambient Temperature
Temperature (°C)
20
10
0
-10
-20
-30
-40
29-Sep-08
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
Date

GT09-17

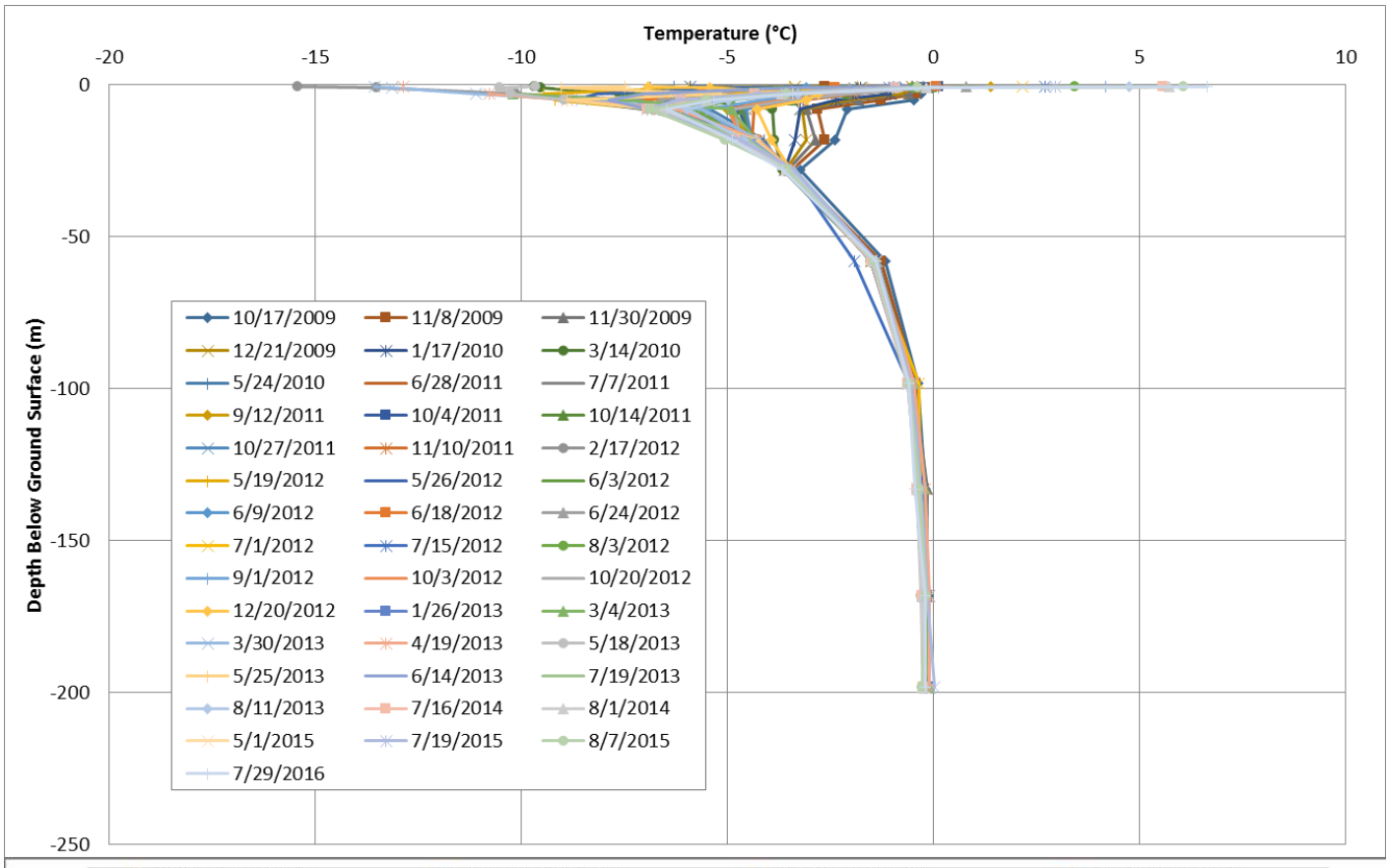

Temperature (°C)
-12
-10
-8
-6
-4
-2
0
2
4
0
-5
-10
-15
-20
-25
Depth Below Ground Surface (m)
9/10/2009
9/15/2009
10/2/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/12/2011
10/4/2011
10/14/2011
10/27/2011
11/10/2011

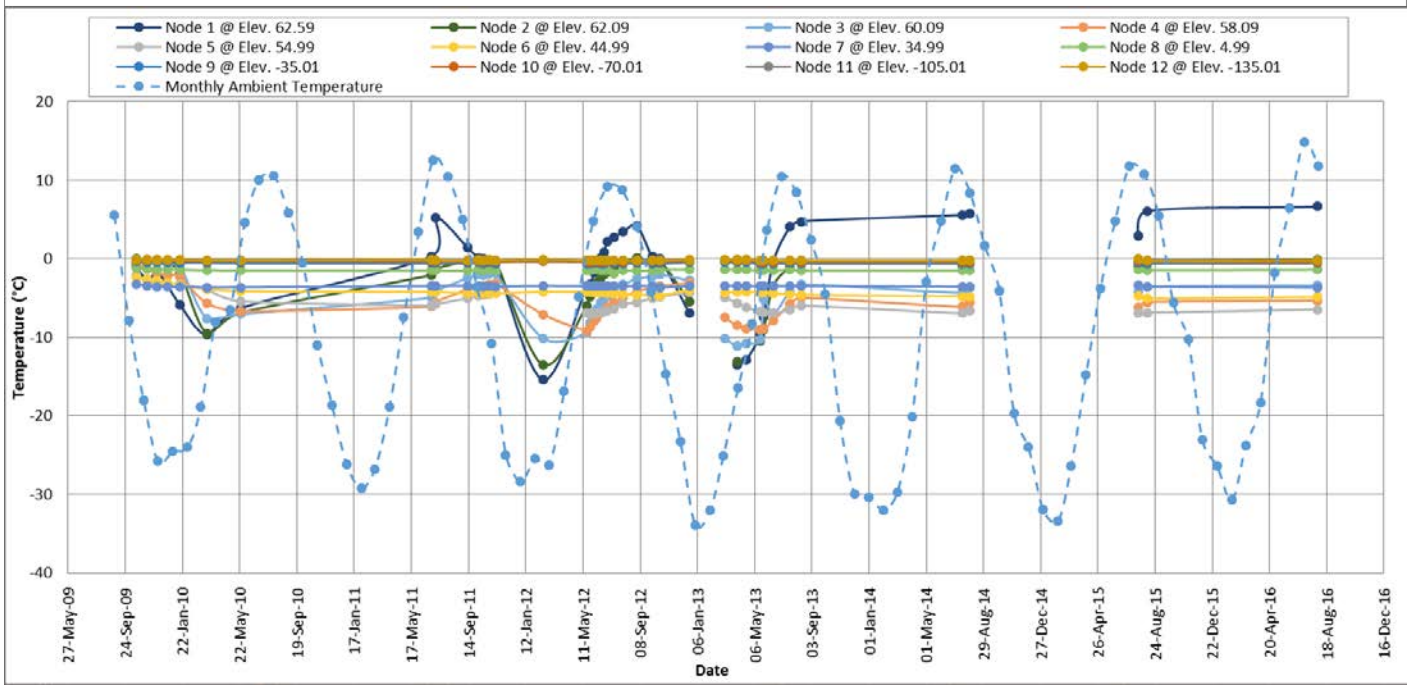

Node 1 @ Elev. 63.04
Node 2 @ Elev. 62.54
Node 3 @ Elev. 62.04
Node 4 @ Elev. 61.54
Node 5 @ Elev. 61.04
Node 6 @ Elev. 60.54
Node 7 @ Elev. 58.54
Node 8 @ Elev. 53.54
Node 9 @ Elev. 48.54
Node 10 @ Elev. 43.54
Monthly Ambient Temperature
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
Temperature (°C)
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
Date

GT09-18

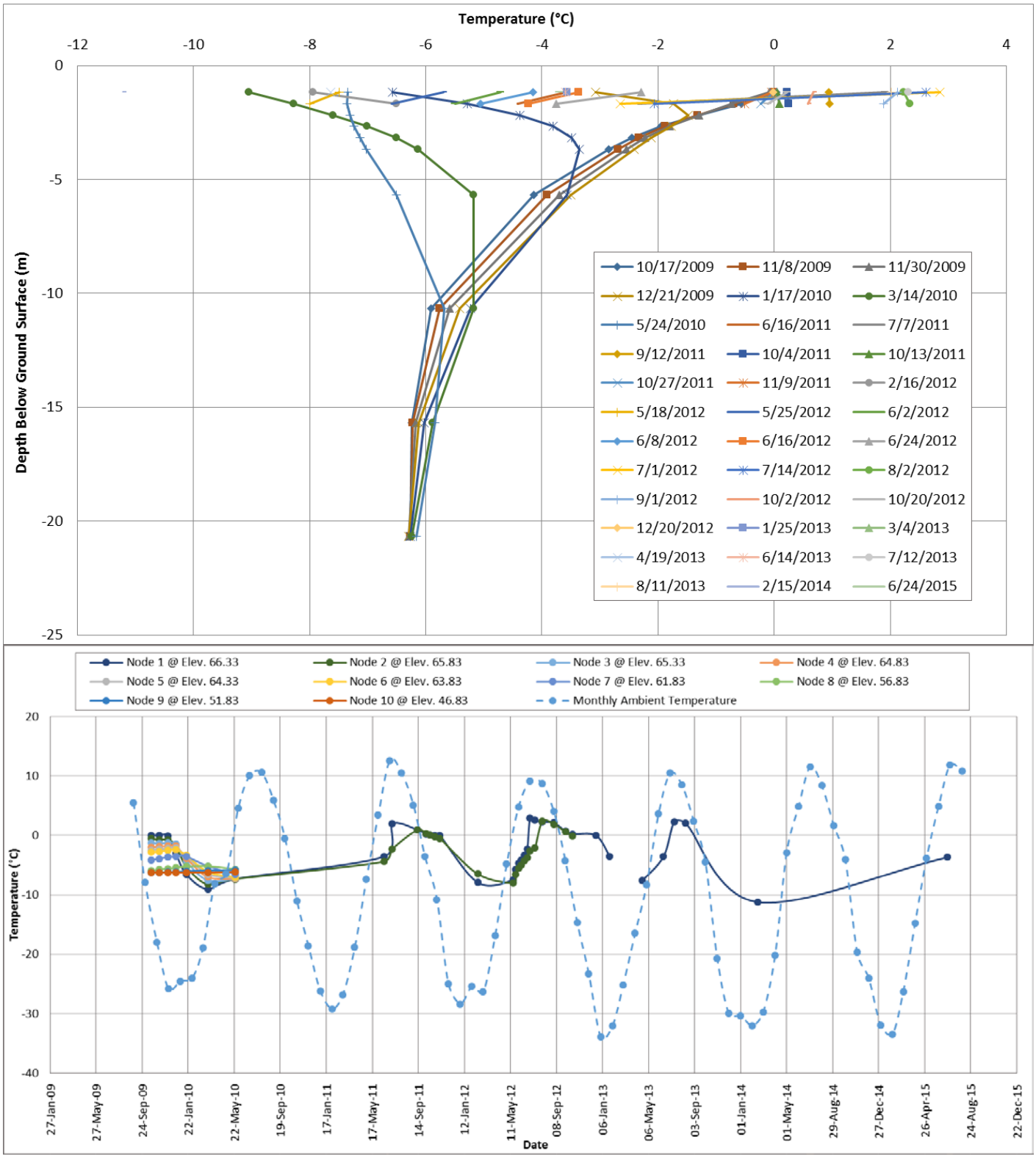

Temperature (°C)
-15
-10
-5
0
5
10
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
10/2/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
9/12/2011
10/4/2011
10/14/2011
10/27/2011
11/10/2011
2/17/2012
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/26/2013
2/7/2013
3/4/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
2/17/2014
Node 1 @ Elev. 61.56
Node 2 @ Elev. 61.06
Node 3 @ Elev. 60.56
Node 4 @ Elev. 60.06
Node 5 @ Elev. 59.56
Node 6 @ Elev. 59.06
Node 7 @ Elev. 57.06
Node 8 @ Elev. 52.06
Node 9 @ Elev. 47.06
Node 10 @ Elev. 42.06
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
Date

GT09-19

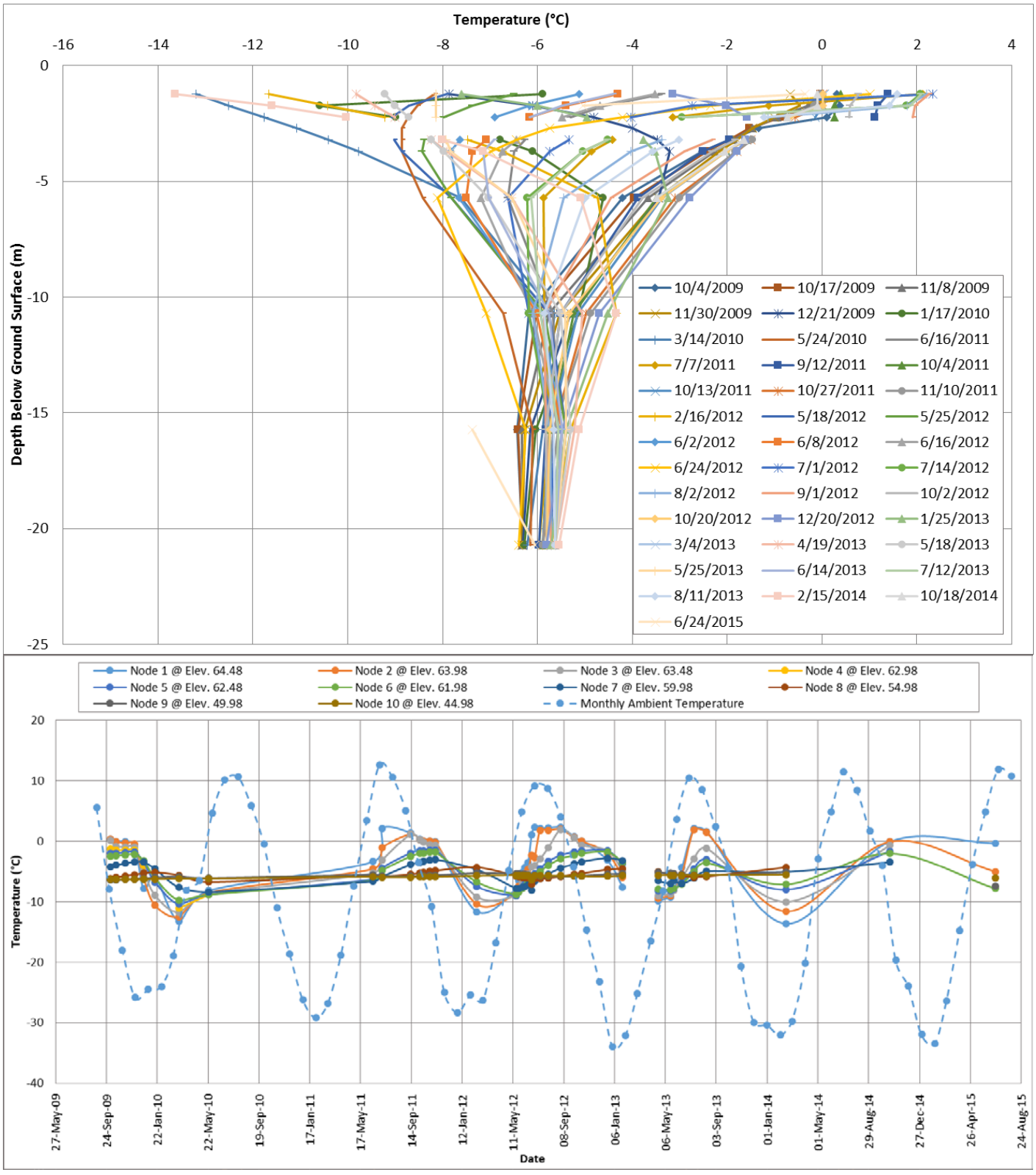

Temperature (°C)
-20
-15
-10
-5
0
5
10
0
-50
-100
-150
-200
-250
Depth Below Ground Surface (m)
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/28/2011
7/7/2011
9/12/2011
10/4/2011
10/14/2011
10/27/2011
11/10/2011
2/17/2012
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/26/2013
3/4/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
7/16/2014
8/1/2014
5/1/2015
7/19/2015
8/7/2015
7/29/2016


Node 1 @ Elev. 62.59
Node 2 @ Elev. 62.09
Node 3 @ Elev. 60.09
Node 4 @ Elev. 58.09
Node 5 @ Elev. 54.99
Node 6 @ Elev. 44.99
Node 7 @ Elev. 34.99
Node 8 @ Elev. 4.99
Node 9 @ Elev. -35.01
Node 10 @ Elev. -70.01
Node 11 @ Elev. -105.01
Node 12 @ Elev. -135.01
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
Date

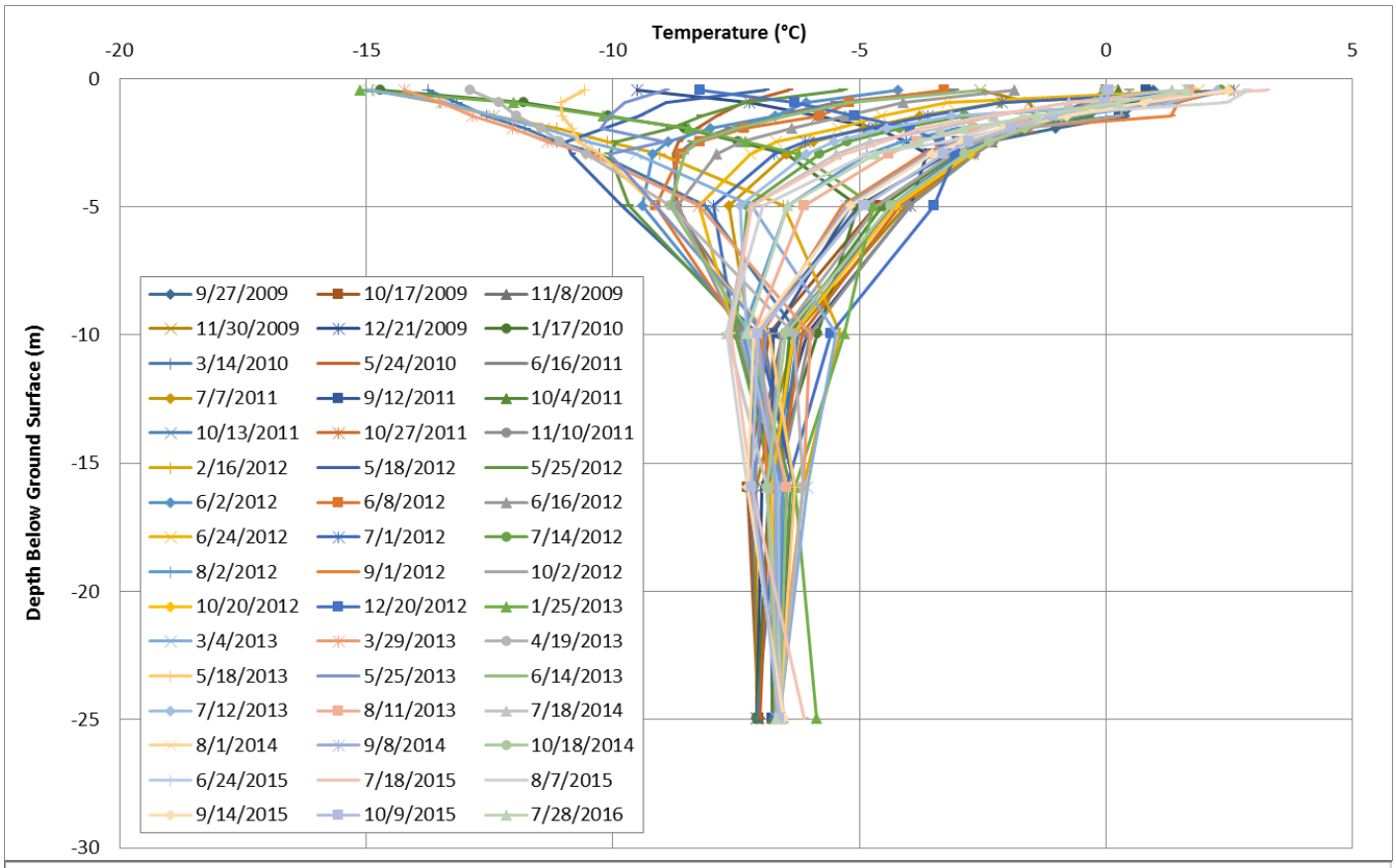
GT09-20

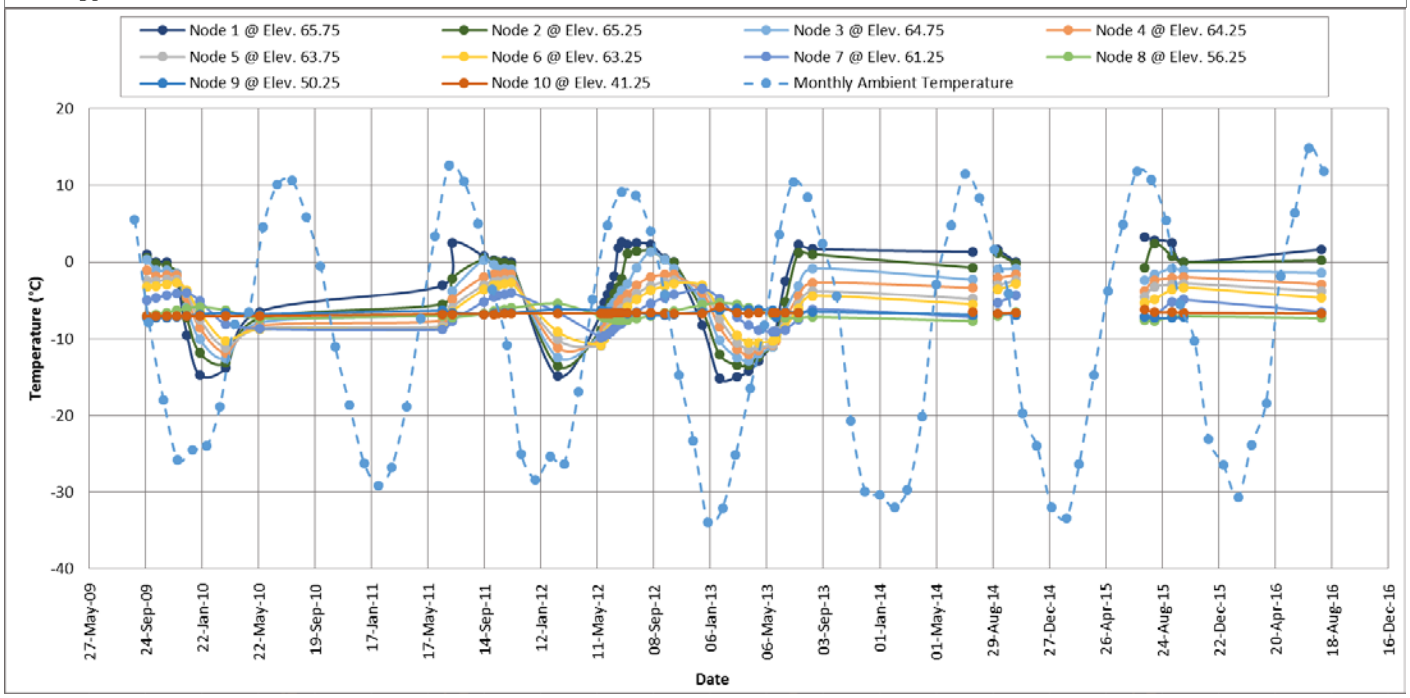

Temperature (°C)
-12
-10
-8
-6
-4
-2
0
2
4
0
-5
-10
-15
-20
-25
Depth Below Ground Surface (m)
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/12/2011
10/4/2011
10/13/2011
10/27/2011
11/9/2011
2/16/2012
5/18/2012
5/25/2012
6/2/2012
6/8/2012
6/16/2012
6/24/2012
7/1/2012
7/14/2012
8/2/2012
9/1/2012
10/2/2012
10/20/2012
12/20/2012
1/25/2013
3/4/2013
4/19/2013
6/14/2013
7/12/2013
8/11/2013
2/15/2014
6/24/2015
Node 1 @ Elev. 66.33
Node 2 @ Elev. 65.83
Node 3 @ Elev. 65.33
Node 4 @ Elev. 64.83
Node 5 @ Elev. 64.33
Node 6 @ Elev. 63.83
Node 7 @ Elev. 61.83
Node 8 @ Elev. 56.83
Node 9 @ Elev. 51.83
Node 10 @ Elev. 46.83
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
27-Jan-09
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
Date

GT09-21

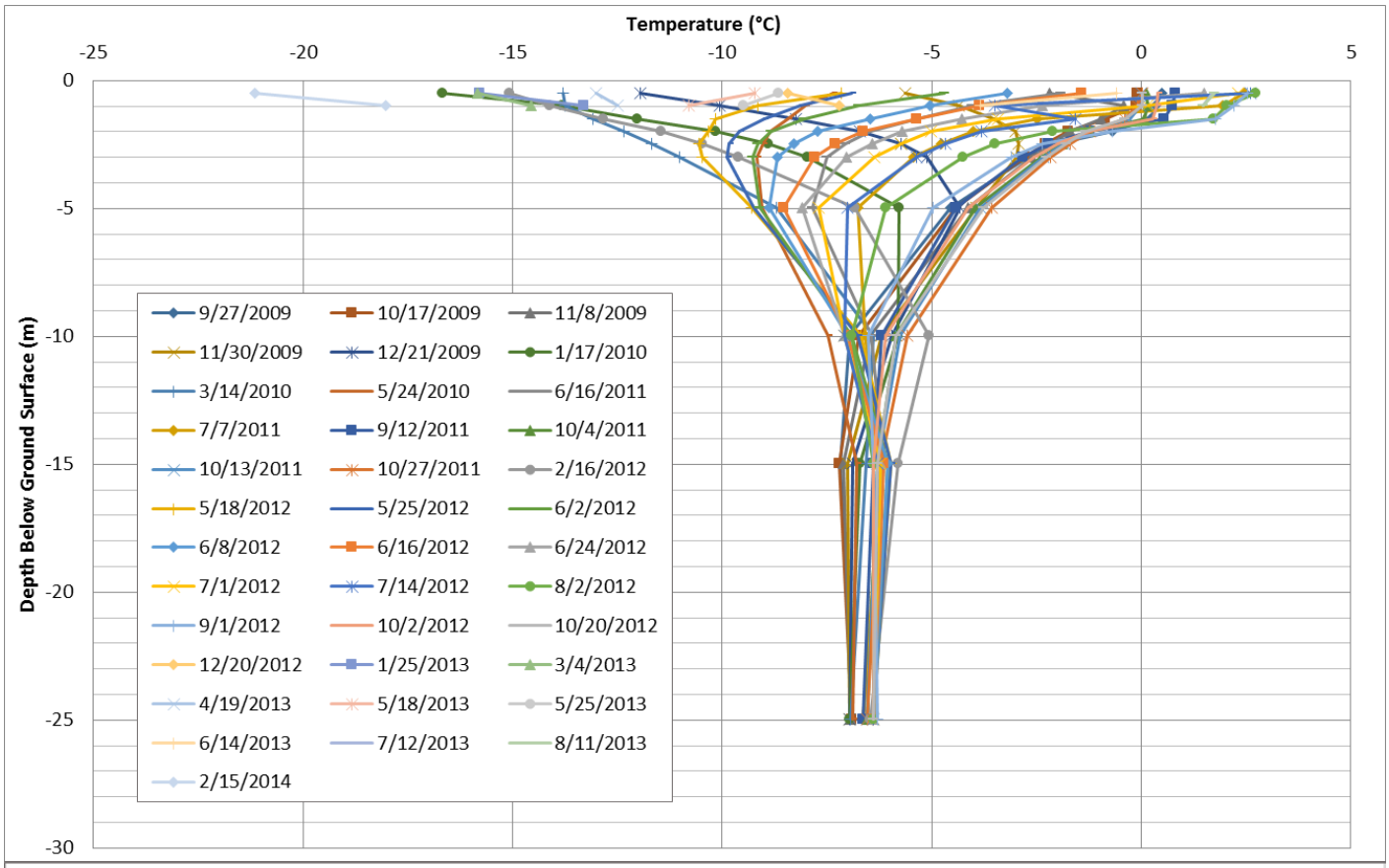

Temperature (°C)
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
10/4/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/12/2011
10/4/2011
10/13/2011
10/27/2011
11/10/2011
2/16/2012
5/18/2012
5/25/2012
6/2/2012
6/8/2012
6/16/2012
6/24/2012
7/1/2012
7/14/2012
8/2/2012
9/1/2012
10/2/2012
10/20/2012
12/20/2012
1/25/2013
3/4/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/12/2013
8/11/2013
2/15/2014
10/18/2014
6/24/2015
Node 1 @ Elev. 64.48
Node 2 @ Elev. 63.98
Node 3 @ Elev. 63.48
Node 4 @ Elev. 62.98
Node 5 @ Elev. 62.48
Node 6 @ Elev. 61.98
Node 7 @ Elev. 59.98
Node 8 @ Elev. 54.98
Node 9 @ Elev. 49.98
Node 10 @ Elev. 44.98
Monthly Ambient Temperature
Temperature (°C)
20
10
0
-10
-20
-30
-40
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
Date

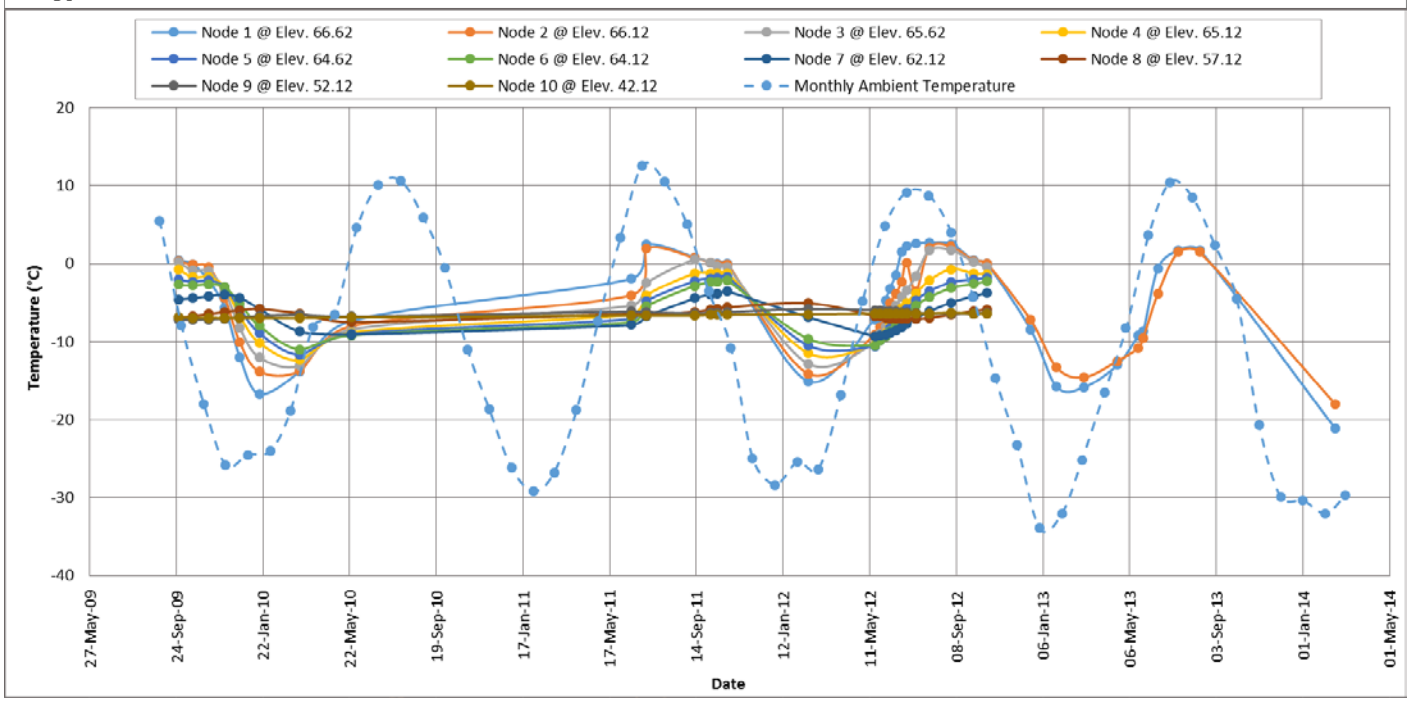
GT09-22


Temperature (°C)
-20
-15
-10
-5
0
5
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
-30
9/27/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/12/2011
10/4/2011
10/13/2011
10/27/2011
11/10/2011
2/16/2012
5/18/2012
5/25/2012
6/2/2012
6/8/2012
6/16/2012
6/24/2012
7/1/2012
7/14/2012
8/2/2012
9/1/2012
10/2/2012
10/20/2012
12/20/2012
1/25/2013
3/4/2013
3/29/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/12/2013
8/11/2013
7/18/2014
8/1/2014
9/8/2014
10/18/2014
6/24/2015
7/18/2015
8/7/2015
9/14/2015
10/9/2015
7/28/2016

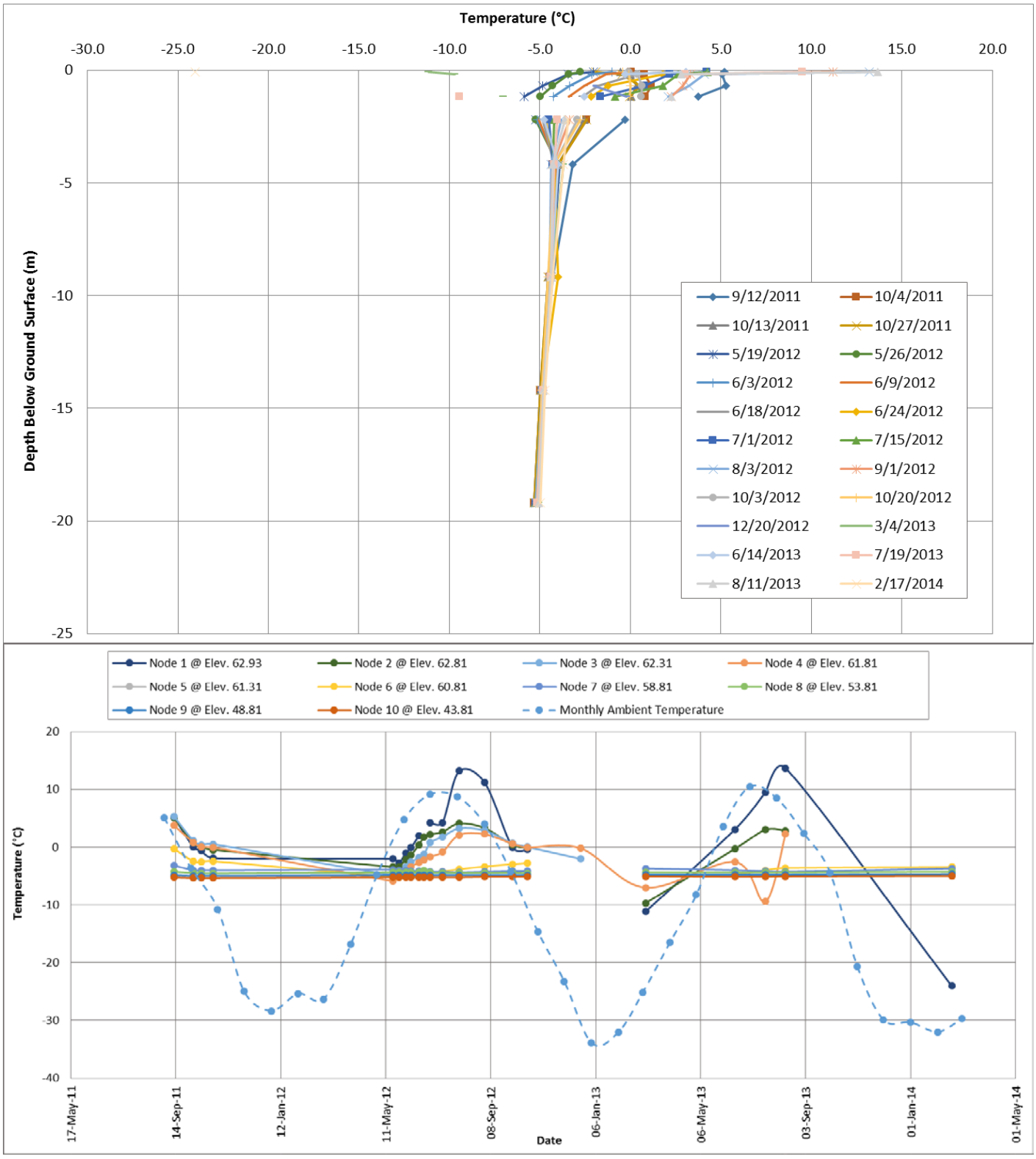

Node 1 @ Elev. 65.75
Node 2 @ Elev. 65.25
Node 3 @ Elev. 64.75
Node 4 @ Elev. 64.25
Node 5 @ Elev. 63.75
Node 6 @ Elev. 63.25
Node 7 @ Elev. 61.25
Node 8 @ Elev. 56.25
Node 9 @ Elev. 50.25
Node 10 @ Elev. 41.25
Monthly Ambient Temperature
Temperature (°C)
20
10
0
-10
-20
-30
-40
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
Date

GT09-25

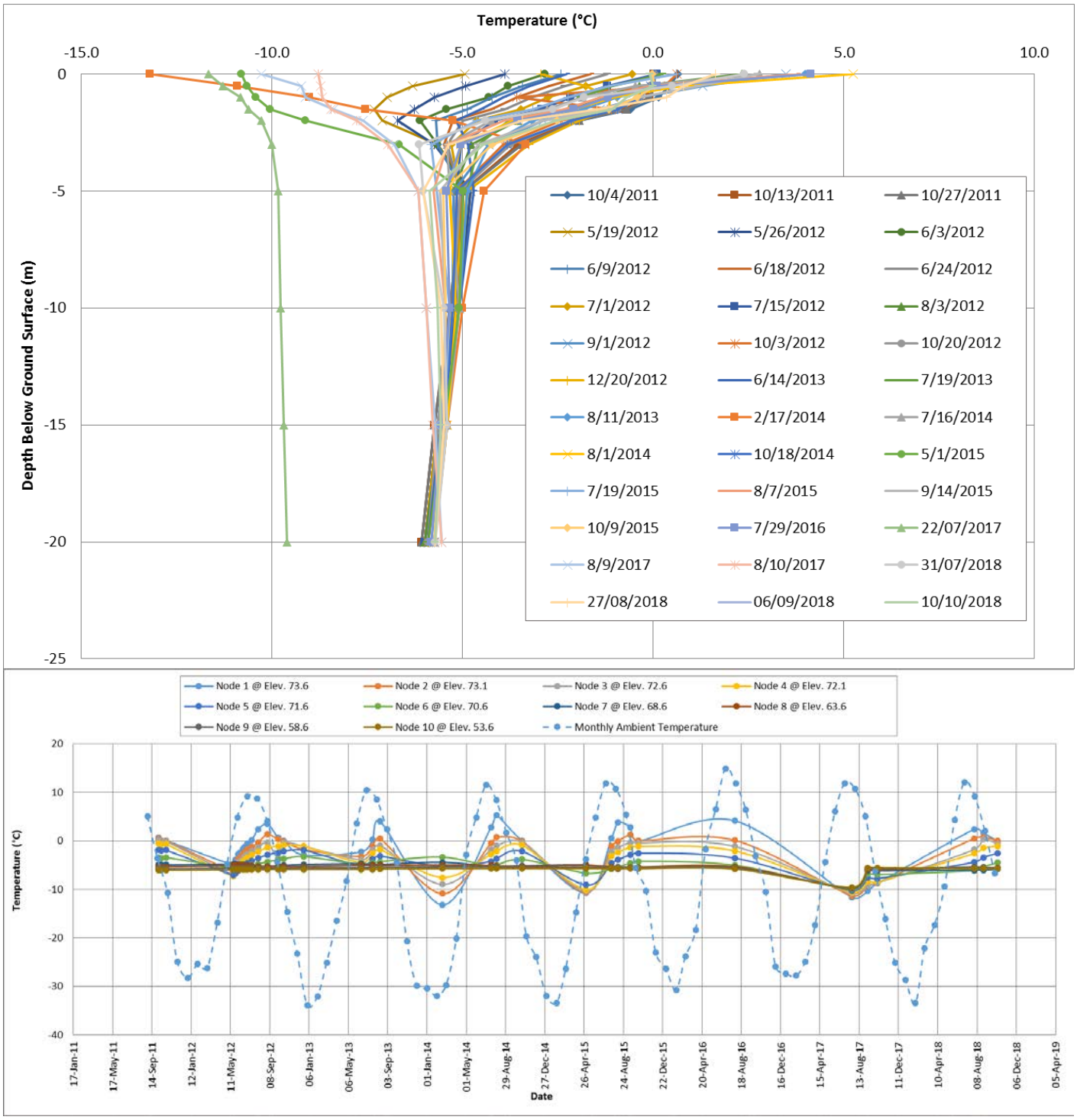

Temperature (°C)
-25
-20
-15
-10
-5
0
5
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
-30
9/27/2009
10/17/2009
11/8/2009
11/30/2009
12/21/2009
1/17/2010
3/14/2010
5/24/2010
6/16/2011
7/7/2011
9/12/2011
10/4/2011
10/13/2011
10/27/2011
2/16/2012
5/18/2012
5/25/2012
6/2/2012
6/8/2012
6/16/2012
6/24/2012
7/1/2012
7/14/2012
8/2/2012
9/1/2012
10/2/2012
10/20/2012
12/20/2012
1/25/2013
3/4/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/12/2013
8/11/2013
2/15/2014


Node 1 @ Elev. 66.62
Node 2 @ Elev. 66.12
Node 3 @ Elev. 65.62
Node 4 @ Elev. 65.12
Node 5 @ Elev. 64.62
Node 6 @ Elev. 64.12
Node 7 @ Elev. 62.12
Node 8 @ Elev. 57.12
Node 9 @ Elev. 52.12
Node 10 @ Elev. 42.12
Monthly Ambient Temperature
Temperature (°C)
20
10
0
-10
-20
-30
-40
27-May-09
24-Sep-09
22-Jan-10
22-May-10
19-Sep-10
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
Date

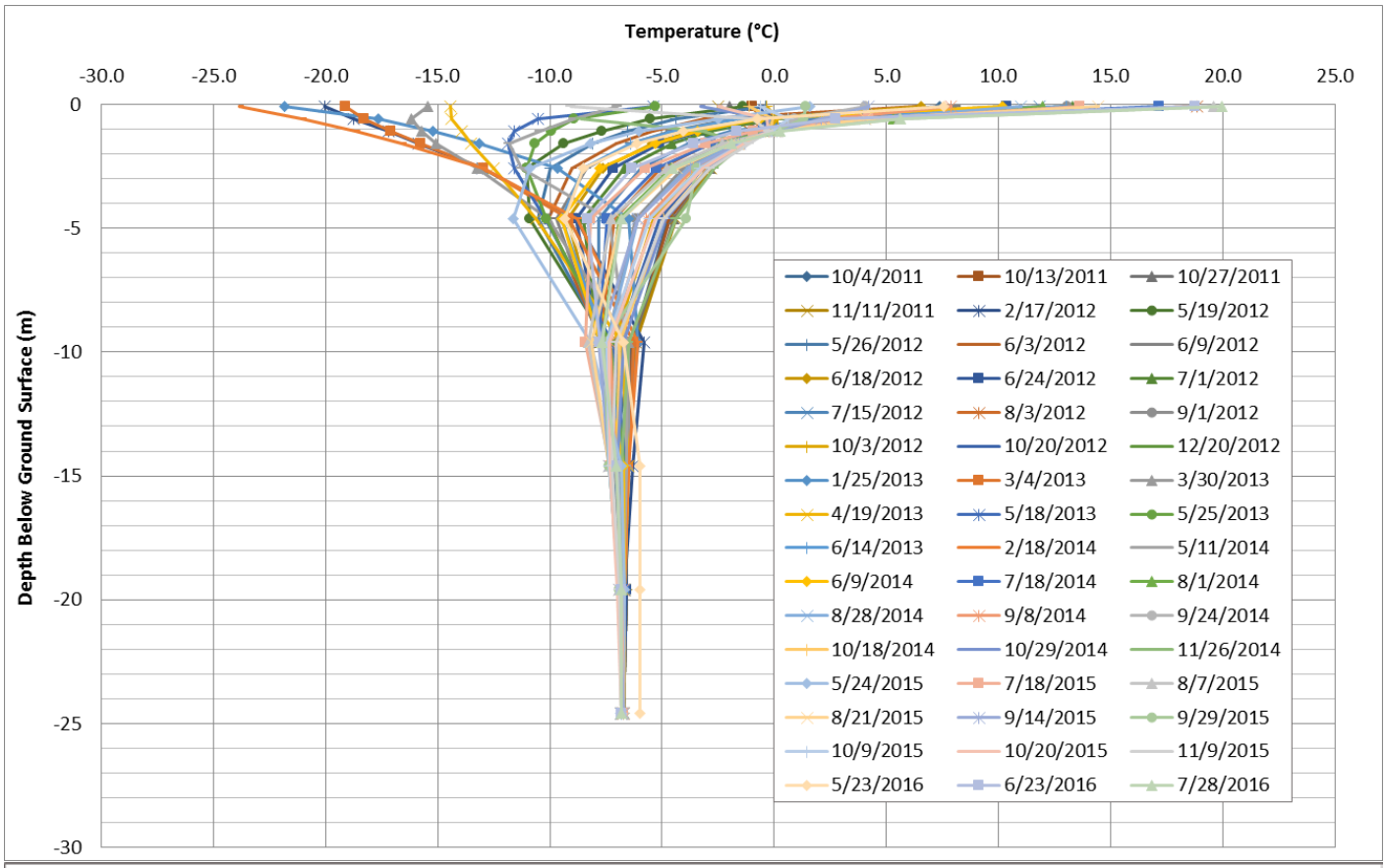
GT11-01

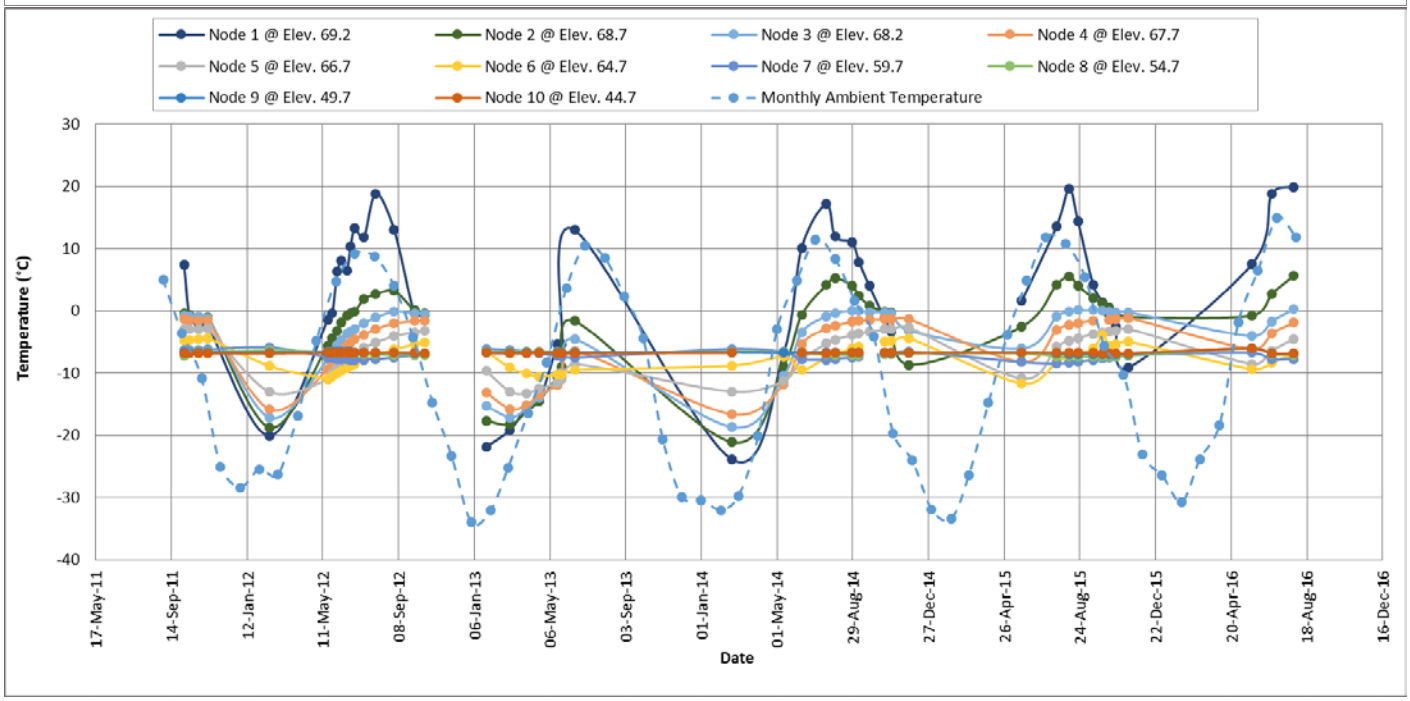

Temperature (°C)
-30.0
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
0
-5
-10
-15
-20
-25
Depth Below Ground Surface (m)
9/12/2011
10/4/2011
10/13/2011
10/27/2011
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
3/4/2013
6/14/2013
7/19/2013
8/11/2013
2/17/2014
Node 1 @ Elev. 62.93
Node 2 @ Elev. 62.81
Node 3 @ Elev. 62.31
Node 4 @ Elev. 61.81
Node 5 @ Elev. 61.31
Node 6 @ Elev. 60.81
Node 7 @ Elev. 58.81
Node 8 @ Elev. 53.81
Node 9 @ Elev. 48.81
Node 10 @ Elev. 43.81
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
Date

GT11-02

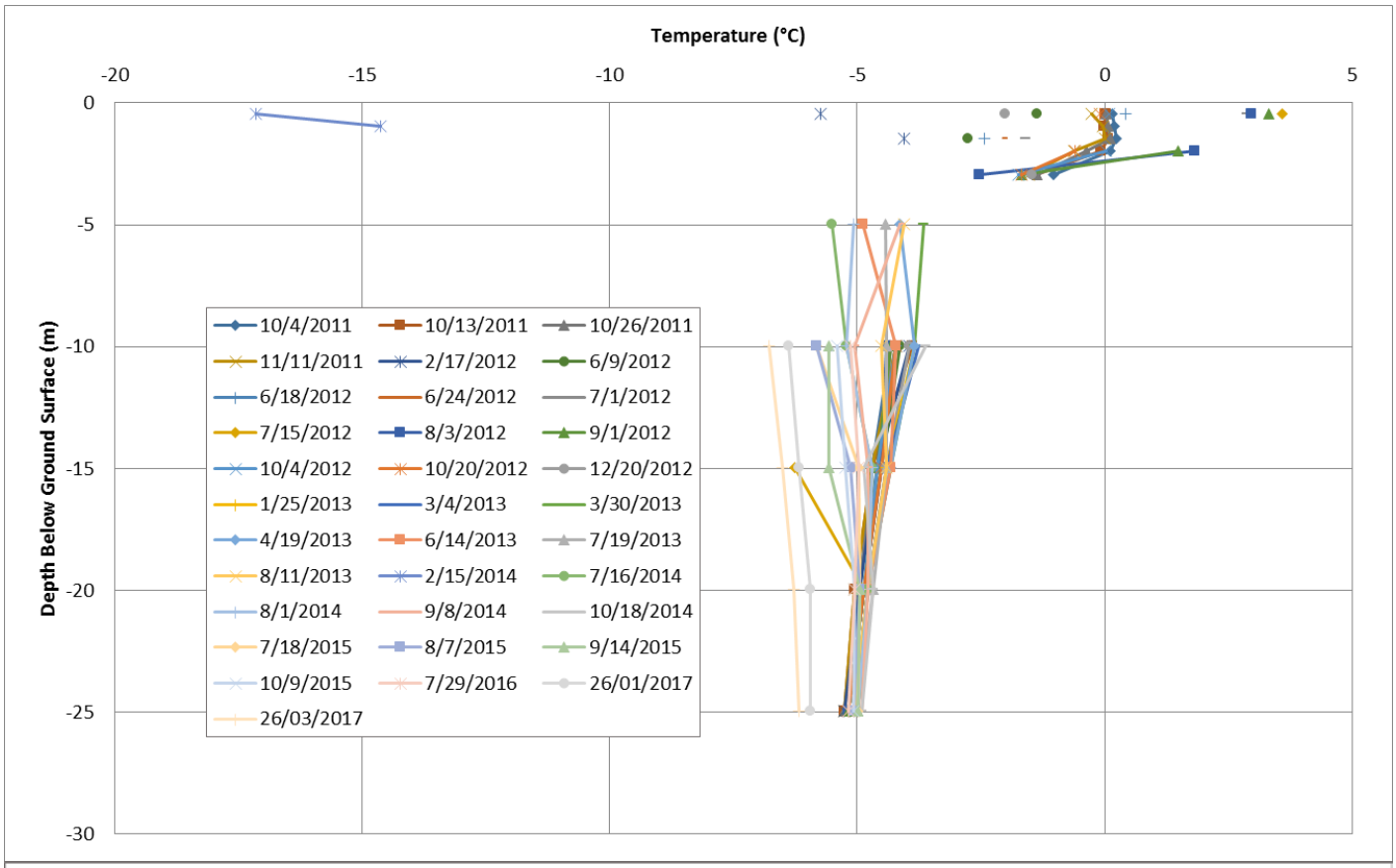

Temperature (°C)
-15.0
-10.0
-5.0
0.0
5.0
10.0
0
-5
-10
-15
-20
-25
Depth Below Ground Surface (m)
10/4/2011
10/13/2011
10/27/2011
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
6/14/2013
7/19/2013
8/11/2013
2/17/2014
7/16/2014
8/1/2014
10/18/2014
5/1/2015
7/19/2015
8/7/2015
9/14/2015
10/9/2015
7/29/2016
22/07/2017
8/9/2017
8/10/2017
31/07/2018
27/08/2018
06/09/2018
10/10/2018
Node 1 @ Elev. 73.6
Node 2 @ Elev. 73.1
Node 3 @ Elev. 72.6
Node 4 @ Elev. 72.1
Node 5 @ Elev. 71.6
Node 6 @ Elev. 70.6
Node 7 @ Elev. 68.6
Node 8 @ Elev. 63.6
Node 9 @ Elev. 58.6
Node 10 @ Elev. 53.6
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
17-Jan-11
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
Date

GT11-05


Temperature (°C)
-30.0
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
25.0
0
-5
-10
-15
-20
-25
-30
Depth Below Ground Surface (m)
10/4/2011
10/13/2011
10/27/2011
11/11/2011
2/17/2012
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/25/2013
3/4/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
2/18/2014
5/11/2014
6/9/2014
7/18/2014
8/1/2014
8/28/2014
9/8/2014
9/24/2014
10/18/2014
10/29/2014
11/26/2014
5/24/2015
7/18/2015
8/7/2015
8/21/2015
9/14/2015
9/29/2015
10/9/2015
10/20/2015
11/9/2015
5/23/2016
6/23/2016
7/28/2016


Node 1 @ Elev. 69.2
Node 2 @ Elev. 68.7
Node 3 @ Elev. 68.2
Node 4 @ Elev. 67.7
Node 5 @ Elev. 66.7
Node 6 @ Elev. 64.7
Node 7 @ Elev. 59.7
Node 8 @ Elev. 54.7
Node 9 @ Elev. 49.7
Node 10 @ Elev. 44.7
Monthly Ambient Temperature
30
20
10
0
-10
-20
-30
-40
Temperature (°C)
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
Date

GT11-07


Temperature (°C)
-20
-15
-10
-5
0
5
0
-5
-10
-15
-20
-25
-30
Depth Below Ground Surface (m)
10/4/2011
10/13/2011
10/26/2011
11/11/2011
2/17/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/4/2012
10/20/2012
12/20/2012
1/25/2013
3/4/2013
3/30/2013
4/19/2013
6/14/2013
7/19/2013
8/11/2013
2/15/2014
7/16/2014
8/1/2014
9/8/2014
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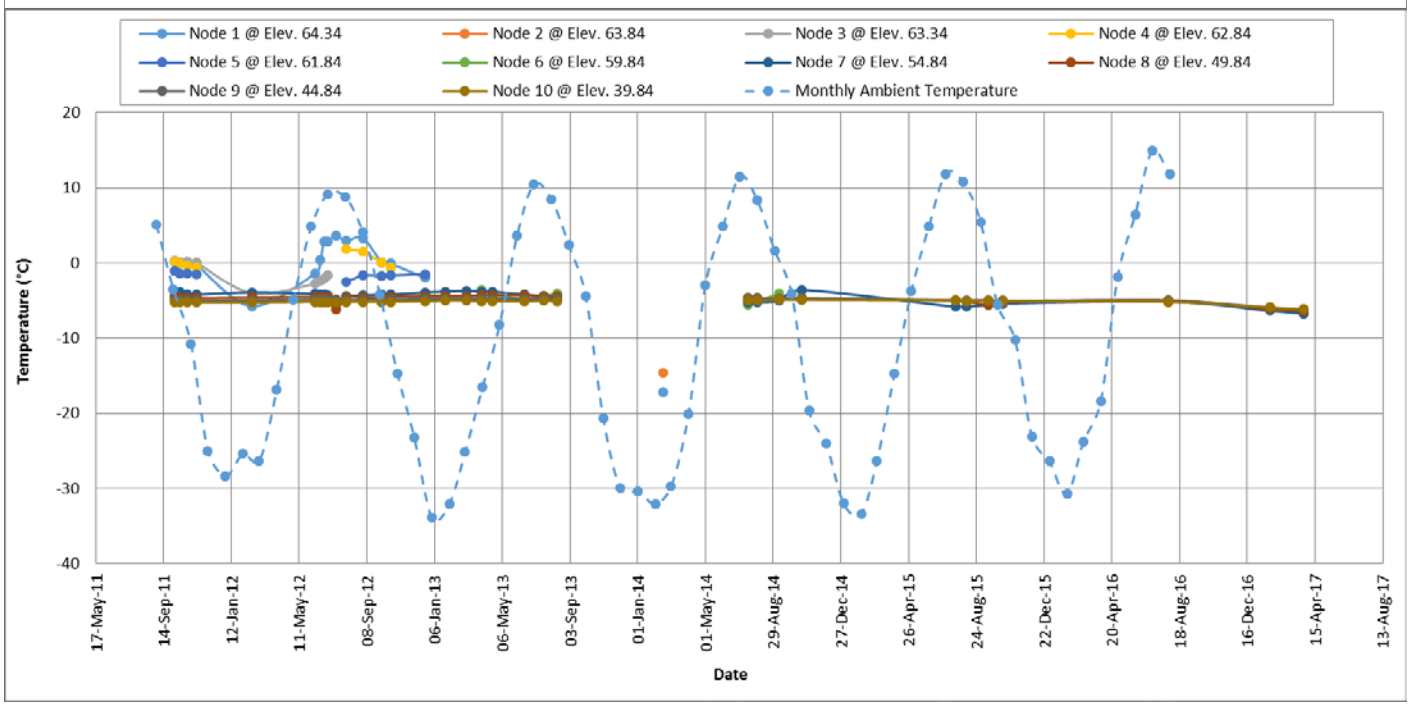
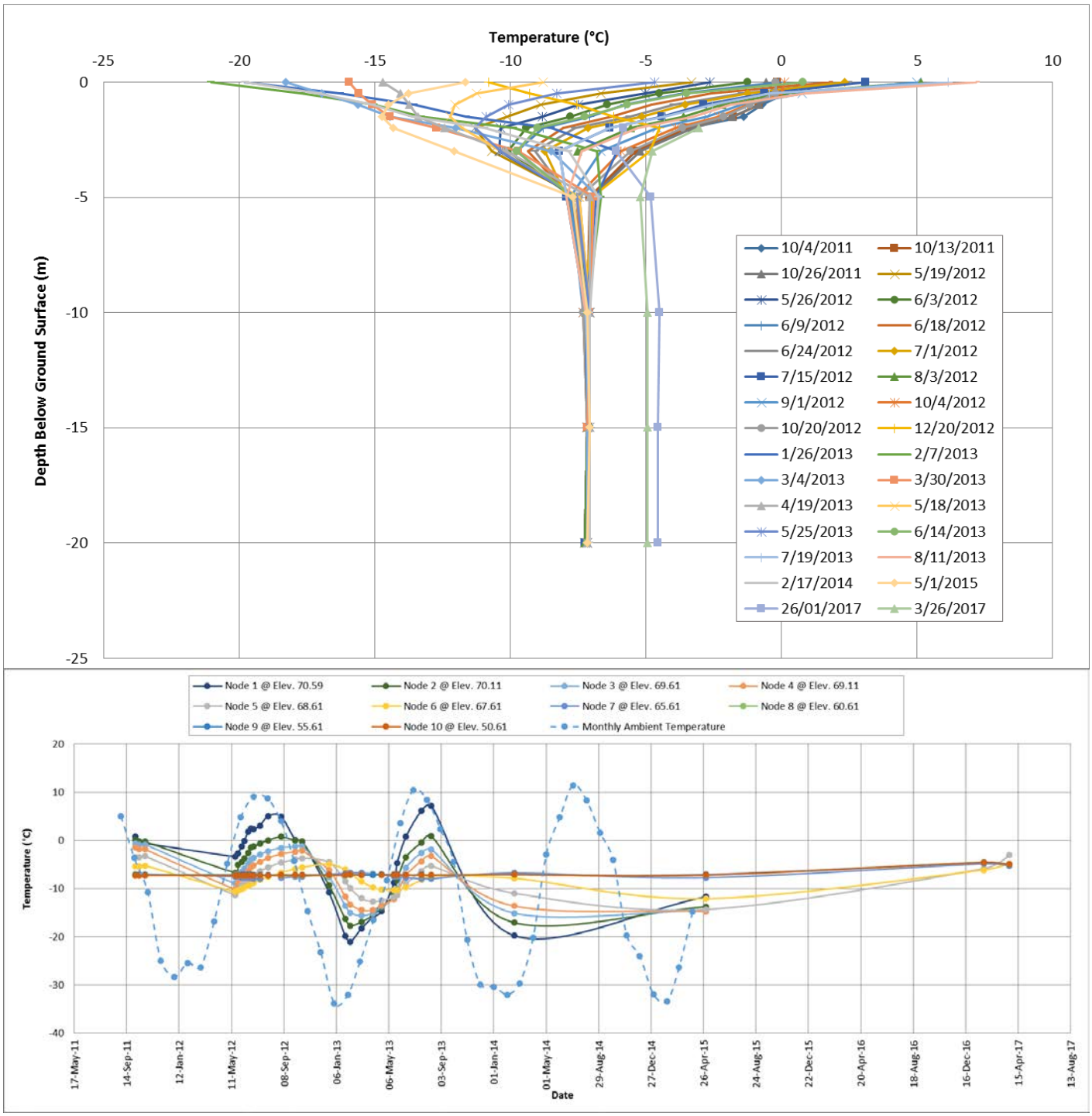
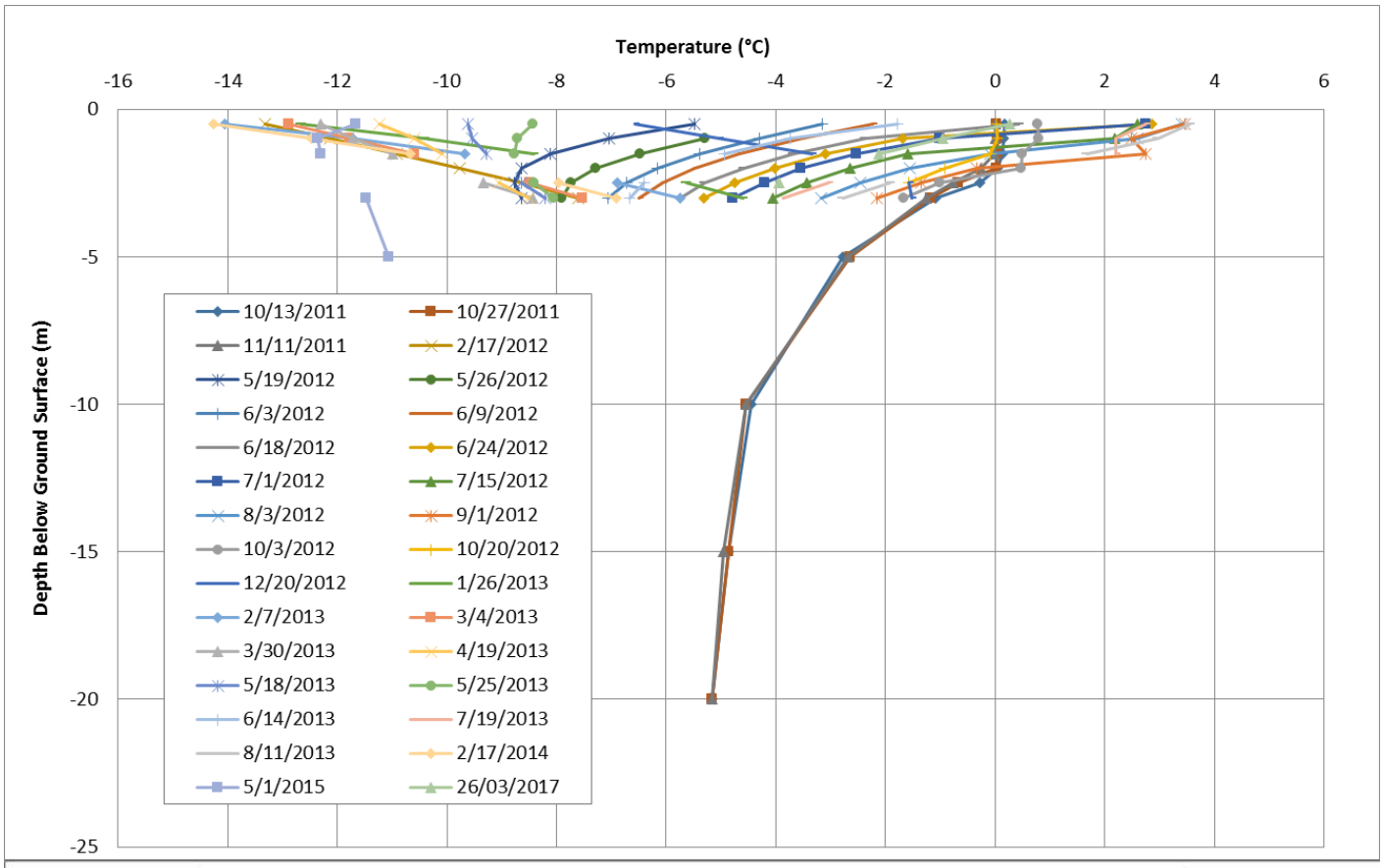
7/18/2015
8/7/2015
9/14/2015
10/9/2015
7/29/2016
26/01/2017
26/03/2017

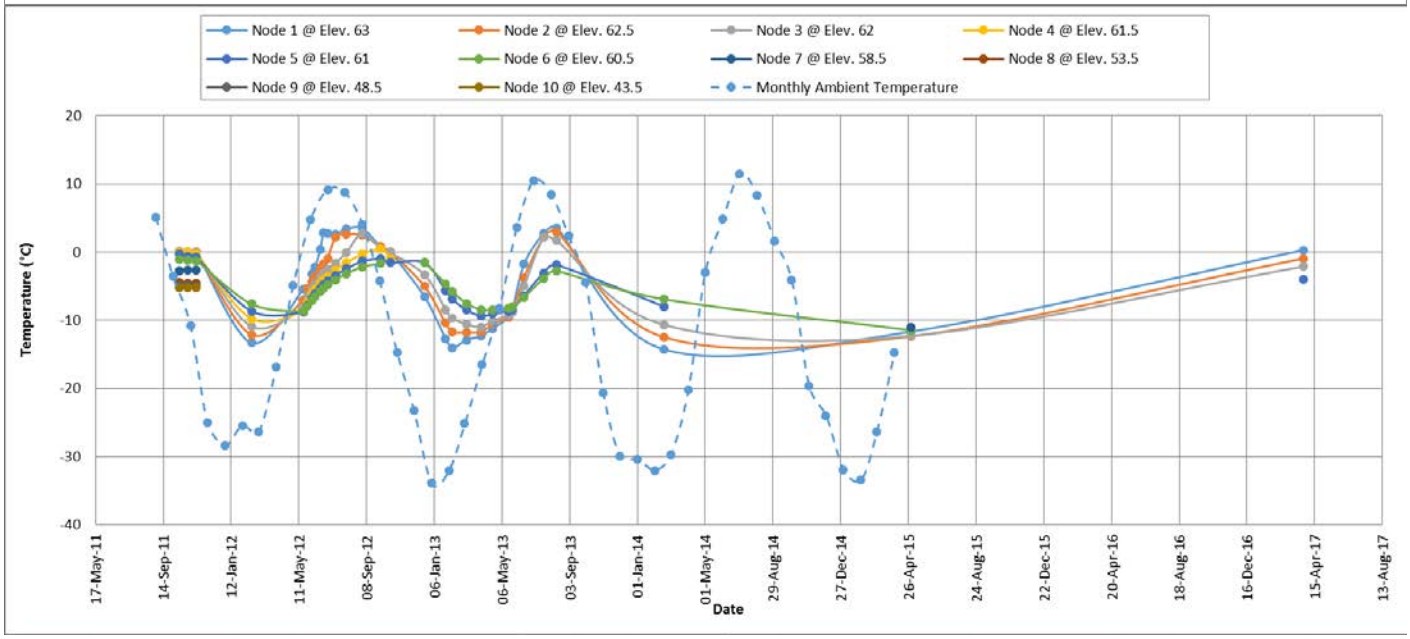

Node 1 @ Elev. 64.34
Node 2 @ Elev. 63.84
Node 3 @ Elev. 63.34
Node 4 @ Elev. 62.84
Node 5 @ Elev. 61.84
Node 6 @ Elev. 59.84
Node 7 @ Elev. 54.84
Node 8 @ Elev. 49.84
Node 9 @ Elev. 44.84
Node 10 @ Elev. 39.84
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
Date

GT11-08

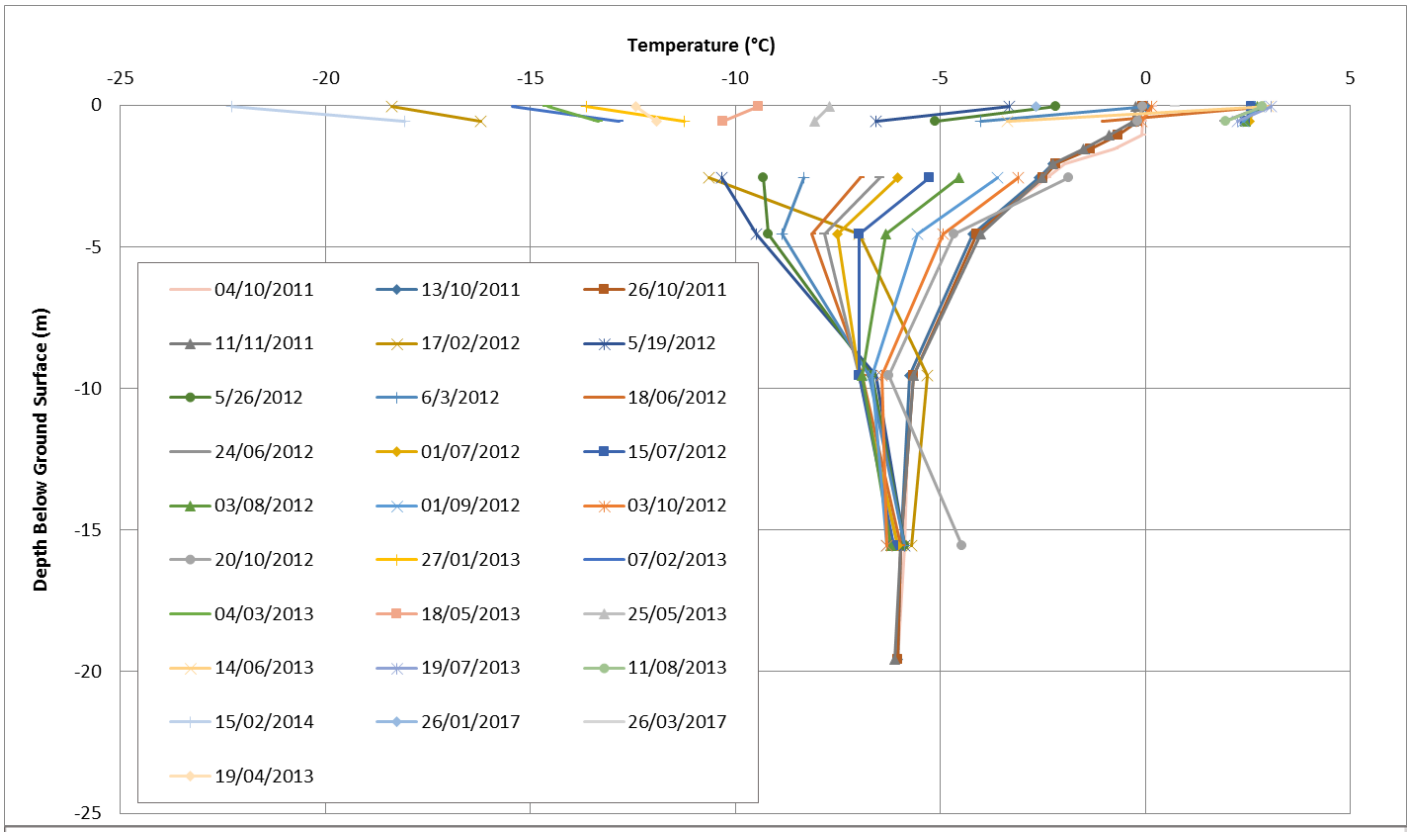

Temperature (°C)
-25
-20
-15
-10
-5
0
5
10
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
10/4/2011
10/13/2011
10/26/2011
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/4/2012
10/20/2012
12/20/2012
1/26/2013
2/7/2013
3/4/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
2/17/2014
5/1/2015
26/01/2017
3/26/2017
Node 1 @ Elev. 70.59
Node 2 @ Elev. 70.11
Node 3 @ Elev. 69.61
Node 4 @ Elev. 69.11
Node 5 @ Elev. 68.61
Node 6 @ Elev. 67.61
Node 7 @ Elev. 65.61
Node 8 @ Elev. 60.61
Node 9 @ Elev. 55.61
Node 10 @ Elev. 50.61
Monthly Ambient Temperature
Temperature (°C)
20
10
0
-10
-20
-30
-40
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
Date

GT11-12


Temperature (°C)
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
0
-5
-10
-15
-20
-25
Depth Below Ground Surface (m)
10/13/2011
10/27/2011
11/11/2011
2/17/2012
5/19/2012
5/26/2012
6/3/2012
6/9/2012
6/18/2012
6/24/2012
7/1/2012
7/15/2012
8/3/2012
9/1/2012
10/3/2012
10/20/2012
12/20/2012
1/26/2013
2/7/2013
3/4/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
2/17/2014
5/1/2015
26/03/2017


Node 1 @ Elev. 63
Node 2 @ Elev. 62.5
Node 3 @ Elev. 62
Node 4 @ Elev. 61.5
Node 5 @ Elev. 61
Node 6 @ Elev. 60.5
Node 7 @ Elev. 58.5
Node 8 @ Elev. 53.5
Node 9 @ Elev. 48.5
Node 10 @ Elev. 43.5
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
17-May-11
14-Sep-11
12-Jan-12
11-May-12
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
Date

GT11-14


Temperature (°C)
-25
-20
-15
-10
-5
0
5
Depth Below Ground Surface (m)
0
-5
-10
-15
-20
-25
04/10/2011
13/10/2011
26/10/2011
11/11/2011
17/02/2012
5/19/2012
5/26/2012
6/3/2012
18/06/2012
24/06/2012
01/07/2012
15/07/2012
03/08/2012
01/09/2012
03/10/2012
20/10/2012
27/01/2013
07/02/2013
04/03/2013
18/05/2013
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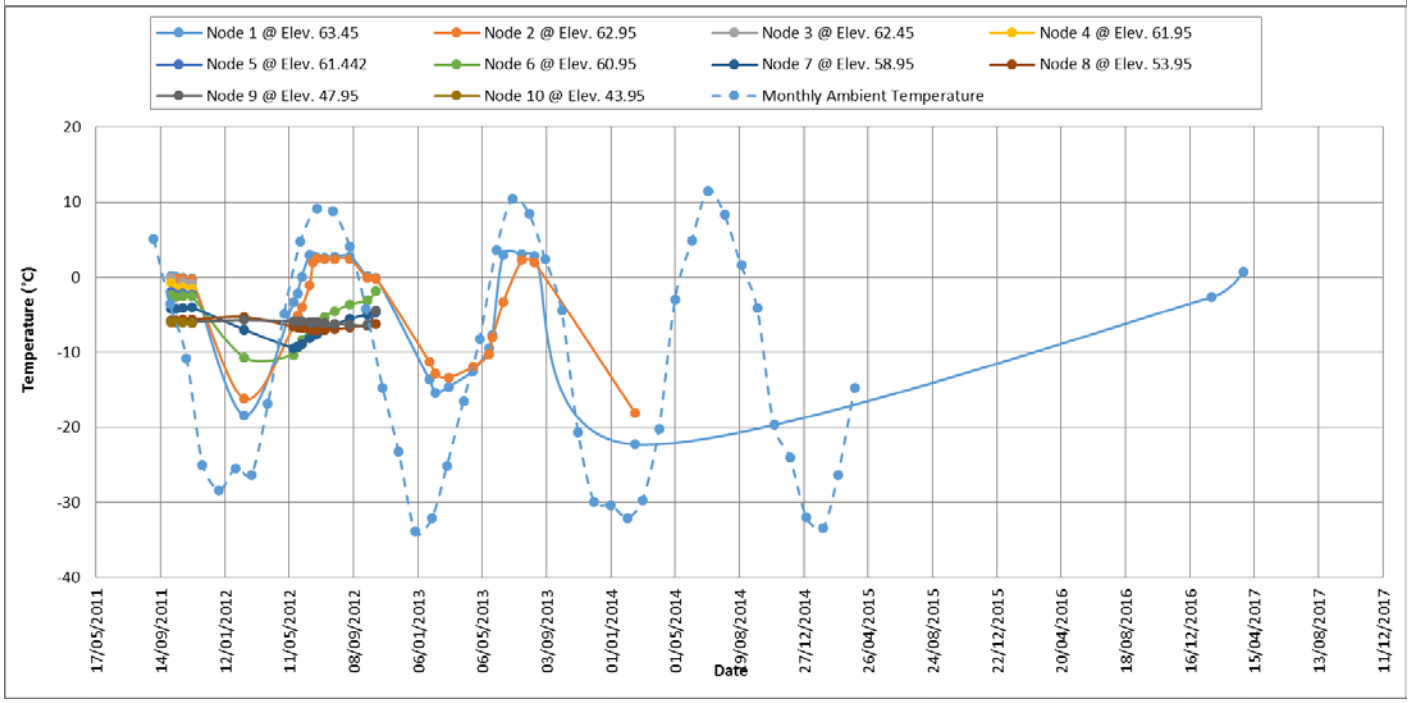
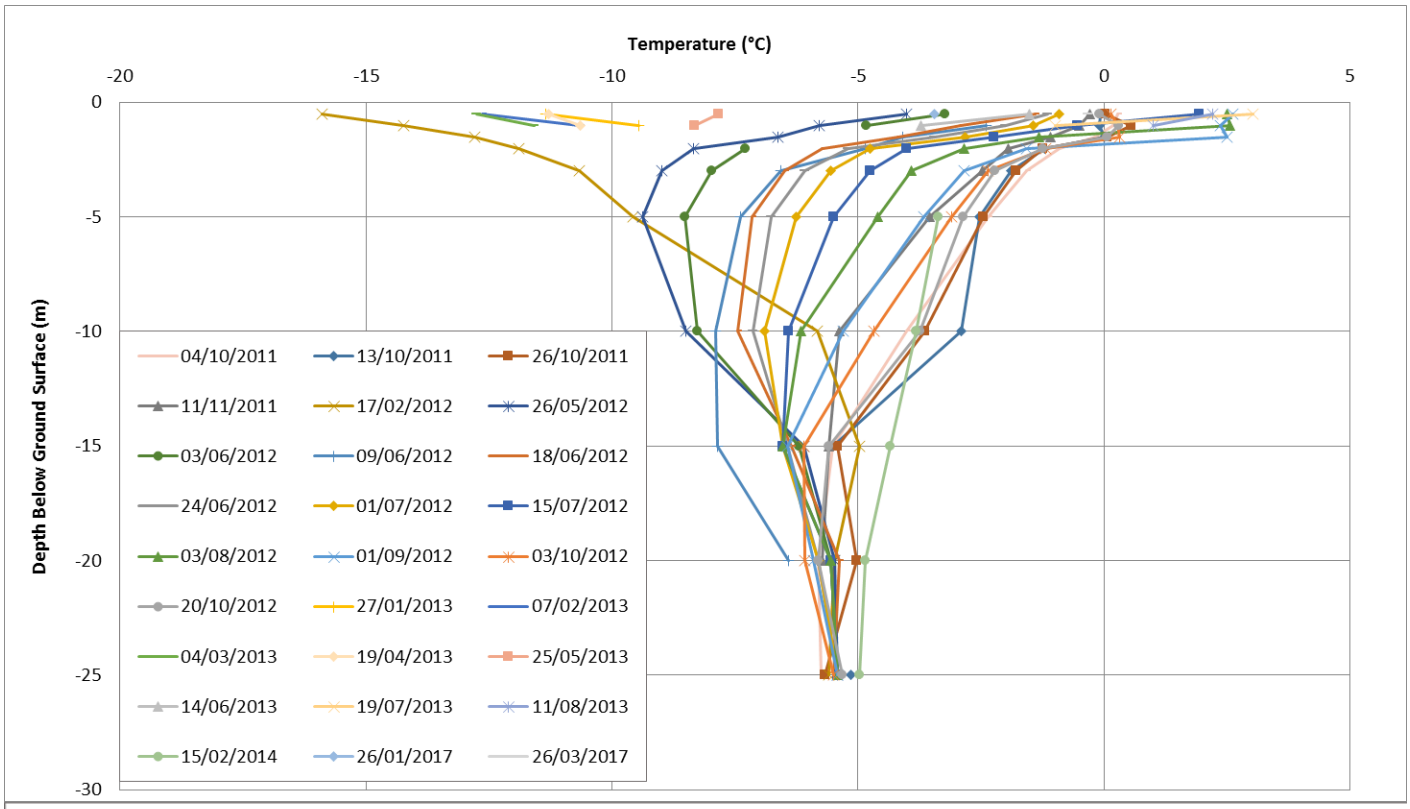
19/07/2013
11/08/2013
15/02/2014
26/01/2017
26/03/2017
19/04/2013


Node 1 @ Elev. 63.45
Node 2 @ Elev. 62.95
Node 3 @ Elev. 62.45
Node 4 @ Elev. 61.95
Node 5 @ Elev. 61.442
Node 6 @ Elev. 60.95
Node 7 @ Elev. 58.95
Node 8 @ Elev. 53.95
Node 9 @ Elev. 47.95
Node 10 @ Elev. 43.95
Monthly Ambient Temperature
Temperature (°C)
20
10
0
-10
-20
-30
-40
17/05/2011
14/09/2011
12/01/2012
11/05/2012
08/09/2012
06/01/2013
06/05/2013
03/09/2013
01/01/2014
01/05/2014
29/08/2014
27/12/2014
26/04/2015
24/08/2015
22/12/2015
20/04/2016
18/08/2016
16/12/2016
15/04/2017
13/08/2017
11/12/2017
Date

GT11-17


Temperature (°C)
-20
-15
-10
-5
0
5
0
-5
-10
-15
-20
-25
-30
Depth Below Ground Surface (m)
04/10/2011
13/10/2011
26/10/2011
11/11/2011
17/02/2012
26/05/2012
03/06/2012
09/06/2012
18/06/2012
24/06/2012
01/07/2012
15/07/2012
03/08/2012
01/09/2012
03/10/2012
20/10/2012
27/01/2013
07/02/2013
04/03/2013
19/04/2013
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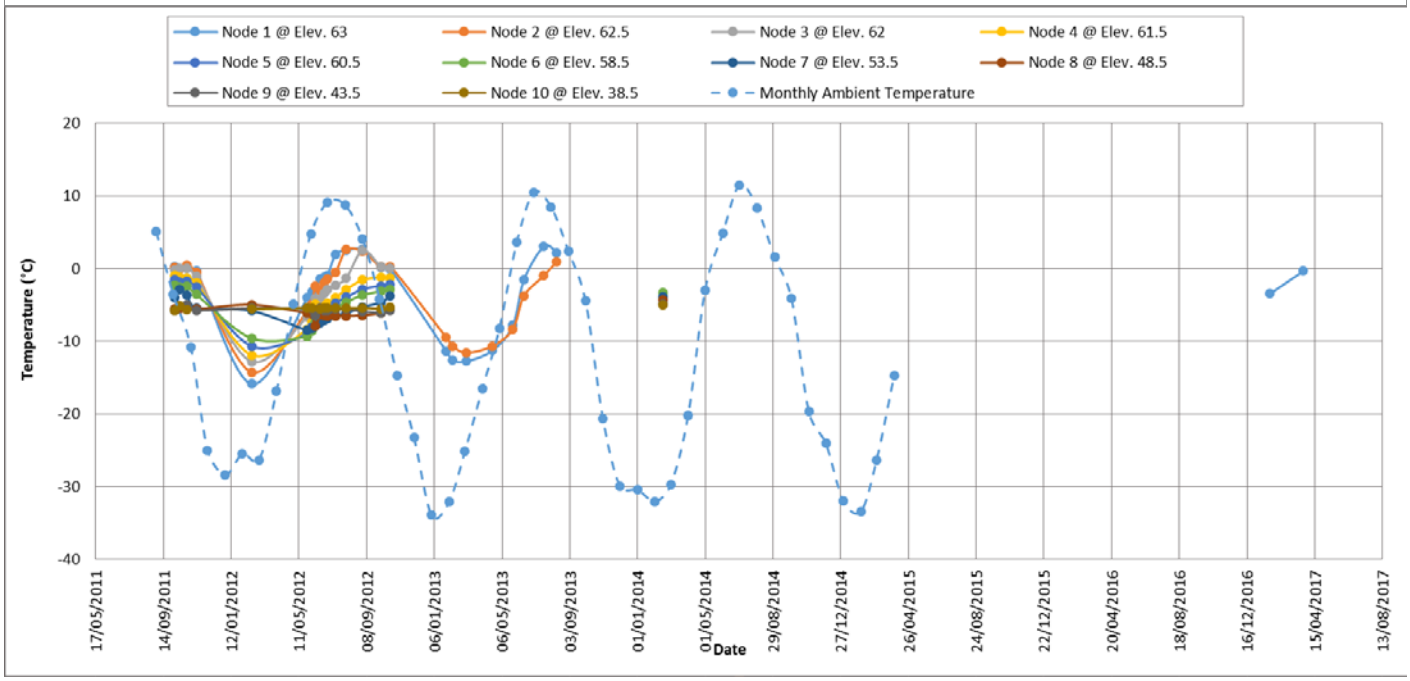
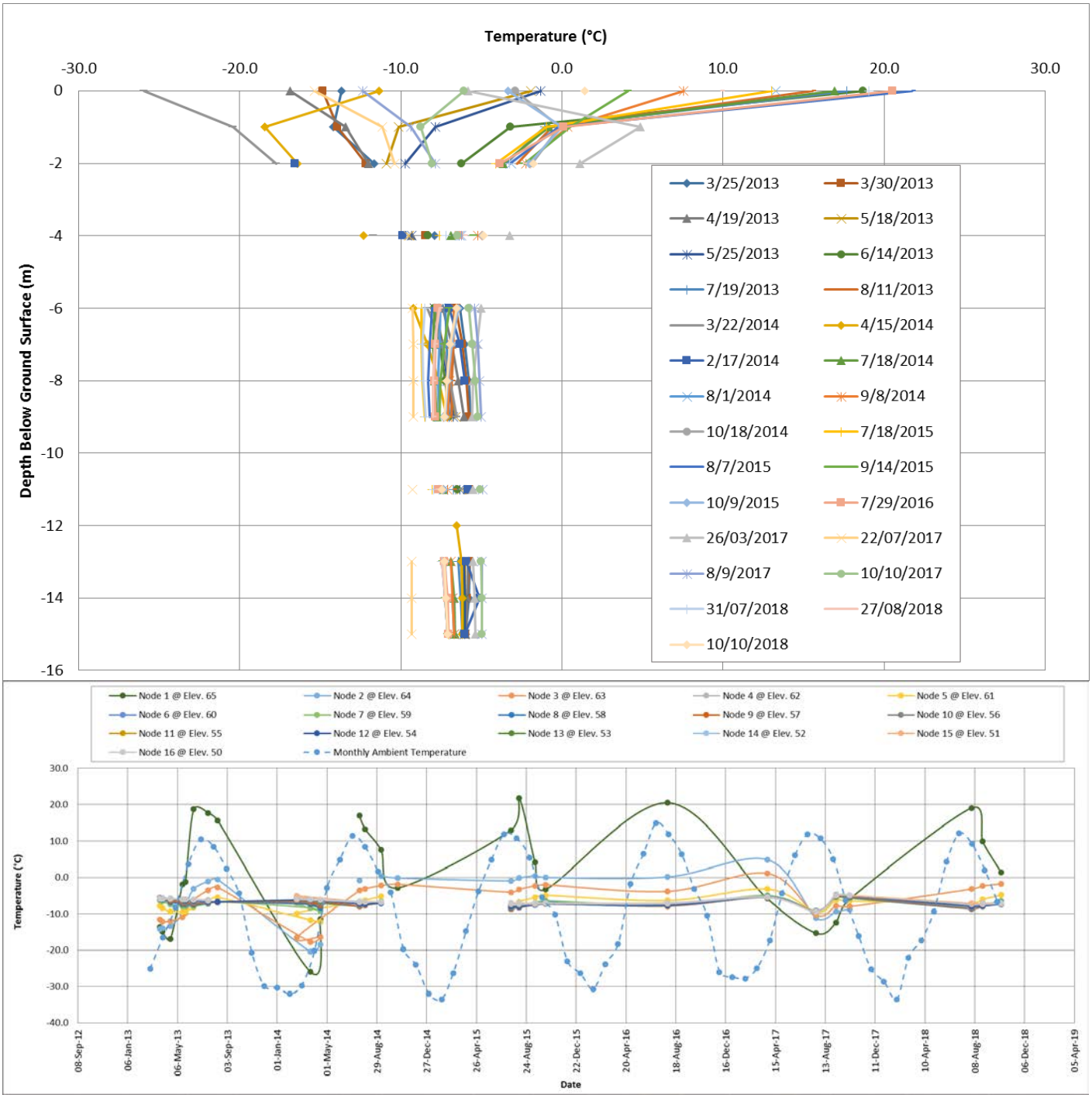
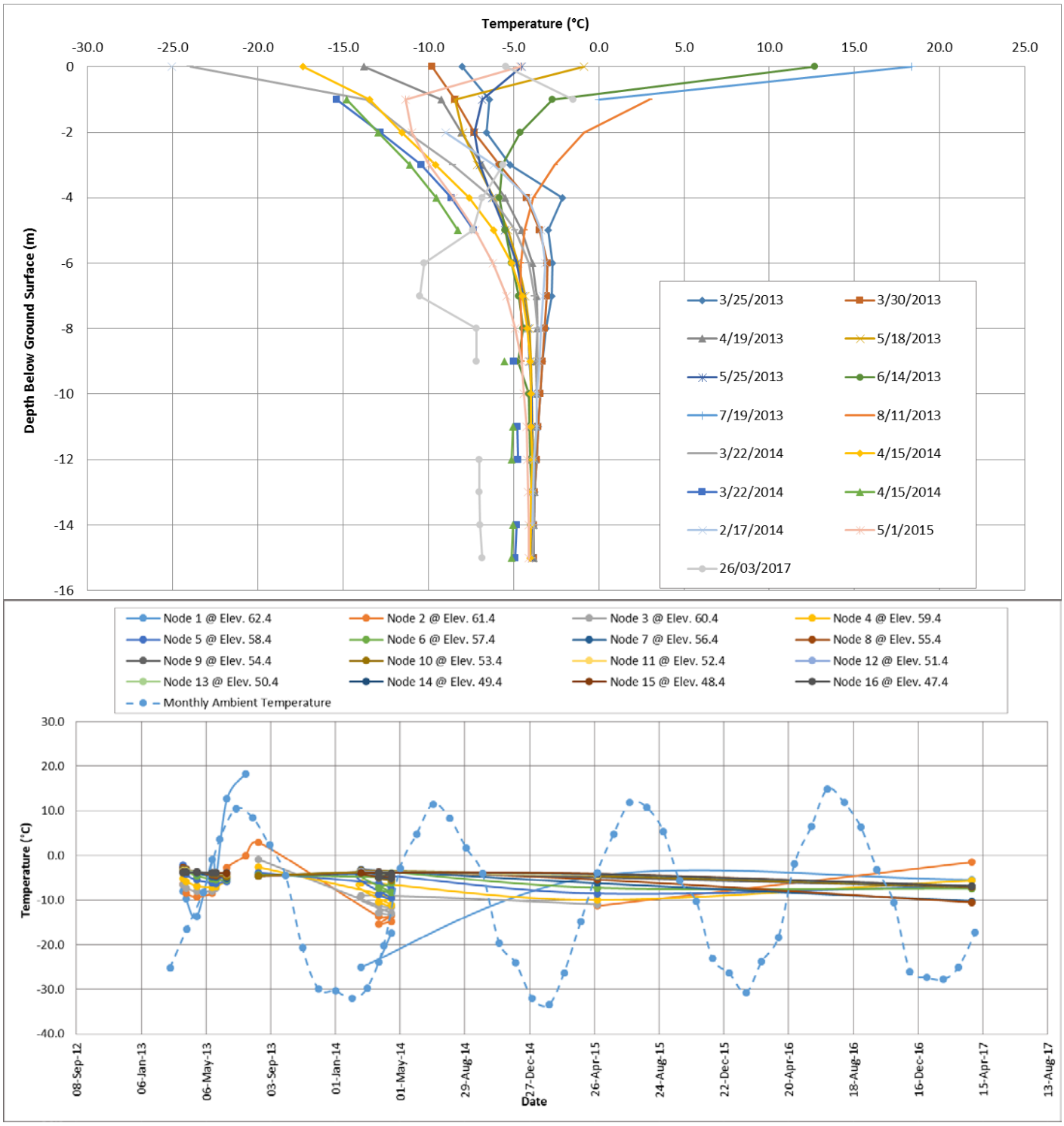
14/06/2013
19/07/2013
11/08/2013
15/02/2014
26/01/2017
26/03/2017


Node 1 @ Elev. 63
Node 2 @ Elev. 62.5
Node 3 @ Elev. 62
Node 4 @ Elev. 61.5
Node 5 @ Elev. 60.5
Node 6 @ Elev. 58.5
Node 7 @ Elev. 53.5
Node 8 @ Elev. 48.5
Node 9 @ Elev. 43.5
Node 10 @ Elev. 38.5
Monthly Ambient Temperature
20
10
0
-10
-20
-30
-40
Temperature (°C)
17/05/2011
14/09/2011
12/01/2012
11/05/2012
08/09/2012
06/01/2013
06/05/2013
03/09/2013
01/01/2014
01/05/2014
29/08/2014
27/12/2014
26/04/2015
24/08/2015
22/12/2015
20/04/2016
18/08/2016
16/12/2016
15/04/2017
13/08/2017
Date

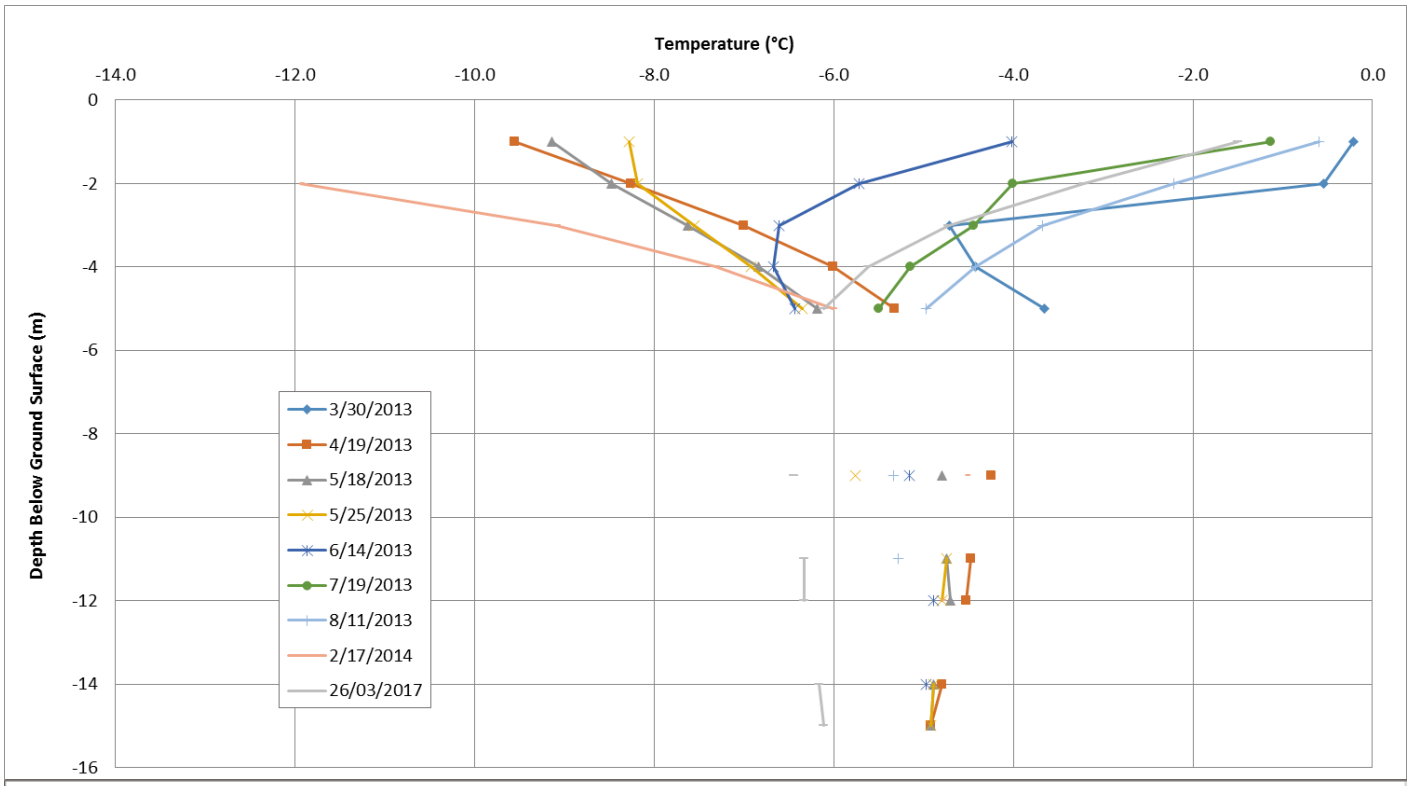
GT13-01

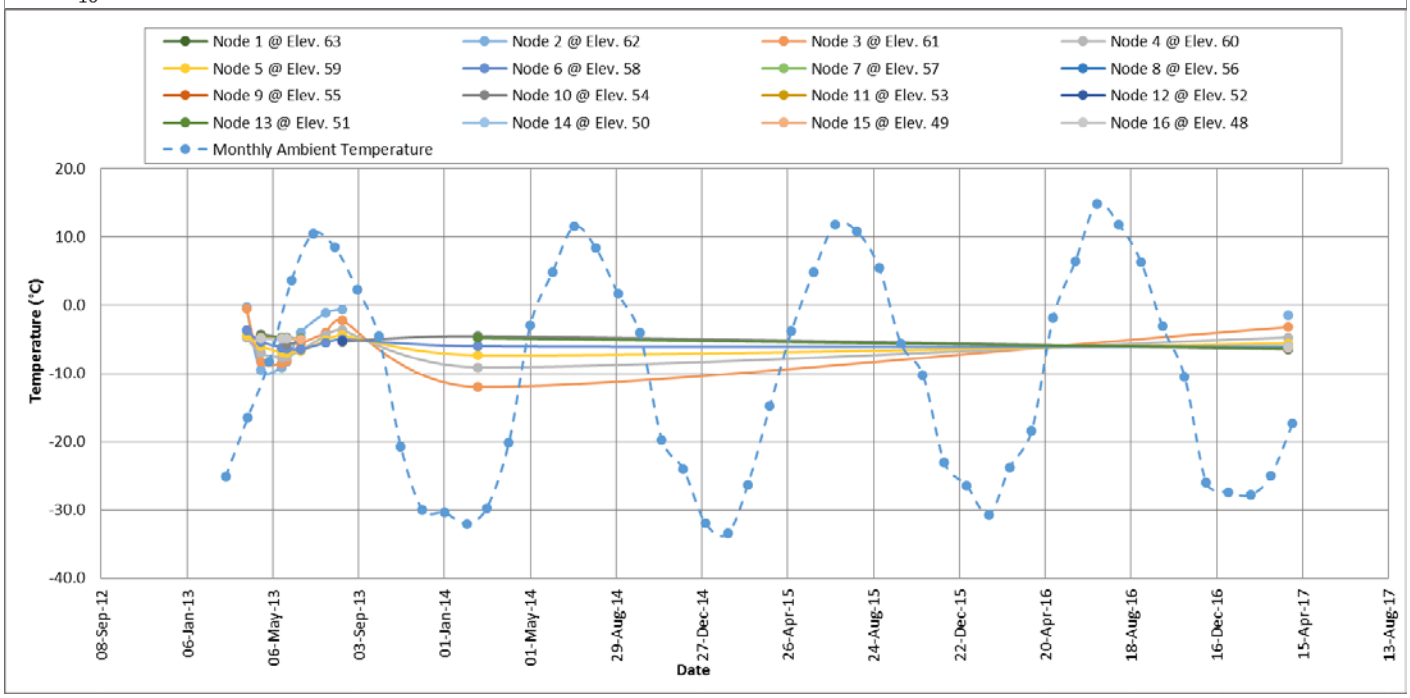

Temperature (°C)
-30.0
-20.0
-10.0
0.0
10.0
20.0
30.0
0
-2
-4
-6
-8
-10
-12
-14
-16
Depth Below Ground Surface (m)
3/25/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
3/22/2014
4/15/2014
2/17/2014
7/18/2014
8/1/2014
9/8/2014
10/18/2014
7/18/2015
8/7/2015
9/14/2015
10/9/2015
7/29/2016
26/03/2017
22/07/2017
8/9/2017
10/10/2017
31/07/2018
27/08/2018
10/10/2018
Node 1 @ Elev. 65
Node 2 @ Elev. 64
Node 3 @ Elev. 63
Node 4 @ Elev. 62
Node 5 @ Elev. 61
Node 6 @ Elev. 60
Node 7 @ Elev. 59
Node 8 @ Elev. 58
Node 9 @ Elev. 57
Node 10 @ Elev. 56
Node 11 @ Elev. 55
Node 12 @ Elev. 54
Node 13 @ Elev. 53
Node 14 @ Elev. 52
Node 15 @ Elev. 51
Node 16 @ Elev. 50
Monthly Ambient Temperature
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Temperature (°C)
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
Date

GT13-04

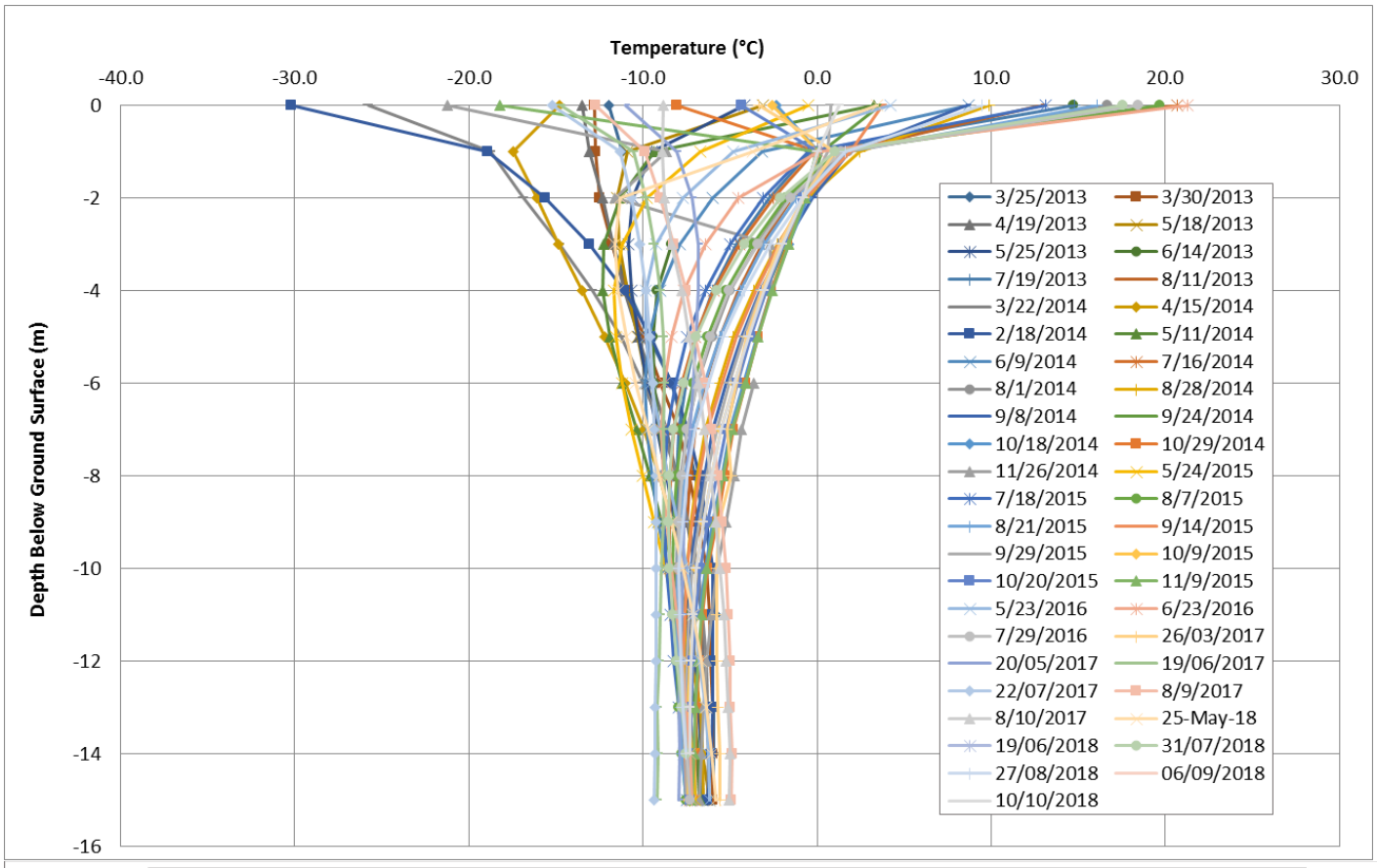

Temperature (°C)
-30.0
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
25.0
Depth Below Ground Surface (m)
0
-2
-4
-6
-8
-10
-12
-14
-16
3/25/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
3/22/2014
4/15/2014
3/22/2014
4/15/2014
2/17/2014
5/1/2015
26/03/2017
Node 1 @ Elev. 62.4
Node 2 @ Elev. 61.4
Node 3 @ Elev. 60.4
Node 4 @ Elev. 59.4
Node 5 @ Elev. 58.4
Node 6 @ Elev. 57.4
Node 7 @ Elev. 56.4
Node 8 @ Elev. 55.4
Node 9 @ Elev. 54.4
Node 10 @ Elev. 53.4
Node 11 @ Elev. 52.4
Node 12 @ Elev. 51.4
Node 13 @ Elev. 50.4
Node 14 @ Elev. 49.4
Node 15 @ Elev. 48.4
Node 16 @ Elev. 47.4
Monthly Ambient Temperature
Temperature (°C)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
Date

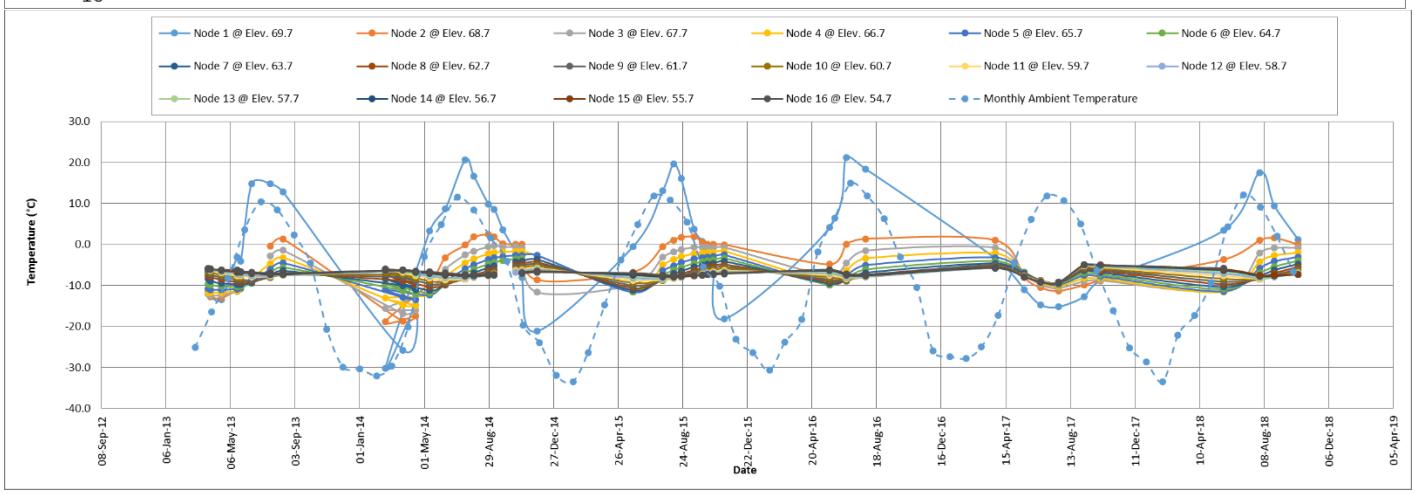
GT13-05


Temperature (°C)
-14.0
-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
0
-2
-4
-6
-8
-10
-12
-14
-16
Depth Below Ground Surface (m)
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
2/17/2014
26/03/2017

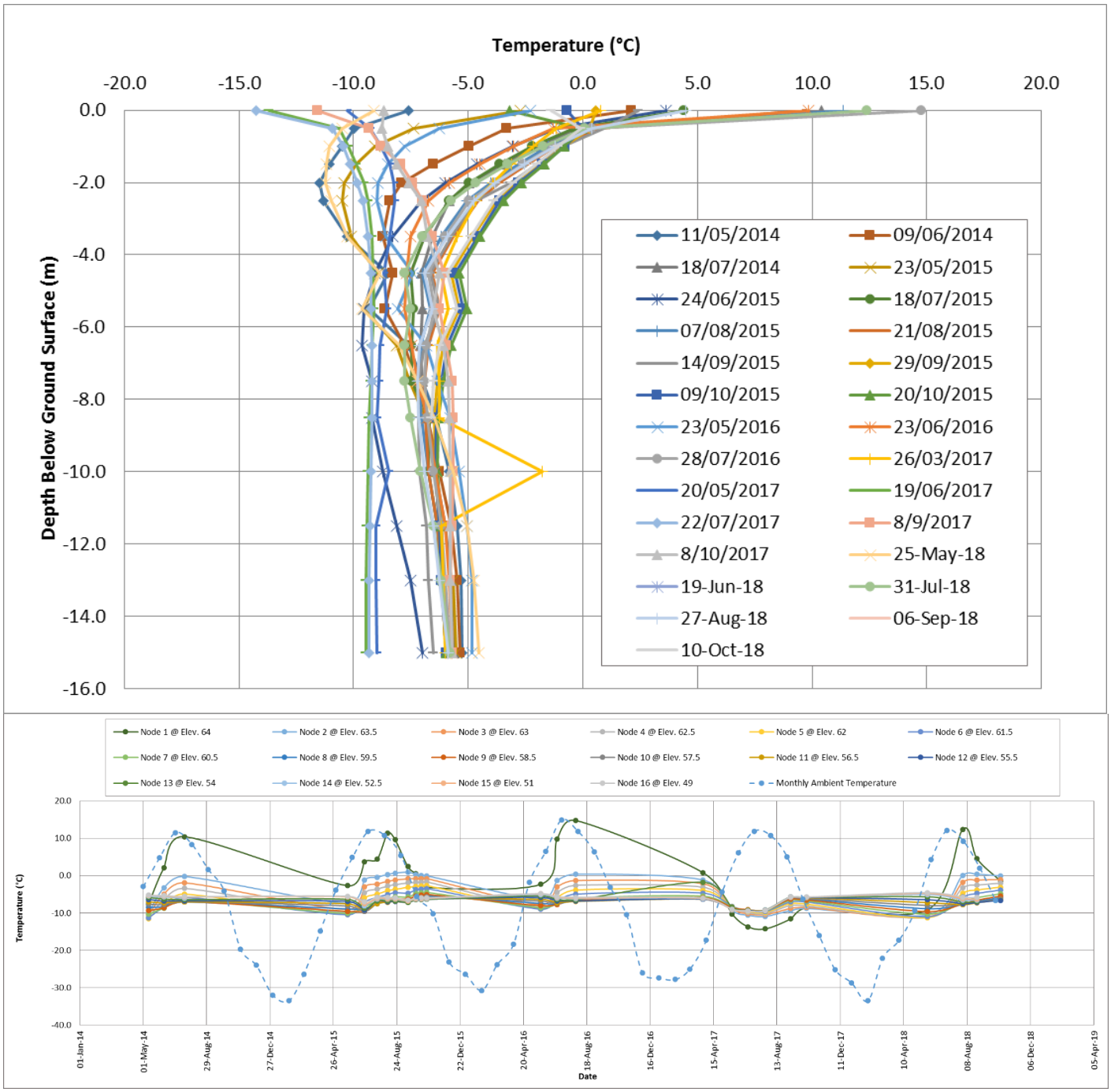

Node 1 @ Elev. 63
Node 2 @ Elev. 62
Node 3 @ Elev. 61
Node 4 @ Elev. 60
Node 5 @ Elev. 59
Node 6 @ Elev. 58
Node 7 @ Elev. 57
Node 8 @ Elev. 56
Node 9 @ Elev. 55
Node 10 @ Elev. 54
Node 11 @ Elev. 53
Node 12 @ Elev. 52
Node 13 @ Elev. 51
Node 14 @ Elev. 50
Node 15 @ Elev. 49
Node 16 @ Elev. 48
Monthly Ambient Temperature
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Temperature (°C)
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
Date

GT13-07

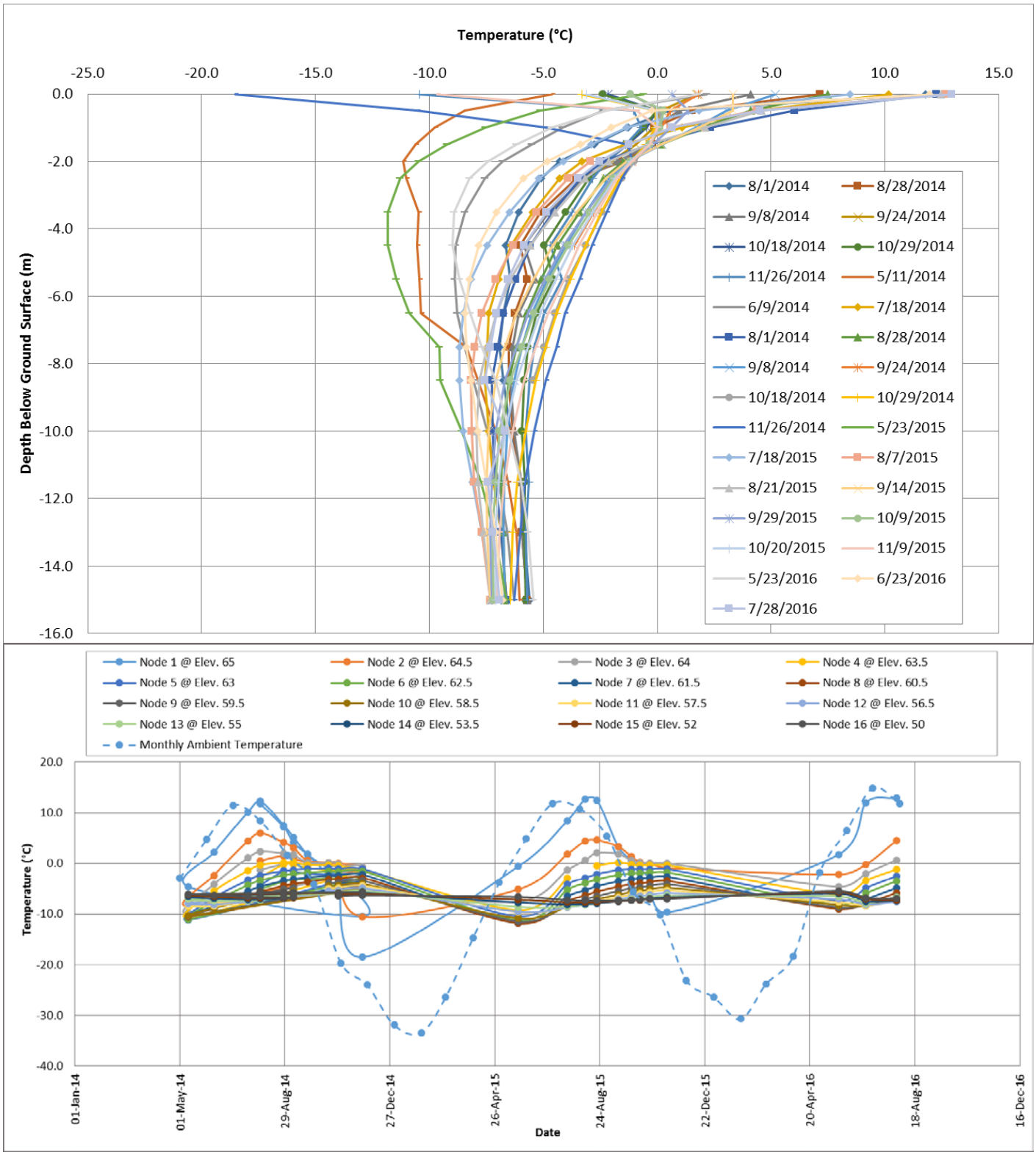

Temperature (°C)
-40.0
-30.0
-20.0
-10.0
0.0
10.0
20.0
30.0
0
-2
-4
-6
-8
-10
-12
-14
-16
Depth Below Ground Surface (m)
3/25/2013
3/30/2013
4/19/2013
5/18/2013
5/25/2013
6/14/2013
7/19/2013
8/11/2013
3/22/2014
4/15/2014
2/18/2014
5/11/2014
6/9/2014
7/16/2014
8/1/2014
8/28/2014
9/8/2014
9/24/2014
10/18/2014
10/29/2014
11/26/2014
5/24/2015
7/18/2015
8/7/2015
8/21/2015
9/14/2015
9/29/2015
10/9/2015
10/20/2015
11/9/2015
5/23/2016
6/23/2016
7/29/2016
26/03/2017
20/05/2017
19/06/2017
22/07/2017
8/9/2017
8/10/2017
25-May-18
19/06/2018
31/07/2018
27/08/2018
06/09/2018
10/10/2018


Node 1 @ Elev. 69.7
Node 2 @ Elev. 68.7
Node 3 @ Elev. 67.7
Node 4 @ Elev. 66.7
Node 5 @ Elev. 65.7
Node 6 @ Elev. 64.7
Node 7 @ Elev. 63.7
Node 8 @ Elev. 62.7
Node 9 @ Elev. 61.7
Node 10 @ Elev. 60.7
Node 11 @ Elev. 59.7
Node 12 @ Elev. 58.7
Node 13 @ Elev. 57.7
Node 14 @ Elev. 56.7
Node 15 @ Elev. 55.7
Node 16 @ Elev. 54.7
Monthly Ambient Temperature
Temperature (°C)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
08-Sep-12
06-Jan-13
06-May-13
03-Sep-13
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
Date

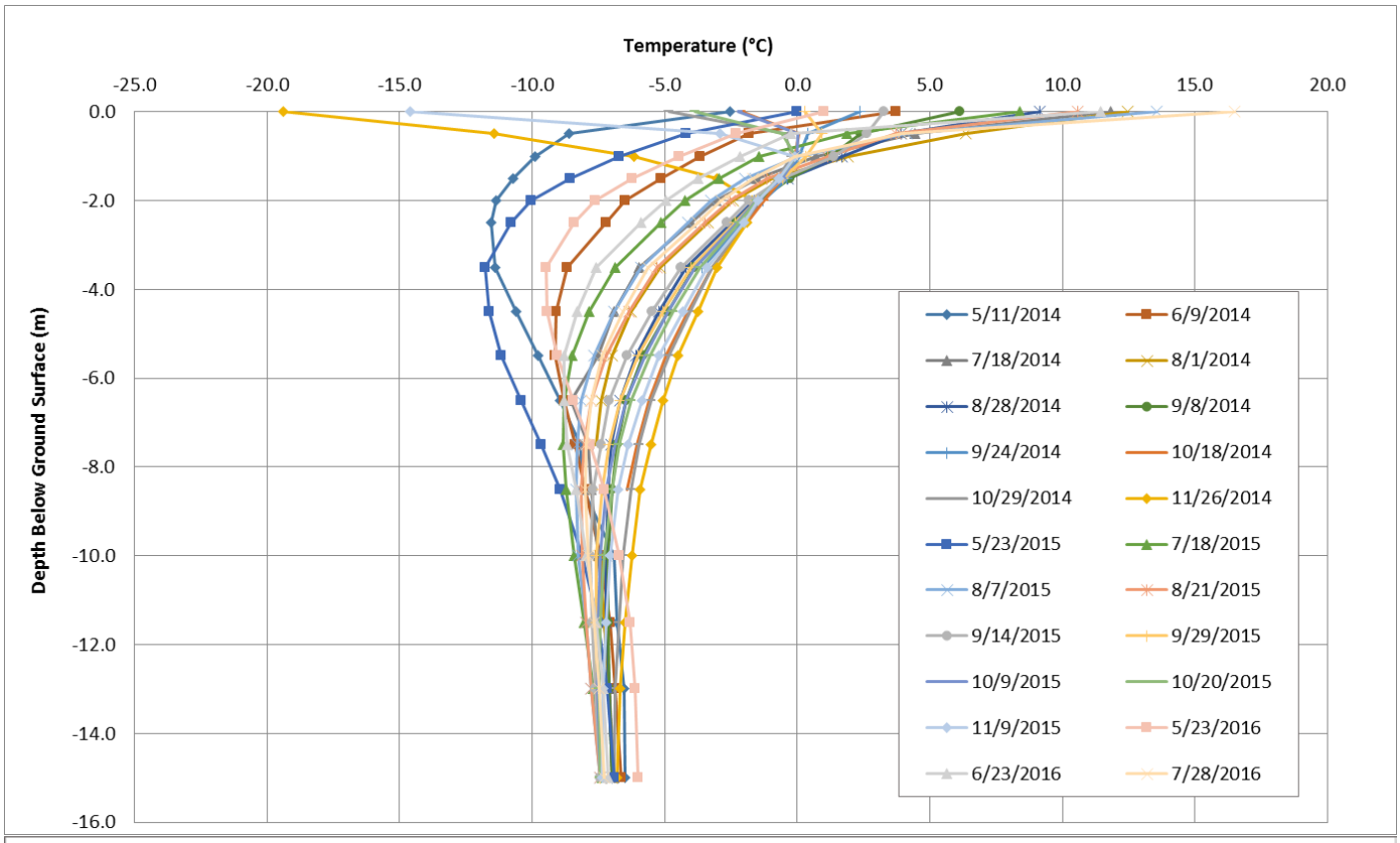
GT14-03

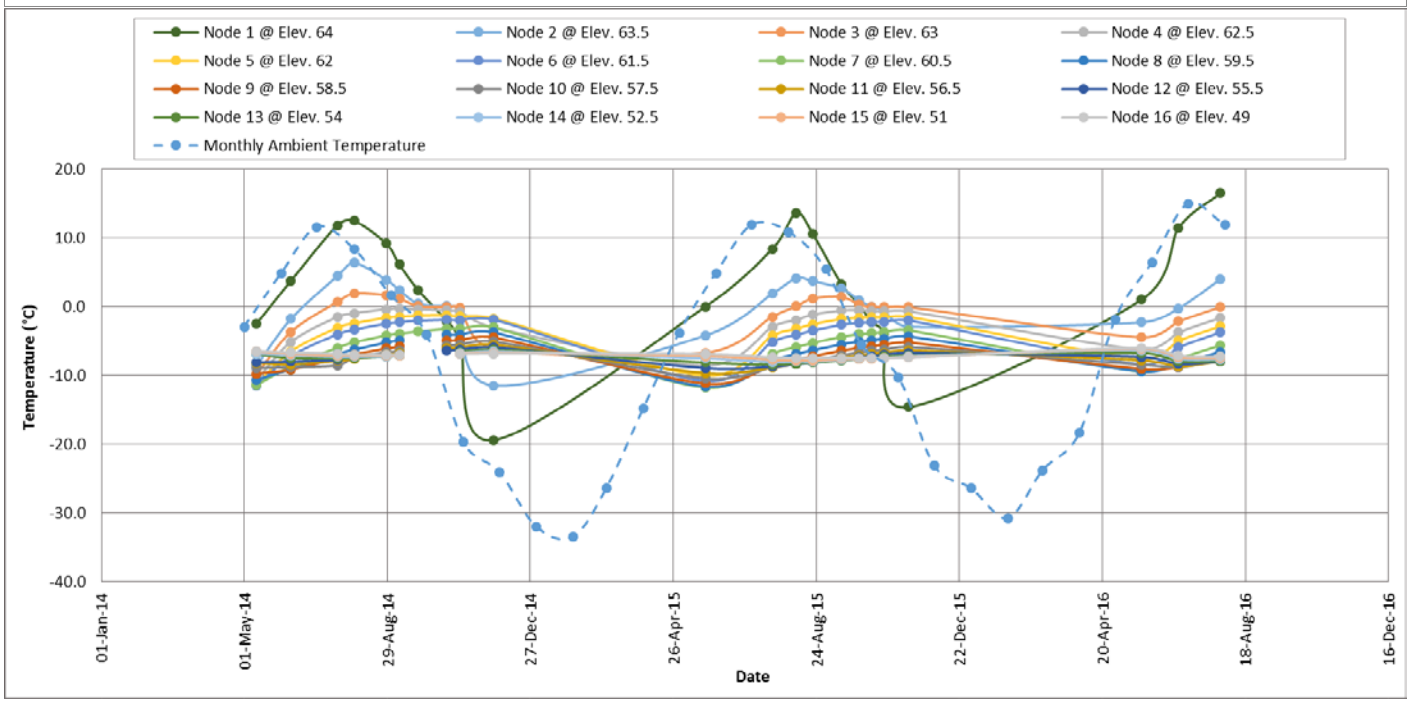

Temperature (°C)
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
11/05/2014
09/06/2014
18/07/2014
23/05/2015
24/06/2015
18/07/2015
07/08/2015
21/08/2015
14/09/2015
29/09/2015
09/10/2015
20/10/2015
23/05/2016
23/06/2016
28/07/2016
26/03/2017
20/05/2017
19/06/2017
22/07/2017
8/9/2017
8/10/2017
25-May-18
19-Jun-18
31-Jul-18
27-Aug-18
06-Sep-18
10-Oct-18
Node 1 @ Elev. 64
Node 2 @ Elev. 63.5
Node 3 @ Elev. 63
Node 4 @ Elev. 62.5
Node 5 @ Elev. 62
Node 6 @ Elev. 61.5
Node 7 @ Elev. 60.5
Node 8 @ Elev. 59.5
Node 9 @ Elev. 58.5
Node 10 @ Elev. 57.5
Node 11 @ Elev. 56.5
Node 12 @ Elev. 55.5
Node 13 @ Elev. 54
Node 14 @ Elev. 52.5
Node 15 @ Elev. 51
Node 16 @ Elev. 49
Monthly Ambient Temperature
Temperature (°C)
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
15-Apr-17
13-Aug-17
11-Dec-17
10-Apr-18
08-Aug-18
06-Dec-18
05-Apr-19
Date

GT14-05

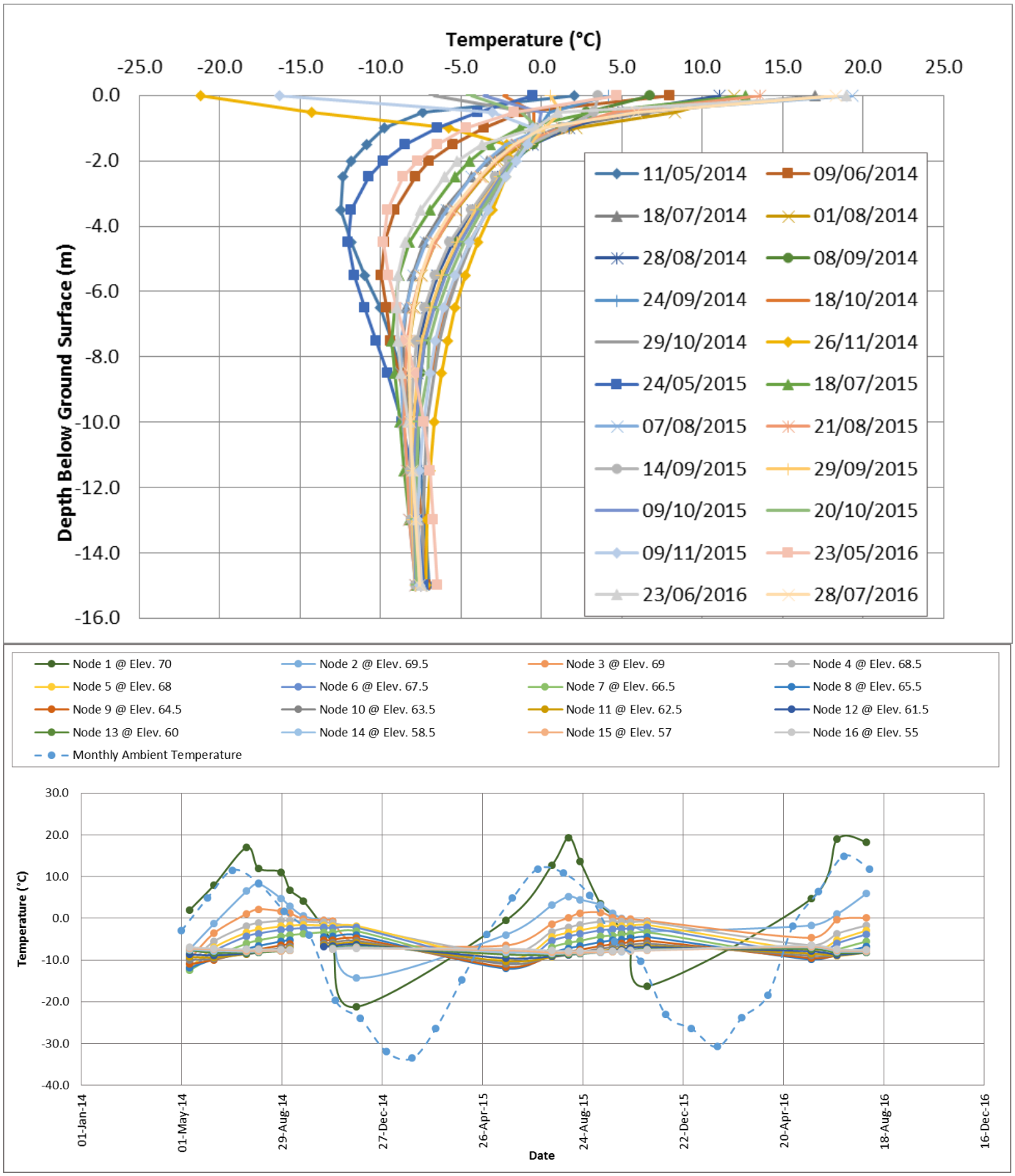

Temperature (°C)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
8/1/2014
8/28/2014
9/8/2014
9/24/2014
10/18/2014
10/29/2014
11/26/2014
5/11/2014
6/9/2014
7/18/2014
8/1/2014
8/28/2014
9/8/2014
9/24/2014
10/18/2014
10/29/2014
11/26/2014
5/23/2015
7/18/2015
8/7/2015
8/21/2015
9/14/2015
9/29/2015
10/9/2015
10/20/2015
11/9/2015
5/23/2016
6/23/2016
7/28/2016
Node 1 @ Elev. 65
Node 2 @ Elev. 64.5
Node 3 @ Elev. 64
Node 4 @ Elev. 63.5
Node 5 @ Elev. 63
Node 6 @ Elev. 62.5
Node 7 @ Elev. 61.5
Node 8 @ Elev. 60.5
Node 9 @ Elev. 59.5
Node 10 @ Elev. 58.5
Node 11 @ Elev. 57.5
Node 12 @ Elev. 56.5
Node 13 @ Elev. 55
Node 14 @ Elev. 53.5
Node 15 @ Elev. 52
Node 16 @ Elev. 50
Monthly Ambient Temperature
Temperature (°C)
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
Date

GT14-07

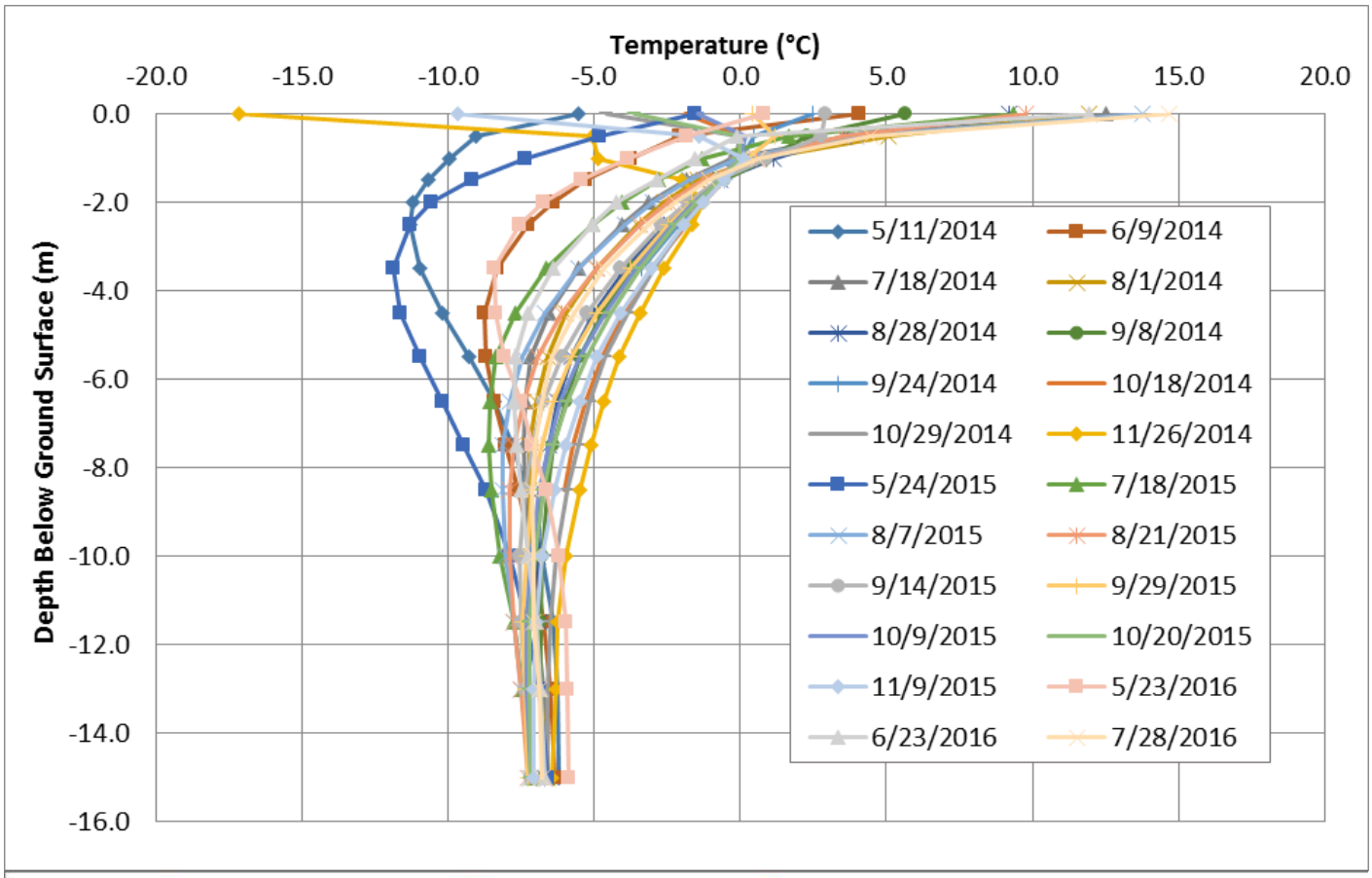

Temperature (°C)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
5/11/2014
6/9/2014
7/18/2014
8/1/2014
8/28/2014
9/8/2014
9/24/2014
10/18/2014
10/29/2014
11/26/2014
5/23/2015
7/18/2015
8/7/2015
8/21/2015
9/14/2015
9/29/2015
10/9/2015
10/20/2015
11/9/2015
5/23/2016
6/23/2016
7/28/2016


Node 1 @ Elev. 64
Node 2 @ Elev. 63.5
Node 3 @ Elev. 63
Node 4 @ Elev. 62.5
Node 5 @ Elev. 62
Node 6 @ Elev. 61.5
Node 7 @ Elev. 60.5
Node 8 @ Elev. 59.5
Node 9 @ Elev. 58.5
Node 10 @ Elev. 57.5
Node 11 @ Elev. 56.5
Node 12 @ Elev. 55.5
Node 13 @ Elev. 54
Node 14 @ Elev. 52.5
Node 15 @ Elev. 51
Node 16 @ Elev. 49
Monthly Ambient Temperature
Temperature (°C)
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
Date

GT14-16


Temperature (°C)
-25.0 -20.0 -15.0 -10.0 -5.0 0.0 5.0 10.0 15.0 20.0 25.0
Depth Below Ground Surface (m)
0.0 -2.0 -4.0 -6.0 -8.0 -10.0 -12.0 -14.0 -16.0
11/05/2014
09/06/2014
18/07/2014
01/08/2014
28/08/2014
08/09/2014
24/09/2014
18/10/2014
29/10/2014
26/11/2014
24/05/2015
18/07/2015
07/08/2015
21/08/2015
14/09/2015
29/09/2015
09/10/2015
20/10/2015
09/11/2015
23/05/2016
23/06/2016
28/07/2016
Node 1 @ Elev. 70
Node 2 @ Elev. 69.5
Node 3 @ Elev. 69
Node 4 @ Elev. 68.5
Node 5 @ Elev. 68
Node 6 @ Elev. 67.5
Node 7 @ Elev. 66.5
Node 8 @ Elev. 65.5
Node 9 @ Elev. 64.5
Node 10 @ Elev. 63.5
Node 11 @ Elev. 62.5
Node 12 @ Elev. 61.5
Node 13 @ Elev. 60
Node 14 @ Elev. 58.5
Node 15 @ Elev. 57
Node 16 @ Elev. 55
Monthly Ambient Temperature
Temperature (°C)
30.0 20.0 10.0 0.0 -10.0 -20.0 -30.0 -40.0
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
Date

GT14-17


Temperature (°C)
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
5/11/2014
6/9/2014
7/18/2014
8/1/2014
8/28/2014
9/8/2014
9/24/2014
10/18/2014
10/29/2014
11/26/2014
5/24/2015
7/18/2015
8/7/2015
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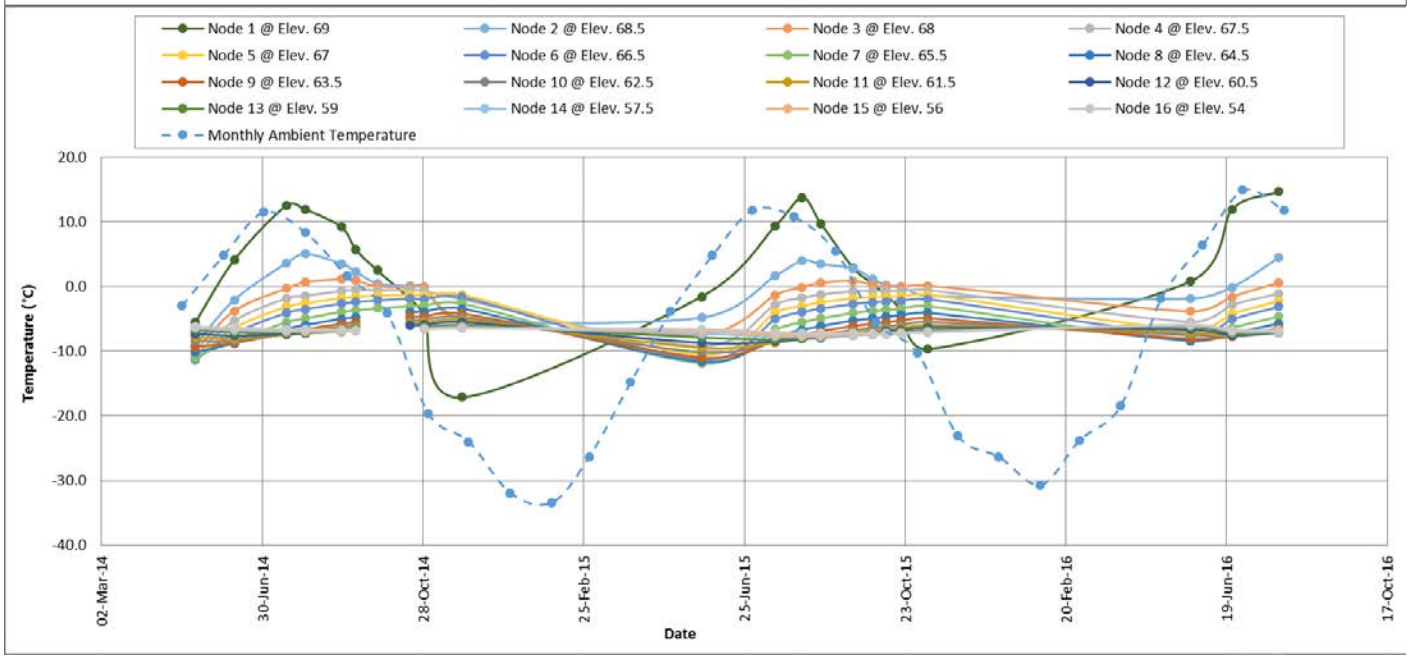
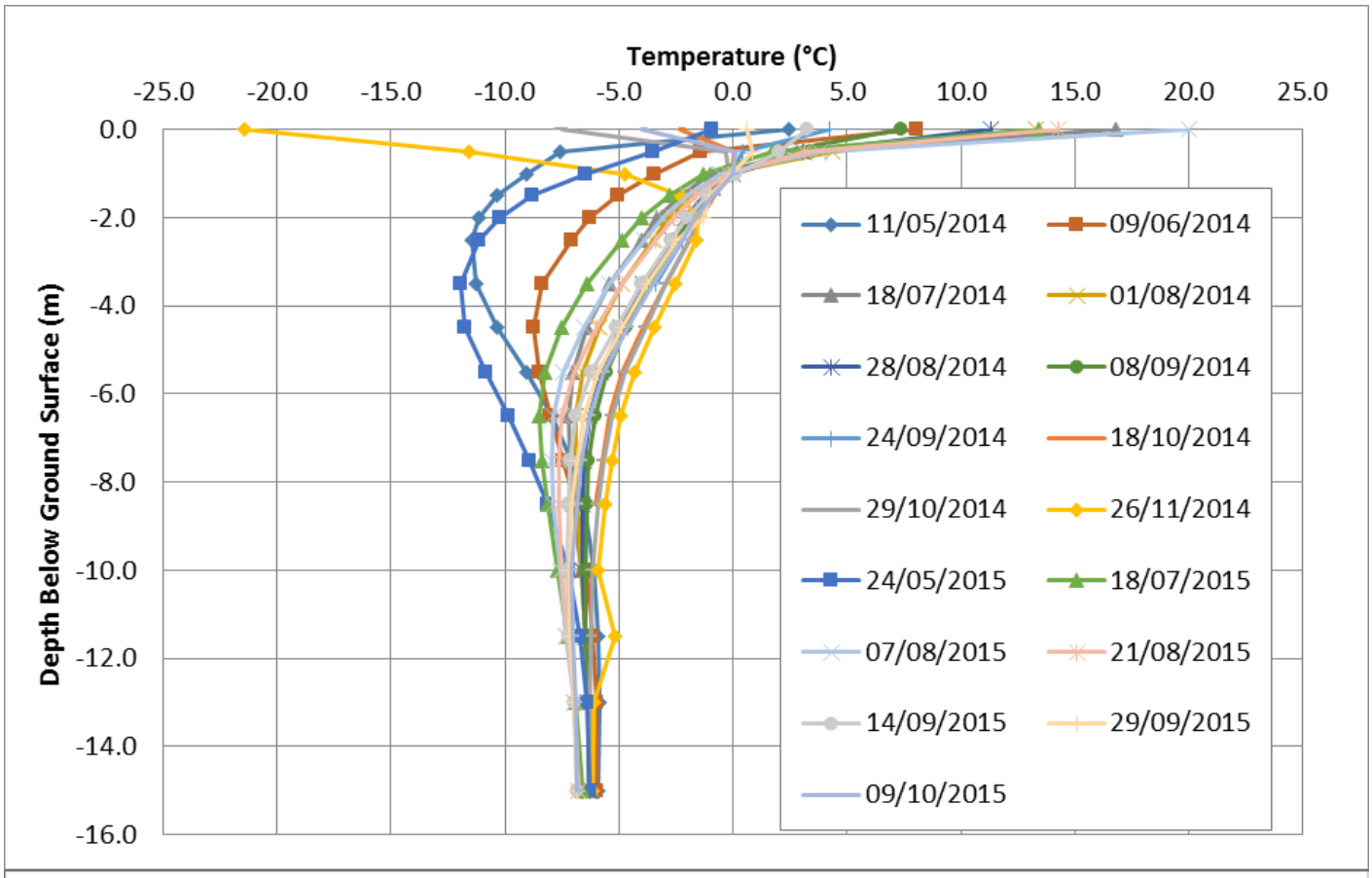
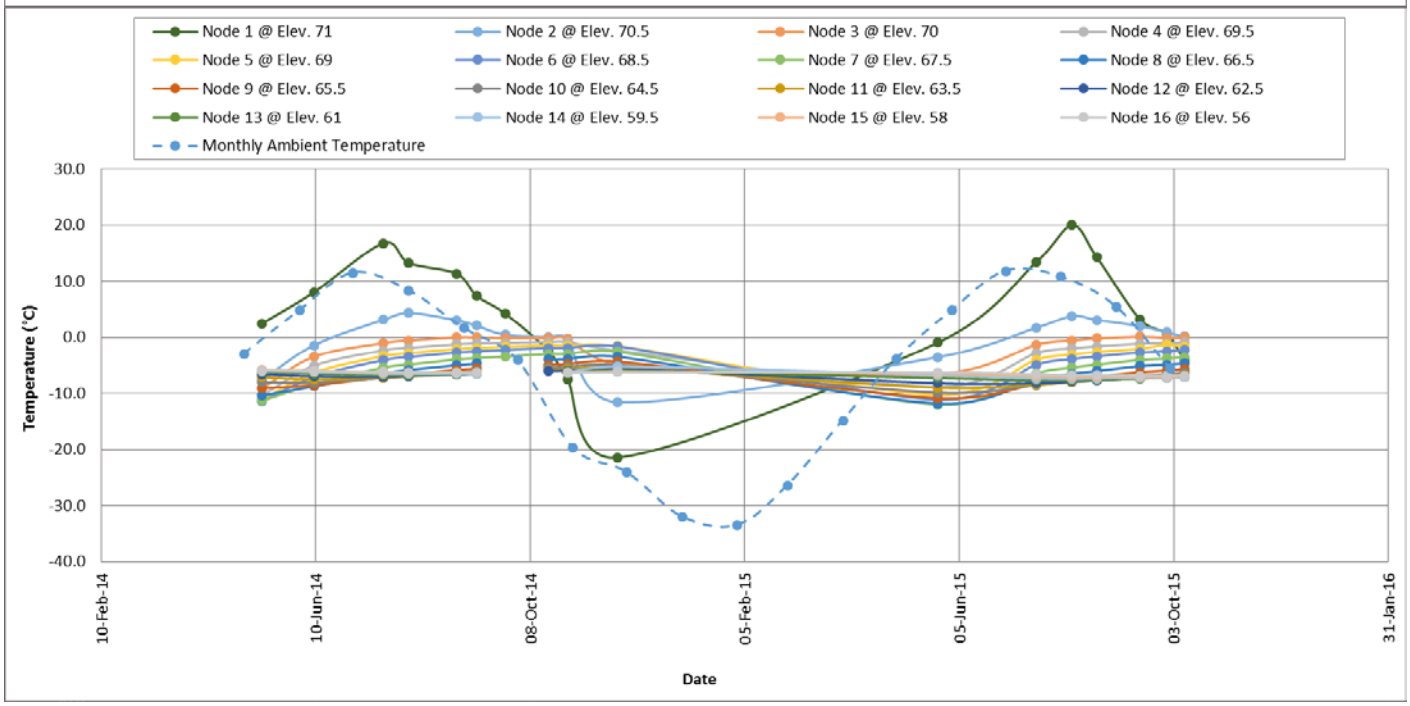
6/23/2016
7/28/2016

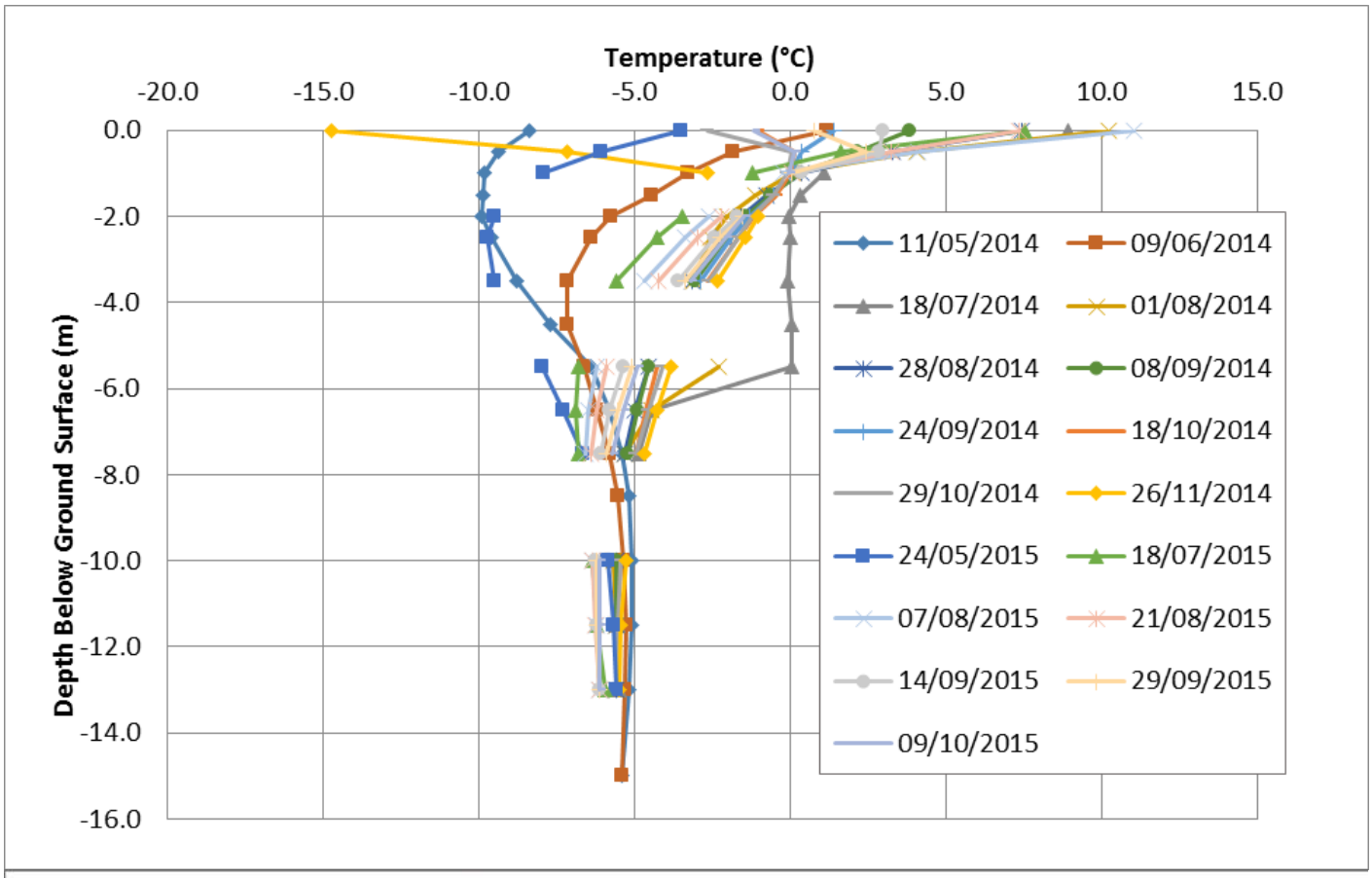

Node 1 @ Elev. 69
Node 2 @ Elev. 68.5
Node 3 @ Elev. 68
Node 4 @ Elev. 67.5
Node 5 @ Elev. 67
Node 6 @ Elev. 66.5
Node 7 @ Elev. 65.5
Node 8 @ Elev. 64.5
Node 9 @ Elev. 63.5
Node 10 @ Elev. 62.5
Node 11 @ Elev. 61.5
Node 12 @ Elev. 60.5
Node 13 @ Elev. 59
Node 14 @ Elev. 57.5
Node 15 @ Elev. 56
Node 16 @ Elev. 54
Monthly Ambient Temperature
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Temperature (°C)
02-Mar-14
30-Jun-14
28-Oct-14
25-Feb-15
25-Jun-15
23-Oct-15
20-Feb-16
19-Jun-16
17-Oct-16
Date

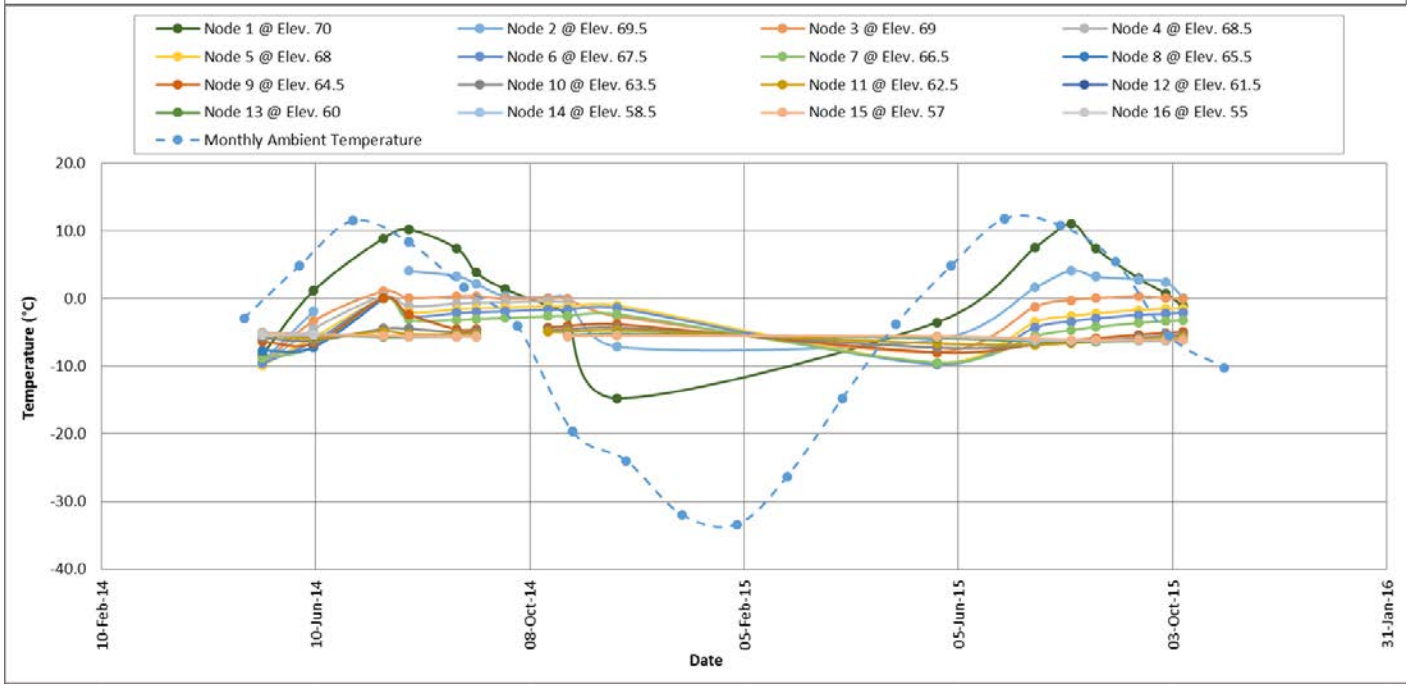
GT14-18


Temperature (°C)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
25.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
11/05/2014
09/06/2014
18/07/2014
01/08/2014
28/08/2014
08/09/2014
24/09/2014
18/10/2014
29/10/2014
26/11/2014
24/05/2015
18/07/2015
07/08/2015
21/08/2015
14/09/2015
29/09/2015
09/10/2015

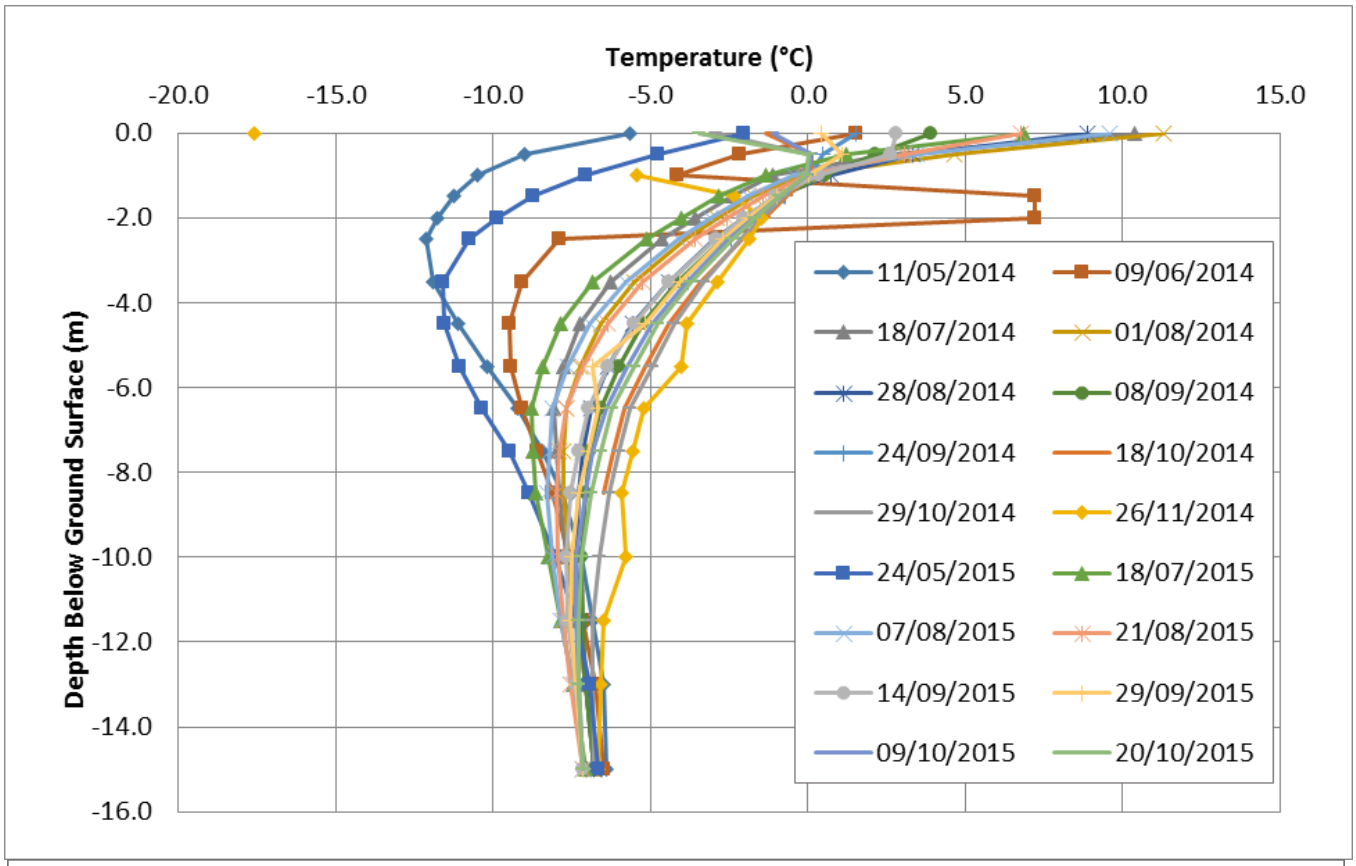

Node 1 @ Elev. 71
Node 2 @ Elev. 70.5
Node 3 @ Elev. 70
Node 4 @ Elev. 69.5
Node 5 @ Elev. 69
Node 6 @ Elev. 68.5
Node 7 @ Elev. 67.5
Node 8 @ Elev. 66.5
Node 9 @ Elev. 65.5
Node 10 @ Elev. 64.5
Node 11 @ Elev. 63.5
Node 12 @ Elev. 62.5
Node 13 @ Elev. 61
Node 14 @ Elev. 59.5
Node 15 @ Elev. 58
Node 16 @ Elev. 56
Monthly Ambient Temperature
Temperature (°C)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
10-Feb-14
10-Jun-14
08-Oct-14
05-Feb-15
05-Jun-15
03-Oct-15
31-Jan-16
Date

GT14-19


Temperature (°C)
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
11/05/2014
09/06/2014
18/07/2014
01/08/2014
28/08/2014
08/09/2014
24/09/2014
18/10/2014
29/10/2014
26/11/2014
24/05/2015
18/07/2015
07/08/2015
21/08/2015
14/09/2015
29/09/2015
09/10/2015


Node 1 @ Elev. 70
Node 2 @ Elev. 69.5
Node 3 @ Elev. 69
Node 4 @ Elev. 68.5
Node 5 @ Elev. 68
Node 6 @ Elev. 67.5
Node 7 @ Elev. 66.5
Node 8 @ Elev. 65.5
Node 9 @ Elev. 64.5
Node 10 @ Elev. 63.5
Node 11 @ Elev. 62.5
Node 12 @ Elev. 61.5
Node 13 @ Elev. 60
Node 14 @ Elev. 58.5
Node 15 @ Elev. 57
Node 16 @ Elev. 55
Monthly Ambient Temperature
Temperature (°C)
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
10-Feb-14
10-Jun-14
08-Oct-14
05-Feb-15
05-Jun-15
03-Oct-15
31-Jan-16
Date

GT14-22


Temperature (°C)
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
11/05/2014
09/06/2014
18/07/2014
01/08/2014
28/08/2014
08/09/2014
24/09/2014
18/10/2014
29/10/2014
26/11/2014
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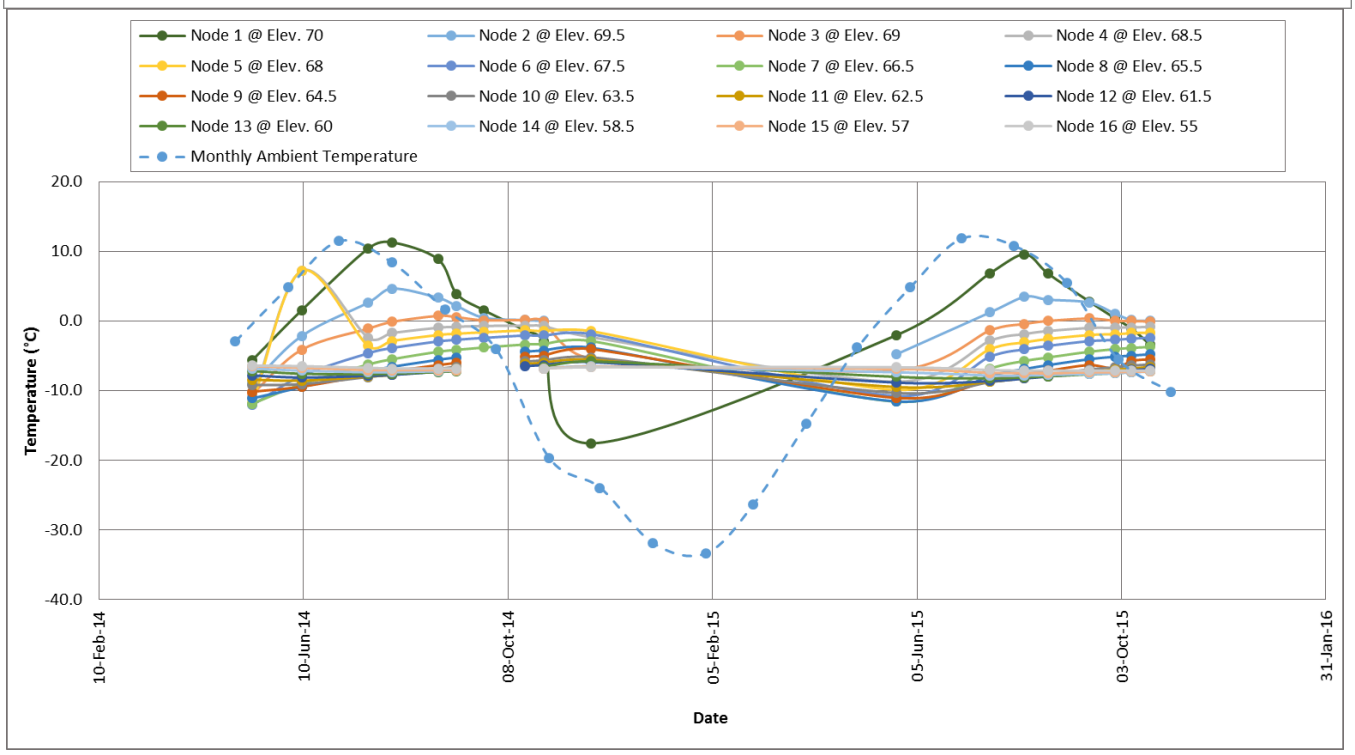
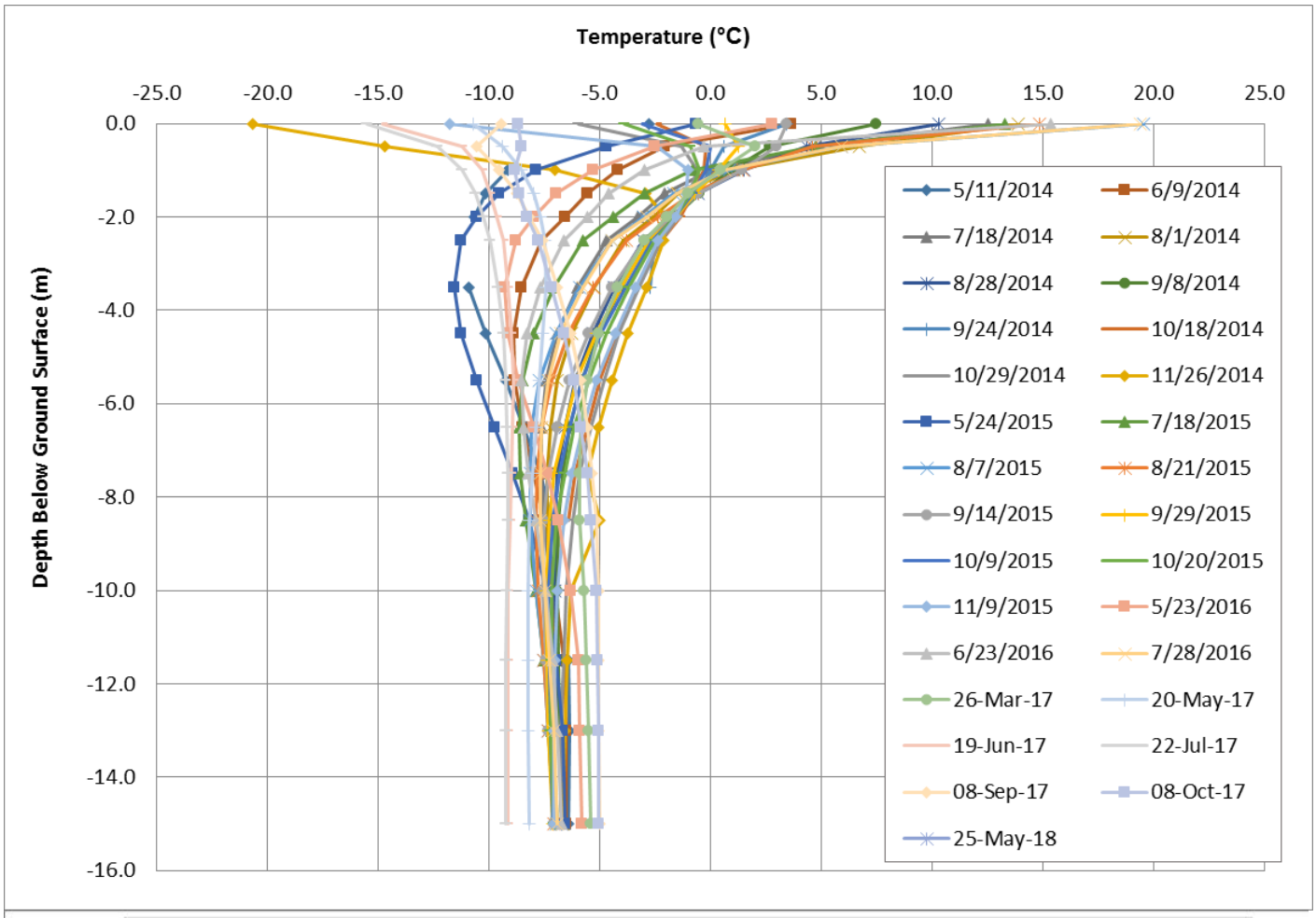
09/10/2015
20/10/2015


Node 1 @ Elev. 70
Node 2 @ Elev. 69.5
Node 3 @ Elev. 69
Node 4 @ Elev. 68.5
Node 5 @ Elev. 68
Node 6 @ Elev. 67.5
Node 7 @ Elev. 66.5
Node 8 @ Elev. 65.5
Node 9 @ Elev. 64.5
Node 10 @ Elev. 63.5
Node 11 @ Elev. 62.5
Node 12 @ Elev. 61.5
Node 13 @ Elev. 60
Node 14 @ Elev. 58.5
Node 15 @ Elev. 57
Node 16 @ Elev. 55
Monthly Ambient Temperature
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Temperature (°C)
10-Feb-14
10-Jun-14
08-Oct-14
05-Feb-15
05-Jun-15
03-Oct-15
31-Jan-16
Date

GT14-27


Temperature (°C)
-25.0
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
15.0
20.0
25.0
Depth Below Ground Surface (m)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
5/11/2014
6/9/2014
7/18/2014
8/1/2014
8/28/2014
9/8/2014
9/24/2014
10/18/2014
10/29/2014
11/26/2014
5/24/2015
7/18/2015
8/7/2015
8/21/2015
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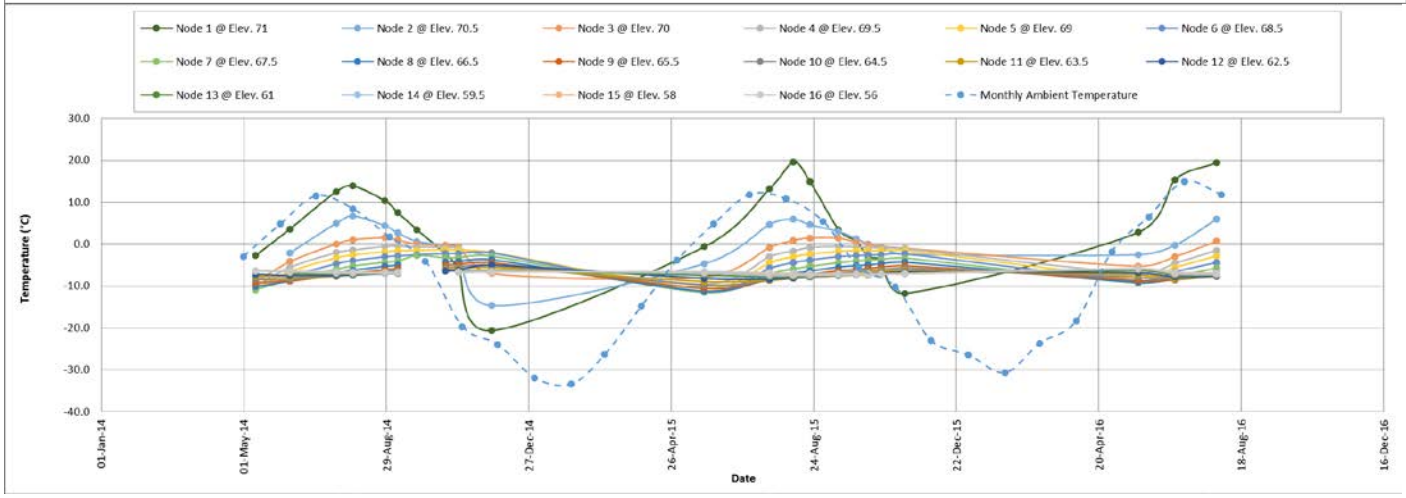
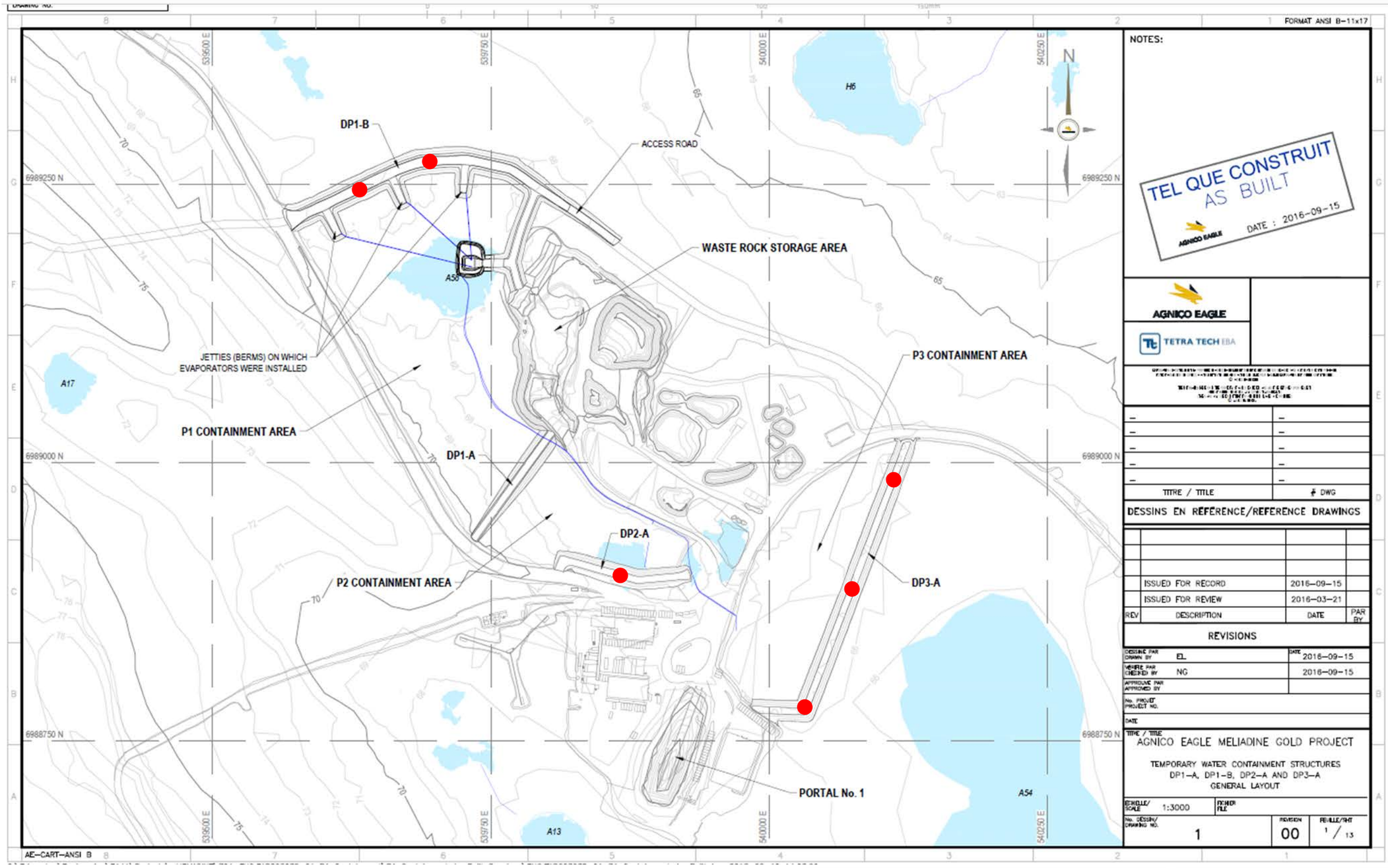
08-Oct-17
25-May-18


Node 1 @ Elev. 71
Node 2 @ Elev. 70.5
Node 3 @ Elev. 70
Node 4 @ Elev. 69.5
Node 5 @ Elev. 69
Node 6 @ Elev. 68.5
Node 7 @ Elev. 67.5
Node 8 @ Elev. 66.5
Node 9 @ Elev. 65.5
Node 10 @ Elev. 64.5
Node 11 @ Elev. 63.5
Node 12 @ Elev. 62.5
Node 13 @ Elev. 61
Node 14 @ Elev. 59.5
Node 15 @ Elev. 58
Node 16 @ Elev. 56
Monthly Ambient Temperature
Temperature (°C)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
01-Jan-14
01-May-14
29-Aug-14
27-Dec-14
26-Apr-15
24-Aug-15
22-Dec-15
20-Apr-16
18-Aug-16
16-Dec-16
Date



Base Drawing from:
Tetra Tech. 2016. Meliadine P-Area Containment Construction Record Report. Prepared for Agnico Eagle Mines Limited. September 2016. Document No. 6515-C-230-002.

CLIENT
AGNICO-EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

CONSULTANT
GOLDER

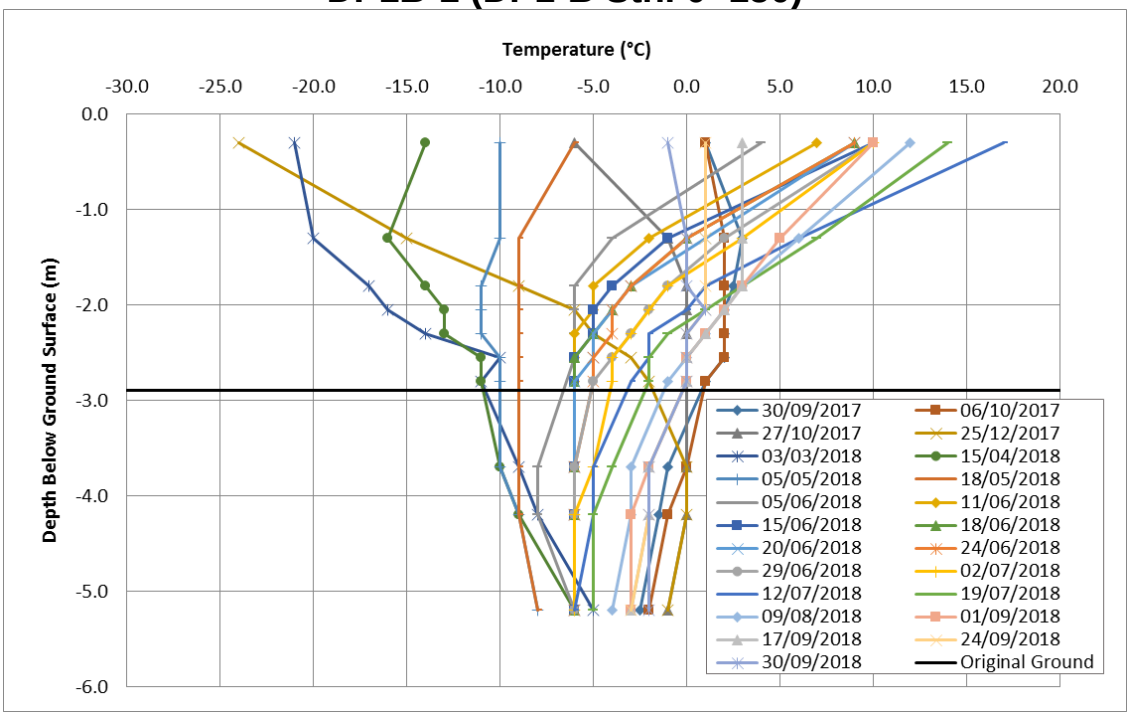
YYYY-MM-DD	2019-02-19
PREPARED	ADP
DESIGN	-
REVIEW	FE
APPROVED	ACI

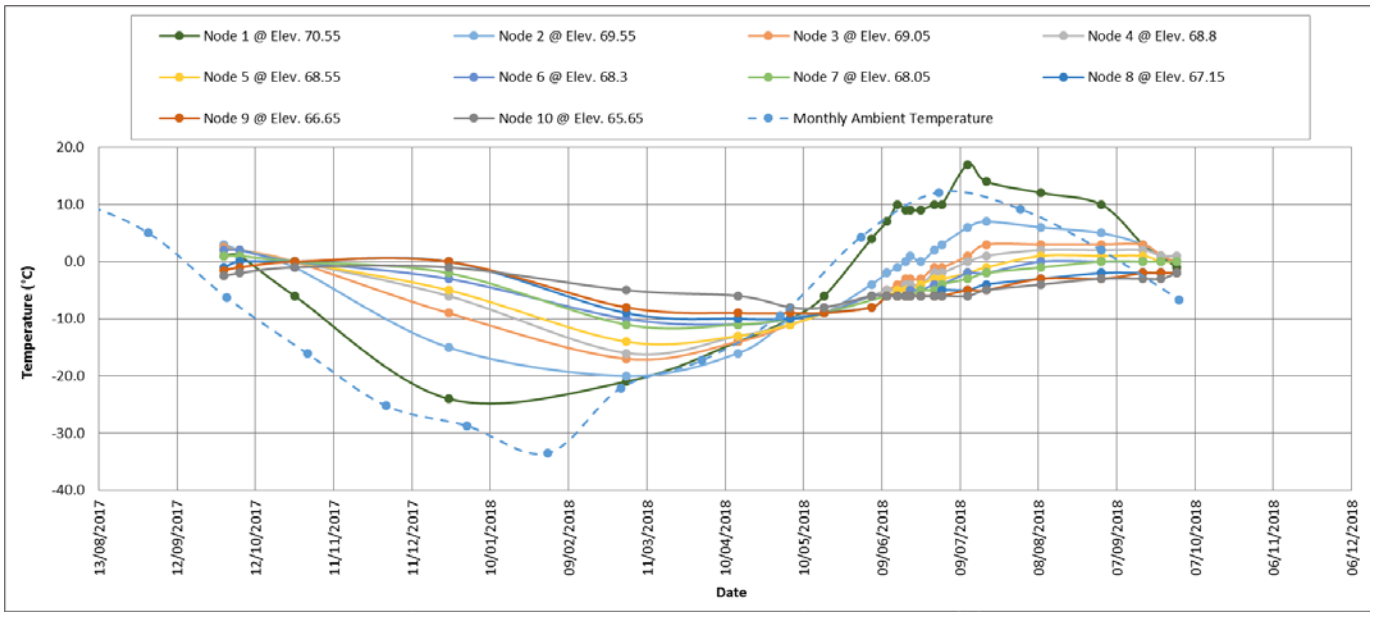
PROJECT
Meliadine Gold Project
Rankin Inlet, Nunavut

TITLE
APPROXIMATE P-AREA VERTICAL THERMISTOR LOCATIONS

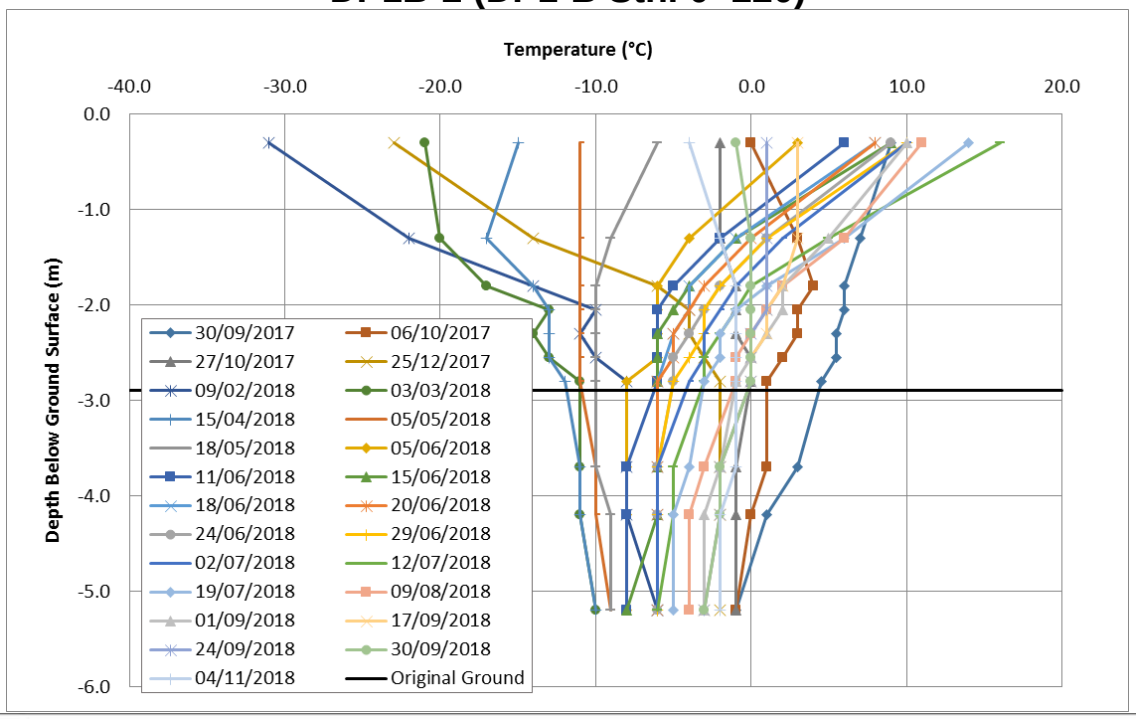
PROJECT No.	PHASE	Rev.	FIGURE
18105719	**3000**	**0**	C3

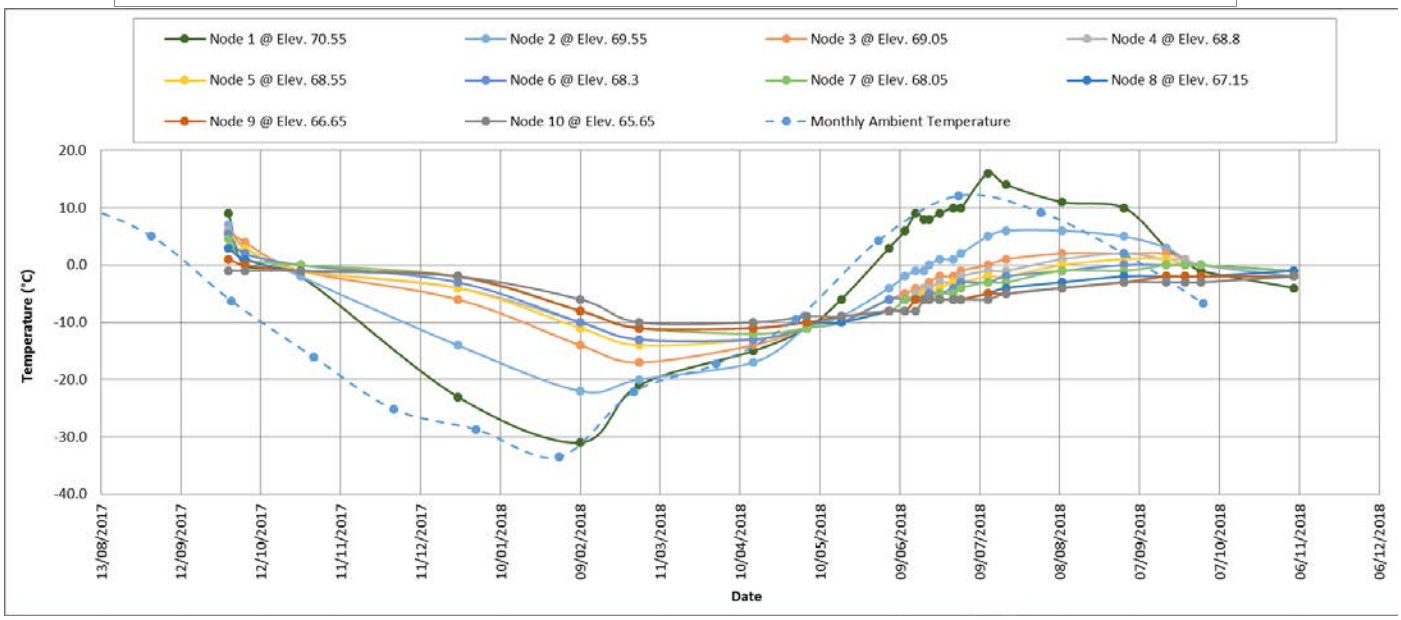
DP1B-1 (DP1-B Stn. 0+150)



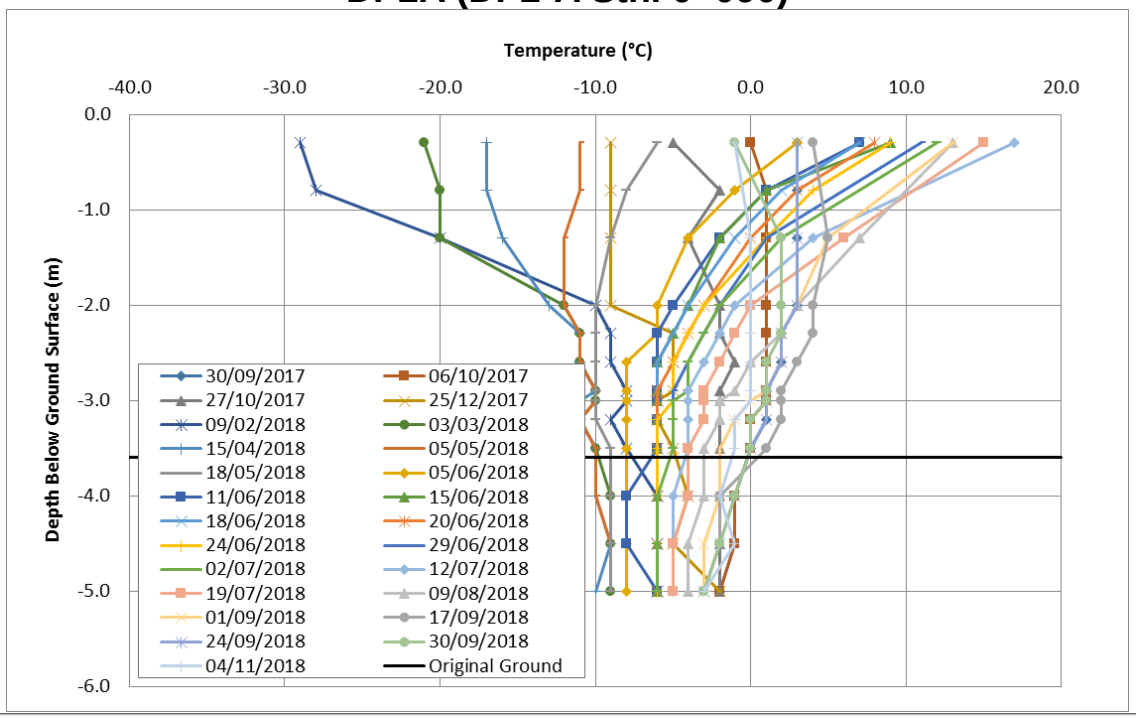


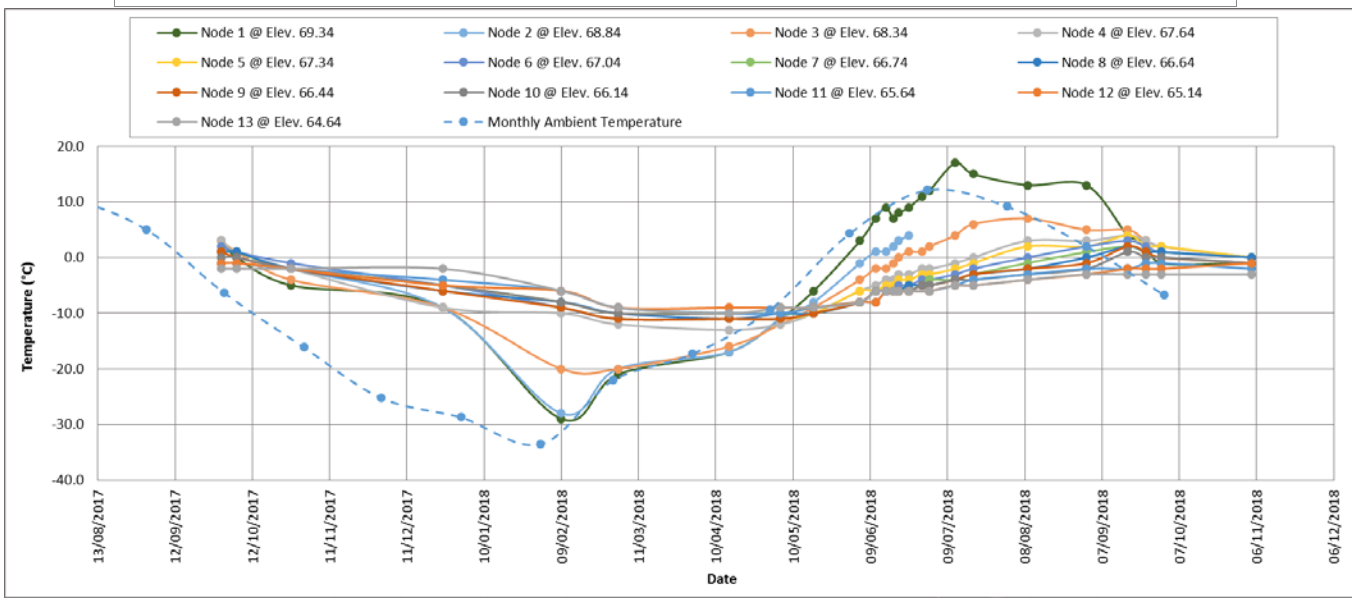
DP1B-2 (DP1-B Stn. 0+220)



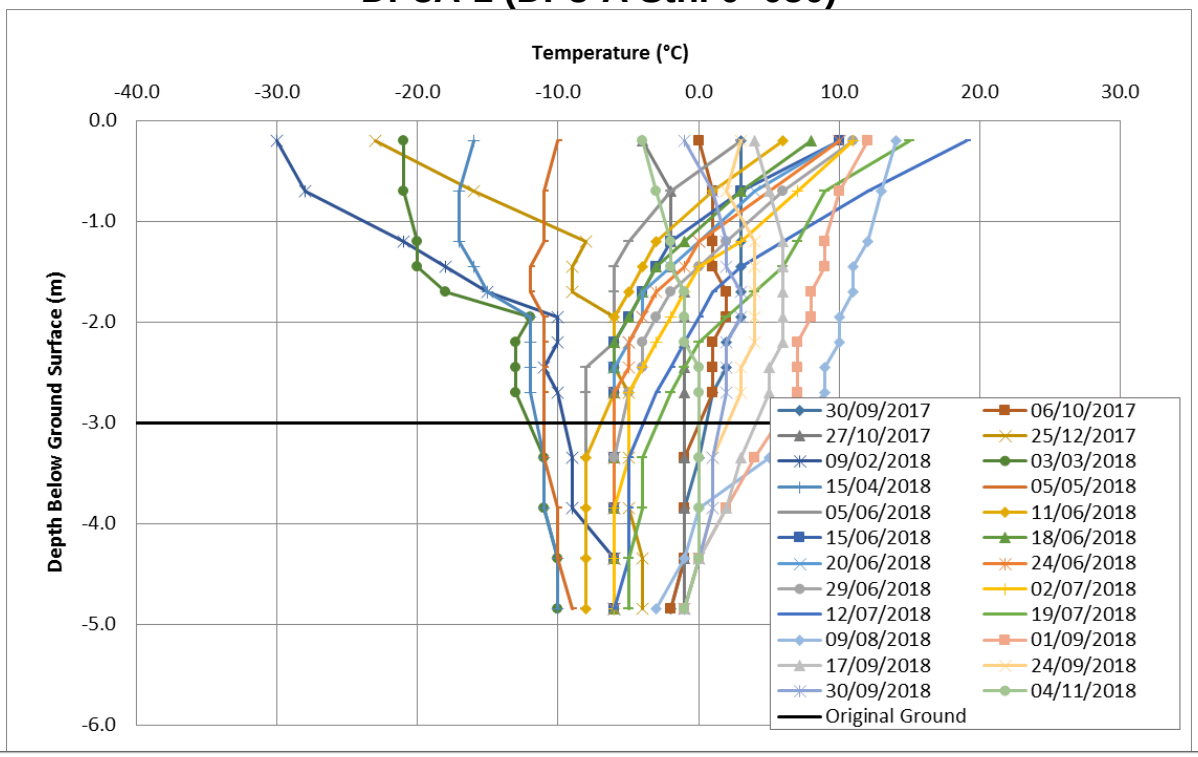


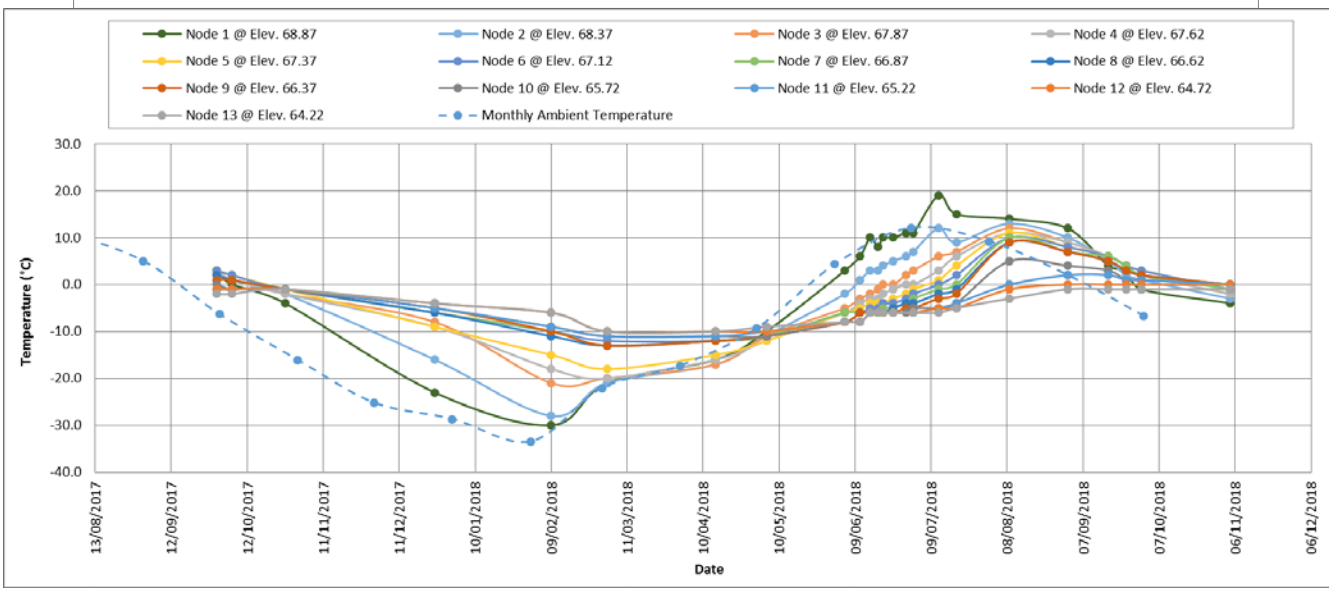
DP2A (DP2-A Stn. 0+090)



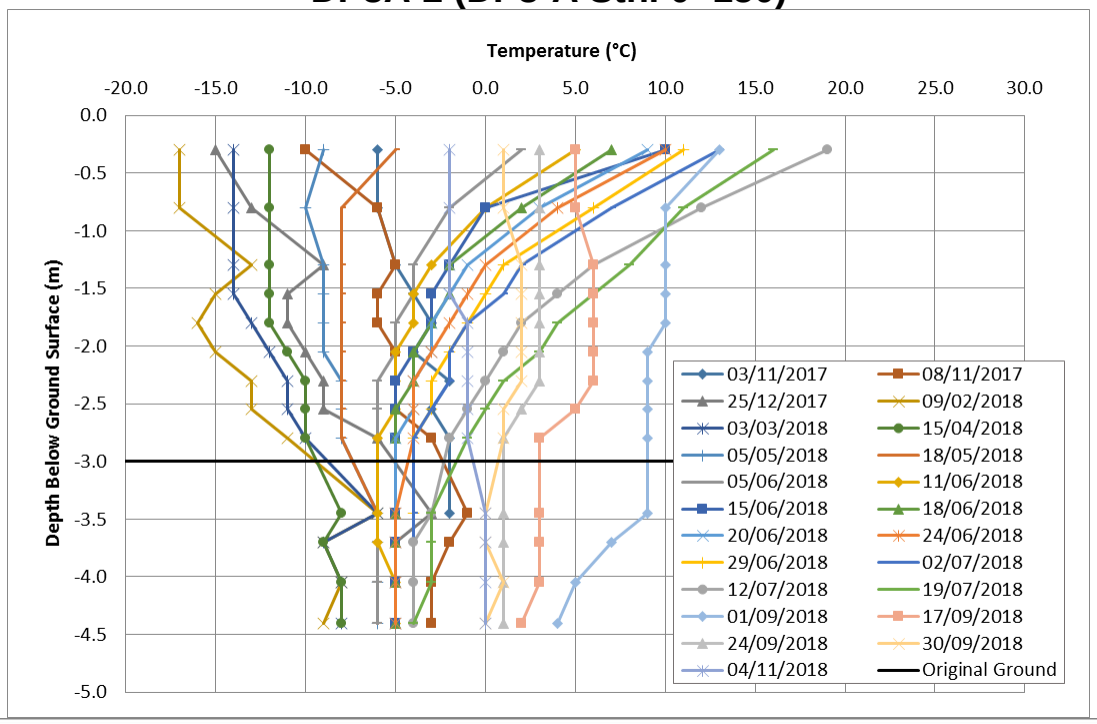


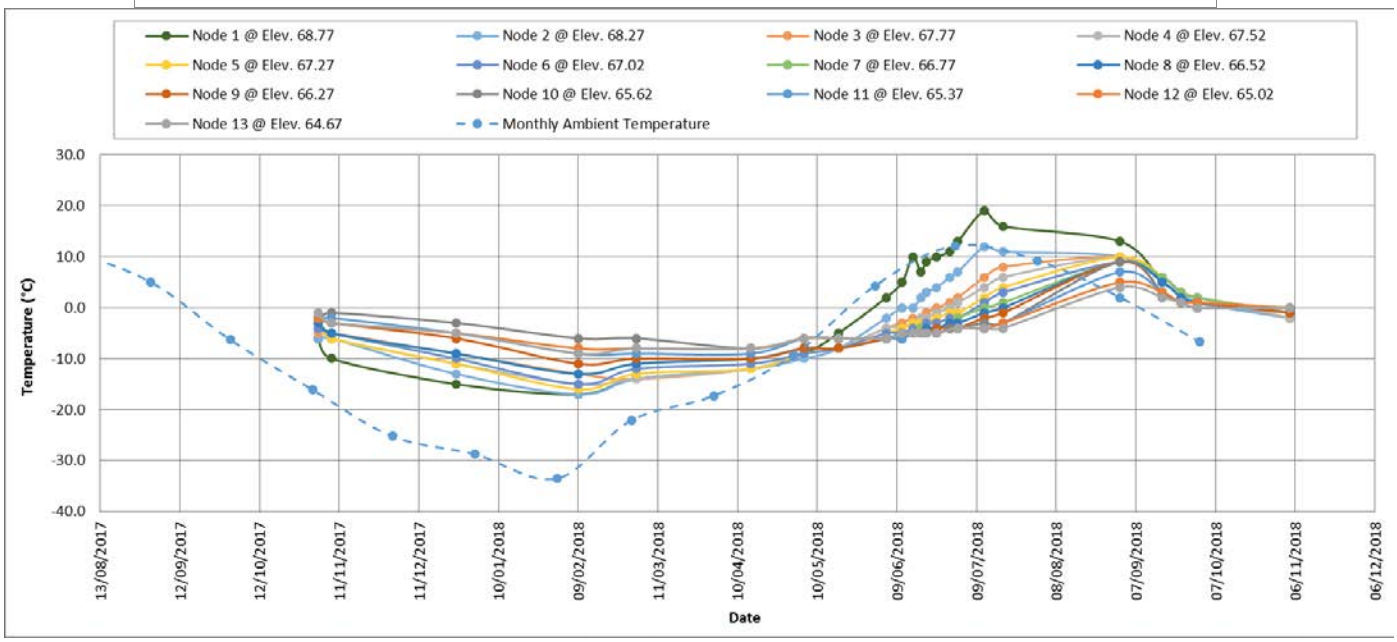
DP3A-1 (DP3-A Stn. 0+050)



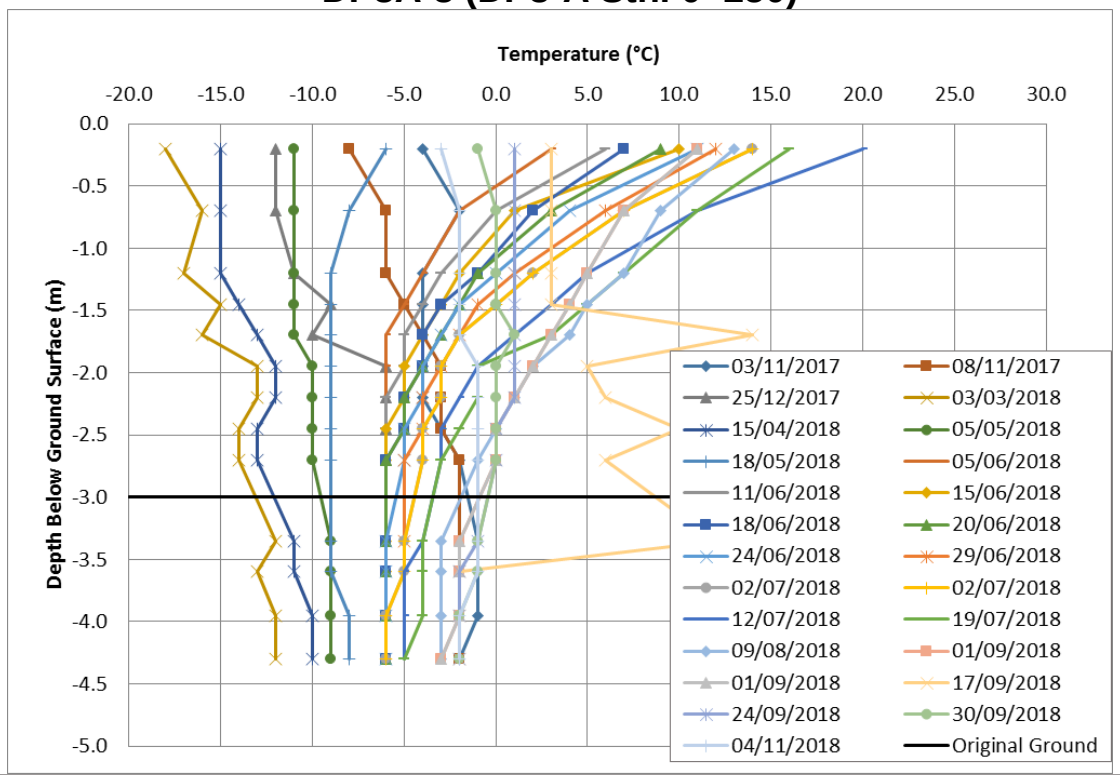


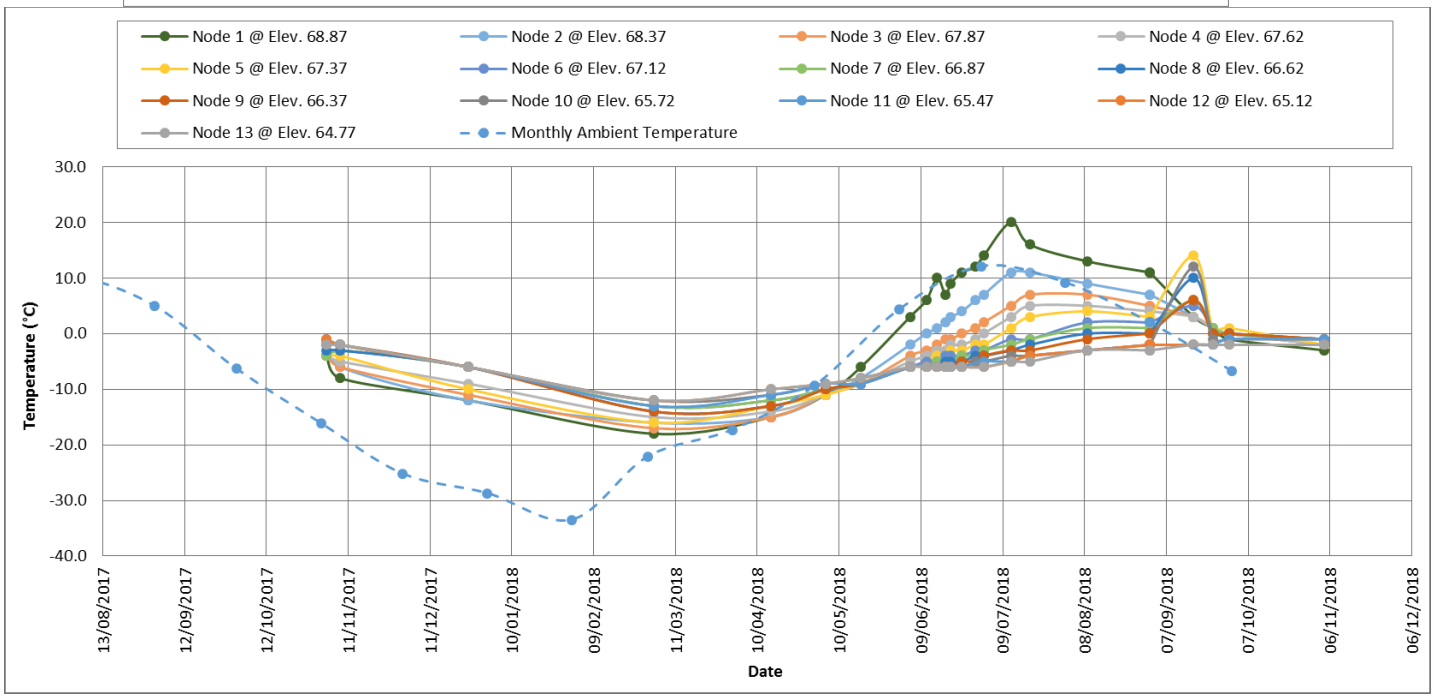
DP3A-2 (DP3-A Stn. 0+150)

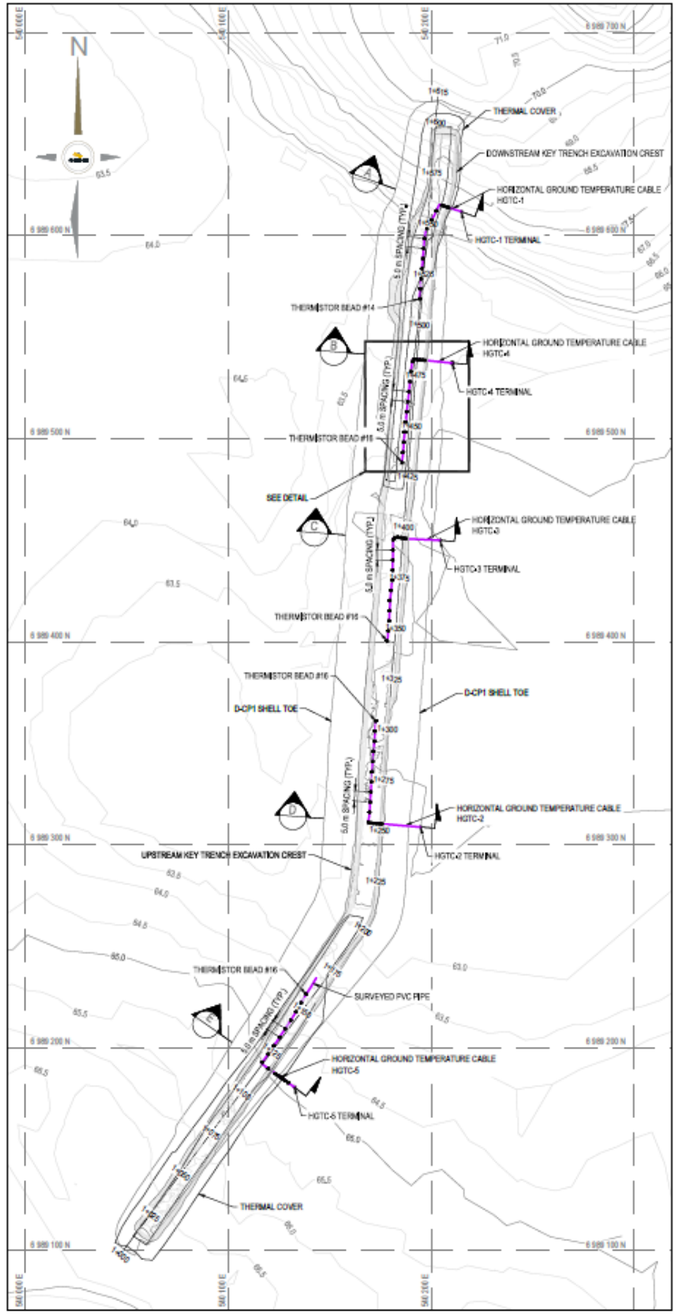




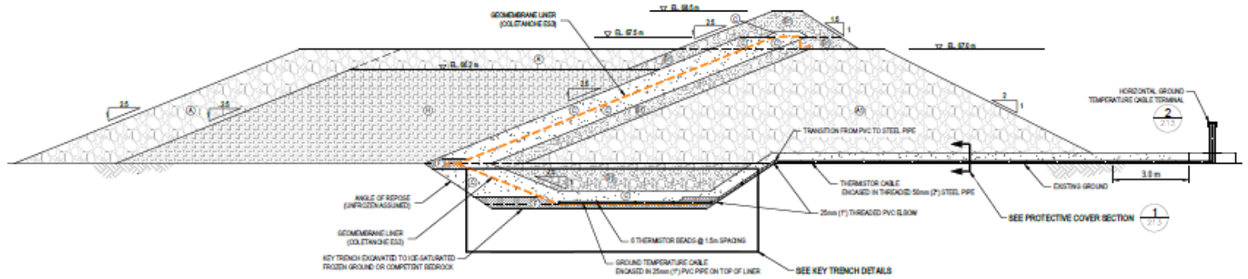
DP3A-3 (DP3-A Stn. 0+250)



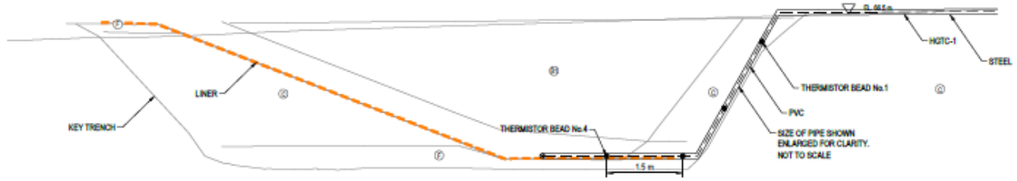




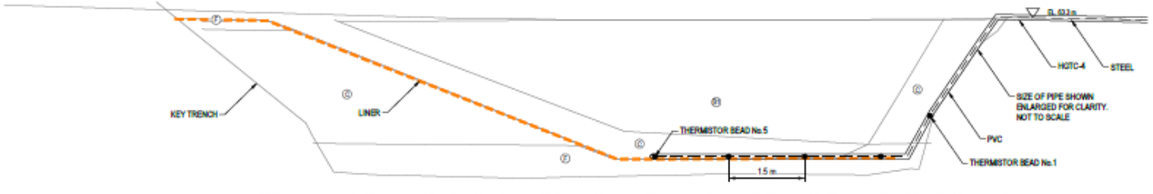
D-CP1 AS-BUILT HORIZONTAL GROUND TEMPERATURE CABLE LAYOUT
SCALE 1:1250



D-CP1 HORIZONTAL GROUND TEMPERATURE CABLE - DESIGN TYPICAL SECTION
SCALE 1:100



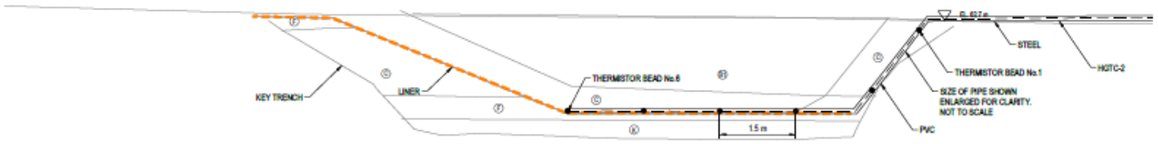
D-CP1 AS-BUILT - SECTION A - HORIZONTAL GROUND TEMPERATURE CABLE - KEY TRENCH DETAIL THROUGH STATION 1+562
SCALE 1:50



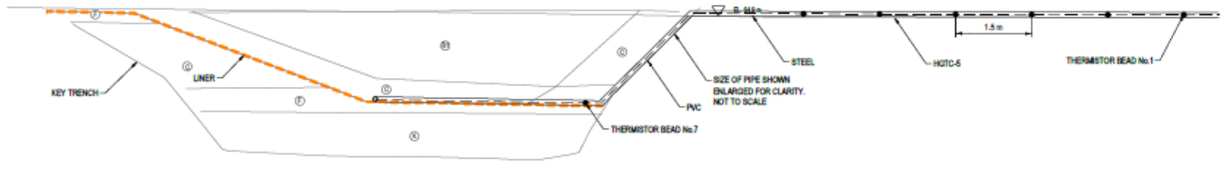
D-CP1 AS-BUILT - SECTION B - HORIZONTAL GROUND TEMPERATURE CABLE - KEY TRENCH DETAIL THROUGH STATION 1+482
SCALE 1:50



D-CP1 AS-BUILT - SECTION C - HORIZONTAL GROUND TEMPERATURE CABLE - KEY TRENCH DETAIL THROUGH STATION 1+394
SCALE 1:50



D-CP1 AS-BUILT - SECTION D - HORIZONTAL GROUND TEMPERATURE CABLE - KEY TRENCH DETAIL THROUGH STATION 1+254
SCALE 1:50



D-CP1 AS-BUILT - SECTION E - HORIZONTAL GROUND TEMPERATURE CABLE - KEY TRENCH DETAIL THROUGH STATION 1+117
SCALE 1:50

Reference:

Tetra Tech. 2017. Construction Summary (as-built) Report Dike D-CP1, Meliadine Gold Project, Nunavut. Prepared for Agnico Eagle Mines Limited. October 2017. Document No. 6515-E-132-007-132-REP-012.

CLIENT
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CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-19
PREPARED	ADP
DESIGN	-
REVIEW	FE
APPROVED	ACI

PROJECT
Meliadine Gold Project
Rankin Inlet, Nunavut

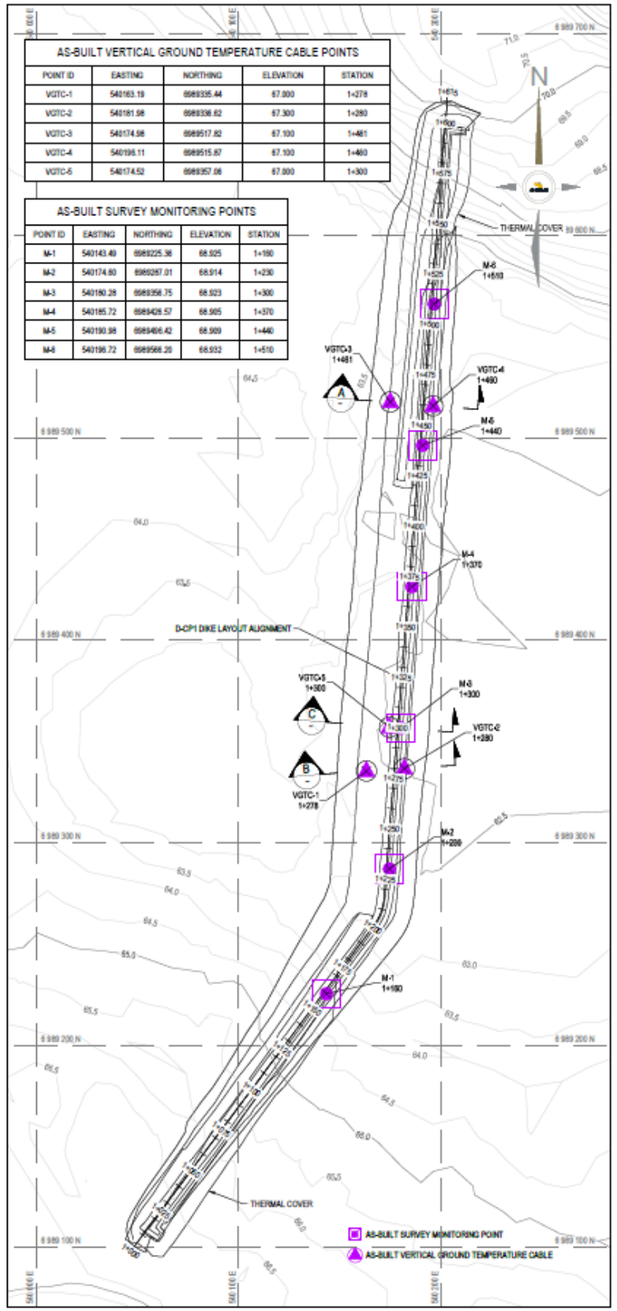
TITLE
D-CP1 AS-BUILT INSTRUMENTATION PLAN AND DETAILS FOR HORIZONTAL GROUND TEMPERATURE CABLES

PROJECT No.	PHASE	Rev.	FIGURE
18105719	**3000**	**0**	C4

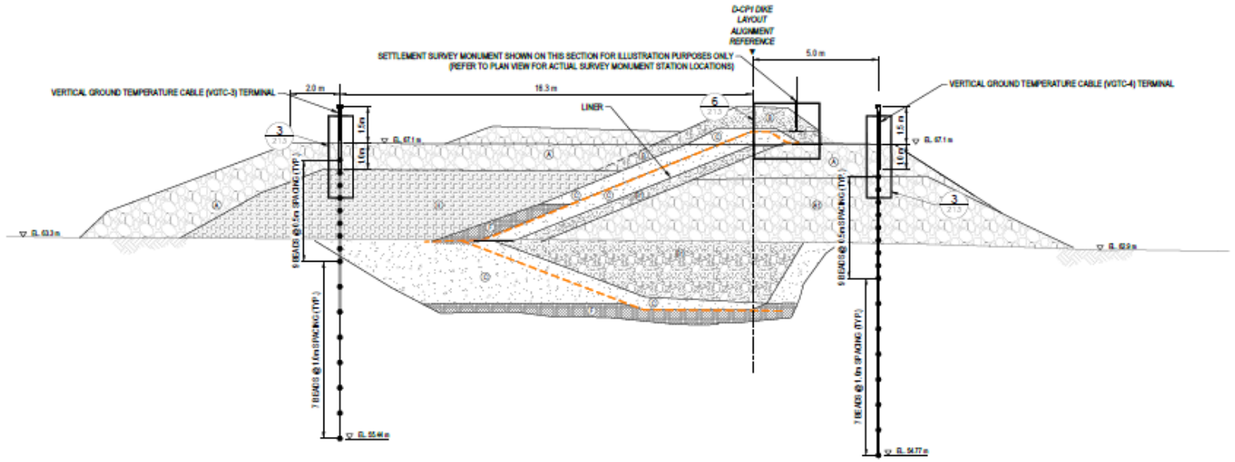
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

AS-BUILT VERTICAL GROUND TEMPERATURE CABLE POINTS				
POINT ID	EASTING	NORTHING	ELEVATION	STATION
VGTC-1	540163.19	6989335.44	67.000	1+278
VGTC-2	540161.98	6989336.62	67.300	1+280
VGTC-3	540174.98	6989517.82	67.100	1+481
VGTC-4	540196.11	6989515.67	67.100	1+490
VGTC-5	540174.52	6989357.06	67.000	1+300

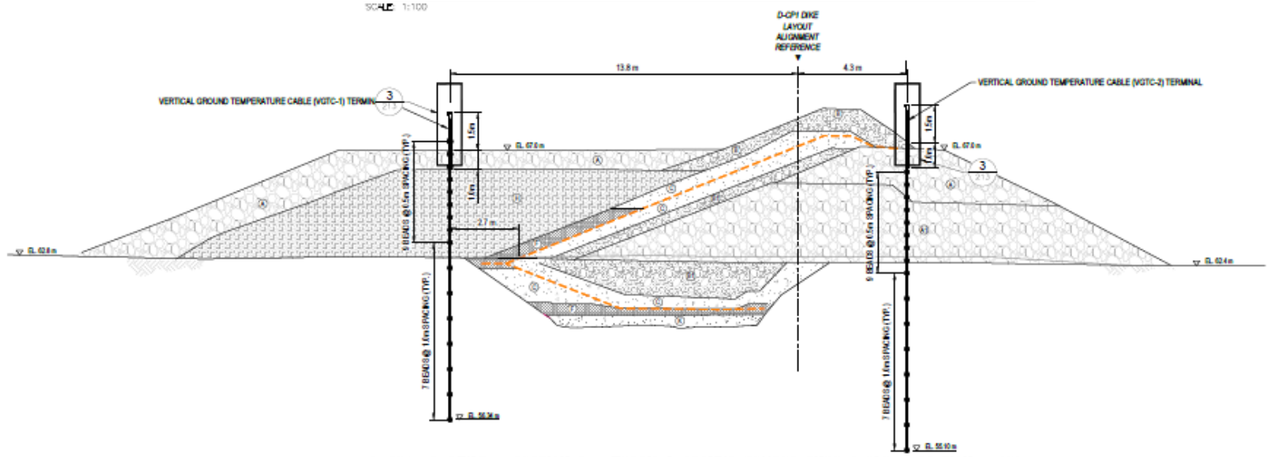
AS-BUILT SURVEY MONITORING POINTS				
POINT ID	EASTING	NORTHING	ELEVATION	STATION
M-1	540143.49	6989225.36	66.925	1+190
M-2	540174.60	6989287.01	66.914	1+230
M-3	540180.28	6989356.75	66.923	1+300
M-4	540185.72	6989426.57	66.905	1+370
M-5	540190.98	6989466.42	66.909	1+440
M-6	540196.72	6989566.20	66.932	1+510



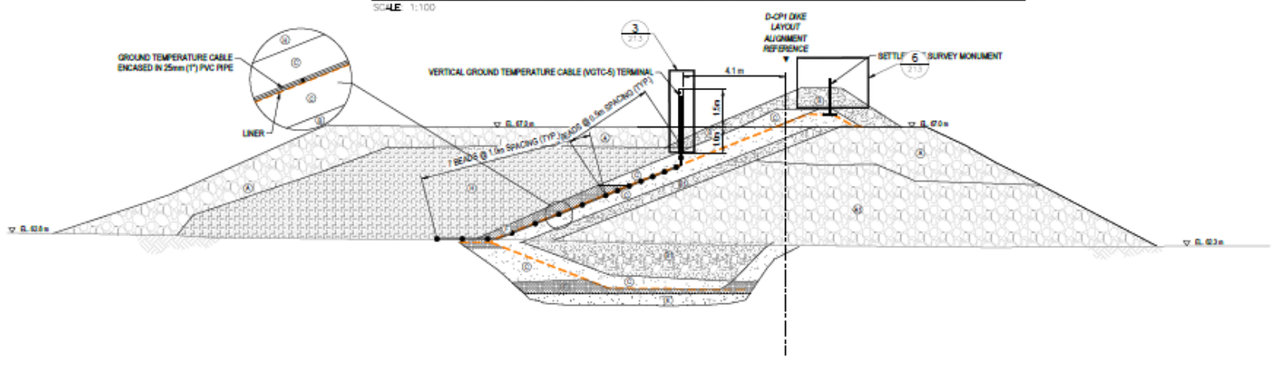
D–CP1 AS–BUILT SURVEY MONUMENT AND VERTICAL GROUND TEMPERATURE CABLE LAYOUT
SCALE: 1:1250



D–CP1 – AS–BUILT – SECTION A – VERTICAL GROUND TEMPERATURE CABLE – STATION 1+460
SCALE: 1:100



D–CP1 AS–BUILT – SECTION B – VERTICAL GROUND TEMPERATURE CABLE – STATION 1+279
SCALE: 1:100



D–CP1 – AS–BUILT – SECTION C – VERTICAL GROUND TEMPERATURE CABLE – STATION 1+300
SCALE: 1:100

Reference:
Tetra Tech. 2017. Construction Summary (as-built) Report Dike D-CP1, Meliadine Gold Project, Nunavut. Prepared for Agnico Eagle Mines Limited. October 2017. Document No. 6515-E-132-007-132-REP-012.

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DESIGN	-
REVIEW	FE
APPROVED	ACI

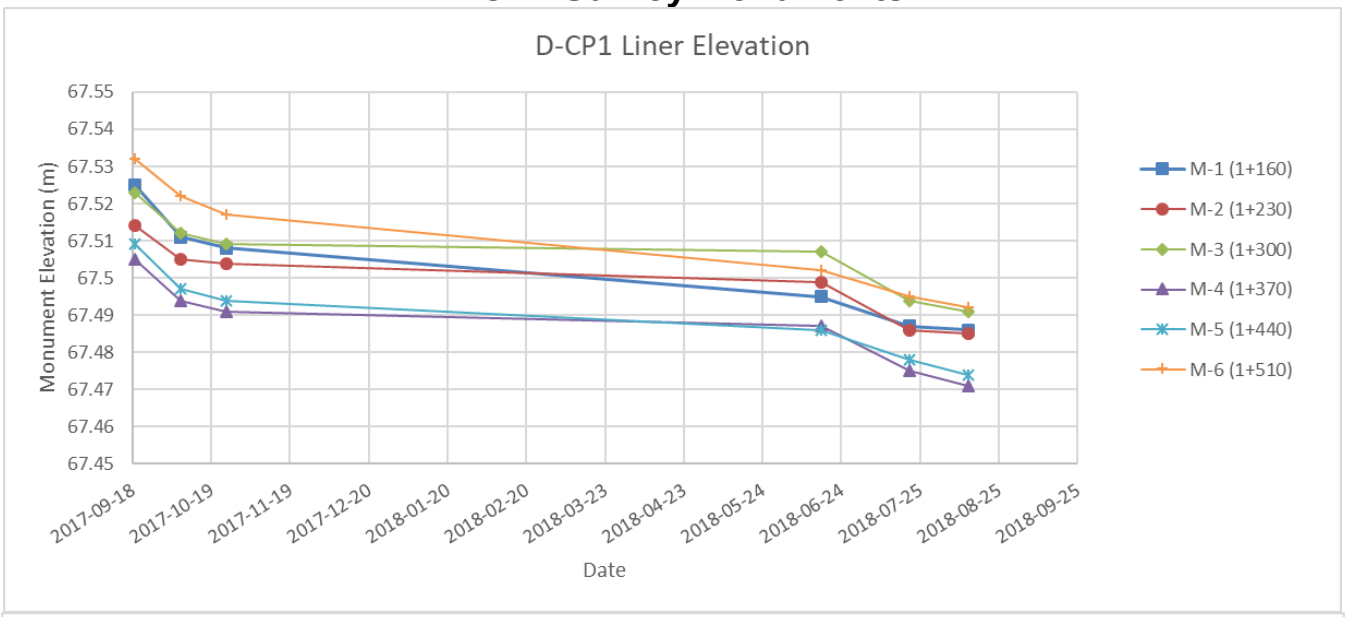
PROJECT
Meliadine Gold Project
Rankin Inlet, Nunavut

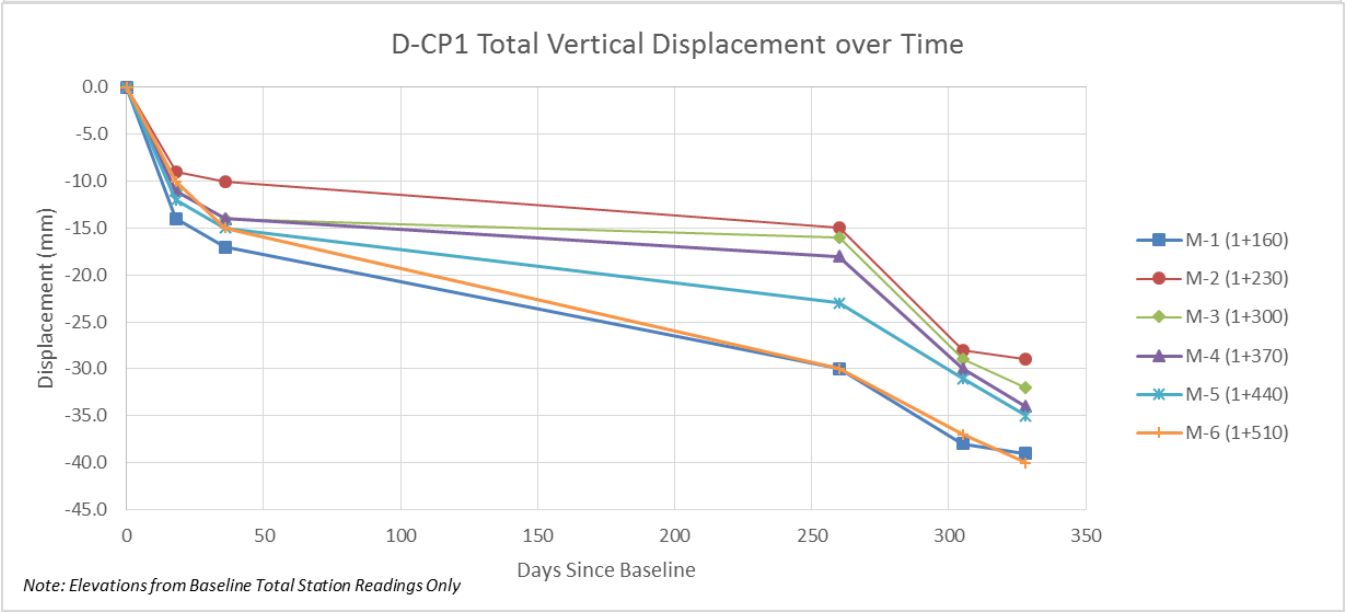
TITLE
D-CP1 AS-BUILT INSTRUMENTATION PLAN AND DETAILS FOR VERTICAL GROUND TEMPERATURE CABLES AND SETTLEMENT SURVEY MONUMENT POINTS

PROJECT No.	PHASE	Rev.	FIGURE
18105719	**3000**	**0**	C5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

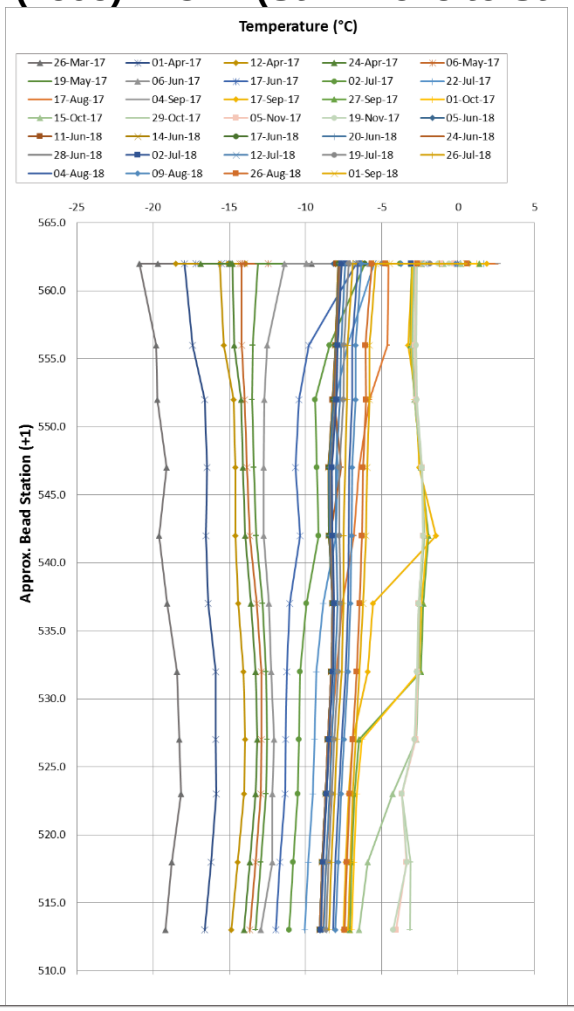
D-CP1 Survey Monuments

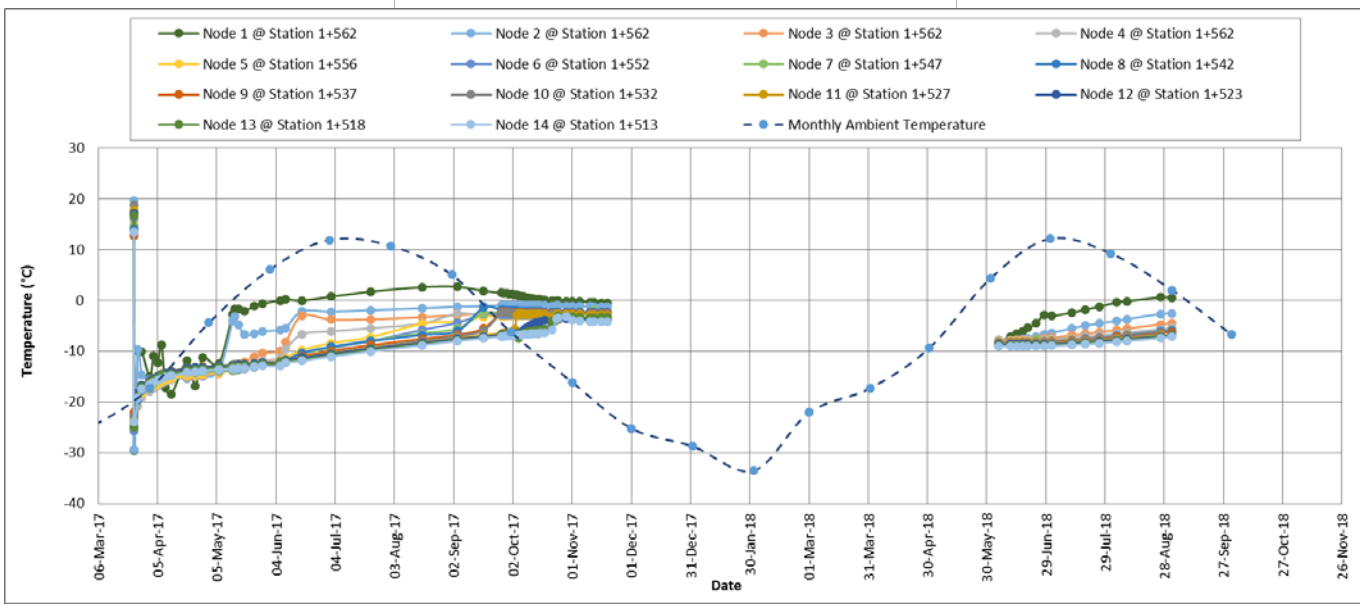




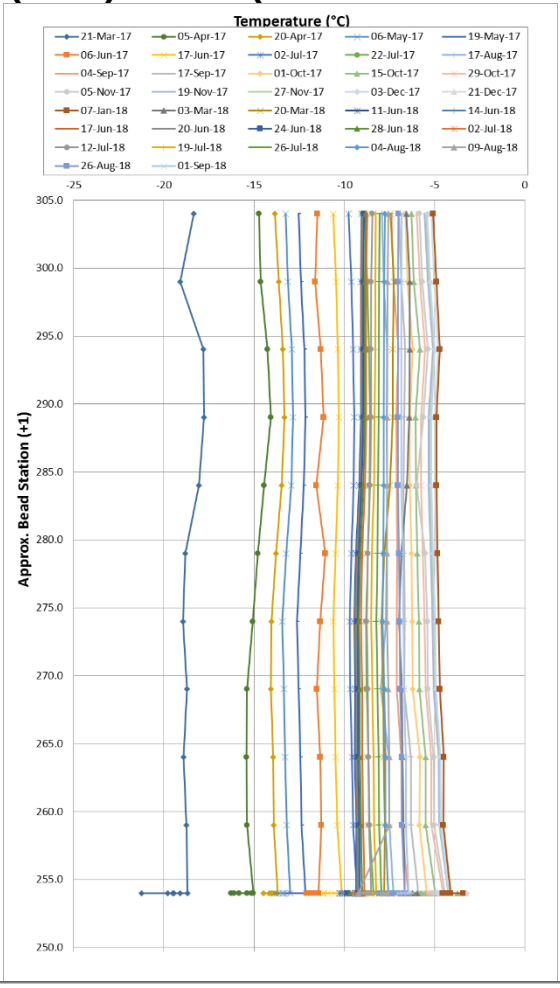
Note: Elevations from Baseline Total Station Readings Only

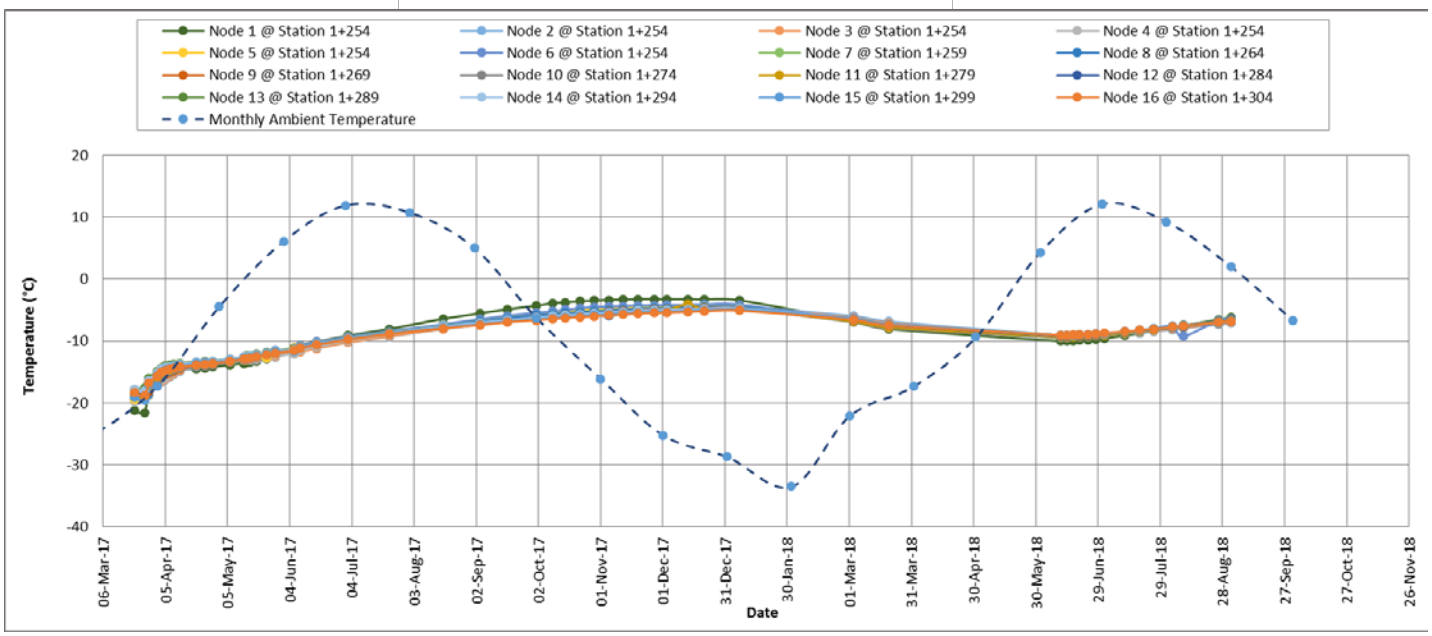
HGTC-1 (2595) D-CP1 (Stn. 1+513 to Stn. 1+562)



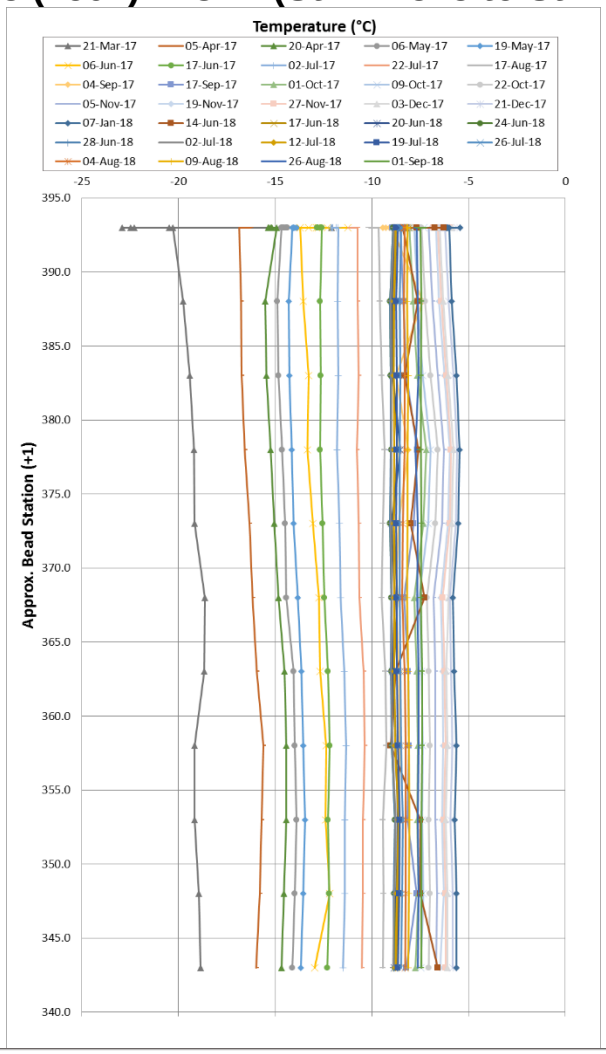


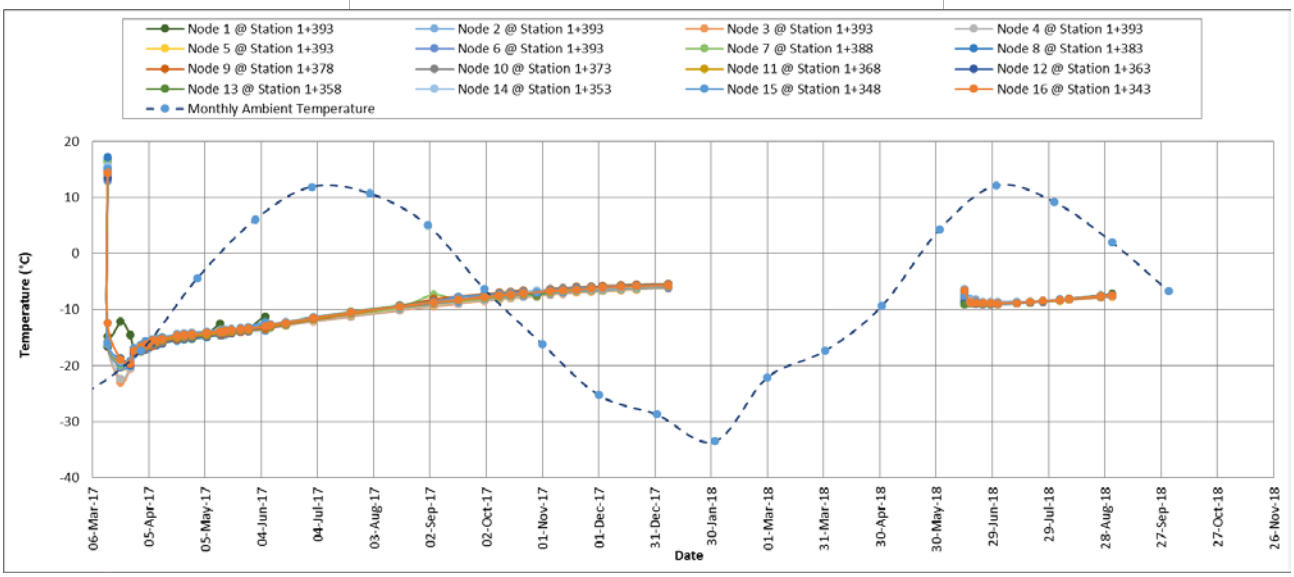
HGTC-2 (2596) D-CP1 (Stn. 1+254 to Stn. 1+304)



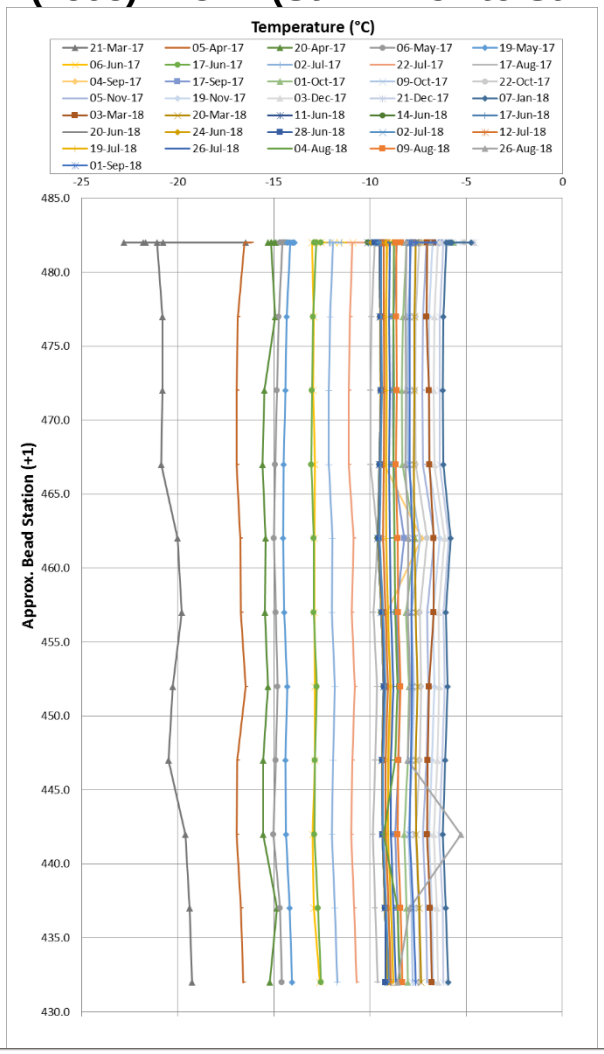


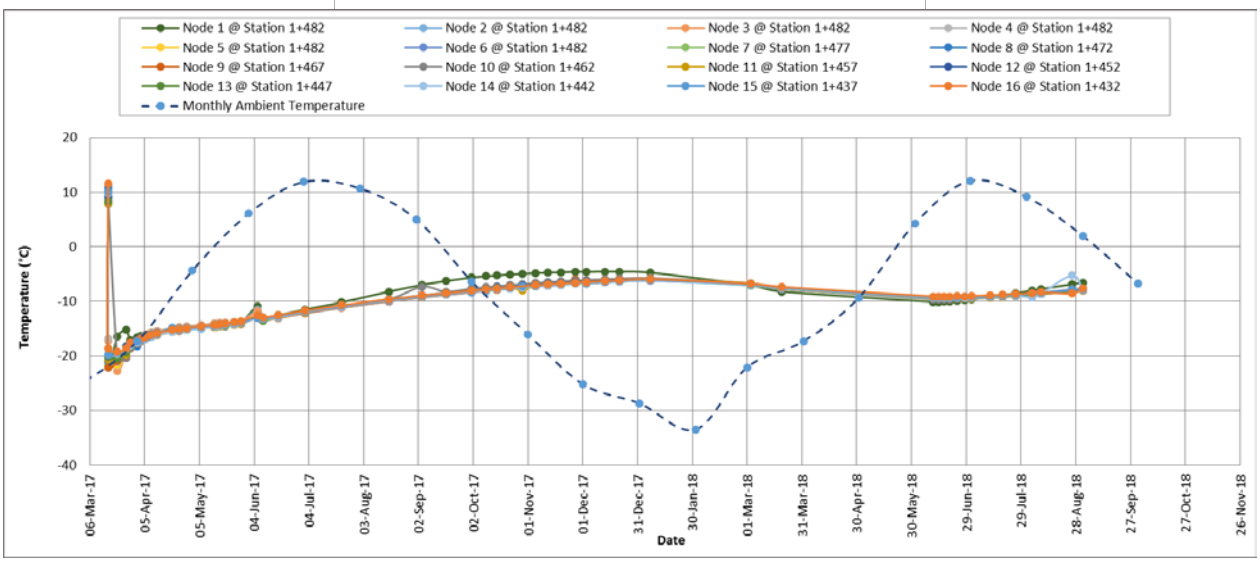
HGTC-3 (2597) D-CP1 (Stn. 1+343 to Stn. 1+394)



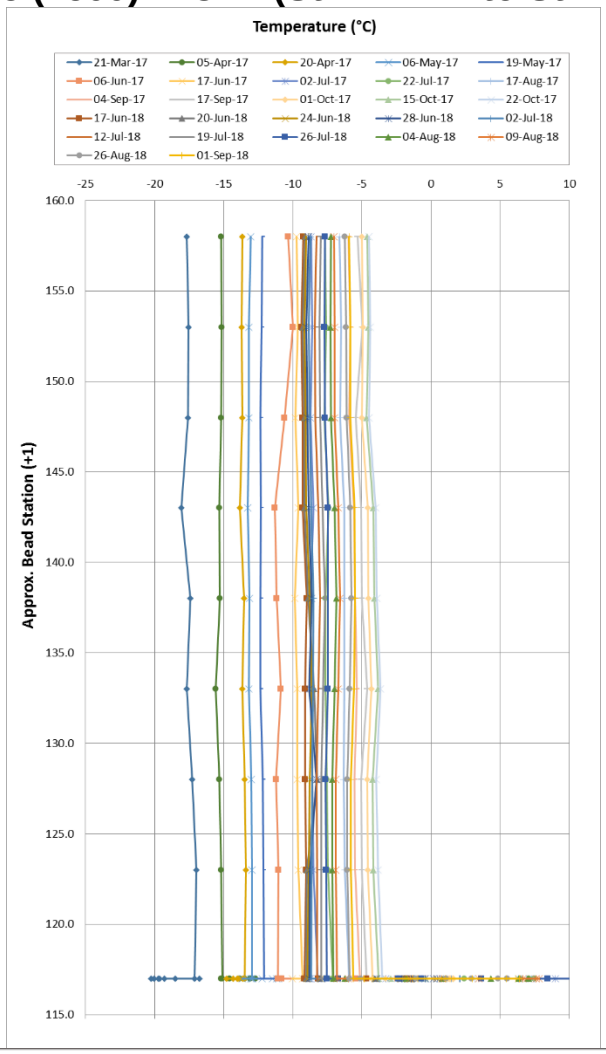


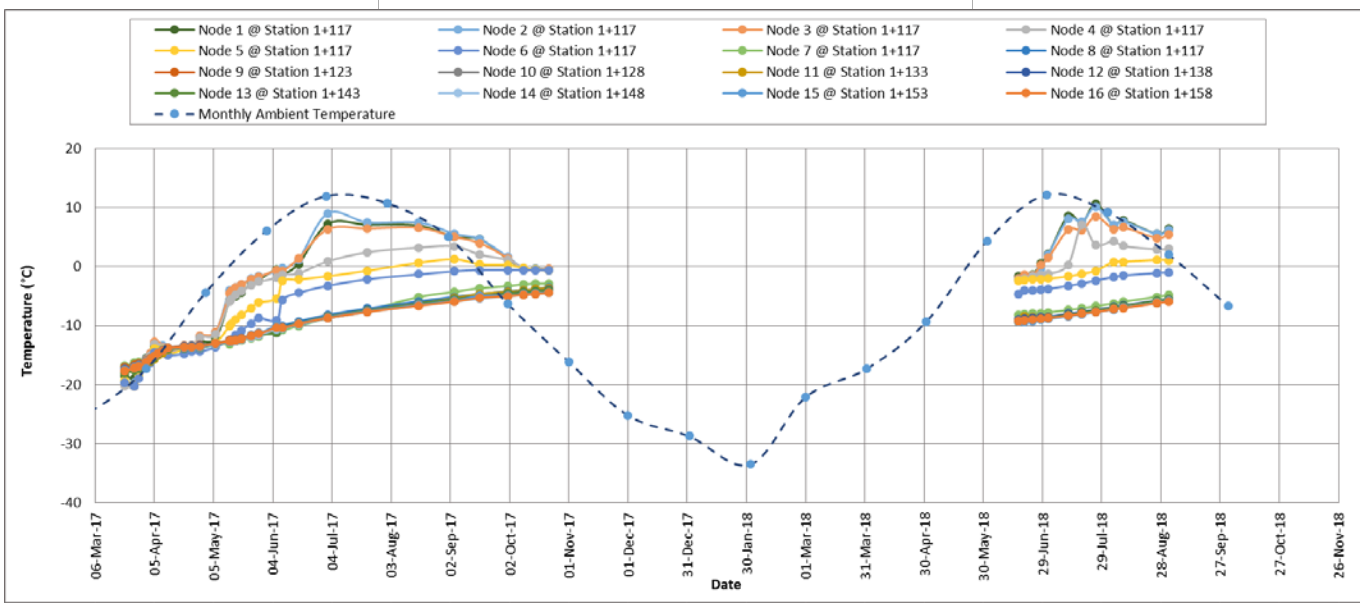
HGTC-4 (2598) D-CP1 (Stn. 1+432 to Stn. 1+482)



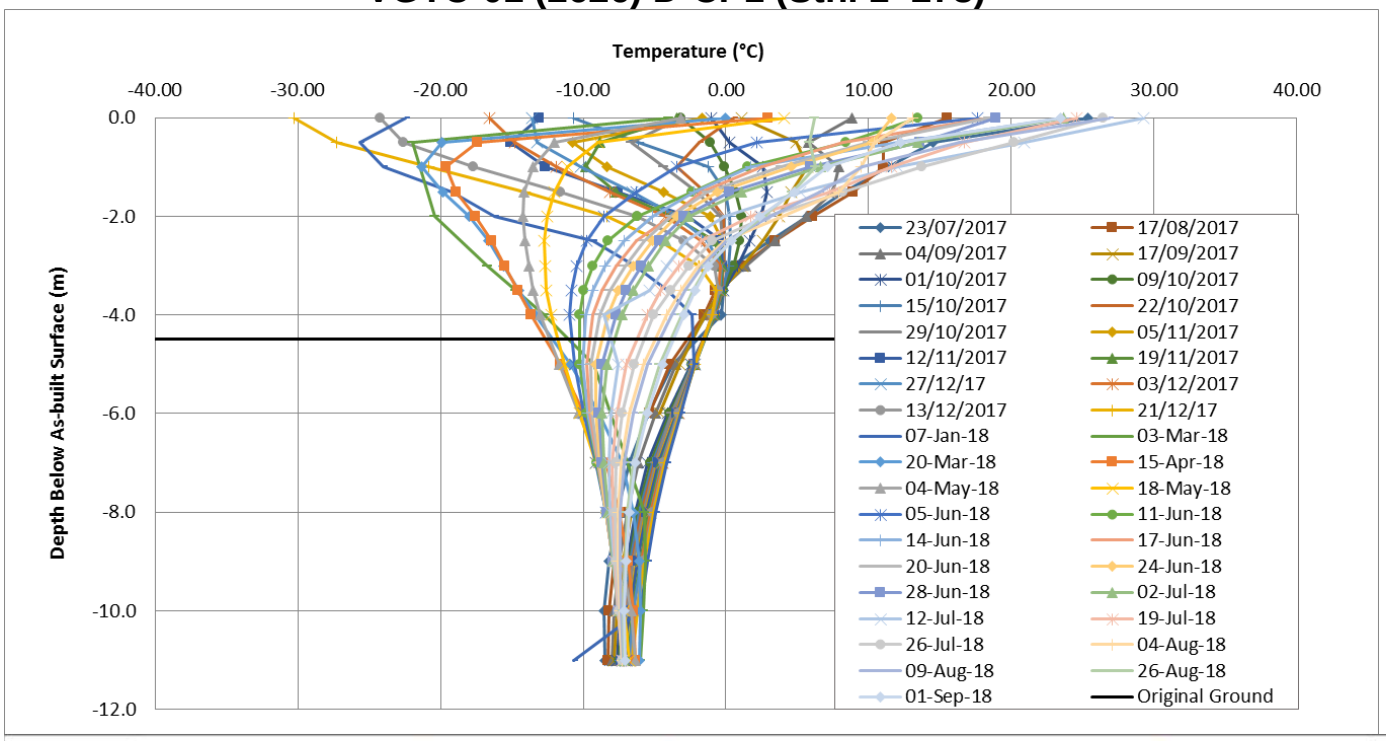


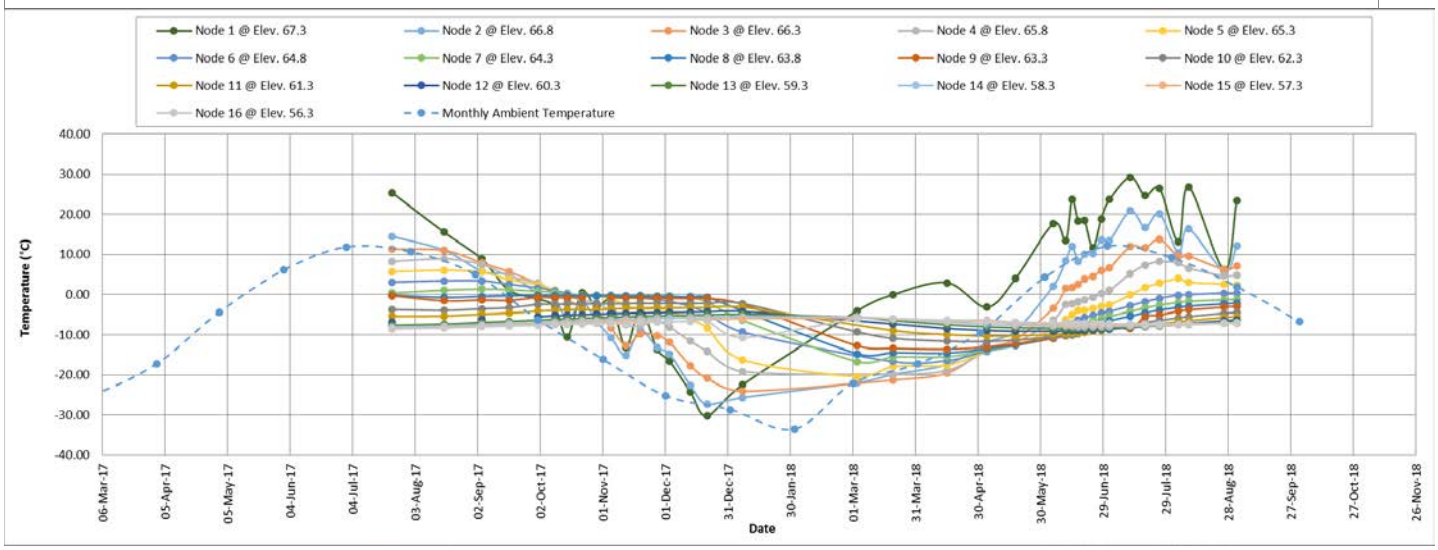
HGTC-5 (2599) D-CP1 (Stn. 1+117 to Stn. 1+158)



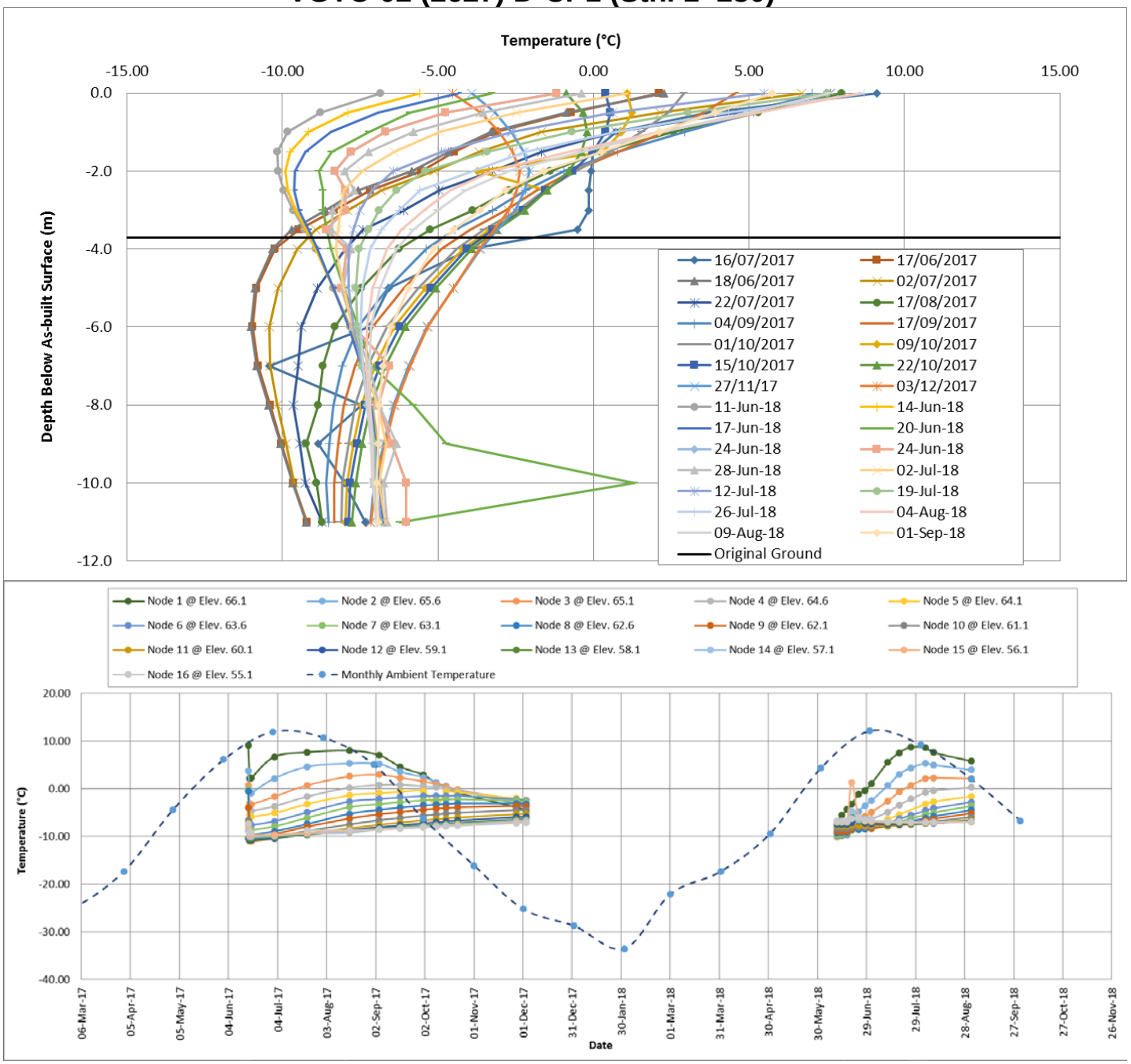


VGTC-01 (2626) D-CP1 (Stn. 1+278)

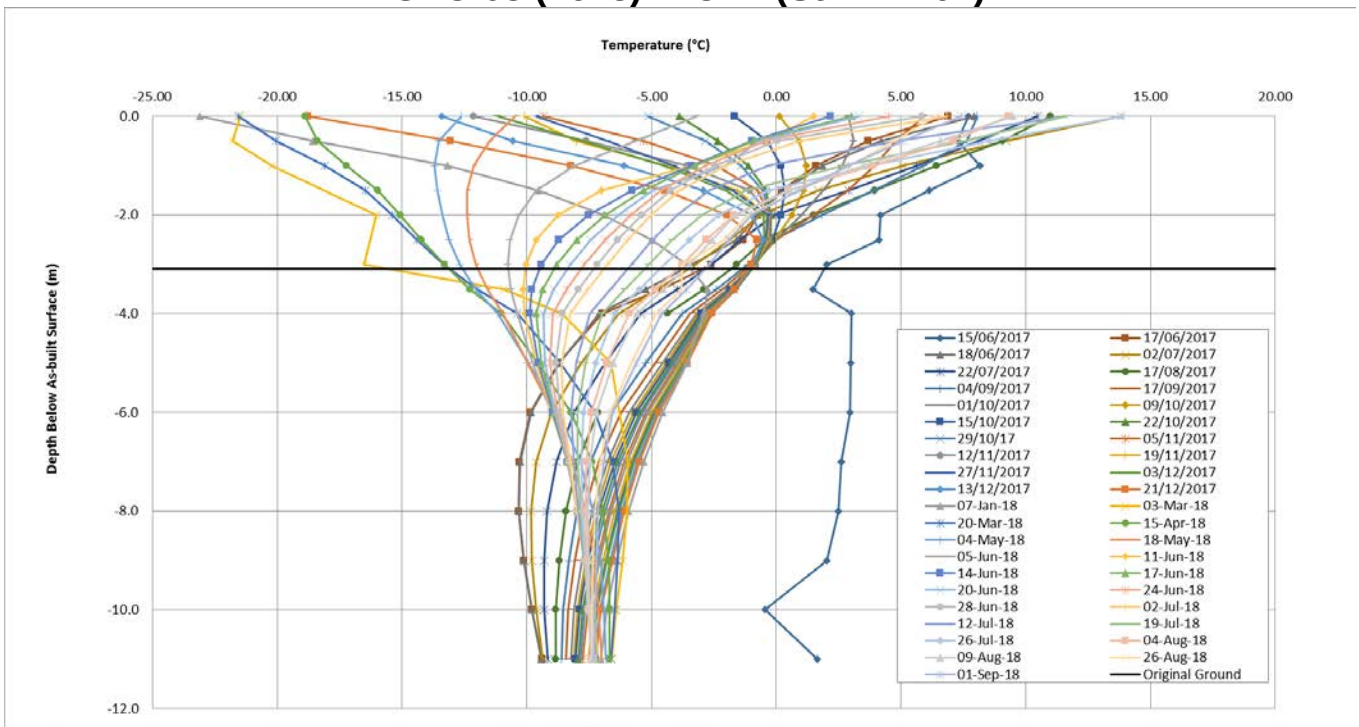


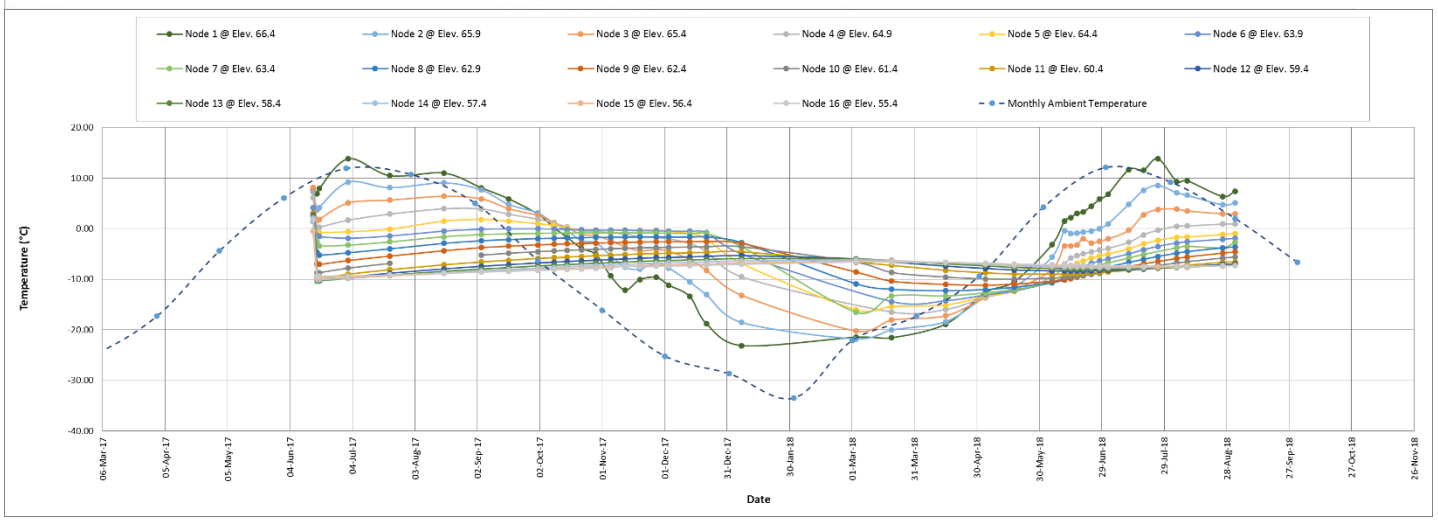


VGTC-02 (2627) D-CP1 (Stn. 1+280)

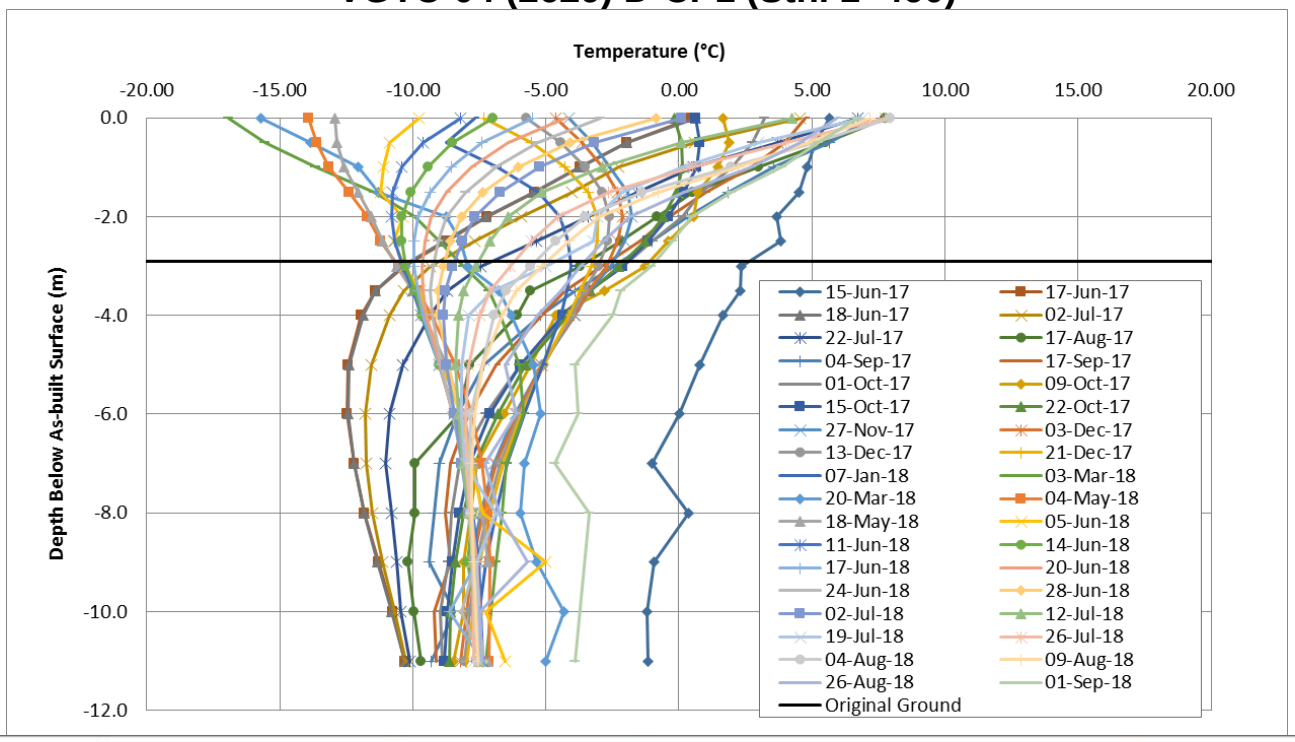


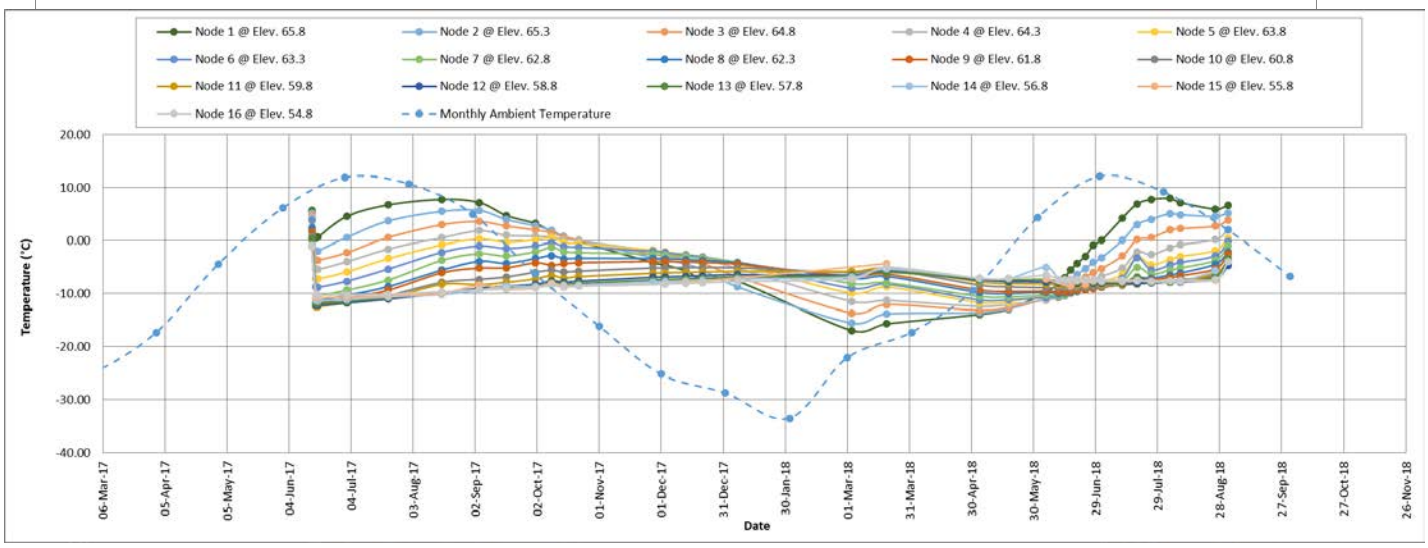
VGTC-03 (2628) D-CP1 (Stn. 1+461)



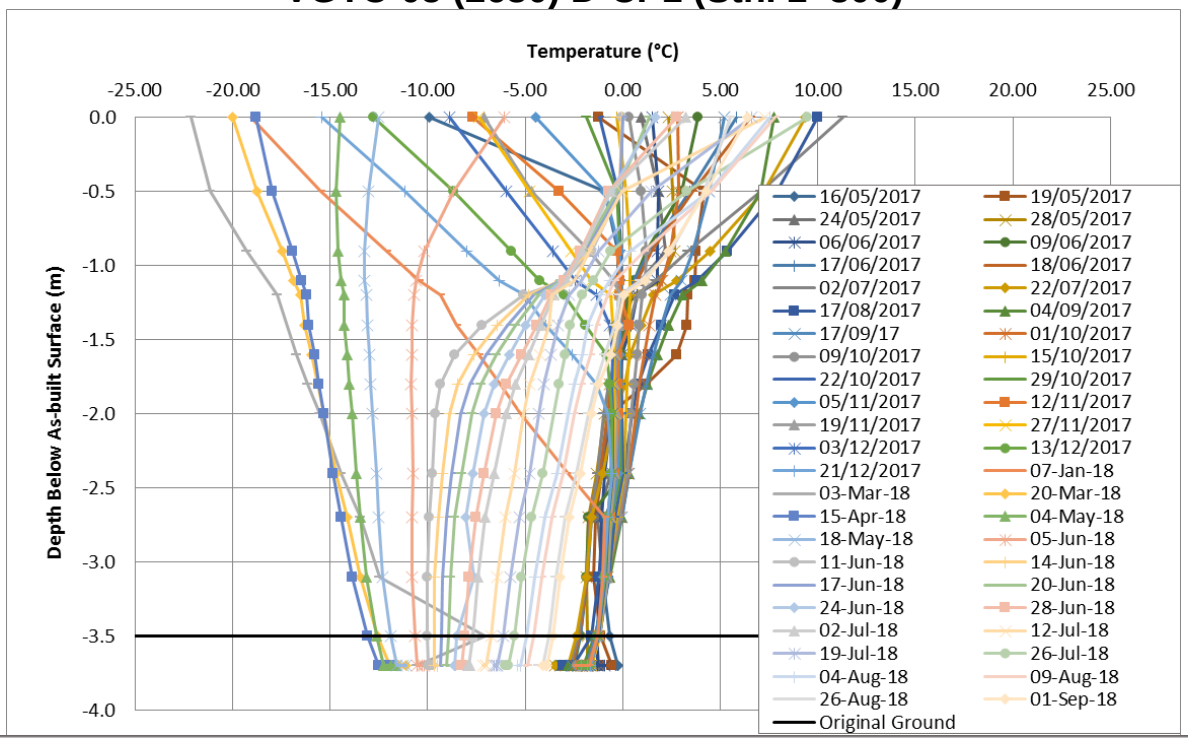


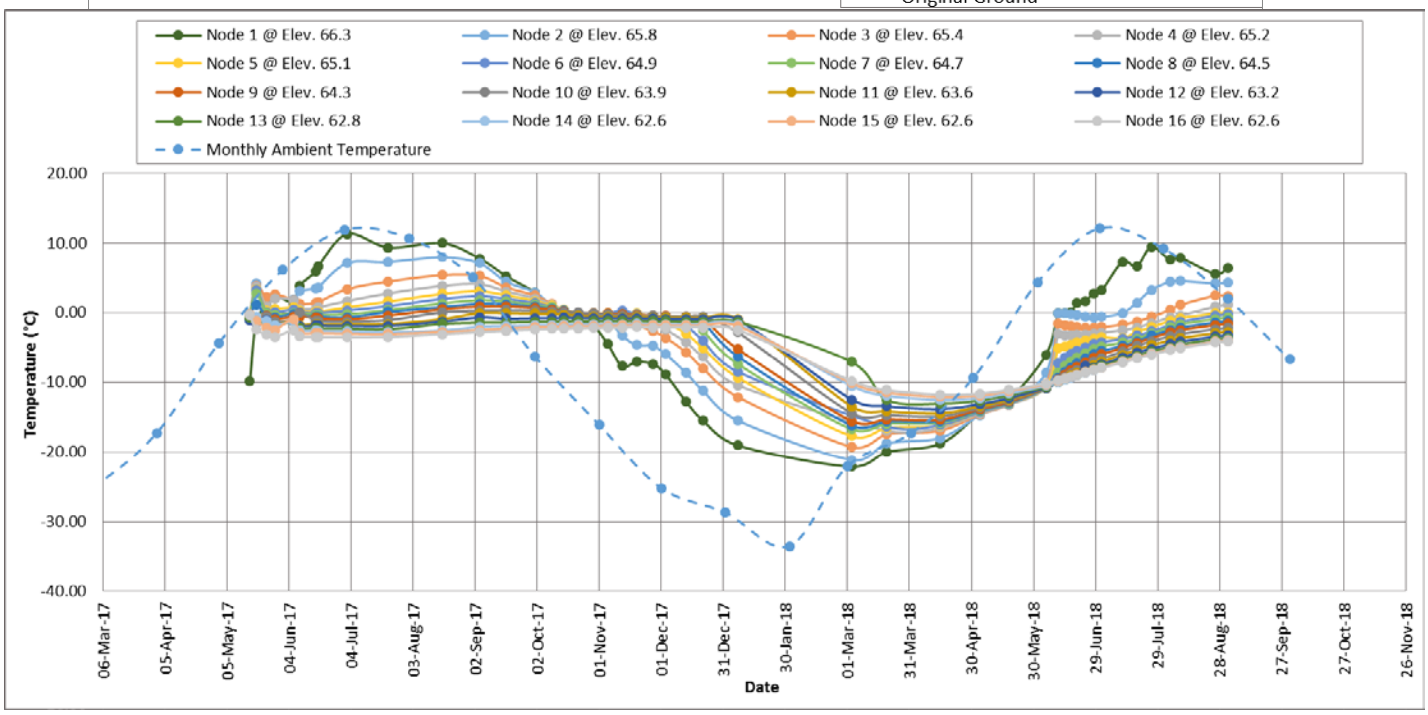
VGTC-04 (2629) D-CP1 (Stn. 1+460)

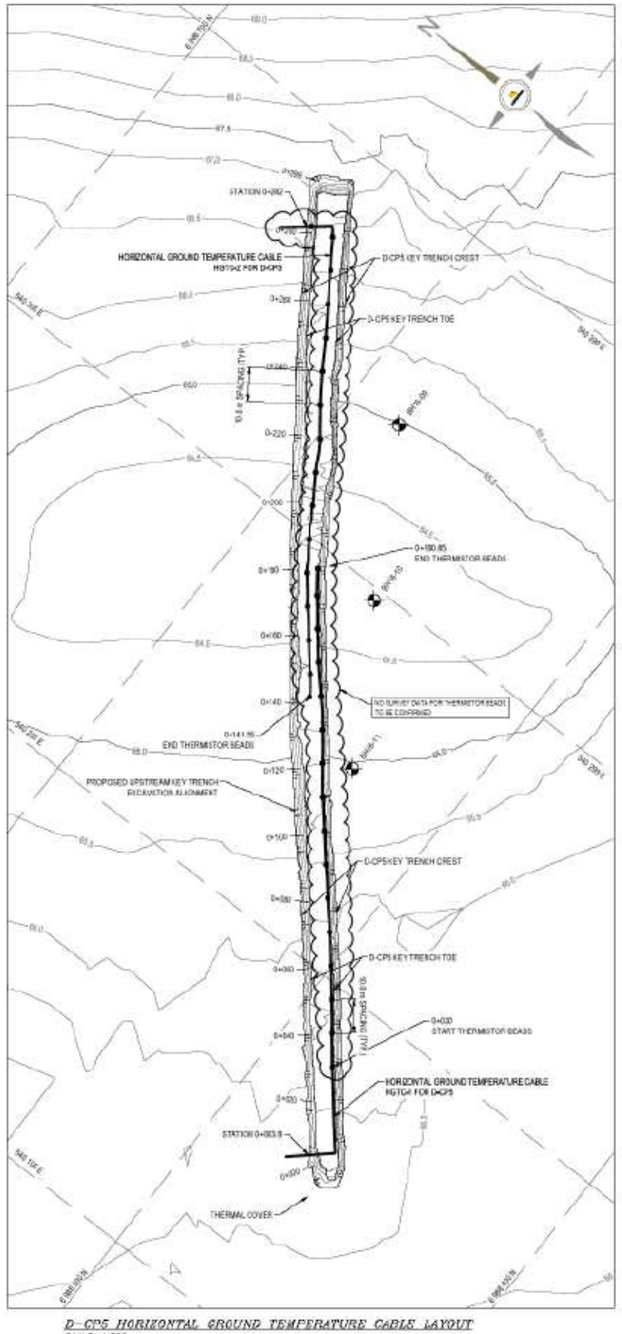




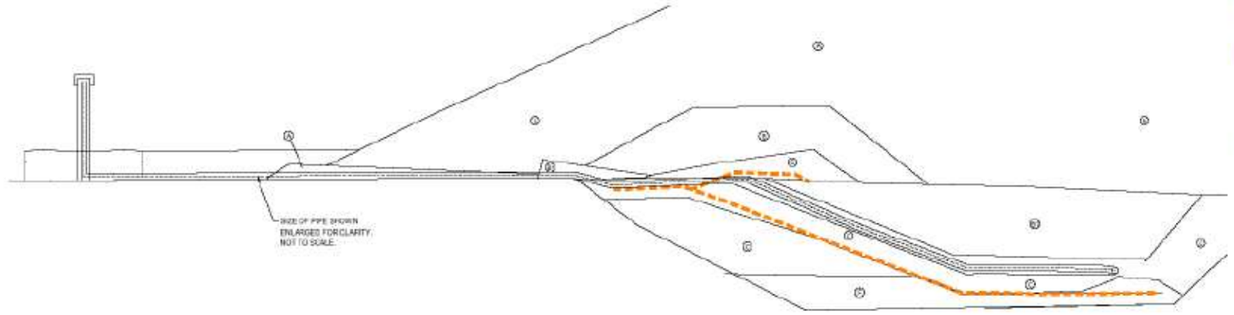
VGTC-05 (2630) D-CP1 (Stn. 1+300)



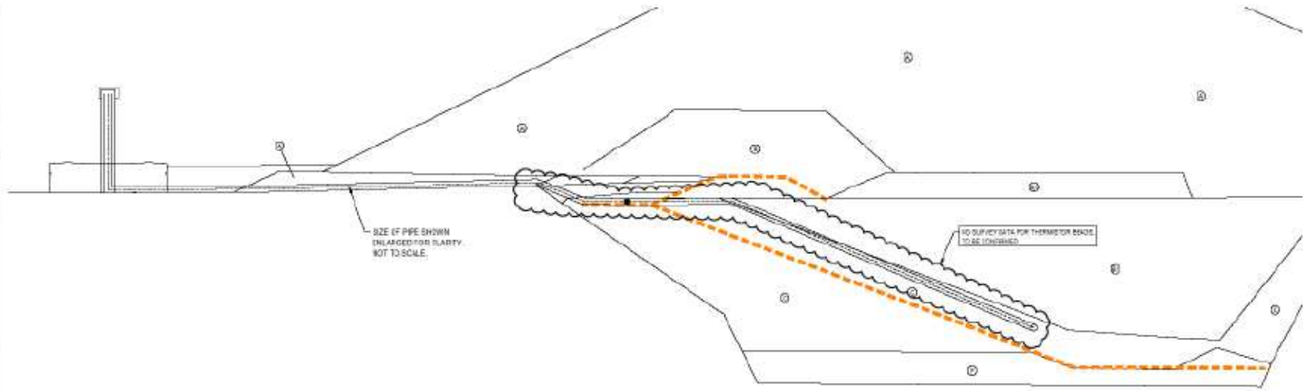




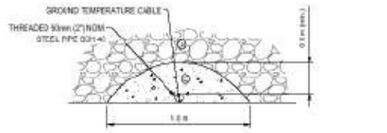
D-CP5 HORIZONTAL GROUND TEMPERATURE CABLE LAYOUT
SCALE: 1:750



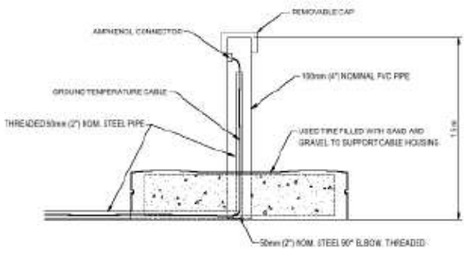
D-CP5 HORIZONTAL GROUND TEMPERATURE CABLE – SOUTH TERMINAL SECTION THROUGH STATION 0+003.8
SCALE: 1:100



D-CP5 HORIZONTAL GROUND TEMPERATURE CABLE – NORTH TERMINAL SECTION THROUGH STATION 0+282
SCALE: 1:100



TEMPERATURE CABLE – PROTECTIVE COVER SECTION
SCALE: NTS



TEMPERATURE CABLE – TERMINAL SUPPORT DETAIL
SCALE: NTS

Reference:

Tetra Tech. 2017. Construction Summary (as-built) Report Dike D-CP5, Meliadine Gold Project, Nunavut. Prepared for Agnico Eagle Mines Limited. October 2017. Document No. 6515-E-132-007-132-REP-013.

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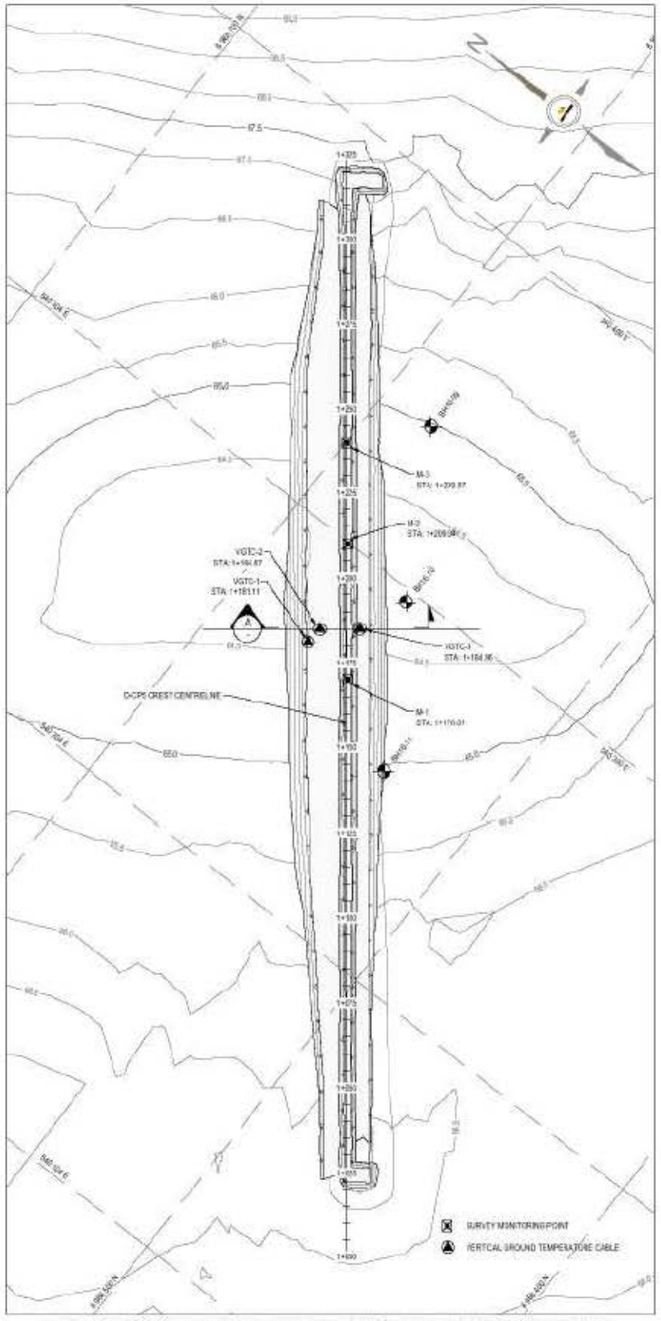
DESIGN	-
REVIEW	FE
APPROVED	ACI

PROJECT
Meliadine Gold Project
Rankin Inlet, Nunavut

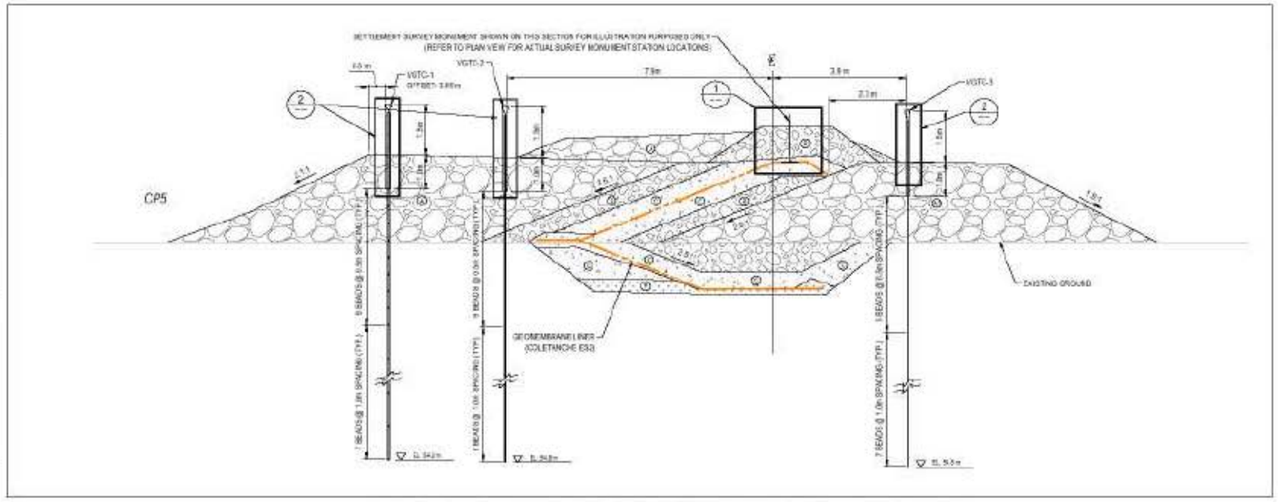
TITLE
D-CP5 AS-BUILT INSTRUMENTATION PLAN AND DETAILS FOR HORIZONTAL GROUND TEMPERATURE CABLES

PROJECT No.	PHASE	Rev.	FIGURE
18105719	**3000**	**0**	C6

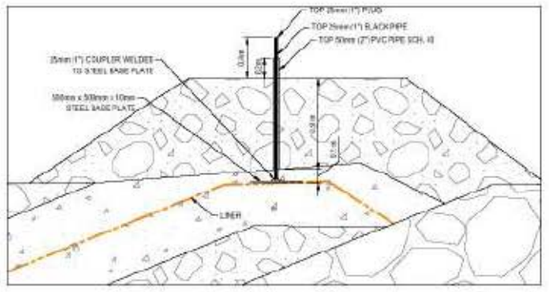
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B
1 in
0



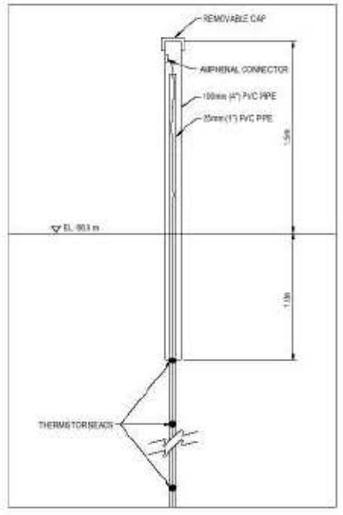
D-CP5 SURVEY MONUMENT AND VERTICAL GROUND TEMPERATURE CABLE LAYOUT
SCALE: 1:750



D-CP5 - SECTION A - VERTICAL GROUND TEMPERATURE CABLE - STATION 1+185
SCALE: 1:70



D-CP1 TYPICAL SETTLEMENT SURVEY MONUMENT DETAIL 1
SCALE: 1:25



D-CP1 TYPICAL VERTICAL GROUND TEMPERATURE CABLE TERMINAL DETAIL 2
SCALE: 1:20

Reference:

Tetra Tech. 2017. Construction Summary (as-built) Report Dike D-CP5, Meliadine Gold Project, Nunavut. Prepared for Agnico Eagle Mines Limited. October 2017. Document No. 6515-E-132-007-132-REP-013.

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GOLDER

YYYY-MM-DD	2019-02-19
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DESIGN	-
REVIEW	FE
APPROVED	ACI

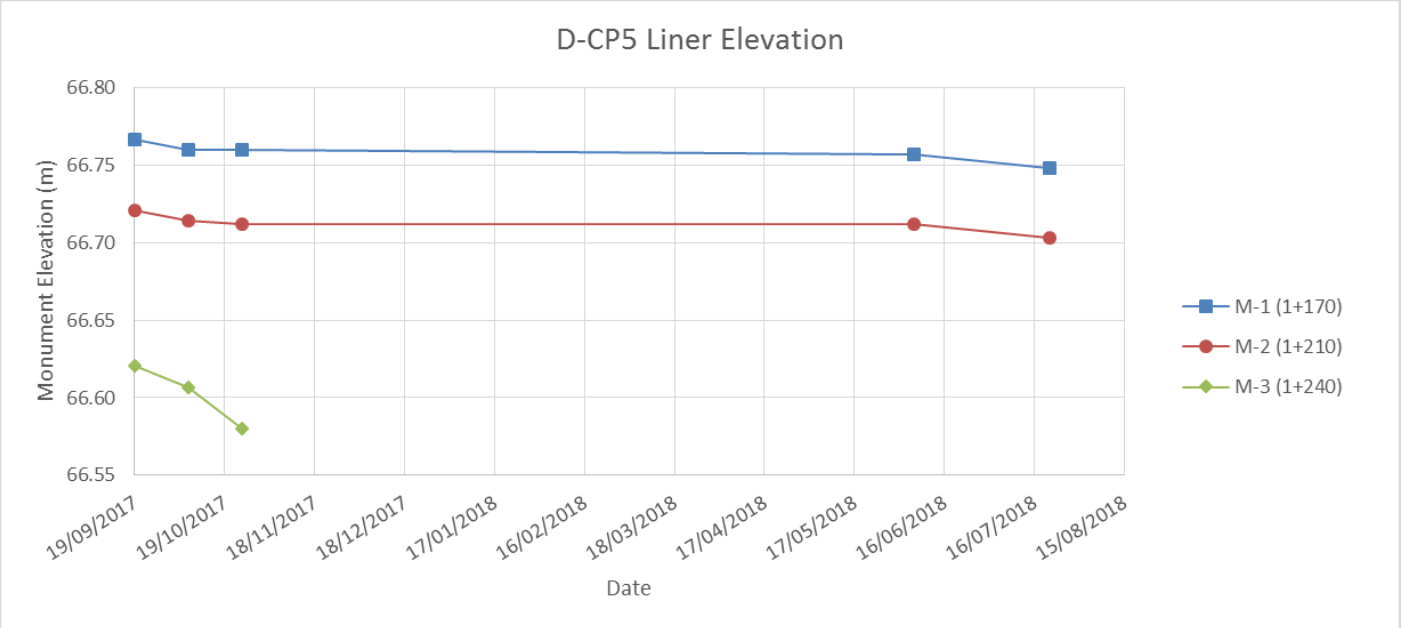
PROJECT
Meliadine Gold Project
Rankin Inlet, Nunavut

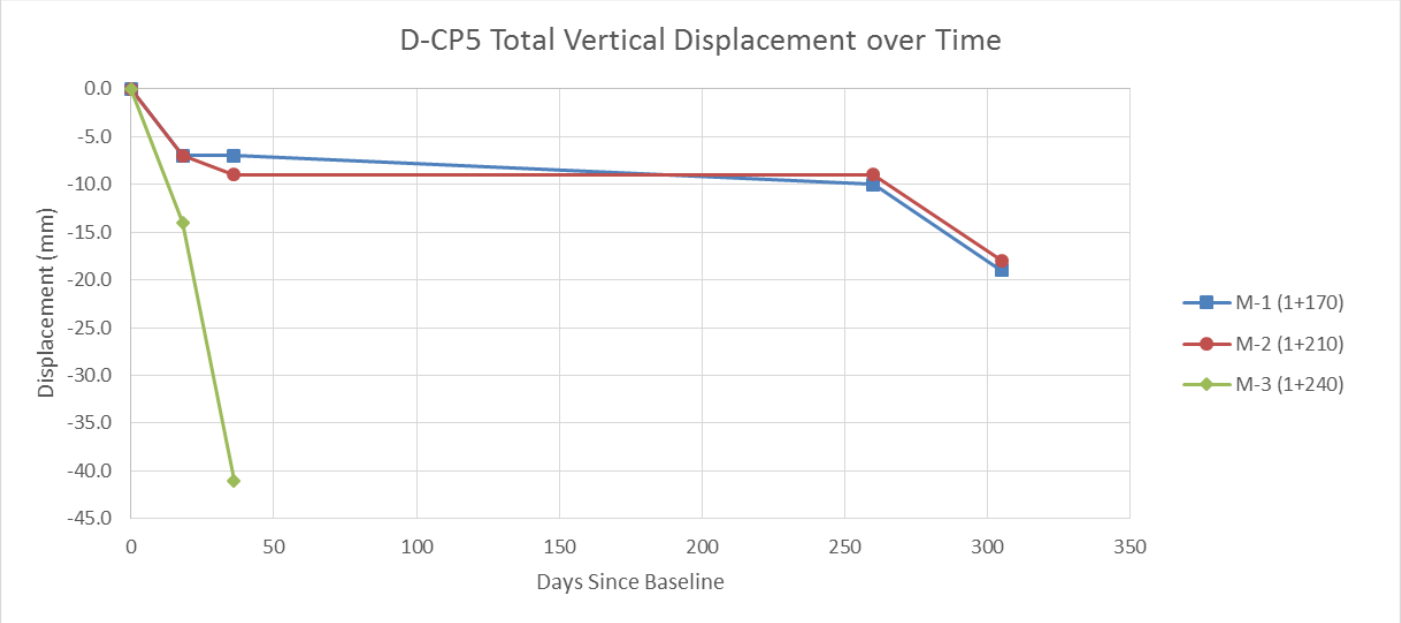
TITLE
D-CP5 AS-BUILT – INSTRUMENTATION PLAN AND DETAILS FOR VERTICAL GROUND TEMPERATURE CABLES AND SETTLEMENT SURVEY MONUMENTS

PROJECT No.	PHASE	Rev.	FIGURE
18105719	**3000**	**0**	C7

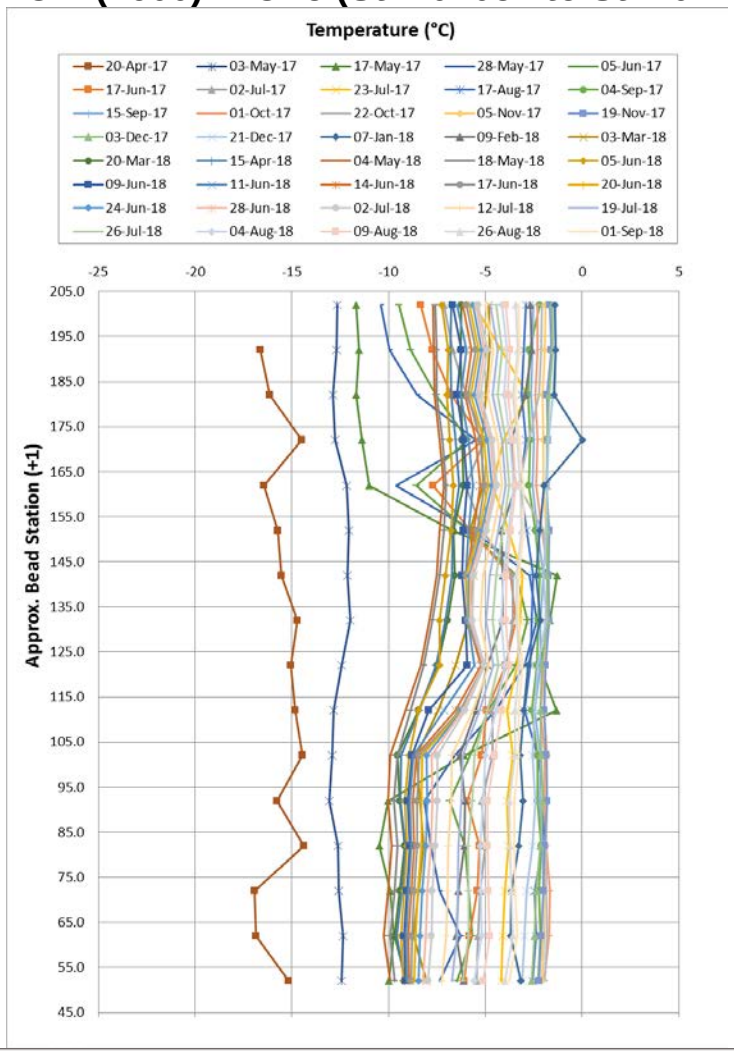
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

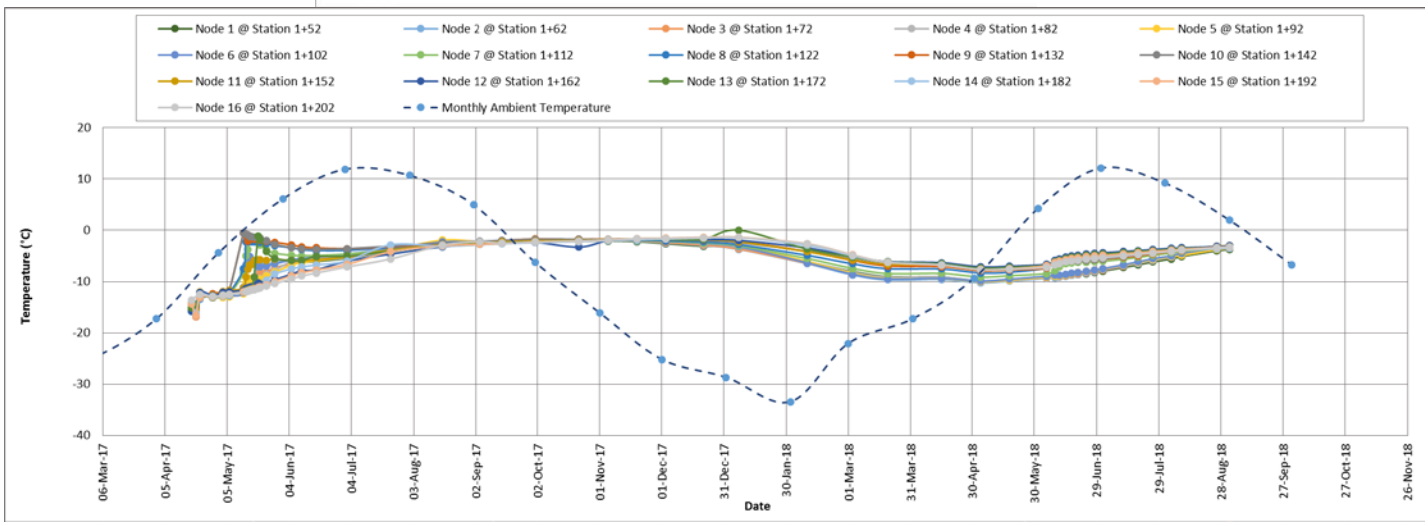
D-CP5 Survey Monuments



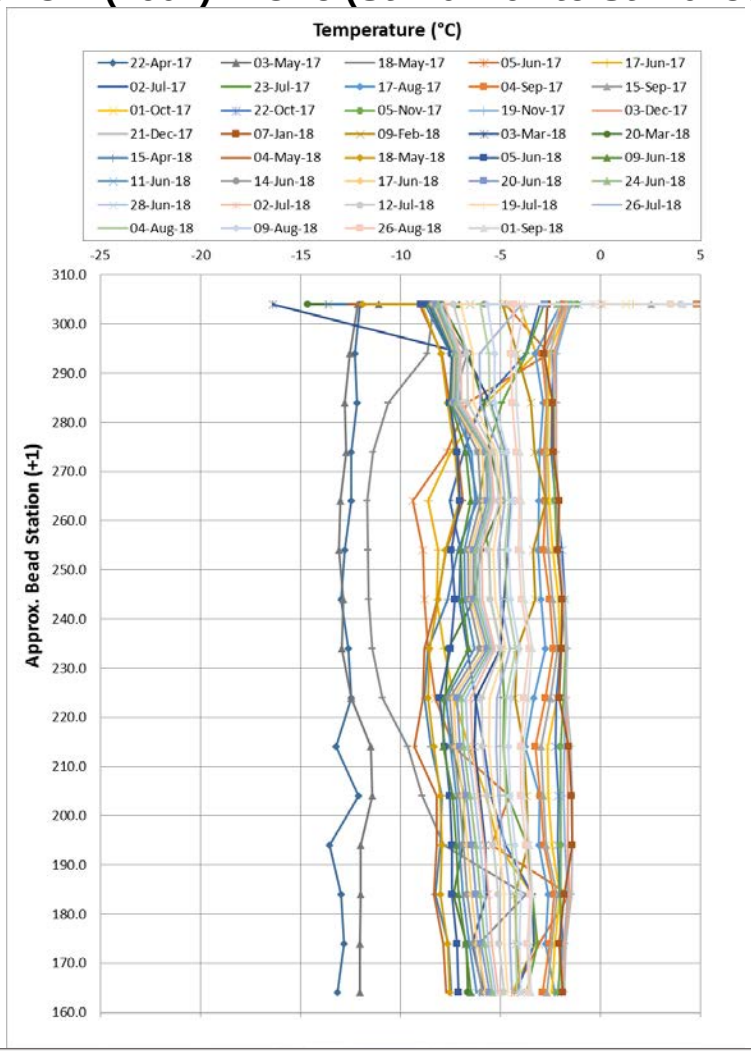


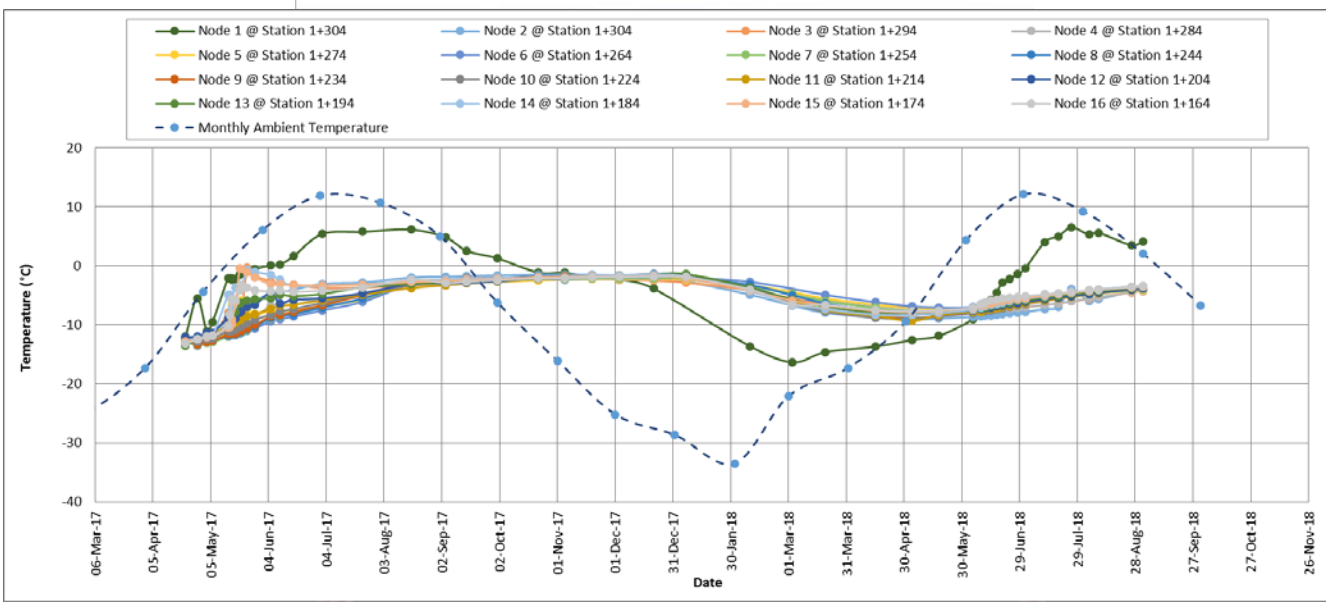
HGTC-1 (2600) D-CP5 (Stn. 0+052 to Stn. 0+202)



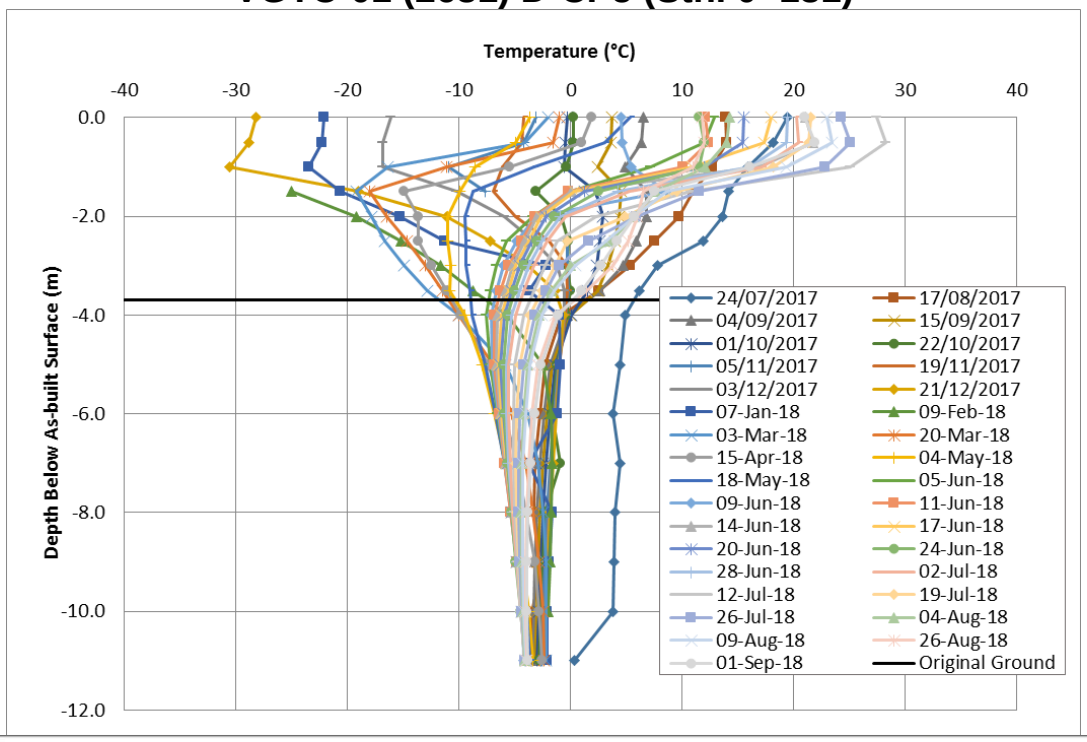


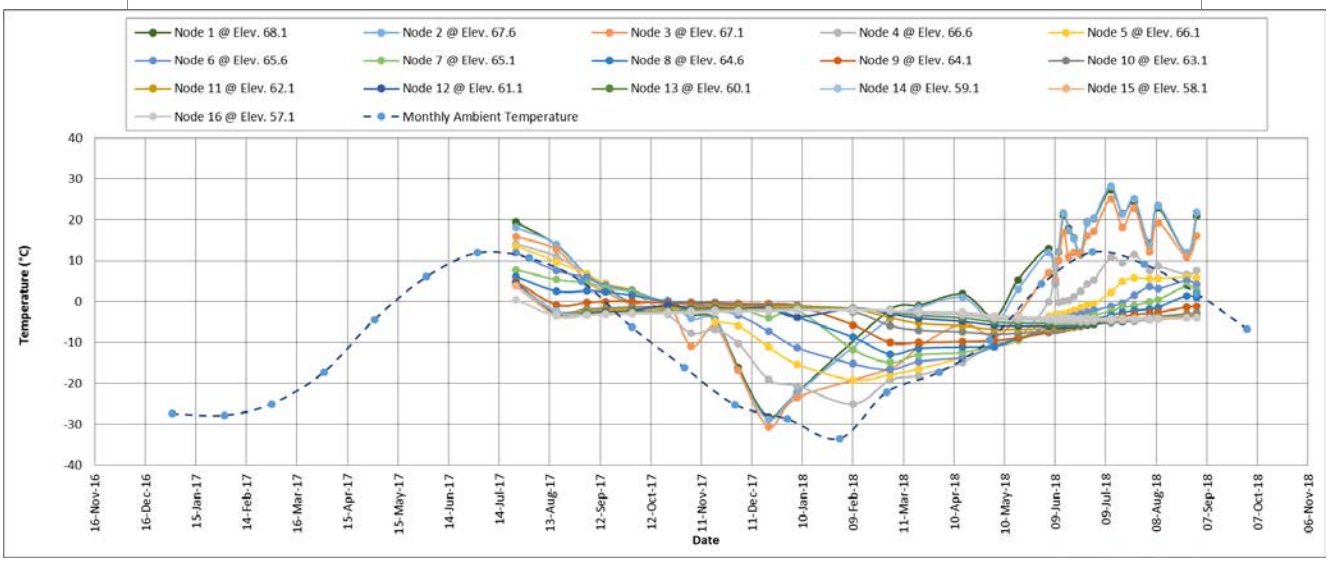
HGTC-2 (2601) D-CP5 (Stn. 0+164 to Stn. 0+304)



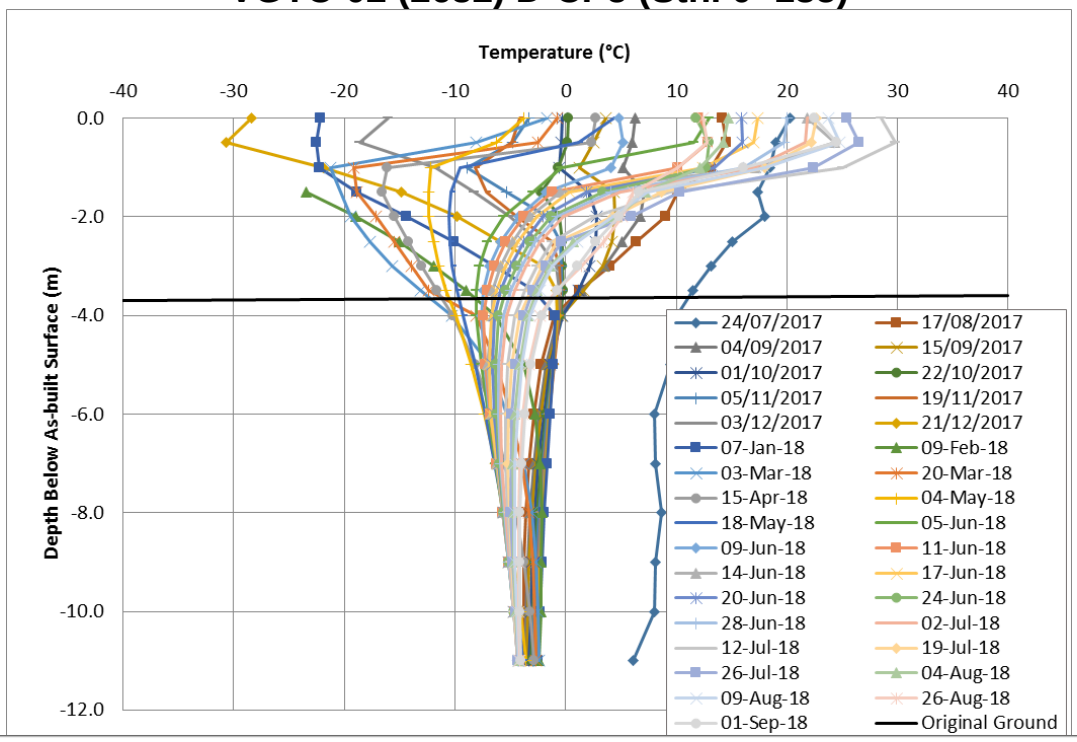


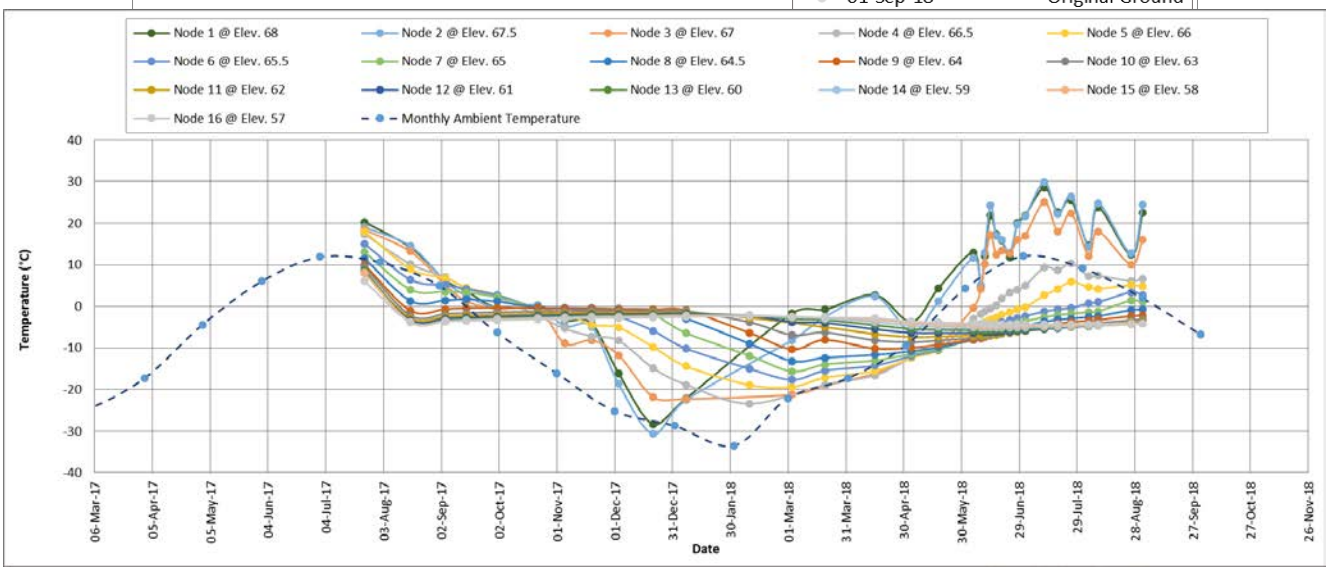
VGTC-01 (2631) D-CP5 (Stn. 0+181)



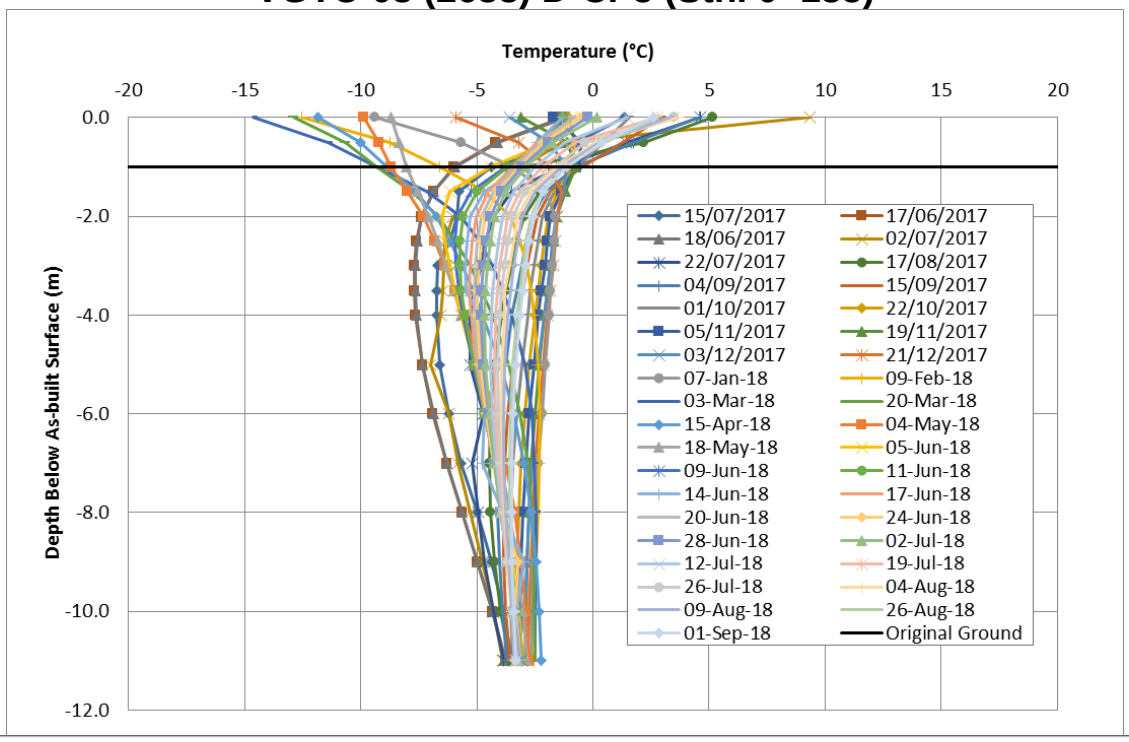


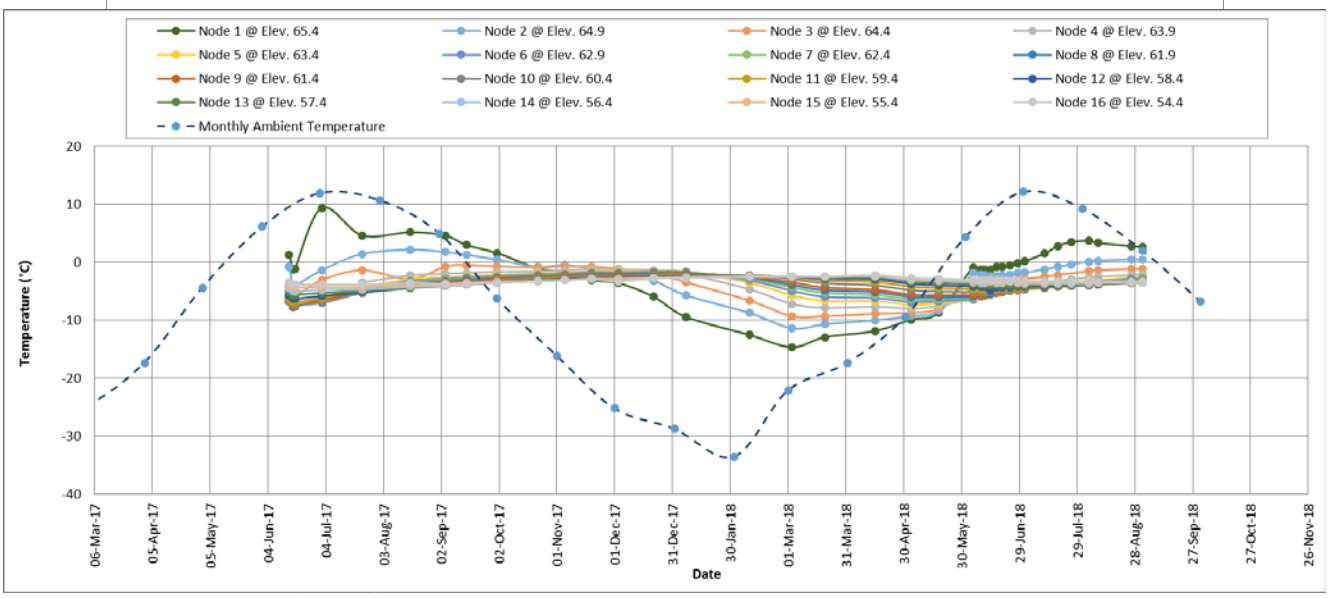
VGTC-02 (2632) D-CP5 (Stn. 0+185)





VGTC-03 (2633) D-CP5 (Stn. 0+185)





APPENDIX D

Itivia Fuel Storage, Laydown, and By-Pass Road Photographs



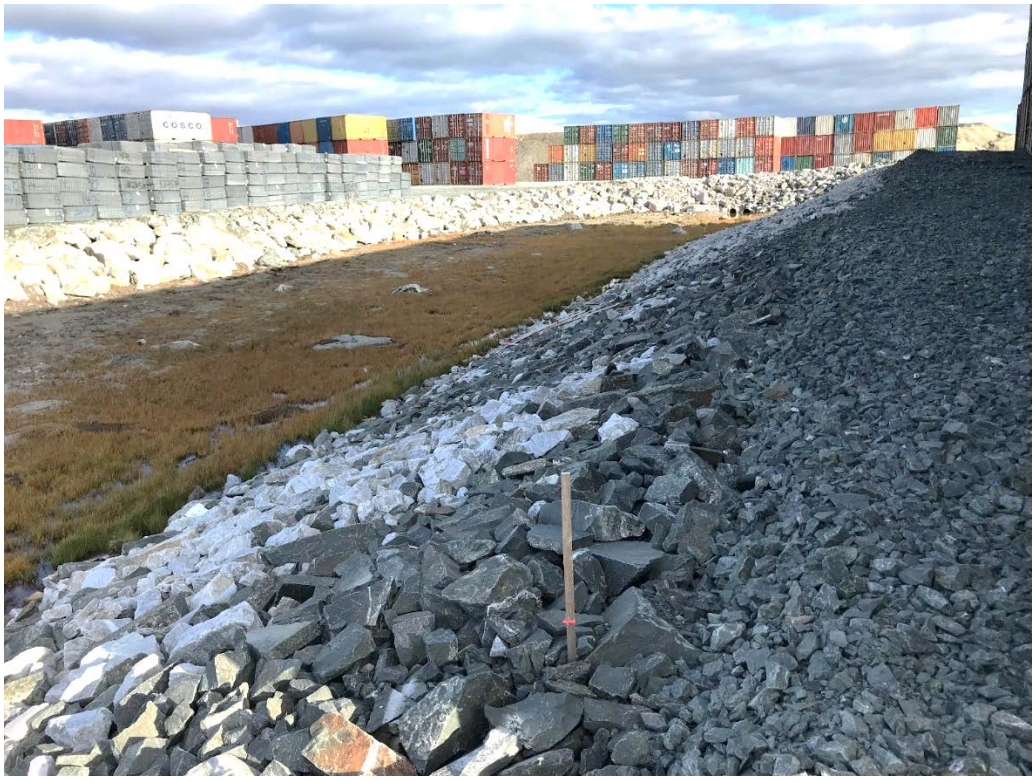
Photograph 1: Inlets of Culverts at Entrance to Itivia Fuel and Laydown Area, Looking Southwest (14 September 2018).



Photograph 2: Outlets of Culverts at Entrance to Itivia Fuel and Laydown Area, Looking North (14 September 2018).



Photograph 3: Itivia Fuel and Laydown Area, South Slope, Looking West (14 September 2018).



Photograph 4: Itivia Fuel and Laydown Area, Pad Slopes on West End of Facility, Looking North (14 September 2018).



Photograph 5: Itivia Fuel and Laydown Area, Pad Slope on North Boundary of Facility, Looking East (14 September 2018).



Photograph 6: Itivia Fuel and Laydown Area, Interior Slope, Looking South (14 September 2018).



Photograph 7: Itivia Fuel and Laydown Area, Overview of Interior of Fuel Storage Area, Looking Northeast from Southwest Corner. (14 September 2018).



Photograph 8: Itivia Fuel and Laydown Area, Interior North Slope of Fuel Storage Facility, Looking West. (14 September 2018).



Photograph 9: Itivia Fuel and Laydown Area, Liner Exposed on Interior Slope of South Berm. (14 September 2018).



Photograph 10: Itivia Fuel and Laydown Area, Liner Exposed on Crest of East Berm. (14 September 2018).



Photograph 11: Itivia Fuel and Laydown Area, Water Ponded on South Side of Tanks, actively being pumped at time of inspection, Looking Northwest. (14 September 2018).



Photograph 12: Inlets of Culvert C01, Looking East (14 September 2018)



Photograph 13: Outlets for Culvert C02, Looking Northeast (14 September 2018)



Photograph 14: Inlets for Culvert C03, Looking North. Upstream Channel Erosion (14 September 2018)



Photograph 15: Inlets for Culvert C03, Looking South (14 September 2018)



Photograph 16: Road Embankment and outlets for Culvert C03, Looking West (14 September 2018)



Photograph 17: Inlets for Culvert C04, Looking West (14 September 2018)



Photograph 18: Road Embankment and outlets for Culvert C04, Looking Southeast (14 September 2018)



Photograph 19: Road Embankment and Inlets for Culvert C05, Looking Northwest (14 September 2018)



Photograph 20: Outlets for Culvert C05, Looking Southwest (14 September 2018)



Photograph 21: Inlets for Culvert C06, Looking Northwest. Water Ponded Adjacent to Road Near Inlets (14 September 2018)



Photograph 22: Diversion Berm West of Culvert C06. Water Ponded Adjacent to Road. Looking Northwest (14 September 2018)



Photograph 23: Outlets of Culvert C06 and Road Embankment, Looking Northwest (14 September 2018)



Photograph 24: Inlet for Culvert C06-1, Looking West (14 September 2018)



Photograph 25: Outlet for Culvert C06-1, Looking West (14 September 2018)



Photograph 26: Inlets and Upstream Ponded Water at Culvert C07a, Looking East (14 September 2018)



Photograph 27: Outlets of Culvert C07a, Looking West (14 September 2018)



Photograph 28: Inlets of Culvert C07b, Looking East (14 September 2018)



Photograph 29: Safety Berm and Embankment Slope over Culvert C07b Outlets, Looking Southeast (14 September 2018)



Photograph 30: Ponded Water to the East of Inlet for Culvert C09, Looking East (14 September 2018)



Photograph 31: Road Embankment and Outlets for Culvert C09, Looking West (14 September 2018)



Photograph 32: Inlets for Culvert C10, Looking East (14 September 2018)



Photograph 33: Inlets for Culvert C10, Looking South (14 September 2018)



Photograph 34: Outlets for Culvert C10, Looking Southeast (14 September 2018)



Photograph 35: Inlets of Culvert C11a, Looking Southwest (14 September 2018)



Photograph 36: Outlets of Culvert C11a, Looking North (14 September 2018)



Photograph 37: Inlets of Culvert C11b. Flow through Left Culvert, Looking East. Minor Amount of Riprap in Front of Culvert Should be Removed. (14 September 2018)



Photograph 38: Small Pond at KM 4.6 with Channel along Road Embankment Toe back to C11b, Looking North (14 September 2018)



Photograph 39: Upstream Natural Drainage Path and Culvert C11b-1 Inlet, Looking West (14 September 2018)



Photograph 40: Culvert C11b-1 Outlet and Downstream Drainage Channel, Looking Southeast (14 September 2018)



Photograph 41: Inlets and Upstream Drainage Channel for Culvert C11c, Looking East (14 September 2018)



Photograph 42: Outlets and Downstream Drainage for Culvert 11c, Looking South (14 September 2018)



Photograph 43: Culvert 12a Inlet, Looking North (14 September 2018)



Photograph 44: Culvert 12a Outlet, Looking North (14 September 2018)



Photograph 45: Culvert 12b Inlets, Looking Southeast (14 September 2018)



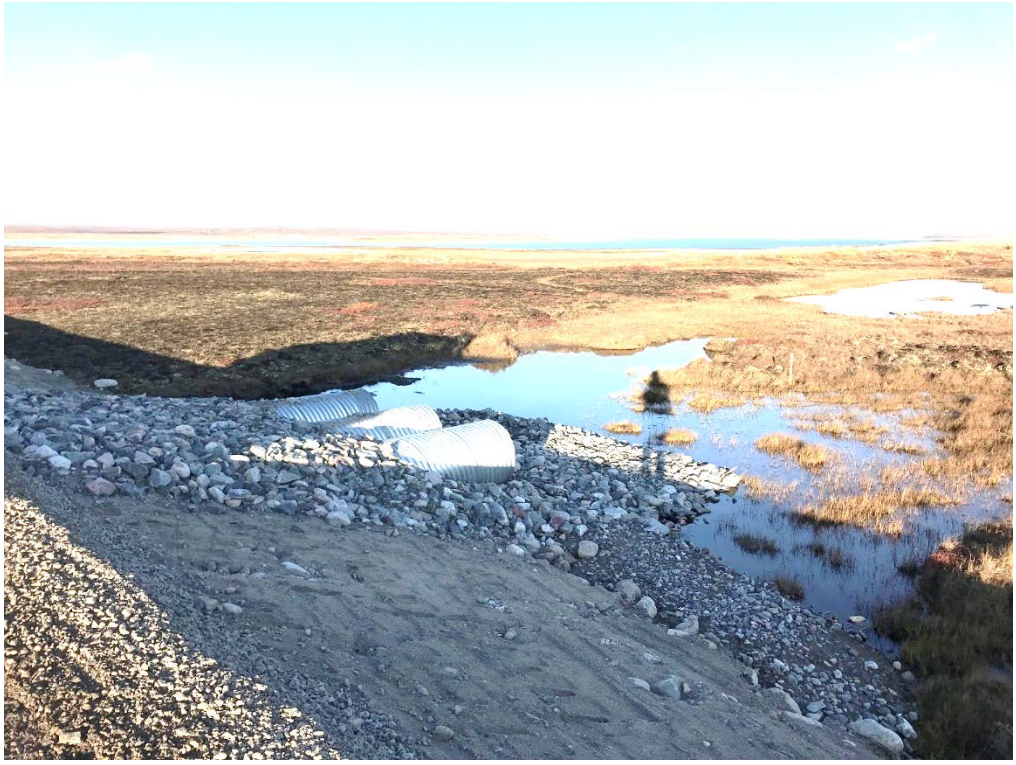
Photograph 46: Culvert 12b Outlets, Ponded Water Below the Inverts and Against Road Embankment Toe, Looking South (14 September 2018)



Photograph 47: Culvert 13 Inlets, Ponded Water Upstream and Below the Culvert Inverts, Looking East (14 September 2018)



Photograph 48: Culvert 13 Outlets, Ponded Water Observed Downstream Below the Culvert Inverts and Against the Road Embankment Toe, Looking Northwest (14 September 2018)



Photograph 49: Culvert 14 Inlets, Ponded Water Upstream and Below Inverts, Looking Northeast (14 September 2018)



Photograph 50: Culvert 14 Outlets, Ponded Water Below Inverts and Along Road Embankment Toe, Looking Northwest (14 September 2018)



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Appendix B-2

Responses to geotechnical recommendations

Dikes

Annual Geotechnical Inspection Recommendation (Golder, 2018)		Priority Level (Golder, 2018)	Recommendation (s) to be Implemented?	AEM Response to Recommendation	Additional Action(s) Required	Responsible Department(s)	Expected Date of Implementation
1. Inspection and Monitoring	Geotechnical inspections should be carried out and documented for D-CP1 and D-CP5 following the schedule developed in the OMS manual. These activities were completed in 2019; however, not quite to the schdedule in the OMS. The OMS manual indicates that daily inspections should be completed and documented using the same form as the weekly inspection, which were not completed in 2018. The OMS manual does not indicate if there is seasonal variability to the frequency of documented inspections. It may be acceptable to seasonally vary the frequency of inspections, but this should be reviewed with the Engineer of Record (EoR) for the dikes and the OMS manual should be updated as required.	High	Yes	The intent, feasibility and value of daily inspections, as well as seasonality variability, are issues that will be addressed during the annual review of the OMS. The frequency of documented visual inspections will be reviewed and discussed with internal stakeholders, the Design Engineer, the EoR and members of the Independant Review Board.	Discuss visual inspection schedule with all stakeholders during annual OMS review. Update OMS as required.	Engineering	June 2019
	In addition, instrumentation should be monitored and the data should be plotted and reviewed following the schedule developed in the OMS manual.	High	Already Implemented	The current schedule of instrumentation data collection, analysis and documentation follows the schedule developed in the OMS.	No	NA	NA
	The OMS should be reviewed and updated annually and is next due for review in June 2019.	High	Already Implemented	An annual review and update of the manual is a requirement of the OMS. The 2019 review will be scheduled to occur in June.	Encourage comments/suggestions from all registered users of the OMS prior to June 2019. Schedule review with registered manual holders and update and improve manual as required.	Engineering	June 2019
	Make sure thermistors in the water management dikes are well marked so they can be located and maintained during the winter and are not damaged during snow removal operations.	High	Already Implemented	Data loggers were installed on all ground temperature cables at both D-CP1 and D-CP5 in October 2018. Each data logger and solar panel is well marked and clearly visible.	No	NA	NA
2. Water Management	Water volumes within the containment ponds should be managed to the levels defined in the OMS manual, including maintaining the water level below the elevation defined for the end of October in the OMS manual over the winter to promote freezing of the dikes.	High	Already Implemented	Upstream water elevations are checked on a daily basis during open water season and monthly during the winter as per the OMS guidelines. Deviations from the levels defined in the OMS are communicated to all stakeholders and management strategies are adjusted accordingly.	No	NA	NA
3. Dike Repair/Maintenance	Cracks and areas of settlement in the containment pond dikes should be filled and/or recontoured to close the cracks and reduce the potential for infiltration and erosion.	Medium	No	The permanent water retention dikes have been in operation for almost two years and are currently stable, with no significant geotechnical concerns identified during the Annual Inspection. Although the dikes were not designed to be resistant to water infiltration (ie. no sloping of the crests to shed surface water), it is acknowledged that the establishment of preferential water pathways within the thermal cover could lead to undesirable impacts on the stability of the structures over time. Therefore, the requirement to close the observed cracking systems on the crest of D-CP5 and the upstream crest of D-CP1 and the implementation of a regularly scheduled maintenance program will be discussed during the OMS review in June 2019 with internal stakeholders, the Design Engineer, the EoR and members of the independent Review Board.	Discuss infill of cracking and regular maintenance program with all stakeholders during annual OMS review. Update OMS as required. Schedule maintenance as required.	Engineering	June 2019
	The pipe ramp constructed out of sand upstream of D-CP1 near Stn. 1+140 is susceptible to erosion and some erosion was observed since the 2017 inspection. It is recommended that the pipe ramp be covered with a coarser rockfill to protect it from erosion.	Not Provided	Yes	The pump ramp at D-CP1 should be covered with a more robust construction material. In addition, the HDPE pipe running over D-CP1 should be covered with enough rockfill material to allow for emergency equipment/vehicle access to the dike.	Cover pump ramps with rock fill material. Protect HDPE with screened esker material/sand. Repair work will be scheduled with the appropriate department.	Engineering/E&I/Construction	Late summer 2019
	Survey monitoring plate M-3 on D-CP5 should be replaced.	Medium	Yes	Survey monuments M3 and M1 (damaged early 2019) will be replaced once the thermal cover on D-CP5 has thawed to allow hand excavation.	Continue monitoring temperatures within the dike (vertical GTC's) to determine depth of thaw and schedule survey monument replacement. Enhance protection of monuments once replacement has been completed. Restrict access to the crest of D-CP5 to authorized personnel only.	Engineering/E&I	Fall 2019
	Where access is feasible, removal of snow from the water collection pond dikes (temporary and permanent) is recommended to reduce the insulating effects of the snow, thereby allowing the temperature of the core material in the dikes and the foundations to drop as low as possible. Snow removal is more important if thermistor data is indicating that the dike and/or foundation temperatures are warmer than expected.	Medium	No	Snow clearing activities have the potential risk of damaging dataloggers, thermistor installations and trench sumps from the downstream of D-CP1 and the upstream of D-CP5. Thermistor data indicates that both dikes are generally performing as expected, with key trench and foundation conditions generally remaining below 0°C. Snow removal is therefore not currently a scheduled maintenance activity. However, snow will be cleared from the downstream toe of D-CP5 prior to freshet as a mitigation measure to prevent overtopping of the D-CP5 trench sump (an area of risk observed during freshet 2018). Thermistor records will continue to be assessed to ensure dike/foundation temperatures do not follow unexpected trends and if warmer than expected conditions arise, routine snow clearing will be reconsidered.	No	NA	NA
4. Sump/Channels	Monitor the cracking observed in the D-CP1 downstream sump berms and adjacent to the downstream channel.	Medium	Already Implemented	Regular inspection and documentation of the D-CP1 downstream sump and channels occur as part of the OMS inpsection plan for the dike.	No	NA	NA
	Recontour and/or compact the areas of cracking in the D-CP1 downstream sump berms to reduce the potential for water to infiltrate into the cracks leading to warming of the permafrost and additional thaw settlement and cracking	Medium	No	The D-CP1 downstream sump was constructed as per design and was not intended to be impervious to water infiltration. The sump area was excavated into natural ground, lined with geotextile and the slopes were covered with rip rap protection of thicknesses varying from 0.2 m to 0.4 m. This material was bucket-tamped into place. It is therefore not anticipated that any amount of recontouring or compacting would reduce the potential for water infiltration. This being noted however, routine maintenance of the sump area is specified in the OMS to prevent erosion and deterioration of the downstream water collection system. This maintenance will occur as required at the direction of the Geotechnical Engineer.	No	NA	NA
	The D-CP1 sump and downstream collection channel should be emptied in the fall/early winter to refreeze the ground around these facilities.	Medium	Already Implemented	As per the design specifications and OMS requirements for the downstream channel and sump, these facilities are emptied in the late fall prior to freeze-up.	No	NA	NA
	During open water season, keeping the water level in the downstream channel and sump low will reduce the potential for thaw of the ground around and associated settlement.	Medium	Already Implemented	Water levels in the D-CP1 sump are monitored and pump-back is automatically triggered when water levels exceed the height of the pump.	No	NA	NA

P Area

Annual Geotechnical Inspection Recommendation (Golder, 2018)		Priority Level (Golder, 2018)	Recommendation (s) to be Implemented?	AEM Response to Recommendation	Additional Action(s) Required	Responsible Department(s)	Expected Date of Implementation
1. OMS	If the P-Area dikes will continue to be used, they should be added to the OMS manual that was developed for D-CP1 and D-CP5. Geotechnical inspections and instrumentation monitoring should be carried out and documented following a schedule developed in the OMS manual.	High	No	The Annual Inspection points out that any potential failure of the P-Area dikes would now report to either CP1 or CP5 and as such, these structures are no longer considered as dams in accordance with CDA classification. AEM therefore does not consider these structures as significant enough in nature to warrant inclusion in the OMS for D-CP1 and D-CP5. However, as part of AEM's committment to exercising due dilligance, geotechnical inspections and instrumentation monitoring will continue for as long as these structures remain functioning.	No	NA	NA
2. Inspection and Monitoring	AEM personnel should continue to conduct geotechnical inspections and document visual observations such as cracking, slumping and/or seepage. Inspection reports should continue to be prepared for documentation. It is recommended that the frequency of visual geotechnical inspections be conducted weekly during freshet and monthly during the open water period.	Not Provided	Already Implemented	Visual geotechnical inspections and documentation will continue in 2019 on a monthly basis during the open water season.	No	NA	NA
	Thermistor data should continue to be collected, plotted and reviewed and pond water levels should continue to be measured and tracked.	Not Provided	Already Implemented	Pond water levels will continue to be read daily during open water season and tracked against the measured depth of thaw in the berms. Thermistor data will be collected, plotted and reviewed on a monthly basis.	No	NA	NA
	Make sure each thermistor cable is well marked so they can be located and maintained during the winter and are not damaged during snow removal operations.	Not Provided	Already Implemented	All thermistor cables are clearly marked and delineated.	No	NA	NA
	Consider adding data loggers to record the temperatures to facilitate data collection, particularly in the winter.	Low	No	Data loggers were installed for the permanent dikes in October 2018. However, owing to the temporary nature of the P-Area, the lower risk of failure and the greater accessibility of the thermistors, the expense of adding data loggers is not felt to be justified.	No	NA	NA
3. Water Management	Continue to collect and pump back seepage water as deemed necessary,in areas where seepage could impact downstream areas.	Not Provided	Already Implemented	Water levels within the collection ponds and seepage channels are monitored daily. Pumping of seepage water occurs as required and pumping records are provided daily.	No	NA	NA
	The water levels in the ponds should be reduced as much as possible in the winter to promote freezing of the dam cores. This would also increase the capacity within the ponds to manage water during the freshet, if necessary. The water levels should also be maintained as low as possible in the summer to reduce thermal warming due to water over the upstream toe of the dikes.	High	Already Implemented	Water levels within the collection ponds are monitored daily during open water season and are kept as low as possible based on the water management strategy and available treatment/discharge options. Daily meetings take place to discuss current water level statuses and targets with stakeholders. When water levels are deemed to be of concern, pumping to the P-Area is stopped and removal is maximized via transfer to the Saline Pond or active evaporation. Prior to freeze, a feasible water level target is made and reached via treatment or discharge. This target will be sufficient to ensure OMM is not reached during freshet.	No	NA	NA
4. Repair/Maintenance	If the dikes continue to be used, consideration for filling in the cracks, with additional fine rockfill or granular fill, regrading and re-compacting the slopes and crests may be warranted.	Medium	No	The Annual Inspection points out that overall, the P Area berms appear stable, with no significant geotechnical concerns identified. Therefore, owing to the temporary nature of the P Area berms and low risk of failure, AEM does not feel that the time and expense of regrading and re-compacting the slopes and crests is warranted. The exception however, would be Jetty #2 off of DP1-B. As was noted during the inspection and as documented in internal inspections throughout 2018, slumping and cracking in this area has been observed to increase over the past year. As Jetty #2 supports an evaporator and there is a risk of impacting operation of the area if the jetty fails, repair and mitigation work will be scheduled for 2019.	Schedule maintanance work with E&I for late summer 2019. Closely monitor jetty condition during summer thawing.	Engineering/E&I	September 2019
	Consider adding rockfill material to cover the till berm in P1, to protect the till and maintain its integrity if this berm is required for water management.	Low	No	The till berm in the middle of the P1 collection pond is not required for water management.	No	NA	NA
	Where access is feasible, removal of snow from the water collection pond dikes is recommended to reduce the insulating effects of the snow, thereby allowing the temperatures of the core materials in the dikes and the foundations to drop as low as possible with the potential that temperatures could get cold enough to maintain frozen conditions throughout the summer. Snow removal is more important if thermistor data indicates that temperatures within the dikes and/or foundations are warmer than expected.	Medium	No	Snow clearing activities have the potential risk of damaging thermistor installations, trench sumps and other infrastructure in the P Area. In addition, thermistor data indicates that the P Area berms will experience complete thawing during the summer/fall months, regardless of any snow removal efforts. Snow removal will therefore not be a scheduled maintenance activity.	No	NA	NA

Main Site Other

Annual Geotechnical Inspection Recommendation (Golder, 2017)		Priority Level (Golder, 2018)	Recommendation (s) to be Implemented?	AEM Response to Recommendation	Additional Action(s) Required	Responsible Department(s)	Expected Date of Implementation
1. Channel 1	The cracking and sloughing along Channel 1 should be assessed to determine if the channel is too steep and rip rap is sloughing over geotextile or if it is caused by thermal degradation or permafrost adjacent to the channel.	Medium	No	The lateral slopes of Channel 1 were locally steepened (2H:1V) for approximately 80 m to accommodate the final crusher ramp design footprint. This deviation from the original design (3H:1V) was done with the approval of the Design Engineer. As discussed in the Tetra Tech as-built report " *Construction Summary (As-Built) Report for Channel1 and Culvert #13, #1, #2, #15, #16*" issued to the NWB February 18, 2019, it is acknowledged that this localized steepening may result in the possibility of slope problems. Channel 1 will be monitored and any signs of instability, sloughing or ravelling will be corrected if observed.	Include Channel 1 in routine geotechnical inspection program and finalize inspection schedule. Prepare inspection criteria and documentation forms. Schedule any repair and/or maintenance work required.	Engineering	Pre-freshet 2019
	If possible, the channel should be kept empty through the winter to promote freezing of the permafrost around the channel.	Medium	No	Channel 1 was constructed as per design and was mechanically excavated within the active layer, lined with geotextile and covered with rip rap protection of minimum thickness 0.3 m. As the channel lies entirely within the active layer, aggradation of the underlying permafrost was neither intended nor foreseen. AEM therefore feels that snow removal throughout the winter is not worth the risk of damage to the infrastructure.	No	NA	NA
	If the bottom of Channel 1 remains below the inlets for Culvert 16, consider lowering the invert of the lowest culvert or adjust the invert of the channel, if possible, so that water will not need to pond in the channel before flowing through the culverts.	Not Provided	No	Culvert 16 was installed as per design specifications as per " *Construction Summary (As-Built) Report for Channel1 and Culvert #13, #1, #2, #15, #16*" (Tetra Tech, 2019). As with all culvert systems installed at site, performance will be monitored regularly during freshet and open water season, with any adjustments or mitigation work conducted as required.	No	NA	NA
2. Wesmeg Esker	The Wesmeg Borrow area should be recontoured and either capped with a coarser material or revegetated to reduce erosion.	Medium	Already Implemented	Rehabilitation of all site esker sources (Wesmeg, Melladine and Tiriganiaq) is scheduled to occur before the cessation of construction activities in 2019. Rehabilitation of the Wesmeg esker is currently on hold pending completion of construction activities at the West Raise. Once drilling and concrete work has finished, the excavated area will be backfilled with the material currently stockpiled on the esker and final rehabilitation of the surface will be completed.	Follow up required upon completion of construction activities.	Engineering/Construction	Fall 2019
3. Channel 5	Monitor the cracking adjacent to Channel 5.	Medium	Yes	A routine geotechnical monitoring schedule and documentation process for water management infrastructures outside of the temporary and permanent dikes is currently being formalized by the AEM Geotechnical Engineer. Channel 5 will be on the list of infrastructure to be inspected by AEM personnel.	Include Channel 5 in routine geotechnical inspection program and finalize inspection schedule. Prepare inspection criteria and documentation forms. Schedule any repair and/or maintenance work required.	Engineering	Pre-freshet 2019
	If cracking gets worse, recontouring and/or compacting the areas of cracking to close the cracks will reduce the potential for water to infiltrate into the cracks leading to warming of the permafrost and additional thaw settlement and cracking.	Medium	No	Channel 5 was constructed as per design and was not intended to be impervious to water infiltration. The channel was excavated into natural ground, lined with geotextile and the slopes were covered with rip rap protection of thicknesses approximately 0.3 m. This material was bucket-tamped into place. It is therefore not anticipated that any amount of recontouring or compacting would reduce the potential for water infiltration. It is also noted that the area adjacent to the Channel is the remnants of the access road placed for construction of Berm 3. The esker material used to construct this access road was removed and placed as rip rap protection during the final stages of Berm construction. There was no expectation that the remnants of the road would be trafficable or usable at the conclusion of construction activities in the area.	No	NA	NA
4. Berm 3	Ponding upstream of Berm 3 should be monitored to determine how much and how often ponding occurs and if Berm 3 can perform as required with the ponding.	Medium	Already Implemented	AEM currently monitors this area during freshet and throughout the open water season. Monitoring will continue in 2019. To-date, Channel 5 effectively drains to CP5 and no ponding against Berm 3 has been observed.	No	NA	NA
	The Berm 3 cover materials may be susceptible to erosion. This should be monitored, and if there is erosion, consideration should be given to placing courser material on the Berm to reduce the potential for erosion.	Medium	Yes	A routine geotechnical monitoring schedule and documentation process for water management infrastructures outside of the temporary and permanent dikes is currently being formalized by the AEM Geotechnical Engineer. Channel 5 will be on the list of infrastructure to be inspected by AEM personnel.	Include Berm 3 in routine geotechnical inspection program and finalize inspection schedule. Prepare inspection criteria and documentation forms. Schedule any repair and/or maintenance work required.	Engineering	Pre-freshet 2019
5. Portal 2	Monitor slopes above Portal 2 for rockfill instability during backfill placement.	High	Already Implemented	AEM Engineering oversaw an extensive scaling and ground support program of the rock and overburden faces at Portal 2 prior to the commencement of construction activities within the excavation. Regular, documented inspections by Ground Control Engineers were on-going during the backfill placement. Backfilling of Portal 2 was completed late in 2018.	No	NA	NA
	Snow management around and above Portal 1 and 2 may be advisable prior to freshet to reduceinflows entering the underground.	Low	Already Implemented	AEM currently clears snow around Portal 1 and Portal 2 throughout the winter and places the snow within P3 as deleterious substances may be mixed with snow. Clearing is conducted throughout the winter and is ensured in the weeks prior to freshet.	No	NA	NA
6. Exploration Landfill	A coarser rockfill layer should be placed over the decommissioned exploration landfill to reduce erosion and cracking.	Medium	No	The exploration landfill will be incorporated into Waste Rock Storage Facility 1 (WRSF1) once construction of this facility commences in 2019.	No	NA	NA
7. Saline Pond	Consideration for filling in the cracks with fine rockfill, recontouring and re-compacting the slopes and crests may be warranted to reduce the potential for infiltration into the berms that may increase the cracking and settlement.	Not Provided	No	A routine geotechnical monitoring schedule and documentation process for water management infrastructures outside of the temporary and permanent dikes is currently being formalized by the AEM Geotechnical Engineer. The perimeter berm of the Saline Pond will be on the list of infrastructure to be inspected by AEM personnel.	Include Saline Pond in routine geotechnical inspection program and finalize inspection schedule. Prepare inspection criteria and documentation forms. Schedule any repair and/or maintenance work required.	Engineering	Pre-freshet 2019
	Monitor the downstream side of the perimeter berm for ponding water and consider diverting it or pumping it so it does not seep into the saline pond and warm the foundation below the berm.	Not Provided	Yes	Monitoring is conducted site-wide as a means to identify areas of concern/seepage. The perimeter berm around the Saline Pond will specifically be added to the inspection template as an area of concern.	Add specific item to monitor the downstream side of the perimeter berm at Saline Pond for ponding. This will be added to the freshet and water structure inspection templates.	Environment	Pre-freshet 2019
	Where possible, try not to allow seepage water from DP3-A to pond against the Saline Pond berm to avoid permafrost degradation.	Medium	Already Implemented	AEM actively pumps the trench downtream of DP3-A during freshet and the open water season. In 2018, the trench pump was upgraded from a 3-hp submersible pump to a 5-hp submersible in order to ensure the trench remains below the elevation of the pump.	No	NA	NA
8. Industrial Pad	Where erosion is occuring on the slopes of the pads, the existing materials should be regraded and compacted, and a coarser material should be placed to further reduce erosion potential. Higher priority should be given to areas where erosion is encroaching on sea containers or other facilities placed close to the slope. The most significant pad erosion was observed at the north side of the main camp/industrial pad and the Emulsion Plant pad.	Medium	Yes	Construction of the Industrial Pad is scheduled to be completed in 2019. Final grading, capping and compaction will occur at this time.	Complete construction of the Industrial Pad to final grade as per design and technical specifications.	Construction	Summer 2019
9. Emulsion Plant/Road	If erosion occurs in the esker sand material used to construct the emulsion plant road, rockfill should be placed to cap the road and reduce erosion. Placement of gravel road capping may also be beneficial to improve the road surface, particularly over the northern section of the road.	Not Provided	Already Implemented	The road to the emulsion plant was constructed using 600 mm minus esker material, due to the requirement of using "clean" (non-underground sourced) construction materials outside of the contained watershed areas. Capping of the access road with a finer grade produced esker material occured in late 2018.	No	NA	NA
	Consider adding a crushed surface material to the Emulsion Plant and storage area pads if trafficability continues to be an issue.	Medium	No	The Emulsion Plant and storage area pads are outside of the contained watersheds for the Project. Therefore, the choice of construction materials was limited to esker materials. Accordingly, the final grade of the Emulsion Plant pad was sloped to encourage drainage. In addition, a ditch was constructed around half of the pad to further encourage water away from the Plant and garage areas. It is expected that proper snow management in this area prior to freshet 2019 will alleviate many of the trafficability issues observed during 2018.	Ensure correct snow management occurs prior to freshet. Monitor trafficability pre/post freshet. Enhance drainage if required.	Environment/E&I	Prior to Freshet 2019
	It is recommended that the disturbed areas adjacent to the emulsion plant road are regraded so that water does not pond adjacent to the road and thaw the permafrost around and under the road which could lead to settlement.	Medium	Yes	Regrading of natural tundra is difficult, if not impossible to achieve without further thermal disturbance. However, the disturbed areas will be rehabilitated by application of a thermal cap of rock fill material of sufficient thickness to prevent thermal degradation.	Rehabilitate either side of the roadway by replacing the natural peat cover with a thermal cap of rockfill.	Engineering/E&I/Construction	Prior to August 2019
	Culverts should be installed in areas of the emulsion plant road where water was flowing over the road in 2018.	Medium	No	The Emulsion Road was monitored daily for flow across the road, with very minor flows observed for 4 days during the 2018 freshet. AEM will continue to monitor and measure flow rates in this area and culverts will be installed accordingly if required.	Measure flow across road during 2019 freshet and install culvert accordingly.	Environment	Freshet 2019
10. Site Roads/Culverts	Implement a road and culvert monitoring program for site roads, as is done for the AWAR, which is tied to the maintenance program	Medium	Already Implemented	AEM monitors culverts and potential sources of TSS from erosion of site roads at a frequency of daily during freshet, monthly thereafter and following rainfall events.	No	NA	NA
	Consider lowering the lower culvert of Culvert 1 so that water won't pond against the road prior to flowing through the culverts.	Not Provided	Already Implemented	The temporary culverts at Culvert 1 were removed in late 2018, replaced with the design specified diameter culverts and were lowered 0.2 m from the design invert elevations based on field observations from the previous year.	No	NA	NA

	Ponding of water adjacent to roads should be avoided. Disturbed areas from road construction should be recontoured to promote drainage away from the road and consideration should be given to installing culverts if ponding occurs in naturally low areas. This was most notable along the Emulsion Plant and Wesmeg Borrow access roads.	Medium	Already Implemented	Ponding has been noted to be ephemeral in most areas adjaent to roadways and thus permafrost degredation is not a concern when ponds only exist following rainfall events or for the first couple of weeks following freshet. With respect to TSS transport and road washout, AEM agrees that ponded areas should not be allowed to overtop during heavy rainfall.	AEM will continue to monitor roadways to identify locations of long-term ponding and plan to install culverts as needed to reduce ponding and potential for road wash outs.	Environment	Freshet/Open water season 2019
	If the Wesmeg Borrow access road is blocking drainage near Lake B33A that is leading to ponding adjacent to the road, a culvert should be installed to allow drainage so that there isn't permafrost degradation and settlement.	Medium	Yes	Ponding will be tracked at this location and a culvert will be installed if permanent ponding is occuring over the 2019 season.	Monitor ponding and install culvert if needed.	Environment	Freshet/Open water season 2019
11. Operation Landfill	The slopes of the Operation Landfill should be monitored, particularly the northeast corner where water was observed to be ponding downstream and there was some possible sloughing on the slope. Regrading and compacting the slope in this area will reduce the potential for erosion.	Medium	No	The Operation Landfill was built to design specifications, with the floor sloped to encourage drainage to the northeast corner. During the design phase, some ponding in this area was anticipated, particularly during freshet and after rainfall events, as it was acknowledged that it may take some time for water to percolate through the perimeter berm. The designer-approved change in the construction materials of the Landfill (from 600 mm minus waste rock to 600 mm minus esker material) does increase the potential for erosion and/or sloughing of the perimeter berms. However, as the Landfill will be encapsulated within WRSF1 (surrounded by waste rock), it is not felt that additional maintenance on the facility will be of value at this time.	No	NA	NA
12. Other	A coarser rockfill cover should be placed over the pipe berm constructed out of sand on the south side of the effluent water treatment plant to protect against erosion.	Not Provided	Yes	The pipe berm at the EWTP should be covered with a more robust construction material.	Cover pipe berm with 600 mm minus esker/ROM material. Protect HDPE with screened esker/sand material.	Engineering/E&I/Construction	Late summer 2019

Exploration Site

Annual Geotechnical Inspection Recommendation (Golder, 2018)		Priority Level (Golder, 2018)	Recommendation (s) Implemented?	AEM Response to Recommendation	Additional Action(s) Required	Responsible Department(s)	Expected Date of Implementation
1. Landfarm	Minimize the amount of water contained within the exploration landfarm until it is decommissioned and remediated.	Medium	Already Implemented	AEM monitors water levels within the landfarm daily during freshet and following rainfall. Water is pumped to the contaminated snow cell for oil-water separation as needed.	No	NA	NA
2. Camp Pad	Repair surface erosion along south slope of exploration camp pad. Grade surface to reduce channelization of surface water flows and therefore reduce the potential for the erosion to reoccur. In this area, a coarser surfacing layer could be placed to help reduce the potential for future erosion.	Low	No	Decommissioning of the exploration camp facilities is scheduled to begin in 2019. Grading and rehabilitation works will occcur as per closure and reclamation plans.	No	NA	NA
3. Site Roads	The diffuser access road could be regraded to close up the cracks and reduce the potential for future cracking.	Low	No	The diffuser access road sees very limited light vehicle traffic. As this item is of low priority with a limited impact, maintenance work on this road will not be scheduled at this time. The roadway will continue to be monitored and addressed if required for trafficability.	No	NA	NA
	The exploration camp access road should be regraded and consideration given to placing some coarser rockfill on the slopes where there is erosion.	Medium	Yes	The areas of erosion along the exploration access road are observed to be along the shoulder area and could cause safety issues during pullovers. The side slopes should be regraded in these areas.	Regrade side slopes of exploration camp access road in areas where erosion affects shoulder stability.	E&I	Post-Freshet 2019
4. Culverts	The culverts through the exploration camp access road should be cleared of material. Large boulders should be removed from above the culverts to prevent potential damage to the culverts and appropriately sized riprap should be added to the road fills around the culverts for erosion protection where there isn't any.	Medium	Already Implemented	AEM performs culvert inspections weekly prior to freshet, daily during freshet, weekly thereafter during the open water season and following rainfall events. All material (i.e., snow, ice, boulders) is removed when observed. As per AEM's Sediment and Erosion Management Plan, when erosion or sediment entrainment is of concern, rip-rap will be applied to armor the system.	No	NA	NA
5. Fuel Storage	The cracks in the fuel storage pad should be monitored; however they are not considered to be a geotechnical concern.	Low	No	Due to the very minor nature of the cracking observed on the pad, and the low priority of the recommendation, additional monitoring of this area will not be undertaken at this time.	No	NA	NA

AWAR

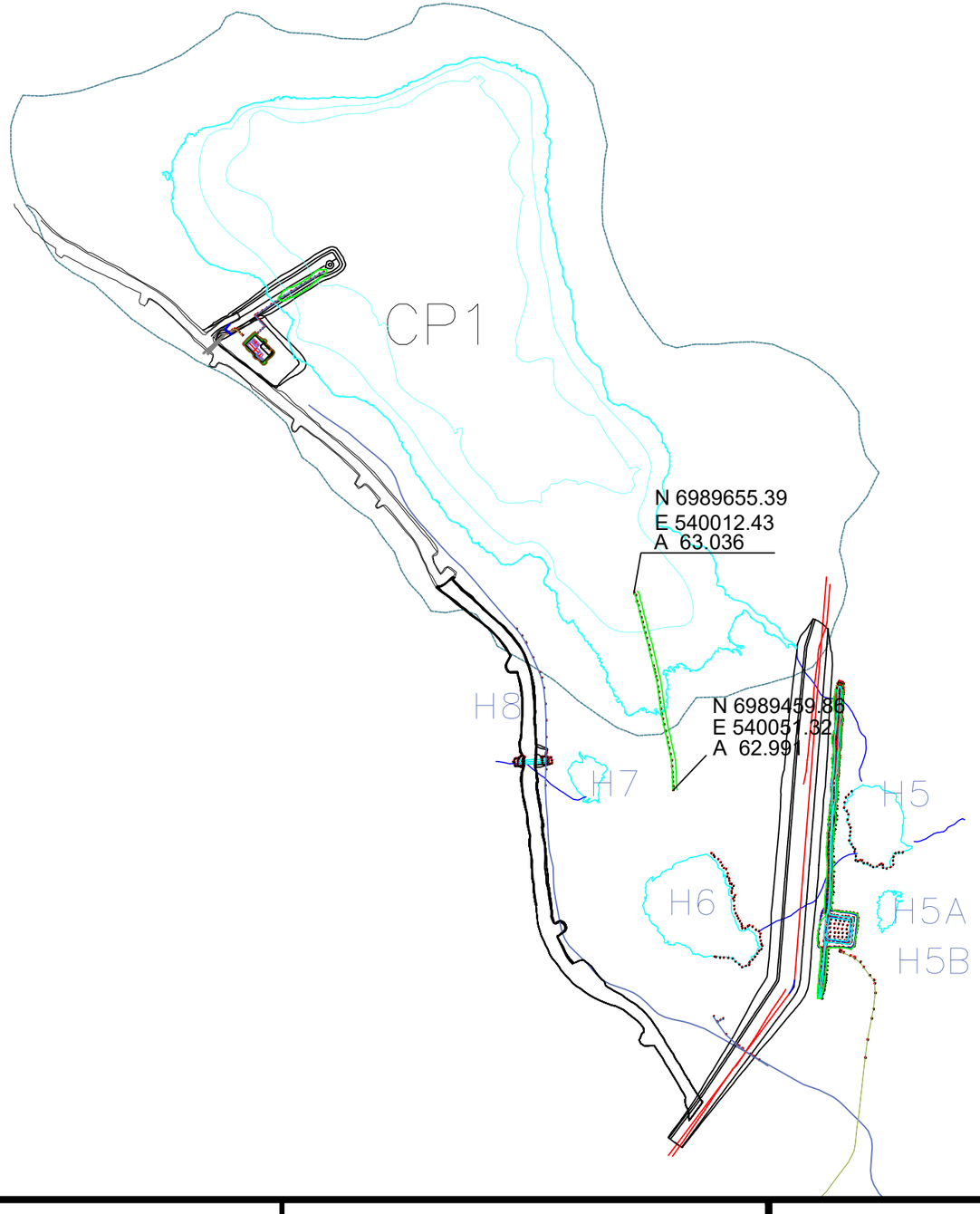
Annual Geotechnical Inspection Recommendation (Golder, 2018)		Priority Level (Golder, 2018)	Recommendation (s) to be Implemented?	AEM Response to Recommendation	Additional Action(s) Required	Responsible Department(s)	Expected Date of Implementation
1. **Culverts**	Continue to monitor culverts and hydraulic effectiveness to assess if current culverts provide adequate capacity and if any changes are required. Evaluate if any culverts need to be installed at a lower elevation to reduce ponding and downstream erosion.	**Medium**	**Already Implemented**	AEM will continue to inspect AWAR culverts weekly prior to freshet, daily during freshet, weekly thereafter and during rainfall events. Focus is given towards identifying ponding and potential sources of sediment. Culvert effectiveness and ponding as the result of perched culverts are assessed.	**No**	**NA**	**NA**
	Monitor areas that have ponding, but no culverts and consider installing culverts to manage water.	**Medium**	**Already Implemented**	AEM will continue to monitor the AWAR for ponding, track ponded areas and assess the need for culverts.	**No**	**NA**	**NA**
2. **Road Maintenance**	The kilometer markings on the AWAR culverts should be checked and replaced with accurate numbers. At the time of the 2018 site visit, AEM indicated that new markers had been ordered but had not yet arrived.	**Medium**	**Already Implemented**	AEM has received the new marker signs for the culverts and installation will occur in 2019.	Install new markers on AWAR culverts.	E&I	End of July 2019
3. **Inspections**	Conduct inspections and document observations and recommendations as laid out in the Road Management Plan (AEM 2015b). Road inspections were completed and documented in 2018, but documentation indicates that the frequency of the inspections did not quite meet what is laid out in the Road Management Plan.	**High**	**Already Implemented**	Caribou migration affected inspections for approximately three weeks of July 2018, as only essential outdoor work was permitted for much of this duration. Aside from the caribou migration period and severe winter weather conditions, AEM will conduct inspections at the frequency stated within the Road Management Plan.	**No**	**NA**	**NA**

Itivia Bypass

Annual Geotechnical Inspection Recommendation (Golder, 2018)		Priority Level (Golder, 2018)	Recommendation (s) to be Implemented?	AEM Response to Recommendation	Additional Action(s) Required	Responsible Department(s)	Expected Date of Implementation
1. Reporting	The locations of some of the culverts through the Itivia by-pass road do not correlate with the design drawings (Tetra Tech 2017e) due to changes made during construction. The culvert locations should be referenced to the as-built report and drawings during the 2019 annual geotechnical inspection. The as-built report should confirm culvert sizes, locations and invert elevations have been constructed to the design. The as-built report should also confirm that safety berms have been constructed where required based on road fill height and confirm that road slopes have been constructed to design.	**Medium**	**Already Implemented**	The as-built report for the Itivia By-Pass Road was completed by the Design Engineer (Tetra Tech) and submitted to the NWB February 20, 2019.	**No**	**NA**	**NA**
2. Inspection	The section of the road and safety berm that is constructed with esker material may be susceptible to erosion. This should be monitored and maintenance completed as required.	**Low**	**Already Implemented**	The Bypass Road and one of the safety berms were constructed with material approved by the Design Engineer (600 mm minus esker material). Inspections of the roadway for erosion will be conducted as per the Road Management Plan.	**No**	**NA**	**NA**
	Conduct insepctions along Itivia by-pass road, as per the Road Management Plan (AEM 2015b), now that the road is complete.	**Not Provided**	**Already Implemented**	AEM will conduct inspections as per the Road Management Plan	**No**	**NA**	**NA**
3. Water Management	Ponding of water along the road should be monitored and if it is impacting the condition of the road, mitigation measures should be implemented, such as, lowering the culverts or ditching or placing fill to direct water to the culvert inlets.	**Medium**	**Already Implemented**	AEM will conduct inspections and implement mitigation measures as per the Road Management Plan	**No**	**NA**	**NA**
4. Culverts	The culverts should be cleared of all materials prior to freshet.	**High**	**Already Implemented**	As per AEM's Freshet Action Management Plan and Procedure, culverts will be cleared of all material prior to freshet and inspections will be carried out to ensure no blockages during freshet.	**No**	**NA**	**NA**
	The damaged outlets of the culverts through the entrance to the Itivia fuel storage area should be fixed.	**Not Provided**	**No**	Water levels observed within the culvert over 2018 did not pose a concern with respect to being impacted by the damage at the top of the culvert. The culvert will be monitored and if the damage is of concern then repairs will be made.	Monitor the outlet of the culvert to ensure damage does not pose an impact to flow passage.	Environment	2019 Open Water Season
5. Fuel Farm	Cover material should be re-established over the liner that has been exposed on the south containment berm of the Itivia fuel storage facility to protect the liner.	**Medium**	**Yes**	After freshet 2019 is completed, cover material should be raked into place over the liner system (exposed geotextile) to protect the system against exposure to UV radiation and risk of damage.	Schedule maintenance with E&I to occur post freshet 2019. Geotechnical Engineer to inspect maintenance work during and afterwards to ensure liner integrity is not compromised.	Engineering/E&I	Post 2019 Freshet

Appendix B-3

As-built drawing of mitigation work



HAMELARPENTAGE	Système de Coord.: UTM15 NAD83 Echelle: NA	No plan: 65-695-CP1 TRENCH	ALIGNMENT CP1 TRENCH	AGNICO	Date des travaux : 2018-09 Date d'envoi : 2018-10-24	Dessine par: Y. Hamel Approuve par: HAMEL ARP

Appendix C-1

Geochemical report

AGNICO EAGLE

MELIADINE GOLD PROJECT

2018 METAL LEACHING AND ACID ROCK DRAINAGE MONITORING REPORT

In Accordance with NIRB Project Certificate No. 006 and Water License 2AM-MEL1631 Schedule B, Item 6.

Prepared by Agnico-Eagle Mines Limited – Meliadine Division

March 2019

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Appendix B: Waste Rock Composition Laboratory Certificates of Analysis

Appendix C: Quarry Acid-Base Accounting Laboratory Certificates of Analysis

Appendix D: Quarry Composition Laboratory Certificates of Analysis

1 INTRODUCTION

In February 2015, Agnico Eagle Mines Ltd. (Agnico Eagle) was issued the NIRB Project Certificate No. 006, which was subsequently amended in February 2019, for the Meliadine Gold Project, near Rankin Inlet, NU. In April 2016 Agnico Eagle was also issued the Water License No 2AM-MEL1631. In accordance with Conditions 19, 22, and 31, of the Project Certificate, Agnico Eagle has developed a waste rock and quarry monitoring plan to characterize the metal leaching and acid rock drainage (ML/ARD) potential of excavated materials on-site. This report provides the ML/ARD characterization results of samples collected in 2018 from underground development areas at the Meliadine Mine, as well as quarry borrow material used for construction.

The baseline geochemical findings for the site (Golder 2014) found that there was low potential for ARD generation in all of the deposits except the Discovery Zone. Mining activities have not started at Discovery and as a result, 2018 sampling was not expected to find samples with ARD potential. Potential for ARD from Quarry locations was also expected to be low based on characterization studies performed by Golder (2010).

Metal and metalloid (hereafter referred to simply as metal) leaching was also found to have low potential for the areas being mined in 2018, with no management requirements. Arsenic was the element of interest in the deposit, although at concentrations that would not pose a water quality risk. The results from 2018 are presented in context of sampling from 2017 results, as well as in comparison to the range of concentrations predicted from project development studies.

As a result of the project baseline studies establishing that management criteria were not required for the operation, the objective of this characterization program was to confirm the findings from the baseline studies and to ensure that the current management plan is protective of the receiving environment.

2 SAMPLING

2.1 WASTE ROCK

In 2018, 45 samples were collected from waste rock produced as part of underground development activities. The location of the samples are shown in Figure 1 and were taken throughout the mine on levels 125-225 and 275-425. Roughly half of the samples were taken in primary footwall drives, primarily in Meta-Volcanic rocks with a few being taken in secondary footwalls being driven in Meta-Sedimentary Rocks. The other half of samples came from cross-cuts being done to access the ore and were a combination of Meta-Volcanics, Meta-Sediments, and Iron Formations. A few samples were taken in the primary or internal ramps (RP425-450 and RP375-400) along with a few other miscellaneous headings, which were all in Meta-Volcanic Rocks.

Sample collection was performed by the operational geology team as follows:

- Sampling frequency was initially quarterly until the further quarter, when it switched to monthly
- Quarterly sampling to recover 12 samples plus one duplicate
- Monthly sampling to recover 6 samples plus one replicate for a total of 7
- The dominant lithologies encountered in the waste rock were selected by
    - choosing 3 from each of the top three priority headings in the month (i.e. one from each heading)
    - 3 additional samples from the other most active headings each month;
    - The rock type (i.e. volcanic (VOL), sedimentary (SED) or iron formation IF)) were noted with each sample

Each sample was approximately 1kg and representative of the bulk composition of the rock being sampled.

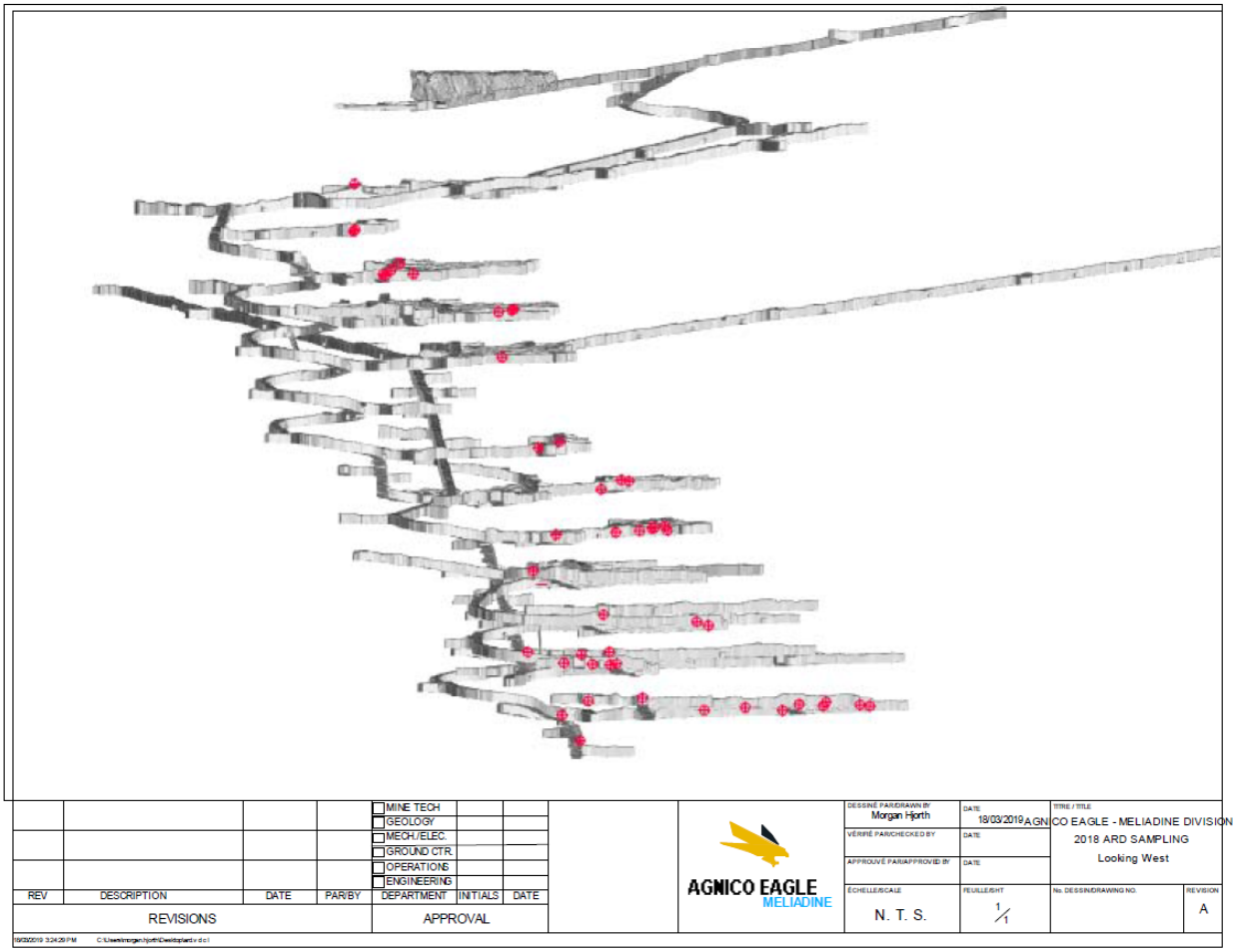

Figure 1: Cross section of underground mine ML/ARD sampling locations.

Note: Sample locations are indicated by red circles.

2.2 SURFACE QUARRIES

In 2018, 30 esker quarry samples were collected for site construction material. The majority of samples in 2018 were from the Meliadine esker (top of Figure 2), with the remainder primarily from Site D (outside of Rankin towards camp, just past the Char River bridge) and the Itivia esker (in Rankin Inlet).

The number of samples collected at each location was based on the estimated volume prior to sampling using a ratio of 8 samples/100,000 tonnes as recommended by MEND (2009). Total volume of the esker/quarry was estimated for bank (in situ) volume and using an estimated bulk density based on typical published values. During excavation of the quarries, typically less material was removed than estimated and the sampling rate was therefore higher than 8/100,000 tonnes.

Depending on whether the quarry location was bedrock or an esker, the material was sampled differently. For bedrock, boreholes were drilled to approximately 5m, with 1 kg of cuttings recovered. In esker material, approximately 1 kg of material was collected by a shovel at each location. The location of quarries is provided in Figure 2.

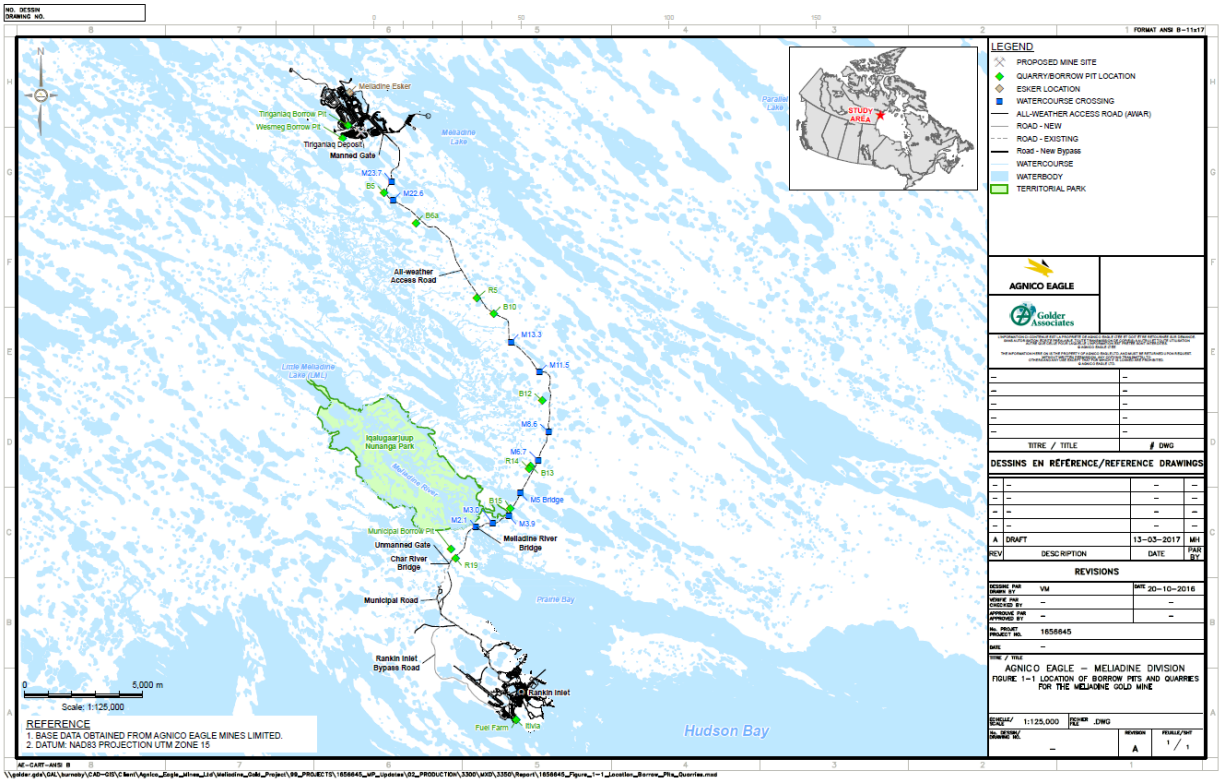

Figure 2: Quarry location map.

3 LABORATORY TESTING

All samples collected were shipped off-site to SGS Lakefield, Ontario, a commercial laboratory with specialization in ML/ARD. Analyses included:

- Acid-base accounting
  - Paste pH
  - Total sulphur (LECO)
  - Sulphate sulphur (HCl leach)
  - Total carbon (LECO)
  - Total inorganic carbon (TIC)
  - Neutralization potential (modified Sobek)
- Element scan by aqua regia digestion and a 31 element ICP-MS finish.

4 RESULTS & DISCUSSION

4.1 MINE DEVELOPMENT WASTE ROCK

4.1.1 ARD POTENTIAL

Neutralization Potential

Neutralization potential (NP) is expected to be primarily provided by calcite and dolomite, with some ankerite (Golder 2014). As a result, carbonate analysis alone would likely be appropriate for determining NP, although both methods were used (i.e. titration and direct carbonate analysis). Complete results are provided in Appendix A, with summary statistics in Table 1.

Golder (2014) indicated that NP from carbonate analysis (NP-Ca) was the more conservative method to determine buffering capacity of the rock and this was used as input into the ARD calculation. The relationship was checked in 2018, and the relationship generally held, especially at low NP values and therefore the continued used of NP-Ca was considered conservative for estimating ARD potential.

Table 1: Summary Statistics for 2018 ARD and Arsenic Results.

Parameter	Units	Min	P5	P25	Median	Mean	P75	P95	Max
Paste pH	s.u.	7.7	8.0	8.3	8.4	8.5	8.8	9.0	9.4
NP	kg $CaCO_3$/t	23	38	72	173	154	222	265	272
AP	kg $CaCO_3$/t	0.62	0.68	1.6	3.8	6.0	6.6	15	43
Sulphur (total)	% S	0.01	0.05	0.09	0.18	0.26	0.29	0.66	1.6
Acid Leachable SO4-S	% S	0.03	0.03	0.05	0.08	0.08	0.10	0.18	0.27
Carbon (total)	% C	0.15	0.51	1.3	2.2	2.1	2.8	4.0	4.2
Carbonate (CO_3)	% CO_3	0.49	2.0	4.5	10	9.4	13	18	20
NP-Ca	kg $CaCO_3$/t	8.2	34	75	168	157	220	307	325
NP-Ca/AP	ratio	1.8	5.71	19	32	26	71	228	246
Arsenic	mg/kg	2.8	4.7	15	56	382	130	1240	6000

Notes: P stands for percentile (e.g. P5 equals 5th percentile); NP-Ca is stands for NP by carbonate content.

Acid Potential

Project prediction studies indicated that the main sulphide minerals in the waste rock was pyrite, but also with arsenopyrite and lesser pyrrhotite, and chalcopyrite (Golder 2014). As a result, the main consideration for acid potential (AP) is the presence of sulphide minerals at Meliadine.

Project prediction studies were confirmed in 2018 sampling with acid-base accounting testing showing that sulphur is primarily present in the sulphide form (Table 1 summary, full results in Appendix A). Sulphur ranged from below detection 0.01% to a maximum of 1.6%, with a median of 0.18%.

ARD Assessment

The potential for ARD was assessed using NP-Ca/AP ratios (or neutralization potential ratios, NPR). AP was calculated from total sulphur. Ratios below 2 were used to indicate potential for ARD (PAG or potentially ARD generating), whereas ratios above 2 indicate low potential for ARD (non-PAG).

The classification of all Meliadine waste rock samples from underground since testing began in 2017 are provided in Figure 3 and a summary of ratios are provided in Table 1. As predicted by Golder (2014), the majority of operational muck samples collected to date were non-PAG. Samples from 2017 have also been included for ease of comparison to historical results.

The one exception was a sedimentary sample with an NPR of 1.8. This sample is not considered a risk as there is excess buffering in all other samples collected and it is only marginally below the non-PAG criterion. Given the carbonate mineralogy of the Meliadine samples, the threshold for a sample to produce ARD is likely closer to an NPR of one and this sample is unlikely to produce ARD even without the buffering of any other samples.

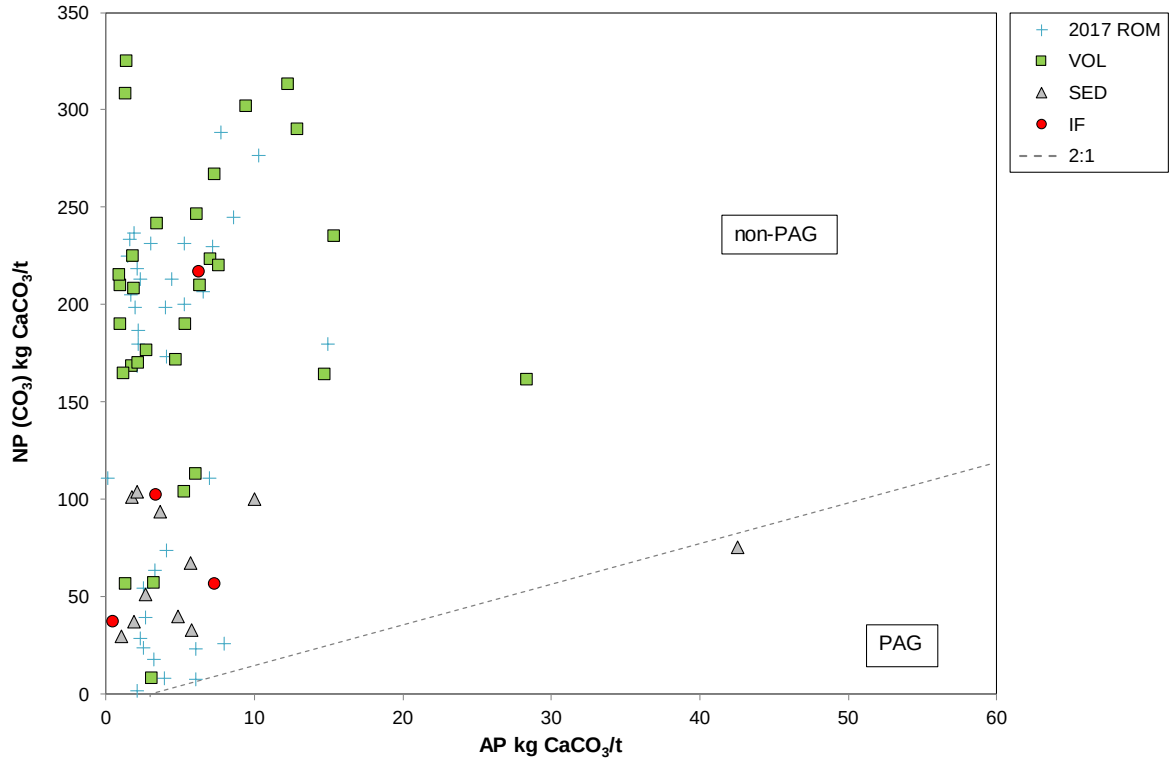

Figure 3: ARD classification of Meliadine Underground Waste Rock Samples.

Notes: ROM stands for run of mine; VOL for volcanics; SED for sedimentary/greywacke; IF for iron formation.

4.1.2 METAL LEACHING

Metal leaching was predicted by Golder (2014) to be low enough that management of waste rock to inhibit leaching was not required. However, based on project screening studies, arsenic was determined to be the main element of interested and analysis of this element (and all regulated elements) were part of operational monitoring since mining began. A statistical summary for arsenic is provided in Table 1, with complete element composition results provided in Appendix B.

To ensure arsenic concentrations were within project predictions, results have been compiled and compared against average and maximum arsenic concentrations reported by Golder (2014). As

shown in Figure 4, solid phase arsenic concentrations mainly fall within or below the average concentration, with no samples exceeding the maximum concentration reported by Golder (2014).

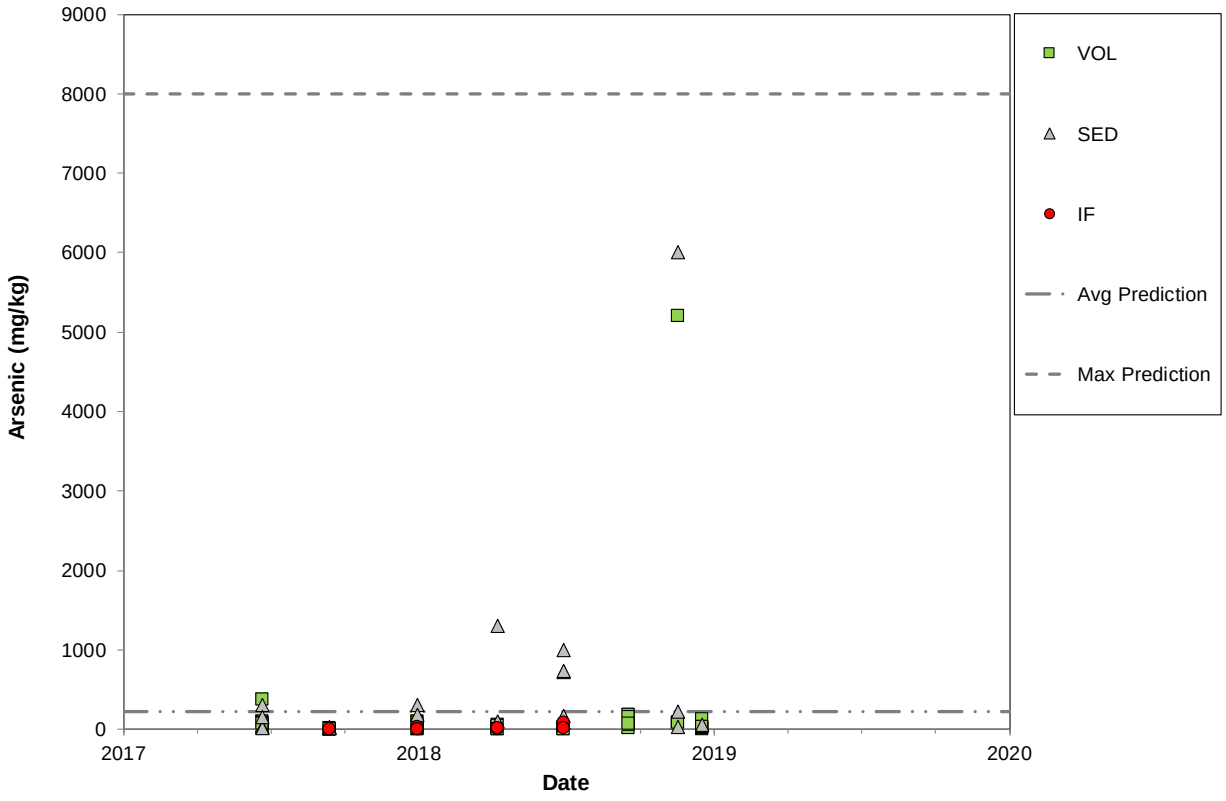

Figure 4: Arsenic concentrations in waste rock compared to project prediction studies.

4.2 Quarry Material

4.2.1 ARD Potential

The potential for ARD from Quarry samples collected in 2018 was assessed by the same approach described above for waste rock in Section 4.1, whereby NP was provided by carbonate (NP-Ca) and AP was estimated based on total sulphur.

Complete results are provided in Appendix C with summary statistics provided in Table 2. NP-Ca ranged from 2 to 44 kg $CaCO_3$/t, with a median of 9.2 kg $CaCO_3$/t. Total sulphur ranged from near detection limits of 0.01% to a 0.1%, with a median of 0.02%. These are relatively low sulphur numbers as typically any rock with less than 0.1% sulphur will not generate acidity regardless of the carbonate content as other rock components such as alkaline silicates (e.g. feldspars) can neutralize the small amount of acid produced.

The potential for quarry material to produce ARD was based on NPR ratios, but also a sulphur limit of 0.1%, meaning that any samples with 0.1% or less sulphur would be non-PAG regardless of the NPR ratio. Based on the two criteria, none of the quarry samples collected were PAG. The 0.1% sulphur criterion affected 4 out of 30 samples. A statistical summary is provided in Table 2 and the classification of all samples collected since operations began are shown in Figure 5.

Table 2: Summary Statistics for Quarry Rock Samples Collected in 2018.

Parameter	Units	Min	P5	P25	Median	Mean	P75	P95	Max
Paste pH	s.u.	5.6	6.1	7.0	8.6	8.1	9.1	9.6	9.7
NP	kg $CaCO_3$/t	2.0	3.1	5.5	9.2	10	11	20	44
AP	kg $CaCO_3$/t	0.62	0.62	0.6	0.6	0.7	0.6	1.3	1.6
Sulphur (total)	% S	0.01	0.01	0.01	0.02	0.03	0.04	0.07	0.1
Acid Leachable SO4-S	% S	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.1
Carbon (total)	% C	0.06	0.06	0.08	0.16	0.44	0.60	1.5	2.2
Carbonate (CO3)	% CO_3	0.04	0.04	0.08	0.14	0.26	0.29	0.82	1.6
NP-Ca	kg $CaCO_3$/t	0.58	0.67	1.3	2.3	4.3	4.9	14	27
NP-Ca/AP	ratio	0.48	1.5	2.3	3.3	5.7	5.9	17	36
Arsenic	mg/kg	0.58	1.3	3.4	5.3	7.7	7.8	17	58

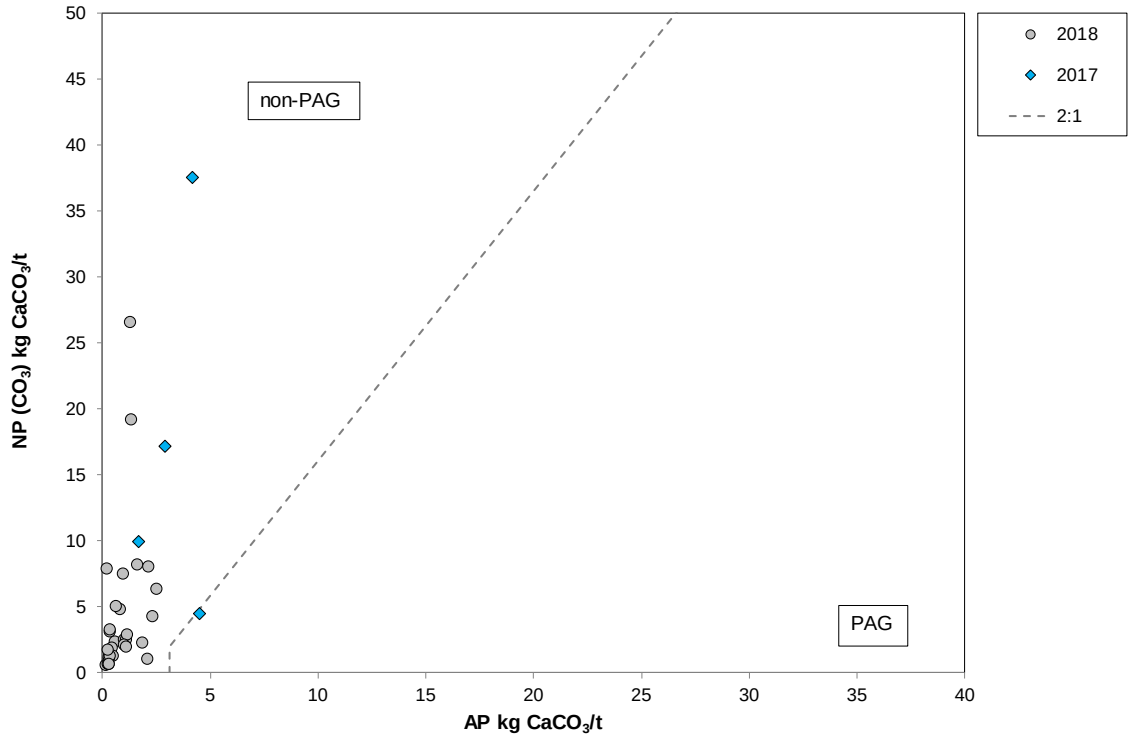

Figure 5: Quarry ARD Assessment.

Note: the vertical dashed line represents 0.1% S threshold.

4.2.2 METAL LEACHING

The same approach taken for waste rock was applied to quarry samples in terms of comparing against project prediction studies. All regulated elements were analysed in solid samples are included in Appendix D. Given the general presence of arsenic in the waste rock and background concentrations in the area, results for this element are summarized below.

Arsenic concentrations ranged from a minimum of 0.58 mg/kg to a maximum of 58 mg/kg, with a median of 5.3 mg/kg. These values are relatively low compared to waste rock and were within project prediction studies as the maximum value reported by Golder (2010) was 121 mg/kg. A statistical summary is provided in Table 2 and all results since sampling began in 2017 are provided in Appendix D.

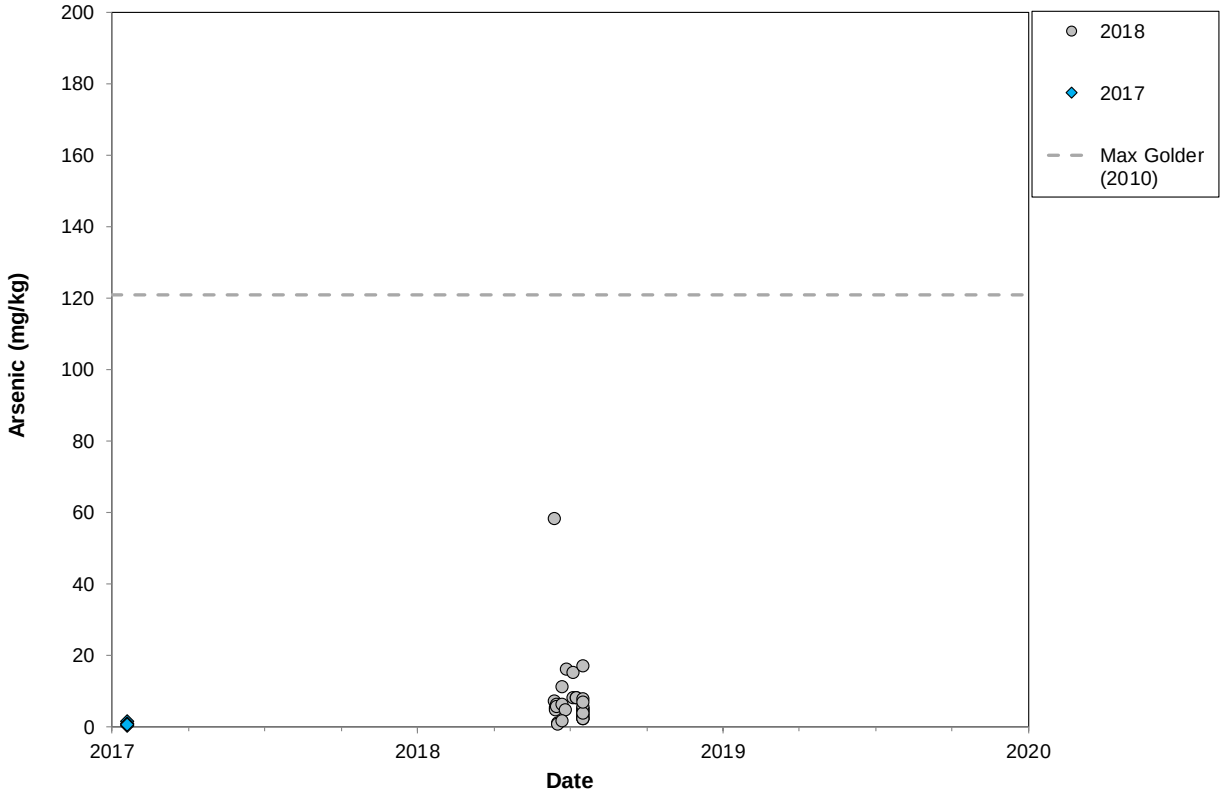

Figure 6: Solid Phase Quarry Arsenic Concentrations.

5 CONCLUSIONS

Based on geochemical characterization results obtained to date for the waste rock and quarry samples, there is low risk for ARD or metal leaching from the materials. Results are within project prediction studies for the project. Sampling will continue in 2019, with results reviewed internally as soon as they are available and provided with the 2019 annual report.

APPENDIX A: WASTE ROCK ACID-BASE ACCOUNTING DATA

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ABA - Modified Sobek

Project : PO#OL-664693

23-April-2018

Date Rec. : 17 April 2018
LR Report: **CA15299-APR18**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106915-DP100-58 MV	6: CAMLM106916-DP300-150 LJ	7: CAMLM106917-DP300-150 LJ	8: CAMLM106918-PF300W MV	9: CAMLM106919-FW375E MV	10: CAMLM10620-FW400E MV	11: CAMLM106921-Level 400 MV	12: CAMLM106922-DP-325-156-KSC	13: CAMLM106923-FW325W KSC
Sample Date & Time			09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18
Paste pH	20-Apr-18	15:54	8.72	8.61	8.55	8.32	8.13	8.39	8.30	8.43	8.97
Fizz Rate [---]	20-Apr-18	15:54	4	3	4	4	4	4	4	3	3
Sample weight [g]	20-Apr-18	15:54	2.05	2.02	2.02	1.93	2.00	2.00	1.99	2.00	1.99
HCl_add [mL]	20-Apr-18	15:54	161.00	27.00	40.00	155.00	138.00	114.00	126.00	30.00	27.50
HCl [Normality]	20-Apr-18	15:54	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	20-Apr-18	15:54	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	20-Apr-18	15:54	67.07	10.35	13.86	58.91	44.09	37.54	29.56	11.45	14.35
Final pH	20-Apr-18	15:54	1.62	1.68	1.72	1.62	1.67	1.68	1.78	1.86	1.58
NP [t CaCO3/1000 t]	20-Apr-18	15:54	229	41	65	249	235	191	242	46	33
AP [t CaCO3/1000 t]	---	---	6.56	0.62	3.44	7.19	1.56	28.4	3.44	1.88	0.62
Net NP [t CaCO3/1000 t]	---	---	223	40.6	61.3	242	233	163	239	44.5	32.4
NP/AP [ratio]	---	---	34.9	66.5	18.8	34.6	150	6.72	70.5	24.7	52.8
S [%]	19-Apr-18	14:06	0.224	0.014	0.138	0.404	0.058	0.956	0.139	0.110	0.033
Acid Leachable SO4-S [%]	---	---	< 0.02	< 0.02	0.03	0.17	< 0.02	0.05	0.03	0.05	< 0.02
Sulphide [%]	19-Apr-18	14:06	0.21	< 0.02	0.11	0.23	0.05	0.91	0.11	0.06	0.02
C [%]	19-Apr-18	12:40	3.00	0.543	1.51	3.51	2.86	2.32	3.00	0.671	0.471
CO3 [%]	19-Apr-18	12:40	13.4	2.24	6.14	16.0	13.5	9.70	14.5	2.24	1.79

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SGS Canada Inc.
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ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA15299-APR18**

Analysis	14: CAMLM106924-FW325E MV	15: CAMLM106925-FW175E MV	16: CAMLM106926-FW175W MV
Sample Date & Time	09-Apr-18	09-Apr-18	09-Apr-18
Paste pH	8.95	8.93	8.73
Fizz Rate [---]	4	4	4
Sample weight [g]	1.98	1.94	2.01
HCl_add [mL]	120.00	40.00	107.00
HCl [Normality]	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	28.72	14.12	41.01
Final pH	1.81	1.62	1.56
NP [t CaCO3/1000 t]	230	67	164
AP [t CaCO3/1000 t]	7.50	3.12	1.56
Net NP [t CaCO3/1000 t]	223	63.6	163
NP/AP [ratio]	30.7	21.3	105
S [%]	0.243	0.134	0.055
Acid Leachable SO4-S [%]	< 0.02	0.03	< 0.02
Sulphide [%]	0.24	0.10	0.05
C [%]	2.78	0.794	2.09
CO3 [%]	13.2	3.43	10.1

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

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ABA - Modified Sobek

Project : PO#OL-664693

23-July-2018

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Fax:(819) 759-3663

Date Rec. : 04 July 2018
LR Report: **CA12122-JUL18**
Reference: PO#OL-664693

Copy: #1

CERTIFICATE OF ANALYSIS
Partial Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: CAMLM106927-DP425 127-MV	6: CAMLM106928-DP425 128-MV	7: CAMLM106929-DP425 127-MV	8: CAMLM106930-DP425 127-MV
Sample Date & Time					29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18
Paste pH	16-Jul-18	08:37	18-Jul-18	10:34	8.35	8.36	8.41	8.83
Fizz Rate [---]	16-Jul-18	08:37	18-Jul-18	10:34	4	4	4	4
Sample weight [g]	16-Jul-18	08:37	18-Jul-18	10:34	2.00	1.96	2.02	1.96
HCl_add [mL]	16-Jul-18	08:37	18-Jul-18	10:34	90.00	130.00	105.00	40.00
HCl [Normality]	16-Jul-18	08:37	18-Jul-18	10:34	0.10	0.10	0.10	0.10
NaOH [Normality]	16-Jul-18	08:37	18-Jul-18	10:34	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	16-Jul-18	08:37	18-Jul-18	10:34	20.17	49.57	40.87	18.34
Final pH	16-Jul-18	08:37	18-Jul-18	10:34	1.91	1.61	1.62	1.72
NP [t CaCO3/1000 t]	16-Jul-18	08:37	18-Jul-18	10:34	175	205	159	55
AP [t CaCO3/1000 t]	---	---	---	---	14.7	6.25	1.56	1.25
Net NP [t CaCO3/1000 t]	---	---	---	---	160	199	157	54.0
NP/AP [ratio]	---	---	---	---	11.9	32.8	102	44.2
S [%]	16-Jul-18	10:26	17-Jul-18	15:06	0.680	0.332	0.069	0.081
Acid Leachable SO4-S [%]	---	---	---	---	0.21	0.13	< 0.02	0.04
Sulphide [%]	17-Jul-18	14:11	17-Jul-18	14:56	0.47	0.20	0.05	0.04
C [%]	16-Jul-18	10:26	17-Jul-18	14:45	2.28	2.68	2.07	0.791
CO3 [%]	16-Jul-18	15:57	17-Jul-18	14:45	9.84	12.6	10.2	3.40
Weight [g]	---	---	---	---	2750	2005	2148	3156
Split	---	---	---	---	2.7	2.0	2.1	3.2
Pulv200M [250g]	---	---	---	---	1	1	1	1

Analysis	9: CAMLM106931-DP425 127-Lj	10: CAMLM106932-DP325-155 KSc	11: CAMLM106933-DP425-127 Lj	12: CAMLM106934-DP325-155 KSc	13: CAMLM106935-FW400E MV	14: CAMLM106936-DP325-155 KSc	15: CAMLM106937-DP325-155 KSc	16: CAMLM106938-DP325-155 KSc
Sample Date & Time	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18
Paste pH	8.35	8.95	8.52	8.98	8.38	8.91	8.93	9.35
Fizz Rate [---]	4	4	4	4	4	4	4	4
Sample weight [g]	1.96	1.99	2.01	1.98	2.00	2.00	2.01	2.00
HCl_add [mL]	56.00	40.00	140.00	40.00	107.00	59.00	61.00	60.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	31.18	25.40	56.53	19.56	40.05	28.67	28.75	28.40
Final pH	1.55	1.56	1.58	1.76	1.62	1.75	1.79	1.69

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ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA12122-JUL18**

Analysis	9: CAMLM106931-DP425 127-Lj	10: CAMLM106932-DP325-155 KSc	11: CAMLM106933-DP425-127 Lj	12: CAMLM106934-DP325-155 KSc	13: CAMLM106935-FW400E MV	14: CAMLM106936-DP325-155 KSc	15: CAMLM106937-DP325-155 KSc	16: CAMLM106938-DP325-155 KSc
NP [t CaCO3/1000 t]	63	37	208	52	167	76	80	79
AP [t CaCO3/1000 t]	7.19	5.62	6.25	2.81	2.81	3.75	1.88	2.19
Net NP [t CaCO3/1000 t]	56.1	31.1	201	48.8	165	72.0	78.3	76.8
NP/AP [ratio]	8.81	6.52	33.2	18.3	59.5	20.2	42.8	36.1
S [%]	0.344	0.285	0.291	0.145	0.178	0.166	0.086	0.116
Acid Leachable SO4-S [%]	0.11	0.10	0.09	0.06	0.09	0.05	0.03	0.05
Sulphide [%]	0.23	0.18	0.20	0.09	0.09	0.12	0.06	0.07
C [%]	0.826	0.505	2.80	0.761	2.18	1.94	1.57	1.34
CO3 [%]	3.38	1.98	13.0	3.06	10.6	5.62	6.07	6.25
Weight [g]	2414	2184	2231	2627	1720	2564	1766	2204
Split	2.4	2.2	2.2	2.6	1.7	2.6	1.8	2.2
Pulv200M [250g]	1	1	1	1	1	1	1	1

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N\ NaOH \times NaOH\ \text{added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Rob Irwin B.Sc., C.Chem
Technical Manager, Spectroscopy
Environmental, Analytical Services

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08-January-2019

Agnico Eagle Mines Limited
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Date Rec. : 07 December 2018
LR Report: **CA14166-DEC18**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: CAMLM10675-R P3-375-400-MV	6: CAMLM106976-F W1-275-W-SED	7: CAMLM106977-R P1-425-450-MV	8: CAMLM106978-FW-1-325-E-MV	9: CAMLM106979-FW1-175-W-MV	10: CAMLM106980-FW1-150-W-MV	11: CAMLM106981-F W1-150-W-MV
Paste pH	02-Jan-19	09:55	07-Jan-19	10:30	8.16	8.26	8.01	8.54	8.58	8.41	8.29
Fizz Rate [---]	02-Jan-19	09:55	07-Jan-19	10:30	4	4	4	4	4	4	4
Sample weight [g]	02-Jan-19	09:55	07-Jan-19	10:30	2.00	1.98	2.03	2.04	1.98	2.02	2.02
HCl Added [mL]	03-Jan-19	08:24	07-Jan-19	10:30	165.50	79.20	120.40	136.00	120.10	134.00	136.50
HCl [Normality]	02-Jan-19	09:55	07-Jan-19	10:30	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	02-Jan-19	09:55	07-Jan-19	10:30	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to pH=8.3 [mL]	03-Jan-19	08:24	07-Jan-19	10:30	67.10	30.04	32.54	50.14	44.49	50.43	48.70
Final pH	03-Jan-19	08:24	07-Jan-19	10:30	1.55	1.52	1.66	1.52	1.57	1.52	1.54
NP [t CaCO3/1000 t]	03-Jan-19	08:24	07-Jan-19	10:30	246	124	216	210	191	207	217
AP [t CaCO3/1000 t]	07-Jan-19	10:30	07-Jan-19	10:31	6.25	10.0	5.31	1.88	0.94	0.94	0.94
Net NP [t CaCO3/1000 t]	07-Jan-19	10:31	07-Jan-19	10:31	240	114	211	209	190	206	216
NP/AP [ratio]	07-Jan-19	10:31	07-Jan-19	10:31	39.4	12.4	40.7	112	204	221	232
Sulphur (total) [%]	02-Jan-19	12:36	04-Jan-19	14:09	0.255	0.450	0.250	0.110	0.070	0.061	0.078
Acid Leachable SO4-S [%]	03-Jan-19	13:17	04-Jan-19	14:22	0.06	0.13	0.08	0.05	0.04	0.03	0.05
Sulphide [%]	03-Jan-19	13:17	04-Jan-19	14:22	0.20	0.32	0.17	0.06	0.03	0.03	0.03
Carbon (total) [%]	02-Jan-19	12:36	04-Jan-19	14:09	3.37	1.64	2.76	2.68	2.32	2.66	2.75
Carbonate [%]	03-Jan-19	10:39	04-Jan-19	14:17	14.8	6.01	11.4	12.5	11.4	12.6	12.9

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*NP (Neutralization Potential)
= 50 x (N of HCL x Total HCL added - N NaOH x NaOH added)

Weight of Sample

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Chris Sullivan

SOCIETY OF THE CHEMICAL PROFESSION OF CANADA
CHARTERED
Christopher Sullivan
CHEMIST

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0001625353

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ABA - Modified Sobek

Project : PO#OL-664693

12-October-2018

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Date Rec. : 18 September 2018
LR Report: **CA14443-SEP18**
Reference: PO#OL-664693 Q4 Samples

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: CAMLM106954-RP3-375-400-W-MV
Paste pH	09-Oct-18	09:30	12-Oct-18	09:19	9.43
Fizz Rate [---]	09-Oct-18	09:30	12-Oct-18	09:19	3
Sample weight [g]	09-Oct-18	09:30	12-Oct-18	09:19	1.99
HCl Added [mL]	09-Oct-18	09:30	12-Oct-18	09:19	30.00
HCl [Normality]	09-Oct-18	09:30	12-Oct-18	09:19	0.10
NaOH [Normality]	09-Oct-18	09:30	12-Oct-18	09:19	0.10
NaOH to pH=8.3 [mL]	09-Oct-18	09:30	12-Oct-18	09:19	20.97
Final pH	09-Oct-18	09:30	12-Oct-18	09:19	1.54
NP [t CaCO3/1000 t]	09-Oct-18	09:30	12-Oct-18	09:19	23
AP [t CaCO3/1000 t]	---	---	---	---	0.62
Net NP [t CaCO3/1000 t]	---	---	---	---	22.1
NP/AP [ratio]	---	---	---	---	36.6
Sulphur (total) [%]	05-Oct-18	10:43	10-Oct-18	11:07	0.098

Analysis	6: CAMLM106955-PL1-375-W-W-MV	7: CAMLM106956-VA1-425-C-W-MV	8: CAMLM106957-VA1-425-C-W-MV	9: CAMLM106958-DP-225-151-W-MV	10: CAMLM106959-FW-175-W-MV	11: CAMLM106960-FW1-125-W-W-MV
Paste pH	8.60	9.05	8.98	8.43	8.19	7.66
Fizz Rate [---]	4	4	4	4	4	4
Sample weight [g]	2.01	2.02	2.00	2.04	2.01	2.00
HCl Added [mL]	90.00	173.00	168.00	95.00	110.50	91.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to pH=8.3 [mL]	19.07	75.39	60.61	47.62	40.83	39.06
Final pH	1.90	1.63	1.75	1.53	1.69	1.53
NP [t CaCO3/1000 t]	176	242	268	116	173	130
AP [t CaCO3/1000 t]	1.25	1.25	0.94	5.31	4.69	5.94
Net NP [t CaCO3/1000 t]	175	240	268	111	169	124
NP/AP [ratio]	141	193	286	21.9	37.0	21.9
Sulphur (total) [%]	0.148	0.081	0.045	0.238	0.240	0.273

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0001541492

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA14443-SEP18**

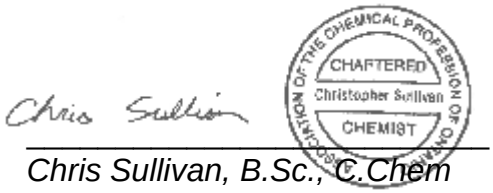
Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: CAMLM106954-RP3-375-400-W-MV
Acid Leachable SO4-S [%]	---	---	---	---	0.10
Sulphide [%]	10-Oct-18	10:33	10-Oct-18	11:07	< 0.02
Carbon (total) [%]	05-Oct-18	10:43	05-Oct-18	13:00	0.145
Carbonate [%]	05-Oct-18	12:55	05-Oct-18	13:00	0.490

Analysis	6: CAMLM106955-PL1-375-W-W-MV	7: CAMLM106956-VA1-425-C-W-MV	8: CAMLM106957--VA1-425-C-W-MV	9: CAMLM106958-DP-225-151-W-MV	10: CAMLM106959-FW-175-W-MV	11: CAMLM106960-FW1-125-W-W-MV
Acid Leachable SO4-S [%]	0.11	0.04	< 0.02	0.07	0.09	0.08
Sulphide [%]	0.04	0.04	0.03	0.17	0.15	0.19
Carbon (total) [%]	2.18	3.69	4.00	1.50	2.38	1.74
Carbonate [%]	9.88	18.5	19.5	6.23	10.3	6.78

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.



Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0001541492

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SGS Canada Inc.
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Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake,
Canada, X0C 0A0
Phone: (819) 759-3555 x3928, Fax:(819) 759-3663

ABA - Modified Sobek

Project : PO # 664693

04-December-2018

Date Rec. : 12 November 2018
LR Report: **CA15204-NOV18**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: CAMLM106968-DP1-175-158-MV	6: CAMLM106968-DP1-175-158-MV DUP	7: CAMLM106970-RP3-375-400-MV	8: CAMLM106971-FW2-375-E-KSC	9: CAMLM106972-FW2-435-W-IF/SED	10: CAMLM106973-FW2425-129-SED	11: CAMLM106974-FW1-150-W-MV
Paste pH	26-Nov-18	09:37	28-Nov-18	09:05	8.06	8.06	8.38	7.97	8.25	8.44	8.33
Fizz Rate [---]	26-Nov-18	09:37	28-Nov-18	09:05	4	4	4	4	4	4	4
Sample weight [g]	26-Nov-18	09:37	28-Nov-18	09:05	2.03	2.00	2.02	2.01	2.02	1.98	1.99
HCl Added [mL]	26-Nov-18	09:37	28-Nov-18	09:05	183.00	196.00	132.00	85.00	60.00	58.00	185.00
HCl [Normality]	26-Nov-18	09:37	28-Nov-18	09:05	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	26-Nov-18	09:37	28-Nov-18	09:05	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to pH=8.3 [mL]	26-Nov-18	09:37	28-Nov-18	09:05	72.69	95.41	42.43	50.57	31.97	29.70	78.17
Final pH	26-Nov-18	09:37	28-Nov-18	09:05	1.65	1.51	1.87	1.55	1.50	1.50	1.64
NP [t CaCO3/1000 t]	26-Nov-18	09:37	28-Nov-18	09:05	272	252	222	86	69	72	268
AP [t CaCO3/1000 t]	---	---	---	---	9.38	12.8	15.3	42.5	5.62	4.69	12.2
Net NP [t CaCO3/1000 t]	---	---	---	---	262	239	206	43.1	63.8	66.8	256
NP/AP [ratio]	---	---	---	---	29.0	19.6	14.5	2.01	12.3	15.3	22.0
Sulphur (total) [%]	23-Nov-18	15:20	04-Dec-18	13:51	0.382	0.523	0.592	1.63	0.233	0.255	0.471
Acid Leachable SO4-S [%]	---	---	---	---	0.08	0.11	0.10	0.27	0.05	0.10	0.08
Sulphide [%]	04-Dec-18	12:52	04-Dec-18	13:51	0.30	0.41	0.49	1.36	0.18	0.15	0.39
Carbon (total) [%]	23-Nov-18	15:20	29-Nov-18	08:56	4.13	3.98	3.37	1.50	1.12	0.939	4.16
Carbonate [%]	28-Nov-18	13:11	29-Nov-18	08:56	18.1	17.4	14.1	4.51	4.05	2.39	18.8

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ABA - Modified Sobek

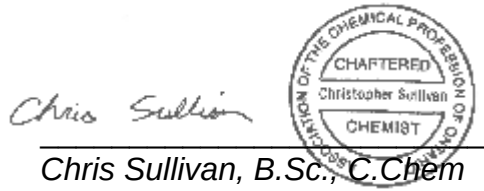
Project : PO # 664693

LR Report : **CA15204-NOV18**

.*NP (Neutralization Potential)
= 50 x (N of HCL x Total HCL added - N NaOH x NaOH added)

Weight of Sample

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.



Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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ABA - Modified Sobek

Project : PO#OL-664693

15-January-2019

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake
, Nunavut
X0C 0A0, Canada

Phone: (819) 759-3555 x3928
Fax:(819) 759-3663

Date Rec. : 27 December 2018
LR Report: **CA15390-DEC18**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: SP2-TH3	6: SP2-TH4	7: SP2-TH7	8: SP2-TH8	9: SP2-TH9	10: SP2-TH10
Sample Date & Time					14-Dec-18	14-Dec-18	14-Dec-18	14-Dec-18	14-Dec-18	14-Dec-18
Paste pH	08-Jan-19	09:22	09-Jan-19	17:24	8.97	9.08	9.00	8.94	8.96	8.85
Fizz Rate [---]	08-Jan-19	09:22	09-Jan-19	17:24	3	3	3	3	3	3
Sample weight [g]	08-Jan-19	09:22	09-Jan-19	17:24	1.99	2.00	2.02	2.01	1.97	1.94
HCl Added [mL]	08-Jan-19	09:22	09-Jan-19	17:24	33.00	28.00	42.00	35.00	31.00	41.00
HCl [Normality]	08-Jan-19	09:22	09-Jan-19	17:24	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	08-Jan-19	09:22	09-Jan-19	17:24	0.10	0.10	0.10	0.10	0.10	0.10
NaOH to pH=8.3 [mL]	08-Jan-19	09:22	09-Jan-19	17:24	15.48	14.14	21.42	17.63	13.99	19.76
Final pH	08-Jan-19	09:22	09-Jan-19	17:24	1.86	1.57	1.60	1.62	1.90	1.57
NP [t CaCO3/1000 t]	08-Jan-19	09:22	09-Jan-19	17:24	44	35	51	43	43	55
AP [t CaCO3/1000 t]	15-Jan-19	12:02	15-Jan-19	12:03	2.81	3.75	2.50	5.94	5.00	8.12
Net NP [t CaCO3/1000 t]	15-Jan-19	12:02	15-Jan-19	12:03	41.2	30.8	48.4	37.3	38.2	46.7
NP/AP [ratio]	15-Jan-19	12:02	15-Jan-19	12:03	15.6	9.23	20.4	7.28	8.64	6.74
Sulphur (total) [%]	08-Jan-19	13:45	11-Jan-19	10:41	0.155	0.241	0.173	0.216	0.218	0.390
Acid Leachable SO4-S [%]	09-Jan-19	16:31	11-Jan-19	10:41	0.06	0.12	0.09	0.03	0.06	0.13
Sulphide [%]	09-Jan-19	15:53	11-Jan-19	10:41	0.09	0.12	0.08	0.19	0.16	0.26
Carbon (total) [%]	08-Jan-19	13:45	09-Jan-19	16:29	0.611	0.450	0.764	0.621	0.623	0.748
Carbonate [%]	09-Jan-19	15:49	09-Jan-19	16:29	2.02	1.65	2.82	2.25	2.14	2.52

Chris Sullivan

CHARTERED
Christopher Sullivan
CHEMIST

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0001632544

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Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA15390-DEC18**

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

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APPENDIX B: WASTE ROCK COMPOSITION DATA

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
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Phone: 705-652-2000 FAX: 705-652-6365

21-March-2019

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Date Rec. : 17 April 2018
LR Report: **CA15300-APR18**

Copy: #1

Baker Lake,
, X0C 0A0
Phone: (819) 759-3555 x3928, Fax:(819) 759-3663

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106915-DP100-58 MV	6: CAMLM106916-DP300-150 LJ	7: CAMLM106917-DP300-150 LJ	8: CAMLM106918-PF300W MV	9: CAMLM106919-FW375E MV	10: CAMLM10620-FW400E MV
Sample Date & Time					09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18
Silver [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	0.11	0.059	0.033	0.14	0.11	0.12
Aluminum [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	72000	88000	7000	64000	67000	60000
Arsenic [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	32	4.1	21	61	7.8	25
Barium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	41	930	22	31	31	36
Beryllium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	0.31	1.4	0.43	0.24	0.36	0.26
Bismuth [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Calcium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	83000	19000	28000	83000	110000	82000
Cadmium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	0.14	0.045	0.060	0.16	0.13	0.16
Cobalt [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	57	8.5	3.0	46	46	49
Chromium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	150	25	21	140	150	110
Copper [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	85	7.7	11	130	130	140
Iron [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	70000	65000	330000	74000	80000	87000
Potassium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	3200	29000	510	4400	2700	3500
Lithium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	69	30	< 2	29	67	47
Magnesium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	24000	8500	6900	23000	26000	22000
Manganese [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	1600	220	670	1900	2100	2100
Molybdenum [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	23	16	12	5.3	4.9	4.3
Sodium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	21000	19000	220	30000	13000	14000

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00016926710

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA15300-APR18**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106915-DP100-58 MV	6: CAMLM106916-DP300-150 LJ	7: CAMLM106917-DP300-150 LJ	8: CAMLM106918-PF300W MV	9: CAMLM106919-FW375E MV	10: CAMLM10620-FW400E MV
Nickel [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	140	24	7.8	140	130	120
Phosphorus [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	280	420	850	210	270	220
Lead [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	6.8	5.0	5.3	17	4.5	3.5
Antimony [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	< 0.8	< 0.8	< 0.8	< 0.8	1.1	< 0.8
Selenium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	1.1
Tin [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	160	280	290	100	170	110
Titanium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	4000	2500	320	3900	4000	4200
Thallium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	0.13	0.41	0.025	0.15	0.10	0.12
Uranium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	0.097	1.2	0.16	0.058	0.082	0.12
Vanadium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	280	59	12	260	270	260
Yttrium [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	7.1	7.2	4.6	6.6	18	14
Zinc [µg/g]	19-Apr-18	08:51	19-Apr-18	15:39	99	50	27	89	130	120

Analysis	11: CAMLM106921-Level 400 MV	12: CAMLM106922-DP-325-156-KSC	13: CAMLM106923-FW325W KSC	14: CAMLM106924-FW325E MV	15: CAMLM106925-FW175E MV	16: CAMLM106926-FW175W MV
Sample Date & Time	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18	09-Apr-18
Silver [µg/g]	0.084	0.13	0.15	0.19	0.085	0.070
Aluminum [µg/g]	63000	100000	160000	61000	68000	64000
Arsenic [µg/g]	16	1300	98	9.6	41	2.8
Barium [µg/g]	85	1100	1000	310	2.7	19
Beryllium [µg/g]	0.32	1.5	1.6	0.37	0.22	0.32
Bismuth [µg/g]	< 0.09	0.18	0.23	< 0.09	< 0.09	< 0.09
Calcium [µg/g]	96000	15000	14000	94000	77000	71000
Cadmium [µg/g]	0.081	0.19	0.11	0.13	0.11	0.11
Cobalt [µg/g]	53	26	26	47	57	53
Chromium [µg/g]	130	96	120	130	140	130
Copper [µg/g]	130	29	35	160	180	110
Iron [µg/g]	75000	61000	68000	64000	100000	93000
Potassium [µg/g]	7200	31000	35000	6500	190	1200

OnLine LIMS

0001692710

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LR Report : **CA15300-APR18**

Analysis	11: CAMLM106921-Level 400 MV	12: CAMLM106922-DP-325-156-KSC	13: CAMLM106923 -FW325W KSC	14: CAMLM106924 -FW325E MV	15: CAMLM106925 -FW175E MV	16: CAMLM106926 -FW175W MV
Lithium [µg/g]	40	27	40	52	33	80
Magnesium [µg/g]	19000	18000	21000	21000	53000	41000
Manganese [µg/g]	2200	400	340	1800	1600	1400
Molybdenum [µg/g]	4.0	4.4	4.5	3.1	2.9	2.8
Sodium [µg/g]	19000	19000	14000	18000	7100	14000
Nickel [µg/g]	140	85	110	110	180	150
Phosphorus [µg/g]	190	530	670	230	220	200
Lead [µg/g]	3.1	21	11	11	3.6	2.7
Antimony [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	2.6	< 0.8
Selenium [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	88	250	300	240	200	130
Titanium [µg/g]	4100	4300	4300	2700	4400	1700
Thallium [µg/g]	0.28	0.61	0.69	0.14	< 0.02	0.037
Uranium [µg/g]	0.071	1.8	2.3	0.099	0.048	0.044
Vanadium [µg/g]	280	160	160	230	260	260
Yttrium [µg/g]	14	11	17	16	16	15
Zinc [µg/g]	90	120	93	78	100	90

Chris Sullivan

CHARTERED
Christopher Sullivan
CHEMIST

Chris Sullivan, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

00016926710

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SGS Canada Inc.
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Project : PO#OL-664693

01-August-2018

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Date Rec. : 04 July 2018
LR Report: **CA12123-JUL18**

Copy: #1

Baker Lake
, Nunavut
X0C 0A0,

Phone: (819) 759-3555 x3928
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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106927-DP425 127-MV	6: CAMLM106928-DP425 128-MV	7: CAMLM106929-DP425 127-MV
Sample Date & Time					29-Jun-18	29-Jun-18	29-Jun-18
Silver [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	0.089	0.076	0.054
Aluminum [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	66000	64000	82000
Arsenic [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	11	14	24
Barium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	40	25	34
Beryllium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	0.30	0.37	0.37
Bismuth [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	< 0.09	0.091	< 0.09
Calcium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	83000	88000	96000
Cadmium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	0.098	0.13	0.14
Cobalt [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	50	44	57
Chromium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	150	100	140
Copper [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	120	76	120
Iron [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	77000	76000	94000
Potassium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	1100	2400	1200
Lithium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	60	56	67
Magnesium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	25000	23000	33000
Manganese [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	1800	2100	2500
Molybdenum [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	0.75	0.74	0.37
Sodium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	15000	16000	16000
Nickel [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	160	110	150
Phosphorus [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	250	270	340
Lead [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	3.3	4.0	4.5
Antimony [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	1.5	0.87	1.4
Selenium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	1.2	< 0.7	< 0.7
Tin [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	< 6	< 6	< 6
Strontium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	190	170	200
Titanium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	3500	4300	4100
Thallium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	0.020	0.065	0.025
Uranium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	0.075	0.12	0.11

OnLine LIMS

0001461149

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SGS Canada Inc.
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Project : PO#OL-664693

LR Report : **CA12123-JUL18**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106927-DP425 127-MV	6: CAMLM106928-DP425 128-MV	7: CAMLM106929-DP425 127-MV
Vanadium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	250	270	330
Yttrium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	17	18	24
Zinc [µg/g]	01-Aug-18	11:22	01-Aug-18	16:05	100	120	140

Analysis	8: CAMLM106930-DP425 127-MV	9: CAMLM106931-DP425 127-Lj	10: CAMLM106932-DP325-155 KSc	11: CAMLM106933-DP425-127 Lj	12: CAMLM106934-DP325-155 KSc	13: CAMLM106935-FW400E MV	14: CAMLM106936-DP325-155 KSc
Sample Date & Time	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18	29-Jun-18
Silver [µg/g]	0.043	0.058	0.17	0.079	0.046	0.093	0.053
Aluminum [µg/g]	37000	53000	73000	61000	80000	66000	39000
Arsenic [µg/g]	9.1	80	1000	18	720	4.4	83
Barium [µg/g]	410	24	1100	97	2200	56	40
Beryllium [µg/g]	0.83	0.42	1.5	0.51	2.5	0.33	0.44
Bismuth [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.12
Calcium [µg/g]	20000	25000	13000	88000	18000	70000	23000
Cadmium [µg/g]	0.059	0.073	0.11	0.15	0.091	0.12	0.061
Cobalt [µg/g]	6.2	11	8.1	48	8.0	59	8.4
Chromium [µg/g]	38	46	35	100	26	130	46
Copper [µg/g]	8.5	21	11	110	4.5	150	38
Iron [µg/g]	180000	170000	68000	75000	70000	85000	190000
Potassium [µg/g]	11000	540	13000	5800	25000	5300	1600
Lithium [µg/g]	15	29	25	59	34	80	14
Magnesium [µg/g]	5400	11000	7000	26000	8500	40000	10000
Manganese [µg/g]	270	420	240	1900	240	1400	450
Molybdenum [µg/g]	2.3	1.6	2.1	0.30	2.9	0.16	3.3
Sodium [µg/g]	3000	11000	30000	8200	16000	5400	18000
Nickel [µg/g]	14	31	18	110	16	160	23
Phosphorus [µg/g]	620	700	380	240	370	190	840
Lead [µg/g]	5.6	7.3	16	3.7	13	4.6	6.2
Antimony [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Selenium [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	250	400	370	140	330	190	280
Titanium [µg/g]	1200	2000	1900	4200	2000	1100	1400
Thallium [µg/g]	0.18	< 0.02	0.37	0.18	0.58	0.24	0.027
Uranium [µg/g]	0.71	1.0	0.96	0.086	1.5	0.052	1.4
Vanadium [µg/g]	32	56	43	260	46	260	39
Yttrium [µg/g]	5.2	6.7	4.6	17	5.8	10	6.4
Zinc [µg/g]	34	72	75	120	71	93	65

OnLine LIMS

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Project : PO#OL-664693

LR Report : **CA12123-JUL18**

Analysis	15: CAMLM106937-DP325-155 KSc	16: CAMLM106938-DP325-155 KSc
Sample Date & Time	29-Jun-18	29-Jun-18
Silver [µg/g]	0.045	0.072
Aluminum [µg/g]	54000	76000
Arsenic [µg/g]	170	730
Barium [µg/g]	300	560
Beryllium [µg/g]	0.83	1.0
Bismuth [µg/g]	< 0.09	0.11
Calcium [µg/g]	23000	22000
Cadmium [µg/g]	0.064	0.081
Cobalt [µg/g]	9.0	10
Chromium [µg/g]	33	25
Copper [µg/g]	16	23
Iron [µg/g]	110000	34000
Potassium [µg/g]	9000	17000
Lithium [µg/g]	12	13
Magnesium [µg/g]	7300	7500
Manganese [µg/g]	360	280
Molybdenum [µg/g]	1.8	0.98
Sodium [µg/g]	25000	35000
Nickel [µg/g]	18	20
Phosphorus [µg/g]	530	360
Lead [µg/g]	9.7	12
Antimony [µg/g]	< 0.8	< 0.8
Selenium [µg/g]	< 0.7	< 0.7
Tin [µg/g]	< 6	< 6
Strontium [µg/g]	280	310
Titanium [µg/g]	1700	2200
Thallium [µg/g]	0.17	0.35
Uranium [µg/g]	0.97	1.3
Vanadium [µg/g]	40	47
Yttrium [µg/g]	4.7	4.8
Zinc [µg/g]	49	58

Chris Sullivan

CHARTERED
Christopher Sullivan
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Chris Sullivan, B.Sc., C.Chem
Project Specialist
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Project : PO#OL-664693

05-October-2018

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X0C 0A0, Canada

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Fax:(819) 759-3663

Date Rec. : 18 September 2018
LR Report: **CA14444-SEP18**
Reference: PO#OL-664693

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106954-RP3-375-400-W-MV	6: CAMLM106955-PL1-375-W-W-MV	7: CAMLM106956-VA1-425-C-W-MV	8: CAMLM106957-VA1-425-C-W-MV	9: CAMLM106958-DP-225-151-W-MV	10: CAMLM106959-FW-175-W-MV	11: CAMLM106960-FW1-125-W-W-MV
Silver [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aluminum [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	66000	61000	57000	55000	63000	54000	56000
Arsenic [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	180	11	60	64	180	150	74
Barium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	380	79	220	200	340	210	240
Beryllium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	1.2	0.33	0.58	0.52	0.85	0.57	0.60
Bismuth [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	0.092
Calcium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	51000	72000	69000	69000	55000	63000	47000
Cadmium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	0.25	0.11	0.15	0.14	0.17	0.17	0.12
Cobalt [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	61	46	43	43	42	33	32
Chromium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	84	240	330	290	120	120	120
Copper [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	160	140	130	140	100	81	56
Iron [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	120000	85000	69000	66000	91000	100000	74000
Potassium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	11000	1600	12000	11000	10000	7200	7700
Lithium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	29	44	40	40	39	33	37
Magnesium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	26000	37000	40000	39000	21000	21000	20000
Manganese [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	1500	1500	1200	1200	1300	1200	1100
Molybdenum [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	2.0	0.49	0.42	0.30	1.3	1.2	0.99
Sodium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	18000	16000	9800	9600	16000	12000	17000

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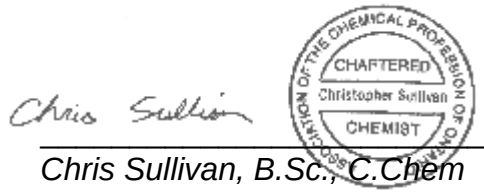
Project : PO#OL-664693
LR Report : **CA14444-SEP18**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106954-RP3-375-400-W-MV	6: CAMLM106955-PL1-375-W-W-MV	7: CAMLM106956-VA1-425-C-W-MV	8: CAMLM106957-VA1-425-C-W-MV	9: CAMLM106958-DP-225-151-W-MV	10: CAMLM106959-FW-175-W-MV	11: CAMLM106960-FW1-125-W-W-MV
Nickel [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	99	99	120	110	89	84	76
Phosphorus [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	1000	240	140	130	540	430	400
Lead [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	11	3.1	6.2	5.9	12	17	11
Antimony [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	1.1	0.81	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Selenium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	260	120	160	150	220	310	190
Titanium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	10000	4500	2200	1900	5000	2600	2600
Thallium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	0.37	0.047	0.41	0.37	0.28	0.20	0.20
Uranium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	1.5	0.19	0.060	0.042	0.58	0.39	0.59
Vanadium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	210	270	190	200	190	160	150
Yttrium [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	28	16	4.4	2.9	16	9.5	9.3
Zinc [µg/g]	05-Oct-18	10:15	05-Oct-18	14:19	150	90	74	70	94	83	81



Chris Sullivan, B.Sc., C.Chem
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Environmental Services, Analytical

OnLine LIMS

00015338990

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Project : PO # 664693

11-December-2018

Date Rec. : 12 November 2018
LR Report: **CA15205-NOV18**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106968-DP1-175-158-MV	6: CAMLM106968-DP1-175-158-MV DUP	7: CAMLM106970-RP3-375-400-MV	8: CAMLM106971-FW2-375-E-KSC	9: CAMLM106972-FW2-435-W-IF/SED	10: CAMLM106973-FW2425-129-SED	11: CAMLM106974-FW1-150-W-MV
Silver [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	< 1	1	< 1	< 1	< 1	< 1	< 1
Aluminum [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	59000	57000	66000	41000	45000	68000	61000
Arsenic [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	80	69	90	6000	36	230	5200
Barium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	75	75	140	310	210	550	190
Beryllium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	0.37	0.34	0.43	0.83	1.0	1.2	0.55
Bismuth [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	< 0.09	< 0.09	< 0.09	0.45	0.12	0.14	< 0.09
Calcium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	100000	98000	81000	29000	27000	26000	83000
Cadmium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	0.16	0.19	0.21	0.12	0.083	0.12	0.19
Cobalt [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	50	49	44	6.6	5.7	9.2	47
Chromium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	130	120	140	63	54	50	140
Copper [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	130	140	110	67	13	25	120
Iron [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	75000	75000	79000	130000	140000	61000	75000
Potassium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	5400	5800	9000	11000	2800	13000	11000
Lithium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	53	50	52	19	15	21	25
Magnesium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	23000	22000	22000	7900	6100	7400	26000
Manganese [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	2100	2100	2800	410	340	330	1800
Molybdenum [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	0.58	0.96	0.41	4.8	5.4	1.9	0.41
Sodium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	10000	8600	9700	6200	20000	28000	19000

OnLine LIMS

08030019000

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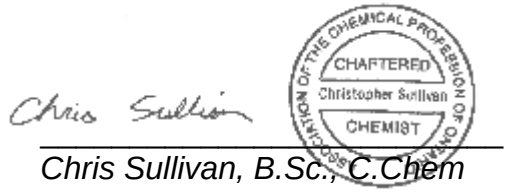
Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO # 664693
LR Report : **CA15205-NOV18**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM106968-DP1-175-158-MV	6: CAMLM106968-DP1-175-158-MV DUP	7: CAMLM106970-RP3-375-400-MV	8: CAMLM106971-FW2-375-E-KS-C	9: CAMLM106972-FW2-435-W-IF/SED	10: CAMLM106973-FW2425-129-SED	11: CAMLM106974-FW1-150-W-MV
Nickel [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	100	95	120	19	14	21	140
Phosphorus [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	230	200	300	1100	530	460	200
Lead [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	7.7	7.5	11	71	87	16	11
Antimony [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	1.2	< 0.8	1.2	1.8	< 0.8	< 0.8	1.5
Selenium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	< 0.7	< 0.7	< 0.7	0.80	< 0.7	< 0.7	< 0.7
Tin [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	130	120	110	370	540	470	150
Titanium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	3600	3500	4600	1400	1400	2100	3400
Thallium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	0.17	0.16	0.26	0.32	0.072	0.27	0.36
Uranium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	0.11	0.14	0.098	0.94	0.83	0.91	0.16
Vanadium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	230	220	250	42	37	46	240
Yttrium [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	11	11	6.6	7.0	5.0	5.8	6.8
Zinc [µg/g]	05-Dec-18	13:00	06-Dec-18	09:04	97	98	100	57	36	53	70



Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0800610000

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

08-January-2019

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Date Rec. : 07 December 2018
LR Report: **CA14167-DEC18**

Baker Lake,
Canada, X0C 0A0
Phone: (819) 759-3555 x3928, Fax:(819) 759-3663

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM10675-RP3-375-400-MV	6: CAMLM106976-FW1-275-W-SED	7: CAMLM106977-RP1-425-450-MV	8: CAMLM106978-FW-1-325-E-MV	9: CAMLM106979-FW1-175-W-MV	10: CAMLM106980-FW1-150-W-MV	11: CAMLM106981-FW1-150-W-MV
Silver [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aluminum [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	61000	64000	63000	61000	63000	65000	62000
Arsenic [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	130	56	15	5.9	10	37	37
Barium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	140	360	41	44	39	18	21
Beryllium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	0.35	0.91	0.27	0.28	0.31	0.23	0.21
Bismuth [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	< 0.09	0.16	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Calcium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	86000	45000	86000	73000	73000	78000	78000
Cadmium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	0.15	0.52	0.099	0.11	0.087	0.078	0.091
Cobalt [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	46	18	54	50	50	52	51
Chromium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	110	87	110	120	110	140	130
Copper [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	97	48	95	97	170	110	110
Iron [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	72000	39000	80000	83000	84000	87000	83000
Potassium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	6400	18000	1900	2000	2700	940	1100
Lithium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	35	22	45	63	63	58	52
Magnesium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	21000	10000	34000	38000	32000	38000	35000
Manganese [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	2100	610	2000	1500	1700	1700	1700
Molybdenum [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	0.41	1.0	0.17	0.17	0.10	0.18	0.12
Sodium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	14000	9200	15000	13000	11000	17000	17000
Nickel [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	120	66	130	140	110	140	140
Phosphorus [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	200	550	200	180	220	170	170
Lead [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	7.1	12	10	3.0	3.0	2.2	2.7
Antimony [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8

OnLine LIMS

00016257357

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SGS Canada Inc.
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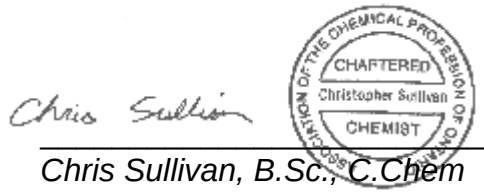
LR Report : **CA14167-DEC18**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: CAMLM10675-RP3-375-400-MV	6: CAMLM106976-FW1-275-W-SED	7: CAMLM106977-RP1-425-450-MV	8: CAMLM106978-FW-1-325-E-MV	9: CAMLM106979-FW1-175-W-MV	10: CAMLM106980-FW1-150-W-MV	11: CAMLM106981-FW1-150-W-MV
Selenium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	160	250	140	110	91	110	100
Titanium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	4800	1500	3900	3300	4300	4300	4200
Thallium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	0.22	0.69	0.068	0.090	0.16	0.030	0.044
Uranium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	0.082	1.2	0.066	0.070	0.10	0.038	0.040
Vanadium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	250	90	240	240	260	260	250
Yttrium [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	9.2	9.4	14	8.8	14	8.0	8.5
Zinc [µg/g]	02-Jan-19	21:11	03-Jan-19	13:25	87	130	85	89	100	89	85



Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0001625357

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P.O. Box 4300 - 185 Concession St.
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11-January-2019

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake,
Canada, X0C 0A0
Phone: (819) 759-3555 x3928, Fax:(819) 759-3663

Date Rec. : 27 December 2018
LR Report: **CA15391-DEC18**
Reference: PO#OL-664693

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SP2-TH3	6: SP2-TH4	7: SP2-TH7	8: SP2-TH8	9: SP2-TH9	10: SP2-TH10
Sample Date & Time					14-Dec-18	14-Dec-18	14-Dec-18	14-Dec-18	14-Dec-18	14-Dec-18
Silver [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	< 1	< 1	< 1	< 1	< 1	< 1
Aluminum [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	80000	78000	76000	84000	77000	72000
Arsenic [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	68	21	140	140	100	62
Barium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	720	710	500	560	480	530
Beryllium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	1.0	1.0	1.0	1.1	1.0	0.92
Bismuth [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	0.25	0.33	0.34	0.35	0.35	0.39
Calcium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	13000	14000	13000	13000	13000	19000
Cadmium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	0.13	0.13	0.11	0.12	0.15	0.20
Cobalt [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	20	21	24	26	20	20
Chromium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	76	88	82	85	80	78
Copper [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	42	53	49	52	46	49
Iron [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	38000	36000	40000	44000	37000	35000
Potassium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	17000	16000	18000	20000	17000	13000
Lithium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	34	34	30	37	30	28
Magnesium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	14000	13000	14000	16000	13000	11000
Manganese [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	380	360	370	420	380	400

OnLine LIMS

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00016300016

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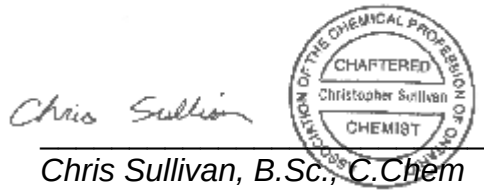
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA15391-DEC18**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: SP2-TH3	6: SP2-TH4	7: SP2-TH7	8: SP2-TH8	9: SP2-TH9	10: SP2-TH10
Molybdenum [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	2.4	2.9	2.5	2.9	2.4	1.8
Sodium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	22000	25000	23000	21000	24000	26000
Nickel [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	66	64	69	76	65	55
Phosphorus [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	440	470	490	500	440	440
Lead [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	12	12	11	12	13	14
Antimony [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Selenium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	390	370	310	320	340	410
Titanium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	950	1300	2200	1400	1300	850
Thallium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	0.40	0.34	0.40	0.41	0.36	0.30
Uranium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	1.5	1.5	1.5	1.7	1.6	1.9
Vanadium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	96	89	100	110	93	78
Yttrium [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	7.1	8.9	6.8	8.0	7.1	8.6
Zinc [µg/g]	09-Jan-19	13:24	10-Jan-19	10:15	78	79	76	82	79	77



Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

00001630016

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APPENDIX C: QUARRY ACID-BASE ACCOUTNING DATA

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : PO#OL-664693

14-July-2018

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake
, Nunavut
X0C 0A0,

Phone: (819) 759-3555 x3928
Fax:(819) 759-3663

Date Rec. : 27 June 2018
LR Report: **CA12927-JUN18**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: Itivia Quarry_262	6: Itivia Quarry_204
Sample Date & Time			18-Jun-18	18-Jun-18
Paste pH	09-Jul-18	09:37	9.71	9.30
Fizz Rate [---]	09-Jul-18	09:37	3	3
Sample weight [g]	09-Jul-18	09:37	1.96	1.97
HCl Added [mL]	09-Jul-18	09:37	20.00	20.00
HCl [Normality]	09-Jul-18	09:37	0.10	0.10
NaOH [Normality]	09-Jul-18	09:37	0.10	0.10
NaOH to [pH=8.3 mL]	09-Jul-18	09:37	15.54	10.98
Final pH	09-Jul-18	09:37	1.36	1.72
NP [t CaCO3/1000 t]	09-Jul-18	09:37	11	23
AP [t CaCO3/1000 t]	---	---	1.56	0.62
Net NP [t CaCO3/1000 t]	---	---	9.84	22.3
NP/AP [ratio]	---	---	7.30	36.6
Sulphur (total) [%]	09-Jul-18	09:37	0.081	0.043
Acid Leachable SO4-S [%]	---	---	0.03	0.02
Sulphide [%]	09-Jul-18	09:37	0.05	0.02
Carbon (total) [%]	09-Jul-18	09:37	0.168	0.414
Carbonate [%]	05-Jul-18	13:10	0.380	1.15

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0001441546

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : PO#OL-664693

05-July-2018

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake
, Nunavut
X0C 0A0,

Phone: (819) 759-3555 x3928
Fax:(819) 759-3663

Date Rec. : 20 June 2018
LR Report: **CA15404-JUN18**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: Itivia Quarry_1057	6: Itivia Quarry_10 025
Sample Date & Time					12-Jun-18	12-Jun-18
Paste pH	28-Jun-18	09:05	29-Jun-18	14:20	9.19	9.56
Fizz Rate [---]	28-Jun-18	09:05	29-Jun-18	14:20	2	2
Sample weight [g]	28-Jun-18	09:05	29-Jun-18	14:20	1.98	2.02
HCl Added [mL]	28-Jun-18	09:05	29-Jun-18	14:20	20.00	20.00
HCl [Normality]	28-Jun-18	09:05	29-Jun-18	14:20	0.10	0.10
NaOH [Normality]	28-Jun-18	09:05	29-Jun-18	14:20	0.10	0.10
NaOH to pH=8.3 [mL]	28-Jun-18	09:05	29-Jun-18	14:20	9.11	11.25
Final pH	28-Jun-18	09:05	29-Jun-18	14:20	1.58	1.42
NP [t CaCO3/1000 t]	28-Jun-18	09:05	29-Jun-18	14:20	28	22
AP [t CaCO3/1000 t]	---	---	29-Jun-18	14:20	0.94	0.62
Net NP [t CaCO3/1000 t]	---	---	29-Jun-18	14:20	26.6	21.1
NP/AP [ratio]	---	---	29-Jun-18	14:20	29.3	34.7
Sulphur (total) [%]	28-Jun-18	11:48	29-Jun-18	14:20	0.039	0.046
Acid Leachable SO4-S [%]	---	---	29-Jun-18	14:20	< 0.02	0.03
Sulphide [%]	29-Jun-18	13:52	29-Jun-18	14:20	0.03	0.02
Carbon (total) [%]	28-Jun-18	11:48	29-Jun-18	14:20	0.525	0.276
Carbonate [%]	29-Jun-18	11:31	29-Jun-18	13:15	1.38	0.919

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

00014303B0

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

25-July-2018

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake,
, X0C 0A0
Phone: (819) 759-3555 x3928, Fax:(819) 759-3663

Date Rec. : 09 July 2018
LR Report: **CA15089-JUL18**
Reference: PO#OL-664693

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Blast3_2018
Sample Date & Time					23-Jun-18
Paste pH	19-Jul-18	08:52	23-Jul-18	11:05	9.73
Fizz Rate [---]	19-Jul-18	08:52	23-Jul-18	11:05	4
Sample weight [g]	19-Jul-18	08:52	23-Jul-18	11:05	2.00
HCl Added [mL]	19-Jul-18	08:52	23-Jul-18	11:05	40.00
HCl [Normality]	19-Jul-18	08:52	23-Jul-18	11:05	0.10
NaOH [Normality]	19-Jul-18	08:52	23-Jul-18	11:05	0.10
NaOH to pH=8.3 [mL]	19-Jul-18	08:52	23-Jul-18	11:05	22.44
Final pH	19-Jul-18	08:52	23-Jul-18	11:05	1.52
NP [t CaCO3/1000 t]	19-Jul-18	08:52	23-Jul-18	11:05	44
AP [t CaCO3/1000 t]	---	---	---	---	0.62
Net NP [t CaCO3/1000 t]	---	---	---	---	43.3
NP/AP [ratio]	---	---	---	---	70.2
Sulphur (total) [%]	19-Jul-18	12:53	19-Jul-18	14:07	0.041
Acid Leachable SO4-S [%]	---	---	---	---	0.02
Sulphide [%]	20-Jul-18	14:10	20-Jul-18	14:40	0.02
Carbon (total) [%]	19-Jul-18	12:53	19-Jul-18	14:07	0.518
Carbonate [%]	20-Jul-18	11:00	23-Jul-18	11:05	1.59

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

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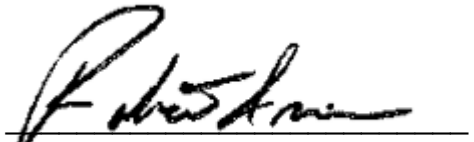
LR Report : **CA15089-JUL18**



Rob Irwin B.Sc., C.Chem
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Environmental, Analytical Services

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ABA - Modified Sobek

Project : PO#OL-664693

03-August-2018

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Date Rec. : 18 July 2018
LR Report: **CA15289-JUL18**
Reference: PO#OL-664693

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Mel NN-001	6: Mel NN-002	7: Mel NN-003
Sample Date & Time					05-Jul-18	05-Jul-18	05-Jul-18
Paste pH	30-Jul-18	08:55	01-Aug-18	13:00	6.94	7.84	6.73
Fizz Rate [---]	30-Jul-18	08:55	01-Aug-18	13:00	1	1	1
Sample weight [g]	30-Jul-18	08:55	01-Aug-18	13:00	2.05	2.05	2.04
HCl_add [mL]	30-Jul-18	08:55	01-Aug-18	13:00	20.00	20.00	20.00
HCl [Normality]	30-Jul-18	08:55	01-Aug-18	13:00	0.10	0.10	0.10
NaOH [Normality]	30-Jul-18	08:55	01-Aug-18	13:00	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	30-Jul-18	08:55	01-Aug-18	13:00	15.36	18.08	18.38
Final pH	30-Jul-18	08:55	01-Aug-18	13:00	1.35	1.16	1.24
NP [t CaCO3/1000 t]	30-Jul-18	08:55	01-Aug-18	13:00	11	4.7	4.0
AP [t CaCO3/1000 t]	---	---	---	---	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	---	---	---	---	10.7	4.08	3.38
NP/AP [ratio]	---	---	---	---	18.2	7.58	6.45
S [%]	30-Jul-18	11:41	03-Aug-18	09:42	0.007	0.006	0.012
Acid Leachable SO4-S [%]	---	---	---	---	< 0.02	< 0.02	< 0.02
Sulphide [%]	02-Aug-18	15:15	03-Aug-18	09:42	< 0.02	< 0.02	< 0.02
C [%]	30-Jul-18	11:41	03-Aug-18	09:42	1.03	0.128	0.740
CO3 [%]	02-Aug-18	13:57	03-Aug-18	09:42	0.470	0.035	0.075

Analysis	8: Mel NN-004	9: Mel NN-005	10: Mel NN-006	11: Mel NN-007	12: Mel NN-008	13: Mel NN-009	14: Mel NN-010
Sample Date & Time	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18
Paste pH	8.04	6.74	8.02	7.06	5.56	6.75	7.35
Fizz Rate [---]	1	1	1	1	1	1	1
Sample weight [g]	2.03	1.97	2.05	2.04	2.00	2.02	1.97
HCl_add [mL]	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10

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ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA15289-JUL18**

Analysis	8: Mel NN-004	9: Mel NN-005	10: Mel NN-006	11: Mel NN-007	12: Mel NN-008	13: Mel NN-009	14: Mel NN-010
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	16.89	18.41	16.48	17.88	19.19	18.64	17.20
Final pH	1.36	1.23	1.33	1.19	1.21	1.21	1.26
NP [t CaCO3/1000 t]	7.7	4.0	8.6	5.2	2.0	3.4	7.1
AP [t CaCO3/1000 t]	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	7.08	3.38	7.98	4.58	1.38	2.78	6.48
NP/AP [ratio]	12.4	6.45	13.9	8.39	3.23	5.48	11.5
S [%]	0.014	0.008	0.012	0.016	0.010	0.010	0.011
Acid Leachable SO4-S [%]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Sulphide [%]	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
C [%]	0.117	0.918	0.240	0.559	2.17	0.648	0.434
CO3 [%]	0.110	0.040	0.185	0.075	0.060	0.070	0.195

Analysis	15: Mel NN-011	16: Mel NN-012	17: Mel NN-013	18: Mel NN-014
Sample Date & Time	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18
Paste pH	6.07	6.03	6.53	7.81
Fizz Rate [---]	1	1	1	1
Sample weight [g]	2.01	1.98	2.01	2.04
HCl_add [mL]	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	18.86	18.52	16.43	17.62
Final pH	1.18	1.20	1.22	1.29
NP [t CaCO3/1000 t]	2.8	3.7	8.9	5.8
AP [t CaCO3/1000 t]	0.62	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	2.18	3.08	8.28	5.18
NP/AP [ratio]	4.52	5.97	14.4	9.35
S [%]	0.010	0.012	0.009	0.010
Acid Leachable SO4-S [%]	< 0.02	< 0.02	< 0.02	< 0.02
Sulphide [%]	< 0.02	< 0.02	< 0.02	< 0.02
C [%]	1.07	1.89	1.06	0.241
CO3 [%]	0.040	0.075	0.100	0.040

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

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ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA15289-JUL18**



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Project : PO#OL-664693

03-August-2018

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Date Rec. : 20 July 2018
LR Report: **CA15349-JUL18**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Site D S01-180614	6: Site D S02-180614	7: Site D S01-180615
Sample Date & Time					14-Jun-18	14-Jun-18	15-Jun-18
Paste pH	30-Jul-18	08:55	01-Aug-18	13:00	9.06	8.27	9.10
Fizz Rate [---]	30-Jul-18	08:55	01-Aug-18	13:00	1	1	1
Sample weight [g]	30-Jul-18	08:55	01-Aug-18	13:00	2.00	1.99	2.01
HCl_add [mL]	30-Jul-18	08:55	01-Aug-18	13:00	20.00	20.00	20.00
HCl [Normality]	30-Jul-18	08:55	01-Aug-18	13:00	0.10	0.10	0.10
NaOH [Normality]	30-Jul-18	08:55	01-Aug-18	13:00	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	30-Jul-18	08:55	01-Aug-18	13:00	16.47	16.15	16.32
Final pH	30-Jul-18	08:55	01-Aug-18	13:00	1.36	1.25	1.27
NP [t CaCO3/1000 t]	30-Jul-18	08:55	01-Aug-18	13:00	8.8	9.7	9.2
AP [t CaCO3/1000 t]	---	---	---	---	0.94	0.62	1.25
Net NP [t CaCO3/1000 t]	---	---	---	---	7.86	9.08	7.95
NP/AP [ratio]	---	---	---	---	9.39	15.5	7.36
S [%]	30-Jul-18	11:41	03-Aug-18	09:42	0.067	0.026	0.059
Acid Leachable SO4-S [%]	---	---	---	---	0.04	< 0.02	< 0.02
Sulphide [%]	02-Aug-18	15:15	03-Aug-18	09:42	0.03	0.02	0.04
C [%]	30-Jul-18	11:41	03-Aug-18	09:42	0.062	0.086	0.069
CO3 [%]	02-Aug-18	13:57	03-Aug-18	09:42	0.060	0.285	0.135

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ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA15349-JUL18**

Analysis	8: Site D S02-180615	9: 01 Site D Topping	10: 02 Site D Topping	11: Site D 30mm Road Topping-June 23 2018-01	12: Site D 30mm Road Topping-June 23 2018-02	13: Site D 2018-06-28-002	14: Site D 2018-06-29-001
Sample Date & Time	15-Jun-18	17-Jun-18	17-Jun-18	23-Jun-18	23-Jun-18	28-Jun-18	29-Jun-18
Paste pH	8.59	9.17	9.21	8.92	8.91	9.55	9.17
Fizz Rate [---]	1	1	1	1	1	1	1
Sample weight [g]	2.00	1.98	2.03	1.99	2.03	1.99	2.03
HCl_add [mL]	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	13.91	16.48	15.25	14.30	15.87	15.77	13.60
Final pH	1.50	1.32	1.42	1.48	1.42	1.35	1.44
NP [t CaCO3/1000 t]	15	8.9	12	14	10	11	16
AP [t CaCO3/1000 t]	0.94	0.62	0.62	0.62	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	14.3	8.28	11.1	13.7	9.58	9.98	15.2
NP/AP [ratio]	16.2	14.4	18.9	23.1	16.5	17.0	25.3
S [%]	0.052	0.019	0.020	0.031	0.032	0.036	0.068
Acid Leachable SO4-S [%]	0.02	< 0.02	0.02	0.03	0.03	< 0.02	0.05
Sulphide [%]	0.03	< 0.02	< 0.02	< 0.02	< 0.02	0.02	0.02
C [%]	0.158	0.065	0.102	0.141	0.077	0.055	0.113
CO3 [%]	0.490	0.140	0.300	0.450	0.150	0.150	0.480

Analysis	15: Site D 2018-07-07-01	16: Site D 2018-07-07-02	17: Site D 2018-07-11-01	18: Site D 2018-07-11-02
Sample Date & Time	07-Jul-18	07-Jul-18	11-Jul-18	11-Jul-18
Paste pH	9.16	9.00	9.00	8.94
Fizz Rate [---]	1	1	1	1
Sample weight [g]	2.04	1.99	1.96	2.01
HCl_add [mL]	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	16.18	16.22	15.80	16.18
Final pH	1.35	1.38	1.33	1.32
NP [t CaCO3/1000 t]	9.4	9.5	11	9.5
AP [t CaCO3/1000 t]	0.62	0.62	1.25	0.62
Net NP [t CaCO3/1000 t]	8.78	8.88	9.45	8.88
NP/AP [ratio]	15.2	15.3	8.56	15.3

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Project : PO#OL-664693

LR Report : **CA15349-JUL18**

Analysis	15: Site D 2018-07-07-01	16: Site D 2018-07-07-02	17: Site D 2018-07-11-01	18: Site D 2018-07-11-02
S [%]	0.037	0.033	0.074	0.035
Acid Leachable SO4-S [%]	0.04	0.03	0.03	0.04
Sulphide [%]	< 0.02	< 0.02	0.04	< 0.02
C [%]	0.067	0.064	0.112	0.074
CO3 [%]	0.170	0.125	0.255	0.115

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N\ NaOH \times NaOH \text{ added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Chris Sullivan

CHARTERED Christopher Sullivan CHEMIST

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Date Rec. : 20 July 2018
LR Report: **CA15349-JUL18**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Site D S01-180614	6: Site D S02-180614	7: Site D S01-180615
Sample Date & Time					14-Jun-18	14-Jun-18	15-Jun-18
Paste pH	30-Jul-18	08:55	01-Aug-18	13:00	9.06	8.27	9.10
Fizz Rate [---]	30-Jul-18	08:55	01-Aug-18	13:00	1	1	1
Sample weight [g]	30-Jul-18	08:55	01-Aug-18	13:00	2.00	1.99	2.01
HCl_add [mL]	30-Jul-18	08:55	01-Aug-18	13:00	20.00	20.00	20.00
HCl [Normality]	30-Jul-18	08:55	01-Aug-18	13:00	0.10	0.10	0.10
NaOH [Normality]	30-Jul-18	08:55	01-Aug-18	13:00	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	30-Jul-18	08:55	01-Aug-18	13:00	16.47	16.15	16.32
Final pH	30-Jul-18	08:55	01-Aug-18	13:00	1.36	1.25	1.27
NP [t CaCO3/1000 t]	30-Jul-18	08:55	01-Aug-18	13:00	8.8	9.7	9.2
AP [t CaCO3/1000 t]	---	---	---	---	0.94	0.62	1.25
Net NP [t CaCO3/1000 t]	---	---	---	---	7.86	9.08	7.95
NP/AP [ratio]	---	---	---	---	9.39	15.5	7.36
S [%]	30-Jul-18	11:41	03-Aug-18	09:42	0.067	0.026	0.059
Acid Leachable SO4-S [%]	---	---	---	---	0.04	< 0.02	< 0.02
Sulphide [%]	02-Aug-18	15:15	03-Aug-18	09:42	0.03	0.02	0.04
C [%]	30-Jul-18	11:41	03-Aug-18	09:42	0.062	0.086	0.069
CO3 [%]	02-Aug-18	13:57	03-Aug-18	09:42	0.060	0.285	0.135

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Project : PO#OL-664693

LR Report : **CA15349-JUL18**

Analysis	8: Site D S02-180615	9: 01 Site D Topping	10: 02 Site D Topping	11: Site D 30mm Road Topping-June 23 2018-01	12: Site D 30mm Road Topping-June 23 2018-02	13: Site D 2018-06-28-002	14: Site D 2018-06-29-001
Sample Date & Time	15-Jun-18	17-Jun-18	17-Jun-18	23-Jun-18	23-Jun-18	28-Jun-18	29-Jun-18
Paste pH	8.59	9.17	9.21	8.92	8.91	9.55	9.17
Fizz Rate [---]	1	1	1	1	1	1	1
Sample weight [g]	2.00	1.98	2.03	1.99	2.03	1.99	2.03
HCl_add [mL]	20.00	20.00	20.00	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	13.91	16.48	15.25	14.30	15.87	15.77	13.60
Final pH	1.50	1.32	1.42	1.48	1.42	1.35	1.44
NP [t CaCO3/1000 t]	15	8.9	12	14	10	11	16
AP [t CaCO3/1000 t]	0.94	0.62	0.62	0.62	0.62	0.62	0.62
Net NP [t CaCO3/1000 t]	14.3	8.28	11.1	13.7	9.58	9.98	15.2
NP/AP [ratio]	16.2	14.4	18.9	23.1	16.5	17.0	25.3
S [%]	0.052	0.019	0.020	0.031	0.032	0.036	0.068
Acid Leachable SO4-S [%]	0.02	< 0.02	0.02	0.03	0.03	< 0.02	0.05
Sulphide [%]	0.03	< 0.02	< 0.02	< 0.02	< 0.02	0.02	0.02
C [%]	0.158	0.065	0.102	0.141	0.077	0.055	0.113
CO3 [%]	0.490	0.140	0.300	0.450	0.150	0.150	0.480

Analysis	15: Site D 2018-07-07-01	16: Site D 2018-07-07-02	17: Site D 2018-07-11-01	18: Site D 2018-07-11-02
Sample Date & Time	07-Jul-18	07-Jul-18	11-Jul-18	11-Jul-18
Paste pH	9.16	9.00	9.00	8.94
Fizz Rate [---]	1	1	1	1
Sample weight [g]	2.04	1.99	1.96	2.01
HCl_add [mL]	20.00	20.00	20.00	20.00
HCl [Normality]	0.10	0.10	0.10	0.10
NaOH [Normality]	0.10	0.10	0.10	0.10
Vol NaOH to pH=8.3 [mL]	16.18	16.22	15.80	16.18
Final pH	1.35	1.38	1.33	1.32
NP [t CaCO3/1000 t]	9.4	9.5	11	9.5
AP [t CaCO3/1000 t]	0.62	0.62	1.25	0.62
Net NP [t CaCO3/1000 t]	8.78	8.88	9.45	8.88
NP/AP [ratio]	15.2	15.3	8.56	15.3

OnLine LIMS

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

0001464914

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

ABA - Modified Sobek

Project : PO#OL-664693

LR Report : **CA15349-JUL18**

Analysis	15: Site D 2018-07-07-01	16: Site D 2018-07-07-02	17: Site D 2018-07-11-01	18: Site D 2018-07-11-02
S [%]	0.037	0.033	0.074	0.035
Acid Leachable SO4-S [%]	0.04	0.03	0.03	0.04
Sulphide [%]	< 0.02	< 0.02	0.04	< 0.02
C [%]	0.067	0.064	0.112	0.074
CO3 [%]	0.170	0.125	0.255	0.115

*NP (Neutralization Potential)

$$= \frac{50 \times (N \text{ of HCL} \times \text{Total HCL added} - N\ NaOH \times NaOH \text{ added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

Chris Sullivan

CHARTERED Christopher Sullivan CHEMIST

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

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APPENDIX D: QUARRY COMPOSITION DATA

SGS Canada Inc.
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12-July-2018

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake,
, X0C 0A0
Phone: (819) 759-3555 x3928, Fax:(819) 759-3663

Date Rec. : 27 June 2018
LR Report: **CA12928-JUN18**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: Itivia Quarry_262	6: Itivia Quarry_204
Sample Date & Time					18-Jun-18	18-Jun-18
Silver [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	0.062	0.054
Aluminum [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	58000	59000
Arsenic [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	0.84	0.58
Barium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	46	160
Beryllium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	0.40	0.25
Bismuth [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	< 0.09	< 0.09
Calcium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	67000	71000
Cadmium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	0.11	0.12
Cobalt [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	63	61
Chromium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	720	680
Copper [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	120	120
Iron [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	84000	84000
Potassium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	1700	3800
Lithium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	15	14
Magnesium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	70000	61000
Manganese [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	1500	1500
Molybdenum [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	0.30	0.68
Sodium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	11000	5200
Nickel [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	280	260
Phosphorus [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	260	190
Lead [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	2.1	2.6
Antimony [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	< 0.8	< 0.8
Selenium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	< 0.7	< 0.7
Tin [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	< 6	< 6
Strontium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	140	130
Titanium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	5300	4600
Thallium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	0.053	0.074
Uranium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	0.21	0.14
Vanadium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	260	250
Yttrium [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	16	14
Zinc [µg/g]	10-Jul-18	21:35	11-Jul-18	15:53	91	86

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SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA12928-JUN18**



Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Project : PO#OL-664693

01-August-2018

Agnico Eagle Mines Limited
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Baker Lake
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X0C 0A0,

Phone: (819) 759-3555 x3928
Fax:(819) 759-3663

Date Rec. : 09 July 2018
LR Report: **CA15090-JUL18**

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CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: Blast3_2018
Sample Date & Time					23-Jun-18
Silver [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	0.21
Aluminum [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	63000
Arsenic [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	1.7
Barium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	81
Beryllium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	0.33
Bismuth [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	< 0.09
Calcium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	74000
Cadmium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	0.30
Cobalt [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	45
Chromium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	260
Copper [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	280
Iron [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	69000
Potassium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	1300
Lithium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	9.3
Magnesium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	41000
Manganese [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	1300
Molybdenum [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	1.2
Sodium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	27000
Nickel [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	96
Phosphorus [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	240
Lead [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	1.6
Antimony [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	< 0.8
Selenium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	< 0.7
Tin [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	< 6
Strontium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	230
Titanium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	4900
Thallium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	< 0.02
Uranium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	0.22
Vanadium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	250
Yttrium [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	15
Zinc [µg/g]	01-Aug-18	11:22	01-Aug-18	16:06	77

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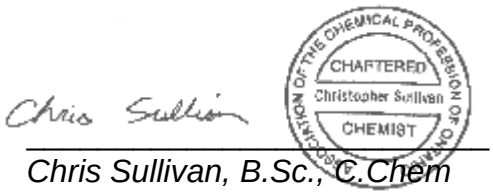
Project : PO#OL-664693

LR Report : **CA15090-JUL18**



Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

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Project : PO#OL-664693

16-August-2018

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Date Rec. : 18 July 2018
LR Report: **CA15290-JUL18**
Reference: PO#OL-664693

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: Mel NN-001	6: Mel NN-002	7: Mel NN-003	8: Mel NN-004	9: Mel NN-005
Sample Date & Time					05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18
Silver [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	< 1	< 1	< 1	< 1	< 1
Aluminum [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	73000	71000	71000	73000	74000
Arsenic [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	4.9	2.3	3.2	4.3	3.2
Barium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	820	560	610	770	670
Beryllium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	1.6	1.6	1.3	1.4	1.5
Bismuth [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	0.12	0.13	0.14	0.18	0.13
Calcium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	23000	19000	20000	20000	20000
Cadmium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	0.081	0.062	0.088	0.082	0.066
Cobalt [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	13	7.7	9.9	13	8.7
Chromium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	110	82	100	78	88
Copper [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	16	8.1	18	17	8.7
Iron [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	37000	24000	29000	34000	27000
Potassium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	22000	15000	17000	20000	16000
Lithium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	19	19	18	27	16
Magnesium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	13000	8000	9700	13000	8800
Manganese [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	540	330	400	460	360
Molybdenum [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	1.2	2.5	1.5	2.4	1.2
Sodium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	30000	34000	30000	29000	34000
Nickel [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	34	20	24	43	19
Phosphorus [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	510	470	460	640	420
Lead [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	14	12	12	12	11
Antimony [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	1.4	< 0.8	< 0.8	1.5	< 0.8
Selenium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	420	500	470	570	520
Titanium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	2900	2100	2500	2900	2200
Thallium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	0.60	0.32	0.33	0.41	0.28
Uranium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	1.6	1.0	1.1	1.3	0.96
Vanadium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	100	53	72	91	63

OnLine LIMS

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#OL-664693

LR Report : **CA15290-JUL18**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: Mel NN-001	6: Mel NN-002	7: Mel NN-003	8: Mel NN-004	9: Mel NN-005
Yttrium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	7.6	7.4	7.4	9.8	7.3
Zinc [µg/g]	08-Aug-18	15:28	09-Aug-18	10:54	66	55	56	74	51

Analysis	10: Mel NN-006	11: Mel NN-007	12: Mel NN-008	13: Mel NN-009	14: Mel NN-010	15: Mel NN-011	16: Mel NN-012	17: Mel NN-013	18: Mel NN-014
Sample Date & Time	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18	05-Jul-18
Silver [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aluminum [µg/g]	72000	71000	68000	69000	76000	73000	70000	66000	71000
Arsenic [µg/g]	7.6	4.2	5.1	17	2.1	2.1	5.7	3.6	6.7
Barium [µg/g]	590	550	670	590	650	640	560	560	680
Beryllium [µg/g]	1.4	1.3	1.4	1.2	1.4	1.4	1.4	1.3	1.4
Bismuth [µg/g]	0.17	0.11	0.14	0.15	0.13	0.17	0.18	0.11	0.16
Calcium [µg/g]	22000	20000	20000	20000	19000	19000	20000	18000	26000
Cadmium [µg/g]	0.081	0.076	0.089	0.12	0.096	0.064	0.090	0.080	0.080
Cobalt [µg/g]	14	9.9	11	13	8.1	7.4	11	12	19
Chromium [µg/g]	75	82	100	95	63	72	98	94	85
Copper [µg/g]	26	16	8.1	14	8.3	7.9	13	14	32
Iron [µg/g]	30000	31000	32000	33000	22000	23000	30000	28000	41000
Potassium [µg/g]	18000	16000	17000	16000	19000	19000	15000	17000	16000
Lithium [µg/g]	20	19	21	20	18	16	23	18	19
Magnesium [µg/g]	11000	9800	11000	10000	7000	6700	10000	9100	14000
Manganese [µg/g]	530	410	440	480	360	320	440	440	630
Molybdenum [µg/g]	2.2	2.3	3.2	1.3	3.0	1.4	2.8	1.4	2.5
Sodium [µg/g]	30000	30000	30000	29000	34000	34000	30000	28000	29000
Nickel [µg/g]	36	26	27	29	25	17	29	30	32
Phosphorus [µg/g]	580	570	690	450	400	710	600	450	770
Lead [µg/g]	16	9.7	14	12	12	13	13	11	13
Antimony [µg/g]	1.3	< 0.8	2.4	0.94	< 0.8	1.9	< 0.8	1.0	< 0.8
Selenium [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	430	430	480	420	470	510	490	390	480
Titanium [µg/g]	2300	2600	2600	2600	1900	2000	2300	2300	3400
Thallium [µg/g]	0.44	0.32	0.36	0.31	0.45	0.33	0.34	0.33	0.39
Uranium [µg/g]	1.5	1.0	1.4	1.1	1.5	1.1	1.2	1.2	1.3
Vanadium [µg/g]	74	76	81	84	50	48	70	71	120
Yttrium [µg/g]	10	8.0	8.0	9.2	6.6	7.3	8.1	7.9	12
Zinc [µg/g]	62	59	69	64	52	52	61	58	66

OnLine LIMS

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#OL-664693

LR Report : **CA15290-JUL18**

Deanna Edwards, B.Sc, C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0001475648

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Project : PO#OL-664693

21-August-2018

Agnico Eagle Mines Limited
Attn : Meliadine Coordinator

Baker Lake
, Nunavut
X0C 0A0,

Phone: (819) 759-3555 x3928
Fax:(819) 759-3663

Date Rec. : 20 July 2018
LR Report: **CA15350-JUL18**

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: Site D S01-180614	6: Site D S02-180614	7: Site D S01-180615	8: Site D S02-180615	9: 01 Site D Topping
Sample Date & Time					14-Jun-18	14-Jun-18	15-Jun-18	15-Jun-18	17-Jun-18
Silver [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	< 1	< 1	2	< 1	< 1
Aluminum [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	68000	73000	73000	71000	68000
Arsenic [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	58	7.1	5.3	4.6	6.2
Barium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	570	600	600	530	620
Beryllium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	1.5	1.7	1.5	1.2	1.4
Bismuth [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	0.34	0.48	0.52	0.67	0.73
Calcium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	22000	24000	26000	29000	26000
Cadmium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	0.073	0.073	0.089	0.065	0.085
Cobalt [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	13	15	17	18	15
Chromium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	96	38	77	96	84
Copper [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	30	28	48	31	28
Iron [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	31000	33000	33000	38000	35000
Potassium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	19000	19000	17000	19000	20000
Lithium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	27	20	24	28	24
Magnesium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	11000	11000	11000	13000	11000
Manganese [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	470	520	520	620	530
Molybdenum [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	2.0	22	2.1	2.0	1.7
Sodium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	27000	28000	29000	25000	25000
Nickel [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	39	31	39	38	35
Phosphorus [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	470	600	500	430	500
Lead [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	16	15	14	14	16
Antimony [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	< 0.8	1.5	< 0.8	1.5	< 0.8
Selenium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	370	360	410	370	380
Titanium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	2500	2600	2800	2800	2800
Thallium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	0.51	0.47	0.43	0.57	0.51
Uranium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	1.6	1.6	1.5	1.6	2.6
Vanadium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	72	69	76	96	79
Yttrium [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	8.2	11	11	11	13
Zinc [µg/g]	08-Aug-18	15:28	09-Aug-18	10:55	60	65	60	74	62

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : PO#OL-664693

LR Report : **CA15350-JUL18**

Analysis	10: 02 Site D Topping	11: Site D 30mm Road Topping-June 23 2018-01	12: Site D 30mm Road Topping-June 23 2018-02	13: Site D 2018-06-28-002	14: Site D 2018-06-29-001	15: Site D 2018-07-07-01	16: Site D 2018-07-07-02	17: Site D 2018-07-11-01	18: Site D 2018-07-11-02
Sample Date & Time	17-Jun-18	23-Jun-18	23-Jun-18	28-Jun-18	29-Jun-18	07-Jul-18	07-Jul-18	11-Jul-18	11-Jul-18
Silver [µg/g]	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Aluminum [µg/g]	67000	68000	67000	67000	73000	65000	69000	70000	68000
Arsenic [µg/g]	5.7	11	6.2	4.7	16	15	8.0	7.9	8.0
Barium [µg/g]	620	620	530	800	720	600	790	650	620
Beryllium [µg/g]	1.5	1.5	1.3	1.5	1.4	4.0	1.6	1.4	1.7
Bismuth [µg/g]	0.91	0.58	0.95	0.24	0.19	0.48	0.61	0.46	2.2
Calcium [µg/g]	25000	26000	25000	25000	26000	22000	23000	24000	25000
Cadmium [µg/g]	0.068	0.088	0.14	0.063	0.055	0.090	0.064	0.085	0.079
Cobalt [µg/g]	14	18	16	15	18	15	15	17	16
Chromium [µg/g]	93	100	98	88	86	95	85	83	79
Copper [µg/g]	29	41	36	29	32	33	37	53	37
Iron [µg/g]	31000	37000	38000	35000	39000	31000	34000	34000	37000
Potassium [µg/g]	22000	19000	16000	19000	18000	18000	20000	18000	17000
Lithium [µg/g]	23	23	23	20	25	24	24	20	27
Magnesium [µg/g]	12000	14000	11000	12000	15000	11000	11000	12000	12000
Manganese [µg/g]	480	540	550	550	550	490	600	470	550
Molybdenum [µg/g]	1.9	3.0	3.3	1.8	1.8	2.1	2.2	2.4	2.1
Sodium [µg/g]	25000	25000	26000	27000	28000	25000	26000	26000	26000
Nickel [µg/g]	40	51	36	41	45	38	36	43	36
Phosphorus [µg/g]	570	520	690	690	540	440	630	460	630
Lead [µg/g]	16	15	13	17	12	13	15	17	14
Antimony [µg/g]	< 0.8	1.2	1.2	4.9	< 0.8	0.86	< 0.8	< 0.8	< 0.8
Selenium [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Tin [µg/g]	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Strontium [µg/g]	370	320	340	470	420	360	380	410	390
Titanium [µg/g]	2500	2800	3700	2800	2800	2500	2700	2600	3200
Thallium [µg/g]	0.58	0.47	0.40	0.46	0.44	0.41	0.55	0.43	0.44
Uranium [µg/g]	2.1	1.6	1.7	1.9	1.8	1.3	1.7	1.3	1.9
Vanadium [µg/g]	69	78	83	73	95	74	73	78	81
Yttrium [µg/g]	10	11	11	11	11	9.3	11	10	11
Zinc [µg/g]	55	68	67	73	81	62	65	67	70

Chris Sullivan

CHARTERED
Christopher Sullivan
CHEMIST

Chris Sullivan, B.Sc., C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

0001481554

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Appendix D-1

Hazardous Waste documentation

MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

This Movement document/manifest conforms to all federal and provincial environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement.

VESSEL : ACADIA DESGAGNÉS

ES71043-4

Movement Document / Manifest Reference No.
N° de référence du document de mouvement/manifeste

A Generator / consignor — Producteur / expéditeur

Registration No. / Provincial ID No. — N° d'immatriculation - d'id. provincial (1): NUG10063

Company name / Nom de l'entreprise: AGNICO-EAGLE MINES LTD

Mailing address / Adresse postale: 145 KING ST E, SUITE400, TORONTO, ON. M5C 2Y7

E-mail / Courriel électronique:

Tel. No. / N° de tél.: 416 947 1212

Shipping site address / Adresse du lieu de l'expédition: MEADOWE SITE - ITIVIA DOCKING AREA

City / Ville: RANKIN INLET — Province: NU — Postal code / Code postal: X0C 0G0

Intended Receiver / consignee — Réceptionnaire / destinataire prévu (2)

Registration No. / Provincial ID No. — N° d'immatriculation - d'id. provincial: 1162026159

Mailing address / Adresse postale: 9935 CHATEAUNEUF AV, SUITE 200, BROSSARD, QC J4Z 3V4

E-mail / Courriel électronique:

Tel. No. / N° de tél.: 450 466 2123

Receiving site address / Adresse du lieu de destination: PORT OF BECANCOUR, 355 ALPHONSE-DESHAIES

City / Ville: BECANCOUR, QC — Province: — Postal code / Code postal: G9H 2Y7

B Carrier — Transporteur

Registration No. / Provincial ID No. — N° d'immatriculation - d'id. provincial (23): NUG20002

Company name / Nom de l'entreprise: NUNAVUT SEALIFT AND SUPPLY INC.

Mailing address / Adresse postale: 6565 HEBERT BLVD, STE-CATHERINE, QC, J5C 1B5

E-mail / Courriel électronique:

Tel. No. / N° de tél.: 450 635 0833

Vehicle / Véhicule	Registration No. / N° d'immatriculation	Prov. (24)
Trailer - Rail car No. 1 — 1re remorque - wagon		
Trailer - Rail car No. 2 — 2e remorque - wagon		

Port of entry — Point d'entrée: International use only

Port of exit — Point de sortie: International use only (25)

Carrier Certification : *I certify that I have received waste or recyclable material from the generator / consignor for delivery to the receiver / consignee as set out in Part A and that the information contained in Part B is complete and correct.* (26)
***Attestation du transporteur** : J'atteste avoir reçu les déchets ou matières recyclables du producteur / expéditeur en vue de leur livraison au réceptionnaire / destinataire, tels qu'ils figurent à la partie A et que les renseignements inscrits à la partie B sont exacts et complets.*

Name of authorized person (print): Nom de l'agent autorisé (caractères d'imprimerie):

Tel. No. / N° de tél.: 450 635 0833

Signature:

Year / Année: 18 — Month / Mois: 09 — Day / Jour: 20

C Receiver / consignee — Réceptionnaire / destinataire

Registration No. / Provincial ID No. — N° d'immatriculation - d'id. provincial (28)

Reference Nos. of other movement document(s)/manifest(s) used / N° de référence des autres documents de mouvement/manifestes utilisés (27): RQ18-118-3

Receiver / consignee information same as in Part A
Les renseignements du réceptionnaire / destinataire sont les mêmes qu'à la Partie A

☒ Yes / Oui ☐ No, complete the box below / Non, remplir la case ci-dessous

Company name / Nom de l'entreprise

Mailing address / Adresse postale

City / Ville — Province — Postal code / Code postal

E-mail / Courriel électronique

Tel. No. / N° de tél. ( )

Receiving site address / Adresse du lieu de destination

Date received / Date de réception — Year / Année — Month / Mois — Day / Jour

Time / Heure (29) ☐ A.M. ☐ P.M.

If waste or recyclable material to be transferred, specify intended company name/ Si les dechets ou matières recyclables doivent être transférés, préciser le nom du destinataire (30)

Registration No./Provincial ID No. — N° d'immatriculation/d'id provincial

	Prov. code Code prov. (3)	Shipping name Appellation réglementaire (4)	Class / Classe Sub. class(es) Classe(s) sub. (5)	UN No. N° NU (6)	Packing / risk gr. Gr. d'emballage/ de risque (7)	Quantity shipped Quantité expédiée	Units L or / ou Kg Unités (8)	Packaging/Contenant No. / N°	Codes Int.– ext. (9)	Phys. state État phys. (10)
(i)		SEE ANNEX ATTACHED								
(ii)										
(iii)										
(iv)										

	Quantity received Quantité reçue	Units L or / ou kg Unités (31)	Comments Commentaires (32)	Handling Code / Code de manutention (33)	Shipment / Envoi Accepted Accepté (34)	Shipment / Envoi Refused Refusé	Decont. Pack. Cont. (35)	Decont. Veh. Véh.
(i)	332632	Kg		01	✓			
(ii)								
(iii)								
(iv)								

If handling code "Other" (specify) / Si code de manutention « autre » (spécifier) (36)

	Notice No. N° de notification (11)	Notice Line No N° de ligne de la notification	Shipment Envoi (12)	Of / De	D or R code Code D ou R (13)	C code Code C (14)	Basel Annex VIII or OECD Code Annexe VIII de Bâle ou Code OCDE (15)	H code Code H (16)	Y code Code Y (17)	National code in country of / Code du pays Export Exportation (18)	Import Importation	Customs code(s) Code(s) de douanes (19)
(i)												
(ii)												
(iii)												
(iv)												

International use only

***Receiver / consignee certification** : I certify that the information contained in Part C is correct and complete. / **Attestation du réceptionnaire / destinataire** : J'atteste que tous les renseignements à la partie C sont exacts et complets.* (37)

Name of authorized person (print) / Nom de l'agent autorisé (caractère d'imprimerie): BENOÎT NANTEL

Signature:

Tel. No. / N° de tél.: 514 821-3081

Special handling / Manutention spéciale (22): IN CASE OF EMERGENCY (24 H/24)

☐ Attached /Ci-joint: ☒ As follows/ Ci-contre : CALL CANUTEC 1-613-996-6666

Date shipped / Date d'expédition (21) — Year / Année: 18 — Month / Mois: 09 — Day / Jour: 20 — Time / Heure ☐ A.M. ☐ P.M

Scheduled arrival date / Date d'arrivée prévue — Year / Année: 18 — Month / Mois: 10 — Day / Jour: 02

***Generator / consignor certification:** I certify that the information contained in Part A is correct and complete. I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.*
***Attestation du producteur / expéditeur:** J'atteste que tous les renseignements à la partie A sont exacts et complets. Je déclare que le contenu de ce chargement est décrit ci-dessus de façon complète et exacte par la désignation officielle de transport et qu'il est convenablement classé, emballé, marqué, étiqueté, muni de plaques-étiquettes et à tous égards bien conditionné pour être transporté conformément aux réglementations internationales et nationales applicables.* (20)

Name of authorized person (print) / Nom de l'agent autorisé (caractère d'imprimerie): YVON BEAUDOIN

Signature:

Tel. No. / N° de tél.: 514 444 9512

Instructions on reverse
Instructions au verso

Copy / Copie 1 (white / blanche)

Meliadine 2018 - List of Hazmat Seacans - manifest : ES71043-4 - VESSEL : ACADIA DESGAGNES

#	marine container no.	Product	Placards
1	176767-5	Hazmat	CLASS 3
2	234988-1	Hazmat	CLASS 2.1
3	CBHU 392818-1	Hazmat	CLASS 8
4	CCLU 211151-4	Hazmat	CLASS 8
5	CLHU 295842-7	Hazmat	CLASS 3
6	FSCU 380408-5	Hazmat	CLASS 2.1
7	GATU 073261-2	Hazmat	CLASS 3
8	GATU 018583-4	Hazmat	CLASS 3
9	TGHU 330722-0	Hazmat	CLASS 3
1	214009-1	Hazmat	No
2	228242-5	Hazmat	No
3	256075-0	Hazmat	No
4	256576-7	Hazmat	No
5	292665-0	Hazmat	No
6	305930-1	Hazmat	No
7	327175-4	Hazmat	No
8	344170-3	Hazmat	No
9	363484-4	Hazmat	No
10	368933-8	Hazmat	No
11	371777-0	Hazmat	No
12	398812-5	Hazmat	No
13	CAXU 654242-4	Hazmat	No
14	CBHU 364736-9	Hazmat	No
15	CBHU 374327-5	Hazmat	No
16	CBHU 391280-0	Hazmat	No
17	CCLU 222700-0	Hazmat	No
18	CCLU 343346-0	Hazmat	No
19	CLHU 224869-9	Hazmat	No
20	CLHU 237080-8	Hazmat	No
21	CRXU 204040-1	Hazmat	No
22	ECMU 158560-1	Hazmat	No
23	FSCU 363598-2	Hazmat	No
24	FSCU 389756-0	Hazmat	No
25	HJCU 817365-9	Hazmat	No
26	HLXU 224764-5	Hazmat	No
27	HLXU 303380-1	Hazmat	No
28	INBU 348720-5	Hazmat	No
29	INBU 351130-1	Hazmat	No
30	IPXU 353529-0	Hazmat	No
31	KKTU 715536-8	Hazmat	No
32	MIGU 289601-0	Hazmat	No
33	MSCU 118282-1	Hazmat	No
34	MSCU 172137-4	Hazmat	No
35	PCIU 312358-6	Hazmat	No
36	REGU 319036-6	Hazmat	No
37	SUDU 366439-0	Hazmat	No
38	TGHU 229020-4	Hazmat	No
39	TGHU 330722-0	Hazmat	No
40	TRLU 289174-0	Hazmat	No
41	ZIMU 236452-5	Hazmat	No

IMDG DECLARATION

Shipper/consignor AGNICO-EAGLE-MINES LTD MEIADINE SITE RANKIN INLET, NU, X0C 0G0 TEL: 1-819-759-3555	Reference number(s) MANIFEST: ES 71043-4 Project: RQ18-118-3 Page 1 of Pages
Consignee QIKIQTAALUQ ENVIRONMENTAL 355, Boul. Alphonse-Desjardins BECANCOUR, QC, G9H 2Y7 TEL: 4504662123	Carrier NUNAVUT SEALIFT AND SUPPLY INC. 6565, HEBERT BLVD STE-CATHERINE, QC, J5C 1A5 TEL: 1-450-635-0833
CONTAINER/VEHICLE PACKING CERTIFICATE **DECLARATION** It is declared that the packing of the goods into the container/vehicle has been carried out in accordance with the applicable provisions. **TO BE COMPLETED FOR SHIPMENTS IN CONTAINERS OR VEHICLES** Container/Vehicle #: SEE ANNEX	Name/status, company/organization of signatory YVON BEAUDOIN / PROJECT MANAGER / SANEXEN Place and date MEIADINE, RANKIN INLET, NU, SEPT 2, 2018 Signature on behalf of packer
Vessel No. and Date Port of loading RANKIN INLET Port of discharge BECANCOUR	(Reserved for text, instructions or other matter)

No. & Kind of Packages	DESCRIPTION OF GOODS (UN Number, PSN, Hazard Class, Packing Group, Flash Point, Marine Pollutant)	QUANTITY Gross mass (kg)	Net mass (kg)	Cube (m^3)
	SEE ANNEX ATTACHED			

Additional Information / Seal Number(s):

Emergency Telephone No. / 24-Hour Number: CANUTEC 1-613-996-6666

SHIPPER'S DECLARATION

I hereby declare that the contents of this consignment are fully and accurately described above by the Proper Shipping Name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national government regulations.

Name/status of declarant
YVON BEAUDOIN / PROJECT MANAGER

Place and date
MEIADINE, SEPT 2, 2018

Signature on behalf of shipper

AGNICO EAGLE

Shipper's Declaration For Dangerous Goods

Shipper : Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031

Transporter : Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002

Consignor Qikiqtaaluk Environmental - Port Of Becancour - Prov ID n°. : 1162926159

CONTAINER # 176767-5

Size and Type : 20 FT marine container **Reference : manifest** ES71043-4

line	No. & Kind of packages		DESCRIPTION OF GOODS UN Number, Shipping Name, Hazard Class (Sub), Packing Group, F.P. (deg. C), Marine Pollutant, Add technical name (s.p. 274 for primary and sub. classes and M.P.)	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	1	Drum 205 L	UN 1202, DIESEL FUEL ,Class 3 P.G. III Flash Point > 38°C closed cup	205	150
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	205	180
c.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	765	100
d.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	765	150
e.	3	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	3000	675
f.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	765	200
g.	9	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6885	1800
h.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	765	1000
i.					
j.					
k.					
l.					
m.					

placards required : Class 3

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the IMDG Code and the Transportation of Dangerous Goods Regulations. It is declared that the packing of the goods into the unit has been carried out in accordance the provisions of 5.4.2.1

Ship's Name : Name, Title, Firm of signatory : Yvon Beaudoin, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M., Rankin Inlet, Nunavut** Place & Date : **AEM - Meliadine site, September 3, 2018**

Port of Discharge : **Port de Becancour** Signature:

AGNICO EAGLE

Shipper's Declaration For Dangerous Goods

Shipper : Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031

Transporter : Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002

Consignor Qikiqtaaluk Environmental - Port Of Becancour - Prov ID n°. : 1162926159

Container n°. 234988-1

Size and Type : 20 FT marine container **Reference : manifest** ES71043-4

line	No. & Kind of packages		DESCRIPTION OF GOODS UN Number, Shipping Name, Hazard Class (Sub), Packing Group, F.P. (deg. C), Marine Pollutant, Add technical name (s.p. 274 for primary and sub. classes and M.P.)	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	7	Drum 205 L	UN 1950, WASTE, AEROSOL, FLAMMABLE, class 2.1	5355	490
b.	3	Quatrex 765 L	UN 1950, WASTE, AEROSOL, FLAMMABLE, class 2.1	2295	750
c.	4	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	3060	400
d.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	205	180
e.	5	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	1025	1125
f.	2	Drum 205 L	Not Regulated under T.D.G.A. - WATER TREATMENT SLUDGE (STP sludge)	410	400
g.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - EMPTY INSULATED FOAM SYSTEM	765	200
h.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	765	250
i.					
j.					
k.					
l.					
m.					

placards required : Class 2.1

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the IMDG Code and the Transportation of Dangerous Goods Regulations. It is declared that the packing of the goods into the unit has been carried out in accordance the provisions of 5.4.2.1

Ship's Name : Name, Title, Firm of signatory : Yvon Beaudoin, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M., Rankin Inlet, Nunavut** Place & Date : **AEM - Meliadine site, September 3, 2018**

Port of Discharge : **Port de Becancour** Signature:

AGNICO EAGLE

Shipper's Declaration For Dangerous Goods

Shipper : Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031

Transporter : Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002

Consignor Qikiqtaaluk Environmental - Port Of Becancour - Prov ID n°. : 1162926159

Container n°. CBHU 392818-1

Size and Type : 20 FT marine container **Reference : manifest** ES71043-4

line	No. & Kind of packages		DESCRIPTION OF GOODS UN Number, Shipping Name, Hazard Class (Sub), Packing Group, F.P. (deg. C), Marine Pollutant, Add technical name (s.p. 274 for primary and sub. classes and M.P.)	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	13	Quatrex 765 L	UN 2794, WASTE, BATTERIES, WET, FILLED WITH ACID, class 8	5005	6439
b.	12	Drum 205 L	Not Regulated under T.D.G.A.- WATER TREATMENT SLUDGE	2460	2460
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : Class 8

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the IMDG Code and the Transportation of Dangerous Goods Regulations. It is declared that the packing of the goods into the unit has been carried out in accordance the provisions of 5.4.2.1

Ship's Name : Name, Title, Firm of signatory : Yvon Beaudoin, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M., Rankin Inlet, Nunavut** Place & Date : **AEM - Meliadine site, September 3, 2018**

Port of Discharge : **Port de Becancour** Signature:

AGNICO EAGLE

Shipper's Declaration For Dangerous Goods

Shipper : Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031

Transporter : Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002

Consignor Qikiqtaaluk Environmental - Port Of Becancour - Prov ID n°. : 1162926159

Container n°. CCLU 211151-4

Size and Type : 20 FT marine container **Reference : manifest** ES71043-4

line	No. & Kind of packages		DESCRIPTION OF GOODS UN Number, Shipping Name, Hazard Class (Sub), Packing Group, F.P. (deg. C), Marine Pollutant, Add technical name (s.p. 274 for primary and sub. classes and M.P.)	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	1	Drum 205 L	UN 3028, WASTE, BATTERIES, DRY, CONTAINING POTASSIUM HYDROXIDE, SOLID, class 8	205	176
b.	7	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	1435	624
c.	8	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6120	2351
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : Class 8

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the IMDG Code and the Transportation of Dangerous Goods Regulations. It is declared that the packing of the goods into the unit has been carried out in accordance the provisions of 5.4.2.1

Ship's Name : Name, Title, Firm of signatory : Yvon Beaudoin, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M., Rankin Inlet, Nunavut** Place & Date : **AEM - Meliadine site, September 3, 2018**

Port of Discharge : **Port de Becancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CLHU 295842-7**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	GrosS(kg) estimated
a.	1	Tote 1000 L	UN 1202, WASTE, DIESEL FUEL ,Class 3 P.G. III Flash Point > 38°C closed cup	1000	433
8	4	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	820	720
c.	4	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	820	800
d.	2	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	2000	1800
e.	7	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	7000	6300
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : Class 3

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Shipper's Declaration For Dangerous Goods

Shipper : Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031

Transporter : Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002

Consignor Qikiqtaaluk Environmental - Port Of Becancour - Prov ID n°. : 1162926159

Container n°. FSCU 380408-5

Size and Type : 20 FT marine container **Reference : manifest** ES71043-4

line	No. & Kind of packages		DESCRIPTION OF GOODS UN Number, Shipping Name, Hazard Class (Sub), Packing Group, F.P. (deg. C), Marine Pollutant, Add technical name (s.p. 274 for primary and sub. classes and M.P.)	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	2	Quatrex 765 L	UN 1950, WASTE, AEROSOL, FLAMMABLE, class 2.1	1530	500
b.	14	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	10710	2800
c.	3	Drum 205 L	Not Regulated under T.D.G.A. - AQUEOUS CONCRETE ADDITIVE	2295	600
d.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	410	360
e.	2	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	410	300
f.	2	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	410	500
g.	1	Drum 205 L	Not Regulated under T.D.G.A. - SOLID PAINT RELATED MATERIAL	205	100
h.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	1000	250
i.					
j.					
k.					
l.					
m.					

placards required : Class 2.1

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : Yvon Beaudoin, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M., Rankin Inlet, Nunavut** Place & Date : **AEM - Meliadine site, September 3, 2018**

Port of Discharge : **Port de Becancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **GATU 073261-2**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	1	Drum 205 L	UN 1202, WASTE, DIESEL FUEL ,Class 3 P.G. III Flash Point > 38°C closed cup	205	186
8	1	Tote 1000 L	UN 1202, WASTE, DIESEL FUEL ,Class 3 P.G. III Flash Point > 38°C closed cup	205	930
c.	32	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	6560	5760
d.	8	Drum 205 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	1640	160
e.	10	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	10000	9000
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : Class 3

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **GATU 018583-4**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	1	Drum 205 L	UN 1203, WASTE, GASOLINE, class 3 Flash Point < -38°C closed cup	205	180
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED GLYCOL (antifreeze)	205	180
c.	8	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	1640	2000
d.	7	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	1435	1260
e.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	410	300
f.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OILY WATER	410	400
g.	3	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	615	300
h.	2	Drum 205 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	410	40
i.	8	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6120	1600
j.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	1000
k.	2	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2000	600
l.					
m.					

placards required : Class 3

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **TRLU 363276-5**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	1	Drum 205 L	UN 1202, WASTE, DIESEL FUEL ,Class 3 P.G. III Flash Point > 38°C closed cup	205	211
b.	21	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	4305	4200
c.	3	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	615	750
d.	4	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	820	720
e.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	205	150
f.	7	Drum 205 L	Not Regulated under T.D.G.A. - HYDROCARBON CONTAMINATED SOIL	1435	2100
g.	2	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	410	500
h.	7	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	5355	1400
i.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - PUNCTURE SRAY CANS	765	250
j.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - MIXED WASTE LABPACK	765	200
k.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	900
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **214009-1**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	12	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	9180	3513
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **228242-5**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	58	Drum 205 L	Not Regulated under T.D.G.A. - SEWER TREATMENT SLUDGE (STP sludge)	11890	12760
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. :	**Manifest : ES71043-4**
Shipper :	**Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**
Transporter :	**Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**
Consignor	**Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**
Container n°.	**256075-0**
Size and Type :	**20 FT marine container Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	6	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	1230	1080
b.	4	Drum 205 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	820	80
c.	6	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	6000	5400
d.	1	Tote 1000 L	Not Regulated under T.D.G.A. - USED GLYCOL	1000	1000
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name :

Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut**

Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour**

Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **256576-7**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	58	Drum 205 L	Not Regulated under T.D.G.A. - SEWER TREATMENT SLUDGE (STP sludge)	11890	12760
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **292665-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	10	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	7650	2000
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	205	150
c.	4	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	820	720
d.	4	Drum 205 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	820	80
e.	4	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	820	1000
f.	8	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6120	1600
g.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - MIXED WASTE LABPACK	765	400
h.	2	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	2000	1800
i.	1	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	1000	500
j.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	1000	250
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **305930-1**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	33	Drum 205 L	Not Regulated under T.D.G.A. - SEWER TREATMENT SLUDGE (STP sludge)	6765	7260
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **327175-4**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	56	Drum 205 L	Not Regulated under T.D.G.A. - SEWER TREATMENT SLUDGE (STP sludge)	11480	12320
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	205	150
c.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	410	360
d.	4	Drum 205 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	820	80
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **344170-3**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	12	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	9180	2400
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **363484-4**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	36	Drum 205 L	Not Regulated under T.D.G.A. - WATER TREATMENT SLUDGE (STP sludge)	27540	7063
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **368933-8**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	2	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	1530	400
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	205	150
c.	1	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	205	250
d.	10	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	7650	2000
e.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - USED SMOKE DETECTOR WITHOUT BATTERIES	765	150
f.	2	Quatrex 765 L	Not Regulated under T.D.G.A. - SOLID WASTE EPOXY RESIN	1530	800
g.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	500
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **371777-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	12	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	9180	2141
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **398812-5**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	765	180
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	205	250
c.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	410	500
d.	10	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	7650	2000
e.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - SOLID WASTE EPOXY RESIN	765	400
f.	1	Pallet	Not Regulated under T.D.G.A. - CONTAMINATED CONTAINMENT PALLET	205	372
g.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	1000	286
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CAXU 654242-4**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	10	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	10000	9000
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CBHU 364736-9**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	10	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	7650	2000
b.	2	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2000	500
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

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Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CBHU 374327-5**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross (kg) estimated
a.	9	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6885	3540
b.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - ELECTRONIC WASTE (e-waste)	765	179
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

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Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CBHU 391280-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	205	180
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	205	250
c.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	410	300
d.	2	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	410	500
e.	12	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	2460	2400
f.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	205	100
g.	3	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2295	600
h.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	1000
i.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	1000	1000
j.					
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CCLU 222700-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	4	Drum 205 L	Not Regulated under T.D.G.A. - USED GLYCOL (antifreeze)	820	720
b.	2	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	410	500
c.	3	Drum 205 L	Not Regulated under T.D.G.A. - USED KITCHEN GREASE	615	600
d.	2	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	410	200
e.	8	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	1640	1600
f.	3	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2295	600
g.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	747
h.	1	Tote 1000 L	Not Regulated under T.D.G.A. - USED KITCHEN GREASE	1000	902
i.					
j.					
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. :	**Manifest : ES71043-4**
Shipper :	**Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**
Transporter :	**Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**
Consignor	**Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**
Container n°.	**CCLU 343346-0**
Size and Type :	**20 FT marine container Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	36	Drum 205 L	Not Regulated under T.D.G.A. - WATER TREATMENT SLUDGE (STP sludge)	7380	7920
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CLHU 224869-9**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	10	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	10000	9000
8					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CLHU 237080-8**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	8	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	1640	1440
8	8	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	8000	7200
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **CRXU 204040-1**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	410	360
8	2	Drum 205 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	410	40
c.	9	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	9000	8100
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **ECMU 158560-1**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	10	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	7650	2000
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **FSCU 363598-2**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	9	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6885	1800
b.	1	Tote 1000 L	Not Regulated under T.D.G.A. - USED GLYCOL (antifreeze)	1000	1000
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **FSCU 389756-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	8	Drum 205 L	Not Regulated under T.D.G.A. - USED KITCHEN GREASE	1640	1600
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. :	**Manifest : ES71043-4**
Shipper :	**Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**
Transporter :	**Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**
Consignor	**Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**
Container n°.	**HJCU 817365-9**
Size and Type :	**20 FT marine container Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	2	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	410	500
8	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	205	150
c.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	205	100
d.	8	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6120	1600
e.	2	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2000	800
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **HLXU 224764-5**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	8	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	1640	1440
8	9	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	9000	8100
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **HLXU 303380-1**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	8	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6120	1600
b.	2	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2000	800
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **INBU 348720-5**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	10	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	10000	1800
8					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **INBU 351130-1**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	3	Drum 205 L	Not Regulated under T.D.G.A. - USED OILY WATER	615	600
b.	6	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	1230	1500
c.	12	Drum 205 L	Not Regulated under T.D.G.A. - WATER TREATMENT SLUDGE (STP sludge)	2460	2400
d.	4	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	820	600
e.	5	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	1025	1250
f.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	205	100
g.	4	Drum 205 L	Not Regulated under T.D.G.A. - SOLID PAINT RELATED MATERIAL	820	737
h.	1	Drum 205 L	Not Regulated under T.D.G.A. - ENVIRONMENTALLY HAZARDOUS SOLID, N.O.S.(LIGHT BULBS)	205	75
i.	2	Drum 60 L	Not Regulated under T.D.G.A. - WASTE GREASE	120	60
j.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	1000
k.					
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **IPXU 353529-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	410	360
8	9	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	9000	8100
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **KKTU 715536-8**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	38	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	7790	6840
8	1	Drum 60 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	60	10
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **MIGU 289601-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	5	Drum 205 L	Not Regulated under T.D.G.A. - USED OILY WATER	1025	1000
b.	4	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	820	1000
c.	3	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	615	540
d.	2	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	410	300
e.	2	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	410	500
f.	3	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2295	600
g.	3	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	3000	1200
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **MSCU 118282-1**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	5	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	1025	900
8	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	205	180
c.	2	Drum 205 L	Not Regulated under T.D.G.A. - RESIDU LAST CONTAINED USED OIL(empty)	410	40
d.	16	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	16000	14400
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **MSCU 172137-4**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	2	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	410	400
b.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	205	250
c.	1	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	205	100
d.	1	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	205	150
e.	3	Drum 205 L	Not Regulated under T.D.G.A. - CONTAMINATED FLOOR SAND	615	750
f.	8	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6120	1600
g.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	1000	400
h.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	900
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport					
Reference no. :	**Manifest : ES71043-4**				
Shipper :	**Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**				
Transporter :	**Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**				
Consignor	**Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**				
Container n°.	**PCIU 312358-6**				
Size and Type :	**20 FT marine container** **Reference : manifest ES71043-4**				

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	10	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	7650	2000
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. :	**Manifest : ES71043-4**
Shipper :	**Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**
Transporter :	**Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**
Consignor	**Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**
Container n°.	**REGU 319036-6**
Size and Type :	**20 FT marine container Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross (kg) estimated
a.	10	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	10000	7781
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **SUDU 366439-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	4	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	820	800
b.	9	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	6885	1800
c.	2	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	2000	800
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **TGHU 229020-4**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross (kg) estimated
a.	2	Drum 205 L	Not Regulated under T.D.G.A. - OILY WATER	410	400
b.	4	Drum 205 L	Not Regulated under T.D.G.A. - OILY SLUDGE FROM WASH BAY AREA	820	1000
c.	3	Drum 205 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	615	300
d.	4	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL FILTERS	820	600
e.	2	Drum 205 L	Not Regulated under T.D.G.A. - HYDROCARBON CONTAMINATED SOIL	410	600
f.	10	Quatrex 765 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	7650	2000
g.	1	Quatrex 765 L	Not Regulated under T.D.G.A. - SOLID WASTE COATING	765	400
h.	2	Quatrex 765 L	Not Regulated under T.D.G.A. - MIXED WASTE LABPACK	1530	400
i.	3	Tote 1000 L	Not Regulated under T.D.G.A. - OILY SOLID WASTE	3000	1200
j.	1	Tote 1000 L	Not Regulated under T.D.G.A. - OILY WATER	1000	900
k.	1	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	1000	800
l.					
m.					

placards required : None

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **TGHU 330722-0**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	16	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	16000	12800
b.	3	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	615	480
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations

Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

AGNICO EAGLE

Shipper :	**Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**
Transporter :	**Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**
Consignor	**Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**
Container n°.	**TRLU 289174-0**
Size and Type :	**20 FT marine container Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross (kg) estimated
a.	10	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	10000	7871
b.					
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

AGNICO EAGLE

Agnico Eagle Mines - Meliadine Project - Bill of Lading - Marine Transport

Reference no. : **Manifest : ES71043-4**

Shipper : **Agnico Eagle Mines ltd - Rankin Inlet, Nunavut - Prov ID n°. : NUG100031**

Transporter : **Nunavut Sealink And Supply Inc. - Prov ID n°. : NUG200002**

Consignor **Qikiqtaaluk Environmental - Port of Becancour - Prov ID n°.: 1162926159**

Container n°. **ZIMU 236452-5**

Size and Type : **20 FT marine container** **Reference : manifest ES71043-4**

line	No. & Kind of packages		DESCRIPTION OF GOODS	QUANTITY	
				Net Qty (L)	Gross mass(kg)
a.	4	Drum 205 L	Not Regulated under T.D.G.A. - USED OIL	820	720
8	16	Tote 1000 L	Not Regulated under T.D.G.A. - USED OIL	16000	14400
c.					
d.					
e.					
f.					
g.					
h.					
i.					
j.					
k.					
l.					
m.					

placards required : None

In case of emergency (24 hours) call : CANUTEC 1-613-996-6666

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Ship's Name : Name, Title, Firm of signatory : **Yvon Beaudoin**, Project Manager, Qikiqtaaluk Environmental

Port of Loading : **A.E.M. Rankin Inlet, Nunavut** Place & Date : **Agnico Eagle Mines - Meliadine, NU. September 3, 2018**

Port of Discharge : **Port de Bécancour** Signature:

Appendix E-1

Stack testing report

CONSULAIR
AIR & ENVIRONMENT GLOBAL MANAGEMENT



PROFESSIONNAL SERVICES
STACK TESTING PROGRAM
AIR EMISSIONS QUANTIFICATION
DOMESTIC WASTE INCINERATOR

AGNICO EAGLE

AGNICO EAGLE MINES LTD,
Rankin Inlet (Nunavut)
MELIADINE DIVISION
Kevin Buck
General Supervisor Environment

O/REF: **#18-5528**

consul-air.com

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AGNICO EAGLE

Revision history

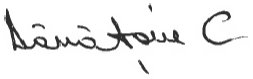
Version name	Date	Detail	Reviewed by
	---	---	---

PREPARED BY:



Louis Lawson, project manager

VERIFIED BY:



Cristina Danatoiu, engineer.

Quebec, December 2018

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GLOSSARY

PM: Particulate matter

SVOC (PCDD/F): Dioxins and furans

ME: Metals

O_2: Oxygen

CO_2: Carbon dioxide

CO: Carbone monoxide

NO_X: Nitrogen oxide

ACFM: Actual cubic feet per minute

ECCC: Environment and Climate Change Canada

USEPA: United Stated Environmental Protection Agency

QA/QC: Quality Assurance / Quality Control

ΔP: Differential pressure read at the stack

ΔH: Differential pressure read at the control unit

DL: Detection Limit

SUMMARY

Consulair was mandated by Agnico Eagle Mines, Meliadine Division, to sample the atmospheric emissions at the outlet of an incinerator of its plant located near Rankin Inlet, Nunavut.

The objectives of the characterization of atmospheric emissions were to:

- Evaluate the physical characteristics of the gas flow in the stack;
- Evaluate the concentration and the emission rate of the particulate matter (P), Metals (ME) and Hydrogen chloride (HCl);
- Demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F);
- Ensure that QA/QC of Consulair is respected throughout the stack sampling program.

For this project, the applicable standards are shown below with the tests results. The applicable standards for dioxins and furans (PCDD/F) were met for all tests, as well as the applicable standard for mercury (Hg). The standards come from the "Environmental Guideline for the Burning and Incineration of Solid Waste" emitted by the Department of Environment of the Government of Nunavut base on the Canadian Council of Ministers of the Environment (CCME) Canada - Wide Standards for Dioxins and Furans and Mercury Emissions.

The government of Nunavut presented a guideline document in October 2010, which was revised in January 2012, for the burning and incineration of solid waste. The document presented two criteria for air emissions which are applicable in the current project. A standard for Dioxins and Furans is stated at 80 pg I-TEQ/m^3 and another standard for mercury is stated at 20 µg/Rm^3. The reference conditions are stated at 101.3 kPa and 25°C and both standards are corrected to 11% O_2.

APPLICABLE STANDARDS		
CONTAMINANTS	**TEST RESULTS**	**STANDARDS**
MERCURY (Hg)	0.23 µg / Rm^3 @ 11 % v/v O_2	20 µg / Rm^3 @ 11 % v/v O_2
DIOXINS AND FURANS (PCDD/F)	0.042 ng / Rm^3 @ 11 % v/v O_2	0.08 ng TEQ / Rm^3 @ 11 % v/v O_2

R: Reference conditions 25 °C and 101.3 kPa on a dry basis.

SUMMARY

INORGANIC SAMPLING TRAIN	
STACK GAS PROPERTIES	
TEMPERATURE (°C)	744
MOISTURE (% v/v)	6.0
VELOCITY (m/s)	11.9
VOLUMETRIC FLOW RATE (m^3/h)	22,871
VOLUMETRIC FLOW RATE (Rm^3/h)	6,282
PARTICULATE MATTER	
PARTICULATE MATTER (mg/Rm^3)	26.8
PARTICULATE MATTER (mg/Rm^3) at 7 % O_2	58.3
PARTICULATE MATTER (mg/Rm^3) at 11 % O_2	41.5
PARTICULATE MATTER (kg/h)	0.16
PARTICULATE MATTER (g/s)	0.045
METALS (µg/Rm^3) @ 11% O_2	
CONCENTRATION	7,440
CLASS I (Cu, Pb, V & Zn)	352
CCME GUIDELINE	1,500
CLASS II (As, Cr & Ni)	22
CCME GUIDELINE	500
CLASS III (Cd, Hg & Tl)	2.3
CCME GUIDELINE	150
HCl	
HCl (mg/Rm^3)	25.7
HCl (mg/Rm^3) at 11 % O_2	37.3
HCl (ppm)	17.2
HCl (kg/h)	0.16
ORGANIC SAMPLING TRAIN	
STACK GAS PROPERTIES	
TEMPERATURE (°C)	743
MOISTURE (% v/v)	6.1
VELOCITY (m/s)	12.1
VOLUMETRIC FLOW RATE (m^3/h)	23,252
VOLUMETRIC FLOW RATE (Rm^3/h)	6,386
PCDD/F	
PCDD/F TEQ (ng/Rm^3) at 11 % O_2	0.042
STANDARD (ng/Rm^3) at 11% O_2	0.08
PCDD/F TEQ (µg/h)	0.18
R: Reference conditions 25 °C, 101.3 kPa on a dry basis.	

SUMMARY (Cont'd)

GAS	
OXYGEN (O_2)	
O_2 (% v/v d) - average	14.3
CARBON DIOXIDE (CO_2)	
CO_2 (% v/v d) - average	5.1
CARBON MONOXIDE (CO)	
CO (ppmvd) - average	2.8
CO (mg/Rm^3)	3.3
CO (kg/h)	0.021
NITROGEN OXIDES (NO_X) as NO_2	
NO_X (ppmvd) - average	53
NO_X as equivalent NO_2 (mg/Rm^3)	100
NO_X (kg/h)	0.65
SULPHUR DIOXIDE (SO_2)	
SO_2 (ppmvd) - average	0.2
SO_2 (mg/Rm^3)	0.6
SO_2 (kg/h)	0.004
R: Reference conditions 25 °C, 101.3 kPa on a dry basis.	

The sampling was performed in compliance with the rules of the requirements of the Report No. EPS 3/UP/2, including methods recommended by "Environment and Climate Change Canada" (ECCC) of the Government of Canada inside "Environment Canada, The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology". Report No. EPS 3/UP/2, Ottawa, 1986.

1 INTRODUCTION

Consulair was mandated by Agnico Eagle Mines, Meliadine Division (Nu), to demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F).

1.1 Sampling scope

The objectives of the characterization of atmospheric emissions were to:

- Evaluate the physical characteristics of the gas flow in the stack;
- Evaluate the concentration and the emission rate of particulate matter (P), Metals (ME) and Hydrogen chloride (HCl);
- Demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F);
- Ensure that QA/QC of Consulair is respected throughout the stack sampling program.

The study included sources and pollutants referred in the following table.

Table 1-1 – OVERALL TEST MATRIX

SOURCE	POLLUTANTS	SAMPLING METHODS
Incinerator outlet	Particulate matter (PM)	EPS 1/RM/8 EC
	Hydrogen chloride (HCl)	EPS 1/RM/1 EC
	Metals	USEPA 29
	SVOC (PCDD/F)	EPS 1/RM/2 EC

2 SAMPLING TEAM AND PARTICIPANT

The interveners of this testing program are listed in Table 2-1 and 2-2. The analysis laboratory used is defined in Table 2-3.

Table 2-1 – CLIENT CONTACT

CLIENT	CONTACT	FUNCTION
Agnico Eagle Mines Limited Meliadine Division Rankin Inlet, Nunavut, Canada X0C 0G0	Kevin Buck General Supervisor Environment Tel: 819-759-3555 Kevin.buck@agnicoeagle.com	Test program coordination

Table 2-2 – SAMPLING TEAM

STAFF	TITLE	FUNCTION
Louis Lawson	Project Manager	On-site team leader On-site sampling Report writing
Jean-François Guay	Health and Safety Manager	On-site sampling
Cristina Danatoiu	Engineer	Report validation

Table 2-3 – ANALYSIS LABORATORY

LABORATORY	ANALYSIS	FIELD OF ACCREDITATION DR-12-LLA
Consulair	Particulate Matter	400
	Hydrogen chloride (HCl)	---
Maxxam	Metals	404 - 406
Agat	PCDD/F	510

3 SAMPLING

3.1 Process operation

A representative of the Agnico Eagle mines company had the responsibility to monitor the operating conditions to ensure the representativeness of the sampling. In order to perform the sampling program under representative conditions, a tight liaison was maintained with the operators during testing.

Process operating conditions of the incinerator were under Agnico-Eagle's responsibility. The operating conditions were maintained stable throughout each days of the test program.

3.2 Source description

The number of measuring points in the stack was determined in accordance with the requirements of Environment Canada's EPS 1/RM/8 sampling method entitled: "Reference methods for source testing: measurement of releases of particulate from stationary sources".

Stacks characteristics are described in the following table.

Table 3-1 – SAMPLED SITE CHARACTERISTICS

SOURCE	DIMENSION(S) Stack (m)	DIAMETER NUMBER)		NUMBER OF SAMPLING POINTS	
		A_D	B_D	Number of port used and sampling points	Total
Incinerator outlet	0.826	5.0	2.0	2 x 6	12

3.3 Sampling methodology

Sampling methods used in this project are methods approved and recommended by known organisms such as the United States Environmental Protection Agency (US EPA) and Environment Canada (EC).

The following table shows the sampling methods that were used during testing.

Table 3-2 – SAMPLING METHODS

PARAMETERS	METHODS	SAMPLING DURATION (min)
Manual sampling methods		
Temperature	Thermometer or thermocouple	With isokinetic value
Gas flow	SPE 1/RM/8, method B – Environment Canada	With isokinetic value
O_2, CO_2, CO	SPE 1/RM/8, method C – Environment Canada	With isokinetic value
Moisture content	SPE 1/RM/8, method D – Environment Canada	With isokinetic value
Particulate matter (PM)	SPE 1/RM/8, method E – Environment Canada	120 / 170 / 180
HCl	SPE 1/RM/1 – Environment Canada	
Metals	USEPA, CFR 40, Part 60, Method 29	
SVOC (PCDD/F)	SPE 1/RM/2 – Environment Canada	240 / 150 / 180
Instrumental sampling method		
NO_X	USEPA, CFR 40, Part 60, Method 7E	60
SO_2	USEPA, CFR 40, Part 60, Method 6C	60

The distribution of parameters within the sampling train is presented in the following table.

Table 3-3 – DISTRIBUTION OF PARAMETERS FOR EACH SAMPLING SYSTEM

SAMPLING TRAIN	PARAMETERS
Metals & Particulate matter & HCl	PM & Metals & HCl
SVOC	PCDD/F

3.4 Temperature, moisture content and flowrate

Gas temperature, flowrate, velocity and moisture content will be measured at the sampling sites according to "Reference methods for source testing: measurement of releases of particulate from stationary sources". Methods B and D, Environment Canada, December 1993, EPS 1/RM/8.

3.5 Isokinetic sampling

Isokinetic sampling allows to collect particles in the sampling nozzle at the same velocity as the gas stack velocity. In non-isokinetic conditions, if the sampling velocity is inferior than the gas stack velocity, more large particles would be collected resulting in an overestimation of the true mass concentration. On the opposite, if the sampling velocity is superior than the gas stack velocity, less large particles would be collected resulting in underestimation of the true mass concentration. In either case, the sample collected would not be an accurate reflection of the gas stack stream.

The following table presents a test acceptance criteria according to the methods (sampling systems) used.

Table 3-4 – SAMPLING ACEPTANCE CRITERIA

PARAMETERS	METHOD	ACCEPTANCE CRITERIA
Particulate Matter	SPE 1/RM/8	• Isokinetic rate comprised between 90 % and 110 % • Less than 10% of the sampled points out of the 90 % to 110 % range
Metals	Method 29 from USEPA	
SVOC	SPE 1/RM/2	

3.5.1 Particulate matter (PM), metals & HCl

Particulate matter (PM) and metals (Al, Sb, Ag, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Mo, Ni, Pb, K, Se, Na, Ti, V, Zn, Sr, Tl, Si (Silicium soluble), Hg) were sampled in accordance with the requirements of Environment Canada EPS 1/RM/8 sampling method entitled: "Reference methods for source testing: measurement of releases of particulate from stationary sources". This method was combined with USEPA method 29 entitled “Metals emissions from stationary sources" in order to allow for metals sampling (including Hg). HCl was analyzed in the first impinger of that sampling train.

Table 3-5 – MAIN COMPONENTS OF THE PM/HCl/METALS SAMPLING SYSTEM

SAMPLING PROBE	SAMPLING TRAIN	CONTROL UNIT
• Quartz nozzle; • Quartz probe; • S type Pitot tube for the gas velocity attached to the sample probe; • Thermocouple for temperature attached to the sample probe.	• A 0.3 µm porosity pre-weighted quartz filter mounted in a Pyrex filter holder and placed in a heated oven to avoid moisture condensation; • Seven impingers placed in series and containing: ○ # 1: 100 mL H_2O; ○ # 2 and # 3: 100 mL HNO_3 (5%) / H_2O_2 (10%) solution; ○ # 4: empty; ○ # 5 and # 6: 100 mL $KMnO_4$ (4%) / H_2SO_4 (10%) solution; ○ # 7: silica gel; • Impingers placed in an ice bath to condense all the flue gas moisture.	• Sampling cord that connects the train to the sampling console; • Sampling console with oil manometer, a dry gas meter, an orifice, a temperature reader and temperature controllers; • Diaphragm vacuum pump.

3.5.2 Semivolatile organic compounds (SVOC) (PCDD/DF)

Semi Volatile Organic Compounds (SVOC) are defined as organic compounds with boiling points greater than 100 °C. This class of compounds includes PCDD (PolyChlorinated Dibenzo p Dioxins), PCDF (PolyChlorinated DibenzoFurans),

SVOCs (PCDD/F) were sampled in accordance with the requirements of Environment Canada EPS 1/RM/2 sampling method entitled: " Reference Method for Source Testing: Measurement of Releases of Selected Semi-Volatile Organic Compounds from Stationary Sources ". For this project, SVOCs included polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). A minimal volume of at least 3.0 Rm^3 was sampled during each run.

For one series of three SVOC tests, a blank train was taken to the stack sampling site. A volume of ambient air equal to the sum of all leak check volumes during the SVOC test was pumped through the blank train, according to the requirements of reference method EPS 1/RM/2.

The following table shows the various components of the sampling system for PCDD/F.

Table 3-6 – MAIN COMPONENTS OF A SVOC SAMPLING SYSTEM

SAMPLING PROBE	SAMPLING TRAIN	CONTROL UNIT

• Glass nozzle of a precisely measured diameter to allow isokinetic sampling;
• Glass heated probe to avoid moisture condensation;
• Probe is fastened to an "S" type Pitot tube for gas velocity measurement and to a thermocouple for temperature measurement.
	• A 0.3 µm porosity pre-weighted fiber glass filter mounted on an accurate holder and placed in a heated oven to avoid moisture condensation;
	• Condenser;
	• XAD-2 resin cartridge;
	• Condensate trap;
	• Three impingers placed in series and containing:
	  ○ # 1: 100 mL ethylene glycol;
	  ○ # 2: empty;
	  ○ # 3: silica gel;
	• Impingers placed in an ice bath to condense all the flue gas moisture.
		• Sampling cord that connects the train to the sampling console;
		• Sampling console with oil manometer, a dry gas meter, an orifice, a temperature reader and temperature controllers;
		• Diaphragm vaccum pump.

3.6 Gaseous parameters (O_2, CO_2, CO, SO_2 & NO_X)

One CEM (Continuous Emission Monitoring) systems was used to determine the concentration of O_2, CO_2, CO, SO_2 & NO_X. The CEM system includes a gas extraction system, one analyzer and a data acquisition system. The moisture-free gas was analysed for O_2, CO_2, CO, SO_2 & NO_X with an analyzer as described in the following table.

Graphics of continuous measurements of gas are presented in Appendix 2 of the report.

Table 3-7 – GAS ANALYZER

ANALYZER	O_2/CO_2	CO	SO_2	NO_X
Method	USEPA 3A	USEPA 10	USEPA 6C	USEPA 7E
Brand	Horiba	Horiba	Horiba	Horiba
Model	PG250	PG 250	PG 250	PG 250
Detector	Galvanic Cell / Infrared	Infrared	Infrared	Chemiluminescence
Zero gas	Nitrogen			
Working Scale	0 - 30 %v	0 – 100 ppmv	0 – 500 ppmv	0 – 1,000 ppmv

3.7 Testing schedule

Table 3-8 – TESTING SCHEDULE

SOURCE	DATE	TIME	TEST
Outlet of incinerator	2018-09-22	13:44-17:44	GAS & SVOC # 1
	2018-09-28	11:32-14:02	GAS & SVOC # 2
	2018-09-29	16:13-19:13	GAS & SVOC # 3
	2018-09-22	14:45-16:45	PM/Metal/HCl # 1
	2018-09-28	11:33-14:23	PM/Metal/HCl # 2
	2018-09-29	16:14-19:14	PM/Metal/HCl # 3

3.8 LAWS AND REGULATIONS

The government of Nunavut presented a guideline document in October 2010, which was revised in January 2012, for the burning and incineration of solid waste. The following emission standards apply to existing, new or expanding solid waste incinerators operating in Nunavut and have been adopted from the Canadian Council of Ministers of the Environment (CCME) Canada - Wide Standards for Dioxins and Furans and Mercury Emissions. The document presented two criteria for air emission which are applicable in the current project. A standard for Dioxins and Furans is stated at 80 pg I-TEQ/m^3 and another standard for mercury is stated at 20 µg/Rm^3. The R conditions are stated at 101.3 kPa and 25°C. Both standards are corrected to 11% O_2.

4 QUALITY CONTROL PROCEDURES (QA/QC)

The quality insurance program and control at Consulair has several elements to validate the methodologies used during sampling. The main points are detailed within this section.

4.1 QA/QC – PRE-TEST

4.1.1 Equipment, instruments and reagents

The sampling train glassware and sample containers were cleaned and checked according to the applicable reference methods.

The instruments used were subject of regular maintenance and are calibrated for less than a year. The calibration constants of the equipment used are shown in Tables 4-1 to 4-3. Calibration certificates of equipment are presented in Appendix 3 of the report.

The gas standards used for calibration of the analyzer were valid at the time of use considering the retention periods imposed by the supplier. The standard gases are certified to ± 2% by the supplier.

4.1.2 Field forms

The forms that present field data for the target parameters are shown in Appendix 5.

4.2 Sample tracking

A clean room inside the incinerator building was used for the assembly and the different stages of recovery of sampling trains. Recovery of samples was performed according to the procedures recommended by the methods.

The samples were collected in suitable containers as specified by the methods. All samples were kept cool during the sampling period and until the delivery of samples to analytical laboratories. Consulair used an identification system for the samples that allowed tracking the origin easily by a unique code coupled to a lookup table. Each sample number includes the date, test number, the precise location of the sampling, the nature and destination (analysis, archiving). This information is indicated on the chain of custody listing and the information is available on the analysis reports.

4.3 Validation criteria

Consulair ensured that each step of the air emission characterization program (including QA / QC program) will achieve the defined objectives, while respecting the deadline set by the customer.

4.3.1 Analytical laboratory

The particulate samples analysis was done in the laboratory of Consulair. This laboratory is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for particulate matter (domain 400 of the air chemical section). The metals samples were analysed by Maxxam's laboratory, which is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for metallic analysis (domain 404 of the air chemical section). The PCDD/F samples were analysed by AGAT's laboratory, which is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for PCDD/F analysis (domain 510 of the air chemical section).

The analytical reports have been signed by a chemist and are presented in appendix 4. The laboratory also made available, in its report, the QA/QC program specific to the analysed contaminants.

4.3.2 Validation criteria – Particulate matter / Metals / HCl (PM/ME/HCl)

The following tables show the validation criteria of the methodology used.

Table 4-1 – QA/QC METHODOLOGY – PM/METALS/HCl

SPE 1/RM/8 METHODOLOGICAL INFORMATION				
TEST	ME-1	ME-2	ME-3	**CRITERIA**
CYCLONIC FLOW	0			≤ 15°
REVERSE FLOW	NO			NO
STACK DIAMETER (m)	0.826			≥ 0.3
A_0	2.0			≥ 0.5
B_0	5.0			≥ 2.0
SAMPLING TIME (min)	120	170	180	≥ 120
VOLUME SAMPLED (Rm^3)	2.76	2.83	3.77	≥ 2.8
ISOKINETICITY AVERAGE (%)	102	101	102	90 ≤ ISO ≤ 110
POURCENTAGE OF ISOKINETIC POINTS	100%	100%	100%	≥ 90
SAMPLING VELOCITY	OK	OK	OK	3.0 ≤ V ≤ 30 m/s
PROBE TEMPERATURE	NOT MEASURED			223 ≤ T ≤ 273 °F
FILTER TEMPERATURE	OK	OK	OK	223 ≤ T ≤ 273 °F
OUTLET TEMPERATURE	OK	OK	OK	32 ≤ T ≤ 68 °F
4% D_{MOY} (pi^3/min)	0.03	0.02	0.03	---
FLOW LEAK BEFORE at -15in Hg (ft^3/min)	0.020	0.020	0.020	≤ 0.02 or 4% Dmoy
FLOW LEAK AFTER (ft^3/min)	0.020	0.020	0.020	≤ 0.02 or 4% Dmoy
EQUIPMENT INFORMATION				
SAMPLING MODULE NO.	25	25	25	
METER FACTOR K_C	0.999	0.999	0.999	$0.95 < K_C < 1.05$
ORIFICE FACTOR K_O	0.733	0.733	0.733	
Δh@	2.529	2.529	2.529	
PITOT ID	05-07 5Q-501	05-07 5Q-501	05-07 5Q-501	
PITOT FACTOR	0.774	0.774	0.774	
NOZZLE ID	5Q-502	5Q-434	5Q-434	
NOZZLE DIAMETER (in)	0.4684	0.4366	0.4366	
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.				

The sampling volume for the first test run is slightly lower than the 2.8 m^3 limit of the test method but should not have any impact on the result.

Table 4-2 – QA/QC METHODOLOGY – SVOC

TEST	PCDD/DF-1	PCDD/DF-2	PCDD/DF-3	CRITERIA
EQUIPEMENT INFORMATION				
SAMPLING MODULE NO.	19	19	19	N/A
METER FACTOR K_C	0.997	0.997	0.997	0.95 - 1.05
ORIFICE FACTOR K_O	0.994	0.994	0.994	N/A
PITOT ID	03-06 3Q-371	03-06 3Q-503	03-06 3Q-503	N/A
PITOT FACTOR	0.778	0.781	0.781	N/A
NOZZLE ID	3Q-371	3Q-503	3Q-503	N/A
NOZZLE DIAMETER (in)	0.3741	0.4958	0.4958	N/A
METHODOLOGICAL INFORMATION				
SAMPLING POINTS NUMBER	12	12	12	24
GAS VELOCITY (m/s)	11.7	10.6	13.9	3.0 - 30
SAMPLING TIME (min)	240	150	180	≥ 180
VOLUME SAMPLED (Rm^3)	3.38	3.39	4.99	≥ 3
SAMPLING RATE (pi^3/min)	0.48	0.78	0.95	N/A
ISOKINETICITY AVERAGE (%)	101	101	101	90 - 110
POURCENTAGE OF ISOKINETIC POINTS	100	100	100	≥ 90
PROBE TEMPERATURE (°F)	NOT MEASURED			223 - 273
FILTER TEMPERATURE (°F)	240 - 258	246 – 253	246 - 257	223 - 273
OUTLET TEMPERATURE (°F)	39 - 58	56 - 91	40 - 63	32 - 68
TRAP TEMPERATURE (°F)	46 - 69	38 - 63	41 - 69	33 - 68
FLOW LEAK BEFORE at -15in Hg (ft^3/min)	< 0.020	< 0.020	< 0.020	< 0.02
FLOW LEAK AFTER (ft^3/min)	< 0.020	< 0.020	< 0.020	< 0.02
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.				

The sampling time for the second run of SVOC is under the 180 minutes limit of the method because of a process malfunction and the sampling had to be stopped. However, since the sampling volume for this test run is higher than the 3.0 m^3 limit of the method, this should have no impact on the result.

5 RESULTS

The reference values are reported at a temperature of 25°C and an atmospheric pressure of 101.3 kPa, on a dry basis.

For the inorganic results, a laboratory analysis value preceded of "<" means that the laboratory result is less than the detection limit reported (LDR) and represents a maximum result. In this case, the detection limit reported (LDR) is the value used.

The PCDD / F result tables include all toxic congeners (17) calculated with TEF (Toxic Equivalency Factor). The term "toxic equivalency (TEQ)" is the sum of the 17 toxic congeners calculated according to the TEF and when a congener was not detected by the laboratory analysis, it was replaced by "zero".

Unless otherwise indicated, the averages indicated in the tables below are the average of all tests carried out to the same source for the same operating condition.

Computer compiled data is presented in Appendix 1.

Table 5-1 – STACK GAS PROPERTIES

TESTS SCHEDULE				
TEST	RUN-1	RUN-2	RUN-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
STACK GAS PROPERTIES – METAL SAMPLING TRAIN				
TEMPERATURE (°C)	727	724	782	744
MOISTURE (% v/v)	6.2	5.5	6.3	6.0
VELOCITY (m/s)	12.0	10.2	13.5	11.9
STACK GAS FLOW RATE (m^3/h)	23 080	19 600	25 932	22 871
STACK GAS FLOW RATE (ft^3/min) (ACFM)	6 498	5 503	6 844	6 282
STACK GAS FLOW RATE (Rm^3/h)	13 585	11 536	15 263	13 461
STACK GAS FLOW RATE (Rft^3/min) (SCFM)	3 825	3 239	4 028	3 697
STACK GAS PROPERTIES – SVOC SAMLING TRAIN				
TEMPERATURE (°C)	726	723	780	743
MOISTURE (% v/v)	6.6	5.1	6.6	6.1
VELOCITY (m/s)	11.7	10.6	13.9	12.1
STACK GAS FLOW RATE (m^3/h)	22 509	20 452	26 796	23 252
STACK GAS FLOW RATE (ft^3/min) (ACFM)	13 248	12 038	15 771	13 686
STACK GAS FLOW RATE (Rm^3/h)	6 314	5 774	7 070	6 386
STACK GAS FLOW RATE (Rft^3/min) (SCFM)	3 717	3 398	4 161	3 759
GAS COMPOSITION				
CO_2 (% v/v d)	5.2	4.4	5.6	5.1
O_2 (% v/v d)	14.1	15.1	13.6	14.3
CO (ppmvd)	3	3	3	3
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-2 – RESULTS PM – HCL

TESTS SCHEDULE				
TEST	MEL-ME-1	MEL-ME-2	MEL-ME-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
PARTICULATE MATTER				
PARTICULATE MATTER (mg/Rm^3)	30.9	35.8	13.6	26.8
PARTICULATE MATTER (mg/Rm^3) at 7 % O_2	63.4	85.7	25.9	58.3
PARTICULATE MATTER (mg/Rm^3) at 11 % O_2	45.2	61.0	18.4	41.5
PARTICULATE MATTER (kg/h)	0.20	0.20	0.093	0.16
HCl				
HCl (mg/Rm^3)	32.4	12.0	32.6	25.7
HCl (mg/Rm^3) at 11 % O_2	**47.4**	**20.5**	**44.1**	**37.3**
HCl (ppm)	21.7	8.1	21.8	17.2
HCl (kg/h)	0.210	0.066	0.223	0.167
HCl (g/s)	0.0584	0.0184	0.0619	0.0463
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-3 – METALS CONCENTRATION

SCHEDULE OF TESTS				
TEST	MEL-ME-1	MEL-ME-1	MEL-ME-1	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
METALS (µg/Rm^3) @ 11% O_2				
Aluminium (Al)	307	24	21	118
Antimony(Sb)	129	2.3	78	70
Silver (Ag)	1.5	< 1.6	1.2	1.4
Arsenic (As)	9.2	0.96	11	7.1
Baryum (Ba)	4.1	0.72	0.45	1.7
Beryllium (Be)	< 0.13	< 0.16	< 0.089	< 0.13
Bismuth (Bi)	0.55	0.19	1.8	0.85
Boron (B)	14	8.6	37	20
Cadmium (Cd)	2.0	0.57	3.5	2.0
Calcium (Ca)	1,095	239	142	492
Chromium (Cr)	9.8	3.2	26	13
Cobalt (Co)	0.42	< 0.24	0.18	0.28
Copper (Cu)	48	15	48	37
Tin (Sn)	54	16	68	46
Iron (Fe)	576	331	49	318
Lithium (Li)	5.8	21	13	13
Magnesium (Mg)	167	28	27	74
Manganese (Mn)	36	14	2.1	17
Mercury (Hg)	0.47	0.21	0.018	0.23
Molybdenum (Mo)	3.6	< 1.6	3.9	3.0
Nickel (Ni)	4.6	0.48	0.82	2.0
Lead (Pb)	68	23	160	83
Potassium (K)	5,348	716	3,662	3,242
Selenium (Se)	0.74	0.48	0.36	0.52
Silicium (Si)	409	107	212	243
Sodium (Na)	4,180	520	2,473	2,391
Strontium (Sr)	2.8	0.42	0.25	1.2
Thallium (Tl)	< 0.21	< 0.24	< 0.14	< 0.20
Titanium (Ti)	29	4.2	3.2	12
Vanadium (V)	0.79	< 0.48	0.39	0.55
Zinc (Zn)	274	34	385	231
DETECTED METAL	**12,780**	**2,111**	**7,430**	**7,440**
TOTAL METALS	**12,780**	**2,115**	**7,430**	**7,442**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-4 – METALS EMISSION RATE

SCHEDULE OF TESTS				
TEST	MEL-ME-2	MEL-ME-1	MEL-ME-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
METALS (g/h)				
Aluminium (Al)	1.4	0.078	0.11	0.52
Antimony(Sb)	0.58	0.0076	0.40	0.33
Silver (Ag)	0.0068	< 0.0051	0.0060	0.0060
Arsenic (As)	0.041	0.0031	0.057	0.034
Baryum (Ba)	0.018	0.0023	0.0023	0.0076
Beryllium (Be)	< 0.00059	< 0.00051	< 0.00045	< 0.00052
Bismuth (Bi)	0.0024	0.00062	0.0091	0.0041
Boron (B)	0.063	0.028	0.19	0.093
Cadmium (Cd)	0.0091	0.0018	0.018	0.0096
Calcium (Ca)	4.9	0.78	0.72	2.1
Chromium (Cr)	0.044	0.010	0.13	0.063
Cobalt (Co)	0.0019	< 0.00078	0.00091	0.0012
Copper (Cu)	0.22	0.050	0.24	0.17
Tin (Sn)	0.24	0.051	0.34	0.21
Iron (Fe)	2.6	1.1	0.25	1.3
Lithium (Li)	0.026	0.070	0.064	0.053
Magnesium (Mg)	0.75	0.091	0.14	0.32
Manganese (Mn)	0.16	0.045	0.011	0.072
Mercury (Hg)	0.0021	0.00070	0.000091	0.00096
Molybdenum (Mo)	0.016	< 0.0051	0.020	0.014
Nickel (Ni)	0.020	0.0016	0.0042	0.0087
Lead (Pb)	0.30	0.074	0.81	0.40
Potassium (K)	24	2.3	19	15
Selenium (Se)	0.0033	0.0016	0.0018	0.0022
Silicium (Si)	1.8	0.35	1.1	1.1
Sodium (Na)	19	1.7	13	11
Strontium (Sr)	0.012	0.0014	0.0013	0.0050
Thallium (Tl)	< 0.00094	< 0.00078	< 0.00073	< 0.00082
Titanium (Ti)	0.13	0.014	0.016	0.053
Vanadium (V)	0.0035	< 0.0016	0.0020	0.0024
Zinc (Zn)	1.2	0.11	2.0	1.1
DETECTED METAL	**57**	**6.9**	**38**	**34**
TOTAL METALS	**57**	**6.9**	**38**	**34**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-5 – CONCENTRATION - PCDD/F CONGENERS

SCHEDULE OF TESTS				
SERIAL NUMBER TEST	MEL-COSV-1	MEL-COSV-2	MEL-COSV-3	**AVERAGE**
DATE	2018-09-22	2018-09-28	2018-09-29	**(1 to 3)**
START OF TEST	13:44	11:32	16:13	
END OF TEST	17:44	14:02	19:13	
DURATION OF THE TEST (MINUTES)	240	150	180	
PCDD/DF CONGENERS (ng/Rm^3)				
2,3,7,8 - Tetra CDD	< 0.00030	0.0015	< 0.0014	0.0011
1,2,3,7,8 - Penta CDD	< 0.00089	0.014	0.0046	0.0065
1,2,3,4,7,8 - Hexa CDD	< 0.00089	0.016	0.0056	0.0074
1,2,3,6,7,8 - Hexa CDD	0.00089	0.021	0.013	0.011
1,2,3,7,8,9 - Hexa CDD	< 0.00089	0.024	0.013	0.013
1,2,3,4,6,7,8 - Hepta CDD	0.0050	0.093	0.061	0.053
1,2,3,4,6,7,8,9 - Octa CDD	0.0098	0.047	0.060	0.039
2, 3, 7, 8 - Tetra CDF	0.0044	0.014	0.043	0.021
1,2,3,7,8 - Penta CDF	< 0.0024	0.0062	0.012	0.0070
2,3,4,7,8 - Penta CDF	0.0027	0.013	0.033	0.016
1,2,3,4,7,8 - Hexa CDF	0.0039	0.018	0.065	0.029
1,2,3,6,7,8 - Hexa CDF	0.0027	0.0074	0.024	0.011
2,3,4,6,7,8 - Hexa CDF	0.0024	0.015	0.055	0.024
1,2,3,7,8,9 - Hexa CDF	< 0.0018	< 0.0059	0.0060	0.0046
1,2,3,4,6,7,8 - Hepta CDF	0.0047	0.019	0.095	0.040
1,2,3,4,7,8,9 - Hepta CDF	< 0.0018	0.0024	0.020	0.0081
1,2,3,4,6,7,8,9 - Octa CDF	0.0059	0.0050	0.045	0.019
Total Tetra CDD	0.0027	0.047	0.043	0.031
Total Penta CDD	0.0033	0.13	0.081	0.072
Total Hexa CDD	0.0074	0.27	0.14	0.14
Total Hepta CDD	0.0059	0.099	0.063	0.056
CDD TOTALS	**0.029**	**0.59**	**0.39**	**0.34**
Total Tetra CDF	0.030	0.083	0.23	0.11
Total Penta CDF	0.021	0.12	0.31	0.15
Total Hexa CDF	0.0095	0.051	0.19	0.084
Total Hepta CDF	0.0083	0.036	0.18	0.074
CDF TOTALS	**0.075**	**0.30**	**0.95**	**0.44**
CONGENERS TOTALS TOXIC	**0.051**	**0.32**	**0.56**	**0.31**
TOTAL HOMOLOGUOUS GROUPS	**0.19**	**1.7**	**2.6**	**1.5**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-6 – CONCENTRATION - PCDD/F TEQ

SCHEDULE OF TESTS				
SERIAL NUMBER TEST	MEL-COSV-1	MEL-COSV-2	MEL-COSV-3	**AVERAGE**
TEQ - PCDD/F (ng/Rm^3) at 11 % O_2				
2,3,7,8 - Tetra CDD	< LD	0.0025	< LD	0.0016
1,2,3,7,8 - Penta CDD	< LD	0.024	0.0062	0.010
1,2,3,4,7,8 - Hexa CDD	< LD	0.0027	0.00076	0.0012
1,2,3,6,7,8 - Hexa CDD	0.00013	0.0036	0.0017	0.0018
1,2,3,7,8,9 - Hexa CDD	< LD	0.0041	0.0018	0.0020
1,2,3,4,6,7,8 - Hepta CDD	0.000074	0.0016	0.00083	0.00083
1,2,3,4,6,7,8,9 - Octa CDD	0.0000014	0.0000080	0.0000081	0.0000059
2, 3, 7, 8 - Tetra CDF	0.00065	0.0024	0.0059	0.0030
1,2,3,7,8 - Penta CDF	< LD	0.00053	0.00084	0.00051
2,3,4,7,8 - Penta CDF	0.0020	0.011	0.022	0.012
1,2,3,4,7,8 - Hexa CDF	0.00056	0.0031	0.0088	0.0042
1,2,3,6,7,8 - Hexa CDF	0.00039	0.0013	0.0033	0.0016
2,3,4,6,7,8 - Hexa CDF	0.00035	0.0025	0.0074	0.0034
1,2,3,7,8,9 - Hexa CDF	< LD	< LD	0.00081	0.00069
1,2,3,4,6,7,8 - Hepta CDF	0.000069	0.00032	0.0013	0.00056
1,2,3,4,7,8,9 - Hepta CDF	< LD	0.000040	0.00027	0.00011
1,2,3,4,6,7,8,9 - Octa CDF	0.00000087	0.00000085	0.0000062	0.0000026
TOXIC EQUIVALENT TOTAL	**0.0042**	**0.059**	**0.062**	**0.042**
STANDARD (ng/Nm^3) at 11% O_2	**0.08**			
TEQ / % OF THE STANDARD	5.2	73.8	77.8	52.3
TEQ - PCDD/F (µg/h)				
2,3,7,8 - Tetra CDD	< LD	0.0085	< LD	0.0068
1,2,3,7,8 - Penta CDD	< LD	0.080	0.033	0.039
1,2,3,4,7,8 - Hexa CDD	< LD	0.0090	0.0040	0.0045
1,2,3,6,7,8 - Hexa CDD	0.00056	0.012	0.0089	0.0072
1,2,3,7,8,9 - Hexa CDD	< LD	0.014	0.0092	0.0079
1,2,3,4,6,7,8 - Hepta CDD	0.00032	0.0054	0.0043	0.0034
1,2,3,4,6,7,8,9 - Octa CDD	0.0000062	0.000027	0.000042	0.000025
2, 3, 7, 8 - Tetra CDF	0.0028	0.0082	0.031	0.014
1,2,3,7,8 - Penta CDF	< LD	0.0018	0.0044	0.0023
2,3,4,7,8 - Penta CDF	0.0084	0.037	0.12	0.054
1,2,3,4,7,8 - Hexa CDF	0.0024	0.011	0.046	0.020
1,2,3,6,7,8 - Hexa CDF	0.0017	0.0043	0.017	0.0076
2,3,4,6,7,8 - Hexa CDF	0.0015	0.0085	0.039	0.016
1,2,3,7,8,9 - Hexa CDF	< LD	< LD	0.0042	0.0029
1,2,3,4,6,7,8 - Hepta CDF	0.00030	0.0011	0.0067	0.0027
1,2,3,4,7,8,9 - Hepta CDF	< LD	0.00014	0.0014	0.00055
1,2,3,4,6,7,8,9 - Octa CDF	0.0000037	0.0000029	0.000032	0.000013
TOXIC EQUIVALENT	**0.018**	**0.20**	**0.33**	**0.18**
R: Reference conditions at 101.3 kPa and 25°C, and dry basis.				

Table 5-7 – STACK GAS MEASUREMENTS

SCHEDULE OF TESTS			
SERIAL NUMBER TEST	MEL GAZ E1	MEL GAZ E2	MEL GAZ E3
DATE	2018-09-22	2018-09-28	2018-09-29
START OF TEST	13:50	11:35	16:15
END OF TEST	17:40	14:25	19:05
DURATION OF THE TEST (MINUTES)	230	170	170
OXYGEN (O_2)			
O_2 (% v/v d) average	14.1	15.1	13.6
O_2 (% v/v d) minimum	13.0	14.1	12.6
O_2 (% v/v d) maximum	15.4	15.8	14.6
CARBON DIOXIDE (CO_2)			
CO_2 (% v/v d) average	5.2	4.4	5.6
CO_2 (% v/v d) minimum	4.4	4.0	4.9
CO_2 (% v/v d) maximum	6.0	5.0	6.3
CARBON MONOXIDE (CO)			
CO (ppmvd) average	2.6	3.4	2.6
CO (ppmvd) minimum	1.9	2.6	1.3
CO (ppmvd) maximum	3.9	4.4	3.5
CO (mg/Rm^3)	3.0	3.9	3.0
AVERAGE EMISSION (kg/h)	0.019	0.022	0.021
NITROGEN OXIDES (NO_X as NO_2)			
NO_X (ppmvd) average	44	49	66
NO_X (ppmvd) minimum	28	42	56
NO_X (ppmvd) maximum	59	58	77
NO_X equivalent NO_2 (mg/Rm^3)	84	93	124
AVERAGE EMISSION (kg/h)	0.53	0.54	0.87
SULPHUR DIOXIDES (SO_2)			
SO_2 (ppmvd) average	0	0	0.6
SO_2 (ppmvd) minimum	0	0	0
SO_2 (ppmvd) maximum	0	0	3.6
SO_2 equivalent NO_2 (mg/Rm^3)	0	0	1.7
AVERAGE EMISSION (kg/h)	0	0	0.012
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.			

6 CONCLUSION

According to the sampling methods and procedures combined with a rigorous quality control, the results of concentrations and / or emission rates presented in this report are valid and representative of the process operation conditions sampled for period test results.

The final results obtained are valid and representative of the operating conditions during the tests.

The sampling was made in compliance with the rules of the requirements of the Report No. EPS 3/UP/2, including methods recommended by “Environment and Climate Change Canada” (ECCC) of the Government of Canada inside “Environment Canada, The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology”. Report No. EPS 3/UP/2, Ottawa, 1986.

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7 REFERENCES

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APPENDIX 1
COMPUTED DATA



AEM Meliadine
18-5528
Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
DONNEES DES EQUIPEMENTS D'ECHANTILLONNAGE				
PRESSION BAROMÉTRIQUE ("Hg)	30.10	29.73	29.83	29.89
PRESSION STATIQUE ("H2O)	-0.08	-0.05	-0.05	-0.06
PRESSION STATIQUE (kPa)	-0.02	-0.01	-0.01	-0.01
COEFFICIENT DU COMPTEUR (25,25,25,25,	0.999	0.999	0.999	0.999
COEFFICIENT DU PITOT (05-07 5Q-501,05-(	0.774	0.774	0.774	0.774
DIAMÈTRE DE LA BUSE (po) (5Q-502,5Q-43	0.4684	0.4366	0.4366	0.4472
TEMPÉRATURE COMPTEUR (°F)	91	91	92	91
TEMPÉRATURE COMPTEUR (°C)	33	33	33	33
HUMIDITE DES GAZ & VOLUME ECHANTILLONNE				
VOLUME D'EAU (g)	133.3	121.6	186.7	147.2
VOLUME D'EAU (pi³)	6.40	5.84	8.96	7.07
HUMIDITÉ GAZ (BWO)	0.062	0.055	0.063	0.060
HUMIDITÉ GAZ (%v)	6.2	5.5	6.3	6.0
VOLUME GAZ REFERENCE (pi³R)	97.44	100.04	133.02	110.17
VOLUME GAZ REFERENCE (m³R)	**2.759**	**2.833**	**3.767**	**3.120**
CARACTERISTIQUES DU CONDUIT				
DIAMÈTRES AVANT LES TROUS D'ÉCHANT	5.0	5.0	5.0	
DIAMÈTRES APRÈS LES TROUS D'ÉCHANT	2.0	2.0	2.0	
DIAMÈTRE DU CONDUIT (pi)	2.71	2.71	2.71	
DIAMÈTRE DU CONDUIT (m)	0.826	0.826	0.826	
ÉPAISSEUR DU PORT D'ÉCHANTILLONNAC	7.5	7.5	7.5	
LONGUEUR DU CONDUIT (pi)	0.0	0.0	0.0	
LARGEUR DU CONDUIT (pi)	0.0	0.0	0.0	
DIAMÈTRE ÉQUIVALENT (pi)	#VALEUR!	#VALEUR!	#VALEUR!	
DIAMÈTRE ÉQUIVALENT (m)	#VALEUR!	#VALEUR!	#VALEUR!	
PRESSION CONDUIT ("Hg)	30.09	29.73	29.83	29.88
PRESSION COMPTEUR ("Hg)	30.25	29.81	29.95	30.00
SURFACE DU CONDUIT (pi²)	5.8	5.8	5.8	5.8
SURFACE DU CONDUIT (m²)	0.54	0.54	0.54	0.54
CARACTERISTIQUES DES GAZ				
TEMPÉRATURE CHEMINÉE (°F)	1340	1336	1440	1372
TEMPÉRATURE CHEMINÉE (°C)	727	724	782	744
CO_2 (%vs)	5.2	4.4	5.6	5.1
O_2 (%vs)	14.1	15.1	13.6	14.3
O_2 (%vh)	13.3	14.3	12.7	13.4
CO (ppmvs)	3	3	3	3
SO_2 (%vs)	0	0	0	0
N_2 (%vs)	80.6	80.5	80.8	80.6
Ar (%vs)	0.00	0.00	0.00	0.00
POIDS MOLECULAIRE SEC	29.40	29.31	29.44	29.39
POIDS MOLECULAIRE HUMIDE	28.70	28.69	28.72	28.70
VITESSE DES GAZ (pi/s)	39.3	33.4	44.2	38.9
VITESSE DES GAZ (m/s)	12.0	10.2	13.5	11.9
DEBITS GAZ ACTUELS (pi³/h)	815 078	692 166	915 770	807 671
DEBITS GAZ ACTUELS (m³/h)	23 080	19 600	25 932	22 871
DEBITS GAZ ACTUELS (pi³/min)(APCM)	13 585	11 536	15 263	13 461
DEBITS GAZ NORMALISES (pi³R/h)	229 478	194 320	241 695	221 831
DEBITS GAZ NORMALISES (m³R/h)	**6 498**	**5 503**	**6 844**	**6 282**
DEBITS GAZ NORMALISES (pi³R/min) (RPCI	3 825	3 239	4 028	3 697

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
INFORMATIONS D'ECHANTILLONNAGE				
COEFFICIENT DE L'ORIFICE DU COMPTEU	0.733	0.733	0.733	
VITESSE MAXIMALE (m/s)	12.75	11.35	14.34	
VITESSE MINIMALE (m/s)	10.47	9.17	12.30	
10%Vmax (pi/s)	1.28	1.14	1.43	
Pourcentage >10%Vmax	100%	100%	100%	
NOMBRE POINTS ΔP 20% et + de ΔPmoy	2	3	0	
ISOCINETISME MOYEN (%)	102.2	100.8	101.6	
% PTS RESPECT CRITERE ISO	100%	100%	100%	
DEBIT DE POMPAGE MAX (pi³/min)	0.91	0.65	0.82	
PRESSION DE VIDE MAX DURANT ESSAI (-	-2	-9	-4	
TEMPÉRATURE SONDE MAX (°F)	250	252	250	
TEMPÉRATURE SONDE MIN (°F)	250	243	250	
TEMPÉRATURE FILTRE MAX (°F)	260	261	250	
TEMPÉRATURE FILTRE MIN (°F)	260	246	250	
TEMPÉRATURE SORTIE MAX (°F)	67	67	40	
TEMPÉRATURE SORTIE MIN (°F)	40	67	40	
TEMPÉRATURE TRAPPE MAX (°F)	0	0	0	
TEMPÉRATURE TRAPPE MIN (°F)	0	0	0	
TEMPÉRATURE AUX 3 MAX (°F)	0	0	0	
TEMPÉRATURE AUX 3 MIN (°F)	0	0	0	
TEMPÉRATURE MODULE MAX (°F)	0	0	0	
TEMPÉRATURE MODULE MIN (°F)	0	0	0	
DEBIT DE POMPAGE MOYEN (pi³/min)	0.82	0.61	0.76	
4% DEBIT DE POMPAGE MOYEN (pi³/min)	0.033	0.024	0.030	
TEST DE FUITE AVANT LES ESSAIS À 15 "H	< 0.020	< 0.020	< 0.020	
TEST DE FUITE APRÈS LES ESSAIS (pi³/mi	< 0.020	< 0.020	< 0.020	
PARTICULES FILTRABLES SPE 1/RM/8				
MASSE FILTRE (mg)	48.2	48.4	46.0	47.5
MASSE SONDE (mg)	37.0	53.1	5.3	31.8
MASSE BLANC ACÉTONE (mg)	< 1			
VOLUME BLANC ACÉTONE (mL)	91			
RÉSIDUS ACÉTONE (%)	0.001			
MASSE SONDE (mg)	37.0	53.1	5.30	31.8
MASSE TOTALE (mg)	85.2	101.5	51.3	79.3
CONCENTRATION (mg/m³R)	**30.9**	**35.8**	**13.6**	**26.8**
CONCENTRATION (mg/m³R) à 7% O₂	**63.4**	**85.7**	**25.9**	**58.3**
CONCENTRATION (mg/m³R) à 11% O₂	**45.2**	**61.0**	**18.4**	**41.5**
TAUX D'ÉMISSION (kg/h)	0.20	0.20	0.093	0.16
TAUX D'ÉMISSION (g/s)	0.056	0.055	0.026	0.045
ACIDE CHLORHYDRIQUE (HCl)				
BLANC HCl (mg)	< 0.040			
CHLORURES (mg)	86.87	33.16	119.33	
HCl (mg)	89.34	34.10	122.72	82.1
HCl (mg/m³R)	32.4	12.0	32.6	25.67
HCl (ppmvs)	21.7	8.1	21.8	17.21
HCl (mg/m³R) 11% O₂	47.4	20.5	44.1	37.32
HCl (kg/h)	0.21	0.07	0.22	0.167

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX				
MÉTAUX PARTICULAIRES (µg)				
Aluminium (Al)	570.0	30.0	46.0	215.3
Antimoine (Sb)	245.0	3.60	219.0	155.9
Argent (Ag)	0.90	< 0.60	1.30	0.93
Arsenic (As)	17.2	1.30	30.9	16.5
Baryum (Ba)	7.28	0.65	1.06	3.00
Béryllium (Be)	< 0.050	< 0.060	< 0.050	< 0.053
Bismuth (Bi)	0.84	0.12	4.83	1.93
Bore (B)	4	4	4	4
Cadmium (Cd)	2.47	0.45	9.52	4.15
Calcium (Ca)	1930.0	309.0	243.0	827.3
Chrome (Cr)	18.20	5	73.4	32.2
Cobalt (Co)	0.50	< 0.10	0.20	0.27
Cuivre (Cu)	89.1	24.7	131.0	81.6
Étain (Sn)	77.4	4.00	166.0	82.5
Fer (Fe)	1070.0	33.0	82.0	395.0
Lithium (Li)	8.00	33.0	32.0	24.3
Magnésium (Mg)	216.0	34.0	36.0	95.3
Manganèse (Mn)	16.5	15.7	4.30	12.2
Molybdène (Mo)	4.80	< 0.60	8.90	4.77
Nickel (Ni)	8.10	0.40	2.00	3.50
Phosphore (P)				
Plomb (Pb)	127.0	36.0	444.0	202.3
Potassium (K)	10100.0	1170.0	10200.0	7156.7
Sélénium (Se)	< 0.50	< 0.50	0.50	0.50
Silicium (Si)	717.0	148.0	397.0	420.7
Sodium (Na)	7900.0	851.0	6890.0	5213.7
Strontium (Sr)	5.00	0.40	0.40	1.93
Tellurium (Te)				
Thallium (Tl)	< 0.10	< 0.10	< 0.10	< 0.10
Titane (Ti)	52.0	4.00	6.00	20.7
Uranium (U)				
Vanadium (V)	0.80	< 0.20	0.40	0.47
Zinc (Zn)	509.0	54.0	1070.0	544.3
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**23697.2**	**2762.4**	**20103.4**	**15521.0**
MÉTAUX TOTAUX	**23697.8**	**2764.6**	**20103.6**	**15522.0**
Proportion de métaux versus particules (%	**27.8**	**2.7**	**39.2**	**23.2**

AEM Meliadine
18-5528
Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX GAZEUX (µg)				
Aluminium (Al)	12.00	10.00	14.0	12.00
Antimoine (Sb)	< 0.30	< 0.30	< 0.30	< 0.30
Argent (Ag)	< 2.00	< 2.00	< 2.00	< 2.00
Arsenic (As)	< 0.30	< 0.30	< 0.30	< 0.30
Baryum (Ba)	0.45	0.55	0.20	0.40
Béryllium (Be)	< 0.20	< 0.20	< 0.20	< 0.20
Bismuth (Bi)	< 0.20	< 0.20	< 0.20	< 0.20
Bore (B)	22.5	10.40	99.3	44.1
Cadmium (Cd)	1.40	0.5	0.3	0.73
Calcium (Ca)	144.0	92.0	154.0	130.0
Chrome (Cr)	< 0.30	< 0.30	< 0.30	< 0.30
Cobalt (Co)	< 0.30	< 0.30	< 0.30	< 0.30
Cuivre (Cu)	2.60	1.10	2.30	2.00
Étain (Sn)	24.0	22.00	23.0	23.00
Fer (Fe)	21.00	521.0	54.0	198.7
Lithium (Li)	< 3.00	< 3.00	< 3.00	< 3.00
Magnésium (Mg)	101.0	13.00	39.0	51.0
Manganèse (Mn)	51.2	7.50	1.50	20.1
Molybdène (Mo)	< 2.00	< 2.00	< 2.00	< 2.00
Nickel (Ni)	0.60	0.40	0.30	0.43
Phosphore (P)				
Plomb (Pb)	< 2.00	< 2.00	< 2.00	< 2.00
Potassium (K)	34.0	< 30.0	< 30.0	< 31.3
Sélénium (Se)	0.90	0.30	0.50	0.57
Silicium (Si)	58.0	32.0	196.0	95.3
Sodium (Na)	< 20.0	< 20.0	< 20.0	< 20.0
Strontium (Sr)	< 0.30	< 0.30	< 0.30	< 0.30
Tellurium (Te)				
Thallium (Tl)	< 0.30	< 0.30	< 0.30	< 0.30
Titane (Ti)	< 3.00	< 3.00	< 3.00	< 3.00
Uranium (U)				
Vanadium (V)	< 0.70	< 0.60	< 0.70	< 0.67
Zinc (Zn)	9.70	2.60	5.10	5.80
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**483**	**745**	**622**	**617**
MÉTAUX TOTAUX	**518**	**778**	**654**	**650**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (µg)				
Aluminium (Al)	582.0	40.0	60.0	227.3
Antimoine (Sb)	245.3	3.90	219.3	156.2
Argent (Ag)	2.90	< 2.60	3.30	2.93
Arsenic (As)	17.5	1.60	31.2	16.8
Baryum (Ba)	7.73	1.20	1.26	3.40
Béryllium (Be)	< 0.250	< 0.260	< 0.250	< 0.253
Bismuth (Bi)	1.04	0.32	5.03	2.13
Bore (B)	27	14	103	48
Cadmium (Cd)	3.87	0.95	9.82	4.88
Calcium (Ca)	2074.0	401.0	397.0	957.3
Chrome (Cr)	18.50	5	73.7	32.5
Cobalt (Co)	0.80	< 0.40	0.50	0.57
Cuivre (Cu)	91.7	25.8	133.3	83.6
Étain (Sn)	101.4	26.00	189.0	105.5
Fer (Fe)	1091.0	554.0	136.0	593.7
Lithium (Li)	11.00	36.0	35.0	27.3
Magnésium (Mg)	317.0	47.0	75.0	146.3
Manganèse (Mn)	67.7	23.2	5.80	32.2
Molybdène (Mo)	6.80	< 2.60	10.90	6.77
Nickel (Ni)	8.70	0.80	2.30	3.93
Phosphore (P)				
Plomb (Pb)	129.0	38.0	446.0	204.3
Potassium (K)	10134.0	1200.0	10230.0	7188.0
Sélénium (Se)	1.40	0.80	1.00	1.07
Silicium (Si)	775.0	180.0	593.0	516.0
Sodium (Na)	7920.0	871.0	6910.0	5233.7
Strontium (Sr)	5.30	0.70	0.70	2.23
Tellurium (Te)				
Thallium (Tl)	< 0.40	< 0.40	< 0.40	< 0.40
Titane (Ti)	55.0	7.00	9.00	23.7
Uranium (U)				
Vanadium (V)	1.50	< 0.80	1.10	1.13
Zinc (Zn)	518.7	56.6	1075.1	550.1
Mercure (Hg)	0.89	0.36	0.05	0
MÉTAUX DÉTECTÉS	**24 216**	**3 536**	**20 757**	**16 170**
MÉTAUX TOTAUX	**24 217**	**3 543**	**20 758**	**16 173**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX PARTICULAIRE (µg/m^{3}R)				
Aluminium (Al)	207	11	12	76
Antimoine (Sb)	89	1.3	58	49
Argent (Ag)	0.33	< 0.21	0.35	0.29
Arsenic (As)	6.2	0.46	8.2	5.0
Baryum (Ba)	2.6	0.23	0.28	1.0
Béryllium (Be)	< 0.018	< 0.021	< 0.013	< 0.018
Bismuth (Bi)	0.30	0.042	1.3	0.54
Bore (B)	1.5	1.4	0.98	1.3
Cadmium (Cd)	0.90	0.16	2.5	1.2
Calcium (Ca)	699	109	65	291
Chrome (Cr)	6.6	1.8	19	9.3
Cobalt (Co)	0.18	< 0.035	0.053	0.090
Cuivre (Cu)	32	8.7	35	25
Étain (Sn)	28	1.4	44	25
Fer (Fe)	388	12	22	140
Lithium (Li)	2.9	12	8.5	7.7
Magnésium (Mg)	78	12	9.6	33
Manganèse (Mn)	6.0	5.5	1.1	4.2
Molybdène (Mo)	1.7	< 0.21	2.4	1.4
Nickel (Ni)	2.9	0.14	0.53	1.2
Phosphore (P)				
Plomb (Pb)	46	13	118	59
Potassium (K)	3660	413	2708	2260
Sélénium (Se)	< 0.18	< 0.18	0.13	0.16
Silicium (Si)	260	52	105	139
Sodium (Na)	2863	300	1829	1664
Strontium (Sr)	1.8	0.14	0.11	0.69
Tellurium (Te)				
Thallium (Tl)	< 0.036	< 0.035	< 0.027	< 0.033
Titane (Ti)	19	1.4	1.6	7.3
Uranium (U)				
Vanadium (V)	0.29	< 0.071	0.11	0.16
Zinc (Zn)	184	19	284	163
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**8588**	**975**	**5337**	**4967**
MÉTAUX TOTAUX	**8588**	**976**	**5337**	**4967**

AEM Meliadine
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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX GAZEUX (µg/m^{3}R)				
Aluminium (Al)	4.3	3.5	3.7	3.9
Antimoine (Sb)	< 0.11	< 0.11	< 0.080	< 0.098
Argent (Ag)	< 0.72	< 0.71	< 0.53	< 0.65
Arsenic (As)	< 0.11	< 0.11	< 0.080	< 0.098
Baryum (Ba)	0.16	0.19	0.053	0.14
Béryllium (Be)	< 0.072	< 0.071	< 0.053	< 0.065
Bismuth (Bi)	< 0.072	< 0.071	< 0.053	< 0.065
Bore (B)	8.2	3.7	26	13
Cadmium (Cd)	0.51	0.18	0.080	0.25
Calcium (Ca)	52	32	41	42
Chrome (Cr)	< 0.11	< 0.11	< 0.080	< 0.098
Cobalt (Co)	< 0.11	< 0.11	< 0.080	< 0.098
Cuivre (Cu)	0.94	0.39	0.61	0.65
Étain (Sn)	8.7	7.8	6.1	7.5
Fer (Fe)	7.6	184	14	69
Lithium (Li)	< 1.1	< 1.1	< 0.80	< 0.98
Magnésium (Mg)	37	4.6	10	17
Manganèse (Mn)	19	2.6	0.40	7.2
Molybdène (Mo)	< 0.72	< 0.71	< 0.53	< 0.65
Nickel (Ni)	0.22	0.14	0.080	0.15
Phosphore (P)				
Plomb (Pb)	< 0.72	< 0.71	< 0.53	< 0.65
Potassium (K)	12	< 11	< 8.0	< 10
Sélénium (Se)	0.33	0.11	0.13	0.19
Silicium (Si)	21	11	52	28
Sodium (Na)	< 7.2	< 7.1	< 5.3	< 6.5
Strontium (Sr)	< 0.11	< 0.11	< 0.080	< 0.098
Tellurium (Te)				
Thallium (Tl)	< 0.11	< 0.11	< 0.080	< 0.098
Titane (Ti)	< 1.1	< 1.1	< 0.80	< 0.98
Uranium (U)				
Vanadium (V)	< 0.25	< 0.21	< 0.19	< 0.22
Zinc (Zn)	3.5	0.92	1.4	1.9
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**175**	**263**	**165**	**201**
MÉTAUX TOTAUX	**188**	**275**	**174**	**212**

AEM Meliadine
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Incinérateur
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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (µg/m^{3}R)				
Aluminium (Al)	211	14	16	80
Antimoine (Sb)	89	1.4	58	49
Argent (Ag)	1.1	< 0.92	0.88	0.95
Arsenic (As)	6.3	0.56	8.3	5.1
Baryum (Ba)	2.8	0.42	0.33	1.2
Béryllium (Be)	< 0.091	< 0.092	< 0.066	< 0.083
Bismuth (Bi)	0.38	0.11	1.3	0.61
Bore (B)	9.6	5.1	27	14
Cadmium (Cd)	1.4	0.34	2.6	1.4
Calcium (Ca)	752	142	105	333
Chrome (Cr)	6.7	1.9	20	9.4
Cobalt (Co)	0.29	< 0.14	0.13	0.19
Cuivre (Cu)	33	9.1	35	26
Étain (Sn)	37	9.2	50	32
Fer (Fe)	395	196	36	209
Lithium (Li)	4.0	13	9.3	8.7
Magnésium (Mg)	115	17	20	50
Manganèse (Mn)	25	8.2	1.5	11
Molybdène (Mo)	2.5	< 0.92	2.9	2.1
Nickel (Ni)	3.2	0.28	0.61	1.3
Phosphore (P)				
Plomb (Pb)	47	13	118	60
Potassium (K)	3673	424	2716	2271
Sélénium (Se)	0.51	0.28	0.27	0.35
Silicium (Si)	281	64	157	167
Sodium (Na)	2870	307	1834	1671
Strontium (Sr)	1.9	0.25	0.19	0.78
Tellurium (Te)				
Thallium (Tl)	< 0.14	< 0.14	< 0.11	< 0.13
Titane (Ti)	20	2.5	2.4	8.3
Uranium (U)				
Vanadium (V)	0.54	< 0.28	0.29	0.37
Zinc (Zn)	188	20	285	164
Mercure (Hg)	0.32	0.13	0.013	0.15
MÉTAUX DÉTECTÉS	**8776**	**1248**	**5511**	**5178**
MÉTAUX TOTAUX	**8777**	**1251**	**5511**	**5179**

AEM Meliadine
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Incinérateur
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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (ug/m^{3}R) À 11 % DE O_2				
Aluminium (Al)	307	24	21	118
Antimoine (Sb)	129	2.3	78	70
Argent (Ag)	1.5	< 1.6	1.2	1.4
Arsenic (As)	9.2	0.96	11	7.1
Baryum (Ba)	4.1	0.72	0.45	1.7
Béryllium (Be)	< 0.13	< 0.16	< 0.089	< 0.13
Bismuth (Bi)	0.55	0.19	1.8	0.85
Bore (B)	14	8.6	37	20
Cadmium (Cd)	2.0	0.57	3.5	2.0
Calcium (Ca)	1095	239	142	492
Chrome (Cr)	9.8	3.2	26	13
Cobalt (Co)	0.42	< 0.24	0.18	0.28
Cuivre (Cu)	48	15	48	37
Étain (Sn)	54	16	68	46
Fer (Fe)	576	331	49	318
Lithium (Li)	5.8	21	13	13
Magnésium (Mg)	167	28	27	74
Manganèse (Mn)	36	14	2.1	17
Molybdène (Mo)	3.6	< 1.6	3.9	3.0
Nickel (Ni)	4.6	0.48	0.82	2.0
Phosphore (P)				
Plomb (Pb)	68	23	160	83
Potassium (K)	5348	716	3662	3242
Sélénium (Se)	0.74	0.48	0.36	0.52
Silicium (Si)	409	107	212	243
Sodium (Na)	4180	520	2473	2391
Strontium (Sr)	2.8	0.42	0.25	1.2
Tellurium (Te)				
Thallium (Tl)	< 0.21	< 0.24	< 0.14	< 0.20
Titane (Ti)	29	4.2	3.2	12
Uranium (U)				
Vanadium (V)	0.79	< 0.48	0.39	0.55
Zinc (Zn)	274	34	385	231
Mercure (Hg)	0.47	0.21	0.018	0.23
MÉTAUX DÉTECTÉS	**12780**	**2111**	**7430**	**7440**
MÉTAUX TOTAUX	**12780**	**2115**	**7430**	**7442**
CLASSE I (Cu, Pb, V & Zn)	**391**	**72**	**593**	**352**
LIGNE DIRECTRICE DU CCME		**1500**		
CLASSE II (As, Cr & Ni)	**24**	**4.7**	**38**	**22**
LIGNE DIRECTRICE DU CCME		**500**		
CLASSE III (Cd, Hg & Tl)	**2.5**	**0.78**	**3.5**	**2.3**
LIGNE DIRECTRICE DU CCME		**150**		
AUTRES MÉTAUX (Al, Ag, Ba, Be, B, Sn, Fe,	**12363**	**2033**	**6795**	**7064**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (g/h)				
Aluminium (Al)	1.4	0.078	0.11	0.52
Antimoine (Sb)	0.58	0.0076	0.40	0.33
Argent (Ag)	0.0068	< 0.0051	0.0060	0.0060
Arsenic (As)	0.041	0.0031	0.057	0.034
Baryum (Ba)	0.018	0.0023	0.0023	0.0076
Béryllium (Be)	< 0.00059	< 0.00051	< 0.00045	< 0.00052
Bismuth (Bi)	0.0024	0.00062	0.0091	0.0041
Bore (B)	0.063	0.028	0.19	0.093
Cadmium (Cd)	0.0091	0.0018	0.018	0.0096
Calcium (Ca)	4.9	0.78	0.72	2.1
Chrome (Cr)	0.044	0.010	0.13	0.063
Cobalt (Co)	0.0019	< 0.00078	0.00091	0.0012
Cuivre (Cu)	0.22	0.050	0.24	0.17
Étain (Sn)	0.24	0.051	0.34	0.21
Fer (Fe)	2.6	1.1	0.25	1.3
Lithium (Li)	0.026	0.070	0.064	0.053
Magnésium (Mg)	0.75	0.091	0.14	0.32
Manganèse (Mn)	0.16	0.045	0.011	0.072
Molybdène (Mo)	0.016	< 0.0051	0.020	0.014
Nickel (Ni)	0.020	0.0016	0.0042	0.0087
Phosphore (P)				
Plomb (Pb)	0.30	0.074	0.81	0.40
Potassium (K)	24	2.3	19	15
Sélénium (Se)	0.0033	0.0016	0.0018	0.0022
Silicium (Si)	1.8	0.35	1.1	1.1
Sodium (Na)	19	1.7	13	11
Strontium (Sr)	0.012	0.0014	0.0013	0.0050
Tellurium (Te)				
Thallium (Tl)	< 0.00094	< 0.00078	< 0.00073	< 0.00082
Titane (Ti)	0.13	0.014	0.016	0.053
Uranium (U)				
Vanadium (V)	0.0035	< 0.0016	0.0020	0.0024
Zinc (Zn)	1.2	0.11	2.0	1.1
Mercure (Hg)	0.0021	0.00070	0.000091	0.00096
MÉTAUX DÉTECTÉS	**57**	**6.9**	**38**	**34**
MÉTAUX TOTAUX	**57**	**6.9**	**38**	**34**

R : Conditions de référence à 101.3 kPa et 25 °C, sur base sèche.

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-1

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
14 h 45	1	1	5	0.15	1.75	1300	79	79	79	534.62	538.31	**3.69**	11.1	98	14.1	5.2	3	-2.0	250	260	40	-	-	-
		1	5	0.15	1.76	1300	82	82	82	538.31	541.93	**3.62**	11.1	96				-2.0	250	260	40	-	-	-
		2	5	0.15	1.77	1300	83	83	83	541.93	545.49	**3.56**	11.1	94				-2.0	250	260	40	-	-	-
		2	5	0.14	1.65	1300	84	84	84	545.49	549.01	**3.52**	10.8	96				-2.0	250	260	40	-	-	-
		3	5	0.18	2.07	1348	84	84	84	549.01	553.11	**4.10**	12.4	100				-2.0	250	260	40	-	-	-
		3	5	0.18	2.07	1349	85	85	85	553.11	557.22	**4.11**	12.4	100				-2.0	250	260	40	-	-	-
		4	5	0.18	2.07	1354	86	86	86	557.22	561.31	**4.09**	12.4	100				-2.0	250	260	40	-	-	-
		4	5	0.18	2.08	1346	88	88	88	561.31	565.42	**4.11**	12.4	100				-2.0	250	260	40	-	-	-
		5	5	0.18	2.08	1348	88	88	88	565.42	569.51	**4.09**	12.4	99				-2.0	250	260	40	-	-	-
		5	5	0.18	2.08	1350	89	89	89	569.51	573.61	**4.10**	12.4	99				-2.0	250	260	40	-	-	-
		6	5	0.18	2.07	1361	89	89	89	573.61	577.68	**4.07**	12.4	99				-2.0	250	260	40	-	-	-
		6	5	0.18	2.07	1362	89	89	89	577.68	581.77	**4.09**	12.4	99				-2.0	250	260	40	-	-	-
	2	6	5	0.19	2.19	1364	92	92	92	581.77	586.08	**4.31**	12.8	102				-2.0	250	260	40	-	-	-
		6	5	0.19	2.21	1352	92	92	92	586.08	590.50	**4.42**	12.7	104				-2.0	250	260	40	-	-	-
		5	5	0.19	2.21	1356	94	94	94	590.50	595.00	**4.50**	12.7	105				-2.0	250	260	40	-	-	-
		5	5	0.19	2.22	1348	94	94	94	595.00	599.50	**4.50**	12.7	105				-2.0	250	260	40	-	-	-
		4	5	0.19	2.22	1352	95	95	95	599.50	604.03	**4.53**	12.7	106				-2.0	250	260	40	-	-	-
		4	5	0.19	2.22	1352	96	96	96	604.03	608.50	**4.47**	12.7	104				-2.0	250	260	40	-	-	-
		3	5	0.18	2.11	1355	97	97	97	608.50	613.00	**4.50**	12.4	108				-2.0	250	260	40	-	-	-
		3	5	0.18	2.11	1355	97	97	97	613.00	617.49	**4.49**	12.4	107				-2.0	250	260	40	-	-	-
		2	5	0.15	1.78	1337	98	98	98	617.49	621.69	**4.20**	11.2	109				-2.0	250	260	67	-	-	-
		2	5	0.15	1.82	1295	98	98	98	621.69	625.82	**4.13**	11.1	106				-2.0	250	260	67	-	-	-
		1	5	0.13	1.54	1337	99	99	99	625.82	629.70	**3.88**	10.5	108				-2.0	250	260	67	-	-	-
		1	5	0.13	1.54	1345	99	99	99	629.70	633.54	**3.84**	10.5	107				-2.0	250	260	67	-	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-2

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O)		Températures (°F)			Orifice	Volume de gaz (pi³)			Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F)					
				ΔP	ΔH	Cheminé	Compteu Entrée	Compteu Sortie		Début	Fin	Total							Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
11 h 33	1	1	5	0.15	1.31	1290	71	71	71	636.82	640.06	3.24	11.2	99	15.1	4.4	3	-7.0	247	250	67	-	-	-
		1	5	0.15	1.28	1341	72	72	72	640.06	643.25	3.19	11.3	99				-7.5	247	256	67	-	-	-
		1	5	0.15	1.27	1349	73	73	73	643.25	646.52	3.27	11.4	101				-8.5	250	252	67	-	-	-
		2	5	0.14	1.19	1352	74	74	74	646.52	649.71	3.19	11.0	102				-8.0	247	255	67	-	-	-
		2	5	0.14	1.19	1354	76	76	76	649.71	652.87	3.16	11.0	101				-7.5	251	252	67	-	-	-
		2	5	0.14	1.20	1354	78	78	78	652.87	656.06	3.19	11.0	102				-7.5	247	253	67	-	-	-
		3	5	0.13	1.12	1344	80	80	80	656.06	659.14	3.08	10.6	101				-7.0	247	252	67	-	-	-
		3	5	0.13	1.13	1340	82	82	82	659.14	662.29	3.15	10.5	103				-7.0	248	249	67	-	-	-
		3	5	0.13	1.13	1348	83	83	83	662.29	665.39	3.10	10.6	101				-9.0	248	250	67	-	-	-
		4	5	0.13	1.13	1347	85	85	85	665.39	668.50	3.11	10.6	101				-9.0	246	250	67	-	-	-
		4	5	0.13	1.13	1345	86	86	86	668.50	671.62	3.12	10.6	101				-6.5	252	253	67	-	-	-
		4	5	0.13	1.14	1348	88	88	88	671.62	674.77	3.15	10.6	102				-6.5	252	253	67	-	-	-
		5	5	0.13	1.15	1334	89	89	89	674.77	677.84	3.07	10.5	99				-9.0	246	249	67	-	-	-
		5	5	0.13	1.15	1330	91	91	91	677.84	680.96	3.12	10.5	100				-9.0	243	249	67	-	-	-
		5	5	0.13	1.15	1337	92	92	92	680.96	684.09	3.13	10.5	100				-9.0	252	252	67	-	-	-
		6	5	0.12	1.07	1334	93	93	93	684.09	687.13	3.04	10.1	101				-9.0	251	255	67	-	-	-
		6	5	0.12	1.07	1335	94	94	94	687.13	690.18	3.05	10.1	101				-9.0	249	251	67	-	-	-
		6	5	0.12	1.07	1340	95	95	95	690.18	693.21	3.03	10.1	101				-9.0	246	255	67	-	-	-
	2	6	5	0.12	1.07	1338	96	96	96	693.21	696.26	3.05	10.1	101				-9.0	248	259	67	-	-	-
		6	5	0.12	1.07	1338	97	97	97	696.26	699.31	3.05	10.1	101				-9.0	246	246	67	-	-	-
		6	5	0.12	1.08	1328	97	97	97	699.31	702.37	3.06	10.1	101				-9.0	251	250	67	-	-	-
		5	5	0.12	1.07	1344	98	98	98	702.37	705.44	3.07	10.1	101				-9.0	251	261	67	-	-	-
		5	5	0.12	1.07	1344	98	98	98	705.44	708.51	3.07	10.1	101				-9.0	249	252	67	-	-	-
		5	5	0.12	1.07	1345	99	99	99	708.51	711.60	3.09	10.1	102				-9.0	249	252	67	-	-	-
		4	5	0.12	1.07	1342	99	99	99	711.60	714.66	3.06	10.1	101				-9.0	249	252	67	-	-	-
		4	5	0.10	0.90	1329	100	100	100	714.66	717.50	2.84	9.2	102				-9.0	249	252	67	-	-	-
		4	5	0.10	0.91	1326	101	101	101	717.50	720.31	2.81	9.2	101				-9.0	249	252	67	-	-	-
		3	5	0.10	0.91	1326	101	101	101	720.31	723.10	2.79	9.2	100				-9.0	249	252	67	-	-	-
		3	5	0.10	0.90	1330	102	102	102	723.10	725.88	2.78	9.2	99				-9.0	249	252	67	-	-	-
		3	5	0.10	0.90	1330	102	102	102	725.88	728.68	2.80	9.2	100				-9.0	249	252	67	-	-	-
		2	5	0.10	0.91	1326	103	103	103	728.68	731.49	2.81	9.2	100				-9.0	249	252	67	-	-	-
		2	5	0.10	0.92	1316	104	104	104	731.49	734.29	2.80	9.2	99				-9.0	249	252	67	-	-	-
		2	5	0.10	0.91	1317	104	104	104	734.29	737.13	2.84	9.2	101				-9.0	249	252	67	-	-	-
		1	5	0.10	0.92	1311	105	105	105	737.13	740.00	2.87	9.2	102				-9.0	249	252	67	-	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-3

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
16:14	1	1	5	0.20	1.74	1327	78	78	78	747.13	750.85	3.72	13.0	99	13.6	5.6	3	-3.0	250	250	40	-	-	-
		1	5	0.20	1.72	1347	79	79	79	750.85	754.60	3.75	13.1	101				-3.0	250	250	40	-	-	-
		1	5	0.20	1.72	1350	80	80	80	754.60	758.43	3.83	13.1	103				-3.0	250	250	40	-	-	-
		2	5	0.20	1.71	1360	81	81	81	758.43	762.18	3.75	13.1	101				-3.0	250	250	40	-	-	-
		2	5	0.20	1.70	1374	81	81	81	762.18	765.96	3.78	13.2	102				-3.0	250	250	40	-	-	-
		2	5	0.20	1.70	1378	82	82	82	765.96	769.75	3.79	13.2	102				-3.0	250	250	40	-	-	-
		3	5	0.22	1.87	1380	83	83	83	769.75	773.68	3.93	13.8	101				-3.0	250	250	40	-	-	-
		3	5	0.23	1.95	1393	84	84	84	773.68	777.76	4.08	14.2	103				-3.0	250	250	40	-	-	-
		3	5	0.23	1.94	1401	85	85	85	777.76	781.76	4.00	14.2	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.93	1410	85	85	85	781.76	785.75	3.99	14.3	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.92	1420	86	86	86	785.75	789.77	4.02	14.3	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.93	1423	87	87	87	789.77	793.77	4.00	14.3	101				-3.0	250	250	40	-	-	-
		5	5	0.23	1.92	1431	88	88	88	793.77	797.79	4.02	14.3	101				-3.0	250	250	40	-	-	-
		5	5	0.20	1.68	1418	89	89	89	797.79	801.59	3.80	13.3	102				-3.0	250	250	40	-	-	-
		5	5	0.20	1.68	1430	90	90	90	801.59	805.38	3.79	13.4	102				-3.0	250	250	40	-	-	-
		6	5	0.20	1.69	1418	90	90	90	805.38	809.19	3.81	13.3	102				-3.0	250	250	40	-	-	-
		6	5	0.20	1.67	1440	90	90	90	809.19	813.00	3.81	13.4	103				-3.0	250	250	40	-	-	-
		6	5	0.20	1.67	1445	91	91	91	813.00	816.78	3.78	13.4	102				-4.0	250	250	40	-	-	-
	2	6	5	0.20	1.66	1451	91	91	91	816.78	820.57	3.79	13.4	102				-4.0	250	250	40	-	-	-
		6	5	0.20	1.66	1460	92	92	92	820.57	824.36	3.79	13.5	102				-4.0	250	250	40	-	-	-
		6	5	0.20	1.65	1467	93	93	93	824.36	828.17	3.81	13.5	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1476	94	94	94	828.17	831.88	3.71	13.2	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1479	95	95	95	831.88	835.60	3.72	13.2	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1481	96	96	96	835.60	839.27	3.67	13.2	101				-4.0	250	250	40	-	-	-
		5	5	0.19	1.55	1502	97	97	97	839.27	842.94	3.67	13.3	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1518	99	99	99	842.94	846.82	3.88	14.0	103				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1518	99	99	99	846.82	850.70	3.88	14.0	103				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1520	100	100	100	850.70	854.57	3.87	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.72	1518	101	101	101	854.57	858.43	3.86	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1525	102	102	102	858.43	862.27	3.84	14.0	101				-4.0	250	250	40	-	-	-
		5	5	0.21	1.72	1522	103	103	103	862.27	866.14	3.87	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.17	1.39	1522	104	104	104	866.14	869.62	3.48	12.6	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.44	1460	105	105	105	869.62	873.16	3.54	12.4	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.46	1436	106	106	106	873.16	876.67	3.51	12.3	100				-4.0	250	250	40	-	-	-
		5	5	0.17	1.47	1429	106	106	106	876.67	880.25	3.58	12.3	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.48	1421	107	107	107	880.25	883.85	3.60	12.3	102				-4.0	250	250	40	-	-	-

AEM Meliadine
18-5528
Incinérateur
COSV

HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DONNÉES DES ÉQUIPEMENTS D'ÉCHANTILLONNAGE									
PRESSION BAROMÉTRIQUE ("Hg)		30.10		29.73		29.83			29.89
PRESSION STATIQUE ("H2O)		-0.08		-0.05		-0.05			-0.06
PRESSION STATIQUE (kPa)		-0.02		-0.01		-0.01			-0.01
COEFFICIENT DU COMPTEUR (19)		0.997		0.997		0.997			0.997
COEFFICIENT DU PITOT (03-06 3Q-371,03-06 3Q-503)		0.778		0.781		0.781			0.780
DIAMÈTRE DE LA BUSE (po) (3Q-371,3Q-503)		0.3741		0.4958		0.4958			0.4552
TEMPÉRATURE COMPTEUR (°F)		60		60		60			60
TEMPÉRATURE COMPTEUR (°C)		16		16		16			16
HUMIDITÉ DES GAZ & VOLUME ÉCHANTILLONNÉ									
MASSE D'EAU (g)		174.8		134.8		259.1			189.6
VOLUME D'EAU (pi^3)		8.39		6.47		12.44			9.10
HUMIDITÉ GAZ (BWO)		0.066		0.051		0.066			0.061
HUMIDITÉ GAZ (% v/v)		6.6		5.1		6.6			6.1
VOLUME GAZ REFERENCE (pi^3R)		119.19		119.67		176.29			138.38
VOLUME GAZ REFERENCE (m^3R)		**3.375**		**3.389**		**4.992**			**3.919**
CARACTERISTIQUES DU CONDUIT									
DIAMÈTRES AVANT LES TROUS D'ÉCHANTILLONNAG		5.0		5.0		5.00			5.0
DIAMÈTRES APRÈS LES TROUS D'ÉCHANTILLONNAG		2.0		2.0		2.00			2.0
DIAMÈTRE DU CONDUIT (pi)		2.71		2.71		2.71			2.71
DIAMÈTRE DU CONDUIT (m)		0.826		0.826		0.826			0.83
ÉPAISSEUR DU PORT D'ÉCHANTILLONNAGE (po)		7.5		7.5		7.5			
LONGUEUR DU CONDUIT (pi)		0.0		0.0		0.0			
LARGEUR DU CONDUIT (pi)		0.0		0.0		0.0			
PRESSION CONDUIT ("Hg)		30.09		29.73		29.83			29.88
PRESSION COMPTEUR ("Hg)		30.13		29.81		29.95			29.96
SURFACE DU CONDUIT (pi^2)		5.8		5.8		5.8			5.8
SURFACE DU CONDUIT (m^2)		0.54		0.54		0.54			0.54
CARACTERISTIQUES DES GAZ									
TEMPÉRATURE CHEMINÉE (°F)		1339		1333		1435			1369
TEMPÉRATURE CHEMINÉE (°C)		726.0		722.8		779.5			742.7
CO_2 (%vs)		5.2		4.4		5.6			5.1
O_2 (%vs)		14.1		15.1		13.6			14.3
O_2 (%vh)		13.2		14.3		12.7			13.4
CO (ppmvs)		3		3		3			3
SO_2 (%vs)		0		0		0			
N_2 (%vs)		80.6		80.5		80.8			81
Ar (%vs)		0.00		0.00		0.00			0.0
POIDS MOLECULAIRE SEC		29.40		29.31		29.44			29.39
POIDS MOLECULAIRE HUMIDE		28.65		28.73		28.69			28.69
VITESSE DES GAZ (pi/s)		38.3		34.8		45.6			39.6
VITESSE DES GAZ (m/s)		11.7		10.6		13.9			12.1
DEBIT GAZ ACTUELS (pi^3/h)		794 892		722 251		946 277			821 140
DEBIT GAZ ACTUELS (m^3/h)		22 509		20 452		26 796			23 252
DEBIT GAZ ACTUELS (pi^3/min)(APCM)		13 248		12 038		15 771			13 686
DEBIT GAZ NORMALISES (pi^3R/h)		222 994		203 892		249 680			225 522
DEBIT GAZ NORMALISES (m^3R/h)		**6 314**		**5 774**		**7 070**			**6 386**
DEBIT GAZ NORMALISES (pi^3R/min) (RPCM)		3 717		3 398		4 161			3 759
INFORMATIONS D'ÉCHANTILLONNAGE									
VITESSE MAXIMALE (m/s)		13.55		11.89		15.22			13.6
VITESSE MINIMALE (m/s)		9.45		9.25		12.42			10.4
10%Vmax (m/s)		1.35		1.19		1.52			1.4
Pourcentage >10%Vmax		75%		100%		100%			92%
NOMBRE POINTS ΔP 20% et + de ΔPmoy		12		5		0			
ISOCINÉTISME MOYEN (%)		101.1		100.9		101.2			101
% PTS RESPECT CRITERE ISO		100%		100%		100%			100%
DEBIT DE POMPAGE MAX (pi^3/min)		≤ 0.54		≤ 0.89		≤ 1.03			0.8
PRESSION DE VIDE MAX DURANT ESSAI (-"Hg)		-2		-6		-5			-4.00
TEMPÉRATURE SONDE MAX (°F)		250		250		254			251.33
TEMPÉRATURE SONDE MIN (°F)		250		235		238			241
TEMPÉRATURE FILTRE MAX (°F)		250		260		262			257
TEMPÉRATURE FILTRE MIN (°F)		250		244		243			246
TEMPÉRATURE SORTIE MAX (°F)		40		68		68			59
TEMPÉRATURE SORTIE MIN (°F)		40		68		66			58
TEMPÉRATURE TRAPPE MAX (°F)		40		58		56			51
TEMPÉRATURE TRAPPE MIN (°F)		40		43		40			41
DEBIT DE POMPAGE MOYEN (pi^3/min)		0.48		0.78		0.95			
4% DEBIT DE POMPAGE MOYEN (pi^3/min)		0.019		0.031		0.038			
TEST DE FUITE AVANT LES ESSAIS À 15 "Hg (pi^3/min)		< 0.020		< 0.020		< 0.020			
TEST DE FUITE APRÈS LES ESSAIS (pi^3/min)		< 0.020		< 0.020		< 0.020			0.020

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES LIMITES DE DETECTION (pg)									
2,3,7,8 - Tetra CDD		1		2		7			3.3
1,2,3,7,8 - Penta CDD		3		9		10			7.3
1,2,3,4,7,8 - Hexa CDD		3		7		10			6.7
1,2,3,6,7,8 - Hexa CDD		3		6		10			6.3
1,2,3,7,8,9 - Hexa CDD		3		7		10			6.7
1,2,3,4,6,7,8 - Hepta CDD		6		10		10			8.7
1,2,3,4,6,7,8,9 - Octa CDD		20		10		20			16.7
2, 3, 7, 8 - Tetra CDF		4		6		9			6.3
1,2,3,7,8 - Penta CDF		8		9		20			12.3
2,3,4,7,8 - Penta CDF		6		7		10			7.7
1,2,3,4,7,8 - Hexa CDF		4		10		10			8.0
1,2,3,6,7,8 - Hexa CDF		4		10		10			8.0
2,3,4,6,7,8 - Hexa CDF		4		10		10			8.0
1,2,3,7,8,9 - Hexa CDF		6		20		20			15.3
1,2,3,4,6,7,8 - Hepta CDF		3		5		20			9.3
1,2,3,4,7,8,9 - Hepta CDF		6		8		20			11.3
1,2,3,4,6,7,8,9 - Octa CDF		9		7		30			15.3
Total Tetra CDD		1		2		7			3.3
Total Penta CDD		3		9		10			7.3
Total Hexa CDD		3		7		10			6.7
Total Hepta CDD		6		10		10			8.7
Sommation des PCDDs		20		10		20			16.7
Total Tetra CDF		4		6		9			6.3
Total Penta CDF		8		9		20			12.3
Total Hexa CDF		6		20		20			15.3
Total Hepta CDF		6		8		20			11.3
Sommation des PCDFs		9		20		30			19.7
DIOXINES ET FURANNES (pg)									
2,3,7,8 - Tetra CDD	**1**	< 1.00	< LD	5.00	5.00	< 7.00	< LD	4.3	4.3
1,2,3,7,8 - Penta CDD	**1**	< 3.00	< LD	47.0	47.0	23.0	23.0	24.3	24.3
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 3.00	< LD	53.0	5.30	28.0	2.80	2.80	28.0
1,2,3,6,7,8 - Hexa CDD	**0.1**	3.0	0.3	71.0	7.10	63.0	6.30	4.57	45.7
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 3.00	< LD	81.0	8.10	65.0	6.50	4.97	49.7
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	17.0	0.17	316.0	3.16	307.0	3.07	2.13	213.3
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	33.0	0.0033	160.0	0.016	300.0	0.030	0.016	164.3
2, 3, 7, 8 - Tetra CDF	**0.1**	15.0	1.50	48.0	4.80	216.0	21.6	9.30	93.0
1,2,3,7,8 - Penta CDF	**0.05**	< 8.00	< LD	21.0	1.05	62.0	3.10	1.52	30.3
2,3,4,7,8 - Penta CDF	**0.5**	9.00	4.50	43.0	21.5	165.0	82.5	36.2	72.3
1,2,3,4,7,8 - Hexa CDF	**0.1**	13.0	1.30	62.0	6.20	326.0	32.6	13.4	133.7
1,2,3,6,7,8 - Hexa CDF	**0.1**	9.00	0.90	25.0	2.50	120.0	12.0	5.13	51.3
2,3,4,6,7,8 - Hexa CDF	**0.1**	8.00	0.80	50.0	5.00	273.0	27.3	11.0	110.3
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 6.00	< LD	< 20.0	< LD	30.0	3.00	1.9	18.7
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	16.0	0.16	64.0	0.64	474.0	4.74	1.85	184.7
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 6.00	< LD	8.0	0.08	100.0	1.00	0.38	38.0
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	20.0	0.0020	17.0	0.0017	227.0	0.023	0.0088	88.0
Total Tetra CDD	**MDDEFP**	9.00		159.0		214.0			127.3
Total Penta CDD		11.0		446.0		406.0			287.7
Total Hexa CDD		25.0		900.0		718.0			547.7
Total Hepta CDD		20.0		334.0		315.0			223.0
Sommation des PCDDs		99.0		2000.0		1950.0			1349.7
Total Tetra CDF		100.0		282.0		1140.0			507.3
Total Penta CDF		72.0		406.0		1540.0			672.7
Total Hexa CDF		32.0		172.0		963.0			389.0
Total Hepta CDF		28.0		123.0		880.0			343.7
Sommation des PCDFs		253.0		1000.0		4750.0			2001.0
ÉQUIVALENCE TOXIQUE TOTALE			**9.64**		**117.4**		**229.6**	**118.9**	
CONGÉNÈRES TOXIQUES TOTAUX		**173.0**		**1091.0**		**2786.0**			**1350.0**
GROUPES HOMOLOGUES TOTAUX		**649.0**		**5822.0**		**12876.0**			**6449.0**

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES (ng/m³R)									
2,3,7,8 - Tetra CDD	**1**	< 0.00030	< LD	0.0015	0.0015	< 0.0014	< LD	0.0011	0.0011
1,2,3,7,8 - Penta CDD	**1**	< 0.00089	< LD	0.014	0.014	0.0046	0.0046	0.0065	0.0065
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.00089	< LD	0.016	0.0016	0.0056	0.00056	0.00074	0.0074
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.00089	0.000089	0.021	0.0021	0.013	0.0013	0.0011	0.011
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.00089	< LD	0.024	0.0024	0.013	0.0013	0.0013	0.013
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.0050	0.000050	0.093	0.00093	0.061	0.00061	0.00053	0.053
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.0098	0.0000010	0.047	0.0000047	0.060	0.0000060	0.0000039	0.039
2, 3, 7, 8 - Tetra CDF	**0.1**	0.0044	0.00044	0.014	0.0014	0.043	0.0043	0.0021	0.021
1,2,3,7,8 - Penta CDF	**0.05**	< 0.0024	< LD	0.0062	0.00031	0.012	0.00062	0.00035	0.0070
2,3,4,7,8 - Penta CDF	**0.5**	0.0027	0.0013	0.013	0.0063	0.033	0.017	0.0081	0.016
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.0039	0.00039	0.018	0.0018	0.065	0.0065	0.0029	0.029
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.0027	0.00027	0.0074	0.00074	0.024	0.0024	0.0011	0.011
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.0024	0.00024	0.015	0.0015	0.055	0.0055	0.0024	0.024
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.0018	< LD	< 0.0059	< LD	0.0060	0.00060	0.00046	0.0046
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.0047	0.000047	0.019	0.00019	0.095	0.00095	0.00040	0.040
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.0018	< LD	0.0024	0.000024	0.020	0.00020	0.000081	0.0081
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.0059	0.00000059	0.0050	0.00000050	0.045	0.0000045	0.0000019	0.019
Total Tetra CDD	**MDDEFP**	0.0027		0.047		0.043			0.031
Total Penta CDD		0.0033		0.13		0.081			0.072
Total Hexa CDD		0.0074		0.27		0.14			0.14
Total Hepta CDD		0.0059		0.099		0.063			0.056
Sommation des PCDDs		0.029		0.59		0.39			0.34
Total Tetra CDF		0.030		0.083		0.23			0.11
Total Penta CDF		0.021		0.12		0.31			0.15
Total Hexa CDF		0.0095		0.051		0.19			0.084
Total Hepta CDF		0.0083		0.036		0.18			0.074
Sommation des PCDFs		0.075		0.30		0.95			0.44
ÉQUIVALENCE TOXIQUE TOTALE			**0.0029**		**0.035**		**0.046**	**0.028**	
CONGÉNÈRES TOXIQUES TOTAUX		**0.051**		**0.32**		**0.56**			**0.31**
GROUPES HOMOLOGUES TOTAUX		**0.19**		**1.72**		**2.58**			**1.50**
DIOXINES ET FURANNES (ng/m³R) 11 % D'OXYGÈNE									
2,3,7,8 - Tetra CDD	**1**	< 0.00043	< LD	0.0025	0.0025	< 0.0019	< LD	0.0016	0.0016
1,2,3,7,8 - Penta CDD	**1**	< 0.0013	< LD	0.024	0.024	0.0062	0.0062	0.010	0.010
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.0013	< LD	0.027	0.0027	0.0076	0.00076	0.0012	0.012
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.0013	0.00013	0.036	0.0036	0.017	0.0017	0.0018	0.018
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.0013	< LD	0.041	0.0041	0.018	0.0018	0.0020	0.020
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.0074	0.000074	0.16	0.0016	0.083	0.00083	0.00083	0.083
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.014	0.0000014	0.080	0.0000080	0.081	0.0000081	0.0000059	0.059
2, 3, 7, 8 - Tetra CDF	**0.1**	0.0065	0.00065	0.024	0.0024	0.059	0.0059	0.0030	0.030
1,2,3,7,8 - Penta CDF	**0.05**	< 0.0035	< LD	0.011	0.00053	0.017	0.00084	0.00051	0.010
2,3,4,7,8 - Penta CDF	**0.5**	0.0039	0.0020	0.022	0.011	0.045	0.022	0.012	0.023
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.0056	0.00056	0.031	0.0031	0.088	0.0088	0.0042	0.042
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.0039	0.00039	0.013	0.0013	0.033	0.0033	0.0016	0.016
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.0035	0.00035	0.025	0.0025	0.074	0.0074	0.0034	0.034
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.0026	< LD	< 0.010	< LD	0.0081	0.00081	0.00069	0.0069
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.0069	0.000069	0.032	0.00032	0.13	0.0013	0.00056	0.056
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.0026	< LD	0.0040	0.000040	0.027	0.00027	0.00011	0.011
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.0087	0.00000087	0.0085	0.00000085	0.062	0.0000062	0.0000026	0.026
Total Tetra CDD	**MDDEFP**	0.0039		0.080		0.058			0.047
Total Penta CDD		0.0048		0.22		0.11			0.11
Total Hexa CDD		0.011		0.45		0.19			0.22
Total Hepta CDD		0.0087		0.17		0.085			0.087
Sommation des PCDDs		0.043		1.01		0.53			0.53
Total Tetra CDF		0.043		0.14		0.31			0.16
Total Penta CDF		0.031		0.20		0.42			0.22
Total Hexa CDF		0.014		0.086		0.26			0.12
Total Hepta CDF		0.012		0.062		0.24			0.10
Sommation des PCDFs		0.11		0.50		1.29			0.63
ÉQUIVALENCE TOXIQUE TOTALE			**0.0042**		**0.059**		**0.062**	**0.042**	
NORME AU PRMRQA	**0.08**								
CONGÉNÈRES TOXIQUES TOTAUX		**0.075**		**0.55**		**0.76**			**0.46**
GROUPES HOMOLOGUES TOTAUX		**0.28**		**2.93**		**3.49**			**2.23**

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES (µg/h)									
2,3,7,8 - Tetra CDD	**1**	< 0.0019	< LD	0.0085	0.0085	< 0.0099	< LD	0.0068	0.0068
1,2,3,7,8 - Penta CDD	**1**	< 0.0056	< LD	0.080	0.080	0.033	0.033	0.039	0.039
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.0056	< LD	0.090	0.0090	0.040	0.0040	0.0045	0.045
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.0056	0.00056	0.12	0.012	0.089	0.0089	0.0072	0.072
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.0056	< LD	0.14	0.014	0.092	0.0092	0.0079	0.079
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.032	0.00032	0.54	0.0054	0.43	0.0043	0.0034	0.34
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.062	0.0000062	0.27	0.000027	0.42	0.000042	0.000025	0.25
2, 3, 7, 8 - Tetra CDF	**0.1**	0.028	0.0028	0.082	0.0082	0.31	0.031	0.014	0.14
1,2,3,7,8 - Penta CDF	**0.05**	< 0.015	< LD	0.036	0.0018	0.088	0.0044	0.0023	0.046
2,3,4,7,8 - Penta CDF	**0.5**	0.017	0.0084	0.073	0.037	0.23	0.12	0.054	0.11
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.024	0.0024	0.11	0.011	0.46	0.046	0.020	0.20
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.017	0.0017	0.043	0.0043	0.17	0.017	0.0076	0.076
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.015	0.0015	0.085	0.0085	0.39	0.039	0.016	0.16
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.011	< LD	< 0.034	< LD	0.042	0.0042	0.0029	0.029
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.030	0.00030	0.11	0.0011	0.67	0.0067	0.0027	0.27
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.011	< LD	0.014	0.00014	0.14	0.0014	0.00055	0.055
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.037	0.0000037	0.029	0.0000029	0.32	0.000032	0.000013	0.13
Total Tetra CDD	**MDDELCC**	0.017		0.27		0.30			0.20
Total Penta CDD		0.021		0.76		0.58			0.45
Total Hexa CDD		0.047		1.5		1.0			0.87
Total Hepta CDD		0.037		0.57		0.45			0.35
Sommation des PCDDs		0.19		3.4		2.8			2.1
Total Tetra CDF		0.19		0.48		1.6			0.76
Total Penta CDF		0.13		0.69		2.2			1.0
Total Hexa CDF		0.060		0.29		1.4			0.57
Total Hepta CDF		0.052		0.21		1.2			0.50
Sommation des PCDFs		0.47		1.7		6.7			3.0
ÉQUIVALENCE TOXIQUE TOTALE			**0.018**		**0.20**		**0.33**	**0.18**	
CONGÉNÈRES TOXIQUES TOTAUX		**0.32**		**1.86**		**3.95**			**2.04**
GROUPES HOMOLOGUES TOTAUX		**1.21**		**9.92**		**18.2**			**9.79**

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-1

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
13 h 44	1	1	5	0.18	0.45	1330	60	60	76	483.04	485.51	2.47	12.4	98	14.1	5.2	3	-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	485.51	488.00	2.49	12.1	102				-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	488.00	490.46	2.46	12.1	101				-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	490.46	492.97	2.51	12.1	103				-1.0	250	250	40	40	-	-
		2	5	0.17	0.43	1352	60	60	78	492.97	495.48	2.51	12.1	103				-1.0	250	250	40	40	-	-
		2	5	0.17	0.43	1356	60	60	79	495.48	497.85	2.37	12.1	97				-1.0	250	250	40	40	-	-
		2	5	0.18	0.45	1354	60	60	80	497.85	500.35	2.50	12.5	100				-1.0	250	250	40	40	-	-
		2	5	0.18	0.45	1353	60	60	80	500.35	502.87	2.52	12.4	100				-1.0	250	250	40	40	-	-
		3	5	0.18	0.45	1361	60	60	82	502.87	505.38	2.51	12.5	100				-1.0	250	250	40	40	-	-
		3	5	0.21	0.53	1366	60	60	82	505.38	508.08	2.70	13.5	100				-1.0	250	250	40	40	-	-
		3	5	0.21	0.52	1381	60	60	84	508.08	510.79	2.71	13.5	101				-1.0	250	250	40	40	-	-
		3	5	0.21	0.52	1377	60	60	83	510.79	513.50	2.71	13.5	101				-1.5	250	250	40	40	-	-
		4	5	0.21	0.52	1379	60	60	84	513.50	516.20	2.70	13.5	100				-1.5	250	250	40	40	-	-
		4	5	0.21	0.52	1380	60	60	85	516.20	518.88	2.68	13.5	100				-1.5	250	250	40	40	-	-
		4	5	0.21	0.53	1373	60	60	85	518.88	521.61	2.73	13.5	101				-1.5	250	250	40	40	-	-
		4	5	0.21	0.53	1373	60	60	85	521.61	524.28	2.67	13.5	99				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1347	60	60	87	524.28	526.84	2.56	12.4	102				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1348	60	60	87	526.84	529.27	2.43	12.4	97				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1350	60	60	88	529.27	531.82	2.55	12.4	101				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1354	60	60	88	531.82	534.26	2.44	12.5	97				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1355	60	60	88	534.26	536.79	2.53	12.5	101				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1359	60	60	90	536.79	539.34	2.55	12.5	102				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1361	60	60	90	539.34	541.87	2.53	12.5	101				-1.5	250	250	40	40	-	-
		6	5	0.17	0.44	1350	60	60	90	541.87	544.36	2.49	12.1	102				-1.5	250	250	40	40	-	-
	2	6	5	0.15	0.38	1357	60	60	93	544.36	546.67	2.31	11.4	101				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1350	60	60	93	546.67	549.00	2.33	11.7	98				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1355	60	60	94	549.00	551.26	2.26	11.7	96				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1352	60	60	96	551.26	553.57	2.31	11.7	98				-1.5	250	250	40	40	-	-
		5	5	0.16	0.42	1348	60	60	97	553.57	555.93	2.36	11.7	100				-1.5	250	250	40	40	-	-
		5	5	0.16	0.41	1350	60	60	97	555.93	558.42	2.49	11.7	105				-1.5	250	250	40	40	-	-
		5	5	0.16	0.42	1345	60	60	97	558.42	560.77	2.35	11.7	99				-1.5	250	250	40	40	-	-
		5	5	0.15	0.39	1340	60	60	98	560.77	563.08	2.31	11.3	100				-1.5	250	250	40	40	-	-
		4	5	0.15	0.39	1332	60	60	99	563.08	565.37	2.29	11.3	99				-1.5	250	250	40	40	-	-
		4	5	0.13	0.35	1280	60	60	100	565.37	567.67	2.30	10.4	106				-1.5	250	250	40	40	-	-
		4	5	0.13	0.35	1300	60	60	100	567.67	569.98	2.31	10.4	107				-1.5	250	250	40	40	-	-
		4	5	0.11	0.29	1306	60	60	101	569.98	572.08	2.10	9.6	106				-1.5	250	250	40	40	-	-
		3	5	0.11	0.29	1304	60	60	101	572.08	574.08	2.00	9.6	100				-0.5	250	250	40	40	-	-
		3	5	0.11	0.30	1280	60	60	102	574.08	576.10	2.02	9.5	101				0.5	250	250	40	40	-	-
		3	5	0.11	0.30	1250	60	60	102	576.10	578.09	1.99	9.5	98				1.5	250	250	40	40	-	-
		3	5	0.11	0.30	1266	60	60	103	578.09	580.17	2.08	9.5	103				2.5	250	250	40	40	-	-
		2	5	0.13	0.35	1318	60	60	103	580.17	582.40	2.23	10.5	103				3.5	250	250	40	40	-	-
		2	5	0.13	0.35	1320	60	60	103	582.40	584.62	2.22	10.5	103				4.5	250	250	40	40	-	-
		2	5	0.13	0.35	1324	60	60	103	584.62	586.87	2.25	10.5	105				5.5	250	250	40	40	-	-
		2	5	0.13	0.35	1310	60	60	102	586.87	589.10	2.23	10.5	103				6.5	250	250	40	40	-	-
		1	5	0.13	0.35	1317	60	60	102	589.10	591.32	2.22	10.5	103				7.5	250	250	40	40	-	-
		1	5	0.13	0.35	1317	60	60	102	591.32	593.56	2.24	10.5	104				8.5	250	250	40	40	-	-
		1	5	0.13	0.35	1318	60	60	102	593.56	595.76	2.20	10.5	102				9.5	250	250	40	40	-	-
		1	5	0.13	0.35	1326	60	60	103	595.76	598.00	2.24	10.5	104				10.5	250	250	40	40	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-2

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
11 h 32	1	6	5	0.16	1.28	1275	60	60	72	600.12	604.57	4.45	11.6	102	15.1	4.4	3	-5.0	246	253	68	44	-	-
		6	5	0.15	1.15	1353	60	60	73	604.57	608.84	4.27	11.5	104				-5.0	246	247	68	48	-	-
		6	5	0.15	1.15	1360	60	60	73	608.84	612.97	4.13	11.5	101				-5.0	247	253	68	49	-	-
		5	5	0.15	1.15	1362	60	60	74	612.97	617.11	4.14	11.5	101				-5.0	247	246	68	51	-	-
		5	5	0.15	1.15	1369	60	60	75	617.11	621.25	4.14	11.5	101				-5.5	249	251	68	52	-	-
		5	5	0.15	1.16	1362	60	60	77	621.25	625.40	4.15	11.5	101				-5.5	245	253	68	57	-	-
		4	5	0.16	1.23	1369	60	60	77	625.40	629.66	4.26	11.9	101				-5.5	248	250	68	52	-	-
		4	5	0.15	1.16	1371	60	60	79	629.66	633.81	4.15	11.5	101				-5.5	249	256	68	46	-	-
		4	5	0.15	1.16	1372	60	60	80	633.81	637.92	4.11	11.5	100				-5.5	249	255	68	47	-	-
		3	5	0.15	1.16	1369	60	60	81	637.92	642.08	4.16	11.5	102				-5.5	247	254	68	47	-	-
		3	5	0.15	1.17	1370	60	60	83	642.08	646.17	4.09	11.5	100				-5.5	247	247	68	48	-	-
		3	5	0.15	1.17	1373	60	60	84	646.17	650.31	4.14	11.5	101				-5.5	245	251	68	49	-	-
		2	5	0.13	1.05	1315	60	60	86	650.31	654.36	4.05	10.6	105				-5.5	249	249	68	50	-	-
		2	5	0.13	1.04	1320	60	60	86	654.36	658.15	3.79	10.6	98				-5.5	246	250	68	52	-	-
		2	5	0.12	0.97	1316	60	60	88	658.15	661.97	3.82	10.1	103				-5.5	248	251	68	55	-	-
		1	5	0.12	0.97	1314	60	60	89	661.97	665.75	3.78	10.1	102				-5.5	247	246	68	58	-	-
		1	5	0.12	0.97	1318	60	60	90	665.75	669.50	3.75	10.2	101				-5.5	250	251	68	54	-	-
		1	5	0.12	0.97	1318	60	60	91	669.50	673.25	3.75	10.2	101				-5.0	235	253	68	46	-	-
	2	1	5	0.12	0.98	1318	60	60	92	673.25	677.00	3.75	10.2	101				-5.0	250	249	68	43	-	-
		1	5	0.12	0.98	1311	60	60	94	677.00	680.74	3.74	10.1	100				-5.0	249	256	68	43	-	-
		1	5	0.12	0.99	1300	60	60	94	680.74	684.49	3.75	10.1	100				-4.5	249	251	68	44	-	-
		2	5	0.12	0.98	1317	60	60	95	684.49	688.23	3.74	10.1	101				-5.5	250	250	68	46	-	-
		2	5	0.12	0.98	1322	60	60	96	688.23	691.97	3.74	10.2	101				-5.5	246	253	68	48	-	-
		2	5	0.12	0.98	1318	60	60	96	691.97	695.73	3.76	10.2	101				-5.5	247	258	68	50	-	-
		3	5	0.12	0.98	1325	60	60	97	695.73	699.41	3.68	10.2	99				-5.5	250	244	68	52	-	-
		3	5	0.11	0.90	1320	60	60	98	699.41	703.00	3.59	9.7	101				-5.5	249	260	68	56	-	-
		3	5	0.11	0.90	1318	60	60	98	703.00	706.58	3.58	9.7	101				-5.5	249	247	68	58	-	-
		4	5	0.10	0.83	1310	60	60	100	706.58	709.94	3.36	9.2	99				-5.5	248	247	68	52	-	-
		4	5	0.10	0.83	1310	60	60	100	709.94	713.35	3.41	9.2	100				-5.5	249	250	68	45	-	-
		4	5	0.10	0.83	1314	60	60	101	713.35	716.79	3.44	9.3	101				-5.5	248	249	68	44	-	-

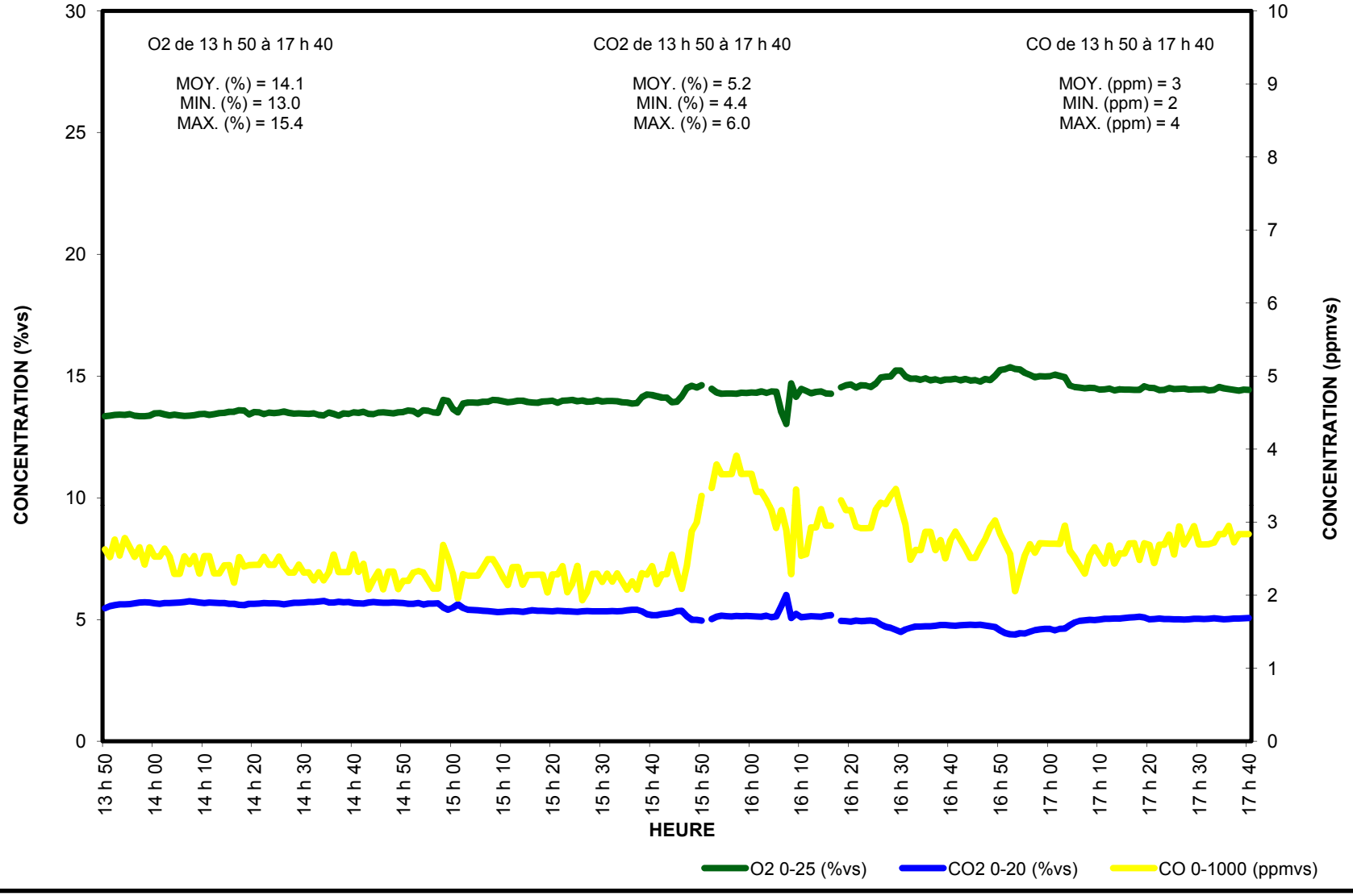
RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-3

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
16 h 13	1	6	5	0.24	1.85	1356	60	60	75	729.20	734.29	5.09	14.5	100	13.6	5.6	3	-4.5	250	251	68	52	-	-
		6	5	0.24	1.83	1377	60	60	76	734.29	739.45	5.16	14.6	102				-4.5	244	252	68	42	-	-
		6	5	0.24	1.82	1386	60	60	76	739.45	744.61	5.16	14.6	102				-4.5	247	252	68	40	-	-
		5	5	0.24	1.83	1385	60	60	78	744.61	749.76	5.15	14.6	102				-4.5	253	250	68	40	-	-
		5	5	0.24	1.82	1405	60	60	79	749.76	754.91	5.15	14.7	102				-4.5	247	253	68	40	-	-
		5	5	0.24	1.81	1410	60	60	80	754.91	760.08	5.17	14.7	103				-4.5	245	247	68	41	-	-
		4	5	0.21	1.63	1366	60	60	81	760.08	764.98	4.90	13.6	103				-4.5	240	247	67	41	-	-
		4	5	0.23	1.77	1380	60	60	82	764.98	770.00	5.02	14.3	101				-4.5	252	252	66	42	-	-
		4	5	0.23	1.77	1387	60	60	82	770.00	775.00	5.00	14.3	101				-4.0	252	243	66	42	-	-
		3	5	0.23	1.76	1396	60	60	83	775.00	780.01	5.01	14.3	101				-4.0	251	262	66	42	-	-
		3	5	0.23	1.76	1403	60	60	84	780.01	785.00	4.99	14.4	101				-4.0	249	250	66	43	-	-
		3	5	0.23	1.75	1409	60	60	84	785.00	789.95	4.95	14.4	100				-4.5	254	244	66	44	-	-
		2	5	0.18	1.39	1382	60	60	84	789.95	794.45	4.50	12.6	102				-4.5	244	251	66	44	-	-
		2	5	0.19	1.48	1381	60	60	86	794.45	799.04	4.59	13.0	102				-4.5	249	250	67	45	-	-
		2	5	0.18	1.40	1387	60	60	87	799.04	803.50	4.46	12.7	102				-4.5	250	251	67	48	-	-
		1	5	0.18	1.40	1380	60	60	87	803.50	807.95	4.45	12.6	101				-4.0	253	250	68	50	-	-
		1	5	0.18	1.39	1400	60	60	88	807.95	812.39	4.44	12.7	101				-4.0	238	250	66	41	-	-
		1	5	0.18	1.38	1410	60	60	89	812.39	816.86	4.47	12.7	102				-4.5	252	253	66	40	-	-
	2	1	5	0.18	1.38	1413	60	60	90	816.86	821.26	4.40	12.8	101				-4.5	250	252	68	40	-	-
		1	5	0.18	1.38	1417	60	60	90	821.26	825.67	4.41	12.8	101				-4.5	250	252	68	47	-	-
		1	5	0.17	1.30	1423	60	60	91	825.67	829.97	4.30	12.4	102				-4.5	245	248	68	49	-	-
		2	5	0.17	1.30	1440	60	60	94	829.97	834.30	4.33	12.5	103				-4.0	247	251	68	49	-	-
		2	5	0.17	1.29	1438	60	60	92	834.30	838.54	4.24	12.5	101				-4.0	252	247	68	49	-	-
		2	5	0.17	1.30	1443	60	60	94	838.54	842.77	4.23	12.5	101				-4.0	249	251	68	51	-	-
		3	5	0.17	1.29	1450	60	60	95	842.77	847.00	4.23	12.5	101				-4.0	250	250	68	51	-	-
		3	5	0.24	1.75	1529	60	60	95	847.00	851.90	4.90	15.2	100				-4.0	243	251	68	54	-	-
		3	5	0.24	1.75	1535	60	60	97	851.90	856.84	4.94	15.2	101				-4.0	245	251	68	54	-	-
		4	5	0.24	1.76	1533	60	60	97	856.84	861.77	4.93	15.2	101				-4.0	253	255	68	56	-	-
		4	5	0.24	1.76	1533	60	60	98	861.77	866.72	4.95	15.2	102				-4.0	241	250	68	56	-	-
		4	5	0.24	1.75	1542	60	60	98	866.72	871.64	4.92	15.2	101				-4.0	252	249	68	56	-	-
		5	5	0.24	1.76	1541	60	60	99	871.64	876.54	4.90	15.2	101				-5.0	248	249	68	56	-	-
		5	5	0.23	1.68	1548	60	60	101	876.54	881.29	4.75	14.9	100				-5.0	251	248	68	51	-	-
		5	5	0.22	1.65	1500	60	60	101	881.29	886.00	4.71	14.4	100				-4.0	252	252	68	50	-	-
		6	5	0.22	1.68	1463	60	60	102	886.00	890.71	4.71	14.3	99				-4.0	254	251	68	51	-	-
		6	5	0.22	1.69	1457	60	60	103	890.71	895.49	4.78	14.3	100				-5.0	254	251	68	54	-	-
		6	5	0.22	1.69	1460	60	60	103	895.49	900.26	4.77	14.3	100				-5.0	248	255	68	55	-	-

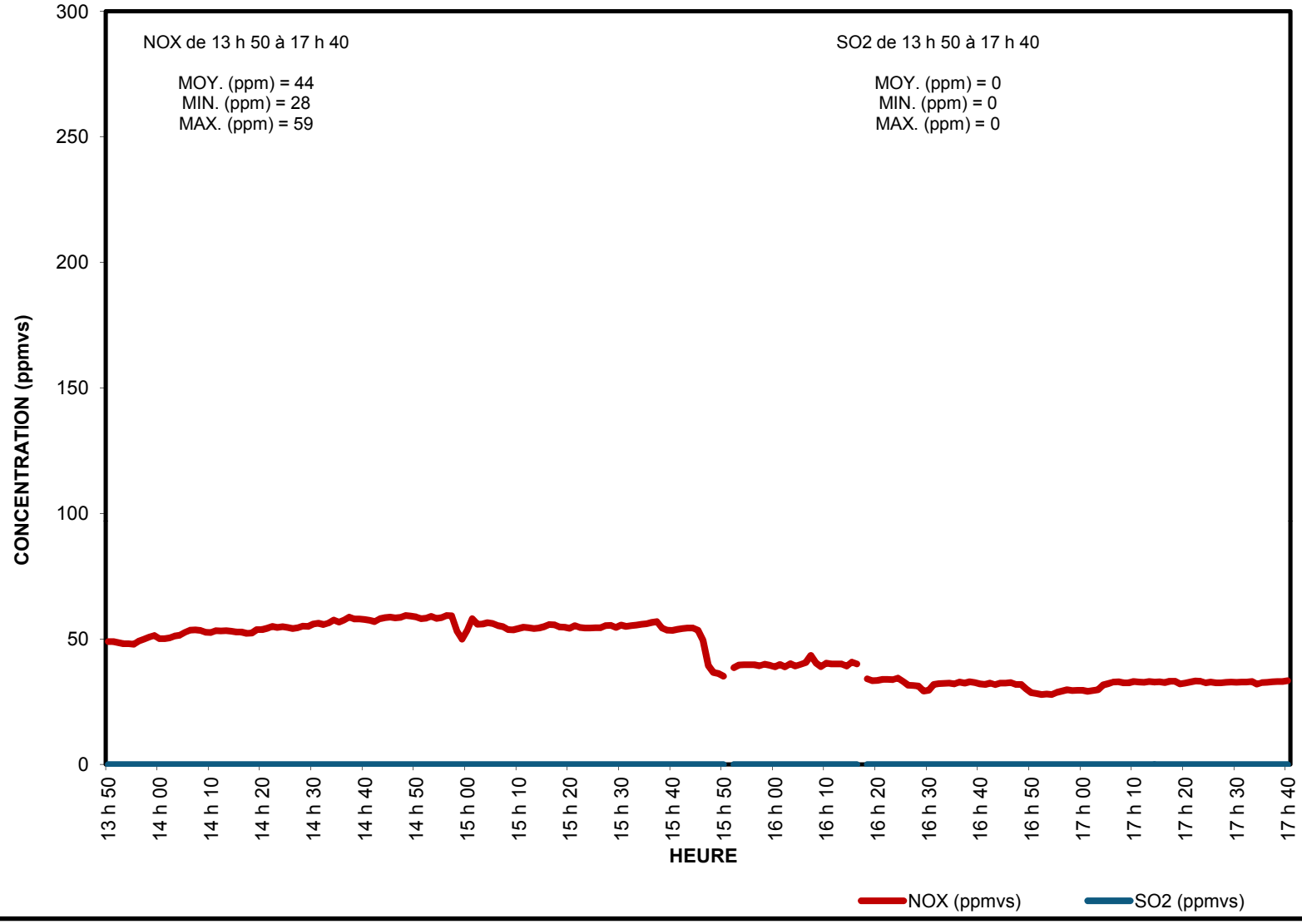
APPENDIX 2
CONTINUOUS MEASUREMENTS OF GAS



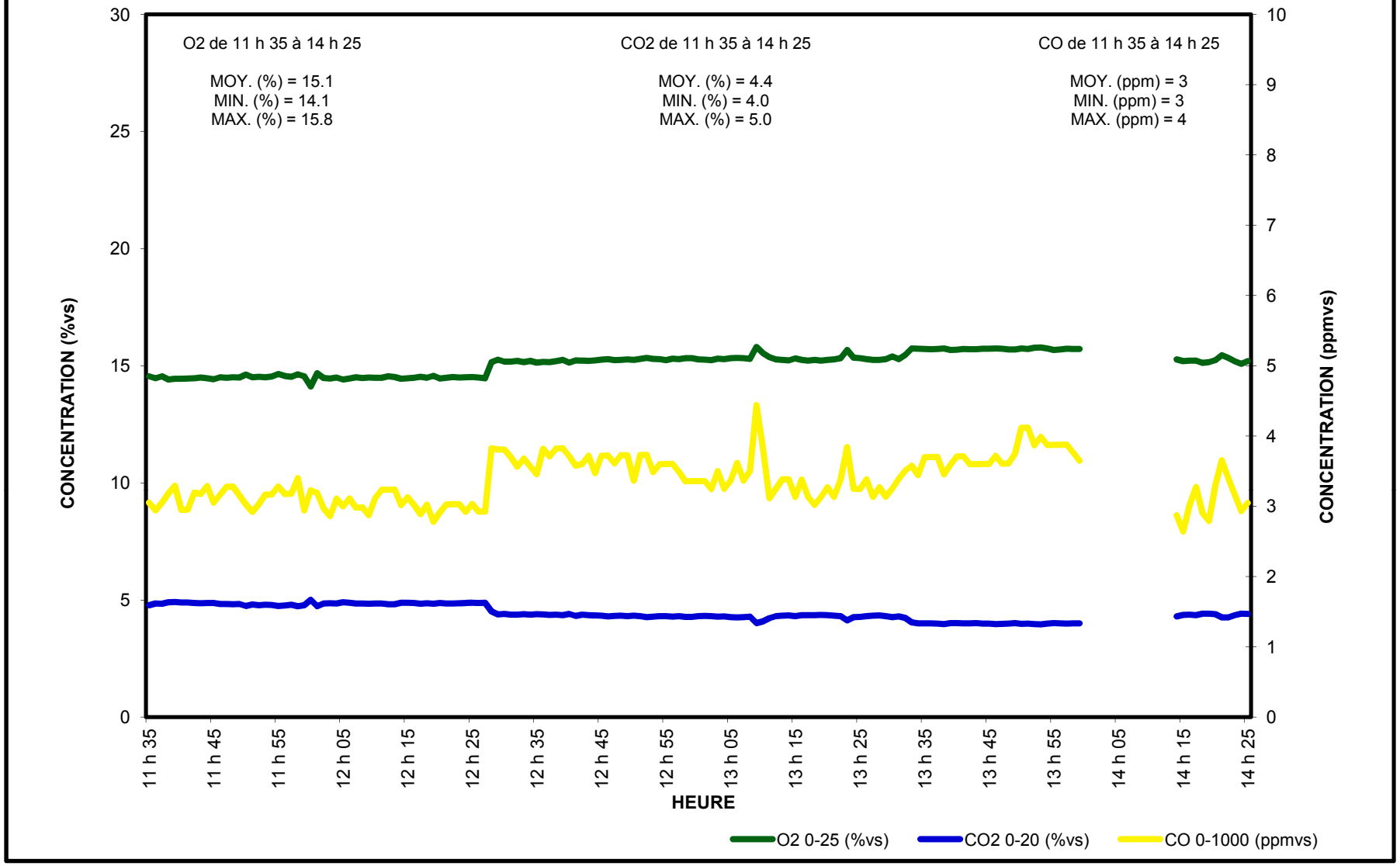
INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 22 SEPTEMBRE 2018 - ESSAI MEL GAZ E1

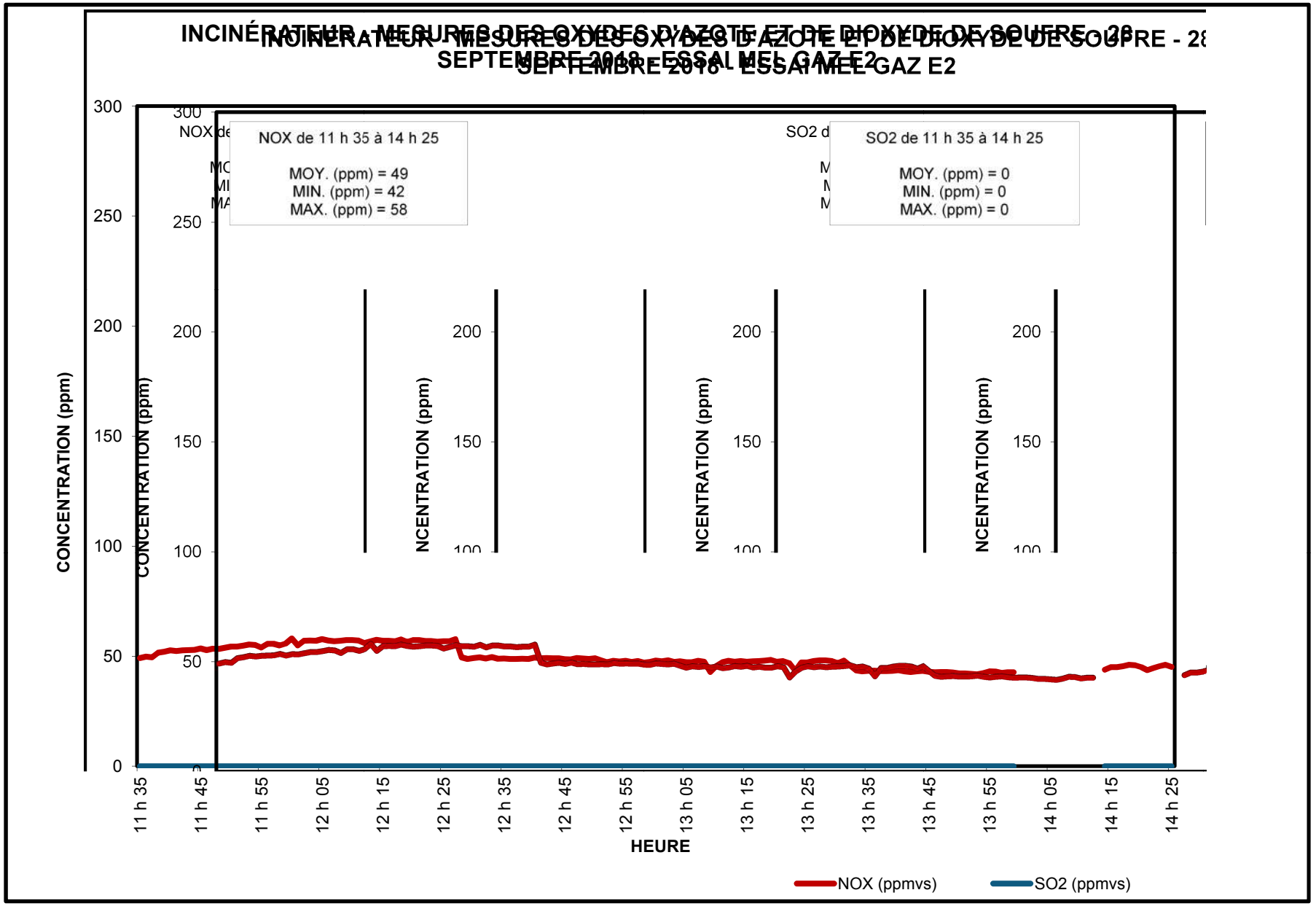


INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 22 SEPTEMBRE 2018 - ESSAI MEL GAZ E1

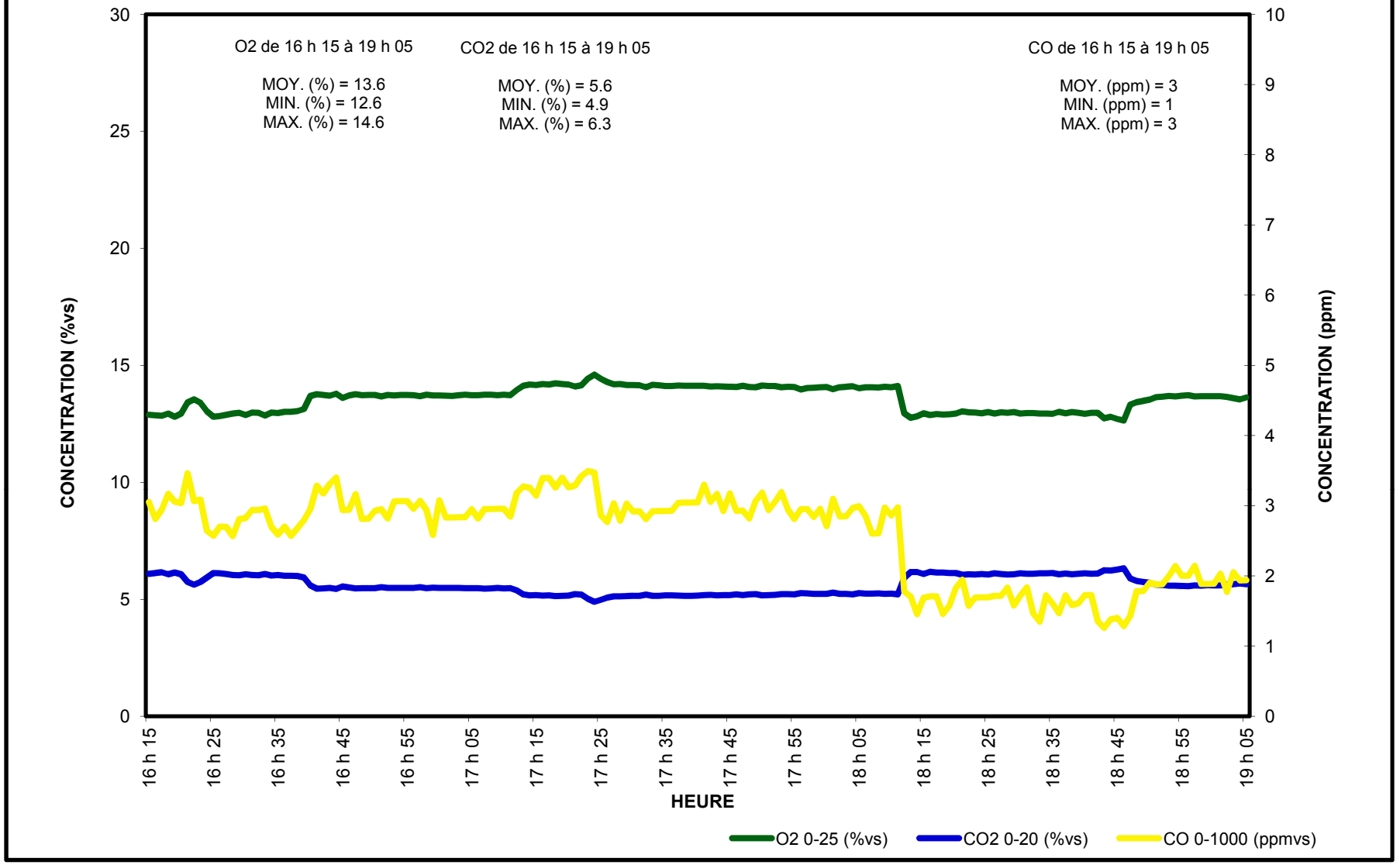


INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 28 SEPTEMBRE 2018 - ESSAI MEL GAZ E2

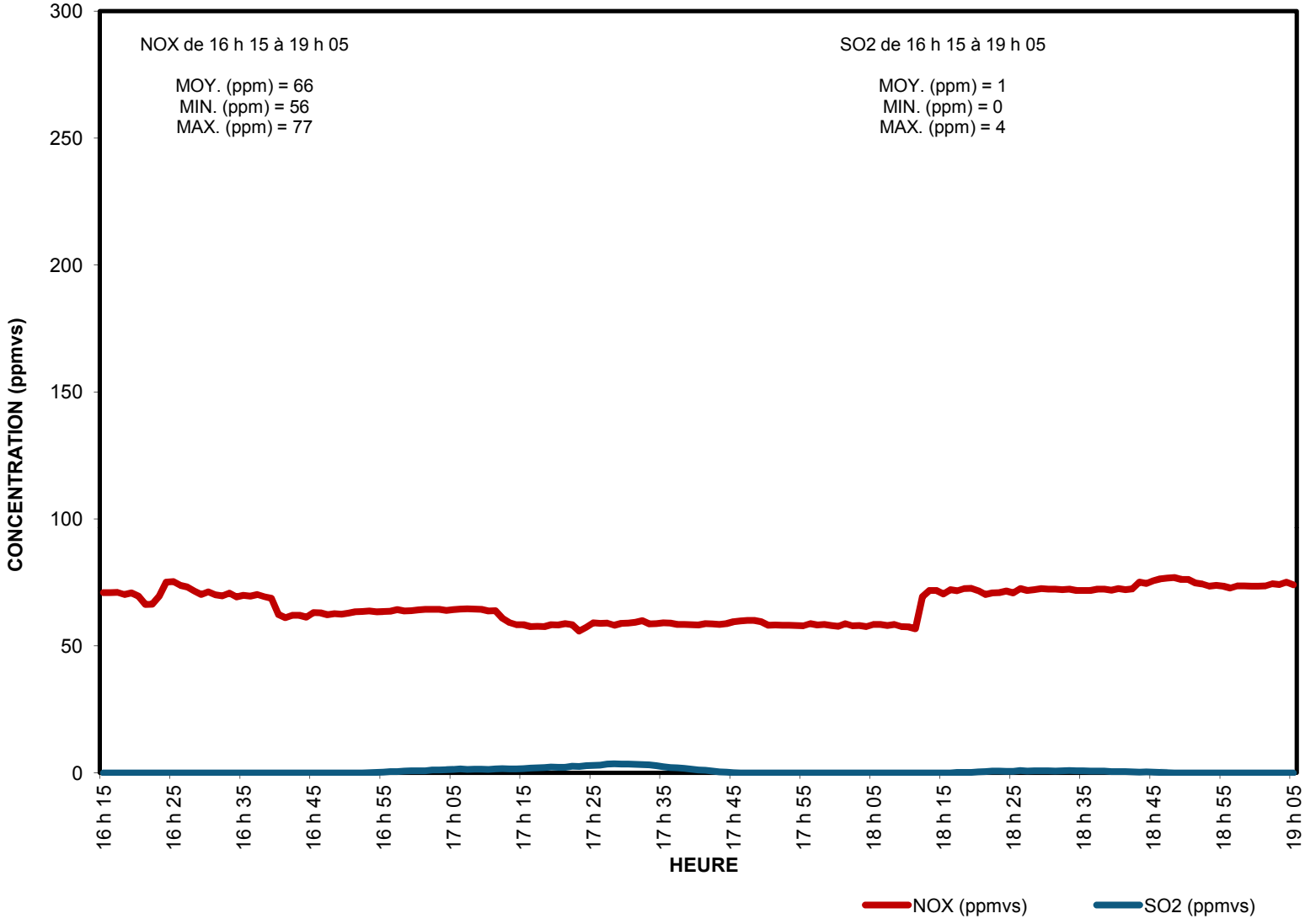



INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 28 SEPTEMBRE 2018 - ESSAI MEL GAZ E2
NOX de 11 h 35 à 14 h 25
MOY. (ppm) = 49
MIN. (ppm) = 42
MAX. (ppm) = 58
SO2 de 11 h 35 à 14 h 25
MOY. (ppm) = 0
MIN. (ppm) = 0
MAX. (ppm) = 0
CONCENTRATION (ppm)
300
250
200
150
100
50
0
11 h 35
11 h 45
11 h 55
12 h 05
12 h 15
12 h 25
12 h 35
12 h 45
12 h 55
13 h 05
13 h 15
13 h 25
13 h 35
13 h 45
13 h 55
14 h 05
14 h 15
14 h 25
HEURE
NOX (ppmvs)
SO2 (ppmvs)

INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 29 SEPTEMBRE 2018 - ESSAI MEL GAZ E3



INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 29 SEPTEMBRE 2018 - ESSAI MEL GAZ E3



	AQ	AR	AS	AT
1		Graphique		
2	**22 sept. 2018**	**2018-09-22**	**2018-09-28**	**2018-09-29**
3	**ESSAIS**	**MEL GAZ E1**	**MEL GAZ E2**	**MEL GAZ E3**
4	**Début**	13 h 50	11 h 35	16 h 15
5	**Fin**	17 h 40	14 h 25	19 h 05
6	**O2 0-25 (%vs) corrigé**	**#1**	**#2**	**#3**
7	**MOY.**	14.1	15.1	13.6
8	**MIN**	13.0	14.1	12.6
9	**MAX**	15.4	15.8	14.6
10	**CO2 0-20 (%vs) corrigé**	**#1**	**#2**	**#3**
11	**MOY.**	5.2	4.4	5.6
12	**MIN**	4.4	4.0	4.9
13	**MAX**	6.0	5.0	6.3
14	**CO 0-1000 (ppmvs) corrigé**	**#1**	**#2**	**#3**
15	**MOY.**	2.6	3.4	2.6
16	**MIN**	1.9	2.6	1.3
17	**MAX**	3.9	4.4	3.5
18	**SO2 (ppmvs) corrigé**	**#1**	**#2**	**#3**
19	**MOY.**	0.0	0.0	0.6
20	**MIN**	0.0	0.0	0.0
21	**MAX**	0.0	0.0	3.6
22	**NOX (ppmvs) corrigé**	**#1**	**#2**	**#3**
23	**MOY.**	44.5	49.3	65.8
24	**MIN**	27.9	41.8	55.8
25	**MAX**	59.4	58.1	76.9

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
7	22-09-2018 13:50:15	13 h 50	13.4	5.5	2.6	0.0	49.0
8	22-09-2018 13:51:15	13 h 51	13.4	5.6	2.5	0.0	49.0
9	22-09-2018 13:52:15	13 h 52	13.4	5.6	2.8	0.0	48.6
10	22-09-2018 13:53:15	13 h 53	13.4	5.6	2.5	0.0	48.1
11	22-09-2018 13:54:15	13 h 54	13.4	5.6	2.8	0.0	48.2
12	22-09-2018 13:55:15	13 h 55	13.4	5.6	2.7	0.0	47.9
13	22-09-2018 13:56:15	13 h 56	13.4	5.7	2.5	0.0	49.2
14	22-09-2018 13:57:15	13 h 57	13.4	5.7	2.7	0.0	49.9
15	22-09-2018 13:58:15	13 h 58	13.4	5.7	2.4	0.0	50.8
16	22-09-2018 13:59:15	13 h 59	13.4	5.7	2.7	0.0	51.4
17	22-09-2018 14:00:15	14 h 00	13.5	5.7	2.5	0.0	50.1
18	22-09-2018 14:01:15	14 h 01	13.5	5.6	2.5	0.0	50.1
19	22-09-2018 14:02:15	14 h 02	13.4	5.7	2.6	0.0	50.4
20	22-09-2018 14:03:15	14 h 03	13.4	5.7	2.5	0.0	51.1
21	22-09-2018 14:04:15	14 h 04	13.4	5.7	2.3	0.0	51.5
22	22-09-2018 14:05:15	14 h 05	13.4	5.7	2.3	0.0	52.6
23	22-09-2018 14:06:15	14 h 06	13.4	5.7	2.5	0.0	53.5
24	22-09-2018 14:07:15	14 h 07	13.4	5.8	2.4	0.0	53.7
25	22-09-2018 14:08:15	14 h 08	13.4	5.7	2.5	0.0	53.4
26	22-09-2018 14:09:15	14 h 09	13.4	5.7	2.3	0.0	52.7
27	22-09-2018 14:10:15	14 h 10	13.4	5.7	2.5	0.0	52.6
28	22-09-2018 14:11:15	14 h 11	13.4	5.7	2.5	0.0	53.3
29	22-09-2018 14:12:15	14 h 12	13.4	5.7	2.3	0.0	53.2
30	22-09-2018 14:13:15	14 h 13	13.5	5.7	2.3	0.0	53.3
31	22-09-2018 14:14:15	14 h 14	13.5	5.7	2.4	0.0	53.0
32	22-09-2018 14:15:15	14 h 15	13.5	5.7	2.4	0.0	52.8
33	22-09-2018 14:16:15	14 h 16	13.5	5.6	2.2	0.0	52.8
34	22-09-2018 14:17:15	14 h 17	13.6	5.6	2.5	0.0	52.2
35	22-09-2018 14:18:15	14 h 18	13.6	5.6	2.4	0.0	52.4
36	22-09-2018 14:19:15	14 h 19	13.4	5.6	2.4	0.0	53.7
37	22-09-2018 14:20:15	14 h 20	13.5	5.7	2.4	0.0	53.7
38	22-09-2018 14:21:15	14 h 21	13.5	5.7	2.4	0.0	54.3
39	22-09-2018 14:22:15	14 h 22	13.4	5.7	2.5	0.0	55.0
40	22-09-2018 14:23:15	14 h 23	13.5	5.7	2.4	0.0	54.6
41	22-09-2018 14:24:15	14 h 24	13.5	5.7	2.4	0.0	54.9
42	22-09-2018 14:25:15	14 h 25	13.5	5.7	2.5	0.0	54.6
43	22-09-2018 14:26:15	14 h 26	13.5	5.6	2.4	0.0	54.2
44	22-09-2018 14:27:15	14 h 27	13.5	5.7	2.3	0.0	54.5
45	22-09-2018 14:28:15	14 h 28	13.5	5.7	2.3	0.0	55.1
46	22-09-2018 14:29:15	14 h 29	13.5	5.7	2.4	0.0	55.0
47	22-09-2018 14:30:15	14 h 30	13.5	5.7	2.3	0.0	56.0
48	22-09-2018 14:31:15	14 h 31	13.4	5.7	2.3	0.0	56.3
49	22-09-2018 14:32:15	14 h 32	13.5	5.7	2.2	0.0	55.7
50	22-09-2018 14:33:15	14 h 33	13.4	5.7	2.3	0.0	56.3
51	22-09-2018 14:34:15	14 h 34	13.4	5.8	2.2	0.0	57.5
52	22-09-2018 14:35:15	14 h 35	13.5	5.7	2.3	0.0	56.6
53	22-09-2018 14:36:15	14 h 36	13.4	5.7	2.6	0.0	57.5
54	22-09-2018 14:37:15	14 h 37	13.4	5.7	2.3	0.0	58.7
55	22-09-2018 14:38:15	14 h 38	13.5	5.7	2.3	0.0	58.0
56	22-09-2018 14:39:15	14 h 39	13.4	5.7	2.3	0.0	58.0
57	22-09-2018 14:40:15	14 h 40	13.5	5.7	2.6	0.0	57.7
58	22-09-2018 14:41:15	14 h 41	13.5	5.7	2.3	0.0	57.5
59	22-09-2018 14:42:15	14 h 42	13.5	5.7	2.4	0.0	56.9
60	22-09-2018 14:43:15	14 h 43	13.5	5.7	2.1	0.0	58.1
61	22-09-2018 14:44:15	14 h 44	13.4	5.7	2.2	0.0	58.5
62	22-09-2018 14:45:15	14 h 45	13.5	5.7	2.3	0.0	58.7
63	22-09-2018 14:46:15	14 h 46	13.5	5.7	2.1	0.0	58.4
64	22-09-2018 14:47:15	14 h 47	13.5	5.7	2.3	0.0	58.6
65	22-09-2018 14:48:15	14 h 48	13.5	5.7	2.3	0.0	59.4
66	22-09-2018 14:49:15	14 h 49	13.5	5.7	2.1	0.0	59.1
67	22-09-2018 14:50:15	14 h 50	13.5	5.7	2.2	0.0	58.8
68	22-09-2018 14:51:15	14 h 51	13.6	5.7	2.2	0.0	58.1
69	22-09-2018 14:52:15	14 h 52	13.6	5.6	2.3	0.0	58.3
70	22-09-2018 14:53:15	14 h 53	13.4	5.7	2.3	0.0	59.0
71	22-09-2018 14:54:15	14 h 54	13.6	5.6	2.3	0.0	58.2
72	22-09-2018 14:55:15	14 h 55	13.6	5.7	2.2	0.0	58.5
73	22-09-2018 14:56:15	14 h 56	13.5	5.7	2.1	0.0	59.4

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
74	22-09-2018 14:57:15	14 h 57	13.5	5.7	2.1	0.0	59.2
75	22-09-2018 14:58:15	14 h 58	14.0	5.5	2.7	0.0	53.1
76	22-09-2018 14:59:15	14 h 59	14.0	5.4	2.5	0.0	49.9
77	22-09-2018 15:00:15	15 h 00	13.6	5.5	2.3	0.0	53.4
78	22-09-2018 15:01:15	15 h 01	13.5	5.6	2.0	0.0	58.0
79	22-09-2018 15:02:15	15 h 02	13.9	5.5	2.3	0.0	55.8
80	22-09-2018 15:03:15	15 h 03	13.9	5.4	2.3	0.0	56.0
81	22-09-2018 15:04:15	15 h 04	13.9	5.4	2.3	0.0	56.4
82	22-09-2018 15:05:15	15 h 05	13.9	5.4	2.3	0.0	56.2
83	22-09-2018 15:06:15	15 h 06	13.9	5.4	2.4	0.0	55.3
84	22-09-2018 15:07:15	15 h 07	14.0	5.4	2.5	0.0	54.9
85	22-09-2018 15:08:15	15 h 08	14.0	5.3	2.5	0.0	53.8
86	22-09-2018 15:09:15	15 h 09	14.0	5.3	2.4	0.0	53.6
87	22-09-2018 15:10:15	15 h 10	14.0	5.3	2.3	0.0	54.1
88	22-09-2018 15:11:15	15 h 11	13.9	5.3	2.1	0.0	54.7
89	22-09-2018 15:12:15	15 h 12	14.0	5.4	2.4	0.0	54.5
90	22-09-2018 15:13:15	15 h 13	14.0	5.3	2.4	0.0	54.2
91	22-09-2018 15:14:15	15 h 14	14.0	5.3	2.1	0.0	54.4
92	22-09-2018 15:15:15	15 h 15	13.9	5.3	2.3	0.0	54.9
93	22-09-2018 15:16:15	15 h 16	13.9	5.4	2.3	0.0	55.8
94	22-09-2018 15:17:15	15 h 17	13.9	5.4	2.3	0.0	55.6
95	22-09-2018 15:18:15	15 h 18	14.0	5.4	2.3	0.0	54.8
96	22-09-2018 15:19:15	15 h 19	14.0	5.4	2.0	0.0	54.7
97	22-09-2018 15:20:15	15 h 20	14.0	5.3	2.3	0.0	54.2
98	22-09-2018 15:21:15	15 h 21	13.9	5.4	2.3	0.0	55.3
99	22-09-2018 15:22:15	15 h 22	14.0	5.4	2.4	0.0	54.6
100	22-09-2018 15:23:15	15 h 23	14.0	5.3	2.0	0.0	54.3
101	22-09-2018 15:24:15	15 h 24	14.0	5.3	2.2	0.0	54.3
102	22-09-2018 15:25:15	15 h 25	14.0	5.3	2.4	0.0	54.5
103	22-09-2018 15:26:15	15 h 26	14.0	5.3	1.9	0.0	54.5
104	22-09-2018 15:27:15	15 h 27	13.9	5.3	2.0	0.0	55.3
105	22-09-2018 15:28:15	15 h 28	14.0	5.3	2.3	0.0	55.4
106	22-09-2018 15:29:15	15 h 29	14.0	5.3	2.3	0.0	54.6
107	22-09-2018 15:30:15	15 h 30	14.0	5.3	2.2	0.0	55.5
108	22-09-2018 15:31:15	15 h 31	14.0	5.3	2.3	0.0	55.0
109	22-09-2018 15:32:15	15 h 32	14.0	5.3	2.2	0.0	55.3
110	22-09-2018 15:33:15	15 h 33	14.0	5.3	2.3	0.0	55.5
111	22-09-2018 15:34:15	15 h 34	13.9	5.3	2.2	0.0	55.8
112	22-09-2018 15:35:15	15 h 35	13.9	5.4	2.1	0.0	56.1
113	22-09-2018 15:36:15	15 h 36	13.9	5.4	2.2	0.0	56.6
114	22-09-2018 15:37:15	15 h 37	13.9	5.4	2.1	0.0	56.9
115	22-09-2018 15:38:15	15 h 38	14.1	5.3	2.3	0.0	54.4
116	22-09-2018 15:39:15	15 h 39	14.2	5.2	2.3	0.0	53.5
117	22-09-2018 15:40:15	15 h 40	14.2	5.2	2.4	0.0	53.4
118	22-09-2018 15:41:15	15 h 41	14.2	5.2	2.2	0.0	53.9
119	22-09-2018 15:42:15	15 h 42	14.1	5.2	2.3	0.0	54.2
120	22-09-2018 15:43:15	15 h 43	14.1	5.2	2.3	0.0	54.4
121	22-09-2018 15:44:15	15 h 44	13.9	5.3	2.6	0.0	54.4
122	22-09-2018 15:45:15	15 h 45	13.9	5.4	2.3	0.0	53.5
123	22-09-2018 15:46:15	15 h 46	14.2	5.4	2.1	0.0	49.5
124	22-09-2018 15:47:15	15 h 47	14.5	5.1	2.4	0.0	39.5
125	22-09-2018 15:48:15	15 h 48	14.6	5.0	2.9	0.0	36.6
126	22-09-2018 15:49:15	15 h 49	14.5	5.0	3.0	0.0	36.2
127	22-09-2018 15:50:15	15 h 50	14.6	5.0	3.4	0.0	35.2
128	22-09-2018 15:51:15	15 h 51					
129	22-09-2018 15:52:15	15 h 52	14.5	5.0	3.5	0.0	38.6
130	22-09-2018 15:53:15	15 h 53	14.3	5.1	3.8	0.0	39.7
131	22-09-2018 15:54:15	15 h 54	14.3	5.2	3.7	0.0	39.8
132	22-09-2018 15:55:15	15 h 55	14.3	5.1	3.7	0.0	39.8
133	22-09-2018 15:56:15	15 h 56	14.3	5.1	3.7	0.0	39.8
134	22-09-2018 15:57:15	15 h 57	14.3	5.2	3.9	0.0	39.3
135	22-09-2018 15:58:15	15 h 58	14.3	5.1	3.7	0.0	39.9
136	22-09-2018 15:59:15	15 h 59	14.3	5.2	3.7	0.0	39.5
137	22-09-2018 16:00:15	16 h 00	14.3	5.1	3.7	0.0	38.9
138	22-09-2018 16:01:15	16 h 01	14.3	5.1	3.4	0.0	39.8
139	22-09-2018 16:02:15	16 h 02	14.4	5.1	3.4	0.0	38.9
140	22-09-2018 16:03:15	16 h 03	14.3	5.2	3.3	0.0	40.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
141	22-09-2018 16:04:15	16 h 04	14.4	5.1	3.2	0.0	39.2
142	22-09-2018 16:05:15	16 h 05	14.4	5.1	2.9	0.0	39.8
143	22-09-2018 16:06:15	16 h 06	13.5	5.6	3.2	0.0	40.6
144	22-09-2018 16:07:15	16 h 07	13.0	6.0	2.9	0.0	43.4
145	22-09-2018 16:08:15	16 h 08	14.7	5.1	2.3	0.0	40.5
146	22-09-2018 16:09:15	16 h 09	14.1	5.2	3.4	0.0	39.0
147	22-09-2018 16:10:15	16 h 10	14.5	5.1	2.5	0.0	40.3
148	22-09-2018 16:11:15	16 h 11	14.4	5.1	2.6	0.0	40.0
149	22-09-2018 16:12:15	16 h 12	14.3	5.1	2.9	0.0	40.0
150	22-09-2018 16:13:15	16 h 13	14.3	5.1	2.9	0.0	40.1
151	22-09-2018 16:14:15	16 h 14	14.4	5.1	3.2	0.0	39.2
152	22-09-2018 16:15:15	16 h 15	14.3	5.2	3.0	0.0	40.8
153	22-09-2018 16:16:15	16 h 16	14.3	5.2	3.0	0.0	40.1
154	22-09-2018 16:17:15	16 h 17					
155	22-09-2018 16:18:15	16 h 18	14.5	4.9	3.3	0.0	34.2
156	22-09-2018 16:19:15	16 h 19	14.6	4.9	3.2	0.0	33.4
157	22-09-2018 16:20:15	16 h 20	14.7	4.9	3.2	0.0	33.5
158	22-09-2018 16:21:15	16 h 21	14.5	5.0	2.9	0.0	33.9
159	22-09-2018 16:22:15	16 h 22	14.6	4.9	2.9	0.0	33.9
160	22-09-2018 16:23:15	16 h 23	14.6	5.0	2.9	0.0	33.8
161	22-09-2018 16:24:15	16 h 24	14.6	5.0	2.9	0.0	34.4
162	22-09-2018 16:25:15	16 h 25	14.7	4.9	3.2	0.0	33.1
163	22-09-2018 16:26:15	16 h 26	14.9	4.8	3.3	0.0	31.6
164	22-09-2018 16:27:15	16 h 27	15.0	4.7	3.2	0.0	31.5
165	22-09-2018 16:28:15	16 h 28	15.0	4.7	3.4	0.0	31.3
166	22-09-2018 16:29:15	16 h 29	15.2	4.6	3.5	0.0	29.2
167	22-09-2018 16:30:15	16 h 30	15.2	4.5	3.2	0.0	29.6
168	22-09-2018 16:31:15	16 h 31	15.0	4.6	3.0	0.0	31.9
169	22-09-2018 16:32:15	16 h 32	14.9	4.7	2.5	0.0	32.2
170	22-09-2018 16:33:15	16 h 33	14.9	4.7	2.6	0.0	32.3
171	22-09-2018 16:34:15	16 h 34	14.8	4.7	2.6	0.0	32.4
172	22-09-2018 16:35:15	16 h 35	14.9	4.7	2.9	0.0	32.1
173	22-09-2018 16:36:15	16 h 36	14.8	4.7	2.9	0.0	32.9
174	22-09-2018 16:37:15	16 h 37	14.9	4.8	2.6	0.0	32.4
175	22-09-2018 16:38:15	16 h 38	14.8	4.8	2.8	0.0	32.9
176	22-09-2018 16:39:15	16 h 39	14.9	4.8	2.5	0.0	32.6
177	22-09-2018 16:40:15	16 h 40	14.9	4.8	2.8	0.0	32.1
178	22-09-2018 16:41:15	16 h 41	14.9	4.8	2.9	0.0	31.9
179	22-09-2018 16:42:15	16 h 42	14.8	4.8	2.8	0.0	32.4
180	22-09-2018 16:43:15	16 h 43	14.9	4.8	2.6	0.0	31.8
181	22-09-2018 16:44:15	16 h 44	14.8	4.8	2.5	0.0	32.4
182	22-09-2018 16:45:15	16 h 45	14.8	4.8	2.5	0.0	32.4
183	22-09-2018 16:46:15	16 h 46	14.8	4.8	2.7	0.0	32.6
184	22-09-2018 16:47:15	16 h 47	14.9	4.8	2.8	0.0	31.9
185	22-09-2018 16:48:15	16 h 48	14.8	4.7	2.9	0.0	31.9
186	22-09-2018 16:49:15	16 h 49	15.0	4.7	3.0	0.0	30.1
187	22-09-2018 16:50:15	16 h 50	15.2	4.6	2.8	0.0	28.6
188	22-09-2018 16:51:15	16 h 51	15.3	4.5	2.7	0.0	28.3
189	22-09-2018 16:52:15	16 h 52	15.4	4.4	2.6	0.0	27.9
190	22-09-2018 16:53:15	16 h 53	15.3	4.4	2.1	0.0	28.1
191	22-09-2018 16:54:15	16 h 54	15.3	4.4	2.3	0.0	27.9
192	22-09-2018 16:55:15	16 h 55	15.1	4.4	2.5	0.0	28.7
193	22-09-2018 16:56:15	16 h 56	15.1	4.5	2.7	0.0	29.2
194	22-09-2018 16:57:15	16 h 57	14.9	4.6	2.6	0.0	29.8
195	22-09-2018 16:58:15	16 h 58	15.0	4.6	2.7	0.0	29.5
196	22-09-2018 16:59:15	16 h 59	15.0	4.6	2.7	0.0	29.6
197	22-09-2018 17:00:15	17 h 00	15.0	4.6	2.7	0.0	29.6
198	22-09-2018 17:01:15	17 h 01	15.1	4.6	2.7	0.0	29.2
199	22-09-2018 17:02:15	17 h 02	15.0	4.6	2.7	0.0	29.5
200	22-09-2018 17:03:15	17 h 03	15.0	4.6	3.0	0.0	29.8
201	22-09-2018 17:04:15	17 h 04	14.6	4.8	2.6	0.0	31.7
202	22-09-2018 17:05:15	17 h 05	14.5	4.9	2.5	0.0	32.2
203	22-09-2018 17:06:15	17 h 06	14.5	4.9	2.4	0.0	32.8
204	22-09-2018 17:07:15	17 h 07	14.5	5.0	2.3	0.0	33.0
205	22-09-2018 17:08:15	17 h 08	14.5	5.0	2.5	0.0	32.5
206	22-09-2018 17:09:15	17 h 09	14.5	5.0	2.7	0.0	32.6
207	22-09-2018 17:10:15	17 h 10	14.4	5.0	2.5	0.0	33.0

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
208	22-09-2018 17:11:15	17 h 11	14.5	5.0	2.4	0.0	32.9
209	22-09-2018 17:12:15	17 h 12	14.5	5.0	2.7	0.0	32.8
210	22-09-2018 17:13:15	17 h 13	14.4	5.0	2.4	0.0	33.1
211	22-09-2018 17:14:15	17 h 14	14.5	5.0	2.6	0.0	32.8
212	22-09-2018 17:15:15	17 h 15	14.4	5.1	2.6	0.0	33.0
213	22-09-2018 17:16:15	17 h 16	14.4	5.1	2.7	0.0	32.7
214	22-09-2018 17:17:15	17 h 17	14.4	5.1	2.7	0.0	33.1
215	22-09-2018 17:18:15	17 h 18	14.4	5.1	2.5	0.0	33.2
216	22-09-2018 17:19:15	17 h 19	14.6	5.1	2.7	0.0	32.1
217	22-09-2018 17:20:15	17 h 20	14.5	5.0	2.7	0.0	32.4
218	22-09-2018 17:21:15	17 h 21	14.5	5.0	2.4	0.0	32.9
219	22-09-2018 17:22:15	17 h 22	14.4	5.0	2.7	0.0	33.3
220	22-09-2018 17:23:15	17 h 23	14.4	5.0	2.7	0.0	33.2
221	22-09-2018 17:24:15	17 h 24	14.5	5.0	2.8	0.0	32.6
222	22-09-2018 17:25:15	17 h 25	14.5	5.0	2.6	0.0	32.9
223	22-09-2018 17:26:15	17 h 26	14.5	5.0	2.9	0.0	32.6
224	22-09-2018 17:27:15	17 h 27	14.5	5.0	2.7	0.0	32.6
225	22-09-2018 17:28:15	17 h 28	14.4	5.0	2.8	0.0	32.7
226	22-09-2018 17:29:15	17 h 29	14.5	5.0	2.9	0.0	32.9
227	22-09-2018 17:30:15	17 h 30	14.5	5.0	2.7	0.0	32.7
228	22-09-2018 17:31:15	17 h 31	14.5	5.0	2.7	0.0	32.9
229	22-09-2018 17:32:15	17 h 32	14.4	5.0	2.7	0.0	32.9
230	22-09-2018 17:33:15	17 h 33	14.4	5.1	2.7	0.0	33.0
231	22-09-2018 17:34:15	17 h 34	14.6	5.0	2.8	0.0	32.0
232	22-09-2018 17:35:15	17 h 35	14.5	5.0	2.8	0.0	32.6
233	22-09-2018 17:36:15	17 h 36	14.5	5.0	3.0	0.0	32.8
234	22-09-2018 17:37:15	17 h 37	14.4	5.0	2.7	0.0	32.9
235	22-09-2018 17:38:15	17 h 38	14.4	5.0	2.8	0.0	33.1
236	22-09-2018 17:39:15	17 h 39	14.4	5.1	2.8	0.0	33.1
237	22-09-2018 17:40:15	17 h 40	14.4	5.1	2.8	0.0	33.4
238	28-09-2018 11:35:51	11 h 35	14.6	4.8	3.1	0.0	49.2
239	28-09-2018 11:36:51	11 h 36	14.5	4.9	2.9	0.0	49.8
240	28-09-2018 11:37:51	11 h 37	14.6	4.8	3.1	0.0	49.5
241	28-09-2018 11:38:51	11 h 38	14.4	4.9	3.2	0.0	51.6
242	28-09-2018 11:39:51	11 h 39	14.4	4.9	3.3	0.0	52.1
243	28-09-2018 11:40:51	11 h 40	14.4	4.9	3.0	0.0	52.7
244	28-09-2018 11:41:51	11 h 41	14.5	4.9	3.0	0.0	52.3
245	28-09-2018 11:42:51	11 h 42	14.5	4.9	3.2	0.0	52.7
246	28-09-2018 11:43:51	11 h 43	14.5	4.9	3.2	0.0	52.8
247	28-09-2018 11:44:51	11 h 44	14.5	4.9	3.3	0.0	52.8
248	28-09-2018 11:45:51	11 h 45	14.4	4.9	3.1	0.0	53.5
249	28-09-2018 11:46:51	11 h 46	14.5	4.8	3.2	0.0	52.8
250	28-09-2018 11:47:51	11 h 47	14.5	4.8	3.3	0.0	53.4
251	28-09-2018 11:48:51	11 h 48	14.5	4.8	3.3	0.0	53.3
252	28-09-2018 11:49:51	11 h 49	14.5	4.8	3.2	0.0	53.8
253	28-09-2018 11:50:51	11 h 50	14.6	4.8	3.0	0.0	54.3
254	28-09-2018 11:51:51	11 h 51	14.5	4.8	2.9	0.0	54.4
255	28-09-2018 11:52:51	11 h 52	14.5	4.8	3.0	0.0	54.8
256	28-09-2018 11:53:51	11 h 53	14.5	4.8	3.2	0.0	55.3
257	28-09-2018 11:54:51	11 h 54	14.5	4.8	3.2	0.0	55.1
258	28-09-2018 11:55:51	11 h 55	14.6	4.7	3.3	0.0	54.0
259	28-09-2018 11:56:51	11 h 56	14.6	4.8	3.2	0.0	55.6
260	28-09-2018 11:57:51	11 h 57	14.5	4.8	3.2	0.0	55.6
261	28-09-2018 11:58:51	11 h 58	14.6	4.7	3.4	0.0	54.9
262	28-09-2018 11:59:51	11 h 59	14.6	4.8	2.9	0.0	55.7
263	28-09-2018 12:00:51	12 h 00	14.1	5.0	3.2	0.0	58.1
264	28-09-2018 12:01:51	12 h 01	14.7	4.7	3.2	0.0	54.9
265	28-09-2018 12:02:51	12 h 02	14.5	4.8	3.0	0.0	57.0
266	28-09-2018 12:03:51	12 h 03	14.4	4.9	2.9	0.0	57.1
267	28-09-2018 12:04:51	12 h 04	14.5	4.9	3.1	0.0	57.0
268	28-09-2018 12:05:51	12 h 05	14.4	4.9	3.0	0.0	57.8
269	28-09-2018 12:06:51	12 h 06	14.5	4.9	3.1	0.0	57.1
270	28-09-2018 12:07:51	12 h 07	14.5	4.9	3.0	0.0	56.8
271	28-09-2018 12:08:51	12 h 08	14.5	4.9	3.0	0.0	57.0
272	28-09-2018 12:09:51	12 h 09	14.5	4.8	2.9	0.0	57.3
273	28-09-2018 12:10:51	12 h 10	14.5	4.9	3.1	0.0	57.3
274	28-09-2018 12:11:51	12 h 11	14.5	4.9	3.2	0.0	57.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
275	28-09-2018 12:12:51	12 h 12	14.6	4.8	3.2	0.0	55.9
276	28-09-2018 12:13:51	12 h 13	14.5	4.8	3.2	0.0	56.7
277	28-09-2018 12:14:51	12 h 14	14.4	4.9	3.0	0.0	57.5
278	28-09-2018 12:15:51	12 h 15	14.5	4.9	3.1	0.0	57.0
279	28-09-2018 12:16:51	12 h 16	14.5	4.9	3.0	0.0	57.1
280	28-09-2018 12:17:51	12 h 17	14.5	4.8	2.9	0.0	56.8
281	28-09-2018 12:18:51	12 h 18	14.5	4.9	3.0	0.0	57.7
282	28-09-2018 12:19:51	12 h 19	14.6	4.8	2.8	0.0	56.5
283	28-09-2018 12:20:51	12 h 20	14.5	4.9	2.9	0.0	57.3
284	28-09-2018 12:21:51	12 h 21	14.5	4.9	3.0	0.0	57.3
285	28-09-2018 12:22:51	12 h 22	14.5	4.9	3.0	0.0	56.9
286	28-09-2018 12:23:51	12 h 23	14.5	4.9	3.0	0.0	56.9
287	28-09-2018 12:24:51	12 h 24	14.5	4.9	2.9	0.0	56.6
288	28-09-2018 12:25:51	12 h 25	14.5	4.9	3.0	0.0	56.8
289	28-09-2018 12:26:51	12 h 26	14.5	4.9	2.9	0.0	56.8
290	28-09-2018 12:27:51	12 h 27	14.5	4.9	2.9	0.0	57.7
291	28-09-2018 12:28:51	12 h 28	15.1	4.5	3.8	0.0	49.5
292	28-09-2018 12:29:51	12 h 29	15.3	4.4	3.8	0.0	48.8
293	28-09-2018 12:30:51	12 h 30	15.2	4.4	3.8	0.0	49.2
294	28-09-2018 12:31:51	12 h 31	15.2	4.4	3.7	0.0	49.5
295	28-09-2018 12:32:51	12 h 32	15.2	4.4	3.6	0.0	48.9
296	28-09-2018 12:33:51	12 h 33	15.1	4.4	3.7	0.0	49.5
297	28-09-2018 12:34:51	12 h 34	15.2	4.4	3.6	0.0	48.8
298	28-09-2018 12:35:51	12 h 35	15.1	4.4	3.5	0.0	49.0
299	28-09-2018 12:36:51	12 h 36	15.2	4.4	3.8	0.0	48.7
300	28-09-2018 12:37:51	12 h 37	15.2	4.4	3.7	0.0	48.7
301	28-09-2018 12:38:51	12 h 38	15.2	4.4	3.8	0.0	48.9
302	28-09-2018 12:39:51	12 h 39	15.3	4.4	3.8	0.0	48.7
303	28-09-2018 12:40:51	12 h 40	15.1	4.4	3.7	0.0	49.3
304	28-09-2018 12:41:51	12 h 41	15.2	4.3	3.6	0.0	49.1
305	28-09-2018 12:42:51	12 h 42	15.2	4.4	3.6	0.0	49.2
306	28-09-2018 12:43:51	12 h 43	15.2	4.4	3.7	0.0	49.1
307	28-09-2018 12:44:51	12 h 44	15.2	4.3	3.5	0.0	49.1
308	28-09-2018 12:45:51	12 h 45	15.3	4.3	3.7	0.0	48.7
309	28-09-2018 12:46:51	12 h 46	15.3	4.3	3.7	0.0	48.5
310	28-09-2018 12:47:51	12 h 47	15.2	4.3	3.6	0.0	49.1
311	28-09-2018 12:48:51	12 h 48	15.2	4.3	3.7	0.0	49.0
312	28-09-2018 12:49:51	12 h 49	15.3	4.3	3.7	0.0	48.7
313	28-09-2018 12:50:51	12 h 50	15.2	4.3	3.4	0.0	49.0
314	28-09-2018 12:51:51	12 h 51	15.3	4.3	3.7	0.0	48.2
315	28-09-2018 12:52:51	12 h 52	15.3	4.3	3.7	0.0	47.3
316	28-09-2018 12:53:51	12 h 53	15.3	4.3	3.5	0.0	47.9
317	28-09-2018 12:54:51	12 h 54	15.3	4.3	3.6	0.0	47.6
318	28-09-2018 12:55:51	12 h 55	15.2	4.3	3.6	0.0	47.9
319	28-09-2018 12:56:51	12 h 56	15.3	4.3	3.6	0.0	47.3
320	28-09-2018 12:57:51	12 h 57	15.3	4.3	3.5	0.0	47.8
321	28-09-2018 12:58:51	12 h 58	15.3	4.3	3.4	0.0	47.1
322	28-09-2018 12:59:51	12 h 59	15.3	4.3	3.4	0.0	47.4
323	28-09-2018 13:00:51	13 h 00	15.3	4.3	3.4	0.0	48.0
324	28-09-2018 13:01:51	13 h 01	15.3	4.3	3.4	0.0	47.7
325	28-09-2018 13:02:51	13 h 02	15.2	4.3	3.2	0.0	48.1
326	28-09-2018 13:03:51	13 h 03	15.3	4.3	3.5	0.0	47.4
327	28-09-2018 13:04:51	13 h 04	15.3	4.3	3.3	0.0	47.7
328	28-09-2018 13:05:51	13 h 05	15.3	4.3	3.4	0.0	47.3
329	28-09-2018 13:06:51	13 h 06	15.3	4.3	3.6	0.0	47.3
330	28-09-2018 13:07:51	13 h 07	15.3	4.3	3.4	0.0	47.9
331	28-09-2018 13:08:51	13 h 08	15.3	4.3	3.5	0.0	47.4
332	28-09-2018 13:09:51	13 h 09	15.8	4.0	4.4	0.0	42.8
333	28-09-2018 13:10:51	13 h 10	15.5	4.1	3.8	0.0	45.6
334	28-09-2018 13:11:51	13 h 11	15.4	4.2	3.1	0.0	47.3
335	28-09-2018 13:12:51	13 h 12	15.3	4.3	3.3	0.0	47.9
336	28-09-2018 13:13:51	13 h 13	15.2	4.3	3.4	0.0	47.5
337	28-09-2018 13:14:51	13 h 14	15.2	4.3	3.4	0.0	47.8
338	28-09-2018 13:15:51	13 h 15	15.3	4.3	3.1	0.0	47.5
339	28-09-2018 13:16:51	13 h 16	15.2	4.4	3.4	0.0	47.7
340	28-09-2018 13:17:51	13 h 17	15.2	4.4	3.1	0.0	47.8
341	28-09-2018 13:18:51	13 h 18	15.2	4.4	3.0	0.0	48.0

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
342	28-09-2018 13:19:51	13 h 19	15.2	4.4	3.1	0.0	48.3
343	28-09-2018 13:20:51	13 h 20	15.3	4.4	3.3	0.0	47.4
344	28-09-2018 13:21:51	13 h 21	15.3	4.3	3.1	0.0	47.7
345	28-09-2018 13:22:51	13 h 22	15.3	4.3	3.4	0.0	46.9
346	28-09-2018 13:23:51	13 h 23	15.7	4.1	3.8	0.0	43.3
347	28-09-2018 13:24:51	13 h 24	15.3	4.3	3.2	0.0	47.2
348	28-09-2018 13:25:51	13 h 25	15.3	4.3	3.2	0.0	47.2
349	28-09-2018 13:26:51	13 h 26	15.3	4.3	3.4	0.0	47.8
350	28-09-2018 13:27:51	13 h 27	15.2	4.3	3.1	0.0	48.1
351	28-09-2018 13:28:51	13 h 28	15.3	4.3	3.3	0.0	48.1
352	28-09-2018 13:29:51	13 h 29	15.3	4.3	3.1	0.0	47.8
353	28-09-2018 13:30:51	13 h 30	15.4	4.3	3.3	0.0	46.8
354	28-09-2018 13:31:51	13 h 31	15.3	4.3	3.4	0.0	48.0
355	28-09-2018 13:32:51	13 h 32	15.5	4.2	3.5	0.0	45.8
356	28-09-2018 13:33:51	13 h 33	15.7	4.0	3.6	0.0	43.6
357	28-09-2018 13:34:51	13 h 34	15.7	4.0	3.4	0.0	43.2
358	28-09-2018 13:35:51	13 h 35	15.7	4.0	3.7	0.0	43.3
359	28-09-2018 13:36:51	13 h 36	15.7	4.0	3.7	0.0	43.5
360	28-09-2018 13:37:51	13 h 37	15.7	4.0	3.7	0.0	43.2
361	28-09-2018 13:38:51	13 h 38	15.7	4.0	3.5	0.0	43.2
362	28-09-2018 13:39:51	13 h 39	15.7	4.0	3.6	0.0	43.4
363	28-09-2018 13:40:51	13 h 40	15.7	4.0	3.7	0.0	43.7
364	28-09-2018 13:41:51	13 h 41	15.7	4.0	3.7	0.0	43.1
365	28-09-2018 13:42:51	13 h 42	15.7	4.0	3.6	0.0	42.8
366	28-09-2018 13:43:51	13 h 43	15.7	4.0	3.6	0.0	43.2
367	28-09-2018 13:44:51	13 h 44	15.7	4.0	3.6	0.0	43.3
368	28-09-2018 13:45:51	13 h 45	15.7	4.0	3.6	0.0	42.9
369	28-09-2018 13:46:51	13 h 46	15.7	4.0	3.7	0.0	42.8
370	28-09-2018 13:47:51	13 h 47	15.7	4.0	3.6	0.0	42.8
371	28-09-2018 13:48:51	13 h 48	15.7	4.0	3.6	0.0	42.8
372	28-09-2018 13:49:51	13 h 49	15.7	4.0	3.7	0.0	42.6
373	28-09-2018 13:50:51	13 h 50	15.7	4.0	4.1	0.0	42.2
374	28-09-2018 13:51:51	13 h 51	15.7	4.0	4.1	0.0	42.2
375	28-09-2018 13:52:51	13 h 52	15.8	4.0	3.9	0.0	41.9
376	28-09-2018 13:53:51	13 h 53	15.8	4.0	4.0	0.0	41.8
377	28-09-2018 13:54:51	13 h 54	15.7	4.0	3.9	0.0	42.3
378	28-09-2018 13:55:51	13 h 55	15.7	4.0	3.9	0.0	43.2
379	28-09-2018 13:56:51	13 h 56	15.7	4.0	3.9	0.0	43.0
380	28-09-2018 13:57:51	13 h 57	15.7	4.0	3.9	0.0	42.4
381	28-09-2018 13:58:51	13 h 58	15.7	4.0	3.8	0.0	42.7
382	28-09-2018 13:59:51	13 h 59	15.7	4.0	3.6	0.0	42.7
383	28-09-2018 14:00:51	14 h 00					
384	28-09-2018 14:01:51	14 h 01					
385	28-09-2018 14:02:51	14 h 02					
386	28-09-2018 14:03:51	14 h 03					
387	28-09-2018 14:04:51	14 h 04					
388	28-09-2018 14:05:51	14 h 05					
389	28-09-2018 14:06:51	14 h 06					
390	28-09-2018 14:07:51	14 h 07					
391	28-09-2018 14:08:51	14 h 08					
392	28-09-2018 14:09:51	14 h 09					
393	28-09-2018 14:10:51	14 h 10					
394	28-09-2018 14:11:51	14 h 11					
395	28-09-2018 14:12:51	14 h 12					
396	28-09-2018 14:13:51	14 h 13					
397	28-09-2018 14:14:51	14 h 14	15.3	4.3	2.9	0.0	43.9
398	28-09-2018 14:15:51	14 h 15	15.2	4.4	2.6	0.0	45.1
399	28-09-2018 14:16:51	14 h 16	15.2	4.4	3.0	0.0	45.1
400	28-09-2018 14:17:51	14 h 17	15.2	4.4	3.3	0.0	45.5
401	28-09-2018 14:18:51	14 h 18	15.1	4.4	2.9	0.0	46.1
402	28-09-2018 14:19:51	14 h 19	15.1	4.4	2.8	0.0	45.9
403	28-09-2018 14:20:51	14 h 20	15.2	4.4	3.3	0.0	45.0
404	28-09-2018 14:21:51	14 h 21	15.5	4.3	3.7	0.0	43.6
405	28-09-2018 14:22:51	14 h 22	15.3	4.3	3.4	0.0	44.6
406	28-09-2018 14:23:51	14 h 23	15.2	4.4	3.2	0.0	45.5
407	28-09-2018 14:24:51	14 h 24	15.1	4.4	2.9	0.0	46.1
408	28-09-2018 14:25:51	14 h 25	15.2	4.4	3.0	0.0	45.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
409	29-09-2018 16:15:41	16 h 15	12.9	6.1	3.1	-2.7	70.9
410	29-09-2018 16:16:41	16 h 16	12.9	6.1	2.8	-2.9	71.0
411	29-09-2018 16:17:41	16 h 17	12.8	6.2	2.9	-2.8	71.1
412	29-09-2018 16:18:41	16 h 18	12.9	6.1	3.2	-2.8	70.3
413	29-09-2018 16:19:41	16 h 19	12.8	6.1	3.1	-2.8	70.9
414	29-09-2018 16:20:41	16 h 20	12.9	6.1	3.0	-2.8	69.6
415	29-09-2018 16:21:41	16 h 21	13.4	5.7	3.5	-2.6	66.3
416	29-09-2018 16:22:41	16 h 22	13.5	5.6	3.1	-2.4	66.4
417	29-09-2018 16:23:41	16 h 23	13.4	5.7	3.1	-2.4	69.6
418	29-09-2018 16:24:41	16 h 24	13.0	5.9	2.6	-2.5	75.1
419	29-09-2018 16:25:41	16 h 25	12.8	6.1	2.6	-2.3	75.4
420	29-09-2018 16:26:41	16 h 26	12.8	6.1	2.7	-2.1	73.8
421	29-09-2018 16:27:41	16 h 27	12.9	6.1	2.7	-2.1	73.2
422	29-09-2018 16:28:41	16 h 28	12.9	6.0	2.6	-2.1	71.6
423	29-09-2018 16:29:41	16 h 29	13.0	6.0	2.8	-1.8	70.2
424	29-09-2018 16:30:41	16 h 30	12.9	6.1	2.8	-1.8	71.3
425	29-09-2018 16:31:41	16 h 31	13.0	6.0	2.9	-1.5	70.1
426	29-09-2018 16:32:41	16 h 32	13.0	6.0	2.9	-1.6	69.8
427	29-09-2018 16:33:41	16 h 33	12.9	6.1	3.0	-1.4	70.8
428	29-09-2018 16:34:41	16 h 34	13.0	6.0	2.7	-1.3	69.3
429	29-09-2018 16:35:41	16 h 35	13.0	6.0	2.6	-1.3	69.9
430	29-09-2018 16:36:41	16 h 36	13.0	6.0	2.7	-1.3	69.6
431	29-09-2018 16:37:41	16 h 37	13.0	6.0	2.6	-1.1	70.3
432	29-09-2018 16:38:41	16 h 38	13.0	6.0	2.7	-1.1	69.4
433	29-09-2018 16:39:41	16 h 39	13.1	5.9	2.8	-1.1	68.7
434	29-09-2018 16:40:41	16 h 40	13.7	5.6	3.0	-1.0	62.4
435	29-09-2018 16:41:41	16 h 41	13.8	5.5	3.3	-1.0	61.1
436	29-09-2018 16:42:41	16 h 42	13.7	5.5	3.2	-1.0	62.0
437	29-09-2018 16:43:41	16 h 43	13.7	5.5	3.3	-1.1	62.0
438	29-09-2018 16:44:41	16 h 44	13.8	5.4	3.4	-0.9	61.3
439	29-09-2018 16:45:41	16 h 45	13.6	5.6	2.9	-0.8	63.1
440	29-09-2018 16:46:41	16 h 46	13.7	5.5	2.9	-0.6	63.0
441	29-09-2018 16:47:41	16 h 47	13.8	5.5	3.2	-0.7	62.3
442	29-09-2018 16:48:41	16 h 48	13.7	5.5	2.8	-0.6	62.7
443	29-09-2018 16:49:41	16 h 49	13.7	5.5	2.8	-0.5	62.5
444	29-09-2018 16:50:41	16 h 50	13.7	5.5	2.9	-0.3	62.9
445	29-09-2018 16:51:41	16 h 51	13.7	5.5	2.9	-0.2	63.4
446	29-09-2018 16:52:41	16 h 52	13.7	5.5	2.8	-0.2	63.6
447	29-09-2018 16:53:41	16 h 53	13.7	5.5	3.1	0.0	63.7
448	29-09-2018 16:54:41	16 h 54	13.7	5.5	3.1	0.2	63.5
449	29-09-2018 16:55:41	16 h 55	13.7	5.5	3.1	0.3	63.5
450	29-09-2018 16:56:41	16 h 56	13.7	5.5	3.0	0.5	63.7
451	29-09-2018 16:57:41	16 h 57	13.7	5.5	3.1	0.5	64.3
452	29-09-2018 16:58:41	16 h 58	13.7	5.5	2.9	0.7	63.7
453	29-09-2018 16:59:41	16 h 59	13.7	5.5	2.6	0.8	63.9
454	29-09-2018 17:00:41	17 h 00	13.7	5.5	3.1	0.8	64.2
455	29-09-2018 17:01:41	17 h 01	13.7	5.5	2.8	0.9	64.4
456	29-09-2018 17:02:41	17 h 02	13.7	5.5	2.8	1.1	64.4
457	29-09-2018 17:03:41	17 h 03	13.7	5.5	2.8	1.2	64.4
458	29-09-2018 17:04:41	17 h 04	13.7	5.5	2.8	1.3	64.0
459	29-09-2018 17:05:41	17 h 05	13.7	5.5	3.0	1.4	64.3
460	29-09-2018 17:06:41	17 h 06	13.7	5.5	2.8	1.6	64.5
461	29-09-2018 17:07:41	17 h 07	13.7	5.5	3.0	1.4	64.6
462	29-09-2018 17:08:41	17 h 08	13.7	5.5	3.0	1.5	64.5
463	29-09-2018 17:09:41	17 h 09	13.7	5.5	3.0	1.5	64.4
464	29-09-2018 17:10:41	17 h 10	13.7	5.5	3.0	1.4	63.8
465	29-09-2018 17:11:41	17 h 11	13.7	5.5	2.8	1.6	63.8
466	29-09-2018 17:12:41	17 h 12	13.9	5.4	3.2	1.7	60.9
467	29-09-2018 17:13:41	17 h 13	14.1	5.2	3.3	1.6	59.2
468	29-09-2018 17:14:41	17 h 14	14.2	5.2	3.3	1.6	58.3
469	29-09-2018 17:15:41	17 h 15	14.2	5.2	3.1	1.7	58.3
470	29-09-2018 17:16:41	17 h 16	14.2	5.2	3.4	1.9	57.6
471	29-09-2018 17:17:41	17 h 17	14.2	5.2	3.4	2.0	57.8
472	29-09-2018 17:18:41	17 h 18	14.2	5.1	3.3	2.1	57.6
473	29-09-2018 17:19:41	17 h 19	14.2	5.2	3.4	2.3	58.4
474	29-09-2018 17:20:41	17 h 20	14.2	5.2	3.3	2.2	58.3
475	29-09-2018 17:21:41	17 h 21	14.1	5.2	3.3	2.2	58.7

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
476	29-09-2018 17:22:41	17 h 22	14.1	5.2	3.4	2.6	58.3
477	29-09-2018 17:23:41	17 h 23	14.4	5.0	3.5	2.6	55.8
478	29-09-2018 17:24:41	17 h 24	14.6	4.9	3.5	2.8	57.3
479	29-09-2018 17:25:41	17 h 25	14.4	5.0	2.9	3.0	59.1
480	29-09-2018 17:26:41	17 h 26	14.3	5.1	2.8	3.1	58.9
481	29-09-2018 17:27:41	17 h 27	14.2	5.1	3.0	3.4	59.0
482	29-09-2018 17:28:41	17 h 28	14.2	5.1	2.8	3.6	58.1
483	29-09-2018 17:29:41	17 h 29	14.2	5.1	3.0	3.4	58.8
484	29-09-2018 17:30:41	17 h 30	14.2	5.2	2.9	3.4	59.0
485	29-09-2018 17:31:41	17 h 31	14.1	5.1	2.9	3.3	59.3
486	29-09-2018 17:32:41	17 h 32	14.1	5.2	2.8	3.3	60.0
487	29-09-2018 17:33:41	17 h 33	14.2	5.1	2.9	3.1	58.7
488	29-09-2018 17:34:41	17 h 34	14.1	5.1	2.9	2.8	58.7
489	29-09-2018 17:35:41	17 h 35	14.1	5.2	2.9	2.4	59.1
490	29-09-2018 17:36:41	17 h 36	14.1	5.2	2.9	2.1	59.0
491	29-09-2018 17:37:41	17 h 37	14.1	5.2	3.0	1.9	58.4
492	29-09-2018 17:38:41	17 h 38	14.1	5.2	3.0	1.7	58.5
493	29-09-2018 17:39:41	17 h 39	14.1	5.2	3.0	1.4	58.4
494	29-09-2018 17:40:41	17 h 40	14.1	5.2	3.0	1.1	58.3
495	29-09-2018 17:41:41	17 h 41	14.1	5.2	3.3	1.1	58.8
496	29-09-2018 17:42:41	17 h 42	14.1	5.2	3.1	0.7	58.7
497	29-09-2018 17:43:41	17 h 43	14.1	5.2	3.2	0.4	58.4
498	29-09-2018 17:44:41	17 h 44	14.1	5.2	2.9	0.3	58.7
499	29-09-2018 17:45:41	17 h 45	14.1	5.2	3.2	0.1	59.5
500	29-09-2018 17:46:41	17 h 46	14.1	5.2	2.9	-0.1	59.8
501	29-09-2018 17:47:41	17 h 47	14.1	5.2	2.9	-0.3	60.0
502	29-09-2018 17:48:41	17 h 48	14.1	5.2	2.8	-0.3	60.0
503	29-09-2018 17:49:41	17 h 49	14.1	5.2	3.1	-0.4	59.5
504	29-09-2018 17:50:41	17 h 50	14.1	5.2	3.2	-0.5	58.2
505	29-09-2018 17:51:41	17 h 51	14.1	5.2	2.9	-0.5	58.2
506	29-09-2018 17:52:41	17 h 52	14.1	5.2	3.1	-0.6	58.1
507	29-09-2018 17:53:41	17 h 53	14.1	5.2	3.2	-0.7	58.1
508	29-09-2018 17:54:41	17 h 54	14.1	5.2	2.9	-0.7	58.0
509	29-09-2018 17:55:41	17 h 55	14.1	5.2	2.8	-0.6	57.9
510	29-09-2018 17:56:41	17 h 56	14.0	5.3	3.0	-0.7	58.8
511	29-09-2018 17:57:41	17 h 57	14.0	5.3	3.0	-0.8	58.3
512	29-09-2018 17:58:41	17 h 58	14.0	5.2	2.8	-0.8	58.4
513	29-09-2018 17:59:41	17 h 59	14.1	5.2	3.0	-0.7	58.0
514	29-09-2018 18:00:41	18 h 00	14.1	5.2	2.7	-0.8	57.7
515	29-09-2018 18:01:41	18 h 01	14.0	5.3	3.1	-0.7	58.8
516	29-09-2018 18:02:41	18 h 02	14.1	5.2	2.8	-0.7	57.9
517	29-09-2018 18:03:41	18 h 03	14.1	5.2	2.9	-0.8	58.1
518	29-09-2018 18:04:41	18 h 04	14.1	5.2	3.0	-0.6	57.7
519	29-09-2018 18:05:41	18 h 05	14.0	5.3	3.0	-0.6	58.4
520	29-09-2018 18:06:41	18 h 06	14.1	5.2	2.9	-0.6	58.4
521	29-09-2018 18:07:41	18 h 07	14.1	5.3	2.6	-0.7	58.0
522	29-09-2018 18:08:41	18 h 08	14.0	5.3	2.6	-0.8	58.5
523	29-09-2018 18:09:41	18 h 09	14.1	5.2	3.0	-0.8	57.6
524	29-09-2018 18:10:41	18 h 10	14.1	5.2	2.9	-0.6	57.5
525	29-09-2018 18:11:41	18 h 11	14.1	5.2	3.0	-0.5	56.8
526	29-09-2018 18:12:41	18 h 12	13.0	5.9	1.8	-0.4	69.4
527	29-09-2018 18:13:41	18 h 13	12.8	6.2	1.7	-0.3	71.8
528	29-09-2018 18:14:41	18 h 14	12.8	6.2	1.5	-0.3	71.8
529	29-09-2018 18:15:41	18 h 15	12.9	6.1	1.7	-0.3	70.5
530	29-09-2018 18:16:41	18 h 16	12.9	6.2	1.7	-0.1	72.2
531	29-09-2018 18:17:41	18 h 17	12.9	6.1	1.7	0.2	71.7
532	29-09-2018 18:18:41	18 h 18	12.9	6.1	1.5	0.1	72.6
533	29-09-2018 18:19:41	18 h 19	12.9	6.1	1.6	0.2	72.6
534	29-09-2018 18:20:41	18 h 20	12.9	6.1	1.8	0.4	71.7
535	29-09-2018 18:21:41	18 h 21	13.0	6.1	1.9	0.5	70.3
536	29-09-2018 18:22:41	18 h 22	13.0	6.1	1.6	0.7	70.9
537	29-09-2018 18:23:41	18 h 23	13.0	6.1	1.7	0.7	71.0
538	29-09-2018 18:24:41	18 h 24	13.0	6.1	1.7	0.6	71.6
539	29-09-2018 18:25:41	18 h 25	13.0	6.1	1.7	0.7	70.9
540	29-09-2018 18:26:41	18 h 26	12.9	6.1	1.7	0.9	72.6
541	29-09-2018 18:27:41	18 h 27	13.0	6.1	1.7	0.7	71.8
542	29-09-2018 18:28:41	18 h 28	13.0	6.1	1.8	0.8	72.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
543	29-09-2018 18:29:41	18 h 29	13.0	6.1	1.6	0.8	72.6
544	29-09-2018 18:30:41	18 h 30	12.9	6.1	1.7	0.8	72.3
545	29-09-2018 18:31:41	18 h 31	13.0	6.1	1.8	0.7	72.3
546	29-09-2018 18:32:41	18 h 32	13.0	6.1	1.5	0.8	72.2
547	29-09-2018 18:33:41	18 h 33	12.9	6.1	1.4	0.9	72.4
548	29-09-2018 18:34:41	18 h 34	12.9	6.1	1.7	0.8	71.8
549	29-09-2018 18:35:41	18 h 35	12.9	6.1	1.6	0.8	71.8
550	29-09-2018 18:36:41	18 h 36	13.0	6.1	1.5	0.7	71.8
551	29-09-2018 18:37:41	18 h 37	12.9	6.1	1.7	0.7	72.3
552	29-09-2018 18:38:41	18 h 38	13.0	6.1	1.6	0.8	72.3
553	29-09-2018 18:39:41	18 h 39	13.0	6.1	1.6	0.5	71.9
554	29-09-2018 18:40:41	18 h 40	12.9	6.1	1.7	0.5	72.5
555	29-09-2018 18:41:41	18 h 41	13.0	6.1	1.7	0.5	72.1
556	29-09-2018 18:42:41	18 h 42	13.0	6.1	1.4	0.4	72.4
557	29-09-2018 18:43:41	18 h 43	12.7	6.2	1.3	0.3	75.2
558	29-09-2018 18:44:41	18 h 44	12.8	6.2	1.4	0.4	74.6
559	29-09-2018 18:45:41	18 h 45	12.7	6.3	1.4	0.3	75.7
560	29-09-2018 18:46:41	18 h 46	12.6	6.3	1.3	0.2	76.4
561	29-09-2018 18:47:41	18 h 47	13.3	5.9	1.4	0.1	76.8
562	29-09-2018 18:48:41	18 h 48	13.4	5.8	1.8	-0.1	76.9
563	29-09-2018 18:49:41	18 h 49	13.5	5.7	1.8	0.0	76.2
564	29-09-2018 18:50:41	18 h 50	13.5	5.7	1.9	-0.2	76.2
565	29-09-2018 18:51:41	18 h 51	13.6	5.6	1.9	-0.4	74.8
566	29-09-2018 18:52:41	18 h 52	13.7	5.6	1.9	-0.3	74.4
567	29-09-2018 18:53:41	18 h 53	13.7	5.6	2.0	-0.5	73.5
568	29-09-2018 18:54:41	18 h 54	13.7	5.6	2.1	-0.4	73.8
569	29-09-2018 18:55:41	18 h 55	13.7	5.6	2.0	-0.7	73.6
570	29-09-2018 18:56:41	18 h 56	13.7	5.6	2.0	-0.5	72.8
571	29-09-2018 18:57:41	18 h 57	13.7	5.6	2.1	-0.8	73.6
572	29-09-2018 18:58:41	18 h 58	13.7	5.6	1.9	-0.7	73.6
573	29-09-2018 18:59:41	18 h 59	13.7	5.6	1.9	-0.8	73.5
574	29-09-2018 19:00:41	19 h 00	13.7	5.6	1.9	-0.8	73.5
575	29-09-2018 19:01:41	19 h 01	13.7	5.6	2.0	-1.0	73.7
576	29-09-2018 19:02:41	19 h 02	13.6	5.6	1.8	-1.1	74.5
577	29-09-2018 19:03:41	19 h 03	13.6	5.7	2.1	-0.8	74.2
578	29-09-2018 19:04:41	19 h 04	13.5	5.7	1.9	-0.9	75.1
579	29-09-2018 19:05:41	19 h 05	13.6	5.6	1.9	-0.9	74.0

APPENDIX 3
CALIBRATION CERTIFICATES



CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

FEUILLE D'ÉTALONNAGE DES MODULES 2018

MODULE	GAMMA (K_c)	ORIFICE (K_o) K_o	ΔH@ moy	DATE ÉTALONNAGE	COMPENSÉ 60 °F
1	1.009	0.999	0.970	13-mars-18	OUI
2	0.999	0.969	1.001	15-mars-18	OUI
3	0.990	0.950	1.188	05-déc-17	NON
4	1.001	0.946	1.040	15-août-18	NON
5	0.996	0.997	0.923	20-mars-18	NON
6	1.004	0.991	1.027	06-sept-18	OUI
7	0.981	0.994	0.928	27-oct-17	NON
8	1.013	1.037	0.958	06-juil-18	OUI
9	0.998	1.012	0.899	14-sept-17	NON
10	1.011	0.993	1.005	20-mars-18	OUI
11	0.989	0.974	1.054	06-sept-18	OUI
12	0.999	0.911	1.208	24-mai-18	NON
13	1.019	0.974	0.921	19-mars-18	NON
14	1.000	1.004	0.975	21-mars-18	OUI
15	1.000	0.982	1.021	13-nov-17	NON
16	1.017	1.027	0.872	15-sept-17	NON
17	0.987	1.050	0.833	15-sept-17	NON
18	1.002	1.013	0.896	07-sept-18	NON
19	0.997	1.000	1.005	06-sept-18	OUI
20	1.005	0.970	1.072	07-sept-18	OUI
21	0.989	1.011	0.984	13-nov-17	OUI
22	0.993	0.996	0.995	04-déc-17	NON
23	1.013	1.029	0.875	15-sept-17	NON
24	1.007	0.995	1.160	04-déc-17	NON
25	0.999	0.733	2.529	24-mai-18	NON

MODULE	GAMMA (K_C)	DATE ÉTALONNAGE
F-1	0.973	27-oct-17
F-2	0.977	05-juil-18
F-3	1.006	13-nov-17
F-4	1.009	17-juil-17
F-5	1.001	26-oct-17
F-6	1.013	22-mars-18

Version: 4
Date: 07-09-2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

FEUILLE D'ÉTALONNAGE DES MODULES 2018

MODULE	GAMMA (K_c)	ORIFICE (K_o) K_o	ΔH@ moy	DATE ÉTALONNAGE	COMPENSÉ 60 °F
1	1.009	0.999	0.970	13-mars-18	OUI
2	0.999	0.969	1.001	15-mars-18	OUI
3	0.990	0.950	1.188	05-déc-17	NON
4	1.001	0.946	1.040	15-août-18	NON
5	0.996	0.997	0.923	20-mars-18	NON
6	1.004	0.991	1.027	06-sept-18	OUI
7	0.981	0.994	0.928	27-oct-17	NON
8	1.013	1.037	0.958	06-juil-18	OUI
9	0.998	1.012	0.899	14-sept-17	NON
10	1.011	0.993	1.005	20-mars-18	OUI
11	0.989	0.974	1.054	06-sept-18	OUI
12	0.999	0.911	1.208	24-mai-18	NON
13	1.019	0.974	0.921	19-mars-18	NON
14	1.000	1.004	0.975	21-mars-18	OUI
15	1.000	0.982	1.021	13-nov-17	NON
16	1.017	1.027	0.872	15-sept-17	NON
17	0.987	1.050	0.833	15-sept-17	NON
18	1.002	1.013	0.896	07-sept-18	NON
19	0.997	1.000	1.005	06-sept-18	OUI
20	1.005	0.970	1.072	07-sept-18	OUI
21	0.989	1.011	0.984	13-nov-17	OUI
22	0.993	0.996	0.995	04-déc-17	NON
23	1.013	1.029	0.875	15-sept-17	NON
24	1.007	0.995	1.160	04-déc-17	NON
25	0.999	0.733	2.529	24-mai-18	NON

MODULE	GAMMA (K_C)	DATE ÉTALONNAGE
F-1	0.973	27-oct-17
F-2	0.977	05-juil-18
F-3	1.006	13-nov-17
F-4	1.009	17-juil-17
F-5	1.001	26-oct-17
F-6	1.013	22-mars-18

Version: 4
Date: 07-09-2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

RÉSUMÉ D'ÉTALONNAGE DES SONDES - S-03 V

Version 1 (02-03-2018)

#	Année	MDF	LV	#	1	2	3	4	5	6	7	8	9	10	11	12	Moy. V	Thermocouple (Validation)	P-T-B	Endroit
				Buse	A-312-1												---			
03-05	2018	O	O	Ct	0.797												0.797	OK	OK	LE-02-W
				E. Rel	0.6												0.6			
				Buse	3Q-371	3Q-431	3Q-503	3Q-682									---			
03-06	2018	N	Q	Ct	0.778	0.779	0.781	0.773									0.778	OK	OK	Atelier
				E. Rel	0.6	0.4	0.6	0.7									0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-07	2018	O	O	Ct	0.779	0.777	0.792	0.790	0.777	0.778	0.782	0.770	0.782	0.781	0.777	0.771	0.780	OK	OK	LE-02-W
				E. Rel	1.0	0.9	0.8	0.8	1.1	1.1	1.0	1.4	1.3	1.1	1.3	1.4	1.1			
				Buse	A-312-3												---			
03-09	2018	O	O	Ct	0.827												0.827	OK	OK	LE-14-B
				E. Rel	0.4												0.4			
				Buse	A-312-3												---			
03-10	2018	O	O	Ct	0.778												0.778	OK	OK	LE-11-V
				E. Rel	1.3												1.3			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-2	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-11	2018	O	O	Ct	0.792	0.795	0.794	0.793	0.796	0.796	0.795	0.798	0.796	0.793	0.793	0.789	0.794	OK	OK	LE-05-O
				E. Rel	1.1	0.8	1.0	1.1	1.1	1.0	1.0	0.6	1.0	1.2	0.9	1.1	1.0			
				Buse	A-312-3												---			
03-12	2018	O	O	Ct	0.791												0.791	OK	OK	LE-14-B
				E. Rel	1.1												1.1			
				Buse	A-312-3												---			
03-13	2018	O	O	Ct	0.772												0.772	OK	OK	LE-11-V
				E. Rel	0.9												0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-14	2018	O	O	Ct	0.801	0.799	0.813	0.811	0.810	0.806	0.808	0.796	0.805	0.802	0.792	0.799	0.804	OK	OK	LE-02-W
				E. Rel	1.2	0.8	1.0	0.7	0.8	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-2	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-15	2018	O	O	Ct	0.808	0.805	0.816	0.811	0.808	0.804	0.800	0.798	0.802	0.800	0.792	0.784	0.802	OK	OK	LE-02-W
				E. Rel	1.2	1.2	1.2	1.0	1.2	1.2	1.3	1.2	1.1	1.3	1.3	1.0	1.2			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-16	2018	O	O	Ct	0.790	0.790	0.794	0.796	0.797	0.794	0.794	0.791	0.800	0.802	0.796	0.793	0.795	OK	OK	LE-02-W
				E. Rel	0.7	1.1	1.3	1.1	1.2	1.3	1.1	1.2	1.4	1.5	1.1	1.1	1.2			
				Buse	A-312-3												---			
03-18	2018	O	O	Ct	0.822												0.822	OK	OK	LE-08-Br
				E. Rel	1.0												1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-19	2018	O	V	Ct	0.765	0.779	0.780	0.772	0.787	0.767	0.774	0.781	0.779	0.781	0.770	0.761	0.775	OK	OK	Atelier Qc
				E. Rel	1.0	0.4	1.0	0.7	0.6	0.0	0.0	0.0	0.0	0.9	1.0	1.0	0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-437-1	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-20	2018	O	V	Ct	0.769	0.779	0.787	0.791	0.795	0.776	0.782	0.788	0.791	0.796	0.785	0.788	0.786	OK	OK	Atelier Qc
				E. Rel	1.3	0.8	1.0	1.1	1.3	1.0	1.1	1.1	1.0	1.1	1.0	1.0	1.1			
				Buse	A-312-3												---			
03-21	2018	O	O	Ct	0.805												0.805	OK	OK	LE-08-Br
				E. Rel	0.4												0.4			
				Buse	A-312-3												---			
03-22	2018	O	N	Ct	0.785												0.785	OK	OK	LE-09-G
				E. Rel	1.1												1.1			
				Buse	A-312-3												---			
03-23	2018	O	O	Ct	0.785												0.785	OK	OK	LE-09-G
				E. Rel	0.0												0.0			

Effectué par: JM / DR / JFG / SA Date: Février 2018

Endroit de la calibration: Université Laval

Vérifié par: Eric Trépanier

Signature:  Date: 2 mars 2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

RÉSUMÉ D'ÉTALONNAGE DES SONDES - S-05 V

Version 1 (02-03-2018)

#	Année	MDF	LV	#	1	2	3	4	5	6	7	8	9	10	11	12	Moy. V	Thermocouple (Validation)	P-T-B	Endroit
				Buse	A-312-3												---			
05-03	2018	N	O	Ct	0.769												0.769	OK	OK	LE-09-G
				E. Rel	1.5												1.5			
				Buse	A-312-3												---			
05-05	2018	O	O	Ct	0.800												0.800	OK	OK	LE-14-B
				E. Rel	1.0												1.0			
				Buse	5Q-374	5Q-434	5Q-501	5Q-681									---			
05-07	2018	N	Q	Ct	0.783	0.786	0.774	0.792									0.784	OK	OK	Atelier
				E. Rel	1.3	1.3	1.2	1.5									1.3			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-08	2018	O	O	Ct	0.786	0.786	0.783	0.780	0.783	0.779	0.779	0.781	0.809	0.804	0.798	0.802	0.789	OK	OK	LE-05-O
				E. Rel	0.4	0.8	0.8	1.3	0.9	1.2	1.3	0.8	1.4	1.2	1.3	1.2	1.1			
				Buse	A-312-3												---			
05-09	2018	O	O	Ct	0.796												0.796	OK	OK	LE-14-B
				E. Rel	1.1												1.1			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-10	2018	O	O	Ct	0.792	0.792	0.795	0.794	0.796	0.791	0.793	0.792	0.795	0.798	0.790	0.794	0.794	OK	OK	LE-05-O
				E. Rel	0.7	0.7	0.8	0.4	0.9	0.6	0.7	0.6	0.8	0.0	0.6	0.4	0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-1	A-437-1	A-500-1	A-562-1	---			
05-11	2018	O	O	Ct	0.803	0.798	0.805	0.805	0.802	0.800	0.806	0.801	0.807	0.805	0.803	0.802	0.803	OK	OK	LE-02-W
				E. Rel	0.6	0.9	1.0	1.0	1.0	1.0	0.8	1.2	1.0	1.0	1.0	1.0	1.0			
				Buse	A-312-3												---			
05-12	2018	O	O	Ct	0.783												0.783	OK	OK	LE-15-B
				E. Rel	1.0												1.0			
				Buse	A-312-3												---			
05-13	2018	O	O	Ct	0.808												0.808	OK	OK	LE-11-V
				E. Rel	0.9												0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-14	2018	O	O	Ct	0.828	0.824	0.830	0.830	0.830	0.825	0.813	0.816	0.839	0.836	0.832	0.826	0.827	OK	OK	LE-02-W
				E. Rel	0.7	0.0	0.4	0.0	0.4	0.9	1.0	1.5	1.4	0.8	0.8	0.8	0.7			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-15	2018	O	O	Ct	0.774	0.778	0.785	0.787	0.783	0.783	0.782	0.783	0.787	0.791	0.777	0.775	0.782	OK	OK	LE-02-W
				E. Rel	1.5	1.3	1.0	1.0	1.1	0.7	0.7	0.7	0.9	0.7	0.4	0.7	0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-16	2018	O	O	Ct	0.823	0.819	0.823	0.824	0.818	0.820	0.823	0.820	0.823	0.821	0.816	0.817	0.821	OK	OK	LE-02-W
				E. Rel	0.8	0.9	0.7	0.7	0.0	0.4	0.7	0.9	0.7	0.0	0.0	0.0	0.5			
				Buse	A-312-3												---			
05-18	2018	O	O	Ct	0.767												0.767	OK	OK	LE-08-Br
				E. Rel	0.7												0.7			
				Buse	A-312-3												---			
05-19	2018	O	O	Ct	0.830												0.830	OK	OK	LE-08-Br
				E. Rel	0.7												0.7			
				Buse	A-312-3												---			
05-20	2018	O	O	Ct	0.777												0.777	OK	OK	LE-08-Br
				E. Rel	1.0												1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-21	2018	O	V	Ct	0.812	0.815	0.812	0.808	0.820	0.811	0.820	0.813	0.815	0.817	0.815	0.809	0.814	OK	OK	Atelier Qc
				E. Rel	0.4	0.4	1.0	1.0	0.4	0.0	0.7	0.9	1.0	1.0	1.0	1.0	0.7			
				Buse	A-312-3												---			
05-22	2018	O	O	Ct	0.786												0.786	OK	OK	LE-09-G
				E. Rel	0.7												0.7			

Effectué par: JM / DR / JFG / SA

Date: Février 2018

Endroit de la calibration: Université Laval

Vérifié par: Eric Trépanier

Signature: 

Date: 2 mars 2018

APPENDIX 4
LABORATORY ANALYSIS REPORT



AGAT Laboratoires

9770 ROUTE TRANSCANADIENNE
ST. LAURENT, QUEBEC
CANADA H4S 1V9
TEL (514)337-1000
FAX (514)333-3046
http://www.agatlabs.com

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC
2022 LAVOISIER LOCAL 125
QUEBEC, QC G1N4L5
(418) 650-5960

À L'ATTENTION DE: Eric Trépanier

N° DE PROJET: Agnico Eagle/5528

N° BON DE TRAVAIL: 18M395832

HAUTE RÉSOLUTION VÉRIFIÉ PAR: Anastasia Kazakova, chimiste

DATE DU RAPPORT: 2018-11-01

VERSION*: 1

NOMBRE DE PAGES: 7

Si vous désirez de l'information concernant cette analyse, S.V.P. contacter votre chargé de projets au (514) 337-1000.

*NOTES

Nous disposerons des échantillons dans les 30 jours suivants les analyses. S.V.P. Contactez le laboratoire si vous désirez avoir un délai d'entreposage.

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AGAT Laboratoires

9770 ROUTE TRANSCANADIENNE
ST. LAURENT, QUEBEC
CANADA H4S 1V9
TEL (514)337-1000
FAX (514)333-3046
http://www.agatlabs.com

Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

				501 à 506 - Inc.		507 à 512-Inc.-2		513 à 518-Inc.-3		519 à 524-Inc.
IDENTIFICATION DE L'ÉCHANTILLON:				-1						-BL
MATRICE:				Air		Air		Air		Air
DATE D'ÉCHANTILLONNAGE:				2018-09-22		2018-09-22		2018-09-22		2018-09-22
Paramètre	Unités	C / N	LDR	9616643	LDR	9616650	LDR	9616651	LDR	9616652
2,3,7,8-TCDD (pg total)	pg		1	<1	2	5	7	<7	0.8	<0.8
1,2,3,7,8 PeCDD (pg total)	pg		3	<3	9	47	10	23	2	<2
1,2,3,4,7,8 HxCDD (pg total)	pg		3	<3	7	53	10	28	2	<2
1,2,3,6,7,8 HxCDD (pg total)	pg		3	3	6	71	10	63	2	<2
1,2,3,7,8,9 HxCDD (pg total)	pg		3	<3	7	81	10	65	2	<2
1,2,3,4,6,7,8 HpCDD (pg total)	pg		6	17	10	316	10	307	5	<5
OCDD (pg total)	pg		20	33	10	160	20	300	20	<20
2,3,7,8 TCDF (pg total)	pg		4	15	6	48	9	216	2	<2
1,2,3,7,8 PeCDF (pg total)	pg		8	<8	9	21	20	62	2	<2
2,3,4,7,8-PeCDF (pg total)	pg		6	9	7	43	10	165	2	<2
1,2,3,4,7,8 HxCDF (pg total)	pg		4	13	10	62	10	326	2	<2
1,2,3,6,7,8 HxCDF (pg total)	pg		4	9	10	25	10	120	2	<2
2,3,4,6,7,8-HxCDF (pg total)	pg		4	8	10	50	10	273	2	<2
1,2,3,7,8,9 HxCDF (pg total)	pg		6	<6	20	<20	20	30	3	<3
1,2,3,4,6,7,8 HpCDF (pg total)	pg		3	16	5	64	20	474	2	<2
1,2,3,4,7,8,9 HpCDF (pg total)	pg		6	<6	8	8	20	100	3	<3
OCDF (pg total)	pg		9	20	7	17	30	227	7	<7
Sommation des Tétrachlorodibenzodioxines	pg		1	9	2	159	7	214	0.8	3.3
Sommation des Pentachlorodibenzodioxines	pg		3	11	9	446	10	406	2	8
Sommation des Hexachlorodibenzodioxines	pg		3	25	7	900	10	718	2	5
Sommation des Heptachlorodibenzodioxines	pg		6	20	10	334	10	315	5	<5
Sommation des PCDDs	pg		20	99	10	2000	20	1950	20	<20
Sommation des Tétrachlorodibenzofuranes	pg		4	100	6	282	9	1140	2	20

Certifié par:

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.

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AGAT Laboratoires

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ST. LAURENT, QUEBEC
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TEL (514)337-1000
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Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

IDENTIFICATION DE L'ÉCHANTILLON:				501 à 506 - Inc. -1		507 à 512-Inc.-2		513 à 518-Inc.-3		519 à 524-Inc. -BL
MATRICE:				Air		Air		Air		Air
DATE D'ÉCHANTILLONNAGE:				2018-09-22		2018-09-22		2018-09-22		2018-09-22
Paramètre	Unités	C / N	LDR	9616643	LDR	9616650	LDR	9616651	LDR	9616652
Sommation des Pentachlorodibenzofuranes	pg		8	72	9	406	20	1540	2	15
Sommation des Hexachlorodibenzofuranes	pg		6	32	20	172	20	963	3	3
Sommation des Heptachlorodibenzofuranes	pg		6	28	8	123	20	880	3	5
Sommation des PCDFs	pg		9	253	20	1000	30	4750	7	43
2,3,7,8-Tetra CDD (TEF 1.0)	TEQ			0		5.30		0		0
1,2,3,7,8-Penta CDD (TEF 1.0)	TEQ			0		47.2		23.4		0
1,2,3,4,7,8-Hexa CDD (TEF 0.1)	TEQ			0		5.31		2.83		0
1,2,3,6,7,8-Hexa CDD (TEF 0.1)	TEQ			0.296		7.05		6.32		0
1,2,3,7,8,9-Hexa CDD (TEF 0.1)	TEQ			0		8.11		6.46		0
1,2,3,4,6,7,8-Hepta CDD (TEF 0.01)	TEQ			0.171		3.16		3.07		0
Octa CDD (TEF 0.0001)	TEQ			0.00335		0.0160		0.0300		0
2,3,7,8-Tetra CDF (TEF 0.1)	TEQ			1.48		4.84		21.6		0
1,2,3,7,8-Penta CDF (TEF 0.05)	TEQ			0		1.03		3.12		0
2,3,4,7,8-Penta CDF (TEF 0.5)	TEQ			4.36		21.6		82.5		0
1,2,3,4,7,8-Hexa CDF (TEF 0.1)	TEQ			1.30		6.24		32.6		0
1,2,3,6,7,8-Hexa CDF (TEF 0.1)	TEQ			0.926		2.48		12.0		0
2,3,4,6,7,8-Hexa CDF (TEF 0.1)	TEQ			0.818		4.96		27.3		0
1,2,3,7,8,9-Hexa CDF (TEF 0.1)	TEQ			0		0		3.04		0
1,2,3,4,6,7,8-Hepta CDF (TEF 0.01)	TEQ			0.162		0.636		4.74		0
1,2,3,4,7,8,9-Hepta CDF (TEF 0.01)	TEQ			0		0.0830		0.998		0
Octa CDF (TEF 0.0001)	TEQ			0.00201		0.00173		0.0227		0
Sommation des PCDDs et PCDFs (TEQ)				9.51		118		230		0

Certifié par:

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AGAT Laboratoires

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http://www.agatlabs.com

Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

			501 à 506 - Inc.			519 à 524-Inc.
IDENTIFICATION DE L'ÉCHANTILLON:			-1	507 à 512-Inc.-2	513 à 518-Inc.-3	-BL
MATRICE:			Air	Air	Air	Air
DATE D'ÉCHANTILLONNAGE:			2018-09-22	2018-09-22	2018-09-22	2018-09-22
Étalon de recouvrement	Unités	Limites	9616643	9616650	9616651	9616652
13C-2378-TCDF	%	30-140	56	60	45	54
13C-12378-PeCDF	%	30-140	48	48	38	52
13C-23478-PeCDF	%	30-140	71	60	56	55
13C-123478-HxCDF	%	30-140	84	89	72	73
13C-123678-HxCDF	%	30-140	94	95	68	88
13C-234678-HxCDF	%	30-140	104	109	68	86
13C-123789-HxCDF	%	30-140	94	101	60	72
13C-1234678-HpCDF	%	30-140	70	72	49	64
13C-1234789-HpCDF	%	30-140	57	61	51	55
13C-2378-TCDD	%	30-140	75	73	54	74
13C-12378-PeCDD	%	30-140	65	61	50	60
13C-123478-HxCDD	%	30-140	99	103	72	77
13C-123678-HxCDD	%	30-140	103	117	67	98
13C-1234678-HxCDD	%	30-140	58	62	50	57
13C-OCDD	%	30-140	31	37	33	30

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

9616643-9616652 Le résultat en pg total correspond au composite de chacune des parties du train d'échantillonnage.

Certifié par:

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Contrôle de qualité

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Analyse haute résolution

Date du rapport: 2018-11-01			DUPLICATA			MATÉRIAU DE RÉFÉRENCE				BLANC FORTIFIÉ			ÉCH. FORTIFIÉ		
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.
Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)															
2,3,7,8-TCDD (pg total)	1	MR	32	30	0.0	< 0.7	80%	70%	130%	NA	70%	130%	74%	70%	130%
1,2,3,7,8 PeCDD (pg total)	1	MR	165	178	0.0	< 2	82%	70%	130%	NA	70%	130%	89%	70%	130%
1,2,3,4,7,8 HxCDD (pg total)	1	MR	179	180	0.0	< 2	89%	70%	130%	NA	70%	130%	90%	70%	130%
1,2,3,6,7,8 HxCDD (pg total)	1	MR	197	183	0.0	< 2	99%	70%	130%	NA	70%	130%	92%	70%	130%
1,2,3,7,8,9 HxCDD (pg total)	1	MR	201	183	0.0	< 2	100%	70%	130%	NA	70%	130%	91%	70%	130%
1,2,3,4,6,7,8 HpCDD (pg total)	1	MR	184	179	0.0	< 2	92%	70%	130%	NA	70%	130%	89%	70%	130%
OCDD (pg total)	1	MR	376	341	0.0	< 4	94%	70%	130%	NA	70%	130%	85%	70%	130%
2,3,7,8 TCDF (pg total)	1	MR	37	39	0.0	< 2	92%	70%	130%	NA	70%	130%	97%	70%	130%
1,2,3,7,8 PeCDF (pg total)	1	MR	208	214	0.0	< 2	104%	70%	130%	NA	70%	130%	107%	70%	130%
2,3,4,7,8-PeCDF (pg total)	1	MR	204	215	0.0	< 1	102%	70%	130%	NA	70%	130%	107%	70%	130%
1,2,3,4,7,8 HxCDF (pg total)	1	MR	197	194	0.0	< 2	98%	70%	130%	NA	70%	130%	97%	70%	130%
1,2,3,6,7,8 HxCDF (pg total)	1	MR	209	209	0.0	< 2	105%	70%	130%	NA	70%	130%	105%	70%	130%
2,3,4,6,7,8-HxCDF (pg total)	1	MR	209	203	0.0	< 2	105%	70%	130%	NA	70%	130%	102%	70%	130%
1,2,3,7,8,9 HxCDF (pg total)	1	MR	196	197	0.0	< 3	98%	70%	130%	NA	70%	130%	98%	70%	130%
1,2,3,4,6,7,8 HpCDF (pg total)	1	MR	195	187	0.0	< 2	97%	70%	130%	NA	70%	130%	94%	70%	130%
1,2,3,4,7,8,9 HpCDF (pg total)	1	MR	197	190	0.0	< 3	99%	70%	130%	NA	70%	130%	95%	70%	130%
OCDF (pg total)	1	MR	427	401	0.0	< 3	107%	70%	130%	NA	70%	130%	100%	70%	130%

Certifié par:

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Sommaire de méthode

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
Analyse haute résolution					
2,3,7,8-TCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8 PeCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8 HpCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
OCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8 TCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8 PeCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,7,8-PeCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,6,7,8-HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8 HpCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8,9 HpCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
OCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Tétrachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Pentachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Hexachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Heptachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDDs	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Tétrachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Pentachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Hexachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Heptachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDFs	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8-Tetra CDD (TEF 1.0)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8-Penta CDD (TEF 1.0)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8-Hepta CDD (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Octa CDD (TEF 0.0001)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8-Tetra CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8-Penta CDF (TEF 0.05)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,7,8-Penta CDF (TEF 0.5)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR_151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,6,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8-Hepta CDF (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8,9-Hepta CDF (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS

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Sommaire de méthode

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N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
Octa CDF (TEF 0.0001)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDDs et PCDFs (TEQ)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-2378-TCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-12378-PeCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-23478-PeCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123478-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123678-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-234678-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123789-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234678-HpCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234789-HpCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-2378-TCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-12378-PeCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123478-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123678-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234678-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-OCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS

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CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

RAPPORT D'ESSAI

Date : 21 novembre 2018

Réf : P2334-1

Client

 # Client : C8

Nom : Trépanier Éric

Téléphone : (418) 650-5960 # 2208

Courriel : eric.trepanier@consul-air.com

Adresse :
CONSULAIR Québec
125-2022,rue Lavoisier
Québec QC
G1N 4L5 Canada

Résumé du projet

Nb. d'objets : 4

 # Projet lab. : P2334

Votre # projet : 18-5528

Chantier : Agnico-Eagle

Résumé des essais

Paramètre(s) non accrédités

ST	Paramètre	Q.	Principe (Méthode)	Matrice
	Chlorures (Cl)	4	Spectrophotométrie	Eau

ST : Paramètre Sous-Traité

Résultats d'essai(s)

ST	Param.	Échantillon (s)		Dates			Résultat(s)		LDR
		# Lab	*# Client*	*Échantillon.*	*Récep.*	*Essai*	*Valeur*	*Unité*	
	Cl	171018-8	**304 - Inc - B1 - 1**	22-09-18	17-10-18	30-10-18	**86.87**	mg	1.76
		171018-9	**312 - Inc - B1 - 2**	28-09-18	17-10-18	30-10-18	**33.16**	mg	0.73
		171018-10	**320 - Inc - B1 - 3**	29-09-18	17-10-18	30-10-18	**119.33**	mg	1.87
		171018-11	**328 - Bl - Eau - Bl**	23-09-18	17-10-18	30-10-18	**< LDR**	mg	0.04

ST : Essai Sous-Traité
LDR : Limite de Détection Rapportée

Commentaire(s)

1.

Contrôle de qualité

ST	Param.	Date	# Réf	Type	Résultat(s)		LDR
					Valeur	***Unité***	
	Cl	30-10-18	BL3010	BL	< LDR	mg/l	0.39
			MR3010	MR	103.4	% Récup.	-
			AD171018-9	AD	103.1	% Récup.	-
			AD171018-11	AD	101.8	% Récup.	-

ST : Contrôle qualité Sous-Traité
 # Réf : Référence du contrôle qualité dans le système de suivi du laboratoire
BL : Blanc
MR : Matériau de Référence
DP : Duplicata
RP : Réplicata
AD : Ajout Dosé
EA : Étalon Analogue
TM: Témoin de l'extraction
LDR : Limite de Détection Rapportée

Signature

Les résultats ne se rapportent qu'aux objets soumis à l'essai
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Ce rapport d'essai est certifié par la (les) personne(s) mentionnée(s) ci-après.
Pour toute question concernant ce certificat d'analyse, veuillez vous adresser directement à :





Malha Kirèche

Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE
Votre # Bordereau: N/A

Attention: Éric Trépanier

CONSULAIR INC.
2022 Lavoisier
Local 125
Québec, QC
Canada G1N 4L5

Date du rapport: 2018/11/21
Rapport: R2413187
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B847715
Reçu: 2018/10/19, 12:30

Matrice: FILTRE
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles totaux par ICP-MS	4	2018/11/06	2018/11/06	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Matrice: Solution barboteur
Nombre d'échantillons reçus: 16

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Mercure par AAVF	2	2018/10/30	2018/10/31	STL SOP-00042	MA.200–Hg 1.1 R1 m
Mercure par AAVF	2	2018/11/01	2018/11/05	STL SOP-00042	MA.200–Hg 1.1 R1 m
Métaux extractibles	5	2018/11/01	2018/11/05	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Métaux extractibles	3	2018/11/06	2018/11/07	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Métaux extractibles	4	2018/11/14	2018/11/17	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Volume d'échantillon	3	2018/11/02	2018/11/02		

Matrice: SOLVANT
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles	4	2018/11/06	2018/11/07	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Matrice: TRAIN
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles	4	2018/11/01	2018/11/08	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE
Votre # Bordereau: N/A

Attention: Éric Trépanier

CONSULAIR INC.
2022 Lavoisier
Local 125
Québec, QC
Canada G1N 4L5

Date du rapport: 2018/11/21
Rapport: R2413187
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B847715
Reçu: 2018/10/19, 12:30

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

Note : Les paramètres inclus dans le présent certificat sont accrédités par le MDDELCC, à moins d'indication contraire.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Argyro Frangoulis, Chargée de projets
Courriel: afrangoulis@maxxam.ca
Téléphone (514)448-9001 Ext:7066229

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Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5271	FX5271			FX5389		
Date d'échantillonnage		2018/09/22	2018/09/22			2018/09/22		
# Bordereau		N/A	N/A			N/A		
	Unités	**305-INC-B2345-1 VT:334ML**	**305-INC-B2345-1 VT:334ML Dup. de Lab.**	**LDR**	**Lot CQ**	**307+308-INC-B67-1 VT:615ML**	**LDR**	**Lot CQ**
MÉTAUX								
Aluminium (Al) †	ug	9	8	3	1949070			
Antimoine (Sb) †	ug	<0.3	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	<2	2	1949070			
Arsenic (As) †	ug	<0.3	<0.3	0.3	1949070			
Baryum (Ba) †	ug	0.2	0.2	0.2	1949070			
Béryllium (Be) †	ug	<0.2	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	<0.2	0.2	1949070			
Bore (B) †	ug	2.6	3.6	0.7	1949070			
Cadmium (Cd) †	ug	1.4	1.4	0.2	1949070			
Calcium (Ca) †	ug	126	123	20	1949070			
Chrome (Cr) †	ug	<0.3	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	2.1	1.9	0.3	1949070			
Etain (Sn) †	ug	24	23	2	1949070			
Fer (Fe) †	ug	21	20	20	1949070			
Lithium (Li) †	ug	<3	<3	3	1949070			
Magnésium (Mg) †	ug	96	93	7	1949070			
Manganèse (Mn) †	ug	49.3	49.4	0.3	1949070			
Mercure (Hg)	ug					0.85	0.31	1949380
Mercure (Hg) †	ug	0.4	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	<2	2	1949070			
Nickel (Ni) †	ug	0.4	0.4	0.3	1949070			
Plomb (Pb) †	ug	<2	<2	2	1949070			
Potassium (K) †	ug	34	41	30	1949070			
Sélénium (Se) †	ug	<0.3	<0.3	0.3	1949070			
Silicium (Si) †	ug	46	49	20	1949070			
Sodium (Na) †	ug	<20	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	<3	3	1949070			
Vanadium (V) †	ug	<0.7	<0.7	0.7	1949070			
Zinc (Zn) †	ug	7.5	7.1	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5496			FX5497		
Date d'échantillonnage		2018/09/28			2018/09/28		
# Bordereau		N/A			N/A		
	Unités	**313-INC-B2345-2 VT:323ML**	**LDR**	**Lot CQ**	**315+316-INC-B67-2 VT:625ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	7	3	1949070			
Antimoine (Sb) †	ug	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	2	1949070			
Arsenic (As) †	ug	<0.3	0.3	1949070			
Baryum (Ba) †	ug	0.4	0.2	1949070			
Béryllium (Be) †	ug	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	0.2	1949070			
Bore (B) †	ug	0.9	0.6	1949070			
Cadmium (Cd) †	ug	0.5	0.2	1949070			
Calcium (Ca) †	ug	60	20	1949070			
Chrome (Cr) †	ug	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	0.4	0.3	1949070			
Etain (Sn) †	ug	22	2	1949070			
Fer (Fe) †	ug	<20	20	1949070			
Lithium (Li) †	ug	<3	3	1949070			
Magnésium (Mg) †	ug	13	6	1949070			
Manganèse (Mn) †	ug	3.1	0.3	1949070			
Mercure (Hg)	ug				0.60	0.31	1949380
Mercure (Hg) †	ug	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	2	1949070			
Nickel (Ni) †	ug	<0.3	0.3	1949070			
Plomb (Pb) †	ug	<2	2	1949070			
Potassium (K) †	ug	<30	30	1949070			
Sélénium (Se) †	ug	<0.3	0.3	1949070			
Silicium (Si) †	ug	21	20	1949070			
Sodium (Na) †	ug	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	3	1949070			
Vanadium (V) †	ug	<0.6	0.6	1949070			
Zinc (Zn) †	ug	1.3	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5498			FX5499		
Date d'échantillonnage		2018/09/29			2018/09/29		
# Bordereau		N/A			N/A		
	Unités	**321-INC-B2345-3 VT:330ML**	**LDR**	**Lot CQ**	**323+324-INC-B67-3 VT:625ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	9	3	1949070			
Antimoine (Sb) †	ug	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	2	1949070			
Arsenic (As) †	ug	<0.3	0.3	1949070			
Baryum (Ba) †	ug	<0.2	0.2	1949070			
Béryllium (Be) †	ug	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	0.2	1949070			
Bore (B) †	ug	6.7	0.7	1949070			
Cadmium (Cd) †	ug	0.3	0.2	1949070			
Calcium (Ca) †	ug	137	20	1949070			
Chrome (Cr) †	ug	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	2.3	0.3	1949070			
Etain (Sn) †	ug	23	2	1949070			
Fer (Fe) †	ug	54	20	1949070			
Lithium (Li) †	ug	<3	3	1949070			
Magnésium (Mg) †	ug	39	7	1949070			
Manganèse (Mn) †	ug	1.2	0.3	1949070			
Mercure (Hg)	ug				<0.31	0.31	1948181
Mercure (Hg) †	ug	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	2	1949070			
Nickel (Ni) †	ug	0.3	0.3	1949070			
Plomb (Pb) †	ug	<2	2	1949070			
Potassium (K) †	ug	<30	30	1949070			
Sélénium (Se) †	ug	<0.3	0.3	1949070			
Silicium (Si) †	ug	48	20	1949070			
Sodium (Na) †	ug	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	3	1949070			
Vanadium (V) †	ug	<0.7	0.7	1949070			
Zinc (Zn) †	ug	4.4	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5500			FX5502		
Date d'échantillonnage		2018/09/23			2018/09/23		
# Bordereau		N/A			N/A		
	Unités	**329-BL-B123-BL VT:200ML**	**LDR**	**Lot CQ**	**330+331-BL-B56-BL VT:325ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	4	2	1949070			
Antimoine (Sb) †	ug	<0.2	0.2	1949070			
Argent (Ag) †	ug	<1	1	1949070			
Arsenic (As) †	ug	<0.2	0.2	1949070			
Baryum (Ba) †	ug	<0.1	0.1	1949070			
Béryllium (Be) †	ug	<0.1	0.1	1949070			
Bismuth (Bi) †	ug	<0.1	0.1	1949070			
Bore (B) †	ug	0.9	0.4	1949070			
Cadmium (Cd) †	ug	0.8	0.1	1949070			
Calcium (Ca) †	ug	43	10	1949070			
Chrome (Cr) †	ug	0.2	0.2	1949070			
Cobalt (Co) †	ug	<0.2	0.2	1949070			
Cuivre (Cu) †	ug	<0.2	0.2	1949070			
Etain (Sn) †	ug	22	1	1949070			
Fer (Fe) †	ug	19	10	1949070			
Lithium (Li) †	ug	<2	2	1949070			
Magnésium (Mg) †	ug	10	4	1949070			
Manganèse (Mn) †	ug	0.5	0.2	1949070			
Mercure (Hg)	ug				<0.16	0.16	1948181
Mercure (Hg) †	ug	<0.1	0.1	1949070			
Molybdène (Mo) †	ug	<1	1	1949070			
Nickel (Ni) †	ug	<0.2	0.2	1949070			
Plomb (Pb) †	ug	<1	1	1949070			
Potassium (K) †	ug	<20	20	1949070			
Sélénium (Se) †	ug	<0.2	0.2	1949070			
Silicium (Si) †	ug	23	10	1949070			
Sodium (Na) †	ug	<10	10	1949070			
Strontium (Sr) †	ug	<0.2	0.2	1949070			
Thallium (Tl) †	ug	<0.2	0.2	1949070			
Titane (Ti) †	ug	<2	2	1949070			
Vanadium (V) †	ug	<0.4	0.4	1949070			
Zinc (Zn) †	ug	0.5	0.2	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FZ0589	FZ0590		FZ0591		
Date d'échantillonnage		2018/09/22	2018/09/28		2018/09/29		
# Bordereau		N/A	N/A		N/A		
	Unités	**304-INC-B1-1 VT:180ML**	**312-INC-B1-2 VT:188ML**	**LDR**	**320-INC-B1-3 VT:240ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	3	3	2	5	2	1952598
Antimoine (Sb) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Argent (Ag) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Arsenic (As) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Baryum (Ba) †	ug	0.25	0.15	0.09	0.2	0.1	1952598
Béryllium (Be) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Bismuth (Bi) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Bore (B) †	ug	19.9	9.5	0.4	92.6	0.5	1952598
Cadmium (Cd) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Calcium (Ca) †	ug	18	32	9	17	10	1952598
Chrome (Cr) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Cobalt (Co) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Cuivre (Cu) †	ug	0.5	0.7	0.2	<0.2	0.2	1952598
Etain (Sn) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Fer (Fe) †	ug	<9	521	9	<10	10	1952598
Lithium (Li) †	ug	<2	<2	2	<2	2	1952598
Magnésium (Mg) †	ug	5	<4	4	<5	5	1952598
Manganèse (Mn) †	ug	1.9	4.4	0.2	0.3	0.2	1952598
Mercure (Hg) †	ug	<0.09	0.12	0.09	0.1	0.1	1952598
Molybdène (Mo) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Nickel (Ni) †	ug	0.2	0.4	0.2	<0.2	0.2	1952598
Plomb (Pb) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Potassium (K) †	ug	<20	<20	20	<20	20	1952598
Sélénium (Se) †	ug	0.9	0.3	0.2	0.5	0.2	1952598
Silicium (Si) †	ug	12	11	9	148	10	1952598
Sodium (Na) †	ug	<9	<9	9	<10	10	1952598
Strontium (Sr) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Thallium (Tl) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Titane (Ti) †	ug	<2	<2	2	<2	2	1952598
Vanadium (V) †	ug	<0.4	<0.4	0.4	<0.5	0.5	1952598
Zinc (Zn) †	ug	2.2	1.3	0.2	0.7	0.2	1952598

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FZ0592		
Date d'échantillonnage		2018/09/23		
# Bordereau		N/A		
	Unités	**328-BL-EAU-BL VT:100ML**	**LDR**	**Lot CQ**
MÉTAUX				
Aluminium (Al) †	ug	<1	1	1952598
Antimoine (Sb) †	ug	<0.1	0.1	1952598
Argent (Ag) †	ug	<0.5	0.5	1952598
Arsenic (As) †	ug	<0.1	0.1	1952598
Baryum (Ba) †	ug	0.07	0.05	1952598
Béryllium (Be) †	ug	<0.05	0.05	1952598
Bismuth (Bi) †	ug	<0.05	0.05	1952598
Bore (B) †	ug	0.6	0.2	1952598
Cadmium (Cd) †	ug	<0.05	0.05	1952598
Calcium (Ca) †	ug	<5	5	1952598
Chrome (Cr) †	ug	<0.1	0.1	1952598
Cobalt (Co) †	ug	<0.1	0.1	1952598
Cuivre (Cu) †	ug	<0.1	0.1	1952598
Etain (Sn) †	ug	<0.5	0.5	1952598
Fer (Fe) †	ug	<5	5	1952598
Lithium (Li) †	ug	<1	1	1952598
Magnésium (Mg) †	ug	<2	2	1952598
Manganèse (Mn) †	ug	0.2	0.1	1952598
Mercure (Hg) †	ug	<0.05	0.05	1952598
Molybdène (Mo) †	ug	<0.5	0.5	1952598
Nickel (Ni) †	ug	<0.1	0.1	1952598
Plomb (Pb) †	ug	<0.5	0.5	1952598
Potassium (K) †	ug	<10	10	1952598
Sélénium (Se) †	ug	<0.1	0.1	1952598
Silicium (Si) †	ug	<5	5	1952598
Sodium (Na) †	ug	<5	5	1952598
Strontium (Sr) †	ug	<0.1	0.1	1952598
Thallium (Tl) †	ug	<0.1	0.1	1952598
Titane (Ti) †	ug	<1	1	1952598
Vanadium (V) †	ug	<0.2	0.2	1952598
Zinc (Zn) †	ug	0.3	0.1	1952598

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

PARAMÈTRES CONVENTIONNELS (SOLUTION BARBOTEUR)

ID Maxxam		FY0848	FY0856	FY0857	
Date d'échantillonnage		2018/09/22	2018/09/28	2018/09/29	
# Bordereau		N/A	N/A	N/A	
	Unités	**302-INC-BS-HNO3-1**	**310-INC-BS-HNO3-2**	**318-INC-BS-HNO3-3**	**Lot CQ**
CONVENTIONNELS					
Volume final †	ml	88	110	66	1949618

Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (TRAIN)

ID Maxxam		FY0848		FY0856		FY0857		
Date d'échantillonnage		2018/09/22		2018/09/28		2018/09/29		
# Bordereau		N/A		N/A		N/A		
	Unités	**301+302+303-INC-1**	**LDR**	**309+310+311-INC-2**	**LDR**	**317+318+319-INC-3**	**LDR**	**Lot CQ**
MÉTAUX								
Aluminium (Al) †	ug	570	2	30	2	46	2	1949322
Antimoine (Sb) †	ug	245	0.1	3.6	0.1	219	0.1	1949322
Argent (Ag) †	ug	0.9	0.5	<0.6	0.6	1.3	0.5	1949322
Arsenic (As) †	ug	17.2	0.1	1.3	0.1	30.9	0.1	1949322
Baryum (Ba) †	ug	7.28	0.05	0.65	0.06	1.06	0.05	1949322
Béryllium (Be) †	ug	<0.05	0.05	<0.06	0.06	<0.05	0.05	1949322
Bismuth (Bi) †	ug	0.84	0.05	0.12	0.06	4.83	0.05	1949322
Bore (B) †	ug	4.1	0.5	4.0	0.5	3.7	0.5	1949322
Cadmium (Cd) †	ug	2.47	0.05	0.45	0.06	9.52	0.05	1949322
Calcium (Ca) †	ug	1930	50	309	50	243	50	1949322
Chrome (Cr) †	ug	18.2	0.1	5.1	0.1	73.4	0.1	1949322
Cobalt (Co) †	ug	0.5	0.1	<0.1	0.1	0.2	0.1	1949322
Cuivre (Cu) †	ug	89.1	0.1	24.7	0.1	131	0.1	1949322
Etain (Sn) †	ug	77.4	0.5	4.0	0.6	166	0.5	1949322
Fer (Fe) †	ug	1070	5	33	6	82	5	1949322
Lithium (Li) †	ug	8	1	33	1	32	1	1949322
Magnésium (Mg) †	ug	216	2	34	2	36	2	1949322
Manganèse (Mn) †	ug	16.5	0.1	15.7	0.1	4.3	0.1	1949322
Mercure (Hg)	ug	<0.1	0.1	<0.1	0.1	<0.1	0.1	1949322
Molybdène (Mo) †	ug	4.8	0.5	<0.6	0.6	8.9	0.5	1949322
Nickel (Ni) †	ug	8.1	0.3	0.4	0.3	2.0	0.3	1949322
Plomb (Pb) †	ug	127	0.5	36.0	0.6	444	0.5	1949322
Potassium (K) †	ug	10100	10	1170	10	10200	10	1949322
Sélénium (Se) †	ug	<0.5	0.5	<0.5	0.5	0.5	0.5	1949322
Silicium (Si) †	ug	717	5	148	6	397	5	1949322
Sodium (Na) †	ug	7900	10	851	10	6890	10	1949322
Strontium (Sr) †	ug	5.0	0.1	0.4	0.1	0.4	0.1	1949322
Thallium (Tl) †	ug	<0.1	0.1	<0.1	0.1	<0.1	0.1	1949322
Titane (Ti) †	ug	52	1	4	1	6	1	1949322
Vanadium (V) †	ug	0.8	0.2	<0.2	0.2	0.4	0.2	1949322
Zinc (Zn) †	ug	509	1	54	1	1070	1	1949322

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (TRAIN)

ID Maxxam		FY0858		
Date d'échantillonnage		2018/09/23		
# Bordereau		N/A		
	Unités	**325+326+327-BL-BL**	**LDR**	**Lot CQ**
MÉTAUX				
Aluminium (Al) †	ug	4	3	1949322
Antimoine (Sb) †	ug	<0.3	0.3	1949322
Argent (Ag) †	ug	<2	2	1949322
Arsenic (As) †	ug	<0.3	0.3	1949322
Baryum (Ba) †	ug	0.2	0.2	1949322
Béryllium (Be) †	ug	<0.2	0.2	1949322
Bismuth (Bi) †	ug	<0.2	0.2	1949322
Bore (B) †	ug	4.4	0.6	1949322
Cadmium (Cd) †	ug	<0.2	0.2	1949322
Calcium (Ca) †	ug	<50	50	1949322
Chrome (Cr) †	ug	11.0	0.3	1949322
Cobalt (Co) †	ug	<0.3	0.3	1949322
Cuivre (Cu) †	ug	0.3	0.3	1949322
Etain (Sn) †	ug	<2	2	1949322
Fer (Fe) †	ug	<20	20	1949322
Lithium (Li) †	ug	<3	3	1949322
Magnésium (Mg) †	ug	8	6	1949322
Manganèse (Mn) †	ug	<0.3	0.3	1949322
Mercure (Hg)	ug	<0.2	0.2	1949322
Molybdène (Mo) †	ug	<2	2	1949322
Nickel (Ni) †	ug	<0.3	0.3	1949322
Plomb (Pb) †	ug	<2	2	1949322
Potassium (K) †	ug	<30	30	1949322
Sélénium (Se) †	ug	<0.5	0.5	1949322
Silicium (Si) †	ug	63	20	1949322
Sodium (Na) †	ug	143	20	1949322
Strontium (Sr) †	ug	<0.3	0.3	1949322
Thallium (Tl) †	ug	<0.3	0.3	1949322
Titane (Ti) †	ug	<3	3	1949322
Vanadium (V) †	ug	<0.6	0.6	1949322
Zinc (Zn) †	ug	<1	1	1949322

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

REMARQUES GÉNÉRALES

MÉTAUX (SOLUTION BARBOTEUR)

Les limites de détection indiquées sont modifiées en fonction du volume d'échantillon reçu.

MÉTAUX (TRAIN)

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.
Les limites de détection indiquées sont modifiées en fonction du volume d'échantillon reçu.

Les résultats ne se rapportent qu'aux échantillons soumis pour analyse

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
1948181	EHA	Blanc fortifié	Mercure (Hg)	2018/10/31		160 (1)	%
1948181	EHA	Blanc de méthode	Mercure (Hg)	2018/10/31	<0.050		ug
1949070	EHA	Blanc fortifié	Aluminium (Al)	2018/11/05		105	%
			Antimoine (Sb)	2018/11/05		110	%
			Argent (Ag)	2018/11/05		102	%
			Arsenic (As)	2018/11/05		110	%
			Baryum (Ba)	2018/11/05		106	%
			Béryllium (Be)	2018/11/05		104	%
			Bismuth (Bi)	2018/11/05		108	%
			Bore (B)	2018/11/05		112	%
			Cadmium (Cd)	2018/11/05		105	%
			Calcium (Ca)	2018/11/05		107	%
			Chrome (Cr)	2018/11/05		105	%
			Cobalt (Co)	2018/11/05		105	%
			Cuivre (Cu)	2018/11/05		106	%
			Etain (Sn)	2018/11/05		112	%
			Fer (Fe)	2018/11/05		107	%
			Lithium (Li)	2018/11/05		106	%
			Magnésium (Mg)	2018/11/05		105	%
			Manganèse (Mn)	2018/11/05		107	%
			Mercure (Hg)	2018/11/05		119	%
			Molybdène (Mo)	2018/11/05		110	%
			Nickel (Ni)	2018/11/05		104	%
			Plomb (Pb)	2018/11/05		109	%
			Potassium (K)	2018/11/05		101	%
			Sélénium (Se)	2018/11/05		109	%
			Silicium (Si)	2018/11/05		99	%
			Sodium (Na)	2018/11/05		107	%
			Strontium (Sr)	2018/11/05		118	%
			Thallium (Tl)	2018/11/05		107	%
			Titane (Ti)	2018/11/05		102	%
			Vanadium (V)	2018/11/05		107	%
			Zinc (Zn)	2018/11/05		103	%
1949070	EHA	Blanc de méthode	Aluminium (Al)	2018/11/05	<1		ug
			Antimoine (Sb)	2018/11/05	<0.1		ug
			Argent (Ag)	2018/11/05	<0.5		ug
			Arsenic (As)	2018/11/05	<0.1		ug
			Baryum (Ba)	2018/11/05	<0.05		ug
			Béryllium (Be)	2018/11/05	<0.05		ug
			Bismuth (Bi)	2018/11/05	<0.05		ug
			Bore (B)	2018/11/05	<0.2		ug
			Cadmium (Cd)	2018/11/05	<0.05		ug
			Calcium (Ca)	2018/11/05	<5		ug
			Chrome (Cr)	2018/11/05	<0.1		ug
			Cobalt (Co)	2018/11/05	<0.1		ug
			Cuivre (Cu)	2018/11/05	<0.1		ug
			Etain (Sn)	2018/11/05	<0.5		ug
			Fer (Fe)	2018/11/05	<5		ug
			Lithium (Li)	2018/11/05	<1		ug
			Magnésium (Mg)	2018/11/05	<2		ug
			Manganèse (Mn)	2018/11/05	<0.1		ug
			Mercure (Hg)	2018/11/05	<0.05		ug

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
			Molybdène (Mo)	2018/11/05	<0.5		ug
			Nickel (Ni)	2018/11/05	<0.1		ug
			Plomb (Pb)	2018/11/05	<0.5		ug
			Potassium (K)	2018/11/05	<10		ug
			Sélénium (Se)	2018/11/05	<0.1		ug
			Silicium (Si)	2018/11/05	<5		ug
			Sodium (Na)	2018/11/05	<5		ug
			Strontium (Sr)	2018/11/05	<0.1		ug
			Thallium (Tl)	2018/11/05	<0.1		ug
			Titane (Ti)	2018/11/05	<1		ug
			Vanadium (V)	2018/11/05	<0.2		ug
			Zinc (Zn)	2018/11/05	<0.1		ug
1949380	SD2	MRC	Mercure (Hg)	2018/11/05		110	%
1949380	SD2	Blanc fortifié	Mercure (Hg)	2018/11/05		125 (1)	%
1949380	SD2	Blanc de méthode	Mercure (Hg)	2018/11/05	<0.050		ug
1952598	EHA	Blanc fortifié	Aluminium (Al)	2018/11/17		102	%
			Antimoine (Sb)	2018/11/17		100	%
			Argent (Ag)	2018/11/17		115	%
			Arsenic (As)	2018/11/17		104	%
			Baryum (Ba)	2018/11/17		113	%
			Béryllium (Be)	2018/11/17		101	%
			Bismuth (Bi)	2018/11/17		98	%
			Bore (B)	2018/11/17		105	%
			Cadmium (Cd)	2018/11/17		96	%
			Calcium (Ca)	2018/11/17		98	%
			Chrome (Cr)	2018/11/17		102	%
			Cobalt (Co)	2018/11/17		98	%
			Cuivre (Cu)	2018/11/17		100	%
			Etain (Sn)	2018/11/17		106	%
			Fer (Fe)	2018/11/17		98	%
			Lithium (Li)	2018/11/17		100	%
			Magnésium (Mg)	2018/11/17		98	%
			Manganèse (Mn)	2018/11/17		105	%
			Mercure (Hg)	2018/11/17		108	%
			Molybdène (Mo)	2018/11/17		102	%
			Nickel (Ni)	2018/11/17		98	%
			Plomb (Pb)	2018/11/17		101	%
			Potassium (K)	2018/11/17		98	%
			Sélénium (Se)	2018/11/17		103	%
			Silicium (Si)	2018/11/17		98	%
			Sodium (Na)	2018/11/17		104	%
			Strontium (Sr)	2018/11/17		109	%
			Thallium (Tl)	2018/11/17		97	%
			Titane (Ti)	2018/11/17		105	%
			Vanadium (V)	2018/11/17		102	%
			Zinc (Zn)	2018/11/17		111	%
1952598	EHA	Blanc de méthode	Aluminium (Al)	2018/11/17	<1		ug
			Antimoine (Sb)	2018/11/17	<0.1		ug
			Argent (Ag)	2018/11/17	<0.5		ug
			Arsenic (As)	2018/11/17	<0.1		ug
			Baryum (Ba)	2018/11/17	<0.05		ug
			Béryllium (Be)	2018/11/17	<0.05		ug

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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
			Bismuth (Bi)	2018/11/17	<0.05		ug
			Bore (B)	2018/11/17	0.2, LDR=0.2		ug
			Cadmium (Cd)	2018/11/17	<0.05		ug
			Calcium (Ca)	2018/11/17	<5		ug
			Chrome (Cr)	2018/11/17	<0.1		ug
			Cobalt (Co)	2018/11/17	<0.1		ug
			Cuivre (Cu)	2018/11/17	<0.1		ug
			Etain (Sn)	2018/11/17	<0.5		ug
			Fer (Fe)	2018/11/17	<5		ug
			Lithium (Li)	2018/11/17	<1		ug
			Magnésium (Mg)	2018/11/17	<2		ug
			Manganèse (Mn)	2018/11/17	<0.1		ug
			Mercure (Hg)	2018/11/17	<0.05		ug
			Molybdène (Mo)	2018/11/17	<0.5		ug
			Nickel (Ni)	2018/11/17	<0.1		ug
			Plomb (Pb)	2018/11/17	<0.5		ug
			Potassium (K)	2018/11/17	<10		ug
			Sélénium (Se)	2018/11/17	<0.1		ug
			Silicium (Si)	2018/11/17	<5		ug
			Sodium (Na)	2018/11/17	<5		ug
			Strontium (Sr)	2018/11/17	<0.1		ug
			Thallium (Tl)	2018/11/17	<0.1		ug
			Titane (Ti)	2018/11/17	<1		ug
			Vanadium (V)	2018/11/17	<0.2		ug
			Zinc (Zn)	2018/11/17	<0.1		ug

LDR = Limite de détection rapportée

MRC: Un échantillon de concentration connue préparé dans des conditions rigoureuses par un organisme externe. Utilisé pour vérifier la justesse de la méthode.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

(1) La récupération ou l'écart relatif (RPD) pour ce composé est en dehors des limites de contrôle, mais l'ensemble du contrôle qualité rencontre les critères d'acceptabilité pour cette analyse

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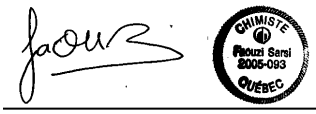
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Faouzi Sarsi, B. Sc. Chimiste



Miryam Assayag, B.Sc. Chimiste

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CONSULAIR
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Travaux effectués à : Agnico Eagle Meliadine

Projet #: 18-5528

Chargé de Projet : Eric Trépanier

LABORATOIRE RESPONSABLE DES ANALYSES :
Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
301 - Inc - BS-Acétone - 1	Acétone	BS-Acétone	1	2018-09-22	Métaux, Hg	mg	Combiner les échantillons 301 à 303 pour les métaux particulaires de la source Inc - Essai #1
302 - Inc - BS-HNO3 - 1	HNO3	BS-HNO3	1	2018-09-22	Métaux, Hg	mg	Combiner avec les échantillons 301 et 303 pour les métaux particulaires de la source Inc - Essai #1
303 - Inc - Filtre - 1	Filtre	Poids avant : 0.5266 gr	1	2018-09-22	Métaux, Hg	mg	Combiner les échantillons 301 à 303 pour les métaux particulaires de la source Inc - Essai #1
304 - Inc - B1 - 1	Eau	B1 - Vt: 180 mL	1	2018-09-22	Métaux, Hg	mg	
305 - Inc - B2345 - 1	H2O2 10% / HNO3 5%	B2345 - Vt: 334 mL	1	2018-09-22	Métaux, Hg	mg	
307 - Inc - B67 - 1	KMNO4 4%/H2SO4 10%	B67 - Vt: 390 mL	1	2018-09-22	Hg	mg	Combiner les échantillons 307 et 308 pour le Hg de la source Inc - Essai #1

B847715_COC

19-Oct-18 12:30
Argyro Frangoulis
B847715
AM1

REMIS PAR:	DATE:	HEURE:
REÇU PAR: Vilue Daulos	DATE: 2018/10/19	HEURE: 12:30

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DRIVER 7,7,6

ICE : YES
SEAL : NO

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

CHAÎNE DE RESPONSABILITÉ

2022-125, rue Lavoiser
Québec (Qc) G1N 4L5
Tél..: (418) 650-5960
Fax : (418) 704-2221
www.consul-air.com

Travaux effectués à : Agnico Eagle Meliadine

Projet #:

Chargé de Projet :

LABORATOIRE RESPONSABLE DES ANALYSES :
Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
308 - Inc - B67-HCl - 1	HCl	B67-HCl - Vt: 225 mL	1	2018-09-22	Hg	mg	Combiner les échantillons 307 et 308 pour le Hg de la source Inc - Essai #1
309 - Inc - BS-Acétone - 2	Acétone	BS-Acétone	1	2018-09-28	Métaux, Hg	mg	Combiner les échantillons 309 à 311 pour les métaux particulaires de la source Inc - Essai #2
310 - Inc - BS-HNO3 - 2	HNO3	BS-HNO3	1	2018-09-28	Métaux, Hg	mg	Combiner avec les échantillons 309 et 311 pour les métaux particulaires de la source Inc - Essai #2
311 - Inc - Filtre - 2	Filtre	Poids avant : 0.5248 gr	1	2018-09-28	Métaux, Hg	mg	Combiner les échantillons 309 à 311 pour les métaux particulaires de la source Inc - Essai #2
312 - Inc - B1 - 2	Eau	B1 - Vt: 188 mL	1	2018-09-28	Métaux, Hg	mg	
313 - Inc - B2345 - 2	H2O2 10% / HNO3 5%	B2345 - Vt: 323 mL	1	2018-09-28	Métaux, Hg	mg	

REMIS PAR:		DATE: 10/10/19	HEURE: 12:30
REÇU PAR:	VILLE DAVID	DATE:	HEURE:

Page 2 de 5

ICE: YES
SEAL: NO

WT: 533.

DRIVEZ

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

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Travaux effectués à : Agnico Eagle Meliadine

Projet #:

Chargé de Projet :

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Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
315 - Inc - B67 - 2	KMNO4 4%/H2SO4 10%	B67 - Vt: 400 mL	1	2018-09-28	Hg	mg	Combiner les échantillons 315 et 316 pour le Hg de la source Inc - Essai #2
316 - Inc - B67-HCl - 2	HCl	B67-HCl - Vt: 225 mL	1	2018-09-28	Hg	mg	Combiner les échantillons 315 et 316 pour le Hg de la source Inc - Essai #2
317 - Inc - BS-Acétone - 3	Acétone	BS-Acétone	1	2018-09-29	Métaux, Hg	mg	Combiner les échantillons 317 à 319 pour les métaux particulaires de la source Inc - Essai #3
318 - Inc - BS-HNO3 - 3	HNO3	BS-HNO3	1	2018-09-29	Métaux, Hg	mg	Combiner avec les échantillons 317 et 319 pour les métaux particulaires de la source Inc - Essai #3
319 - Inc - Filtre - 3	Filtre	Poids avant : 0.5182 gr	1	2018-09-29	Métaux, Hg	mg	Combiner les échantillons 317 à 319 pour les métaux particulaires de la source Inc - Essai #3
320 - Inc - B1 - 3	Eau	B1 - Vt: 240 mL	1	2018-09-29	Métaux, Hg	mg	

ICE: YES
SEAL: NO.

REMIS PAR:		DATE: 2018/10/19	HEURE: 12:30
REÇU PAR:	VILLE DAVIDE	DATE:	HEURE:

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DRIVER 7,7,6

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

CHAÎNE DE RESPONSABILITÉ

2022-125, rue Lavoisier
Québec (Qc) G1N 4L5
Tél.: (418) 650-5960
Fax : (418) 704-2221
www.consul-air.com

Travaux effectués à : Agnico Eagle Meliadine

Projet #: _____

Chargé de Projet : _____

LABORATOIRE RESPONSABLE DES ANALYSES :
Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
321 - Inc - B2345 - 3	H2O2 10% / HNO3 5%	B2345 - Vt: 330 mL	1	2018-09-29	Métaux, Hg	mg	
323 - Inc - B67 - 3	KMNO4 4%/H2SO4 10%	B67 - Vt: 400 mL	1	2018-09-29	Hg	mg	Combiner les échantillons 323 et 324 pour le Hg de la source Inc - Essai #3
324 - Inc - B67-HCl - 3	HCl	B67-HCl - Vt: 225 mL	1	2018-09-29	Hg	mg	Combiner les échantillons 323 et 324 pour le Hg de la source Inc - Essai #3
325 - Bl - BS-Acétone - Bl	Acétone	BS-Acétone - Vt: 100 mL	1	2018-09-23	Métaux, Hg	mg	Combiner les échantillons 325 à 327 pour les métaux particulaires de la source Blanc - Essai #Bl
326 - Bl - BS-HNO3 - Bl	HNO3	BS-HNO3 - Vt: 300 mL	1	2018-09-23	Métaux, Hg	mg	Combiner avec les échantillons 325 et 327 pour les métaux particulaires de la source Blanc - Essai #Bl
327 - Bl - Filtre - Bl	Filtre	Poids avant : 0.5176 gr	1	2018-09-23	Métaux, Hg	mg	Combiner les échantillons 325 à 327 pour les métaux particulaires de la source Blanc - Essai #Bl

REMIS PAR:		DATE: 2018/10/19	HEURE: 12:30
REÇU PAR: Jules DAVIDS		DATE:	HEURE:

ICE : Yes
SEAL : No.

DAVA 7,7,6

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

CHAÎNE DE RESPONSABILITÉ

2022-125, rue Lavoisier
Québec (Qc) G1N 4L5
Tél.: (418) 650-5960
Fax : (418) 704-2221
www.consul-air.com

Travaux effectués à : Agnico Eagle - Meliadine

Projet #: _____

Chargé de Projet : _____

LABORATOIRE RESPONSABLE DES ANALYSES :
Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
328 - BI - Eau - BI	Eau	Eau - Vt: 100 mL	1	2018-09-23	Métaux, Hg	mg	
329 - BI - B123 - BI	H2O2 10% / HNO3 5%	B123 - Vt: 200 mL	1	2018-09-23	Métaux, Hg	mg	
330 - BI - B56 - BI	KMNO4 4%/H2SO4 10%	B56 - Vt: 100 mL	1	2018-09-23	Hg	mg	Combiner les échantillons 330 et 331 pour le Hg de la source Blanc - Essai #BI
331 - BI - B56-HCl - BI	HCl	B56-HCl - Vt: 225 mL	1	2018-09-23	Hg	mg	Combiner les échantillons 330 et 331 pour le Hg de la source Blanc - Essai #BI

REMIS PAR:		**DATE:** 2018/10/19	**HEURE:** 12:30
REÇU PAR:	TROY DAVIS	**DATE:**	**HEURE:**

DRIVER

4,7,6

ICE: YES
SEAL: NO

Page 5 de 5

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Québec, le lundi 15 octobre 2018
Argyro Frangoulis
Maxxam
Ligne Directe: 514.448.9001 #6229
Courriel: AFrangoulis@maxxam.ca

Objet : **Explications de la demande d'analyses pour le projet de Agnico Eagle (Meliadine).**
Notre no de projet : #18-5528

Bonjour Argyro,

Voici la demande d'analyse concernant le dossier mentionné précédemment. Les mesures ont été effectuées du 22 au 29 septembre 2018. Les échantillons se retrouvent dans une glacière. À cela suivra plus tard les échantillons des métaux particulaires et les échantillons d'eau (# 304, 312, 320 et 328).

DEMANDE D'ANALYSES / MÉTAUX

Les fractions filtres et buse-sonde acétone vous seront envoyées un peu plus tard afin de faire l'analyse pour les métaux particulaires. Pour chacun des essais, nous voulons un résultat combiné des 2 fractions Buse-Sonde (Acétone et HNO_3) et le Filtre (donc 3 échantillons à combiner ex. éch.# 301, 302 et 303 – 309, 310 et 311 etc. Aussi, pour le Mercure d'un même essai, les fractions de $KmnO_4$ (BB56) et de HCl 8N (BB56-HCL) doivent être combinées (ex. éch.# 307 et 308). Il est important de respecter ces combinaisons exigées.

Il y a aussi les échantillons d'eau, # 304, 312, 320 et 328 qui vont arriver plus tard. L'analyse des métaux et du Hg sera également à faire.

Les métaux à analyser sont les suivants : Al, Sb, Ag, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Mo, Ni, Pb, K, Se, Na, Ti, V, Zn, Sr, Tl, Si (Silicium soluble), Hg

Il est important de ne pas jeter les échantillons et de nous les retourner après l'analyse.

Pour des renseignements supplémentaires n'hésitez pas à communiquer avec nous.

Envoyer les résultats à eric.trepanier@consul-air.com.

Salutations.

Eric Trépanier

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

Envoi pour analyse à Maxxam
Date: 24/10/2018
Chantier: Agnico Eagle(Meliadine)
Projet: 18-5528
Projet Lab: P2333

# du Labo	# de l'échantillon	# Bécher	Date d'envoi	Retour
171018-1	301 - Inc - BS-Acétone - 1	368	24-10-2018	
171018-2	309 - Inc - BS-Acétone - 2	716	24-10-2018	
171018-3	317 - Inc - BS-Acétone - 3	735	24-10-2018	
171018-4	325 - BI - BS-Acétone - BI	#453	24-10-2018	

Note:Nous retourner SVP les béchers aprés analyse dans leurs boîtes à:

Consulair
Bureau de Repentigny
101-800 Rue Leclerc
Repentigny (Qc), J6A 2E5
Tél: (450) 654-8000 poste 2304
Fax: (450) 654-6730
Courriel: laboratoire@consul-air.com



B847715_COC

to Laurie Dowley
2018/10/24
13:00.
ice-me
seal to
driver.

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

RAPPORT D'ESSAI

Date : 25 octobre 2018

Réf : P2338-1

Client

 # Client : C8

Nom : Trépanier Éric

Téléphone : (418) 650-5960 # 2208

Courriel : eric.trepanier@consul-air.com

Adresse :
CONSULAIR Québec
125-2022,rue Lavoisier
Québec QC
G1N 4L5 Canada

Résumé du projet

Nb. d'objets : 7

 # Projet lab. : P2338

Votre # projet : 18-5517

Chantier : Agnico-Eagle

Résumé des essais

Paramètre(s) accrédités

ST	Paramètre	Q.	Principe (Méthode)	Matrice
	Matières particulaires (MP-A)	4	Gravimétrie (LPT1)	Acétone
	Matières particulaires (MP-F)	3	Gravimétrie (LPT2)	Filtre

ST : paramètre Sous-Traité

Résultats d'essai(s)

ST	Param.	Échantillon (s)		Dates			Résultat(s)		LDR
		# Lab	# Client	Échantillon.	Récep.	Essai	Valeur	Unité	
	MP-A	191018-1	**301 - Inc - BS-Acétone - 1**	05-10-18	19-10-18	19-10-18	**37.0**	mg	1.0
		191018-2	**309 - Inc - BS-Acétone - 2**	06-10-18	19-10-18	19-10-18	**53.1**	mg	1.0
		191018-3	**317 - Inc - BS-Acétone - 3**	07-10-18	19-10-18	19-10-18	**5.3**	mg	1.0
		191018-4	**325 - Bl - BS-Acétone - Bl**	06-10-18	19-10-18	19-10-18	**< LDR**	mg	1.0
	MP-F	191018-5	**303 - Inc - Filtre - 1**	05-10-18	19-10-18	24-10-18	**48.2**	mg	0.1
		191018-6	**311 - Inc - Filtre - 2**	06-10-18	19-10-18	24-10-18	**48.4**	mg	0.1
		191018-7	**319 - Inc - Filtre - 3**	07-10-18	19-10-18	24-10-18	**46.0**	mg	0.1

ST : Essai Sous-Traité
LDR : Limite de Détection Rapportée

Commentaire(s)

1. LPT1 & LPT2: Méthode MA.100-Part 1.0 (Domaine 400 de Chimie de l'air)
2. Le volume de l'échantillon 191018-4 ; V= 110 ml.

Contrôle de qualité

ST	Param.	Date	# Réf	Type	Résultat(s)		LDR
					Valeur	***Unité***	
	MP-A	19-10-18	BL1910	BL	< LDR	mg	1.0
			MR1910	MR	100.7	% Récup.	-
	MP-F	24-10-18	AP- 02 Conforme	-	-	mg	0.1

ST : Contrôle qualité Sous-Traité
 # Réf : Référence du contrôle qualité dans le système de suivi du laboratoire
BL : Blanc
MR : Matériau de Référence
DP : Duplicata
RP : Réplicata
AD : Ajout Dosé
EA : Étalon Analogue
TM: Témoin de l'extraction
LDR : Limite de Détection Rapportée

Signature

Les résultats ne se rapportent qu'aux objets soumis à l'essai
Tout ou partie de ce document ne peut être reproduit sans l'autorisation du laboratoire de CONSULAIR.
Ce rapport d'essai est certifié par la (les) personne(s) mentionnée(s) ci-après.
Pour toute question concernant ce certificat d'analyse, veuillez vous adresser directement à :



Malha Kirèche



APPENDIX 5
RAW FIELD DATA



CONSULAIR

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME. E1

February/2017

Usine : ME. Meljadine	Date : 22.05.2018	P. Bar (po Hg) :	# Cold box : ME-1		
Ville: Rankin Inlet		P. Stat. (po H_2O) :			
ID point d'émission : Incinérateur	Sonde N° : 05.07	Module N° : #25 NC	K' : 30.14		
Diamètre : 32.5	Cp : 0.774	Kc : 0.999			
Distance avant : 5 D	Buse N° : 500-502	Ko : 0.733	Niveau du manomètre: ✓		
Distance après : 2 D	Coef : 0.4684	Distance P-T°-B : ✓	Zéro du manomètre: ✓		

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										534.62								
1445	1	1	5	0.15	1.55	1300	79	79		538.31	13.4	5.7	2	-2.0	—	270		
		1		0.15	1.55	1300	82	82		541.93								
		2		0.15	1.55	1300	83	83		545.49						270		
		2		0.19	1.65	1348	84	84		549.01	14.0	5.4	2					
		3		0.18	2.00	1348	84	84		553.11								
		3		0.18	2.00	1349	85	85		557.22	14.0	5.4	2	-2.0		270		
		4		0.18	2.00	1354	86	86		561.31	14.0	5.3	2					
		4		0.18	2.00	1346	88	88		565.42								
		5		0.18	2.00	1348	88	88		569.51	13.9	5.4						
		5		0.18	2.00	1350	89	89		573.61								
		6		0.18	2.00	1361	89	89		577.68								
		6		0.18	2.00	1362	89	89		581.77								
		1		0.19	2.28	1354	92	92		586.08								
		1		0.19	2.28	1356	92	92		590.50	14.3	5.1				270		
		5		0.19	2.20	1356	94	94		595.00								
		5		0.19	2.20	1348	94	94		599.50	14.2	5.1						
		4		0.19	2.20	1352	95	95		604.03								
		4		0.19	2.20	1352	96	96		608.50								
		3		0.18	2.11	1355	97	97		613.00								
		3		0.18	2.11	1355	97	97		617.49	14.3	5.1						
		2		0.15	1.78	1377	98	98		621.69								
		2		0.15	1.80	1295	98	98		625.82								
		1		0.13	1.54	1377	99	99		629.70								
		1	D	0.13	1.54	1341	99	99		633.54				-2.0				

TDF Initial Débit (pi^3/min): < 0.01	Pression (inhg) : -15" Hg	Volume ini (pi^3):	Volume fin (pi^3): Volume (pi^3):
TDF Final Débit (pi^3/min): < 0.01	Pression (inhg) : -12" Hg	Volume ini (pi^3):	Volume fin (pi^3): Volume (pi^3):

Fuite Pitot (ΔP) : ✓

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

$\Delta P \rightarrow 0.17$ 1340

$\Delta P_x \Rightarrow 0.19$

$\Delta P_N \Rightarrow 0.13$

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI : MRE, E1 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie:	AE - MRGIADNZ	Projet:	5528
Source:	Incinérateur	Essai: MRE1	# Cold Box: MR-1
Échantillonnée le:	22.09.2018	Date de l'assemblage : 21.09.2018	Heure:

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	(NON)

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	(NON)

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	~~VIDE (optionnel)~~ OU CMM H_2O déminéralisée (100 ml)	682.1	599.7	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	722.2	693.0	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	567.3	562.3	
4	Barboteur 4 - GS mod	VIDE ✓	517.1	517.7	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	613.0	613.4	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	791.5	792.2	
7	Contenant de dessicant	GEL DE SILICE	1766.2	1747.8	(33.3)
TOTAL			5659.4	5526.1	

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES
8228.4823		

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ~~ACS~~ Optima	153394
Solution d'acide nitrique (HNO_3) 10%	A.148
Solution d'acide nitrique (HNO_3) 0.1 N	A.148
Solution d'acide sulfurique (H_2SO_4) 10%	A.136
Solution d'acide chlorhydrique (HCl) 8N	A.095
Permanganate de potassium ($KMnO_4$)	A.1017
Solution H_2O_2 10% / HNO_3 5%	A.148 / R-387

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (2/2)

August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération :	23-09-2018	Heure de récupération:	8Lxx
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)	BB 1234	✓	✓	334

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec 123	✓	✓	✓

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	390

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB1 → HCl 180 cc

BB4 → Rincé avec BB 123 parce qu'il était vide après les tests

Blancs :

100 mL Acétone		Pour la demande d'analyse, voici les échantillons:
300 mL 0.1 N HNO_3		1a- Métaux sur contenants 1 + 2 + 3
100 mL H_2O		1b- Hg sur contenants 1 + 2 + 3
200 mL Solution H_2O_2 10% / HNO_3 5%		2a- Métaux sur contenant 4
100 mL KMnO4 4% / H2SO4 10%		2b- Hg sur contenant 4
200 mL H_2O + 25 mL HCL 8N		3a- Hg sur contenant 5
Filtre Quartz (x3)		3b- Hg sur contenant 6
		3c- Hg sur contenant 7

Technicien :

Consulair
Échantillonnage de l'air
Conformité environnementale

Formulaire: F_11_V4 janvier-2014

Laboratoire - Décontamination initiale des ensembles de verrerie - MÉTAUX USEPA 29

Compagnie:	Projet:	# du Cold box : ME-1
Source:	Essai:	# du filtre :
Échantillonnée le:	Date décontamination:	Heure:

Décontamination			Rinçage Eau	Eau + Savon	Eau	Rincer H_2O démin.	Tremper HNO_3 10%	Rincer H_2O démin.	Rincer Acétone
Item (dans l'ordre)		Remarques	1 x	1 x	3 x	3 x	4 hres	3 x	3 x
By pass			✓	✓	✓	✓	✓		
Cyclone (si applicable)									
Erlenmeyer (si applicable)									
Cloche femelle									
Support à filtre en téflon									
Cloche mâle									
Coude (bas cloche - barb.)									
Barboteur 1 x1			✓	✓	✓	✓	✓	✓	✓
Barboteur 2			✓	✓	✓	✓	✓	✓	✓
Barboteur 3			✓	✓	✓	✓	✓	✓	✓
Barboteur 4 (si applicable)			✓	✓	✓	✓	✓	✓	✓
Barboteur 5 (si Hg)			✓	✓	✓	✓	✓	✓	✓
Barboteur 6 (si Hg)			✓	✓	✓	✓	✓	✓	✓
Coudes (5 ou ....)			✓	✓	✓	✓	✓	✓	✓
Liner de verre							Rincer		+ Brosser
Vérification initiale de la verrerie et du liner du train d'échantillonnage et conserver le dernier rinçage à l'acétone si nécessaire.									
Buse de verre									+ Brosser
Vérification initiale de la buse, conserver le dernier rinçage à l'acétone si nécessaire.									
N.B. Joint d'étanchéité en téflon									

Commentaires:

Décontaminé par: ID Date: 04/09/2018 Endroit: QC

Consulair
Échantillonnage de l'air
Conformité environnementale

Formulaire: F_11_V4 **janvier-2014**

Laboratoire - Décontamination initiale des ensembles de verrerie - MÉTAUX USEPA 29

Compagnie:	Projet:	# du Cold box :
Source:	Essai:	# du filtre :
Échantillonnée le:	Date décontamination:	Heure:

Décontamination			Rinçage Eau	Eau + Savon	Eau	Rincer H_2O démin.	Tremper HNO_3 10%	Rincer H_2O démin.	Rincer Acétone
Item (dans l'ordre)		**Remarques**	**1 x**	**1 x**	**3 x**	**3 x**	**4 hres**	**3 x**	**3 x**
By pass			✓	✓	✓	✓	✓	✓	✓
Cyclone (si applicable)									
Erlenmeyer (si applicable)									
Cloche femelle			✓	✓	✓	✓	✓	✓	✓
Support à filtre en téflon			✓	✓	✓	✓	✓	✓	✓
Cloche mâle			✓	✓	✓	✓	✓	✓	✓
Coude (bas cloche - barb.)									
Barboteur 1									
Barboteur 2									
Barboteur 3									
Barboteur 4 (si applicable)									
Barboteur 5 (si Hg)									
Barboteur 6 (si Hg)									
Coudes (5 ou ....)									
Liner de verre							**Rincer**		**+ Brosser**
Vérification initiale de la verrerie et du liner du train d'échantillonnage et conserver le dernier rinçage à l'acétone si nécessaire.									
Buse de verre									**+ Brosser**
Vérification initiale de la buse, conserver le dernier rinçage à l'acétone si nécessaire.									
N.B. Joint d'étanchéité en téflon									

Commentaires:

Décontaminé par: [illegible] Date: 04/09/2015 Endroit: QC

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME-EZ

February/2017

Usine : AE Meliadine	Date : 23-09-2018	P. Bar (po Hg) :	# Cold box : ME-1
Ville: Rankin Inlet		P. Stat. (po H_2O) : — 0.01	
ID point d'émission : Incinérateur	Sonde N° : 05-07 (SQ-501)	Module N° : 25 NC	K' : 28.82
Diamètre : 33 1/2"	Cp : 0.724	Kc : 0.599	
Distance avant : 50	Buse N° : SQ-434	Ko : 0.733	Niveau du manomètre: —
Distance après : 20	Coef : 0.4366	Distance P-T°-B : —	Zéro du manomètre: —

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										636.82								
1434	1	1	5	0.15	1.31	1290	72	71		670.06	14.4	4.9	3	-2.0	/	260	/	40
		1		0.15	1.28	1341	73	72		643.21								
		1		0.15	1.28	1349	73	73		646.52								
		2		0.14	1.19	1352	74	74		649.71								
		2		0.14	1.19	1354	76	76		652.87	14.6	4.7						
		2		0.14	1.19	1354	78	78		656.06					—	272	—	
		3		0.13	1.13	1344	80	80		659.14	14.7	4.7						
		3		0.13	1.13	1340	82	82		662.29								
		3		0.13	1.12	1348	83	83		665.19	14.5	4.9	3					
		4		0.13	1.12	1347	85	85		668.50								
		4		0.13	1.12	1345	86	86		671.62	14.5	4.9						
		4		0.13	1.14	1348	83	83		674.77								
		5		0.13	1.15	1334	85	85		677.84	15.2	4.4						
		5		0.13	1.11	1336	91	91		680.96								
		5		0.13	1.15	1337	92	92		684.09	15.1	4.4	4					
		6		0.12	1.06	1334	93	93		687.13								
		6		0.12	1.06	1335	94	94		690.18	15.3	4.3	4	-3.0	/	270		40
		6	▷	0.12	1.06	1340	95	95	↓	693.21								

TDF Initial Débit (pi^3/min): 0.01	Pression (inhg) : 1" Hg	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : ME-ED

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										693.21								
	2	6	5	0.12	1.07	1358	96	96		696.26	15.3	4.3	4	-30	✓	273	40	✓
		6		0.12	1.07	1338	97	97		699.31								
		6		0.12	1.08	1328	97	97		702.37	15.3	4.3	4					
		5		0.12	1.08	1344	98	98		705.44								
		5		0.12	1.08	1344	98	98		708.51					✓	271	40	✓
		5		0.12	1.08	1341	99	99		711.60	15.3	4.3	4					
		4		0.12	1.08	1342	99	99		714.66								
		4		0.10	0.90	1329	100	100		717.50								
		4		0.10	0.90	1326	100	100		720.31								
		3		0.10	0.90	1326	100	101		723.10								
		3		0.10	0.90	1330	102	102		725.88	15.3	4.0						
		3		0.10	0.90	1330	102	102		728.68								
		3		0.10	0.90	1326	103	103		731.49								
		2		0.10	0.90	1316	104	104		734.29	15.3	4.4						
		2		0.10	0.90	1317	104	104		737.13								
		1		0.10	0.90	1311	105	105		740.0								
		1	▷						▷									

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Arrêt procédé (180 min - 15 min)

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI : ME-2 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AEM - M4		Projet: 18-5528	
Source: incinérateur		Essai: 2	# Cold Box: ME-1
Échantillonnée le: 28-05-2018	Date de l'assemblage : 18-09-26		Heure: 10h30

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	NON

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6		✓	✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	NON

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	~~VIDE (optionnel) OU~~ CMM H_2O déminéralisée (100 ml)	682.6	609.7	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	707.5	684.9	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	573.5	565.5	
4	Barboteur 4 - GS mod	VIDE	520.4	520.8	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	611.7	611.2	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	781.4	783.3	
7	Contenant de dessicant	GEL DE SILICE	1782.6	1761.7	121.6
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS	
Solution d'acide nitrique (HNO_3) 10%	
Solution d'acide nitrique (HNO_3) 0.1 N	
Solution d'acide sulfurique (H_2SO_4) 10%	
Solution d'acide chlorhydrique (HCl) 8N	
Permanganate de potassium ($KMnO_4$)	
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (2/2)

August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération : 29-09-2018		Heure de récupération: 8h00	
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3) +4		✓	✓	323

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
~~barboteur 4~~	Avec BB123			

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB1 → HCl → 188cc

BB4 → Vide Rincer Avec BB123

Blancs :

100 mL Acétone	
300 mL 0.1 N HNO_3	
100 mL H_2O	
200 mL Solution H_2O_2 10% / HNO_3 5%	
100 mL KMnO4 4% / H2SO4 10%	
200 mL H_2O + 25 mL HCL 8N	
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

P1

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME - E3

février-2017

Usine : AE MELIADINE	Date : 29-09-2018	P. Bar (po Hg) :	# Cold box : ME.1
Ville: RANAN INLET		P. Stat. (po H_2O) :	
ID point d'émission : Incinérateur	Sonde N° : 05-07 Q 501	Module N° : 25 NC	K' : 28,82
Diamètre : 32,5"	Cp : 0,774	Kc : 0,999	
Distance avant : 5D	Buse N° : SQ. 434	Ko : 0,733	Niveau du manomètre: ✓
Distance après : 2D	Coef : 0,4366	Distance P-T°-B : ✓	Zéro du manomètre: ✓

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi^3)	Masse molaire O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										747,13								
16h14	1	1	5	0,20	1,68	1327	78	78		750,85	12,9	6,0	3	-3,0	—	250	50	/
		1		0,20	1,72	1347	79	79		754,60								
		1		0,20	1,77	1350	80	80		758,43	13,0	6,0	3					
		2		0,20	1,71	1360	81	81		762,18								
		2		0,20	1,70	1374	81	81		765,96	12,8	6,1						
		2		0,20	1,70	1378	82	82		769,75								
		3		0,22	1,87	1380	83	83		773,68								
		3		0,23	1,95	1393	84	84		777,76	13,7	5,5				268		
		3		0,23	1,94	1401	85	85		781,76								
		4		0,23	1,94	1410	85	85		785,75								
		4		0,23	1,92	1420	86	86		789,72	13,7	5,5	3					
		4		0,23	1,93	1423	87	87		793,77								
		5		0,23	1,92	1431	88	88		797,79								
		5		0,20	1,68	1418	89	89		801,59								
		5		0,20	1,68	1430	90	90		805,38	14,5	5,2						
		6		0,20	1,69	1418	90	90		809,19	14,2	5,1						
		6		0,20	1,67	1440	90	90		813,00				-4,0		270		
		6	10	0,20	1,67	1445	91	91		816,78								

TDF Initial Débit (pi^3/min): < 0,01	Pression (inhg) :- 15" Hg	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) : ✓

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : ME-E3

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

février-2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										816.78								
	2	6	5	0.20	1.66	145	91	91		820.57	14.1	5.2	3	-3.0	—	220	90	—
		6		0.20	1.66	146	92	92		824.36								
		6		0.20	1.65	146	93	93		828.17								
		5		0.19	1.57	1476	94	94		831.88	14.0	5.3	3					
		5		0.19	1.57	1479	95	95		835.60								
	—	5		0.19	1.57	1481	96	96		839.27								
		4		0.19	1.55	1502	97	97		842.94	12.9	6.2						
		4		0.21	1.72	1518	99	99		846.82								
		4		0.21	1.71	1518	99	99		850.30								
		3		0.21	1.71	1520	100	100		854.57								
		3		0.21	1.72	1518	101	101		858.43								
	—	3		0.21	1.71	1525	101	102		862.07								
		2		0.21	1.71	1522	103	103		866.14								
		2		0.17	1.39	1522	104	104		869.62								
		2		0.17	1.44	1460	105	101		873.16								
		1		0.17	1.46	1436	106	106		876.67								
		1		0.17	1.47	1429	106	106		880.21								
		1	5	0.17	1.48	1421	107	107		883.85								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI: ME-3 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AE Méliadine		Projet: 5128	
Source: Incinérateur		Essai: # 3	# Cold Box: ME-1
Échantillonnée le:	Date de l'assemblage : 28-09-2018		Heure: 7h00

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓

Vérification de la buse et sondes d'échantillonnage à conserver : OUI / NON (NON)

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓

Vérification du train d'échantillonnage à conserver : OUI / NON (NON)

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS APRÈS	POIDS AVANT	POIDS TOTAL
1	Barboteur 1 - GS mod	VIDE (optionnel) OU CMM H_2O déminéralisée (100 ml)	740.1	604.4	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	711.9	684.0	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	575.8	570.9	
4	Barboteur 4 - GS mod	VIDE	519.6	518.9	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	623.3	624.0	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	773.1	774.0	
7	Contenant de dessicant	GEL DE SILICE	1801.7	1783.6	18.1
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS	
Solution d'acide nitrique (HNO_3) 10%	
Solution d'acide nitrique (HNO_3) 0.1 N	
Solution d'acide sulfurique (H_2SO_4) 10%	
Solution d'acide chlorhydrique (HCl) 8N	
Permanganate de potassium ($KMnO_4$)	
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT F_12_V9 (2/2) August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération :	30 Q 2018	Heure de récupération:	9h15
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)	230+100	✓		330

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec BB 123			

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB 1 → HCl → 240 mL

BB4 avec BB 123

Blancs :

100 mL Acétone	
300 mL 0.1 N HNO_3	
100 mL H_2O	
200 mL Solution H_2O_2 10% / HNO_3 5%	
100 mL KMnO4 4% / H2SO4 10%	
200 mL H_2O + 25 mL HCL 8N	
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (1/2) CODE D'ESSAI : ME-BL blanc August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AER - Mel		Projet: 19-5528	
Source: Incinérateur		Essai: BL	# Cold Box: ME-1
Échantillonnée le: 2018-09-23	Date de l'assemblage : 18-09-23		Heure: 9h00

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre			✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	NON

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	NON

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	VIDE (optionnel) OU CMM H_2O déminéralisée (100 ml)		603.0	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)		705.1	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)		560.1	
4	Barboteur 4 - GS mod	VIDE		519.2	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium		620.4	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium		764.1	
7	Contenant de dessicant	GEL DE SILICE		766.7	
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS Optima	153 994
Solution d'acide nitrique (HNO_3) 10%	A-148
Solution d'acide nitrique (HNO_3) 0.1 N	A-148
Solution d'acide sulfurique (H_2SO_4) 10%	A-136
Solution d'acide chlorhydrique (HCl) 8N	A-095
Permanganate de potassium ($KMnO_4$)	AZ0F7
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT F_12_V9 (2/2) August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération : 24-09-2018		Heure de récupération: 10h00	
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)		✓	✓	≈ 300

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec 123	✓	✓	✓

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques: BB1 - HCl → 100 cc

BB4 - Rincer avec BB 123

Blancs :

100 mL Acétone	✓
300 mL 0.1 N HNO_3	✓
100 mL H_2O	✓
200 mL Solution H_2O_2 10% / HNO_3 5%	✓
100 mL KMnO4 4% / H2SO4 10%	✓
200 mL H_2O + 25 mL HCL 8N	✓
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

P1-

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU-E1

February/2017

Usine : AE Methadone	Date : 22-09-2018	P. Bar (po Hg) :		# Cold box : OR-2/U1	
Ville: Rankin Inlet		P. Stat. (po H_2O) :	−0.06		
ID point d'émission : Incinérateur	Sonde N° : 03-06 (371)	Module N° :	19 COMP	K' :	26.18
Diamètre : 32.5	Cp : 0.78	Kc :	0.997		
Distance avant : 5D	Buse N°: 3 371	Ko :	1.000	Niveau du manomètre:	~
Distance après : 2D	Coef : 0.[illegible] (3741)	Distance P-T°-B :	~	Zéro du manomètre:	~

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi³)	Masse molaire O_2 (%v)	Masse molaire CO_2 (%v)	Masse molaire CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Température Filtre (°F)	Température Sortie (°F)	Température Trappe/Filtre (°F)
										483.64								
13h44	1	1	5	0.18	0.45	1330	60	60	76	485.51	13.4	5.3	3	−1.0	~	200	—	37
		1		0.17	0.43	1345			77	488.0								
		1		0.17	0.43	1345			77	490.46	13.4	5.6	3	−1.0				
		1		0.17	0.43	1341			77	493.97	13.4	5.7	3			200		36
		2		0.17	0.43	1352			78	495.48	13.4	5.7	3					
		2		0.17	0.43	1356			79	497.85	13.5	5.7	2					
		2		0.18	0.41	1354			80	500.35	13.5	5.7	2			200		36
		2		0.18	0.41	1353			80	502.87	13.5	5.7	2	−1.0				
		3		0.18	0.41	1361			82	505.38	13.5	5.7	2			200		36
		3		0.21	0.53	1366			82	508.08	13.5	5.7	2	−1.0				
		3		0.21	0.53	1381			84	510.79	13.4	5.8	2					39
		3		0.21	0.53	1377			83	513.50	13.4	5.7	2	−1.5				
14h44	AE	4		0.21	0.53	1379			84	516.20	13.4	5.7	2					
		4		0.21	0.53	1380			85	518.83	13.5	5.7	2					
		4		0.21	0.53	1373			84	521.61	13.7	5.6		−1.5		200		39
		4		0.21	0.53	1373			85	524.28	13.9	5.4						
		5		0.18	0.41	1351			85	526.78	13.9	5.4						39
		5		0.18	0.41	1348			87	529.27	14.0	5.3		−1.5		200		
		5		0.18	0.41	1350			87	531.86	14.0	5.3						
				0.18	0.41	1354			88	534.26	14.0	5.4						
		6		0.18	0.41	1355			88	536.79	14.0	5.3	2					
		6		0.18	0.41	1359			90	539.34	14.0	5.3	2					
		6		0.18	0.41	1361			90	541.87	14.0	5.3	2					
		6	↓	0.17	0.41	1350	↓	↓	90	544.36	14.0	5.3						

TDF Initial Débit (pi³/min): 0.015	Pression (inhg) : ~15"Hg	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	Fuite Pitot (ΔP) : ~
TDF Final Débit (pi³/min):	Pression (inhg) :	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

$\overline{\Delta P} = 0.16$ $\Delta P_{min} = 0.11$

$\Delta P_{max} = 0.21$

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU-E1

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi^3)	Masse molaire O_2 (%v)	Masse molaire CO_2 (%v)	Masse molaire CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Température Filtre (°F)	Température Sortie (°F)	Température Trappe/Filtre (°F)
										544.36								
		6	5	0.15	0.38	1357	60	60	93	546.67						250		
		6		0.16	0.41	1350			93	549.00	14.3	5.1						
		6		0.16	0.41	1355			94	551.26								
		6		0.16	0.41	1357			95	553.57	14.3	5.1						
		5		0.16	0.41	1343			97	555.93								
		5		0.16	0.41	1350			97	558.42								
		5		0.16	0.41	1335			97	560.77	14.3	5.1						
		5		0.15	0.37	1340			98	563.08								
		4		0.15	0.39	1332			99	565.37								
		4		0.13	0.35	1280			100	567.67								
		4		0.13	0.35	1300			100	569.98	14.9	4.7						
		4		0.11	0.29	1306			101	572.08								
		3		0.11	0.29	1304			101	574.08	14.8	4.8						38
		3		0.11	0.29	1280			102	576.10								
		3		0.11	0.29	1250			102	578.09								
		3		0.11	0.29	1266			103	580.17	14.9	4.6	3					
		2		0.13	0.31	1318			103	582.40								
		2		0.13	0.35	1320			103	584.62								
		2		0.13	0.35	1324			103	586.87	14.4	5.0						
		2		0.13	0.31	1310			102	589.10								
		1		0.13	0.35	1317			102	591.32	14.5	5.0						
		1		0.13	0.31	1322			102	593.56								
		1		0.13	0.35	1318			102	595.76								
		1		0.13	0.31	1306			102	598.00								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : MEC COSV - E1

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AE Heliantus	Projet: 5528	# Ensemble de verrerie : 28
Source: Incinérateur	Essai: #1	# Hot Box : OR.2 / V1
Date : 22-05-2018		Heure : 17h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	(NON)

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	(NON)

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 #4781	401.1	382.8	
3	Trappe à condensat	VIDE	502.9	365.3	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-~~150~~ mL)	599.7	586.7	
5	Barboteur modifié	VIDE	446.7	446.20	
6	Contenant de dessicant	GEL DE SILICE	1713.9	1708.0	174.8
			3664.3	3488.0 TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	156309
Acétone (grade optima)	153394
Éthylène glycol	142823
Eau HPLC	135150
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 2018-09-23	Heure de récupération:	
Nettoyage de l'extérieur des différentes pièces : ✓	✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :	✓ ✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	
Résine XAD-2 (environ 40g, 1 tube)	
Eau HPLC	
Éthylène Glycol	
Acétone	
Hexane	

Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AE Metadrive		Projet: 5728	
Échantillonné le: 22-05-2018		Récupéré par:	
Source: Incinérateur	Essai: #1	Date: 21-05-2018	Heure:

CAISSE # 28

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass	OR-28-BP	By pass	✓	✓	✓	✓	✓
Cloche femelle	(N/A)	Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon	(N/A)	Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle	(N/A)	Cloche mâle	✓	✓		✓	✓
Réfrigérant	ORC-28-R	Réfrigérant	✓	✓	✓	✓	✓
Trappe de résine		Trappe de résine					
Trappe à condensat verticale	OR-28TC	Trappe à condensat verticale	✓	✓	✓	✓	✓
Long coude		Tuyau MF pour Réfrigérant	✓	✓	✓	✓	✓
	OR-28-LC	Long coudé	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith	(N/A)	Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude	ORC-28-C	Coude	✓	✓	✓	✓	✓
Barbotteur Std	(N/A)	Barbotteur Std	✓	✓	✓	✓	✓
Bouteille de verre ambrée (1)		Bouteille de verre ambrée	✓	✓	✓		✓
Garnitures (Téflon + Aluminium)							
Nombre total de pièces	10	# Unique	1494				

Décontaminé par:	Date: 30/08/2018	Endroit: Québec
Code de décontamination (pot):	JD-30082018-OR28	
# Lot Des Solvants:	Dichlorométhane: 176773	
	Hexane: 175762	
	Acétone: 161822	

Commentaires

Formulaire mis-à-jour le 2018-05-14

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU. E2

February/2017

Usine : AE McMadine	Date : 28.09.2018	P. Bar (po Hg) :	# Cold box : OR2/U1		
Ville: Rankin Inlet		P. Stat. (po H_2O) : −0.05			
ID point d'émission : Incinerateur	Sonde N° : 03.06 3Q.503	Module N° : 19 COMP	K' : 26.19		
Diamètre : 32 1/2	Cp : 0.781	Kc : 0.997			
Distance avant : 5D	Buse N° : 3Q.503	Ko : 1.000	Niveau du manomètre: ✓		
Distance après : 2D	Coef : 0.4958	Distance P-T°-B : ✓	Zéro du manomètre: ✓		

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi³)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
11:50	1	6	5	0.12	1.08	1375	60	60	72	604.57	14.5	4.6	3	−7.0	—	210		45
		6		0.15	1.26	1353			73	608.84								
		6		0.15	1.15	1360			73	612.97	14.5	4.9	3					
		5		0.15	1.15	1362			74	617.11								
		5		0.15	1.15	1369			75	621.25								
		5		0.15	1.15	1362			77	625.40	14.6	4.7	3	−6.5	—	251		41
		4		0.12	1.23	1369			77	629.66	14.7	4.7	3					
		4		0.15	1.15	1371			79	633.81								
		4		0.15	1.16	1372			80	637.92	14.5	4.9	3					
		3		0.15	1.16	1369			81	642.08								
		3		0.15	1.16	1370			83	646.17	14.5	4.9						
		3		0.15	1.16	1373			84	650.31								
		2		0.13	1.04	1315			86	654.36	15.2	4.4	3					
		2		0.13	1.04	1320			87	658.45								
		2		0.12	0.97	1316			88	661.97	15.1	14.4	4					
		1		0.12	0.97	1314			89	665.75								
		1		0.12	0.97	1318			90	669.50	15.3	4.3	4			210		40
		1	↓	0.12	0.97	1318	↓	↓	91	673.25								

TDF Initial Débit (pi³/min): 20.05	Pression (inhg) : −15"Hg	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	Fuite Pitot (ΔP) :
TDF Final Débit (pi³/min):	Pression (inhg) :	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Changement réfrigérant — Cassé à cause du gel

TECHNICIEN :

P2

CONSULAIR

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COJV-E2

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										673,25								
	2	1	5	0,12	0,98	1318	60	60	92	677,00	15,3	4,3	4	-5,5	~	252	~	34
		1		0,12	0,98	1311			94	680,74								
		1		0,12	0,99	1300			94	684,49	15,3	4,3	4					
		2		0,12	0,98	1317			95	688,23								
		2		0,12	0,98	1322			96	691,97					~	252	~	40
		2		0,12	0,98	1318			96	695,73	15,3	4,3						
		3		0,12	0,98	1325			98	699,41								
		3		0,11	0,90	1320			98	703,00								
		3		0,11	0,90	1318			90	706,53								
		4		0,10	0,82	1310			100	709,94								
		4		0,10	0,82	1310			100	713,38	15,3	4,4						
1417		4		0,10	0,83	1314			101	716,79								
		4		0,10	0,83	1300			101									
		5																
		6																
		6																
		6																

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES | O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Fin bris équipement (réfrigérant) changé de point !

TECHNICIEN :

MEV

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : COSV - 2

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AEM - MV	Projet: 18-5578	# Ensemble de verrerie : 10
Source: Incinérateur	Essai: 2	# Hot Box : OR-2
Date : 28 - 09 - 2018		Heure :

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	NON

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	NON

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2	131.7	125.6	
3	Trappe à condensat	VIDE	375.6	269.5	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	713.9	700.8	
5	Barboteur modifié	VIDE	—	—	
6	Contenant de dessicant	GEL DE SILICE	1723.1	1713.6	134.8
				TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

trappe XAD: 1172

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	
Acétone (grade optima)	
Éthylène glycol	
Eau HPLC	
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération :	28.06.2018	Heure de récupération:	15h00
Nettoyage de l'extérieur des différentes pièces :			
Conditionnement (HA) des contenants **(verre ambré)** de récupération :			

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde				

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine				

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau			

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final			

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite		
Résine XAD-2 (environ 40g, 1 tube)		
Eau HPLC		
Éthylène Glycol		
Acétone		
Hexane		
Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AÉ Meliadine		Projet: 5528	
Échantillonné le: 23-09-2018		Récupéré par: [signature]	
Source: Incinérateur	Essai: ~~[illegible]~~ E-2	Date: 23-09-2018	Heure:

CAISSE # 10

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass		By pass	✓	✓	✓	✓	✓
Cloche femelle		Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon		Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle		Cloche mâle	✓	✓	✓	✓	✓
Réfrigérant		Tuyau MF	✓	✓	✓	✓	✓
		Réfrigérant	✓	✓	✓	✓	✓
		Court MF	✓	✓	✓	✓	✓
Trappe à condensat		Trappe à condensat	✓	✓	✓	✓	✓
Grand L							
		Grand " L"	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith		Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude		Coude	✓	✓	✓	✓	✓
Barbotteur Std		Barbotteur Std	✓	✓	✓	✓	✓
Pot pour le proofing		Pot pour le proofing	✓	✓	✓		✓
Nombre total de pièces		# Unique	988				

Sur le terrain

Verrerie de laboratoire							
Bouteilles de verre ambrée (5)							
Teflon							
Aluminium							
Trappe de résine		Trappe de résine					

Décontaminé par: JD	Date: 24/08/2018	Endroit: Québec
Code de décontamination (pot): JD-24/08/2018-0210		
# Lot Des Solvants:	Dichlorométhane: 162956 Hexane: 182082 Acétone: 181822	

Commentaires

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSV-E3

février-2017

| | | |

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : COSV - E3

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

février-2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										816.86								
	2	1	5	0.18	1.38	1413	60	60	90	821.26	14.1	5.2	3	-60				
		1		0.18	1.38	1417			90	825.67								
		1		0.17	1.30	1423			91	829.97								
		2		0.17	1.30	1440			94	834.34								
		2		0.17	1.29	1433			92	838.54								
		2		0.17	1.30	1443			94	842.77								
		3		0.17	1.29	1450			95	847.00								
		3		0.24	1.33	1529			91	851.90								
		3		0.24	1.35	1535			97	856.84								
		4		0.24	1.36	1533			97	861.77								
		4		0.24	1.36	1533			98	866.72								
		4		0.24	1.36	1542			99	871.64								
		5		0.24	1.36	1541			99	876.54								
		5		0.23	1.68	1548			101	881.29								
		5		0.22	1.65	1500			101	886.00								
		6		0.22	1.68	1463			102	890.71								
		6		0.22	1.69	1457			103	895.49								
		6	↓	0.22	1.69	1460	↓	↓	103	900.26								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR
SECTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : MEL- COSU - E3

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AE Meliadine	Projet: 5528	# Ensemble de verrerie : 1
Source: Imaginatum	Essai: #3	# Hot Box : OR2-V1
Date : 28-09-2018		Heure : 16h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	NON

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	NON

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 1151	121.0	114.1	
3	Trappe à condensat	VIDE	523.10	304.5	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	751.7	729.0	
5	Barboteur modifié	VIDE		—	
6	Contenant de dessicant	GEL DE SILICE	1734.0	1723.1	259.1
				TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT	
Dichlorométhane (grade optima)		
Hexane (grade optima)		
Acétone (grade optima)		
Éthylène glycol		
Eau HPLC		
Résine XAD-2		
Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 30-09-2018		Heure de récupération: 8h20	
Nettoyage de l'extérieur des différentes pièces :		✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :		✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	
Résine XAD-2 (environ 40g, 1 tube)	
Eau HPLC	
Éthylène Glycol	
Acétone	
Hexane	

Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUE

Compagnie: AE Medicine		Projet: 5528	
Échantillonné le:		Récupéré par:	
Source: Mainstream	Essai: ROSU E3	Date:	Heure:

CAISSE # 1

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass		By pass	✓	—	—	—	—
Cloche femelle		Cloche femelle	✓	✓	—	—	—
Support à filtre en téflon		Support à filtre en téflon	—	—	—	—	—
Cloche mâle		Cloche mâle	—	—	—	—	—
Réfrigérant							
		Réfrigérant	✓	✓	—	—	—
Trappe de résine		Trappe de résine					
Trappe à condensat		Trappe à condensat	✓	—	—	—	—
Grand L		Tige MM	✓	✓	—	—	—
		Tige MF	—	—	—	—	—
		Coude 4 po.	✓	—	—	—	—
Barbotteur Greenberg Smith		Barbotteur Greenberg Smith	—	—	—		
Coude		Coude	—	—	—	—	—
Barbotteur Std		Barbotteur Std	—	—	—	—	—
Pot pour le proofing							
Bouteille de verre ambrée (5)		Bouteille de verre ambrée	—	—	—		—
Garnitures (Téflon + Aluminium)							
Nombre total de pièces		# Unique	495				

Décontaminé par: JD	Date: 28/08/2018	Endroit: Québec
Code de décontamination (pot):	JD-28/08/2018	

Lot des Solvants:
Dichlorométhane: 182968
Hexane: 175762
Acétone: 181822

Commentaires

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSV - Blanc

February/2017

Usine : LEM-Mtl	Date :	P. Bar (po Hg) :	# Cold box :
Ville: Montréal		P. Stat. (po H_2O) :	
ID point d'émission : incinérateur	Sonde N° :	Module N° : 25	K' :
Diamètre :	Cp :	Kc : 0.799	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										34.7								
							71	71	71	35.7								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES | O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN : JFC

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI: MEV COSV-2 blanc

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: NE Meliadine	Projet: 5078	# Ensemble de verrerie : 22
Source: Incinérateur	Essai: #2	# Hot Box : OR2-V1
Date : 22-09-2018		Heure : 10h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	(NON)

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	(NON)

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 lisr	123.4	123.3	
3	Trappe à condensat	VIDE	371.8	371.8	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	686.2	687.0	
5	Barboteur modifié	VIDE	—	—	
6	Contenant de dessicant	GEL DE SILICE	1730	1730	
				TOTAL	0

*: Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	156309
Acétone (grade optima)	153394
Éthylène glycol	142823
Eau HPLC	135150
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 24.09.2018	Heure de récupération: 15h00	
Nettoyage de l'extérieur des différentes pièces : ✓	✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :	✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch.	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	✓
Résine XAD-2 (environ 40g, 1 tube)	✓
Eau HPLC	✓
Éthylène Glycol	
Acétone	✓
Hexane	✓

Récupération par : fm	Date : 15-09-20	Endroit : MEL

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AE Meliadine		Projet: 5528	
Échantillonné le: 23-09-2018		Récupéré par:	
Source: Incinérateur	Essai: [illegible] BL	Date: 23-09-2018	Heure: 10h00

CAISSE # 22

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass 125 mm	(N/A)	By pass 125 mm	✓	✓	✓	✓	✓
Cloche femelle	(N/A)	Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon	(N/A)	Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle	B	Cloche mâle	✓	✓	✓	✓	✓
Réfrigérant	OR-13-R1	Réfrigérant	✓	✓	✓	✓	✓
	OR-13-R2	Rallonge de réfrigérant	✓	✓	✓	✓	✓
	(N/A)	~~Coude réfrigérant~~ Tuyau MFo	✓	✓	✓	✓	✓
Trappe de résine	[redacted]	Trappe de résine					
Trappe à condensat verticale	OR-22-TC	Trappe à condensat verticale	✓	✓	✓	✓	✓
Coude	(N/A)	Coude	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith	(N/A)	Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude	(N/A)	Coude	✓	✓	✓	✓	✓
Barbotteur Std	(N/A)	Barbotteur Std	✓	✓	✓	✓	✓
Bouteille de verre ambrée (1)	[redacted]	[illegible]mbrée	✓	✓	✓	[redacted]	✓
Garnitures (Téflon + Aluminium)	[redacted]						
Nombre total de pièces	12	[redacted]	1000				

Bouteille de verre a[illegible]

Décontaminé par: JD	[illegible]018	Endroit: QC
Code de décontamination (pot):	[illegible]: 3[illegible] 08/2018-OR22	
# Lot Des Solvants:	Dichlorométhane: 176773 Hexane: 175762 Acétone: 181822	

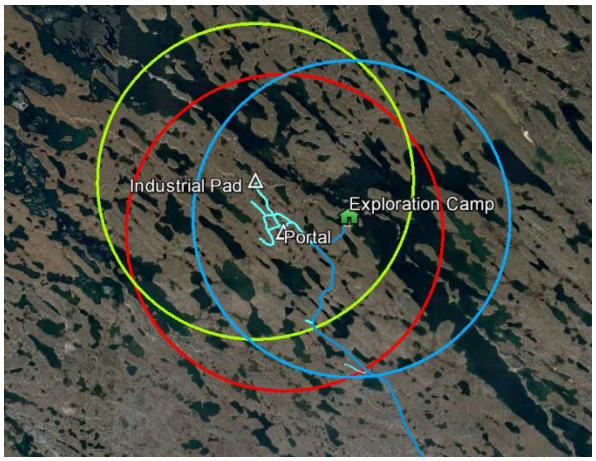
Commentaires

Formulaire mis-à-jour le 2018-05-14

Appendix F-1

Toolbox presentations





Caribou Migration

- During late June to early July, herds of 1000 to 5000 Caribou cross the site for a period of 3 to 10 days.
- Environment technicians perform ground surveys 3 times per day (6:00 am, 12:00 pm, 6:00 pm) during the migration period.
- Information collected is presented on a map and a "Caribou Migration Alert" email is sent to all Meliadine Employees and Contractors.
- Alerts apply to a 5 km radius around the Project
- Alerts apply to a 100 m buffer zone along the AWAR road corridor.

When is an alert triggered?

When 50 or more Caribou are within 5km of site

What does the alert mean?

The following work must stop:

- Helicopter flights and drill operations off site*
- Surface mining/operations activities such as transportation to mining areas, hauling of material, and non-essential refueling of equipment. Non-essential light vehicle traffic will be suspended.
- Surface activities related to underground mining such as surface stockpiling of ore or waste with heavy equipment.
- Surface construction activities: outdoor construction development, earthworks, road construction, structural work, non-essential waste deposition, refueling, transportation of equipment.
- Water management activities, such as unauthorized pumping, piping installation and outdoor unapproved maintenance of water management facilities.
- Outdoor unapproved camp activities.
- Only essential light vehicle traffic (for crew changes and wildlife survey) will be authorized.
- All activities, not previously approved by the Environment Department, during a Migration Alert will require approval by the Mine Manager or acting Manager.

What activities are permitted?

Essential activities allowed:
↗ **Refueling of essential generator and power supplies;**
↗ **Operation/maintenance of water treatment systems;**
↗ **Critical inspections required in case of a malfunction;**
↗ **ERT deployment in case of a Code 1;**
↗ **Intervention in case of a reportable spill;**
↗ **Medical treatment or site evacuation of employee;**
↗ **Activity intended to prevent a health and safety or environmental risk.**

When can I resume work?

When the Environment Department notify the site by radio and email.

Please be patient during the migration period and refrain from calling the environment department for updates. During alert periods, environment staff continuously monitor the herd.

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MELIADINE

Safety & Environmental incidents can be avoided: drop the excuses.
When we believe in safety & environment, we follow the instructions.
Everyone is responsible for behavior that ensures safety & environmental compliance.

MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Modular FSB
Supervisor: Neil MacLennan - Joey McCormack

DATE: June 22, 2018

MEETING (DÉTAILS) :
Topic: Caribou Migration
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Kevin Buckley	KBB		
Sheldon Underhill	Sheldon Underhill		
Luc Savoie			
Colton Connors			
Daniel Allain	Daniel Allain		
Tony Hallihan	Tony Hallihan		
Jason McEachern	Jason McEachern		
Richard Frawley	Richard Frawley		

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MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Alma Construction
Supervisor: [signature]

DATE: 2018/06/23

MEETING (DÉTAILS) :

Topic:
Caribou Migration

Environmental Discussions/Concerns:
What does the alert mean?

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Dany Boucher	[signature]	[illegible]	
Kevin Laborte	[signature]	Jocelyn Hebert	[signature]
Jean-Luc Brisson	[signature]	Herménigilde Plusquellec	[signature]
Mathieu Savard	[signature]	Steeve Lacharce	[signature]
[illegible]	[signature]	Renaud Montmagny	[signature]
JP Bois	[signature]	Antonio Goncalves	[signature]
Lou-Marigira	[signature]	Eric Tremblay	[signature]
Mathieu [illegible]	[signature]	Réne Rivard	[signature]
Denis Essiombe	[signature]	Gaston Aspirot	[signature]
Daniel Corbeyros	[signature]	Eric Cyr	[signature]
Denis [illegible]	[signature]	Marcel Fortin	[signature]
Marcel Fortin	[signature]		
[illegible]	[signature]		
Fernand Hebert	[signature]		
[illegible]	[signature]		
George [illegible]	[signature]		
Nicolas [illegible]	[signature]		
Jonathan Doucet	[signature]		
Bruno DuFour	[signature]		
Zacharie Beaulieu	[signature]		
Jean Mathieu Larouche	[signature]		

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MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: MINE ENG / GEO
Supervisor: JAWAD HALOUI

DATE: 7/18/18

MEETING (DÉTAILS) :

Topic:
CARIBOU MIGRATION
WATER USE AND MOVEMENT

Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Sophie Lin			
Yannick Roy			
Ryan Roberts			
Kristin Foster			
Alexie Racicot Rud			
Jean-Claude Blais			
Jean-Christophe Genest			
Christophe Cousin			
Jerome Robert Martel			
Marc Alex Croft			
JAWAD HALOUI			

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CREDO
An injury can be avoided: drop the excuses. When we believe in safety, we first follow the instructions. Everyone is responsible for behavior that ensures its safety.

MONTHLY SAFETY MEETING

Fill out this form, attach the minutes and handouts

Department: ENGINEERING.
Supervisor: C. PENNA.

DATE: 24/06/2018

MEETING (DÉTAILS) :

Topic: WALKING & RUNNING AROUND CAMP
PROTECTION FROM SUN.

Safety Concerns: Need full face mask to punch cam.

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Gilles Paradis			
KULKA KULKA			
Roxanne Takpanie			
Marcel Pleau			
Benoit Quinn			
Mathieu Grégoire			
Steve Lacelle			
Marc LAMBERT			
RUTH ANN SCOTT			
CEDRIC PENNA			

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Safety & Environmental incidents can be avoided: drop the excuses.
When we believe in safety & environment, we follow the instructions.
Everyone is responsible for behavior that ensures safety & environmental compliance.

MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Engineering.
Supervisor: C. Penna.

DATE: 24/04/2018.

MEETING (DÉTAILS) :
Topic: CARIBOU MIGRATION.
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Gilles Paradis			
KULWA FULWA			
Roxanne Takpanie			
BENOIT QUINN			
Marcel Pleau			
RUTH ANN SCOTT			
MARC LAMBERT			
Shane Lacelle			
CHRIS PENNA			

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MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Housekeeping / Kitchen **DATE: June 24, 2018**
Supervisor: Marie-France Masse

MEETING (DÉTAILS) :
Topic: Caribou Migration
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Yann Audet	[illegible]		
Cindy L'Abbé Turcotte	Cindy L Turcotte		
CLÉMENT FORTIN	Clément Fortin		
Zachary Arvigut	[illegible]		
Janine Gordon	Janine Gordon		
Dominic Garrad	Dominic Garrad		
Felicity Sinnisiak	Felicity Sinnisiak		
Judy Ubluriak	J. Ubluriak		
Jessica Irksuk	Jessica Irksuk		
Nancy Emiktowt	Nancy Emiktowt		
[illegible]	[illegible]		
[illegible]	[illegible]		

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MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Maintenance. AEM.

DATE: 23-06-2018.

Supervisor: _____

MEETING (DÉTAILS) :
Topic: CARIBOU MIGRATION
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Gilbert Lamiaux	[signature]		
Bruno Beaulieu	[signature]		
Jean-Marc Cha	[signature]		
Rob Thicker	[signature]		
Jean Patrick Lelinos	[signature]		
Pascal Dionne	[signature]		
Marc Thoudreau	[signature]		
Julio Lara	[signature]		
B. Gauthier	[signature]		
Eric Cadorne	[signature]		
Mauricio Bustos	Mauricio Bustos		
Pier-Luc Vachon	[signature]		
Eric Neveu	[signature]		
Gabrielle Roy	Gabrielle Roy		
Max Hebert	[signature]		
Nick Lutz	[signature]		
Ricky Fox	[signature]		
Marc-André Gagnon	[signature]		
Gino Cameron	[signature]		
MARK MORIN	[signature]		

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MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Caribou Dion
Supervisor: Yves Gagnon

DATE: 22/06/18

MEETING (DÉTAILS) :
Topic: Caribou Migration
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Yves Gagnon	Yves Gagnon		
Alexandre Perron	Alexandre Perron		
AARON KOPAK	Aaron		
JONATHAN Bergeron	Jonathan		

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MONTHLY ENVIRONMENT TOPIC

SPILL PREVENTION

What is a spill?

A spill is defined as, an accidental release of product into the environment that has the potential for adverse impacts to the receiving environment, Agnico Eagle property, or human health. This can include potential impacts to water, surface and groundwater, land, equipment, buildings, human health and the atmosphere.

Steps to follow when a spill occurs (***only if safe to do so)***

1- Stop the activity causing the spill (e.g. shut down the equipment, close the valve, etc.).
2- Contain the spill to avoid spreading the contamination (e.g. use secondary containment, build a berm or dig a trench, repair the leak, etc.)
3- Decontaminate the area (e.g. dig out the contaminated soil, pump out the contaminated liquid, etc.).
4- Segregate the material, put rags and booms in a container (quatrex or drum) and take contaminated soil to the appropriate location.
5- Complete the spill report (below), providing as much detail as possible, and send it to the environment department.

Depending on the substance and volume, the spill may need to be reported to the Government Spill Hotline within 24 hours of the incident. The *Spill Contingency Plan* outlines reportable spill volumes for specific substances. If unsure, please contact the environment department.

Spill >100 L need to be declared to Env. Dept. Immediately

Meliadine Gold Project
Internal Spill Report Form

Everyone is responsible of cleaning their spills

AGNICO EAGLE

Date of spill	
Date of spill report	
Date at the end of cleanup/incident	

Reported by / Unreported		Select one Cause for the incident
Contractor Involved		In the selection under :
Employee Involved		Check Equipment Breakdown
Supervisor Involved		Check Equipment malfunction
Equipment Involved		Check Human error
Nature of Contaminant		Check Improper storage
Quantity of Contaminant		Check Act of god
Exact Location : Easting / Northing		Check Non respect of procedure
Environmental Personnel Contacte		Check Other

Description of the incident

Immediate Corrective Action

Action to be taken to reduce/eradicate risk of similar incident in the future

Volume (in m3 - cubic meter) of soil transferred to the landfarm

Report Completed by	

For Environmental Department Purpose Only

Incident Investigation Recommended	
Government agency notified	
Date of notification to government agency	
Comment :	
Environment Personnel Signature	

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MONTHLY ENVIRONMENT TOPIC

SPILL PREVENTION

How Meliadine deals with spills?

At Meliadine, all spills, regardless of size, quantity, location, or time, must be reported to the environment department, cleaned up and brought to the appropriate location.

1- Contaminated soils resulting from spills of petroleum products (motor oil, hydraulic oil, gasoline, fuel and lubricant) must be sent to the landfarm area.

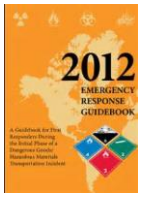




2- Spills with chemical products (coolant, windshield washer, glycol, tailings, cyanide, sulfur, etc.) must be stored as Hazardous Material and shipped off site for proper disposal.



For other potentially life threatening substances & emergencies, call 3911 or radio CODE 1, CODE 1, CODE 1, or refer to the Emergency Response Plan.



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MONTHLY ENVIRONMENT TOPIC

SPILL PREVENTION

Preventing spills is much easier than cleaning them up. Examples of spill prevention include:

- Adhering to proper work methods and procedures

- Taking care when transferring fuel or sewage

- Maintaining equipment

- Using portable secondary containment for small containers

- Using portable secondary containment when refueling

- Installing lined secondary containment for large fuel tanks and chemical storage areas

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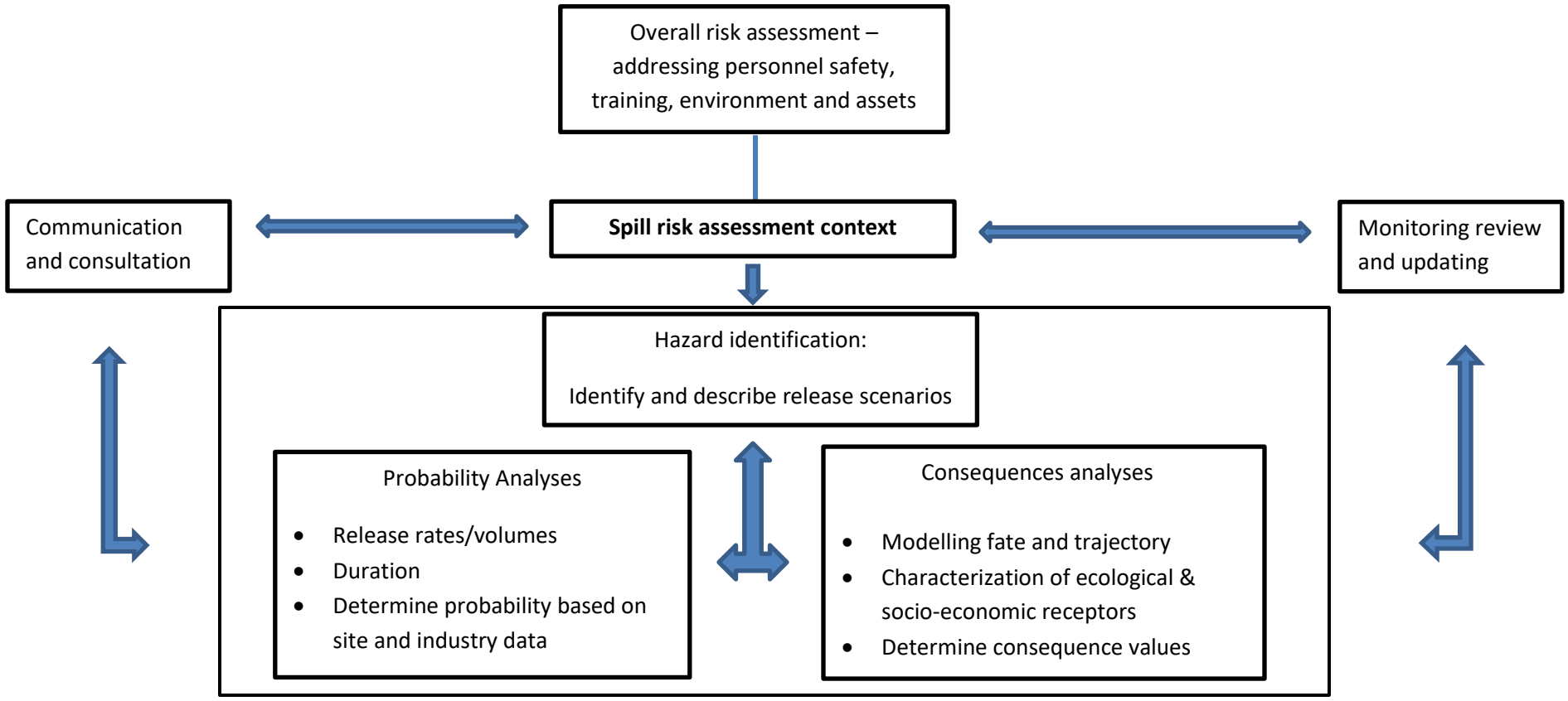
MONTHLY ENVIRONMENT TOPIC

SPILL PREVENTION

OVERALL RISK ASSESMENTS DIAGRAM



Protecting the environment requires the commitment and participation of all site personnel

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MELIADINE

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: __MAINTENANCE_____ **DATE: ___09-12-2018_____**

Supervisor: _____

MEETING (DÉTAILS) :

Topic:
SPILL PREVENTION

Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Jean-piere loranger		Martin fournier	
Guy fournier		Jean-patrick gelinas	
Marc-antoine boily		Marc-andre paradis	
Hugo sarrazin		Mauricio bustos	Mauricio Bustos
Olivier sarrazin		Jacob mcloed	
Emmanuel girard-page		Raphael bedard	Raphael Bédard
Alain gariepy		Pier-luc vachon	
Marc-andre gagnon		Jean-phillipe gingras	
Daniel taylor		Jean-phillipe bondu	
Maxime hebert		Michel grenier	
Real grandmont		Jean-francois tessier	
Bruno beaulieu		Luc mercier	
Marc boudreau		Gilbert lemieux	
Pascal dionne		Nicholas lentz	
Jean-marc otis		Robert krieger	
Ricky roy		Rick Guay	
Dean humphrey		Mathieu Rodier	
Stephane b morin		Jocelyn Gauthier	
Stephane dionne		Eric Coderre	
Stephane Gagnon	Stephane Gagnon	Jules Lachapelle	
Sébastien Cloutier		Alain Gauthier	

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Piping Primer
Supervisor: R. Lamothe

DATE: 07/12/18

MEETING (DÉTAILS) :

Topic: Spills prevention

Environmental Discussions/Concerns: Where to Bring Them

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
R Lamothe			
ALAIN DESCHÊNES			
Sebastien Dumont			
ROGER LEVERT			
Gilles Racicot			
MAXIME Groleau			
mike NORMANDIN			

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Orbit Garant Drilling
Supervisor: André Beaulieu

DATE: Jan 7th 2018

MEETING (DÉTAILS) :
Topic: Spills
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Moses Kiblakoot	[signature]	Dave Thurmier	[signature]
Ste Phane Robert	S. Robert	Alex Mainville	[signature]
David Daigle	[signature]	Jonathan Desrochers	Jonathan Desrochers
Patrick Tousignant	[signature]	Miguel Vanier	Miguel Vanier
Steven Rodgers	[signature]	Guillaume Mantha	[signature]
Simon Lewis	[signature]	Serge Tawambe	[signature]
Steve Léveillé	Steve Léveillé	Adam Desrosiers	[signature]
Yasmin Fakli	[signature]		
JOEL FORGET	[signature]		
Simon Aubé	[signature]		
André Beaulieu	[signature]		
Dan Lamontagne	[signature]		
Alexis Proulx	[signature]		
Olivier Bergeron	Olivier Bergeron		
Ryan Alexander	Ryan Alexander		
Jason Bowie	Jason Bowie		
Phil Snable	[signature]		
David Perreault	[signature]		
Jean Sébastien Hamel	Jean Sébastien Hamel		
David Perreault	[signature]		

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: E&I
Supervisor: Josh Bazar, Jeff Pratt, Eric Parent

DATE: December 9, 2018

MEETING (DÉTAILS) :
Topic: **SPILL PREVENTION**
Environmental Discussions/Concerns: Steps to follow when a spill occurs

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Steve Bates	[signature]	[illegible]	[signature]
Stéphane CRAIG	[signature]	JEFF PRATT	[signature]
Joël Laplante	[signature]	Bruno Laverdure	[signature]
Luc FORTIN	[signature]	Marco Francan	[signature]
CHRISTIAN BEAUMIER	[signature]	Eric Parent	[signature]
Mathieu Cossetto	[signature]	JOSH BAZAR	[signature]
MARCO CAPRIO	[signature]	Sonny James	[signature]
DANIEL BEAUPRÉ	[signature]	BEITH SMITH	[signature]
J MAINVILLE	[signature]	FRANCIS LECOURS	[signature]
Paul D. Paniyuk	[signature]	Roger R. Cabrini	[signature]
Veronica Martynook	[signature]	Philippe Tremblay	[signature]
Scott Saunders	[signature]	Sébastien [illegible]	[signature]
TROY INNUKSHUK	[signature]	KARIM GANA	GANA KARIM
Aaron Kigeak	[signature]	Cedrick Dubois	[signature]
Bettina Navayuk	[signature]	KALAI PILAKAPA	[signature]
Eric Ducaud	[signature]	Quentin [illegible]	[signature]
Nolan Aupalukuq	[signature]		
Lazarus Iqqaat	[signature]		
Bradley White	[signature]		
Stephen Ofosi	[signature]		
Lance Singaqti	[signature]		

AGNICO EAGLE
MELIADINE

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Metallurgy / Process Plant
Supervisor: Sarah Simard

DATE: 12/10/2018

MEETING (DÉTAILS) :
Topic: Spill prevention: Discussed about the procedure to follow if a spill occur during the pick up utilization (only vehicle that metallurgy team will use)
Environmental Discussions/Concerns: Ø

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
J. ANTONIO VENGARA			
Gabriel C. Bellavance			
Alberto Sasaki			

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MELIADINE

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Metallurgy Process Plant
Supervisor: David Hernandez

DATE: Dec 27, 2018

MEETING (DÉTAILS) :
Topic: Spills Prevention
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Alberto Sasaki			
Trista Reese			
David Hernandez			

AGNICO EAGLE
MELIADINE

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: ENGINEERING + Geology
Supervisor: Christopher PENNA

DATE: 12-16-2018

MEETING (DÉTAILS) :
Topic: Sealant On top of Rooms (gap in wall) will it be done for all wings?
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Mathieu Grégoire	[signature]		
Jonathan Gignac	[signature]		
François Pulinche	[signature]		
GUILHEM SERVELLE	[signature]		
Marcel Plecun	[signature]		
Christophe Cousin	[signature]		
LEANDRE VEILLETTE	[signature]		
ADAM FOURNIER	[signature]		
HERMANN FEUDJIO	[signature]		
Kristin Foster	[signature]		
Gabriel Côté	[signature]		
Anthony Laroche	[signature]		
RUTH ANN SCOTT	[signature]		
Marc-Alex Croft	[signature]		
Jean-Claude Blais	[signature]		
Yannick Roy	[signature]		
BENOIT QUINN	[signature]		
Nicolas Stonge	[signature]		
CHRIS PENNA	[signature]		

Waste Management

WHY IS IT IMPORTANT TO BE MANAGED CORRECTLY?

It is important to manage all waste at Site for the safety and protection of personnel, wildlife and the environment. It also saves time and improves efficiency if it is managed correctly at the source so that sorting and rework is not required.

WHO IS RESPONSIBLE FOR MANAGING WASTE?

You are all responsible! Similar to safety, all personnel at Meliadine are responsible for environment protection and this includes waste management.

HOW SHOULD IT BE MANAGED?

Segregation at the source is key to the success of any waste management program. Waste is required to be separated accordingly. This allows for increased efficiency and allows for appropriate disposal of materials.



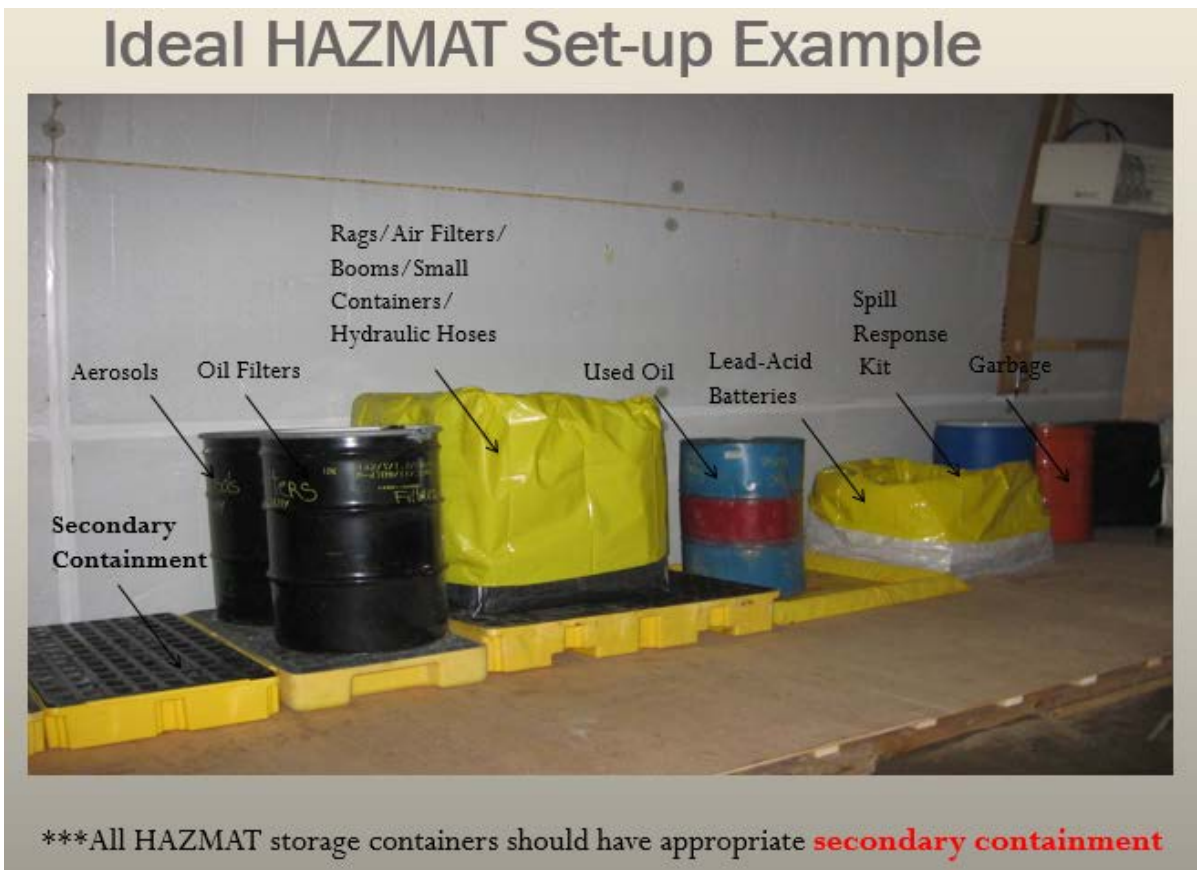
Containment of domestic waste and hazardous waste is required. All domestic waste should be kept in a closed container with a lid to mitigate odors and access to wildlife. Secondary containment to mitigate any spills or leaking of hazardous materials is required.

Labelling all storage containers is required on Site, including seacans. →→→→→→→→→→→

Food and drinks should not be brought outside and should never be left outside.

Cigarette butts need to be disposed of inside the appropriate storage containers located at designated smoking areas and should never be disposed of on the ground, waterbodies, or on-stop of a disposal container. They need to be contained so that they will not be blown by wind where they may migrate to the ground or waterbodies nearby.

Example of Segregation, labelling and secondary containment:



WHAT IS WASTE?

Waste at the Meliadine Site includes garbage and food waste, construction materials, hazardous materials (HAZMAT) and recycling.

Examples of Waste and Segregation:

Domestic Waste, Garbage and Food Waste	Construction Waste	HAZMAT	Recycling
Paper Cardboard Food packaging Food wastes Drink boxes Food grease Coffee/coffee cups Sandwich wrappers	Air filters Cold ash Roofing materials Carpet Insulation Treated wood pallets Rubber Caulking tubes Non-contaminated: • Wood • Concrete • Metal • Plastics	Petroleum Products Waste oil Oil filters Oily solids Oil rags Paint/Paint cans Aerosol cans Batteries	Pop cans/bottles Scrap metal Electrical components Electric cable/wiring

WHAT CAN EVERYONE DO TO HELP?

In addition to segregating, labelling and keeping food and drinks inside, please ask questions. If you are unsure, ask your supervisor. If additional information is required or anything is unclear, do not hesitate to ask the Environment Department.

Take ownership and be proud to work at Meliadine. Everyone wants a clean, safe and environmentally compliant workplace to work.

AGNICO EAGLE
MELIADINE

Safety & Environmental incidents can be avoided: drop the excuses.
When we believe in safety & environment, we follow the instructions.
Everyone is responsible for behavior that ensures safety & environmental compliance.

MONTHLY ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Engineering/Geology
Supervisor: Kristin Foster.

DATE: May 13/18

MEETING (DÉTAILS) :

Topic:
Waste Management
HAZMAT

Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Yannick Roy			
Francois Pinsonneault			
Patrick Gagnon			
LÉANDRE VEILLETTE			
JEAN CHRISTOPHE GENEST			
Alexie Racicot-Ruel			
JEROME ROBERT MARTEL			
Gilles Paradis			
Ryan Roberts			
Kristin Foster			

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MONTHLY SAFETY MEETING

Fill out this form, attach the minutes and handouts

Department: MINE ENG **DATE:** 20/5/2018

Supervisor: JAWAD HALOUI

MEETING (DÉTAILS) :

Topic:
Statistics
Engineering incidents of the month
Aerosol (Spray) Can Disposal
Environmental Topic - Waste Management
Health and Safety Topic

Safety Concerns:

- DO WE NEED FULL FACE PROTECTION WHEN PUNCHING CANS
- HSB EXIT IDENTIFICATION

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Patrick Gagnon			
RAFIL EL-HACHEM			
FULVIA FULVIA			
Ryan Roberts			
Gilles Paradis			
Nicolas St-Onge			
Nicolas Puyvelde			
JAWAD HALOUI			

Wildlife Memorandum

To all AEM employees and Contractors on the Meliadine Project and associated Facilities:

We are at time of year when our local wildlife will start being seen on a more frequent basis, such as it is every winter. Arctic Fox sightings have been on the rise over the last couple weeks.



We ask that no one tries to feed, take close-up pictures, get close to these wild creatures, or coax them to come closer. Animals that become habituated to humans generally end up being dispatched.

Arctic fox are generally timid, yet curious little animals. Naturally, these critters will not attack humans, and will be more afraid of humans than we are of them.



However, if protecting a food source, if surprised, or if cornered in a location they cannot get out of, these creatures, like any other wild animal, will defend itself. We again ask everyone on site to be sure to keep all sea cans, and doorways closed to avoid allowing access for these creatures. Please be sure to properly dispose of all food wastes in the appropriate containers to be sure there are no food attractants for these creatures.

If you are bit by an Arctic Fox, please contact the H&S Department. Offsite treatment to protect you against rabies will be required. Fox look cute and cuddly, but can carry disease and bacteria that can seriously harm humans.

When leaving a doorway and travelling outside, be sure to have a look around and proceed with caution to avoid walking up to an animal and startling it. Here are some simple rules to follow in the case of an encounter:

- Respect them – they are wild
- Be alert at all times
- If you encounter one, back away slowly
- Make noise – don't surprise animals
- Close Sea can doors
- Be cautious in noisy areas
- Do not approach them
- ABOVE ALL; NEVER FEED THEM!!!

IMPORTANT: Any person caught feeding or coaxing animals or disposing of food related waste in an improper manner, including not disposing of food waste in the proper containers or disposing at the landfill, will be met with disciplinary measures.

Please find the Meliadine Wildlife Pamphlet below as well.

If wildlife is seen, please call the Environment Department on camp channel or at extension 3903 or 3925.

Supervisors, please review with you crews.

Thank you for your cooperation,

Meliadine Environment Department

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MELIADINE

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Everyone is responsible for behavior that ensures safety & environmental compliance.

ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: SARLIAQ DION
Supervisor: Yves Gagnon / Sylvain Beauregard

DATE: 19/10/18

MEETING (DÉTAILS) :
Topic: **Wildlife and attractants**
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Yves Gagnon	Yves Gagnon		
Anthony Camirand	Anthony Camirand		
Alexandre Perron	Alexandre Perron		
Sylvain Beauregard			

ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Hanco-construction

Supervisor: A. Pelletier

DATE: 2018/10/19

MEETING (DÉTAILS) :
Topic: Wildlife and attractants
Environmental Discussions/Concerns: Waste segregation, working in wildlife

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Alain Morin	Alain Morin		
Kevin Levesque	Kevin Levesque		
Alexandre Lachance	Alexandre Lachance		
Blaise Aggarwal	Blaise Aggarwal		
Frederic Roy	Frederic Roy		
Samuel Paquette	Samuel Paquette		
Jasmin Vezina	Jasmin Vezina		

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Orbit Garant SURF & UG **DATE:** oct. 19th 2018
Supervisor: Todd Lenard H&S Ève D'Amours

MEETING (DÉTAILS) :
Topic: **Wildlife and attractants**
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Simon Aubé	[signature]	Drew Halan	[signature]
Steven Rodgers	[signature]	[signature]	[signature]
Patrick Tousignant	[signature]	[signature]	[signature]
Alex Mainville	[signature]	[signature]	[signature]
Samuel Poisson	[signature]	Kalvin Gauthier	[signature]
Pascal Dugas	[signature]	Franky Lévesque	[signature]
Samuel Cisen	[signature]	David Perreault	[signature]
Dave Guerin	[signature]	Sylvain Harrison	Sylvain Harrison
Steve Léveillé	[signature]	Maxime Demas Gabeil	[signature]
Stéphane Robert	[signature]	Serge Tawamba	[signature]
MARIO ROSS	[signature]	Simon Lewis	[signature]
André Boulier	[signature]	Dave Pineault	[signature]
ÈVE D'AMOURS	[signature]	David Pineault	[signature]
Matthew Carroll	[signature]	JOEL FORGET	[signature]
Steve Lacorte	[signature]		
Olivier Bergeron	[signature]		
Ryan Alexander	[signature]		
Roger Arseneault	[signature]		
MARIO LAROSO	[signature]		

AGNICO EAGLE
MELIADINE

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ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Orbit Garant SURF & UG **DATE:** oct. 19th 2018
Supervisor: Todd Lenard H&S Ève D'Amours

MEETING (DÉTAILS) :
Topic: **Wildlife and attractants**
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Simon Aubé	[signature]	Drew Halan	[signature]
Steven Rodgers	[signature]	[signature]	[signature]
Patrick Tousignant	[signature]	[signature]	[signature]
Alex Mainville	[signature]	[signature]	[signature]
Samuel Poisson	[signature]	Kalvin Gauthier	[signature]
Pascal Dugas	[signature]	Franky Lévesque	[signature]
Samuel Cisen	[signature]	David Perreault	[signature]
Dave Guerin	[signature]	Sylvain Harrison	Sylvain Harrison
Steve Léveillé	[signature]	Maxime Demas Gabeil	[signature]
Stéphane Robert	[signature]	Serge Tawamba	[signature]
MARIO ROSS	[signature]	Simon Lewis	[signature]
André Boulier	[signature]	Dave Pineault	[signature]
ÈVE D'AMOURS	[signature]	David Pineault	[signature]
Matthew Carroll	[signature]	JOEL FORGET	[signature]
Steve Lacorte	[signature]		
Olivier Bergeron	[signature]		
Ryan Alexander	[signature]		
Roger Arseneault	[signature]		
MARIO LAROSO	[signature]		

AGNICO EAGLE
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Everyone is responsible for behavior that ensures safety & environmental compliance.

ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: WAREHOUSE **DATE: 2018-10-21**
Supervisor: Benoit Lacoursiere

MEETING (DÉTAILS) :
Topic: Wildlife and attractants
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
RICHARD ST-CYR	Richard St-Cyr		
KEVEN DUCHESNE	KEVIN DUCHESNE		
STEVEN LAROUCHE	Steve Larouche		
OLIVIER RODRIGUE			
JEAN-PIERRE VAILLANCOURT			
FRANCIS CLOUTIER			
JAMES BOOST	James Boost		
JACOB AUPILARDJUK	Jacob Aupilardjuk		
SERGE DUMONT			
Jaël Tremblay			

AGNICO EAGLE
MELIADINE

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Everyone is responsible for behavior that ensures safety & environmental compliance.

ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: Geology
Supervisor: Morgan / Marc-Alexandre

DATE: 19 Oct 2018

MEETING (DÉTAILS) :
Topic: **Wildlife and attractants**
Environmental Discussions/Concerns:

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Christophe Cousin	[signature]		
Marcel Pleau	[signature]		
Morgan Hjorth	[signature]		
Laura Krupka	[signature]		
Roxanne Takpanie	[signature]		
Jean-Christophe Gonest	[signature]		

AGNICO EAGLE
MELIADINE

Safety & Environmental incidents can be avoided: drop the excuses.
When we believe in safety & environment, we follow the instructions.
Everyone is responsible for behavior that ensures safety & environmental compliance.

ENVIRONMENTAL TOPIC

Fill out this form, attach the minutes and handouts

Department: PROCESS PLANT **DATE:** OCT. 20 - 2018
Supervisor: Denis Leblanc PROCESS PLANT OPS CREW A & B

MEETING (DÉTAILS) :
Topic: **Wildlife and attractants** WILDLIFE MEMORANDUM.
Environmental Discussions/Concerns: NO Concerns

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Luc Gagnon	[signature]		
Marly Girard	[signature]		
Dayan Côté Lafontaine	[signature]		
ROGER LEVASSEUR	[signature]		
Pascal Hamelin	[signature]		
Stéphane Champoux	[signature]		
Luc Tremblay	[signature]		
SYLVAIN ROMPRÉ	[signature]		
Bryan McCormick	[signature]		
ANDREW ROSE	[signature]		
Michaël CHACOT	Michael Chacot		
Alexandre Dubois	Alexandre Dubois		
Julien Bleau	Julien Bleau		
Simon L Tremblay	[signature]		
Denis Leblanc	[signature]		

Appendix F-2

Mock scenario report

AGNICO EAGLE

On August 4, 2018 the AEM Environment Department conducted a mock spill event at the Itivia refueling station/tank farm with AEM emergency response (ERT) members, Orbit Garant Environmental/health and safety AEM warehouse staff, AEM Site Service/HTO vice president and AEM community relations personnel., Spill Training contractor, Nunatta Environmental was on site to assist and provide advice/training, The Rankin Inlet Fire Chief also attended the event as an observer.

An AEM ENV Tech documented the spill response actions and acted as the "Control Room" responder, Rankin Inlet dispatch and the ENV Tech/ENV Coordinator on site.

The mock scenario involved a broken fuel line fitting at the onshore receiving manifold during refueling (from offshore ship) of the fuel storage tanks at Itivia.

14:12 – Spill occurs (4000 L of leaking fuel towards the shoreline) Dave Loder spotted fuel leaking from the broken fitting/line



14:13 – ERT responder calls the vessel to stop transfer of fuel ASAP and relays the message of a leaking fitting to the Captain.

14:18 - Confirmation from the Captain that the transfer has stopped. During that time, AEM Site Service blocked the access to the area and called "CODE 1" to Rankin Inlet dispatch and requested to have environmental personnel contact ERT responder on the radio.

14:19- ERT responder asks ENV Coordinator to contact the coast guard
14:20 – ERT responder requested heavy equipment from construction/site services to dig a trench (no operators in area)

14:25 – Fire Marshall from Rankin Inlet arrived (did not participate but was ready with staff if assistance needed assistance)

14:25- AEM Warehouse staff from Itivia and started deploying booms along coast from emergency sea-can/ ERT responder supported.

14:38- Additional AEM Environment Dep't staff were travelling on the road to Meliadine site when the "CODE 1" was called (came to Itivia to provide support) and helped deploy absorbent booms and rags as ERT responder instructed.

15:50 – full ERT team arrived for assistance- First ERT responder (Commander) instructed immediate deployment of marine curtain (water was too rough 80 km/hr winds- did not want to put anyone's safety at risk; deployed on shore)





16:00 – More absorbent booms are placed in front of the marine barrier to collect spill and prevent it from going under marine barrier- no operators present for heavy equipment; ERT and environment staff attempted to make a trench – did not succeed due to bed rock



16:04 – Absorbent padding was placed on top of spill where visible product was observed behind marine barrier (wind blowing toward shore)





17:25 – ERT, ENV and Agnico staff declare the spill has been contained and absorbed; called off the ”CODE 1” and spill report prepared with follow up investigation of event.

Summary:

Nunatta - guided and assisted AEM staff (total 14 on site) to implement the correct procedures and equipment handling to successfully participate in the mock spill training event (fuel leak/water); the ERT commander did a great job of delegating responsibilities with everyone; all communication was satisfactory during the event. Heavy equipment (excavator) would be required as the area is underlain be bedrock – shovels and picks were not effective to dig a collection trench. It took 23 minutes for the spill to go from the pipe connection to the marine barrier- it would in a realistic scenario take ERT a minimum of 1 hour (It took 1.5hr) to get from Meliadine to Rankin Inlet (includes time to prepare) and Environment Dep’t staff members could mobilize within 50 minutes. In order to provide additional line of defense to capture fugitive oil/fuel spills the overburden on the inter-tidal zone should be removed so that loose absorbent can be spread. Nunatta advised that we contact Department of Fisheries and Oceans and ask if we can remove some rock along the beach in case of an emergency (this is fish habitat). A collection trench or sump would reduce the speed of any spill.

AEM and Nunatta Comments/Recommendations

- Buoys that can be attached to the maritime barrier or the fuel line were not blown up- these should be blown up prior to refueling season
- Sea-cans that contain Emergency environmental spill response should be placed together (one is placed on top of hill- these sea-cans should be placed as close to the shore manifold as possible)
- Shore line where fuel line connects should be cleaned of all obstructions to prevent injury to staff and damaging the containment booms
- Life jackets or mustang suits must be worn while working near the water and/or on boats
- It’s required that AEM warehouse staff working at Itivia area review the OPEP and Emergency Response Plan with ENV Tech prior to barge/fuel transfer season (both rotations)
- AEM observed that the OPEP and Spill Contingency plan was located in the Itivia warehouse office
- Follow up with DFO; if strip of overburden can be removed from inter-tidal zone to facilitate spill response and pro spill prevention measures
- Order more shackles
- OPEP should include the local municipality emergency numbers (I included this document in the PDF)
- AEM and ERT members will conduct annual training with Environment Dep’t staff.
- Lighter anchors (20 pound range) for the boat (ordered); currently have 60 pound anchors

Annual Mock Spill Attendee List

AGNICO EAGLE
MEL IADINE

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4 m^3 - water truck

ANNUAL MOCK SPILL EVENT

Fill out this form, attach the minutes and handouts

Department: ENV
Supervisor: _____

DATE: 2018-08-04

MEETING (DÉTAILS) :
Topic: Mock Spill event - Itivia refueling area
Safety Concerns: High winds

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Randy Schwandt			
Jean-Francois Demers			
Hugues Dubé			
David Loder			
Claudia Remillay			
Robert Eno			
Candace Ramcharan			
Richard Jackson			
ISRaiel Aliyah			
Matt Caitlin			
Sean Arida			
MARK WYATT			
[illegible]			

Emergency Contact Numbers

Last update: Jan 15, 2017 Version D

Radio: Channel 1; call "CODE 1, CODE 1, CODE 1"

AGNICO EAGLE
MELIADINE

Agnico-Eagle Mines (AEM) Meliadine Project
25 km north-north-west of Rankin Inlet

63.027400 (N), - 92.171700 (W) (Helipad)

Meliadine Site Telephone Number: **819-759-3555**
Rankin Office: (Ext:3199) 867-645-2920

Onsite Health Care Professional: 3911

Medical Emergency		
Rankin Inlet Health Center Head Nurse: Gracy Dcunha	Monday - Friday 8h30 to 17h00 AFTER HOURS EMERGENCY	**(867) 645-8300** **(867) 645-6700**
Rankin Inlet Ambulance Service (Fire Dept.)	**Emergency**	**(867) 645-2525**
Rankin Inlet Search and Rescue		(867) 645-3300
Poison Control Centre (Qikiqtani General Hospital, Iqaluit)	Emergencies General inquiries	(867) 979-7350 (867) 979-7300
Law Enforcement, Rescue, Wildlife		
RCMP in Rankin Inlet (Death on camp or for Search & Rescue) (0123 = General Information, 1111 for emergency, 24H)		(867) 645-1111 (867) 645-0123
Workers' Safety and Compensation Commission (WSCC) Mine Inspector: Lex Lovatt		(800) 661-0792 **Hot Line** (867) 920-3849
Coroner		(867) 975-7292 (867) 975-1063 cell
Conservation & Wildlife officer in Rankin Inlet Officer Johanne Coutut Autut		(867) 645-8084 (867) 645-8085
Hazmat & Spills		
CANUTEC		(613) 996-6666
Spills Hotline	Phone	(867) 920-8130
Agnico-Eagle Mines (AEM)		
Program Manager: Martin Plante martin.plante@agnico-eagle.com	Office	(819) 759-3555 ext:8058 (819) 856-1873 Cell
Others		
Health & Safety Superintendent: Dominic Richard dominic.richard@agnicoeagle.com Environment Superintendent: Nancy Harvey nancy.harvey@agnicoeagle.com Human Resources Superintendent : Sandra Marseille sandra.marseille@agnicoeagle.com		(819) 856-4104 Cell (819) 856-4385 Cell (819) 860-3723 Cell
FM Radio Frequencies		
Channel 1 – CAMP (Emergency call Channel)		Rx & Tx: 167.43000
Channel 2 – CONSTRUCTION		Rx & Tx: 163.32000
Channel 3 – EXPLORATION		Rx: 163.57500 Tx: 168.70500
Channel 8 – ROAD Meliadine		Rx: 162.54000 Tx: 165.57000
Channel 9 – ROAD Rankin		Rx: 162.66000 Tx: 167.64000
Channel 10 – UG OPERATION		
Channel 11 – UG Spare		

Appendix F-3

Reportable spills and follow up reports

Northwest Territories | Nunavut | Canada

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **1-31-2018**	REPORT TIME **18:00**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 027**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **1-31-2018**	OCCURRENCE TIME **15:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **2** SECONDS **23**	LONGITUDE DEGREES **92** MINUTES **13** SECONDS **34**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED **Sewage**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **~500 L**	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER **NA**
I	SPILL SOURCE **Lift station**	SPILL CAUSE **Equipment failure**	AREA OF CONTAMINATION IN SQUARE METRES **10 m2**
J	FACTORS AFFECTING SPILL OR RECOVERY **Cold weather**	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On January 31st, a sewage spill occurred at a lift station by the Meliadine main camp STP. At approximately 15:00, a leak from the discharge pipe of a lift station was noticed by personnel and was immediately reported to the Site Services and Environment departments. It was determined that a leak from a rubber joint was the source of the spill. The lift station was shutdown and the joint is being replaced with a mechanical joint. Due to the extreme cold weather, the sewage froze immediately around the lift station. The impacted area is minimal and did not reach any water bodies.

A follow-up report will be submitted within 30 days.

General Supervisor Environment - Jessica Huza: Ext 3928
Sr. Environmental Technician - Justin MacMillan: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY **Jessica Huza**	POSITION **General Supervisor**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Justin MacMillan**	POSITION **Sr. Env Technician**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

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MELIADINE

Follow Up Report – January 31st 2018 Sewage Spill #18-027

Description of Spill:

On January 31st, a sewage spill occurred at a lift station by the Meliadine main camp STP. At approximately 15:00, a leak from the discharge pipe of a lift station was noticed by personnel and was immediately reported to the Site Services and Environment departments. It was determined that a leak from a rubber joint was the source of the spill. The lift station was shut down and the joint replaced with a mechanical joint. Due to the extreme cold weather, the sewage froze immediately around the lift station. Approximately 500L of sewage was spilt. The impacted area is minimal and did not reach any water bodies.

Spill Location:

The spill occurred at the Meliadine main camp sewage treatment plant. The fluid flowed from the lift station, pasted the sewage treatment plant, and ceased flowing approximately 20m from the source. The spill covered an area of approximately $10m^2$.



Figure 1: View from above – Main Camp: Location of lift station piping (source of leak) and spill area.

Spill cause:

A rubber joint on the sewage treatment plant piping failed. The equipment failure was likely due to the material fatiguing in frigid temperatures.

Spill response:

The spill froze to the immediate area and was excavated and disposed of appropriately. The joint has been replaced with a mechanical joint made of more suitable material. A third party review of the system was completed and recommendations have been provided to Agnico Eagle for implementation in order to improve the performance of the STP.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
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REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **2-2-2018**	REPORT TIME **14:30**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 029**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **2-2-2018**	OCCURRENCE TIME **13:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **1** SECONDS **43**	LONGITUDE DEGREES **92** MINUTES **10** SECONDS **9**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED **Sewage**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **~120000 L**	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER **NA**
I	SPILL SOURCE **Retention Tank**	SPILL CAUSE **Human Error**	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY **Cold weather, accessibility**	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On February 2nd, during an inspection of the exploration camp retention tanks it was noticed by a member of the Site Services team that water was flowing on to Meliadine Lake near the discharge area of the sewage treatment plant. The environment department and site services supervisor were notified immediately and an inspection was conducted to determine the source of the water. it was discovered that a valve at the base of one of the retention tanks had been left open, resulting in the draining of the contents of all 4 tanks (connected in series). Discharge from the sewage treatment plant had been suspended since November 2017 due to exceedances. The quality of the substance is to be verified and is likely not deleterious.

Sr. Environmental Coordinator - Dan Gorton: Ext 3996
Sr. Environmental Technician - Justin MacMillan: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY **Dan Gorton**	POSITION **Sr. Env Coordinator**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Justin MacMillan**	POSITION **Sr. Env Technician**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report – February 2nd 2018 MEL-07 Treated Water Discharge

Description of Exceedance:

On February 2nd, during an inspection of the exploration camp retention tanks it was noticed by a member of the Site Services team that water was flowing on to Meliadine Lake near the discharge area of the sewage treatment plant. The environment department and site services supervisor were notified immediately and an inspection was conducted to determine the source of the water. It was discovered that a valve at the base of one of the retention tanks had been left open, resulting in the draining of the contents of all four tanks, which are connected in series. Discharge from the sewage treatment plant had been suspended since November 2017 due to exceedances.

Samples were collected from a melt channel in the ice, and sent for laboratory analysis. A spill report was issued on February 2nd 2018 through the NT-NU Spill Report. As a response to the spill report issued, Christine Wilson (INAC) visited the Meliadine Exploration Camp on February 2nd 2018, and was unable to collect a representative sample, as there was no pooling on the surface of the ice.

Jeff Tulugak (KIA) also inspected the spill area on February 2nd, 2018. A telephone inquiry was received by Craig Broom (Environment Canada) and Dan Gorton provided an account of the spill information available to date on February 5th, 2018.



Picture 1: Channel formed by release water flowing through ice into Meliadine Lake.



Picture 2: Release valve left open causing the spill.



Picture 3: Discharge hose connected to retention tank release valve.

Samples were collected from the STP release valve on February 2nd, shortly after the release occurred. The samples did not arrive at the laboratory within the recommended 24 hours timeframe for fecal coliform analysis. The delay was due to the delivery not being picked up at the airport by the receiving party. Total coliforms were expressed in MPN as opposed to CFU, which are the recommended units in the water license. Although these are not the preferred units, they can be converted.

Table 1: Laboratory analysis of retention tank treated water samples collected at spill site.

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2052826-1 RETENTION TANK							
Sampled By: CLIENT on 02-FEB-18 @ 01:45							
Matrix: WATER							
Miscellaneous Parameters							
Fecal Coliforms	214		1	MPN/100mL		05-FEB-18	R3955854
Heterotrophic Plate Count	>3000		10	CFU/mL		05-FEB-18	R3956754
Total Coliform and E.coli by MPN QT97							
Total Coliforms	>2420		1	MPN/100mL		05-FEB-18	R3955855
Escherichia Coli	285		1	MPN/100mL		05-FEB-18	R3955855

Table 2: Laboratory analysis of retention tank treated water in months leading up to the event.

Station: STP-FINAL (MEL-7)	December				January						February					
DATE	12/4/2017	12/12/2017	12/14/2017	12/18/2017	1/2/2018	1/4/2018	1/8/2018	1/15/2018	1/22/2018	1/29/2018	2/5/2018	2/12/2018	2/19/2018			
Ammonia as N (mg/L)					4.5	3.3	7.3	25	26	14	16	0.05				
Biochemical Oxygen Demand					12	11	6	5	9	4	9	13				
Kjeldahl nitrogen					6	3.7	7.4	25	29	15	17	<2				
pH					6.94	7.15	7.49	6.87	7.72	7.18	6.75	6.82				
Phosphorus (P)-Total					8.5	7.8	6.9	10	11	9.5	10	9.8				
Total Suspended Solids					8	5	7	9	14	5	6	8				
Transmitance %					37	37	39	31	20	36	37	34				
Nitrite-N					0.359	0.332	0.522	0.307	0.173	0.588	0.372	0.312				
Nitrate-N					22.5	20.8	23.5	33.8	36.1	39.5	47.2	41.4				
Nitrate and Nitrite as N					22.9	21.2	24	34.1	36.3	40.1	47.6	41.8				
Oil & Grease-(IR)					1.9	0.6	<0.50	0.6	<0.50	**1.8**	0.6	<0.50				
Total Nitrogen (N)					-	-	-	-	-	-	-	-				
Total Chemical Oxygen Demand (COD)					82	83	83	98	110	68	73	34				
Total Dissolved Solids					430	-	565	495	**710**	465	475	505				
Alkalinity					36	54	74	41	**320**	47	27	37				
Atypical	950	30	170	180	66000		<10	1020	530	10	330	5800	490			
Fecal Coliforms (CFU/100mL)	20	<2	<2	<10	<10		<10	<10	<2	<2	<10	<10	<2			
Heterotrophic Plate Count (AAHB) (CFU/100mL)	4,300	450	500.00	209	21,000		360	1,000	820	430	260	1,330	560			
Total Coliforms (CFU/100mL)	30	90	70	90	<1000		<10	200	10	10	<10	<100	<10			

The sample collected from the retention tank discharge had **214 MPN/100mL fecals** and **285 MPN/100mL E.coli.**

Spill Discharge Location:

The MEL-07 effluent discharges to land at a location situated approximately 65 m from the ordinary high water mark of Meliadine Lake (see Figure 1). Once the effluent reaches the end of the pipe, it travels along a rock channel intended to reduce the flow and prevent erosion. The effluent will then follow the rock channel to Meliadine Lake. It is expected that with the extreme cold temperatures on February 2nd, and the fact that the effluent discharges to land first, the bacteria would likely not have survived.



Figure 1: View from above - MEL-07 discharge configuration with rock channel and flow path to Meliadine Lake

Spill cause:

Investigation into the release was inconclusive. However, it is believed that a water truck operator failed to close the release valve after transferring water to a truck.

Spill response:

The release was deemed to be caused by human error. The release valve is now fitted with a locking mechanism. A supervisor now keeps a register to record which operator is in possession of the key.

Dan Gorton, Environmental Coordinator, AEM

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REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 02-19-2018	REPORT TIME 17:00	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 047
B	OCCURRENCE DATE: MONTH – DAY – YEAR 02-18-2018	OCCURRENCE TIME 16:45		
C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES 63 MINUTES 1 SECONDS 24	LONGITUDE DEGREES 92 MINUTES 11 SECONDS 7		
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0		
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED Diesel Fuel	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 2578 L	U.N. NUMBER 1202	
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA	
I	SPILL SOURCE GenSet (Generator) Fuel Tank	SPILL CAUSE Human Error	AREA OF CONTAMINATION IN SQUARE METRES TBD	
J	FACTORS AFFECTING SPILL OR RECOVERY NA	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

At around 16:45 pm on February 18th Richard Montreuil was passing by the fuel tank farm and notice that a flexible hose was spreading fuel on the ground. He inform Francis Lecours which stop immediately the fuel transfer to the raise ventilation tank (linked to the same pipe line). Richard called Environment on the radio to have support for the spill remediation.

Actions Taken: Stopped fuel transfer, called Environment Department, contained the fuel spill with spill kit available in the spill trailer, proceeded with pumping and collecting spilled fuel and absorbent materials

Actions to be Taken: As the cause of the spill is an human error by not respecting all steps included in a JHA, we did create a procedural check list to ensure that all steps are done and executed correct

L	REPORTED TO SPILL LINE BY Jennifer Brown	POSITION Environmental Coordit	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8198604515
M	ANY ALTERNATE CONTACT Jessica Huza	POSITION General Supervisor	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 819856-5097

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report:
February 18, 2018 Fuel Tank Farm Spill

Description of Exceedance:

On February 18, 2018 a fuel spill was reported at the fuel tank farm. The spill occurred after the commissioning of the system, while transferring fuel to the Portal 1 fuel storage tank. A valve was left opened and not locked out at a connection that transferred fuel to the gas boy. Visual observations during the fuel transfer to the Portal 1 fuel storage tank showed that fuel was spilling out of the gas boy fuel line. Upon immediate observation of the spill, the system was shut down and no additional spill volumes occurred. During the fuel transfer, 1,022 liters of fuel were transferred to the Portal 1 fuel storage tank and approximately 6,500 liters were released to the environment in the area around the gas boy. This volume was calculated from instrumentation readings. No contaminants reached any water body.

Spill response:

E&I personnel were at the spill location during the occurrence. The Environment department was contacted immediately and straw logs and spill absorbent pads were mobilized to contain the fuel spill and to prevent the transport of contaminant away from the spill area. Due to the position of the fuel tanks located within the spill area near the gas boy, fuel spilled under the tanks was not easily accessed to be absorbed and disposed of as hazmat. There was extremely cold temperatures at this time (approximately -70 ^{o}C) and the ground where the spill occurred was frozen and the fuel also froze.

Spill Cleanup:

Once control of the spill site was obtained, spill cleanup activities were initiated. Approximately 4,500 l of free product was collected by pump to storage drums and totes. The collected free product is planned to be recycled as fuel for operating the incinerator at Site. Approximately 140 m^3 of snow and frozen fuel was removed and placed in the License A Landfarm. Since the area under the fuel tanks was not easily accessed for excavation, the tanks are currently being emptied so that they can be disconnected and removed so that equipment can access the area to complete the spill clean-up by excavating the area to remove any remaining fuel from the spill.

Spill Cause and Corrective Measures

The operator failed to close and lock-out a valve prior to initiating the fuel transfer. The spill was caused by human error, by not respecting all steps included in a JHA. A procedural check list was drafted to ensure that all steps are completed and executed correctly during future fuel transfers.

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A	REPORT DATE: MONTH – DAY – YEAR 06-15-2018	REPORT TIME 16:20	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 231
B	OCCURRENCE DATE: MONTH – DAY – YEAR 05-27-2018	OCCURRENCE TIME 16:00		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 62 MINUTES 47 SECONDS 58	LONGITUDE DEGREES 92 MINUTES 5 SECONDS 42
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED Suspended Solids (TSS)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 500 - 1200 mg/L	U.N. NUMBER NA
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
I	SPILL SOURCE Snow melt containing sediment	SPILL CAUSE Freshet	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY Access and ability to divert	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

While conducting a routine inspection of the Itivia construction site on May 27th, turbid surface run-off water was observed crossing over a roadway and through a culvert into Melvin Bay. As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on June 15th and showed that TSS concentrations exceeded those outlined in the Type A water license for discharge/release into a water body.

License Limit = 100 mg/L (maximum concentration of any grab sample)
Analysis results = 500 and 1200 mg/L

L	REPORTED TO SPILL LINE BY Dan Gorton	POSITION Environmental Coordit	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 819.759.3555
M	ANY ALTERNATE CONTACT Justin MacMillan	POSITION Sr. Environment Tech	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 819.759.3555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report: #18-231
May 27, 2018 Itivia Surface Water Run-off

Description of Exceedance:

While conducting a routine inspection of the Itivia construction site on May 27th, turbid surface water run-off was observed crossing over a roadway and through a culvert into Melvin Bay.

Spill response:

As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on June 15th and showed that TSS concentrations exceeded those outlined in the Type A water license for discharge/release into a water body.

Spill Cleanup:

Clean up was not applicable as surface water run-off diluted into seawater.

Spill Cause and Corrective Measures

Run-off was caused by snow melting inside and outside the site disturbance area. A sediment trap was created using gravel and straw logs prior to the run-off event being sampled. The sediment traps were not effective enough to reduce TSS below acceptable levels. Improving the snow management plan and following the procedure will help reduce run-off volumes in the future.



Picture 1: Sampling location between access road and Melvin Bay.



Picture 2: Sample location immediately after sediment controls at culvert.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
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REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 06-21-2018	REPORT TIME 17:20	[X] ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 247
B	OCCURRENCE DATE: MONTH – DAY – YEAR 06-03-2018	OCCURRENCE TIME 12:00		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT [X] NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 62 MINUTES 47 SECONDS 58	LONGITUDE DEGREES 92 MINUTES 5 SECONDS 48
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED Suspended Solids (TSS)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 420 mg/L	U.N. NUMBER NA
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
I	SPILL SOURCE Snow melt containing sediment	SPILL CAUSE Freshet	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY Access and ability to divert	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

While conducting a routine inspection of the Itivia construction site on June 3rd, turbid surface run-off water was observed flowing into Melvin Bay from the eastern entrance to the bypass road. As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on June 21st and showed that TSS concentrations exceeded those outlined in the Type A water license for discharge/release into a water body.

License Limit = 100 mg/L (maximum concentration of any grab sample)
Analysis results = 420 mg/L

L	REPORTED TO SPILL LINE BY Dan Gorton	POSITION Environmental Coordit	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 819.759.3555
M	ANY ALTERNATE CONTACT Justin MacMillan	POSITION Sr. Environment Tech	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 819.759.3555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-247
June 3rd, 2018 Itivia Surface Water Run-off

Description of Exceedance:

While conducting a routine inspection of the Itivia construction site on June 3rd, turbid surface run-off water was observed flowing into Melvin Bay from the eastern entrance to the bypass road. This is an area of foreshore with a gentle gradient. The sampling location is referred to as SR11.



Figure 1: Sample location at Melvin Bay foreshore

Spill response:

As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on June 21st and showed that TSS concentrations exceeded those outlined in the Type A water license for discharge/release into a water body. The license limit for any grab sample is 100mg/L while the sample analysis reading was 420mg/L.

Spill Cleanup:

Clean up was not appropriate as surface water run-off diluted into seawater.

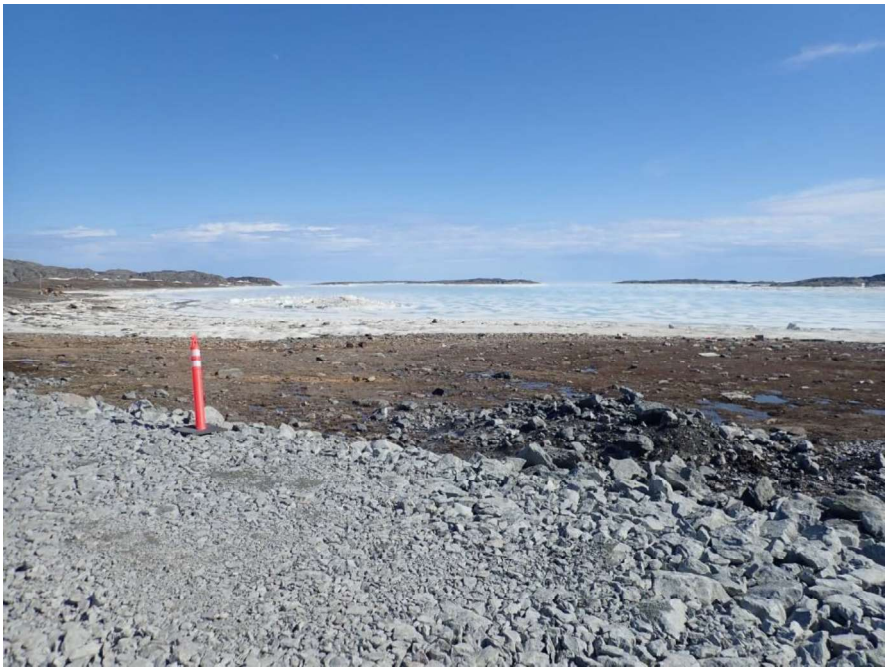
Spill Cause and Corrective Measures

Run-off was caused by snow melting inside and outside the site disturbance area. A sediment trap was created using straw logs prior to the run-off event being sampled. The sediment traps were not effective enough to reduce TSS below acceptable levels. Improving the snow management plan and following the procedure will help reduce run-off volumes in the future.

*Add a map showing the area and where SR-11 was taken. I think Justin has already produced this map.



Picture 1: Straw log sediment trap between Bypass Road entrance at Itivia and Melvin Bay.



Picture 2: Run-off area from Bypass Road entrance at Itivia to Melvin Bay.



Picture 3: Run-off area from Bypass Road entrance at Itivia to Melvin Bay.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
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FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR June 08-2018	REPORT TIME 19:04	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 213
B	OCCURRENCE DATE: MONTH – DAY – YEAR Unknown	OCCURRENCE TIME Unknown		
C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVCL102J168	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION MELIADINE GOLD PROJECT	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES 63 MINUTES 1 SECONDS 24	LONGITUDE DEGREES 92 MINUTES 11 SECONDS 7		
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0		
G	ANY CONTRACTOR INVOLVED Orbit Garant	CONTRACTOR ADDRESS OR OFFICE LOCATION 3200, boul. Jean-Jacques Cossette, Val d'Or, QC J9P 6Y6		
H	PRODUCT SPILLED Hydraulic Oil	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES Unknown	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE) NA	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES NA	U.N. NUMBER	
I	SPILL SOURCE Hydraulic Oil Hose Drip	SPILL CAUSE Equipment Malfunction	AREA OF CONTAMINATION IN SQUARE METRES NA	
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

Drilling activities have been underway near Lake B8 and a small drip from a hydraulic hose in the drilling shack was observed when the drill was being demobilized from the location. The hose was dripping for an unknown duration, however, maintenance and a hose change was conducted approximately 3-weeks prior to the spill report. Lake B8 is a non-fish bearing lake. Despite B8 being non-fish bearing lake, it remains a non-contact water body as part of Meliadine's Water Management Plan until the dike D-CP4 is constructed and B8 becomes containment pond CP4. At present moment, the impact to B8 is expected to be minimal; however, ongoing spill clean up and observations are planned as snow and ice thaws at this location (GPS UTM 83 Z015: 539096.07, 6988864.61, 1006.40). The drill will be inspected and repaired prior to starting at the next location and better secondary containment to be sought to reduce risks from hose drips. Spill report by Jennifer Brown 819-759-3555 ext. 3996

L	REPORTED TO SPILL LINE BY Jennifer Brown	POSITION Sr. Env Coordinator	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine	TELEPHONE 819-759-3555
M	ANY ALTERNATE CONTACT Jessica Huza	POSITION Gen Supervisor	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Mirabel	ALTERNATE TELEPHONE 819-759-3555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report – #18-213
June 8th 2018 Drill 3 Hydraulic Oil Spill at B8

Description of Exceedance:

Drilling activities have been underway near Lake B8 and a small drip from a hydraulic hose in the drilling shack was observed when the drill was being demobilized from the location. The hose was dripping for an unknown duration, however, maintenance and a hose change was conducted approximately 3-weeks prior to the spill report. Lake B8 is a non-fish bearing lake. Despite B8 being non-fish bearing lake, it remains a non-contact water body as part of Meliadine's Water Management Plan until the dike D-CP4 is constructed and B8 becomes containment pond CP4. At present moment, the impact to B8 is expected to be minimal; however, ongoing spill clean-up and observations are planned as snow and ice thaws at this location (GPS UTM 83 Z015: 539096.07, 6988864.61, 1006.40).

Spill response:

Booms were placed around the spill area to prevent hydrocarbon flow to B8. Some contaminated soil was removed and placed in the landfarm.



Figure 1: Booms placed downstream of spill location.

Spill Cleanup:

A shop-vac was used to remove hydraulic oil observed on surface and peat moss was placed to help remediate the area. The area was inspected on 22nd June, 2018. No flowing water was observed. Booms were removed and disposed of appropriately as Hazmat.

Spill Cause and Corrective Measures

The drill will be inspected and repaired prior to starting at the next location and better secondary containment to be sought to reduce risks from hose drips.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 06-27-2018	REPORT TIME 16:40	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 251
B	OCCURRENCE DATE: MONTH – DAY – YEAR 06-10-2018	OCCURRENCE TIME 09:20		
C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES 62 MINUTES 47 SECONDS 58	LONGITUDE DEGREES 92 MINUTES 5 SECONDS 42		
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0		
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED Suspended Solids (TSS)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 160 mg/L (~10-20m3)	U.N. NUMBER NA	
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA	
I	SPILL SOURCE Snow melt containing sediment	SPILL CAUSE Freshet	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY Access and ability to divert	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	

K ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

While conducting a routine inspection of the Itivia construction site on June 10th 2018, surface run-off water was observed flowing through a culvert into Melvin Bay. Samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on June 25th and 160 mg/L TSS was measured. This exceeds the license limit of 100 mg/L TSS as outlined in the Type A water license for discharge/release into a water body. Discharge and flow rate were minimal, and caused by light rain and snow melt.
A follow-up report with additional details will be provided.

The exceedance is being reported under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act
License Limit = 100 mg/L (maximum concentration of any grab sample)

L	REPORTED TO SPILL LINE BY Dan Gorton	POSITION Environmental Coordit	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 819.759.3555
M	ANY ALTERNATE CONTACT Laura Hanson	POSITION Environmental Tech	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 819.759.3555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-251
June 10, 2018 Itivia Surface Water Run-off

Description of Exceedance:

While conducting a routine inspection of the Itivia construction site on June 10, 2018, surface run-off water was observed flowing through a culvert into Melvin Bay. Samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on June 25, 2018 and a concentration of 160 mg/L TSS was measured. This exceeded the water quality criteria of 100 mg/L TSS, as outlined in part D, item 18 of the NWB Water Licence 2AM-MEL1631 for TSS discharge/release into a water body. Discharge and flow rate were minimal, and caused by light rain and snow melt.

The sampling location is referred to as SR1 and is shown in Figure 1.



Figure 1: Sample location SR-1 shown at Itivia Laydown

Spill Cleanup:

Straw logs were placed downstream of the culvert to reduce TSS.

Spill Cause and Corrective Measures

Run-off was caused by snow melting inside and outside the site disturbance area. Due to changes in the topography of the quarry, surface water is directed back towards the approved disturbance area, away from the quarry boundary. The decantation sump down-stream of the culvert had been repaired to minimize additional TSS flow during possible future rain periods. Silt fences and straw logs have been installed upstream of the site and are inspected weekly. A third party consultant has inspected the area to recommend improvements to mitigate and reduce erosion and sediment control. A final report on the consultant findings will be issued on August 24th.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 06-13-2018	REPORT TIME 11:00	[X] ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 223
B	OCCURRENCE DATE: MONTH – DAY – YEAR 6-12-2018	OCCURRENCE TIME 11:00		
C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT [X] NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES 63 MINUTES 1 SECONDS 43	LONGITUDE DEGREES 92 MINUTES 10 SECONDS 9		
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0		
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED Sewage	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES ~3000L	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA	
I	SPILL SOURCE Retention Tank Lift Station	SPILL CAUSE Ground thaw	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY N/A	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	

K ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

As the ground started to thaw, the building sank into the ground which induced strain on the connection for the discharge line. This resulted in the line disconnecting and when the lift station level reached its preset level started the pumps and the effluent discharged inside the building and eventually leaked onto the ground. Sewage was removed with a hydro suction truck and stored for sewage treatment discharge.

Sr. Environmental Coordinator - Jennifer Brown: Ext 3996
Sr. Environmental Technician - Justin MacMillan: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY Jennifer Brown	POSITION Sr. Env Coordinator	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8197593555
M	ANY ALTERNATE CONTACT Justin MacMillan	POSITION Sr. Env Technician	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 8197593555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report –
June 12th 2018 Sewage Spill #18-223

Description of Spill:

As the ground started to thaw, the building sank into the ground which induced strain on the connection for the discharge line. This resulted in the line disconnecting and when the lift station level reached its preset level the pumps started and the effluent discharged inside the building and eventually leaked onto the ground. The impacted area is minimal and did not reach any water bodies.

Spill Location:

The spill occurred at the Meliadine main camp sewage treatment plant. The fluid flowed from the lift station, pasted the sewage treatment plant, and ceased flowing approximately 20m from the source. The spill covered an area of approximately $10m^2$.



Figure 1: View from above – Main Camp: Location of lift station piping (source of leak) and spill area.

Spill cause:

The building housing the STP sunk into the ground due to thawing ground conditions causing the discharge line to disconnect from the lift station.

Spill response:

Sewage was removed with a hydro suction truck and stored for sewage treatment discharge.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 07-08-2018	REPORT TIME 10:55	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 259
B	OCCURRENCE DATE: MONTH – DAY – YEAR 06-17-2018	OCCURRENCE TIME 10:55		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 62 MINUTES 47 SECONDS 58	LONGITUDE DEGREES 92 MINUTES 5 SECONDS 48
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED Suspended Solids (TSS)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 670 mg/L	U.N. NUMBER NA
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
I	SPILL SOURCE Snow melt containing sediment	SPILL CAUSE Freshet	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY high flow rate	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

While conducting a routine inspection on June 20th, surface run-off water was observed at sampling station MEL-SR9 at the Itivia Fuel Pad. Samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on July 3rd and TSS concentrations exceeded criteria of 670 mg/L, as per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18.

A follow-up report will be provided.

Please contact Jennifer Brown/ Dan Gorton @ 819-759-3555 EXT: 4603996 (or)

Meliadine Environmental Tech - Ext: 4603903 or 4603925

L	REPORTED TO SPILL LINE BY Jennifer Brown	POSITION Env. Coordinator	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 819.759.3555
M	ANY ALTERNATE CONTACT Randy Schwandt	POSITION Environmental Tech	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 819.759.3555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-259
June 17, 2018 Itivia Surface Water Run-off

Description of Exceedance:

While conducting a routine inspection on June 17th, surface run-off water was observed at sampling station MEL-SR9 east of the Itivia Laydown and Storage Facility Pad. Samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on June 20, 2018 and TSS concentrations were 670 mg/L and exceeded criteria of 100 mg/L, as per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18.

The sampling location is referred to as MEL-SR9 and is shown in Figure 1.



Figure 1: Sample location MEL-SR9 shown east of the Itivia Laydown

Spill Cleanup:

Straw logs were installed downstream of the source to minimize TSS reaching Melvin Bay.

Spill Cause and Corrective Measures

Run-off was caused by snow melting inside and outside the site disturbance area. Silt fences and straw logs have been installed upstream and downstream of the site and are inspected weekly. A third party consultant has inspected the area to recommend improvements to mitigate and reduce erosion and sediment control.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 07-08-2018	REPORT TIME 16:45	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 313
B	OCCURRENCE DATE: MONTH – DAY – YEAR 06-20-2018	OCCURRENCE TIME 11:25		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVCL102j168	WATER LICENCE NUMBER (IF APPLICABLE) 2BB-MEL1424
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 63 MINUTES 1 SECONDS 24	LONGITUDE DEGREES 92 MINUTES 11 SECONDS 7
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED TSS	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 260 mg/L	U.N. NUMBER NA
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE Old Landfill	SPILL CAUSE Freshet run-off	AREA OF CONTAMINATION IN SQUARE METRES NA
J	FACTORS AFFECTING SPILL OR RECOVERY NA	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

While conducting a routine inspection on June 20th, surface run-off water was observed downstream of the old Landfill. Flow did not go into the receiving environment and was observed to be contained within the footprint and water management infrastructures of the mine. Samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on July 6th and TSS concentrations exceeded criteria of 15 mg/L, as per the obligations under the Nunavut Water Board License 2BB-MEL1424, Part D, item 14.
A follow-up report will be provided.

Please contact Jennifer Brown/ Dan Gorton @ 819-759-3555 EXT: 4603996 (or)

Meliadine Environmental Tech - Ext: 4603903 or 4603925

L	REPORTED TO SPILL LINE BY Jennifer Brown	POSITION Sr. Env Coordinator	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8197593555
M	ANY ALTERNATE CONTACT Dan Gorton	POSITION Env Coordinator	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 8197593555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-313
June 20, 2018 Itivia Surface Water Run-off

Description of Exceedance:

While conducting a routine inspection on June 20th, surface run-off water was observed at sampling station MEL-SR8 east of the Itivia Laydown and Storage Facility Pad. Samples were collected for laboratory analysis to assess the TSS concentration and other water quality parameters. The laboratory results were received on July 6, 2018 and TSS concentrations were 260 mg/L and exceeded the criteria of 100 mg/L, as per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part D, item 18.

The sampling location is referred to as MEL-SR8 and is shown in Figure 1.



Figure 1: Sample location MEL-SR8 shown east of the Itivia Laydown

Spill Cleanup:

Straw logs were placed downstream of the source to reduce TSS flow to Melvin Bay.

Spill Cause and Corrective Measures

Run-off was caused by snow melting inside and outside the site disturbance area. Silt fences and straw logs have been installed upstream and downstream of the site and are inspected weekly. A third party consultant has inspected the area to recommend improvements to mitigate and reduce erosion and

sediment control. The consultant's findings will be summarized in a final report and issued to regulators on August 24th

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 07-08-2018	REPORT TIME 16:50	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 287
B	OCCURRENCE DATE: MONTH – DAY – YEAR 07-08-2018	OCCURRENCE TIME 05:30		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 63 MINUTES 2 SECONDS 23	LONGITUDE DEGREES 92 MINUTES 13 SECONDS 34
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED Sewage Sludge	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES ~200 L	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
I	SPILL SOURCE Sewage Treatment Plant (STP)	SPILL CAUSE Equipment failure	AREA OF CONTAMINATION IN SQUARE METRES 10 m2
J	FACTORS AFFECTING SPILL OR RECOVERY Caribou Migration	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On July 8, 2018, a sewage sludge spill occurred at the Main-STP at the Meliadine Site. During the night a pump failed on the membrane train #2. Approximately 200 L outside the STP onto the ground. The membrane #1 continue running normally, but the recirculating sludge was backfilling the membrane #2 tank as there is no check valve on the three way junction for the activated sludge recirculating pipe. This action overfilled the tank and caused overflow. A check valve will be installed. The impacted area is with the footprint of the mine and did not reach any water bodies.

A follow-up report will be provided.

Please contact Jennifer Brown/ Dan Gorton @ 819-759-3555 EXT: 4603996 (or)
Meliadine Environmental Tech - Ext: 4603903 or 4603925

L	REPORTED TO SPILL LINE BY Jennifer Brown	POSITION Sr. Env. Coordinateor	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8197593555
M	ANY ALTERNATE CONTACT Dan Gorton	POSITION Env. Coordinator	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 8197593555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report – 18-287
July 8th 2018 Sewage Spill

Description of Spill:

On July 8, 2018, a sewage sludge spill occurred at the Main-STP at the Meliadine Site. During the night a pump failed on the membrane train #2. Approximately 200 L overflowed outside the STP onto the ground.

Spill Location:

The spill occurred at the Meliadine main camp sewage treatment plant. The sewage flowed from the sewage treatment plant to the ground. The impacted area is within the footprint of the mine and did not reach any water bodies.



Figure 1: View from above – Main Camp: Location of Sewage Treatment Plant.

Spill cause:

The membrane #1 continue running normally, but the recirculating sludge was backfilling the membrane #2 tank as there was no check valve on the three way junction for the activated sludge recirculating pipe. This action overfilled the tank and caused overflow.

Spill response:

Sewage was removed with a hydro suction truck and stored for sewage treatment discharge.

Spill Mitigation:

A check valve was installed.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 07-16-2018	REPORT TIME 18:40	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 279
B	OCCURRENCE DATE: MONTH – DAY – YEAR 07-11-2018	OCCURRENCE TIME 16:15		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 62 MINUTES 81 SECONDS 52	LONGITUDE DEGREES 92 MINUTES 14 SECONDS 42
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED Inukshuk Construction	CONTRACTOR ADDRESS OR OFFICE LOCATION Rankin Inlet, NU X0C 0G0

H	PRODUCT SPILLED Hydraulic Oil	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
I	SPILL SOURCE Equipment - Roller	SPILL CAUSE Hydraulic hose failure	AREA OF CONTAMINATION IN SQUARE METRES 1
J	FACTORS AFFECTING SPILL OR RECOVERY None	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

While conducting an inspection of the Itivia construction site on July 11th, it was noted that hydraulic oil from equipment spilled to road base material on the bypass road. The spill was cleaned up and reported internally as it was outside the 31m high water mark. After discussion with INAC it was explained that the spill should be reported as it was within 31m of a fish bearing waterway, which feeds into the bay. The volume was estimated at 5L. The spill was cleaned up before it had time to disperse into the road base.
This spill is being reported as per part H, item 9 of the 2AM-MEL1631 Water License.
A follow-up report will be issued.
Dan Gorton 819759-3555 x 4603996
Jessica Huza 819759-3555x 4608170

L	REPORTED TO SPILL LINE BY Dan Gorton	POSITION Env. Coordinator	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 819.759.3555
M	ANY ALTERNATE CONTACT Jessica Huza	POSITION Env. Supervisor	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 819.759.3555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report: #18-279
July 11, 2018 Itivia Hydraulic Hose Failure

Description of Incident:

While conducting an inspection of the Itivia construction site on July 11th, it was noted that hydraulic oil from equipment spilled to the road base material on the bypass road. The spill was cleaned up and reported internally as it was observed as outside the 31 m high water mark. After discussion with INAC it was explained that the spill should be reported as it was within 31 m of a fish bearing waterway, which feeds into Melvin Bay. The volume was estimated at 5 L.

Spill Cleanup:

The spill was cleaned up with absorbent pads before it had time to disperse into the road base.

Spill Cause and Corrective Measures

The spill was caused by equipment failure. Maintenance is scheduled regularly for all equipment at Site and spill kits are required to be stored inside all vehicles. The Environment Department conducts quarterly vehicle spill kit inventory audits to ensure availability and quick response to a timely and efficient cleanup to mitigate spill migration.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 7-23-2018	REPORT TIME 08:30	[X] ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 289
B	OCCURRENCE DATE: MONTH – DAY – YEAR 7-20-2018	OCCURRENCE TIME 18:00		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT [X] NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 63 MINUTES 1 SECONDS 43	LONGITUDE DEGREES 92 MINUTES 10 SECONDS 9
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED Treated Sewage Effluent	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES ~3000L	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
I	SPILL SOURCE Water Truck	SPILL CAUSE Open valve on truck	AREA OF CONTAMINATION IN SQUARE METRES 500m2
J	FACTORS AFFECTING SPILL OR RECOVERY Seepage into road surface	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On July 20th, after loading a water truck with treated water from the retention tank at exploration camp's Sewage Treatment Plant, the operator proceeded to drive towards the discharge location at CP1. On his way a colleague contacted him informing that the truck was leaking water.
The truck driver stopped and found that the valve rear was opened, proceeded to closing the valve. Approximately 3000 L of treated effluent was spilled on the road between the exploration camp and CP1 for an estimated distance of 500m. The treated effluent did not extend beyond the road surface and had evaporated or seeped into the road making it difficult to clean it up. The treated effluent did not flow outside of the site's managed water area or into any waterbody. A follow up report with further details will be provided
Environmental Coordinator - Dan Gorton: Ext 3996
Environmental Technician - Alex Gauthier: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY Dan Gorton	POSITION Env Coordinator	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8197593555
M	ANY ALTERNATE CONTACT Alex Gauthier	POSITION Env Technician	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 8197593555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report: #18-289
July 20, 2018 Treated Sewage Effluent

Description of Incident:

On July 20th, after loading a water truck with treated water from the treated retention tank at the Exploration camp's Sewage Treatment Plant, the operator proceeded to drive towards the discharge location at CP1. During transport, the operator was advised by an observer that the truck was leaking water.

Spill Response & Cleanup:

The truck driver stopped and found that the valve rear was opened and closed the valve.

Approximately 3000 L of treated effluent had drained from the water truck to the road, between the exploration camp and CP1, an estimated distance of 500 m. The treated effluent did not extend beyond the road surface and had evaporated or seeped into the road making it difficult to clean it up. The effluent was treated and did not flow outside the Site's managed water area or into any water body.

Spill Cause and Corrective Measures

The spill was caused by human error with the training and procedure not followed. The employee has been suspended from operating mobile equipment and is required to successfully complete additional equipment training prior to being assigned equipment operating tasks.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **10-01-2018**	REPORT TIME **10:41**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 409**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **07-23-2018**	OCCURRENCE TIME **15:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **2** SECONDS **15**	LONGITUDE DEGREES **92** MINUTES **13** SECONDS **06**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION **NA**

H	PRODUCT SPILLED **Treated effluent**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **4.39 mg/L (~15,691 m3/d)**	U.N. NUMBER **NA**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **NA**	U.N. NUMBER **NA**
I	SPILL SOURCE **Mel-14**	SPILL CAUSE **NWB Licence Criteria Exceeded**	AREA OF CONTAMINATION IN SQUARE METRES **NA**
J	FACTORS AFFECTING SPILL OR RECOVERY **NA**	DESCRIBE ANY ASSISTANCE REQUIRED **NA**	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT **NA**

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

A sample of treated water from Mel-14 (final discharge point to Meliadine Lake) was collected on July 23, 2018. Upon receiving the sampling results, the total aluminum concentration was found to be 4.39 mg/L which exceeded the permitted discharge limit of 2 mg/L. When the exceedance was observed, the lab was requested to re-analyze the sample to determine if the result was an outlier; however, the sample had been disposed of and re-analysis was not possible at the date of the request.

This spill is being reported as per the 2AM-MEL1631 Nunavut Water Board License, part F item 3.

A follow up report will be issued.

Environmental Coordinator - Dan Gorton/Jennifer Brown: Ext 4603996

L	REPORTED TO SPILL LINE BY **Jennifer Brown**	POSITION **Sr.Environment Coord**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8198565097**
M	ANY ALTERNATE CONTACT **Dan Gorton**	POSITION **Environment Coord**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-409
July 23, 2018 MEL-14 Aluminum Concentration Criteria Exceeded

Description of Incident:

A sample of treated water from MEL-14 (final effluent sampling port prior to discharge to Meliadine Lake) was collected on July 23, 2018. Upon review of the laboratory analysis results, the total aluminum concentration was found to be 4.39 mg/L which exceeded the permitted discharge limit of 2 mg/L.
As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part F, item 3 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess the total metal concentrations and other water quality parameters during final effluent discharge at MEL-14. The laboratory results were received on August 8, 2018, however, the exceeded criteria for the total aluminum concentration was not observed at the initial time of the data review and data input. During the quarterly reporting for MDMER-EEM (RIIS) on October 1, 2018, the exceeded concentration was observed and reported immediately.

Exceedance Cause and Corrective Measures

The exceeded criteria for final effluent discharge criteria for total aluminum concentrations is assumed to be a laboratory error. When the exceeded criteria was observed, the lab was requested to re-analyze the sample to determine if the reported concentration was a result of laboratory error; however, the sample had been disposed of and re-analysis was not possible at the date of the request.

When comparing the total aluminum concentrations from a sample collected and analyzed on the same day from MEL-13 (the discharge location at Meliadine Lake), total aluminum concentrations were also elevated (6.64 mg/L). Results for total aluminum concentration were then compared to results from 2018 sampling events. The results from July 23, 2018 had the maximum concentrations for both MEL-13 and MEL-14. Table 1 presents a summary of laboratory analysis for MEL-13 and MEL-14 in 2018 and includes the minimum, maximum and average total aluminum concentrations for samples collected in 2018. Figure 1 shows the aluminum concentrations for MEL-13 and MEL-14 in 2018. No other samples collected and analyzed in 2018 have exceeded criteria concentrations for total aluminum at MEL-14.

The Environment Department at Meliadine is currently implementing a data management system for laboratory results. Once it has been fully commissioned, it should mitigate delays with reporting criteria exceedances and improve the timing for requests that may be made if re-analysis is required at the laboratory.

Table 1 Summary of MEL-13 and MEL-14 Total Aluminum Analysis:

MEL 13										
Date	**23-Jul-18**	**20-Aug-18**	**26-Aug-18**	**4-Sep-18**						
Total Aluminum (mg/L)	6.64	0.0118	0.0098	0.0083						
Average	1.6675									
Max	6.64									
Min	0.0083									
MEL 14										
Date	**24-Jun-18**	**1-Jul-18**	**10-Jul-18**	**15-Jul-18**	**23-Jul-18**	**29-Jul-18**	**5-Aug-18**	**13-Aug-18**	**19-Aug-18**	**26-Aug-18**
Total Aluminum (mg/L)	0.134	1.22	0.518	1.23	4.39	0.811	0.784	0.705	1.03	0.005
Average	1.0827									
Max	4.39									
Min	0.005									

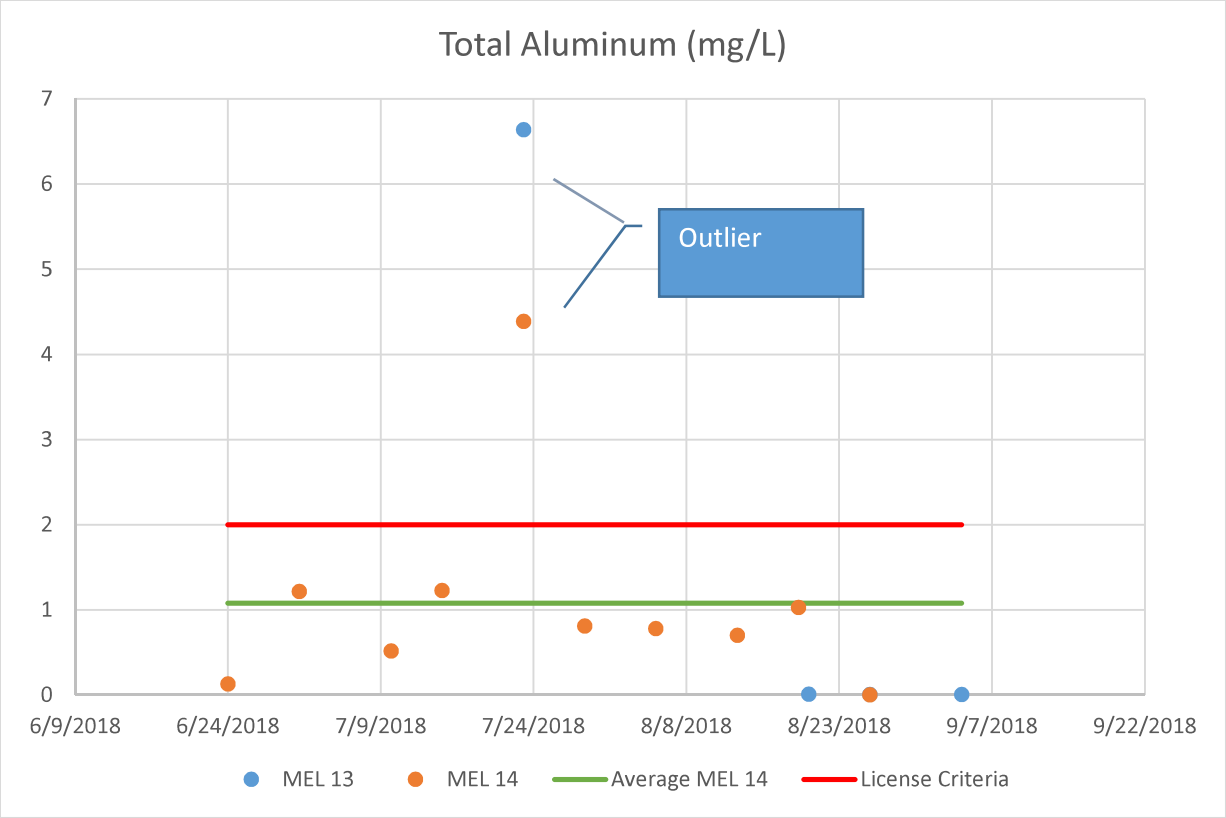


Figure 1: 2018 total aluminum concentrations at MEL-13 and MEL-14

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **08-03-2018**	REPORT TIME **09:45**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 308**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **08-02-2018**	OCCURRENCE TIME **09:25**		
C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVCL102J168**	WATER LICENCE NUMBER (IF APPLICABLE) **2BB-MEL1424**		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES **63** MINUTES **1** SECONDS **24**	LONGITUDE DEGREES **92** MINUTES **11** SECONDS **7**		
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**		
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED **Treated Water**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **1600 liters**	U.N. NUMBER **NA**	
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER **NA**	
I	SPILL SOURCE **Sewage Treatment Plant**	SPILL CAUSE **Human Error**	AREA OF CONTAMINATION IN SQUARE METRES **NA**	
J	FACTORS AFFECTING SPILL OR RECOVERY **NA**	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On August 2, 2018, the water truck operator was collecting the treated STP effluent from the retention tanks at MEL-07 and the truck was overfilled and spilled out onto the road under the water truck. Some water spilled down the bank to the spillway that was previously used for the MEL-07 discharge. No water migration to Meliadine Lake was observed. An investigation is underway to determine the cause of the incident. Upon completion, a follow up report will be issued.

This spill is being reported as per part H, item 4 of the 2BB-MEL1424 Water Licence.

Contact Jennifer Brown/Daniel Gorton (Environment Coordinator) @ 819-759-3555 EXT: 4603996

L	REPORTED TO SPILL LINE BY **Jennifer Brown**	POSITION **Sr. Env. Coordinator**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Daniel Gorton**	POSITION **Env. Coordinator**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-308
August 2, 2018 Treated Sewage Effluent

Description of Incident:

On August 2, 2018, the water truck operator was collecting the treated STP effluent from the retention tanks at MEL-07. The truck was overfilled and spilled out onto the road under the water truck. Some water spilled down the bank to the spillway that was previously used for the MEL-07 discharge.

Spill Response & Cleanup:

When the truck operated observed that the treated effluent was overflowing, pumping was halted.

Approximately 1,600 liters of treated effluent water spilled to the access road behind wing “P” at the Exploration Camp and some observed spill towards the rock bed channel. No water migration to Meliadine Lake was observed and the treated water was quickly absorbed into the road or evaporated.

Spill Cause and Corrective Measures

The spill was caused by human error with the training and procedure not followed. The supervisor of the employee has discussed corrective measure with the operator.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 09-15-2018	REPORT TIME 15:00	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 378
B	OCCURRENCE DATE: MONTH – DAY – YEAR 8-19-2018	OCCURRENCE TIME 8:00		
C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES 63 MINUTES 2 SECONDS 15	LONGITUDE DEGREES 92 MINUTES 13 SECONDS 06		
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0		
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED Treated effluent	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 1430 mg/L (~3600 m3/d)	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA	
I	SPILL SOURCE Mel-14	SPILL CAUSE saline water	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY N/A	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	

K ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

A sample of treated water from Mel-14 (final discharge point to Meliadine Lake) was collected on August 19th 2018. Upon receiving the sampling results, the TDS was found to be 1430 mg/L which exceeded the permitted discharge limit of 1400 mg/L.

This spill is being reported as per the 2AM-MEL1631 Nunavut Water Board License, part F item 3.

A follow up report will be issued.

Sr. Environmental Coordinator - Dan Gorton/Jennifer Brown: Ext 3996
Environmental Technician - Laura Hanson: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY Jessica Huza	POSITION Gen. Supervisor Env	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8198565097
M	ANY ALTERNATE CONTACT Dan Gorton	POSITION Enviro Coordinator	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 8197593555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report: #18-378
August 19, 2018 MEL-14 TDS Concentration Criteria Exceeded

Description of Incident:

A sample of treated water from MEL-14 (final effluent sampling port prior to discharge to Meliadine Lake) was collected on August 19, 2018. Upon review of the laboratory analysis results, the total dissolved solids (TDS) concentration was found to be 1,430 mg/L which exceeded the permitted discharge limit of 1,400 mg/L.

As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part F, item 3 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess TDS concentrations and other water quality parameters during final effluent discharge at MEL-14. The laboratory results were received on September 13, 2018 and reviewed and reported on September 15, 2018. With regards to your question on reporting delay, due to the remote location and the extensive list of parameters that we sample for the Mel-14 sample, the delay in receiving results from the lab is generally 3-4 weeks. This is because the lab sub-contracts part of the analysis to their sister lab in Burnaby BC, so it can take a while for the sample to be received and processed.

Cause and Corrective Measures

The sample was collected at 10:30 am on August 19, 2018. During this time, there was an unscheduled power outage and effluent release had stopped at the effluent water treatment plant (EWTP). Water was not pumped through the sampling port located at MEL-14 during this time. The person that conducted the sampling was a summer intern student who has returned to school and the sampling conditions and confirmation of the location that the sample was collected has not been verified. Based on the field parameter monitoring, the power outage, review of laboratory results from previous and post sampling events, the TDS concentrations reported from the laboratory analysis for MEL-14 on August 19, 2019 are assumed to be not representative for the final effluent discharged the sampling port for MEL-14 to Meliadine Lake. It is possible that it was sampled from a port that was not treated and not discharging to Meliadine Lake.

Table 1 presents the operational report, which summarizes the monitoring results at the EWTP on August 19, 2018. Table 2 presents the daily volume effluents discharged at MEL-14 to Meliadine Lake in August 2018.

Training for all personnel responsible has been conducted to ensure that future MEL-14 sampling is always collected from the same location, after treatment when the power and pumps are working. In addition,

the Environment Department at Meliadine is currently implementing a data management system for laboratory results. Once it has been fully commissioned, it should mitigate delays with reporting criteria exceedances and improve the timing for requests that may be made if re-analysis is required at the laboratory.

Agnico eagle understands the importance to meet water quality discharge criteria without exceedances. All departments involved discussed the EWTP changes or updates daily in a morning water management meeting and the monitoring and comparisons of data was an important part of a decision-making process.

Table 1: August 19 EWT Operational Report:

AGNICO EAGLE NUNAVUT

EWTP DAILY OPERATIONAL REPORT

Day Shift Operator:	J. Roussy			**Date:**		Aug 19 2018	
Night Shift Operator:				**Weather Conditions D/S:**			
				Weather Conditions N/S:			
ACTIFLO #1	**7:00**	**8:00**	**10:00**	**12:00**	**14:00**	**16:00**	**18:00**
Flowrate (m3/hr)	400	400	D	250	200	170	
Total Suspended Solids (TSS) (mg/l) Actiflo discharge (limit 15 mg/l)	3.43	4.25	O	3.7	3.6	4.44	
Feed Turbidity (NTU)	50.93	43.9	W	29.18	25.45	23.45	
pH	6.83	6.82	N	6.77	6.67	6.68	
. Turbidity (NTU) Actiflo discharge	3.68	3.83		4.83	3.4	4.51	
Conductivity (ms/cm) EWTP Discharge pump	2073	2078	D	2173	2098	2142	
Cationic Polymer Set Point (mg/l)	1	1	O	1	1	1	
Coagulant Set Point (mg/l)	35	35	W	37	42	50	
Micro-Sand Quantity (g/l)			N				

Production – ACTIFLO #1	**6:00**	**18:00**	**Variances**
Totaliser Flowrate (m3)	726700	729400	2700

D/S COMMENTS :

Unscheduled power outage in the morning.

Cleaned conductivity probe.

Table 2: EWT Volume Compilation for August 2018

AGNICO EAGLE NUNAVUT

EWTP DAILY OPERATIONAL REPORT

Day	D/S Volume			N/S Volume			Day Total Volume			
	CP1 Total Actiflo (m3)	CP1 recirculated	Meliadine Lake (m3)	CP1 Total Actiflo (m3)	CP1 recirculated	Meliadine Lake (m3)	CP1 Total Actiflo (m3)	CP1 recirculated (m3)	Meliadine Lake Dicharge (m3)	
1-Aug	7,397			8,265			15,662		15,662	
2-Aug	7,105			7,885			14,990		14,990	
3-Aug	6,658			6,252			12,910		12,910	
4-Aug	7,075			7,968			15,043		15,043	
5-Aug	7,532			7,314			14,846		14,846	
6-Aug	6,725			6,151			12,876		12,876	
7-Aug	1,000			7,162			8,162		8,162	Numbers are estimated from time running at flow setpoints. Ran for 2 hours at ~ 500m3/hr
8-Aug	0			0			0		0	
9-Aug	5,006	4,013	993	0	0	0	5,006	4,013	993	Total flow for the day was 5006m3 but only 993m3 reported to Meliadine in the afternoon. There was a bit that was discharged in the morning but could not be recorded.
10-Aug	5,305	1,035	4,270	7,490	7,490	0	12,795	8,525	4,270	
11-Aug	3,360	3,360	0	4,621	18	4,603	7,981	3,378	4,603	
12-Aug	4,729	4,148	581	4,756	2,696	2,060	9,485	6,844	2,641	
13-Aug	4,194	2,863	1,331	4,200	1,229	2,971	8,394	4,092	4,302	
14-Aug	5,100	3,993	1,107	2,001	594	1,407	7,101	4,587	2,514	
15-Aug	3,099	1,909	1,190	3,070	1,284	1,786	6,169	3,193	2,976	
16-Aug	2,830	2,234	596	1,126	897	229	3,956	3,131	825	
17-Aug	2,105	1,283	822	6,406	22	6,384	8,511	1,305	7,206	
18-Aug	2,798	728	2,070	5,000	0	5,000	7,798	728	7,070	
19-Aug	2,783	1,076	1,707	2,543	616	1,927	5,326	1,692	3,634	
20-Aug	3,725	383	3,342	3,710	210	3,500	7,435	593	6,842	
21-Aug	3,081	1,062	2,019	3,050	1,062	1,988	6,131	2,124	4,007	Flow totalizer now programmed to reset every morning. 24hr result taken from totalizer Low production on D/S due to RO cleaning and conductivity riding the limit
22-Aug	2,775	899	1,876	2,958	1,251	1,707	5,733	2,150	3,583	RO cleaning 5hrs, CP1 conductivity above 2,300, need both RO's constantly for EWTP to discharge in Mel
23-Aug	1,613	961	652	2,329	1,438	891	3,942	2,399	1,543	RO cleaning 5hrs, CP1 conductivity above 2,300, Actiflow input flow down to 180m3/h
24-Aug	1,772	1,192	580	1,775	1,775	0	3,547	2,967	580	CP1 conductivity 2400, very low permeate production from RO, windy, poor water quality at MF
25-Aug	764	325	439	0	0	0	764	325	439	NO water from CP1, all water reporting to lake is from RO discharge
26-Aug	537	434	103	0	0	0	537	434	103	RO to MEL 103m3/d, Changed to pump RO to CP1 via EWTP pump. Waiting for samples on RO discharge toxicity
27-Aug	301	301	0	301	301	0	601	601	0	RO to CP1 using EWTP discharge pump (recirc) pipe
28-Aug	192	192	0	192	192	0	384	384	0	RO 2 down for ~14hrs,
29-Aug	181	181	0	181	181	0	362	362	0	
30-Aug	59	59	0	59	59	0	117	117	0	Shutdow both RO 8am, permeate conductivity too high. Did not run overnight
31-Aug	638.5	570	68.5	638.5	570	68.5	1,277	1,140	137	
Total Volume (m3	99,800				21,314		207,841	55,084	152,757	Both RO online 4:30pm, Both RO down at 8:30pm issues.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 08-26-2018	REPORT TIME 8:00	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 344
B	OCCURRENCE DATE: MONTH – DAY – YEAR 8-25-2018	OCCURRENCE TIME 10:00		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVPL11D01	WATER LICENCE NUMBER (IF APPLICABLE) 2AM-MEL1631
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 63 MINUTES 2 SECONDS 23	LONGITUDE DEGREES 92 MINUTES 13 SECONDS 37
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED None	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED Sewage	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES ~200L	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE) None	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER NA
I	SPILL SOURCE Retention Tank Lift Station	SPILL CAUSE Mechanical coupling loosened	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY N/A	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

As sewage enters the lift station, pressure is applied on the fixed piping. The pressure caused the fixed piping to come uncoupled. This resulted in a spill of approximately 400 L at the lift station on the ground. The lift station was shut down and repaired. New flexible piping is being ordered for this application to prevent re-occurrence. Spilled sewage was cleaned up. No contaminants reached any water body. This spill is being reported as per the 2AM-MEL1631 Nunavut Water Board License, part H item 8.

A follow up report will be issued.

Sr. Environmental Coordinator - Dan Gorton/Jennifer Brown: Ext 3996
Environmental Technician - Laura Hanson: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY Jessica Huza	POSITION Gen. Supervisor Env	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8198565097
M	ANY ALTERNATE CONTACT Laura Hanson	POSITION Env Technician	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 8197593555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-344
August 25, 2018 Sewage Spill

Description of Incident:

On August 25, 2018 at approximately 10:00, a sewage spill was observed and reported at the MSB sewage lift station. As sewage entered the lift station, pressure was applied on the fixed piping. The pressure caused the fixed piping to come uncoupled. This resulted in a spill of approximately 200 L at the lift station and onto the ground. No contaminants reached any water body.

Spill Response & Cleanup:

The lift station was shut down and the sewage was removed from surface with a vacuum truck and surface soil was excavated and disposed of as HAZMAT.

Corrective Measures

Daily inspections were conducted at the lift station prior to receiving new parts to be installed. New flexible piping has been installed to prevent re-occurrence. Figures 1 and 2 show the flexible pipe installed and insulation of the piping that continues outside, respectively.



Figure 1: Newly installed flexible hose.



Figure 2: Insulated piping outside the MSB sewage lift station.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR 09-21-2018	REPORT TIME 14:30	[X] ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER 18 - 396
B	OCCURRENCE DATE: MONTH – DAY – YEAR 09-20-2018	OCCURRENCE TIME 10:00		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) KVCL102J168	WATER LICENCE NUMBER (IF APPLICABLE) 2BB-MEL1424
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION Meliadine Gold Project	REGION ☐ NWT [X] NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES 63 MINUTES 1 SECONDS 24	LONGITUDE DEGREES 92 MINUTES 11 SECONDS 7
F	RESPONSIBLE PARTY OR VESSEL NAME Agnico Eagle Mines Ltd.	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION Meliadine, Rankin Inlet, Nunavut, X0C 0G0
G	ANY CONTRACTOR INVOLVED N/A	CONTRACTOR ADDRESS OR OFFICE LOCATION N/A

H	PRODUCT SPILLED Treated Sewage Sludge	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES 100 L	U.N. NUMBER NA
	SECOND PRODUCT SPILLED (IF APPLICABLE) N/A	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES N/A	U.N. NUMBER NA
I	SPILL SOURCE Sludge Holding Tanks	SPILL CAUSE Human error/communication	AREA OF CONTAMINATION IN SQUARE METRES Unknown
J	FACTORS AFFECTING SPILL OR RECOVERY Full tanks and snow	DESCRIBE ANY ASSISTANCE REQUIRED N/A	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT ProperPPE required for cleanup

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On September 20, 2018 during a site inspection with INAC and ECCC personnel, a spill was observed at three separate tanks (100,000 L tanks) used for treated sewage sludge storage. The storage tanks are located at the old fuel farm used under Licence 2BB-MEL1424 and is 219 m and 394 m up-gradient (0.91% 2.3%, receptively) from Lake J5 and Lake H20, respectively. Based on the distance, gradients and mine infrastructure located between the spill and the Lakes, migration of the spill material is not anticipated to meet any water bodies.

The spill is being reported as per NWB Licence 2BB-MEL1424, Part H, item 4.
The spill removal and cleanup is planned and follow up report will be issued.

Contacts: Jennifer Brown / Dan Gorton: Ext 4603996

L	REPORTED TO SPILL LINE BY Jennifer Brown	POSITION Sr. Env. Coordinator	EMPLOYER Agnico Eagle	LOCATION CALLING FROM Meliadine Project	TELEPHONE 8197593555
M	ANY ALTERNATE CONTACT Dan Gorton	POSITION Env. Coordinator	EMPLOYER Agnico Eagle	ALTERNATE CONTACT LOCATION Meliadine Project	ALTERNATE TELEPHONE 8197593555

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-396
September 20, 2018 Treated Sewage Sludge

Description of Incident:

On September 20, 2018 during a site inspection with INAC and ECCC personnel, a spill was observed at a storage tank (100,000 L tanks) used for treated sewage sludge storage. The spill occurred at one tank during filling, however, overspray was observed on two adjacent storage tanks. The storage tanks are located at the old fuel farm used under Licence 2BB-MEL1424 and is 219 m and 394 m up-gradient (0.91% 2.3%, receptively) from Lake J5 and Lake H20, respectively. Based on the distance, gradients and mine infrastructure located between the spill and the Lakes, migration of the spill material is not anticipated to meet any water bodies.

Spill Response & Cleanup:

On the day of the spill observation, the ground froze and it snowed during the evening. Personnel were unable to excavate the material with a hand-shovel. Since the tanks are filled, the tanks cannot be mobilized to improve access for heavy equipment, until emptied. It is Agnico Eagle's intent is to empty the tanks and to discharge the material to the dry-stack tailings storage facility when operational (in compliance with the sludge disposal planning). The timeframe to have the tanks emptied is not defined at the moment.

Spill Cause and Corrective Measures

The spill was caused by human error and miscommunication between the pump operator and the person filling the tank with the treated sewage sludge. Spill reporting procedures have been reviewed with the personnel involved, since the procedure to report was not followed. Additionally, a procedure has been modified for the discharge of effluent to a storage tank. This procedure has been delivered to personnel and will continue to be communicated. The spill located under the storage tank will be excavated (by hand shovel or with heavy equipment) and disposed of as HAZMAT once the ground is thawed and prior to freshet to mitigate transport migration with surface flow.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **10-05-2018**	REPORT TIME **7:30**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 417**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **10-04-2018**	OCCURRENCE TIME **16:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **2** SECONDS **23**	LONGITUDE DEGREES **92** MINUTES **13** SECONDS **37**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **Sarliaq Fournier**	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED **Diesel**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **844L**	U.N. NUMBER **1202**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER **NA**
I	SPILL SOURCE **Fuel Truck**	SPILL CAUSE **Overfilling**	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY **N/A**	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

While loading fuel truck, excess volume of fuel was programmed to be loaded into the truck, causing an overflow of diesel. Upon seeing the overflow operator immediately hit the kill switch, stopping flow of fuel. No water body were impacted by the spill and contaminated material will be send to the landfarm.

A follow up report will be issued.

Environmental Compliance Counselor
Sr. Environmental Coordinator - Dan Gorton/Jennifer Brown: Ext 3996

L	REPORTED TO SPILL LINE BY **Martin Theriault**	POSITION **Compliance counselor**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Dan Gorton**	POSITION **Env Coordinator**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-417
October 4th, 2018 Diesel fuel

Description of Incident:

On October 4th, while loading the fuel truck, excess volume of fuel was programmed to be loaded into the truck causing an overflow of Diesel. The fuel truck operator took a first dip and set the load to 8500L for the first sequence. The operator than carried out for the second sequence and reset a second load of 8500L without taking a second dip. The tanker started to overflow near the end of the second sequence.

The first estimation (400L) was a visual one during clean up to report as soon as possible the spill to the authority. During the investigation, the amount was corrected according to facts. A dip was performed prior to the first sequence showing 2800L remaining in the tanker. Two sequence of 8500L were set and 29L was left from the second sequence when the operator hit the emergency stop button. The fuel tank capacity is 18 927L which lead us towards a 844L spill

Spill Response & Cleanup:

As soon as the operator saw the overflow, he pressed the emergency stop button and called his supervisor. The supervisor immediately dispatched a grader and a loader for cleanup. Berms were established and absorbent pads deployed. The excess fuel was pumped to another truck. The grader and the loader began scrapping the surface material. Clean up efforts continued the next day, with an excavator excavating the contaminated material (10 to 12 inches deep). Approximately 20m3 of contaminated soil was taken to the landfarm A. Readings at the excavated site were taken following the completion of excavation with a MiniRAE Lite instrument. The values were below 25ppm and as such are deemed decontaminated.

Spill Cause and Corrective Measures

It was found during the investigation process that the spill was caused by human error. The operator didn't follow the procedure for which he was trained and didn't carry out a second dip before setting the load for the second sequence. Also, no spotter was use while fueling the tanker. For the corrective measures, the supervisor will meet with all employees to review procedure and discuss criticality of being sure to follow all step of fuel loading procedure. A warning system for fuel truck will be installed for high level alarm. A secondary containment will be built in this area in 2019.



Photo 1: Contain the spill with berm and absorbent pads



Photo 2: Scrapping of the surface material



Photo 3: Excavation of the contaminated material



Photo 4: Contaminated material brought to the landfarm



Photo 5: Spill area after cleanup

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **10-31-2018**	REPORT TIME **12:00**	[X] ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 440**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **10-30-2018**	OCCURRENCE TIME **15:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT [X] NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **2** SECONDS **23**	LONGITUDE DEGREES **92** MINUTES **13** SECONDS **37**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED **Sewage**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **~ 1000L**	U.N. NUMBER **NA**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE **Retention Tank Lift Station**	SPILL CAUSE **Mechanical failure**	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY **N/A**	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On October 30th, 2018, a worker called E.I. supervisor regarding water coming out of the main camp lift station. Upon arrival, the system got shut down and material was put to contain the spill. The vaccum truck was use to remove extra liquid and the contaminated material was scrapped and will be disposed properly.

No water body was impacted by the spill, the closer water body is over 250 meters.
A follow up report will be issued.

The spill is being reported as per NWB Licence 2AM-MEL1631 Part H, item 8.

L	REPORTED TO SPILL LINE BY **Martin Theriault**	POSITION **Compliance counselor**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Dan Gorton**	POSITION **Env Coordinator**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-440
October 30th, 2018 Lift Station Sewage Spill

Description of Incident:

On October 30th, pump #1 of the main lift station failed, causing untreated sewage to begin spilling out onto the gravel pad a few meters west of the main entrance of the camp. The current design of the lift station wiring works in such a way that when one pump goes into failure mode, the circuitry shuts off both pumps. Consequently, both pumps shut off within the effluent storage tank and it overfilled, resulting in sewage being released onto the ground.

Spill Response & Cleanup:

Initially, an employee who was outside at the time noticed the water flowing and called the E&I supervisor over the radio. The system was then shut down and E&I began using gravel to contain/absorb the spill, and a vacuum truck to remove as much standing water as possible. Peat moss was then used to further absorb any more saturated ground and was left to sit overnight.

The following day the contaminated material was scraped up with a loader and brought to the License A Landfarm (approximately 6m^3), and will later be spread over existing windrows to enhance the bio-remediation process. INAC was first contacted to ensure that this was a suitable plan of action for disposing of the sewage-contaminated material.

Spill Cause and Corrective Measures

An investigation was completed and the cause of the spill was determined to be a failed pump, which lead to an overflow of the effluent storage tank. A new pump is being brought in on a rush order to replace the broken one. The system's circuitry will be reconfigured so that when one pump fails, the other will remain operating. An alarm horn will be added to warn of high levels in the storage tank, and will send a signal advising central control.



Photo 1: Panorama showing the extent of the affected area.



Photo 2: Peat moss applied to contaminated area to absorb material.



Photo 3: Excavation of the contaminated material.



Photo 4: Contaminated material brought to the License A Landfarm (the dark material).

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **11-18-2018**	REPORT TIME **09:30**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-____
B	OCCURRENCE DATE: MONTH – DAY – YEAR **11-17-2018**	OCCURRENCE TIME **11:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVCL102J168**	WATER LICENCE NUMBER (IF APPLICABLE) **2BB-MEL1424**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **1** SECONDS **24**	LONGITUDE DEGREES **92** MINUTES **11** SECONDS **7**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED **Treated Water**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **100**	U.N. NUMBER **NA**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **NA**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **NA**	U.N. NUMBER **NA**
I	SPILL SOURCE **Sewage Treatment Plant**	SPILL CAUSE **Other**	AREA OF CONTAMINATION IN SQUARE METRES **2**
J	FACTORS AFFECTING SPILL OR RECOVERY **Freezing Temperatures**	DESCRIBE ANY ASSISTANCE REQUIRED **None**	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT **None**

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

Due to a hole in a Sea-Can door and freezing of a hose and valve at the outlet of the Exploration STP retention tank, the retention tank could not be emptied, causing a spill from an overflow at the top of the tank. Following the overflow, water to the Exploration Camp was temporarily shut down, the hose and valve was thawed and the retention tank was emptied. As a preventative measure, a plywood door with insulation applied was installed to the Sea-Can to prevent freezing in the future. Treated water was frozen in place below the Mel-7 pipeline. The spilled water will be removed with ice picks and transported to CP1. The last Mel-7 results pertaining to the November 5th sample date showed a fecal coliforms concentration of <2 CFU/100ml and a total coliform concentration of <10 CFU/100ml. Results of November 12th & November 19th sampling events will be supplied in the follow-up report.

This spill is being reported as per part H, item 4 of the 2BB-MEL1424 Water Licence.

L	REPORTED TO SPILL LINE BY **Matt Gillman**	POSITION **Hydrology Tech.**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Daniel Gorton**	POSITION **Env. Coordinator**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report: #18-455
November 17, 2018 Retention Tank Overflow

Description of Incident:

Due to freezing of an outlet hose and valve at the Exploration Camp Sewage Treatment Plant retention tank, the retention tank could not be emptied. The tank overflowed treated sewage effluent within the Sea-can housing and made contact with the ground via a hole in the door. The flow extended less than 5m from the spill source and the nearest water body, Meliadine Lake is approximately 78m from the source.

Spill Response & Cleanup:

Following the overflow, water to the Exploration Camp was temporarily shut down, the hose and valve was thawed and the retention tank was emptied. Treated effluent was frozen in place beneath the Mel-7 pipeline. The material was removed with ice picks and transported to CP1.

Spill Cause and Corrective Measures

The Sea-Can containing the retention tank had shifted in such a way that the door was not able to be closed completely, and had been left slightly ajar. Although a heater runs inside the Sea-Can, the outside temperature was less than -30°C, which led to the freezing of the hose and valve. As a preventative measure, an insulated plywood door was installed on the Sea-Can so that it can be closed completely and prevent freezing in the future.

Treated water at this location is sampled and tested weekly (MEL-7 sampling location). At the time of the spill, the most recent results were that of the November 5th sample, which indicated a fecal coliform level of <2 CFU/100ml reported in the original spill report. Following the spill, two further sets of results showed all parameters were well below the former Type B (1424) water license discharge limits (Table 1).

Table 1: Results of lab analysis from MEL-7 treated effluent and corresponding license discharge limits.

Parameter	Type B 1424 License Limits	2018-11-05 Results	2018-11-12 Results	2018-11-19 Results
pH	**6.0 to 9.5**	6.91	7.08	7.61
TSS	**100 mg/L**	2	1	4
Oil & Grease	**5 mg/L**	<0.50	0.90	1.6
Fecal Coliforms	**1000 CFU/100mL**	<2	<2	10
BOD5	**80 mg/L**	<2	3	7



Figure 1: 2018-11-17 – The day of spill, before clean up.



Figure 2: 2018-11-30 – After clean up with new door installed.

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **11-12-2018**	REPORT TIME **09:45**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 477**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **11-12-2018**	OCCURRENCE TIME **13:30**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **1** SECONDS **24**	LONGITUDE DEGREES **92** MINUTES **11** SECONDS **7**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED **Boiler System Water**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **200L**	U.N. NUMBER **NA**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **NA**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **NA**	U.N. NUMBER **NA**
I	SPILL SOURCE **Boiler System**	SPILL CAUSE **Equipment failure**	AREA OF CONTAMINATION IN SQUARE METRES **20**
J	FACTORS AFFECTING SPILL OR RECOVERY **Freezing Temperatures**	DESCRIBE ANY ASSISTANCE REQUIRED **None**	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT **None**

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

Due to failure of an expansion joint on the boiler recirculation system, approximately 200L of water with corrosion inhibitor (Drewgard 4109) spilled to ground. The water froze 8m3 of snow mixed with spilled material was taken to P3, a containment pond with the sites managed water system. Last analysis of Drewgard concentration was 0.195ppm. No water body was impacted. The nearest body of water is >300m away.

Dan Gorton ext 4603996, Matt Gillman ext 4603172, Kevin Buck 8198604515

L	REPORTED TO SPILL LINE BY **Matt Gillman**	POSITION **Hydrology Tech.**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Daniel Gorton**	POSITION **Env. Coordinator**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-477
December 11, 2018 Boiler Recirculation Loop Leak

Description of Incident:

Due to failure of an expansion joint on the boiler recirculation system, approximately 200L of water with corrosion inhibitor (Drewgard 4109) spilled to ground. The coordinates of the spill were, 63° 2'19.52"N, 92°13'39.97"W. The water froze and 8m^3 of snow and ice was transferred to P3, a containment pond within the site's managed water system. Most recently analyzed at 0.195ppm. No water body was impacted. The nearest body of water is >300m away.



Spill Response & Cleanup:

Site personnel shut off values preventing further release of water from the boiler recirculation system. Water followed through the floor of the Arctic corridor to ground and froze. Frozen water from the system was cleaned up with heavy equipment. Material was transported and contained in P3, part of the site’s water management system. A sample of the boiler system water was collected for analysis.

Spill Cause and Corrective Measures

The release occurred due to the failure of an expansion joint in the boiler recirculation system. The cause of the failed component is unknown. The expansion joint was replaced and the system inspected for leaks.



Figure 1: Water from boiler recirculation system flowing to ground.



Figure 2: Frozen material cleaned up and transported to P3.

Appendix G-1

AEMP/EEM report

NUQSANA GOLDER
ENGINEERING AND ENVIRONMENTAL INC.

REPORT

Cycle 1 Environmental Effects Monitoring Report and 2018 Aquatic Effects Monitoring Program Annual Report

Agnico Eagle Mines Limited – Meliadine Gold Mine

Submitted to:

Agnico Eagle Mines Limited
Meliadine Project
Rankin Inlet, Nunavut X0C 0G0

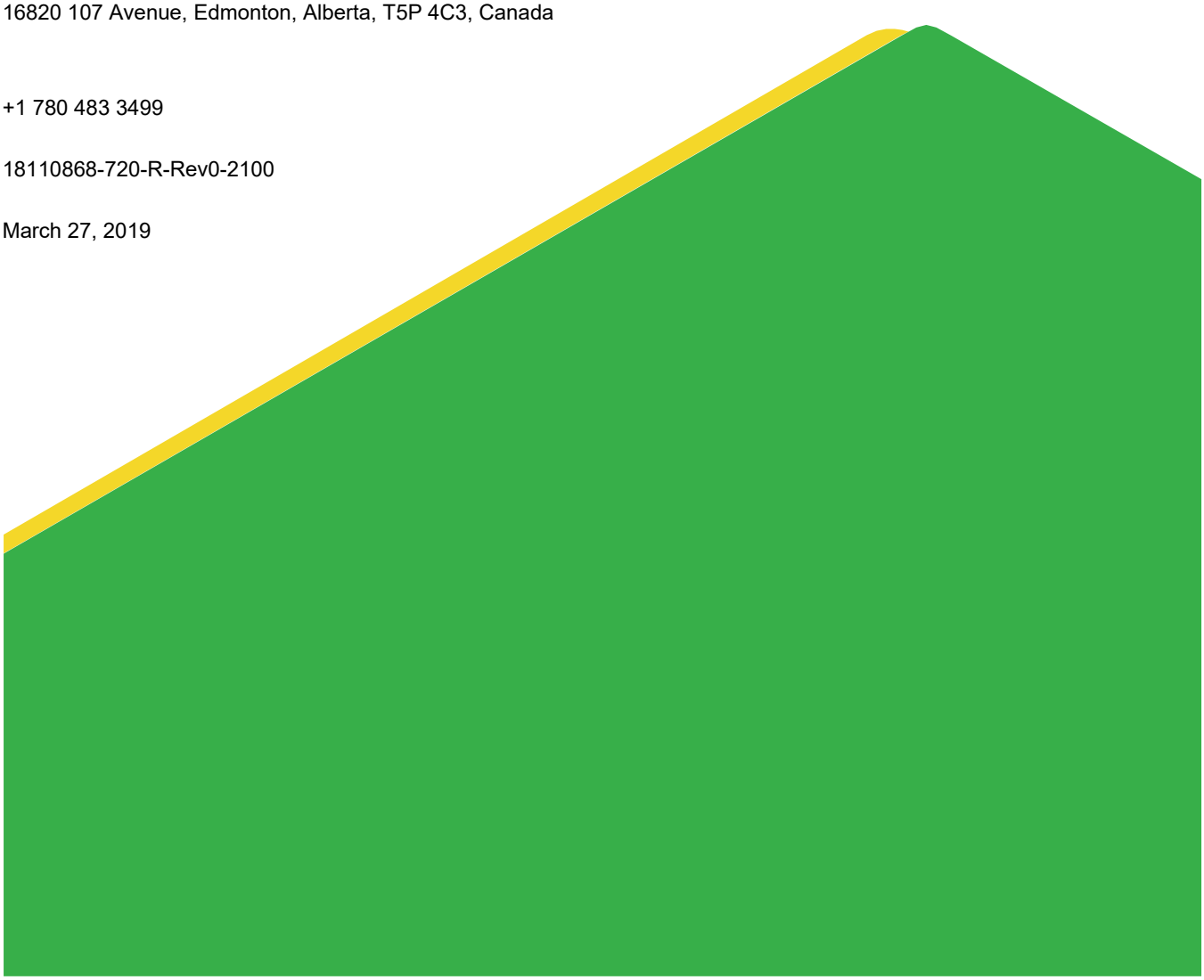
Submitted by:

Golder Associates Ltd.
16820 107 Avenue, Edmonton, Alberta, T5P 4C3, Canada

+1 780 483 3499

18110868-720-R-Rev0-2100

March 27, 2019



Distribution List

Electronic Copy – Agnico Eagle Mines Limited

Electronic Copy – Golder Associates Ltd.

Plain Language Summary

Overview

The Meliadine Gold Mine (Mine) is located in the Kivalliq District of Nunavut near the western shore of Hudson Bay, in Northern Canada, approximately 25 km north of Rankin Inlet. Pre-construction activities were completed at the Mine between January 2015 and June 2017, and construction activities were initiated in July 2017. Dewatering of Lake H17 occurred in August to October 2016 to create Collection Pond 1 (CP1), with dewatering effluent discharged into the narrows between the east and west/south basins of Meliadine Lake. The first mine effluent discharge through the permanent diffuser (CP1 diffuser) into the east basin of Meliadine Lake occurred from June to September 2018.

Upon the discharge of dewatering effluent to Meliadine Lake, the Mine became subject to the Metal and Diamond Mining Effluent Regulations (MDMER). Under the MDMER, the Mine is required to conduct Environmental Effects Monitoring (EEM) studies, the results of which are used by Environment and Climate Change Canada (ECCC) to assess the effectiveness of the effluent regulations by evaluating effects on fish, fish habitat, and use of fisheries resources by humans.

The original objective of the Cycle 1 EEM study was to assess the effect of the dewatering discharge from Lake H17 on the benthic invertebrate community and fish population health in Meliadine Lake. In their comments on the EEM study design, the ECCC recommended that the EEM Near-field exposure area be relocated to better capture the effects of effluent release from the new permanent CP1 diffuser, which became operational in 2018. Therefore, the EEM Near-field area was relocated and is now aligned with the AEMP Near-field area. A plume delineation study was also conducted during the discharge period to describe effluent mixing in the Near-field area. The biological monitoring studies in 2018 included a benthic invertebrate community survey and a small-bodied fish health survey, with supporting water and sediment quality data collection.

The Aquatic Effects Monitoring Program (AEMP) is a requirement of the Type A Water Licence (2AM-MEL-1631, Part I, Item 3). The AEMP is intended to function as an integrated monitoring program, which considers pathways to potential effects of the Mine on the aquatic environment, including changes in surface water quality, sediment quality, lower trophic communities, fish habitat, and fish health due to release of mine water, physical alteration of watersheds, and air emissions during construction, operations, and closure. The AEMP was also designed to incorporate EEM requirements of the MDMER throughout the life of the Mine, with supplemental components included to fulfill the additional conditions and requirements of the Water Licence. Beginning in 2018, the Cycle 1 EEM biological monitoring program was conducted concurrently with the AEMP.

There are two distinct programs in the AEMP for the Meliadine Mine: the Meliadine Lake study and the Peninsula Lakes study. The Meliadine Lake study was designed around the key aspects of the EEM program, with the study design for the benthic invertebrate community survey and the fish population health survey based on the EEM requirements. The core components of the Meliadine Lake study are water quality, sediment quality, benthic invertebrate community, and fish health and fish tissue chemistry. A targeted plankton study was also included to investigate the potential for plankton as a useful monitoring tool to support interpretation of potential Mine effects on the aquatic environment. Whereas the Cycle 1 EEM study included two sampling areas in Meliadine Lake: Near-field area and Reference Area 1, the AEMP includes two exposure areas (Near-field and Mid-field areas) and up to three reference areas (Reference Areas 1, 2, and 3). The Peninsula Lakes study was

designed to detect potential indirect effects from deposition of aerial emissions or alteration of watersheds. Water quality is the core component of the Peninsula Lakes study, with the intent to add biological studies if the water quality results suggest Mine-related changes have occurred.

Data and results presented in this report were collected as per the approved AEMP and Cycle 1 EEM study designs for the Mine. This report documents data collected in 2018, with a detailed evaluation of all data collected from 2015 to 2018, and was designed to address the reporting requirements for both the EEM and the AEMP. This is the first combined AEMP/EEM interpretive report for the Mine, and the first evaluation of effects since the CP1 diffuser became operational.

This report also presents normal ranges for water and sediment quality parameters, benthic invertebrate community variables and phytoplankton variables including chlorophyll *a*. The normal range is intended to estimate the range of natural spatial and temporal variability, and the more reference data incorporated into the calculation, the more accurate the estimate becomes. The normal ranges provided in this report are considered provisional due to the limited sample sizes used in the calculations for some components. These normal ranges may be re-defined in future reports to allow for the inclusion of additional monitoring data from the reference areas.

Mine Development Updates

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

Water management activities that occurred in 2018 included transporting treated sewage effluent to CP1 (starting in November 2017), and initiation of mine effluent discharge through the CP1 diffuser to Meliadine Lake in June 2018. Water quality monitoring associated with the final discharge point MEL-14 and the receiving environment monitoring station above the CP1 diffuser (i.e., MEL-13) was conducted during the discharge period. The new freshwater intake was installed in winter 2018.

Water Quality

In 2018, water quality sampling was conducted in Meliadine Lake once during the ice cover season (March) and twice in the open water season (July and August) from up to 25 stations across five sampling areas. Beginning in the open-water season, four new stations were added in the Near-field area and four historical stations were discontinued. New stations in the Near-field area were selected based on the location of the CP1 diffuser, which was installed and became operational in 2018. Water quality monitoring was scheduled for four times in 2018, but the September water quality program was cancelled due to unsafe conditions that prevented safe access to sampling stations. Three peninsula lakes (i.e., Lakes A8, B7, and D7) were sampled during the open-water season (July and August), at three stations per lake. This report provides a summary of the water quality monitoring programs completed in 2018 at Meliadine Lake and at the Peninsula Lakes, analysis of data collected between 2015 and 2018, and an interpretation of the results per the requirements of the AEMP and EEM.

In general, water quality in Meliadine Lake in 2018 was characterized as consistent in temperature through the water column, well oxygenated, neutral to alkaline, clear water, low specific conductivity, soft water, oligotrophic (very low in nutrients), and very low in metals. This characterization was similar to previous AEMP monitoring years (i.e., 2015 to 2017) and baseline (pre-2015). Water quality data were analyzed to determine if there were differences between the two exposure areas (i.e., Near-field and Mid-field), and the pooled reference areas of Meliadine Lake. Differences in water quality were observed in the Near-field area compared to the Mid-field and

reference areas for the open water season for several conventional parameters (e.g., specific conductivity, hardness, TDS, and turbidity), major ions, nutrients (total Kjeldahl nitrogen), organic carbon and several total metals. Similar patterns among areas were observed during ice-covered conditions. Similar spatial patterns were observed in previous AEMP monitoring years (e.g., 2016 and 2018); however, for specific conductivity, hardness and major ions the relative difference in concentrations of chloride, magnesium, and sodium among areas appears to have increased in 2018, relative to 2016 and 2017.

The analysis of the 2018 water quality results included a visual comparison of 2018 and 2017 construction phase data to pre-construction phase data (i.e., 2015 and 2016) in the Near-field area, alongside an evaluation of trends in the Mid-field and reference areas. Increasing trends in the Near-field area over time and relative to trends over time in the reference areas, were observed for specific conductivity, hardness, TDS, major ions, TOC, DOC, total metals (i.e., aluminum, barium, lithium, and strontium). Concentrations of these parameters also fell outside of the normal range for the Near field area. Normal ranges were calculated using data collected during baseline conditions (i.e., 1995 to 2013) and from reference areas (2015 to 2018). The normal range was also exceeded for several of these parameters in the Mid-field area. The observed changes in water quality suggest a Mine-related effect on water quality in the Near-field and Mid-field areas. However, the effect is within the range of conditions predicted by the Final Environmental Impact Statement (FEIS) for the Mine, and all parameters were well below Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life.

Water quality in the Peninsula Lakes in 2018 was similar to water quality from previous AEMP monitoring years (i.e., 2015 to 2017). In these lakes, water quality is characterized as having consistent water temperature through the water column, being well oxygenated with neutral to alkaline pH, and oligotrophic to mesotrophic in trophic status (of low to moderate level of productivity). Concentrations of water quality parameters in Peninsula Lakes remained below CWQGs for all parameters. Water quality in the Peninsula Lakes was outside of the normal range for a number of total metals; however, water quality was generally consistent with FEIS predictions.

A visual analysis to evaluate potential changes in water quality over time was conducted for the Peninsula Lakes, with the purpose of comparing 2018 construction phase data to pre-construction phase data (i.e., 2016 to 2017). Increasing trends in each consecutive year were observed for reactive silica (Lake A8), dissolved phosphorus (Lake B7 and D7), total aluminum (Lake A8 and B7), arsenic (Lake A8), and molybdenum (Lake D7), relative to previous AEMP monitoring years. A step-increase in concentrations in 2018 (relative to previous AEMP monitoring years) was observed for total manganese (Lake A8 and D7), total boron, lithium, and strontium (Lake B7), and total vanadium (Lake B7 and D7). However, given the limited dataset, there is uncertainty associated with trend detection, and potential sources of the temporal trends are not identified in this report.

Sediment Quality

Sediment quality sampling was conducted in Meliadine Lake concurrently with benthic invertebrate sampling. Concentrations of arsenic, chromium, and copper exceeded the Canadian Sediment Quality Guidelines (SQG) in 2018, as also observed under baseline conditions. These guidelines include two categories: Interim Sediment Quality Guidelines (ISQG) and Probable Effect Levels (PEL). ISQG represent the concentrations below which adverse effects on benthic organism are expected to occur rarely, and PEL represents the concentrations above which adverse effects are probable. Comparisons to SQGs are used to assess the potential for adverse effects to aquatic biota, but do not indicate that actual effects may occur, because these guidelines apply Canada-wide and do not necessarily account for site-specific factors, such as the natural geology of the study area. Thus, guideline exceedances can be indicative of naturally elevated concentrations due to site-specific factors, and are not necessarily mine-related.

Specifically, arsenic concentrations in the Near-field area exceeded the ISQG and concentrations at four of the five stations also exceeded the PEL. For chromium and copper, sediments at all five Near-field stations were above the ISQGs but were below their respective PELs. In the Mid-field area, arsenic and copper concentrations exceeded ISQG at the five stations sampled in 2018 but did not exceed PEL. Chromium concentrations were also above the ISQG but below the PEL at four of the five stations sampled in the Mid-field Area. In Reference Area 1, only one out of five samples exceeded the ISQG for arsenic and chromium, whereas for copper concentrations at three of the five stations were above the ISQG. In Reference Area 3, ISQGs were exceeded at four of the five stations sampled for arsenic and three of the five stations for copper. Other than the above exceptions, concentrations of metals and metalloids at exposure and reference stations sampled in 2018 were below sediment quality guidelines.

As observed in previous years, the reference area sediments had significantly more sand and the Near-field area sediments had significantly more silt. As proportion of fine sediment in a sample can influence the total concentration of metals, the sediment chemistry data were normalized to the percent of fines before evaluation of statistical comparisons of areas of Meliadine Lake, and calculation of normal ranges for Meliadine Lake. Percentages of silt and sand did not differ significantly between the Mid-field and pooled reference areas.

Normalized arsenic concentrations were higher in the Near-field area compared to the pooled reference areas. Both Near-field and Mid-field areas had higher concentrations of normalized cadmium relative to the pooled reference areas. The Mid-field area had significantly higher total organic carbon relative to the other areas and had greater normalized concentrations of chromium and copper relative to the Near-field and pooled reference area concentrations.

Differences between exposure and reference areas were mainly associated with natural variability, which was also observed in 2015 and 2016, prior to the Mine effluent discharge. For metals above sediment quality guidelines in the Near-field area, concentrations in 2018 were lower than those reported under baseline conditions in 2015 and 2016.

Benthic Invertebrate Community

Benthic invertebrates are small animals with no backbones that live within sediments, or on the sediment surface, for all or part of their life cycles, and are an integral part of Arctic ecosystem food webs. In August 2018, benthic invertebrate community sampling was conducted in Meliadine Lake in the two exposure areas (Near-field and Mid-field), and two reference areas (Reference Area 1 and 3). Reference Area 2 was not sampled due to logistical and weather limitations. This report summarizes benthic invertebrate community data obtained in 2018, analyses the 2018 data and compares to data collected in 2015 and 2016, and interprets the results as per the requirements of the AEMP and EEM programs.

Because the Near-field and reference areas were found to have different substrates in previous sampling programs, a Sediment Reconnaissance Survey was conducted in July 2018 to further investigate suitable and comparable stations for future benthic invertebrate and sediment sampling. New stations were selected to maintain alignment with water quality, and to avoid excessive sampling effort in retrieving acceptable grab samples. Four new Near-field stations and two new Mid-field stations were selected for the 2018 sediment sampling program.

Meliadine Lake benthic invertebrate communities were reflective of typical subarctic communities and were characterized by low densities and low to moderate family-level richness. Communities were dominated by the midge family Chironomidae, with fingernail clams (Pisidiidae) subdominant. Snails (Gastropoda) were observed

in the Near-field area at higher proportions than in other areas, and amphipods were only present outside of the Near-field area, which likely reflects differences in habitat between the Near-field area and other sampling areas, as a result of taxon-specific habitat preferences.

To assess the potential impacts from the Mine effluent discharge for the Cycle 1 EEM study, EEM benthic invertebrate community comparisons were conducted at the family level to detect differences between the Near-field area and Reference Area 1. No statistically significant differences were identified between the Near field area and Reference Area 1 for the EEM effect endpoints and supporting endpoints evaluated in the EEM study.

The 2018 AEMP data analysis compared data collected from the two exposure areas to two reference areas through statistical and visual comparisons, to evaluate potential changes in benthic invertebrate communities due to changes in water and sediment quality. Comparisons were made at the lowest taxonomic level. A significant difference was found between sampling areas for total invertebrate density but not for total richness. Density was found to be significantly lower in the Near-field area compared to the pooled reference areas. No significant differences in density were detected between the Mid-field area and the pooled reference areas, or between the two reference areas. Total richness values were similar among the Near-field area, Mid-field area, and Reference Area 1; richness was higher in Reference Area 3. Total density was lower in the Near-field area compared to Reference Area 1, but both areas had similar family level richness. Comparisons between the Near-field area and Reference Area 1 showed higher diversity, evenness, and dissimilarity in the Near-field area. Differences in these endpoints between the two sampling areas likely reflect pre-discharge differences in habitat, particularly differences in sediment substrate composition. Sediments sampled from the Near-field area had a higher proportion of fines (i.e., silt + clay) and less sand compared to the Mid-field and Reference areas. Thus, spatial differences in particle size distribution between the Near-field area and other sampling areas have the potential to confound the ability of the AEMP and EEM study comparisons made to evaluate whether benthic invertebrate communities were impacted by the Mine effluent discharge in 2018.

Overall, the 2018 AEMP results indicate that benthic community has not been measurably affected by potential Mine-related changes in water and sediment quality in Meliadine Lake. Benthic invertebrate variables in the Near-field area were within their respective normal ranges. Statistical comparisons among areas did identify some significant differences between Near-field and reference areas, but these appeared to reflect pre-discharge differences in sediment composition among areas.

Fish Population Health

The 2018 fish health survey was performed to meet EEM requirements and evaluated the potential differences in indicators of fish health (e.g., energy storage, energy usage, and survival) between the exposure area of Meliadine Lake (i.e., the Near-field area) and one reference area (i.e., Reference Area 1), resulting from the development and operations of the Mine. It was not intended to meet the specific requirements of the Mine's AEMP fish health or fish tissue components, because it did not include a second reference area, a large-bodied sentinel species (i.e., Lake Trout [*Salvelinus namaycush*) or a fish tissue chemistry component (as neither mercury or selenium concentrations in the mine effluent triggered a fish tissue study under the MDMER). Fish health and tissue chemistry sampling for the AEMP is currently scheduled for 2021.

Threespine Stickleback (*Gasterosteus aculeatus*) from the Near-field area were generally larger than those collected from Reference Area 1. Female Threespine Stickleback sampled from the Near-field area had greater condition than individuals sampled from Reference Area 1, which means that female fish from the Near-field area had higher body weight while adjusting for length of the fish. This finding suggests fish from the Near-field area

had increased energy storage; however, the magnitude of difference (i.e., 6%) was below the CES of 10%. A similar response was not observed in supporting energy storage endpoints (i.e., relative liver weight and relative egg weight). Statistical power was low for age and gonad weight comparisons, as age was not a strong predictor of fish size. Threespine Stickleback were encountered at multiple reproductive stages during sampling, which resulted in greater variability within the dataset.

The majority of Threespine Stickleback captured were infected by a tapeworm that competes with the host for available resources and decreases the energy allocated to storage and spawning. This represents a complicating factor that needs to be considered in the design and interpretation of future fish health and fish tissue monitoring programs.

Plankton

Plankton are small organisms that live suspended in the water column. Phytoplankton are small, free-floating algae and zooplankton are small, sometimes microscopic, animals (crustaceans) that eat algae.

Plankton monitoring was conducted as a targeted study in Meliadine Lake to characterize baseline conditions for the plankton community and to evaluate the usefulness of plankton as a potential long-term monitoring tool. Prior to the 2018 sampling program, the plankton study included sampling and analysis of depth-integrated nutrients, chlorophyll *a*, phytoplankton, and zooplankton over three years in Meliadine Lake (2015, 2016, and 2017) and two years in the Peninsula Lakes (2015 and 2016). Nutrients included total nitrogen (TN), total phosphorus (TP), nitrate, nitrite, ammonia, and orthophosphate. “Depth-integrated” means that nutrients were analyzied in a water sample that included water collected throughout the water column where plankton live.

Based on the data collected in 2017, it was determined that the phytoplankton dataset (i.e., chlorophyll *a*, and phytoplankton abundance, biomass, and composition of major taxonomic groups, along with supporting nutrient data collection) should be carried forward to future years for Meliadine Lake to further evaluate its usefulness as a monitoring tool. As a result, phytoplankton sampling during the summer season was carried forward for 2018 to evaluate potential changes in key monitoring endpoints (abundance, biomass, community composition) and to provide an indication of potential changes to trophic status in the lake. This report provides a summary of plankton data collected during the summer 2018 phytoplankton sampling program in Meliadine Lake, with a comparison against data collected during summer sampling events during the pre-construction and construction phases of the Mine (2015 through 2017). Phytoplankton sampling stations for 2018 were aligned with water quality stations, including those adopted in 2018.

Concentrations of most depth integrated nutrients were generally low in 2018 and consistent with concentrations observed in previous years (i.e., 2015 to 2017). The mean concentration of TN in the Near-field area was slightly higher than in previous years. Concentrations of TP in 2018 were generally above detection limits but were low and consistent with TP concentrations observed previously. Concentrations of nitrate, nitrite, ammonia, and orthophosphate were below detection limits in the majority of samples collected in 2018, consistent with previous years. Chlorophyll *a* concentrations in Meliadine Lake followed a similar spatial trend in 2018 as observed in previous years, with higher concentrations in the Near-field area than in the Mid-field and reference areas. Chlorophyll *a* concentrations had a significant, weak to moderately strong linear relationship with phytoplankton biomass. Given this relationship, the current results suggest chlorophyll *a* is a useful indicator of phytoplankton biomass in Meliadine Lake.

Higher phytoplankton abundance and biomass were observed in the Near-field area compared to other areas. Abundance, but not biomass, was higher in the Near-field area in 2018 than in previous years. Spatial trends were consistent with previous years; however, higher variability was observed among years in the reference areas with the inclusion of the 2018 data, which interfered with the evaluation of spatial trends in the phytoplankton community.

Based on the August phytoplankton dataset collected from Meliadine Lake since 2015, late-summer phytoplankton monitoring is considered a useful monitoring tool for Meliadine Lake to detect potential effects resulting from nutrient enrichment.

Conclusions

Results of the harmonized 2018 Cycle 1 EEM/AEMP study indicate that the Mine discharge to Meliadine Lake through the permanent diffuser (CP1 diffuser) has resulted in measurable effects on water quality and phytoplankton community, but no effects attributable to the Mine discharge were apparent on sediment quality, benthic invertebrates and small-bodied fish. The type of effect observed on water quality consisted of increased concentrations of TDS, major ions, nutrients, organic carbon and several total metals in the Near-field area compared to the reference areas. Concentrations of these parameters fell outside of the normal range, but remained well below Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life. The observed effects were within the range of conditions predicted by the FEIS for the Mine. A mild enrichment effect was detected on phytoplankton in the Near-field area, as well as a spatial trend of decreasing primary productivity with increasing distance form the Mine discharge. No Mine-related effects were detected in the peninsula lakes.

Comparison of the 2018 water quality and benthic invertebrate results to Low Action Levels resulted in no Action Levels being triggered for toxicological impairment or nutrient enrichment.

Study Limitations

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Acknowledgements

Golder would like to acknowledge the support of Agnico Eagle (Martin Theriault, Jessica Huza) during the execution of the field program and preparation of this report. During the field programs, Agnico Eagle provided on-the-ground logistic support, provision of workspace, and provision of field personnel. In particular, Golder would like to recognize field and logistical support from Agnico Eagle (Dan Gorton, Jennifer Brown, Laura Sue Hanson, Justin MacMillan, Randy Schwandt, Sean Arruda) and Golder (Brian Linglebach, Kia Marin, Mike Hildebrand, Jarett Nevill, Carol Zastavniouk, Jaimie Weir).

Inuit involvement in monitoring included the following:

- Louis Ulayok for the first few months of 2018
- Peter Naitok for two weeks during the AEMP
- John Papak on though Sarliaq for a week or two during the EEM
- Other Inuit workers through Golder Nuqsana

The following people contributed to this report as primary authors or senior reviewers:

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- Charity Beres, B.Sc. (Golder: Senior review of Introduction, Site Characterization)
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- Jill LaPorte, B.Sc. (Golder: Benthic Invertebrate Community)
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- Elaine Irving, Ph.D., R.P.Bio., P.Biol. (Golder: Senior technical review of Sediment Quality and Benthic Invertebrate Community)
- Collin Arens, Ph.D. (Golder: Fish Health and Normal Range Calculations)
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- John Sherrin, M.Sc. (Golder: Plankton)
- Kerrie Serben, M.Sc. (Golder: Overall document review, Overall Summary and Conclusions)
- Zsolt Kovats, M.Sc. (Golder: Overall Senior Technical Review)

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ABBREVIATIONS AND ACRONYMS

Term	Definition
#	number
<	less than
>	greater than
=	equal
≤	less than or equal to
+	plus
±	plus or minus
×	multiply or by
$\bar{x}$	mean
Σ	sum
%SE	percent standard error of the mean
%v/v	percent volume by volume
α	alpha
AEMP	Aquatic Effects Monitoring Program
AENV	Alberta Environment
Agnico Eagle	Agnico Eagle Mines Limited
ALS	ALS Environmental Laboratory
ANCOVA	analysis of covariance
ANOVA	analysis of variance
β	beta
BCI	Bray-Curtis Index
BURB	Burbot (*Lota lota*)
BP	backpack electrofishing
BTEX	benzene, toluene, ethylbenzene, and xylene
C	concentration
CA	cortical alveolar
$CaCO_3$	calcium carbonate
CALA	Canadian Association for Laboratory Accreditation Inc.
CCME	Canadian Council of Ministers of the Environment
CDWQG	Canadian Drinking Water Quality Guidelines
CES	critical effect size
Chl	chlorophyll *a*
cont'd	continued
CPUE	catch-per-unit-effort
CW	carcass weight
CWQG-PAL	Canadian Water Quality Guidelines for the Protection of Aquatic Life
BIC	benthic Invertebrate Community
DF	dilution factor
DIN	depth-integrated nutrient

Term	Definition
DL	detection limit
DO	dissolved oxygen
DOC	dissolved organic carbon
dup	duplicate
CDWQG	Canadian Drinking Water Quality Guidelines
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
e.g.	example
EWTP	Effluent Water Treatment Plant
EXP	Exposure Area
Feb	February
FEIS	Final Environmental Impact Statement
FEQG	Federal Environmental Quality Guideline
GE	germinal epithelium
Golder	Golder Associates Ltd.
GPS	global positioning system
GSI	gonadosomatic index
GVBD	germinal vesicle breakdown
GVM	germinal vesicle migration
ID	identifier
i.e.	that is
IQ	Inuit Qaujimajatuqangit
KIA	Kivalliq Inuit Association
K-S	Kolmogorov-Smirnov test
K-W	Kruskal Wallis test
IC25	inhibition concentration at 25%
INAC	Indigenous and Northern Affairs Canada
ISQG	Interim Sediment Quality Guideline
LC50	median lethal concentration
Log_{10}	logarithm base 10
LSI	liversomatic index
Ltd.	Limited
LTL	lowest taxonomic level
Max	maximum
MBq	megabecquerel
MDMER	Metal and Diamond Mining Effluent Regulations
MF	Mid-field
Min	minimum
Mine	Meliadine Gold Mine
ML	monthly load
MSE	mean squared error

Term	Definition
MT	minnow trap
Mann-Whitney	Mann-Whitney U Statistical Test
n	number / sample Size
N	North
NA	not applicable
NAD 83	North American Datum of 1983
Nd	not detected
NE	northeast
NF	Near-field
nMDS	Non-metric multidimensional scaling
NNST	Ninespine Stickleback (*Pungitius pungitius*)
No.	number
NS	not significant
NW	northwest
NWB	Nunavut Water Board
OM	oocyte maturation
OW	open-water
P	plankton sample
Pi	the proportion of the ith taxon
P-value	probability value
P_{50}	50% probability
P	probability
PI	prediction interval
PI(λ)	80% prediction interval on Box-Cox transformed data
PEL	probable effect level
PG	primary growth
Percentile	2.5th and 97.5th percentiles
POF	postovulatory follicle complex
PVC	polyvinyl chloride
Q2	second quarter
Q4	fourth quarter
QA	quality assurance
QC	quality control
QA/QC	quality assurance and quality control
r	correlation coefficient
R	R statistic
R^2	coefficient of determination
RA	Reference Area
RA1	Reference Area 1
RA2	Reference Area 2
RA3	Reference Area 3

Term	Definition
Rank	rank transformed data
RDL	reported detection limits
REF	Reference Area
REP	replicate
RO	reverse osmosis
RPD	relative percent difference
S	south
Sc1	primary spermatocyte
Sc2	secondary spermatocyte
SD	standard deviation
SE	southeast
	standard error of the mean
SEI	Simpson's Evenness Index
Sg1	primary spermatogonia
Sg2	secondary spermatogonia
SiO_2	silicon dioxide
SLSC	Slimy Sculpin (*Cottus cognatus*)
SQ	sediment quality
SR	studentized residuals
SRSi	soluble reactive silica
SSD	statistically significant difference
SSW	south-southwest
SSWQO	Site-Specific Water Quality Objective
St	spermatid
STP	sewage treatment plant
SW	southwest
Sz	spermatozoa
TAP	Technical Advisory Panel
TDP	total dissolved phosphorus
TDS	total dissolved solids
TGD	Technical Guidance Document
THST	Threespine Stickleback (*Gasterosteus aculeatus*)
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TOC	total organic carbon
TP	total phosphorus
TSI	Trophic State Index
TSS	total suspended solids
T-test	Two-sample t-test
Tukey's	Tukey's Honestly Significant Difference Test
TW	total weight

Term	Definition
UI	under ice
UTM	Universal Transverse Mercator
V	volume
Vtg1	primary vitellogenic
Vtg2	secondary vitellogenic
Vtg3	tertiary vitellogenic
W	west
WAD	weak acid dissociable
WL	Water Licence
WNW	west-northwest
WSW	west-southwest
YOY	young-of-the-year

UNITS OF MEASURE

Unit	Definition
Bq/L	becquerel per litre
°C	degrees Celsius
cells/L	number of cells per litre
cm	centimetre
cm^2	square centimetre
g	gram
ha	hectare
h/hr	hour
kg	kilogram
km	kilometre
km^2	square kilometres
m	metre
m^2	square metres
m^3	cubic meters
mg	milligram
mg $CaCO_3$/L	milligrams calcium carbonate per litre
mg/kg dw	milligram per kilogram dry weight
mg/kg ww	milligrams per kilogram wet weight
mg/L	milligrams per litre
mg-N/L	miligrams nitrogen per litre
mg-P/L	miligrams phosphorus per litre
mg/m^3	milligrams per cubic metre
mg-N/L	milligrams of nitrogen per litre
mg-P/L	milligrams of phosphorus per litre
mL	millilitre
mm	millimetre
m/s	metres per second
Mt	million tonnes
‘	minutes
org/L	organism per litre
org/m^2	organisms per square metre
org/m^3	organisms per cubic metre
%	percent
µg/g	microgram per gram

Unit	Definition
µg/g dw	microgram per gram dry weight
µg/g dw%Fines	microgram per grams dry weight normalized to percent-fines
µg/L	microgram per litre
µm	micrometre
µS/cm	microSiemens per centimetre
NTU	nephelometric turbidity units
s	seconds
“	
tpd	tonnes per day
y/yr	years

1.0 INTRODUCTION

The Meliadine Gold Mine (Mine) is located in the Kivalliq District of Nunavut near the western shore of Hudson Bay in Northern Canada (Figure 1.1-1) and is owned by Agnico Eagle Mines Limited (Agnico Eagle). The Mine is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4). The nearest community is Rankin Inlet (coordinates: 62°48'35''N; 092°05'58''W), which is approximately 25 km south of the Mine (coordinates: 63°01'03''N, 92°12'03''W).

The Mine is required to conduct aquatic monitoring under both federal and provincial legislation. This report documents the aquatic receiving environment monitoring activities as required by the Metal and Diamond Mining Effluent Regulations (MDMER; Government of Canada 2018) and the Type A Water Licence (2AM-MEL1631) (NWB 2016). These activities include the Environmental Effects Monitoring (EEM) program under the MDMER, and the Aquatic Effects Monitoring Program (AEMP) under the Water Licence. In 2018, the Cycle 1 EEM biological monitoring was conducted concurrently with the AEMP.

1.1 Background

1.1.1 EEM

The MDMER permits the deposit of mine effluent under certain conditions: 1) the effluent pH must be within a defined range, 2) the concentrations of deleterious substances must not exceed authorized limits as defined in the MDMER, and 3) the effluent must not be acutely lethal to rainbow trout. Mines that are subject to the MDMER are required to conduct EEM studies, the results of which are used by Environment and Climate Change Canada (ECCC) to assess the effectiveness of the effluent regulations by evaluating effects on fish, fish habitat, and use of fisheries resources by humans.

Effluent was discharged to Meliadine Lake from August to October 2016 during the dewatering of Lake H17, which triggered the Mine to be subject to the MDMER due to the volume of dewatering effluent discharged (i.e., more than 50 m^3/day). This discharge occurred through the discharge point MEL-D-1 into Meliadine Lake. The dewatering infrastructure was dismantled in October 2016 and a new diffuser was constructed in 2017 at a different location on Meliadine Lake, which will function as the permanent discharge structure for effluent discharge from the Mine. As per the MDMER, the first EEM study design was submitted to ECCC in August 2017, with the intention of conducting the required biological monitoring studies in August 2018 (Golder 2017a). Biological study components included benthic invertebrate community (BIC) survey and fish population survey, with supporting water and sediment quality.

1.1.2 AEMP

The AEMP is an annual requirement of the Type A Water Licence (2AM-MEL-1631; NWB 2016) and has been designed to function as an integrated monitoring program, which considers pathways to potential effects of the Mine on the aquatic environment (Golder 2016a). The AEMP was developed through consultation with communities, stakeholders, and regulatory authorities, and includes incorporation of Inuit Qaujimajatuqangit (IQ), plus scientific knowledge of aquatic ecosystems. The AEMP design incorporates EEM requirements of the MDMER throughout the life of the Mine, with supplemental components included to fulfill the additional conditions and requirements of the Water Licence (NWB 2016). The AEMP considers changes in surface water quality, sediment quality, lower trophic communities, fish habitat, and fish health due to release of Mine water, physical alteration of watersheds, and air emissions during construction, operations, and closure. The AEMP was also designed to provide an early warning system, whereby the results of aquatic monitoring are used to reduce or

prevent adverse environmental effects through a Response Framework and evaluation of the monitoring program at regular intervals.

As per the AEMP Design Plan, water quality monitoring in Meliadine Lake and the Peninsula lakes is an annual program, and monitoring of sediment quality, BIC, and fish health and fish tissue has been moved to the EEM schedule, because pre-operations data have been collected. The 2018 study components included water quality in Meliadine Lake and selected peninsula lakes (i.e., Lakes A8, B7, and D7), and sediment quality and BIC in Meliadine Lake. A special study on plankton was also conducted in Meliadine Lake to continue evaluating the usefulness of plankton as a monitoring tool for the AEMP.

480000 500000 520000 540000 560000 580000

7040000 7020000 7000000 6980000 6960000

Diana River
Peter Lake
Meliadine Lake
Meliadine Lake
Parallel Lake
Mine Location
Meliadine River
Little Meliadine Lake (LML)
Char River
Thompson
Dry Cove
Atulik
Rankin Inlet
Rankin Inlet
Rankin Inlet
Hudson Bay

LEGEND

- DIRECTION OF FLOW AT WATERSHED OUTLET
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- TERRITORIAL PARK
- WATERCOURSE
- WATERBODY



0 8 16
1:400,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED
AGNICO EAGLE

PROJECT
CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE
LOCATION OF THE MELIADINE GOLD MINE

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	JN
PREPARED	MH
REVIEWED	RS
APPROVED	RS

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1.2 Objectives

The focus of this report is to evaluate the effects of the Mine on the aquatic receiving environment in Meliadine Lake under the current Water Licence 2AM-MEL-1631 (NWB 2016).

1.2.1 EEM

The original objective of the Cycle 1 EEM study was to assess the effect of the dewatering discharge form Lake H17 on the BIC and fish population health in Meliadine Lake. As such, the Cycle 1 EEM Study Design proposed that the exposure area for the EEM be located within the vicinity of MEL-D-1 (Golder 2017a). In their comments on the study design, ECCC recommended that the exposure area be relocated to assess the effects of the mine effluent discharge from the permanent discharge point (MEL-14) instead of the dewatering discharge (ECCC 2018). This recommendation considered that dewatering discharge from MEL-D-1 would have occurred two years before the 2018 biological monitoring study and that the effluent discharged from MEL-14 starting in 2018 would be a more concentrated effluent with a higher potential for adverse effects on the receiving environment. Therefore, the EEM Near-field exposure area was relocated to better capture the effects of effluent release from MEL-14 and is aligned with the AEMP Near-field area.

The Cycle 1 EEM study design was reviewed by the Technical Advisory Panel (TAP), which consisted of representatives from ECCC, Nunavut Water Board (NWB), and Indigenous and Northern Affairs Canada (INAC). Other recommendations and requirements identified by the TAP following their review of the Cycle 1 EEM study design (ECCC 2018) were addressed and incorporated into the Cycle 1 EEM Study and into this first interpretative report.

This report presents the results of the Cycle 1 EEM study, which consisted of the following components:

- effluent and water quality monitoring
- effluent sublethal toxicity testing
- a BIC survey
- a lethal small-bodied fish survey

In addition to describing the methods and results of each of the EEM study components, this report provides an interpretation of those results with regards to potentially Mine-related effects. The study design (Golder 2017a) and the implementation of the field survey and data analysis followed, where appropriate, the guidance and recommendations provided in the Metal Mining EEM Technical Guidance Document (TGD; Environment Canada 2012).

1.2.2 AEMP

The overall objective of the AEMP is to assess potential Mine-related effects on the aquatic ecosystem and to meet regulatory requirements outlined in the Type A Water Licence (2AM-MEL1631; NWB 2016) while also meeting commitments made during the environmental permitting process (see Table 1-1 in the AEMP Design Plan [Golder 2016a]). In addition, the AEMP was designed to meet the MDMER requirements.

The specific objectives of the AEMP for the Mine are as follows:

- to determine the short- and long-term effects of the Mine on the aquatic receiving environment;

- to evaluate the accuracy of predictions made in the Final Environmental Impact Statement (FEIS; Golder 2014a), including the final significance statements regarding impact to the aquatic ecosystem;
- to assess the efficacy of planned mitigation incorporated into the Project design; and
- to collect data required to identify the need for potential additional mitigation of Project effects within a management response framework.

The specific objectives of this report were to document 2018 data collection and detailed analyses for the core components of the AEMP that were sampled in 2018 (i.e., water quality, sediment quality, and BIC), and to present the findings of the special study on plankton community monitoring. This report also includes a comparison of previous data collected during the construction phase of the Mine (2015 through 2017). Recommendations and requirements identified by ECCC, INAC, and Kivalliq Inuit Association (KIA) following their review of the 2017 AEMP Annual Report were addressed and incorporated into the the 2018 AEMP study and this report.

1.3 Structure of Report

This report presents the results of both the Cycle 1 EEM and the 2018 annual AEMP. This combined EEM/AEMP report also includes an updated summary of data collected in 2015 to 2017 for water quality. The document is organized as follows:

- Executive Summary
- Acknowledgements
- Introduction (Section 1)
- Site Characterization (Section 2)
- Summary of Previous Biological Monitoring Studies (Section 3)
- Study Design Overview (Section 4)
- Supporting Environmental Data (Section 5)
- Water Quality – Meliadine Lake (Section 6)
- Water Quality – Peninsula Lakes (Section 7)
- Sediment Quality (Section 8)
- Benthic Invertebrate Community (Section 9)
- Fish Health (Section 10)
- Plankton Targeted Study (Section 11)
- Overall Summary and Conclusions (Section 12)

1.4 Concordance Table

The report was designed to clearly address the reporting requirements of both the EEM and the AEMP. To failitate the review process, a concordance table is provided to cross-reference EEM requirements and AEMP commitments with the appropriate report section number (Table 1.4-1).

Table 1.4-1: Concordance Table of EEM Requirements or AEMP Commitments

Item No.	EEM Requirement or AEMP Commitment	2018 EEM/AEMP Combined Report Section No.
EEM Requirement[(a)]		
12(1)(a)	a description of any deviation from the study design that occurred while the biological monitoring studies were being conducted and any impact that the deviation had on the studies;	Study Design Overview, Section 4.1, Table 4.1-1 Water Quality, Section 6.2.1 Sediment Quality, Section 8.2.1 Benthic Invertebrate Community, Section 9.2.1 Fish Health, Section 10.2
12(1)(b)	the latitude and longitude of sampling areas and a description of the sampling areas sufficient to identify the location of the sampling areas;	Site Characterization, Section 2.5, Table 2.5-1 Water Quality, Section 6.2.2.1, Table 6.2-1 Sediment Quality, Section 8.2.2.1, Table 8.2-1 Benthic Invertebrate Community, Section 9.2.1, Table 9.2-1 Fish Health, Appendix 10A
12(1)(c)	the dates and times when samples were collected;	Water Quality, Table 6.2-1, Appendix 6D Sediment Quality, Table 8.2-1, Appendix 8B Benthic Invertebrate Community, Table 9-1 Fish Health, Appendix 10A
12(1)(d)	the sample sizes;	Water Quality, Section 6.4.2.1, Table 6.4-3 and Table 6.4-5 Sediment Quality, Section 8.4.2.1, Table 8.4-5 Benthic Invertebrate Community, Section 9.2.2 Fish Health, Sections 10.4.2 and 10.4.3
12(1)(e)	the mean, median, standard deviation, standard error and minimum and maximum values in the sampling areas	Water Quality, Section 6.4.2.1, Table 6.4-3 and Table 6.4-5 Sediment Quality, Table 8.4-5 Benthic Invertebrate Community, Appendix 9D Fish Health, Table 10.4-3 and 10.4-6
12(1)(e)(i)	in the case of the study respecting fish population, effect indicators of growth, reproduction, condition and survival that include, if practicable, the length, total body weight and age of the fish, the weight of its liver or hepatopancreas and, if the fish are sexually mature, the egg weight, fecundity and gonad weight of the fish	Fish Health, Table 10.4-3 and 10.4-6

Table 1.4-1: Concordance Table of EEM Requirements or AEMP Commitments

Item No.	EEM Requirement or AEMP Commitment	2018 EEM/AEMP Combined Report Section No.
12(1)(e)(ii)	in the case of the study respecting the benthic invertebrate community, effect indicators of the total benthic invertebrate density, evenness index, taxa richness and, if the study is conducted in an area where it is possible to sample sediment, total organic carbon content of sediment and particle size distribution of sediment	Benthic Invertebrate Community, Appendix 9D
12(1)(e)(iii)	in the case of the study respecting fish tissue mercury, the effect indicator of the concentration of total mercury (wet weight) in the fish tissue	Not applicable. See Study Design Overview, Section 4.1
12(1)(e)(iv)	in the case of the study respecting fish tissue selenium, the concentration — in the muscle or whole body and, if practicable, in the ovaries or eggs — of total selenium (dry weight) reported in µg/g and the percentage of the moisture content of the sample	Not applicable. See Study Design Overview, Section 4.1
12(1)(f)	in the case of the study respecting the benthic invertebrate community, a calculation of the similarity index effect indicator	Benthic Invertebrate Community, Table 9-5 and Appendix 9D
12(1)(g)	an identification of the sex of the fish sampled and of the presence of any lesions, tumours, parasites or other abnormalities and, in the case of the study respecting fish tissue selenium, the type of fish tissue studied and the scientific rationale for the selection of that tissue	Fish Health, Appendix 10B, Table 10B-3 and Table 10B-5
12(1)(h)	a determination as to whether there is a statistically significant difference between the sampling areas for the calculations under subparagraphs (e)(i) to (iii) and paragraph (f) taking into consideration the information identified under paragraph (g), with the statistical comparison made separately and independently for each effect indicator	Benthic Invertebrate Community, Table 9-6 Fish Health, Section 10.4, Table 10.4-4 and Table 10.4-7
12(1)(i)	a statistical analysis of the results of the calculations under subparagraphs (e)(i) to (iii) and paragraph (g) that indicates the probability of correctly detecting an effect of a pre-defined size and the degree of confidence that can be placed in the calculations	Benthic Invertebrate Community, Table 9-5 Fish Health, Section 10.4, Table 10.4-4 and Table 10.4-7
12(1)(j)	for an effect indicator referred to in paragraph (e) with an assigned critical effect size, a comparison of the magnitude of the effect — calculated in accordance with subsection (2) or (3), as the case may be — to its critical effect size	Benthic Invertebrate Community, Table 9-5 Fish Health, Section 10.4, Table 10.4-4 and Table 10.4-7

Table 1.4-1: Concordance Table of EEM Requirements or AEMP Commitments

Item No.	EEM Requirement or AEMP Commitment	2018 EEM/AEMP Combined Report Section No.
12(1)(k)	any supporting data, including raw data, for the information provided under paragraphs (e) to (j)	Benthic Invertebrate Community, Section 9.4.1, Section 9.4.2.1, and Appendix 9D Fish Health, Appendix 10A, Appendix 10B
12(1)(l)	a description of any quality assurance or quality control measures that were implemented and the data related to the implementation of those measures	Water Quality, Section 6.3, Appendix 6A Sediment Quality, Section 8.3, Appendix 8A Benthic Invertebrate Community, Section 9.3 and Appendix 9C Fish Health, Section 10.3 and Appendix 10B
12(1)(m)	based on the information referred to in paragraphs (e) to (k), the identification of	-
12(1)(m)(i)	any effect on the fish population	Fish Health, Section 10.5, Table 10.5-1 and Table 10.5-2
12(1)(m)(ii)	any effect on the benthic invertebrate community	Benthic Invertebrate Community, Section 9.4.2.1, Section 9.5.1 and Appendix 9D
12(1)(m)(iii)	any effect on fish tissue from mercury	Not applicable. See Study Design Overview, Section 4.1
12(1)(n)	for an effect indicator with an assigned critical effect size, a statement as to whether the absolute value of the magnitude of the effect is equal to or greater than the absolute value of its critical effect size	Benthic Invertebrate Community, not applicable, Table 9-5 Fish Health, not applicable, Section 10.5
12(1)(o)	a summary of the results of effluent characterization, sublethal toxicity testing and water quality monitoring reported under paragraph 8(e) beginning on the day on which the mine becomes subject to section 7 of these Regulations	Overall Summary and Conclusions, Section 12.1
12(1)(p)	the conclusions of the biological monitoring studies, and a description of how those conclusions will impact the study design for subsequent biological monitoring studies, taking into account	Overall Summary and Conclusions, Section 12.1
12(1)(p)(i)	the results of any studies referred to in paragraph 10(f)	Summary of Previous Biological Monitoring Studies, Section 3.0
12(1)(p)(ii)	the presence of anthropogenic, natural or other factors that are not related to the effluent under study and that may reasonably be expected to contribute to any observed effect	Site Characterization, Section 2.6
12(1)(p)(iii)	the results of the statistical analysis conducted under paragraphs (h) and (i)	Benthic Invertebrate Community, Table 9-5 and Table 9-6 Fish Health, Section 10.4, Table 10.4-4 and Table 10.4-7

Table 1.4-1: Concordance Table of EEM Requirements or AEMP Commitments

Item No.	EEM Requirement or AEMP Commitment	2018 EEM/AEMP Combined Report Section No.
12(1)(p)(iv)	the data referred to in paragraph (l)	Water Quality, Appendix 6A Sediment Quality, Appendix 8A Benthic Invertebrate Community, Appendix 9C Fish Health, Appendix 10B
12(1)(q)	the month in which the next biological monitoring studies will start, if any biological monitoring studies are required	Overall Summary and Conclusions, Section 12.3.1
12(1)(r)	the date when the next interpretative report is required to be submitted or would be required to be submitted but for the application of subsection 16(3)	Overall Summary and Conclusions, Section 12.3.1
12(2)	For the purpose of the study respecting fish population, the magnitude of the effect for an effect indicator is to be calculated using the following formula: (A – B)/B × 100 where A is (a) for the purpose of the age indicator, the mean value for the indicator in the exposure area, and (b) for the purpose of the indicators other than age, the adjusted mean value — obtained using the analysis of covariance (ANCOVA) statistical test method — for the indicator in the exposure area; and B is (a) for the purpose of the age indicator, the mean value for the indicator in the reference area, and (b) for the purpose of the indicators other than age, the adjusted mean value — obtained using the analysis of covariance (ANCOVA) statistical test method — for the indicator in the reference area.	Fish Health, Section 10.2.6

Table 1.4-1: Concordance Table of EEM Requirements or AEMP Commitments

Item No.	EEM Requirement or AEMP Commitment	2018 EEM/AEMP Combined Report Section No.
12(3)	For the purposes of the study respecting the benthic invertebrate community, the magnitude of the effect for an effect indicator is to be calculated using the following formula: (A – B)/C where A is the mean value for the indicator in the exposure area; B is the mean value for the indicator in the reference area; and C is the standard deviation for the indicator in the reference area.	Benthic Invertebrate Community, Section 9.2.4.5.2 and Table 9-5
AEMP Commitment[(b)]		
KIA 18 and 26	For the 2018 AEMP Annual Report, baseline and pre-construction statistics will be recalculated for the Near-field area, open-water conditions, using data from 2015 and 2016 only; statistics for the other areas will not be recalculated as all data used represent baseline conditions.	Water Quality, Appendix 6H
KIA 19	For the 2018 AEMP Annual Report, data from 1997, 1998, and 2008 will be reviewed and it will be determined if they should be included in the calculation of Normal Ranges of open-water and under-ice conditions in Meliadine Lake.	Water Quality, Appendix 6B
KIA 24	Action levels and the response framework will be provided in the 2018 AEMP Annual Report, based on the results of the 2017 AEMP Annual Report as the program moves from pre-construction to construction.	AEMP Action Level Assessment, Section 12.2
KIA 27	In 2018, updates will be made to the AEMP Design Plan with refined Action Levels (using baseline and pre-construction data) and a response framework. Data collected in 2018, the first full year of the Construction Phase, will be compared to these Action Levels, and the ecological relevance of each triggered parameter, if appropriate, will be discussed.	AEMP Action Level Assessment, Section 12.2
KIA 29	In the event that nutrient enrichment triggering a low Action Level is detected in 2018, and is attributed to effluent discharge from the diffuser, a response plan will be prepared during the appropriate time frame following the 2018 Annual Report.	AEMP Action Level Assessment, Section 12.2

Table 1.4-1: Concordance Table of EEM Requirements or AEMP Commitments

Item No.	EEM Requirement or AEMP Commitment	2018 EEM/AEMP Combined Report Section No.
INAC	INAC recommends that the annual report include a summary and discussion of the relevant AEMP results. Agnico Eagle committed to including a summary of the 2018 AEMP Annual Report findings within the annual report.	Executive Summary
ECCC 6	ECCC recommends that the Proponent identify reference areas with similar substrate to the Near-field exposure area. Agnico Eagle committed to providing the results of the 2018 sediment reconnaissance survey and the adjusted sediment sampling locations in the 2018 AEMP Annual Report.	Sediment Quality, Section 8.2.1 Benthic Invertebrate Community, Appendix 9A and Section 9.2.1
ECCC 7	Magnitude and direction of statistically significant differences between exposure and reference areas will be included in future reports when statistical results are presented.	Water Quality, Section 6.4.2.1.2, Table 6.4-3 and 6.4-4 Sediment Quality, Section 8.4.2.2, Table 8.4-6 Benthic Invertebrate Community, Table 9-5
ECCC 8	Normal Ranges will be recalculated and presented in the 2018 AEMP Annual Report. Inclusion of pre-2017 data from the Near-field exposure area in the calculation of the Normal Ranges will be evaluated and data will be excluded if determined to be different from reference area data.	Water Quality, Section 6.4.3 Sediment Quality, Section 8.4.4 Benthic Invertebrate Community, Section 9.2.4.4
ECCC 11	Further analysis of the water chemistry data for the pre-construction and construction phases will be completed for the 2018 AEMP Annual Report, and differences between areas and between mine phases will be identified, if any, and addressed in the 2018 report.	Water Quality, Section 6.4.5
ECCC 13	The magnitude of the difference in grain-size adjusted metal concentrations in sediment will be clarified in the 2018 AEMP Annual Report.	Sediment Quality, Section 8.4.2.2, Table 8.4-6
ECCC 14	The 2018 AEMP Annual Report will clarify what sediment data are included and excluded from the statistical analysis.	Sediment Quality, Section 8.4.2.2 and Appendix 8F
ECCC 17	ECCC recommends that the Proponent consider multivariate methods to assess the Bray-Curtis Index. NMDS multivariate analysis was used in the 2017 AEMP Annual Report and has been widely used in northern mining programs but following review of the 2018 benthic and supporting data, other methods, where appropriate, could be considered.	Benthic Invertebrate Community, Section 9.2.4.5.4
ECCC 19	Subsampling precision in the benthic invertebrate community samples will be evaluated in the 2018 AEMP Annual Report.	Benthic Invertebrate Community, Section 9.2.3 and Appendix 9B

Table 1.4-1: Concordance Table of EEM Requirements or AEMP Commitments

Item No.	EEM Requirement or AEMP Commitment	2018 EEM/AEMP Combined Report Section No.
ECCC 22	To support wholistic interpretations of fish tissue chemistry, a review of supporting data will be completed in future reports.	Not applicable – fish tissue chemistry was not collected this year
ECCC 24	The results for the plume delineation study will be incorporated into the discussion for the 2018 AEMP Annual Report.	Site Characterization, Section 2.5.3

a) Requirements for the first interpretative report as per the MDMER Schedule 5, Section 12.

b) Commitments made in response to comments made by reviewers on the 2017 AEMP Annual Report. References to the original comment are provided in the first column.

AEMP = Aquatic Effects Monitoring Program; EEM = Environmental Effects Monitoring; MDMER = Metal and Diamond Mining Effluent Regulations; No. = number.

1.5 References

Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. National EEM Office, Ottawa, ON, Canada.

Environment and Climate Change Canada (ECCC). 2018. Metal Mining Effluent Regulations – Evaluation of 1st Environmental Effects Monitoring Study Design, Meliadine Gold Mine, NU. April 2018.

Golder 2014a. Final Environmental Impact Statement, Meliadine Gold Project. Nunavut. April 2017.

Golder. 2016b. Meliadine Gold Project, Nunavut. Aquatic Effects Monitoring Program (AEMP) Design Plan 6513-REP-03 Version 1. Prepared for Agnico Eagle Mines Limited, Rouyn Noranda, Quebec.

Golder 2017a. EEM Cycle 1 Study Design: Meliadine Gold Mine. Prepared for Agnico Eagle Mines Limited., Meliadine Division, Rankin Inlet, Nunavut. Document Number Doc635-1781142. August 2017.

Government of Canada. 2018. Metal and Diamond Mining Effluent Regulations. SOR/2002-222; current to 12 December 2018

NWB. 2016. Type A Water Licence No: 2AM-MEL1631. April 2016.

2.0 SITE CHARACTERIZATION

2.1 Environmental Setting

The Mine is located in the Kivalliq Region of Nunavut, near the western shore of Hudson Bay, Canada. Continuous permafrost underlies the ground surface and the terrain is gently rolling with a mean elevation of 65 m above sea level. Drumlins (i.e., glacial till) and eskers (i.e., gravel and sand) are among the dominant land forms within the region. The climate is characterized by long, cold winters and short, cool summers. Total annual precipitation is less than (<) 30 cm and strong winds are prevalent due to the openness of the landscape.

Given that low lying areas are poorly drained, the landscape is characterized by a series of interconnected shallow ponds and lakes. Local watersheds include Meliadine Lake and the Chickenhead and Control sub-watersheds that drain to Meliadine Lake, Meliadine River, and several smaller watersheds. Aquatic habitats support a variety of fish species, including Arctic char (*Salvelinus alpinus*), Arctic grayling (*Thymallus arcticus*), Burbot (*Lota lota*), Cisco (*Coregonus clupeaformis*), Lake trout (*Salvelinus namaycush*), Ninespine stickleback (*Pungitius pungitius*), Round whitefish (*Prosopium cylindraceum*), Slimy Sculpin (*Cottus cognatus*), and Threespine stickleback (*Gasterosteus aculeatus*). Dominant benthic invertebrates previously documented in Meliadine Lake include insects (mostly midges [Chironomidae]), mollusks (fingernail clams [Pisidiidae]), aquatic worms (Oligochaeta), and amphipods (shrimp-like crustaceans) (Golder 2013b).

The region supports some of Canada's largest caribou (*Rangifer tarandus groenlandicus*) herds during the calving season and summer, including the Qamanirjuaq Caribou Herd, which is an important food source for the Inuit. Carnivores such as gray wolf (*Canis lupis*) and polar bear (*Ursus maritimus*) are also found in the region, as are nesting and breeding migratory birds. Protected areas of the Kivalliq region include Arvia'juaq and Qikiqtaarjuk National Historic Site of Canada, East Bay Migratory Bird Sanctuary, Fall Caribou Crossing National Historic Site of Canada, Harry Gibbons Migratory Bird Sanctuary, Iqalugaarjuup Nunanga Territorial Park, Inuujarvik Territorial Park, McConnell River Migratory Bird Sanctuary, and part of the Thelon Wildlife Sanctuary.

Over 80% of the human population in the Kivalliq Region is Inuit. The area is sparsely populated, and the local economy is dependent on subsistence hunting, trapping, and fishing. Other activities in the area include mineral exploration, mining, construction, tourism, and government services.

2.1.1 Meliadine Lake

Meliadine Lake has a water surface area of approximately 107 km^2, a maximum length of 31 km. The lake features a highly convoluted shoreline and has 243 islands (Golder 2014a). Unlike most lakes, Meliadine Lake has two outflows that drain into Hudson Bay through two separate river systems (Figure 1.1-1). It has a drainage area of 560 km^2 upstream of its two outflows. The majority of drainage occurs via the Meliadine River, which originates at the southwest end of the lake. The Meliadine River flows for a total stream distance of 39 km through a series of waterbodies, until it reaches Little Meliadine Lake and then continues to flow to Hudson Bay. The second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Meliadine Lake has a long shoreline perimeter of 465 km (Golder 2014a). Meliadine Lake consists of three sub-basins: east, south, and west (Figure 2.5-1). The east basin of Meliadine Lake is 2,212 ha and contributes approximately 21% to the entire area of the lake. It is separated from the rest of the lake by a shallow and narrow area (up to 2.3 m deep, 100 to 300 m wide, and 800 m long) that features numerous rocky islands and reefs.

This constriction may result in isolation of the east basin from the rest of the lake during winter, which may limit movement of fish (Golder 2014a). The west basin, which contains proposed Reference Areas 1 and 2, represents approximately 68% of the lake area and connects the east and south basins. The south basin of Meliadine Lake is 1,135 ha and contributes approximately 11% to the entire lake area (Golder 2014a). The southeast end of the south basin is generally shallow (less than 4 m deep), and the northwest sections feature more extensive areas of water deeper than 8 m.

More than one third of Meliadine Lake volume is contributed by lake areas that are less than 2 m in depth, which indicates a considerable reduction in lake volume and overwintering potential during winter. Owing to the long shoreline perimeter and the shallow nature of the basins, the littoral zones (i.e., areas less than 6 m in depth) contribute approximately 66% and 72% of the east and south basins, respectively (Golder 2014a).

Substrate in Meliadine Lake is characterized by coarse materials, consisting of a boulder/cobble mix along the shallow areas close to shore. Transition areas, consisting of fine organic materials interspersed among cobble are common throughout most of the lake. Substrates within the deep sections of the lake are composed primarily of fine particulate organic material and silt (Golder 2014a).

2.1.2 Peninsula Lakes

Several small watersheds drain to Meliadine Lake from the peninsula between the south and east basins of Meliadine Lake. These peninsula watersheds comprise an extensive network of lakes, ponds, and interconnecting streams. The lakes within the peninsula are generally small (<90 ha in area) and shallow (between 2 and 5 m in maximum depth). They do not freeze to the bottom. They are connected to each other (and to Meliadine Lake) through short stream sections; however, they can often be isolated by limited flow during the summer/fall and frozen stream conditions during the winter.

Three peninsula lakes were selected for water quality monitoring as part of the AEMP: Lake A8, Lake B7, and Lake D7. These are headwater lakes in three different peninsula watersheds and are located close to the Mine footprint. Two of the lakes (Lakes B7 and D7) were previously fished by the Inuit during the winter (pers. comm. Wesley from Rankin Inlet Hunters and Trappers Organization). Some morphological characteristics of these peninsula lakes are provided in Table 2.1-1.

Table 2.1-1: Morphological Characteristics of AEMP Peninsula Lakes

Lake	Surface Area (ha)	Volume ($m^3 \times 10^3$)	Depth (m)		Total Shoreline Length (km)
			Mean	Maximum	
A8	89.7	1,419.3	1.6	4.2	7.5
B7	58.1	852.5	1.5	5.1	5.5[(a)]
D7	72.5	1,183.4	2.8	5.2	5.2

Source: Golder. 2009. Aquatic Baseline Synthesis Report.

(a) Includes shoreline length around two islands.

2.2 Mine Description and Summary of Activities from 2018

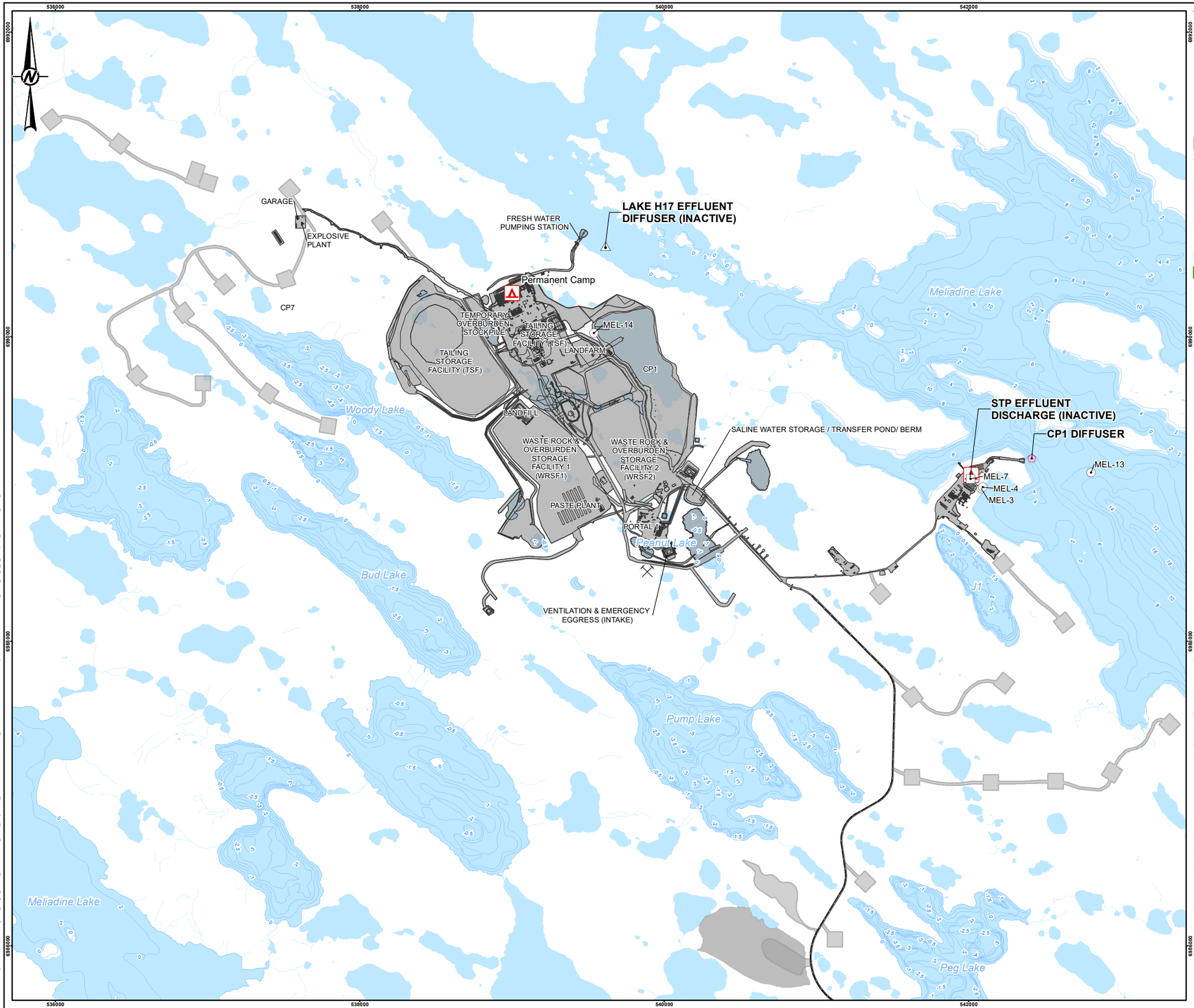
The Mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine (Figure 2.2-1). The Mine is expected to produce approximately 14.9 million tonnes (Mt) of ore. The produced ore will be milled over approximately eight years of Mine life at a rate of 3,000 tonnes per day (tpd) in Year 1 to Year 3 and 5,000 tpd in Year 4 to Year 8. Of the total 14.9 Mt of tailings produced, about 10.9 Mt of tailings will be placed in the tailings storage facility as dry stack tailings, while the remaining 4.0 Mt will be backfilled to the underground mine as cemented paste backfill. Approximately 31.4 Mt of waste rock will be mined from the open pits and underground mine operations. Approximately 7.1 Mt of overburden will be produced.

The four development phases of Tiriganiaq gold deposit include three and a half years of construction (Q4 Year-5 to Q2 Year-1), eight and a half years mine operation (Q2 Year 1 to Year 8), three years closure (Year 9 to Year 11), and post-closure (Year 11 forward; Agnico Eagle 2015; Table 2.2-1). Pre-construction activities were completed at the Mine between January 2015 and June 2017, and construction activities were initiated in July 2017 (Table 2.2-1).

Table 2.2-1: Timelines of Mine Phases

Mine Phase	Planned Timelines	Total Time (years)
Pre-construction	Beginning of Q1 2015 to end of Q3 2017	2.5
Construction	Beginning of Q3 2017 to end of Q4 2020	3.5
Operation	Q2 2019 to Q4 2027	8.5
Closure	Q4 2027 to Q4 2030	3.0
Post-Closure	Q4 2030 - Forward	-

Notes: Q = calendar quarter where Q1 = January, February, March; Q2 = April, May, June; Q3 = July, August, September; and Q4 = October, November, December.



LEGEND

- LAKE H17 EFFLUENT DIFFUSER (INACTIVE)
- STP EFFLUENT DISCHARGE (INACTIVE)
- CP1 DIFFUSER
- WATER QUALITY STATION
- CAMP
- PROPOSED MINE SITE
- MINE FOOTPRINT
- PROJECT INFRASTRUCTURE
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- RANKIN INLET
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK



0 500 1,000

1:25,000 METRES

NOTE(S)

1. TSF, WRSF1, WRSF2, CP1 ARE THE MAXIMUM EXTENT UNDER THE APPROVED MINE PLAN AND DO NOT REPRESENT SIZE IN 2018.
2. BORROW PIT B1A IS EXCLUDED AND IS NOT ILLUSTRATED IN THE CURRENT FOOTPRINT.
3.. THE PROPOSED MINE PLAN INCLUDES TIRIGANIAQ PIT 1, TIRIGANIAQ PIT 2, AND WASTE ROCK STORAGE FACILITY 3 (WRSF3) AND ASSOCIATED INFRASTRUCTURE; THESE ITEMS HAVE NOT BEEN CONSTRUCTED YET (AS OF THE END OF 2018) AND THEREFORE WERE NOT INCLUDED ON THIS MAP

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE LIMITED.
2. DATUM: NAD83 PROJECTION: UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

PROJECT

CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE

FOOTPRINT OF MELIADINE GOLD MINE

CONSULTANT

GOLDER

YYYY-MM-DD	2019-03-27
DESIGNED	KB
PREPARED	MH
REVIEWED	CD
APPROVED	CD

PROJECT NO.	CONTROL	REV.	FIGURE
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Water management activities that occurred in 2018 included transporting treated sewage effluent to CP1 (starting in November 2017), and initiation of mine effluent discharge through the CP1 diffuser to Meliadine Lake in June 2018. Water quality monitoring associated with the final discharge point MEL-14 and the receiving environment station above the CP1 diffuser (i.e., MEL-13) was conducted during the discharge period (Figure 2.2-1). Water from landfarm A was treated with an oil/water separator; oil was disposed of as hazardous material and water was sent to CP1. While landfarm B contains material, no additional material was added in 2018. Water from landfarm B was also treated with an oil/water separator; oil was disposed of as hazardous material and water was sent to P1. The design report for the freshwater intake was submitted on June 8, 2018 and approved on July 5, 2018 (Tetra Tech 2017). In-water works associated with the freshwater intake causeway did not occur during the open water season of 2018; all work for the water intake occurred on ice.

Water quality monitoring outside of the EEM program and the AEMP occurs at Meliadine Lake as part of the requirements under MDMER and the WL. The MDMER requires monthly effluent discharge volume and loadings, weekly effluent monitoring of deleterious substances and pH, monthly acute lethality testing of effluent, expanded effluent characterization concurrently with the biannual sublethal toxicity testing, and quarterly surface water quality monitoring in an exposure and reference area. The data are provided in an annual MDMER report to ECCC by 31 March of each year. The monitoring stations are described in Table 2.2-1. The WL requires water quality monitoring at several locations related to dewatering discharge, freshwater intake, water treatment plant discharge, seepage, and receiving environment monitoring (Table 2.2-1). The data are provided in an annual report to the NWB by 31 March of each year. Note that this EEM/AEMP report focuses on monitoring conducted at the EEM and AEMP exposure and reference areas; see Section 2.5 for a description of these areas.

Table 2.2-2: Overview of 2018 Monitoring Stations at Meliadine Gold Mine

Monitoring Station	Description	Reporting Requirement
MEL-14	Effluent from the water treatment plant (post-treatment = water prior to discharge to the receiving environment)	MDMER and WL
MEL-13	Surface water quality monitoring location in the exposure area in Meliadine Lake	MDMER and WL
MEL-03-01	Surface water quality monitoring location in the reference area	MDMER
MEL-1	Raw water supply intake at Meliadine Lake for the exploration camp (only intake volume is monitored)	WL
MEL-2	Raw water supply intake at Pump, A8, or other Lakes (only intake volume is monitored)	WL
MEL-7	Treated sewage effluent from exploration camp	WL
MEL-11	Water intake from Meliadine Lake	WL
MEL-12	Influent from water treatment plant (pre-treatment = water coming from CP1)	WL
MEL-15	Lake E2 located west of the Mine site	WL
MEL-16	Lake G2 located northwest of the Mine site	WL
MEL-17	Lake H1 located east of the Mine site	WL
MEL-18	Lake B5 located southwest of the Mine site	WL
MEL-19	CP2, which is a pond that collects natural catchment drainage from the outer berm slopes of the landfarm and industrial pad. No sample collected in 2018 because no water accumulated in this pond in 2018.	WL
MEL-20	Lake B28, which will become CP3 once construction is completed. CP-3 will collect drainage from dry stacked tailings located west of the Mine site.	WL

Table 2.2-2: Overview of 2018 Monitoring Stations at Meliadine Gold Mine

Monitoring Station	Description	Reporting Requirement
MEL-21	Lake B8, which will become CP4 once construction is completed. CP-4 will collect drainage from the WRSF1 located west of the Mine site.	WL
MEL-22	CP5, which was previously Lake A54 and is now a collection pond consisting of drainage from WRSF1 and WRSF2. Located south of the Mine site.	WL
MEL-23	Lake H19, which will become CP6 once construction is completed. CP-4 will collect drainage from the WRSF3 located east of the Mine site.	WL
MEL-24	Seepage from the landfill between the landfill and Pond H3, as well as drainage from other nearby areas.	WL
MEL-25	Secondary containment area at the Itivia Site Fuel Storage and Containment Facility.	WL

WRSF = Waste Rock Storage Facility.

2.3 Interactions with the Aquatic Environment

The Project will interact with the aquatic environment throughout all phases of Mine development through the following pathways:

- the release of treated effluent;
- the release of air emissions (i.e., acidifying emissions, dust, and associated metals);
- the alteration of natural watersheds;
- potential accidental seepage and spills; and
- Influence from underground workings.

Project components specific to the Peninsula Lakes that may affect the aquatic environment include the altering watersheds through dewatering operations, diverting natural drainage paths, constructing new drainage channels, and changing the water balance.

2.4 Treated Mine Effluent

Mine effluent discharge to the receiving environment of Meliadine Lake is permitted under Type A Water Licence 2AM-MEL1631 (NWB 2016). Mine effluent consists of treated effluent from CP1. CP1 receives water from surface runoff from the project footprint and from another surface water runoff collection pond, CP5. Water from CP5 is highly saline and is treated to reduce dissolved solids by reverse osmosis (RO) membrane treatment prior to transferring to CP1. Prior to discharge into Meliadine Lake, water from CP1 is treated at the Effluent Water Treatment Plant (EWTP) with ActiFlow treatment. Treated effluent is discharged to Meliadine Lake through a permanent diffuser (CP1 diffuser; Figure 2.2-1) located in the AEMP Near-field area. MEL-14 is the final point of control for the treated effluent and is the effluent compliance point (Figure 2.2-1). MEL-13 is the receiving environment monitoring station that is located directly above the diffuser (Figure 2.2-1).

2.4.1 Discharge Volume

Effluent was discharged daily from the EWTP into Meliadine Lake from June to September 2018 (Table 2.4-1). A total volume of 642,521 m^3 was discharged into Meliadine Lake through MEL-14 during the 75-day discharge period (June 21 to September 3) (Appendix 2A).

Table 2.4-1: Monthly Discharge Volume into Meliadine Lake from MEL-14 in 2018

Month	Total Volume (m^3)
June	134,272
July	352,551
August	153,066
September	2,632
Total	**642,521**

2.4.2 Effluent Quality

Samples for effluent chemistry and toxicity were collected at the last point of control (i.e., MEL-14). Water quality was also collected in the receiving environment directly above the CP1 diffuser (i.e., at MEL-13 within the mixing zone). Additional details on monitoring at MEL-14 and MEL-13 are described in the Water Management Plan (Agnico Eagle 2016).

2.4.2.1 Chemistry

Discharge limits must be achieved to maintain compliance with the Type A Water Licence (2AM-MEL1631; NWB 2016) and the MDMER (Government of Canada 2018).

As per Part F, Item 3 of the Water Licence (NWB 2016), the discharge of effluent from the final discharge point at monitoring program station MEL-14 shall be directed to Meliadine Lake through the Meliadine Lake outfall diffuser (i.e., CP1 diffuser) and shall not exceed the effluent quality limits as presented in Table 2.4-2. Discharge chemistry is to be monitored prior to discharge and weekly during discharge and discharge volume is monitored weekly (Schedule I, Table 2 of the Water Licence; NWB 2016).

Table 2.4-2: Effluent Quality Limits for the Discharge of Effluent from MEL-14, as per the Water Licence (NWB 2016)

Parameter	Unit	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
pH	-	6.0 to 9.5[(a)]	6.0 to 9.5[(a)]
Total Dissolved Solids (measured)	mg/L	1,400	1,400
Total Suspended Solids	mg/L	15[(a)]	30[(a)]
Total Phosphorus	mg/L	2.0	4.0
Total Aluminum	mg/L	2	3
Total Arsenic	mg/L	0.3	0.6
Total Cyanide	mg/L	0.5	1.0
Total Copper	mg/L	0.2	0.4
Total Ammonium	mg/L	14	18
Total Nickel	mg/L	0.5[(a)]	1.0[(a)]

Table 2.4-2: Effluent Quality Limits for the Discharge of Effluent from MEL-14, as per the Water Licence (NWB 2016)

Parameter	Unit	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Lead	mg/L	0.2[(a)]	0.4
Total Zinc	mg/L	0.4	0.8
Total Petroleum Hydrocarbons	mg/L	5	5

a) Adopted from Metal and Diamond Mining Effluent Regulations (Government of Canada 2018).

As per the MDMER (Government of Canada 2018), the Mine is permitted to discharge an effluent containing any deleterious substance if the concentration of deleterious substance in the effluent does not exceed the maximum authorized concentrations that are set out in columns 2, 3 and 4 (Table 2.4-3). Effluent chemistry is monitored weekly for these deleterious substances.

Table 2.4-3: Authorized Limits of Deleterious Substances as per the MDMER Schedule 4 (Government of Canada 2018)

Item	Column 1	Column 2	Column 3	Column 4
	Deleterious Substance	Maximum Authorized Monthly Mean Concentration	Maximum Authorized Concentration in a Composite Sample	Maximum Authorized Concentration in a Grab Sample
1	Arsenic	0.50 mg/L	0.75 mg/L	1.00 mg/L
2	Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
3	Cyanide	1.00 mg/L	1.50 mg/L	2.00 mg/L
4	Lead	0.20 mg/L	0.30 mg/L	0.40 mg/L
5	Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
6	Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
7	TSS	15.00 mg/L	22.50 mg/L	30.0 mg/L
8	Radium 226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L

TSS = total suspended solids; mg/L = milligrams per litre; Bq/L = becquerel per litre.

In addition to the above effluent monitoring, mines are required under the MDMER to analyze additional parameters in effluent as part of the effluent characterization (as per Schedule 5, Section 4). This effluent characterization is required quarterly, and samples must be collected at least one month apart.

Effluent quality for samples collected from MEL-14 in 2018 are presented in Table 2.4-4 and Appendix 2B. Effluent chemistry met the MDMER effluent limits (Table 2.4-4). Total dissolved solids (TDS) concentrations exceeded the Water Licence effluent limits in one sample collected in July 2018 (1,430 mg/L) and total aluminum concentration exceeded the effluent limit in one sample collected in August (4.39 mg/L) (Appendix 2B). While TDS concentrations were generally elevated in the effluent samples throughout the sampling period, the high total aluminum value in the 23 July sample was anomalous in comparison to results in other samples. Total aluminum concentrations in effluent were generally variable, with a large range of measured values (i.e., 5.0 to 1,320 mg/L; Appendix 2B). Concentration of TSS in the 23 July was slightly elevated at 21 mg/L, but not enough to explain the much higher total aluminum concentration (Appendix 2B). Dissolved aluminum concentration in this sample (i.e., 0.099 mg/L) was within the range of other values (i.e., 0.0043 to 0.22 mg/L; Appendix 2B).
Elevated aluminum concentration was also observed in the corresponding receiving environment sample,

despite relatively low TSS of 1.0 mg/L (see Appendix 2C). Overall, the total aluminum exceedance appears anomalous and should be interpreted with caution.

Water quality for samples collected from MEL-13 (i.e., receiving water directly above the diffuser) are presented in Table 2.4-5 and Appendix 2C. This station provides additional information about water quality within the mixing zone. Total aluminum, total copper, and total iron concentrations exceeded the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG-PAL; CCME 1999) in one sample collected in July 2018 (Appendix 2C). Aesthetic objectives for drinking water quality were exceeded for water temperature, iron, and manganese in this sample. All other concentrations were less than the CWQG-PAL, CDWQG (Health Canada 2017), and Site-Specific Water Quality Objectives (SSWQO; Golder 2013b).

Table 2.4-4: Summary of Effluent Quality Discharged from MEL-14, 2018

Parameter	Unit	MDMER	WL	Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limits	
											MDMER	WL
Field Measured												
pH	-	-	6.0 to 9.5	7.5	7.5	7	8.1	0.35	0	10	-	-
Specific conductivity	µS/cm	-	-	1,646	1,702	1,420	2,210	246	0	11	-	-
Water temperature	°C	-	-	12	12	4.8	19	4.2	0	11	-	-
Conventional Parameters												
pH	-	-	-	7.3	7.2	6.8	7.6	0.23	0	11	-	-
Specific conductivity	µS/cm	-	-	1800	1855	1500	2400	305	0	11	-	-
Hardness, as $CaCO_3$	mg/L	-	-	462	423	59	565	133	0	11	-	-
Total alkalinity, as $CaCO_3$	mg/L	-	-	34	32	<0.1	51	14	1	11	-	-
Total dissolved solids	mg/L	-	1,400	1,144	1,136	870	1,430	173	0	11	-	9
Total suspended solids	mg/L	30	30	9	9.2	<1.0	21	5.3	1	11	-	-
Total organic carbon	mg/L	-	-	8.4	8	<0.5	13	3.4	1	11	-	-
Dissolved organic carbon	mg/L	-	-	7.3	6.6	<0.5	11	2.7	1	11	-	-
Turbidity	NTU	-	-	0.7	0.81	<0.1	2.5	0.7	1	11	-	-
Major Ions												
Bicarbonate, as $CaCO_3$	mg/L	-	-	34	33	6	51	13	0	11	-	-
Calcium	mg/L	-	-	144	131	17	173	41	0	11	-	-
Carbonate, as $CaCO_3$	mg/L	-	-	<1.0	-	<1.0	<1.0	-	11	11	-	-
Chloride	mg/L	-	-	440	482	300	660	117	0	11	-	-
Magnesium	mg/L	-	-	25	23	4	32	7	0	11	-	-
Potassium	mg/L	-	-	14	14	10	17	2.2	0	11	-	-
Reactive silica, as SiO_2	mg/L	-	-	0.45	0.57	0.07	1.3	0.45	0	11	-	-
Sodium	mg/L	-	-	136	142	94	236	42	0	11	-	-
Sulphate	mg/L	-	-	51	46	7	60	14	0	11	-	-

Table 2.4-4: Summary of Effluent Quality Discharged from MEL-14, 2018

Parameter	Unit	MDMER	WL	Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limits	
											MDMER	WL
Nutrients												
Nitrate	mg-N/L	-	-	5	5.5	3	15	3.4	0	11	-	-
Nitrite	mg-N/L	-	-	0.19	0.21	0.09	0.36	0.09	0	11	-	-
Nitrate + nitrite	mg-N/L	-	-	5.2	5.7	3.1	16	3.4	0	11	-	-
Total ammonia	mg-N/L	-	18	0.9	1.6	0.1	4.1	1.3	0	11	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	1.4	2	0.9	3.6	1	0	11	-	-
Total nitrogen (calculated)	mg-N/L	-	-	7.3	7.7	4	19	4.1	0	11	-	-
Total phosphorus	mg-P/L	-	4.0	0.032	0.038	<0.020	0.099	0.03	2	11	-	-
Orthophosphate	mg-P/L	-	-	<0.01	-	<0.01	0.07	-	10	11	-	-
General Organics												
Total oil and grease	mg/L	-	-	1	-	<0.5	1.8	-	4	8	-	-
Total Metals												
Aluminum	mg/L	-	3	0.811	1.104	0.005	4.39	1.171	0	11	-	9
Antimony	mg/L	-	-	<0.0005	-	<0.0005	<5	-	11	11	-	-
Arsenic	mg/L	1	0.6	0.0019	0.0017	0.0003	0.003	0.0007	0	11	-	-
Barium	mg/L	-	-	0.1	0.1067	0.0043	0.16	0.0415	0	11	-	-
Beryllium	mg/L	-	-	<0.0001	-	<0.0001	<0.0001	-	11	11	-	-
Bismuth	mg/L	-	-	<0.0010	<0.0010	-	-	-	1	1	-	-
Boron	mg/L	-	-	0.154	0.2119	0.094	0.77	0.1964	0	11	-	-
Cadmium	mg/L	-	-	<0.0001	-	<0.0001	<0.0001	-	6	11	-	-
Chromium	mg/L	-	-	<0.0010	-	<0.0010	<0.0010	-	11	11	-	-
Cobalt	mg/L	-	-	0.0007	0.0007	-	-	-	0	1	-	-
Copper	mg/L	0.6	0.4	0.0013	0.0019	<0.0005	0.0085	0.0023	1	11	-	-
Iron	mg/L	-	-	0.118	0.1534	<0.0100	0.374	0.1099	1	11	-	-
Lead	mg/L	0.4	0.4	<0.0002	-	<0.0002	0.0003	-	8	11	-	-
Lithium	mg/L	-	-	0.118	0.127	0.0917	0.159	0.021	0	11	-	-

Table 2.4-4: Summary of Effluent Quality Discharged from MEL-14, 2018

Parameter	Unit	MDMER	WL	Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limits	
											MDMER	WL
Total Metals (cont'd)												
Manganese	mg/L	-	-	0.237	0.2125	0.0024	0.406	0.1425	0	11	-	-
Mercury	mg/L	-	-	<0.0001	-	<0.0001	<0.0001	-	10	11	-	-
Molybdenum	mg/L	-	-	<0.0010	-	<0.0010	0.0022	-	6	11	-	-
Nickel	mg/L	1	1	0.0025	0.0025	<0.0010	0.0034	0.0008	1	11	-	-
Selenium	mg/L	-	-	<0.0001	-	<0.0001	<0.0001	-	11	11	-	-
Silicon	mg/L	-	-	0.65	0.65	-	-	-	0	1	-	-
Silver	mg/L	-	-	<0.0001	-	<0.0001	<0.0001	-	11	11	-	-
Strontium	mg/L	-	-	2.47	2.6819	0.401	4.06	1.0114	0	11	-	-
Thallium	mg/L	-	-	<0.0001	-	<0.0001	<0.0001	-	3	11	-	-
Tin	mg/L	-	-	<0.0050	-	<0.0050	<0.0050	-	11	11	-	-
Titanium	mg/L	-	-	<0.0050	-	<0.0050	<0.0050	-	11	11	-	-
Uranium	mg/L	-	-	0.0001	0.0002	0.0001	0.0006	0.0002	0	11	-	-
Vanadium	mg/L	-	-	<0.0050	-	<0.0050	<0.0050	-	11	11	-	-
Zinc	mg/L	0.8	1	0.0054	-	<0.0050	0.0086	-	5	11	-	-
Zirconium	mg/L	-	-	<0.0001	<0.0001	-	-	-	1	1	-	-
Dissolved Metals												
Aluminum	mg/L	-	-	0.0561	0.0648	0.0043	0.22	0.061	0	11	-	-
Antimony	mg/L	-	-	<0.0005	-	<0.0005	<0.0250	-	11	11	-	-
Arsenic	mg/L	-	-	0.0016	0.0016	0.0003	<0.0050	0.0007	1	11	-	-
Barium	mg/L	-	-	0.114	0.1052	0.0044	0.15	0.0392	0	11	-	-
Beryllium	mg/L	-	-	<0.0001	-	<0.0001	<0.0050	-	11	11	-	-
Bismuth	mg/L	-	-	<0.0010	<0.0010	-	-	-	1	1	-	-
Boron	mg/L	-	-	0.146	0.3131	0.101	<2.5000	0.3583	1	11	-	-
Cadmium	mg/L	-	-	<0.0001	-	<0.0001	<0.0005	-	6	11	-	-
Chromium	mg/L	-	-	<0.0010	-	<0.0010	<0.0500	-	11	11	-	-

Table 2.4-4: Summary of Effluent Quality Discharged from MEL-14, 2018

Parameter	Unit	MDMER	WL	Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limits	
											MDMER	WL
Dissolved Metals (cont'd)												
Cobalt	mg/L	-	-	0.0006	0.0006	-	-	-	0	1	-	-
Copper	mg/L	-	-	0.001	0.0013	0.0002	<0.0100	0.0013	1	11	-	-
Iron	mg/L	-	-	0.0324	-	<0.0050	<0.2500	-	3	11	-	-
Lead	mg/L	-	-	<0.0002	-	<0.0002	<0.0100	-	11	11	-	-
Lithium	mg/L	-	-	0.135	0.1345	0.104	0.163	0.0181	0	11	-	-
Manganese	mg/L	-	-	0.209	0.1807	0.0025	0.382	0.1448	0	11	-	-
Molybdenum	mg/L	-	-	<0.0001	-	<0.0001	<0.0001	-	10	11	-	-
Nickel	mg/L	-	-	0.0011	-	<0.0010	<0.0500	-	6	11	-	-
Selenium	mg/L	-	-	0.0023	0.0043	<0.0010	<0.0500	0.0069	2	11	-	-
Silicon	mg/L	-	-	<0.0001	-	<0.0001	<0.0050	-	11	11	-	-
Silver	mg/L	-	-	0.59	0.59	-	-	-	0	1	-	-
Strontium	mg/L	-	-	<0.0001	-	<0.0001	<0.0010	-	11	11	-	-
Thallium	mg/L	-	-	2.6	2.6247	0.422	4.1	0.8983	0	11	-	-
Tin	mg/L	-	-	<0.0001	-	<0.0001	<0.0005	-	3	11	-	-
Titanium	mg/L	-	-	<0.0050	-	<0.0050	<0.2500	-	11	11	-	-
Uranium	mg/L	-	-	<0.0050	-	<0.0050	<0.2500	-	11	11	-	-
Vanadium	mg/L	-	-	<0.0001	-	<0.0001	<0.0050	-	8	11	-	-
Zinc	mg/L	-	-	<0.0050	-	<0.0050	<0.2500	-	11	11	-	-
Zirconium	mg/L	-	-	<0.0050	-	<0.0050	<0.2500	-	7	11	-	-

Table 2.4-4: Summary of Effluent Quality Discharged from MEL-14, 2018

Parameter	Unit	MDMER	WL	Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limits	
											MDMER	WL
Volatile Organics												
Benzene	mg/L	-	-	<0.0002	-	<0.0002	<0.0002	-	10	10	-	-
Ethylbenzene	mg/L	-	-	<0.0002	-	<0.0002	<0.0002	-	10	10	-	-
Toluene	mg/L	-	-	<0.0002	-	<0.0002	0.0003	-	9	10	-	-
Xylenes	mg/L	-	-	<0.0004	-	<0.0004	<0.0004	-	10	10	-	-
m, p-Xylenes	mg/L	-	-	<0.0004	-	<0.0004	<0.0004	-	10	10	-	-
o-Xylene	mg/L	-	-	<0.0002	-	<0.0002	<0.0002	-	10	10	-	-
F1 (C6-C10)	mg/L	-	-	<0.0250	-	<0.0250	<0.0250	-	10	10	-	-
Hydrocarbons												
F2 (C11-C16)	mg/L	-	-	<0.1000	-	<0.1000	<0.1000	-	11	11	-	-
F3 (C17-C34)	mg/L	-	-	<0.2000	-	<0.2000	<0.2000	-	11	11	-	-
F4 (C35-C50)	mg/L	-	-	<0.2000	-	<0.2000	<0.2000	-	11	11	-	-
Radionuclides												
Radium-226	Bq/L	-	-	<0.005	-	<0.005	0.008	-	9	11	-	-
Other												
Cyanide	mg/L	2.0	1.0	<0.005	-	<0.005	<0.005	-	11	11	-	-

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; Bq/L = becquerels per litre; + = plus; °C = degrees Celsius; NTU = nephelometric turbidity unit; $CaCO_3$ = calcium carbonate; SiO_2 = silicon dioxide; BTEX = benzene, toluene, ethylbenzene, and xylene; min = minimum; max = maximum; SD = standard deviation; nd = not detected; <= less than ; % = percent; MDMER = Metal and Diamond Mining Effluent Regulations; WL = Water Licence; - = parameter below MDMER or WL effluent limits, or no effluent limit or no data.

Table 2.4-5: Summary of Water Quality Data from MEL-13, 2018

Parameter	Unit	Guidelines and Objectives					Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q								A	C	D	S	Q
Field Measured																		
pH	-	-	6.5 to 9.0	-	7.0 to 11	-	8	7.8	7.2	8.2	0.48	0	4	-	-	-	-	-
Specific conductivity	µS/cm	-	-	-	-	-	83	83	80	85	2.6	0	4	-	-	-	-	-
Water temperature	°C	-	-	-	15	-	10	12	10	16	2.7	0	4	-	-	-	25	-
Conventional Parameters																		
pH	-	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.3	7	7.4	0.17	0	4	-	-	-	-	-
Specific conductivity	µS/cm	-	-	-	-	-	88	88	84	91	2.9	0	4	-	-	-	-	-
Hardness, as CaCO3	mg/L	-	-	-	-	-	25	25	24	25	0.7	0	3	-	-	-	-	-
Total alkalinity, as CaCO3	mg/L	-	-	-	-	-	16	16	15	17	0.82	0	4	-	-	-	-	-
Total dissolved solids	mg/L	-	-	-	500	-	88	148	15	400	172	0	4	-	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	-	1	1	1	1	0	0	4	-	-	-	-	-
Total organic carbon	mg/L	-	-	-	-	-	3	3	2.9	3.1	0.082	0	4	-	-	-	-	-
Dissolved organic carbon	mg/L	-	-	-	-	-	2.9	2.9	2.8	3	0.082	0	4	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	0.3	0.28	0.2	0.3	0.05	0	4	-	-	-	-	-
Major Ions																		
Bicarbonate, as CaCO3	mg/L	-	-	-	-	-	16	16	15	17	0.82	0	4	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	7.5	7.5	7	7.8	0.35	0	4	-	-	-	-	-
Carbonate, as CaCO3	mg/L	-	-	-	-	-	<1.0	-	<1.0	<1.0	-	4	4	-	-	-	-	-
Chloride	mg/L	640	120	-	250	-	13	13	13	13	0	0	4	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	1.3	1.3	1.3	1.4	0.053	0	4	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	0.93	0.94	0.9	0.99	0.038	0	4	-	-	-	-	-
Reactive silica, as SiO2	mg/L	-	-	-	-	-	0.29	0.3	0.27	0.33	0.031	0	3	-	-	-	-	-
Sodium	mg/L	-	-	-	200	-	5.4	5.4	5.2	5.7	0.19	0	4	-	-	-	-	-
Sulphate	mg/L	-	-	-	500	-	4.4	4.3	3.7	4.8	0.46	0	4	-	-	-	-	-

Table 2.4-5: Summary of Water Quality Data from MEL-13, 2018

Parameter	Unit	Guidelines and Objectives					Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q								A	C	D	S	Q
Nutrients																		
Nitrate	mg-N/L	124	2.9	10	-	-	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Total ammonia	mg-N/L	-	0.56	-	-	-	<0.05	-	<0.05	0.19	-	3	4	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.13	0.15	<0.1	0.27	0.092	1	4	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.13	0.15	<0.1	0.27	0.092	1	4	-	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	-	<0.02	-	<0.02	<0.02	-	4	4	-	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
General Organics																		
Total oil and grease	mg/L	-	-	-	-	-	0.6	-	<0.5	0.6	-	1	2	-	-	-	-	-
Total Metals																		
Aluminum	mg/L	-	0.1	-	-	-	0.0108	1.667	0.0083	6.64	3.315	0	4	-	25	-	-	-
Antimony	mg/L	-	-	0.006	-	-	<0.0005	-	<0.0005	<0.0005	-	4	4	-	-	-	-	-
Arsenic	mg/L	-	0.005	0.01	-	0.025	0.0004	0.001	0.0004	0.0028	0.0012	0	4	-	-	-	-	-
Barium	mg/L	-	-	1	-	-	0.0081	0.0375	0.0077	0.126	0.059	0	4	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Boron	mg/L	29	1.5	5	-	-	<0.0500	-	<0.0500	0.156	-	3	4	-	-	-	-	-
Cadmium	mg/L	0.00049	0.000048	0.005	-	-	<0.0001	-	<0.0001	<0.0001	-	3	4	-	-	-	-	-
Chromium	mg/L	-	0.001	0.05	-	-	<0.0010	-	<0.0010	<0.0010	-	4	4	-	-	-	-	-
Copper	mg/L	-	0.002	-	1	-	0.0008	0.0013	0.0008	0.0028	0.001	0	4	-	25	-	-	-
Iron	mg/L	-	0.3	-	0.3	1.06	0.0265	0.1193	0.019	0.405	0.1905	0	4	-	25	-	25	-
Lead	mg/L	-	0.001	0.01	-	-	<0.0002	-	<0.0002	0.0002	-	3	4	-	-	-	-	-
Lithium	mg/L	-	-	-	-	-	<0.0020	-	<0.0020	0.145	-	3	4	-	-	-	-	-
Manganese	mg/L	-	-	-	0.05	-	0.0047	0.071	0.0044	0.271	0.1332	0	4	-	-	-	25	-
Mercury	mg/L	-	0.000026	0.001	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-

Table 2.4-5: Summary of Water Quality Data from MEL-13, 2018

Parameter	Unit	Guidelines and Objectives					Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q								A	C	D	S	Q
Total Metals (cont'd)																		
Molybdenum	mg/L	-	0.073	-	-	-	<0.0010	-	<0.0010	0.0013	-	3	4	-	-	-	-	-
Nickel	mg/L	-	0.025	-	-	-	<0.0010	-	<0.0010	0.0033	-	3	4	-	-	-	-	-
Selenium	mg/L	-	0.001	0.05	-	-	<0.0001	-	<0.0001	0.0001	-	3	4	-	-	-	-	-
Silver	mg/L	-	0.00025	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	0.0491	0.9866	0.0482	3.8	1.8756	0	4	-	-	-	-	-
Thallium	mg/L	-	0.0008	-	-	-	<0.0001	-	<0.0001	<0.0001	-	3	4	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	<0.0050	-	<0.0050	<0.0050	-	4	4	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	<0.0050	-	<0.0050	<0.0050	-	4	4	-	-	-	-	-
Uranium	mg/L	0.033	0.015	0.02	-	-	<0.0001	-	<0.0001	0.001	-	3	4	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	<0.0050	-	<0.0050	<0.0050	-	4	4	-	-	-	-	-
Zinc	mg/L	-	-	-	5	-	<0.0050	-	<0.0050	0.0107	-	3	4	-	-	-	-	-
Dissolved Metals																		
Aluminum	mg/L	-	-	-	-	-	0.0069	0.0079	0.0054	0.0123	0.0031	0	4	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	<0.0005	-	<0.0005	<0.0005	-	4	4	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	0.0004	0.0004	0.0003	0.0004	<0.0001	0	4	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	0.0076	0.0076	0.0075	0.0078	0.0001	0	4	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	<0.0500	-	<0.0500	<0.0500	-	4	4	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Chromium	mg/L	-	-	-	-	-	<0.0010	-	<0.0010	<0.0010	-	4	4	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	0.0007	0.0007	0.0006	0.0008	0.0001	0	4	-	-	-	-	-
Iron	mg/L	-	-	-	-	-	0.0083	0.0083	0.0054	0.0113	0.0025	0	4	-	-	-	-	-
Lead	mg/L	-	-	-	-	-	<0.0002	-	<0.0002	<0.0002	-	4	4	-	-	-	-	-
Lithium	mg/L	-	-	-	-	-	<0.0020	-	<0.0020	<0.0020	-	4	4	-	-	-	-	-
Manganese	mg/L	-	-	-	-	-	<0.0010	-	<0.0010	0.0012	-	3	4	-	-	-	-	-

Table 2.4-5: Summary of Water Quality Data from MEL-13, 2018

Parameter	Unit	Guidelines and Objectives					Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q								A	C	D	S	Q
Dissolved Metals (cont'd)																		
Mercury	mg/L	-	-	-	-	-	<0.00001	-	<0.00001	<0.00001	-	4	4	-	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	<0.0010	-	<0.0010	<0.0010	-	4	4	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	<0.0010	-	<0.0010	<0.0010	-	4	4	-	-	-	-	-
Selenium	mg/L	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	0.0491	0.0491	0.0471	0.0512	0.0017	0	4	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	<0.0050	-	<0.0050	<0.0050	-	4	4	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	<0.0050	-	<0.0050	<0.0050	-	4	4	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	<0.0001	-	<0.0001	<0.0001	-	4	4	-	-	-	-	-
Vanadium	mg/L	-	-	-	-	-	<0.0050	-	<0.0050	<0.0050	-	4	4	-	-	-	-	-
Zinc	mg/L	0.031	0.0044	-	-	-	<0.0050	-	<0.0050	<0.0050	-	4	4	-	-	-	-	-
Volatile Organics																		
Benzene	mg/L	-	0.37	0.005	-	-	<0.0002	-	<0.0002	<0.0002	-	4	4	-	-	-	-	-
Ethylbenzene	mg/L	-	0.09	0.14	0.0016	-	<0.0002	-	<0.0002	<0.0002	-	4	4	-	-	-	-	-
Toluene	mg/L	-	0.002	0.06	0.024	-	<0.0002	-	<0.0002	<0.0002	-	4	4	-	-	-	-	-
Xylenes	mg/L	-	-	0.09	0.02	-	<0.0004	-	<0.0004	<0.0004	-	4	4	-	-	-	-	-
m, p-Xylenes	mg/L	-	-	-	-	-	<0.0004	-	<0.0004	<0.0004	-	4	4	-	-	-	-	-
o-Xylene	mg/L	-	-	-	-	-	<0.0002	-	<0.0002	<0.0002	-	4	4	-	-	-	-	-
F1 (C6-C10) – BTEX	mg/L	-	-	-	-	-	<0.0250	-	<0.0250	<0.0250	-	4	4	-	-	-	-	-
F1 (C6-C10)	mg/L	-	-	-	-	-	<0.0250	-	<0.0250	<0.0250	-	4	4	-	-	-	-	-
Hydrocarbons																		
F2 (C11-C16)	mg/L	-	-	-	-	-	<0.1000	-	<0.1000	<0.1000	-	4	4	-	-	-	-	-
F3 (C17-C34)	mg/L	-	-	-	-	-	<0.2000	-	<0.2000	<0.2000	-	4	4	-	-	-	-	-
F4 (C35-C50)	mg/L	-	-	-	-	-	<0.2000	-	<0.2000	<0.2000	-	4	4	-	-	-	-	-

Table 2.4-5: Summary of Water Quality Data from MEL-13, 2018

Parameter	Unit	Guidelines and Objectives					Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q								A	C	D	S	Q
Radionuclides																		
Radium-226	Bq/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	4	4	-	-	-	-	-
Other																		
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.005	-	<0.005	<0.005	-	4	4	-	-	-	-	-
Cyanide (free)	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	4	4	-	-	-	-	-

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; Bq/L = becquerels per litre; + = plus; °C = degrees Celsius; NTU = nephelometric turbidity unit; $CaCO_3$ = calcium carbonate; SiO_2 = silicon dioxide; BTEX = benzene, toluene, ethylbenzene, and xylene; Min = minimum; Max = maximum; SD = standard deviation; nd = not detected; <= less than ; % = percent; MDMER = Metal and Diamond Mining Effluent Regulations; - = parameter below water quality guideline or objective, or no guideline/objective or no data.

2.4.2.2 Acute and Sublethal Toxicity

As per Schedule I Table 2 of the Water Licence (NWB 2016), acute lethality testing of mine effluent is required prior to discharge and monthly thereafter. Effluent must not be acutely lethal to Rainbow Trout (Part F, Section 4). Monthly acute lethality testing is also required under the MDMER, with the same prohibition of discharge of acutely lethal effluent.

Sublethal toxicity testing is required as part of EEM. Tests are conducted twice per year on aliquots of the same effluent sample submitted for effluent characterization.

Methods

Acute lethality testing was performed using the following test protocols:

- Environment Canada (2000a): Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout (EPS 1/RM/13)
- Environment Canada (2000b): Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna* (EPS 1/RM/14)

An acutely lethal effluent is defined as an effluent at 100% concentration that kills more than 50% of the rainbow trout exposed during a 96-hour period (Government of Canada 2018). Testing with *Daphnia* was performed to provide additional information of acute toxicity. The effluent samples were submitted to Eurofins Environmental Testing, Saint-Augustin-de-Desmaures, Quebec, for acute lethality testing.

Sublethal toxicity testing was performed using the following test protocols:

- Environment Canada (2011): Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows (EPS 1/RM/22)
- Environment Canada (2007a): Biological Test Method: Test of Reproduction and Survival Using the Cladoceran *Ceriodaphnia dubia* (EPS 1/RM/21)
- Environment Canada (2007b): Biological Test Method: Test for Measuring the Inhibition of Growth Using the Freshwater Macrophyte, *Lemna minor* (EPS 1/RM/37)
- Environment Canada (2007c): Biological Test Method: Growth Inhibition Test Using a Freshwater Alga (EPS 1/RM25)

The effluent samples were submitted to AquaTox Testing & Consulting Inc., Puslinch, Ontario, for sublethal toxicity testing.

Results

Monthly mine effluent samples collected from MEL-14 from June to September 2018 were not acutely toxic to Rainbow Trout or *Daphnia magna* (Table 2.4-6; Appendix 2D).

Three mine effluent samples collected from MEL-14 in August and September 2018 did not adversely affect Fathead Minnow (*Pimephales promelas*) survival and growth, or green algae (*Pseudokirchneriella subcapitata*) growth. Stimulation of growth was observed in the green algae tests. Sublethal effects were observed on growth of common duckweed (*Lemna minor*) in two of the three samples, and on reproduction of the water flea (*Ceriodaphnia dubia*) in one sample (Table 2.4-7). Sublethal toxicity test reports are provided in Appendix 2E.

Table 2.4-6: Summary of Acute Lethality Data for MEL-14, 2018

Date	Acute Toxicity to Rainbow Trout		Acute Toxicity to *Daphnia magna*	
	% Mortality in 100% Effluent	LC50 (%v/v)	% Mortality in 100% Effluent	LC50 (%v/v)
24-Jun-2018	10	>100	0	>100
1-Jul-2018	0	>100	0	>100
5-Aug-2018	0	>100	0	>100
3-Sep-2018	0	>100	0	>100

LC50 = median lethal concentration; %v/v = percent volume by volume; > = greater than.

Table 2.4-7: Summary of Sublethal Toxicity Data for MEL-14, 2018

Species	Endpoint	Test Results (%v/v)		
		07-Aug-2018	13-Aug-2018	03-Sep-2019
Pimephales promelas	LC50	>100	>100	>100
	IC25 (Growth)	>100	>100	>100
Ceriodaphnia dubia	LC50	>100	-[(a)]	>100
	IC25 (Reproduction)	>100	-[(a)]	90.1 (23.3 to 96.3)
Lemna minor	IC25 (Weight)	>97.0	42.0 (26.5 to 63.2)	>97
	IC25 (Frond Yield)	72.3 (36.4 to 86.5)	38.2 (26.6 to 52.1)	>97
Pseudokirchneriella subcapitata	IC25 (Growth)	>90.91	>90.91	>90.91

Note: The 95% confidence limits, if available, are presented in parentheses. Due to the addition of nutrient spikes, the maximum effluent concentration that can be tested using *Lemna minor* and *Pseudokirchneriella subcapitata* is 97%v/v and 90.91%v/v, respectively.

(a) Test failed laboratory control validity criteria.

LC50 = median lethal concentration; IC25 = inhibition concentration at 25%; %v/v = percent volume by volume; > = greater than.

2.4.2.3 Loadings

As per Part 2, Division 2, Section 20 of the MDMER (Government of Canada 2018), the Mine shall record the loading of deleterious substances (in kg or megabecquerel [MBq]) that are contained in the effluent deposited from each final discharge point (i.e., MEL-14) for each month during which there was a deposit and during which a sample is collected. Monthly loadings are calculated using Equation 1:

$$ML = C \times V / 1{,}000 \quad \text{(Equation 1)}$$

Where ML is the loading for a month in kg, C is the monthly mean concentration of the deleterious substances in mg/L, and V is the total monthly volume of effluent deposited from each final discharge point (i.e., MEL-14) in m^3. The monthly loadings of effluent quality parameters are shown in Table 2.4-8. Loadings of each effluent quality parameter discharged from MEL-14 in July were generally higher than those reported in August and September due to a higher effluent volume (352,551 m^3) released into Meliadine Lake. Daily discharge volumes and concentrations of effluent quality parameters are presented in Appendices 2A and 2B, respectively.

Table 2.4-8: Monthly Loadings of Effluent Quality Parameters Discharged from MEL-14, 2018

Parameter	July[a]		August[b]		September[c]	
	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)
Conventional Parameters						
Hardness, as $CaCO_3$	433	152,655	402	61,464	510	1,342
Total alkalinity, as $CaCO_3$	38	133,26	26	3,907	15	39
Total dissolved solids	1,046	368,768	1176	180,006	1360	3,580
Total suspended solids	10.6	3,737.0	7.5	1,148	14.0	36.8
Total organic carbon	8.2	2,883.9	7.5	1,148	9.1	24.0
Dissolved organic carbon	6.2	2,171.7	6.9	1,060	7.0	18.4
Major Ions						
Bicarbonate, as $CaCO_3$	38	13,256	27	4,140	15	39
Calcium	135	47,453	123	18,873	156	411
Carbonate, as $CaCO_3$	1.0	352.6	1.0	153.1	1.0	2.6
Chloride	432	152,302	545	83,421	660	1,737
Magnesium	24	8,285	23	3,465	29	77
Potassium	12	4,386	15	2,273	17	46
Reactive silica, as SiO_2	0.24	86.09	0.73	111.7	1.20	3.16
Sodium	118	41,460	172	26,366	189	497
Sulphate	48	17,063	44	6,666	53	139
Nutrients						
Nitrate	4.8	1,691.5	6.3	961	5.7	15.1
Nitrite	0.18	64.31	0.23	35.36	0.33	0.87
Nitrate + nitrite	5.0	1,755.7	6.5	997.2	6.1	16.0
Total ammonia	1.4	505.2	1.5	232.7	0.9	2.4
Total Kjeldahl nitrogen	2.1	740.4	1.8	274.8	1.3	3.4
Total nitrogen (calculated)	7.1	2,496.1	8.3	1,272	7.4	19.4
Total phosphorus	0.045	15.794	0.025	3.75	0.023	0.061

Table 2.4-8: Monthly Loadings of Effluent Quality Parameters Discharged from MEL-14, 2018

Parameter	July[a]		August[b]		September[c]	
	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)
Nutrients (cont'd)						
Orthophosphate	0.01	3.53	0.01	1.53	0.01	0.03
General Organics						
Total oil and grease	1.0	359.6	0.7	112.2	-	-
Total Metals						
Aluminum	1.6338	575.9978	0.6310	96.6	1.3200	3.47
Antimony	0.0005	0.1763	1.2504	191.4	0.0005	0.0013
Arsenic	0.0014	0.5070	0.0019	0.29	0.0024	0.0062
Barium	0.1006	35.4666	0.1053	16.1	0.1500	0.3948
Beryllium	0.0001	0.0353	0.0001	0.015	0.0001	0.0003
Bismuth	-	-	-	-	0.0010	0.0026
Boron	0.1202	42.3766	0.3263	49.9	0.3250	0.8554
Cadmium	0.0001	0.0353	0.0001	0.015	0.0001	0.0003
Chromium	0.0010	0.3526	0.0010	0.15	0.0010	0.0026
Cobalt	-	-	-	-	0.0007	0.0017
Copper	0.0014	0.4999	0.0028	0.43	0.0006	0.0016
Iron	0.1364	48.0880	0.1208	18.48	0.1530	0.4027
Lead	0.0002	0.0797	0.0002	0.031	0.0002	0.0005
Lithium	0.1111	39.1825	0.1435	22.0	0.1570	0.4132
Manganese	0.1437	50.6686	0.2566	39.3	0.2530	0.6659
Mercury	0.0001	0.0353	0.0001	0.015	0.0001	0.0003
Molybdenum	0.0011	0.3808	0.0017	0.260	0.0014	0.0037
Nickel	0.0024	0.8461	0.0026	0.390	0.0027	0.0071
Selenium	0.0001	0.0353	0.0001	0.015	0.0001	0.0003
Silicon	-	-	-	-	0.6500	1.7108
Silver	0.0001	0.0353	0.0001	0.015	0.0001	0.0003
Strontium	2.4020	846.8275	2.7553	421.7	4.0600	10.6859
Thallium	0.0001	0.0353	0.0001	0.015	0.0001	0.0003
Tin	0.0050	1.7628	0.0050	0.765	0.0050	0.0132
Titanium	0.0050	1.7628	0.0050	0.765	0.0050	0.0132
Uranium	0.0003	0.0888	0.0001	0.020	0.0001	0.0003
Vanadium	0.0050	1.7628	0.0050	0.765	0.0050	0.0132
Zinc	0.0059	2.0801	0.0063	0.964	0.0050	0.0132
Zirconium	-	-	-	-	0.0001	0.0003
Dissolved Metals						
Aluminum	0.0683	24.0792	0.0843	12.90	0.0233	0.0613
Antimony	0.0005	0.1763	0.0005	0.077	0.0005	0.0013
Arsenic	0.0013	0.4618	0.0025	0.387	0.0020	0.0053
Barium	0.1035	36.4890	0.1024	15.67	0.1410	0.3711
Beryllium	0.0001	0.0353	0.0013	0.203	0.0001	0.0003

Table 2.4-8: Monthly Loadings of Effluent Quality Parameters Discharged from MEL-14, 2018

Parameter	July[a]		August[b]		September[c]	
	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)
Dissolved Metals (cont'd)						
Bismuth	-	-	-	-	0.0010	0.0026
Boron	0.1294	45.6201	0.9060	138.7	0.3170	0.8343
Cadmium	0.0001	0.0353	0.0002	0.031	0.0001	0.0003
Chromium	0.0010	0.3526	0.0133	2.028	0.0010	0.0026
Cobalt	-	-	-	-	0.0006	0.0015
Copper	0.0010	0.3681	0.0029	0.441	0.0005	0.0013
Iron	0.0250	8.8067	0.0827	12.65	0.0414	0.1090
Lead	0.0002	0.0705	0.0027	0.406	0.0002	0.0005
Lithium	0.1274	44.9150	0.1453	22.23	0.1580	0.4159
Manganese	0.1004	35.3891	0.2351	35.99	0.2090	0.5501
Mercury	0.0001	0.0353	0.0001	0.015	0.0001	0.0003
Molybdenum	0.0011	0.3878	0.0137	2.10	0.0013	0.0034
Nickel	0.0022	0.7827	0.0142	2.177	0.0023	0.0061
Selenium	0.0001	0.0353	0.0013	0.203	0.0001	0.0003
Silicon	-	-	-	-	0.5900	1.5529
Silver	0.0001	0.0353	0.0003	0.050	0.0001	0.0003
Strontium	2.5460	897.5948	2.6205	401.1	3.3100	8.7119
Thallium	0.0001	0.0353	0.0002	0.031	0.0001	0.0003
Tin	0.0050	1.7628	0.0663	10.14	0.0050	0.0132
Titanium	0.0050	1.7628	0.0663	10.14	0.0050	0.0132
Uranium	0.0001	0.0353	0.0013	0.203	0.0001	0.0003
Vanadium	0.0050	1.7628	0.0663	10.14	0.0050	0.0132
Zinc	0.0054	1.8967	0.0668	10.22	0.0050	0.0132
Zirconium	-	-	-	-	0.0001	0.0003
Volatile Organics						
Benzene	0.0002	0.0705	0.0002	0.031	0.0002	0.0005
Ethylbenzene	0.0002	0.0705	0.0002	0.031	0.0002	0.0005
Toluene	0.0002	0.0790	0.0002	0.031	0.0002	0.0005
Xylenes	0.0004	0.1410	0.0004	0.061	0.0004	0.0011
m,p-Xylenes	0.0004	0.1410	0.0004	0.061	0.0004	0.0011
o-Xylene	0.0002	0.0705	0.0002	0.031	0.0002	0.0005
F1 (C6-C10) – BTEX	0.0250	8.8138	0.0250	3.827	0.0250	0.0658
F1 (C6-C10)	0.0250	35.2551	0.0250	3.827	0.0250	0.0658

Table 2.4-8: Monthly Loadings of Effluent Quality Parameters Discharged from MEL-14, 2018

Parameter	July[a]		August[b]		September[c]	
	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)	Concentration (mg/L)	Monthly Load (kg)
Hydrocarbons						
F2 (C10-C16)	0.1000	70.5102	0.1000	15.31	0.1000	0.2632
F3 (C17-C34)	0.2000	8.8138	0.2000	30.61	0.2000	0.5264
F4 (C35-C50)	0.2000	70.5102	0.2000	30.61	0.2000	0.5264
Other						
Cyanide	0.005	2.128	0.005	0.765	0.005	0.013

a) Total discharge volume in July was 352,551 m^3.

b) Total discharge volume in August was 153,066 m^3.

c) Total discharge volume in September was 2,632 m^3.

mg/L = milligrams per litre; + = plus; $CaCO_3$ = calcium carbonate; SiO_2 = silicon dioxide; BTEX = benzene, toluene, ethylbenzene, and xylene; m^3 = cubic metres; kg = kilogram; - = no data.

2.4.3 Delineation of the Mine Effluent Mixing Zone

A plume delineation study was conducted in July and August 2018. This report section provides a summary of the results. Details of the sampling design are available in Golder (2018c). The plume delineation study was based on previous experience at mines in Northern Canada (Golder 2013a, 2015). Coordinates of the plume delineation study sampling stations are shown in Table 2.4-9.

2.4.3.1 Background Information

Turbulent mixing caused by the diffusers results in an initial effluent plume adjacent to the diffusers. The term “plume” in this section refers to the mixture of treated effluent and lake water that is chemically distinguishable from the surrounding ambient lake water.

A submerged diffuser was installed in Meliadine Lake in August 2017 to disperse the water discharged from CP1. The diffuser is 30 m long, 400 mm diameter, nearly north-south oriented, and connected to the pipelines through a T-connection. Ten 51 mm ports are evenly spaced at every 3 m along the diffuser (Tetra Tech 2017). The as-built diffuser differed from the project design (see Tetra Tech 2017) in terms of its horizontal position and depth of diffuser system at T-connection (42 m horizontal shift and a 3.2 m shallower depth). Therefore, the performance of the diffuser system was reassessed by Tetra Tech in 2018. Despite the deviations from the original design, the predicted minimum dilution of 23:1 was achieved at the edge of the mixing zone, and water quality criteria were met (Tetra Tech 2018).

Based on previous experience in low conductivity subarctic lakes, conductivity was considered an appropriate tracer to delineate the effluent plume in Meliadine Lake, because effluent conductivity (i.e., specific conductivity, temperature-corrected to 25°C) is higher than the conductivity of natural lake water.

CP1 receives water from surface runoff from the project footprint and from another surface water runoff collection pond, CP5. Water from CP5 is highly saline and was treated for TDS by RO membrane treatment prior to transferring to CP1. Specific conductivity in CP1 ranged from 1,100 to 2,500 µS/cm in 2017 and 2018 (Appendix 2F) and in EWTP (MEL-14) results ranged from 1,600 to 2,100 µS/cm (Appendix 2B).

Table 2.4-9: Coordinates of Plume Delineation Study Sampling Stations

Sample ID	Date	UTM Coordinates (NAD 83, Zone 15V)	
		Easting	Northing
50-01	10 August	54280	6989212
50-03	10 August	542793	6989086
100-01	10 August	542808	6989262
100-02	23 July	542876	6989227
100-03	10 August	542897	6989141
100-04	10 August	542861	6989059
100-05	10 August	542788	6989036
100-06	10 August	542720	6989070
100-07	19 July	54269	6989157
100-08	10 August	542729	6989233
175-01	10 August	542814	6989337
175-03	10 August	542782	6988961
250-01	10 August	543047	6989128
250-03	10 August	542776	6988886
250-05	10 August	542549	6989170
250-06	10 August	542623	6989340

2.4.3.2 Methods

The sampling design selected for the plume delineation in Meliadine Lake is a modified radial grid design that allows measurement of plume dispersion in all directions. According to the MVLWB/GNWT Guidelines for Effluent Mixing Zones (GNWT 2017), the regulated mixing zone is defined as an area where concentrations of some substances may not comply with Site-Specific Water Quality Objectives for the receiving environment. For lakes in the Mackenzie Valley, regulated mixing zones should have a maximum of 100 m radius from the discharge point (GNWT 2017). As per the MDMER (Government of Canada 2018) a description of the manner in which the effluent mixes within the exposure area at 100 m and 250 m from each final discharge point is required for site characterization. Taking this information as starting points, a modified radial grid containing 16 sampling stations was designed (Figure 2.4-1); from these, two stations were sampled in 19 and 23 July 2018 by Golder staff as per the July AEMP field work and fourteen were sampled on 10 August 2018 by Agnico Eagle's staff. Coordinates and dates of all sampling stations visited are given in Table 2.4-9. Although provided in Appendix 2G, the July data were not incorporated in this report because differences in pH (average pH of 7.6 and 8.5) between the July and August data were observed, possibly as a result of different environmental conditions during collection time. The July data were not considered to be reasonably similar enough to the August data to allow inclusion in the final dataset for the plume delineation.

As described by Golder (2018a), the plume delineation was based on vertical profiles of specific conductivity in the Near-field area of Meliadine Lake. Vertical profiles of the lake water column were measured using water quality meters (Eureka Manta II) equipped with a 20 m long cable. The water quality meters were calibrated before going out in the field, and the water quality probe was placed in lake water for at least one minute to allow readings to stabilize. The results obtained during the field work were stable and in the expected range of results.

At each sampling station, profile measurements were taken from surface (i.e., 0.3 m) and at 1-m intervals, starting from 1 m below surface to 1 m above the bottom. Temperature, specific conductivity, dissolved oxygen (DO) concentration, oxygen saturation, and pH were recorded on field data sheets and later transcribed to an Excel spreadsheet by a Golder or Agnico Eagle staff.

Data were plotted using R v. 3.4.2 environment (R Core Team 2018). All data obtained are presented as vertical profile plots, but because of the high number of sampling stations (fourteen), they were grouped based on their distance to the diffuser (50, 100, 175 and 250 m). The locations of these stations are provided in Figure 2.4-1. This approach aimed to simplify the legends and improve readability while retaining the information on distance. Water quality results obtained under the AEMP were used for comparisons with pre-discharge conditions.

The dilution factor provides a result of the mixing characteristics of the discharge; a higher value typically indicates a larger degree of dilution of the discharge in the lake water. Following a conservative approach, the dilution factors were calculated according to the Equation 2.

$$DF = \frac{[C_{eff}]-[C_{amb}]}{[MC_{dif}]-[C_{amb}]} \quad \text{(Equation 2)}$$

Where DF is the dilution factor, $[C_{eff}]$ is the average specific conductivity in the treated effluent (MEL-14) in August 2018, $[MC_{dif}]$ is the maximum specific conductivity at a given plume delineation sampling station, and $[C_{amb}]$ is the average specific conductivity in the Near-field area characterizing pre-discharge conditions during the open water season.

The most recent results for specific conductivity in the treated effluent (MEL-14) were collected on 5 August and 13 August (1,900 and 2,100 µS/cm respectively; Appendix 2B). As the stations for plume delineation measurements were visited on 10 August, the effluent chemistry for these two dates were averaged for use in the dilution factor calculations. The maximum specific conductivity of each sampling location was used to yield the minimum dilution factor possible.

Water quality data collected as part of the AEMP during the open water season were used to characterize pre-discharge conditions in the Near-field area. Discharge from MEL-14 started in June 2018; therefore, data collected before this date can be used to characterize pre-discharge conditions (i.e., July 2015 to July 2017, Golder 2016b; 2017a). Specific conductivity in the Meliadine Lake Near-field area ranged from 49 to 99 µS/cm between 2015 and 2017 (Golder 2016b; 2017a; 2018a). However, average values were slightly higher in 2017 (i.e., 81.3 µS/cm) than in 2015/2016 (i.e., 69.3 µS/cm) (see Figure 2.4-8). The apparent increase in specific conductivity may be due to the discharge of treated sewage effluent into a channel that eventually flows into the bay with the Near-field area.

As stated in the response to comments on the 2017 AEMP Annual Report (Golder 2018a), water quality data collected from July 2017 to present is considered part of the “construction” phase, and data collected prior to July 2017 are considered “pre-construction.” Given the observed slight increase in specific conductivity between the two periods, two different scenarios were calculated based on different estimates of average specific conductivity in the Near-field area:

- Scenario A: near-field average specific conductivity for 2015 to 2016; and
- Scenario B: near-field average specific conductivity for 2017.

539000
540000
541000
542000
543000
6891000
6890000
6889000
6888000

MEL-14
CP1
CP5
NEAR-FIELD EXPOSURE AREA (MEL-01)
250-06
175-01
100-01
100-08
50-01
100-02
250-05
100-07
100-03
250-01
50-03
100-06
100-04
100-05
175-03
250-03
H14A
H17
H14
H18
H16
H1
H13
H12
H9
H10
H8
H11
H7
H5
H4
H3
H2
H6
A58
H19
A17
B8
H20
A54
B9
A13
A12
A11
B10
E33A
A10
A39
A40
A9
A38
A37
A35
B34
A8
A8
ML
J5
J4
J3
J6
J1
J2
J8
J7
I1

LEGEND
- SAMPLING LOCATION
- DIFFUSER
- DIRECTION OF FLOW AT WATERSHED OUTLET
- MELIADINE AEMP
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- WATERCOURSE
- WATERBODY

STUDY AREA

0 300 600
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REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED
AGNICO EAGLE

PROJECT
CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE
SAMPLING STATIONS IN MELIADINE LAKE NEAR-FIELD EXPOSURE AREA FOR THE PLUME DELINEATION STUDY

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	JN
PREPARED	MH
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
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2.4.3.3 Results and Discussion

2.4.3.3.1 Physicochemical Profiles

The compiled dataset of vertical profiles measured in July and August 2018 is presented in Table 1 of Appendix 2G. Vertical profile plots are displayed below in Figure 2.4-2 through Figure 2.4-6. Temperature, pH and DO were nearly homogeneous among sampling stations within the same sampling event and within the water column.

Temperature in the August profiles were between 12.5 and 13.2°C, with temperature decreasing with depth (Figure 2.4-2).

In August, DO concentrations were between 9.8 and 10.0 mg/L and oxygen saturation in the water ranged from 92 to 95%. The water column was well oxygenated with small differences between surface and bottom concentrations (Figure 2.4-3 and Figure 2.4-4).

Results for pH obtained in August ranged from 8.4 to 8.6, with very little vertical variation and low variability across sampling stations (Figure 2.4-5).

Specific conductivity results were more variable, ranging from 86 to 106 µS/cm in the profiles taken in August. The variation occurred both horizontally and vertically (Figure 2.4-6). Being the only parameter in which a spatial pattern in variability was observed, corroborates the choice of specific conductivity as the effluent tracer and illustrates the dilution of effluent in the water column at various distances from the diffuser.

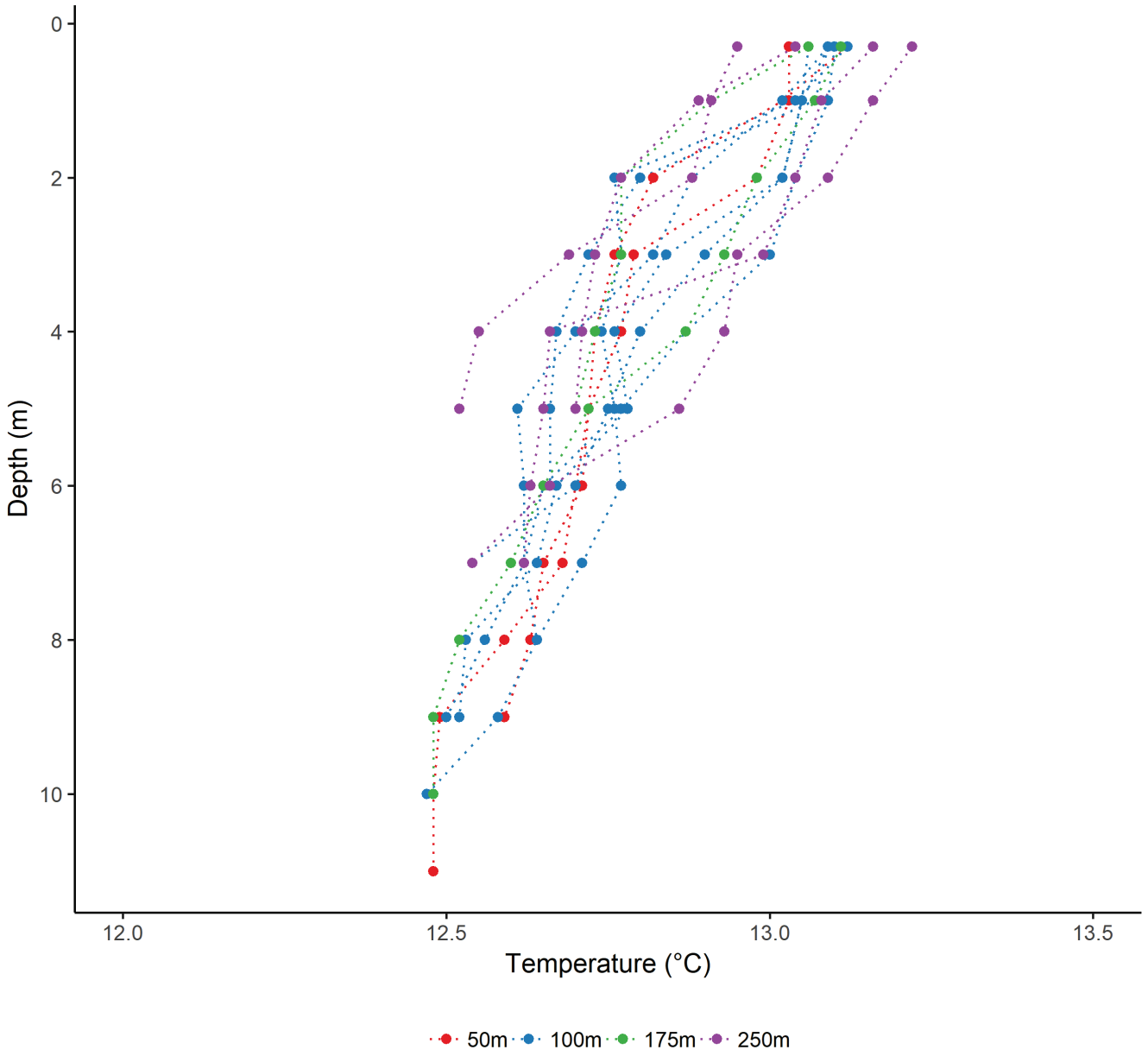


Figure 2.4-2: Vertical Profiles of Temperature in the Near-Field Exposure Area at Meliadine Lake During the Plume Delineation Study, August 2018

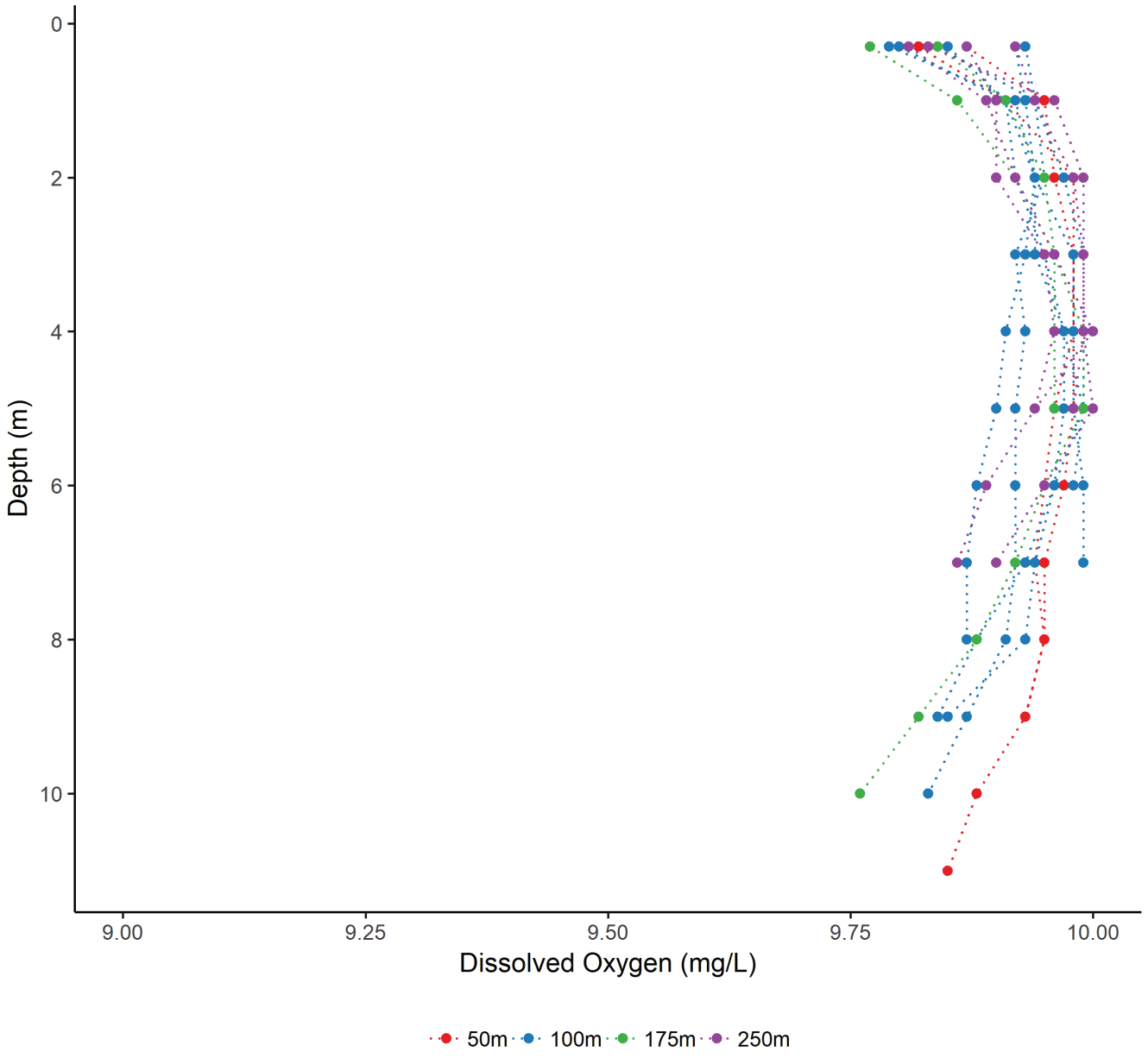


Figure 2.4-3: Vertical Profiles of Dissolved Oxygen in the Near-Field Exposure Area at Meliadine Lake During the Plume Delineation Study, August 2018

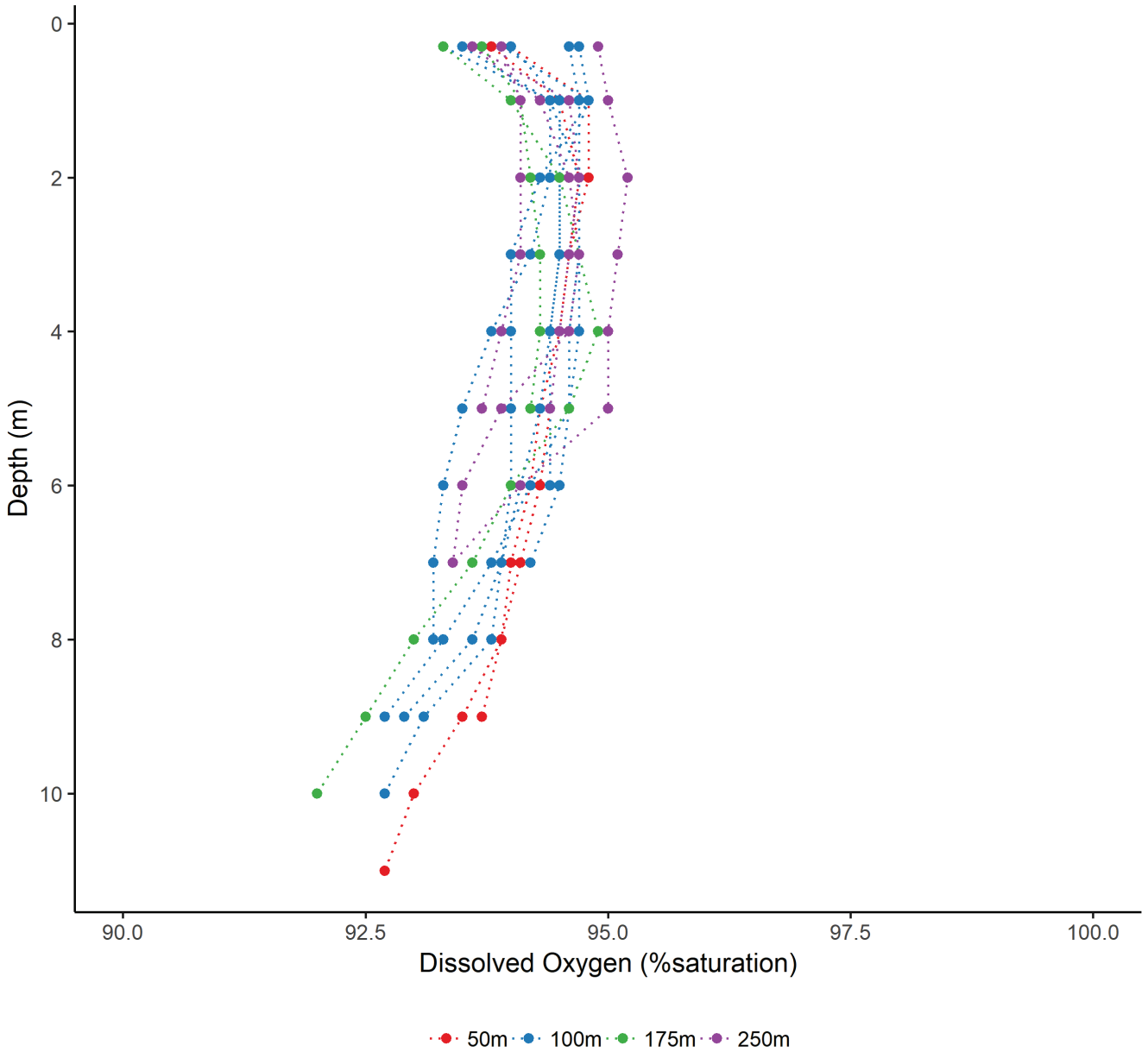


Figure 2.4-4: Vertical Profiles for Dissolved Oxygen (Percent Saturation) in the Near-Field Exposure Area at Meliadine Lake During the Plume Delineation Study, August 2018

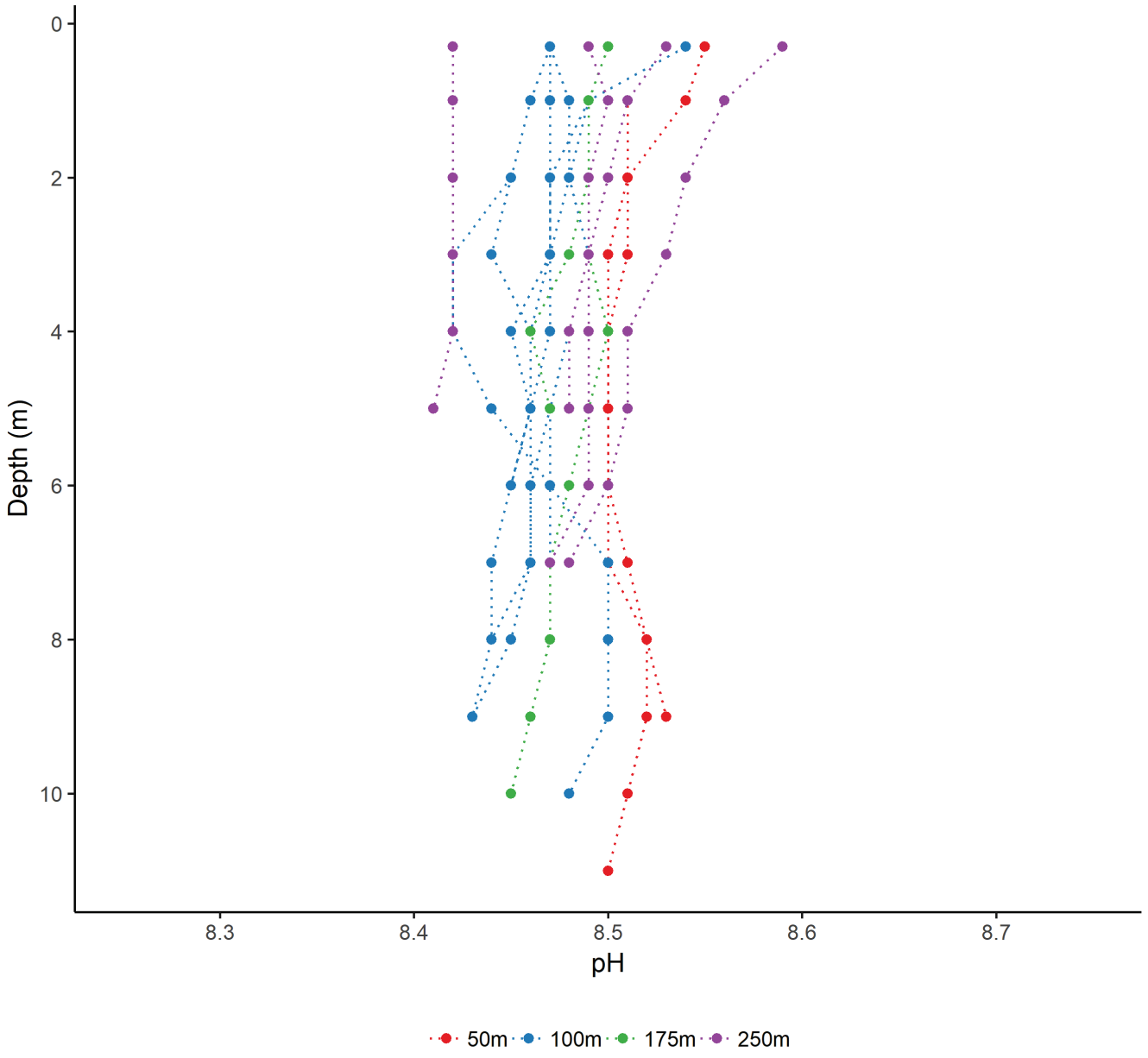


Figure 2.4-5: Vertical Profiles of pH in the Near-Field Exposure Area at Meliadine Lake During the Plume Delineation Study, August 2018

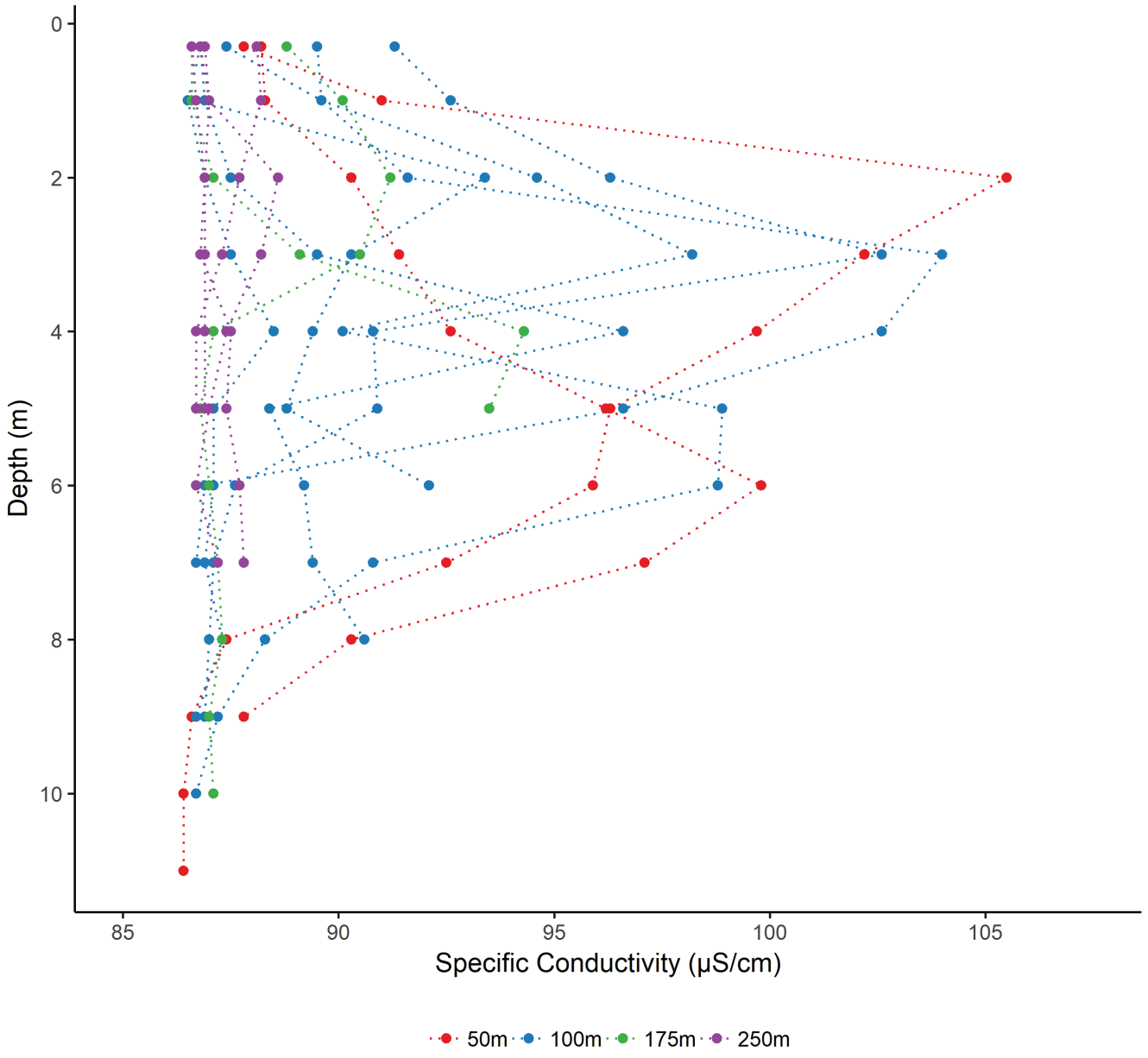


Figure 2.4-6: Vertical Profiles of Specific Conductivity in the Near-Field Exposure Area at Meliadine Lake During the Plume Delineation Study, August 2018

2.4.3.3.2 Plume Characterization

In terms of depth, the increases in specific conductivity were observed roughly between 3 and 7 m. Maximum specific conductivity was 106 µS/cm, observed at station 50-03 at a depth of 3 m, followed by station 100-03 at a depth of 4 m. The results for specific conductivity at stations 50-03 and 100-03 at surface and close to the bottom were restricted to a limited range (85 to 90 µS/cm), which is the same specific conductivity range observed for the measurements taken at all depths up to 250 m away from the diffuser. The presence of plume at mid-depth indicates that the receiving water and the effluent have similar densities and/or intense mixing.

Stations where the plume was more noticeable were to the south-west of the diffuser, which indicates a preferential direction of plume advection during the time the field work was completed (Figure 2.4-7). Changes in wind speed and direction are key factors determining the plume dispersion direction.

By analyzing the results of the specific conductivity measurements taken on previous open-water AEMP field campaigns (July 2015 to July 2018, Golder 2016b; 2017a; 2018a), the plume was discernible by the greater variability observed in July 2018. Whereas in previous sampling events, little or no variation among stations was observed, more variation among and within stations was observed in 2018 (Figure 2.4-8). Even in 2017 prior to effluent discharge, water column conductivity was nearly homogeneous. Comparison of these results to the plume delineation results from Figure 2.4-6 clearly shows how effluent discharge affected specific conductivity in the water column of the Near-field area in 2018. Nevertheless, the effect was limited to the stations closer to the diffuser. Evidence of the plume was noticeable at most sampling stations located 100 m away from the diffuser, while 250 m away from the diffuser the plume was no longer evident.

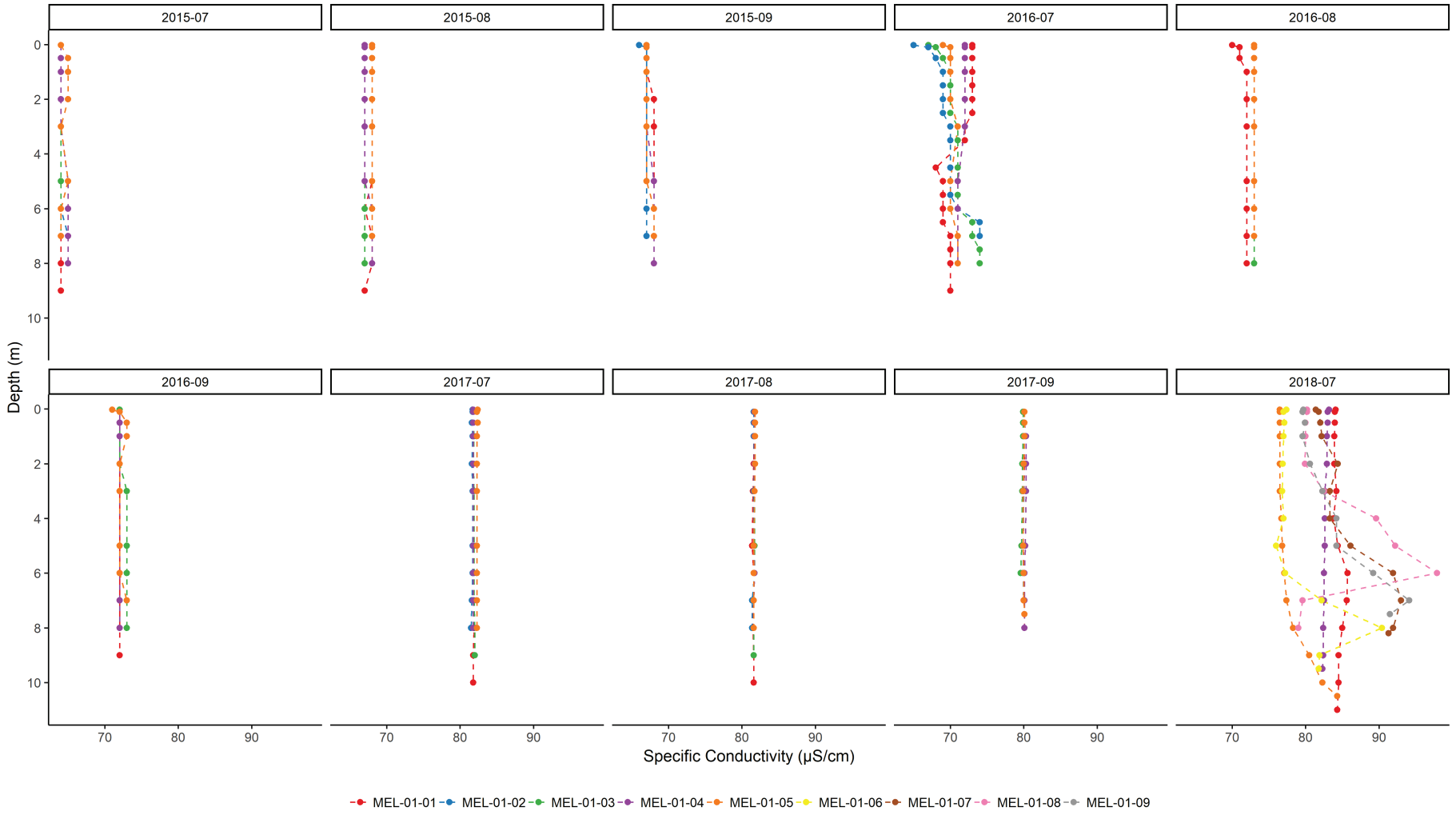
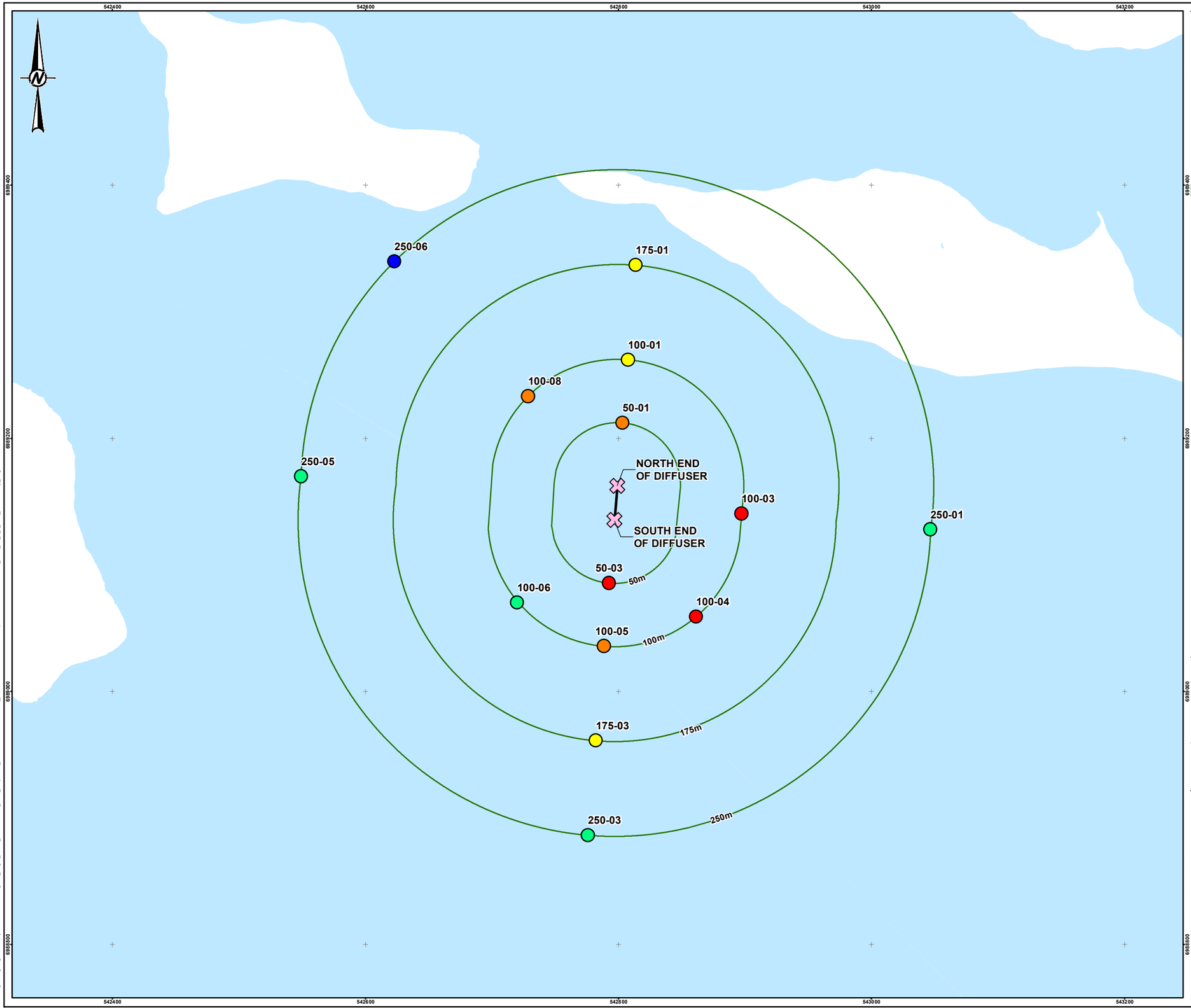


Figure 2.4-7: Maximum Specific Conductivity Under the Plume Delineation Study in the Meliadine Lake Near-Field Exposure Area in August 2018

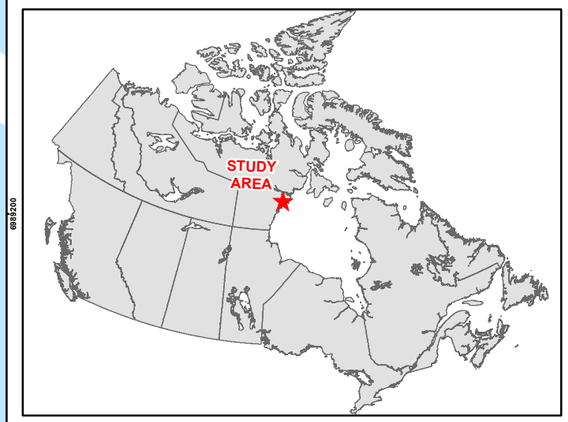


LEGEND

- DIFFUSER

Maximum Specific Conductivity (uS/cm)

- 85.70 - 86.90
- 86.91 - 88.60
- 88.61 - 94.30
- 94.31 - 99.80
- 99.81 - 105.50
- FINAL DISCHARGE BUFFER
- AS-BUILT DIFFUSER



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REFERENCE(S)

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2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE

MAXIMUM SPECIFIC CONDUCTIVITY UNDER THE PLUME DELINEATION STUDY AT MELIADINE LAKE NEAR-FIELD EXPOSURE AREA IN AUGUST 2018

CONSULTANT

GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	ER
PREPARED	MH/CC
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
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2.4.3.3.3 Dilution Factors

The diffuser was designed to maximize initial mixing of the effluent discharged to Meliadine Lake. The dilution factor provides an assessment of the mixing characteristics, where larger values are indicative of more efficient mixing. The results for the different scenarios of dilution factor calculations are given below in Table 2.4-10.

Table 2.4-10: Dilution Factors in the Near-Field Exposure Area at Meliadine Lake

Sampling Station	Maximum Specific Conductivity in 2018 (µS/cm)	Dilution Factor – Scenario A	Dilution Factor – Scenario B
50-01	99.8	63	104
50-03	105.5	53	79
100-01	93.4	80	159
100-03	104.0	56	85
100-04	102.6	58	90
100-05	98.9	65	109
100-06	88.5	101	266
100-08	96.6	71	125
175-01	94.3	77	148
175-03	91.2	88	194
250-01	88.2	102	278
250-03	88.6	100	263
250-05	87.8	104	295
250-06	86.9	110	343

DF = dilution factor.

Under Scenario A (average specific conductivity for 2015 and 2016), which is the more conservative approach, a minimum dilution factor of 53 was obtained. This scenario used the average specific conductivity 2,000 µS/cm for effluent in August 2018 and 69.3 µS/cm for lake water conductivity between 2015 and 2016. Larger dilution factors were obtained under Scenario B, which used the average specific conductivity for lake water in the Near-field area as observed in 2017.

As a general rule, the dilution factor tended to increase as distance to the diffuser increased, even though there were a few exceptions (e.g., station 100-03 and 100-04). For the sampling stations 250 m away from the diffuser the minimum dilution factor was 100 while at 100 m from the diffuser the lowest dilution factor was 56 at 100-03 (Scenario A). This result was nearly two times higher than the lowest results obtained at 50 m. The calculated dilution factors suggest efficient mixing of the effluent in the Near-field area within 50 m from the diffuser.

2.4.3.4 Conclusions

Plume delineation was successful in that the effluent plume could be measured and characterized in the Near-field area in Meliadine Lake. Evidence of an effluent plume was observed between 50 and 100 m from the diffusers, with slight preference for south-west orientation. Vertical influence of the effluent mixing was restricted to 3 to 7 m depths. Based on the specific conductivity results, the effluent was rapidly diluted in the surrounding water, with a minimum dilution factor of 53 at 50 m from the diffuser. The results indicate that maximum effluent concentration observed at 250 m away from the diffuser was 1%, and less than 2% at 100 m.

2.5 Description of the Exposure and Reference Areas

The exposure area is defined as “all fish habitat and waters frequented by fish that are exposed to effluent,” and the reference area is defined as “water frequented by fish that is not exposed to effluent and that has fish habitat that, as far as practical, is most similar to that of the exposure area (Schedule 5, Section 1; Government of Canada 2018).”

The exposure and reference areas are both located within Meliadine Lake. Within-lake reference areas were selected for the following reasons:

- The quantity of effluent to be released is small (maximum annual water volume of 729,000 cubic metres during operations; Agnico Eagle 2016) relative to the volume of Meliadine Lake (east and south basins estimated at 98,851,000 cubic metres and 48,429,000 cubic metres, respectively).
- Concentrations at the edge of the mixing zone (100 m from the diffuser) were predicted to be at or less than CWQG-PAL and CDWQG (FEIS, Volume 7; Golder 2014a).
- The effluent discharge point is approximately 20 km from the outlet in the northwest basin (secondary outlet) and 48 km from the outlet in the southwest basin (main outlet).
- The target small-bodied fish species for the Fish Population study is Threespine Stickleback (*Gasterosteus aculeatus*), based on presence and abundance in the areas studied in Meliadine Lake (Golder 2014). This species is not found in any other regional lake studied to date (Golder 2016a), and individual fish home-range sizes in the exposure area do not overlap with the proposed reference areas.
- No alternative nearby reference lakes with a similar large size and fish assemblage, and accessibility that meets health and safety needs, have been identified (Golder 2014a).

Information on the geology, hydrology, and limnology of Meliadine Lake is provided in Section 2.1. Information on water and sediment quality, and characteristics of BIC and fish populations are provided in Section 3.0.

The Near-field area and at least one Reference area are consistent between the Cycle 1 EEM study and the AEMP. An additional Mid-field exposure area and two additional Reference areas are included in the AEMP. Further description of the exposure and reference areas for each program are provided below.

2.5.1 EEM

2.5.1.1 Exposure Area

The TGD recommends that exposure area sampling be carried out in an area closest to the effluent discharge that ideally supports habitat for both BIC and fish populations, and where effects may be found (Environment Canada 2012). The Near-field area for the Cycle 1 EEM study is located in the vicinity of the CP1 diffuser (Figure 2.6-1). As stated on Section 1.2.1, the Near-field area was relocated to match that of the AEMP (i.e., MEL-01). The coordinates for the Near-field area are provided in Table 2.5-1.

2.5.1.2 Reference Area

The TGD recommends that "where feasible, the reference area should be located in the same waterbody as the effluent discharge, upstream of or beyond any influence from the discharge (Environment Canada 2012)."

The reference area for the Cycle 1 EEM study were located within the northeast bay of Meliadine Lake's West basin (Reference Area 1; MEL-03) (Figure 2.6-1). It is located outside the zone of influence of the mine effluent discharge. The coordinates for the Reference Area 1 (MEL-03) are provided in Table 2.5-1.

2.5.2 AEMP

2.5.2.1 Meliadine Lake

The AEMP study area for the Mine was selected based on the spatial extent of effects predicted in the FEIS (Agnico Eagle 2014c), concerns raised through the FEIS process about potential far downstream effects, and requirements under the federal MDMER requirements (Government of Canada 2018). Reviewers of the FEIS were concerned about potential far-field changes in Meliadine Lake and potential changes as far downstream as Peter Lake. To verify the prediction from the FEIS, address concerns about extent of potential changes, and meet EEM requirements, Meliadine Lake will be monitored in the Near-field area (MEL-01), a Mid-field area (MEL-02), and three downstream reference areas (Figure 2.5-1 and Table 2.5-1). Two reference areas will be located near the two lake outlets (Reference Area 4 [MEL-04] and Reference Area 5 [MEL-05]). One reference area is located within the northeast bay of the lake's west basin (Reference Area 1 [MEL-01]). The reasons for selecting reference areas within Meliadine Lake rather than separate reference lakes are provided above.

2.5.2.2 Peninsula Lakes

Monitoring of Peninsula Lakes is intended to assess indirect effects from the Mine, such as alteration of natural watersheds and potential effects from dust deposition. Headwater lakes (Lake A8, Lake B7, Lake D7) in three peninsula watersheds were selected (Table 2.5-1). The selected peninsula lakes include two lakes close to the proposed mine footprint that were previously fished by the Inuit (Lakes B7 and D7) during winter (Golder 2016a).

Table 2.5-1: Exposure and Reference Areas in Meliadine Lake, 2018

Waterbody	Area	Monitoring Program	UTM Coordinates (NAD 83, Zone 15V)		Geographic Coordinates	
			Easting (m)	Northing (m)	Latitude	Longitude
Meliadine Lake	Near-field Exposure (MEL-01)	EEM and AEMP	542657	6989124	92° 9'25.24"W	63° 1'45.14"N
	Mid-field Exposure (MEL-02)	AEMP	537611	6992659	92°15'21.25"W	63° 3'41.38"N
	Reference Area 1 (MEL-03)	EEM and AEMP	533498	6998574	92°20'9.85"W	63° 6'53.96"N
	Reference Area 2 (MEL-04)	AEMP	525713	7001178	92°29'23.84"W	63° 8'20.39"N
	Reference Area 3 (MEL-05)	AEMP	530644	6990942	92°23'38.52"W	63° 2'48.27"N
Peninsula Lakes	Lake A8	AEMP	540211	6987204	92°12'20.853"W	63°0' 44.151"N
	Lake B7	AEMP	538195	6989436	92°14'42.320"W	63°1'57.047"N
	Lake D7	AEMP	536567	6988868	92°16'38.599"W	63°1'39.300"N

Note: Coordinates are approximate.

UTM = Universal Transverse Mercator; NAD = North American Datum; m = metre; ° = degree; ‘ = minute; “ = second; W = West; N = North.

525000
530000
535000
540000
545000
7000000
6995000
6990000

REFERENCE AREA 2 (MEL-04)

REFERENCE AREA 1 (MEL-03)

REFERENCE AREA 3 (MEL-05)

MID-FIELD EXPOSURE AREA (MEL-02)

NEAR-FIELD EXPOSURE AREA (MEL-01)

LAKE H17 EFFLUENT DIFFUSER (INACTIVE)

STP EFFLUENT DISCHARGE (INACTIVE)

CP1 DIFFUSER

Meliadine Lake

Meliadine Lake

Control Lake

E2 E9 E3 F4 F3 F7 D12 D24 D1 E4 D23 D3 D35 D36 B4 D3 B7 B7 B8 B5 B17 B4 B36 B59 B46 B46 B2 P2 O2 C5 A6 A6 M7 ML H20 J1

LEGEND

- LAKE H17 EFFLUENT DIFFUSER (INACTIVE)
- STP EFFLUENT DISCHARGE (INACTIVE)
- CP1 DIFFUSER
- DIRECTION OF FLOW AT WATERSHED OUTLET
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- WATERCOURSE
- WATERBODY



0 1.5 3
1:75,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT
CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE
STUDY AREAS FOR MELIADINE GOLD MINE ENVIRONMENTAL EFFECTS MONITORING AND AQUATIC EFFECTS MONITORING PROGRAM

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	JN
PREPARED	MH
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
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2.6 Additional Considerations – Potential Confounding Factors

Under Schedule 5, Section 12 of the MDMER, the first interpretative report is required to describe "the presence of anthropogenic, natural or other factors that are not related to the effluent under study and that may reasonably be expected to contribute to any observed effect" (Government of Canada 2018). Due to the remote location of the Mine, there are limited anthropogenic influences other than the Mine (e.g., public recreational areas, infrastructure, or industrial developments) that could contribute to effects in the study area beyond those associated with the Mine itself (e.g., dust and associated local aerial deposition). The following sub-sections outline potential Mine-related factors other than mine effluent discharge and dust deposition that may confound the determination of effects of the mine effluent on the receiving environment in Meliadine Lake or the Peninsula Lakes.

2.6.1 Greywater

Under Water Licence 2BB-MEL0709 (NWB 2007), exploration camp greywater was discharged to a wetland, which then discharged into Meliadine Lake from 2007 to 2010. Water chemistry was monitored at station MEL-03 in the wetland (UTM 542083E, 6989004N) and at station MEL-04 in Meliadine Lake (UTM 542092E, 6989012N) (Figure 2.2-1).

Greywater samples collected in July and October 2007 showed elevated total phosphorus concentration (3.1 to 3.2 mg/L), which was attributed to the use of phosphate-containing detergents in the kitchen and dry wash activities (Comaplex 2007). Total phosphorus was not detected (detection limit = 0.02 mg/L) in the MEL-04 samples. Total phosphorus was also elevated in 2008 greywater samples, with concentrations of 4.2 mg/L (June 30) and 2.9 mg/L (August 19) (Comaplex 2008a). Total phosphorus was detected at the detection limit of 0.02 mg/L in the concurrent MEL-04 samples. No additional MEL-03 samples were collected in October 2008; one sample was collected at MEL-04 (total phosphorus was not detected at 0.02 mg/L) (Comaplex 2008b).

Greywater volume was not reported in the 2007 and 2008 annual reports. However, water intake related to camp use was reported for part of October and for November 2007; daily average use was 3.8 m^3 in October and 4.3 m^3 in November (Comaplex 2007). Total volume used for camp use from October 2007 to December 2008 was estimated to be 2,007 m^3 (Comaplex 2008b).

2.6.2 Sewage

Under Water Licence 2BB-MEL0914 (NWB 2009), a BIODISK wastewater treatment system (sewage treatment plant; STP) was approved for use at the exploration camp to treat sewage. The camp was typically open from the beginning of April to the end of November. Prior to this, sewage (i.e., human waste) was bagged and incinerated or transported off site to a suitable disposal facility.

In 2009, the BIODISK system and associated wash car (with flush toilets) was in the process of being commissioned or was put into use. The two BIODISK system in operation could handle 125 workers. Treated sewage discharge was monitored at MEL-07 (in the STP) starting in July 2010. There is no mention of a monitoring station in Meliadine Lake associated with MEL-07 (STP) discharge. At some point, greywater was diverted to the STP for treatment instead of discharging through the wetland. At the end of October 2010, the camp entered care and maintenance with two people remaining on site to maintain the microbes in the BIODISK system over the winter. Prior to this, the camp was presumed to be closed over the winter.

Issues with the STP were observed in 2012, and a consultant was hired to help with recurring fecal coliform exceedances. TP concentration in the MEL-07 final effluent discharge from the BIODISK treatment system was as high as 24.7 mg/L in some samples in May 2012, with TKN as high as 116 mg/L. Effluent discharge volume was not reported, nor was camp use intake volumes. In June 2012, camp use intake was 20.6 m^3, and intake declined to ~10 m^3 in November. A report to the inspector with regards to the STP in November 2013 stated "During the quarter, number of people on site decreased from 78 to 45 persons. The flow at STP decreased from 17 to 10 m^3 at the end of the quarter". From 2015 to 2016, additional ultraviolet treatment was added, and the STP was further upgraded to accommodate an increased number of workers at the exploration camp. In April 2016, camp population was between 115 to 137 people, and was as high as 220 people in October 2017. Over the past few years, TP concentration in the STP effluent was relatively consistent around 11 to 16 mg/L.

Starting in November 2017, exploration camp STP effluent was trucked to the main camp STP for treatment due to recurring issues with fecal coliforms. All treated sewage discharge was diverted to CP1, and therefore further treatment occurred through the wastewater treatment plant prior to discharge through the Meliadine Lake main diffuser (MEL-14). Discharge through the main diffuser into Meliadine Lake did not occur until June 2018.

The estimated annual loadings of nutrients directly or indirectly discharged from MEL-07 from the exploration camp STP indirectly into Meliadine Lake in 2013, 2015, 2016, 2017, and 2018 is shown in Table 2.6-1. Physicochemical characteristics and monthly loadings of sewage discharged from MEL-07 in previous years are provided in Appendix 2B. Total phosphorus loadings were similar in 2013 (52.4 kg) and 2015 (52.9 kg), then doubled in 2016 (100.7 kg) and maintained a similar amount in 2017 (96 kg), before declining in 2018 (22.9 kg). Note that no STP was discharged directly to Meliadine Lake in 2018, so the loadings for 2018 represent those discharged to CP1 and not to Meliadine Lake.

The higher TP loadings in STP discharge aligns with 2016 observations of the BIC showing a nutrient enrichment response pattern that was not present in 2015. Loadings of nitrogen compounds (i.e., nitrate, nitrite, total Kjeldahl nitrogen, and total nitrogen) showed a similar pattern, but nitrogen loadings did not decline in 2018, which could be attributed to mine activities (i.e., increase in use of nitrogenous compounds for blasting, and the resulting nitrogen loading to CP1).

Table 2.6-1: Annual Loadings of Nutrients Directly or Indirectly Discharged from MEL-07 into the Near-field Area, 2013, 2015 to 2018

Year	Project Phase	Type of Effluent Discharge	Nitrate (kg)	Nitrite (kg)	TKN (kg)	TN (kg)	TP (kg)
2013	Baseline	Sewage/grey water	58.7	5.4	86.7	150.8	52.4
2015	Baseline	Sewage/grey water	48.3	10.3	127.6	186.1	52.9
2016	Construction	Sewage/grey water	155.2	14.0	211.2	380.4	100.7
2017	Construction	Sewage/grey water	171.2	17.6	221.0	409.8	96.0
2018[a]	Construction	Mine effluent[b]	3,018	114	1,172	4,304	22.9

a) Discharge occurred from July through to September.

b) Mine effluent under the MDMER (Government of Canada 2018) and Type A Water Licence (NWB 2016).

kg = kilogram; TN = total nitrogen; TP = total phosphorus; TKN = total Kjeldahl nitrogen; MDMER = Metal and Diamond Mining Effluent Regulations.

2.6.3 Spills

One spill and two effluent limit exceedances were reported in 2018.

On February 2, 2018, during an inspection of the exploration camp retention tanks, it was noticed by a member of the Site Services team that water was flowing into Meliadine Lake near the discharge area of the STP. The environment department and site services supervisor were notified immediately, and an inspection was conducted to determine the source of the water. It was discovered that a valve at the base of one of the retention tanks had been left open, resulting in the draining of the contents of all four tanks, which are connected in series. Discharge from the STP had been suspended since November 2017 due to exceedances. Additional information regarding the spill can be found in Appendices 2P and 2Q.

A sample of treated water from MEL-14 (final effluent sampling port prior to discharge to Meliadine Lake) was collected on July 23, 2018. Upon review of the laboratory analysis results, the total aluminum concentration was found to be 4.39 mg/L, which exceeded the permitted discharge limit of 2 mg/L. As per the obligations under the NWB License 2AM-MEL1631, Part F, item 3 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act, samples were collected for laboratory analysis to assess the total metal concentrations and other water quality parameters during final effluent discharge at MEL-14. The laboratory results were received on August 8, 2018; however, the exceeded criteria for total aluminum concentration was not observed at the initial time of the data review and data input. During the quarterly reporting for MDMER-EEM (RIIS) on October 1, 2018, the exceedance was observed and reported immediately. Further details regarding the exceedance are provided in Appendices 2R and 2S.

A sample of treated water from MEL-14 was collected on August 19, 2018. Upon review of the laboratory analysis results, the TDS concentration was found to be 1,430 mg/L which exceeded the permitted discharge limit of 1,400 mg/L. Further details regarding the exceedances are provided in Appendices 2T and 2U.

2.7 List of Appendices

- Appendix 2A: Daily Discharge Volume from MEL-14 into Meliadine Lake, 2018
- Appendix 2B: Effluent Quality Data for MEL 14, 2018
- Appendix 2C: Water Quality Data for MEL-13, 2018
- Appendix 2D: Acute Lethality Toxicology Laboratory Reports
- Appendix 2E: Sublethal Toxicity Toxicology Laboratory Reports
- Appendix 2F: Effluent Quality Data at CP1, 2017
- Appendix 2G: Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018
- Appendix 2H: Spill Reports, 2018
- Appendix 2I: Summary of Treated Sewage Discharge Quality from MEL-07, 2016 to 2018
- Appendix 2J: Monthly Loadings of Select Sewage Quality Parameters Discharged from MEL-07, 2013 and 2015 to 2018

2.8 References

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3.0 SUMMARY OF PREVIOUS BIOLOGICAL MONITORING STUDIES

This report section provides a summary of the results from the 2017 AEMP Annual Report for water quality, sediment quality, BIC, fish health and fish tissue, and plankton biological monitoring studies conducted at Meliadine Lake and/or the Peninsula Lakes. Baseline sampling programs carried out in 2015 and 2016 reflect conditions prior to discharge of the Type A Water Licence (NWB 2016) effluent to the Near-field area of Meliadine Lake. Additional details can be found in the final 2017 AEMP Annual Report (Golder 2018c).

3.1 Water Quality

3.1.1 Meliadine Lake

Water quality data were collected from Meliadine Lake in 2015 (Near-field and Mid-field areas, during the open-water season), 2016 (Near-field and Mid-field areas during open-water and under-ice; reference areas during open-water), and 2017 (Near-field and Mid-field areas during open-water and under-ice; reference areas during open-water). Based on the analyses conducted as part of the 2017 AEMP Annual Report (Golder 2018c), there were differences in water quality of the Near-field area for open-water conditions in 2017 as compared to 2015 and 2016. Under-ice water quality of the Near-field area in 2016 and 2017 was similar (under-ice data were not collected in 2015). Open-water season water quality of the Mid-field and reference areas in 2015, 2016, and 2017 was similar.

Water quality in Meliadine Lake characterized during ice-covered and open-water conditions lacked stratification within the water column and was generally well-oxygenated. Concentration of TDS, hardness, alkalinity, specific conductivity, nutrients, and metals were low and none of the relevant CWQG-PAL, CDWQG, or SSWQO developed for the Mine were exceeded. Specific conductivity, major cations, chloride, sulphate, and some metals (e.g., total arsenic, barium, cobalt, copper, nickel, silicon, and strontium) concentrations were slightly higher in the exposure areas than the reference areas; the Near-field area tended to have slightly higher concentrations compared to the Mid-field area. In addition, specific conductivity, hardness, chloride, major cations, ammonia, and some metals (e.g., barium, boron, copper, strontium) had slightly higher concentrations during ice-covered conditions compared to open-water conditions.

3.1.2 Peninsula Lakes

In general, water quality in the Peninsula Lakes was similar in 2017 compared to 2015 and 2016, and thus all data were considered to be representative of baseline (Golder 2018c). The Peninsula Lakes were well-oxygenated, with pH values indicative of slightly basic conditions, low sensitivity to acid deposition, and low to moderate ionic strength. Parameter concentrations in the Peninsula Lakes were low and none of the relevant guidelines or site-specific objectives were exceeded. Specific conductivity, hardness, and concentrations of TDS (including chloride and sulphate) and some metals (including arsenic, barium, and strontium) in Lake A8 were slightly higher than in the other two Peninsula Lakes. Concentrations of phosphorus, major ions (i.e., bicarbonate and fluoride), and several metals including boron, lithium, molybdenum, selenium, uranium, and vanadium were slightly higher in Lake D7 compared to Lake A8 and Lake B7. Specific conductivity, hardness, alkalinity, TDS, major ions, and some metals including arsenic, barium, lithium, and strontium were generally slightly higher in the Peninsula Lakes compared to Meliadine Lake.

3.2 Sediment Quality

In 2015 and 2016, a total of 35 sediment quality samples from Meliadine Lake, five samples from Lake A8, four samples from Lake B7, and three samples from Lake D7 were collected and analyzed for particle size, total organic carbon, nutrients, and metals. These data form a baseline dataset for comparisons to future monitoring of sediment quality trends during the life of the Mine.

Under baseline conditions, concentrations of arsenic, chromium, and copper exceed guideline values. Arsenic concentrations in Meliadine Lake were generally highest in the Near-field area (MEL-01). Due to the strong relationship between fine sediment content and metal concentrations in Melidine Lake sediments, data were normalized to fine sediment content prior to running statistical tests. Even after normalization, some sediment quality parameters (arsenic, iron, mercury, strontium, and sulphur) were higher in the Near-field area compared to the reference areas. The Mid-field area had similar particle size distribution to the reference areas, but concentrations of some parameters (arsenic, chromium, cobalt, lead, manganese, molybdenum, nickel, uranium, and zinc) were higher in the Mid-field area than in reference areas.

Sediment samples from the Peninsula Lakes were also relatively sandy, with concentrations of arsenic, chromium and copper that exceeded SQGs. The lowest concentrations of these three parameters were observed in Lake B7.

3.3 Benthic Invertebrate Community

Benthic invertebrate communities sampled in Meliadine Lake exposure and reference areas during 2015 and 2016 baseline sampling programs were representative of subarctic systems (Golder 2018c). Benthic invertebrate communities were characterized by low total density and low to moderate richness. Simpson's Diversity Index and evenness values suggested that baseline benthic invertebrate communities sampled at most stations in the reference and exposure areas had moderate to high diversity with few taxa that were overly dominant. Benthic communities were dominated by midges (family Chironomidae), with the tribe Chironomini being the most dominant chironomid group in all areas sampled within Meliadine Lake. Spatial and temporal differences in community structure among Near-field and Mid-field exposure areas and the reference areas were observed during evaluation of the 2015 and 2016 data. In particular, the BIC of the Near-field area was found to differ from communities in the three reference areas in 2016. These differences may have been attributed to potential differences in the physical habitat sampled (i.e., due to substrate type variation), or possibly, mild nutrient enrichment in the Near-field area from the exploration camp STP discharge. Overall, the BIC of the Near-field area was most similar to the community in Reference Area 1.

3.4 Fish Health and Fish Tissue

Baseline fish health and tissue chemistry data were collected in 2015 for Threespine Stickleback (*Gasterosteus aculeatus*) and Lake Trout (*Salvelinus namaycush*) from the Near-field area of Meliadine Lake (Golder 2016a). Threespine Stickleback were subsequently sampled from two reference areas (Reference Areas 1 and 2) in 2017 to complete the fish health and tissue chemistry baseline dataset (Golder 2018c). Threespine Stickleback were captured in sufficient numbers from the Near-field area and reference areas of Meliadine Lake to meet sampling requirements for the fish health and tissue chemistry components of the AEMP. Threespine Stickleback were abundant throughout shallow areas (i.e., less than 3 m) of Meliadine Lake, and susceptible to capture using minnow traps and backpack electrofishing. The majority of Threespine Stickleback captured in Meliadine Lake (i.e., 76% of fish sampled) were infected by the tapeworm *Schistocephalus solidus* that competes with the host for available resources. In general, Threespine Stickleback were similar between the Near-field and reference areas;

however, differences were observed in population structure and tissue chemistry parameters. Threespine Stickleback sampled from the Near-field area were generally larger and exhibited lower metal concentrations in carcass tissue relative to fish sampled from the reference areas.

3.5 Plankton

Plankton monitoring was conducted as a targeted study during the open-water seasons of 2015, 2016, and 2017 (Golder 2018c). Samples of phytoplankton, zooplankton, chlorophyll *a*, and nutrients were collected in five areas of Meliadine Lake (i.e., Near-field and Mid-field areas, and three reference areas). Trophic status calculations indicated conditions in Meliadine Lake were oligotrophic in all areas and years. Higher chlorophyll *a* concentrations and phytoplankton biomass, and unique phytoplankton community structure (based on multivariate analysis) in the Near-field area was suspected indicate the potential effects of nutrient enrichment originating from the exploration camp STP effluent outfall. Although total phosphorus (TP) concentrations were not unusually elevated in the Near-field area, they were highest in this area in September during each year of monitoring. Zooplankton biomass was primarily dominated by cladocerans and rotifers in all areas of Meliadine Lake. This targeted study provided useful information to characterize plankton communities in Meliadine Lake and to inform selection of monitoring tools for incorporation into the AEMP.

3.6 References

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4.0 STUDY DESIGN OVERVIEW

The AEMP was designed to harmonize with the EEM requirements of the MDMER throughout the life of the Mine. The Cycle 1 EEM study design (Golder 2017a) and AEMP Design Plan (Golder 2016a) are summarized below.

4.1 EEM

An overview of the Cycle 1 EEM study design is provided in Table 4.1-1. The biological monitoring studies in 2018 included a BIC survey and a small-bodied fish health survey with Threespine Stickleback (*Gasterosteus aculeatus*), with supporting water and sediment quality data collection. A fish tissue survey was not conducted because concentrations of mercury and selenium in effluent did not meet the criteria for initiating a survey as per Schedule 5, Section 9c and 9d of the MDMER. A plume delineation study was conducted during the discharge period to describe effluent mixing in the Near-field area. Effluent quality samples (chemistry and toxicity) were collected by Agnico Eagle as per MDMER requirements (Government of Canada 2018).

Component-specific deviations from the Cycle 1 EEM study design are summarized in Table 4.1-1; additional details and descriptions of how the deviations affected the results interpretations are provided in the corresponding report sections. A key deviation was the change in the Near-field area location. In the Cycle 1 EEM study design (Golder 2017), the exposure area was proposed to be near MEL-D-1. In their comments on the EEM study design, ECCC recommended that the exposure area be relocated to assess the effects of the permanent discharge point (MEL-14), which was implemented during the Cycle 1 EEM study.

Table 4.1-1: Summary of Cycle 1 EEM Study Design

Component	Description	Measurement Endpoints	Target Sample Sizes	Deviations from Study Design	Report Section with Detailed Methods/ Results
Effluent Quality (Chemistry and Toxicity)	Description of effluent quality since the Mine became subject to the MDMER	■ Chemistry: ▪ Deleterious substances as per Schedule 4 of the MDMER ▪ Effluent Characterization as per Schedule 5 of the MDMER ■ Toxicity: ▪ Acute Lethality to Rainbow Trout and *Daphnia magna* ▪ Sublethal toxicity to Fathead Minnows, *Ceriodaphnia dubia, Lemna minor, Pseudokirchneriella subcapitata*	Weekly and quarterly monitoring as per MDMER	Not applicable	Section 2.4.2
Effluent Plume Delineation	Distribution of the effluent plume and percent effluent concentration in the Near-field exposure area	Concentration of effluent at 100 m and 250 m from final discharge point	not applicable	None	Section 2.4.3
Benthic Invertebrate Community	Structure and composition of the benthic invertebrate assemblage	Total invertebrate density, total taxonomic richness, Simpson's diversity index, Simpson's evenness index (SEI), Bray Curtis Index (BCI)	Five stations in each of exposure and reference area	■ Change in Near-field area ■ Petite Ponar grab was used instead of an Ekman grab ■ Change in station where discrete samples were collected for within-station variability assessment	Section 9.0

Table 4.1-1: Summary of Cycle 1 EEM Study Design

Component	Description	Measurement Endpoints	Target Sample Sizes	Deviations from Study Design	Report Section with Detailed Methods/ Results
Fish Population	Lethal and non-lethal fish health survey of Threespine Stickleback	■ Size at age, relative gonad size, condition, relative liver size, age, length-frequency distribution, young-of-the-year abundance ■ Additional supporting endpoints including sex, maturity, life stage, egg weight, fecundity, internal and external abnormalities	■ Lethal survey: 20 males, 20 females, and 20 juveniles from each exposure and reference area ■ Non-lethal survey: an additional 100 fish from each exposure and reference area	■ Change in Near-field area ■ Ages were assigned based on otoliths instead of length-frequency distributions (TAP request) ■ No YOY were captured	Section 10.0
Supporting Data - Water Quality	Physical and chemical characteristics of surface waters	■ Field-measured vertical profiles (dissolved oxygen, pH, water temperature, specific conductivity) ■ Laboratory-measured chemistry (conventional parameters, total metals, radium-226, cyanide)	At least two stations in each of exposure and reference area	None	Section 6.0
Supporting Data - Sediment Quality	Physical and chemical characteristics of bottom sediments	Total organic carbon, particle size, total metals	Five stations in each exposure and reference area	None	Section 8.0

MDMER = Metal and Diamond Mining Effluent Regulations; SDI = Simpson's diversty index; SEI = Simpson's evenness index; BCI = Bray-Curtis Index.

4.2 AEMP

The AEMP consists of two distinct programs: the Meliadine Lake study and the Peninsula Lakes study, with the study design based on Project design, IQ, consultation, and regulatory requirements (Golder 2016a). Based on IQ and community consultation, the importance of clean water and the health of fish and birds were emphasized by the Elders and other people in the communities who rely on these resources for traditional use. Elders have expressed concerns regarding potential Project-related adverse effects on drinkability of water and fish populations in waterbodies of the Meliadine watershed. Key questions were developed for each monitoring component in both studies to focus the study design and to analyze the results in the annual monitoring reports.

The Meliadine Lake study was designed around the key aspects of EEM requirements (e.g., number of stations per area, sample sizes, measurement endpoints and supporting variables), as Meliadine Lake will receive direct effluent discharge. The core components of the Meliadine Lake study are water quality, sediment quality, benthic invertebrate communities, and fish health. A targeted plankton study is also included to investigate the potential for plankton monitoring. For the Meliadine Lake study, up to three within-lake reference areas are included in the study design. Within-lake reference areas were chosen because a different small-bodied fish assemblage was found in Meliadine Lake compared to other lakes in the region, and effects on water quality are expected to be localized; this allows use of reference areas at some distance downstream from the diffuser.

The Peninsula Lakes study was designed to detect potential indirect effects of the Mine (e.g., aerial deposition and physical alteration of watersheds). The core component of the Peninsula Lakes study is water quality. Water quality is monitored on a regular basis, with biological or other studies (i.e., targeted studies) added if the water quality results suggest Mine-related changes have occurred.

Key questions for the Meliadine AEMP are proposed for each core component to focus the study methods, data analyses, and interpretation. The key questions for each study, by component, are provided in Table 4.2-1.

Table 4.2-1: Key Questions Addressed by the Aquatic Effects Monitoring Program

Study	Component	Key Questions
Meliadine Lake	Water Quality	■ Are concentrations of key parameters in effluent less than Water Licence limits? ■ Are concentrations of key parameters in Meliadine Lake consistent with FEIS predictions and less than AEMP Action Levels? ■ Are concentrations in the exposure area increasing over time relative to the reference areas?
	Sediment Quality	■ Are concentrations of sediment quality parameters in Meliadine Lake less than benchmarks? ■ Are concentrations in the exposure area increasing over time relative to the reference areas?
	Benthic Invertebrate Community	■ Is the benthic invertebrate community affected by potential Mine-related changes in water and sediment quality in Meliadine Lake?
	Fish Health	■ Is fish health affected by changes in water and sediment quality in Meliadine Lake?
	Fish Tissue Chemistry	■ Are tissue metal concentrations in fish from Meliadine Lake increasing due to mining activities? ■ Are tissue metal concentrations in fish from Meliadine Lake increasing relative to reference areas or baseline?

Table 4.2-1: Key Questions Addressed by the Aquatic Effects Monitoring Program

Study	Component	Key Questions
Peninsula Lakes	Water Quality	■ Are concentrations of key parameters in the Peninsula Lakes consistent with FEIS predictions and less than AEMP Action Levels? ■ Are concentrations of key parameters in the Peninsula Lakes increasing over time relative to baseline or reference conditions?

An overview of the AEMP study design is provided in Table 4.2-2. In Meliadine Lake, the field programs in 2018 included water quality sampling in Near-field and Mid-field areas during the ice-cover season and in all areas during the open-water season, and sediment quality sampling and benthic invertebreate community surveys in both exposure areas and two reference areas during the open-water season. Additional studies included effluent plume characterization, and a plankton survey as part of the plankton targeted study. Water quality sampling during the open-water season was also conducted in the Peninsula Lakes.

Table 4.2-2: Summary of Aquatic Effects Monitoring Program Study Design

Area	Component	# Stations per Area	# Samples per Station	Parameters	Sample Type	Sampling Frequency	Sampled in 2018?	Report Section with Detailed Methods
Meliadine Lake Exposure Area (Near-field and Mid-field)[a]	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	once during under-ice; monthly during open-water discharge period	Yes	Section 6.0
		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated	monthly during open-water discharge period	Yes	Section 11.0
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	once in late open-water discharge period	Yes	Section 9.0
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	once in late open-water discharge period	Yes	Section 8.0
	Plankton[b]	5	1	phytoplankton taxonomy	composite; depth-integrated	monthly during open-water discharge period	Yes	Section 11.0
		5	1	zooplankton taxonomy	composite; vertical tow of water column	monthly during open-water discharge period	No	not applicable
	Fish Health[c]	n/a	60[d]	lengths, weights, sex, fecundity, age, external and internal health	individual fish	once per year	No	not applicable
	Fish Tissue Chemistry[c]	n/a	40[d]	metals	carcass (adults only), muscle, liver, kidney	once per year	No	not applicable

Table 4.2-2: Summary of Aquatic Effects Monitoring Program Study Design

Area	Component	# Stations per Area	# Samples per Station	Parameters	Sample Type	Sampling Frequency	Sampled in 2018?	Report Section with Detailed Methods
Meliadine Lake Reference Area 1 (northeast bay)	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	monthly during open-water discharge period	Yes	Section 6.0
		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated	monthly during open-water discharge period	Yes	Section 11.0
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	once in late open-water discharge period		Section 9.0
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	once in late open-water discharge period	Yes	Section 8.0
	Plankton[(c)]	5	1	phytoplankton taxonomy	composite; depth-integrated	monthly during open-water discharge period	Yes	Section 11.0
		5	1	zooplankton taxonomy	composite; vertical tow of water column	monthly during open-water discharge period	No	not applicable
	Fish Health[(c,e)]	n/a	60[(d)]	lengths, weights, sex, fecundity, age, external and internal health	individual fish	once per year	No	not applicable
	Fish Chemistry[(c,e)]	n/a	40[(d)]	metals	carcass (adults only)	once per year	No	not applicable

Table 4.2-2: Summary of Aquatic Effects Monitoring Program Study Design

Area	Component	# Stations per Area	# Samples per Station	Parameters	Sample Type	Sampling Frequency	Sampled in 2018?	Report Section with Detailed Methods
Meliadine Lake Reference Area 2 (northwest bay)	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	monthly during open-water discharge period	Yes	Section 6.0
		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated	monthly during open-water discharge period	Yes	Section 11.0
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	as required[(f)]		Section 9.0
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	as required[(f)]	No	not applicable
	Plankton[(b)]	5	1	phytoplankton taxonomy	composite; depth-integrated	as required[(f)]	Yes	Section 11.0
		5	1	zooplankton taxonomy	composite; vertical tow of water column	as required[(f)]	No	not applicable
	Fish Health[(c,e)]	n/a	60[(d)]	lengths, weights, sex, fecundity, age, external and internal health	individual fish	once per year	No	not applicable
	Fish Chemistry[(c,e)]	n/a	40[(d)]	metals	carcass (adults only)	once per year	No	not applicable

Table 4.2-2: Summary of Aquatic Effects Monitoring Program Study Design

Area	Component	# Stations per Area	# Samples per Station	Parameters	Sample Type	Sampling Frequency	Sampled in 2018?	Report Section with Detailed Methods
Meliadine Lake Reference Area 3 (southwest bay)	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	monthly during open-water discharge period	Yes	Section 6.0
		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated	monthly during open-water discharge period	Yes	Section 11.0
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	as required		Section 9.0
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	as required	Yes	Section 8.0
	Plankton[(b)]	5	1	phytoplankton taxonomy	composite; depth-integrated	as required	Yes	Section 11.0
		5	1	zooplankton taxonomy	composite; vertical tow of water column	as required	No	not applicable
Peninsula Lakes: Lake B7 Lake A8 Lake D7	Water Quality	3	1	major ions, nutrients, metals	composite; from specific depth	twice during open-water season	Yes	Section 7.0

Notes:

(a) Only the Near-field area, and Reference Areas 1 and 2 are planned for sampling fish health and fish tissue chemistry.

(b) Plankton monitoring is not a core component of the AEMP but was planned as a targeted study to evaluate the usefulness of plankton monitoring for future monitoring.

(c) Fish health and tissue chemistry sampling for the AEMP is currently scheduled for 2021.

(d) Sample size is for Threespine Stickleback; Lake Trout sample sizes will be determined prior to next AEMP Fish Health/Tissue Chemistry program.

(e) Lake Trout will not be collected from the Reference Areas.

(f) Reference Area 2 was sampled to provide additional baseline data; further sampling will depend on triggering by water quality results from the Mid-field area or Reference Area 1.

"Metals" include non-metals (e.g. selenium) and metalloids (e.g., arsenic).

4.3 References

Golder. 2016b. Meliadine Gold Project, Nunavut Aquatic Effects Monitoring Program (AEMP) Design Plan 6513-REP-03 Version 1. Prepared for Agnico Eagle Mines Limited, Rouyn Noranda, Quebec.

Golder 2017a. EEM Cycle 1 Study Design: Meliadine Gold Mine. Prepared for Agnico Eagle Mines Limited, Meliadine Division, Rankin Inlet, Nunavut. Document Number Doc635-1781142. August 2017.

5.0 SUPPORTING ENVIRONMENTAL DATA

Supporting environmental data provided by Agnico Eagle included monthly air temperature, wind speed, and precipitation (Table 5-1).

Table 5-1: Monthly Air Temperature, Wind Speed, and Precipitation in 2018

Month	Average Temperature	Maximum Temperature	Minimum Temperature	Average Wind Speed	Maximum Wind Speed	Total Precipitation	Daily Average Precipitation	Maximum Precipitation
Unit	°C	°C	°C	m/s	m/s	mm	mm	mm
January	-28.8	-14.6	-37.0	17.4	68.0	7.9	0.25	3.0
February	-35.2	-16.9	-46.8	15.3	58.7	10.6	0.38	3.8
March	-21.6	-4.2	-36.4	17.6	67.7	13.2	0.43	4.6
April	-17.3	1.8	-33.7	20.1	72.0	8.8	0.29	2.8
May	-9.4	1.7	-23.2	22.7	73.6	38	1.23	8.6
June	3.6	17.1	-8.4	16.6	62.4	28.4	0.95	20
July	13.0	27.5	-0.1	15.6	66.9	15.8	0.51	6
August	9.7	20.7	2.0	23.3	88.7	52.8	1.70	16
September	2.2	13.4	-5.8	18.2	70.3	19	0.63	5.4
October	-6.9	2.9	-27.1	17.5	66.5	24.6	0.79	6.8
November	-21.8	-1.0	-37.9	16.8	54.8	19.6	0.65	9.2
December	-24.6	-7.2	-38.4	15.4	61.0	8.6	0.28	2.2

°C = degrees Celsius; m/s = metres per second; mm = millimetre.

6.0 WATER QUALITY – MELIADINE LAKE

In support of the AEMP and Water Licence (2AM-MEL1631) requirements of the Mine, water quality monitoring was completed from 2015 to 2018 in Meliadine Lake (Figure 6.1-1) and Peninsula Lakes (Section 7.0). Beginning in 2018, water quality monitoring was completed at address EEM requirements of the MDMER (Schedule 5, Section 7).

This report section provides a summary of the water quality monitoring programs completed in 2018 at Meliadine Lake, analysis of data collected between 2015 and 2018, and an interpretation of the results per the requirements of the AEMP and EEM. Data analyses presented in this report are based on the AEMP Design Plan (Golder 2016a), and response to comments from ECCC, INAC and KIA during review of the 2017 AEMP Annual Report (Golder 2018a).

6.1 Objectives

The specific objective of monitoring under the AEMP is to characterize water quality conditions in Meliadine Lake so that water quality trends and adaptive management strategies can be identified, as required, during the life of the Mine. The primary objectives of the water quality component of the AEMP, as defined in the AEMP Design Plan (Golder 2016a) are as follows:

- characterize and interpret water quality within Meliadine Lake for the purpose of identifying Mine-related effects and meeting Part 2, Section 7 of the MDMER requirements (Government of Canada 2018)
- verify FEIS predictions (Agnico Eagle 2014), and update them if applicable based on monitoring results
- assess the efficacy of mitigation strategies proposed in the AEMP Design Plan (Golder 2016a) and the Environmental Management and Protection Plan to minimize the water quality effects of the Mine
- recommend appropriate changes to the water quality component of the AEMP for future years
- provide data to inform adaptive management intended to reduce or eliminate Mine-related effects to water quality in Meliadine Lake

As per the EEM (Environment Canada 2012), water quality monitoring was conducted to:

- monitor for changes in environmental conditions in the receiving environment
- provide an indication of temporal or seasonal trends
- evaluate supporting environmental variables to help interpret results from biological monitoring

To meet the primary objectives of the water quality component, analysis and interpretation of water quality data in 2018 were focused on answering two key questions, as defined in the AEMP Design Plan (Golder 2016a):

1) Are concentrations of key parameters in Meliadine Lake consistent with FEIS predictions and less than AEMP Action Levels?

2) Are concentrations in the exposure area increasing over time relative to the reference areas?

The field survey and data analysis methods used to answer the key questions are described in Section 6.2. A summary of quality assurance and quality control (QA/QC) assessment on the 2018 data is provided in Section 6.3. Results and discussion are presented in Section 6.4, where results to meet AEMP requirements are discussed first, followed by results to meet EEM requirements. A summary of the water quality results and conclusions is provided for both the AEMP and EEM in Section 6.5.

6.2 Methods

6.2.1 Sampling Design

The 2018 water quality program was designed to align with the AEMP Design Plan (Golder 2016a) and Cycle 1 EEM Study Design (Golder 2017). The program consisted of one sampling program during ice-covered conditions and two sampling programs during open-water conditions (Table 6.2-1). As a result of a number of site-related factors and field-related occurrences, a few adjustments were made to each program. These included the following:

- Water quality monitoring was not conducted at the former exposure area MEL-D-2 as per the Cycle 1 EEM Study Design (Golder 2017a). In response to ECCC comments on the Cycle 1 EEM Study Design, the EEM exposure study area was relocated to the current AEMP Near-field area to better capture the effects of effluent released from the permanent effluent discharge location (i.e., MEL-14) (Golder 2018d).
- Beginning during the open-water program, four new stations were added in the Near-field area and four historical stations were discontinued (Table 6.2-1). New stations in the Near-field area were selected based on the location of the diffuser, which was installed in 2018. Station locations were redefined based on the as-built location of the diffuser and the results observed during the plume delineation study (Section 2.4.3), with the objective of capturing the water quality within the vicinity of the edge of the mixing zone. Specifically, MEL-01-01 was retained because it had the most historical data, relative to other Near-field stations. The locations of sampling stations MEL-01-06 and 01-07 were selected to meet sampling requirements for stations near the diffuser (i.e., within 100 m) as per ECCC comments on the Cycle 1 EEM Study Design (Golder 2018d). Additional stations MEL-01-08 and 01-09 were selected because they were closer to the mid-basin and away from rocky outcrops that occur closer to shore.
- During the August open-water program, water quality samples were not collected at Mid-field area stations MEL-02-01 or 02-04. Instead, samples were collected at MEL-02-06 and 02-08, which were sediment sample locations. Stations MEL-02-06 and 02-08 are also located within the defined Mid-field exposure area and therefore, this deviation is not expected have affected classification of water quality within this zone.
- Field DO measurements collected at all stations during the ice-cover season and field pH measurements collected at stations MEL-01-01, 01-06, 01-07, 01-08, 01-09, 02-03, 02-05, 03-01, 03-02, 03-03, 03-04, 03-05, 05-03, and 05-05 during the August program were deemed unreliable during the data quality review (i.e., data were anomalous, being well outside the range of previously measured data within exposure and reference areas; Appendix 6A), and were subsequently invalidated. These data were excluded from the analysis. For invalidated pH field data, laboratory pH was used as a surrogate measurement to characterize open-water water quality and in water quality guideline calculation at individual stations. However, as laboratory pH was measured outside the holding time requirement, it is acknowledged that these laboratory pH data have corresponding uncertainty.
- The sampling frequency in 2018 deviated from the frequency requirements of four programs per calendar year as specified under the AEMP Design Plan and MDMER (Section[2][a]) because only three water quality programs were completed (Golder 2016a; Government of Canada 2018). In 2018, water quality monitoring was scheduled for four times per calendar year, but the September water quality program was cancelled due to unsafe boating conditions (i.e., high winds) that prevented safe access to sampling stations.

- Radium-226 was erroneously omitted from the chain-of-custody form for the Travel Blank (T-18-07-01) collected on 23 July 2018 during the July open-water program.

QA/QC procedures described in Section 6.3 and Appendix 6A were followed during the 2018 water quality monitoring program.

6.2.2 Field Methods

6.2.2.1 Sample Location and Sampling Frequency

As per the AEMP Design Plan, five stations in each of the proposed Near-field and Mid-field areas, and Reference Areas 1, 2, and 3 of Meliadine Lake, at a target water depth of 8 to 10 m, were included in the water quality program (Figure 6.2-1). EEM stations included the Near-field area as the EEM exposure area and Reference Area 1 as the EEM reference area. Near-field and Mid-field stations were sampled once during ice-covered conditions and twice during open-water conditions, whereas Reference Area 1 was sampled during each open-water program and Reference Areas 2 and 3 were sampled once during the open-water season (in August). The location and timing of sample collection in 2018 are summarized in Table 6.2-1.

525000
530000
535000
540000
7000000
6995000
6990000
6985000

REFERENCE AREA 2 (MEL-04)
MEL-04-02
MEL-04-03
MEL-04-05
MEL-04-04
MEL-04-01

Meliadine Lake

REFERENCE AREA 1 (MEL-03)
MEL-03-02
MEL-03-03
MEL-03-04
MEL-03-01
MEL-03-05

MID-FIELD EXPOSURE AREA (MEL-02)
MEL-02-01
MEL-02-06
MEL-02-05
MEL-02-04
MEL-02-02
MEL-02-03
MEL-02-08

MEL-05-03
MEL-05-04
MEL-05-01
MEL-05-05
MEL-05-02
REFERENCE AREA 3 (MEL-05)

MEL-01-02
MEL-01-07
MEL-01-05
MEL-01-04
NEAR-FIELD EXPOSURE AREA (MEL-01)
MEL-01-08
MEL-01-06
MEL-01-09
MEL-01-03
MEL-01-01

LEGEND

- WATER QUALITY STATION
- DIRECTION OF FLOW AT WATERSHED OUTLET
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- BATHYMETRIC CONTOUR (0.5 AND 2 m INTERVAL)
- WATERCOURSE
- WATERBODY



0 1.5 3
1:70,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED
AGNICO EAGLE

PROJECT
CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE
MELIADINE LAKE WATER QUALTY STATIONS SAMPLED IN 2018

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	JL
PREPARED	MH
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
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Table 6.2-1: Water Quality Sampling Stations and Sampling Effort Summary for Meliadine Lake in 2018

Area	Station ID	UTM Coordinates (NAD 83, Zone 15V)		Geographic Coordinates		Average Total Depth[a] (m)	Average Secchi Depth[b] (m)	Ice-Cover	Open-Water	
								2 to 6 Mar	19 to 25 Jul	15 Aug to 2 Sept
		Easting	Northing	Latitude	Longitude			Winter[c]	Late Spring[c]	Summer[c]
Near-field Area	MEL-01-01	542690	6989132	92° 9' 22.811"W	63° 1' 45.420"N	9.8	5.8	✓	✓	✓
	MEL-01-02	542665	6989282	92° 9' 24.449"W	63° 1' 50.276"N	8.5	-	✓ (QC)	D	-
	MEL-01-03	542638	6988979	92° 9' 26.653"W	63° 1' 40.499"N	9.0	-	✓	D	-
	MEL-01-04	543145	6989086	92° 8' 50.488"W	63° 1' 43.740"N	8.8	-	✓	F	-
	MEL-01-05	542140	6989358	92° 10' 1.727"W	63° 1' 52.953"N	7.4	-	✓	F	-
	MEL-01-06	542952	6988993	92° 9' 4.304"W	63° 1' 40.818"N	8.4	6.6	-	✓ N	✓[e]
	MEL-01-07	542873	6989218	92° 9' 9.712"W	63° 1' 48.120"N	8.1	6.2	-	✓ N (QC)	✓
	MEL-01-08	543044	6989067	92° 8' 57.690"W	63° 1' 43.169"N	7.8	6.7	-	✓ N	✓
	MEL-01-09	542555	6989188	92° 9' 32.362"W	63° 1' 47.286"N	7.4	6.3	-	✓ N (QC)	✓ (QC)
Mid-field Area	MEL-02-01	537491	6992999	92° 15' 29.480"W	63° 3' 52.425"N	7.6	6.1	✓	✓	-[d]
	MEL-02-02	537093	6992642	92° 15' 58.118"W	63° 3' 41.039"N	8.3	6.5	✓ (QC)	✓	✓
	MEL-02-03	537497	6992332	92° 15' 29.601"W	63° 3' 30.874"N	8.8	6.9	✓	✓	✓
	MEL-02-04	537961	6992341	92° 14' 56.553"W	63° 3' 30.990"N	8.3	6.0	✓	✓	-[d]
	MEL-02-05	537831	6992692	92° 15' 5.519"W	63° 3' 42.379"N	9.1	7.0	✓	✓	✓[f]
	MEL-02-06	536922	6992853	92° 16' 10.125"W	63° 3' 47.919"N	7.3	-	-	-	✓ E
	MEL-02-08	538342	6991952	92°14'29.749"W	63°3'18.278"N	8.0	6.7	-	-	✓ E
Reference Area 1	MEL-03-01	533321	6998540	92°20'22.432"W	63°6'52.915"N	6.8	-	-	✓	✓ (QC)
	MEL-03-02	533253	6998664	92°20'27.192"W	63°6'56.944"N	8.5	7.1	-	✓	✓
	MEL-03-03	532954	6998860	92°20'48.384"W	63°7'3.375"N	9.9	6.6	-	✓	✓
	MEL-03-04	533629	6998660	92°20'0.368"W	63°6'56.690"N	7.8	7.1	-	✓	✓
	MEL-03-05	533997	6998265	92°19'34.406"W	63°6'43.804"N	7.6	6.8	-	-[d]	✓

Table 6.2-1: Water Quality Sampling Stations and Sampling Effort Summary for Meliadine Lake in 2018

Area	Station ID	UTM Coordinates (NAD 83, Zone 15V)		Geographic Coordinates		Average Total Depth[a] (m)	Average Secchi Depth[b] (m)	Ice-Cover	Open-Water	
								2 to 6 Mar	19 to 25 Jul	15 Aug to 2 Sept
		Easting	Northing	Latitude	Longitude			Winter[c]	Late Spring[c]	Summer[c]
Reference Area 2	MEL-04-01	525634	7000884	92°29'29.572"W	63°8'10.907"N	7.4	-	-	-	✓
	MEL-04-02	526151	7001525	92°28' 2.287"W	63°8'31.483"N	9.9	7.5	-	-	✓
	MEL-04-03	525343	7001363	92°29'50.083"W	63°8'26.457"N	8.4	7.5	-	-	✓
	MEL-04-04	525401	7001085	92°29'46.096"W	63°8'17.460"N	-	-	-	-	-[d]
	MEL-04-05	525727	7001134	92°29'22.790"W	63°8'18.960"N	7.6	-	-	-	✓
Reference Area 3	MEL-05-01	530922	6990859	92°23'18.811"W	63°2'45.520"N	9.0	8.5	-	F	✓
	MEL-05-02	530675	6990883	92° 23' 36.377"W	63° 2' 46.371"N	9.3	7.5	-	F	✓
	MEL-05-03	530737	6991365	92°23'31.639"W	63°3'1.925"N	8.5	7.5	-	F	✓
	MEL-05-04	530573	6991231	92°23'43.404"W	63°2'57.645"N	9.5	7.5	-	F	✓
	MEL-05-05	530241	6991156	92°24'7.088"W	63°2'55.322"N	8.5	7.5	-	F	✓

Notes: Samples were analyzed for the required parameters listed in Table 6.2-2, except where noted otherwise. Samples were collected during daylight hours. EEM study areas included the Near-field area and Reference Area 1.

✓ = Sample collected.

A = Station could not be accessed due to weather, no sample collected.

D = Station was discontinued for the 2018 water quality program.

N = New station added for the 2018 water quality program.

E = Water quality samples were collected at the same location as sediment samples resulting in collection of water quality samples at two unplanned locations.

F = Field data were measured but no water chemistry sample was collected.

(a) The total depths recorded during each sampling program were averaged for individual stations, when stations were sampled on more than one occasion.

(b) The average Secchi depth (a measure of water clarity) was calculated based on Secchi depths recorded during each of the open-water (i.e., late spring and summer) sampling programs.

(c) Blank samples (i.e., travel and equipment) were collected.

(d) Sample collection at these locations was missed due to time constraints and/or technical error.

(e) Station MEL-01-06 was sampled approximately 230 m south of the planned location at UTM coordinates of 542907 E, 6988767 N.

(f) Station MEL-02-05 was sampled approximately 140 m north of the planned location at UTM coordinates of 537845 E, 6992831 N.

QC = duplicate quality control samples were collected; - = the site was not included in the sampling plan for a particular field program or was discontinued from the program.

ID = identifier; UTM = Universal Transverse Mercator; NAD = North American Datum.

6.2.2.2 Collection of Supporting Field Measurements

At each sampling station, water depth and physicochemical measurements were collected. Total depth of the water column was measured either by using a sounding line or a boat-mounted sonar unit; during the ice-cover program a sounding line was used to measure total depth. Prior to collecting surface water samples, field measurements of the following four parameters were recorded using a Eureka Manta II multiprobe:

- water temperature (degrees Celsius [°C])
- pH
- DO (in mg/L and percent [%])
- specific conductivity (in microSiemens per centimetre [µS/cm])

In situ physicochemical measurements were taken just below the surface (or below the ice during ice-covered conditions), at 0.5 m below the surface, at 1.0 m below the surface and every 1 m thereafter throughout the water column ending at approximately 0.5 m above the lake bed. During open-water conditions, Secchi depth was measured using a Secchi disk at each station. Secchi disk data were used to provide a coarse estimate of the euphotic zone depth for the purposes of the depth-integrated nutrient sample collection to support the plankton special study (Section 11.0). During ice-covered conditions, ice thickness was measured.

6.2.2.3 Water Sample Collection

Surface water samples were collected as grab samples in accordance with Golder's technical procedures, the Standard Operating Procedures for Water Quality Sampling prepared by Golder, and specific laboratory instructions. Discrete water samples were collected at each sampling station from mid-depth (approximately 4 m) using a Kemmerer sampler. Water for filling ultra-low metals and ultra-low mercury sample bottles were collected with a Teflon Kemmerer sampler, whereas the remaining bottles were filled with water from the polyvinyl chloride (PVC) Kemmerer sampler. At each station, the Kemmerer was triple-rinsed with surface water representative of the station, and then lowered to the required depth (i.e., mid-depth in the water column), triggered by the messenger to collect a sample, returned to the surface, and used to fill the lab-supplied sample bottles. This procedure was repeated until all sample bottles for the station were filled. For the ice-cover program, a pump with tubing extended to the required samples depth was used to collect the samples because the Kemmerer could not be lowered and/or retrieved through the ice.

6.2.3 Laboratory Analysis

Water quality samples collected during the 2018 Meliadine Lake study, with the exception of the radium-226, were analyzed by ALS Environmental Laboratory (ALS; Edmonton and Winnipeg locations). Analysis of radium-226 was subcontracted by ALS Edmonton to ALS in Fort Collins, Colorado, USA. ALS is an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Specific ALS analytical methods and reported detection limits (RDL) for the required analyses are provided in Appendix 6A.

Water sample bottles were provided by ALS (Section 6.2.2.3). Water samples were processed (i.e., filtered and/or preserved as required, and refrigerated) at site according to the instructions provided by the laboratory. Water samples requiring filtration were filtered through a 0.45 micrometre (µm) Millipore filter in a Nalgene filter tower using a vacuum pump before being preserved with laboratory-provided preservative based on the required analysis. Water samples were kept refrigerated before shipping; ice packs were added to the coolers to keep the samples as cool as possible during transport. Samples were shipped to ALS as soon as possible after sample collection and processing.

Water quality samples were analyzed for the following suite of parameters:

- routine parameters: pH, specific conductivity, hardness, total alkalinity, total dissolved solids [TDS], total suspended solids [TSS], and turbidity
- major ions: bicarbonate, carbonate, chloride, fluoride, sulphate, calcium, magnesium, potassium, sodium, and silica
- nutrients and organics: nitrate, nitrite, total ammonia, total Kjeldahl nitrogen [TKN], total phosphorus [TP], total dissolved phosphorus [TDP], orthophosphate, total organic carbon [TOC], and dissolved organic carbon [DOC]
- total and dissolved metals, metalloids, and non-metals[1]: aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc
- cyanide (i.e., weak acid dissociable, total, and free)
- radium-226 collected during open-water programs only at the Near-field area and Reference Area 1

The samples were analyzed using laboratory test methods with analytical detection limits (DLs) less than the Canadian Council of Ministers of the Environment (CCME) CWQG-PAL (CCME 1999), and Health Canada CDWQGs (Health Canada 2017). Specific ALS analytical methods and RDL for the required analyses are provided in Appendix 6A.

6.2.4 Data Analysis

Comparisons of key parameters to FEIS predictions, water quality guidelines and normal ranges are provided in this section. Descriptive statistics were calculated and presented for the 2018 dataset by area at the Near-field, Mid-field and reference areas (pooled). Descriptive statistics included the sample size, mean, median, minimum, maximum, and standard deviation. Field data (physicochemical) profiles were compared graphically within each lake area (by showing results for each station) and by season (ice-cover and open-water) to qualitatively evaluate seasonal and vertical patterns. Water temperature, DO concentration and percent saturation, pH, and specific conductivity, were plotted against measured depth. The field measured physicochemical parameters and general water chemistry in each area are discussed for ice-cover and open-water conditions in Section 6.4.2.A quantitativetemporal analysis was conducted for the Near-field area data and discussed in Sections 6.2.4.3.3 and 6.2.4.3.4.

6.2.4.1 Summary Statistics and Comparison to Water Quality Guidelines

Water quality guidelines for the protection of aquatic life are numerical limits or narrative statements based on the most current, scientifically defensible toxicological data available for the parameter of interest, and are designed to be protective of all forms of aquatic life including the most sensitive life stage of the most sensitive species. An exceedance of a guideline does not necessarily imply the likelihood of an adverse environmental effect. Exceedances of guidelines at reference areas indicate naturally elevated concentrations relative to other sites and suggest that resident aquatic biota have adapted to these concentrations. Similarly, water quality results can

[1] Metals, metalloids (e.g., arsenic), and non-metals (e.g., selenium) are referred to as “metals” in this document.

be compared to drinking water guidelines to evaluate if water is safe for consumption by humans or if there is potential risk to human and wildlife health.

Descriptive statistics were calculated from the chemistry data collected from the Near-field, Mid-field and pooled reference areas sampled in 2018. Specifically, mean, median, minimum, maximum values were calculated and compared to acute and chronic CWQG-PAL (CCME 1999) and drinking water quality guidelines and aesthetic objectives (Health Canada 2017). Water quality results from Meliadine Lake stations were also compared to the SSWQO developed for the Mine (Golder 2013). For the mean and standard deviation calculation results below the DL were replace with half DL, when more than 50% of the results were below DL the standard deviation was not calculated.

These guidelines and objectives are summarized in Table 6.2-2; these guidelines, in addition to baseline data, form a starting point for the future monitoring benchmarks.

Table 6.2-2: Water Quality Guidelines and Objectives

Parameter[a]	Unit	CCME Aquatic Life [b]		Health Canada Drinking Water Guideline[c]	Health Canada Aesthetic Objective[c]	Site-specific Water Quality Objective[d]
		Acute	Chronic			
Field Parameters						
pH	unitless	-	6.5 to 9.0	7.0 to 10.5	-	-
Temperature	ºC	-	-	-	15	-
Dissolved Oxygen	mg/L	-	6.5[e]	-	-	-
Conventional Parameters						
pH	unitless		6.5 to 9.0	-	7.0 to 10.5	-
Total dissolved solids	mg/L	-	-	-	500	-
Major Ions						
Chloride	mg/L	640	120	-	250	-
Fluoride	mg/L	-	0.12	1.5	-	2.8
Sodium	mg/L	-	-	-	200	-
Sulphate	mg/L	-	-	-	500	-
Nutrients						
Total ammonia	mg-N/L	-	2.68[f]	-	-	-
Nitrate	mg-N/L	124	2.9	10	-	-
Nitrite	mg-N/L	-	0.06	1	-	-
Total Metals[g]						
Aluminum	µg/L	-	5 to 100[h]	-	-	-
Antimony	µg/L	-	-	6	-	-
Arsenic	µg/L	-	5	10	-	25
Barium	µg/L	-	-	1,000	-	-
Boron	µg/L	29,000	1,500	5,000	-	-
Cadmium	µg/L	0.46[i]	0.05[i]	5	-	-
Chromium	µg/L	-	1	50	-	-
Copper	µg/L	-	2[i]	-	1,000	-
Iron	µg/L	-	300	-	300	1,060

Table 6.2-2: Water Quality Guidelines and Objectives

Parameter[a]	Unit	CCME Aquatic Life [b]		Health Canada Drinking Water Guideline[c]	Health Canada Aesthetic Objective[c]	Site-specific Water Quality Objective[d]
		Acute	Chronic			
Total Metals[g] (cont'd)						
Lead	µg/L	-	1[i]	10	-	-
Manganese	µg/L	-	-	-	50	-
Mercury	µg/L	-	0.026	1	-	-
Molybdenum	µg/L	-	73	-	-	-
Nickel	µg/L	-	25[i]	-	-	-
Selenium	µg/L	-	1	50	-	-
Silver	µg/L	-	0.25	-	-	-
Thallium	µg/L	-	0.8	-	-	-
Uranium	µg/L	33	15	20	-	-
Zinc	µg/L	-	-	-	5,000	-
Dissolved Metals[g]						
Zinc	µg/L	11[j]	2[k]	-	-	-
Other						
Cyanide	mg/L	-	0.005	0.2	-	-

(a) Only parameters with water quality guidelines or an SSWQO are included in this table.

(b) CCME 1999.

(c) Health Canada 2017.

(d) SSWQO developed for the Meliadine Gold Mine (Golder 2013). SSWQOs supersede generic guidelines for review of monitoring and determination of effects.

(e) Lowest acceptable for cold water biota (CCME 1999).

(f) The guideline shown corresponds to a temperature of 10°C and pH of 7.5. For individual samples, the guidelines were calculated based on the specific temperature and pH measured from the sample (CCME 2010).

(g) The list of elements reported for metals analysis includes metalloids such as arsenic and non-metals such as selenium, which are collectively referred to as "total metals" or "dissolved metals" in this table.

(h) The guideline is pH dependent. The 5 µg/L guideline correspond to a pH<6.5 and 100 µg/L corresponds to a pH≥6.5. Guidelines were applied to individual sample based on specific pH measurement taken from the sample.

(i) The guideline is hardness dependent (value shown corresponds to a median hardness of 22.5 mg/L as $CaCO_3$). For individual samples, the guideline was calculated based on the specific hardness measurement taken from the sample.

(j) The acute dissolved zinc guideline is hardness and DOC-dependent. The guideline value shown is the minimum acute guideline calculated using the minimum validated hardness of 13.8 mg/L (as $CaCO_3$) and DOC of 0.3 mg/L. For individual samples, the guideline was calculated based on the specific hardness and DOC measurement taken from the sample. Hardness and DOC values falling outside of the validated range (i.e., hardness 13.8 to 250.5 mg/L as $CaCO_3$ and DOC 0.3 to 17.3 mg/L) were constrained to within the validated range as per CCME guidance (CCME 2018).

(k) The chronic dissolved zinc guideline is hardness, DOC and pH-dependent. The guideline value shown is the minimum chronic guideline calculated using the minimum validated hardness of 23.4 mg/L (as $CaCO_3$) and DOC of 0.3 mg/L and the maximum pH of 8.13; zinc toxicity increases with increasing pH. For individual samples, the guideline was calculated based on the specific hardness, DOC and pH measurement taken from the sample. Hardness, DOC and pH values falling outside of the validated range (i.e., pH 6.5 to 8.13, hardness 23.4 to 399 mg/L and DOC 0.3 to 22.9 mg/L) were constrained to within the validated range as per CCME guidance (CCME 2018).

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; mg/L = milligrams per litre; - = no guideline; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; - = not available.

6.2.4.2 Normal Ranges

The methods for estimating normal ranges for the water quality component of the AEMP follow the methods of Barrett et al. (2015) and are consistent with the approach used for calculating normal ranges for other AEMP components (i.e., sediment, benthos, and plankton). When the baseline data were normally distributed, the normal range was estimated as the 80% prediction interval (PI) of the dataset. Normality was assessed using the Shapiro-Wilk test, using $\alpha = 0.05$ to indicate a significant departure from normality. When the baseline data were not normally distributed, but normality could be achieved after Box-Cox transformation (Box and Cox 1964), the normal range was calculated on the Box-Cox transformed data and the upper and lower bound of the normal ranges were back-transformed. If neither the untransformed data or Box-Cox transformed datasets were normally distributed, the normal range boundaries were defined as the 10th and 90th percentile of the baseline data. In cases where the percentile method was used, a dataset of 1,000 samples was randomly generated from the normal range dataset and the 10th and 90th percentile were calculated from this distribution of 1,000 samples to estimate the normal range. In cases where the lower bound was below the analytical DL, the lower bound was set at the DL.

Prior to calculating the normal range, statistical outliers were identified using studentized residual, which provide a measure of the difference between observed and expected values (i.e., residuals), normalized to the variance of the dataset. Data points with studentized residuals (SR) greater than |3.5| (i.e., more than 3.5 standard deviations from the sample mean), were omitted from analysis. All values at the DL were set to half the DL for the purposes of calculating the normal range.

The provisional normal range concentrations were calculated for Meliadine Lake open-water conditions from pooled reference area (MEL-03, MEL-04, and MEL-05) data collected during the AEMP Monitoring Program between 2016 and 2018 and baseline data collected in Meliadine Lake between 1995 and 2013 (Agnico Eagle 2014). Near-field and Mid-field data collected between 2015 and 2017 were not included in the normal range calculation. Near-field and Mid-field data were screened, and it was determined that they were not suitable for inclusion in the normal range calculation. For ice-covered conditions, provisional normal range concentrations were not calculated because adequate reference and baseline data were not available for the calculation. Additional detail on data screening as part of the normal range calculation is provided in Appendix 6B.

The normal ranges provided in this report are considered provisional during initial monitoring under the AEMP due to the limited sample sizes used in the calculations. The normal range is intended to estimate the range of natural spatial and temporal variability, and the more reference data incorporated into the calculation, the more accurate the estimate becomes. These normal ranges may be re-defined in future reports to allow for the inclusion of additional monitoring data from the reference areas. Normal ranges were not calculated for water quality constituents that were represented by other constituents (e.g., turbidity was not included because it is represented by TSS), or for dissolved metals.

Each calculated normal range was evaluated for representativeness. For example, some parameters had variable RDLs, or parameters with low detection frequency could have calculated normal range upper bound values that were less than the RDL, whereas actual concentrations could be anywhere between zero and the RDL. Therefore, the calculated normal ranges for parameters with non-detect concentrations in the dataset were revised according to the following criteria:

- If all values were less than the RDL, then the lower bound of the normal range was set to zero and the upper bound was set to the RDL value.
- If the lower bound of the normal range was less than the RDL, then it was set to zero.

- If the upper bound of the normal range was less than the RDL, then it was set to the DL value.
- If the dataset included a mix of RDLs and all the values were non-detect, then the normal range was set to zero (lower bound) and the most common used RDL (upper bound).
- If the dataset included a mix of RDLs, and the upper bound of the normal range was between the lowest and highest RDL, then the upper bound of the normal range was set to the highest RDL.
- If the dataset included a mix of RDLs, and the RDLs varied by more than an order of magnitude, then the data with the higher RDL was removed from analysis and the normal range was re-calculated.

The normal ranges are presented in Section 6.4.3.

6.2.4.3 Statistical Analysis

6.2.4.3.1 Overview

Concentrations of water quality parameters in Meliadine Lake were analyzed spatially for 2018 to determine if concentrations in the exposure areas (i.e., Near-field and Mid-field) differed from reference areas (Section 6.2.4.3.2). A qualitative temporal analysis was also conducted to determine if water quality in the Near-field area has changed over the period of the AEMP water quality monitoring program (Section 6.2.4.3.4). A qualitative analysis was also conducted with 2018 Near-field data to determine if there was spatial variability among Near-field stations (Section 6.2.4.3.3).

As part of EEM requirements, water quality in the exposure areas was compared to the references areas to determine if concentrations differed by greater than a factor of two (Section 6.2.4.3.2.2).

6.2.4.3.2 Exposure versus Reference Area Comparison

6.2.4.3.2.1 AEMP Approach

Spatial patterns in 2018 were qualitatively and statistically examined to determine if water quality differed among Near-field and Mid-field exposure areas, and reference areas. Dissolved metals were excluded from spatial analysis because they followed similar trends to total metals. Box plots of water chemistry parameters from Near-field, Mid-field exposure and pooled reference areas for 2018 were visually evaluated for spatial patterns. Additionally, a statistical analysis was conducted to determine if there were significant differences in the concentration of key parameters between exposure and reference areas.

Prior to completing statistical analyses, values below the RDL were substituted with one-half of the RDL. Parameters with greater than 50% of data below RDL were not included in the analysis. Statistical outliers were evaluated using SRs from the analysis of variance (ANOVA) model. A magnitude of |3.5| for the SR was used to identify observations that may be unusual. When an outlier was detected, the validity of the data point was examined. If the outlier was determined to be the result of a data entry error, it was corrected. If the outlier was not the result of data entry errors and could not be resolved otherwise, the analysis was completed with and without the outlier included.

Statistical analysis was conducted separately on ice-cover and open-water datasets. To compare the water quality parameters among areas at Meliadine Lake, an ANOVA test was completed in SYSTAT Version 13.1 (Systat Inc. 2009), followed by post-hoc pairwise comparisons (Tukey's tests; Zar 1999) if the ANOVA test result was significant. Prior to analysis, the water quality data were checked for statistical assumptions (i.e., normality, and homoscedasticity; Zar 1999). If data did not meet the statistical assumptions, the equivalent non-parametric

test (e.g., Kruskal-Wallis [K-W test] with post-hoc Conover-Inman tests; Systat Inc. 2009) were completed. Data were considered significantly different at α (alpha) of 0.1.

Open-water post-hoc statistical comparisons were conducted for Near-field versus Mid-field, Near-field versus pooled reference areas and Mid-field versus pooled reference areas. Open-water data were collected in July and August and pooled for the purposes of the statistical analysis. Ice-cover data statistical comparisons were conducted between Near-field and Mid-field areas.

When significant differences in water quality parameters were observed between sampling areas, the magnitude of difference among the areas (i.e., Near-field, Mid-field and pooled reference) was calculated by expressing the difference as a percentage of the reference mean or median. The area farthest away from the Mine was set as the denominator in the calculation of magnitude of difference. For example, to calculate the magnitude of difference between Near-field and pooled reference areas for a parameter the equation was as follows:

Magnitude: $$Magnitude = \frac{\bar{x}_{NF} - \bar{x}_{Reference\ Areas}}{\bar{x}_{Reference\ Areas}}$$

where $\bar{x}$ is the median or mean (dependent on the statistical analysis). If the statistical comparison between sampling areas was conducted using the K-W test, the data were not considered to be normally distributed and the magnitude was calculated using medians. As the K-W test is a non-parametric method for testing whether samples originate from the same distribution (i.e., it is not a comparison of sample medians), there were instances where the overall K-W test was significant, but no differences in medians were observed.

When spatial patterns were detected (i.e., as significant statistical test results), concentrations of parameters that increased with distance from the Near-field area were categorized as being positive patterns, while parameters with declining concentration with increasing distance were categorized as negative patterns.

6.2.4.3.2.2 EEM Approach

As per the EEM TGD (Environment Canada 2012), a spatial comparison between exposure (Near-field) and Reference Area 1 (EEM reference area) was conducted to identify parameters that differed by more than a factor of two between the two areas. Comparisons were made using the median.

6.2.4.3.3 Spatial Patterns in the Near-field Area

Prior to evaluating if conditions within the Near-field area have changed over time (Section 6.2.4.3.4), the 2018 water quality data at each Near-field station were qualitatively examined for spatial patterns:

- Scatter plots for water chemistry parameters from AEMP stations in the Near-field area were evaluated to identify spatial patterns and trends. The scatter plots were developed to illustrate station data relative to distance from the CP1 diffuser and by station.

Parameters that markedly differed among stations (i.e., by more than a factor of two based on median concentrations) were identified as key parameters and discussed in-text. Detection limits were set as one-half DL when comparing median concentrations. Concentrations of key parameters that increased with distance within the Near-field area were categorized as being positive patterns, while key parameters with declining concentration with increasing distance were categorized as negative patterns. Parameters with greater than 50% of data below RDL were not included in analysis.

6.2.4.3.4 Identification of Temporal Trends

Time series plots of parameter concentrations were completed (Appendix 6F) for Meliadine Lake Exposure and Reference Areas and qualitatively examined to identify increasing trends in 2018 relative to previous AEMP monitoring years (i.e., 2015 to 2017). Temporal trends were first evaluated in the Near-field area and if identified, were further analyzed on temporal box-and-whisker plots by area (Appendix 6G). This analysis was conducted separately for ice-covered and open-water conditions.

6.2.4.4 Comparison to FEIS Predictions

Comparison of Near-field area data for 2018 were compared to applicable model predictions in the FEIS for Meliadine (Agnico Eagle 2014). The FEIS predictions for water quality included an evaluation of water quality in the mixing zone of Meliadine Lake to evaluate potential contaminants of concern. The results of the model predictions indicated that background concentrations of cadmium exceeded CCME guidelines for the protection of aquatic life. It was predicted that the addition of effluent would not increase concentrations of cadmium at the edge of the mixing zone to above background.

Within the mixing zone of Meliadine Lake, FEIS predictions indicated that several parameter concentrations would increase above baseline: TDS, major ions (i.e., chloride, sodium, fluoride and sulphate) and several total metals. To examine this prediction, concentrations at the edge of the mixing zone in the Near-field were compared to FEIS predictions.

In the east bay of Meliadine Lake, the FEIS predictions indicated that TDS and major ions would gradually increase during the construction and operations phases of the Mine; the maximum concentrations are predicted to occur in the last year of the operations phase (i.e., 176, 66, and 19 mg/L TDS, chloride, and sodium, respectively). These predicted maximum concentrations do not exceed guidelines for TDS, chloride and sodium but exceed the range of concentrations observed in Meliadine Lake during baseline.

Concentrations of DO in Meliadine Lake were modelled under construction, operations and closure phases. Predictions indicate that DO concentrations in Meliadine Lake are expected to be above CCME guidelines for the protection of aquatic life (i.e., 6.5 mg/L; CCME 1999) under most conditions. In the mixing zone, it is predicted that DO will fall below the guideline in late summer during the operations phase.

Overall, based on the conceptual diffuser design, the predicted Mine water quality and quantity discharged to Meliadine Lake, and the physical mixing attributes in Meliadine Lake in the vicinity of the diffuser, it was predicted that there will be a minor change in water quality, but that no parameters will exceed CCME guidelines at the edge of the mixing zone. Therefore, no residual impacts from the point source discharge of effluent into Meliadine Lake are anticipated and it is predicted that water quality outside of the mixing zone would support the same uses as during baseline conditions (i.e., safe for aquatic life, safe for use as drinking water, and for recreational activities; Agnico Eagle 2014).

6.3 Quality Assurance/Quality Control

6.3.1 Overview of Procedures

The QA/QC practices applied during this study and detailed results of the QC analyses for discrete water quality samples collected at Meliadine Lake are provided in Appendix 6A. The QA components of the program included the use of trained personnel and an accredited analytical laboratory; QC components included assessments of duplicates and field, equipment, and travel blank samples. Dissolved and total parameter concentrations were also compared.

6.3.2 Summary of Results

Detailed results are provided in Appendix 6A. The results of the review of field and laboratory data indicated that field measurements and laboratory data were of high quality. Key findings from the 2018 QA/QC evaluation are as follows:

- In general, field measurements and results of laboratory samples collected during the 2018 sampling program were within the ranges that would be expected for Meliadine Lake, with the exception of several field pH measurements collected in August. These field pH measurements were invalidated because the values were far outside of the range of historical variation at these stations. DO measurements in the Near-field and Mid-field areas during ice-covered conditions were also far outside the range considered likely (i.e., were in the range of extreme supersaturation). These data were deemed unreliable and excluded from analysis.
- No issues were identified in analytical methods used or units reported by the laboratory.
- Holding times recommended by the laboratory were exceeded for some parameters. The holding time exceedances were not expected to affect data quality for the Meliadine water quality program.
- QC samples (i.e., blanks and duplicates) accounted for approximately 16% of the total number of water samples submitted for analysis.
- The water quality QC sample evaluation indicated that for the combined equipment and travel blanks, 1% of parameters were detected at concentrations more than five times the DL. No notable contamination occurred in the blank samples.
- Approximately 3% of paired concentrations in duplicate discrete water quality samples had a relative percent difference (RPD) of more than 20%. Within-station variability and field precision for the 2018 dataset were rated as low and high, respectively.

The overall quality of the water quality data was rated high. Therefore, the results reported in the report are considered reliable and meet the needs of the program.

6.4 Results and Discussion

6.4.1 Field Measured Physicochemical Parameters

Field physicochemical water column profiles for each of the three water quality sampling periods are presented in Appendix 6C.

During ice-covered conditions (March sampling event) the field profiles followed a similar pattern between Near-field and Mid-field areas. A summary of field profiles for the Near-field and Mid-field areas is presented in Appendix 6C, Tables 6C.2-1 and 6C.2-4 (respectively) and described below:

- Water temperatures were generally consistent among Near-field and Mid-field stations at approximately 0°C below ice cover, and slightly higher (i.e., 1.9°C to 2.6°C) above the lakebed (Appendix 6C, Figure 6C.1-1).
- Water column pH ranged from 7.1 to 8.1 in the Near-field area and 7.2 to 8.0 in the Mid-field area (Appendix 6C, Figure 6C.1-7). In both areas, pH declined with depth. Surface pH was within the acceptable CWQG-PAL range of 6.5 to 9.0 at all stations in the Near-field and Mid-field areas.
- Water column specific conductivity ranged between 102 to 161 µS/cm in the Near-field area and 91 to 126 µS/cm in the Mid-field area. Specific conductivity generally declined with depth (Figure 6C.1-10).

During open-water conditions (July and August sampling events) the field profiles generally followed similar patterns among areas. A summary of field profiles for the Near-field, Mid-field and reference areas is presented in Appendix 6C, Tables 6C.2-2 to 6C.2-11 and described below:

- Water temperature was relatively constant with depth in all areas during the July program, with the exception of the Mid-field area and Reference Area 1, both of which showed a slight decrease in temperature at approximately 5 and 4 m depth, respectively (Figure 6C.1-2). In August, no thermal stratification was observed in any area (Figure 6C.1-3). Surface water temperatures across all areas varied between 8°C to 13°C.
- DO was close to saturated to supersaturated in all areas in July and August, and remained relatively constant through the water column. A greater variability in DO with depth was observed in July, relative to August in all areas (Appendix 6C, Figure 6C.1-5 and 6C.1-6). Surface DO was well above CWQG-PAL of 6.5 mg/L at all stations in the Near-field and Mid-field areas.
- Water column pH ranged from 7.0 to 8.1 in all areas and was consistent with depth in July and August (Appendix 6C, Figure 6C.1-8 and 6C.1-9). Surface pH was within the acceptable CWQG-PAL range of 6.5 to 9.0 at all stations during open-water conditions.
- Water column specific conductivity was constant with depth in all areas in July and August, with the exception of three stations in the Near-field area in July; at MEL-01-07, MEL-01-08, and MEL-01-09 specific conductivity increased between 4 to 7 m depths and then declined in deeper waters (Appendix 6C, Figure 6C.1-11 and 6C.1-12). Water column specific conductivity ranged between 76 to 98 µS/cm in the Near-field area, 69 to 78 µS/cm in the Mid-field area, and 63 to 76 µS/cm in the References Areas.

6.4.2 Water Chemistry

Water chemistry data for discrete samples collected from Meliadine Lake in 2018 are presented in Appendix 6D, Tables 6D-1 to 6D-5. Summary statistics were calculated for each sampling area during ice-cover (Table 6.4-1) and open-water conditions (Tables 6.4-2). Open-water summary statistics were based on pooled data for the July and August sampling programs because water quality variability was low between the two programs. Summary statistics for the reference areas during open-water conditions were calculated used pooled reference area data. Time-series plots for selected parameters of interest are presented in Appendix 6F to illustrate general trends in parameter concentrations in Meliadine Lake.

6.4.2.1 AEMP

6.4.2.1.1 Overview

Lake water quality during ice-covered conditions (Table 6.4-1; Appendix 6D, Table 6D-1 and 6D-2) was characterized as follows:

- low ionic strength (Near-field and Mid-field area median laboratory specific conductivity was 118 and 99 µS/cm, respectively)
- bicarbonate, chloride, calcium, and sodium are the dominant major ions
- basic pH (median field-measured pH in the Near-field and Mid-field areas was 7.6)
- low hardness (median values in the Near-field and Mid-field areas of 36 and 30 mg/L as $CaCO_3$, respectively; this indicates soft water according to the scale of water hardness by McNeely et al. [1979])
- low nutrient concentrations, with median TP and TN concentrations in the Near-field (0.0046 mg-P/L and 0.15 mg-N/L, respectively) and Mid-field (0.0038 mg-P/L and 0.067 mg-N/L, respectively) areas within the range of oligotrophic classification according to the scale of trophic status by Vollenweider (1968)
- low metal concentrations, which were either below detection or below water quality guidelines

In general, lake water quality during the open-water season was characterized as follows (Table 6.4-2; Appendix 6D, Table 6D-1 to 6D-5):

- low ionic strength (median laboratory specific conductivity across all areas ranged from 74 to 85 µS/cm)
- bicarbonate, chloride, and calcium as the major ions
- basic pH (median field-measured pH across all areas ranged from 7.4 to 7.5)
- low hardness (median values across all areas ranged from 21 to 25 mg/L as $CaCO_3$; this indicates soft water according to the scale of water hardness by McNeely et al. [1979])
- low nutrient concentrations, with median TP and TN concentrations across all areas (0.0025 to 0.0035 mg-P/L and 0.18 to 0.24 mg-N/L, respectively) within the range of oligotrophic classification according to the scale of trophic status by Vollenweider (1968)
- low metal concentrations across all areas, which were either below detection or below water quality guidelines

The following sections provide a more detailed analysis of the AEMP water chemistry data collected from each of the lake areas. In particular, notable water quality results (e.g., guideline exceedances) are presented and discussed.

Table 6.4-1: Water Quality Summary during Ice-Covered Conditions in Meliadine Lake, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary Statistics												
		CCME Aquatic Life		Health Canada Drinking Water Guideline	Aesthetic Objective	SSWQO	Near-field							Mid-field					
		Acute	Chronic				Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Field Measured																				
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.6	7.6	7.3	7.8	0.19	0	5	7.6	7.6	7.5	7.6	0.056	0	5
Specific conductivity	µS/cm	-	-	-	-	-	120	120	116	123	2.8	0	5	101	101	100	102	0.69	0	5
Temperature	°C	-	-	-	15	-	1.5	1.5	1.4	1.5	0.054	0	5	1.3	1.3	1.2	1.3	0.047	0	5
Dissolved oxygen	mg/L	-	6.5	-	-	-	-[a]	-	-	-	-	-	-	-[a]	-	-	-	-	-	-
Dissolved oxygen	%	-	-	-	-	-	-[a]	-	-	-	-	-	-	-[a]	-	-	-	-	-	-
Conventional Parameters																				
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.3	7.2	7.3	0.019	0	5	7.3	7.3	7.2	7.3	0.039	0	5
Specific conductivity	µS/cm	-	-	-	-	-	118	118	115	122	2.7	0	5	99	99	98	100	0.71	0	5
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	36	36	35	37	0.93	0	5	30	30	29	30	0.47	0	5
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	27	27	27	28	0.60	0	5	25	25	25	25	0.33	0	5
Total dissolved solids	mg/L	-	-	-	500	-	68	68	66	70	1.5	0	5	61	61	58	63	2.1	0	5
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	59	59	59	61	0.78	0	5	50	49	49	50	0.40	0	5
Total suspended solids	mg/L	-	-	-	-	-	<1.0	-	<1.0	<1.0	-	5	5	<1.0	-	<1.0	<1.0	-	5	5
Turbidity	NTU	-	-	-	-	-	0.24	0.23	0.20	0.28	0.034	0	5	0.14	0.14	0.12	0.16	0.017	0	5
Major Ions																				
Bicarbonate	mg/L	-	-	-	-	-	33	33	32	34	0.75	0	5	30	30	30	31	0.41	0	5
Calcium	mg/L	-	-	-	-	-	11	11	11	12	0.30	0	5	9.2	9.3	9.1	9.5	0.20	0	5
Carbonate	mg/L	-	-	-	-	-	<0.6	-	<0.6	<0.6	-	5	5	<0.6	-	<0.6	<0.6	-	5	5
Chloride	mg/L	640	120	-	250	-	15	15	14	15	0.42	0	5	12	12	12	12	0.071	0	5
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.029	0.029	0.027	0.030	0.0011	0	5	0.025	0.025	0.025	0.025	0	0	5
Magnesium	mg/L	-	-	-	-	-	2.0	2.0	1.9	2.0	0.087	0	5	1.5	1.6	1.5	1.7	0.094	0	5
Potassium	mg/L	-	-	-	-	-	1.4	1.5	1.4	1.5	0.024	0	5	1.3	1.3	1.3	1.3	0.020	0	5
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.71	0.71	0.68	0.77	0.035	0	5	0.46	0.46	0.45	0.49	0.015	0	5
Sodium	mg/L	-	-	-	200	-	7.8	7.9	7.7	8.3	0.25	0	5	6.2	6.2	6.1	6.4	0.12	0	5
Sulphate	mg/L	-	-	-	500	-	5.8	5.8	5.7	5.9	0.080	0	5	4.5	4.5	4.4	4.5	0.045	0	5
Nutrients and Organics																				
Nitrate	mg-N/L	124	2.9	10	-	-	0.0089	0.0083	0.0054	0.012	0.0027	0	5	0.012	0.012	0.011	0.016	0.0018	0	5
Nitrite	mg-N/L	-	0.06	1.0	-	-	<0.001	-	<0.001	0.0017	-	4	5	<0.001	-	<0.001	<0.001	-	5	5
Nitrate + nitrite	mg-N/L	-	-	-	-	-	0.0089	0.0087	0.0054	0.014	0.0033	0	5	0.012	0.012	0.011	0.016	0.0018	0	5
Total ammonia	mg-N/L	-	2.6 to 7.9[b]	-	-	-	0.0078	0.0079	<0.005	0.012	0.0038	1	5	0.012	0.012	0.011	0.014	0.0012	0	5
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.14	0.15	0.11	0.21	0.039	0	5	0.055	0.086	<0.05	0.23	0.081	1	5
Total phosphorus	mg-P/L	-	-	-	-	-	0.0046	0.0047	0.0039	0.0057	0.00066	0	5	0.0038	0.0039	0.0032	0.0046	0.00051	0	5
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0021	0.0022	0.0020	0.0027	0.00029	0	5	0.0020	0.0019	0.0016	0.0022	0.00022	0	5
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	5	5	<0.001	-	<0.001	<0.001	-	5	5
Total organic carbon	mg/L	-	-	-	-	-	4.0	4.0	3.9	4.2	0.11	0	5	3.0	3.0	3.0	3.1	0.038	0	5
Dissolved organic carbon	mg/L	-	-	-	-	-	3.8	3.8	3.7	4.0	0.11	0	5	3.0	3.0	2.9	3.1	0.068	0	5

Table 6.4-1: Water Quality Summary during Ice-Covered Conditions in Meliadine Lake, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary Statistics												
		CCME Aquatic Life		Health Canada Drinking Water Guideline	Aesthetic Objective	SSWQO	Near-field							Mid-field					
		Acute	Chronic				Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Total Metals																				
Aluminum	µg/L	-	100[c, d]	-	-	-	0.50	0.52	0.39	0.69	0.11	0	5	0.69	0.67	0.46	0.87	0.15	0	5
Antimony	µg/L	-	-	6.0	-	-	<0.02	-	<0.02	<0.02	-	5	5	<0.02	-	<0.02	<0.02	-	5	5
Arsenic	µg/L	-	5.0	10	-	25	0.53	0.53	0.52	0.54	0.0097	0	5	0.31	0.31	0.28	0.34	0.024	0	5
Barium	µg/L	-	-	1,000	-	-	12	12	11	12	0.57	0	5	11	11	11	11	0.21	0	5
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	5	5	<0.01	-	<0.01	<0.01	-	5	5
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	5	5	<0.01	-	<0.01	<0.01	-	5	5
Boron	µg/L	29,000	1,500	5,000	-	-	5.4	5.3	5.1	5.5	0.20	0	5	4.8	4.8	4.1	5.3	0.52	0	5
Cadmium	µg/L	0.60 to 0.77[e]	0.057 to 0.070[e]	5.0	-	-	<0.005	-	<0.005	<0.005	-	5	5	<0.005	-	<0.005	<0.005	-	5	5
Chromium	µg/L	-	1.0	50[f]	-	-	<0.06	-	<0.06	<0.06	-	5	5	<0.06	-	<0.06	<0.06	-	5	5
Cobalt	µg/L	-	-	-	-	-	0.012	0.012	0.010	0.013	0.0015	0	5	<0.01	-	<0.01	<0.01	-	5	5
Copper	µg/L	-	2.0[e]	-	1,000	-	1.1	1.1	1.0	1.2	0.047	0	5	0.88	0.88	0.86	0.89	0.015	0	5
Iron	µg/L	-	300	-	300	1,060	5.7	5.6	4.4	6.6	0.83	0	5	2.2	2.5	2.1	3.2	0.50	0	5
Lead	µg/L	-	1.0[e]	10	-	-	0.057	0.063	0.035	0.11	0.027	0	5	0.039	0.038	0.027	0.045	0.0068	0	5
Lithium	µg/L	-	-	-	-	-	<0.5	-	<0.5	0.98	-	4	5	<0.5	-	<0.5	0.63	-	3	5
Manganese	µg/L	-	-	-	50	-	2.0	2.0	1.7	2.2	0.21	0	5	1.0	1.1	1.0	1.2	0.077	0	5
Mercury	µg/L	-	0.026	1.0	-	-	0.0010	0.00098	0.00090	0.0011	0.000084	0	5	0.00080	0.00084	0.00070	0.0010	0.00011	0	5
Molybdenum	µg/L	-	73	-	-	-	0.099	0.10	0.096	0.11	0.0054	0	5	0.085	0.094	0.071	0.12	0.020	0	5
Nickel	µg/L	-	25[e]	-	-	-	0.79	0.80	0.78	0.82	0.017	0	5	0.57	0.57	0.55	0.59	0.016	0	5
Selenium	µg/L	-	1.0	50	-	-	0.057	0.055	0.041	0.070	0.011	0	5	0.049	0.048	<0.04	0.064	0.018	1	5
Silver	µg/L	-	0.25	-	-	-	<0.005	-	<0.005	<0.005	-	5	5	<0.005	-	<0.005	<0.005	-	5	5
Strontium	µg/L	-	-	-	-	-	51	50	48	51	1.5	0	5	45	45	41	49	3.0	0	5
Thallium	µg/L	-	0.80	-	-	-	<0.005	-	<0.005	<0.005	-	5	5	<0.005	-	<0.005	<0.005	-	5	5
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	5	5	<0.05	-	<0.05	<0.05	-	5	5
Titanium	µg/L	-	-	-	-	-	<0.1	-	<0.1	<0.1	-	5	5	<0.1	-	<0.1	<0.1	-	5	5
Uranium	µg/L	33	15	20	-	-	0.018	0.018	0.017	0.019	0.00084	0	5	0.015	0.015	0.015	0.015	0	0	5
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	5	5	<0.05	-	<0.05	<0.05	-	5	5
Zinc	µg/L	-	-	-	5,000	-	<0.8	-	<0.8	0.85	-	4	5	<0.8	-	<0.8	0.86	-	3	5
Dissolved Metals																				
Aluminum	µg/L	-	-	-	-	-	<0.3	-	<0.3	2.8	-	3	5	0.35	0.34	<0.3	0.46	0.12	1	5
Antimony	µg/L	-	-	-	-	-	<0.02	-	<0.02	<0.02	-	5	5	<0.02	-	<0.02	<0.02	-	5	5
Arsenic	µg/L	-	-	-	-	-	0.53	0.53	0.52	0.56	0.016	0	5	0.31	0.31	0.29	0.33	0.018	0	5
Barium	µg/L	-	-	-	-	-	12	12	12	12	0.37	0	5	11	11	11	11	0.12	0	5
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	5	5	<0.01	-	<0.01	<0.01	-	5	5
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	5	5	<0.01	-	<0.01	<0.01	-	5	5
Boron	µg/L	-	-	-	-	-	5.4	5.6	5.3	6.3	0.41	0	5	4.6	4.7	4.4	5.1	0.27	0	5
Cadmium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	5	5	<0.005	-	<0.005	<0.005	-	5	5
Chromium	µg/L	-	-	-	-	-	<0.06	-	<0.06	<0.06	-	5	5	<0.06	-	<0.06	<0.06	-	5	5
Cobalt	µg/L	-	-	-	-	-	<0.01	-	<0.01	0.010	-	4	5	<0.01	-	<0.01	<0.01	-	5	5

Table 6.4-1: Water Quality Summary during Ice-Covered Conditions in Meliadine Lake, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary Statistics												
		CCME Aquatic Life		Health Canada Drinking Water Guideline	Aesthetic Objective	SSWQO	Near-field							Mid-field					
		Acute	Chronic				Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Dissolved Metals (cont'd)																				
Copper	µg/L	-	-	-	-	-	1.1	1.1	1.0	1.1	0.050	0	5	0.85	0.85	0.81	0.89	0.029	0	5
Iron	µg/L	-	-	-	-	-	2.1	2.0	1.4	2.5	0.42	0	5	<1.0	-	<1.0	<1.0	-	5	5
Lead	µg/L	-	-	-	-	-	0.056	0.056	0.036	0.078	0.019	0	5	0.040	0.038	0.029	0.044	0.0062	0	5
Lithium	µg/L	-	-	-	-	-	0.86	0.85	0.69	1.0	0.13	0	5	0.59	0.58	<0.5	0.86	0.22	1	5
Manganese	µg/L	-	-	-	-	-	0.23	0.24	0.22	0.28	0.027	0	5	0.22	0.21	0.18	0.23	0.025	0	5
Mercury	µg/L	-	-	-	-	-	0.00060	0.00056	0.00050	0.00060	0.000055	0	5	0.00050	0.00042	<0.0005	0.00060	0.00016	2	5
Molybdenum	µg/L	-	-	-	-	-	0.10	0.10	0.096	0.11	0.0046	0	5	0.076	0.077	0.073	0.080	0.0031	0	5
Nickel	µg/L	-	-	-	-	-	0.80	0.80	0.77	0.82	0.019	0	5	0.56	0.56	0.55	0.56	0.0044	0	5
Selenium	µg/L	-	-	-	-	-	0.051	0.052	0.044	0.060	0.0065	0	5	0.051	0.039	<0.04	0.055	0.018	2	5
Silver	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	5	5	<0.005	-	<0.005	<0.005	-	5	5
Strontium	µg/L	-	-	-	-	-	52	52	52	54	0.78	0	5	44	44	43	46	1.2	0	5
Thallium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	5	5	<0.005	-	<0.005	<0.005	-	5	5
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	5	5	<0.05	-	<0.05	<0.05	-	5	5
Titanium	µg/L	-	-	-	-	-	<0.1	-	<0.1	<0.1	-	5	5	<0.1	-	<0.1	<0.1	-	5	5
Uranium	µg/L	-	-	-	-	-	0.018	0.018	0.016	0.019	0.0013	0	5	0.015	0.015	0.014	0.016	0.00084	0	5
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	5	5	<0.05	-	<0.05	<0.05	-	5	5
Zinc	µg/L	36 to 47[g]	7.9 to 13[h]	-	-	-	<0.8	-	<0.8	0.86	-	4	5	<0.8	-	<0.8	<0.8	-	5	5
Other																				
Total Cyanide	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	5	5	<0.001	-	<0.001	<0.001	-	5	5
Free Cyanide	mg/L	-	0.005	0.20	-	-	<0.001	-	<0.001	<0.005	-	5	5	<0.005	-	<0.001	<0.005	-	5	5
Cyanide WAD	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	5	5	<0.002	-	<0.001	<0.002	-	5	5
Radium-226	Bq/L	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	0	0

(a) Dissolved oxygen measurements during ice-covered conditions were outside the acceptable range. Data were deemed unreliable and excluded from analysis.

(b) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (2.61 mg-N/L) is based on the combination of field pH (7.8) and water temperature (1.5°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.3 to 7.8). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(d) Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(e) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (29.1 to 37.1 mg/L as CaCO3). The guideline is calculated based on the individual hardness value for each sample.

(f) Guideline is for chromium VI.

(g) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (29.1 to 37.1 mg/L as $CaCO_3$) and DOC (2.9 to 4.0 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(h) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.3 to 7.8), hardness (29.1 to 37.1 mg/L as $CaCO_3$) and DOC (2.9 to 4.0 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range of pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L). When field pH was not available laboratory pH was used.

Note:

In cases where 50% or more of data were <DL, no mean or standard deviation was calculated.

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; SD = standard deviation; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; Bq/L = Becquerels per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; WAD = weak acid dissociable; - = no guideline or data not measured.

Table 6.4-2: Water Quality Summary during Open-water Conditions Meliadine Lake, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary																				
		CCME Aquatic Life		Health Canada Drinking Water Guidelines	Aesthetic Objectives	SSWQO	Near-field							Mid-field							Pooled Reference Areas						
		Acute	Chronic				Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Field Measured																											
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.8	7.7	7.4	8.0	0.19	0	5	7.6	7.7	7.4	8.6	0.38	0	8	7.9	7.8	7.3	8.0	0.21	0	12
Specific conductivity	µS/cm	-	-	-	-	-	86	85	77	91	3.8	0	10	76	75	70	78	2.9	0	11	73	72	63	85	5.3	0	19
Temperature	°C	-	-	-	15	-	11	12	11	13	1.2	0	10	12	11	9.0	13	1.2	0	11	9.6	9.7	8.4	12	1.2	0	19
Dissolved oxygen	mg/L	-	6.5	-	-	-	12	12	12	12	0.14	0	10	12	11	10	12	0.84	0	11	12	12	11	13	0.37	0	19
Dissolved oxygen	%	-	-	-	-	-	112	112	109	115	2.4	0	10	103	104	95	113	7.1	0	11	105	107	102	116	5.4	0	18
Conventional Parameters																											
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.4	7.4	7.4	7.5	0.037	0	10	7.5	7.5	7.4	7.6	0.059	0	10	7.5	7.5	7.4	7.6	0.046	0	19
Specific conductivity	µS/cm	-	-	-	-	-	85	86	83	90	2.6	0	10	77	77	73	82	2.8	0	10	74	73	67	81	4.3	0	19
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	25	25	24	26	1.0	0	10	23	22	18	23	1.7	0	9	21	22	20	39	4.0	0	19
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	16	16	15	17	0.57	0	10	17	18	16	21	1.4	0	10	17	18	16	21	1.6	0	19
Total dissolved solids	mg/L	-	-	-	500	-	53	54	50	63	4.5	0	10	45	46	35	53	5.8	0	10	46	43	20	54	9.1	0	19
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	42	42	40	44	1.2	0	10	37	37	32	39	2.2	0	9	36	36	33	40	1.7	0	19
Total suspended solids	mg/L	-	-	-	-	-	<1.0	-	<1.0	<1.0	-	10	10	<1.0	-	<1.0	2.8	-	9	10	<1.0	-	<1.0	1.0	-	18	19
Turbidity	NTU	-	-	-	-	-	0.41	0.43	0.31	0.59	0.079	0	10	0.29	0.31	0.24	0.46	0.068	0	10	0.22	0.25	0.16	0.84	0.15	0	19
Major Ions																											
Bicarbonate	mg/L	-	-	-	-	-	20	20	18	20	0.70	0	10	21	22	20	25	1.7	0	10	21	22	20	25	1.9	0	19
Calcium	mg/L	-	-	-	-	-	7.5	7.6	7.3	8.2	0.32	0	10	7.0	6.7	5.0	7.2	0.64	0	10	6.7	7.0	6.4	12	1.2	0	19
Carbonate	mg/L	-	-	-	-	-	<0.6	-	<0.6	<0.6	-	10	10	<0.6	-	<0.6	<0.6	-	10	10	<0.6	-	<0.6	<0.6	-	19	19
Chloride	mg/L	640	120	-	250	-	13	13	11	14	0.72	0	10	9.4	9.4	9.2	9.6	0.16	0	10	8.4	8.4	7.9	8.7	0.26	0	19
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.023	0.021	<0.02	0.024	0.0043	1	10	0.024	0.024	0.022	0.028	0.0021	0	10	0.026	0.025	<0.02	0.028	0.0042	1	19
Magnesium	mg/L	-	-	-	-	-	1.4	1.4	1.3	1.5	0.054	0	10	1.2	1.1	0.45	1.3	0.25	0	10	1.1	1.2	1.1	2.2	0.24	0	19
Potassium	mg/L	-	-	-	-	-	0.98	0.98	0.95	1.0	0.022	0	10	0.93	0.87	0.25	0.97	0.22	0	10	0.90	0.92	0.84	1.3	0.10	0	19
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.39	0.39	0.35	0.43	0.035	0	10	0.35	0.34	0.28	0.40	0.039	0	10	0.25	0.25	0.22	0.28	0.018	0	19
Sodium	mg/L	-	-	-	200	-	5.7	5.8	5.5	6.2	0.29	0	10	4.9	4.6	1.8	5.2	0.99	0	10	4.4	4.6	4.1	8.5	0.97	0	19
Sulphate	mg/L	-	-	-	500	-	4.3	4.2	3.8	4.5	0.20	0	10	3.8	3.9	3.8	4.1	0.096	0	10	3.6	3.6	3.2	3.8	0.16	0	19
Nutrients and Organics																											
Nitrate	mg-N/L	124	2.9	10	-	-	0.011	-	<0.005	0.022	-	5	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	0.0073	-	17	18
Nitrite	mg-N/L	-	0.06	1.0	-	-	<0.001	-	<0.001	0.0017	-	6	10	<0.001	-	<0.001	<0.001	-	10	10	<0.001	-	<0.001	<0.001	-	18	18
Nitrate + nitrite	mg-N/L	-	-	-	-	-	0.011	-	<0.005	0.024	-	5	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	0.0073	-	17	18
Total ammonia	mg-N/L	-	0.22 to 4.6[(a)]	-	-	-	<0.005	-	<0.005	0.0094	-	9	10	<0.005	-	<0.005	0.018	-	7	10	<0.005	-	<0.005	0.029	-	15	19
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.23	0.23	0.18	0.30	0.031	0	10	0.23	0.23	0.15	0.34	0.061	0	10	0.17	0.18	0.11	0.26	0.047	0	19
Total phosphorus	mg-P/L	-	-	-	-	-	0.0045	0.0062	0.0021	0.020	0.0056	0	10	0.0025	0.0029	<0.001	0.0061	0.0019	1	10	0.0035	0.0032	<0.001	0.0044	0.0012	2	19
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0029	-	<0.001	0.0034	-	5	10	0.0019	-	<0.001	0.0029	-	5	10	0.0022	0.0020	<0.001	0.0030	0.00076	3	19
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	-	<0.001	0.0010	-	9	10	<0.001	-	<0.001	<0.001	-	10	10	<0.001	-	<0.001	0.0033	-	18	19
Total organic carbon	mg/L	-	-	-	-	-	3.1	3.2	2.9	3.6	0.24	0	10	2.7	2.7	2.3	2.8	0.20	0	10	2.3	2.3	2.2	2.6	0.11	0	19
Dissolved organic carbon	mg/L	-	-	-	-	-	3.1	3.1	2.9	3.4	0.15	0	10	2.7	2.7	2.3	3.1	0.22	0	10	2.3	2.3	2.2	2.7	0.099	0	19

Table 6.4-2: Water Quality Summary during Open-water Conditions Meliadine Lake, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary																			
		CCME Aquatic Life					Near-field							Mid-field							Pooled Reference Areas						
		Acute	Chronic	Health Canada Drinking Water Guidelines	Aesthetic Objectives	SSWQO	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Total Metals																										
Aluminum	µg/L	-	100[b, c]	-	-	-	8.3	14	7.0	29	8.4	0	10	3.0	3.2	2.6	3.9	0.46	0	10	2.8	3.1	1.8	10	1.9	0	19
Antimony	µg/L	-	-	6.0	-	-	<0.02	-	<0.02	<0.02	-	10	10	<0.02	-	<0.02	<0.02	-	10	10	<0.02	-	<0.02	<0.02	-	19	19
Arsenic	µg/L	-	5.0	10	-	25	0.38	0.39	0.34	0.45	0.037	0	10	0.25	0.26	0.24	0.29	0.015	0	10	0.20	0.21	0.18	0.26	0.026	0	19
Barium	µg/L	-	-	1,000	-	-	8.2	8.3	7.9	9.0	0.45	0	10	8.1	8.2	7.6	8.6	0.45	0	10	7.7	7.7	7.1	8.2	0.28	0	19
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	19	19
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	19	19
Boron	µg/L	29,000	1,500	5,000	-	-	5.0	5.0	4.5	5.3	0.22	0	10	4.1	4.1	3.7	4.6	0.30	0	10	3.9	3.7	2.8	4.0	0.35	0	19
Cadmium	µg/L	0.36 to 0.80[d]	0.038 to 0.072[d]	5.0	-	-	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	19	19
Chromium	µg/L	-	1.0	50[e]	-	-	<0.06	-	<0.06	0.10	-	9	10	<0.06	-	<0.06	0.065	-	8	10	<0.06	-	<0.06	0.56	-	15	19
Cobalt	µg/L	-	-	-	-	-	0.025	0.024	0.019	0.028	0.0033	0	10	0.019	0.018	0.012	0.027	0.0045	0	10	0.012	0.013	<0.01	0.027	0.0065	4	19
Copper	µg/L	-	2.0[d]	-	1,000	-	0.79	0.83	0.70	1.3	0.19	0	10	0.71	0.73	0.65	0.92	0.084	0	10	0.68	0.70	0.62	0.88	0.078	0	19
Iron	µg/L	-	300	-	300	1,060	24	25	20	40	6.0	0	10	18	19	9.8	32	7.9	0	10	11	12	5.5	25	5.7	0	19
Lead	µg/L	-	1.0[d]	10	-	-	0.010	0.012	<0.01	0.024	0.0067	3	10	<0.01	-	<0.01	0.027	-	9	10	<0.01	-	<0.01	0.098	-	14	19
Lithium	µg/L	-	-	-	-	-	1.5	1.5	1.2	1.8	0.25	0	10	0.64	0.82	0.57	1.3	0.32	0	10	0.58	0.53	<0.5	0.66	0.13	3	19
Manganese	µg/L	-	-	-	50	-	5.9	6.0	4.3	8.6	1.6	0	10	4.3	4.2	3.1	5.2	0.78	0	10	2.8	2.7	2.1	3.4	0.45	0	19
Mercury	µg/L	-	0.026	1.0	-	-	0.00090	0.00091	0.00060	0.0013	0.00020	0	10	0.0012	0.0010	<0.0005	0.0014	0.00039	1	10	0.00050	0.00048	<0.0005	0.00080	0.00021	7	19
Molybdenum	µg/L	-	73	-	-	-	0.080	0.077	0.055	0.10	0.015	0	10	0.078	0.080	0.055	0.11	0.023	0	10	0.078	0.077	0.057	0.11	0.013	0	19
Nickel	µg/L	-	25[d]	-	-	-	0.66	0.67	0.61	0.75	0.041	0	10	0.61	0.63	0.47	0.97	0.15	0	10	0.39	0.45	0.35	0.78	0.13	0	19
Selenium	µg/L	-	1.0	50	-	-	<0.04	-	<0.04	0.047	-	9	10	<0.04	-	<0.04	0.046	-	9	10	<0.04	-	<0.04	0.050	-	17	19
Silver	µg/L	-	0.25	-	-	-	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	19	19
Strontium	µg/L	-	-	-	-	-	49	51	45	59	6.0	0	10	35	38	34	44	4.2	0	10	32	32	28	34	1.3	0	19
Thallium	µg/L	-	0.80	-	-	-	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	19	19
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	10	10	<0.05	-	<0.05	<0.05	-	10	10	<0.05	-	<0.05	0.19	-	18	19
Titanium	µg/L	-	-	-	-	-	0.19	0.16	<0.1	0.24	0.072	2	10	<0.1	-	<0.1	0.11	-	8	10	<0.1	-	<0.1	0.14	-	17	19
Uranium	µg/L	33	15	20	-	-	0.017	0.017	0.016	0.021	0.0016	0	10	0.016	0.015	0.013	0.017	0.0015	0	10	0.013	0.015	<0.01	0.048	0.0084	1	19
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	0.057	-	8	10	<0.05	-	<0.05	<0.05	-	10	10	<0.05	-	<0.05	<0.1	-	19	19
Zinc	µg/L	-	30	-	5,000	-	<0.8	-	<0.8	1.4	-	9	10	<0.8	-	<0.8	<0.8	-	10	10	<0.8	-	<0.8	1.4	-	15	19
Dissolved Metals																										
Aluminum	µg/L	-	-	-	-	-	5.1	9.0	2.9	22	7.6	0	10	1.5	1.7	0.68	3.4	0.79	0	10	1.4	1.3	0.92	1.9	0.23	0	19
Antimony	µg/L	-	-	-	-	-	<0.02	-	<0.02	0.10	-	8	10	0.023	0.053	<0.02	0.24	0.074	4	10	<0.02	-	<0.02	0.17	-	16	19
Arsenic	µg/L	-	-	-	-	-	0.37	0.37	0.32	0.41	0.039	0	10	0.25	0.23	0.10	0.27	0.048	0	10	0.20	0.21	0.18	0.25	0.021	0	19
Barium	µg/L	-	-	-	-	-	8.2	8.3	7.9	8.8	0.30	0	10	8.1	7.5	3.1	8.4	1.6	0	10	7.5	7.7	7.3	11	0.72	0	19
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	19	19
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	<0.01	-	19	19
Boron	µg/L	-	-	-	-	-	4.7	4.7	4.4	5.0	0.23	0	10	3.9	3.7	2.5	4.1	0.52	0	10	3.5	3.8	3.0	9.5	1.4	0	19
Cadmium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	19	19
Chromium	µg/L	-	-	-	-	-	<0.06	-	<0.06	0.18	-	8	10	<0.06	-	<0.06	0.084	-	9	10	<0.06	-	<0.06	0.13	-	15	19
Cobalt	µg/L	-	-	-	-	-	0.010	-	<0.01	0.022	-	5	10	<0.01	-	<0.01	0.011	-	8	10	<0.01	-	<0.01	0.076	-	15	19
Copper	µg/L	-	-	-	-	-	0.70	0.75	0.64	1.0	0.13	0	10	0.68	0.66	0.19	0.92	0.18	0	10	0.65	0.66	0.57	0.82	0.058	0	19
Iron	µg/L	-	-	-	-	-	8.7	8.1	5.6	11	2.1	0	10	7.5	6.8	<1.0	12	3.7	1	10	4.5	5.7	3.0	13	3.1	0	19

Table 6.4-2: Water Quality Summary during Open-water Conditions Meliadine Lake, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary																				
		CCME Aquatic Life					Near-field							Mid-field							Pooled Reference Areas						
		Acute	Chronic	Health Canada Drinking Water Guidelines	Aesthetic Objectives	SSWQO	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Dissolved Metals (cont'd)																											
Lead	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	10	10	<0.01	-	<0.01	0.010	-	9	10	<0.01	-	<0.01	0.012	-	18	19
Lithium	µg/L	-	-	-	-	-	1.5	1.6	1.2	2.0	0.31	0	10	0.79	0.83	0.71	1.0	0.11	0	10	0.66	0.81	<0.5	4.4	0.90	4	19
Manganese	µg/L	-	-	-	-	-	0.98	1.2	0.33	2.7	0.94	0	10	0.87	0.90	0.24	1.6	0.50	0	10	0.47	1.4	0.32	16	3.4	0	19
Mercury	µg/L	-	-	-	-	-	0.00090	0.00089	<0.0005	0.0015	0.00045	1	10	0.00085	0.00087	<0.0005	0.0014	0.00045	1	10	0.00080	0.00068	<0.0005	0.0015	0.00042	8	19
Molybdenum	µg/L	-	-	-	-	-	0.083	0.082	0.054	0.10	0.020	0	10	0.069	0.072	0.058	0.095	0.012	0	10	0.082	0.087	0.063	0.18	0.025	0	19
Nickel	µg/L	-	-	-	-	-	0.63	0.61	0.55	0.65	0.040	0	10	0.58	0.56	0.19	0.77	0.16	0	10	0.42	0.46	0.34	0.70	0.12	0	19
Selenium	µg/L	-	-	-	-	-	<0.04	-	<0.04	0.042	-	8	10	<0.04	-	<0.04	0.045	-	9	10	<0.04	-	<0.04	0.042	-	18	19
Silver	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	19	19
Strontium	µg/L	-	-	-	-	-	49	50	44	56	5.2	0	10	35	34	26	36	2.9	0	10	32	37	30	122	21	0	19
Thallium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	10	10	<0.005	-	<0.005	<0.005	-	19	19
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	10	10	<0.05	-	<0.05	0.14	-	8	10	<0.05	-	<0.05	0.39	-	15	19
Titanium	µg/L	-	-	-	-	-	<0.1	-	<0.1	<0.1	-	10	10	<0.1	-	<0.1	<0.1	-	10	10	<0.1	-	<0.1	<0.1	-	19	19
Uranium	µg/L	-	-	-	-	-	0.017	0.017	0.014	0.020	0.0023	0	10	0.015	0.014	0.010	0.016	0.0020	0	10	0.013	0.018	0.011	0.11	0.023	0	19
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	0.063	-	8	10	<0.05	-	<0.05	0.053	-	7	10	<0.05	-	<0.05	<0.1	-	15	19
Zinc	µg/L	23 to 45[f]	4.2 to 13[g]	-	-	-	<0.8	-	<0.8	1.6	-	9	10	1.3	1.3	<0.8	3.0	0.79	2	10	<0.8	-	<0.8	2.9	-	15	19
Other																											
Total Cyanide	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	10	10	<0.001	-	<0.001	<0.001	-	10	10	<0.001	-	<0.001	<0.001	-	19	19
Free Cyanide	mg/L	-	0.005	0.20	-	-	<0.001	-	<0.001	<0.005	-	10	10	<0.001	-	<0.001	<0.005	-	10	10	<0.001	-	<0.001	<0.005	-	19	19
Cyanide WAD	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.002	-	10	10	<0.001	-	<0.001	<0.002	-	10	10	<0.001	-	<0.001	<0.002	-	19	19
Radium-226	Bq/L	-	-	-	-	-	0.0072	-	<0.0053	0.10	-	7	10	-	-	-	-	-	0	0	<0.0083	-	<0.0034	0.011	-	9	10

(a) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.22 mg-N/L) is based on the combination of field pH (8.6) and water temperature (11.9°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.3 to 8.6). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(d) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (17.7 to 39 mg/L as CaCO3). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (17.7 to 38.7 mg/L as $CaCO_3$) and DOC (2.2 to 3.4 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.3 to 8.6), hardness (17.7 to 38.7 mg/L as CaCO3) and DOC (2.2 to 3.4 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L). When field pH was not available laboratory pH was used.

Note:

In cases where 50% or more of data were <DL, no mean or standard deviation was calculated.

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; SD = standard deviation; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; Bq/L = Becquerels per litre; DOC = dissolved organic carbon; CaCO3 = calcium carbonate; WAD = weak acid dissociable; - = no guideline or data not measured.

6.4.2.1.2 Exposure versus Reference Area Comparison

The results of the statistical analysis (with outliers excluded) are presented in Tables 6.4-3 (ice-cover) and 6.4-4 (open-water). Statistical outliers and the results of the statistical tests with outliers included (where applicable) are presented in Appendix 6E. In all cases, outliers were not the result of data entry errors. The outcome of the statistical test with and without outliers included was the same for all parameters except for TKN and total lead during ice-covered conditions. These results are discussed in more detail below.

Spatial patterns during ice-covered conditions were detected for 45 of 55 water quality parameters (Table 6.4-3). Spatial patterns during open-water conditions were detected for 43 of 51 water quality parameters (Table 6.4-4). Time-series plots are presented in Appendix 6F and were qualitatively examined to identify if similar spatial patterns were present in years prior to 2018. The following sections discuss water chemistry and the results of the spatial analysis among exposure and reference areas in more detail.

Field Parameters

Median pH was similar between ice-cover and open-water conditions, whereas conductivity and DO were generally higher during ice-covered conditions (compared to open-water conditions), and temperature was lower during ice-covered conditions (compared to open-water conditions) (Tables 6.4-1 and 6.4-2). Field and laboratory pH in all areas was within the acceptable range for the CWQG-PAL.

A negative spatial trend was detected for field specific conductivity and a positive spatial trend was detected for DO (mg/L) in 2018. Specific conductivity was significantly higher in the Near-field relative to Mid-field (ice-cover and open-water) and reference areas (open-water). A similar spatial trend was observed in 2016 and 2017. Field DO concentrations in all areas during open-water conditions were above the minimum acceptable limit (i.e., 6.5 mg/L) based on the CWQG-PAL.

Conventional Parameters

Specific conductivity, water hardness and total alkalinity (as $CaCO_3$) in Meliadine Lake were elevated during ice-covered conditions (ranging from 98 to 122 µS/cm, 29 to 37 mg/L, and 25 to 28 mg/L, respectively) compared to open-water conditions (ranging from 63 to 91 µS/cm, 18 to 39 mg/L, and 15 to 21 mg/L, respectively; Table 6.4-1). Salt exclusion during ice formation can result in elevated ions and conductivity under-ice (Agnico Eagle 2014). A similar phenomenon was observed in previous monitoring years and during baseline monitoring in Meliadine Lake (Agnico Eagle 2014; Golder 2018c).

Median concentrations of TDS in 2018 ranged from 45 to 68 mg/L (Tables 6.4-1 and 6.4-2). Similar to hardness and total alkalinity, TDS was elevated during ice-covered conditions in the Near-field and Mid-field areas in 2018, relative to previous years, but was within the range of concentrations observed in previous years during open-water conditions (Golder 2018c). However, all TDS concentrations in 2018 were well below the Health Canada aesthetic objective of 500 mg/L (Health Canada 2017). Concentrations of total suspended solids (TSS) were all less than DL, with the exception of a single measurement in the Mid-field area in August (Appendix 6D, Table 6D-2).

Negative spatial patterns were detected in 2018 for specific conductivity, hardness, TDS and turbidity. Concentrations were highest in the Near-field, followed by the Mid-field (under-ice and open-water) and lowest in the reference areas (open-water), with the exception of TDS. TDS concentrations did not significantly differ between the Mid-field and reference areas. Similar spatial patterns were observed in 2016 and 2017, although the relative difference in concentration of specific conductivity and hardness among areas appears to have increased over the duration of the AEMP monitoring program. A positive spatial pattern was detected for total alkalinity;

concentrations were significantly lower in the Near-field area relative to the Mid-field and reference areas but did not significantly differ between Mid-field and reference areas. Turbidity had the highest magnitude of difference among areas during ice-covered and open-water conditions (Tables 6.4-3 and 6.4-4; Figure 6.41).

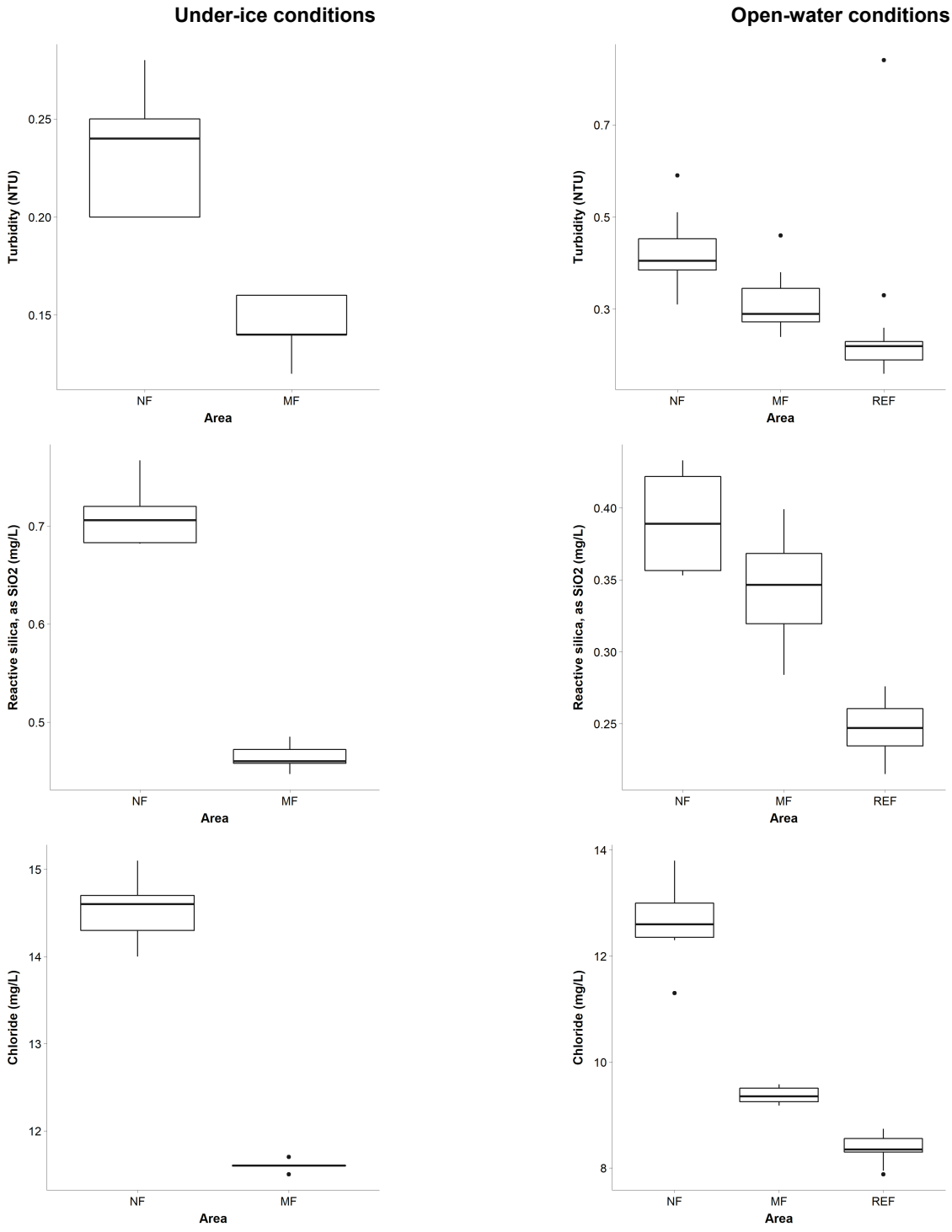
Major Ions

Generally, concentrations of major ions measured in 2018 were within similar ranges as those measured in previous three years (Appendix 6D). Bicarbonate, chloride, and calcium were the dominant ions during both ice-cover and open-water conditions (Tables 6.4-1 and 6.4-2); carbonate was non-detectable in all samples. Similar to 2017, major ion concentrations in 2018 were elevated under-ice, relative to open-water, but overall, concentrations in 2018 were slightly higher under-ice relative to 2017 (Golder 2018c). Similar to previous years, chloride, fluoride, sodium and sulphate were all below applicable CWQG-PAL, CDWQG and aesthetic objectives, and SSWQOs in all areas during ice-cover and open-water conditions (Tables 6.4-2 and 6.4-2).

Negative spatial patterns were detected for all major ions during ice-covered and open-water conditions, except bicarbonate and fluoride (open-water only) (Tables 6.4-3 and 6.4-4). Concentrations were highest in the Near-field, followed by the Mid-field (under-ice and open-water) and lowest in the reference areas (open-water). Positive spatial patterns were detected for bicarbonate and fluoride, with higher concentrations in the Mid-field (bicarbonate only) and reference areas relative to Near-field.

Spatial patterns of chloride, magnesium and sodium in 2018 were similar to 2016 and 2017 (i.e., higher in the Near-field, then Mid-field and lowest in the reference areas), although the relative difference in concentration of these ions among areas appears to have increased during the duration of the AEMP monitoring program. Reactive silica similarly varied among areas in 2016 and 2017, relative to 2018. Based on the time-series plots (Appendix 6F), there was higher variability in sulphate concentrations among areas in 2017, relative to 2018 and 2016; sulphate spatial patterns were similar in 2016 and 2018.

During ice-covered conditions, reactive silica had the highest magnitude of difference between Near-field and Mid-field areas (Figure 6.41). In open-water, the magnitude of difference was highest for chloride and reactive silica concentrations in the Near-field area, relative to the Mid-field and reference areas (Figure 6.41). Although significantly higher ion concentrations were observed in the Near-field area relative to Mid-field and reference areas, the concentrations were orders of magnitude below the generic and conservative guidelines and are therefore, not ecologically relevant.



NF = Near-field Area; MF = Mid-field Area; REF = pooled Reference Area data; mg/L = milligrams per litre; NTU = Nephelometric Turbidity Units; SiO_2 = silicon dioxide.

Figure 6.4-1: Box-and-Whisker Plots for Selected Conventional and Major Ion Parameters with Spatial Patterns Among Areas in Meliadine Lake, 2018

Nutrients

Nutrient concentrations in 2018 were low and generally consistent with previous years (Golder 2018c). Median nitrate concentrations under-ice in the Mid-field area were higher (median 0.012 mg/L) relative to concentrations observed during open-water conditions, which were below detection (i.e., <0.005 mg/L). The opposite was true in the Near-field area, with lower concentrations under-ice (median 0.0089 mg/L), relative to open-water (0.012 mg/L). Nitrite was below detection during ice-covered and open-water conditions in all areas (i.e., <0.001 mg/L), with the exception of open-water concentrations in the Near-field area (range <0.001 to 0.0017 mg/L). Nitrate and nitrite concentrations were below CWQG-PAL and CDWQG and aesthetic objectives (Table 6.4-2).

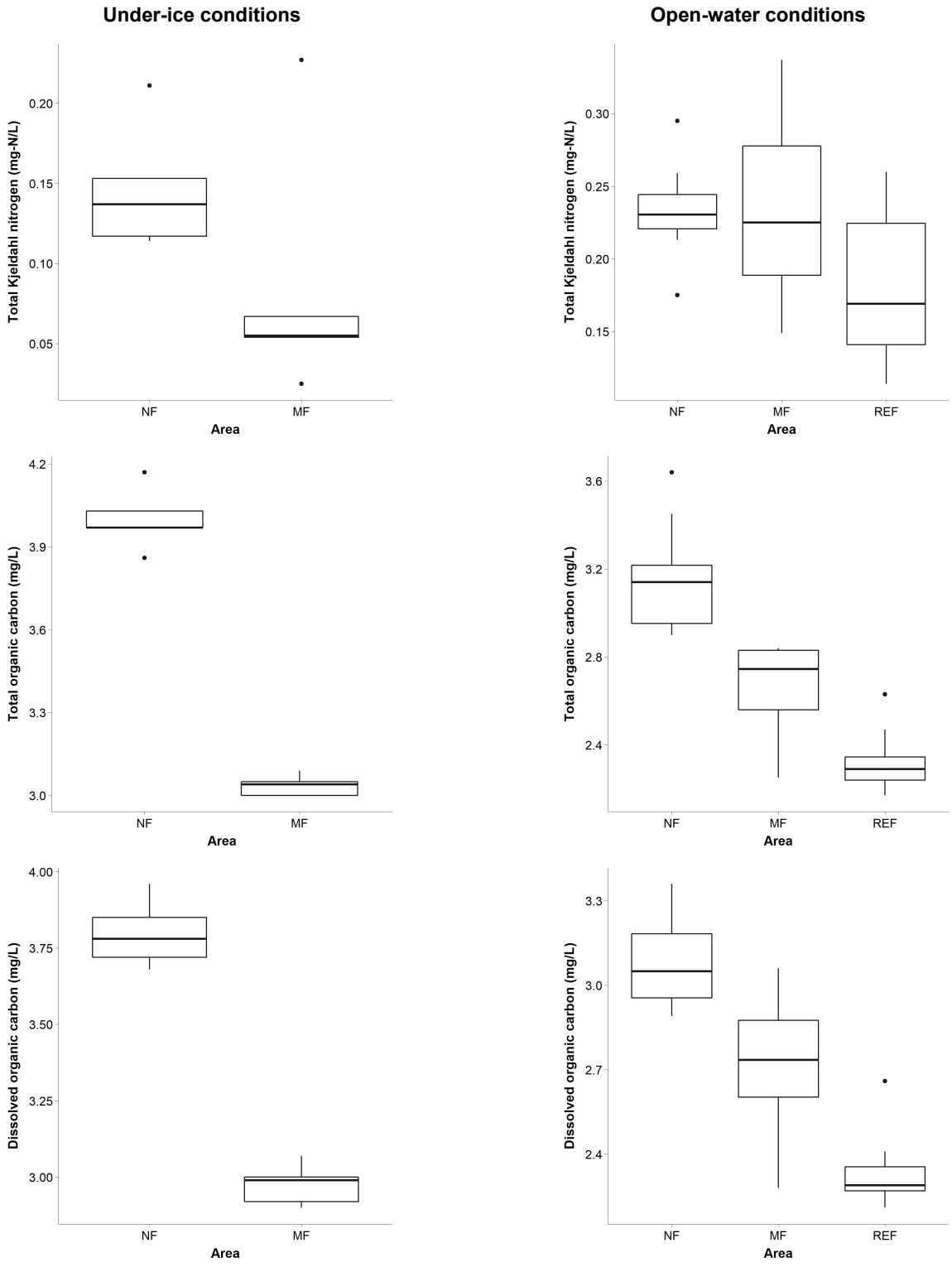
Total ammonia concentrations were low in 2018, ranging from <0.005 to 0.029 mg-N/L (Tables 6.4-1 and 6.4-2). Similar to previous years, total ammonia concentrations in the Near-field and Mid-field areas were elevated in ice-covered relative to open-water conditions. However, concentrations under-ice in 2018 were not as high as observed in previous years (Golder 2018c). All detected ammonia concentrations were below the CWQG-PAL.

Concentrations of TKN were similar to previous years and were slightly lower under-ice compared to open-water conditions (i.e., <0.05 to 0.23 mg-N/L and 0.11 to 0.34 mg-N/L, respectively; Golder 2018c). Concentrations of TP and TDP in 2018 were similar to previous years, ranging from <0.001 to 0.02 mg-P/L and <0.001 to 0.003 mg-P/L, respectively (Tables 6.4-1 and 6.4-2; Golder 2018c).

Similar to 2017, organic carbon in 2018 occurred primarily in the dissolved form (Golder 2018c). Concentrations of TOC and DOC in 2018 were within ranges observed in previous years, at 2.2 to 4.2 mg/L and 2.2 to 4.0 mg/L, respectively. Median TOC and DOC concentrations were slightly higher in the Near-field and Mid-field areas during ice-covered conditions relative to open-water (Tables 6.4-1 and 6.4-2).

During ice-covered conditions, negative spatial patterns were detected for TKN, TN, TP, TOC and DOC, whereas positive spatial patterns were detected for nitrate, nitrate and nitrite, and total ammonia; the greatest magnitude of difference between Near-field and Mid-field concentrations under-ice was observed for TKN, TN, and TOC (Table 6.4-3; Figure 6.4-2). With an outlier from the Mid-field area (0.227 mg/L) included in the analysis, the outcome of the statistical test changed for TKN; no significant difference was detected during ice-covered conditions between Near-field and Mid-field areas (Appendix 6E).

During open-water conditions, fewer nutrient parameters were statistically analyzed because several parameters had >50% of measurements below DL. TP and TDP were not significantly different among areas in 2018 and showed similar spatial patterns as 2016 and 2017; however, median concentrations of TP in 2018 were higher in the Near-field area (0.0045 mg-P/L), relative to the Mid-field area (0.0025 mg-P/L), and the pooled reference areas (0.0032 mg-P/L; Table 6.4-4). Negative spatial patterns were detected for TKN, TOC and DOC. Spatial patterns for TKN, TOC, and DOC in 2018 were similar to 2017; no patterns were observed in 2016. The highest magnitude of difference among areas was observed for TKN between Near-field and reference areas and Mid-field and reference areas, and for TOC and DOC, between Near-field and reference areas (Figure 6.4-2).



NF = Near-field Area; MF = Mid-field Area; REF = pooled Reference Area data; mg-N/L = milligrams nitrogen per litre; mg/L = milligrams per litre.

Figure 6.4-2: Box-and-Whisker Plots for Selected Nutrient Parameters with Spatial Patterns among Areas in Meliadine Lake, 2018

Metals

Total and dissolved metals analyzed in 2018 were detected in most samples, but concentrations were generally low. Metals were analyzed using DLs below applicable guidelines and SSWQOs, and all detected metal concentrations in 2018 were lower than applicable CWQG-PAL, CDWQG and aesthetic objectives, and SSWQOs (Tables 6.4-1 and 6.4-2).

Several metals were detected below the DL in all samples, including total antimony, beryllium, bismuth, cadmium, silver, and thallium, as well as dissolved beryllium, bismuth, cadmium, silver, thallium, and titanium. Total chromium, tin, titanium, vanadium and dissolved antimony, chromium, tin and vanadium were not detected in any sample collected during ice-covered conditions but were detected in some samples during open-water conditions (Appendix 6D, Tables 6D-1 to 6D-5). All total and dissolved metal concentrations were well below applicable CWQG-PAL, CDWQG and aesthetic objectives, and SSWQOs in 2018 (Tables 6.4-1 and 6.4-2).

In general, metals were primarily in the dissolved form (i.e., ratio between total and dissolved metals was less than two) in all areas during ice-cover and open-water conditions except for aluminum, iron and manganese. The ratio between total and dissolved metal concentrations for total aluminum, iron, and manganese was greater than two in all areas during ice-cover and open-water conditions suggesting that a greater relative fraction of these metals occurs as particulate matter rather than dissolved.

Several total metals were excluded from statistical analysis because the datasets contained >50% of concentrations below DL. During ice-covered conditions, negative spatial patterns were detected for total arsenic, barium, boron, copper, iron, manganese, mercury, nickel, strontium and uranium (Table 6.4-3). Median concentrations of total uranium in the Near-field (0.018 µg/L) and Mid-field (0.015 µg/L) areas were just above the DL (i.e., 0.01 µg/L) and therefore, the statistical variability in concentrations between these areas may be a result of analytical variability associated with measuring low analyte concentrations. Total aluminum, lead, molybdenum, and selenium were not significantly different between Near-field and Mid-field areas during ice-covered conditions. The magnitude of difference between Near-field and Mid-field area concentrations under-ice was highest for total arsenic, iron, manganese, and nickel (Figure 6.4-3). With an outlier from the Near-field area (0.107 µg/L) included in the analysis, the outcome of the statistical test changed for total lead; a significant negative spatial pattern was detected during ice-covered conditions between Near-field and Mid-field areas (Appendix 6E).

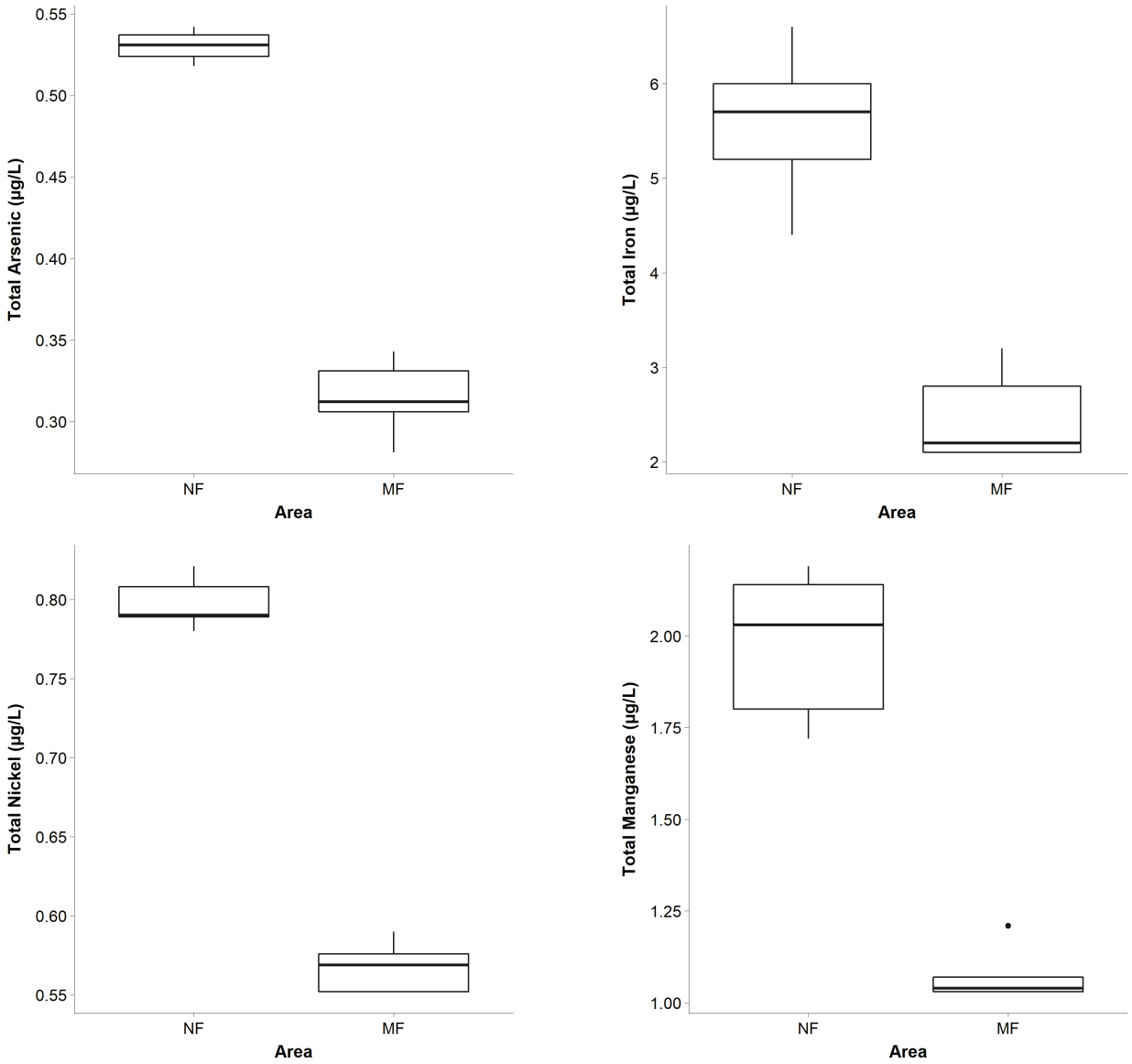
Spatial patterns among areas in 2018 were similar for total barium, copper, iron, and manganese relative to 2016 and 2017. Spatial patterns among areas in 2018 for total arsenic, mercury, nickel, strontium and uranium were also similar to 2016 and 2017, except that in 2018 the relative differences in concentration among areas appear to have increased.

During open-water conditions, negative spatial patterns were detected for total aluminum, arsenic, barium, boron, cobalt, copper, iron, lithium, manganese, mercury, nickel, strontium, and uranium (Table 6.4-4; Figure 6.4-5). Total molybdenum did not significantly differ among areas. Median concentrations of total cobalt and uranium in the Near-field, Mid-field and reference areas were just above their respective DLs (i.e., 0.01 and 0.01 µg/L, respectively) and therefore, the statistical variability in concentrations between these areas may be a result of analytical variability associated with measuring low analyte concentrations (Table 6.4-4). Significant differences in concentrations were observed among all areas for these metals, with the following exceptions: total aluminum and copper did not differ significantly between Mid-field and reference areas, and mercury did not differ significantly between Near-field and Mid-field areas.

Spatial patterns during open-water conditions in 2018 for arsenic, barium, cobalt, copper, iron, and manganese were similar to those observed in 2016 and 2017. Concentrations of total aluminum, and lithium were variable among areas in 2016 and 2017, with spatial patterns emerging in 2018. In 2017, total boron and uranium had similar spatial patterns as 2018, but no spatial pattern was observed in 2016. Spatial patterns of total strontium were similar in 2016, 2017 and 2018, but the relative differences in concentration among areas appear to have increased in each successive sampling year.

Cyanide

Free and weak acid dissociable cyanide species measured in 2018 were below the analytical DL for all stations and sampling events (Tables 6.4-1 and 6.4-2). Detection limits for cyanide species were lower than the applicable guidelines (i.e., 0.005 mg/L, CCME 1999).



NF = Near-field; MF = Mid-field; µg/L = micrograms per litre.

Figure 6.4-3: Box-and-Whisker Plots for Selected Total Metal Parameters with Spatial Patterns among Areas in Meliadine Lake during Ice-covered Conditions, 2018

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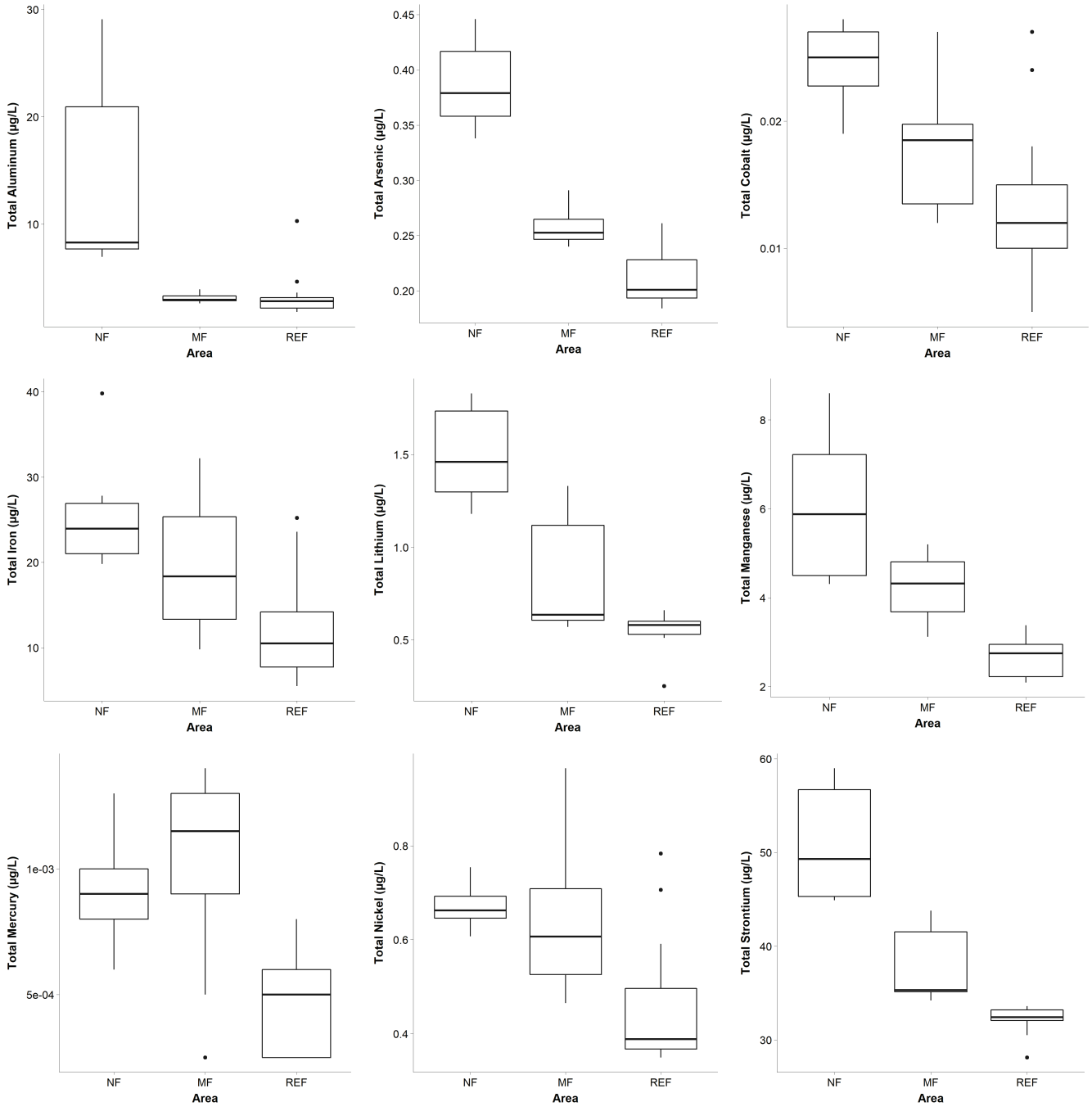


NF = Near-field; MF = Mid-field; REF = pooled Reference Area data; µg/L = micrograms per litre.

Figure 6.4-4: Box-and-Whisker Plots for Selected Total Metal Parameters with Spatial Patterns among Areas in Meliadine Lake during Open-water Conditions, 2018

Table 6.4-3: Spatial Comparison of Selected Water Quality Parameters between Near-field and Mid-field Exposure Areas during Ice-covered Conditions in 2018

Parameter	Unit	Test[(a)]	*P*-value	Magnitude (%)	Overall Trend
Field Measured					
pH	unitless	Mann-Whitney	0.834	NS	No change
Specific conductivity	µS/cm	ANOVA	**<0.001**	18	↓
Conventional Parameters					
pH	unitless	ANOVA	0.288	NS	No change
Specific conductivity	µS/cm	Mann-Whitney	**0.009**	20	↓
Hardness (as $CaCO_3$)	mg/L	ANOVA	**<0.001**	21	↓
Total alkalinity (as $CaCO_3$)	mg/L	ANOVA	**<0.001**	10	↓
Total dissolved solids	mg/L	ANOVA	**<0.001**	13	↓
Turbidity	NTU	ANOVA	**0.001**	63	↓
Major Ions					
Bicarbonate	mg/L	ANOVA	**<0.001**	10	↓
Calcium	mg/L	ANOVA	**<0.001**	20	↓
Chloride	mg/L	Mann-Whitney	**0.008**	26	↓
Fluoride	mg/L	Mann-Whitney	**0.005**	16	↓
Magnesium	mg/L	ANOVA	**<0.001**	26	↓
Potassium	mg/L	ANOVA	**<0.001**	14	↓
Reactive silica (as SiO_2)	mg/L	ANOVA	**<0.001**	53	↓
Sodium	mg/L	ANOVA	**<0.001**	27	↓
Sulphate	mg/L	ANOVA	**<0.001**	30	↓
Nutrients and Organics					
Nitrate	mg-N/L	ANOVA	**0.022**	-33	↑
Nitrate + nitrite	mg-N/L	ANOVA	**0.057**	-30	↑
Total ammonia	mg-N/L	ANOVA	**0.037**	-36	↑
Total Kjeldahl nitrogen	mg-N/L	Mann-Whitney	**0.014**	149	↓
Total phosphorus	mg-P/L	ANOVA	**0.059**	21	↓
Total organic carbon	mg/L	ANOVA	**<0.001**	32	↓
Dissolved organic carbon	mg/L	ANOVA	**<0.001**	28	↓
Total Metals					
Aluminum	µg/L	ANOVA	0.108	NS	↓
Arsenic	µg/L	ANOVA	**<0.001**	69	↓
Barium	µg/L	Mann-Whitney	**0.058**	10	↓
Boron	µg/L	ANOVA	**0.071**	11	↓
Copper	µg/L	ANOVA	**<0.001**	24	↓
Iron	µg/L	ANOVA	**<0.001**	125	↓
Lead	µg/L	Mann-Whitney	0.14	NS	No change
Manganese	µg/L	Mann-Whitney	**0.009**	95	↓

Table 6.4-3: Spatial Comparison of Selected Water Quality Parameters between Near-field and Mid-field Exposure Areas during Ice-covered Conditions in 2018

Parameter	Unit	Test[(a)]	*P*-value	Magnitude (%)	Overall Trend
Total Metals (cont'd)					
Mercury	µg/L	ANOVA	**0.058**	17	↓
Molybdenum	µg/L	Mann-Whitney	0.602	NS	No change
Nickel	µg/L	ANOVA	**<0.001**	40	↓
Selenium	µg/L	ANOVA	0.452	NS	No change
Strontium	µg/L	ANOVA	**0.008**	12	↓
Uranium	µg/L	Mann-Whitney	**0.007**	20	↓

(a) Statistical results are presented with outliers removed. Results with outliers included are provided in Appendix 6E.

Note:

Bold values indicate statistical significance. Tests were considered significant at P <0.1.

Parameters with greater than 50% of the dataset below the detection limit were excluded from analysis and are not shown in this table.

ANOVA = analysis of variance; Mann-Whitney = Mann Whitney U test; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; $CaCO_3$ = calcium carbonate; <= less than; NS = no significant difference between areas; ↓ = negative spatial pattern; ↑ = positive spatial pattern.

Table 6.4-4: Spatial Comparison of Select Water Quality Parameters between Near-field and Mid-field Exposure Areas and Reference Areas during Open-water Conditions in 2018

Parameter	Unit	Overall Model[a]		Pairwise Comparisons[a]						Overall Trend
				Near-field to Mid-field		Near-field to Reference[b]		Mid-field to Reference[b]		
		Test	*P*-value	*P*-value	Magnitude (%)	*P*-value	Magnitude (%)	*P*-value	Magnitude (%)	
Field Measured										
pH	unitless	K-W	0.197	-	-	-	-	-	-	No change
Specific conductivity	µS/cm	K-W	**<0.001**	**<0.001**	12	**<0.001**	18	**0.009**	5	↓
Dissolved oxygen	mg/L	K-W	0.128	-	-	-	-	-	-	No change
Dissolved oxygen	%	K-W	**0.038**	0.013	8	**0.036**	6	0.439	NS	↓
Conventional Parameters										
pH	-	K-W	**<0.001**	**<0.001**	-1	**<0.001**	-1	0.792	NS	↑; No change MF to REF
Specific conductivity	µS/cm	K-W	**<0.001**	**<0.001**	11	**<0.001**	15	**0.077**	3	↓
Hardness (as $CaCO_3$)	mg/L	ANOVA	**<0.001**	**<0.001**	14	**<0.001**	14	**0.015**	0	↓
Total alkalinity (as $CaCO_3$)	mg/L	K-W	**0.001**	**0.001**	-6	**<0.001**	-7	0.998	NS	↑; No change MF to REF
Total dissolved solids	mg/L	K-W	**<0.001**	**0.001**	18	**<0.001**	15	0.443	NS	↓; No change MF to REF
Turbidity	NTU	K-W	**<0.001**	**0.002**	40	**<0.001**	84	**<0.001**	32	↓
Major Ions										
Bicarbonate	mg/L	K-W	**0.001**	**0.001**	-6	**<0.001**	-6	0.998	NS	↑; No change MF to REF
Calcium	mg/L	K-W	**<0.001**	**<0.001**	8	**<0.001**	13	0.156	NS	↓; No change MF to REF
Chloride	mg/L	K-W	**<0.001**	**<0.001**	35	**<0.001**	51	**<0.001**	12	↓
Fluoride	mg/L	K-W	**0.002**	0.264	NS	**<0.001**	-13	**0.007**	-10	↑: No change NF to MF
Magnesium	mg/L	K-W	**<0.001**	**<0.001**	13	**<0.001**	21	**<0.001**	8	↓
Potassium	mg/L	K-W	**<0.001**	**0.001**	5	**<0.001**	9	**0.006**	3	↓
Reactive silica (as SiO_2)	mg/L	K-W	**<0.001**	**0.030**	12	**<0.001**	57	**<0.001**	40	↓
Sodium	mg/L	K-W	**<0.001**	**<0.001**	16	**<0.001**	30	**<0.001**	12	↓
Sulphate	mg/L	K-W	**<0.001**	**<0.001**	12	**<0.001**	19	**<0.001**	6	↓
Nutrients and Organics										
Total Kjeldahl nitrogen	mg-N/L	K-W	**0.021**	0.827	NS	**0.013**	36	**0.023**	33	↓; No change MF to REF
Total phosphorus	mg-P/L	K-W	0.396	-	-	-	-	-	-	No change
Dissolved phosphorus	mg-P/L	K-W	0.259	-	-	-	-	-	-	No change
Total organic carbon	mg/L	K-W	**<0.001**	**<0.001**	14	**<0.001**	37	**<0.001**	20	↓
Dissolved organic carbon	mg/L	K-W	**<0.001**	**<0.001**	12	**<0.001**	33	**<0.001**	19	↓
Total Metals										
Aluminum	µg/L	K-W	**<0.001**	**<0.001**	179	**<0.001**	193	0.175	NS	↓; No change MF to REF
Arsenic	µg/L	K-W	**<0.001**	**<0.001**	50	**<0.001**	89	**<0.001**	26	↓
Barium	µg/L	K-W	**<0.001**	**0.053**	1	**<0.001**	6	**0.007**	6	↓
Boron	µg/L	K-W	**<0.001**	**<0.001**	23	**<0.001**	28	**0.002**	4	↓
Cobalt	µg/L	K-W	**<0.001**	**0.007**	35	**<0.001**	108	**0.011**	54	↓
Copper	µg/L	K-W	**0.011**	**0.077**	11	**0.002**	15	0.182	NS	↓; No change MF to REF
Iron	µg/L	K-W	**<0.001**	**0.077**	31	**<0.001**	128	**0.004**	75	↓

Table 6.4-4: Spatial Comparison of Select Water Quality Parameters between Near-field and Mid-field Exposure Areas and Reference Areas during Open-water Conditions in 2018

Parameter	Unit	Overall Model[a]		Pairwise Comparisons[a]						Overall Trend
				Near-field to Mid-field		Near-field to Reference[b]		Mid-field to Reference[b]		
		Test	*P*-value	*P*-value	Magnitude (%)	*P*-value	Magnitude (%)	*P*-value	Magnitude (%)	
Total Metals (cont'd)										
Lithium	µg/L	K-W	**<0.001**	**<0.001**	130	**<0.001**	152	**<0.001**	9	↓
Manganese	µg/L	K-W	**<0.001**	**0.023**	37	**<0.001**	111	**<0.001**	54	↓
Mercury	µg/L	K-W	**<0.001**	0.175	NS	**<0.001**	80	**<0.001**	130	↓; No change NF to MF
Molybdenum	µg/L	K-W	0.990	0.421	-	-	-	-	-	No change
Nickel	µg/L	K-W	**<0.001**	**<0.001**	9	**<0.001**	71	**<0.001**	56	↓
Strontium	µg/L	K-W	**<0.001**	**<0.001**	40	**<0.001**	52	**<0.001**	9	↓
Uranium	µg/L	K-W	**<0.001**	**0.009**	6	**<0.001**	31	**0.002**	23	↓

(a) Statistical results are presented with outliers removed. Results with outliers included are provided in Appendix 6E.

(b) Reference area data were pooled from Reference Areas 1, 2, and 3.

Note:

Bold values indicate statistical significance. Tests were considered significant at *P* <0.1.

Parameters with greater than 50% of the dataset below the detection limit were excluded from analysis and are not shown in this table.

ANOVA = analysis of variance; K-W = Kruskal-Wallis Test; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; $CaCO_3$ = calcium carbonate; <= less than; NS = post-hoc test indicated no significant difference between areas; - = pairwise comparison was not conducted because overall model indicated no significant difference; ↓ = negative spatial pattern; ↑ = positive spatial pattern.

6.4.2.2 EEM

6.4.2.2.1 Comparison to Canadian Water Quality Guidelines

For the purposes of the EEM, the results of the comparison to CWQG-PAL (CCME 1999) are summarized below.

- All samples collected in the Exposure Area (i.e., Near-field) and Reference Area (i.e., Reference Area 1) during the 2018 EEM program were below CWQG-PAL (Table 6.4-2).

6.4.2.2.2 Exposure versus Reference Area Comparison

The EEM TGD (Environment Canada 2012) recommends that a comparison of water quality data be conducted between the exposure and reference areas. In particular, parameters that are greater than a magnitude of two in the exposure area should be identified. A summary of the parameters where exposure area median concentrations (Near-field; MEL-01) were more than two times greater than the reference area (Reference Area 1; MEL-03) concentrations is provided in Table 6.4-5.

Table 6.4-5: Comparison of Near-field (Exposure Area) and MEL-03 (Reference Area) Water Quality, 2018

Sampling Period	Exposure Area Concentrations More than Two Times Greater than the Reference Area Concentrations	
Open-water[a]	Routine Parameters	none
	Major Ions	none
	Nutrients	Nitrate[b] and nitrate plus nitrite[b]
	Total Metals	aluminum, arsenic, lithium, manganese, titanium[b]
	Dissolved Metals	aluminum, arsenic, cobalt[b], lithium

Notes:

(a) Data were pooled from the 19 to 25 July and the 15 August to 2 September 2018 programs.

(b) The MEL-03 (reference area) parameter concentrations were below reported detection limits; comparison to corresponding Near-field area concentrations were based on setting values below detection to half the reported detection limit.

Environment Canada (2012) recommends that for parameters with exposure area medians more than two times greater than the reference area means, the Mine estimate the geographic extent for which this condition exists. This recommendation also provides supporting information for biological monitoring results. An assessment of the treated effluent plume was completed during this EEM cycle and can be used to estimate the geographic extent of these conditions based on the measured Mine effluent mixing zone (Section 2.4.3). As discussed in Section 2.4.3, the geographic extent of the plume extended to sampling stations located 100 m away from the diffuser but did not extend to stations located 250 m away from the diffuser. Therefore, the conditions for water quality parameters present in the Near-field area at concentrations two times higher than the Reference Area is unlikely to persist beyond 250 m distance from the effluent diffuser.

6.4.3 Comparison to Normal Range

Meliadine Lake Near-field mean/median concentrations were higher than their respective normal range upper bound concentrations during open-water conditions for field pH, specific conductivity, hardness, TDS, calcium, chloride, magnesium, potassium, sodium, sulphate, reactive silica, nitrate, total aluminum, arsenic, barium, cobalt, iron, lithium, manganese, mercury, nickel, and strontium (Table 6.4-6). Meliadine Lake Mid-field mean/median concentrations were higher than their respective normal range upper bound concentrations during open-water conditions for specific conductivity, hardness, TDS, chloride, magnesium, sodium, sulphate, reactive silica, total arsenic, barium, iron, manganese, mercury, nickel, and strontium. Meliadine Lake pooled reference area mean/median concentrations fell within their respective normal range for all parameters in 2018.

Table 6.4-6: Normal Ranges for Selected Water Quality Parameters during Open-water Conditions in Meliadine Lake and Comparisons of 2018 Results to Normal Ranges

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Baseline Years	AEMP Reference Years	Calculation Method	Normal Ranges		2018 Mean/Median[a]		
								Lower Bound	Upper Bound	Near-field	Mid-field	Reference Area[b]
Conventional Parameters												
pH (field)	unitless	0.1[c]	83	0	1997 to 2013	2015 to 2018	Percentile	7.0	7.9	**8.3**	7.8	7.9
Specific conductivity (laboratory)	µS/cm	1	96	1	1997 to 2013	2015 to 2018	Percentile	58	74	**85**	**77**	73
Hardness (as $CaCO_3$)	mg/L	0.2	85	2	1997 to 2013	2015 to 2018	Percentile	18	23	**25**	**23**	21
Total alkalinity (as $CaCO_3$)	mg/L	1	96	1	1997 to 2013	2015 to 2018	Percentile	14	18	16	17	17
Total dissolved solids (calculated)	mg/L	-	79	1	1997 to 2013	2015 to 2018	Percentile	32	37	**42**	**37**	36
Total suspended solids	mg/L	1	75	1	1997 to 2013	2015 to 2018	Percentile	0[d]	1.0	0.5	0.5	0.5
Turbidity	NTU	0.1	85	1	1997 to 2013	2015 to 2018	PI(λ)	0.18	0.43	0.41	0.29	0.21
Major Ions												
Bicarbonate	mg/L	1.2	96	1	1997 to 2013	2015 to 2018	Percentile	16	22	20	21	21
Calcium	mg/L	0.02	95	2	1997 to 2013	2015 to 2018	Percentile	5.6	7.2	**7.5**	7.0	6.7
Chloride	mg/L	0.1	97	0	1997 to 2013	2015 to 2018	Percentile	5.1	8.5	**12.6**	**9.4**	8.4
Fluoride	mg/L	0.020	76	0	2013	2015 to 2018	Percentile	0.020	0.028	0.023	0.024	0.027
Magnesium	mg/L	0.004	96	1	1997 to 2013	2015 to 2018	Percentile	0.8	1.1	**1.4**	**1.2**	1.1
Potassium	mg/L	0.02	96	1	1997 to 2013	2015 to 2018	PI	0.74	0.96	**0.98**	0.87	0.90
Reactive silica (as SiO_2)	mg/L	0.01	69	0	-	2015 to 2018	Percentile	0.19	0.27	**0.39**	**0.35**	0.25
Sodium	mg/L	0.005	96	1	1997 to 2013	2015 to 2018	Percentile	3.1	4.4	**5.7**	**4.9**	4.4
Sulphate	mg/L	0.3	97	0	1997 to 2013	2015 to 2018	Percentile	2.7	3.6	**4.3**	**3.8**	3.6
Nutrients and Organics												
Nitrate	mg-N/L	0.005	68	1	-	2015 to 2018	Percentile	0[d]	0.005[e]	**0.007**	0.0025	0.0025
Nitrite	mg-N/L	0.001	68	0	-		Percentile	0[d]	0.001[e]	0.0005	0.0005	0.0005
Total ammonia	mg-N/L	0.005	68	1	-	2015 to 2018	Percentile	0[d]	0.009	0.003	0.0025	0.0025
Total Kjeldahl nitrogen	mg-N/L	0.05	97	0	1997 to 2013	2015 to 2017	PI	0.07	0.25	0.23	0.23	0.18
Total phosphorus	mg-P/L	0.001	96	1	1997 to 2013	2015 to 2018	Percentile	0.0031	0.0065	0.0045	0.0025	0.0035
Dissolved phosphorus	mg-P/L	0.001	96	1	1997 to 2013	2015 to 2018	Percentile	0.001	0.0034	0.0017	0.0012	0.0022
Orthophosphate	mg-P/L	0.001	94	3	1997 to 2013	2015 to 2018	Percentile	0[d]	0.001[e]	0.001	0.0005	0.0005
Total organic carbon	mg/L	0.5	95	2	1997 to 2013	2015 to 2018	Percentile	2.1	3.0	**3.1**	2.7	2.3
Dissolved organic carbon	mg/L	0.5	84	0	1997 to 2013	2015 to 2018	Percentile	2.1	2.8	**3.1**	2.7	2.3
Total Metals												
Aluminum	µg/L	0.3	68	1	-	2015 to 2018	PI(λ)	1.8	4.5	**10**	3.1	2.6
Antimony	µg/L	0.02	67	0	-	2015 to 2018	-	0[f]	0.02[f]	0.01	0.01	0.01
Arsenic	µg/L	0.02	69	0	-	2015 to 2018	PI(λ)	0.17	0.24	**0.38**	**0.25**	0.21
Barium	µg/L	0.05	69	0	-	2015 to 2018	PI	7.3	7.9	**8.3**	**8.2**	7.7
Beryllium	µg/L	0.01	69	0	-	2015 to 2018	-	0[f]	0.01[f]	0.005	0.005	0.005
Bismuth	µg/L	0.01	69	0	-	2015 to 2018	-	0[f]	0.01[f]	0.005	0.005	0.005
Boron	µg/L	1	69	0	-	2015 to 2018	Percentile	2.5	7.1	5.0	4.1	3.9
Cadmium	µg/L	0.005	68	1	-	2015 to 2018	Percentile	0[d]	0.005[e]	0.003	0.0025	0.0025
Chromium	µg/L	0.06	68	1	-	2015 to 2018	Percentile	0[d]	0.06[e]	0.03	0.03	0.03

Table 6.4-6: Normal Ranges for Selected Water Quality Parameters during Open-water Conditions in Meliadine Lake and Comparisons of 2018 Results to Normal Ranges

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Baseline Years	AEMP Reference Years	Calculation Method	Normal Ranges		2018 Mean/Median[a]		
								Lower Bound	Upper Bound	Near-field	Mid-field	Reference Area[b]
Total Metals (cont'd)												
Cobalt	µg/L	0.01	68	1	-	2015 to 2018	Percentile	0[d]	0.02	**0.03**	0.02	0.01
Copper	µg/L	0.1	69	0	-	2015 to 2018	PI(λ)	0.65	0.83	0.78	0.71	0.68
Iron	µg/L	1	68	1	-	2015 to 2018	Percentile	6.7	14.7	**24**	**18**	11
Lead	µg/L	0.01	68	1	-	2015 to 2018	Percentile	0[d]	0.02	0.01	0.005	0.005
Lithium	µg/L	0.5	69	0	-	2015 to 2018	Percentile	0[d]	0.71	**1.5**	0.64	0.58
Manganese	µg/L	0.05	68	0	-	2015 to 2018	Percentile	2.1	3.3	**5.9**	**4.3**	2.7
Mercury	µg/L	0.0005	69	0	-	2015 to 2018	Percentile	0[d]	0.0008	**0.0009**	**0.0012**	0.0005
Molybdenum	µg/L	0.05	69	0	-	2015 to 2018	Percentile	0.05	0.083	0.080	0.078	0.078
Nickel	µg/L	0.06	67	2	-	2015 to 2018	Percentile	0.33	0.43	**0.66**	**0.61**	0.38
Selenium	µg/L	0.02	69	0	-	2015 to 2018	Percentile	0.02	0.04	0.02	0.02	0.02
Silver	µg/L	0.005	69	0	-	2015 to 2018	-	0[f]	0.005[f]	0.0025	0.0025	0.0025
Strontium	µg/L	0.05	69	0	-	2015 to 2018	PI	30	33	**51**	**38**	32
Thallium	µg/L	0.005	69	0	-	2015 to 2018	Percentile	0[d]	0.005[e]	0.0025	0.0025	0.0025
Tin	µg/L	0.05	68	1	-	2015 to 2018	Percentile	0[d]	0.05[e]	0.025	0.025	0.025
Titanium	µg/L	0.1	69	0	-	2015 to 2018	Percentile	0[d]	0.25	0.19	0.05	0.05
Uranium	µg/L	0.01	68	1	-	2015 to 2018	PI(λ)	0.01	0.02	0.02	0.02	0.01
Vanadium	µg/L	0.05	69	0	-	2015 to 2018	-	0[f]	0.05[f]	0.025	0.025	0.025
Zinc	µg/L	0.8	68	1	-	2015 to 2018	Percentile	0[d]	2.3	0.4	0.4	0.4
Dissolved Metals												
Zinc	µg/L	0.8	68	1	-	2015 to 2018	Percentile	0[d]	2.0	0.4	1.3	0.4
Other												
Total cyanide	mg/L	0.001	67	2	-	2015 to 2018	Percentile	0[f]	0.001[f]	0.0005	0.0005	0.0005

(a) Lake area means were calculated using the back-transformed mean when the normal range was defined as the prediction interval using Box-Cox transformed data. The arithmetic mean was used when the normal range was defined using untransformed data. The median was used when the calculation method was Percentile. When normal range could not be calculated because the dataset contained too many values below DL, the median was used.

(b) Reference area data were pooled from Reference Areas 1, 2, and 3.

(c) Detection limit for laboratory pH is provided.

(d) The lower bound of the normal range was less than the detection limit; therefore, the lower bound of the normal range was set to zero.

(e) The upper bound of the normal range was less than the detection limit; therefore, the upper bound of the normal range was set to the detection limit.

(f) All values in the dataset were non-detect; therefore, the normal range was set from zero to the detection limit.

Bolded concentrations exceed the upper bound of the normal range.

Percentile = 2.5th and 97.5th percentiles; PI= 80% prediction intervals; PI(λ) = 80% prediction interval on Box-Cox transformed data.

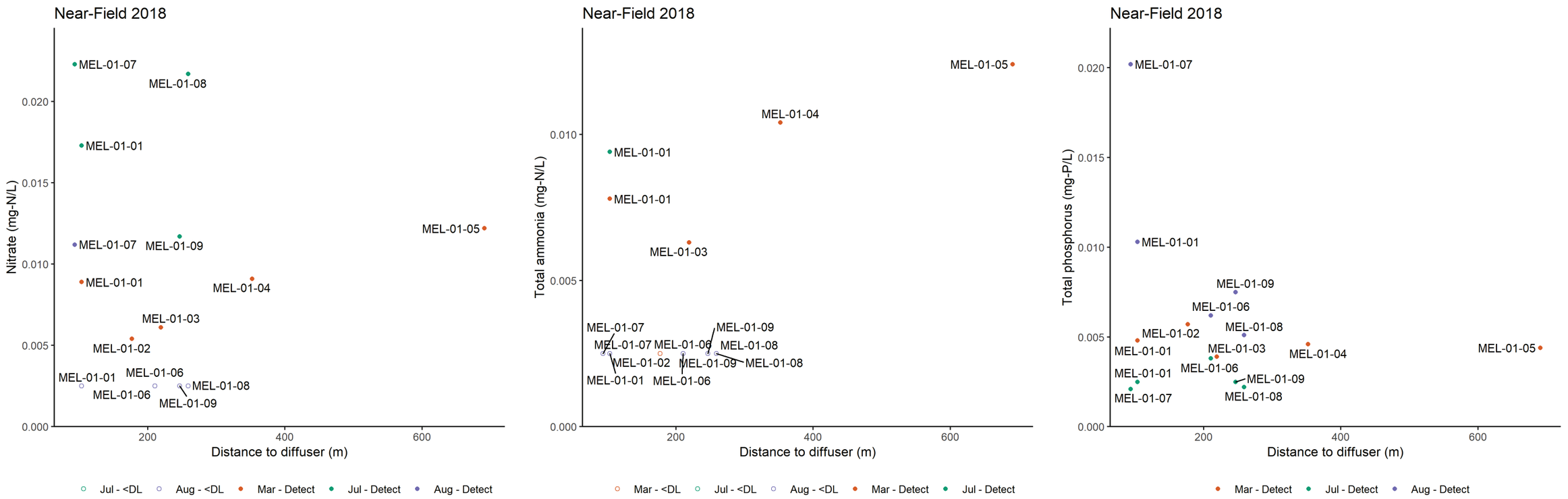
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg‑N/L = milligrams nitrogen per litre; mg‑P/L = milligrams phosphorus per litre; µg/L = micrograms per litre; - = baseline data were unavailable and/or normal range could not be calculated because all values in the dataset were below detection.

6.4.4 Spatial Patterns in the Near-field Area

Visual assessment was used to evaluate spatial trends in water quality in the Near-field area in relation to the CP1 diffuser in Meliadine Lake. Positive and negative spatial patterns were detected for a few water quality parameters during ice-covered and open-water conditions in the Near-field area.

Variability among stations in the Near-field area was low overall (i.e., less than two-fold differences in concentrations) for conventional parameters (e.g., specific conductivity, TDS, hardness) and major ions during ice-covered and open-water conditions. Spatial patterns within the Near-field area were observed for nitrate and total ammonia during ice-covered conditions (selected parameters are shown in Figure 6.4-5). Concentrations of these parameters were lower at stations in closer proximity to the diffuser (i.e., MEL-01-02 and 01-03), relative to stations located farther away (i.e., MEL-01-04 and 01-05), with the exception of nitrate at station MEL-01-01; at this station, concentrations of nitrate were similar to MEL-01-04 and 01-05. In general, concentrations of nitrate and total ammonia were higher at MEL-01-05, which is located the farthest west of the Near-field stations. Sampling at this station was discontinued in July 2018. Total and dissolved lead concentrations were variable (i.e., by more than two-times) among Near-field stations but a spatial pattern was not observed with distance from the diffuser.

During open-water conditions, the only within Near-field spatial pattern observed was for total phosphorus (Figure 6.4-5). A weak negative spatial pattern was observed for total phosphorus with concentrations decreasing with distance from the diffuser for the August samples only; a within Near-field area spatial pattern was not observed in July. Nitrate, total aluminum, lead, and dissolved aluminum concentrations were variable (i.e., by more than two-times) among Near-field stations but a spatial pattern was not observed with distance from the diffuser.



MEL-01 = Meliadine Near-field Station; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; OW = open-water; UI = under-ice.

Figure 6.4-5: Scatter Plots for Selected Parameters with Spatial Patterns Observed in the Near-field Area, 2018

6.4.5 Investigation of Temporal Trends

Water quality data within Meliadine Lake were qualitatively examined for temporal patterns on temporal box plots presented in Appendix 6G. If observed, trends were further evaluated in temporal box-and-whisker plots presented in Appendix 6G.

Ice-cover Season

Temporal patterns were observed for most conventional parameters, nutrients, major ions and total metals in the Near-field area during ice-covered conditions. Temporal trends were not observed for field and laboratory pH, turbidity, fluoride, sulphate, nitrite, nitrate, total ammonia, total aluminum, antimony, boron, cobalt, manganese, molybdenum, nickel, and lead.

Temporal patterns detected during ice-covered conditions in the Near-field were as follows:

- Gradual increases in each consecutive year were observed in the Near-field area for specific conductivity, hardness, TDS, turbidity, TOC, DOC, calcium, chloride, magnesium, potassium, reactive silica, sulphate, total arsenic, mercury, molybdenum, nickel, selenium, and strontium. Similar trends were observed in the Mid-field area, except that concentrations were generally lower relative to the Near-field area (especially in 2018).
- Step-trend increases were observed in 2018 in the Near-field area for total alkalinity, bicarbonate, sodium, barium, and copper. Similar trends were observed in the Mid-field, with the exception of total copper.
- Step-trend increases in 2017 persisting to 2018 was observed for TP and total uranium.
- TKN, total iron and lithium decreased in 2018, relative to 2016 and 2017. Similar temporal trends were observed in the Mid-field area. Total manganese decreased in 2017 (Near-field) or 2018 (Near-field and Mid-field) relative to 2016.

Of note, despite temporal trends for several parameters in the Near-field area under-ice between 2016 and 2018, all concentrations were well below applicable water quality guidelines in 2018 (Section 6.4.2.1.2), and therefore, below concentrations anticipated to result in adverse effects on aquatic life.

Open-water Season

Temporal patterns were observed for conventional parameters, nutrients, major ions and total metals in the Near-field during open-water conditions. Temporal trends were not observed for field and laboratory pH, turbidity, total phosphorus, dissolved phosphorus, nitrate, nitrite, total ammonia, fluoride, sulphate, total antimony, boron, cobalt, iron, lead, manganese, selenium, and uranium.

Temporal patterns detected during open-water conditions were as follows:

- Gradual increases in the Near-field area each consecutive year were observed for specific conductivity, hardness, total alkalinity, TDS, calcium, chloride, magnesium, potassium, sodium, total barium, and strontium in the Near-field. Similar temporal trends were observed in the Mid-field area. In the pooled reference area, similar temporal trends were observed for conductivity and total alkalinity.
- Step-trend increases in 2018 were observed in the Near-field area for total aluminum and lithium. Similar temporal trends were not observed in the Mid-field and reference areas.

- Step-trend increases in 2017 persisting to 2018 were observed for bicarbonate, TOC and DOC in the Near-field. Similar trends were observed in the Mid-field area for all three parameters, and in the reference areas for bicarbonate and TKN.
- Increasing temporal trends up to 2017 were observed for reactive silica, total arsenic, copper, mercury, molybdenum, and nickel. Similar temporal trends were observed in both the Mid-field and reference areas for these metals, and in the Mid-field area for reactive silica.

Increasing concentrations of TDS, hardness, DOC, TOC, TP and major ions may be related to ongoing construction activities on-site, sewage effluent, and/or mine effluent discharge. Increases in total aluminum and lithium in 2018 in the Near-field area only (i.e., no observable temporal trend in the Mid-field or reference areas) suggest that these metals may have increased as result of mine effluent discharge from the CP1 diffuser; concentrations of both metals are still relatively low in the Near-field area (i.e., median concentrations during open-water in 2018 were 8.3 and 1.5 µg/L for total aluminum and lithium, respectively). However, there is uncertainty associated with identifying a source of water quality temporal trends in the Near-field area due to the limited dataset. Temporal trends will continue to be monitored in future AEMP programs to identify potential Mine-related effects on water quality in Meliadine Lake.

Despite temporal trends observed for several parameters in the Near-field area during open-water conditions between 2015 and 2018, all concentrations were well below applicable water quality guidelines in 2018 (Section 6.4.2.1.2) and therefore, are below levels expected to result in adverse effects on aquatic life.

6.4.6 Comparisons to FEIS predictions

As per FEIS predictions, water quality guidelines for the protection of aquatic and human health (CCME 1999; Health Canada 2017) were expected to be met at the edge of the mixing zone (i.e., in the Near-field area) and no residual impacts from the effluent discharge were anticipated in Meliadine Lake outside of the mixing zone (i.e., same as baseline conditions; and below WQGs). Minor changes in water quality in Meliadine Lake were predicted at the edge of the mixing zone. A minor change is a measurable increase in a water quality parameter that is outside the range of baseline values but is still within water quality guidelines.

In the mixing zone, FEIS predictions indicated that DO could fall below the CWQG-PAL (i.e., 6.5 mg/L) in late summer during the operations phase. In 2018, concentrations of DO in Meliadine Lake in all areas were above the CCME CWQG-PAL during ice-covered and open-water conditions.

Median concentrations in the Near-field area during open-water conditions were compared to maximum allowable effluent concentrations predicted at the edge of the mixing zone (Appendix 7.4A in Agnico Eagle 2014; Table 6.4-7). The 2018 water quality in Near-field area was within FEIS predictions, with the following exception: chloride concentrations during open-water (13 mg/L) and ice-covered (15 mg/L) conditions were just below and above (respectively) the FEIS prediction of 14 mg/L at the edge of the mixing zone. Fluoride and sodium concentrations were just above FEIS predictions, but major ion concentrations were below their respective WQGs (Section 6.4.2.1.2). Median TDS concentrations under-ice were at the FEIS prediction of 68 mg/L, whereas during open-water conditions TDS concentrations were just below the FEIS prediction at 53 mg/L. All other parameter concentrations fell below FEIS predictions at the edge of the mixing zone.

The preliminary maximum allowable effluent concentrations in the mixing zone represent a snap-shot of predicted effects during mine effluent discharge. FEIS predictions were modelled for TDS, chloride, and sodium and assumed that accumulation would occur in the east basin of Meliadine Lake (based on the characteristics of the basin). It was predicted that concentrations of these parameters would gradually increase during the construction

and operation phases of the Mine and that maximum concentrations would be achieved in the final year of operations (i.e., 176, 66, and 19 mg/L for TDS, chloride, and sodium, respectively). Concentrations of major ions in the Near-field area have increased over time (Section 6.4.5), but median open-water concentrations (i.e., 53, 13, and 5.7 mg/L for TDS, chloride, and sodium, respectively) are still well below predicted maximum concentrations in the final year of operations.

Concentrations of several parameters have increased over time in the Near-field area during ice-covered and open-water conditions (Section 6.4.2.1.2; Section 6.4.5), and were outside the normal range in recent years (Section 6.4.3):

- Field specific conductivity, hardness, turbidity, TDS, and major ions have gradually increased in the Near-field area over time, and compared to the Mid-field and reference areas. In 2018, these parameters (with the exception of turbidity and selected major ions) were outside their respective normal ranges for Meliadine Lake in the Near-field and Mid-field areas.
- TOC and DOC have increased in the Near-field area relative to the Mid-field and reference areas, and TOC concentrations have increased in 2018 relative to previous AEMP monitoring years. In 2018, TOC and DOC were outside of their respective normal ranges for Meliadine Lake in the Near-field area but not in the Mid-field area.
- Increasing temporal trends up to 2017 were observed for total copper, mercury, molybdenum, nickel, and uranium. Similar temporal trends were observed in both the Mid-field and reference areas for these metals. These metals were outside their respective normal ranges in the Near-field and Mid-field in 2018 for mercury and nickel.
- Increasing temporal trends up to and including 2018 were detected for total aluminum, barium, lithium, and strontium. Total barium and strontium have increased in each consecutive year. During open-water conditions, total aluminum and lithium increased in the Near-field area relative to the Mid-field and reference areas, and relative to previous AEMP monitoring years. In 2018, these parameters were outside their respective normal ranges in the Near-field area for all parameters, and in the Mid-field area for barium and strontium.

Increases in specific conductivity and concentrations of major ions, organics and selected total metals in the Near-field area over time, combined with spatial patterns observed in 2018, suggest a Mine-related effect on water quality. Concentrations of TDS, and major ions in Meliadine Lake were projected to increase during all phases of Mine operation. Lake-wide mean/median concentrations for all water quality parameters in Meliadine Lake during ice-covered and open-water conditions were within expectations and remained below WQGs.

Table 6.4-7: Water Quality in the Near-field Area in Meliadine Lake in 2018 Compared to FEIS Predictions for the Edge of the Mixing Zone

Parameter	Unit	FEIS Predictions at Edge of Mixing Zone	2018 Median Values	
			Ice-Cover	Open-water
Conventional Parameters				
Total dissolved solids	mg/L	68	68	53
Total suspended solids	mg/L	31	<1.0	<1.0
Major Ions				
Chloride	mg/L	14	**15**	13
Fluoride	mg/L	0.0084	**0.029**	**0.023**
Sodium	mg/L	5.3	**7.8**	**5.7**
Sulphate	mg/L	38	5.8	4.3
Nutrients				
Nitrate	mg-N/L	0	0.0089	0.011
Nitrite	mg-N/L	0.051	<0.001	<0.001
Total ammonia	mg-N/L	0.540	0.0078	<0.005
Total phosphorus	mg-P/L	0.0049	0.0046	0.0045
Total Metals				
Aluminum	µg/L	9.1	0.50	8.3
Antimony	µg/L	0.51	<0.02	<0.02
Arsenic	µg/L	3.8	0.53	0.38
Barium	µg/L	77	12	8.2
Boron	µg/L	23	5.4	5.0
Cadmium	µg/L	0.05	<0.005	<0.005
Chromium	µg/L	1.1	<0.06	<0.06
Copper	µg/L	2	1.1	0.79
Iron	µg/L	42	5.7	24
Lead	µg/L	0.15	0.057	0.010
Manganese	µg/L	5.5	2.0	**5.9**
Mercury	µg/L	0.02	0.0010	0.00090
Molybdenum	µg/L	5.2	0.099	0.080
Nickel	µg/L	2.7	0.79	0.66
Selenium	µg/L	0.16	0.057	<0.04
Silver	µg/L	0.1	<0.005	<0.005
Thallium	µg/L	0.1	<0.005	<0.005
Tin	µg/L	1.5	<0.05	<0.05
Uranium	µg/L	1.1	0.018	0.017
Zinc	µg/L	6.7	<0.8	<0.8
Other				
Cyanide	mg/L	9	<0.001	<0.001

Note: FEIS predictions are sourced from Agnico Eagle 2014.

6.5 Summary

6.5.1 EEM

The results of the EEM water quality monitoring program are summarized below:

- In 2018, surface water quality monitoring for the Meliadine Mine was performed on two occasions as part of the EEM program: 19 to 25 July, and 15 August to 2 September.
- Concentrations of water quality parameters in the exposure area (Near-field area) and reference area (Reference Area 1) were below the CWQG-PAL.
- Nitrate, nitrate and nitrite, total aluminum, arsenic, lithium, magnesium, and titanium, as well as dissolved aluminum, arsenic, cobalt and lithium were two times higher in the exposure area, relative to the reference area.

6.5.2 AEMP

This section summarizes the water quality results relative to guidelines, normal ranges and FEIS predictions in the context of the two key questions for the AEMP water quality component.

Are concentrations of key parameters in Meliadine Lake consistent with FEIS predictions and less than AEMP Action Levels?

In 2018, concentrations and values of water quality parameters in Meliadine Lake remained within their respective WQGs during ice-covered and open-water conditions. Concentrations and values of key water quality parameters in all areas of Meliadine Lake were measured within CWQG-PAL and CDWQG.

Water quality in the Near-field and Mid-field areas of Meliadine Lake in 2018 was outside of the normal range for specific conductivity, TDS, hardness, several major ions and selected total metals (Section 6.4.3). However, the water quality in the Near-field area was generally consistent with FEIS predictions (Section 6.4.6).

An assessment of water quality parameters and exceedances of Action Levels is provided in Section 12.2.2.

Are concentrations in the exposure area increasing over time relative to the reference areas?

Increasing concentrations over time in the Near-field area and relative to temporal variation in reference areas were identified for specific conductivity, hardness, TDS, major ions (in particular calcium, chloride, magnesium, potassium, sodium, and sulphate), TOC, DOC, total aluminum, barium, lithium, and strontium. Concentrations of these parameters also exceeded the upper bound of their respective normal ranges in the Near-field area. Concentrations declined with distance from the Near-field area, but exceeded the upper bound of their respective normal ranges in the Mid-field area for all parameters except calcium, TOC, DOC, aluminum, and lithium. All parameters were within their respective normal ranges in the reference areas.

The analysis of the 2018 water quality results focused on comparing 2018 and 2017 construction phase data to pre-construction phase data in the Near-field area, and comparing water quality between the Near-field, Mid-field and reference areas in 2018. The observed changes in water quality suggest a Mine-related effect on water quality in the Near-field and Mid-field areas. The effect is within the range of conditions predicted by FEIS. However, given the limited dataset, there is uncertainty associated with identifying a source for the spatial and temporal trends identified in this report. It is anticipated that the 2019 and 2020 monitoring will allow for more detailed analysis of trends and Mine-related effects.

6.6 Recommendations

There are no recommendations for the 2019 AEMP water quality monitoring program.

6.7 List of Appendices

- Appendix 6A Water Quality QA/QC, which includes detailed methods and findings from the QA/QC assessment for the 2018 AEMP water quality program;
- Appendix 6B Normal Range Data Screening, which includes detailed description of the data screening approach and results used for calculating the normal ranges for water quality in Meliadine Lake;
- Appendix 6C Field Water Profile Measurements, which includes field data tables and vertical field profile plots;
- Appendix 6D 2018 Water Chemistry Tables, which includes raw water chemistry data tables for the 2018 water quality monitoring program in Meliadine Lake;
- Appendix 6E Statistical Outliers, which includes a data tables of statistical outliers excluded from spatial and temporal statistical analysis in the 2018 AEMP water quality monitoring report for Meliadine Lake;
- Appendix 6F Time-series Plots, which includes time-series plots of AEMP data collected in the Near-field, Mid-field and reference areas between 2015 and 2018 during open-water and ice-covered conditions;
- Appendix 6G Temporal Box-and-Whisker Plots by Area, which includes box-and-whisker plots for select parameters in the Near-field, Mid-field and reference areas between 2015 and 2018 during open-water and ice-covered conditions; and,
- Appendix 6H Historical Summary Statistics for the Near-field, which includes summary statistic tables for Near-field data collected in Meliadine Lake between 2015 and 2017.

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7.0 WATER QUALITY – PENINSULA LAKES

In support of the AEMP and Water Licence (2AM-MEL1631) requirements of the Mine, water quality monitoring was completed between 2015 to 2018 in Peninsula Lakes.

This report section provides a summary of the water quality monitoring programs completed in 2018 at Peninsula Lakes, and an interpretation of the results as per the requirements of the AEMP. Data analyses presented in this report were based on the AEMP Design Plan (Golder 2016a), and response to comments from ECCC, INAC, and KIA during review of the 2017 AEMP Annual Report (Golder 2018a).

7.1 Objectives

The specific objective of AEMP monitoring activities at Peninsula Lakes was to detect potential indirect effects of the Mine on the lakes (i.e., aerial deposition and physical alteration of watersheds). The primary objectives of the water quality component of the Peninsula Lake study, as defined in the AEMP Design Plan (Golder 2016a) were to:

- characterize and interpret water quality in the selected monitoring lakes for purposes of identifying Mine-related effects;
- verify and update the FEIS predictions;
- assess efficacy of impact mitigation strategies to minimize the water quality effects of the Mine; and,
- provide data to inform management intended to reduce or eliminate Mine-related effects to water quality in the Peninsula Lakes.

To meet the primary objectives of the water quality component, analysis and interpretation of water quality data in 2018 were focused on answering two key questions, as defined in the AEMP Design Plan (Golder 2016a):

1) Are concentrations of key parameters in the Peninsula Lakes consistent with FEIS predictions and less than AEMP benchmarks[2]?

2) Are concentrations in the Peninsula Lakes increasing over time relative to baseline or reference conditions?

For the field survey and data analysis methods used to answer the key questions are described in Section 7.2. A summary of QA/QC assessment on the 2018 data are provided in Section 7.3. Results and discussion are presented in Section 7.4. and a summary of the water quality results and conclusions is provided in Section 7.5.

[2] This key question has been revised to refer to AEMP benchmarks instead of Action Levels.

7.2 Methods

7.2.1 Sampling Design

The 2018 Peninsula Lakes program consisted of two sampling programs during open-water conditions (Table 6.2-1). As a result of a number of site-related factors of field-related occurrences, a few adjustments were made to each program. These included the following:

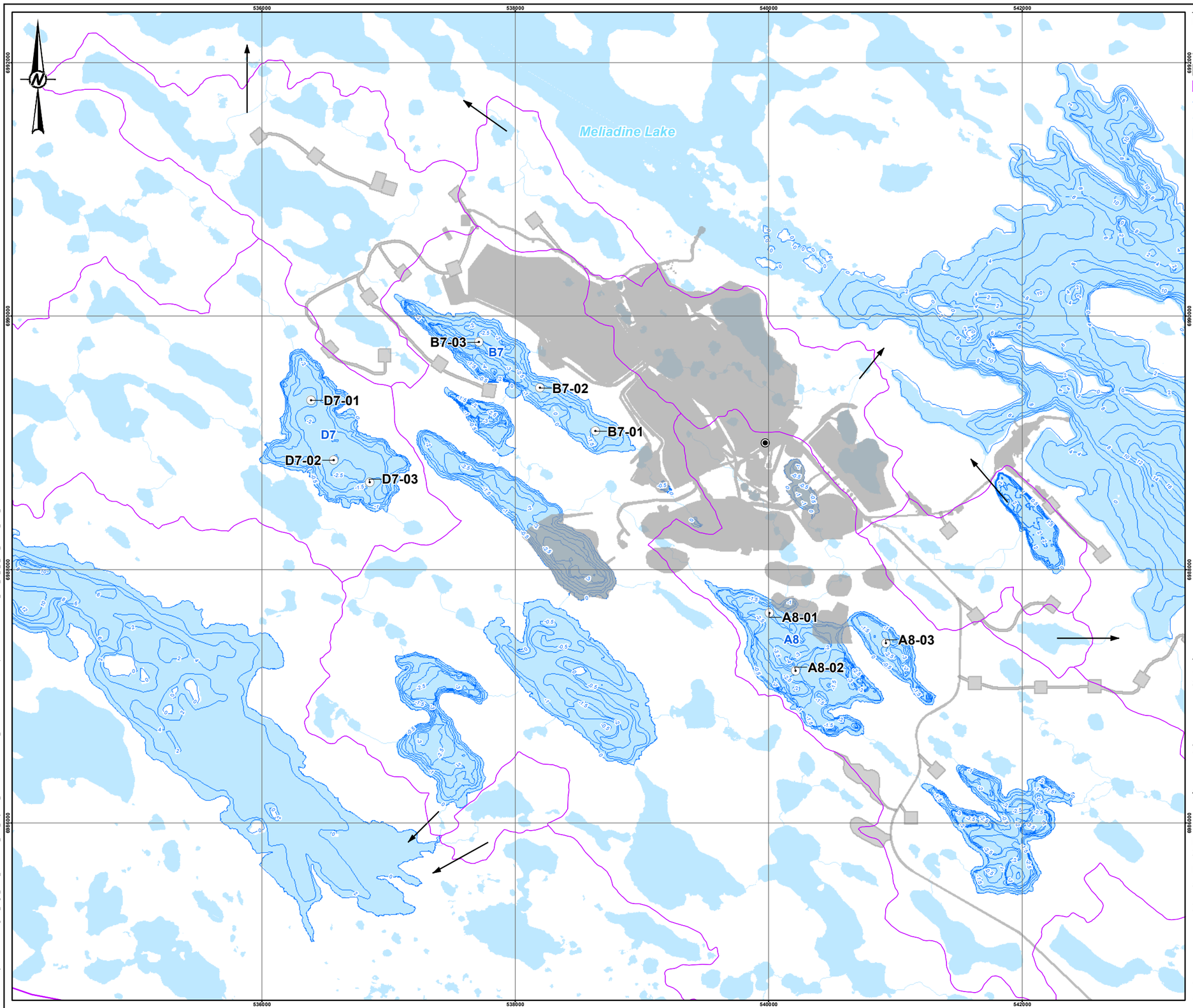
- Field pH measurements collected at stations B-07-01 and B-07-02 during the July program and A8-01, A8-02, A8-03, B7-01, B7-02, and B7-03 during the August program were deemed unreliable during the data quality review (i.e., data were anomalous, being well outside the range of previously measured data; Appendix 6A), and were subsequently invalidated. These data were excluded from the assessments. For these invalidated field data, laboratory pH was used as a surrogate pH measurement to characterize open-water season water quality and in water quality guideline calculation at individual stations. However, as laboratory pH was measured outside the holding time requirement, it is acknowledged that these laboratory pH data have corresponding uncertainty.
- Stations D7-02 and D7-03 were not sampled as part of the July program because of weather delays (i.e., high wind).
- In 2018, water quality monitoring was scheduled for three times per calendar year, but the September water quality program was cancelled due to unsafe boating conditions (i.e., high winds) that prevented safe access to the open-water stations.

QA/QC procedures described in Section 7.3 and Appendix 6A were followed during the 2018 water quality monitoring program.

7.2.2 Field Methods

7.2.2.1 Sample Location and Sampling Frequency

As per the AEMP Design Plan, three stations in each of Lakes A8, B7, and D7, with a target water depth of 1.5 to 2.5 m, were sampled as part of the Peninsula Lakes study (Figure 7.2-1). The three lakes were sampled twice during the open-water season in July and August. The location and timing of sample collection in 2018 are summarized in Table 7.2-1.



LEGEND

- WATER QUALITY STATION
- DIRECTION OF FLOW AT WATERSHED OUTLET
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- BATHYMETRIC CONTOUR (0.5 AND 2 m INTERVAL)
- WATERCOURSE
- WATERBODY



0 600 1,200

1:30,000 METRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE

PENINSULA LAKES WATER QUALTY STATIONS SAMPLED IN 2018

CONSULTANT

GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	JL
PREPARED	MH
REVIEWED	RS
APPROVED	RS

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Table 7.2-1: Water Quality Sampling Stations and Sampling Effort Summary for Peninsula Lakes in 2018

Peninsula Lake	Station ID	UTM Coordinates (NAD 83, Zone 15V)		Average Total Depth[a] (m)	Average Secchi Depth[b] (m)	22 to 24 Jul	17 Aug to 1 Sept
		Easting	Northing			Late Spring[c]	Summer[c]
Lake A8	A8-01	540007	6987659	2.3	-	✓	✓
	A8-02	540211	6987204	2.2	-	✓	✓
	A8-03	540925	6987421	1.7	-	✓	✓
Lake B7	B7-01	538631	6989096	1.0	-	✓	✓
	B7-02	538195	6989436	1.7	-	✓	✓
	B7-03	537713	6989798	1.7	-	✓	✓
Lake D7	D7-01	536390	6989340	1.7	-	✓	✓
	D7-02	536567	6988868	1.7	-	-[d]	Yes
	D7-03	536852	6988689	1.8	-	-[d]	Yes

Samples were analyzed for the required parameters listed in Table 6.2-2, except where noted otherwise.

✓ = Sample collected.

(a) The total depths recorded during each sampling program were averaged for individual stations, when stations were sampled on more than one occasion.

(b) The average Secchi depth (a measure of the clarity of surface waters) was not calculated because the secchi was visible to the lake bed at all stations.

(c) Blank samples (i.e., travel and equipment) were collected.

(d) Samples were not collected at these locations during the July program due to weather delays (i.e., high wind).

ID = identifier; UTM = Universal Transverse Mercator; NAD = North American Datum.

7.2.2.2 Collection of Supporting Field Measurements

At each sampling station, water depth and physicochemical measurements were collected. Total depth of the water column was measured either by using a sounding line or a boat-mounted sonar unit. Prior to collecting surface water samples, field measurements of the following four parameters were recorded using a Eureka Manta II multiprobe:

- water temperature (degrees Celsius [°C])
- pH
- DO (in mg/L and percent [%])
- specific conductivity (in microSiemens per centimetre [µS/cm])

In situ physicochemical measurements were taken at 0.5 m below the surface, and every 0.5 m thereafter throughout the water column, ending at approximately 0.5 m above the lake bed. Secchi depth was measured using a Secchi disk at each station.

7.2.2.3 Water Sample Collection

Surface water samples were collected as grab samples in accordance with Golder's technical procedures, the Standard Operating Procedures for Water Quality Sampling prepared by Golder, and specific laboratory instructions. Discrete water samples were collected at each sampling station from a depth of approximately 1 m using a Kemmerer sampler. Water for filling ultra-low metals and ultra-low mercury sample bottles were collected with a Teflon Kemmerer sampler, whereas the remaining bottles were filled with water from the Polyvinyl Chloride (PVC) Kemmerer sampler. At each station, the Kemmerer was triple-rinsed with surface water representative of the station, and then lowered to the required depth, triggered by the messenger to collect a sample, returned to the surface, and used to fill the lab-supplied sample bottles. This procedure was repeated until all sample bottles for the station were filled.

7.2.2.4 Laboratory Analysis

Water quality samples collected during the 2018 Peninsula Lake study were analyzed by ALS (Edmonton and Winnipeg locations). ALS is an analytical laboratory accredited by the CALA. Specific ALS analytical methods and RDL for the required analyses are provided in Appendix 6A.

Water sample bottles were provided by ALS (Section 7.2.2.3). Water samples were processed (i.e., filtered and/or preserved as required, and refrigerated) at site according to the instructions provided by the laboratory. Water samples requiring filtration were filtered through a 0.45 micrometre (µm) Millipore filter in a Nalgene filter tower using a vacuum pump before being preserved with laboratory-provided preservative based on the required analysis. Water samples were kept refrigerated before shipping; ice packs were added to the coolers to keep the samples as cool as possible during transport. Samples were shipped to ALS as soon as possible after sample collection and processing.

Water quality samples were analyzed for the following suite of parameters:

- routine parameters: pH, specific conductivity, hardness, total alkalinity, total dissolved solids [TDS], total suspended solids [TSS], and turbidity
- major ions: bicarbonate, carbonate, chloride, fluoride, sulphate, calcium, magnesium, potassium, sodium, and silica
- nutrients: nitrate, nitrite, total ammonia, total Kjeldahl nitrogen [TKN], total nitrogen [TN], total phosphorus [TP], total dissolved phosphorus [TDP], orthophosphate, total organic carbon [TOC], and dissolved organic carbon [DOC]
- total and dissolved metals, metalloids, and non-metals[3]: aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc
- cyanide (i.e., weak acid dissociable, total, and free)

[3] Metals, metalloids (e.g., arsenic), and non-metals (e.g., selenium) are referred to as "metals" in this document.

The samples were analyzed using laboratory test methods with analytical DLs below the CWQG-PAL for the protection of aquatic life (CCME 1999), and Health Canada Drinking Water Quality Guidelines (CDWQGs; Health Canada 2017). Specific ALS analytical methods and RDL for the required analyses are provided in Appendix 6A.

7.2.3 Data Analysis

Comparisons of key parameters to FEIS predictions, water quality guidelines and normal ranges are provided in this section. Descriptive statistics were calculated and presented for the 2018 dataset by lake. Descriptive statistics included the sample size, mean, median, minimum, maximum, and standard deviation. Field data (physicochemical) profiles were compared graphically within each lake (by showing results for each station) to qualitatively evaluate vertical patterns. Water temperature, DO concentration and percent saturation, pH, and specific conductivity, were plotted against measured depth.

7.2.3.1 Comparison to Water Quality Guidelines

The approach for comparison to WQGs is outlined in Section 6.2.4.1. Guidelines and objectives are summarized in Table 6.2-2; these guidelines, in addition to baseline data, form a starting point for the future monitoring benchmarks.

Water quality results for Peninsula Lake stations were compared to acute and chronic CWQG-PAL (CCME 1999), drinking water quality guidelines and aesthetic objectives (Health Canada 2017). Water quality results from Peninsula Lake stations were also compared to the SSWQO developed for the Mine (Golder 2013).

Water chemistry results were plotted as a time series plot for each parameter at each station, with visual representation of guidelines and SSWQOs to qualitatively evaluate water quality trends against guidelines and SSWQOs in 2018, relative to previous years.

7.2.3.2 Normal Ranges

Normal range concentrations were calculated for Peninsula Lakes using water quality data collected during baseline conditions between 2015 and 2017, and using historical data collected between 1995 and 2011. The calculation methods used to estimate normal ranges are described in Section 6.2.4.2 and Appendix 6B.

7.2.3.3 Comparison to FEIS Predictions

Comparison of near-field exposure data for 2018 were compared to applicable model predictions reported by the FEIS for Meliadine (Agnico Eagle 2014). The FEIS predictions for water quality included an evaluation of the water quality in Lakes A8, B7, and D7 to evaluate the potential for indirect effects in small waterbodies within the vicinity of the Mine. The results of the model predictions indicated that changes to water quality in the small waterbodies could result from diversion of water, changes in watershed size and contributing areas, natural hydrological processes, evaporation, and aerial deposition of particulate matter (modelled as TSS), nutrients from blasting activities at the Mine (modelled as nitrate), and metals (modelled by individual metal parameter). It was predicted that aerial deposition from mine activities will increase from background levels during pre-production, peak during pit development, and decrease to background levels by closure (Agnico Eagle 2014). Specific model predictions for the small waterbodies were as follows:

- Total suspended solids (TSS) was not predicted to increase to concentrations that would affect aquatic life (i.e., concentrations will be less than guidelines, or less than 10% different from baseline conditions) in any waterbody.

- Nitrate was not predicted to increase to concentrations that would affect aquatic life (i.e., concentrations will be less than guidelines, or less than 10% different from baseline conditions) in any waterbody.
- In Lake A8, metal concentrations were not predicted to be more than background or guidelines.
- In Lake D7, titanium was expected to be more than 10% higher than background concentrations.

Lake B7 was not included in the model predictions under FEIS (Agnico Eagle 2014). These predictions are examined in Section 7.4.4.

7.2.3.4 Identification of Temporal Trends

Time series plots of parameter concentrations were completed (Appendix 7C) for stations in Peninsula Lakes A8, B7 and D7 and qualitatively examined to identify increasing trends in 2018 relative to baseline conditions (i.e., 2015 to 2017).

7.3 Quality Assurance/Quality Control

The QA/QC practices applied during this study and detailed results of the QC analyses for discrete water quality samples collected at Peninsula Lakes are provided in Appendix 6A. QA components of the program included the use of trained personnel and an accredited analytical laboratory; QC components included assessments of duplicates and field, equipment, and travel blank samples. Dissolved and total parameter concentrations were also compared.

7.3.1 Summary of Results

Detailed results are provided in Appendix 6A. The results of the review of field and laboratory data indicated that field measurements and laboratory data were of high quality. Key findings from the 2018 QA/QC evaluation are as follows:

- In general, field measurements and results of laboratory samples collected during the 2018 sampling program were within the ranges that would be expected for the Peninsula Lakes water quality program, with the exception of two field pH measurements collected in July and all field pH measurements collected in August at Lakes A8 and B7. These field pH measurements were invalidated because the values were far outside of the range of historical variation at these stations.
- No issues were identified in analytical methods used or units reported by the laboratory.
- Holding times recommended by the laboratory were for exceeded some parameters. The holding time exceedances were not expected to affect data quality for the Peninsula Lakes water quality program.
- QC samples were collected in coordination with the Meliadine Lake water quality program. QC samples (i.e., blanks and duplicates) accounted for approximately 16% of the total number of water samples submitted for analysis.
- The water quality QC sample evaluation indicated that for the combined equipment and travel blanks, 1% of parameters were detected at concentrations more than five times the DL. No notable contamination occurred in the blank samples.

- Approximately 3% of paired concentrations in duplicate discrete water quality samples had a RPD of more than 20%. Within-station variability and field precision for the 2018 dataset were rated as low and high, respectively.

The overall quality of the water quality data was rated high. Therefore, the results reported in the report are considered reliable and meet the needs of the program.

7.4 Results and Discussion

7.4.1 Field Measured PhysicoChemical Parameters

The field profiles generally followed similar patterns among Peninsula Lakes. A summary of field profiles for Lakes A8, B7, and D7 are presented in Appendix 7A, Tables 7A.1-1 to 7A.1-6, and below:

- No thermal stratification was observed during the July and August programs in the Peninsula Lakes (Appendix 7A, Figures 7A.1-1 and 7A.1-2). Average surface water temperatures were higher in July than August in all lakes. Average temperatures in Lake A8, B7, and D7 in July and August were 15.7°C and 11.7°C, 17.1°C and 10.5°C, and 18.0°C and 9.7°C, respectively.
- DO was close to saturated in all lakes in July and August, and remained relatively constant through the water column (Appendix 7A, Figure 7A.1-3 and 7A.1-4). Surface DO was well above CWQG-PAL of 6.5 mg/L at all stations in the Near-field and Mid-field.
- Water column pH in Lake A8, B7, and D7 ranged between 8.3 to 8.6 in all lakes and was consistent with depth in July and August (Appendix 6C, Figure 6A.1-5 and 6A.1-6). Surface pH was within the acceptable CWQG-PAL range of 6.5 to 9.0 at all stations during the open-water season.
- Water column specific conductivity was constant with depth in all lakes in July and August (Appendix 7A, Figure 7A.1-7 and 7A.1-8). Water column specific conductivity was highest in Lake A8 ranging between 193 to 240 µS/cm compared to 134 to 159 µS/cm in Lake B7 and 117 to 141 µS/cm in Lake D7.

7.4.2 Water Chemistry

Water quality results from 2018 in the Peninsula Lakes are presented below and summarized in Table 7.4-1. Raw water quality data collected between 2015 and 2018 are provided in Appendix 7B, Table 6B-1 to 6B-6. Peninsula Lakes water quality can be characterized as having:

- low to moderate ionic strength (median laboratory specific conductivity in Lake A8, B7 and D7 was 225, 151, and 142 µS/cm, respectively);
- bicarbonate, chloride, and calcium as the major ions; chloride, fluoride, sodium, and sulphate concentrations fell below their applicable WQGs in Peninsula Lakes;
- basic pH (median field-measured pH across all lakes ranged from 7.6 to 7.8). Field and laboratory pH were within the acceptable range (i.e., 6.5 to 9.0) of the CWQG-PAL for all samples in Lakes A8, B7, and D7;
- low to moderately low hardness (hardness was low in Lakes B7 and D7 with median values of 57 and 48 mg/L as $CaCO_3$, respectively and moderately low in Lake A8 with a median value of 84 mg/L; this indicates soft water in Lake B7 and D7 and moderately soft water in Lake A8, according to the scale of water hardness by McNeely et al. [1979]);

- low to moderate TDS with median concentrations of 174, 101, and 77 mg/L in Lakes A8, B7, and D7, respectively. TDS concentrations fell below the aesthetic objective of 500 mg/L.
- low nutrient concentrations, with median TP and TN concentrations in Lakes A8, B7 and D7 of 0.0047 and 0.40 mg/L, 0.0069 and 0.37 mg/L, and 0.016 and 0.35 mg/L, respectively. The concentrations of TP and TN in the Peninsula Lakes were within the range of oligotrophic lakes classification, according to the scale of trophic status by Vollenweider (1968). Nitrate, nitrite, and total ammonia concentrations fell below their applicable WQGs in Peninsula Lakes; and
- low total and dissolved metal concentrations in all lakes, which were either below detection or below water quality guidelines.

Table 7.4-1: Water Quality Summary at Peninsula Lakes, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary																			
		CCME Aquatic Life		Health Canada Drinking Water Guidelines	Aesthetic Objectives	SSWQO	Lake A8							Lake B7							Lake D7						
		Acute	Chronic				Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Field Measured																										
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	8.5	8.6	8.5	8.6	0.036	0	3	8.5	8.5	-	-	-	0	1	8.3	8.3	8.3	8.4	0.026	0	4
Specific conductivity	µS/cm	-	-	-	-	-	218	219	193	240	19	0	6	147	146	134	158	12	0	6	140	135	118	141	11	0	4
Temperature	°C	-	-	-	15	-	14	14	12	16[(a)]	2.2	0	6	14	14	9.8	17[(a)]	3.7	0	6	9.7	12	9.5	18[(a)]	4.2	0	4
Dissolved oxygen	mg/L	-	6.5	-	-	-	11	11	11	11	0.048	0	6	11	11	11	11	0.046	0	6	12	11	10	12	0.63	0	4
Dissolved oxygen	%	-	-	-	-	-	104	104	99	109	4.9	0	6	104	104	95	112	8.4	0	6	104	105	103	111	3.0	0	4
Conventional Parameters																										
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.8	7.8	7.8	7.9	0.025	0	6	7.6	7.6	7.5	7.8	0.11	0	6	7.8	7.8	7.8	7.8	0.0050	0	4
Specific conductivity	µS/cm	-	-	-	-	-	225	225	204	239	13	0	6	151	150	140	160	8.6	0	6	142	136	117	142	12	0	4
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	84	84	80	86	2.2	0	6	57	57	55	58	1.4	0	6	48	47	44	50	2.6	0	4
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	43	43	40	49	3.3	0	6	32	33	29	43	5.2	0	6	50	48	44	51	3.3	0	4
Total dissolved solids	mg/L	-	-	-	500	-	174	175	163	189	10.0	0	6	101	104	99	113	6.4	0	6	77	77	71	84	5.9	0	4
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	110	110	102	117	5.4	0	6	73	75	71	82	4.3	0	6	73	70	62	73	5.3	0	4
Total suspended solids	mg/L	-	-	-	-	-	<1.0	-	<1.0	1.2	-	4	6	1.3	1.3	1.0	1.7	0.25	0	6	1.6	-	<1.0	1.8	-	2	4
Total organic carbon	mg/L	-	-	-	-	-	3.6	3.7	3.3	4.3	0.39	0	6	4.0	4.0	3.8	4.2	0.15	0	6	4.8	4.6	4.0	4.9	0.42	0	4
Dissolved organic carbon	mg/L	-	-	-	-	-	3.5	3.6	3.2	4.1	0.35	0	6	3.9	3.9	3.8	4.1	0.090	0	6	4.7	4.5	4.0	4.7	0.34	0	4
Turbidity	NTU	-	-	-	-	-	0.54	0.56	0.49	0.66	0.074	0	6	0.48	0.49	0.40	0.59	0.074	0	6	0.71	0.69	0.56	0.77	0.091	0	4
Major Ions																										
Bicarbonate	mg/L	-	-	-	-	-	53	53	48	59	4.1	0	6	39	40	36	53	6.4	0	6	61	59	53	62	4.0	0	4
Calcium	mg/L	-	-	-	-	-	28	28	26	29	0.74	0	6	19	19	19	20	0.45	0	6	15	15	14	15	0.70	0	4
Carbonate	mg/L	-	-	-	-	-	<0.6	-	<0.6	<0.6	-	6	6	<0.6	-	<0.6	<0.6	-	6	6	<0.6	-	<0.6	<0.6	-	4	4
Chloride	mg/L	640	120	-	250	-	39	39	33	43	3.6	0	6	24	24	23	25	0.66	0	6	11	10	9.0	11	0.80	0	4
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.028	0.028	0.025	0.032	0.0025	0	6	0.025	0.025	0.023	0.026	0.0014	0	6	0.045	0.044	0.039	0.047	0.0035	0	4
Magnesium	mg/L	-	-	-	-	-	3.7	3.6	3.4	3.7	0.12	0	6	2.1	2.0	2.0	2.1	0.058	0	6	2.7	2.7	2.4	2.8	0.21	0	4
Potassium	mg/L	-	-	-	-	-	1.7	1.7	1.5	1.8	0.080	0	6	1.3	1.3	1.2	1.4	0.056	0	6	1.3	1.3	1.1	1.3	0.10	0	4
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.72	0.76	0.70	0.94	0.093	0	6	0.58	0.57	0.46	0.68	0.086	0	6	0.21	0.21	0.20	0.22	0.0086	0	4
Sodium	mg/L	-	-	-	200	-	6.5	6.6	5.8	8.0	0.74	0	6	3.6	3.5	3.2	3.7	0.23	0	6	8.0	7.8	7.1	8.3	0.56	0	4
Sulphate	mg/L	-	-	-	500	-	5.5	5.5	4.4	6.3	0.72	0	6	4.9	4.9	4.5	5.2	0.22	0	6	5.1	4.7	3.2	5.2	0.99	0	4
Nutrients and Organics																										
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	4	4
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	4	4
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	-	<0.0051	<0.0051	-	6	6	<0.0051	-	<0.0051	<0.0051	-	6	6	<0.0051	-	<0.0051	<0.0051	-	4	4
Total ammonia	mg-N/L	-	0.16 to 1.8[(b)]	-	-	-	<0.005	-	<0.005	0.011	-	4	6	<0.005	-	<0.005	<0.005	-	6	6	0.0079	0.021	<0.005	0.067	0.030	1	4
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.40	0.40	0.34	0.48	0.047	0	6	0.37	0.38	0.30	0.50	0.074	0	6	0.35	0.34	0.24	0.42	0.075	0	4
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.40	0.40	0.34	0.48	0.047	0	6	0.37	0.38	0.30	0.50	0.074	0	6	0.35	0.34	0.24	0.42	0.075	0	4
Total phosphorus	mg-P/L	-	-	-	-	-	0.0047	0.0046	0.0017	0.0071	0.0024	0	6	0.0069	0.0060	0.0027	0.0079	0.0023	0	6	0.016	0.014	0.0074	0.019	0.0050	0	4
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0021	0.0020	<0.001	0.0038	0.0015	2	6	0.0024	0.0024	<0.001	0.0049	0.0020	2	6	0.0063	0.0063	0.0058	0.0069	0.00047	0	4
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	0.0011	-	5	6	<0.001	-	<0.001	<0.001	-	4	4

Table 7.4-1: Water Quality Summary at Peninsula Lakes, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary																			
		CCME Aquatic Life		Health Canada Drinking Water Guidelines	Aesthetic Objectives	SSWQO	Lake A8							Lake B7							Lake D7						
		Acute	Chronic				Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Total Metals																										
Aluminum	µg/L	-	100[c, d]	-	-	-	3.2	4.3	2.4	7.9	2.4	0	6	3.3	4.0	2.9	7.1	1.6	0	6	5.3	5.1	4.1	5.7	0.74	0	4
Antimony	µg/L	-	-	6.0	-	-	<0.02	-	<0.02	0.021	-	4	6	<0.02	-	<0.02	<0.02	-	6	6	<0.02	-	<0.02	<0.02	-	4	4
Arsenic	µg/L	-	5.0	10	-	25	2.5	2.5	2.2	2.9	0.26	0	6	1.6	1.6	1.4	1.8	0.17	0	6	0.93	1.0	0.90	1.4	0.22	0	4
Barium	µg/L	-	-	1,000	-	-	24	24	23	25	0.95	0	6	20	20	20	21	0.32	0	6	18	18	16	18	0.86	0	4
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	4	4
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	4	4
Boron	µg/L	29,000	1,500	5,000	-	-	2.9	2.9	2.5	3.1	0.24	0	6	10	10	10	11	0.27	0	6	12	12	11	13	0.94	0	4
Cadmium	µg/L	0.90 to 1.8[e]	0.08 to 0.14[e]	5.0	-	-	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	4	4
Chromium	µg/L	-	1.0	50[f]	-	-	<0.06	-	<0.06	0.15	-	5	6	<0.06	-	<0.06	0.066	-	4	6	<0.06	-	<0.06	0.33	-	3	4
Cobalt	µg/L	-	-	-	-	-	0.047	0.048	0.032	0.066	0.011	0	6	0.042	0.045	0.032	0.061	0.010	0	6	0.068	0.064	0.051	0.069	0.0086	0	4
Copper	µg/L	-	2.0 to 2.1[e]	-	1,000	-	0.67	0.70	0.57	0.84	0.11	0	6	0.71	0.73	0.64	0.85	0.087	0	6	0.93	0.93	0.86	0.99	0.062	0	4
Iron	µg/L	-	300	-	300	1,060	79	78	58	97	17	0	6	68	72	54	90	13	0	6	57	67	52	100	22	0	4
Lead	µg/L	-	2.4 to 2.6[e]	10	-	-	0.018	0.020	<0.01	0.043	0.013	1	6	0.024	0.024	0.018	0.032	0.0049	0	6	0.019	0.018	0.015	0.019	0.0020	0	4
ok.	µg/L	-	-	-	-	-	6.6	6.6	5.4	7.6	0.74	0	6	14	15	14	15	0.46	0	6	1.4	1.4	1.3	1.4	0.080	0	4
Manganese	µg/L	-	-	-	50	-	13	12	6.5	19	4.7	0	6	6.5	7.0	2.3	11	3.1	0	6	16	16	14	18	1.7	0	4
Mercury	µg/L	-	0.026	1.0	-	-	0.001	0.001	0.001	0.001	0.000	0	6	0.0010	0.0010	0.00090	0.0011	0.00007	0	6	0.0005	0.0007	0.0005	0.0013	0.0004	0	4
Molybdenum	µg/L	-	73	-	-	-	0.25	0.25	0.18	0.33	0.063	0	6	0.18	0.19	0.15	0.25	0.045	0	6	0.55	0.53	0.43	0.58	0.063	0	4
Nickel	µg/L	-	81 to 85[e]	-	-	-	0.82	0.84	0.69	1.1	0.14	0	6	0.94	0.94	0.87	1.00	0.055	0	6	0.83	0.82	0.73	0.88	0.069	0	4
Selenium	µg/L	-	1.0	50	-	-	<0.04	-	<0.04	<0.04	-	6	6	<0.04	-	<0.04	0.042	-	5	6	<0.04	-	<0.04	0.042	-	3	4
Silver	µg/L	-	0.25	-	-	-	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	4	4
Strontium	µg/L	-	-	-	-	-	212	212	173	246	25	0	6	220	226	206	251	19	0	6	76	74	68	76	4.1	0	4
Thallium	µg/L	-	0.80	-	-	-	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	4	4
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	6	6	<0.05	-	<0.05	<0.05	-	6	6	<0.05	-	<0.05	<0.05	-	4	4
Titanium	µg/L	-	-	-	-	-	0.10	-	<0.1	0.26	-	3	6	0.14	-	<0.1	0.29	-	3	6	0.26	0.23	0.12	0.30	0.081	0	4
Uranium	µg/L	33	15	20	-	-	0.037	0.038	0.030	0.048	0.0066	0	6	0.025	0.023	0.018	0.027	0.0036	0	6	0.070	0.065	0.048	0.074	0.012	0	4
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	0.067	-	5	6	0.074	0.070	<0.05	0.092	0.023	1	6	0.070	0.071	0.064	0.080	0.0073	0	4
Zinc	µg/L	-	-	-	5,000	-	<0.8	-	<0.8	<0.8	-	6	6	0.91	0.81	<0.8	1.3	0.34	2	6	<0.8	-	<0.8	<0.8	-	4	4
Dissolved Metals																											
Aluminum	µg/L	-	-	-	-	-	1.9	1.9	1.5	2.1	0.26	0	6	2.3	2.6	1.3	4.3	1.0	0	6	2.3	2.8	1.8	4.8	1.4	0	4
Antimony	µg/L	-	-	-	-	-	<0.02	-	<0.02	0.13	-	4	6	<0.02	-	<0.02	0.25	-	4	6	<0.02	-	<0.02	<0.02	-	4	4
Arsenic	µg/L	-	-	-	-	-	2.0	2.1	1.9	2.5	0.26	0	6	1.4	1.4	1.2	1.8	0.22	0	6	0.80	0.88	0.79	1.1	0.16	0	4
Barium	µg/L	-	-	-	-	-	24	24	23	24	0.32	0	6	19	19	19	20	0.47	0	6	17	18	16	21	2.0	0	4
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	4	4
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	4	4
Boron	µg/L	-	-	-	-	-	2.5	2.6	2.0	3.1	0.37	0	6	9.6	9.5	8.4	11	0.92	0	6	13	12	11	13	0.97	0	4
Cadmium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	4	4
Chromium	µg/L	-	-	-	-	-	<0.06	-	<0.06	0.16	-	4	6	<0.06	-	<0.06	0.085	-	4	6	<0.06	-	<0.06	<0.06	-	4	4

Table 7.4-1: Water Quality Summary at Peninsula Lakes, 2018

Parameter	Unit	Water Quality Guidelines and Objectives					Summary																			
		CCME Aquatic Life		Health Canada Drinking Water Guidelines	Aesthetic Objectives	SSWQO	Lake A8							Lake B7							Lake D7						
		Acute	Chronic				Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Dissolved Metals (cont'd)																										
Cobalt	µg/L	-	-	-	-	-	0.020	0.022	0.016	0.033	0.0063	0	6	0.020	0.026	0.014	0.061	0.017	0	6	0.023	0.023	0.021	0.024	0.0013	0	4
Copper	µg/L	-	-	-	-	-	0.59	0.65	0.56	0.84	0.11	0	6	0.64	0.67	0.57	0.82	0.085	0	6	0.78	0.78	0.78	0.79	0.0058	0	3
Iron	µg/L	-	-	-	-	-	35	35	26	51	9.1	0	6	40	45	26	89	23	0	6	24	28	20	45	12	0	4
Lead	µg/L	-	-	-	-	-	0.011	0.012	<0.01	0.017	0.0040	1	6	0.018	-	<0.01	0.022	-	3	6	0.013	-	<0.01	0.083	-	2	4
Lithium	µg/L	-	-	-	-	-	6.5	6.3	5.6	6.8	0.50	0	6	14	14	13	14	0.55	0	6	1.6	1.6	1.4	1.7	0.15	0	4
Manganese	µg/L	-	-	-	-	-	1.7	1.6	1.2	2.0	0.31	0	6	1.5	2.9	0.66	11	3.9	0	6	0.82	1.1	0.75	1.9	0.53	0	4
Mercury	µg/L	-	-	-	-	-	0.00095	0.00086	<0.0005	0.0013	0.00041	1	6	0.00095	0.00092	0.00050	0.0013	0.00035	0	6	0.00065	0.00083	0.00060	0.0014	0.00039	0	4
Molybdenum	µg/L	-	-	-	-	-	0.23	0.23	0.20	0.27	0.027	0	6	0.17	0.17	0.15	0.19	0.025	0	6	0.56	0.53	0.42	0.59	0.076	0	4
Nickel	µg/L	-	-	-	-	-	0.83	0.86	0.72	1.1	0.16	0	6	0.88	0.87	0.83	0.93	0.039	0	6	0.79	0.77	0.70	0.81	0.051	0	4
Selenium	µg/L	-	-	-	-	-	<0.04	-	<0.04	<0.04	-	6	6	<0.04	-	<0.04	0.046	-	5	6	<0.04	-	<0.04	0.046	-	3	4
Silver	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	4	4
Strontium	µg/L	-	-	-	-	-	198	193	171	209	16	0	6	209	209	203	218	5.1	0	6	73	72	65	77	6.3	0	4
Thallium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.008	-	6	6	0.0050	-	<0.005	0.0080	-	4	6	<0.005	-	<0.005	<0.005	-	4	4
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	6	6	<0.05	-	<0.05	<0.05	-	6	6	<0.05	-	<0.05	<0.05	-	4	4
Titanium	µg/L	-	-	-	-	-	<0.1	-	<0.1	<0.1	-	6	6	<0.1	-	<0.1	<0.1	-	6	6	<0.1	-	<0.1	<0.1	-	4	4
Uranium	µg/L	-	-	-	-	-	0.037	0.037	0.031	0.048	0.0058	0	6	0.023	0.022	0.019	0.024	0.0022	0	6	0.079	0.073	0.051	0.082	0.015	0	4
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	0.061	-	4	6	0.061	0.056	<0.05	0.085	0.027	2	6	0.061	0.054	<0.05	0.068	0.020	1	4
Zinc	µg/L	55 to 95[g]	10 to 20[h]	-	-	-	0.90	0.89	<0.8	1.5	0.44	2	6	0.96	1.2	<0.8	3.6	1.2	2	6	0.84	-	<0.8	2.4	-	2	4
Other																											
Total Cyanide	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	4	4
Free Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	4	4
Cyanide WAD	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	4	4

(a) Temperature for some samples fell above the aesthetic objective of 15°C but were not flagged in this table.

(b) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.16 mg-N/L) is based on the combination of field pH (8.6) and water temperature (15.6°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.8 to 8.9). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(d) Guideline is pH dependent: 5 µg/L at pH <6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(e) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (43.6 to 86.2 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(f) Guideline is for chromium VI.

(g) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (43.6 to 86.2 mg/L as $CaCO_3$) and DOC (3.2 to 4.7 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(h) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.8 to 8.9), hardness (43.6 to 86.2 mg/L as $CaCO_3$) and DOC (3.2 to 4.7 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L). When field pH was not available laboratory pH was used.

Note:

In cases where 50% or more of data were <DL, no mean or standard deviation was calculated.

Half of the detection limit value was used for total Kjeldahl nitrogen to calculate total nitrogen concentrations.

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; SD = standard deviation; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; WAD = Weak Acid Dissociable; - = no guideline or data not measured.

7.4.3 Comparison to Normal Range

The 2018 Lake A8 mean/median concentrations of total aluminum, arsenic, iron, and molybdenum were higher than upper bound concentrations of their respective normal ranges (Tables 7.4-2). The 2018 Lake B7 mean/median concentrations were higher than upper bound concentrations of their normal ranges for total boron, lithium, and strontium (Table 7.4-3). The 2018 Lake D7 mean/median concentrations of total ammonia, total barium, cobalt, manganese, molybdenum, nickel, and dissolved zinc were higher than upper bound concentrations of their normal ranges (Table 7.4-4).

Table 7.4-2: Normal Ranges (1997 to 2009; 2015 to 2017) for Selected Parameters, Lake A8

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Calculation Method	Normal Ranges		2018 Mean/Median[a]
						Lower Bound	Upper Bound	
Conventional Parameters								
pH (field)	unitless	0.1[b]	21	1	PI	7.7	8.3	8.2[c]
Specific conductivity	µS/cm	1	20	0	Percentile	100	334	218
Hardness (as $CaCO_3$)	mg/L	0.2	20	0	Percentile	37	123	84
Total alkalinity (as $CaCO_3$)	mg/L	1	15	0	PI(λ)	29	83.6	43
Total dissolved solids (calculated)	mg/L	-	17	0	Percentile	57	152	110
Total suspended solids	mg/L	1	19	1	Percentile	0[d]	4	1
Turbidity	NTU	0.1	17	0	PI(λ)	0.37	0.87	0.54
Major Ions								
Bicarbonate	mg/L	1.2	20	0	PI(λ)	36	91	52
Calcium	mg/L	0.02	20	0	Percentile	12	40	28
Chloride	mg/L	0.1	20	0	Percentile	7	61	39
Fluoride	mg/L	0.02	13	0	PI	0.03	0.04	0.03
Magnesium	mg/L	0.004	20	0	Percentile	1.7	5.6	3.7
Potassium	mg/L	0.02	20	0	Percentile	0.7	2.5	1.7
Reactive silica (as SiO_2)	mg/L	0.01	17	1	PI	0.18	1.3	0.76
Sodium	mg/L	0.005	20	0	Percentile	1.9	8.4	6.5
Sulphate	mg/L	0.3	20	0	PI	2.7	9.3	5.5
Nutrients and Organics								
Nitrate	mg-N/L	0.005	13	0	Percentile	0[d]	0.015	0.003
Nitrite	mg-N/L	0.005	13	0	-	0[f]	0.0005[f]	0.0005
Total ammonia	mg-N/L	0.005	13	0	Percentile	0[d]	0.011	0.003
Total Kjeldahl nitrogen	mg-N/L	0.05	19	0	PI(λ)	0.22	0.63	0.39
Total nitrogen	mg-N/L	0.05	10	0	PI	0.25	0.37	-[g]
Total phosphorus	mg-P/L	0.001	19	0	PI	0.004	0.009	0.001
Dissolved phosphorus	mg-P/L	0.001	19	0	PI(λ)	0.002	0.006	0.002
Orthophosphate	mg-P/L	0.001	19	0	Percentile	0[d]	0.0023	0.001
Total organic carbon	mg/L	0.5	17	1	PI	3.5	4.7	3.7
Dissolved organic carbon	mg/L	0.5	14	1	PI	3.5	4.9	3.6
Total Metals								
Aluminum	µg/L	0.3	13	0	PI(λ)	1.1	3.0	**3.5**
Antimony	µg/L	0.02	13	0	Percentile	0[d]	0.40	0.02
Arsenic	µg/L	0.02	13	0	PI	1.7	2.4	**2.5**
Barium	µg/L	0.05	13	0	PI	23	32	24
Beryllium	µg/L	0.01	13	0	-	0[f]	0.01[f]	0.01
Bismuth	µg/L	0.01	13	0	-	0[f]	0.01[f]	0.01
Boron	µg/L	1	13	0	Percentile	2.5	5	2.9
Cadmium	µg/L	0.005	13	0	Percentile	0[d]	0.005[e]	0.005
Chromium	µg/L	0.06	13	0	Percentile	0[d]	0.06[e]	0.03

Table 7.4-2: Normal Ranges (1997 to 2009; 2015 to 2017) for Selected Parameters, Lake A8

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Calculation Method	Normal Ranges		2018 Mean/Median[a]
						Lower Bound	Upper Bound	
Total Metals (cont'd)								
Cobalt	µg/L	0.01	13	0	PI	0.02	0.05	0.05
Copper	µg/L	0.1	13	0	PI	0.54	0.89	0.7
Iron	µg/L	1	13	0	PI	18	67	**78**
Lead	µg/L	0.01	13	0	Percentile	0.01	0.03	0.02
Lithium	µg/L	0.5	13	0	Percentile	7.5	10	6.6
Manganese	µg/L	0.05	13	0	PI	3.0	13	12
Mercury	µg/L	0.0005	13	0	PI	0[d]	0.0012	0.001
Molybdenum	µg/L	0.05	13	0	Percentile	0.17	0.22	**0.25**
Nickel	µg/L	0.06	13	0	PI	0.75	0.92	0.84
Selenium	µg/L	0.02	13	0	-	0[f]	0.02[f]	0.02
Silver	µg/L	0.005	13	0	-	0[f]	0.005[f]	0.005
Strontium	µg/L	0.05	13	0	PI(λ)	203	273	214
Thallium	µg/L	0.005	13	0	Percentile	0[d]	0.005[e]	0.005
Tin	µg/L	0.05	13	0	Percentile	0[d]	0.05[e]	0.05
Titanium	µg/L	0.1	13	0	Percentile	0.05	0.25	0.08
Uranium	µg/L	0.01	13	0	PI(λ)	0.027	0.054	0.037
Vanadium	µg/L	0.01	13	0	-	0[d]	0.01[e]	0.025
Zinc	µg/L	0.8	13	0	Percentile	0.4	1.2	0.8
Dissolved Metals								
Zinc	µg/L	0.8	13	0	Percentile	0[d]	8.5	1.1
Other								
Total cyanide	mg/L	0.001	17	0	-	0[d]	0.001	0.001

(a) Lake area means were calculated using the back-transformed mean when the normal range was defined as the prediction interval using Box-Cox transformed data. The arithmetic mean was used when the normal range was defined using untransformed data. The median was used when the calculation method was Percentile.

(b) Detection limit for laboratory pH is provided.

(c) Laboratory pH was used in place of field pH for select 2018 samples in cases where field pH was invalidated.

(d) The lower bound of the normal range was less than the detection limit; therefore, the lower bound of the normal range was set to zero.

(e) The upper bound of the normal range was less than the detection limit; therefore, the upper bound of the normal range was set to the detection limit.

(f) All values in the dataset were non-detect; therefore, the normal range was set from zero to the detection limit.

(g) Total nitrogen was not measured during the July or August 2018 water quality programs.

Bolded concentrations exceed the upper bound of the normal range.

Percentile = 2.5th and 97.5th percentiles; PI= 80% prediction intervals; PI(λ) = 80% prediction interval on Box-Cox transformed data.

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg‑N/L = milligrams nitrogen per litre; mg‑P/L = milligrams phosphorus per litre; µg/L = micrograms per litre.

Table 7.4-3: Normal Ranges (1997 to 2011; 2015 to 2017) for Selected Parameters, Lake B7

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Calculation Method	Normal Ranges		2018 Mean/Median[a]
						Lower Bound	Upper Bound	
Conventional Parameters								
pH (field)	unitless	0.1[b]	25	0	PI(λ)	7.0	8.2	7.7
Specific conductivity (laboratory)	µS/cm	1	24	1	Percentile	101	302	151
Hardness (as $CaCO_3$)	mg/L	0.2	24	1	Percentile	42	118	57
Total alkalinity (as $CaCO_3$)	mg/L	1	24	0	Percentile	29	110	32
Total dissolved solids (calculated)	mg/L	-	19	0	Percentile	77	171	101
Total suspended solids	mg/L	1	24	0	PI(λ)	0[d]	3	1.3
Turbidity	NTU	0.1	21	0	PI(λ)	0.34	0.69	0.48
Major Ions								
Bicarbonate	mg/L	1.2	24	0	Percentile	32	135	39
Calcium	mg/L	0.02	24	1	Percentile	14	39	19
Chloride	mg/L	0.1	24	1	Percentile	5	25	24
Fluoride	mg/L	0.02	16	0	PI(λ)	0.02	0.04	0.02
Magnesium	mg/L	0.004	24	0	Percentile	1.4	5.3	2.1
Potassium	mg/L	0.02	24	0	Percentile	0.9	2.8	1.3
Reactive silica (as SiO_2)	mg/L	0.01	21	0	Percentile	0.34	2.3	0.58
Sodium	mg/L	0.005	24	0	Percentile	2.1	7.5	3.6
Sulphate	mg/L	0.3	24	0	Percentile	3.8	6.0	4.9
Nutrients and Organics								
Nitrate	mg-N/L	0.005	16	1	Percentile	0[d]	0.005[e]	0.005
Nitrite	mg-N/L	0.005	16	0	-	0[f]	0.005[f]	0.005
Total ammonia	mg-N/L	0.005	16	0	Percentile	0[d]	0.025	0.005
Total Kjeldahl nitrogen	mg-N/L	0.05	23	0	PI(λ)	0.27	0.73	0.37
Total nitrogen	mg-N/L	0.05	12	0	PI	0.28	0.42	-[g]
Total phosphorus	mg-P/L	0.001	23	1	PI(λ)	0.006	0.010	0.006
Dissolved phosphorus	mg-P/L	0.001	24	0	PI(λ)	0.002	0.008	0.002
Orthophosphate	mg-P/L	0.001	24	1	Percentile	0[d]	0.001[e]	0.0005
Total organic carbon	mg/L	0.5	23	1	PI(λ)	4.6	7.6	4.0
Dissolved organic carbon	mg/L	0.5	17	1	PI	4.8	5.5	3.9
Total Metals								
Aluminum	µg/L	0.3	16	0	PI(λ)	1.4	6.6	3.5
Antimony	µg/L	0.02	16	0	-	0[f]	0.02[f]	0.02
Arsenic	µg/L	0.02	16	0	PI(λ)	1.3	1.8	1.6
Barium	µg/L	0.05	16	0	Percentile	18	20	20
Beryllium	µg/L	0.01	16	0	-	0[f]	0.01[f]	0.01
Bismuth	µg/L	0.01	16	0	-	0[f]	0.01[f]	0.01
Boron	µg/L	1	16	0	Percentile	2.5	8	**10**
Cadmium	µg/L	0.005	16	1	Percentile	0[d]	0.007	0.005
Chromium	µg/L	0.06	16	0	Percentile	0[d]	0.06[e]	0.03

Table 7.4-3: Normal Ranges (1997 to 2011; 2015 to 2017) for Selected Parameters, Lake B7

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Calculation Method	Normal Ranges		2018 Mean/Median[a]
						Lower Bound	Upper Bound	
Total Metals (cont'd)								
Cobalt	µg/L	0.01	16	1	PI	0.03	0.05	0.04
Copper	µg/L	0.1	16	0	Percentile	0.6	1.13	0.71
Iron	µg/L	1	16	0	PI	51	103	72
Lead	µg/L	0.01	16	0	Percentile	0.01	0.08	0.02
Lithium	µg/L	0.5	16	0	PI(λ)	4.1	7.5	**14**
Manganese	µg/L	0.05	16	0	Percentile	4.2	8.6	6.5
Mercury	µg/L	0.0005	16	0	PI(λ)	0[d]	0.004	0.001
Molybdenum	µg/L	0.05	16	0	PI(λ)	0.14	0.24	0.18
Nickel	µg/L	0.06	16	0	PI(λ)	0.81	1.4	0.94
Selenium	µg/L	0.02	16	0	Percentile	0.02	0.04	0.02
Silver	µg/L	0.005	16	1	-	0[f]	0.005[f]	0.005
Strontium	µg/L	0.05	16	0	PI	136	155	**226**
Thallium	µg/L	0.005	16	0	Percentile	0[d]	0.005	0.005
Tin	µg/L	0.05	16	0	Percentile	0[d]	0.05[e]	0.05
Titanium	µg/L	0.1	16	0	Percentile	0[d]	0.25	0.1
Uranium	µg/L	0.01	16	0	PI	0.023	0.030	0.023
Vanadium	µg/L	0.01	16	1	-	0[f]	0.01[f]	0.07
Zinc	µg/L	0.8	16	1	Percentile	0[d]	1.9	0.91
Dissolved Metals								
Zinc	µg/L	0.8	16	0	Percentile	0[d]	2.2	1.0
Other								
Total Cyanide	mg/L	0.001	23	0	-	0[d]	0.001	0.001

(a) Lake area means were calculated using the back-transformed mean when the normal range was defined as the prediction interval using Box-Cox transformed data. The arithmetic mean was used when the normal range was defined using untransformed data. The median was used when the calculation method was Percentile.

(b) Detection limit for laboratory pH is provided.

(c) Laboratory pH was used in place of field pH for select 2018 samples in cases where field pH was invalidated.

(d) The lower bound of the normal range was less than the detection limit; therefore, the lower bound of the normal range was set to zero.

(e) The upper bound of the normal range was less than the detection limit; therefore, the upper bound of the normal range was set to the detection limit.

(f) All values in the dataset were non-detect; therefore, the normal range was set from zero to the detection limit.

(g) Total nitrogen was not measured during the July or August 2018 water quality programs.

Bolded concentrations exceed the upper bound of the normal range.

Percentile = 2.5th and 97.5th percentiles; PI= 80% prediction intervals; PI(λ) = 80% prediction interval on Box-Cox transformed data.

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg‑N/L = milligrams nitrogen per litre; mg‑P/L = milligrams phosphorus per litre; µg/L = micrograms per litre; - = normal range could not be calculated because all values in the dataset were below detection.

Table 7.4-4: Normal Ranges (1994 to 2011; 2015 to 2017) for Selected Parameters, Lake D7

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Calculation Method	Normal Ranges		2018 Mean/Median[a]
						Lower Bound	Upper Bound	
Conventional Parameter								
pH (field)	unitless	0.1[b]	21	0	PI(λ)	7.6	8.3	8.3
Specific conductivity	µS/cm	1	20	1	Percentile	111	159	142
Hardness (as $CaCO_3$)	mg/L	0.2	20	1	Percentile	41	56	48
Total alkalinity (as $CaCO_3$)	mg/L	1	20	1	Percentile	38	55	50
Total dissolved solids (calculated)	mg/L	-	19	1	Percentile	57	81	73
Total suspended solids	mg/L	1	20	0	Percentile	0[c]	2	1.1
Turbidity	NTU	0.1	18	0	PI	0.51	1.1	0.71
Major Ions								
Bicarbonate	mg/L	1.2	19	1	Percentile	46	68	61
Calcium	mg/L	0.02	20	1	Percentile	13	17	15
Chloride	mg/L	0.1	20	0	Percentile	8	25	11
Fluoride	mg/L	0.02	16	0	Percentile	0.03	0.05	0.045
Magnesium	mg/L	0.004	20	1	Percentile	2.2	3.3	2.7
Potassium	mg/L	0.02	20	1	PI(λ)	1.0	1.8	1.3
Reactive silica (as SiO_2)	mg/L	0.01	17	1	Percentile	0.14	0.28	0.21
Sodium	mg/L	0.005	20	0	Percentile	5.2	17	8.0
Sulphate	mg/L	0.3	20	0	Percentile	2.5	10	5.1
Nutrients								
Nitrate	mg-N/L	0.005	15	0	-	0[e]	0.005[e]	0.005
Nitrite	mg-N/L	0.005	15	0	-	0[e]	0.0005[e]	0.005
Total ammonia	mg-N/L	0.005	15	0	PI	0[c]	0.009	**0.02**
Total Kjeldahl nitrogen	mg-N/L	0.05	19	1	PI(λ)	0.26	0.52	0.35
Total nitrogen	mg-N/L	0.05	12	0	PI	0.25	0.43	-[f]
Total phosphorus	mg-P/L	0.001	20	1	Percentile	0.01	0.02	0.01565
Dissolved phosphorus	mg-P/L	0.001	19	1	PI(λ)	0.003	0.008	0.006
Orthophosphate	mg-P/L	0.001	19	0	Percentile	0[c]	0.003	0.0005
Total organic carbon	mg/L	0.5	19	0	Percentile	3.5	14	4.8
Dissolved organic carbon	mg/L	0.5	15	0	PI(λ)	3.4	5.1	4.6
Total Metals								
Aluminum	µg/L	0.3	15	0	PI	3.8	6.7	5.1
Antimony	µg/L	0.02	15	0	Percentile	0.0	0.03	0.02
Arsenic	µg/L	0.02	15	0	PI	0.9	1.2	1.0
Barium	µg/L	0.05	15	0	PI	15	17	**18**
Beryllium	µg/L	0.01	15	0	-	0[e]	0.01[e]	0.01
Bismuth	µg/L	0.01	15	0	-	0[e]	0.01[e]	0.01
Boron	µg/L	1	15	0	PI	9.4	17	12
Cadmium	µg/L	0.005	15	1	-	0[e]	0.005[e]	0.005
Chromium	µg/L	0.06	15	0	Percentile	0[c]	0.06[d]	0.03

Table 7.4-4: Normal Ranges (1994 to 2011; 2015 to 2017) for Selected Parameters, Lake D7

Parameter	Unit	Detection Limit	Sample Size	Outliers Removed	Calculation Method	Normal Ranges		2018 Mean/Median[a]
						Lower Bound	Upper Bound	
Total Metals (cont'd)								
Cobalt	µg/L	0.01	15	0	Percentile	0.04	0.05	**0.07**
Copper	µg/L	0.1	15	0	PI	0.55	1.0	0.93
Iron	µg/L	1	15	0	PI(λ)	41	112	59
Lead	µg/L	0.01	15	0	Percentile	0.01	0.02	0.019
Lithium	µg/L	0.5	15	0	PI	1.2	1.9	1.4
Manganese	µg/L	0.05	15	0	PI	8.6	13	**16**
Mercury	µg/L	0.0005	15	0	PI	0[c]	0.001	0.0007
Molybdenum	µg/L	0.05	15	0	PI(λ)	0.28	0.48	**0.54**
Nickel	µg/L	0.06	15	0	PI	0.55	0.75	**0.82**
Selenium	µg/L	0.02	15	0	Percentile	0.02	0.06	0.02
Silver	µg/L	0.005	15	0	-	0[e]	0.005[e]	0.005
Strontium	µg/L	0.05	15	0	PI(λ)	63	83	75
Thallium	µg/L	0.005	15	0	Percentile	0[c]	0.005[d]	0.005
Tin	µg/L	0.05	15	0	Percentile	0[c]	0.05[d]	0.05
Titanium	µg/L	0.1	15	0	PI(λ)	0.16	0.34	0.25
Uranium	µg/L	0.01	15	0	PI	0.06	0.10	0.07
Vanadium	µg/L	0.01	15	0	PI(λ)	0.04	0.07	0.07
Zinc	µg/L	0.8	15	0	Percentile	0[c]	2.0	0.8
Dissolved Metals								
Zinc	µg/L	0.8	15	0	Percentile	0[c]	1.4	**1.6**
Other								
Total Cyanide	mg/L	0.001	18	0	Percentile	0[c]	0.001[d]	0.001

(a) Lake area means were calculated using the back-transformed mean when the normal range was defined as the prediction interval using Box-Cox transformed data. The arithmetic mean was used when the normal range was defined using untransformed data. The median was used when the calculation method was Percentile.

(b) Detection limit for laboratory pH is provided.

(c) The lower bound of the normal range was less than the detection limit; therefore, the lower bound of the normal range was set to zero.

(d) The upper bound of the normal range was less than the detection limit; therefore, the upper bound of the normal range was set to the detection limit.

(e) All values in the dataset were non-detect; therefore, the normal range was set from zero to the detection limit.

Bolded concentrations exceed the upper bound of the normal range.

Percentile = 2.5th and 97.5th percentiles; PI= 80% prediction intervals; PI(λ) = 80% prediction interval on Box-Cox transformed data.

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity unit; mg‑N/L = milligrams nitrogen per litre; mg‑P/L = milligrams phosphorus per litre; µg/L = micrograms per litre; - = normal range could not be calculated because all values in the dataset were below detection.

7.4.4 Comparison to FEIS Predictions

As per FEIS predictions, it was expected that WQGs would be met for all parameters in Peninsula Lakes and that minor changes to water quality would occur as a result of indirect effects from Mine-related activities. (Agnico Eagle 2014). The 2018 water quality data were examined relative to the specific model predictions for the Peninsula Lakes.

- Mean/median concentrations for all water quality parameters in remained below their respective WQGs;
- Concentrations of TSS measured in 2018 in the Peninsula Lakes were within the normal range;
- Concentrations of nitrate measured in 2018 in the Peninsula Lakes were within the normal range;
- In Lake A8, concentrations of four metals exceeded the upper bound of the respective normal range: total aluminum, arsenic, iron, and molybdenum. However, these metals did not exceed the upper bounds of their respective normal range by more than 10%, with the exception of iron.
- In Lake D7, titanium concentrations were within the normal range.

7.4.5 Temporal Trends

Water quality data within each Peninsula Lake were qualitatively examined for temporal patterns on time-series plots presented in Appendix 7C. Temporal patterns were observed for some parameters in Lake A8, B7, and D7 as follows:

- Steady increases in concentrations in each consecutive year were observed for: reactive silica, total aluminum and arsenic in Lake A8; dissolved phosphorus, and total aluminum in Lake B7; and dissolved phosphorus and total molybdenum in Lake D7.
- Step increase in concentration in 2018 (relative to previous years) was observed for: total manganese in Lake A8; total boron, lithium, strontium, and vanadium in Lake B7; total manganese and vanadium in Lake D7.

The analysis of the 2018 water quality results in the Peninsula Lakes focused on comparing year-to-year changes in water quality within each lake. It is anticipated that the 2019 and 2020 monitoring will allow for more detailed trends analysis and results interpretation with respect to potential Mine-related effects.

7.5 Summary

This section summarizes the water quality results relative to guidelines, normal ranges and FEIS predictions in the context of the two key questions for the AEMP water quality component.

Are concentrations of key parameters in Peninsula Lakes consistent with FEIS predictions and less than AEMP Action Levels?

In 2018, concentrations and values of water quality parameters in Peninsula Lakes remained below applicable WQGs and AEMP benchmarks for all parameters. Water quality in Peninsula Lakes in 2018 was outside of the normal range for some total metals in Lakes A8, B7, and D7 (Section 7.4.3). However, water quality in all lakes was generally consistent with FEIS predictions (Section 7.4.4).

Are concentrations in the Peninsula Lakes increasing over time relative to baseline or reference conditions?

A qualitative analysis of temporal trends observed increasing trends in each consecutive year for reactive silica (Lake A8), dissolved phosphorus (Lake B7 and D7), total aluminum (Lake A8 and B7), arsenic (Lake A8), and molybdenum (Lake D7), relative to previous AEMP monitoring years. A step-increase in concentrations in 2018 (relative to previous monitoring years) was observed for total manganese (Lake A8 and D7), total boron, lithium, and strontium (Lake B7), and total vanadium (Lake B7 and D7). The analysis of the 2018 water quality results focused on visually comparing 2018 construction phase data to pre-construction phase data in the Peninsula Lakes and detecting gradual trends. Given the limited dataset, there is uncertainty associated with trend detection, and potential sources of the temporal trends are not identified in this report. It is anticipated that the 2019 and 2020 monitoring will allow for more detailed trend analysis.

7.6 Recommendations

There are no recommendations for the 2019 Peninsula Lake water quality program.

7.7 List of Appendices

- Appendix 7A Field Plots, which includes field data tables and vertical field profile plots;
- Appendix 7B 2018 Water Chemistry Tables, which includes raw water chemistry data tables for the 2018 water quality monitoring program in the Peninsula Lakes; and,
- Appendix 7C Time-series plots, which includes time-series plots of AEMP data collected in the Peninsula Lakes between 2015 and 2018.

7.8 References

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8.0 SEDIMENT QUALITY

To date, sediment quality monitoring has been completed at Meliadine Lake in 2015, 2016, and 2018 to meet Type A Water Licence requirements, and to meet MDMER EEM program requirements for the first year of the mine effluent discharge in 2018. Sampling was completed in August as per the AEMP Design Plan and the Cycle 1 EEM Study Design approved by the relevant regulatory agencies (Golder 2016, 2017).
Sediment monitoring programs in 2015 and 2016 were intended to characterize baseline conditions within exposure and reference areas on Meliadine Lake. Sediment quality and supporting data generated were evaluated in the 2017 AEMP Annual Report to establish baseline conditions for the AEMP prior to the onset of operations (Golder 2018c).

This section provides a summary of sediment quality data obtained in 2018 during the first year of mine effluent discharge, an analysis of the baseline and construction data collected between 2015 and 2018 in Meliadine Lake, and an interpretation of the results as per the requirements of the AEMP and EEM programs.

Data analyses presented in this section have been undertaken as per the AEMP Design Plan (Golder 2016a), the Cycle 1 EEM Study Design (Golder 2017a), and in response to comments from ECCC, INAC, and KIA during review of the 2017 AEMP Annual Report. The report also considers comments provided by ECCC on that design document (Golder 2018d).

8.1 Objectives

According to the AEMP Design Plan (Golder 2016a), the objective of the sediment quality component is to determine whether treated Mine effluent has had effects on sediment quality in Meliadine Lake, and to provide supporting information for the AEMP benthic invertebrate component. Specific objectives of the sediment quality component were to:

- characterize sediment quality in Meliadine Lake;
- verify predictions made in the FEIS in relation to sediment quality in Meliadine Lake (Agnico Eagle 2014);
- collect supporting data for the benthic invertebrate and water quality components to aid in interpretation of results (as per Part 2, Schedule 16 (a) (iii) of the MDMER regulations [Government of Canada 2018]); and
- provide data to inform adaptive management intended to reduce or eliminate Mine-related effects on Meliadine Lake sediment quality.

To achieve these objectives, analysis and interpretation of sediment quality data in 2018 were focused on answering two key questions, as defined in the AEMP Design Plan (Golder 2016a):

- Are concentrations of sediment quality parameters in Meliadine Lake less than benchmarks?
- Are concentrations in the exposure area increasing over time relative to the reference areas?

Field survey and data analysis methods employed to answer these key questions are described in Section 8.2. A summary of quality assurance (QA) and quality control (QC) assessment on the 2018 data is provided in Section 8.3. Results and discussion are presented in Section 8.4. Results to meet AEMP requirements are discussed in this section, followed by results to meet the Cycle 1 EEM study requirements not already covered under the AEMP. A summary of the sediment quality results and conclusions are provided for both the AEMP and the Cycle 1 EEM study in Section 8.5.

8.2 Methods

8.2.1 Sampling Design

The 2018 sediment quality program was designed to align with the AEMP Design Plan (Golder 2016a) and Cycle 1 EEM requirements under the MDMER (Golder 2017a, 2018b; Government of Canada 2018). The program consisted of one sediment sampling event with concomitant water quality and benthic invertebrate sampling events in August 2018.

As previously described in the 2017 AEMP Annual Report (Golder 2018c), the Near-field and reference areas had different substrates, with the Near-field area being silt-dominated and the reference areas sand-dominated. In order to minimize this potential confounding factor, a Sediment Reconnaissance Survey (Appendix 9A) was planned and executed in July 2018 prior to the sediment quality sampling event. The purpose of the survey was to further investigate suitable and comparable stations for sediment and benthos sampling within the already established exposure and reference areas. Based on the survey results and consideration of the Plume Delineation Study (Section 2.2.4), some sampling stations were relocated for the August 2018 sampling event to optimize the AEMP and EEM sampling locations. Detailed results of the Sediment Reconnaissance Survey are presented in Appendix 9A.

Although the 2018 study design remained consistent with the AEMP Design Plan and the Cycle 1 EEM Study Design, there were some modifications to sampling station locations as a result of the Sediment Reconnaissance Survey and the Plume Delineation Study (Section 2.4.4). Specific deviations in relation to station location were as follows:

- **Near-field Stations**: MEL-01-01 was retained because it was the only original station included by the water quality component Near-field station re-alignment after review of the 2018 plume delineation study results (Section 2.4.3). Furthermore, the 2018 Sediment Reconnaissance Survey confirmed that sampling efficiency and grab fullness at this station were acceptable. The other four stations confirmed by the water quality station re-alignment (i.e., MEL01-06, MEL01-07, MEL01-08 and MEL01-09) were also adopted as 2018 sediment and benthic monitoring stations because they had acceptable sampling efficiency and grab fullness. Furthermore, substrate composition was relatively consistent among the five 2018 Near-field water quality stations.
- **Mid-field Stations**: 2018 sediment stations were selected to maintain alignment with water quality, and also to avoid excessive sampling effort in retrieving acceptable grab samples. Therefore, MEL-02-06 and MEL-02-08 were chosen to replace MEL-02-01 and MEL-02-04, because of difficulty retrieving acceptable samples from MEL-02-01 and MEL-02-04 with respect to sample fullness and efficiency. For stations that were re-sampled for consistency with previous years, some stations were adjusted to within 5 to 10 m of the original sample locations.
- **Reference Areas**: Sediment quality samples were not taken from the MEL-04 reference area (Reference Area 2) due to meteorological challenges; i.e., strong winds during August that limited the time available for sediment sampling, such that only two of the three reference areas were sampled. Reference Area 2 was removed from the sampling program, because of limited similarity in terms of sample composition to the Near-field area during previous sampling years (i.e., 2015 and 2018), and limited sampling success during the Sediment Reconnaissance Survey (Appendix 9A). Reference areas 1 (MEL-03) and 3 (MEL-05) were sampled in 2018.

QA/QC procedures described in Section 8.3 were followed during the 2018 sediment quality monitoring program.

8.2.2 Field Methods

8.2.2.1 Sample Location and Timing

According to the AEMP Design Plan, five stations in each one of the five sampling areas were scheduled to be sampled once during the open-water season, in August 2018. EEM and AEMP sampling areas were aligned, in that the Near-field area was considered the EEM exposure area and Reference Area 1 was considered the EEM reference area. The location and timing of sample collection is summarized in Table 8.2-1 and presented in Figure 8.2-1.

Table 8.2-1: Sediment Quality Sampling Stations and Sampling Effort Summary for Meliadine Lake in 2018

Area	Station ID	UTM Coordinates (NAD 83, Zone 15V)		Geographic Coordinates		Average Total Depth[a] (m)	Open-Water
		Easting	Northing	Latitude	Longitude		15 Aug to 2 Sept
Near-field Exposure	MEL-01-01	542690	6989132	92° 9' 22.811"W	63° 1' 45.420"N	9.0	✓
	MEL-01-06(N)	542952	6988993	92° 10' 1.727"W	63° 1' 52.953"N	7.2	✓[b]
	MEL-01-07(N)	542873	6989218	92° 9' 4.304"W	63° 1' 40.818"N	8.0	✓
	MEL-01-08(N)	543044	6989067	92° 9' 9.712"W	63° 1' 48.120"N	7.5	✓
	MEL-01-09(N)	542555	6989188	92° 8' 57.690"W	63° 1' 43.169"N	7.2	✓QC-dup
Mid-field Exposure	MEL-02-02	537093	6992642	92° 15' 58.118"W	63° 3' 41.039"N	7.0	✓
	MEL-02-03	537497	6992332	92° 15' 29.601"W	63° 3' 30.874"N	8.6	✓
	MEL-02-05	537831	6992692	92° 15' 5.519"W	63° 3' 42.379"N	8.5	✓[c]
	MEL-02-06(N)	536922	6992853	92° 16' 10.125"W	63° 3' 47.919"N	7.3	✓
	MEL-02-08(N)	538342	6991952	92°14'29.749"W	63°3'18.278"N	9.0	✓
Reference Area 1	MEL-03-01	533321	6998540	92°20'22.432"W	63°6'52.915"N	6.8	✓
	MEL-03-02	533253	6998664	92°20'27.192"W	63°6'56.944"N	6.9	✓
	MEL-03-03	532954	6998860	92°20'48.384"W	63°7'3.375"N	9.5	✓
	MEL-03-04	533629	6998660	92°20'0.368"W	63°6'56.690"N	6.6	✓
	MEL-03-05	533997	6998265	92°19'34.406"W	63°6'43.804"N	6.1	✓[d]
Reference Area 2	MEL-04-01	525634	7000884	92°29'29.572"W	63°8'10.907"N	-	[e]
	MEL-04-02	526151	7001525	92°28' 2.287"W	63°8'31.483"N	-	[e]
	MEL-04-03	525343	7001363	92°29'50.083"W	63°8'26.457"N	-	[e]
	MEL-04-04	525401	7001085	92°29'46.096"W	63°8'17.460"N	-	[e]
	MEL-04-05	525727	7001134	92°29'22.790"W	63°8'18.960"N	-	[e]

Table 8.2-1: Sediment Quality Sampling Stations and Sampling Effort Summary for Meliadine Lake in 2018

Area	Station ID	UTM Coordinates (NAD 83, Zone 15V)		Geographic Coordinates		Average Total Depth[(a)] (m)	Open-Water
		Easting	Northing	Latitude	Longitude		15 Aug to 2 Sept
Reference Area 3	MEL-05-01	530922	6990859	92°23'18.811"W	63°2'45.520"N	9.0	✓
	MEL-05-02	530675	6990883	92° 23' 36.377"W	63° 2' 46.371"N	9.3	✓QC-dup
	MEL-05-03	530737	6991365	92°23'31.639"W	63°3'1.925"N	8.5	✓
	MEL-05-04	530573	6991231	92°23'43.404"W	63°2'57.645"N	9.5	✓
	MEL-05-05	530241	6991156	92°24'7.088"W	63°2'55.322"N	8.5	✓

Note: Samples were collected during daylight hours. EEM study areas included the Near-field area and Reference Area 1.

✓ = Sample collected.

N = New station added for the 2018 sediment quality program.

(a) Average depth for each grab sample

(b) Station MEL-01-06 was sampled approximately 230 m south of the planned location at UTM coordinates of 542907 E, 6988767 N.

(c) Station MEL-02-05 was sampled approximately 140 m north of the planned location at UTM coordinates of 537842 E, 6992835 N.

(d) Station MEL-03-05 was sampled approximately 130 m south of the planned location at UTM coordinates of 533956 E, 69985004 N.

(e) Sample collection at these locations was not undertaken due to time, weather, and safety constraints.

QC-dup = duplicate quality control samples were collected; - = data not available.

ID = identifier; UTM = Universal Transverse Mercator; NAD = North American Datum

525000
530000
535000
540000
7000000
6995000
6990000

REFERENCE AREA 2 (MEL-04)

REFERENCE AREA 1 (MEL-03)
MEL-03-03
MEL-03-04
MEL-03-05
MEL-03-02
MEL-03-01

MID-FIELD EXPOSURE AREA (MEL-02)
MEL-02-06
MEL-02-05
MEL-02-03
MEL-02-02
MEL-02-08

REFERENCE AREA 3 (MEL-05)
MEL-05-04
MEL-05-03
MEL-05-05
MEL-05-01
MEL-05-02

NEAR-FIELD EXPOSURE AREA (MEL-01)
MEL-01-01
MEL-01-09
MEL-01-07
MEL-01-08
MEL-01-06

LEGEND

- SEDIMENT QUALITY SAMPLING LOCATION
- DIRECTION OF FLOW AT WATERSHED OUTLET
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- BATHYMETRIC CONTOUR (0.5 AND 2m INTERVAL)
- WATERCOURSE
- WATERBODY



DRAFT

0 1.5 3
1:70,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED
AGNICO EAGLE

PROJECT
CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE
MELIADINE LAKE SEDIMENT QUALITY SAMPLING LOCATIONS, 2018

CONSULTANT
GOLDER

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DESIGNED	JL
PREPARED	MH
REVIEWED	
APPROVED	

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8.2.2.2 Sediment Sample Collection

The sediment quality monitoring program was based on the AEMP Design Plan (Golder 2016a), the Cycle 1 EEM Study Design (Golder 2017a), and the EEM TGD for metal mines (Environment Canada 2012) (hereafter referred to as TGD). Sediment quality samples were collected as a composite of grab samples from surficial sediments at each station. Sediment samples were collected either on the same day or within two days before or after collection of water quality samples. When water and sediment samples were collected on the same day, sediment samples were collected after all *in situ* measurements and water quality samples had been collected.

Composite sediment samples were collected using a stainless steel Petite Ponar grab (15.24 × 15.24 cm; bottom sampling area of 0.0232 m²). Each composite sample comprised up to five separate grabs collected at the sampling station. Lake sediment was removed from the Ponar grab with a plastic trowel; sediments were removed from the center of the grab to avoid the metal sides of the Ponar grab, from the upper 5 cm of the sample. The process was repeated up to five times until sufficient sediment was collected (approximately 450 g dry weight or 1.5 kg wet weight) for analysis of the required parameters. Sediment samples were composited by placing each of the five subsamples into a clean, shallow, plastic pan and mixed with a plastic spoon. Sediment samples were placed in plastic bags and jars provided by the analysical laboratory, kept refrigerated, and transported to the laboratory as soon as possible.

8.2.3 Laboratory Methods

Sediment quality samples were analyzed by ALS (Edmonton and Saskatoon). ALS is an analytical laboratory accredited by the CALA. Specific ALS analytical methods and RDL for the required analyses are provided in Appendix 8A.

Sediment samples were then analyzed for the following parameters:

- particle-size distribution (sand: 0.05 to 2 mm; silt: 0.002 to 0.05 mm; and clay: <0.002 mm);
- total organic carbon; and
- metals: aluminum, antimony, arsenic, barium, beryllium, bismuth, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, sulfur, thallium, tin, titanium, uranium, vanadium, and zinc.

Sediment quality laboratory test methods with analytical DLs less than the CCME sediment quality guidelines for the protection of aquatic life (CCME 2001) were used to analyze the samples collected in 2018.

8.2.4 Data Analysis

The data analysis approach for the 2018 sediment quality data was developed to address Cycle 1 EEM Study Design and AEMP Design Plan requirements (Golder 2016, 2017). These included calculation of descriptive statistics, comparison of sediment chemistry to available CCME guidelines, statistical comparisons between exposure areas and reference areas, temporal comparison between years for the Near-field area, a comparison to FEIS predictions, and comparison to normal ranges calculated for the AEMP.

Details of data analysis methods are provided in the following subsections.

8.2.4.1 Summary Statistics and Comparison to Canadian Sediment Quality Guidelines

Comparisons to sediment quality guidelines allow an assessment of potential adverse effects to aquatic biota. CCME sediment quality guidelines are based on toxicological information according to a standard protocols (CCME 2001). These guidelines apply Canada-wide and do not necessarily account for site-specific factors, such as the natural geology of the study area. Thus, guideline exceedances in reference areas can be indicative of naturally elevated concentrations due to site-specific factors. Sediment quality can vary spatially within a lake or between lakes due to lake morphology, composition of the bedrock, interaction of surface and groundwater, tributary inputs, and other factors.

Descriptive statistics were calculated from data collected from the exposure and reference areas sampled in 2018. Specifically, mean, median, minimum, maximum values were calculated and compared to CCME Interim Sediment Quality Guideline (ISQG) and Probable Effects Level (PEL) for the protection of freshwater aquatic life (CCME 2001; Table 8.2-2). The percentage of exceedances above sediment quality guidelines was also calculated, and sample size and standard deviation were provided. For mean and standard deviation calculations, data below the RDL were replaced with half the RDL. When more than 50% of the data were below RDL, the standard deviation was not calculated.

CCME (2001) indicates that at concentrations below the ISQG, adverse biological effects are not expected to occur, while at concentrations above the ISQG adverse biological effects may occur. At concentrations above the PEL adverse biological effects are likely, but not certain, to occur.

Table 8.2-2: Canadian Sediment Quality Guidelines for Metals

Parameter	Unit	Canadian Council of Ministers of the Environment Sediment Quality Guidelines[a]	
		Interim Sediment Quality Guideline (ISQG)	Probable Effect Level (PEL)
Arsenic	µg/g dw	5.9	17
Cadmium	µg/g dw	0.6	3.5
Chromium	µg/g dw	37.3	90
Copper	µg/g dw	35.7	197
Lead	µg/g dw	35	91.3
Mercury	µg/g dw	0.17	0.486
Zinc	µg/g dw	123	315

(a) CCME (2001).

µg/g dw = micrograms per gram dry weight.

8.2.4.2 Statistical Analysis

8.2.4.2.1 Exposure versus Reference: 2018 Spatial Comparison

8.2.4.2.1.1 EEM

Given that sediment quality is a supporting component within the EEM program, the TGD does not provide specific details on comparisons of sediment quality between exposure and reference areas. The TGD recommends that particle-size and TOC analysis be used to determine if there are habitat differences between exposure and reference areas. The TGD encourages the determination of metal concentrations in sediments to facilitate interpretation of BIC data collected concurrently. Thus, to address EEM requirements for this report and as communicated in the approved Cycle 1 EEM Study Design, particle-size distribution, TOC and metal concentrations were summarized statistically, screened against applicable sediment quality guidelines, and qualitatively compared between the EEM exposure and reference areas. The findings of this assessment support the comparison of benthic invertebrate communities among sampling areas in Section 9.4.1.

8.2.4.2.1.2 AEMP

Spatial patterns in 2018 were qualitatively and statistically examined to determine if sediment quality differed among Near-field and Mid-field exposure areas, and reference areas. Box-and-whisker plots of sediment chemistry parameters from Near-field and Mid-field exposure areas and pooled reference areas were visually evaluated for spatial patterns. Additionally, a statistical analysis was undertaken to determine if there were significant differences in parameter concentrations between Near-field exposure, Mid-field exposure, and the reference areas.

Prior to statistical analyses, values below the RDL were substituted with one-half of the RDL and normalized to percent fines. Statistical outliers were evaluated using SRs from the ANOVA model. A magnitude of |3.5| for the SR was used to identify observations that may be unusual. When an outlier was detected, the validity of the data point was examined. If the outlier was determined to be the result of a data entry error, it was corrected. If the outlier was not the result of data entry errors and could not be resolved otherwise, the analysis was completed with and without the outlier included.

To compare sediment quality parameter concentrations among AEMP areas in Meliadine Lake, an ANOVA was completed in SYSTAT Version 13.1 (Systat Inc. 2009), followed by *post-hoc* pairwise comparisons (Tukey's tests; Zar 1999) if the ANOVA test result was significant. Prior to analysis, the sediment quality data were checked for statistical assumptions (i.e., normality, and homoscedasticity; Zar 1999). If data did not meet the statistical assumptions, the equivalent non-parametric test (e.g., K-W with *post-hoc* Conover-Inman tests; Systat Inc. 2009) were completed. Data were considered significantly different at $\alpha = 0.1$.

Reference area data collected in 2018 were pooled and the following statistical comparisons were made:

- Near-field versus Mid-field area
- Near-field versus reference areas
- Mid-field versus reference areas

When significant differences in sediment quality parameters were observed between sampling areas, the magnitude of difference among the areas (i.e., Near-field, Mid-field and pooled reference) was calculated by expressing the difference as a percentage of the mean or median. The area farthest away from the Mine was set as the denominator in the calculation of magnitude of difference. For example, to calculate the magnitude of difference between Near-field and pooled reference areas for a parameter, the equation was as follows:

$$Magnitude = \frac{\bar{x}_{NF} - \bar{x}_{Reference\ Areas}}{\bar{x}_{Reference\ Areas}}$$

where $\bar{x}$ is the mean or median and NF is the Near-field area.

If the statistical comparison between sampling areas was conducted using the K-W test, the data were not considered to be normally distributed and the magnitude was calculated using medians. As the K-W test is a non-parametric method for testing whether samples originate from the same distribution (i.e., it is not a comparison of sample medians), situations were a K-W test was significant, but no differences in medians were observed are possible.

When spatial patterns were detected (i.e., as significant statistical test results), concentrations of parameters that increased with distance from the Near-field area were categorized as being positive patterns, while parameters with declining concentration with increasing distance were categorized as negative patterns.

8.2.4.2.2 Within Near-field Area Temporal Comparison (2015 to 2018)

A qualitative temporal evaluation of Near-field data collected between 2015 and 2018 was undertaken to evaluate whether sediment parameter concentrations within the Near-field area have increased over time. Prior to completing this analysis, values below the RDL were substituted with one-half of the RDL. Box-and-whisker plots of raw data and fine-normalized data were generated for each sediment parameter to facilitate this evaluation.

Comparison to FEIS Predictions

During the development of the FEIS, predictions of contaminants of potential concern in sediments were not completed due to the high degree of uncertainty associated with these predictions. In addition, the FEIS noted high variability in evidence for changes in sediment quality from other mines in Northern Canada (Agnico Eagle 2014, Volume 7, Section 7.4.6.1.3). The FEIS also predicted that changes to water quality would result in final water concentrations lower than the applicable guidelines and that the TSS in the effluent would be regulated to meet the MDMER. Based on this information, the FEIS qualitatively predicted that sediment quality in the vicinity of the diffuser would be comparable to baseline sediment quality.

8.2.4.3 Comparison to Normal Ranges

Normal ranges were calculated for each sediment quality parameter using available baseline data for Meliadine Lake stations; i.e.,1994, 1998, 2008, 2011, 2013, 2015, 2016, and 2018.

Prior to completing statistical analyses and normal range calculations, one half the RDL was substituted for non-detect values in the dataset. Sediment quality data were then normalized to the fraction of fine sediments ([silt + clay]/100) to account for the relationship of most parameters with percent fines. This procedure is aligned with the recommendation provided by the EEM TGD (Environment Canada 2012) to account for sediment particle size influence. If a linear regression between concentration of a parameter and percent fines was significant at $\alpha = 0.1$, normalization was achieved by dividing each individual metal concentration with the respective fine sediment proportion of the sample.

Methods for estimating normal ranges for sediment quality followed the methods of Barrett et al. (2015) and are consistent with the approach used for calculating normal ranges for other AEMP components (i.e., water quality, benthos, and plankton). A summary of the methods used in this assessment is provided below:

- When data were normally distributed, the normal range was estimated as the 80% prediction interval (PI) of the dataset. Normality was assessed using the Shapiro-Wilk test, using $\alpha = 0.05$ to indicate a significant departure from normality.
- When the baseline data were not normally distributed, but normality could be achieved after Box-Cox transformation (Box and Cox 1964), the normal range was calculated on the Box-Cox transformed data and the upper and lower bound of the normal ranges were back-transformed.
- If neither the untransformed data or Box-Cox transformed datasets were normally distributed, the normal range boundaries were defined as the 10th and 90th percentile of the baseline data. In cases where the percentile method was used, a dataset of 1,000 samples was randomly generated from the normal range dataset and the 10th and 90th percentile were calculated from this distribution of 1,000 samples to estimate the normal range.

It should be noted that the normal ranges provided in this report are considered provisional during the initial monitoring years under the AEMP, due to the limited sample sizes used in the calculations. The normal range is intended to estimate the range of natural spatial and temporal variability, and the more reference data are incorporated into the calculation, the more accurate the estimate becomes. These normal ranges may be redefined in future reports to allow for the inclusion of additional monitoring data from reference areas as they become available.

Each calculated normal range was evaluated for representativeness. For example, some parameters had variable RDLs, or parameters with low detection frequency could have calculated upper bound normal ranges that were less than the RDL, whereas actual concentrations could be anywhere between zero and the RDL. Consequently, the calculated normal ranges for parameters with non-detect concentrations in the dataset were revised according to the following criteria:

- If all values were less than the RDL, then the lower bound of the normal range was set to zero and the upper bound was set to the RDL value.
- If the lower bound of the normal range was less than the RDL, then it was set to zero.
- If the upper bound of the normal range was less than the RDL, then it was set to the RDL value.
- If the dataset included a mix of RDLs and all the values were non-detect, then the normal range was set to zero (lower bound) and the most common used RDL (upper bound).
- If the dataset included a mix of RDLs, and the upper bound of the normal range was between the lowest and highest RDL, then the upper bound of the normal range was set to the highest RDL.

If the dataset included a mix of RDLs, and the RDLs varied by more than an order of magnitude, then the data with the higher RDL was removed from analysis and the normal range was re-calculated.

8.3 Quality Assurance/Quality Assurance

8.3.1 Overview of Procedures

The QA/QC practices applied during this study and detailed results of the QC analyses for sediment quality samples collected in Meliadine Lake are provided in Appendix 8A. QA components of the program included the use of trained personnel, standard procedures, and an accredited analytical laboratory; QC components included assessments of duplicate samples.

8.3.2 Summary of Results

Detailed results are provided in Appendix 8A. The results of the review of field and laboratory data indicated that field measurements and laboratory data were of high quality. Key findings from the 2018 QA/QC results are as follows:

- Overall good repeatability was observed in the analysis.
- Two sets of duplicate samples were collected and analyzed, equivalent to 20% of the total sampling effort for 2018. In duplicates analyzed, only 4% of the results had an RPD of more than 30% when one or both parameter concentrations were above five times the DL.
- Re-analyses were requested for ALS for particle-size analysis of MEL-01-09 and cadmium of MEL-05-02, results were confirmed by the re-analyses.

8.4 Results and Discussion

8.4.1 Summary Statistics and Sediment Quality Guideline Comparison

For the 2018 sediment data, descriptive statistics (minimum, median, mean, maximum, standard deviation, and sample count) were calculated for the Near-field, Mid-field, and reference areas and the results were compared to applicable PELs and ISQGs (Tables 8.4.1 to 8.4.3). The full 2018 dataset is presented in Appendix 8B and the time-series plots for the parameters analyzed are presented in Appendix 8C. Box-and-whisker plots showing parameter concentrations by area in 2018 are presented in Appendix 8D.

Table 8.4-1: Sediment Quality Summary for the Near-Field Exposure Area in 2018

Parameter	Unit (Dry Weight)	Guidelines		Summary Statistics							
		ISQG	PEL	Median	Mean	Minimum	Maximum	Standard Deviation	Count	% Above Guideline	
										I	P
Particle-size and Organic Carbon											
Sand	%	-	-	24	21	6.3	42	14	5	-	-
Silt	%	-	-	64	69	55	82	12	5	-	-
Clay	%	-	-	11	10	3.3	15	4.2	5	-	-
Fines (Silt + Clay)	%	-	-	76	79	58	94	14	5	-	-
Total organic carbon	%	-	-	4.5	4.5	3.0	5.7	1.1	5	-	-
Metals											
Aluminum	µg/g	-	-	12,700	12,960	11,100	14,500	1,315	5	-	-
Antimony	µg/g	-	-	0.15	0.15	0.13	0.18	0.019	5	-	-
Arsenic	µg/g	5.9	17	**23**[I, P]	**24**[I, P]	**15**[I]	**33**[I, P]	7	5	100	80
Barium	µg/g	-	-	115	115	90	136	20	5	-	-
Beryllium	µg/g	-	-	0.33	0.32	0.28	0.37	0.033	5	-	-
Bismuth	µg/g	-	-	0.32	0.32	0.25	0.37	0.045	5	-	-
Boron	µg/g	-	-	6.9	6.8	5.9	8.2	0.92	5	-	-
Cadmium	µg/g	0.6	3.5	0.52	0.52	0.41	**0.6**[I]	0.07	5	20	-
Calcium	µg/g	-	-	4,460	4,368	3,760	4,700	360	5	-	-
Chromium	µg/g	37	90	**51**[I]	**51**[I]	**43**[I]	**57**[I]	5.5	5	100	-
Cobalt	µg/g	-	-	16	16	8.5	27	6.9	5	-	-
Copper	µg/g	36	197	**81**[I]	**81**[I]	**61**[I]	**95**[I]	13	5	100	-
Iron	µg/g	-	-	29,400	27,020	20,200	31,600	4,669	5	-	-
Lead	µg/g	35	91	11	11	8.8	13	1.7	5	-	-
Lithium	µg/g	-	-	15	15	13	17	1.7	5	-	-

Table 8.4-1: Sediment Quality Summary for the Near-Field Exposure Area in 2018

Parameter	Unit (Dry Weight)	Guidelines		Summary Statistics							
		ISQG	PEL	Median	Mean	Minimum	Maximum	Standard Deviation	Count	% Above Guideline	
										I	P
Metals (cont'd)											
Magnesium	µg/g	-	-	7,180	7,254	6,160	8,030	722	5	-	-
Manganese	µg/g	-	-	351	360	273	471	72	5	-	-
Mercury	µg/g	0.17	0.49	0.028	0.03	0.019	0.044	0.01	5	-	-
Molybdenum	µg/g	-	-	4.4	5.3	3.0	9.4	2.5	5	-	-
Nickel	µg/g	-	-	69	67	47	85	14	5	-	-
Potassium	µg/g	-	-	2,290	2,304	1,940	2,530	242	5	-	-
Selenium	µg/g	-	-	0.94	0.95	0.69	1.2	0.17	5	-	-
Silver	µg/g	-	-	0.2	0.19	0.14	0.22	0.033	5	-	-
Sodium	µg/g	-	-	330	318	250	360	44	5	-	-
Strontium	µg/g	-	-	25	24	20	27	2.5	5	-	-
Thallium	µg/g	-	-	0.37	0.36	0.26	0.45	0.073	5	-	-
Tin	µg/g	-	-	<2.0	-	<2.0	<2.0	-	5	-	-
Titanium	µg/g	-	-	739	726	641	786	58	5	-	-
Uranium	µg/g	-	-	4.2	4.3	3.6	5.1	0.51	5	-	-
Vanadium	µg/g	-	-	57	58	47	66	6.9	5	-	-
Zinc	µg/g	123	315	94	91	71	101	12	5	-	-

Bolded values are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

ISQG = Interim Sediment Quality Guideline; PEL = Probable Effects Level; µg/g = micrograms per gram; - = no guideline or data.

Table 8.4-2: Sediment Quality Summary for the Mid-Field Exposure Area in 2018

Parameter	Unit (Dry Weight)	Guidelines		Summary Statistics							
		ISQG	PEL	Median	Mean	Minimum	Maximum	Standard Deviation	Count	% Above Guideline	
										I	P
Particle-size and Organic Carbon											
Sand	%	-	-	46	50	33	68	15	5	-	-
Silt	%	-	-	44	39	24	51	12	5	-	-
Clay	%	-	-	9.5	11	7.3	17	3.9	5	-	-
Fines (Silt + Clay)	%	-	-	54	50	32	67	15	5	-	-
Total organic carbon	%	-	-	6.2	6.7	4.6	9.0	1.6	5	-	-
Metals											
Aluminum	µg/g	-	-	10,500	10,142	7,560	12,000	1,748	5	-	-
Antimony	µg/g	-	-	0.11	0.096	<0.1	0.14	0.043	5	-	-
Arsenic	µg/g	5.9	17	**11**[(I)]	**11**[(I)]	**8.4**[(I)]	**16**[(I)]	2.9	5	100	-
Barium	µg/g	-	-	115	107	91	120	14	5	-	-
Beryllium	µg/g	-	-	0.28	0.26	0.22	0.29	0.032	5	-	-
Bismuth	µg/g	-	-	0.23	0.19	<0.2	0.25	0.079	5	-	-
Boron	µg/g	-	-	7.0	6.1	<5.0	8.2	2.2	5	-	-
Cadmium	µg/g	0.6	3.5	0.34	0.33	0.22	0.45	0.082	5	-	-
Calcium	µg/g	-	-	5,070	4,692	3,840	5,250	641	5	-	-
Chromium	µg/g	37	90	**45**[(I)]	**44**[(I)]	31	**54**[(I)]	9.1	5	80	-
Cobalt	µg/g	-	-	10	10	7.6	12	1.8	5	-	-
Copper	µg/g	36	197	**88**[(I)]	**80**[(I)]	**56**[(I)]	**99**[(I)]	18	5	100	-
Iron	µg/g	-	-	19,000	18,000	12,900	21,700	3,552	5	-	-
Lead	µg/g	35	91	8.7	8.4	6.1	10	1.7	5	-	-
Lithium	µg/g	-	-	12	12	10	15	1.8	5	-	-
Magnesium	µg/g	-	-	5,930	5,920	4,370	7,010	1,002	5	-	-
Manganese	µg/g	-	-	300	293	193	400	80	5	-	-
Mercury	µg/g	0.17	0.49	0.018	0.019	0.013	0.029	0.0060	5	-	-

Table 8.4-2: Sediment Quality Summary for the Mid-Field Exposure Area in 2018

Parameter	Unit (Dry Weight)	Guidelines		Summary Statistics							
		ISQG	PEL	Median	Mean	Minimum	Maximum	Standard Deviation	Count	% Above Guideline	
										I	P
Metals (cont'd)											
Molybdenum	µg/g	-	-	3.7	3.7	2.6	5.2	0.94	5	-	-
Nickel	µg/g	-	-	50	48	38	60	10	5	-	-
Potassium	µg/g	-	-	1,840	1,732	1,320	2,040	292	5	-	-
Selenium	µg/g	-	-	0.91	0.84	0.55	1.1	0.20	5	-	-
Silver	µg/g	-	-	0.15	0.13	<0.1	0.17	0.048	5	-	-
Sodium	µg/g	-	-	290	258	190	310	58	5	-	-
Strontium	µg/g	-	-	27	25	20	28	3.5	5	-	-
Thallium	µg/g	-	-	0.25	0.24	0.18	0.29	0.043	5	-	-
Tin	µg/g	-	-	<2.0	-	<2.0	<2.0	-	5	-	-
Titanium	µg/g	-	-	599	560	419	677	103	5	-	-
Uranium	µg/g	-	-	3.2	3.0	1.9	3.8	0.75	5	-	-
Vanadium	µg/g	-	-	46	42	32	48	7.2	5	-	-
Zinc	µg/g	123	315	91	83	68	96	14	5	-	-

Bolded values are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

ISQG = Interim Sediment Quality Guideline; PEL = Probable Effects Level; µg/g = micrograms per gram; - = no guideline or data.

Table 8.4-3: Sediment Quality Summary for the Pooled Reference Areas in 2018

Parameter	Unit (Dry Weight)	Guidelines		Summary Statistics							
		ISQG	PEL	Median	Mean	Minimum	Maximum	Standard Deviation	Count	% Above Guideline	
										I	P
Particle-size and Organic Carbon											
Sand	%	-	-	55	54	13	92	24	10	-	-
Silt	%	-	-	37	40	7.5	77	21	10	-	-
Clay	%	-	-	5.8	6.1	<1.0	16	4.8	10	-	-
Fines (Silt + Clay)	%	-	-	45	46	8.0	87	24	10	-	-
Total organic carbon	%	-	-	5.9	4.7	0.29	7.7	2.9	10	-	-
Metals											
Aluminum	µg/g	-	-	7,820	8,146	5,160	13,600	2,764	10	-	-
Antimony	µg/g	-	-	<0.1	-	<0.1	0.27	-	10	-	-
Arsenic	µg/g	5.9	17	**6.4**[I]	**7.9**[I]	3.4	**23**[I, P]	5.7	10	50	10
Barium	µg/g	-	-	65	68	22	132	34	10	-	-
Beryllium	µg/g	-	-	0.19	0.18	<0.1	0.27	0.066	10	-	-
Bismuth	µg/g	-	-	<0.2	-	<0.2	0.35	-	10	-	-
Boron	µg/g	-	-	5.1	4.5	<5.0	8.0	2.2	10	-	-
Cadmium	µg/g	0.6	3.5	0.18	0.18	<0.02	0.43	0.12	10	-	-
Calcium	µg/g	-	-	3,745	3,847	1,530	6,080	1,428	10	-	-
Chromium	µg/g	37	90	33	36	19	**65**[I]	16	10	40	-
Cobalt	µg/g	-	-	7.1	7.2	3.6	15	3.5	10	-	-
Copper	µg/g	36	197	**62**[I]	**50**[I]	7.4	**92**[I]	31	10	70	-
Iron	µg/g	-	-	12,650	13,875	9,000	28,300	5,612	10	-	-
Lead	µg/g	35	91	4.9	5.0	1.8	10	2.5	10	-	-
Lithium	µg/g	-	-	9.9	11	6.4	17	3.2	10	-	-
Magnesium	µg/g	-	-	4,660	4,979	2,930	8,800	1,785	10	-	-
Manganese	µg/g	-	-	158	166	104	285	62	10	-	-
Mercury	µg/g	0.17	0.49	0.009	0.0082	<0.005	0.015	0.0046	10	-	-

Table 8.4-3: Sediment Quality Summary for the Pooled Reference Areas in 2018

Parameter	Unit (Dry Weight)	Guidelines		Summary Statistics							
		ISQG	PEL	Median	Mean	Minimum	Maximum	Standard Deviation	Count	% Above Guideline	
										I	P
Metals (cont'd)											
Molybdenum	µg/g	-	-	2.4	2.7	0.5	9.5	2.5	10	-	-
Nickel	µg/g	-	-	33	32	12	65	16	10	-	-
Potassium	µg/g	-	-	1,265	1,490	654	3,160	711	10	-	-
Selenium	µg/g	-	-	0.52	0.5	<0.2	1.2	0.36	10	-	-
Silver	µg/g	-	-	<0.1	-	<0.1	0.17	-	10	-	-
Sodium	µg/g	-	-	190	204	<100	360	95	10	-	-
Strontium	µg/g	-	-	19	19	8.3	31	7.2	10	-	-
Thallium	µg/g	-	-	0.14	0.15	0.056	0.31	0.076	10	-	-
Tin	µg/g	-	-	<2.0	-	<2.0	<2.0	-	10	-	-
Titanium	µg/g	-	-	512	551	350	819	144	10	-	-
Uranium	µg/g	-	-	1.8	2.2	0.46	7.2	1.9	10	-	-
Vanadium	µg/g	-	-	33	36	20	77	16	10	-	-
Zinc	µg/g	123	315	48	44	20	70	17	10	-	-

Bolded values are higher than sediment quality guidelines.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

ISQG = Interim Sediment Quality Guideline; PEL = Probable Effects Level; µg/g = micrograms per gram; - = no guideline or data.

8.4.1.1 Particle-size and Organic Carbon

Sediment particle-size analysis revealed different substrate types across the AEMP study area. As observed in previous years, a greater percentage of silt was observed in the Near-field and Mid-field areas compared to the reference areas, which tended to be more dominated by sand (Figures 8.4.1 and 8.4.2). In 2018, TOC ranged from 0.3% and 9.0% at the stations sampled, but most values were between 4.0% and 8.0%. This range is consistent with results obtained in the previous years for Meliadine Lake (Figure 8.4-3). Of the areas sampled in 2018, the reference areas were more variable in TOC compared to the exposure areas.

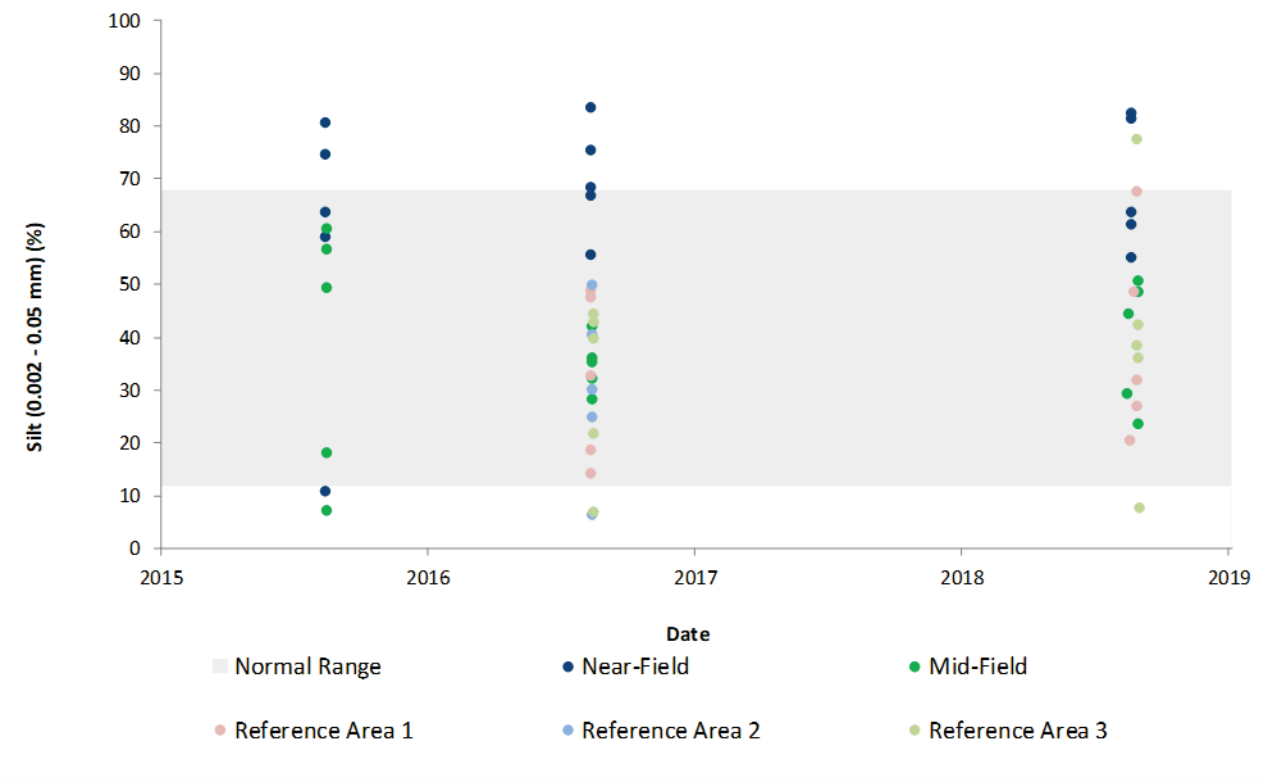


Figure 8.4-1: Silt (%) in Meliadine Lake, 2015 to 2018

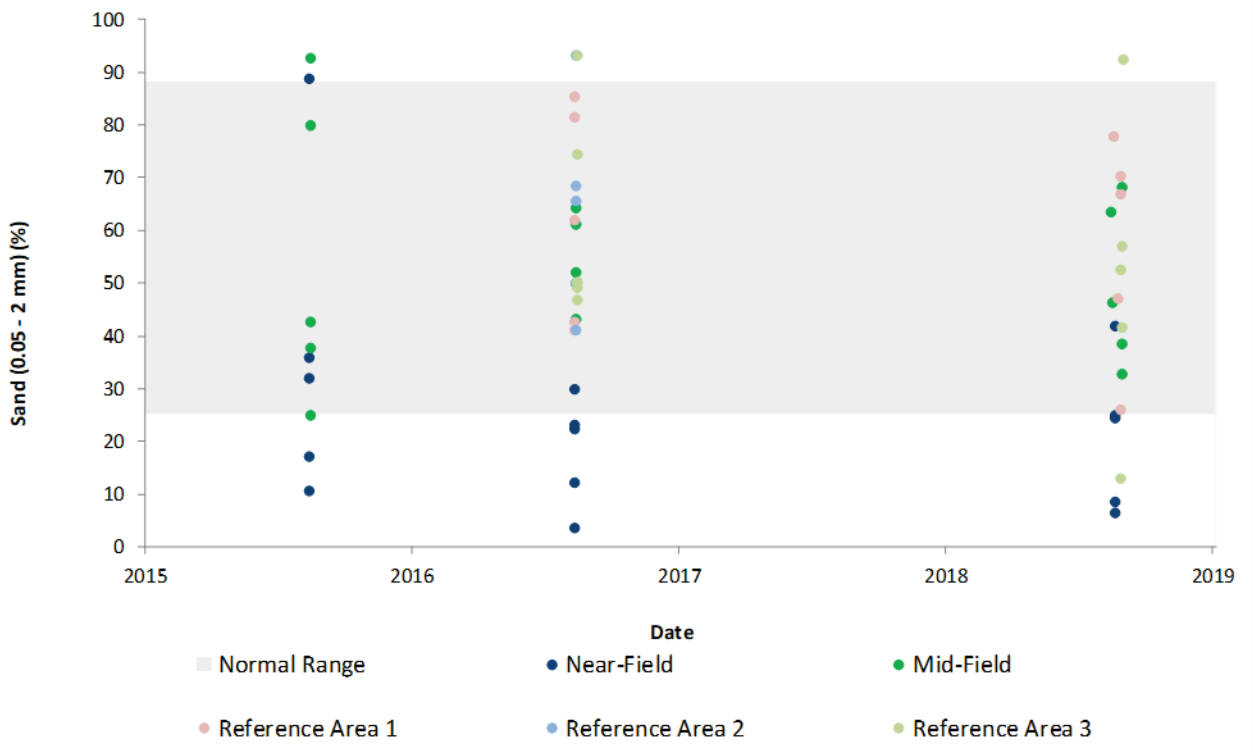


Figure 8.4-2: Sand (%) in Meliadine Lake, 2015 to 2018

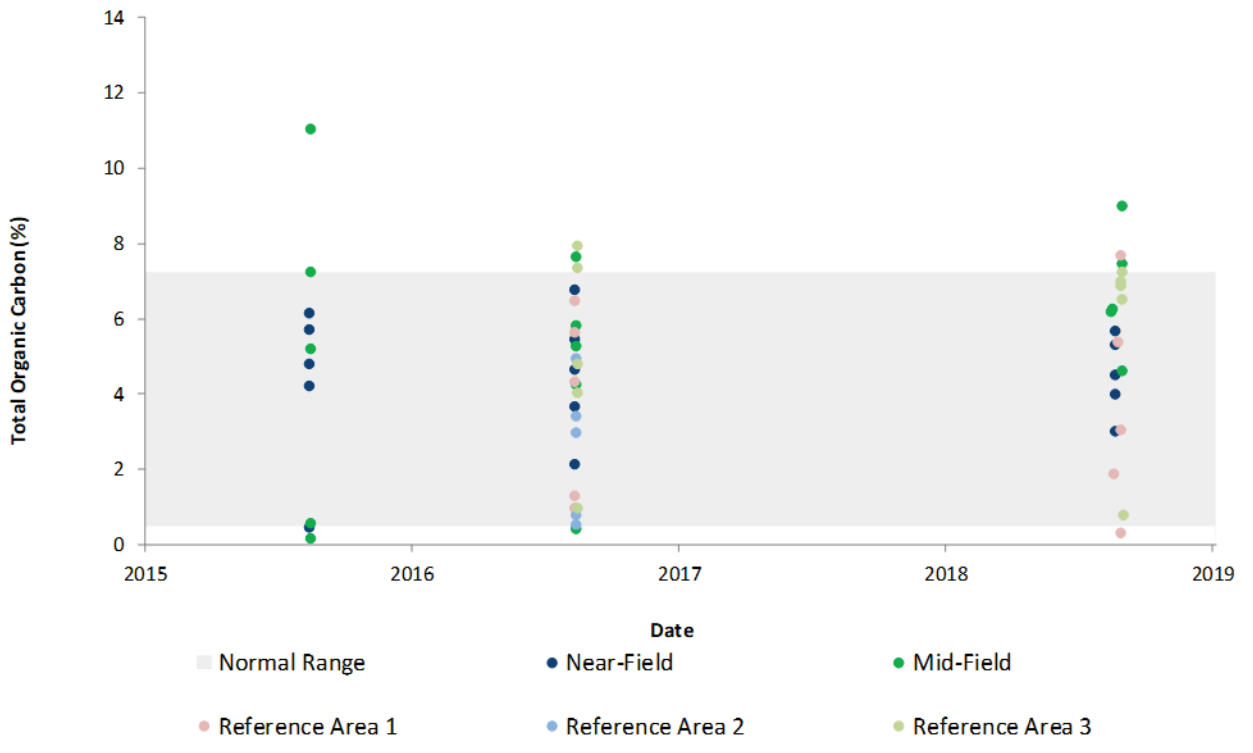


Figure 8.4-3: Concentrations of Total Organic Carbon in Meliadine Lake, 2015 to 2018

8.4.1.2 Metals

Concentrations of metals and metalloids[4] at exposure and reference stations sampled in 2018 were below sediment quality guidelines with the following exceptions:

- Arsenic concentrations at the five Near-field stations exceeded the ISQG. Concentrations at four of the five stations also exceeded the PEL (Figure 8.4.4). The maximum arsenic concentration of 33 µg/g was 5.6 times the ISQG and 1.9 times the PEL. For chromium and copper, sediments at all five Near-field stations were above the ISQGs but were below their respective PELs.
- In the Mid-field area, arsenic and copper concentrations exceeded ISQG at the five stations sampled in 2018 but did not exceed PEL. Chromium concentrations were also above the ISQG but below the PEL at four of the five stations sampled.
- At one Near-field station, sediment cadmium concentration was equivalent to the ISQG.
- In Reference Area 1, only one out of five samples exceeded the ISQG for arsenic and chromium, whereas for copper concentrations at three of the five stations were above the ISQG.
- In Reference Area 3, ISQGs were exceeded at four of the five stations sampled for arsenic and three of the five stations for copper. The arsenic concentration at one station of 23 µg/g was also above the PEL by a factor of 1.4.

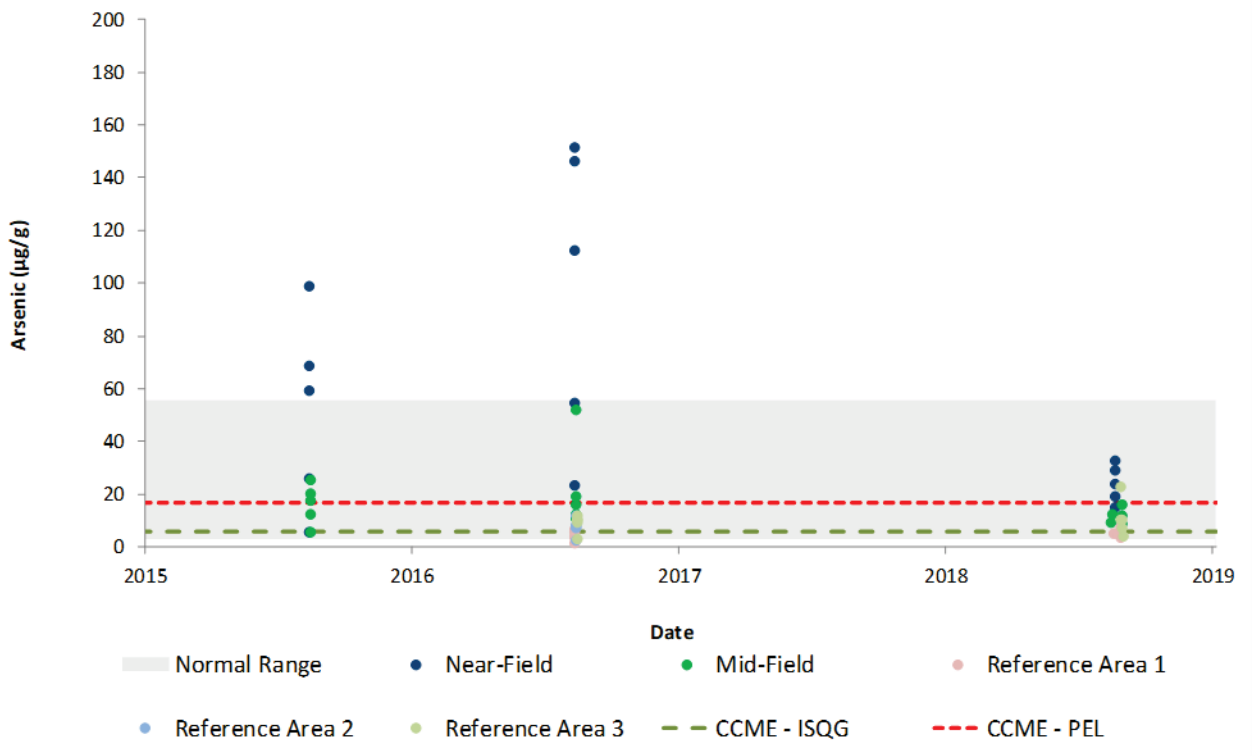


Figure 8.4-4: Concentrations of Arsenic in Meliadine Lake, 2015 to 2018

Metals, metalloids (e.g., arsenic), and non-metals (e.g., selenium) are referred to as “metals” in this document.

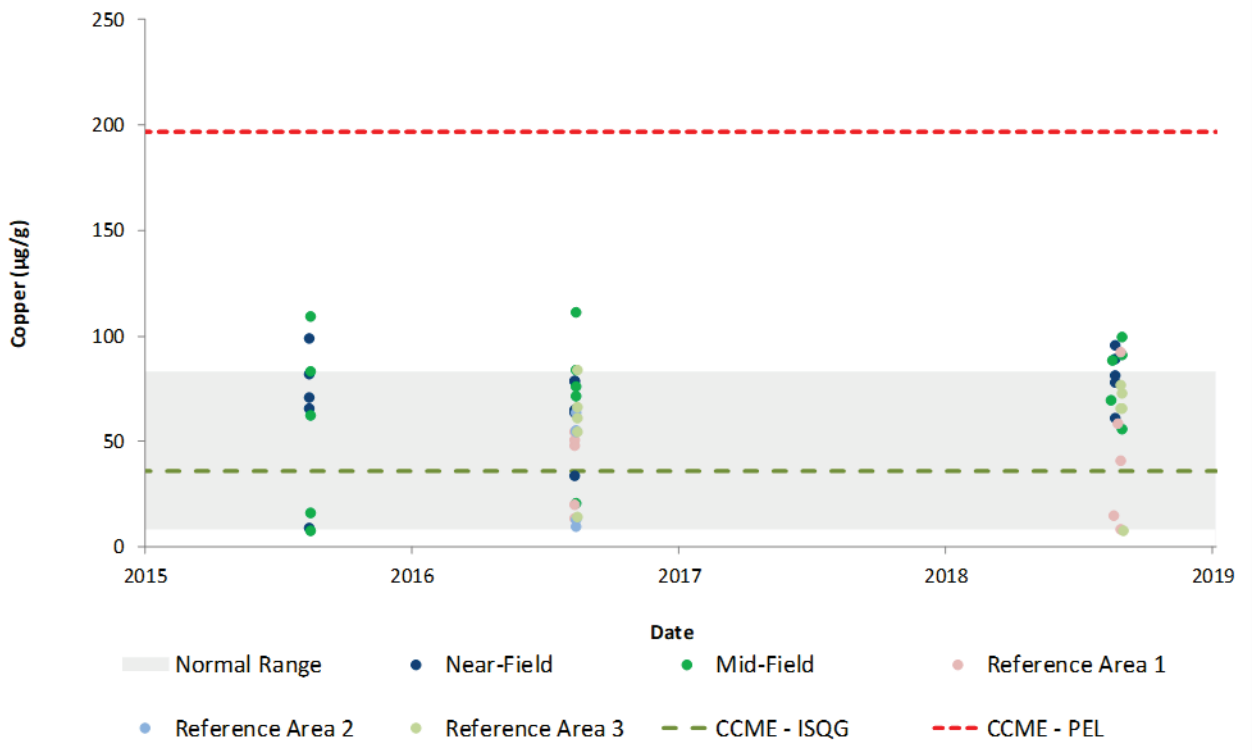


Figure 8.4-5: Concentrations of Copper in Meliadine Lake, 2015 to 2018

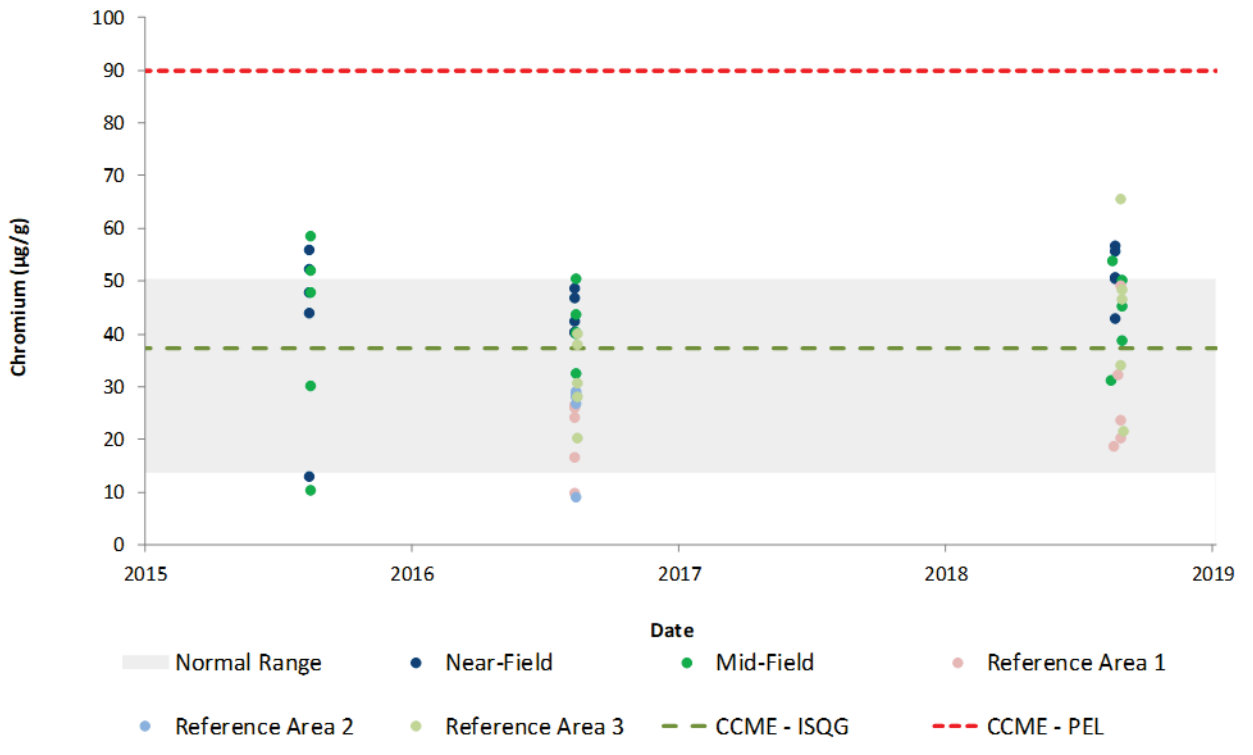


Figure 8.4-6: Concentrations of Chromium in Meliadine Lake, 2015 to 2018

Naturally elevated concentrations of arsenic, chromium, and copper have also been observed in sediments in other northern Canadian lakes. The occurrence of ISQG exceedances for several metals and the occasional arsenic PEL exceedance in the 2018 sediment data are consistent with observations made by Puznicki (1997) in an overview of sediment chemistry in lakes of the Northwest Territories (NT). The author reported that arsenic and nickel concentrations frequently exceeded ISQGs (>70% of samples) and occasionally PELs (>15% of samples); other metals also occasionally exceeded ISQGs (i.e., cadmium, chromium, copper, lead, mercury, zinc).

With specific reference to arsenic, sediment concentrations reported in the Near-field area under baseline conditions in 2015 and 2016 were above sediment quality guidelines and extended above the concentration range reported for this area in 2018 (Figure 8.4-4 and Table 8.4-1). Although to a lesser extent, arsenic guideline exceedances were also reported under baseline conditions for the Mid-field and reference areas located further away from the mine (Figure 8.4-4 and Table 8.4-3). Naturally elevated arsenic concentrations were previously identified in sediments and soils within the vicinity of the Meliadine Mine Site during baseline sampling and development of the FEIS (Agnico Eagle 2014, Volume 6, SD6-3; Volume 7; Section 7.4). For example:

- Mean sediment arsenic concentration in Meliadine Lake exceeded the ISQG by a factor of two, and arsenic concentrations in Peninsula Lakes exceeded both ISQG and PEL.
- Soil arsenic concentrations in the vicinity of the Meliadine Mine Site ranged from 10 to 10,000 µg/g, with an average of 30 µg/g.

Naturally high concentrations of arsenic associated with gold deposits are a common feature (Straskraba and Moran 1990), as the arsenic-associated minerals arsenopyrite, pyrite, pyrrhotite, and chalcopyrite are directly associated with gold mineralization (Agnico Eagle 2014).

8.4.1.3 Relationship Between Particle Size and Metal Concentrations

Particle-size is a key factor in determining the distribution of metals in lake sediments, with a propensity for most metals to preferentially accumulate in finer sediments, such as silt and clay. As well as sediment texture, TOC content can also influence metal concentrations in sediments, with higher concentrations typically associated with higher TOC values. However for the AEMP, TOC values were relatively consistent across study areas in 2018 when compared to particle-size, which, as described in Section 8.4.1.1 differed between the Near-field area and the other study areas located farther away from the Mine. Similar observations regarding differences in particle-size between areas were also made by Golder (2018c) for data collected under baseline conditions. Golder (2018c) demonstrated that a higher proportion of finer sediments in the Near-field area was associated with proportionally higher concentrations of some metals compared to the reference areas. As a consequence, 2015 and 2016 sediment metals data were normalized prior to statistical analysis for the 2018 assessment to address the potentially confounding factor of varying particle-size distribution among sampling areas.

Normalization of metal data is a procedure that aims to reduce the influence of particle-size and mineralogy on metal concentrations, and thus allows assessing the differences between natural and anthropogenic inputs (Ho et al. 2012). It is well documented that finer sediments tend to offer more binding sites for metals, and so are often highly correlated with metal concentrations (Environment Canada 2012). The use of fine sediments to normalize sediment chemistry was appropriate for the 2015 to 2018 dataset, because strong correlations were observed between metal concentrations and percent fines (Table 8.4-4, Figure 8.4-7). This is the normalization method suggested by EC (2012) to address differences in substrate composition. An alternative normalization method is to normalize sediment data to conservative elements such aluminum, iron or lithium (Ho et al 2012). The high correlation between aluminum and fines in 2018 (r = 0.929; Figure 8.4-7) suggests that both

normalization procedures would yield similar results, which was confirmed by the scatter-plots (Appendix 8E) and correlation matrices for 2018 and all available data (Table 8.4-4).

Table 8.4-4: Spearman Rank Correlations between Percent-fines or Aluminum and Sediment Quality Variables, 2015 to 2018 (n=55) and 2018 only (n=20).

Sediment Variable	2015 to 2018				2018			
	Correlation Coefficient (*r*)		*P*-value		Correlation Coefficient (*r*)		*P*-value	
	Fines (%)	Aluminum	Fines (%)	Aluminum	Fines (%)	Aluminum	Fines (%)	Aluminum
Fines (%)	1.000	0.819	**<0.001**	**<0.001**	1.000	0.929	**<0.001**	**<0.001**
Aluminum	0.819	1.000	**<0.001**	**<0.001**	0.929	1.000	**<0.001**	**<0.001**
Antimony	0.729	0.715	**<0.001**	**<0.001**	0.814	0.760	**<0.001**	**<0.001**
Arsenic	0.784	0.818	**<0.001**	**<0.001**	0.886	0.893	**<0.001**	**<0.001**
Barium	0.783	0.914	**<0.001**	**<0.001**	0.843	0.894	**<0.001**	**<0.001**
Beryllium	0.823	0.946	**<0.001**	**<0.001**	0.855	0.916	**<0.001**	**<0.001**
Bismuth	0.785	0.897	**<0.001**	**<0.001**	0.881	0.916	**<0.001**	**<0.001**
Boron	0.628	0.626	**<0.001**	**<0.001**	0.848	0.814	**<0.001**	**<0.001**
Cadmium	0.806	0.893	**<0.001**	**<0.001**	0.829	0.865	**<0.001**	**<0.001**
Calcium	0.662	0.818	**<0.001**	**<0.001**	0.785	0.776	**<0.001**	**<0.001**
Chromium	0.811	0.971	**<0.001**	**<0.001**	0.893	0.971	**<0.001**	**<0.001**
Cobalt	0.833	0.907	**<0.001**	**<0.001**	0.875	0.949	**<0.001**	**<0.001**
Copper	0.683	0.852	**<0.001**	**<0.001**	0.839	0.806	**<0.001**	**<0.001**
Iron	0.783	0.871	**<0.001**	**<0.001**	0.905	0.974	**<0.001**	**<0.001**
Lead	0.842	0.912	**<0.001**	**<0.001**	0.901	0.927	**<0.001**	**<0.001**
Lithium	0.814	0.934	**<0.001**	**<0.001**	0.893	0.938	**<0.001**	**<0.001**
Magnesium	0.804	0.977	**<0.001**	**<0.001**	0.891	0.988	**<0.001**	**<0.001**
Manganese	0.776	0.870	**<0.001**	**<0.001**	0.852	0.909	**<0.001**	**<0.001**
Mercury	0.713	0.708	**<0.001**	**<0.001**	0.776	0.818	**<0.001**	**<0.001**
Molybdenum	0.729	0.773	**<0.001**	**<0.001**	0.877	0.869	**<0.001**	**<0.001**
Nickel	0.880	0.938	**<0.001**	**<0.001**	0.926	0.951	**<0.001**	**<0.001**
Potassium	0.876	0.908	**<0.001**	**<0.001**	0.911	0.950	**<0.001**	**<0.001**
Selenium	0.826	0.885	**<0.001**	**<0.001**	0.903	0.904	**<0.001**	**<0.001**
Silver	0.775	0.890	**<0.001**	**<0.001**	0.854	0.869	**<0.001**	**<0.001**
Sodium	0.878	0.907	**<0.001**	**<0.001**	0.930	0.940	**<0.001**	**<0.001**
Strontium	0.720	0.889	**<0.001**	**<0.001**	0.811	0.811	**<0.001**	**<0.001**
Thallium	0.843	0.891	**<0.001**	**<0.001**	0.853	0.886	**<0.001**	**<0.001**
Titanium	0.779	0.855	**<0.001**	**<0.001**	0.770	0.854	**<0.001**	**<0.001**
TOC	0.538	0.549	**<0.001**	**<0.001**	0.439	0.365	**0.053**	**0.113**
Uranium	0.837	0.930	**<0.001**	**<0.001**	0.907	0.932	**<0.001**	**<0.001**
Vanadium	0.810	0.930	**<0.001**	**<0.001**	0.918	0.979	**<0.001**	**<0.001**
Zinc	0.780	0.928	**<0.001**	**<0.001**	0.795	0.844	**<0.001**	**<0.001**

Fines (%) = silt + clay, TOC = total organic carbon.

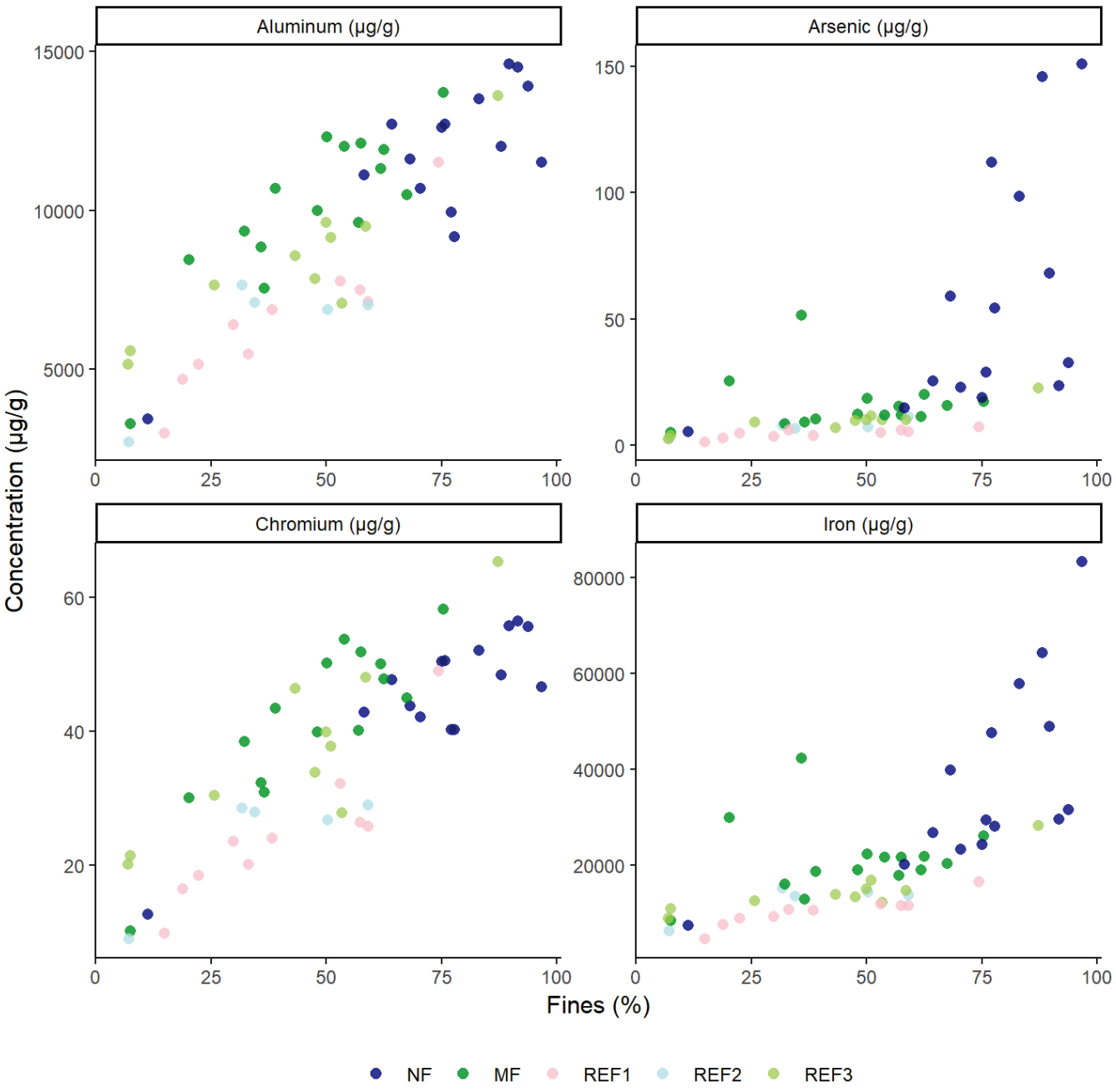


Figure 8.4-7: Scatter-plots of Selected Sediment Metal Concentrations versus Percent-fines in Meliadine Lake, 2015 to 2018

8.4.2 2018 Spatial Comparison

8.4.2.1 EEM

The Cycle 1 EEM Study Design is based on a control-impact comparison of Near-field area (MEL-01) and Reference Area 1 (MEL-03). Summary statistics calculated for both areas are presented in Table 8.4-5.

In 2018, the following parameters had a mean concentration in the Near-field area that was greater than two times the Reference area mean, up to a maximum of 4.6 times the reference mean (arsenic):

- clay
- arsenic
- bismuth
- cadmium
- cobalt
- iron
- lead
- manganese
- mercury
- molybdenum
- nickel
- selenium
- thallium
- uranium
- zinc

Sediments at Near-field area stations were mostly silt-dominated in comparison to sediments sampled at Reference Area 1, which had a higher percentage of sand (Table 8.4-5). Mean% fines in the Near-field area was approximately 1.9 times higher than mean% fines in Reference Area 1. Correspondingly, mean% sand in the Near-field area was approximately 2.5 times lower than mean% sand in Reference Area 1. Higher metal concentrations and finer sediments documented in the Near-field area in 2018 relative to the reference areas also occurred prior to the Mine effluent discharge under baseline conditions in 2015 and 2016 (as discussed in Section 8.4.1.2).

For arsenic, the 2018 Near-field concentrations were substantially lower than those reported under baseline conditions, as discussed further in Section 8.4.1.2 and shown in Figures 8.4-4 to 8.4-6. Sediment arsenic concentrations were also less variable between Near-field stations in 2018 compared to the previous two monitoring years.

Table 8.4-5: Sediment Quality Summary for the Cycle 1 EEM Exposure and Reference Areas in 2018

Parameter	Unit (Dry Weight)	Guidelines		Summary Statistics												
				Exposure Area						Reference Area						Comparison
		ISQG	PEL	Median	Mean	Minimum	Maximum	Standard Deviation	Count	Median	Mean	Minimum	Maximum	Standard Deviation	Count	EXP / REF
Particle-size and Organic Carbon																
Sand	%	-	-	24	21	6.3	42	14	5	67	57	26	78	21	5	0.4
Silt	%	-	-	64	69	55	82	12	5	32	39	20	67	19	5	1.8
Clay	%	-	-	11	10	3.3	15	4.2	5	3.1	3.6	1.5	6.9	2.2	5	2.8
Fines (Silt + Clay)	%	-	-	76	79	58	94	14	5	33	43	22	74	21	5	1.9
Total organic carbon	%	-	-	4.5	4.5	3.0	5.7	1.1	5	3.0	3.6	0.29	7.7	2.9	5	1.3
Total Metals																
Aluminum	µg/g	-	-	12,700	12,960	11,100	14,500	1,315	5	6,410	7,268	5,160	11,500	2575	5	1.8
Antimony	µg/g	-	-	0.15	0.15	0.13	0.18	0.019	5	<0.1	-[a]	<0.1	0.12	-[a]	5	-[a]
Arsenic	µg/g	5.9	17	**23**[I, P]	**24**[I, P]	**15**[I]	**33**[I, P]	7	5	5.0	5.2	3.4	**7.2**[I]	1.4	5	4.6
Barium	µg/g	-	-	115	115	90	136	20	5	63	65	31	104	31	5	1.8
Beryllium	µg/g	-	-	0.33	0.32	0.28	0.37	0.033	5	0.15	0.18	0.12	0.27	0.060	5	1.8
Bismuth	µg/g	-	-	0.32	0.32	0.25	0.37	0.045	5	<0.2	0.12	<0.2	0.21	0.049	5	2.7
Boron	µg/g	-	-	6.9	6.8	5.9	8.2	0.92	5	<5.0	4.0	<5.0	6.9	2.1	5	1.7
Cadmium	µg/g	0.6	3.5	0.52	0.52	0.41	**0.6**[I]	0.07	5	0.18	0.14	<0.02	0.28	0.11	5	3.7
Calcium	µg/g	-	-	4,460	4,368	3,760	4,700	360	5	3,300	3,752	2,660	5,880	1355	5	1.2
Chromium	µg/g	37	90	**51**[I]	**51**[I]	**43**[I]	**57**[I]	5.5	5	24	29	19	**49**[I]	13	5	1.8
Cobalt	µg/g	-	-	16	16	8.5	27	6.9	5	5.8	5.8	3.6	9.0	2.3	5	2.8
Copper	µg/g	36	197	**81**[I]	**81**[I]	**61**[I]	**95**[I]	13	5	**41**[I]	**42**[I]	7.6	**92**[I]	34	5	1.9
Iron	µg/g	-	-	29,400	27,020	20,200	31,600	4,669	5	10,700	11,510	9,000	16,600	3069	5	2.3
Lead	µg/g	35	91	11	11	8.8	13	1.7	5	3.4	4.1	2.8	6.9	1.6	5	2.7
Lithium	µg/g	-	-	15	15	13	17	1.7	5	9.6	11	7.9	17	3.4	5	1.4
Magnesium	µg/g	-	-	7,180	7,254	6,160	8,030	722	5	3,840	4,180	2,930	6,500	1447	5	1.7
Manganese	µg/g	-	-	351	360	273	471	72	5	123	149	104	251	61	5	2.4
Mercury	µg/g	0.17	0.49	0.028	0.03	0.019	0.044	0.01	5	0.0064	0.0071	<0.005	0.015	0.0053	5	4.2
Molybdenum	µg/g	-	-	4.4	5.3	3.0	9.4	2.5	5	1.7	2.0	1.4	2.8	0.63	5	2.7
Nickel	µg/g	-	-	69	67	47	85	14	5	24	26	15	46	13	5	2.6
Potassium	µg/g	-	-	2,290	2,304	1,940	2,530	242	5	1,330	1,454	1040	2,200	469	5	1.6
Selenium	µg/g	-	-	0.94	0.95	0.69	1.2	0.17	5	0.34	0.36	<0.2	0.79	0.29	5	2.6
Silver	µg/g	-	-	0.2	0.19	0.14	0.22	0.033	5	<0.1	0.062	<0.1	0.11	0.027	5	3.1
Sodium	µg/g	-	-	330	318	250	360	44	5	190	208	130	350	89	5	1.5
Strontium	µg/g	-	-	25	24	20	27	2.5	5	16	18	12	31	7.6	5	1.3
Thallium	µg/g	-	-	0.37	0.36	0.26	0.45	0.073	5	0.15	0.13	0.058	0.21	0.066	5	2.8
Tin	µg/g	-	-	<2.0	-[a]	<2.0	<2.0	-[a]	5	<2.0	-[a]	<2.0	<2.0	-[a]	5	-[a]
Titanium	µg/g	-	-	739	726	641	786	58	5	525	570	486	787	124	5	1.3
Uranium	µg/g	-	-	4.2	4.3	3.6	5.1	0.51	5	1.4	1.7	0.91	3.1	0.88	5	2.5
Vanadium	µg/g	-	-	57	58	47	66	6.9	5	25	30	22	45	9.0	5	1.9
Zinc	µg/g	123	315	94	91	71	101	12	5	41	41	20	70	21	5	2.2

(a) Not calculated due to high percentage of results below the detection limits

Bolded values are higher than sediment quality guidelines.

Shaded values are greater than 2 times those in the Reference Area. Calculations were based on mean results.

(I) = value higher than the Interim Sediment Quality Guideline.

(P) = value higher than the Probable Effects Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.

ISQG = Interim Sediment Quality Guideline; PEL = Probable Effects Level; µg/g = micrograms per gram; EXP = Exposure Area; REF = Reference Area; - = no guideline or data.

8.4.2.2 AEMP

A spatial comparison between the three sampling areas (i.e. Near-field, Mid-field and pooled Reference) was completed for the 2018 sediment quality dataset. As discussed above, sediment metals data were normalized to percent-fines prior to conducting the analysis. The results are summarized in Table 8.4-6 and presented visually in box-and-whisker plots in Appendix 8D. The results identified as outliers are presented in Appendix 8F, the overall test results are also available in Table 8F-1, while the results obtained after outlier removal are presented and discussed below (Table 8.4-6).

A total of thirty-two parameters underwent statistical analysis to compare normalized metal concentrations between the exposure areas and the pooled reference areas[5]. Nineteen parameters met ANOVA assumptions for normality and homoscedasticity while thirteen parameters failed to meet these assumptions and were therefore tested using the non-parametric Kruskal-Wallis test.

A significant statistical difference between study areas was identified at $\alpha = 0.1$ for the majority of parameters, with the exception clay content and several normalized metals (i.e., aluminum, lithium, magnesium, potassium, titanium, vanadium) (Table 8.4-6). Where significant differences between the reference and exposure area were identified, the following were noted:

- Statistical testing confirmed differences observed in particle-size composition between the Near-field, Mid-field, and pooled reference areas.
- Sediments in the Near-field area had a significantly greater% of silt and a significantly lower% sand relative to the other areas.
- Percentages of silt and sand did not differ significantly between the Mid-field and pooled reference areas.
- Normalized TOC concentrations were significantly different for all comparisons, and followed the order Mid-field >Near-field >Reference area. Thus, the Mid-field had significantly higher TOC relative to the other areas.
- Normalized arsenic concentrations were significantly higher in the Near-field area compared to the pooled reference areas.
- For normalized cadmium, both the Near-field and Mid-field areas had higher concentrations relative to the pooled reference areas.
- Chromium and copper had greater normalized concentrations in the Mid-field area relative to the Near-field area, while Near-field area and pooled reference area concentrations were not significantly different.
- For three parameters, the outlier removal affected the test results; these are arsenic, cobalt and nickel. For these parameters, the overall comparison was not significant when the outliers were included, but tests were significant without the outliers.

The combined presence of higher concentrations of some normalized metals and TOC in the Mid-field area suggests that the TOC content could be partly responsible for the observed metal concentrations, given that some metals preferentially accumulate in sediments with elevated organic matter (Ho et al. 2012). Concentrations of several metals, both within and between the AEMP study areas, have consistently been shown to exhibit a degree

[5] Antimony, bismuth, silver and tin were removed from the parameter list due to the high percentage of results below DL.

of natural variability in part due to variability in substrate type and organic matter content. The exception is arsenic, which even when normalized for fine sediment content, still had significantly higher concentrations compared to the reference areas. Higher concentrations of arsenic in Near-field sediments even after normalization could be an indication of local sources (i.e., different mineralogy in a local scale) or effects of mine effluent discharge. Arsenic was not, however, elevated in the effluent or in the lake water (concentrations were also below the effluent discharge limit and the AEMP benchmark); therefore, the higher concentrations in the Near-field area were not linked to the Mine effluent discharge. Furthermore, as discussed in Section 8.4.1, a concentration gradient for sediment arsenic with higher concentrations within the Near-field area was evident before start-up of the Mine effluent discharge in 2018.

Statistical outliers were identified for a number of metals. As described in Section 8.2.4.2.1.2, the among-area statistical comparisons were completed with and without the relevant outliers, and the results are provided in Appendix 8F. The removal of the outliers reduced the *P*-value which resulted in three parameters (arsenic, cobalt, and nickel) showing a significant difference between areas that was not detected when the outliers were included in the analysis. However, excluding outliers did not substantially influence responses to the AEMP key questions for the sediment quality component, or the overall conclusions of the 2018 AEMP.

Table 8.4-6: Sediment Quality Comparison among Near-field, Mid-field Exposure Areas and the Pooled Reference Areas, 2018

Parameter	Unit	Overall Model		Outliers Removed	Near-field		Mid-field		Pooled Reference Area		Pairwise Comparisons					
											Near-field to Mid-field		Near-field to Reference		Mid-field to Reference	
		Test	*P*-value		Median	Mean	Median	Mean	Median	Mean	*P*-value	Magnitude (%)	*P*-value	Magnitude (%)	*P*-value	Magnitude (%)
Sand	%	ANOVA	**0.024**	-	24	21	46	50	55	54	**0.094**	-58%	**0.021**	-61%	0.907	NS
Silt	%	ANOVA	**0.016**	-	64	69	44	39	37	40	**0.040**	77%	**0.019**	73%	0.999	NS
Clay	%	ANOVA	0.102	-	11	10	9.5	11	5.8	6.1	-	-	-	-	-	-
Clay+Silt	%	ANOVA	**0.024**	-	76	79	54	50	45	46	**0.094**	57%	**0.021**	73%	0.908	NS
Total organic carbon	% /%Fines	ANOVA	**<0.001**	1	5.3	5.7	13	14	10	9.9	**<0.001**	-59%	**0.001**	-42%	**0.093**	41%
Aluminum	µg/g dw%Fines	ANOVA	0.112	-	16755	16654	20656	21164	16524	22920	-	-	-	-	-	-
Arsenic	µg/g dw%Fines	ANOVA	**0.001**	1	26	30	23	23	17	19	0.125	NS	**0.001**	58%	0.103	NS
Barium	µg/g dw%Fines	ANOVA	**0.002**	1	148	146	217	223	152	163	**0.004**	-35%	0.977	NS	**0.002**	37%
Beryllium	µg/g dw%Fines	ANOVA	**0.080**	-	0.41	0.42	0.54	0.54	0.41	0.43	0.113	NS	0.955	NS	0.105	NS
Boron	µg/g dw%Fines	ANOVA	**0.054**	-	8.1	8.8	12	12	9.7	11	**0.072**	-27%	0.914	NS	**0.084**	9%
Cadmium	µg/g dw%Fines	ANOVA	**0.001**	-	0.66	0.68	0.66	0.67	0.4	0.37	1.000	NS	**0.002**	84%	**0.002**	81%
Calcium	µg/g dw%Fines	ANOVA	**0.001**	1	5778	5631	9518	9771	8008	9739	**0.002**	-42%	**0.006**	-42%	0.436	NS
Chromium	µg/g dw%Fines	ANOVA	**0.052**	-	67	66	84	90	77	95	**0.043**	-27%	0.432	NS	0.217	NS
Cobalt	µg/g dw%Fines	Kruskal-Wallis	**0.077**	1	17	20	21	21	17	19	0.393	NS	0.166	NS	**0.026**	24%
Copper	µg/g dw%Fines	Kruskal-Wallis	**0.007**	1	104	103	163	163	117	105	**0.001**	-36%	0.267	NS	**0.002**	39%
Iron	µg/g dw%Fines	Kruskal-Wallis	**0.088**	-	33725	34378	35246	37241	31723	40259	0.951	NS	**0.058**	6%	**0.067**	11%
Lead	µg/g dw%Fines	Kruskal-Wallis	**0.001**	1	14	14	17	17	11	12	**0.033**	-18%	**<0.001**	27%	**<0.001**	55%
Lithium	µg/g dw%Fines	Kruskal-Wallis	0.257	-	19	19	27	26	23	30	-	-	-	-	-	-
Magnesium	µg/g dw%Fines	Kruskal-Wallis	0.213	-	9472	9322	11940	12495	10067	14369	-	-	-	-	-	-
Manganese	µg/g dw%Fines	Kruskal-Wallis	**0.001**	-	467	458	593	594	340	457	**0.011**	-21%	**0.001**	37%	**<0.001**	74%
Mercury	µg/g dw%Fines	ANOVA	**<0.001**	-	0.036	0.037	0.04	0.039	0.019	0.019	0.947	NS	**<0.001**	95%	**<0.001**	105%
Molybdenum	µg/g dw%Fines	Kruskal-Wallis	**0.035**	1	5.3	6.8	7.7	7.6	5.3	5.7	**0.029**	-31%	1.000	NS	**0.010**	45%
Nickel	µg/g dw%Fines	ANOVA	**0.003**	1	81	86	101	99	72	77	0.299	-13%	**0.094**	12%	**0.003**	29%
Potassium	µg/g dw%Fines	Kruskal-Wallis	0.362	-	2983	2958	3607	3605	3169	3791	-	-	-	-	-	-
Selenium	µg/g dw%Fines	Kruskal-Wallis	**0.004**	-	1.2	1.2	1.7	1.7	1.2	1.0	**0.003**	-29%	0.429	NS	**<0.001**	42%
Sodium	µg/g dw%Fines	Kruskal-Wallis	**0.090**	-	399	406	519	526	423	478	**0.028**	-23%	0.147	NS	0.228	NS
Strontium	µg/g dw%Fines	ANOVA	**0.002**	1	32	31	52	53	41	49	**0.001**	-42%	**0.047**	-37%	**0.064**	8%
Thallium	µg/g dw%Fines	ANOVA	**0.002**	1	0.45	0.46	0.47	0.5	0.33	0.36	0.812	NS	**0.013**	28%	**0.003**	39%
Titanium	µg/g dw%Fines	Kruskal-Wallis	0.205	-	929	938	1145	1200	1116	1588	-	-	-	-	-	-
Uranium	µg/g dw%Fines	ANOVA	**<0.001**	1	5.6	5.5	6.0	6.1	4.1	4.5	0.459	NS	**0.008**	22%	**<0.001**	36%
Vanadium	µg/g dw%Fines	Kruskal-Wallis	0.234	-	75	74	89	87	79	94	-	-	-	-	-	-
Zinc	µg/g dw%Fines	ANOVA	**<0.001**	1	118	116	171	172	98	114	**0.002**	-33%	0.263	NS	**<0.001**	51%

Note:
Shaded values indicate that the magnitude of difference was greater or equal to ±30%
Bolded values were significantly different at α = 0.1.
Italicized values were detection limits set as one-half the detection limit
Parameters with greater than 50% of the dataset below the detection limit were excluded from analysis and are not shown in this table.
ANOVA = analysis of variance; µg/g dw%Fines = microgram per grams dry weight normalized to percent-fines; NS = post-hoc test indicated no significant difference among areas; - = pairwise comparison was not conducted because overall model indicated no significant difference.

8.4.3 Temporal Comparison in the Near-field Area

Box-and-whisker Plots of the Near-field data are provided in Appendix 8G to facilitate interpretation of the Near-field area data over time. Box plots were generated for all reported sediment parameters with the exception of antimony, bismuth, silver and tin, which had a high percentage of results below RDLs.

Particle size parameters and TOC concentrations were reasonably consistent over time, and no clear trend was visible (Figure 8.4-8 and 8.4-9, Appendix 8G). These results suggest that the changes in the sampling station locations within in the Near-field area between 2016 and 2018 did not substantially influence the sediment substrate type sampled.

A decrease in arsenic concentrations between 2016 and 2018 within the Near-field area was observed (Figure 8.4-10, Appendix 8G). Arsenic concentrations in 2018 were lower than those reported in 2016 and 2015. These results highlight the natural variability of metal concentrations within the Near-field area of Meliadine Lake over time, given that grain size and TOC were reasonably consistent between years. Iron and mercury also showed a decrease between 2016 and 2018, but not to the same extent as observed for arsenic.

Several other metals increased in concentration between 2016 and 2018; i.e., aluminum, beryllium, chromium, copper, magnesium, sodium, strontium, thallium, titanium, vanadium and zinc. These increases between years were also considered to reflect natural variability in sediment metal concentrations within the Near-field area over time. This conclusion is further supported by the identification of variability for several metals between baseline years prior to the mine effluent discharge.

The re-positioning of the Near-field stations in 2018 in response to the Plume Delineation Study and the Sediment Reconnaissance Survey may also account, at least in part, for differences in the concentrations of some metals between 2015/2016 and 2018. The geochemical baseline study that supported the FEIS observed small-scale variability in the chemical composition of the soil (or overburden) (Agnico Eagle 2014), consistent with the natural spatial and temporal variability identified for lake sediments by the AEMP.

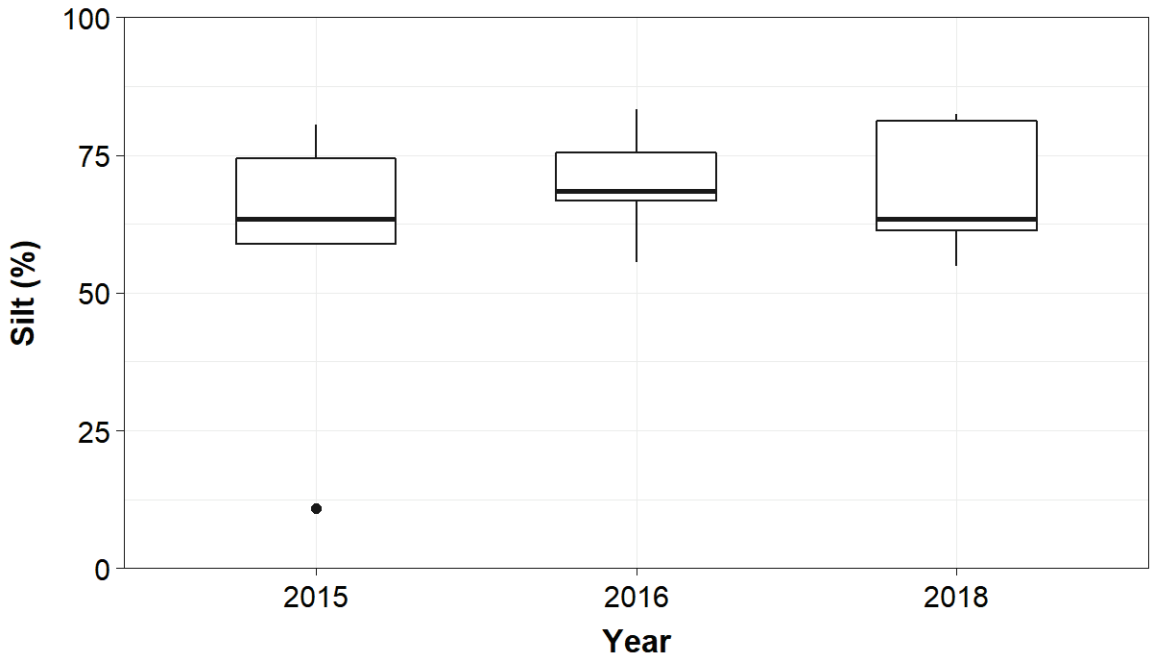
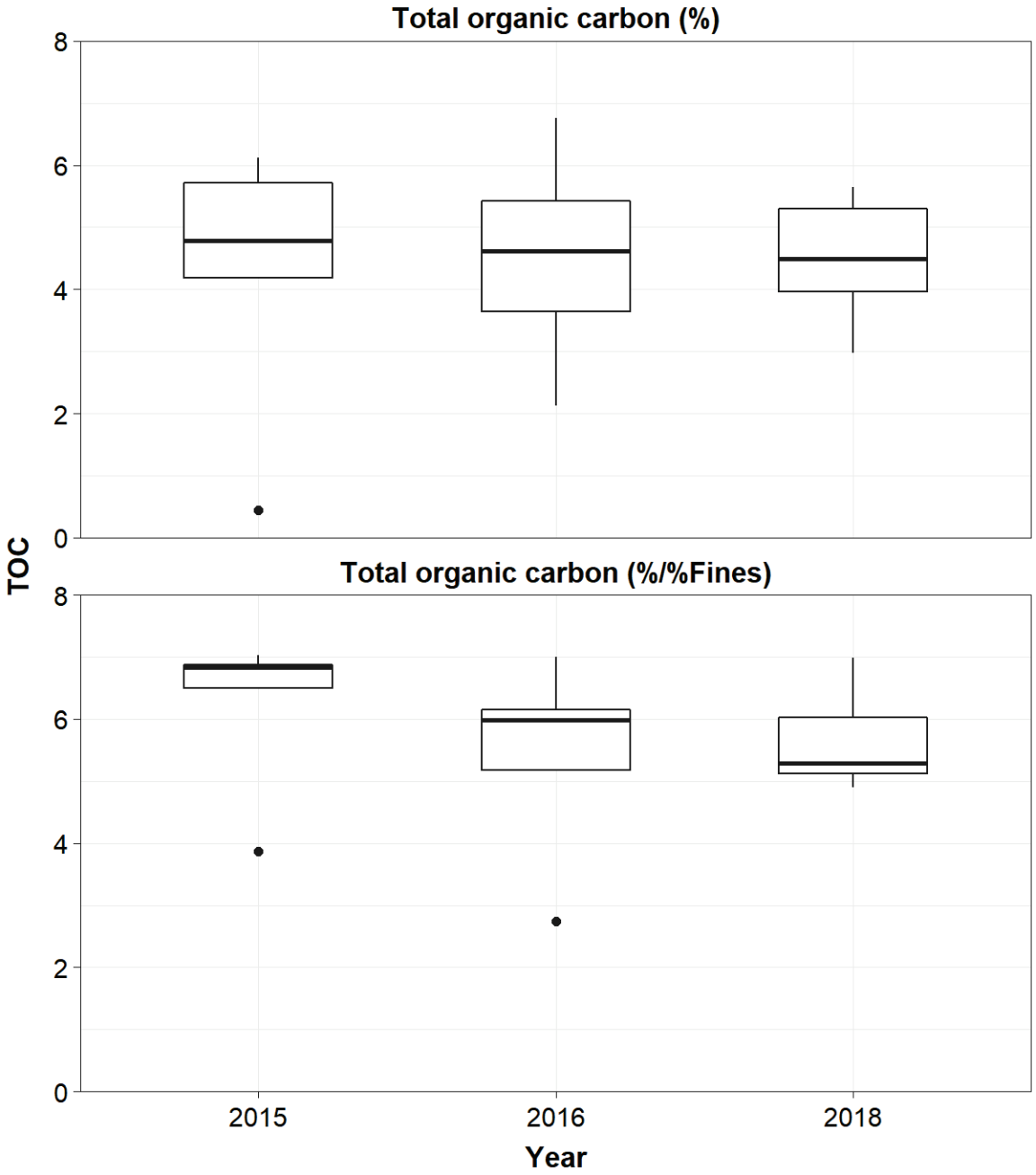
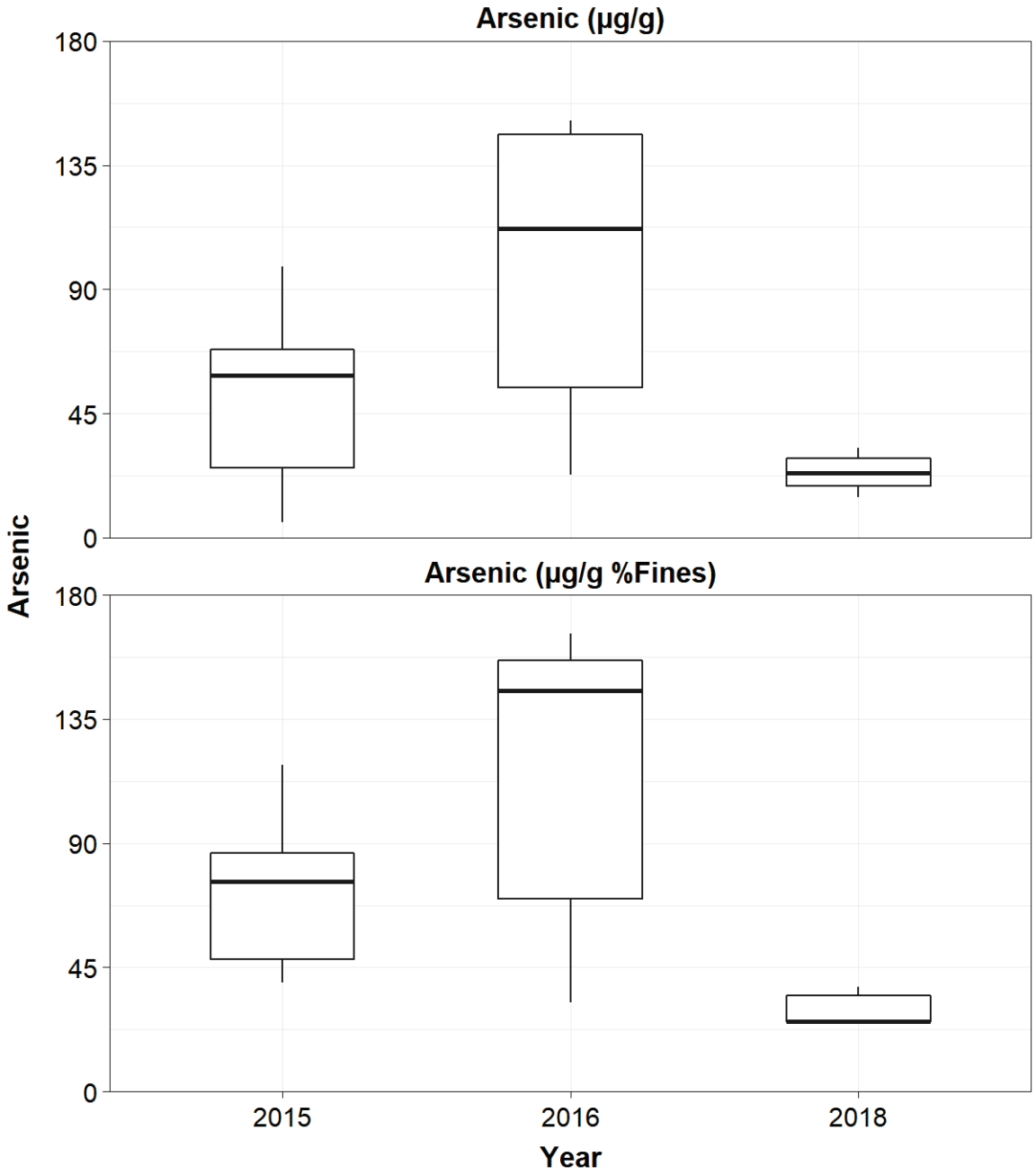


Figure 8.4-8: Box-and-whisker Plots of Silt (%) in the Meliadine Lake Near-field Area, 2018



Note: top: non-normalized data; bottom: data normalized to% fines.

Figure 8.4-9: Box-and-whisker Plots of Total Organic Carbon Concentrations in the Meliadine Lake Near-field Area, 2018



Note: top: non-normalized data; bottom: data normalized to% fines.

Figure 8.4-10: Box-and-whisker Plots of Arsenic Concentrations in Meliadine Lake Near-field Area, 2018

8.4.4 Comparison to Normal Ranges

Normal ranges were calculated using data available from the AEMP Reference areas, 2015 and 2016 data from the Near-field and Mid-field AEMP exposure areas, and appropriate pre-2015 data included in the FEIS[6]. These data were included in the normal range calculation to make sure that the normal ranges captured the natural spatial and temporal variability in particle-size and some metals, as identified within and among AEMP study areas by this 2018 assessment. Normal ranges may be updated with future AEMP reference area data as they become available to further characterize natural variability.

The normal ranges are summarized in Table 8.4-7 and shown graphically on plots provided in Appendix 8C. The lower bound of the normal range for clay, beryllium, bismuth, boron, mercury, selenium and silver was set to zero because the calculated value was below the most frequent DL. Tin was the only parameter where all results were below the DL, thus the lower bound was set to zero and the upper bound was set to the DL.

Near-field measures of central tendency (i.e., means or medians) for the first year of the mine effluent discharge (2018) are also provided in Table 8.4-8 and were compared to the normal range for each parameter. The 2018 Near-field mean/median values for the following parameters exceeded their respective normal ranges: % fines, aluminum, beryllium, cadmium, nickel, silver, thallium, and zinc. In the Mid-field area, only the copper mean/median value was above the normal range upper boundary.

Where mean/median values exceeded a normal range, values were only marginally above, by less than a factor of 1.2 (i.e., 20%), which is within the range of sampling variability that is typically observed in sediment quality data. As more sediment quality data are collected as part of the AEMP and the EEM program, emerging temporal trends will be evaluated relative to the normal ranges.

Table 8.4-7: Sediment Quality Normal Ranges for Meliadine Lake, 2018

Parameter	Unit (dry wt.)	Detection Limit[a]	Sample Size	Outliers Removed	Calculation Method	Normal Range		2018 Mean/Median[b]		
						Lower Bound	Upper Bound	Near-field	Mid-field	Reference Area[c]
Particle-size and Organic Carbon										
Sand	%	1	70	0	PI	25	88	21	50	54
Silt	%	1	70	0	PI(λ)	12	68	67	40	38
Clay	%	1	70	0	PI(λ)	0[d]	12	11	10	4.9
Fines (Silt + Clay)	%	1	70	0	PI	12	75	**79**	50	46
Total organic carbon	%	0.05	77	0	Percentile	0.49	7.2	4.5	6.2	5.9
Metals										
Aluminum	µg/g	50	60	0	PI	4,139	12,738	**12,960**	10,142	8,146
Antimony	µg/g	0.1	54	0	Percentile	0[d]	0.24	0.15	0.11	<0.1
Arsenic	µg/g	0.1	75	1	PI(λ)	2.9	56	23	11	6.1
Barium	µg/g	0.5	76	0	PI(λ)	25	134	115	109	64
Beryllium	µg/g	0.1	54	0	Percentile	0[d]	0.3	**0.33**	0.28	0.19
Bismuth	µg/g	0.2	54	0	Percentile	0[d]	0.35	0.32	0.23	<0.2

[6] With exceptions for antimony, beryllium, bismuth, cadmium, mercury, silver, thallium, tin and uranium analyzed under higher detection limits and with high percentage of non-detects. If data with high DLs was included it would artificially increase the upper lower of the normal ranges, therefore, following a conservative approach it was decided that these results should be excluded from analysis.

Table 8.4-7: Sediment Quality Normal Ranges for Meliadine Lake, 2018

Parameter	Unit (dry wt.)	Detection Limit[a]	Sample Size	Outliers Removed	Calculation Method	Normal Range		2018 Mean/Median[b]		
						Lower Bound	Upper Bound	Near-field	Mid-field	Reference Area[c]
Metals (cont'd)										
Boron	µg/g	5	54	0	Percentile	0[d]	7.8	6.9	7.0	5.1
Cadmium	µg/g	0.02	54	0	Percentile	0.033	0.51	**0.52**	0.34	0.18
Calcium	µg/g	100	60	0	Percentile	1,519	5,363	4,460	5,070	3,745
Chromium	µg/g	0.5	76	0	Percentile	14	51	51	45	33
Cobalt	µg/g	0.1	75	1	PI(λ)	2.9	17	15	10	6.4
Copper	µg/g	0.5	76	0	Percentile	8.4	83	81	**88**	62
Iron	µg/g	50	60	0	PI(λ)	7,446	45,945	27,759	18,407	12,319
Lead	µg/g	0.5	73	0	Percentile	2.1	14	11	8.7	4.9
Lithium	µg/g	0.5	55	0	Percentile	5.2	15	15	12	9.9
Magnesium	µg/g	20	60	0	PI(λ)	2,523	7,176	7,341	6,045	4,619
Manganese	µg/g	1	58	2	PI(λ)	102	625	352	289	150
Mercury	µg/g	0.005	54	0	PI(λ)	0[d]	0.061	0.029	0.018	0.0079
Molybdenum	µg/g	0.1	73	1	PI(λ)	0.73	6.7	4.7	3.6	2.1
Nickel	µg/g	0.5	76	0	Percentile	10	67	**69**	50	33
Potassium	µg/g	50	60	0	PI	647	2,453	2,304	1,732	1,490
Selenium	µg/g	0.2	73	0	Percentile	0[d]	1.2	0.94	0.91	0.52
Silver	µg/g	0.1	54	0	Percentile	0[d]	0.18	**0.2**	0.15	<0.1
Sodium	µg/g	100	60	0	Percentile	50	352	330	290	190
Strontium	µg/g	0.5	59	0	PI	10.1	29.6	24	25	19
Thallium	µg/g	0.05	54	0	Percentile	0[e]	0.32	**0.37**	0.25	0.14
Tin	µg/g	2	54	-	-	0[e]	2[e]	<2.0	<2.0	<2.0
Titanium	µg/g	1	59	0	PI	280	815	726	560	551
Uranium	µg/g	0.05	54	0	PI(λ)	0.67	4.3	4.3	3.1	1.6
Vanadium	µg/g	0.2	76	0	PI(λ)	15	59	58	43	31
Zinc	µg/g	2	76	0	Percentile	20	93	**94**	91	48

(a) Most frequent report detection limit.

(b) Lake area means or medians were calculated using the back-transformed mean when the normal range was defined as the prediction interval using Box-Cox transformed data. The arithmetic mean was used when the normal range was defined using untransformed data.

(c) Reference area data were pooled from Reference Areas 1 and 3.

(d) The lower bound of the normal range was less than the detection limit; therefore, the lower bound of the normal range was set to zero.

(e) All values in the dataset were non-detect; therefore, the normal range was set from zero to the detection limit.

Bolded concentrations exceed the upper bound of the normal range.

Percentile = 2.5th and 97.5th percentiles; PI= 80% prediction interval; PI(λ) = 80% prediction interval on Box-Cox transformed data; µg/g = micrograms per gram.

8.5 Summary

8.5.1 EEM

The main findings of the Cycle 1 EEM sediment quality assessment to support the EEM benthic invertebrate assessment were the following:

- ISQG exceedances for arsenic, cadmium and chromium were identified in both exposure and reference areas. Near-field arsenic concentrations in sediments were also above the PEL, by less than a factor of 2. The arsenic concentration at one reference station was above the PEL, by a factor of 1.4. All other sediment metal concentrations reported in 2018 were below sediment quality guidelines.
- Differences between exposure and reference areas were mainly associated with natural variability, which was also observed in 2015 and 2016, prior to the Mine effluent discharge. For metals above sediment quality guidelines in the Near-field area, concentrations in 2018 were lower than those reported under baseline conditions in 2015 and 2016.
- Higher concentrations of metals and finer sediments in the Near-Field area compared to reference areas was also observed under baseline conditions prior to the 2018 Mine effluent discharge; therefore, Near-field area concentrations are considered representative of pre-discharge conditions.

8.5.2 AEMP

In 2018, the AEMP sediment quality assessment was undertaken as per the approved AEMP Design Plan for the first year of Mine effluent discharge (Golder 2016a). This AEMP summary is focused on providing responses to two AEMP key questions:

- Are concentrations of sediment quality parameters in Meliadine Lake less than benchmarks[7]?
- Are concentrations in the exposure area increasing over time relative to the reference areas?

Action levels are not discussed here, because Action Levels for sediment chemistry were not developed for the current AEMP Design Plan. With respect to FEIS predictions, the FEIS stated that sediment quality was not expected to change due to the Mine effluent discharge, but the FEIS did not generate quantitative sediment quality predictions for contaminants of potential concern. The FEIS conclusion of no expected mine effluent-related change in sediment quality is addressed below in relation to the two AEMP key questions.

Are concentrations of sediment quality parameters in Meliadine Lake less than benchmarks?

Data obtained for the sediment quality component in 2018 identified ISQG exceedances for arsenic, copper, and chromium. The PEL for arsenic was exceeded in the Near-field area by less than a factor of 2 and at one reference station by a factor of 1.4. The 2018 Near-field mean/median values exceeded their respective normal ranges for % fines and several metals (i.e., aluminum, beryllium, cadmium, nickel, silver, thallium, and zinc). In the Mid-field area, copper exceeded its normal range. Reference area mean/median values were within normal ranges.

[7] Sediment quality guidelines are assumed surrogate for AEMP benchmarks for the purposes of this 2018 AEMP report.

Arsenic ISQG and PEL exceedances were more frequent in the Near-field area, possibly due to the combination of higher content of fine sediments and the known association of arsenic with gold deposits (i.e., the Near-field area might be more mineralogically enriched with arsenic compared to areas farther away from the mine). Arsenic concentrations within the same range were reported under AEMP baseline conditions and have been documented in other regional northern lakes. Thus, when 2018 Near-field data were compared to the arsenic normal range, the 2018 data were within that normal range calculated to represent the observed variability.

The majority of 2018 sediment metal concentrations were either below AEMP benchmarks or within normal range boundaries. Where mean/median values exceeded a normal range, values were only marginally above, by less than a factor of 1.2 (i.e., 20%), which is within the range of sampling variability typically observed in sediment quality data.

Are concentrations in the exposure area increasing over time relative to the reference areas?

Differences in particle-size composition among AEMP study areas was identified as a potential confounding factor in differentiating between mine-effluent related effects and natural variability within Meliadine Lake. After normalization to% fines to try to account for this potential confounding factor, arsenic, cadmium, iron, lead, manganese, mercury, nickel, thallium and uranium concentrations were still higher in the Near-field area.

Although some metals had higher concentrations in the Near-field area compared to baseline years, only a subset of these metals had mean/median values above their respective normal ranges. Normal ranges were calculated to represent natural variability observed in the sediment AEMP dataset to date. Where mean/median values exceeded a normal range, values were only marginally above, by less than a factor of 1.2 (i.e., 20%), which is within the range of sampling variability that is typically observed in sediment quality data. Thus, when natural variability was accounted for, the 2018 data indicated that concentrations in the Near-field area had not increased over time relative to the reference areas.

As more sediment quality data are collected by the AEMP, temporal trends will be further evaluated relative to normal ranges.

Overall, sediment quality in Meliadine Lake study areas was generally consistent with FEIS predictions.

8.6 Recommendations

No recommendations are provided for changes to benthic invertebrate monitoring under the EEM or AEMP.

8.7 List of Appendices

- Appendix 8A – Quality Assurance and Quality Control
- Appendix 8B – 2018 Sediment Quality Dataset
- Appendix 8C – Time Series Plots with Normal Ranges
- Appendix 8D – Box-and-Whisker Plots Comparing Sampling Areas
- Appendix 8E – Scatter Plots of Sediment Quality Parameter Concentrations versus Fines
- Appendix 8F – Statistical Outliers
- Appendix 8G – Box-and-Whisker Plots Comparing Sediment Quality among Years in the Near-field Area

8.8 References

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9.0 BENTHIC INVERTEBRATE COMMUNITY

To date, AEMP BIC monitoring has been completed at Meliadine Lake in 2015, 2016, and 2018 to meet Type A Water Licence requirements (Type A Water Licence (2AM-MEL1631, Part I, Item 3), and MDMER EEM program requirements for the first year of the Mine effluent discharge in 2018. Sampling was completed in August of each year as per the AEMP Design Plan and the Cycle 1 EEM Study Design approved by the relevant regulatory agencies (Golder 2016; 2017b). Sample collection was aligned with AEMP water and sediment quality monitoring programs in August 2018.

Benthic invertebrate monitoring programs in 2015 and 2016 were intended to characterize baseline conditions within exposure and reference areas on Meliadine Lake. The BIC and supporting data generated were evaluated in the 2017 AEMP Annual Report to establish baseline conditions for the AEMP prior to the onset of mine effluent discharge (Golder 2018c). This section provides a summary of BIC data obtained in 2018, analysis of the 2018 data and baseline data, and an interpretation of the results as per the requirements of the AEMP and EEM programs. Data analyses presented in this section have been undertaken as per the AEMP Design Plan (Golder 2016a), the Cycle 1 EEM Study Design (Golder 2017a), and in response to comments from ECCC, INAC, and the KIA during review of the 2017 AEMP annual report (Golder 2018a). The report also follows the Cycle 1 EEM Study Design and considers comments provided by ECCC on the design document (Golder 2017a; 2018d).

9.1 Objectives

The main objective of the 2018 benthic invertebrate program with respect to fulfilling EEM requirements was to determine if the Mine effluent discharge has had an effect on the BIC in Meliadine Lake. The primary objective of 2018 benthic invertebrate program with respect to fulfilling AEMP requirements was to determine whether treated Mine effluent has the potential to cause short- or long-term effects on the BIC due to changes in water or sediment quality in Meliadine Lake.

Specific objectives for the BIC component of the 2018 AEMP are as follows:

- Compare benthic invertebrate communities in exposure areas in Meliadine Lake at the lowest trophic level (LTL) to within-lake reference areas, based on benthic invertebrate effect endpoints (e.g., invertebrate density, taxonomic richness, evenness, and similarity to reference communities)
- Verify predictions made in the FEIS relating to benthic invertebrate communities
- Meet the requirements of Part 2, Schedule 9 (d) of the MDMER regulations (Government of Canada 2018).
- Assess the efficacy of mitigation strategies proposed in the AEMP Design Plan (Golder 2016a) and the Environmental Management and Protection Plan to minimize the effects of the Mine on the aquatic environment
- Provide data to inform adaptive management intended to reduce or eliminate Mine-related effects on benthic invertebrate communities in Meliadine Lake

To achieve these objectives, analysis and interpretation of benthic invertebrate data in 2018 were focused on answering the following key question, as defined in the AEMP Design Plan (Golder 2016a):

Is the benthic invertebrate community affected by potential Mine-related changes in water and sediment quality in Meliadine Lake?

Field survey and data analysis methods employed to answer these key questions are described in Section 9.2. A summary of QA and QC assessment on the 2018 data is provided in Section 9.3. Results and discussion are presented in Section 9.4. A summary of the BIC results and conclusions are provided for both the EEM Cycle 1 EEM study and the AEMP in Section 9.5.

9.2 Methods

9.2.1 Sampling Design

Benthic invertebrate community monitoring was completed according to the methods outlined in the Cycle 1 EEM Study Design (Golder 2017a) and the AEMP Design Plan (Golder 2016a). The program consisted of one benthic sampling event with concomitant water quality and sediment sampling events in August 2018.

The Cycle 1 EEM study was designed to evaluate potential structural differences in Meliadine Lake communities between the area exposed to the MEL-14 effluent discharge (i.e., Near-field area) and Reference Area 1. Determination of effect was based on statistical analysis of BIC effect endpoints, such as density, richness, and evenness and the Bray-Curtis similarity index, as recommended by EEM TGD (Environment Canada 2012). Supporting endpoints were analyzed to provide additional input in assessment a range of effects that may result from Mine effluent discharge at the family level (FL).

For the 2018 AEMP program, BIC sampling was undertaken at two exposure areas (i.e., Near-field area and Mid-field area) and two reference areas (Reference Area 1 and Reference Area 3) in 2018 (Table 9.2-1, Figure 9.2-1). Although the study designs were consistent between the EEM and the AEMP, some modifications to these designs were made, as outlined below for each program.

Sampling in 2018 deviated from the Cycle 1 EEM study design as follows:

- A petite Ponar grab was used in place of an Ekman grab in 2018, following an evaluation of the success rate of each grab sampler during the 2018 Sediment Reconnaissance Survey (described further below; details are provided in Appendix 9A). Previous monitoring programs (2015 and 2016) used both the Ekman and Ponar grabs in Meliadine Lake. The Ponar grab was selected to provide better penetration and recovery of coarse sand substrates. Equipment dimensions and sampling area were unchanged from the original study design (15.24 × 15.24 cm; bottom sampling area of 0.0232 m²).
- The location of the Near-field area differed from that specified in the EEM study design (located close the MEL-D-1 diffuser location for the previous dewatering discharge). As approved by ECCC, the Near-field area was re-located for the 2018 sampling event to monitor the first year of Mine effluent discharge from the CP1 diffuser. Prior to the August 2018 EEM/AEMP sampling event, a Plume Delineation Study was completed to determine placement of the five stations within the Near-field area (Section 2.4.4). Near-field stations remained within the profundal zone to allow for compatibility of habitat characteristics with the Mid-field area and reference areas.
- Discrete samples to assess within-station variability were not collected at Near-field station MEL-01-06 as listed in the EEM study design, due to time constraints related to weather delays and an equipment malfunction. Instead, discrete samples were collected from Reference Area 3 station MEL-05-04.

Although the 2018 study design remained consistent with the AEMP Design Plan, there were some modifications to sampling station locations in response to the Sediment Reconnaissance Survey and the Plume Delineation Study. As described in the 2017 AEMP Annual Report (Golder 2018c), the Near-field and reference areas had

different substrates, with the Near-field area are being silt-dominated and the reference areas sand-dominated. To minimize this potential confounding factor, a Sediment Reconnaissance Survey was executed in July 2018 prior to the August benthic community sampling event. The purpose of the survey was to further investigate suitable and comparable stations for sediment and benthos sampling within the already established exposure and reference areas. Based on the survey results and consideration of the Plume Delineation Study, some sampling stations were relocated for the August 2018 sampling event to optimize the AEMP and EEM study designs. Detailed results of the Sediment Reconnaissance Survey are presented in Appendix 9A.

Specific deviations from the AEMP Design Plan in relation to station location were as follows:

- **Near-field Stations**: MEL-01-01 was retained because it was also retained as part of the water quality component near-field station re-alignment, after review of the 2018 Plume Delineation Study results. Furthermore, the July 2018 Sediment Reconnaissance Survey confirmed that sampling efficiency and grab fullness at this station were acceptable. The other four stations confirmed by the water quality realignment (i.e., MEL01-06, MEL01-07, MEL01-08 and MEL01-09) were adopted as 2018 sediment and benthic monitoring stations because they also had acceptable sampling efficiency and grab fullness. Furthermore, substrate composition was relatively consistent among the five 2018 near-field water quality stations.
- **Mid-field Stations**: 2018 sediment stations were selected to maintain alignment with water quality but to also avoid excessive sampling effort in retrieving acceptable grab samples. Therefore, MEL-02-06 and MEL-02-08 were chosen to replace MEL-02-01 and MEL-02-04 because of difficulty retrieving acceptable samples from MEL-02-01 and MEL-02-04. For stations that were re-sampled for consistency with previous years, locations were adjusted to within 5 to 10 m of the original sample locations based on sampling success.

As a result of the 2018 Sediment Reconnaissance Survey, sampling constraints such as target depth and sampler fullness were adjusted from the previous AEMP program to allow for future success in sediment-limited areas. A target depth range of 7 to 10 m and a grab sampler fullness of >40% was set as the project criteria for sampling; the AEMP Design Plan previously specified 8 to 10 m depth. To assess the potential effect of this adjustment on monitoring results, depth was added as a parameter to the correlation analysis run to evaluate habitat relationships, and sampler fullness was used as a screening variable when identifying outliers prior to data analysis (Appendix 9C).

Two of the three reference areas specified in the AEMP Design Plan were sampled in 2018. Benthic invertebrate samples were not taken from Reference Area 2 (MEL-04) due to meteorological challenges; i.e., strong winds during August limited the time available for sediment sampling, such that only two of the three reference areas could be sampled. Reference Area 2 (MEL-04) was removed from the sampling program because it was the least similar to the Near-field area in 2016, and during the 2018 Sediment Reconnaissance Survey it was challenging to meet the sampling success criteria in this area (Appendix 9A).

QA/QC procedures described in Section 9.3 were followed during the 2018 benthic invertebrate monitoring program.

Table 9.2-1: Benthic Invertebrate Community Sampling Stations in Meliadine Lake, 2018

Area	Station ID (Distance from the Diffuser)	Sampling Date	Depth (m)	UTM Coordinates (NAD 83 Zone 15V)		Coordinates	
				Easting	Northing	Latitude	Longitude
Near-field area	MEL-01-01 (295 m)	22-Aug-18	9.0	542701	6989134	63° 1’45.5”N	92° 9’22.0”W
	MEL-01-06 (665 m)	22-Aug-18	7.2	542907	6988757	63° 1’33.5”N	92° 9’7.7”W
	MEL-01-07 (463 m)	21-Aug-18	8.0	542878	6989205	63° 1’47.7”N	92° 9’9.4”W
	MEL-01-08 (644 m)	22-Aug-18	7.5	543043	6989062	63° 1’43.0”N	92° 8’57.8”W
	MEL-01-09 (144 m)	22-Aug-18	7.2	542558	6989186	63° 1’47.2”N	92° 9’32.2”W
Mid-field area	MEL-02-02	31-Aug-18	7.0	537079	6992606	63° 3’39.9”N	92° 15’59.1”W
	MEL-02-03	18-Aug-18	8.6	537496	6992330	63° 3’30.8”N	92° 15’29.7”W
	MEL-02-05	31-Aug-18	8.5	537842	6992835	63° 3’47.0”N	92° 15’4.6”W
	MEL-02-06	31-Aug-18	7.3	536922	6992853	63° 3’47.9”N	92° 16’10.1”W
	MEL-02-08	15-Aug-18	9.0	538342	6991952	63° 3’18.3”N	92° 14’29.7”W
Reference Area 1	MEL-03-01	20-Aug-18	6.8	533305	6998516	63° 6’52.1”N	92° 20’23.6”W
	MEL-03-02	28-Aug-18	6.9	533262	6998588	63° 6’54.5”N	92° 20’26.6”W
	MEL-03-03	28-Aug-18	9.5	532943	6998851	63° 7’3.1”N	92° 20’49.2”W
	MEL-03-04	26-Aug-18	6.6	533629	6998650	63° 6’56.4”N	92° 20’0.4”W
	MEL-03-05	28-Aug-18	6.1	533956	6998504	63° 6’56.4”N	92° 19’37.2”W
Reference Area 3	MEL-05-01	1-Sep-18	9.0	530992	6990859	63° 2’45.5”N	92° 23’13.8”W
	MEL-05-02	30-Aug-18	9.3	530675	6990883	63° 2’46.4”N	92° 23’36.4”W
	MEL-05-03	29-Aug-18	8.5	530737	6991365	63° 3’1.9”N	92° 23’31.6”W
	MEL-05-04	30-Aug-18	9.5	530573	6991231	63° 2’57.6”N	92° 23’24.4”W
	MEL-05-05	29-Aug-18	8.5	530241	6991156	63° 2’55.3”N	92° 24’7.1”W

Samples were collected during daylight hours. EEM study areas included the Near-field area and Reference Area 1.
ID = identification; UTM = Universal Transverse Mercator.

525000
530000
535000
540000
7000000
6995000
6990000

REFERENCE AREA 2 (MEL-04)

REFERENCE AREA 1 (MEL-03)
MEL-03-03
MEL-03-04
MEL-03-05
MEL-03-02
MEL-03-01

MID-FIELD EXPOSURE AREA (MEL-02)
MEL-02-06
MEL-02-05
MEL-02-03
MEL-02-02
MEL-02-08

REFERENCE AREA 3 (MEL-05)
MEL-05-04
MEL-05-03
MEL-05-05
MEL-05-01
MEL-05-02

NEAR-FIELD EXPOSURE AREA (MEL-01)
MEL-01-01
MEL-01-09
MEL-01-07
CP1 DIFFUSER
MEL-01-08
MEL-01-06

LEGEND

- BENTHIC INVERTEBRATE SAMPLING LOCATION
- CP1 DIFFUSER
- DIRECTION OF FLOW AT WATERSHED OUTLET
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- BATHYMETRIC CONTOUR (0.5 AND 2m INTERVAL)
- WATERCOURSE
- WATERBODY



0 1.5 3
1:70,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED
AGNICO EAGLE

PROJECT
CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE
MELIADINE LAKE BENTHIC INVERTEBRATE COMMUNITY STATIONS SAMPLED IN 2018

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	JL
PREPARED	MH
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
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9.2.2 Field Methods

As discussed above, following the July 2018 sediment reconnaissance and plume delineation surveys, stations in the Near-field and Mid-field areas were relocated based on proximity to the MEL-14 diffuser location, sampling efficiency and retrieval success, and comparable sediment composition. The results of the Sediment Reconnaissance Survey are described in Appendix 9A and the Plume Delineation Study is described further in Section 2.4.4.3.2. Benthic invertebrate community samples were collected in the fall, which is the period of highest community diversity and stability (MOE 2007).

Habitat characteristics were standardized to the extent possible for sediment particle size and water depth (i.e., between 7 and 10 m) to reduce habitat-related variability in the BIC data. Benthic invertebrate samples were collected using a Petite Ponar grab (15.24 × 15.24 cm; bottom sampling area of 0.0232 m²). At each station, five subsamples were collected and sieved through a 500 µm mesh screen in the field. At the majority of stations sampled, subsamples were combined to form a composite sample from material retained by the mesh, placed in a 500 mL sample bottle, and preserved with 10% neutral buffered formalin.

Pooling of subsamples in the field to form a single composite sample for taxonomic analysis from a station is commonly done to reduce analytical cost, without an effect on study results. Analysis of data collected during EEM and AEMP surveys is based on station as the unit of replication and does not require data for separate subsamples. Analyses of separate subsamples is useful to initially evaluate within-station variation, but once the number of subsamples required is determined, collection of subsample data is no longer necessary. As per the Cycle 1 EEM Study Design (Golder 2017a) and AEMP Design Plan (Golder 2016a), individual subsamples were collected at one station MEL-05-04, and were preserved separately. Samples were shipped to Cordillera Consulting, Summerland, British Columbia, for taxonomic identification and enumeration of invertebrates.

Sediment quality samples were also collected using a Petite Ponar grab, concurrently with BIC samples, to characterize particle size and TOC as outlined in Section 8.0. Environmental data and observations, such as habitat characteristics and field water quality data, were also recorded in conjunction with benthic invertebrate sampling to provide supporting information. Specifically, the following in-situ surface water quality measurements, habitat characteristics, and other information were recorded at each sampling station:

- sampling date
- GPS coordinates, recorded as UTM
- water depth
- presence of aquatic vegetation and algae
- near-bottom in situ water quality measurements of water temperature, DO, pH and specific conductivity
- observations of the sediments for colour, consistency, and odour

9.2.3 Laboratory Methods

Samples were submitted to Cordillera Consulting Inc. (Cordillera; Summerland, BC) for taxonomic identification and enumeration of invertebrates to the lowest practical level (typically genus or species). Cordillera team members are certified by the Society for Freshwater Science in taxonomic identification and have over seven years' experience in sample processing for EEM programs. Benthic invertebrate samples were initially processed to remove the preservative and remaining fine sediment. Samples with high inorganic content were elutriated to separate the organic material from the inorganic material prior to sorting. Inorganic material was checked for shelled or cased invertebrates that may have been too heavy to elutriate; this heavier material was included in the remaining sample to be sorted.

Subsampling was not necessary for any of the 2018 samples. Benthic invertebrates were identified to the genus level where possible. If organisms could not be identified to the genus level, they were identified to the next higher taxonomic level of identification (i.e., family, order, class or phylum). A reference collection was prepared, consisting of representative specimens from each taxon. The reference collection was archived by the taxonomist for possible comparison with BIC data from future studies and for QC of future taxonomic identifications. Further details regarding taxonomy methods and reference collection results are provided in Appendix 9B.

Raw invertebrate abundance data were received from the taxonomist in electronic format. To meet EEM requirements, data were entered into the latest version of ECCC EEM Metal and Diamond Mining Data Entry Software. For reporting purposes, data were stored in Excel spreadsheets.

9.2.4 Data Analysis

9.2.4.1 Review of Field Data

Field data collected in 2018 were pre-screened based on adherence to acceptability criteria for the collection of grab samples:

- acceptable grab sample volume of a minimum 40% fullness
- sample depth between 7 and 10 m

The 2018 field data met these acceptability criteria. With respect to the AEMP baseline dataset brought forward to support interpretation of the 2018 benthic data, there was an absence of sufficient depositional sediments at three locations in 2015 (i.e., stations MEL-01-05, MEL-02-04 and MEL-02-05), resulting in samples with <10% fullness of the petite Ponar grab. As a result, these samples did not meet the ">40% fullness" criterion and were eliminated from the dataset used for 2018 reporting in this section. All samples collected in 2016 and 2018 met this criterion and were considered to be acceptable.

9.2.4.2 Review of Taxonomic Data

The 2018 taxonomic dataset was pre-screened prior to analysis and adjustments were made as described below:

- The composite benthic sample taken at station MEL-05-05 in 2018 contained only one benthic invertebrate organism. This was despite the sample meeting acceptability criteria for suitable particle size, grab fullness and sampling an area equivalent to five grab samples (i.e., 0.116 m^2). Data for this sample were therefore considered to be anomalous, potentially resulting from inadequate sample preservation, and this station was excluded from the data analysis.
- Data for Nematoda and Ostracoda were removed from the dataset before data analysis. These meiofauna are not reliably enumerated using 500 µm mesh sampling gear (Environment Canada 2012).

- Copepoda and Cladocera were excluded from the dataset before data analysis because they are non-benthic organisms.
- *Baetis sp.*, *Zapada columbiana*, and *Brachycentrus occidentalis* were removed from the dataset because they are not considered to be part of the resident BIC in Meliadine Lake. These taxa are typical of fast-flowing waters and were present in low abundance (i.e., one or a few individuals) in some samples as a result of incidental capture at the time of the survey. Each of these taxa represented <1% of the total invertebrate abundance.

9.2.4.3 Variable Selection

A summary of the benthic invertebrate variables calculated from the screened datasets is presented in Table 9.2-2. These variables align with the endpoints recommended of the EEM TGD (Environment Canada 2012), and meet MDMER and AEMP Design Plan requirements (Golder 2016, Government of Canada 2018), and provide supporting information to aid in the interpretation of the results.

Table 9.2-2: Summary of Benthic Invertebrate Variables Assessed for 2018 EEM and AEMP Programs

Variable	Cycle 1 EEM (Family Level)[a]	2018 AEMP (Lowest Level)[b]
Total invertebrate density (number of organisms per square metre)	Effect Endpoint (MDMER-required)	AEMP Variable
Total taxonomic richness (number of taxa per station)	Effect Endpoint (MDMER-required)	AEMP Variable
Simpson's diversity index (SDI)	Supporting Endpoint	AEMP Variable
Simpson's evenness index (SEI)	Effect Endpoint (MDMER-required)	AEMP Variable
Bray-Curtis Index, using the EEM method (i.e., comparisons to reference median) (BCI-EEM)	Effect Endpoint (not MDMER-required)	AEMP Variable
Bray-Curtis Index, using the pairwise method (BCI-PW)	Supporting Endpoint	AEMP Variable
Presence/absence by each taxon	Supporting Endpoint	Supporting Endpoint
Community composition as percentages of major taxonomic groups[c]	Supporting Endpoint	AEMP Variable
Densities of dominant invertebrates: midges (Chironomidae), bivalves (Pisidiidae), andamphipods (Amphipoda)	-	AEMP Variable

a) As presented in the EC EEM TGD (2012) and/or the MDMER (Government of Canada 2018).
b) As presented in the AEMP Design Plan (Golder 2016a).
c) Henceforth reported as relative density.
- = not applicable.

Total invertebrate density was calculated as the number of organisms per square metre (org/m^2) for each station. This calculation was based on the bottom area of the grab sampler (0.0232 m^2) multiplied by 5 grabs (i.e., 0.116 m^2) to represent the total area sampled by five grabs.

$$\frac{\text{number of organisms per replicate sample}}{\textit{(sampler area [0.0232 } m^2\textit{] } \times \textit{ number of subsamples [5])}}$$

Richness is the total number of taxa/station at the family level or the LTL. Richness provides an indication of the diversity of benthic invertebrates in an area; a higher richness value typically indicates a more healthy and balanced community.

For interpretation purposes, ranges in benthic invertebrate densities and LTL richness values were operationally defined as low/moderate/high, based on previous AEMP in northern lakes within Canada and information documented in associated annual reports (e.g., 2016 Diavik AEMP Annual Report [Golder 2017b], 2016 De Beers Gahcho Kue AEMP Annual Report [De Beers 2017c]). Observed density and richness values were categorized as follows:

- **low:** density less than 5,000 org/m²; LTL richness less than 10 taxa/station
- **moderate:** density ranging from 5,000 to 50,000 org/m²; LTL richness ranging from 10 to 40 taxa/station
- **high:** density greater than 50,000 org/m²; LTL richness greater than 40 taxa/station

When compared to other lake environments, the range of densities described above are relatively low considering some lake environments have densities greater than 100,000 individuals per square metre (Hynes 1970; Resh and Rosenberg 1984; Rosenberg and Resh 1993).

Simpson's Diversity Index (SDI) measures the proportional distribution of organisms in the community, taking into account taxonomic richness and how evenly the total density is distributed among these taxa. Certain conditions may favour one organism over another, resulting in the community being dominated by a few taxa, which is reflected in decreased diversity (Simpson 1949). The SDI values range between zero and one, where lower values indicate a less diverse community and higher values indicate a more diverse community. The SDI was calculated using the formula provided by Krebs (Krebs 1999):

$$SDI = 1 - \sum_{i=1}^{S} (p_i)^2$$

Where:

- SDI = Simpson's diversity index
- S = the total number of taxa
- p_i = the proportion of the ith taxon

Simpson's Evenness Index (SEI) is a measure of how evenly the total invertebrate density is distributed among the taxa present at the station. The SEI is included along with the SDI to provide context as to whether taxonomic richness or the distribution of total density among taxa is driving the SDI values. The SEI is also expressed as a value between one and zero, with one representing high evenness (i.e., equal numbers of all taxa present in a sample) and zero representing low evenness (i.e., a high degree of dominance by one or a few organisms). The SEI values were calculated using the following formula (Smith and Wilson 1996):

$$SEI = 1/\sum_{i=1}^{S}(p_i)^2/S$$

Where:

- SEI = Simpson's evenness index
- S = the total number of taxa
- p_i = the proportion of the ith taxon

The above variables are measures of total invertebrate density, taxonomic richness, and structural aspects of the community, but do not consider any quantitative information of the types of organism's present. Therefore, the Bray-Curtis Index (BCI; a dissimilarity index) was calculated to compare entire communities between reference and exposure areas. The BCI summarizes the overall difference in community structure between two stations (Environment Canada 2012). BCI values range between 0 and 1, whereby lower values indicate that the community in the exposure area is more similar to the reference community.

As recommended by Environment Canada (2012), the BCI was calculated following the method by Legendre and Legendre (1983), where the distance statistic is calculated as:

$$\text{B-C}=\frac{\sum_{i=1}^{n}|y_{i1}-y_{i2}|}{\sum_{i=1}^{n}(y_{i1}-y_{i2})}$$

Where:

- B-C = Bray-Curtis distance between sites 1 and 2
- y_{i1} = count for taxon i at site 1
- y_{i2} = count for taxon i at site 2
- n = total number of taxa present at the two sites

BCI values have historically been calculated by comparing the benthic community of each station to the median reference area community (using pooled reference area data). This method (henceforth abbreviated to BCI-EEM in this assessment) is recommended by the EEM TGD (Environment Canada 2012). Hubert et al. (2011) pointed out that using the reference median value as the basis for calculating Bray-Curtis distance values results in frequently finding effects where none exist, referred to as a Type I error (false positive). To correctly calculate Bray-Curtis distance, Huebert et al. (2011) recommended that pairwise, among-area comparisons of individual reference and exposure stations be conducted to generate Bray-Curtis distance values for statistical comparisons.

Therefore, Bray-Curtis distance values were also calculated using the pairwise comparisons method (henceforth abbreviated to BCI-PW in this assessment). For replicated reference areas, this meant that each reference area station was compared to all stations in the other reference area and a mean BCI was calculated (to estimate background among-area variation). Similarly, each exposure station was compared to all reference stations and a mean BCI was calculated. To meet the Cycle 1 EEM requirements and those of the AEMP Study Design, Bray-Curtis distances for all years were calculated using both pairwise and the EEM methods.

9.2.4.4 Normal Range

The magnitude of effect on benthic invertebrate communities was evaluated by comparing benthic variables (i.e., density, richness, SDI, SEI, BCI and densities of dominant taxa) in the Near-field area to background values. Background values (or normal ranges) were calculated using reference area data (i.e., from MEL-03, MEL-04 and MEL-05 [also referred to as Reference areas 1, 2, and 3]) collected from 2015 to 2018, and baseline data collected from the Near-field and Mid-field areas in 2015.

The 2016 Near-field data were excluded from normal range calculations because the 2017 AEMP Annual Report (Golder 2018c) suggested that benthic communities in the Near-field area may have been influenced by STP effluent discharged to a rock-bed channel that emptied into Meliadine Lake near the exploration camp. The benthic invertebrate response pattern in the Near-field area was consistent with mild nutrient enrichment. A review of nutrient loadings from the STP discharge in Section 2.7 identified an approximate doubling of TP loadings, in 2016 relative to 2015, from the STP discharge to the rockbed channel close to the Meliadine Lake Near-field area. The increase in TP loadings from the STP discharge represents a confounding factor that prohibits the 2016 Near-field data (collected under baseline conditions for the Mine effluent discharge) from being included in the dataset used to calculate the normal ranges for BIC variables in Meliadine Lake.

Methods for defining the BIC normal range follow the methods of Barrett et al. (2015) and are consistent with the approach used for defining normal ranges for other AEMP components (i.e., water quality, sediment quality, and plankton). A summary of the methods considered in this assessment is provided below:

- When background data were normally distributed, the normal range was estimated as the 80% prediction interval (PI) of the dataset. Normality was assessed using the Shapiro Wilk test, using $\alpha = 0.05$ to indicate a significant departure from normality.
- When the background data were not normally distributed, but normality could be achieved after Box-Cox transformation (Box and Cox 1964), the normal range was calculated on the Box-Cox transformed data and the upper and lower bound of the normal ranges were back-transformed.

- If neither the untransformed data or Box-Cox transformed datasets were normally distributed, the normal range boundaries were defined as the 10th and 90th percentile of the baseline data. In cases where the percentile method was used, a dataset of 1,000 samples was randomly generated from the normal range dataset and the 10th and 90th percentile were calculated from this distribution of 1,000 samples to estimate the normal range.

It should be noted that the normal ranges provided in this report are considered provisional during the initial monitoring years under the AEMP due to the limited sample sizes used in the calculations. The normal range is intended to estimate the range of natural spatial and temporal variability, and the more reference data incorporated into the calculation, the more accurate the estimate becomes. These normal ranges may be redefined in future reports to allow for the inclusion of additional appropriate monitoring data as they become available.

Normal ranges determined for the 2018 AEMP are summarized in Table 9.2-3.

Table 9.2-3: Normal Ranges for Benthic Invertebrate Community Variables

Benthic Invertebrate Community Variable	Unit	Normal Range	
		Lower Limit	Upper Limit
Total invertebrate density	org/m²	128	1,938
Total taxonomic richness[a]	taxa/station	8	18
Simpson's diversity index[a]	-	0.69	0.88
Simpson's evenness index[a]	-	0.25	0.64
BCI-EEM (compared to REF1 median)[a]	-	0.28	0.73
BCI-EEM (compared to REF3 median)[a]	-	0.21	0.70
BCI-PW[a]	-	0.47	0.74
Chironomid density	org/m²	123	1,588
Bivalve density	org/m²	43	365

a) Normal Ranges were calculated for benthic invertebrate variables at the lowest taxonomic level.

org/m² = organisms per square metre; BCI = Bray-Curtis Index; EEM = Environmental Effects Monitoring; PW = pairwise; REF = reference area.

9.2.4.5 Statistical Analysis

9.2.4.5.1 General Approach

Statistical analysis was used to evaluate whether there were statistically significant differences in EEM BIC endpoints between the Near-field area and Reference Area 1 in 2018. Thus, to evaluate if the Mine effluent discharge had an effect on the BIC in the Near-field area. For the 2018 AEMP data analysis, a similar statistical approach was used to evaluate differences among sampling areas, but it was applied to all areas sampled to meet the objectives of the AEMP Design Plan (Golder 2016a). Univariate statistical tests (i.e., Spearman correlations, ANOVA, pairwise comparisons) were performed using SYSTAT Version 13.2 (Systat Software Inc., Chicago, IL).

Summary statistics (i.e., arithmetic mean, median, minimum, maximum, standard deviation standard error, and sample size) for each BIC endpoint and AEMP variable were calculated and summarized by sampling area.

9.2.4.5.2 Cycle 1 EEM

Prior to undertaking univariate statistical tests for each BIC EEM endpoint, data were screened for outliers and potential data entry errors, as described in Appendix 9C. Based on the screening results presented in Appendix 9C, no outliers were identified in the dataset used for the Cycle 1 EEM statistical analysis.

To compare BIC endpoint values between the Near-field area and Reference Area 1, an ANOVA test was completed in SYSTAT Version 13.1 (Systat Inc. 2017). Prior to analysis, benthic data were checked for statistical assumptions (i.e., normality, homoscedasticity; Zar 1999). If data did not meet the statistical assumptions, the equivalent non-parametric test (e.g., Kruskal-Wallis with post-hoc Conover-Inman) was conducted. Data were considered significantly different at α = 0.1, as recommended by EC (2012).

No data transformations were necessary to satisfy the requirement of normality for ANOVA, with the exception of SEI, where data were ranked prior to analysis. The SEI values are derived variables with unusual statistical properties and, in general, their sampling distributions are unknown (Rosenberg and Resh 1993). Transformation of SEI to rank order (i.e., all stations are pooled for the purpose of ranking) relaxes the assumption of normality and allows the use of ANOVA.

Magnitude of difference between the Near-field area and Reference Area 1 was calculated using untransformed data, according to the following equation:

$$\frac{x_e - x_r}{x_r} \times 100$$

Where:

- x_e = the exposure area mean;
- x_r = the reference area mean

The critical effect size (CES) was calculated as ±2 standard deviations, as recommended by the EEM TGD (Environment Canada 2012), expressed as a percentage of the reference mean. The magnitude of difference was also expressed as the number of reference area standard deviations, as per the following equation:

$$\frac{x_e - x_r}{\sigma_r}$$

Where:

- x_e = the exposure area mean;
- x_r = the reference area mean;
- σ_r = the reference area standard deviation

A statistically significant difference in an effect endpoint was only considered biologically significant if the magnitude of effect exceeded the CES. For a study design with five replicate stations per area, Environment Canada (2012) recommends that α and β be set equally at 0.10 to allow a CES equal to ±2 SD from the reference area mean (refer to Table 9-7 of the EEM TGD [Environment Canada 2002]). Using this design, power was set a priori at 0.90.

For non-significant results, *post-hoc* power analyses were run to determine power required to detect a biologically meaningful effect (i.e., with a magnitude equal to the CES).

9.2.4.5.3 2018 AEMP

Prior to undertaking univariate statistical testing for each benthic AEMP variable, data were screened for outliers, as described in Appendix 9C. Based on the screening results presented in Appendix 9C, no outliers were identified in the dataset used for the AEMP statistical analysis. Reference area data were pooled from Reference Area 1 (MEL-03) and Reference Area 3 (MEL-05) for inclusion in statistical testing for each benthic variable with the Near-field area and the Mid-field area.

To compare benthic variables among AEMP areas within Meliadine Lake, an ANOVA test was completed in SYSTAT Version 13.1 (Systat Inc. 2017). Prior to analysis, benthic data were checked for statistical assumptions (i.e., normality, homoscedasticity; Zar 1999). If data did not meet the statistical assumptions, the equivalent non-parametric test (e.g., Kruskal-Wallis with post-hoc Conover-Inman) was conducted. No data transformations were necessary to satisfy the requirement of normality for ANOVA, with the exception of SEI, where data were ranked prior to analysis by ANOVA (as described in Section 9.2.4.5.2).

Where the overall ANOVA was found to be significant at $\alpha = 0.1$, pairwise comparisons (i.e., planned contrasts) were made to compare the exposure areas to the pooled reference areas for all benthic variables. Specifically, the following pairwise comparisons were made:

- Near-field area versus pooled reference areas
- Mid-field area versus pooled reference areas
- Reference Area 1 versus Reference Area 3

Data were considered significantly different at $\alpha = 0.1$

9.2.4.5.4 Multivariate Analysis

Benthic invertebrate community structure was analyzed using the non-parametric ordination method of non-metric multidimensional scaling (nMDS; Clarke 1993). nMDS is a multivariate method based on the BCI. The nMDS data were scaled in Primer, version 7 for Windows (PRIMER E Ltd., Quest Research 2017; Clarke and Gorley 2016). Lowest taxonomic level (LTL)BIC data were log (x+1) transformed, to improve separation of the data among stations on the nMDS plots and to reduce weighting of the analysis by the most abundant taxa.

A Bray-Curtis resemblance matrix was generated, and the nMDS procedure was applied to this matrix. Using rank order information, nMDS determined the relative positions of stations in two dimensions based on community composition. Goodness-of-fit was determined by examining the Shepard diagrams as well as the stress value, which was calculated from the deviations in the Shepard diagrams. Lower stress values (i.e., less than 0.10) indicate less deviation and a greater goodness-of-fit, higher stress values (i.e., greater than 0.20) must be interpreted with caution and often higher dimensions (i.e., 3-D) are needed to describe the data (Clarke 1993). Points that fall close together on the nMDS ordination plot represent samples with similar community composition; points that are far apart from each other represent samples with dissimilar community composition. A similarity profile (SIMPROF) test was also carried out on the ordination data to identify meaningful clusters of important taxa (i.e., those taxa that behave in a coherent manner across areas) and to prevent over-interpretation of the nMDS plots (Clarke et al. 2014). These SIMPROF clusters were superimposed on the MDS plots.

An overall one-way analysis of similarities (ANOSIM) test was carried out on the Bray-Curtis resemblance matrix to confirm interpretation of the separation of the points on the MDS ordination plot, and to investigate whether differences in community composition observed in the nMDS ordination plots were significant. In addition, an area-level pair-wise ANOSIM was carried out to compare Near-field and Mid-field areas to the reference areas

sampled in 2018. Pair-wise comparisons of the Near-field area between 2015, 2016 and 2018 (all pairwise combinations) were also conducted. A Bray-Curtis resemblance matrix was generated to test differences among areas contrasted with differences among stations within each area (Clarke et al. 2014) or differences among years contrasted with differences among stations within each year in the Near-field area.

An R-statistic ranging from 0 to 1 was produced by the analysis; a strong difference in community composition was indicated by R = 1 and no difference between communities was indicated by R = 0. Significance of the R statistic was achieved when a *P*-value of >0.05 was reported, based on the five replicate stations per area.

9.2.4.5.5 Evaluation of the Effects of Habitat Variation

Spearman rank correlation analysis was used to test the strength of relationships between key habitat variables (i.e., water depth, TOC, particle size, sediment metal concentrations above sediment quality guidelines, nutrient [TN and TP] concentrations in lake water) and benthic community variables (i.e., total density, richness, diversity, evenness, densities of dominant invertebrate groups). This analysis was completed on pooled data from all stations sampled in 2018 to identify environmental factors that could potentially confound the study design (e.g., habitat variables), or account for the variation observed in the benthic community (e.g., metals in sediments). Critical values for significance were determined from Siegel and Castellan (1988). Spearman rank correlation coefficients were calculated using SYSTAT Version 13.2 (Systat Software Inc., Chicago, IL). Thresholds for statistical significance of $P < 0.05$, $P < 0.01$, and $P < 0.001$ were applied to identify significance of correlations.

Results of the correlation analysis were used to evaluate whether variation in key habitat variables may represent confounding factors that could potentially influence statistical comparisons between sampling areas. This analysis also provided a preliminary evaluation of relationships between key sediment and water quality variables, and benthic community variables. Where a correlation between environmental variables and benthic community variables was moderately to highly statistically significant (i.e., P<0.01), scatter plots were produced to support the interpretation of the significant correlations.

9.2.4.5.6 Characterization of Within-Station Variability

To characterize within-station variability, discrete samples were collected from station MEL-05-04 in Reference Area 3. At this station, five subsamples (discrete grab samples) were collected and sorted separately from one another. Total abundance and richness values for the five subsamples were visually assessed and percent standard error of the mean (%SE)[8] of the five subsamples was calculated for each variable. A%SE value of <20% is considered to be indicative of within-station variability typical for benthic invertebrate communities based on Elliott (1971).

[8] SE expressed as the percentage of the mean.

9.3 Quality Assurance/Quality Control

The QA/QC practices applied during this study and detailed results of the QC analyses are provided in Appendix 9C). QA components of the program included the use of trained personnel and a qualified taxonomist; QC components included assessments of sampler fullness and sorting efficiency. A summary of key QC results and observations is provided below.

- Grab sampler fullness was evaluated and only data from samples where grabs were at least 40% full were included in the BIC assessment as per Golder's Specific Work Instructions (Golder 2018e unpublished file information).
- Sorting efficiency was considered acceptable for the two samples tested (96% and 100%) (Environment Canada 2012).
- Samples were sorted in their entirety by the taxonomic laboratory, so an assessment of subsampling efficiency was not required for 2018.
- Due to an equipment malfunction, samples from stations MEL-01-01, MEL-01-06, MEL-01-08, and MEL-01-09 were not field sieved at the time of collection. Samples were preserved and kept cold and sieved at the earliest opportunity. These samples were replenished with the addition of new preservative prior to submission to the taxonomist.

Based on this assessment, the benthic invertebrate monitoring data are considered adequate to meet the requirements of the Cycle 1 EEM Study Design (Golder 2017a) and the AEMP Design Plan (Golder 2016a).

9.4 Results and Discussion

9.4.1 Habitat Characteristics

Habitat characteristics for 2018 are summarized in Table 9.4-1, Figure 9.4-1 and Figure 9.4-2. Detailed habitat data and summary statistics are presented in Appendix 9A, Table 9A-1 and the *Sediment Reconnaissance Survey Summary* (Appendix 9A). Water and sediment quality data collected in conjunction with the BIC monitoring program, for the Water Quality and Sediment Quality AEMP components, are provided in Section 6.0 and 8.0.

The following observations were noted from a review of the 2018 habitat data:

- Mean water depth ranged from 7.2 m (Reference Area 1) to 9.0 m (Reference Area 3) for benthic stations sampled in 2018 (Table 9.4-1). Thus, the reference areas encapsulated the depth range sampled in 2018, with the exposure areas captured within the reference area depth range.
- Average bottom water temperatures represented typical seasonal values for subarctic lakes in Northern Canada, between 8.8°C (Reference Area 3) and 10.7°C (Mid-field area).
- Average DO values indicated the overlying water at all stations in 2018 was well oxygenated and above the CWQG-PAL for minimum DO concentration.
- Average pH values indicated that the overlying water was slightly alkaline and values were within the CWQG-PAL range of 6.5 to 9.0 (Table 9.4-1).

- Mean specific conductivity values in the overlying water were characteristically low, reflective of subarctic environments. Slightly higher mean specific conductivity values were recorded in the Near-field area compared to other areas sampled (i.e., Near-field >Mid-field >Reference Area 3 >Reference Area 1), but they were within a factor of 1.2 of measurements at Reference Area 1 (Table 9.4-1).
- Sediment TOC showed some variability among sampling areas (i.e., Near-field >Mid-field >Reference Area 3 >Reference Area 1), with the Mid-field area TOC higher than Reference Area 1 TOC by a factor of 1.8. The Near-field TOC was most comparable to Reference Area 1 values and the Mid-field TOC was most comparable to Reference Area 3 values Table 9.4-1).
- Sediments sampled from the Near-field area had a higher proportion of fines (i.e., silt + clay) and less sand compared to the Mid-field and reference areas (Figure 9.4-1). These particle size results are consistent with those reported by Golder (2018a) for the 2015 and 2016 AEMP baseline sampling events (Figure 9.4-2). Thus, as discussed by Golder (2018a), spatial differences in particle size distribution between the Near-field area and other sampling areas have the potential to confound the ability of the AEMP and EEM study comparisons made to evaluate whether benthic invertebrate communities were impacted by the Mine effluent discharge in 2018. This is evaluated further in Sections 9.4.2 and 9.4.4.

Table 9.4-1: Summary of Habitat Variables for Meliadine Lake in 2018

Area	Water Depth	In-situ Water Quality				Sediment Total Organic Carbon	Sediment Particle Size			
		Water Temperature	Dissolved Oxygen	pH	Specific Conductivity		Sand	Silt	Clay	Fines (Silt + Clay)
	(m)	(ºC)	(mg/L)	-	(µS/cm)	(%)	(%)	(%)	(%)	(%)
Near-field	7.8	10.6	12.0	8.6	86.8	4.5	21.1	68.7	10.2	78.9
Mid-field	8.1	10.7	10.8	8.3	77.0	6.7	49.7	39.2	11.1	50.4
Reference 1	7.2	9.4	12.0	8.5	72.1	3.7	57.5	38.9	3.6	42.6
Reference 3	9.0	8.8	11.9	8.2	75.9	5.9	50.6	41.1	10.3	49.4

Note: Mean values are presented for each sampling area.

µS/cm = microSiemens per centimetre.

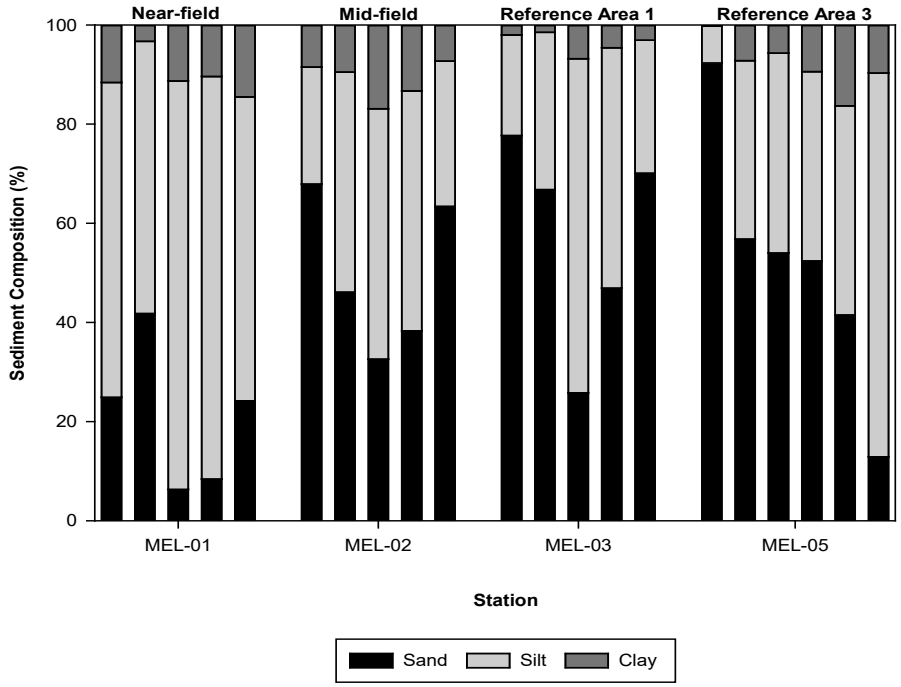
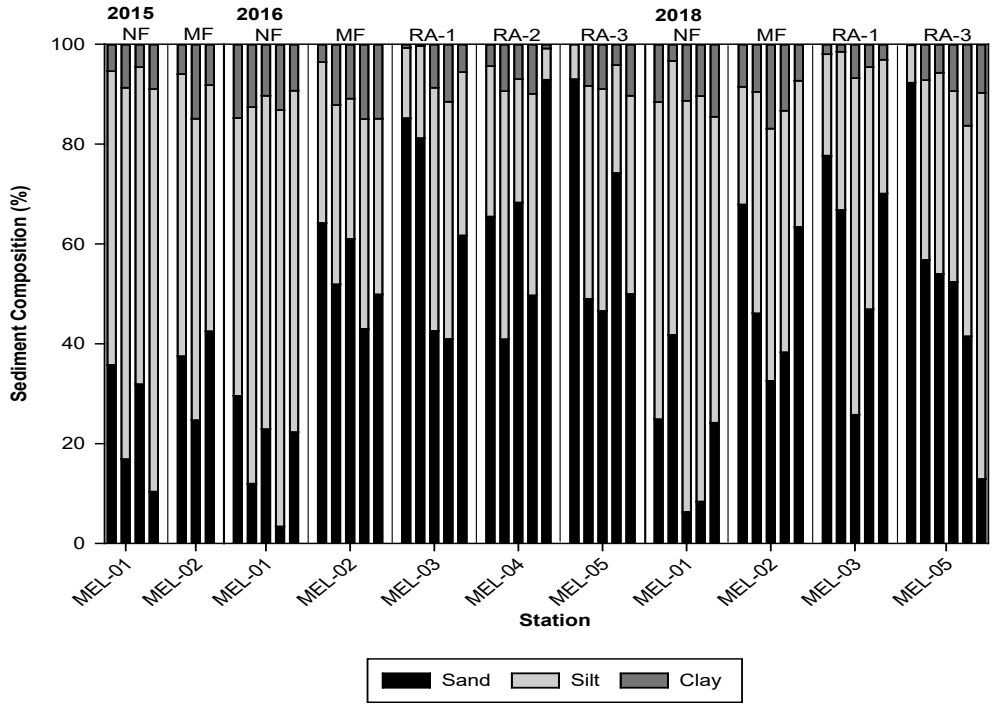


Figure 9.4-1: Sediment Particle Size Comparison for Meliadine Lake, 2018



NF = Near-field area; MF = Mid-field area; RA-1 = Reference Area 1; RA-3 = Reference Area 3

Figure 9.4-2: Sediment Particle Size Comparison for Meliadine Lake, 2015, 2016 and 2018

9.4.2 Benthic Invertebrate Community

Raw benthic invertebrate abundance data, presence/absence data, and a summary of BIC variables calculated from the raw taxonomy data are presented in Appendix 9D, Tables 9D-2 to 9D-4. A summary of the results from the analysis of the EEM and AEMP benthic community variables is provided below.

9.4.2.1 EEM

Total density (<2,000 organisms/m^2 per station) and richness (<6 taxa per station) were low in all areas sampled in Meliadine Lake in 2018. Moderate to low SDI, SEI and BCI values were also calculated in 2018.

EEM BIC comparisons were conducted at the family level to detect differences between the Near-field area and Reference Area 1, in relation to potential impacts from the Mine effluent discharge, as per the EEM TGD (Environment Canada 2012). These EEM results are presented below in Figure 9.4-3 and Figure 9.4-4, with statistical results presented in Table 9.4-2. No statistical differences were found between the Near-field area and Reference Area 1 for the EEM or supporting endpoints (i.e., P>0.1). The CES for these endpoints were not exceeded in 2018 (Table 9.4-2). Thus, for all endpoints included in the Cycle 1 EEM assessment, there were no significant effects of the Mine effluent discharge on benthic invertebrate communities in the Near-field area.

Table 9.4-2: Results of Statistical Tests Comparing EEM Sampling Areas, 2018

Variable	Overall Comparison (NF vs Ref 1)[a]	Direction	Magnitude[b] (SD)	Magnitude[c] (%)	CES (±2SD)[d] (%)	Exceeded CES
Total invertebrate density	0.173	NF<REF1	-0.8	-44.9	170	No
Total taxonomic richness (FL)	0.829	NF=REF1	0.0	0.0	50	No
Simpson's diversity index (FL)	0.408	NF>REF1	0.5	21.1	84	No
Simpson's evenness index (FL)	0.275	NF>REF1	1.3	30.7	41	No
BCI-EEM (compared to REF1 median) (FL)	0.490	NF>REF1	0.4	57.1	161	No
BCI-EEM (compared to REF3 median) (FL)	0.534	NF>REF1	0.4	28.1	145	No
BCI-PW (FL)	0.655	NF>REF1	0.3	10.9	84	No
Chironomidae Density	0.224	NF<REF1	-0.7	-51.9	155	No
Pisidiidae Density	0.862	NF>REF1	0.1	7.6	148	No

Note: Statistical testing was completed using family taxonomic levels for the benthic invertebrate variables.

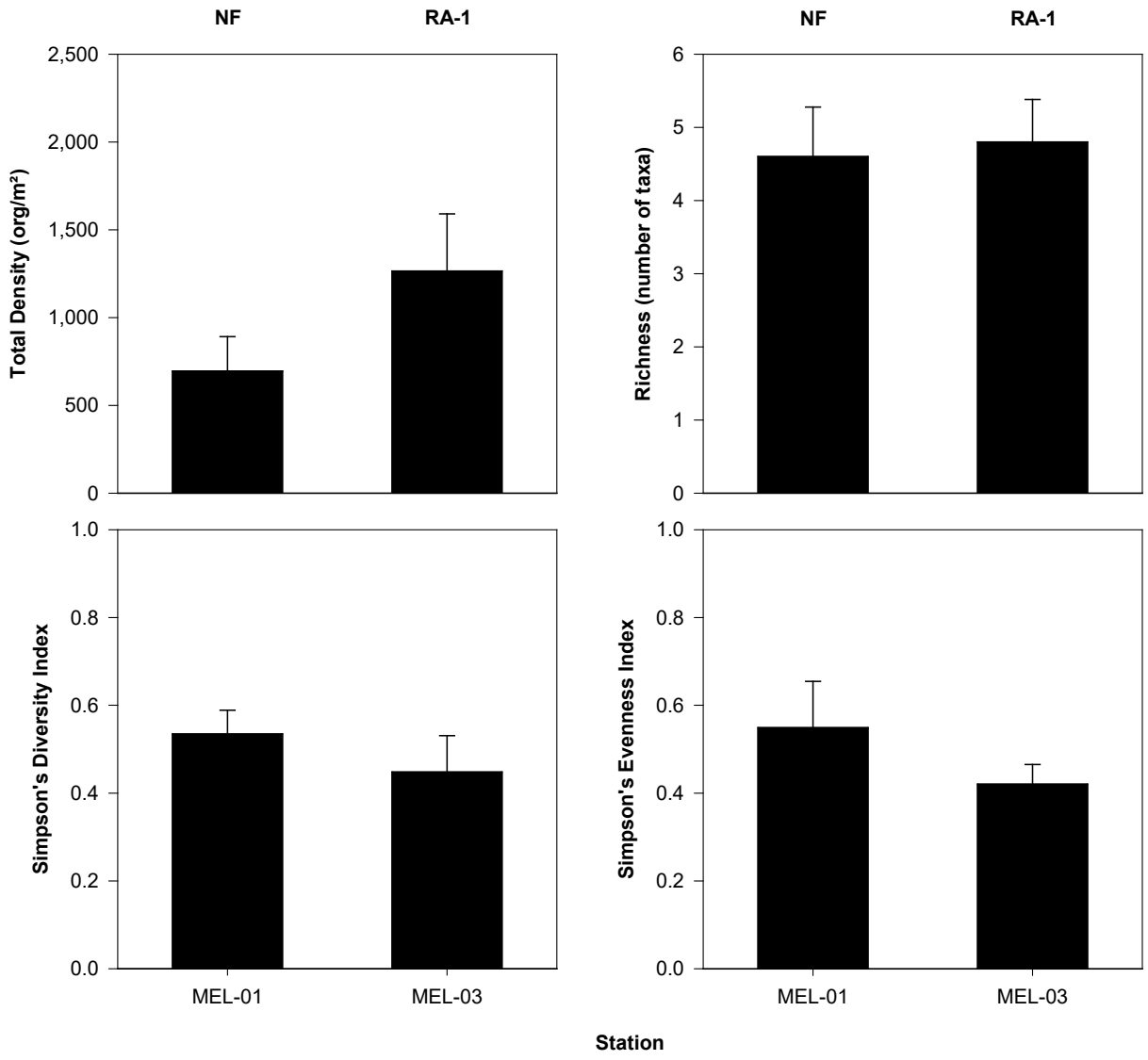
a) Significance evaluated at $\alpha = 0.1$

b) Magnitude was calculated as the difference in number of reference area standard deviations (i.e., NF mean compared to Ref 1 mean).

c) Magnitude was calculated as percent difference between the sampling area means (i.e., NF mean compared to Ref 1 mean).

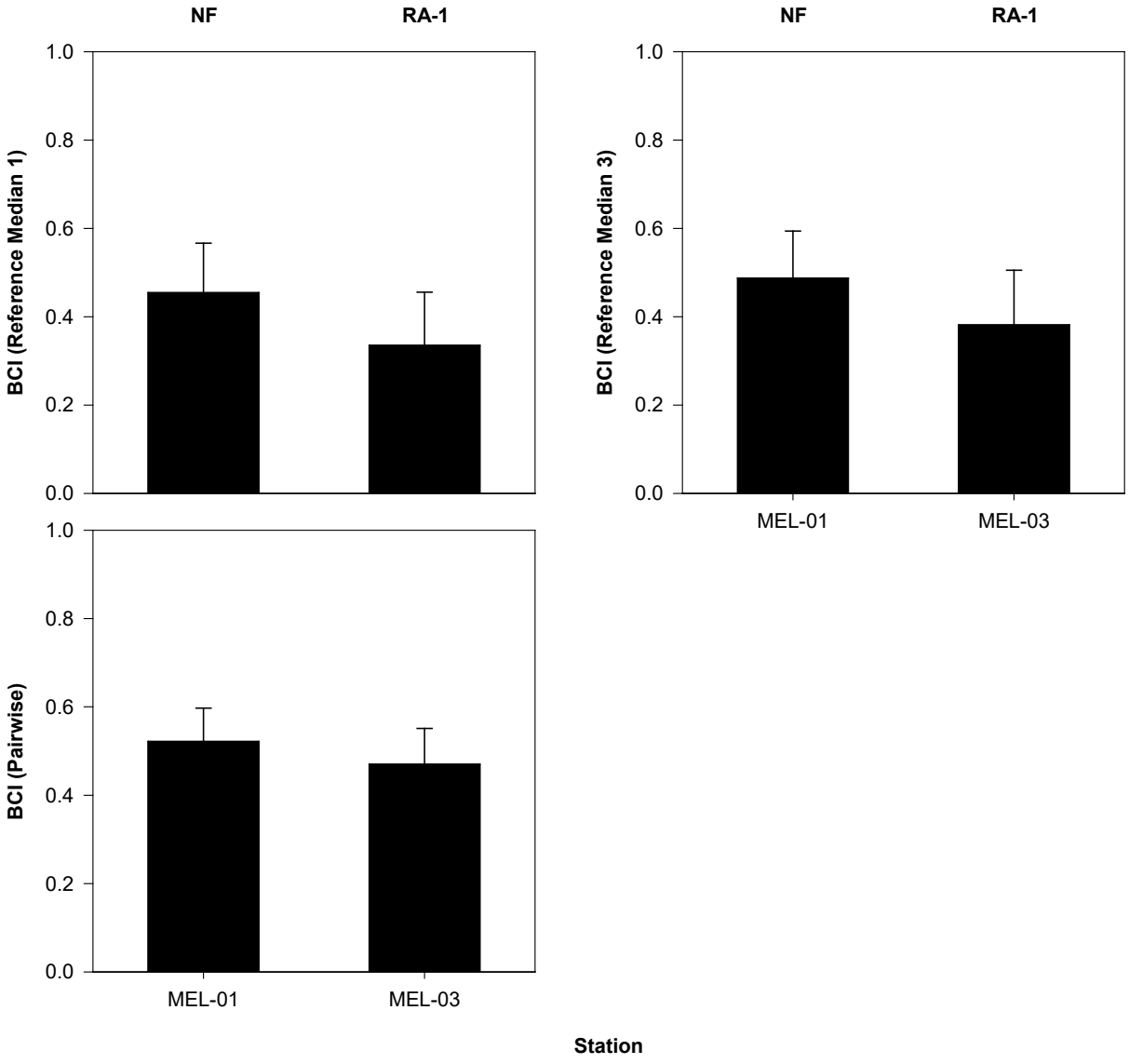
d) Effect size was calculated as ±2 standard deviations, expressed as a percentage of the reference area mean.

BCI = Bray-Curtis Index; EEM = Environmental Effects Monitoring; PW = pairwise; FL = family level; CES = critical effect size; NF = Near-field area; REF = Reference area; SD = standard deviation.



NF = Near-field; MF = Mid-field; RA-1 = Reference Area 1; RA-3 = Reference Area 3. Error bars represent 1 standard error.

Figure 9.4-3: Mean Benthic Invertebrate Endpoints and Supporting Variables in EEM Sampling Areas, 2018



NF = Near-field; MF = Mid-field RA-1 = Reference Area 1; RA-3 = Reference Area 3. Error bars represent 1 standard error.
Note: BCI (Reference Median 1 and Reference Median 3) were calculated using BCI EEM method.

Figure 9.4-4: Mean Bray Curtis Index Values in EEM Sampling Areas, 2018

9.4.2.1.1 *Post-hoc* Power Analysis

As demonstrated in the EEM TGD (Environment Canada 2012), a basic control/impact study design requires five samples per area to attain a power of 0.90 to detect an effect size of ±2SD. *Post-hoc* power analysis specific to the Cycle 1 EEM statistical analysis for the Mine, indicated there was insufficient power for family level richness and family level evenness, despite the sample size of five. In order to detect an effect of ±2SD (based on the Reference Area 1 data) at 90% power, six samples per area would be required for the richness and 16 samples per area for evenness. For evenness, the Cycle 1 EEM dataset had a non-normal data distribution and therefore required rank order transformation prior to analysis, which many have influenced the *post-hoc* power analysis for this endpoint.

9.4.2.2 AEMP

The 2018 AEMP compared data collected from Near-and Mid-field exposure areas to two reference areas through statistical and visual comparisons, to evaluate potential changes in benthic invertebrate communities due to changes in water and sediment quality.

9.4.2.2.1 Spatial Comparisons between Sampling Areas in 2018

Total Density and Richness

In 2018 total invertebrate density and richness in Meliadine Lake were considered to be within the low-density category for subarctic lakes (i.e., <5,000 org/m^2) consistent with the 2015 and 2016 baseline years (Appendix 9D, Table 9D-4, Golder 2018c). In 2018, each sampling area demonstrated a moderate range of variability in density among replicate sampling stations, which was comparable among sampling areas:

- **Exposure Areas**: Near-field area (233 to 1,234 org/m^2), Mid-field area (276 to 1,448 org/m^2)
- **Reference areas**: Reference Area 1 (241 to 1,241 org/m^2), Reference Area 3 (1,078 to 2,172 org/m^2)[9]

At the LTL, total richness values were similar among the Near-field area (8 to 16 taxa), Mid-field area (7 to 18 taxa), and Reference Area 1 (7 to 18 taxa). Richness was higher in Reference Area 3 (13 to 22 taxa).

A significant difference was found between sampling areas for total invertebrate density but not for total richness (Table 9.4-3). *Post-hoc* comparisons found density to be significantly different between the Near-field area and the pooled reference areas. No significant differences in density were detected between the Mid-field area and the pooled reference areas, or between the two reference areas.

Table 9.4-3: Results of Statistical Tests Comparing AEMP Sampling Areas, 2018

Variable	Statistical Test	Overall Comparison[(a)]	NF vs (REF 1 & REF 3)[(a)]	MF vs (REF 1 & REF 3)[(a)]	REF 1 vs REF 3[(a)]
Total invertebrate density	ANOVA	**0.095**	**<0.001**	0.689	0.122
Total taxonomic richness (LTL)	ANOVA	0.258	-	-	-
Simpson's diversity index (LTL)	ANOVA	0.925	-	-	-
Simpson's evenness index (LTL)	ANOVA	0.451	-	-	-
BC-EEM (compared to REF1 median) (LTL)	ANOVA	0.128	-	-	-
BC-EEM (compared to REF3 median) (LTL)	ANOVA	**0.026**	**<0.001**	0.353	0.439
BCI-PW (LTL)	ANOVA	0.158	-	-	-
Chironomidae density	ANOVA	0.142	-	-	-
Pisidiidae density	ANOVA	0.969	-	-	-

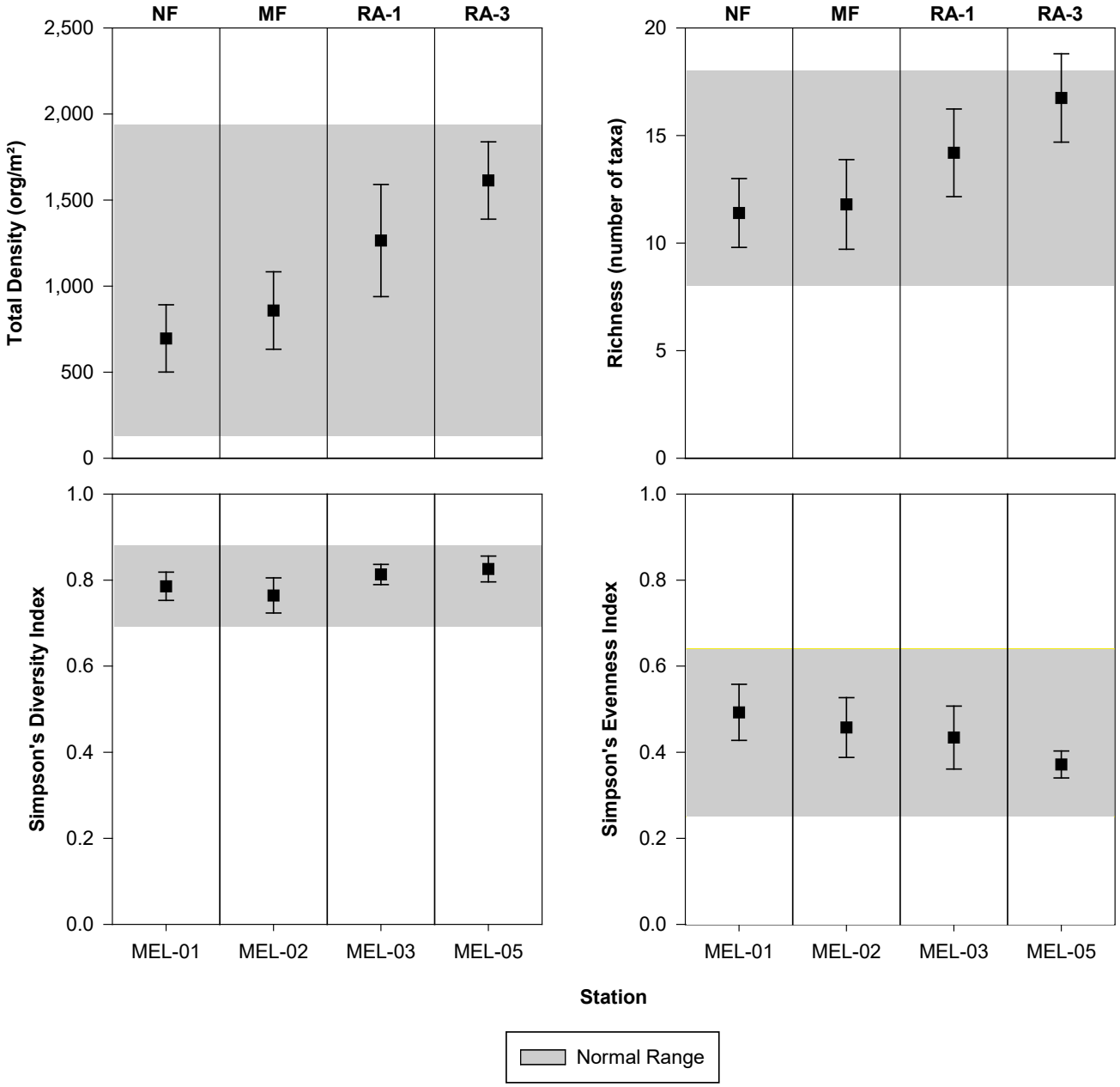
Note: Statistical testing was completed using lowest taxonomic level for the benthic invertebrate variables. No data transformations were required prior to analysis to satisfy parametric test assumptions. Significant differences are **bolded**; significance was evaluated at P <0.10.

a) Significance of planned contrasts was evaluated at P <0.1.

BCI = Bray-Curtis index; EEM = Environmental Effects Monitoring; PW = pairwise; NF = Near-field area; MF = Mid-field area; REF = reference area; REF 1 & REF 3 = pooled reference areas; - = not applicable, ANOVA = analysis of variance; LTL = lowest taxonomic level.

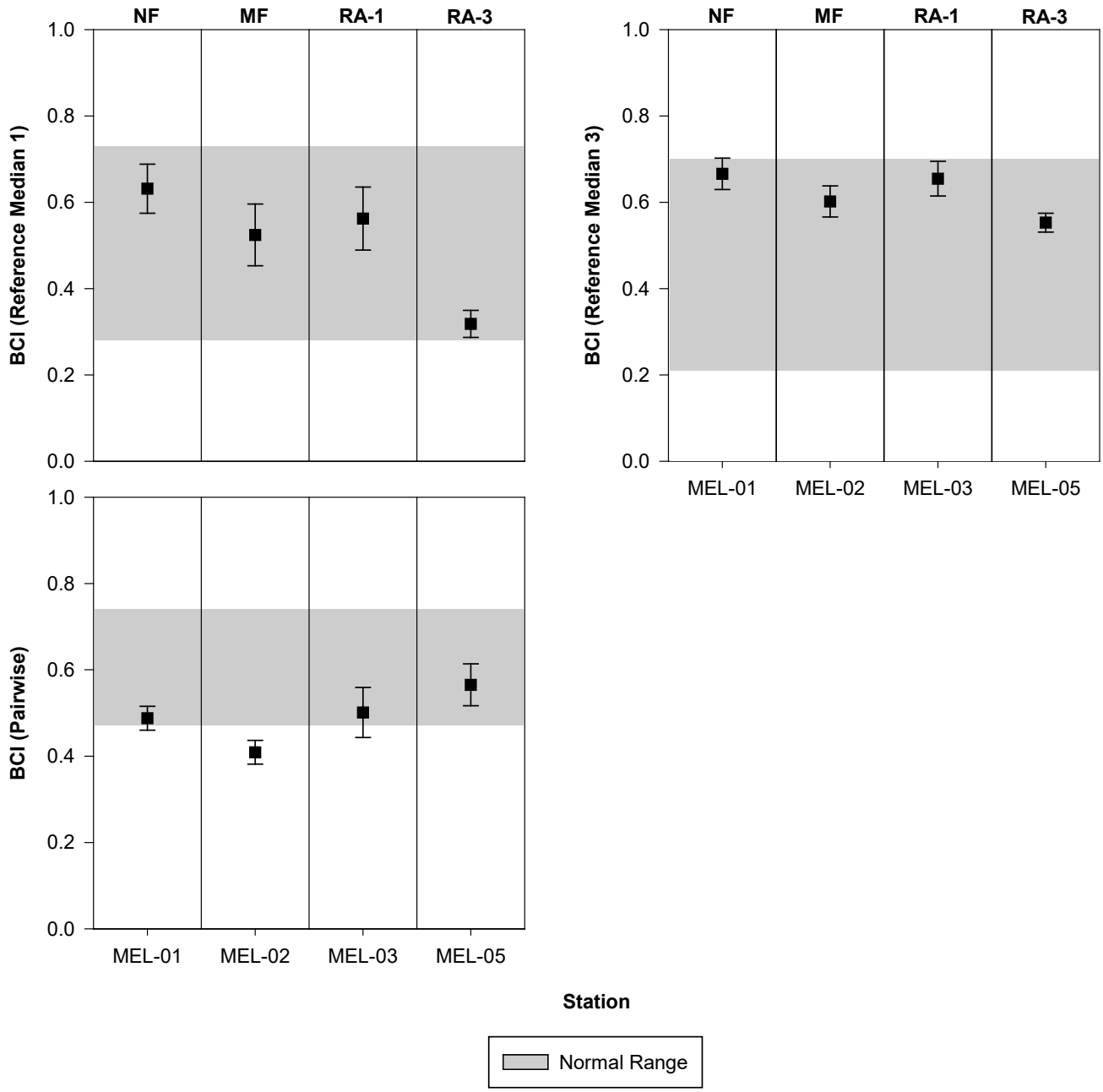
[9] Post removal of the station MEL05-05 from the dataset for Reference Area 3.

All exposure and reference area means were within the normal range for total density and taxonomic richness, although Reference Area 3 mean density and richness values approached the upper limit of the normal range (Figure 9.4-5). Spatial trends showed that the Near-field area and to a lesser degree the Mid-field area had lower mean densities and richness in 2018 compared to Reference Area 1 or Reference Area 3 (Figure 9.4-5). As described above, only density in the Near-field area was significantly lower than the pooled reference area density.



NF = Near-field; MF = Mid-field; RA-1 = Reference Area 1; RA-3 = Reference Area 3. Error bars represent 1 standard error.

Figure 9.4-5: Mean Total Benthic Invertebrate Density, Richness, Simpson's Diversity Index and Simpson's Evenness Index in Meliadine Lake, 2018



NF = Near-field; MF = Mid-field RA-1 = Reference Area 1; RA-3 = Reference Area 3. Error bars represent 1 standard error.
Note: BCI (Reference Median 1 and Reference Median 3) were calculated using BCI EEM method.

Figure 9.4-6: Mean Bray-Curtis Index Values for the Benthic Invertebrate Community in Meliadine Lake, 2018

Diversity, Evenness, and Bray Curtis Indices

In 2018, SDI and SEI calculated at the LTL, showed no statistically significant differences between sampling areas (Table 9.4-3). Diversity (SDI LTL) was consistent across all areas sampled with low variability among replicates (Figure 9.4-5). Evenness (SEI LTL) showed a decreasing trend with distance from the diffuser (i.e. Near-field >Mid-field >Ref 1 >Ref 3) (Figure 9.4-5), but all SDI and SEI values were within the bounds of the normal range.

Consistent with Golder (2018a), 2018 BCI values were calculated using the LTL data for the AEMP analysis, following both EEM and pairwise methods. The following observations were noted from the results from both calculation methods presented in Table 9.4-3 and Figure 9.4-6.

- BCI values were low to moderately dissimilar for all sampling areas using both calculation methods. The Near-field BCI values were most dissimilar compared the Reference Area 3 values using the EEM method and more aligned with those calculated for Reference Area 1. Using the BCI-EEM method (Reference Area 3 median value) a significant difference was detected in the overall ANOVA and for the *post-hoc* comparison, when the Near-field area was compared to the pooled reference areas (Table 9.4-3). Conversely, the ANOVA for the BCI EEM method (Reference Area 1 median value) did not identify a significant difference in the overall comparison.
- Using the BCI-PW method, the Reference Area 3 was the most dissimilar and the Mid-field area the least dissimilar. Again, BCI values calculated for the Near-field area most closely aligned with Reference Area 1. The ANOVA for the BCI PW method did not identify a significant difference in the overall comparison ($P>0.1$).
- All mean BCI values calculated using both the EEM and the pairwise methods were within the bounds of the normal range. The exception was the Mid-field area BCI calculated using the PW method.

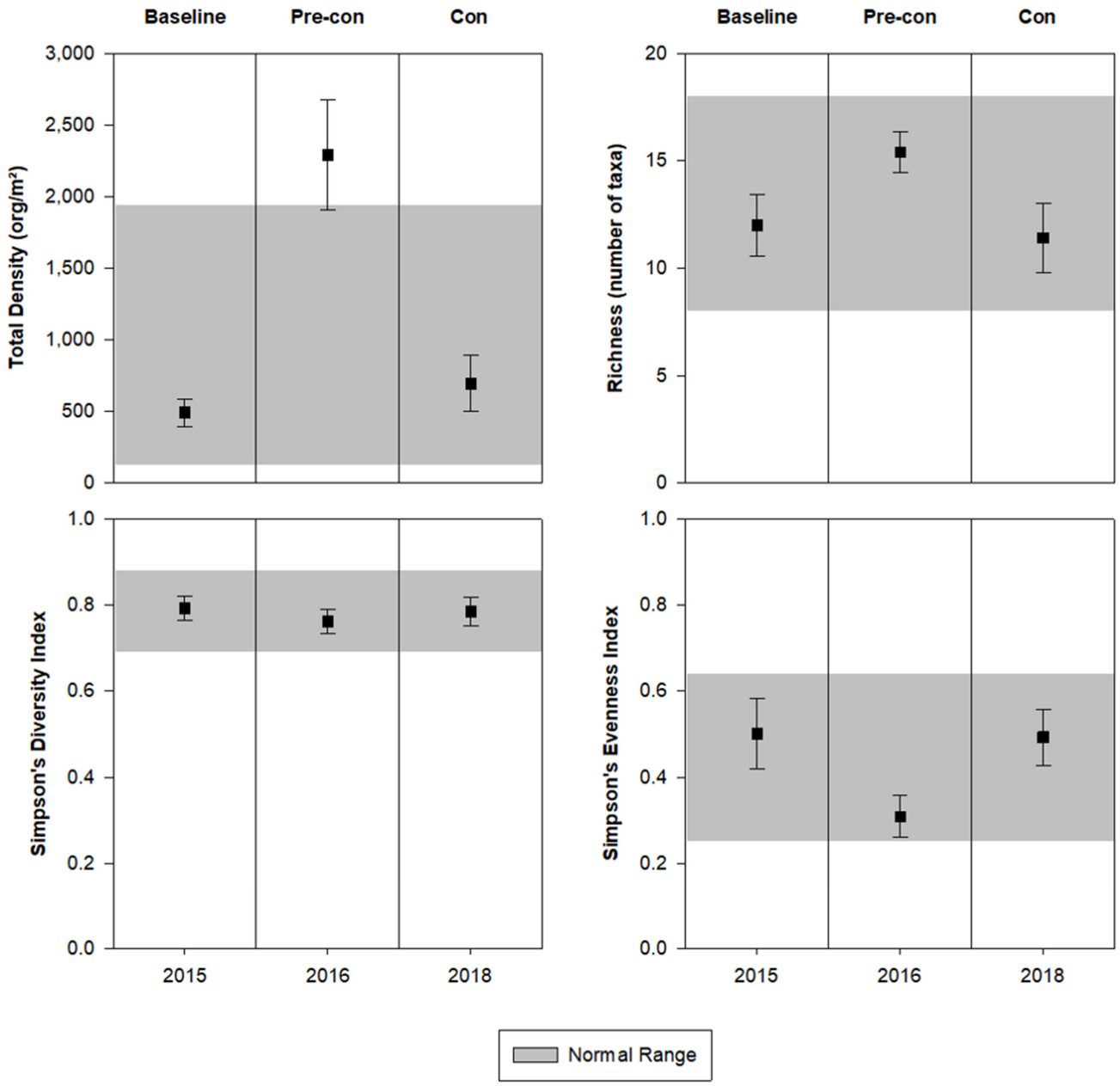
9.4.2.2.2 Temporal Comparisons: Baseline (2015, 2016) and Operation (2018) Years

Temporal trends in biological variables in the Near-field area for the monitoring years 2015, 2016 and 2018 were visually evaluated to evaluate differences in the BIC over time (Figure 9.4-7 and Figure 9.4-8; Figure 9C-2 to 9C-4, Appendix C). The time period evaluated extended from the AEMP baseline into the first year of the Mine effluent discharge.

The following observations were noted with respect to temporal trends:

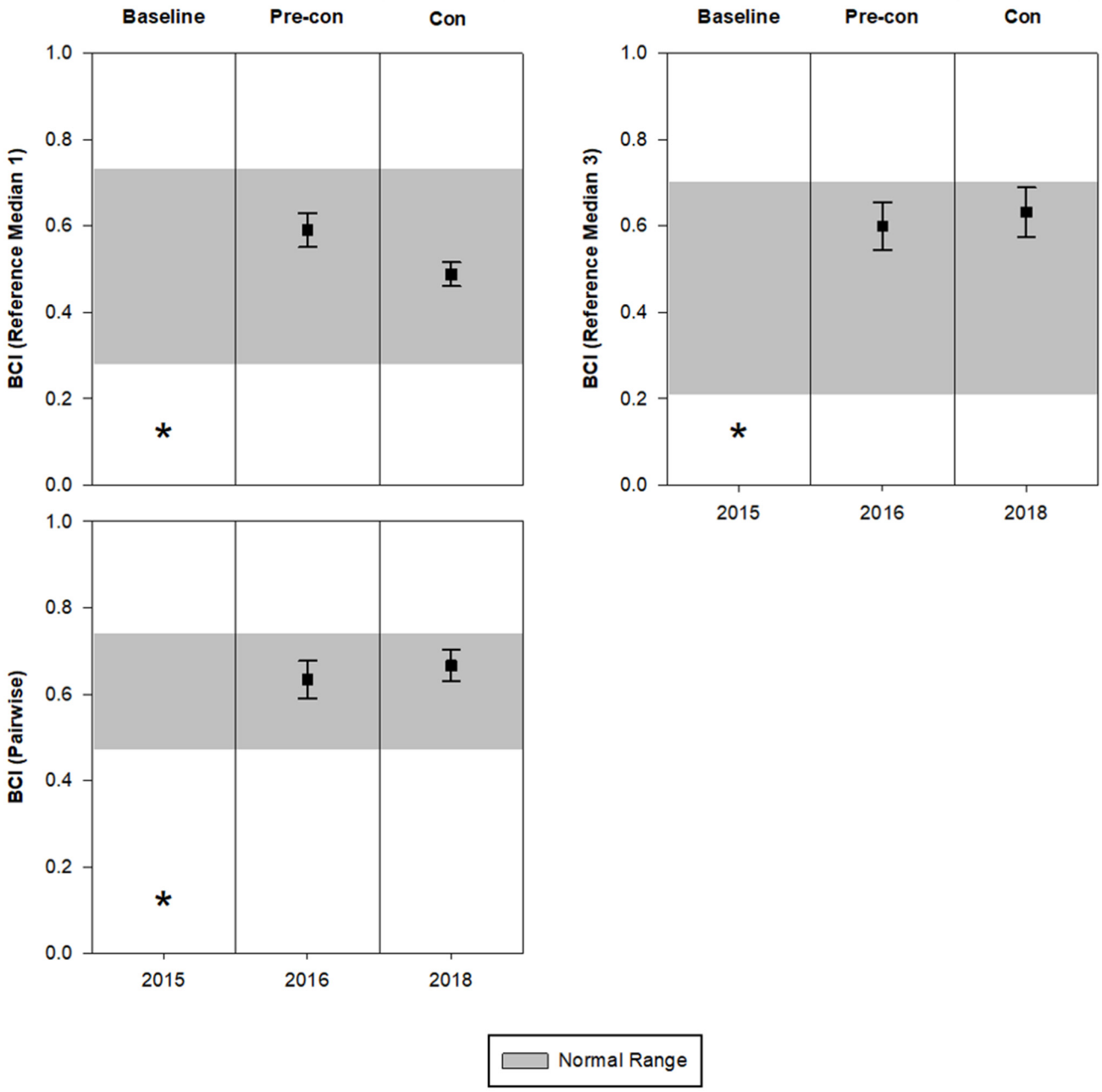
- Total invertebrate density in the Near-field area increased between 2015 and 2016 by almost a factor of two, followed by a decrease from 2016 to 2018 to values similar to those observed in 2015 during pre-construction. Increases in density and richness in 2016 to values above the normal range for density, but within the normal range for richness, potentially reflected a mild nutrient enrichment response, as reported by Golder (2018a). As described in Section 2.6, phosphorus loadings to the Near-field area peaked in 2016 as a result of the exploration camp STP discharge at the MEL-07 and then decreased substantially by 2018. By the 2018 AEMP sampling event, the STP discharge had ceased and the centralized Mine effluent discharge had commenced at the MEL-14 location.
- Unlike density and richness, diversity and evenness values in the Near-field area were reasonably comparable among years, although evenness appeared to decrease in 2016 compared to 2015 and 2018.

- No reference areas were sampled during 2015, therefore no BCI calculations were possible (Figure 9.4-8). BCI values in the Near-field area for both methods (EEM median and PW) showed low to moderate BCI values, with no visual differences among the years, and all years were within the normal range (Figure 9.4-8).



Pre-con = Pre-construction; Con = Construction. Error bars represent 1 standard error.

Figure 9.4-7: Mean Total Benthic Invertebrate Density, Richness, Simpson's Diversity Index and Simpson's Evenness Index in the Near-field Area, 2015, 2016 and 2018



Note: BCI (Reference Median 1 and Reference Median 3) were calculated using BCI EEM method.
Pre-con = Pre-construction; Con = Construction; * = no 2015 reference area data collected, not applicable. Error bars represent 1 standard error; BCI = Bray-Curtis Index.

Figure 9.4-8: Mean Bray-Curtis Index Values for the Benthic Invertebrate Community in the Near-field Area, 2015, 2016 and 2018

9.4.2.2.3 Community Composition and Densities of Dominant Invertebrates

Benthic invertebrate taxa present at all stations consisted of 12 common subarctic taxa from the taxonomic groups Pisidiidae, Hydracarina and Chironomidae subfamilies: Chironominae, Tanypodinae, Orthocladiinae, and Prodiamesinae (Appendix 9D, Table 9D-3).

Dominant benthic invertebrates previously documented in Meliadine Lake include insects, including midges (Chironomidae), fingernail clams (Pisidiidae), valve snails (Valvatidae), and amphipods (shrimp-like crustaceans) (Golder 2018c). Overall, BIC structure in Meliadine Lake is consistent with other subarctic lakes (Golder 2017b and DeBeers 2018). Oliver (1968) stated that dipterans typically contribute one third to one half of total number of species in subarctic benthic invertebrate communities. This is consistent with the 2018 Meliadine Lake AEMP results, which reported Chironomidae to be the dominant group across all sampling stations accounting for 70% of the total density. Pisidiidae (18%) was the subdominant group, followed by Amphipoda (5%) as the third most numerous group (Figure 9.4-9).

The Near-field area benthic community showed a wide range in Chironomidae relative density among stations: from 38% (MEL-01-08) to 80% (MEL-01-07) (Figure 9.4-9 and Figure 9.4-10). Pisidiidae was the subdominant group at all stations in the Near-field area, ranging from 17% (MEL01-07) to 44% (MEL01-06), with the exception of MEL-01-08 where co-dominance was observed between Chironomidae and Pisidiidae. Gastropods were present at all stations at low densities (<18%), likely reflective of their affinity for fine (silt/clay) substrates, which is supported by general preferences of genus present (*Valvata*) (Thorp and Covich 2001). Amphipoda were absent from Near-field area stations.

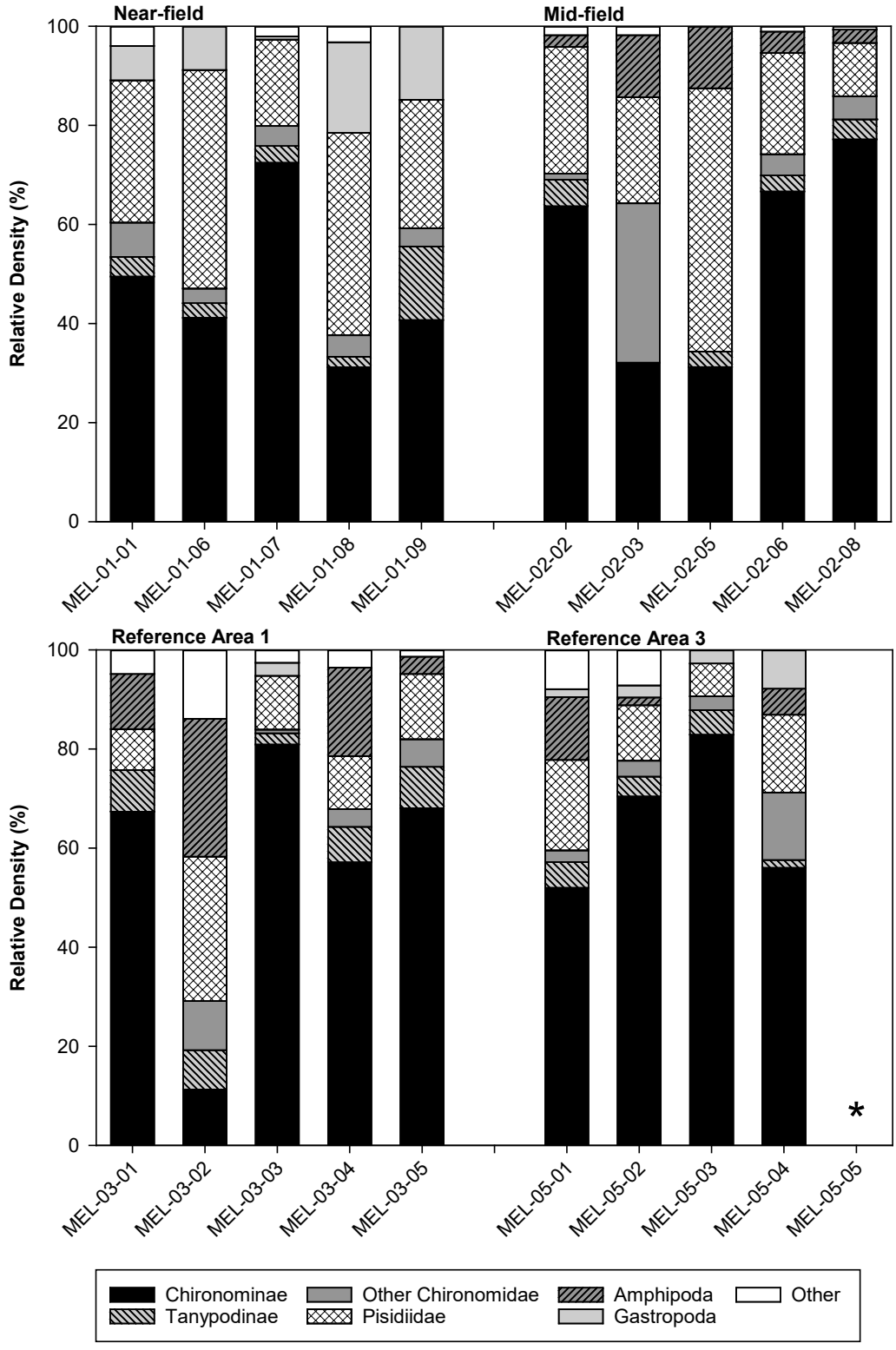
Mid-field area relative densities showed comparable chironomid dominance in comparison to the Near-field area, that ranged from 34% (MEL02-05) to 86% (MEL02-08), and reasonably comparable Pisidiidae densities that ranged from 11% (MEL02-08) to 53% at MEL02-05 (Figure 9.4-9). Amphipods were the third most abundant group, with relative abundance ranging from 2% to 13%. No gastropods were captured in the Mid-field area.

The relative density of Chironomidae in Reference Area 1 was proportionally high at all stations (60% to 84%), with the exception of MEL03-02, where Chironomidae density was 29% in 2018 (Figure 9.4-9). Mean Chironomidae relative density was similar to the Mid-field area (68%). Community composition at MEL03-02 was evenly proportioned among Chironomidae, Pisidiidae and Amphipoda (approximately 29% each). Gastropoda were absent at all stations with the exception of MEL03-03.

Mean Chironomidae relative density in Reference Area 3 in 2018 ranged from 60% (MEL05-01) to 91% (MEL05-04) (Figure 9.4-9). Pisidiidae contributed less than 18% of the relative density in Reference Area 3. Amphipods and gastropods constituted <5% to the community composition. One station (MEL05-05) was removed from the data analyses as it contained only one individual of Chironomidae (*Microtendipes* sp.).

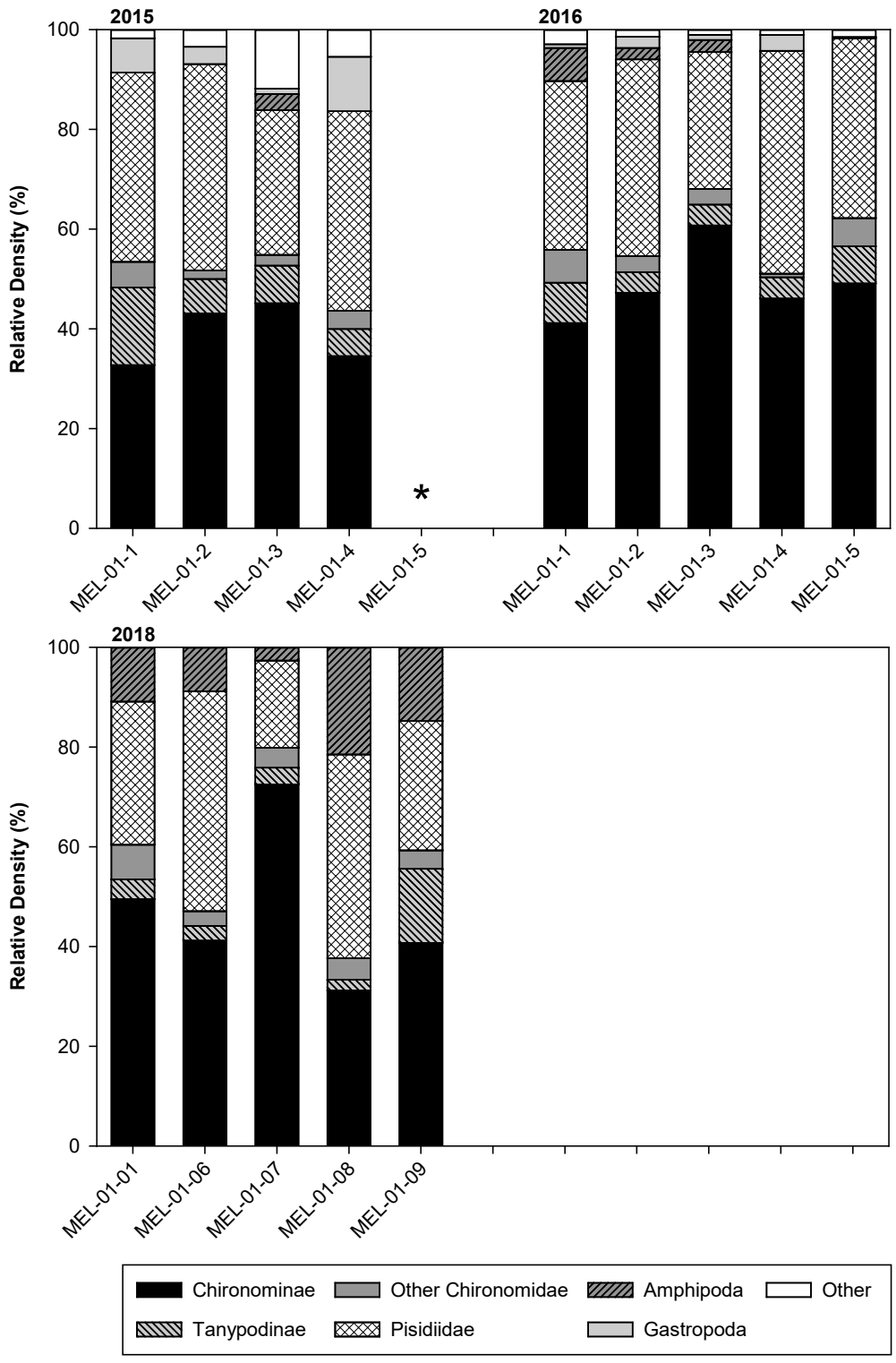
In 2018, there were minor visual differences between the relative densities of dominant taxa (i.e., Chironomidae, Pisidiidae) in the Near-field area compared to Reference Area 1 (Figure 9.4-9). Chironomidae relative density increased with increasing distance from the CP1 diffuser, likely due to higher proportions of sand in the Reference areas. Pisidiidae showed the opposite relationship and the highest proportions were observed in the Near-field and Mid-field areas, likely associated with the presence of finer sediments. Similarly, gastropods were observed in the Near-field area at higher proportions than in any other areas.

Chironomidae density increased with increasing distance from the Near-field area in 2018, while Pisidiidae density was similar in all sampling areas (Fogure 9-12). Visual differences were apparent among years for Chironomidae and Pisidiidae densities: both had higher densities in 2016 compared to both 2015 and 2018 (Figure 9.4-12). However, densities of these groups in 2018 were not visually different from the baseline year of 2015.



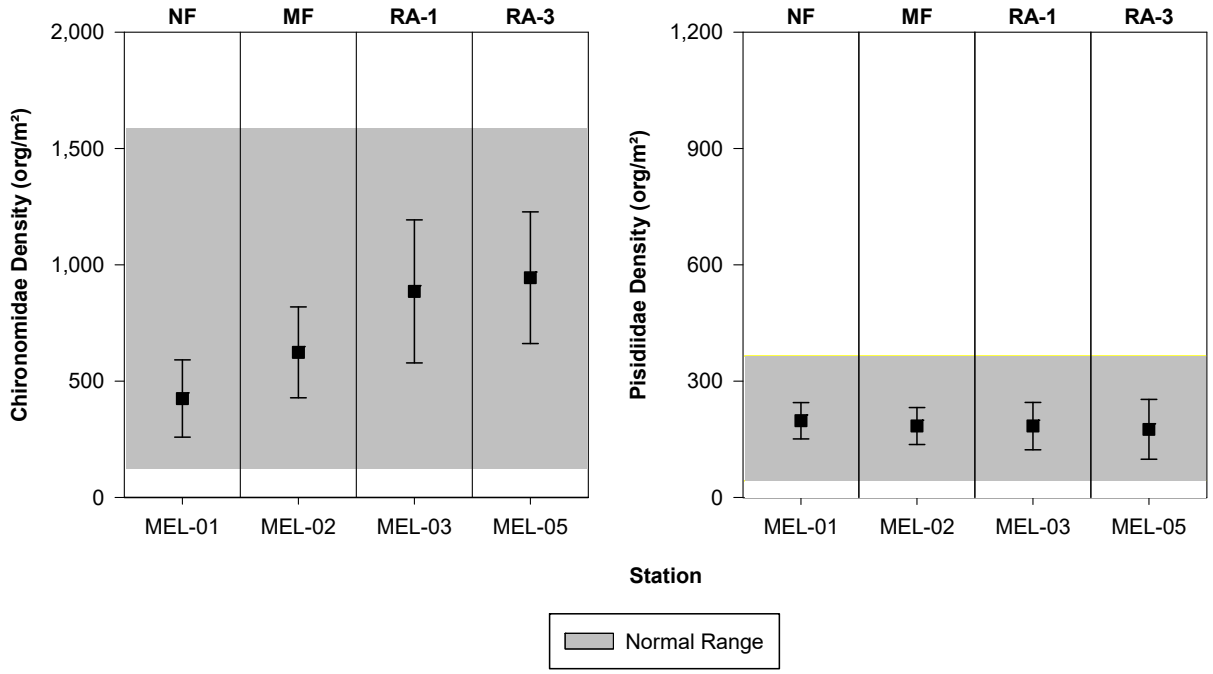
(*) = Sample removed from data analysis due to insufficient densities obtained.

Figure 9.4-9: Relative Densities of Major Benthic Invertebrate Groups in Meliadine Lake, 2018



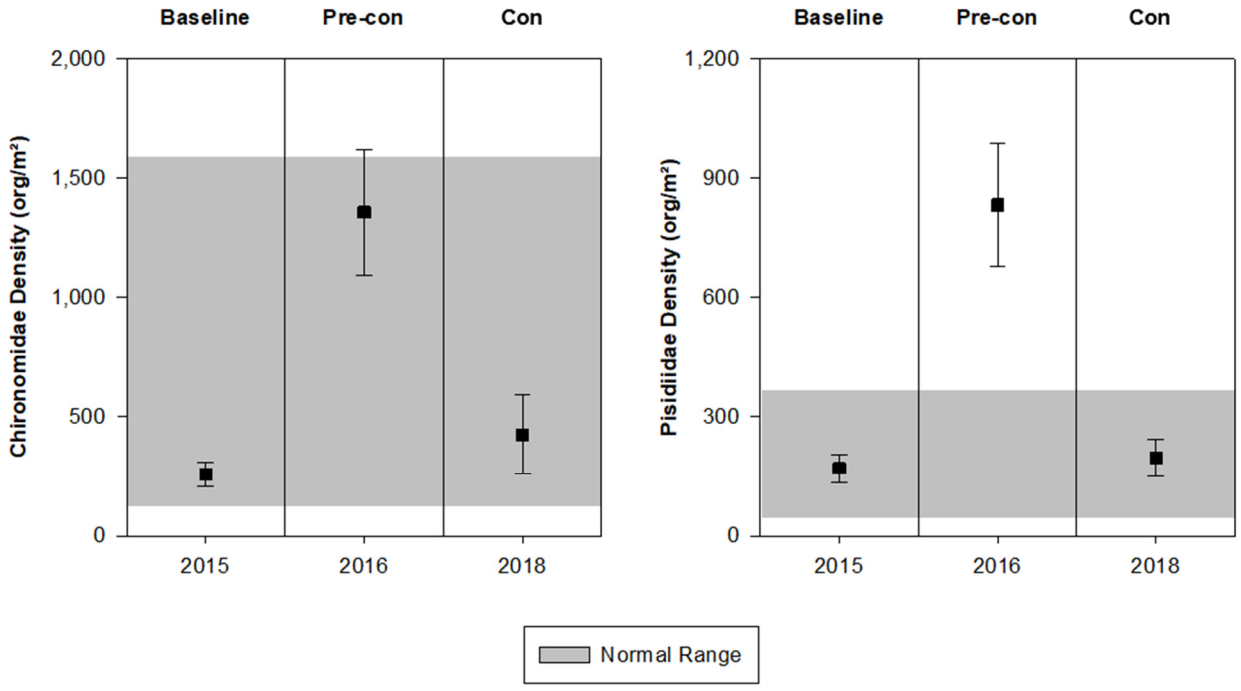
(*) Station removed from the dataset due to insufficient sample volume.

Figure 9.4-10: Relative Densities of Major Benthic Invertebrate Groups in the Near-field Area, 2015, 2016, 2018



NF = Near-field; MF = Mid-field RA-1 = Reference Area 1; RA-3 = Reference Area 3. Error bars represent 1 standard error.

Figure 9.4-11: Mean Total Chironomidae Density and Total Pisidiidae Density in Meliadine Lake, 2018



Pre-con = Preconstruction; Con = Construction. Error bars represent 1 standard error.

Figure 9.4-12: Mean Total Chironomidae Density and Total Pisidiidae Density in the Near-field Area, 2015, 2016, 2018

9.4.2.2.4 Multivariate Analysis

The nMDS run on the 2018 BIC dataset produced a two-dimensional configuration with an overall stress value of 0.12, indicating a good level of fit to the original dataset (Figure 9.4-13). Community structure within all areas was moderately similar (i.e., within the 60% similarity ellipse), although some separation was observed between the Near-field area (MEL01) and the other sampling areas. The similarity was higher (i.e., within the 70% similarity ellipse) between the Mid-field area (MEL02) and the reference areas (MEL03 and MEL05). Similar to the univariate results, the Near-field area showed significant differences from the Mid-field area (i.e., $P = 0.032$) and Reference Area 1 (i.e., $P = 0.024$) (Table 9.4-4). No other significant differences were observed.

The configuration for the Near-field area BIC ordination run on 2015 and 2018 data had an overall stress value of 0.06, indicating a good level of fit to the original dataset (Figure 9.4-14). Community structure within the Near-field area showed separation of the 2016 Near-field area stations from the 2015 and 2018 Near-field area stations, reflective of the univariate results. Although all years were within low to moderate similarity ellipses (i.e. 40% and 50%) the pair-wise ANOSIM results comparing years were significantly different (i.e., R>0.5, $P = 0.08$) for all pairwise comparisons of years (Table 9.4-5). These results suggest a potentially high degree of variation in BIC structure among years in Meliadine Lake.

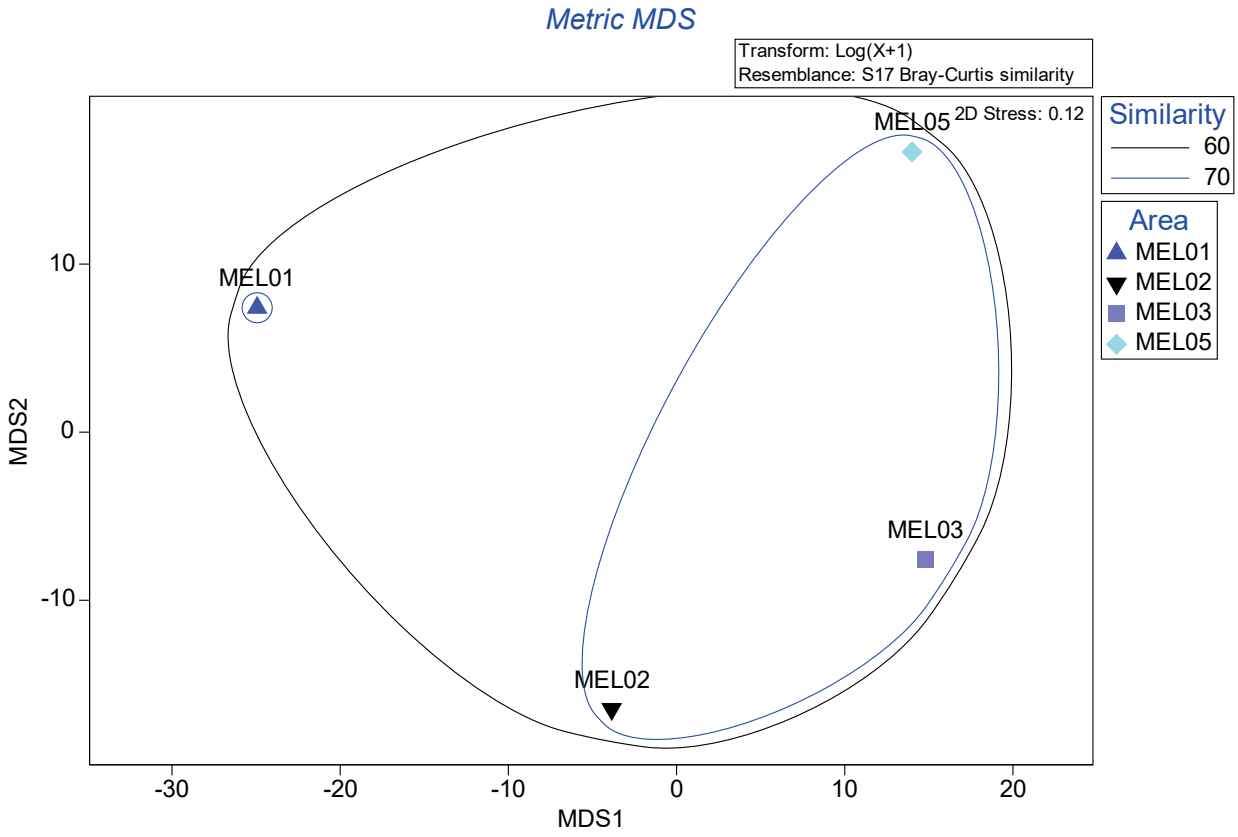


Figure 9.4-13: Ordination Plot of the Benthic Invertebrate Community for Meliadine Lake, 2018

Table 9.4-4: Benthic Invertebrate Community ANOSIM Results, 2018

Area	Area Comparisons	
	R statistic	*P*-value
Near-field Area (MEL01) vs Mid-field Area (MEL-02)	0.488	**0.032**
Near-field Area (MEL01) vs Reference Area 1 (MEL-03)	0.381	**0.024**
Near-field Area (MEL01) vs Reference Area 3 (MEL-05)	0.325	0.063
Mid-field Area (MEL-02) vs Reference Area 1 (MEL-03)	0	0.714
Mid-field Area (MEL-02) vs Reference Area 3 (MEL-05)	0.284	0.056
Reference Area 1 (MEL-03) vs Reference Area 3 (MEL-05)	0.036	0.349

Note: Comparisons are significant at $P < 0.05$. **Bolded** values indicate significance.
P = probability.

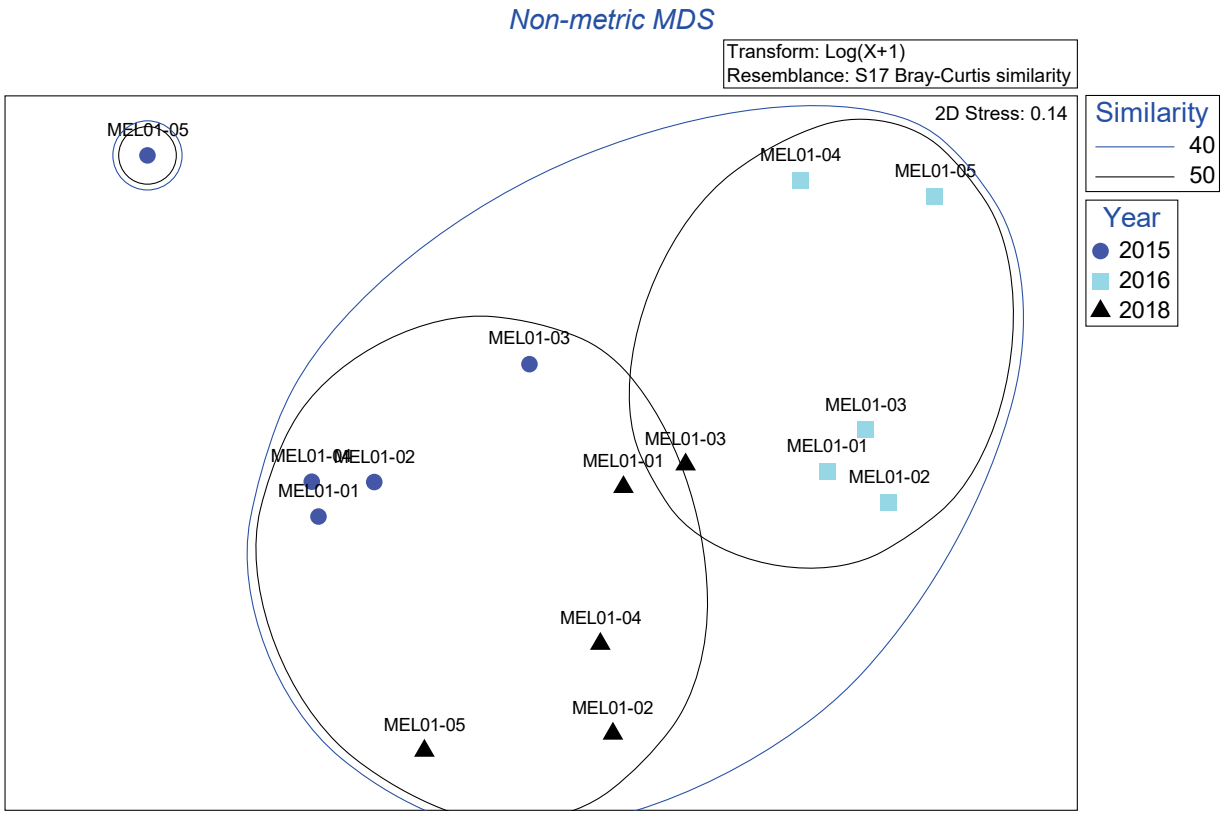


Figure 9.4-14: Ordination Plot of the Benthic Invertebrate Community for Near-Field Stations in Meliadine Lake, 2015, 2016, 2018

Table 9.4-5: Benthic Invertebrate Community ANOSIM Results, 2015, 2016 and 2018

Years	Near-field Comparisons	
	R statistic	*P*-value
2015 vs 2016	0.848	**0.008**
2015 vs 2018	0.640	**0.008**
2016 vs 2018	0.594	**0.008**

Significant differences are **bolded**. Significance was evaluated at $P<0.05$.

9.4.2.2.5 Effect of Variation in Habitat, and Sediment and Water Quality on the Benthic Invertebrate Community

The potential for variation in physical habitat, sediment quality and water quality parameters to contribute to spatial and temporal variability in community structure among stations in Meliadine Lake was evaluated using Spearman rank correlation analysis. Variables included in the correlation analysis were sediment particle size parameters, sediment TOC, concentrations of metals present in Meliadine Lake sediments above CCME sediment quality guidelines (i.e., arsenic, chromium, copper), waterborne concentrations of total phosphorus and nitrogen, and water depth.

Results of the Spearman correlations are provided in Table 9.4-6. Scatter-plots of habitat and community variables were not completed for 2018 because the significant relationships identified were below the moderate to high significance criterion, where further interpretation beyond the analysis presented here would be warranted.

The following significant correlations were identified from the results of the correlation analysis summarized in Table 9.4-6.

- Total invertebrate and Chironomidae densities were significantly negatively correlated with total phosphorus in water. However, these relationships were weak and inconsistent with a nutrient enrichment response (i.e., densities decreased with increased waterborne phosphorus).
- LTL richness was positively correlated with sand and negatively correlated with silt, clay, and sediment arsenic and chromium concentrations. Sediment metal concentrations were shown to increase with decreasing grain size in Section 8.0, with higher metal concentrations reported in finer sediments. This association was observed under baseline conditions; therefore, it is possible that resident biota in finer sediments have adapted to metal concentrations in those sediments.
- LTL evenness was negatively correlated with depth, suggesting that deeper stations had a less even distribution of taxa. This relationship is not unexpected in lakes under background conditions.

Overall, results of this analysis do not indicate that habitat variation, or variation in sediment or water quality, have an overriding influence on the BIC in Meliadine Lake. However, this is a coarse-level analysis, and due to high variation in data close to the analytical DL for TP (i.e., the most likely limiting nutrient in Meliadine Lake), correlation results for nutrient relationships may not be representative. Potential biological effects related to Mine-related variation in nutrient concentrations in Meliadine Lake are discussed further in Section 11.0 (Plankton Targeted Study).

Table 9.4-6: Spearman Rank Correlations between Benthic Invertebrate Community Variables and Selected Habitat Variables for Meliadine Lake, 2018

Benthic Community Variable	Spearman Correlation Coefficient									
	TOC	Sand	Silt	Clay	As in Sediment	Cr in Sediment	Cu in Sediment	TP in Water	TN in Water	Water Depth
Total density	-0.063	0.347	-0.386	-0.300	-0.439	-0.318	-0.296	**-0.544***	-0.022	0.395
Richness, FL	-0.386	0.267	-0.232	-0.402	-0.256	-0.149	-0.256	-0.154	-0.076	0.124
Richness, LTL	-0.296	**0.545***	**-0.566***	**-0.468***	**-0.502***	**-0.520***	-0.449	-0.407	-0.227	0.220
SDI, LTL	-0.384	0.321	-0.363	-0.210	-0.262	-0.170	-0.373	0.059	-0.037	-0.194
SEI, LTL	-0.126	-0.123	0.116	0.201	0.154	0.219	0.010	0.358	0.280	**-0.568***
Chironomidae density	0.109	0.310	-0.363	-0.216	-0.425	-0.248	-0.210	**-0.481***	-0.033	0.431
Pisidiidae density	-0.276	0.043	-0.083	-0.078	-0.105	-0.007	-0.075	0.308	-0.065	0.237

Note: Significant correlation coefficients are **bolded.**

TP = total phosphorus; TN = total nitrogen; FL = family level; LTL = lowest taxonomic level; * = $P<0.05$, ** = $P<0.01$, *** = $P<0.001$, $n = 19$.

9.4.2.2.6 Characterization of Within-Station Variability

The results of the characterization of within-station variability are presented in Appendix 9C, Table 9C-1 and Figure 9C-1.

The %SE value for richness was <20% for subsamples taken at station MEL-05-04, which indicates that the observed within-station variability was within the range expected for benthic invertebrate communities due to natural variability (Elliott 1971). As expected, total abundance was more variable than richness. The %SE for abundance at MEL-05-04 (24.7%) was slightly above 20% but was comparable or lower than within-station variability reported for other subarctic lakes in Northern Canada (e.g., DDMI 2007), including those previously reported for Meliadine Lake (Golder 2018c) and the level of within-station variability is considered acceptable. The assessment of 2018 within-station variability at station MEL-05-04 supports the continued compositing of five grab samples per replicate station for the EEM and AEMP programs at the Meliadine Mine. As per the AEMP Design Plan (Golder 2016a), samples for BIC analysis will therefore continue to be collected as a combination of composite samples (five grabs per station), along with individual subsamples (i.e., discrete samples) at one station to continue to evaluate within-station variation.

9.5 Summary

9.5.1 EEM

The BIC survey for the Cycle 1 EEM study was undertaken in August 2018 to evaluate if the Mine effluent discharge had an effect on benthic communities in Meliadine Lake. Benthic invertebrate community structure in the Near-field area exposed to the MEL-14 effluent discharge was compared to community structure in Reference Area 1 located within Meliadine Lake. Determination of an effect was based on statistical analysis of family-level benthic community effect endpoints and review of supporting endpoints, as recommended by EC (2012). Sediment physical characteristics and in situ water quality were evaluated to facilitate interpretation of benthic invertebrate data collected in fall 2018. The main findings of the 2018 EEM benthic survey are summarized below:

- No statistically significant differences were identified between the Near-field area and Reference Area 1 for the EEM effect endpoints and supporting endpoints evaluated in the Cycle 1 EEM study. The CESs for these endpoints were not exceeded.
- Total density was lower in the Near-field area compared to Reference Area 1, but both areas had similar family level taxa richness. Comparisons between the Near-field area and Reference Area 1 showed higher diversity, evenness, and Bray-Curtis dissimilarity in the Near-field area. Differences in these endpoints between the two sampling areas likely reflect pre-discharge differences in habitat, particularly differences in sediment substrate composition identified in Section 8.

Meliadine Lake benthic invertebrate communities were reflective of typical subarctic communities and were characterized by low densities and low to moderate family-level richness. Communities were dominated by the family Chironomidae, with Pisidiidae being subdominant. Gastropods were observed in the Near-field area at higher proportions compared to other areas, and amphipods were only present outside of the Near-field area, which likely reflects differences in habitat between the Near-field area and other sampling areas, reflecting taxon-specific habitat preferences.

9.5.2 AEMP

The objective of the BIC component of the AEMP was to evaluate whether treated Mine effluent has the potential to cause short or long-term effects on benthic invertebrate communities, due to changes in water or sediment quality in Meliadine Lake. This objective was addressed by comparing 2018 benthic invertebrate communities sampled in Near-field and Mid-field areas to two within-lake Reference areas. Benthic invertebrate AEMP variables were calculated at the LTL for all areas, and then compared among areas. In addition, the AEMP assessment also evaluated temporal changes in benthic community variables within the Near-field area for the monitoring years 2015, 2016 and 2018. This time period extended from the AEMP baseline into the first year of the Mine effluent discharge. Multivariate analysis was also run to investigate differences in community structure among sampling areas.

The main findings of the 2018 AEMP benthic invertebrate component are summarized below in point form to support the subsequent response to the AEMP key question:

- Significant differences were detected between the Near-field area and the pooled reference areas in 2018 for total invertebrate density and BCI (EEM method relative to Reference 3 median), in that the Near-field area had significantly lower density and BCI values compared to the pooled reference areas. There were no significant differences in richness, SDI, SEI or BCI (pairwise method or EEM method relative to Reference 1 median) between benthic communities from exposure and reference areas in 2018 based on LTL data.
- Multivariate analysis also found the Near-field area to be significantly different from the Mid-field area and the two Reference areas in 2018, although the benthic communities in these areas did show some overlap (60% similarity in community composition).
- In general, a limited number of significant correlations were identified between benthic community and habitat variables and they were generally weak. Despite some differences in sediment substrate type and chemistry among sampling areas, a significant correlation between total density and sediment parameters was not identified in 2018. Richness was significantly positively correlated with sand content and negatively correlated with silt, clay, and sediment arsenic and chromium concentrations. However, richness was not significantly different between the AEMP sampling areas.
- Normal ranges were developed for BIC variables using representative data from the 2015, 2016 and 2018 AEMP sampling programs. All mean 2018 AEMP variables for both exposure and reference areas sampled in Meliadine Lake were within their respective normal ranges, with the exception of BCI calculated using the pairwise method, where the Mid-field area mean was below the normal range lower boundary.
- In the Near-field area, 2018 mean values were similar to the corresponding 2015 values for all AEMP benthic variables. For all years, mean values for the AEMP variables were within their respective normal ranges, with the exception of mean density in 2016 that may be attributed to the influence of the STP discharge and the subsequent increase in phosphorus loadings to the Near-field area in 2016.

Key Question: Is the benthic invertebrate community affected by potential Mine-related changes in water and sediment quality in Meliadine Lake?

During the first year of the Mine effluent discharge, the Near-field area was found to have significantly lower density and BCI values compared to the pooled reference areas. There were no significant differences in LTL richness, SDI, SEI or BCI (pairwise method or EEM method relative to Reference 1 median) between benthic communities in exposure and reference areas. These findings were supported by multivariate analysis, which also found the Near-field area to be significantly different from the Mid-field area and the two Reference areas in 2018, although the benthic communities in these areas did show some overlap.

The observed difference in density between the Near-field and the pooled reference area could, at least in part, be due to documented pre-discharge differences in sediment composition between the Near-field area and the reference areas. As part of the 2018 AEMP, normal ranges were developed that considered pre-discharge and reference area variability in Melidaine Lake benthic community structure. Even though 2018 Near-field mean density was lower than in other areas, and was similar to that reported in 2015 under pre-construction conditions, it was within the normal range. All other AEMP variables also had mean values within normal ranges in all sampling areas.

Overall, the 2018 AEMP results indicate that benthic community has not been measurably affected by potential Mine-related changes in water and sediment quality in Meliadine Lake. Benthic invertebrate variables in the Near-field area were within their respective normal ranges. Statistical comparisons between areas did identify some significant differences between Near-field and reference areas, but these appeared to reflect pre-discharge differences in sediment composition among areas.

The 2018 data indicate that the current AEMP Design Plan is able to detect Mine-related differences in benthic invertebrate communities between exposure and reference areas in Meliadine Lake. As more benthic invertebrate data are collected through the AEMP and EEM programs, spatial trends and temporal trends relative to the normal range will be further evaluated.

9.6 Recommendations

No recommendations are provided for changes to benthic invertebrate monitoring under the EEM or AEMP.

9.7 List of Appendices

- Appendix 9A-Sediment Reconnaissance Program
- Appendix 9B-Laboratory Methods and Reference Collection
- Appendix 9C-QC Results for Variability and Outlier Detection
  - Table 9C-1: Within-Station Variation in Benthic Community Variables in Meliadine Lake, 2018
  - Figure 9C-1: Within-station Variability for Abundance and Richness in Meliadine Lake, August 2018
  - Figure 9C-2 Temporal Variability per Station for Total Benthic Invertebrate Density, Richness, Simpson’s Diversity Index, Meliadine Lake 2015, 2016 and 2018
  - Figure 9C-3: Temporal Variability per Station for Total Benthic Invertebrate Simpson’s Evenness Index, Bray Curtis Index (EEM Reference Median 1) and Bray Curtis Index (EEM Reference Median), Meliadine Lake 2015, 2016 and 2018

- Figure 9C-4: Temporal Variability per Station for Bray Curtis Index (PW), Chironomidae density and Pisidiidae density, Meliadine Lake 2015, 2016 and 2018
- Figure 9C-4: Box and Whisker plots for Benthic Invertebrate Endpoints in Meliadine Lake, August 2018

- Appendix 9D: Supporting Habitat Variables and Benthic Invertebrate Community Data Analysis Results
  - Table 9D-1: Summary of Habitat Variables for Meliadine Lake, 2018
  - Table 9D-2: Benthic Invertebrate Abundance Data (numbers per five Ponar grabs), Meliadine Mine EEM and AEMP, Fall 2018
  - Table 9D-3: Presence/Absence of Benthic Invertebrate Taxa in Meliadine Lake, 2018.
  - Table 9D-4: Summary Statistics for Benthic Invertebrate Community Variables, Meliadine Lake, 2018

9.8 References

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10.0 FISH HEALTH

10.1 Introduction

Agnico Eagle's Mine triggered into an EEM in 2017 due to dewatering activities which resulted in a discharge to Meliadine Lake. The fish health component of the EEM evaluates potential differences in indicators of fish health (e.g., energy storage, energy usage, and survival) between the exposure area of Meliadine Lake (i.e., the Near-field area) and one reference area (i.e., Reference Area 1), resulting from the development and operations of the Mine.

The objectives of the fish health component are to:

- determine whether effluent from the Mine has an effect on the growth, reproduction, survival, or condition of fish in Meliadine Lake
- meet the requirements of Part 2, Schedule 5 of the MDMER regulations (Government of Canada 2018)
- provide data to inform adaptive management intended to reduce or eliminate Mine-related effects to fish health in Meliadine Lake

The 2018 fish health survey was implemented to meet EEM sampling requirements and was not intended to meet the specific requirements of the Mine's AEMP fish health component. Specifically, the 2018 fish health survey did not include: a second reference area, a large-bodied sentinel species, or a fish tissue chemistry component (as neither mercury or selenium concentrations in the effluent triggered a fish tissue study under the MDMER [Government of Canada 2018]). Fish health and tissue chemistry sampling for the AEMP is currently scheduled for 2021.

10.2 Methods

A fish health survey was conducted at the Near-field area and Reference Area 1 of Meliadine Lake from 7 to 20 August 2018. The Near-field area is the same as defined for the AEMP, and was selected as the exposure sampling area at the request of the EEM TAP, instead of the H17 discharge location proposed in the Cycle 1 EEM Study Design (Figure 10.2-1; Golder 2017a). Threespine Stickleback (*Gasterosteus aculeatus*) were targeted for the fish health survey based on their relative abundance in Meliadine Lake (Golder 2018c). A second sentinel species was not included in the fish health assessment as no other small-bodied fish species have been captured historically in sufficient abundance to meet EEM sample size requirements, as discussed in the Cycle 1 EEM Study Design (Golder 2017a). Therefore, both a population (i.e., lethal and non-lethal) and a lethal survey were completed with Threespine Stickleback. A brief description of the fish sampling methods are provided in Sections 10.2.1 to 10.2.3. A more detailed description of fish sampling methods is provided in the Cycle 1 EEM Study Design (Golder 2017a).

10.2.1 Field Methods

Fishing methods suitable for nearshore habitats were used to collect Threespine Stickleback from Meliadine Lake, including minnow traps and dip nets. An overview of the sampling area is provided in Figure 10.2-1. Sampling effort details for the Near-field area and Reference Area 1 are provided in Figure 10.2-2 and Figure 10.2-3, respectively. Water quality variables (i.e., water temperature, DO, conductivity, and pH) were measured daily during sampling. Detailed water quality and sediment quality data are provided for Meliadine Lake in Sections 6 and 8, respectively. Benthic invertebrate data are provided in Section 9.

The target sample sizes for the lethal fish health survey were 20 male, 20 female, and 20 juvenile Threespine Stickleback from each of the sampling areas. Non-lethal data were collected from at least 100 additional Threespine Stickleback in each area to supplement the population survey. Non-target species captured during sampling were enumerated, measured, weighed, and assessed for external abnormalities prior to live release near the location of capture. Each fish processed was assigned a unique fish identification number.

The following information was recorded for each sampling effort:

- time (in hours) for each fishing effort and gear type
- gear specific parameters (e.g., trap dimensions)
- water depth of each gear-type set
- latitude and longitude coordinates of each fishing effort
- substrate type (e.g., mud, sand, gravel, cobble) at each fishing location
- water quality field measurements (e.g., DO, water temperature, pH, and conductivity), once daily from the area sampled
- weather (e.g., air and water temperature, precipitation, wind velocity and direction)
- fishing effort identification number (i.e., a unique number for each sampling effort)
- number and species of fish captured
- photographs of representative habitat types and fish species captured

530000
535000
540000
545000
7000000
6995000
6990000
6985000

Meliadine Lake

REFERENCE AREA 1 (Mel-03)

Meliadine Lake

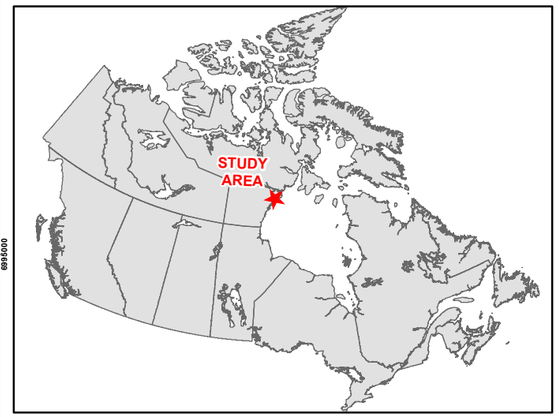
LAKE H17 EFFLUENT DIFFUSER (INACTIVE)

STP EFFLUENT DISCHARGE (INACTIVE)
CP1 DIFFUSER

NEAR-FIELD EXPOSURE AREA (Mel-01)

LEGEND

- MELIADINE LAKE FISH HEALTH SAMPLING AREA
- CP1 DIFFUSER
- LAKE H17 EFFLUENT DIFFUSER (INACTIVE)
- STP EFFLUENT DISCHARGE (INACTIVE)
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- WATERCOURSE
- WATERBODY



0 1.5 3
1:75,000 KILOMETRES

REFERENCE(S)
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2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT
CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE
MELIADINE LAKE FISH HEALTH SAMPLING STATIONS - OVERVIEW MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2019-03-22
DESIGNED	CZ
PREPARED	MH
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
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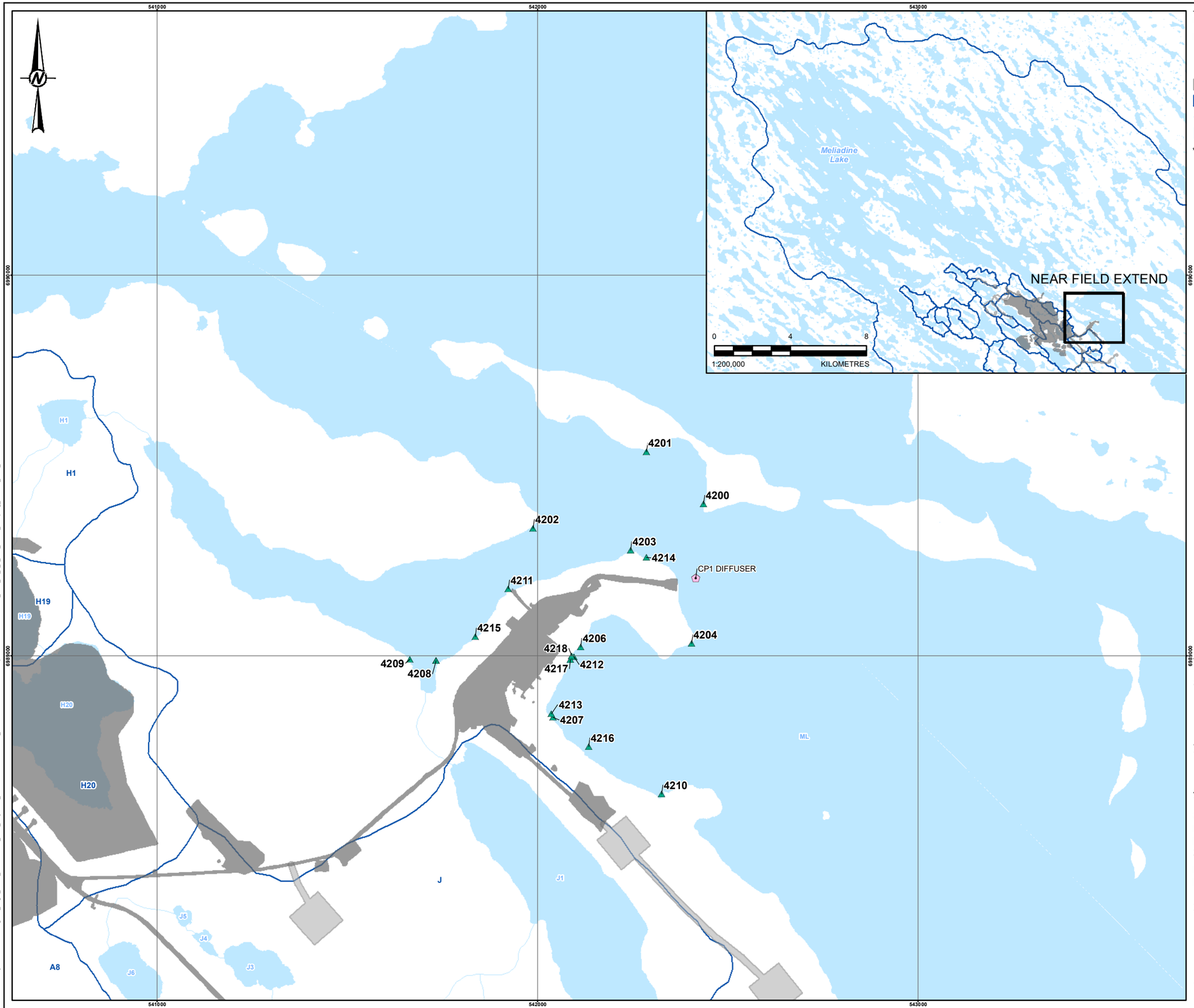
PATH: Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\18110868\02_PRODUCTION\2100\MXD\Report\AEMP2018\18110868_2100_10_2_1_Fish_Health_Sampling_Stations_Overview.mxd PRINTED ON: 2019-03-22 AT: 10:37:41 AM



LEGEND

FISH HEALTH SAMPLING STATION*

- MINNOW TRAPS
- CP1 DIFFUSER
- MINE FOOTPRINT
- SUB-WATERSHED BOUNDARY
- WATERCOURSE
- WATERBODY

*FISHING EFFORT NUMBER INDICATES START LOCATION



0 200 400
1:10,000 METRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE

MELIADINE LAKE FISH HEALTH SAMPLING STATIONS - NEAR FIELD

CONSULTANT

GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	CZ
PREPARED	MH
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
18110868	2100	0	10.2-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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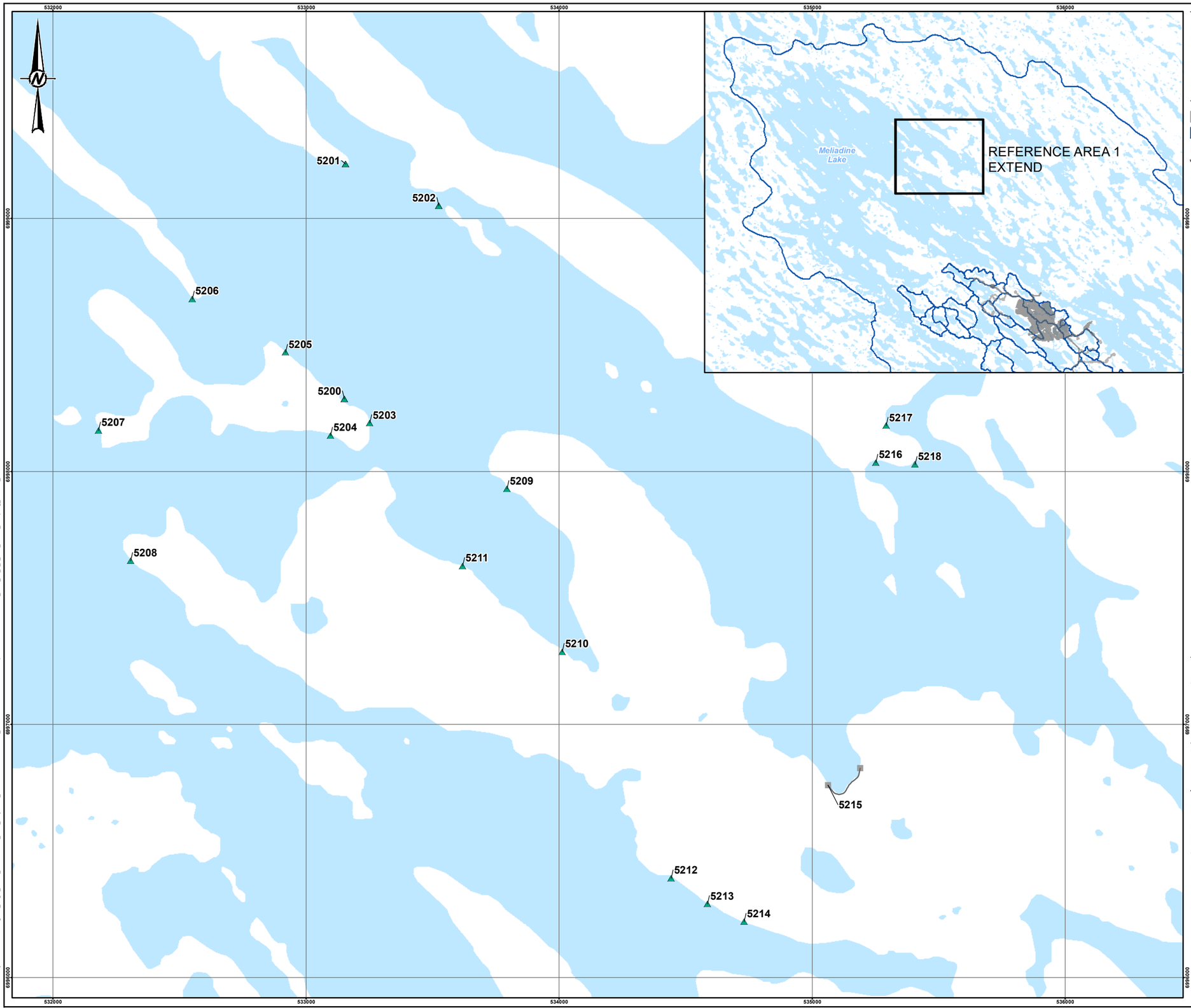

LEGEND

FISH HEALTH SAMPLING STATION*

- DIP NET
- MINNOW TRAP

PATH OF TRAVEL

- DIP NET
- MINE FOOTPRINT
- SUB-WATERSHED BOUNDARY
- WATERBODY

*FISHING EFFORT NUMBER INDICATES START LOCATION



0 300 600

1:15,000 METRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

CYCLE 1 EEM REPORT AND 2018 AEMP ANNUAL REPORT FOR MELIADINE GOLD MINE
NUNAVUT

TITLE

MELIADINE LAKE FISH HEALTH SAMPLING STATIONS - REFERENCE AREA 1

CONSULTANT

GOLDER

YYYY-MM-DD	2019-03-01
DESIGNED	CZ
PREPARED	MH
REVIEWED	RS
APPROVED	RS

PROJECT NO.	CONTROL	REV.	FIGURE
18110868	2100	0	10.2-3

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10.2.2 Population Survey

Threespine Stickleback included in the population survey were sampled using a combination of lethal and non-lethal methods. All fish included in the population survey underwent an external examination and total length (±1 mm) and total body weight (±0.001 g) were recorded. Any features that did not appear normal (i.e., deformities, erosions, lesions, tumours, or external parasites) were documented. Fish that were sampled using non-lethal methods were released near the capture location after processing.

10.2.3 Lethal Survey

Fish processed during the lethal survey were each assigned a fish identification number and underwent an external examination as described in the EEM TGD (Environment Canada 2012). Features of the fish that did not appear normal were documented (e.g., occurrence of deformities, erosion, lesions, tumours, or external parasites). Total length (±0.1 mm) and total body weight (±0.001 g) were recorded. Following the external examination, fish were sacrificed by a concussive blow to the head followed by cervical dislocation (i.e., cutting the spinal cord immediately behind the head). The internal organs were immediately assessed and any abnormalities in size, shape or colouration were documented. The liver and gonads were removed and weighed (±0.001 g). Sex and reproductive stage were assigned for each fish based on a visual examination of the gonads at the time of sampling using macroscopic features described in Table 10.2-1. Gonads were transferred to clean sample containers, preserved in 10% buffered formalin, and labelled with the fish identification number. Gonad histology and fecundity samples were submitted for respective analyses as described in Section 10.2.3.1 and Section 10.2.3.2. Carcasses were labeled with the fish identification number, frozen at -20°C and archived at the Golder Edmonton office for possible future chemistry analyses. Otoliths were extracted from frozen carcasses, dried, and submitted for aging analyses (Section 10.2.3.3).

10.2.3.1 Histology

Gonad samples from Threespine Stickleback were submitted to Dr. Dave Groman at the University of Prince Edward Island, Atlantic Veterinary College to confirm sex and maturity of lethally sampled fish. Sex and maturity were determined based on a histological assessment of gonad tissues with the aid of a light microscope, as per histological features listed in Table 10.2-1. Prior to interpretation, samples were prepared for histology by fixation, dehydration, clearing, embedding, sectioning, and staining.

To verify that data quality objectives were met, histology results were cross-referenced with field designated sex and maturity stages, external and internal photographs, as well as biological data (e.g., gonad weight, and fish length). Outliers and fish identified near the size-at-maturity were selected for reassessment by the lab to confirm the accuracy of their sex and/or reproductive staging assignments. The separation of adults and juveniles was determined after consideration of field assessments, gonad weight and histology results. If there were inconsistencies between field assessments and histology results, gonad histology results were weighed more heavily, with consideration of all available data to assign the final gonad maturity categories and sex determination.

10.2.3.2 Fecundity

Threespine Stickleback fecundity samples were processed by qualified biologists at the Golder Saskatoon office. Fecundity (i.e., the number of ripening eggs contained within the ovaries) was estimated by counting the number of ripening eggs present in a subsample of Threespine Stickleback ovarian tissue. Fecundity was then calculated using the following formula:

$$Fecundity = Subsample\ Egg\ Count * \frac{Ovary\ Weight\ (g)}{Subsample\ Weight\ (g)}$$

Mean egg size was determined by measuring the diameter of 30 eggs. To verify that data quality objectives were met, 10% of samples were independently verified by a second qualified biologist.

10.2.3.3 Aging

Otoliths collected from Threespine Stickleback were submitted to North/South Consultants Inc. (Winnipeg, Manitoba) for fish aging analysis. Whole otoliths from individual fish were mounted on slides to estimate age based on the number of annuli observed under a dissection microscope. To verify that data quality objectives were met, 10% of age estimates were independently verified by a second qualified biologist.

Table 10.2-1: Gonad Maturity Stages Used During the Meliadine Lake Fish Health Assessment, August 2018

Sex	Stage	Code	Macroscopic Features	Histological Features
Female	Unknown stage	10	Unable to determine stage.	Unable to determine stage.
	Immature	11	Small ovaries, often clear, blood vessels indistinct.	Only oogonia and PG oocytes present. No atresia or muscle bundles. Thin ovarian wall and little space between oocytes.
	Early Stage Development	12	Enlarging ovaries, blood vessels more distinct. Granular in appearance.	PG, CA, Vtg1, and Vtg2 oocytes present. No evidence of POFs or Vtg3 oocytes. Some atresia can be present.
	Late Stage Development	13	Large ovaries filling the body cavity, prominent blood vessels. Individual oocytes visible.	Vtg3 oocytes present or POFs in batch spawners. Atresia of vitellogenic and/or hydrated oocytes may be present. Early stages of OM can be present.
	Ripe	14	Eggs released with gentle pressure on abdomen.	Oocytes undergoing late OM including GVM, GVBD and hydration, or ovulation.
	Spent	15	Deflated ovaries, blood vessels prominent.	Presence of oocyte atresia and, in some species, POFs. Few if any Vtg2 or Vtg3 oocytes.
	Reabsorbing	16	Small atretic oocytes throughout the ovaries, which are hard and white.	Advanced stage oocytes are atretic and no POFs are present.
	Resting	17	Small ovaries, blood vessels reduced but present.	Only oogonia and PG oocytes present. Muscle bundles, enlarged blood vessels, thick ovarian wall, atresia and degenerating POFs may be present.

Table 10.2-1: Gonad Maturity Stages Used During the Meliadine Lake Fish Health Assessment, August 2018

Sex	Stage	Code	Macroscopic Features	Histological Features
Male	Unknown stage	20	Unable to determine stage.	Unable to determine stage.
	Immature	21	Small testes, often clear and threadlike.	Sg1 only; no lumen in lobules.
	Early Stage Development	22	Small testes, semi-translucent, but easily identified.	Spermatocysts evident along lobules. Sg2, Sc1, Sc2, St and Sz can be present in spermatocysts. Sz not present in lumen of lobules or in sperm ducts. GE continuous throughout.
	Late Stage Development	23	Testes large, firm and lobate. White to purplish in colour. Granular appearance.	Sz in lumen of lobules and/or sperm ducts. All stages of spermatogenesis (Sg2, Sc, St, Sz) can be present. Spermatocysts throughout the testis, active spermatogenesis. GE may be continuous or discontinuous.
	Ripe	24	Milt released with gentle pressure on abdomen.	Based on macroscopic observation only.
	Spent	25	Small and deflated testes. Blood vessels obvious. Violet-pink in colour.	Residual Sz present in lumen of lobules and in sperm ducts. Widely scattered spermatocysts near periphery containing Sc2, St, Sz. Little to no active spermatogenesis. Spermatogonial proliferation and regeneration of GE common in periphery of testes.
	Reabsorbing	26	Not typically observed in males.	Not typically observed in males.
	Resting	27	Small testes, often threadlike.	No spermatocysts. Lumen of lobule often nonexistent. Proliferation of spermatogonia throughout testes. GE continuous throughout. Small amount of residual Sz occasionally present in lumen of lobules and in sperm duct.

Note: Modified from Brown-Peterson et al. (2011).

CA = cortical alveolar; GVBD = germinal vesicle breakdown, GVM = germinal vesicle migration, OM = oocyte maturation, PG = primary growth, POF = postovulatory follicle complex, Vtg1 = primary vitellogenic, Vtg2 = secondary vitellogenic, Vtg3 = tertiary vitellogenic, GE = germinal epithelium, Sc1 = primary spermatocyte, Sc2 = secondary spermatocyte, Sg1 = primary spermatogonia, Sg2 = secondary spermatogonia, St = spermatid, Sz = spermatozoa.

10.2.4 Data Analysis

Data screening was performed prior to statistical analyses. Fish health data were screened for potential data entry errors or unusual data using box plots and scatterplots to visually examine data. Plots included total length versus carcass weight, carcass weight versus gonad weight, standard length versus total length, total length versus total body weight, carcass weight versus liver weight, total body weight versus carcass weight, age versus total length, age versus total body weight, age versus carcass weight, and age versus gonad weight. Outliers, as detected by the qualitative screening, were removed from the dataset only if they were determined to be the result of human error (i.e., sampling or measurement error). All outliers were checked with field data sheets and field photos as part of the screening process prior to removal from the dataset.

Data collected during the fish health program were compared among sampling areas to identify and quantify potential differences in effect endpoints between the Near-field and Reference Area 1. Endpoints were considered as either “effect” or “supporting” endpoints. Effect endpoints included specific parameters measured to determine whether there were any effects on indicators of survival, energy use, and energy storage among fish populations (Environment Canada 2012). Supporting endpoints included parameters measured to support the interpretation of potential differences in effect endpoints. A list of measured effect and supporting endpoints for the population

survey and the lethal survey are provided in Table 10.2-2 and Table 10.2-3, respectively. The magnitude of differences in effect endpoints were compared to CES as defined in the MDMER (Government of Canada 2018), which establish effects thresholds indicative of a potential risk to the environment (e.g., greater than 10% for relative body weight and greater than 25% for relative liver size and relative gonad size). In cases where sexes were compared separately (i.e., the lethal survey), only fish with sexes confirmed through histology were included in the statistical analysis.

Table 10.2-2: Statistical Procedures Used in the Population Survey

Indicator	Parameter	Endpoint	CES	Response Variable (Y)	Covariate (X)	Statistical Procedure
Survival	Length-frequency	Effect[a]	-	-	-	K-S test
Growth (energy use)	Length (immature fish)	Effect	25%[b]	Total length	-	ANOVA
	Body weight (immature fish)	Effect	25%[b]	Body weight	-	ANOVA
Reproduction (energy use)	YOY relative abundance	Effect	-	YOY relative abundance	-	Fisher's Exact Test
Condition (energy storage)	Relative body weight	Effect	10%	Body weight	Length	ANCOVA

a) Length-frequency is an effect endpoint for non-lethal sampling in the EEM program; however, because effect sizes are not expressed as a magnitude, but rather a maximum percent difference, there are no defined CES.

b) Critical effect size is applied herein but is not defined for the specific endpoint in the MDMER.

CES = critical effect size ; % = percent; K-S = Kolmogrov-Smirnov test; ANOVA = analysis of variance; ANCOVA = analysis of covariance; YOY = young-of-the-year; - = not applicable.

Table 10.2-3: Statistical Procedures Used in the Lethal Survey

Indicator	Parameter	Endpoint	CES	Response Variable (Y)	Covariate (X)	Statistical Procedure
Survival	Length	Effect[a]	25%	Total length	-	ANOVA
Growth (energy use)	Weight-at-age	Effect	25%	Body weight	Age	ANCOVA
Reproduction (energy use)	Relative gonad size	Effect	25%	Gonad weight	Body weight	ANCOVA
Condition (energy storage)	Relative body weight	Effect	10%	Body weight	Total length	ANCOVA
	Relative liver weight	Effect	25%	Liver weight	Body weight	ANCOVA
		Supporting	-	Liver weight	Total length	ANCOVA
	Relative egg size	Supporting	-	Egg size	Body weight	ANCOVA

a) Threespine Stickleback are short-lived in freshwater, so length was used as a surrogate for age (Environment Canada 2012).

CES = critical effect size ; % = percent; # = number; K-W = Kruskal-Wallis test; ANOVA = analysis of variance; ANCOVA = analysis of covariance; - = not applicable.

10.2.5 Descriptive Statistics

Catch-per-unit effort (CPUE) was calculated to provide an estimate of abundance by standardizing catch data to fishing effort. The CPUE was calculated separately for each species and was summarized by sampling area and gear type. For minnow traps, CPUE was calculated as the number of fish captured per trap per hour. For dip nets, CPUE was calculated as the number of fish captured per 100 seconds of sampling effort.

Descriptive statistics were calculated for individual fish health parameters, separated by sex, life stage (i.e., adult or juvenile), and sampling area. Descriptive statistics included sample size, median, arithmetic mean, standard deviation (SD), standard error (SE), and minimum and maximum values. Fish health indices were calculated as follows:

$$Condition\ Factor\ = \left(\frac{body\ weight}{length^3}\right) \times\ 100{,}000$$

$$Gonadosomatic\ index\ = \left(\frac{gonad\ weight}{body\ weight}\right) \times 100$$

$$Liver\ somatic\ index = \left(\frac{liver\ weight}{body\ weight}\right) \times 100$$

Weight and length measurements were reported in units of grams (g) and millimetres (mm), respectively.

Visual comparisons for fish health data were made using censored box plots as outlined in Barrett et al. (2014). The censored boxplots were defined using the minimum values, the quartiles, and the maximum values. Values that were 1.5 times the interquartile range beyond the quartiles were considered extreme and plotted individually. When extreme values were present, the whiskers were truncated to the next value in the dataset that was within 1.5 times the interquartile range beyond the quartiles (i.e., the whiskers may not always extend to the full 1.5 times the interquartile range if the next value in the dataset is closer to the quartile than the full 1.5 times the interquartile range).

10.2.6 Inferential Statistics

Statistical comparisons were conducted among sampling areas for fish health endpoints presented in Table 10.2-2 and Table 10.2-3. Differences in the length and body weight were compared among sampling areas using ANOVA. Differences in weight-at-age, relative gonad size, relative body weight, relative liver size, and relative egg weight were compared among sampling areas using analysis of covariance (ANCOVA). Significant differences between sampling areas were determined using an α of 0.1. As tapeworms were frequently observed in Threespine Stickleback captured from the Near-field area and Reference Area 1, inferential statistics were completed both with and without parasitized fish included (Golder 2017a).

The assumptions of ANOVA and ANCOVA are that the residuals of the data, after being fit to the model, are normally distributed and have equal variance between groups. The assumption of normality was assessed using the Shapiro-Wilk test, while Levene's test was used to assess equality of variances. Significant differences in assumptions were evaluated using an α of 0.05. If the assumptions of normality and equality of variance were not met, the data were $\log_{10}$-transformed and the assumptions were re-tested. When the assumptions could not be met using a $\log_{10}$ transformation, the non-parametric K-W test was used instead of ANOVA, while ANCOVA data were rank transformed. In addition to the assumptions of normality and equality of variance, ANCOVA has the additional assumption that the parameter regression slopes are parallel among sampling areas. To test this

assumption, the ANCOVA was conducted by first fitting separate regression models for each sampling area using a general linear model that included an interaction term between the sampling area and covariate:

Full ANCOVA model: $y = \beta_0 + \beta_1(x) + \beta_2(Area) + \beta_3(x) \times (Area) + \varepsilon$

where y is the response variable, x is the covariate, $Area$ is the sampling area indicator variable, and ε is the error term. If the coefficient β_3 of the $(x) \times (Area)$ interaction term was not significant (i.e., p>0.05), then the slopes were considered parallel and the ANCOVA proceeded by testing the significance of the coefficient β_2 of the $(Area)$ term in the reduced ANCOVA model that fits separate regressions for each area, but with a common regression slope:

Reduced ANCOVA model: $y = \beta_0 + \beta_1(x) + \beta_2(Area) + \varepsilon.$

When a significant interaction was observed, the regression slopes were considered significantly different. When the covariate was a strong predictor of the response variable and the ANCOVA had a high coefficient of determination (R^2 >0.8), the test for parallel slopes had high power to detect a difference that may not be practically significant. In this case, when the interaction term in the full ANCOVA model was significant, the slopes were fixed as parallel by fitting the reduced ANCOVA model because the reduced model explained almost as much (within 2%) of the variability in the response variable as the full model. In this case, the ANCOVA proceeded under the assumption that the regression slopes between groups were practically similar (Barrett et al. 2010).

Statistical outliers were evaluated using SRs from the ANOVA and ANCOVA models. Statistical outliers were identified with a SR value of plus or minus (±) 4.0 (Golder 2017a). When an outlier was detected, the validity of the data point was examined. If the outlier was determined to be the result of a data entry error, it was corrected; if the outlier was not the result of data entry error and could not be resolved otherwise, the analysis was completed with and without outliers included.

When significant differences in fish health parameters were observed between sampling areas, the magnitude of difference between the Near-field area and Reference Area 1 was calculated by expressing the difference as a percentage of the mean as follows:

Magnitude: $Magnitude = \frac{\bar{x}_{NF} - \bar{x}_{RA1}}{\bar{x}_{RA1}} * 100$

where $\bar{x}_{NF}$ is the mean or median value for the effect endpoint at the Near-field area, and $\bar{x}_{RA1}$ is the mean or median value for the effect endpoint at Reference Area 1. A positive magnitude of difference indicated that values were greater in the Near-field area than Reference Area 1, while a negative magnitude of difference indicated that values were greater in Reference Area 1 than the Near-field area.

If the statistical comparison was conducted on $\log_{10}$-transformed data, then the magnitude was calculated using geometric means. If the statistical comparison between sampling areas was conducted using the K-W test, the data were not considered to be normally distributed and the magnitude was calculated using medians. As the K-W test is a non-parametric method for testing whether samples originate from the same distribution (i.e., it is not a comparison of sample medians), there was the potential for the K-W test to be significant, but no differences in medians observed. For effect endpoints analyzed using ANCOVA, magnitudes were calculated from the least squares means.

Length-frequency distributions were compared among sampling areas using the non-parametric, two-sample Kolmogorov-Smirnov (K-S) test. The K-S test compares the cumulative relative distributions of total length between sampling areas by comparing the maximum difference between the two cumulative relative frequency distributions to a critical value, which is determined based on sample size, to assess whether the difference is large enough to indicate that the two distributions came from different populations. Differences in the length of Threespine Stickleback were compared among gear types using the K-W test. The prevalence of abnormalities were compared among sampling areas using the chi-square test.

10.2.7 Power Analysis

Power analyses were performed to determine the statistical power and sample size requirements to detect a magnitude of change that was equivalent to CESs defined in the MDMER as presented in Table 10.2-2 and Table 10.2-3 (Government of Canada 2018). Type I (α) and Type II (β) error rates were set to 0.1 (Environment Canada 2012); therefore, sufficient power was considered to be 0.9 (i.e., 1- β). Power analyses were conducted using the power and sample size function in G*Power 3.1 (Faul et al. 2007). Power analyses were only completed for endpoints with defined CES (Government of Canada 2018).

10.3 Quality Assurance and Quality Control

QA and QC procedures were applied to field sampling, laboratory analyses, data entry, data analyses, and report preparation. Pre-field meetings were held with the field crew prior to the start of the program to review specific work instructions for the field data collection, and to confirm that the field crew were familiar with the expectations of the sampling plan. Field equipment were calibrated throughout the field program following manufacturer specifications and all samples were collected by experienced personnel. Samples were labelled, preserved, and shipped according to standard protocols. Detailed field notes were recorded in waterproof field books and on pre-printed waterproof field data sheets in either pencil or indelible ink. Data sheets and sample labels were checked at the end of each field day for completeness and accuracy and were scanned into electronic copies at the completion of the field program. Chain-of-custody forms were used to track shipment and receipt of samples.

10.4 Results and Discussion

10.4.1 Catch Data Summaries

A total of 1,226 fish from four species were captured during the August 2018 small-bodied fish health survey at Meliadine Lake (Table 10.4-1). Fish were captured using a combination of minnow traps and dip netting. The spatial extent of sampling was indicated for the Near-field area in Figure 10.2-2, and Reference Area 1 in Figure 10.2-3. Species richness varied among sampling areas, with two species captured from the Near-field area and four species from Reference Area 1. Catch varied among sampling areas, with 905 fish captured at the Near-field area and 321 fish captured at Reference Area 1. Catches at each sampling area were dominated by Threespine Stickleback, accounting for 99% of the total catch at the Near-field area and 94% of the catch at Reference Area 1. Threespine Stickleback CPUE varied among sampling areas, with the majority of Threespine Stickleback captured using minnow traps in Meliadine Lake (Table 10.4-2). The CPUE of Threespine Stickleback captured using minnow traps was 0.44 fish per hour at the Near-field area and 0.11 fish per hour at Reference Area 1.

Table 10.4-1: Species Richness and Abundance of Fish Captured at Meliadine Lake, 2018

Species	Near-field Area	Reference Area 1	Total
Threespine Stickleback (*Gasterosteus aculeatus*)	899	301	1,200
Ninespine Stickleback (*Pungitius pungitius*)	6	18	24
Slimy Sculpin (*Cottus cognatus*)	0	1	1
Burbot (*Lota lota*)	0	1	1
Species Richness	2	4	4
Abundance	905	321	1,226

Table 10.4-2: Catch-Per-Unit Effort for Fish Captured from Meliadine Lake, 2018

Area	Sampling Method	Sampling Effort		THST	NNST	SLSC	BURB	Total
NF	Minnow Trap	2049 h	Abundance	899	6	0	0	905
			CPUE #/h	0.44	<0.01	0.00	0.00	0.44
RA1	Minnow Trap	2692 h	Abundance	298	18	1	1	318
			CPUE #/h	0.11	<0.01	<0.01	<0.01	0.12
	Dip Net	3600 s	Abundance	3	0	0	0	3
			CPUE #/100 s	0.08	0.00	0.00	0.00	0.08

NF = Near-field Area; RA1 = Reference Area 1; THST = Threespine Stickleback; NNST = Ninespine Stickleback; SLSC = Slimy Sculpin; BURB = Burbot; CPUE = catch-per-unit-effort; # = number of fish; h = hour; s = second; <= less than.

Water quality measurements were comparable among the Near-field area and Reference Area 1 in 2018. Water temperatures ranged from 10.2 to 12.7°C at the Near-field area and 9.0 to 12.6°C at Reference Area 1. At the Near-field area, pH ranged from 5.9 to 7.4 versus 6.1 to 7.3 at Reference Area 1. DO concentrations ranged from 9.8 to 11.3 mg/L at the Near-field area and 9.2 to 12 mg/L at Reference Area 1. Specific conductivity ranged from 86 to 106 µS/cm at the Near-field area and 71 to 79 µS/cm at Reference Area 1. Fish sampling effort and supporting environmental data are provided for each sampling area in Appendix 10A. Detailed water quality and sediment quality data are provided for Meliadine Lake in Sections 6 and 8, respectively.

10.4.2 Population Survey

A total of 1,200 Threespine Stickleback were captured during the Meliadine Lake fish health program (Table 10.4-1). Of these, 216 were sampled during the lethal survey and an additional 654 Threespine Stickleback were processed using non-lethal methods (Appendix 10B). A combined total of 870 Threespine Stickleback were included in the population survey; 570 fish were collected in the Near-field Area and 300 fish were collected in Reference Area 1. An additional 330 individuals were released without processing to minimize hold times and reduce the risk of incidental mortalities.

Threespine Stickleback sample size targets for the population survey were met at each of the sampling areas. Descriptive statistics for the Threespine Stickleback population survey are provided in Table 10.4-3, with the results of statistical comparisons presented in Table 10.4-4. Data are provided in Appendix 10B, spatial comparisons are presented in Appendix 10C, and temporal comparisons for the Near-field area between 2018 and 2015 are provided in Appendix 10D.

Table 10.4-3: Descriptive Statistics for Threespine Stickleback Collected from Meliadine Lake, 2018

Stage	Parameter	Near-field Area							Reference Area 1						
		n	Mean	Median	Min	Max	SD	SE	n	Mean	Median	Min	Max	SD	SE
Adult	Age (y)	38	2.9	3.0	1.0	5.0	1.0	0.2	42	2.7	2.0	1.0	4.0	1.0	0.2
	Total length (mm)	472	57.0	57.0	42.5	75.0	7.9	0.4	237	53.6	51.0	39.9	79.0	8.0	0.5
	Body weight (g)	466	1.760	1.700	0.565	4.909	0.774	0.036	194	1.435	1.131	0.433	4.222	0.697	0.050
	Condition Factor	466	0.89	0.88	0.59	1.29	0.11	0.01	194	0.87	0.86	0.54	1.19	0.11	0.01
Juvenile	Age (y)	28	1.8	2.0	1.0	2.0	0.4	0.1	19	1.8	2.0	1.0	2.0	0.4	0.10
	Total length (mm)	98	41.2	41.3	35.4	45.5	2.4	0.2	63	41.7	42.0	33.0	47.4	2.4	0.3
	Body weight (g)	97	0.646	0.660	0.361	1.027	0.128	0.013	63	0.687	0.677	0.316	1.092	0.136	0.017
	Condition Factor	97	0.92	0.93	0.65	1.28	0.12	0.01	63	0.94	0.92	0.73	1.28	0.10	0.01

Note: descriptive statistics include parasitized fish.

n = sample size; Min = minimum; Max = maximum; SD = standard deviation; SE = standard error; y = year; mm = millimetre; g = gram.

Table 10.4-4: Statistical Comparison of Fish Population Survey Parameters among Meliadine Lake Sampling Areas, 2018

Parameter	Dependant Variable	Covariate	Endpoint	Statistical Test	Outliers	n		Interaction P-value	Model P-value	MSE	Least Squares Mean		Assumptions		SSD	Magnitude (%)	CES	Power Analysis (↑ / ↓)	
						NF	RA1				NF	RA1	Variance	Normality				Power	n
Length-frequency	-	-	Effect	K-S test	None	570	300	n/a	**<0.001**	n/a	n/a	n/a	n/a	n/a	Yes	20[(d)]	n/a	n/a	n/a
Size-at-age[(a)]	Body weight	n/a	Effect	K-W Test	None	99	65	n/a	0.347	0.017	0.648	0.676	n/a	n/a	No	-1	25%	1.000	12
	Total length	n/a	Effect	K-W Test	None	100	65	n/a	0.203	5.19	41.2	41.6	n/a	n/a	No	-1	25%	1.000	3
Abundance of YOY[(b)]	-	-	Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Relative body weight	Body weight	Total length	Effect	$ANCOVA_{rank}$	Included	563	257	0.007[(c)]	0.460	3352	412	408	0.003	<0.001	No	1	10%	1.000	43
				$ANCOVA_{rank}$	Excluded	563	256	0.012[(c)]	0.349	3286	412	408	0.004	<0.001	No	1		1.000	42

a) Analysis conducted using juvenile fish, defined as individuals below than the size-at-maturity of 44.5 mm.

b) Not tested. No young-of-the-year were captured from either area.

c) Slopes are considered practically similar (Barrett et al. 2010).

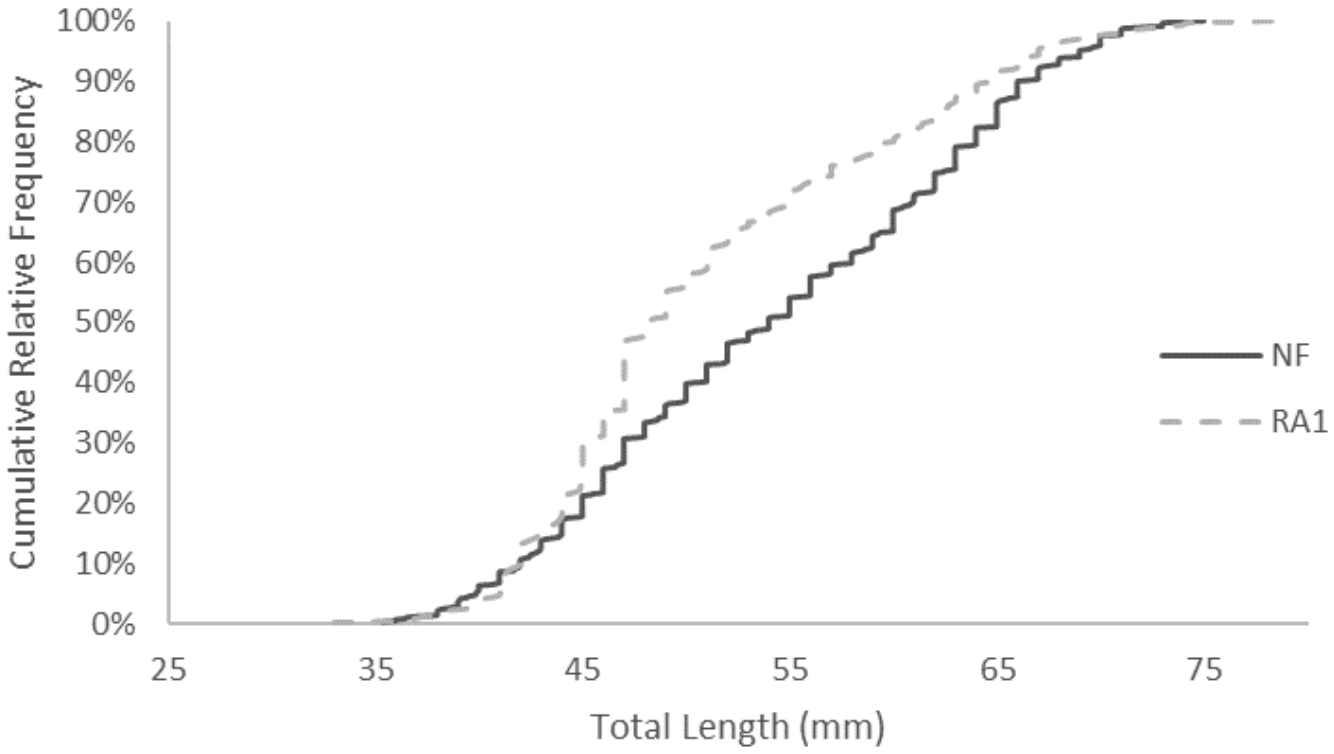
d) Magnitude based on maximum percent difference between groups in cumulative frequency distribution.

n = sample size; ; NF = Near-field Area; RA1 = Reference Area 1; *P*-value = probability value; MSE = mean squared error; SSD = statistically significant difference (α= 0.1) ; % = percent; CES = critical effect size; K-W = Kruskal-Wallis; ANCOVA = analysis of covariance; K-S = Kolmogorov-Smirnov; rank = rank transformed data; <= less than; n/a or - = not applicable.

10.4.2.1 Survival

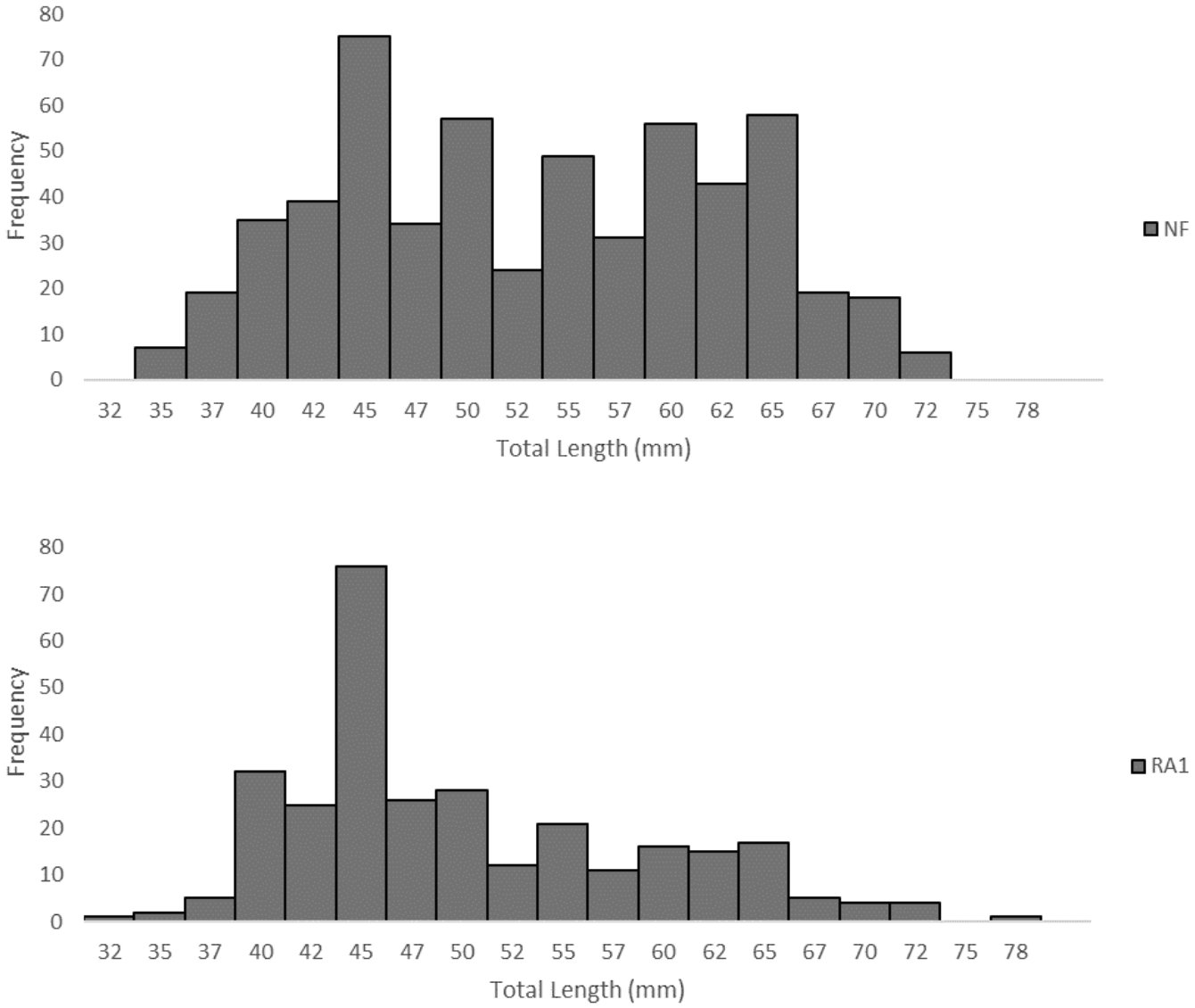
10.4.2.1.1 Length-Frequency

Length-frequency distributions of Threespine Stickleback were significantly different among sampling areas, with a maximum percent difference in cumulative relative frequency of 20% (Table 10.4-4 and Figure 10.4-1). Differences between areas resulted from a greater proportion of larger individuals (i.e., >55 mm) captured from the Near-field area when compared to Reference Area 1 (Figure 10.4-2).



NF = Near-field area; RA1 = Reference Area 1 ; % = percent; mm = millimetre.

Figure 10.4-1: Cumulative Length-Frequency Distribution of Threespine Stickleback Collected from Meliadine Lake, 2018



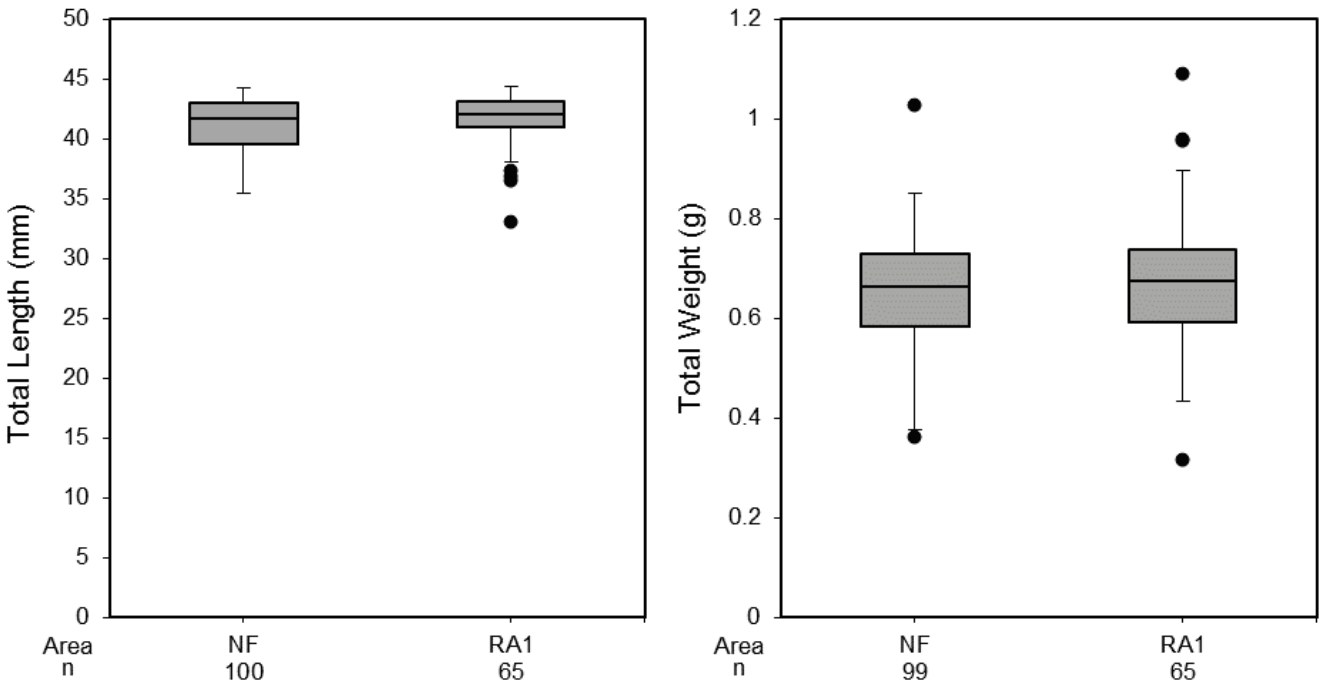
NF= Near-field Area; RA1 = Reference Area 1; mm = millimetre.

Figure 10.4-2: Length-Frequency Distributions for Threespine Stickleback Collected from Meliadine Lake, 2018

10.4.2.2 Growth

10.4.2.2.1 Size-at-Age

Threespine Stickleback ranged in size from 33.0 to 79.0 mm, and 0.316 to 4.909 g (Table 10.4-3, Figure 10.4-3). There were no significant differences observed for total length and body weight of immature Threespine Stickleback (i.e., individuals smaller than the calculated size-at-maturity of 44.5 mm, Section 10.4.3.2.2) captured from the sampling areas (Table 10.4-4). Statistical power was sufficient to detect a CES of 25% for both total length and body weight. Spatial comparisons of total length and body weight for all fish sampled (i.e., juveniles and adults) are provided in Figures 10C-1 and 10C-2, respectively.



NF = Near-field Area; RA1 = Reference Area 1; n = sample size; mm = millimetre; g = gram.

Figure 10.4-3: Length and Weight of Immature Threespine Stickleback Captured from Meliadine Lake During the Population Survey, 2018

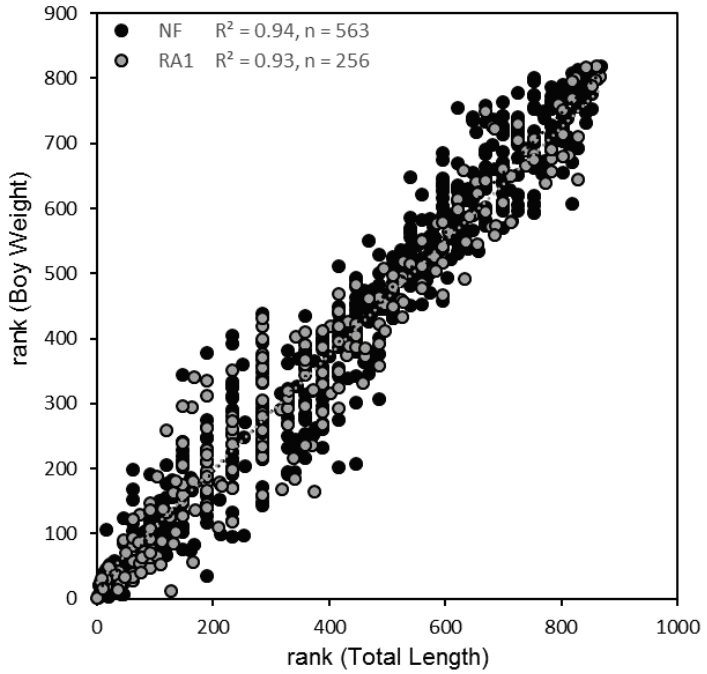
10.4.2.3 Reproduction

No young-of-the-year (YOY) were captured in the Near-field area or Reference Area 1 during the fish heath survey. Therefore, the relative abundance of YOY was not compared between areas. The low catchability of YOY may have been a consequence of the timing and location of sampling effort. Threespine Stickleback were determined to be spawning in Meliadine Lake during the August 2015 and August 2017 sampling periods (Golder 2016c and 2018), based on the presence of male secondary sex characteristics and the occurrence of ripe and spent individuals of both sexes. Similar observations were made in August 2018. Threespine Stickleback are typically a spring spawning species; however, extended spawning seasons have been observed for some populations (Wooton et al. 1978; Chellappa et al. 1989). Based on this information and our observations, Threespine Stickleback likely spawn from June through to August in Meliadine Lake. As a consequence, YOY may have been too small at the time of sampling to be effectively captured, or occupied habitats that were not effectively targeted by the sampling methods employed (e.g., residing within interstitial spaces of the rocky substrate, or at depths greater than 3 m). These results were consistent with previous fish health surveys conducted in Meliadine Lake (i.e., August 2015 and August 2017), that employed a variety of alternative gear types, including beach seines, hoop nets, and backpack electrofishing (Golder 2016c and 2018).

10.4.2.4 Condition

10.4.2.4.1 Condition Factor

Condition factor of Threespine Stickleback collected from Meliadine Lake ranged from 0.54 to 1.29 (Table 10.4-3). Relative body weights were not significantly different among sampling areas (Table 10.4-4), and statistical power was sufficient to detect a CES of 10% for relative body weight.



Note: Data transformations consistent with those used in the statistical analysis (Table 10.4-4). Statistical outliers were excluded.
NF = Near-field Area; RA1 = Reference Area 1; g = gram; mm = millimetre; R^2 = coefficient of determination; n = sample size; rank = rank transformed data.

Figure 10.4-4: Body Weight Relative to Total Length for Threespine Stickleback Collected During the Population Survey from Meliadine Lake, 2018

10.4.3 Lethal Survey

A total of 216 Threespine Stickleback were lethally sampled from Meliadine Lake during the fish health assessment. Target sample sizes were achieved at each sampling area (Table 10.4-5). Descriptive statistics for lethally sampled Threespine Stickleback are provided in Table 10.4-6, with the results of statistical comparisons among sampling areas presented in Table 10.4-7, and statistical comparisons excluding fish parasitized by tapeworms in Table 10.4-8. As sample sizes for unparasitized fish were small (i.e., sample sizes ranged from 13 to 19), results of the lethal survey focused on all Threespine Stickleback sampled. Fish health data and statistical outliers removed from the analyses are provided in Appendix 10B, spatial comparisons for fish health parameters between the Near-field area and Reference Area 1 are presented in Appendix 10C, and temporal comparisons for the Near-field area between 2018 and 2015 are provided in Appendix 10D.

Table 10.4-5: Sample Sizes for Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

Life Stage	Sex	Target Sample Size	Achieved Sample Size		
			Near-field	Reference Area 1	Total
Adult	Female	20	31	25	56
	Male	20	21	23	43
Juvenile		20	46	26	72

Table 10.4-6: Descriptive Statistics for Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

Sex	Parameter	Near-field							Reference Area 1						
		n	Mean	Median	Min	Max	SD	SE	n	Mean	Median	Min	Max	SD	SE
Female	Age (y)	17	2.3	2.0	1.0	4.0	1.0	0.2	19	2.6	2.0	2.0	4.0	0.9	0.2
	Total Length (mm)	31	59.3	60.4	45.4	73.7	9.0	1.6	25	57.9	58.6	43.1	74.1	8.7	1.7
	Body Weight (g)	31	1.982	2.050	0.750	3.649	0.951	0.171	25	1.756	1.799	0.433	4.222	0.935	0.187
	Carcass Weight (g)	31	1.435	1.342	0.620	2.611	0.624	0.112	25	1.223	1.203	0.395	2.383	0.531	0.106
	Condition Factor	31	0.87	0.90	0.73	1.01	0.09	0.02	25	0.82	0.80	0.54	1.09	0.12	0.02
	Liver Weight (g)	31	0.058	0.052	0.023	0.129	0.028	0.005	25	0.049	0.044	0.006	0.108	0.025	0.005
	LSI	31	3.10	2.82	1.84	4.85	0.82	0.15	25	2.87	2.75	1.41	4.62	0.81	0.16
	Gonad Weight (g)	30	0.074	0.046	0.007	0.242	0.066	0.012	25	0.080	0.030	0.003	0.616	0.140	0.028
	GSI	30	3.00	2.44	0.96	7.83	1.89	0.35	25	3.20	1.66	0.78	19.20	3.89	0.78
	Fecundity	21	2388	2592	709	3845	861	188	13	1295	1378	431	1785	447	124
	Mean Egg Weight (mg)	21	0.042	0.033	0.011	0.103	0.026	0.006	13	0.093	0.067	0.010	0.387	0.111	0.031
Male	Age (y)	20	3.5	3.5	2.0	5.0	0.8	0.2	21	2.9	3.0	1.0	4.0	1.0	0.2
	Total Length (mm)	21	57.8	58.9	45.0	65.1	4.6	1.0	23	57.1	60.1	44.9	65.8	6.4	1.3
	Body Weight (g)	21	1.596	1.661	0.738	2.234	0.326	0.071	23	1.634	1.558	0.706	2.596	0.593	0.124
	Carcass Weight (g)	21	1.358	1.431	0.557	1.998	0.311	0.068	23	1.274	1.296	0.584	1.915	0.434	0.090
	Condition Factor	21	0.82	0.81	0.72	0.91	0.05	0.01	23	0.84	0.78	0.69	1.13	0.13	0.03
	Liver Weight (g)	21	0.044	0.044	0.014	0.069	0.018	0.004	23	0.041	0.039	0.014	0.069	0.016	0.003
	LSI	21	2.70	2.77	1.42	4.44	0.90	0.20	23	2.54	2.65	1.25	3.83	0.64	0.13
	Gonad Weight (g)	19	0.014	0.012	0.006	0.035	0.007	0.002	22	0.014	0.012	0.005	0.029	0.007	0.001
	GSI	19	0.83	0.75	0.32	1.91	0.42	0.10	22	0.95	0.69	0.30	2.15	0.60	0.13
Juvenile	Age (y)	28	1.8	2.0	1.0	2.0	0.4	0.1	19	1.8	2.0	1.0	2.0	0.4	0.1
	Total Length (mm)	46	40.7	40.7	35.4	45.5	2.6	0.4	26	41.5	41.5	36.6	47.4	2.6	0.5
	Body Weight (g)	46	0.587	0.621	0.361	0.803	0.128	0.019	26	0.661	0.644	0.459	0.956	0.127	0.025
	Carcass Weight (g)	45	0.405	0.394	0.275	0.582	0.080	0.012	26	0.414	0.415	0.292	0.530	0.073	0.014
	Condition Factor	46	0.86	0.87	0.65	1.07	0.11	0.02	26	0.92	0.90	0.73	1.10	0.10	0.02
	Liver Weight (g)	46	0.014	0.014	0.006	0.032	0.004	0.001	25	0.014	0.014	0.006	0.024	0.004	0.001
	LSI	46	2.48	2.32	1.33	4.84	0.74	0.11	25	2.08	1.95	0.99	3.27	0.57	0.11

Note: descriptive statistics include parasitized fish.

GSI = gonadosomatic index; LSI = liver somatic index; n = sample size; Min = minimum; Max = maximum; SD = standard deviation; SE = standard error; y = year; mm = millimetre; g = gram; mg = milligram.

Table 10.4-7: Statistical Comparisons for Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

Sex	Parameter	Dependent Variable	Covariate	Endpoint	Statistical Test	Outliers	n		Interaction P-value	Model P-value	MSE	Least Squares Mean		Assumptions		SSD	Magnitude (%)	CES	Power Analysis (↑ / ↓)	
							NF	RA1				NF	RA1	Variance	Normality				Power	n
Female	Total length[a]	Total length	n/a	Effect	K-W Test	None	31	25	n/a	0.564	79.0	59.3	57.9	n/a	n/a	No	0	25%	1.000	8
	Weight-at-age	Body weight	Age	Effect	$ANCOVA_{log}$	None	17	19	0.338	0.394	0.042	0.149	0.088	0.741	0.363	No	15	25%	0.397 / 0.554	79 / 48
	Relative gonad size	Gonad weight	Body weight	Effect	$ANCOVA_{log}$	Included	30	25	0.736	0.794	0.032	-1.415	-1.402	0.814	0.072	No	-3	25%	0.628 / 0.815	60 / 37
					$ANCOVA_{log}$	Excluded	30	24	0.662	0.683	0.025	-1.423	-1.441	0.367	0.675	No	4		0.715 / 0.886	47 / 29
	Condition	Body weight	Total length	Effect	$ANCOVA_{log}$	None	31	25	0.259	**0.039**	0.002	0.226	0.202	0.721	0.786	Yes	6	10%	0.975 / 0.991	19 / 16
	Relative liver size	Liver weight	Body weight	Effect	$ANCOVA_{log}$	None	31	25	0.125	0.181	0.014	-1.305	-1.347	0.419	0.169	No	10	25%	0.921 / 0.989	26 / 16
			Total length	Supporting	$ANCOVA_{log}$	Included	31	25	0.086	**0.063**	0.016	-1.295	-1.359	0.419	0.023	Yes	16	n/a	n/a	n/a
					$ANCOVA_{log}$	Excluded	31	24	0.516	0.119	0.012	-1.287	-1.334	0.894	0.319	No	11		n/a	n/a
	Relative egg weight	Egg weight	Body weight	Supporting	$ANCOVA_{log}$	None	21	13	0.249	**<0.001**	0.052	-1.509	-1.175	0.078	0.937	Yes	-54	n/a	n/a	n/a
Male	Total length[a]	Total length	n/a	Effect	K-W test	None	21	23	n/a	0.860	31.3	57.8	57.1	n/a	n/a	No	7	25%	1.000	4
	Weight-at-age	Body weight	Age	Effect	$ANCOVA_{rank}$	None	20	21	0.148	0.239	118	18.8	23.1	<0.001	0.248	No	-18	25%	0.511	62
	Relative gonad size	Gonad weight	Body weight	Effect	$ANCOVA_{log}$	None	19	22	0.401	0.949	0.046	-1.913	-1.908	0.986	0.690	No	-1	25%	0.412 / 0.574	85 / 52
	Condition	Body weight	Total length	Effect	$ANCOVA_{rank}$	Included	21	23	0.155	0.955	25.6	22.5	22.5	<0.001	0.132	No	0	10%	0.424	88
					$ANCOVA_{log}$	Excluded	21	22	0.019[b]	0.742	0.002	0.189	0.194	0.007	0.064	No	-2		0.903 / 0.946	22 / 18
	Relative liver size	Liver weight	Body weight	Effect	ANCOVA	None	21	23	0.346	0.319	<0.001	0.044	0.040	0.565	0.494	No	9	25%	0.872	25

Note: Statistically significant differences indicated in **bold**. Exact power cannot be calculated for the KW test and was estimated based on ANOVA.
a) Threespine Stickleback are short-lived in freshwater, so length was used as a surrogate for age (Environment Canada 2012).
b) Slopes were considered practically similar (Barrett et al. 2010).
n = sample size; *P*-value = probability value; MSE = mean squared error; NF = Near-field Area; RA1 = Reference Area 1; CES = critical effect size ; % = percent; K-W = Kruskal-Wallis; ANOVA = analysis of variance; ANCOVA = analysis of covariance; log = log_{10} transformed data; rank = rank transformed data; <= less than; n/a = not applicable.

Table 10.4-8: Statistical Comparisons for Threespine Stickleback Lethally Sampled from Meliadine Lake Excluding Fish Parasitized by Tapeworms, 2018

Sex	Parameter	Dependent Variable	Covariate	Endpoint	Statistical Test	Outliers	n		Interaction P-value	Model P-value	MSE	Least Squares Mean		Assumptions		SSD	Magnitude (%)	CES	Power Analysis (↑ / ↓)	
							NF	RA1				NF	RA1	Variance	Normality				Power	n
Female	Total length[(a)]	Total length	n/a	Effect	K-W Test	None	13	10	n/a	0.664	27.3	51.1	51.6	n/a	n/a	No	-2	25%	1.000	4
	Weight-at-age	Body weight	Age	Effect	$ANCOVA_{rank}$	Included	12	10	0.115	0.290	38.0	4.56	7.43	<0.001	<0.001	No	-39	25%	0.177	191
					ANCOVA	Excluded	11	10	0.433	0.701	0.053	0.980	0.939	0.400	0.482	No	4		0.721	18
	Relative gonad size	Gonad weight	Body weight	Effect	ANCOVA	None	12	10	0.662	0.506	<0.001	0.024	0.028	0.981	0.643	No	-14	25%	0.326	63
	Condition	Body weight	Total length	Effect	ANCOVA	None	13	10	0.224	**0.058**	0.012	1.139	1.047	0.900	0.359	Yes	9	10%	0.715	20
	Relative liver size	Liver weight	Body weight	Effect	ANCOVA	None	13	10	0.860	0.381	<0.001	0.042	0.041	0.954	0.779	No	5	25%	1.000	5
			Total length	Supporting	$ANCOVA_{log}$	Included	13	10	0.063	**0.024**	0.012	-1.403	-1.517	0.260	0.904	Yes	30	n/a	n/a	n/a
					$ANCOVA_{log}$	Excluded	13	9	0.439	**0.069**	0.008	-1.388	-1.461	0.953	0.659	Yes	18		n/a	n/a
	Relative egg weight	Egg weight	Body weight	Supporting	ANCOVA	None	4	5	0.498	0.390	<0.001	0.031	0.039	0.353	0.883	No	-21	n/a	n/a	n/a
Male	Total length[(a)]	Total length	n/a	Effect	K-W test	None	19	14	n/a	0.126	21.3	58.9	55.5	n/a	n/a	No	6	25%	1.000	3
	Weight-at-age	Body weight	Age	Effect	$ANCOVA_{rank}$	None	18	13	0.266	0.389	77.5	17.4	14.1	0.026	0.083	No	24	25%	0.287	111
	Relative gonad size	Gonad weight	Body weight	Effect	$ANCOVA_{log}$	None	19	13	0.349	0.713	0.049	-1.912	-1.880	0.801	0.777	No	-7	25%	0.326 / 0.455	94 / 57
	Condition	Body weight	Total length	Effect	$ANCOVA_{rank}$	None	19	14	0.370	0.133	14.7	17.9	15.8	0.037	0.227	No	14	10%	0.309	105
	Relative liver size	Liver weight	Body weight	Effect	ANCOVA	None	19	14	0.489	0.663	<0.001	0.043	0.041	0.182	0.398	No	5	25%	0.670	30

Note: Statistically significant differences indicated in **bold**. Exact power cannot be calculated for the KW test and was estimated based on ANOVA.

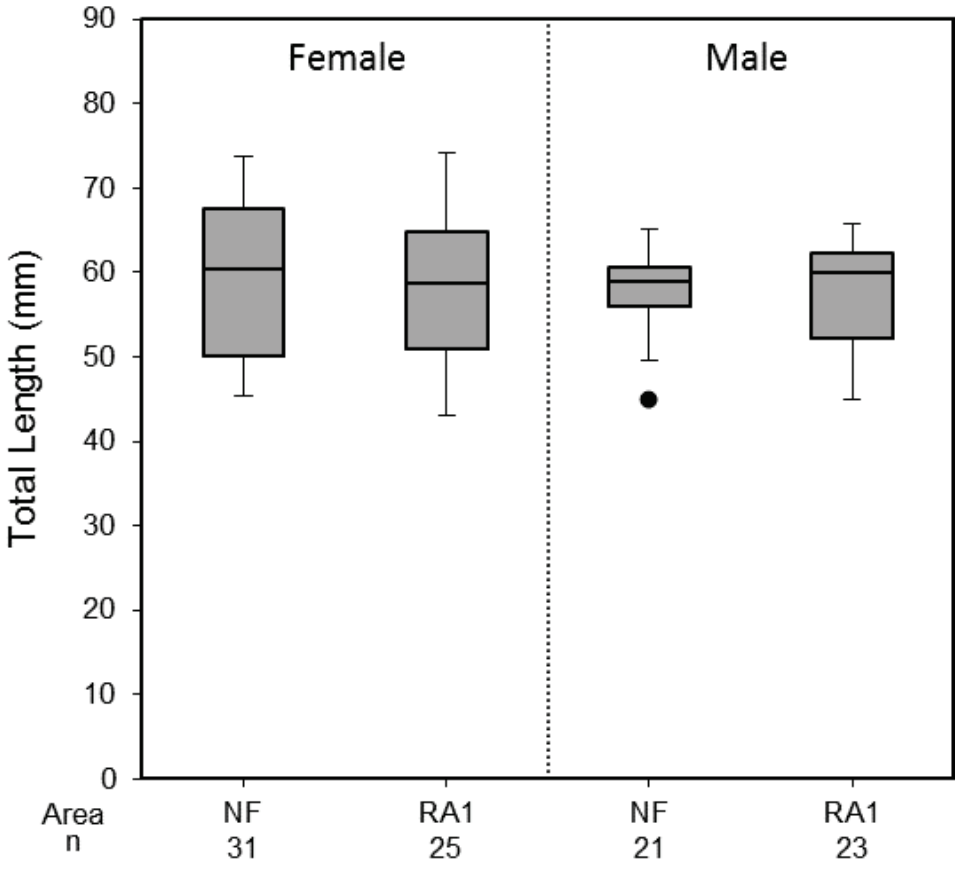
a) Threespine Stickleback are short-lived in freshwater, so length was used as a surrogate for age (Environment Canada 2012).

n = sample size; *P*-value = probability value; MSE = mean squared error; NF = Near-field Area; RA1 = Reference Area 1; CES = critical effect size ; % = percent; K-W = Kruskal-Wallis; ANOVA = analysis of variance; ANCOVA = analysis of covariance; log = log_{10} transformed data; rank = rank transformed data; <= less than; n/a = not applicable.

10.4.3.1 Survival

10.4.3.1.1 Age

Age of Threespine Stickleback sampled from Meliadine Lake[10] during the lethal survey ranged from 1 to 5 years (Table 10.4-6), with the majority of fish sampled reaching sexual maturity between the ages of 1 and 2 (see Figure 10.4-7). As Threespine Stickleback are short-lived, and it can be difficult to detect a 25% difference in age, fish length was used as a surrogate effect endpoint for age (Environment Canada 2012). Lethally sampled female and male Threespine Stickleback ranged in length from 43.1 to 74.1 mm and 44.9 to 65.8 mm, respectively (Table 10.4-6, Figure 10.4-5). No significant differences in length were observed between the Near-field area and Reference Area 1 for female or male Threespine Stickleback. Statistical power was sufficient to detect a CES of 25% for both sexes (Government of Canada 2018).



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NF = Near-field Area; RA1 = Reference Area 1; n = sample size; mm = millimetre.

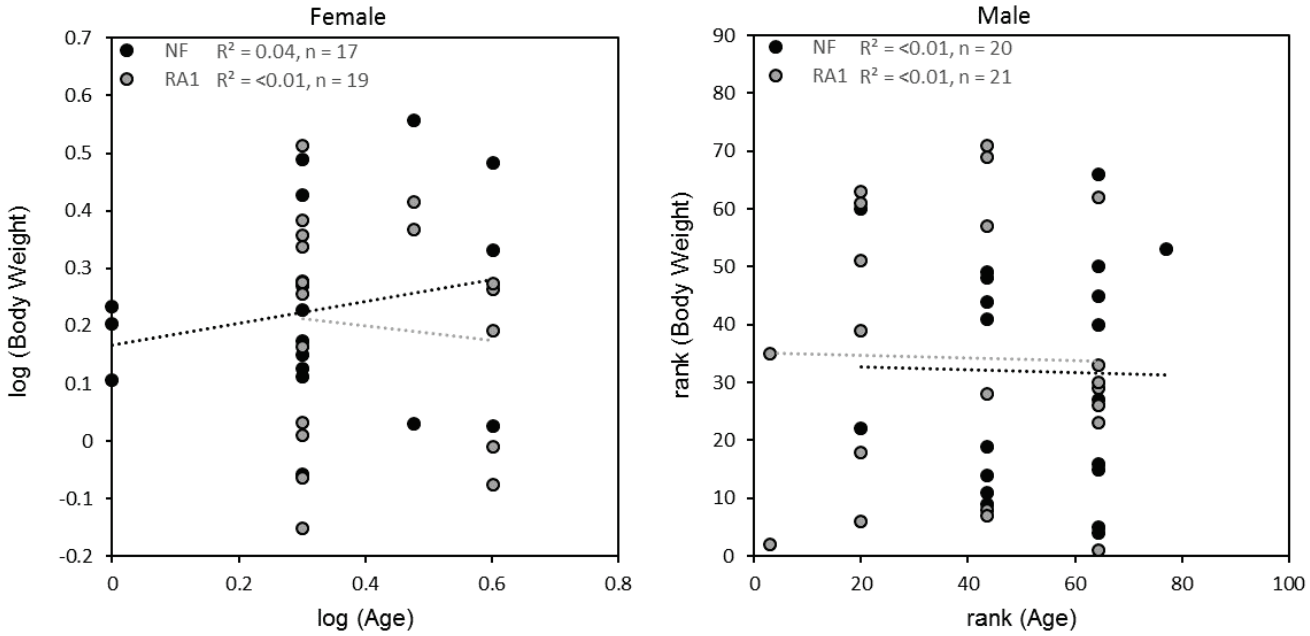
Figure 10.4-5: Length of Female and Male Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

[10] Ages were not assigned based on length-frequency distributions in 2018 as individual modes could not be reconciled with laboratory data. Laboratory assigned ages of Threespine Stickleback ranged from 1 to 5 years; however, only two modes could be distinguished from the length frequency-distribution ranging from 35 mm to 52 mm, and 52 mm to 72 mm (Figure 10.4-5).

10.4.3.2 Growth

10.4.3.2.1 Weight-at-Age

Lethally sampled female and male Threespine Stickleback ranged in total body weight from 0.433 to 4.222 g and 0.706 to 2.596 g, respectively (Table 10.4-3). Using total body weight and laboratory assigned ages, no significant differences in weight-at-age for females or males were observed between the Near-field area and Reference Area 1 (Table 10.4-6, Figure 10.4-6). Laboratory assigned ages were not a strong predictor of body weight (females $R^2 = 0.242$; males $R^2 = 0.198$), resulting in a high degree of variation in the data and a subsequent reduction in statistical power. While statistical power was low for weight-at-age comparisons (i.e., ranging from 0.397 to 0.554 for females and 0.511 for males [Table 10.4-7]), the magnitudes of difference were below the CES of 25%.

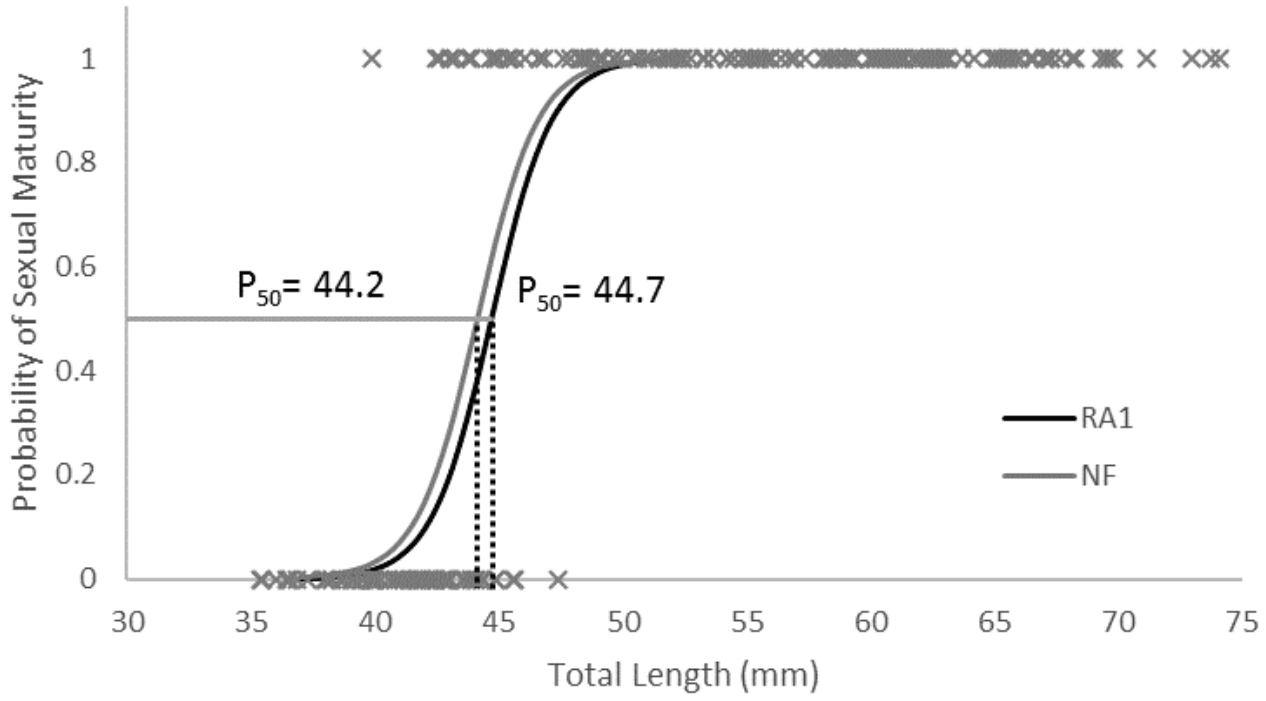


Note: Data transformations consistent with those used in the statistical analysis (Table 10.4-7).
NF = Near-field Area; RA1 = Reference Area 1; g = gram; y = year; R^2 = coefficient of determination; n = sample size; log = $\log_{10}$ transformed data; rank = rank transformed data.

Figure 10.4-6: Body Weight Relative to Age for Female and Male Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

10.4.3.2.2 Size-at-Maturity

Fish length was a significant predictor of maturity in Threespine Stickleback, based on a binary logistic regression (P<0.001). Size-at-maturity (i.e., the total length at which 50% of the population reaches sexual maturity, or P_{50}) was similar between Near-field area and Reference Area 1 (P = 0.446), with fish maturing at 44.2 and 44.7 mm, respectively (Figure 10.4-7). Size-at-maturity was also similar among fish parasitized and unparasitized by tapeworms (P = 0.784), maturing at 44.4 and 44.7 mm, respectively.



Note: Plotted curve represents the modelled size at maturity. Actual data used in the analysis are represented by the symbol x.
NF = Near-field Area; RA1 = Reference Area 1; P_{50} = the total length at which 50% of the population reach sexual maturity; mm = millimetre.

Figure 10.4-7: Size-at-Maturity of Threespine Stickleback at Near-field Area and Reference Area 1, 2018

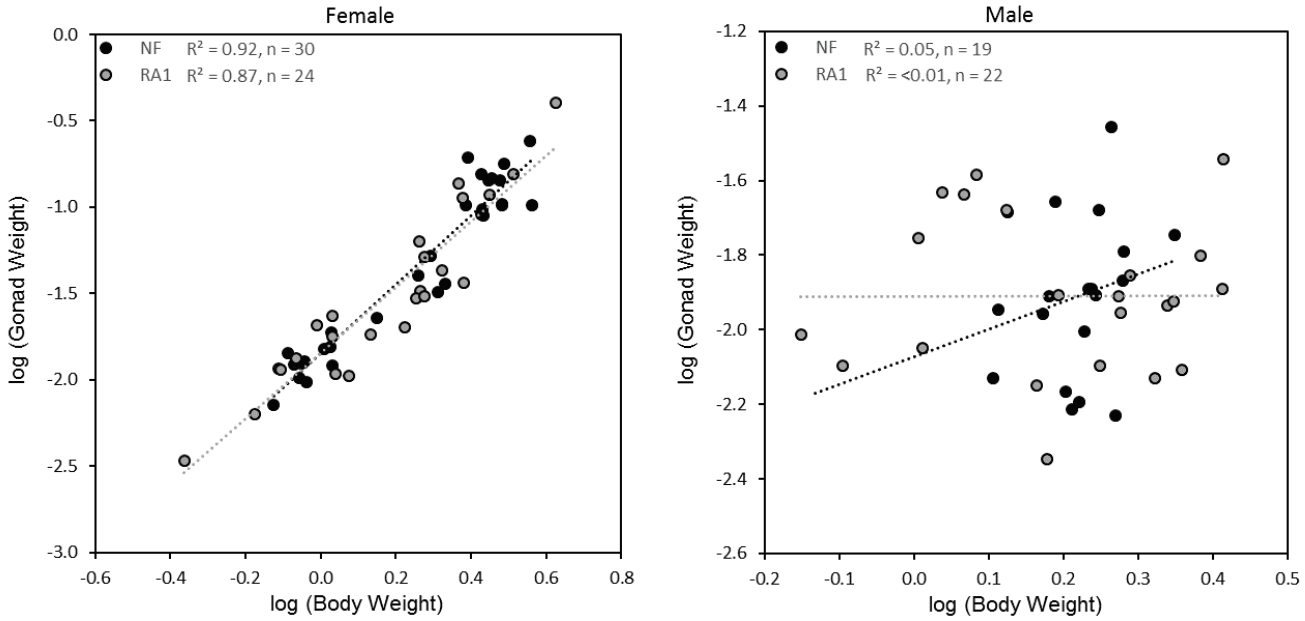
10.4.3.3 Reproduction

10.4.3.3.1 Relative Gonad Size and Fecundity

The gonadosomatic index for female and male Threespine Stickleback ranged from 0.78 to 19.20 and 0.30 to 2.15, respectively. No significant differences were observed in relative gonad weight for female or male Threespine Stickleback, among sampling areas (Table 10.4-7, Figure 10.4-8). Although statistical power for relative gonad weight was low (i.e., ranging from 0.715 to 0.886 for females and 0.412 to 0.574 for males), the magnitudes of difference observed were below the CES of 25%.

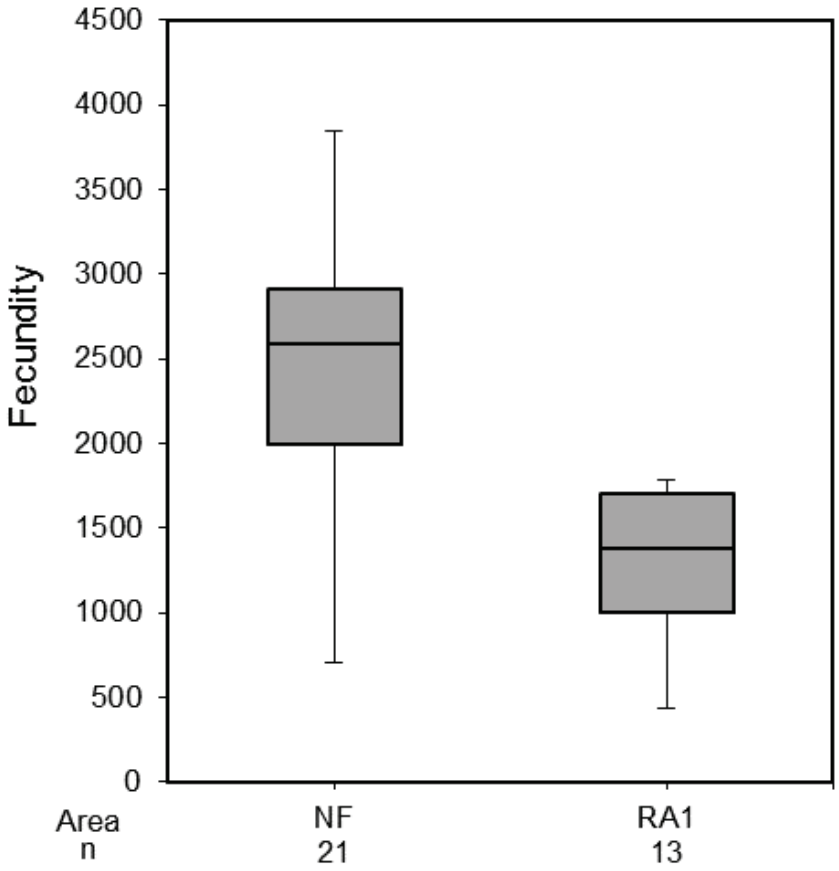
Threespine Stickleback are multiple spawners (Environment Canada 2012), and fish collected in August 2018 included a range of reproductive stages, including early stage development, late stage development, ripe, spent and resting (Table 10.2-1; Appendix 10B). The variability in reproductive stages likely contributed to increased variation in relative gonad size, contributing to the low statistical power observed.

Fecundity of female Threespine Stickleback sampled from Meliadine Lake ranged from 431 to 3845 eggs per female (Table 10.4-6, Figure 10.4-9).



Note: Data transformations consistent with those used in the statistical analysis (Table 10.4-7). Statistical outliers were excluded.
NF = Near-field Area; RA1 = Reference Area 1; g = gram; R^2 = coefficient of determination; n = sample size; log = log10 transformed data.

Figure 10.4-8: Gonad Weight Relative to Body Weight for Female and Male Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018



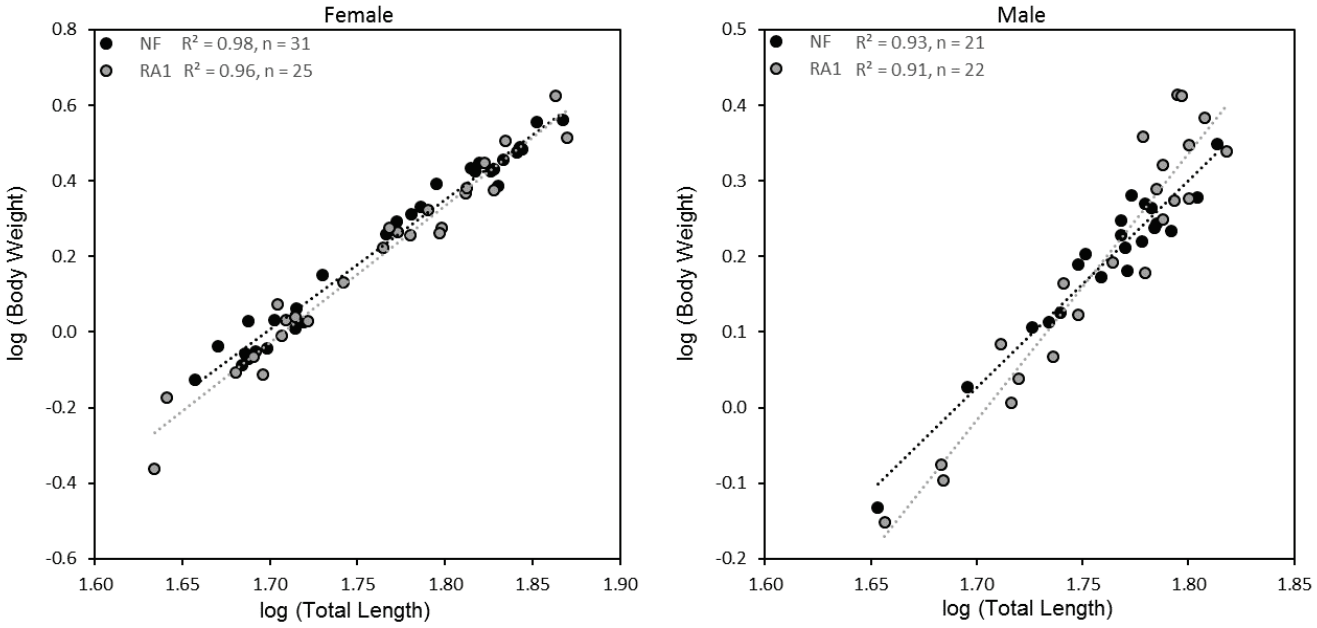
NF = Near-field Area; RA1 = Reference Area 1; n = sample size.

Figure 10.4-9: Fecundity of Female Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

10.4.3.4 Condition

10.4.3.4.1 Condition Factor

Condition factor for lethally sampled female and male Threespine Stickleback from Meliadine Lake ranged from 0.54 to 1.09 and 0.69 to 1.13, respectively (Table 10.4-6). Relative body weight was significantly greater at the Near-field area relative to the Reference Area 1 for lethally sampled female fish (i.e., 6%; Table 10.4-7, Figure 10.4-10), but was not different for male fish. The magnitude of differences between the Near-field area and Reference Area 1 were below the CES of 10% for both female and male fish (Government of Canada 2018). Statistical power was sufficient to detect a 10% difference in relative body weight for both female and male Threespine Stickleback.

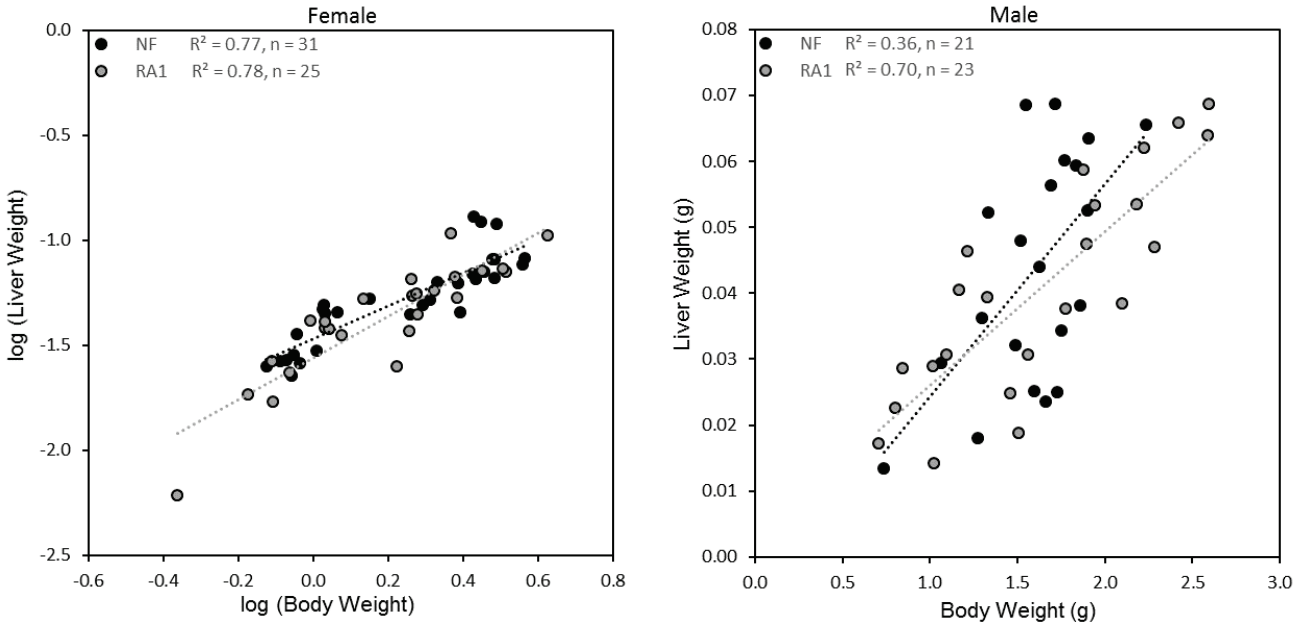


Note: Data transformations consistent with those used in the statistical analysis (Table 10.4-7). Statistical outliers were excluded.
NF = Near-field Area; RA1 = Reference Area 1; g = gram; mm = millimetre; R^2 = coefficient of determination; n = sample size; log = log10 transformed data.

Figure 10.4-10: Body Weight Relative to Total Length for Female and Male Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

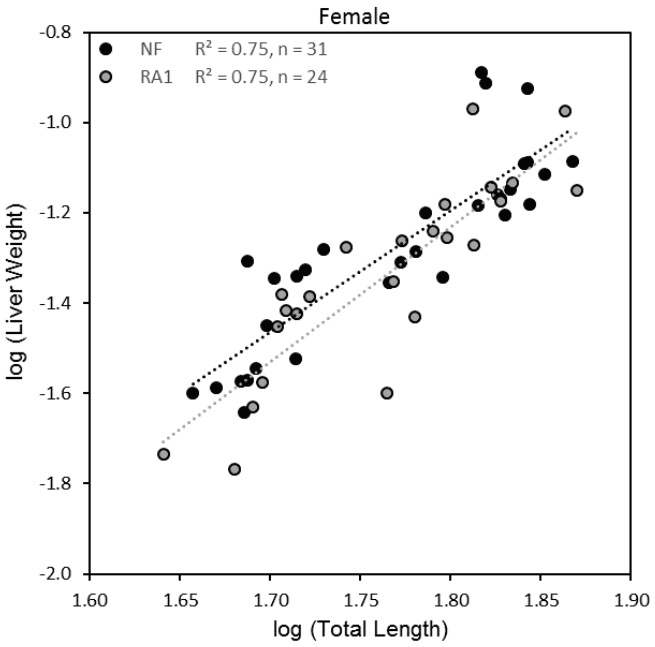
10.4.3.4.2 Relative Liver Size

The liver somatic index ranged from 1.41 to 4.85 for female Threespine Stickleback, and from 1.25 to 4.44 for males (Table 10.4-6). No significant differences were observed among sampling areas in relative liver size with body weight as a covariate for female or male fish (Table 10.4-7, Figure 10.4-11). Statistical power was sufficient to detect a difference of 25% for female relative liver size, while statistical power for male fish was 0.872. Relative liver size with total body length as the covariate was also examined as a supporting endpoint for energy storage in females, with no significant differences found between the two areas (Table 10.4-7, Figure 10.4-12).



Note: Data transformations consistent with those used in the statistical analysis (Table 10.4-7).
NF = Near-field Area; RA1 = Reference Area 1; g = gram; R^2 = coefficient of determination; n = sample size; log = log10 transformed data.

Figure 10.4-11: Liver Weight Relative to Body Weight for Female and Male Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

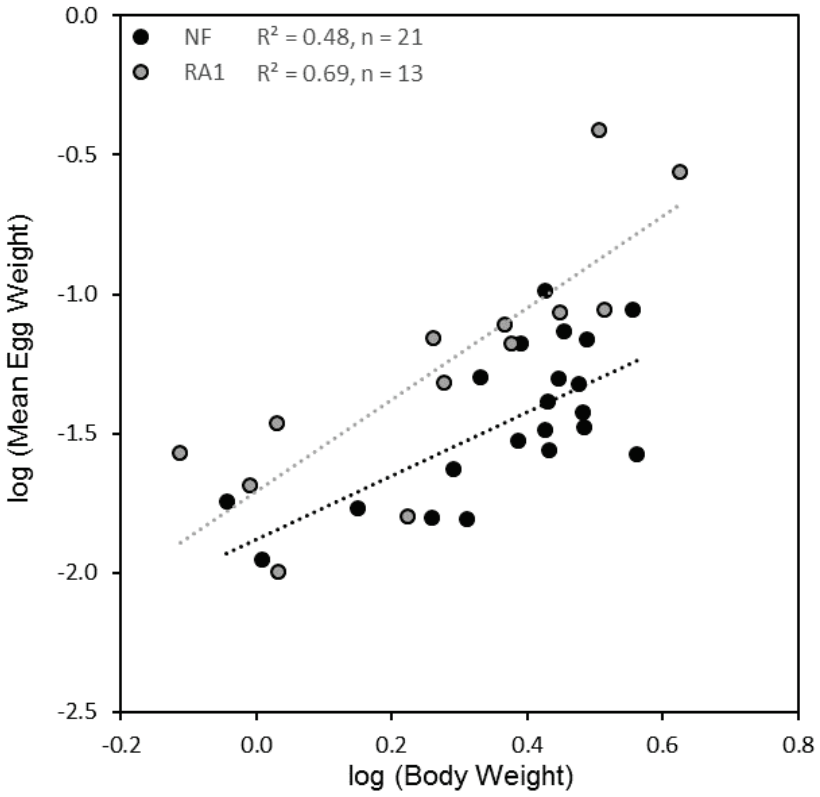


Note: Data transformations consistent with those used in the statistical analysis (Table 10.4-7). Statistical outliers were excluded.
NF = Near-field Area; RA1 = Reference Area 1; g = gram; mm = millimetre; R^2 = coefficient of determination; n = sample size; log = log10 transformed data.

Figure 10.4-12: Liver Weight Relative to Total Length for Female Threespine Stickleback Lethally Sampled from Meliadine Lake, 2018

10.4.3.4.3 Relative Egg Size

Mean egg weight for female Threespine Stickleback sampled from Meliadine Lake ranged from 0.010 to 0.387 mg (Table 10.4-6, Figure 10.4-13). Relative egg size was examined as a supporting endpoint for energy storage in female fish and was 54% less in the Near-field area when compared to Reference Area 1 (Table 10.4-7).



Note: Data transformations consistent with those used in the statistical analysis (Table 10.4-7).
NF = Near-field Area; RA1 = Reference Area 1; g = gram; R^2 = coefficient of determination; n = sample size; log = log10 transformed data.

Figure 10.4-13: Egg Weight Relative to Body Weight for Female Threespine Stickleback Sampled from Meliadine Lake, 2018

10.4.3.5 Pathology

External abnormalities observed in Threespine Stickleback sampled from Meliadine Lake included frayed, clubbed, or marginated gills (i.e., gills with light, discoloured margin along tips of lamellae) and mild fin erosion (Table 10.4-9). The prevalence of external abnormalities was low, affecting 11% of the fish lethally sampled in Meliadine Lake, with a similar prevalence among sampling areas (Table 10.4-9). No body deformities or abnormalities of the eyes, skin, thymus, pseudobranchs, opercula or vent were observed.

Internal abnormalities observed in Threespine Stickleback sampled from Meliadine Lake included liver discoloration (i.e., “fatty” livers with a coffee cream colour) and a low incidence of swollen, mottled or granular kidneys (Table 10.4-11). Fatty livers are commonly observed in fish populations with an abundant food sources and are generally not indicative of disease (Kandemir and Polat 2007). Mesenteric fat content did not vary significantly among sampling areas (*P*=0.186; Table 10.4-10).

Table 10.4-9: Number of Lethally Sampled Threespine Stickleback with External and Internal Abnormalities, 2018

Assessment Type	Category	Near-field Area	Reference Area 1	Chi Square P-value
External	Body Deformities	0	0	1.000
	Eyes	0	0	1.000
	Gills	14	8	0.594
	Pseudobranchs	0	0	1.000
	Thymus	0	0	1.000
	Skin	0	0	1.000
	Fins	2	0	0.230
	Opercula	0	0	1.000
	Vent	0	0	1.000
Internal	Liver	111	78	0.754
	Spleen	0	0	1.000
	Gall Bladder	0	0	1.000
	Kidney	5	2	0.469
Fish with Abnormalities		90%	87%	
Total Number of Fish Surveyed		126	90	

P-value = probability value ; % = percent; <= less than.

Table 10.4-10: Relative Mesenteric Fat Content of Lethally Sampled Threespine Stickleback, 2018

Mesenteric Fat	Near-field Area	Reference Area 1
0	24	24
1	82	60
2	15	5
3	5	1

0 = None; 1 = <50%; 2 = 50%; 3 = >50%.

10.4.3.6 Parasites

Internal parasites were frequently observed in Threespine Stickleback sampled from Meliadine Lake and occurred in 61.9% of fish from the Near-field area and 71.1% of fish from Reference Area 1 (Table 10.4-11). Among lethally sampled fish, no Threespine Stickleback exhibited a low severity of parasitism (e.g., cysts), 62.5% of fish exhibited a moderate severity of parasitism in (e.g., tapeworms), and less than 0.1% exhibited a high severity of parasitism (e.g., multiple tapeworms). A significant difference was observed in the prevalence of parasites between adults and juveniles (P=0.016), with 60% of adults parasitized and 71% of juveniles parasitized. No significant differences were observed in the prevalence of parasites among sampling areas (P=0.248) or between males and females (P=0.129). Only one external parasite was observed in 2018, on a fish from the Near-field area.

A large tapeworm, suspected to be *Schistocephalus solidus,* was the most prevalent parasite among Threespine Stickleback captured in Meliadine Lake. The tapeworm infected 141 of the 216 fish sampled. The tapeworm *S. solidus* parasitizes small-bodied fish and fish-eating birds. Small-bodied fish, such as the Threespine Stickleback, become infected after consuming infected copepods and serve as an intermediate host for the parasite. The parasite develops in the body cavity of the fish until it is consumed by a fish-eating bird and is transmitted to its definitive host (Barber and Huntingford 1995). Potential definitive hosts for *S. solidus* in the Near-field area of Meliadine Lake are Sandhill crane (*Grus canadensis*), which were observed in the area during the time of sampling. On average, tapeworms accounted for 19.0% of body weight in infected fish.

The results of the statistical analysis for the lethal survey are presented for all fish (i.e., with and without parasites; Table 10.4-7) and non-parasitized fish only (Table 10.4-8). The results of the effect endpoint comparisons were similar with parasitized fish included and excluded from the analysis, with significant differences in female condition observed in both comparisons, and the magnitude of difference ranging from 6% to 9%, respectively (Table 10.4-7 and Table 10.4-8). When parasitized fish were excluded from the analysis, mean squared errors were typically smaller, due to reduced model variation; however, statistical power was also lower, due to a decreased sample sizes.

Table 10.4-11: Number of Parasitic Infections and Relative Severity Observed in Threespine Stickleback Collected from Meliadine Lake, 2018

Parasites	Severity	Near-field Area	Reference Area 1
External	0	569	300
	1	1	0
	2	0	0
	3	0	0
Internal	0	48	26
	1	0	0
	2	75	60
	3	3	4

Note: Values represent counts.

0 = no parasites; 1 = few parasites; 2 = moderate parasite infestation; 3 = numerous parasites.

10.5 Summary and Conclusions

Threespine Stickleback were the only species captured in sufficient numbers from the Near-field area and Reference Area 1 of Meliadine Lake to meet sample size requirements for the fish health component of the EEM program. Adult and juvenile Threespine Stickleback were abundant throughout shallow areas of Meliadine Lake (i.e., less than 3 m), and were susceptible to capture using minnow traps and dipnets. Young-of-the-year, however, were not captured or observed during sampling. This may have been due to YOY occupying habitats that were not effectively targeted by the sampling methods employed (e.g., residing within interstitial spaces of the rocky substrate, or at depths greater than 3 m), or YOY may not have been present due to the timing of sampling (i.e., during the spawning period).

Threespine Stickleback were spawning in Meliadine Lake during the August 2018 sampling period, based on the presence of male secondary sex characteristics and the occurrence of ripe and spent individuals of both sexes. Threespine Stickleback undergo multiple spawning events throughout the spring and summer months (Barrett and Munkittrick 2010); and exhibit extended spawning seasons for some populations (Wooton et al. 1978; Chellappa et al. 1989). Based on this information and observations herein, Threespine Stickleback likely spawn throughout the open-water period in Meliadine Lake. The extended spawning period likely contributed to the variability in reproductive endpoints observed during the 2018 sampling, with Threespine Stickleback documented at a variety of maturity stages within the dataset. However, because Threespine Stickleback likely spawn through the open-water period, it is unlikely the sensitivity of reproductive endpoints could be improved by altering sample timing. The current sample timing (i.e., August) conforms with EEM guidance when using Threespine Stickleback as a sentinel species (Barrett and Munkittrick 2010).

The majority of Threespine Stickleback captured were infected by a tapeworm that competes with the host for available resources and has been found to decrease the energy allocated to storage and spawning in Threespine Stickleback (Schultz et al. 2006; Rushbrook et al. 2007). The parasite was abundant at each of the areas sampled and, therefore, has the potential to confound the detection of changes in energy storage and reproductive endpoints that may result from the Mine. To evaluate the effect of parasitism on fish health endpoints, statistical analyses were completed with and without parasitized included (Table 10.4-7 and Table 10.4-8). The results of the two approaches were similar, and the emphasis of the analytical results were focused on analyses with parasitized fish included, due to better sample sizes and statistical power. The August 2018 sampling results also indicated that Threespine Stickleback infected with tapeworms reached sexual maturity at a similar size as uninfected fish.

Population structure for Threespine Stickleback varied among sampling areas, with larger individuals collected from the Near-field area when compared to Reference Area 1 (Table 10.5-1). Female Threespine Stickleback sampled from the Near-field area had greater relative body weight than individuals sampled from Reference Area 1, suggesting increased energy storage at the Near-field area; however, the magnitude of difference (i.e., 6%) was below the CES of 10% (Table 10.5-2). Supporting fish health endpoints for energy storage did not indicate the same; there were no significant differences observed in relative liver size, and relative egg size was significantly greater at Reference Area 1. Fish health endpoints were similar for male Threespine Stickleback among sampling areas (Table 10.5-2).

Power analyses of fish health endpoints indicated that sample sizes were sufficient to reliably detect differences that met or exceeded CESs for the majority of effect endpoints (i.e., power >0.9). However, a large degree of variability in age and gonad weights resulted in low statistical power for weight-at-age and relative gonad size comparisons for both sexes. Despite low power in these instances, the magnitudes of difference observed were below CES (Table 10.4-7).

In conclusion, Threespine Stickleback was the only species captured in sufficient abundance from Meliadine Lake to support sample sizes requirements of the EEM fish population survey. An effect was observed in the Near-field area for female condition, however the effect size of 6% was less than the CES of 10%. A similar response was not observed in supporting energy storage endpoints (i.e., relative liver weight and relative egg weight). Statistical analyses were confounded by a lack of a predictive relationship between age and body weight, and Threespine Stickleback being at a variety of reproductive stages at the time of sampling. These factors contributed to low statistical power for some endpoints. Threespine Stickleback were also commonly parasitized by tapeworms, which increased variability in the dataset; however, when infected fish were included in the statistical analysis, increased variability was offset by increased samples sizes resulting in a net increase in statistical power.

Table 10.5-1: Summary of Effect Endpoints for Threespine Stickleback Collected During the Population Survey, 2018

Parameter	CES	Magnitude of Difference	Comparison to Reference
Length-frequency distribution	(a)	20%(b)	↑
Weight-at-age	25%	-1%	-
Length-at-age	25%	-1%	-
Relative body weight	10%	1%	-

a) Length-frequency is an effect endpoint for non-lethal sampling in the EEM program; however, a CES has not been defined (Government of Canada 2018).

b) Magnitude based on maximum percent difference between groups in cumulative frequency distribution.

CES = critical effect size; NF = Near-field area; RA1 = Reference Area 1; ↑ = endpoint significantly greater at Near-field area compared to Reference Area 1; - = not significantly different.

Table 10.5-2: Summary of Effect Endpoints for Threespine Stickleback Sampled During the Lethal Survey, 2018

Sex	Parameter	CES	Magnitude of Difference	Comparison to Reference
Female	Age(a)	25%	0%	-
	Weight-at-age	25%	15%	-
	Relative gonad size	25%	4%	-
	Relative body weight	10%	6%	↑
	Relative liver size	25%	10%	-
Male	Age(a)	25%	7%	-
	Weight-at-age	25%	-18%	-
	Relative gonad size	25%	-1%	-
	Relative body weight	10%	-2%	-
	Relative liver size	25%	9%	-

a) Length was used as a surrogate for age (Environment Canada 2012).

CES = critical effect size; NF = Near-field area; RA1 = Reference Area 1 ; % = percent; ↑ = endpoint significantly greater at Near-field area compared to Reference Area 1; - = not significantly different.

10.6 Recommendations

No recommendations are provided for changes to fish health monitoring under the EEM.

10.7 List of Appendices

Appendix 10A – Fishing Effort

Appendix 10B – Survey Data

Appendix 10C – Spatial Comparisons

Appendix 10D – Temporal Comparisons

10.8 References

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11.0 PLANKTON TARGETED STUDY

Plankton monitoring was conducted as a targeted study to evaluate if plankton will be a useful long-term monitoring tool for the Mine. Prior to the 2018 sampling program, the plankton study included sampling and analysis of depth-integrated nutrients, chlorophyll *a*, phytoplankton, and zooplankton over three years in Meliadine Lake (2015, 2016, and 2017) and two years in the Peninsula Lakes[11] (2015 and 2016). Based on the data collected, it was determined that the phytoplankton dataset (i.e., chlorophyll *a*, phytoplankton abundance, biomass, and composition of major taxonomic groups, along with supporting nutrient data collection) should be carried forward to future years for Meliadine Lake to further evaluate its usefulness as a monitoring tool (Golder 2018c). Due to high variability between seasonal sampling events, it was recommended that phytoplankton sampling during only a single season be carried forward for future monitoring years. August (summer) was chosen as the most useful target month for analysis of spatial trends due to lower variability in phytoplankton monitoring endpoints among years in August (Golder 2018c). Additionally, due to high variability in the zooplankton dataset as a whole, it was recommended that zooplankton not be carried forward as a monitoring tool for Meliadine Lake. As a result, only phytoplankton sampling during the summer season was carried forward for 2018 to evaluate potential changes in key monitoring endpoints (abundance, biomass, community composition) and to provide an indication of potential changes to trophic status in the lake.

This report section provides a summary of data collected during the summer 2018 phytoplankton sampling program in Meliadine Lake, with a comparison against data collected during summer sampling events during the pre-construction and construction phase of the Mine (2015 through 2017). Data collected during spring and fall sampling events during the pre-construction and construction phase is not reported herein, because seasonal variability in plankton community characteristics does not allow valid year-to-year comparisons of data collected in different months during the open-water season. Data are also provided for the Peninsula Lakes for chlorophyll *a* samples collected in 2018 and compared against data collected during previous monitoring years. Statistical analyses of spatial variability in the phytoplankton community of Meliadine Lake are presented, along with analysis of nutrient concentrations in relation to effluent discharges in the Near-field area, and analysis of potential effects on plankton abundance, distribution and community composition.

11.1 Methods

11.1.1 Sampling Design

The plankton sampling program in 2018 was based on the AEMP Design Plan (Golder 2016a). The sampling program consisted of a single sampling event during open-water conditions in August (summer) targeting the exposure and reference areas of Meliadine Lake, with additional sampling for chlorophyll *a* in the Peninsula Lakes. The 2015 program specifically targeted the exposure areas of Meliadine Lake, with seasonal sampling during three sampling events, July (spring), August (summer), and September (fall), and additional sampling in the Peninsula Lakes. The 2016 program targeted both exposure and reference areas of Meliadine Lake, with sampling during all three seasons and additional sampling in the Peninsula Lakes. The 2017 program targeted the exposure and reference areas of Meliadine Lake during all three seasons and included only chlorophyll *a* sampling in the Peninsula Lakes.

Sampling was conducted in conjunction with the water quality sampling program in August (summer) in 2015 through 2018 (Table 11.1-1; Figure 1-3). A total of five stations were sampled in each of the Near-field (NF) and Mid-field (MF) exposure areas of Meliadine Lake in all years, and in three reference areas of Meliadine Lake

[11] Chlorophyll *a* was also sampled at the peninsula lakes in 2017.

in 2016, 2017 and 2018. New stations were added to replace historical stations in the Near-field and Mid-field exposure areas in 2018 as described in Section 6.2.1. Plankton samples in Meliadine Lake in all years were collected from a target water depth of 8 to 10 m.

Three stations in each of the Peninsula Lakes (A8, B7, and D7) were sampled in 2015 to 2018 from a target water depth of 1.5 to 2.5 m (Figure 1-3). Not all stations were consistently sampled during each field program due to delays caused by inclement weather conditions (e.g., fog, high winds).

The plankton sampling program consisted of the following components:

- measurements of total water depth (m) and Secchi depth (m)
- collection of depth-integrated water samples for nutrient analysis (soluble reactive silica [SRSi], TN, and TP) from the euphotic zone (Meliadine Lake only)
- collection of chlorophyll *a* samples
- collection of phytoplankton samples

Table 11.1-1: Summary of Summer Plankton Sampling Events in Meliadine Lake, 2015 to 2018.

Area	Station	Depth (m)	NAD83, 15V		2015	2016	2017	2018
			Easting (m)	Northing (m)	Summer	Summer	Summer	Summer
Near-field Exposure (MEL-01)	MEL-01-01	10.0	542690	6989132	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P
	MEL-01-02	7.9	542665	6989282	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	-
	MEL-01-03	9.5	542638	6988979	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	-
	MEL-01-04	8.8	543145	6989086	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	-
	MEL-01-05	9.0	542140	6989358	DIN, Chl, P, QC-dup[a,b]	DIN, Chl, P	DIN, Chl, P	-
	MEL-01-06	8.4	542952	6988993	-	-	-	DIN, Chl, P
	MEL-01-07	8.1	542873	6989218	-	-	-	DIN, Chl, P
	MEL-01-08	7.8	543044	6989067	-	-	-	DIN, Chl, P
	MEL-01-09	7.4	542555	6989188	-	-	-	DIN, Chl, P, QC-dup[a]
Mid-field Exposure (MEL-02)	MEL-02-01	8.6	537511	6992932	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	-
	MEL-02-02	8.0	537093	6992642	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P, QC-dup[b]	DIN, Chl, P, QC-dup[b]
	MEL-02-03	9.1	537497	6992332	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P
	MEL-02-04	7.7	537961	6992341	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	-
	MEL-02-05	9.2	537831	6992692	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P
	MEL-02-06	7.3	536922	6992853	-	-	-	DIN, Chl, P
	MEL-02-08	8.0	538342	6991952	-	-	-	DIN, Chl, P

Table 11.1-1: Summary of Summer Plankton Sampling Events in Meliadine Lake, 2015 to 2018.

Area	Station	Depth (m)	NAD83, 15V		2015	2016	2017	2018
			Easting (m)	Northing (m)	Summer	Summer	Summer	Summer
Reference Area 1 (MEL-03)	MEL-03-01	7.2	533317	6998541	-	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P, QC-dup[a]
	MEL-03-02	18.8	533256	6998671	-	DIN, Chl, P	DIN, Chl, P, QC-dup[b]	DIN, Chl, P
	MEL-03-03	10.2	532962	6998844	-	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P
	MEL-03-04	8.2	533628	6998672	-	DIN, Chl, P	DIN, Chl, P, QC-dup[a]	DIN, Chl, P
	MEL-03-05	8.7	534001	6998272	-	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P
Reference Area 2 (MEL-04)	MEL-04-01	8.2	525647	7000878	-	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P
	MEL-04-02	10.5	526149	7001519	-	DIN, Chl, P, QC-dup[a,b]	DIN, Chl, P	DIN, Chl, P
	MEL-04-03	9.7	525351	7001359	-	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P
	MEL-04-04	9.1	525401	7001085	-	DIN, Chl, P	DIN, Chl, P	-
	MEL-04-05	7.4	525735	7001129	-	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P, QC-dup[b]
Reference Area 3 (MEL-05)	MEL-05-01	9.3	530926	6990858	-	DIN, Chl, P, QC-dup	DIN, Chl, P	DIN, Chl, P, QC-dup[b]
	MEL-05-02	9.4	530669	6990884	-	DIN, Chl, P, QC-dup[a,b]	DIN, Chl, P, QC-dup[b]	DIN, Chl, P
	MEL-05-03	8.5	530735	6991374	-	DIN, Chl, P, QC-dup	DIN, Chl, P	DIN, Chl, P
	MEL-05-04	10.2	530570	6991223	-	DIN, Chl, P, QC-dup[b]	DIN, Chl, P, QC-dup[a]	DIN, Chl, P
	MEL-05-05	8.6	530240	6991162	-	DIN, Chl, P	DIN, Chl, P	DIN, Chl, P

NAD = North American Datum; Chl = indicates that chlorophyll *a* samples were collected; DIN = indicates that depth-integrated nutrient samples were collected; P = phytoplankton samples were collected; - = the site was not included in the sampling plan for a particular field program, or was not sampled due to weather, environment, or schedule limitations; QC-dup = indicates that a quality control duplicate sample was collected. (a) DIN QC-dup samples. (b) Phytoplankton QC-dup samples.

11.1.2 Field Methods

11.1.2.1 Supporting Environmental Variables, Nutrients, and Chlorophyll a

During the time of sampling, local weather data (i.e., air temperature, wind conditions, and rainfall) were collected. At each sampling station, water depth and physicochemical measurements were recorded. Total depth of the water column was measured either by using a sounding line or a boat-mounted sonar unit. In situ physicochemical measurements of specific conductivity, DO, pH, and water temperature were collected at each lake station using a submersible multi-sensor probe system (Hanna HI-9828 multiprobe). In situ physicochemical measurements were taken just below the surface and every 1 m thereafter throughout the water column, ending at 1 m above the lake bed. Secchi depth was measured using a 20 cm diameter Secchi disk at each station; this information was used to estimate the euphotic zone depth for depth-integrated sample collection.

Depth-integrated composite samples were collected at all Meliadine Lake stations for analysis of chlorophyll *a* and nutrient concentrations. Given the shallow nature of the Peninsula Lakes, depth-integrated samples were not collected at these locations. Instead, discrete samples at mid-column depths were collected for analysis of chlorophyll *a* and nutrients.

The euphotic zone is defined as the extent of the water column that is exposed to sufficient sunlight for photosynthesis to occur (typically to a depth in the water column where 1% of the surface irradiance is measured). While in the field, the euphotic zone was calculated as two times the Secchi depth (Koenings and Edmundson 1991; Alberta Environment [AENV 2006]).

Once the euphotic zone depth was determined, a Kemmerer sampler was used to collect discrete water samples starting at the surface, and continuing every 2 m through the extent of the euphotic zone. If the total water column depth was less than two times the Secchi depth, a water sample was collected every 2 m from the surface to 2 m above the lake bed.

Equal volumes of water from each discrete depth were combined into a large, clean bucket to create a composite, depth-integrated sample. From this composite sample, single subsamples were collected for nutrient analysis, triplicate subsamples were collected for chlorophyll *a* analysis, and a single subsample was taken for phytoplankton community analysis as described in Section 11.1.2.2.

Sample bottles for nutrient analysis were provided by ALS (Edmonton), which is an analytical laboratory accredited by CALA. Water samples were processed (i.e., filtered and/or preserved as required, and refrigerated) at site according to the instructions provided by ALS. Water samples requiring filtration were filtered through a 0.45-µm Millipore filter in a Nalgene filter tower, using a vacuum pump, before being preserved with laboratory-provided preservative based on the required analysis. Water samples were kept cool through refrigeration before shipping, and during shipping by adding ice-packs to the coolers. Samples were shipped to ALS as soon as possible after sample collection and processing. Samples were analyzed for TN, dissolved nitrogen, total Kjeldahl nitrogen (TKN), dissolved Kjeldahl nitrogen, total ammonia, nitrate, nitrite, TP, dissolved phosphorus, dissolved orthophosphate, and SRSi.

Water samples for chlorophyll *a* analysis were collected at each station during all field programs. Measurement of chlorophyll *a* concentration in water is a standard method to estimate phytoplankton biomass. Chlorophyll *a* is the primary photosynthetic pigment in phytoplankton and is frequently used as an indicator of phytoplankton biomass and primary production. Triplicate water samples for chlorophyll *a* analysis were filtered through a 47 mm diameter Whatman glass fiber type-C filter (nominal pore size: 1.2 µm) in a glass filter tower, using a vacuum pump under low light conditions to prevent photo-shock in the algal cells. A volume of 300 to 500 millilitres (mL) of water was filtered for each chlorophyll *a* sample. The filters were folded in half, placed in a pre-labelled Petri dish, wrapped with aluminum foil, and frozen. Frozen filters were submitted to the Biogeochemical Analytical Service Laboratory at the University of Alberta, Edmonton, Alberta, for spectrophotometric analysis of chlorophyll *a*.

11.1.2.2 Phytoplankton Collection

A single water sample for phytoplankton analysis (either depth-integrated [Meliadine Lake stations] or discrete samples [peninsula lake stations]) was used to fill a 250-mL amber Nalgene bottle. Phytoplankton samples were preserved with approximately 4 mL of Lugol's solution. Samples were sealed, labelled, and stored in the dark (inside coolers) for transportation to Plankton R Us, Winnipeg, Manitoba, for taxonomic identification to the lowest practical taxonomic level, and abundance and biomass estimates.

11.1.3 Laboratory Methods

Laboratory methods for nutrient analysis, including the laboratory test code, laboratory test description and analytical method references are further described in the laboratory certificate of analysis (Attachment A). Laboratory procedures for chlorophyll *a* analysis include extraction, filtration and spectrophotometric analysis. Chlorophyll concentrations were calculated using the absorbencies at specified wavelengths and the original extraction and filtration volumes. Laboratory methods for phytoplankton enumeration, identification, and QA/QC procedures are further described in Appendix 11A.

11.1.4 Data Analysis

11.1.4.1 Depth-Integrated Samples

Descriptive statistics (i.e., minimum, median, maximum, mean, standard error, standard deviation) for depth-integrated nutrients and chlorophyll *a* were calculated to evaluate spatial and temporal data collected in Meliadine Lake. Where concentrations were below the DL, the concentration was set to half the value of the DL for calculating summary statistics. The percentage of non-detect samples in the data set was reported for each parameter.

11.1.4.2 Trophic Status

Trophic status is a useful means of classifying lakes and can be used as an indicator to describe the productivity of a system. Trophic status of a waterbody can be evaluated by examining the concentrations of chlorophyll *a*, nutrients, and water transparency. Chlorophyll *a* is the primary photosynthetic pigment in phytoplankton, and is often used as a surrogate measure of phytoplankton biomass and production in lakes (Franklin et al. 2012). The essential nutrients necessary for phytoplankton growth are nitrogen, phosphorus, carbon, and for some groups (e.g., diatoms), silica. The primary nutrient that often limits phytoplankton growth in lakes is phosphorus (Schindler 1974); therefore, phosphorus is often used to establish the trophic status of lakes. Secchi depth (a measure of water transparency) can be used as a coarse surrogate of phytoplankton biomass, because in many waterbodies, Secchi depth is inversely related to phytoplankton biomass (Dodds and Whiles 2010); therefore, Secchi depth is also considered when evaluating trophic status.

The three main classes of trophic status are the following:

- oligotrophic (nutrient-poor, unproductive systems)
- mesotrophic (moderately productive systems)
- eutrophic (nutrient-rich, highly productive systems)

The trophic status of Meliadine Lake was evaluated by examining the nutrient data (TP), chlorophyll *a* concentrations, and water transparency (Secchi depth). The trophic status was determined using the Vollenweider (1968) trophic classification scheme for lakes (Table 11.1-2), the CCME (2004) trigger ranges (Table 11.1-3), and the Carlson (1977) Trophic State Index (TSI; Table 11.1-4). Of the three commonly used variables to calculate TSI, chlorophyll *a* is considered the best predictor of the overall trophic status of lakes (Carlson and Simpson 1996). As a result, the overall trophic status of Meliadine Lake was determined using the TSI value calculated based on chlorophyll *a* concentrations, and this classification was supported by TSI values calculated based on nutrient availability (TP) and water transparency.

Table 11.1-2: General Trophic Classification of Lakes

Trophic Status	Total Phosphorus (mg/L)		Chlorophyll *a* (µg/L)		Secchi Depth (m)	
	Mean	Range	Mean	Range	Mean	Range
Oligotrophic	0.008	0.003 to 0.018	1.7	0.3 to 4.5	9.9	5.4 to 28.3
Mesotrophic	0.027	0.011 to 0.096	4.7	3.0 to 11.0	4.2	1.5 to 8.1
Eutrophic	0.084	0.016 to 0.386	14.3	3.0 to 78.0	2.5	0.8 to 7.0

Source: Vollenweider 1968.

mg/L = milligrams per litre; µg/L = micrograms per litre.

Table 11.1-3: Trophic Classification of Canadian Lakes Based on Total Phosphorus Trigger Ranges

Trophic Status	Total Phosphorus (mg/L)
Ultra-oligotrophic (very nutrient-poor)	<0.004
Oligotrophic (nutrient-poor)	0.004 to 0.010
Mesotrophic (containing a moderate level of nutrients)	0.010 to 0.020
Meso-eutrophic (containing moderate to high levels of nutrients)	0.020 to 0.035
Eutrophic (nutrient-rich)	0.035 to 0.100
Hyper-eutrophic (very nutrient-rich)	>0.100

Sources: CCME 2004; Environment Canada 2004.

mg/L = milligrams per litre; <= less than; >= greater than.

The TSI is a numerical trophic state index for lakes that classifies lakes on a scale of 0 to 100 (Carlson 1977). The index number is calculated from Secchi depth, chlorophyll *a*, and TP using the following equations (Carlson 1977):

$$TSI\ (TP) = 10\left(6 - \frac{\ln {}^{48}/_{TP}}{\ln 2}\right) \quad \text{Equation 1}$$

$$TSI\ (Chl) = 10\left(6 - \frac{2.04 - 0.68 \ln Chl}{\ln 2}\right) \quad \text{Equation 2}$$

$$TSI\ (Secchi) = 10\left(6 - \frac{\ln Secchi}{\ln 2}\right) \quad \text{Equation 3}$$

where:

- TSI = trophic state index
- TP = total phosphorus
- ln = the natural log
- Chl = chlorophyll *a*
- Secchi = Secchi depth

Values calculated using these equations are multiplied by 10 to give the scale a range of 0 to 100. The numerical scales for each of the three TSIs are presented in Table 11.1-4.

Table 11.1-4: Comparison of Trophic State Index Classification and General Trophic Classification of Lakes

Trophic State Index	Total Phosphorus (mg/L)	Chlorophyll *a* (µg/L)	Secchi Depth (m)	General Trophic Classification
<30 to 40	0 to 0.012	0 to 2.6	>8.0 to 4	Oligotrophic
40 to 50	0.012 to 0.024	2.6 to 20	4 to 2	Mesotrophic
50 to 70	0.024 to 0.096	20 to 56	2 to 0.5	Eutrophic
70 to 100+	0.096 to 0.38+	56 to 155+	0.5 to <0.25	Hyper-eutrophic

Source: Carlson 1977.

mg/L = milligrams per litre; µg/L = micrograms per litre; <= less than; >= greater than.

11.1.4.3 Phytoplankton

Phytoplankton data were analyzed separately, but the same approach was used for both datasets. The following variables were calculated for each sample:

- total abundance (abundance by cell density as cells per litre [cells/L])
- total biomass (biomass as milligrams per cubic metre [mg/m^3])
- total taxonomic richness (richness as number of taxa [no. of taxa] at a station)
- relative abundances (as percentages) of major taxonomic groups
- relative biomass (as percentages) of major taxonomic groups

Abundance and biomass data were divided into major taxonomic groups. Phytoplankton groups were Cyanobacteria, Chlorophyceae (chlorophytes), Chrysophyceae (chrysophytes), Cryptophyceae (cryptophytes), Dinophyceae (dinoflagellates), Bacillariophyceae (diatoms), and Euglenophyceae (euglenoids).

Mean total abundance and mean total biomass were calculated for each sampling area (e.g., Near-field area) and plotted as bar graphs showing the mean and standard error (SE). Mean taxonomic richness at the species level was summarized for each area and plotted as a bar graph. Taxonomic richness provides an indication of the diversity at a station; higher richness values typically indicate more healthy and balanced communities. For stations where duplicate QC samples were collected, total taxonomic richness was calculated as the average richness of the two duplicate samples.

11.1.4.4 Spatial and Temporal Trends

Nutrient concentrations, chlorophyll *a,* and plankton community variables were compared visually among areas and years to explore inter-annual and spatial trends. The following variables were plotted for each area and sampling event:

- mean total nitrogen and total phosphorus concentrations
- mean chlorophyll *a* concentration
- mean total phytoplankton abundance and biomass
- total nitrogen, total phosphorus, chlorophyll a concentrations, and total phytoplankton biomass plotted for each station in the Near-field area

- mean total phytoplankton richness
- mean relative proportion accounted for by each major taxonomic group, based on abundance and biomass, plotted as stacked bars (for phytoplankton)

Scatter plots were used to evaluate the strength of the relationship between chlorophyll *a* concentrations and phytoplankton biomass, and to evaluate the spatial variability of each variable against concentrations of depth-integrated nutrients.

11.1.4.5 Statistical Analysis

The objective of the statistical comparisons of plankton data collected in Meliadine Lake was to compare data collected from the Near-field area (MEL-01) with the Mid-field exposure area (MEL-02) and the three reference areas (MEL-03, MEL-04, and MEL-05). Descriptive statistics (i.e., minimum, maximum, median, mean, standard deviation, standard error) were calculated to compare and evaluate spatial and temporal data collected in Meliadine Lake. One-way ANOVA or the Kruskal-Wallis test was used to compare plankton endpoints (e.g., abundance, biomass, richness) and nutrient and chlorophyll *a* concentrations among sampling areas. Multivariate analysis (nMDS) was also used to investigate differences in community structure among areas. Statistical tests were performed using SYSTAT 13.1 for Windows (Systat Software 2009) or PRIMER version 7.0.13 software (Quest Research 2017).

Statistical Analysis

Univariate statistical comparisons were used to identify differences in plankton community endpoints among areas. A significance level (α) of 0.1 was used for ANOVA models, and an α of 0.05 was used for testing statistical assumptions (i.e., normality and homogeneity of variances). Prior to conducting ANOVAs, the assumptions of parametric statistical tests were verified using the Shapiro-Wilk test for normality and Levene's test for homogeneity of variances on untransformed and log-transformed data. Data that violated assumptions of normality or equality of variances were transformed and the effectiveness of the transformations was verified. If the assumptions of the ANOVA were not met, the non-parametric equivalent of ANOVA (i.e., Kruskal-Wallis test) was used.

Mean values for each parameter from the exposure and reference areas were initially compared to one another in an overall ANOVA. Tukey's honestly significant difference (HSD) method was used for multiple unplanned (i.e., *a posteriori*) comparisons following the overall ANOVA. This test adopts a conservative approach by employing experiment-wise error rates for the Type I error (Day and Quinn 1989). Therefore, a *P* value of 0.1 was used for these tests.

For variables that did not meet parametric test assumptions (e.g., chlorophyll *a*), the Kruskal-Wallis test was used to test for differences among sampling areas. Kruskal-Wallis tests were considered significant at $P < 0.1$. The multiple-comparison procedure controls the experiment wise error rates for the Type I error and, therefore, holds the probability of correctly finding no difference at 1–α. However, under this scenario, the task of correctly detecting differences that are significant is more difficult (Daniel 1990). To maintain a sufficiently small Type II error (β) with the multiple comparisons, a larger α (or *P*-value) was used. The contrasts were tested at $P = 0.1$, and the multiple comparisons were conducted with $P = 0.15$.

Multivariate Analysis

Non-metric multidimensional scaling (nMDS), a multivariate ordination technique, was used to investigate differences in plankton community structure among areas in August 2016, 2017 and 2018. nMDS takes a pair-wise matrix of similarities among cases calculated from the original taxonomic data (biomass by station-year),

and then reduces it to a small number (typically two) of underlying dimensions of variation among cases. In this way, nMDS can visually simplify a multidimensional taxonomic data-set in two or three dimensions that capture the major patterns of variation in community composition.

The plankton taxonomic data were analyzed at the LTL. A square root transformation was applied to improve the separation of the data among stations on the nMDS plots. Transforming the data also reduced weighting of the analysis by the most abundant taxa. The appropriate data transformation was determined by examining “shade plots” created in PRIMER. Alternative data transformations were also explored; however, stronger transformations (i.e., fourth-root and Log x+1 transformations), heavily down-weighted the data, and were deemed unsuitable for this analysis.

Following the data transformation, a Bray-Curtis resemblance matrix was generated, and the nMDS procedure was applied to this matrix. Using rank order information, nMDS determined the relative positions of stations in two dimensions based on community composition. Goodness-of-fit was determined by examining the Shepard diagrams as well as the stress values, which were calculated from the deviations in the Shepard diagrams. Two dimensions were selected for each nMDS after confirming that the final stress value of the two-dimensional configuration was sufficiently low (less than 0.2; Clarke 1993). Points that fall close together on the nMDS ordination plot represent samples with similar community composition; points that are far apart from each other represent samples with dissimilar community composition.

11.1.4.6 Normal Range

The methods for defining the normal range for the Plankton Targeted Study followed the methods described in Section 6.2.4.2. Provisional normal ranges for plankton were calculated for Meliadine Lake from pooled reference area (MEL-03, MEL-04, and MEL-05) data collected during the AEMP between 2016 and 2018. Near-field and Mid-field data collected between 2015 and 2017 were not included in the normal range calculation, because water quality and chlorophyll *a* data collected during these years suggested a slight effect on primary productivity in the exposure areas in Meliadine Lake, potentially as a result of treated sewage discharges from the exploration camp.

The normal ranges provided in this report are considered provisional due to the limited sample sizes used in the calculations. The normal range is intended to estimate the range of natural spatial and temporal variability, and the more reference data incorporated into the calculation, the more accurate the estimate becomes. These normal ranges may be re-defined in future reports to allow for the inclusion of additional monitoring data in the reference areas.

11.2 Quality Assurance/Quality Assurance

11.2.1 Methods

QA components of the program included the use of trained personnel and an accredited analytical laboratory; QC components included assessments of duplicate samples for DIN and phytoplankton. Phytoplankton samples were collected from each sampling station using consistent sampling techniques for each sample. Replicates were collected immediately after one another and were preserved using approximately the same concentration of Lugol's solution. The taxonomic laboratory identified organisms down to the lowest practical taxonomic level.

Chlorophyll *a* samples were collected from each sampling station using consistent sampling techniques for each sample. Replicates were collected immediately after one another and were kept cool and dark until filtered and frozen prior to sample shipment.

Further details regarding the QA/QC practices applied during this study and detailed results of the QA/QC measures implemented by the taxonomic and analytical laboratories are reported in Appendix 11A. A summary of the key QC findings is provided in Section 11.2.2 below.

11.2.2 Results

Key QC findings for the 2018 plankton monitoring programs are as follows:

- Nutrients and Chlorophyll *a*:
  - A total of 12% of paired concentrations in duplicate DIN samples had a RPD greater than 20%. Each of the three RPD exceedances came from duplicate samples collected at MEL-01-09 in August 2018, where RPDs for concentrations of TKN, TN and TP exceeded 20%. All RPDs for the other set of DIN duplicate samples collected at MEL-02-01 in 2018 were below 20%.
  - Concentrations of dissolved parameters were generally lower than corresponding total concentrations for the DIN samples. Dissolved concentrations were higher than total concentrations for 4.4% of comparisons.
  - RPDs for total phosphorus concentrations in 2018 were below 20% in all samples.
- Phytoplankton:
  - The dominant taxon was consistent between duplicate samples for phytoplankton biomass and abundance.
  - RPDs for total phytoplankton biomass and abundance were below 50% for all duplicates.
  - RPDs above 50% were observed in the majority of duplicates for major phytoplankton taxonomic groups; however, graphical presentation of the relative abundances of major phytoplankton groups showed that variation between duplicates was actually low and that the proportions of major groups were similar between duplicates.

Differences between original and QC samples were deemed minor, and within the range of variability expected in plankton data. Based on this assessment, the plankton monitoring data are considered adequate to meet the needs of the AEMP for the Mine.

11.3 Results and Discussion

The results of the phytoplankton sampling programs completed in Meliadine Lake in 2015 to 2018 are summarized in Sections 11.3.1 to 11.3.3. Chlorophyll *a* sampling results in the peninsula lake are summarized in Section 11.4. Results from previous sampling programs in the Peninsula Lakes in 2015 through 2017 were presented in 2017 AEMP Annual Report (Golder 2018c). Detailed results are provided in the following appendices:

- Appendix 11B: Depth-Integrated Nutrients and Chlorophyll *a*
- Appendix 11C: Trophic Status
- Appendix 11D: Phytoplankton Community Results

11.3.1 Depth-Integrated Nutrients and Chlorophyll *a*

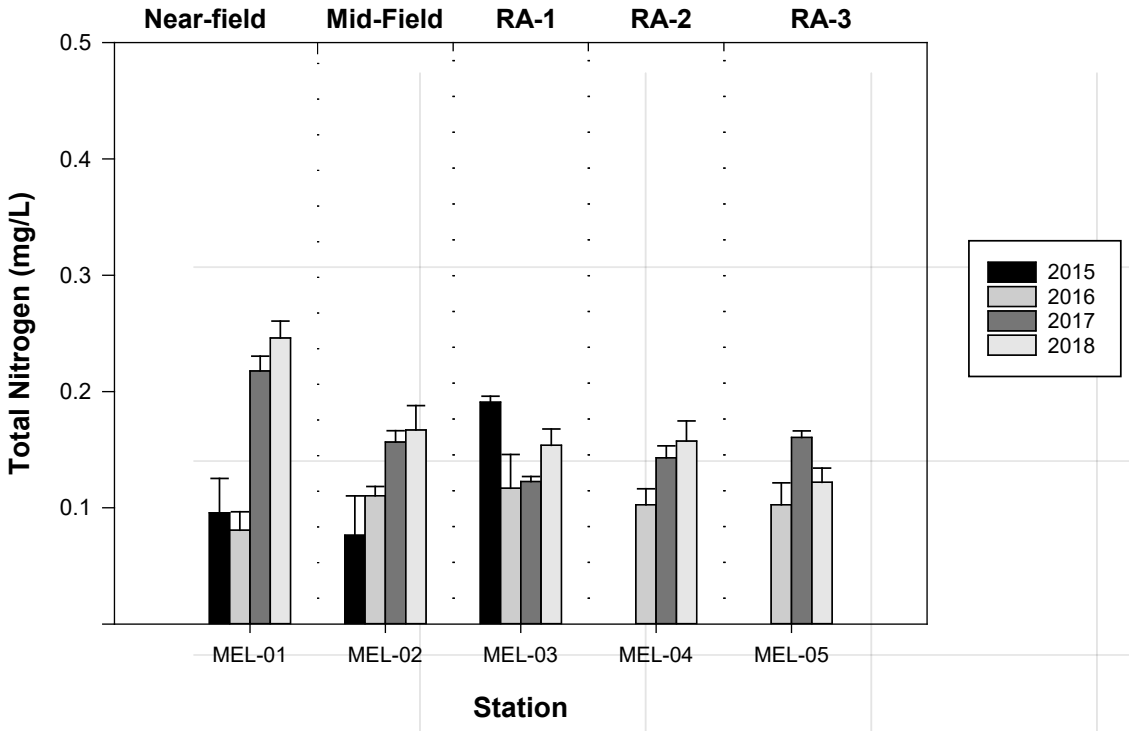
Depth-integrated nutrient and chlorophyll *a* results for samples collected from Meliadine Lake in 2015 to 2018 are provided in Appendix 11B. Summary statistics (count, minimum, median, mean, maximum, standard error, standard deviation) for depth-integrated nutrients are provided in Tables 11B-1 to 11B-3. Summary statistics for chlorophyll *a* are provided in Table 11B-4. Raw data for depth-integrated nutrients and chlorophyll *a* are provided in Tables 11B-5 and 11B-6 respectively.

Concentrations of most depth-integrated nutrients were generally low in 2018 and consistent with concentrations observed in previous years. The mean concentration of TN in the Near-field area was 0.25 mg-N/L in 2018, which is slightly higher than in previous years, when mean TN concentrations ranged between 0.08 and 0.22 mg-N/L (Figure 11.3-1). Concentrations of TN ranged between a mean concentration of 0.12 mg-N/L (MEL-05) and 0.17 mg-N/L (MEL-02) in the Mid-field and reference areas in 2018, compared with a range of 0.08 to 0.19 mg-N/L in previous years.

Concentrations of TP in 2018 were generally above DLs but were low and consistent with TP concentrations observed in 2015, 2016 and 2017 (Figure 11.3-2). Some variability in TP concentrations was observed across sampling areas in 2018, but no consistent trends were apparent. The mean concentration of TP in the Near-field area was 0.0049 mg-P/L which was consistent with TP concentrations in previous years, which ranged between 0.0051 and 0.0060 mg-P/L. Concentrations of TP in the Mid-field exposure and reference areas ranged from a mean concentration of 0.0039 mg-P/L (MEL-03) to 0.0073 mg-P/L (MEL-02) in 2018 compared with a range of 0.0036 to 0.0072 mg-P/L in previous years.

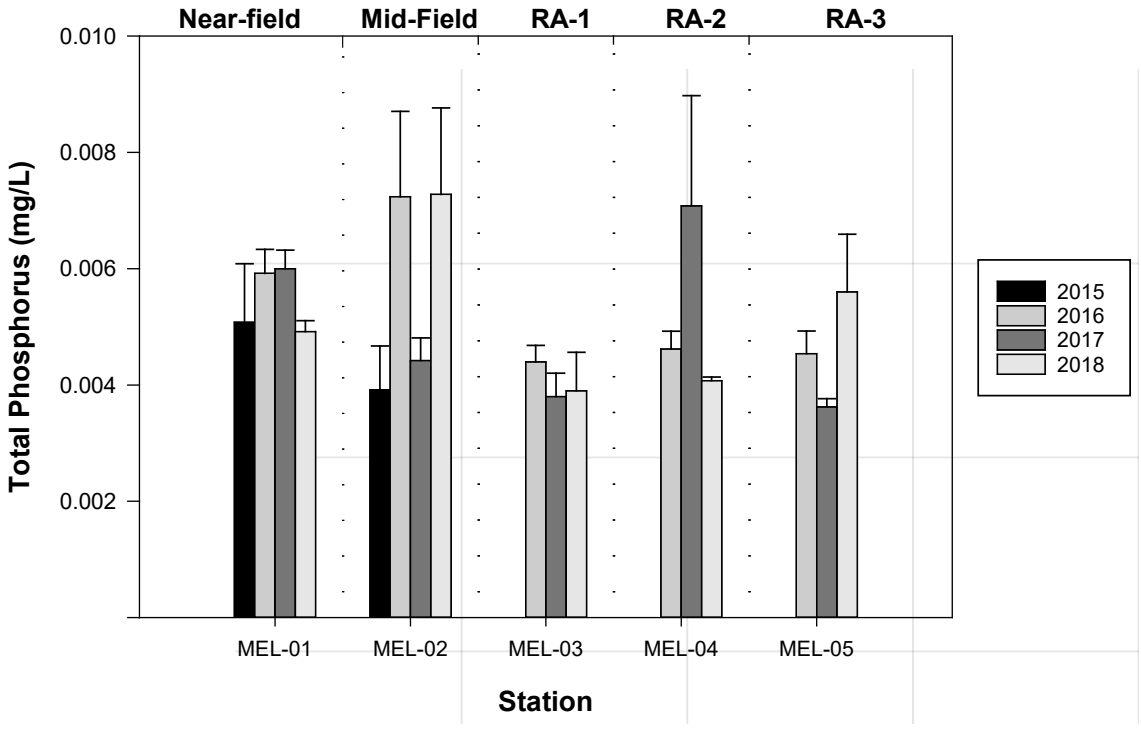
Concentrations of nitrate, nitrite, ammonia, and orthophosphate were below DLs in the majority of samples collected in 2018, consistent with previous years. Minor spatial differences were observed in silica concentrations in Meliadine Lake in 2018, with slightly higher mean concentration of silica in the Near-field area (0.36 mg/L) than in the Mid-field area (0.31 mg/L) and the reference areas (0.24 mg/L); however, the observed difference in silica concentrations was less pronounced than observed in 2017.

Chlorophyll *a* concentrations followed a similar spatial trend in 2018 as observed in previous years, with higher concentrations in the Near-field area than the Mid-field and reference areas (Figure 11.3-3). Mean chlorophyll *a* concentration in the Near-field area in 2018 was 1.9 ± 0.03 µg/L compared to 0.9 ± 0.05 µg/L in the Mid-field area, and 0.6 ± 0.03 µg/L in the reference areas. Chlorophyll *a* concentrations in the Near-field area were higher in 2018 than in 2017 (1.3 ± 0.2 µg/L) and 2015 (0.9 ± 0.2 µg/L) but consistent with concentrations observed in 2016 (1.9 ± 0.07 µg/L).



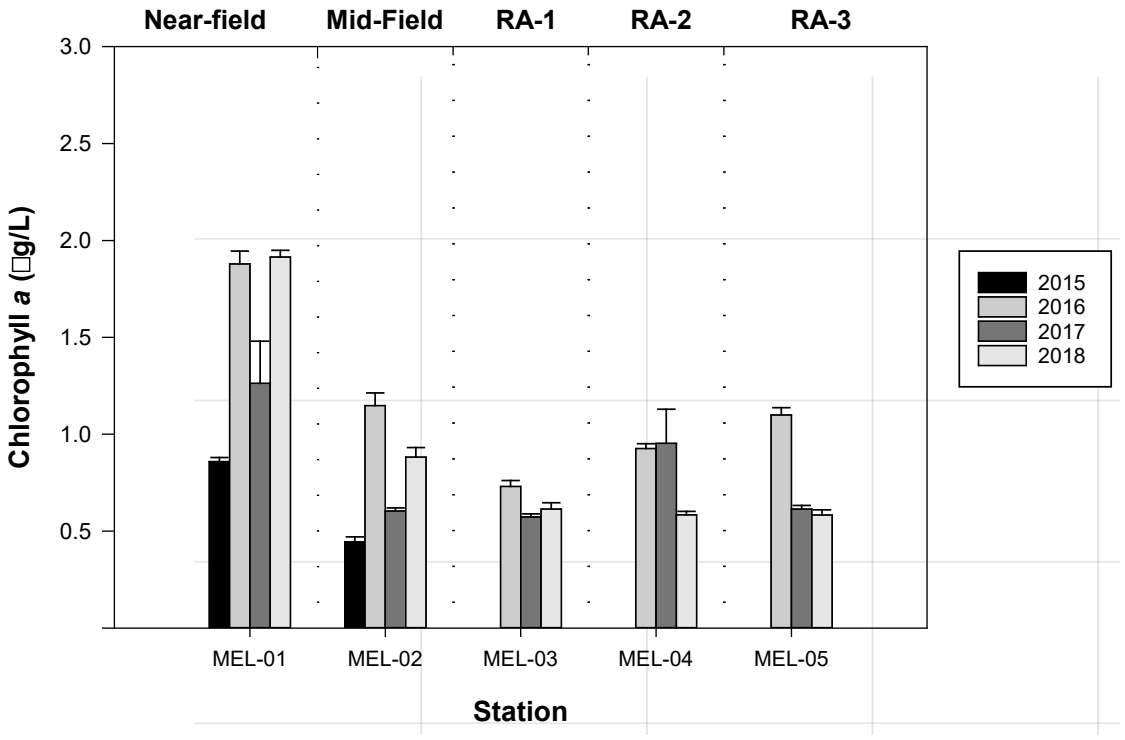
Notes: Mean values are presented for each area. Error bars represent standard error (SE). RA = Reference Area; mg/L = milligrams per litre.

Figure 11.3-1: Mean Total Nitrogen Concentrations in Meliadine Lake, 2015 to 2018



Notes: Mean values are presented for each area. Error bars represent standard error (SE). RA = Reference Area; mg/L = milligrams per litre.

Figure 11.3-2: Mean Total Phosphorus Concentrations in Meliadine Lake, 2015 to 2018



Notes: Mean values are presented for each area. Error bars represent standard error (SE). RA = Reference Area; µg/L = micrograms per litre.

Figure 11.3-3: Mean Chlorophyll *a* Concentrations in Meliadine Lake, 2015 – 2018

11.3.1.1 Statistical Comparisons of Nutrients and Chlorophyll a

Statistical comparisons of depth-integrated nutrient and chlorophyll *a* concentrations from samples collected in August 2016, 2017 and 2018 were made to evaluate spatial variability among the five areas of Meliadine Lake. Data collected in August 2015 was omitted from statistical comparisons due to lack of sampling in the reference areas. Differences observed in the concentrations of total nitrogen, total phosphorus, and chlorophyll *a* in August 2016, 2017 and 2018 in Meliadine Lake are summarized below:

- In 2016, total nitrogen concentrations were not significantly different among any of the five sampling areas ($P = 0.695$) (Table 11.3-1). In 2017, total nitrogen was significantly higher among the areas overall ($P < 0.001$), which was mostly attributed to significant differences between the Near-field and the Mid-field areas and reference areas. Significant differences in nitrogen concentrations were also observed between the Mid-field area and RA-1, and between RA-1 and RA-3 in 2017. In 2018, a similar trend was observed with significant differences in TN overall ($P = 0.041$) and between the Near-field area and all other areas.
- Total phosphorus concentrations varied significantly overall among areas in 2016 ($P = 0.051$), 2017 ($P = 0.054$) and 2018 ($P = 0.056$); however, few significant differences were observed in pairwise comparisons between areas, and there was no clear spatial trend of differences between the Near-field area and other areas (Table 11.3-1). Significant differences were observed between the Mid-field area and RA-1 in 2016, between RA-2 and RA-3 in 2017, and between the Near-field area and RA-2, the Mid-field area and RA-1, and the Mid-field area and RA-2 in 2018.

- Chlorophyll *a* concentrations were significantly different among areas in all years (P <0.001) (Table 11.3-1). Pairwise comparisons revealed that chlorophyll *a* concentrations were significantly different between the Near-field area and all other areas in 2016, 2017 and 2018 (P <0.001). In 2016, significant differences were observed among all other areas except one, while in 2017 there were no significant differences among the Mid-field area and reference areas. In 2018, there were significant differences in chlorophyll *a* concentrations between the Mid-field area and the reference areas but not among the reference areas.

Table 11.3-1: Results of Statistical Analysis and Pairwise Comparisons for Nutrients and Chlorophyll *a* Comparing Areas, August 2016-2018

Year	Variable	Transform[(a)]	Statistical Test	Overall Comparison	Near-field vs. Mid-field	Near-field vs. RA-1	Near-field vs. RA-2	Near-field vs. RA-3	Mid-field vs. RA-1	Mid-field vs. RA-2	Mid-field vs. RA-3	RA-1 vs. RA-2	RA-1 vs. RA-3	RA-2 vs. RA-3
				P-value	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*
2016	Total Nitrogen	log(x)	ANOVA /Tukey's	0.695	0.759	0.646	0.903	0.907	1	0.998	0.997	0.986	0.984	1
	Total Phosphorus	log(x)	ANOVA /Tukey's	**0.051**	0.705	0.585	0.713	0.667	**0.079**	0.119	0.103	0.999	1	1
	Chlorophyll *a*	none	ANOVA /Tukey's	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**0.016**	0.949	**0.040**	**<0.001**	**0.103**
2017	Total Nitrogen	log(x)	ANOVA /Tukey's	**<0.001**	**0.001**	**<0.001**	**<0.001**	**0.002**	**0.086**	0.817	0.997	0.488	**0.045**	0.634
	Total Phosphorus	log(x)	ANOVA /Tukey's	**0.054**	0.725	0.435	0.913	0.359	0.987	0.261	0.968	0.112	1	**0.085**
	Chlorophyll *a*	none	ANOVA /Tukey's	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	0.778	0.999	0.907	0.608	0.999	0.778
2018	Total Nitrogen	log(x)	ANOVA /Tukey's	**0.041**	**0.017**	**0.004**	**0.063**	**<0.001**	0.669	0.285	**0.097**	0.347	0.151	0.662
	Total Phosphorus	log(x)	ANOVA /Tukey's	**0.056**	0.160	0.115	**0.006**	0.638	**0.046**	**0.063**	0.381	0.607	0.140	0.181
	Chlorophyll *a*	none	ANOVA /Tukey's	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	0.242	0.218	0.952

(a) Distributions of all variables violated the assumption of normality even after transformation; however, the results are considered reliable as the assumption of equal variances was not violated and ANOVA is robust against violations of the assumption of normality.

Note: *P*-values representing significant differences between areas (*P*<0.1) are **bolded**.

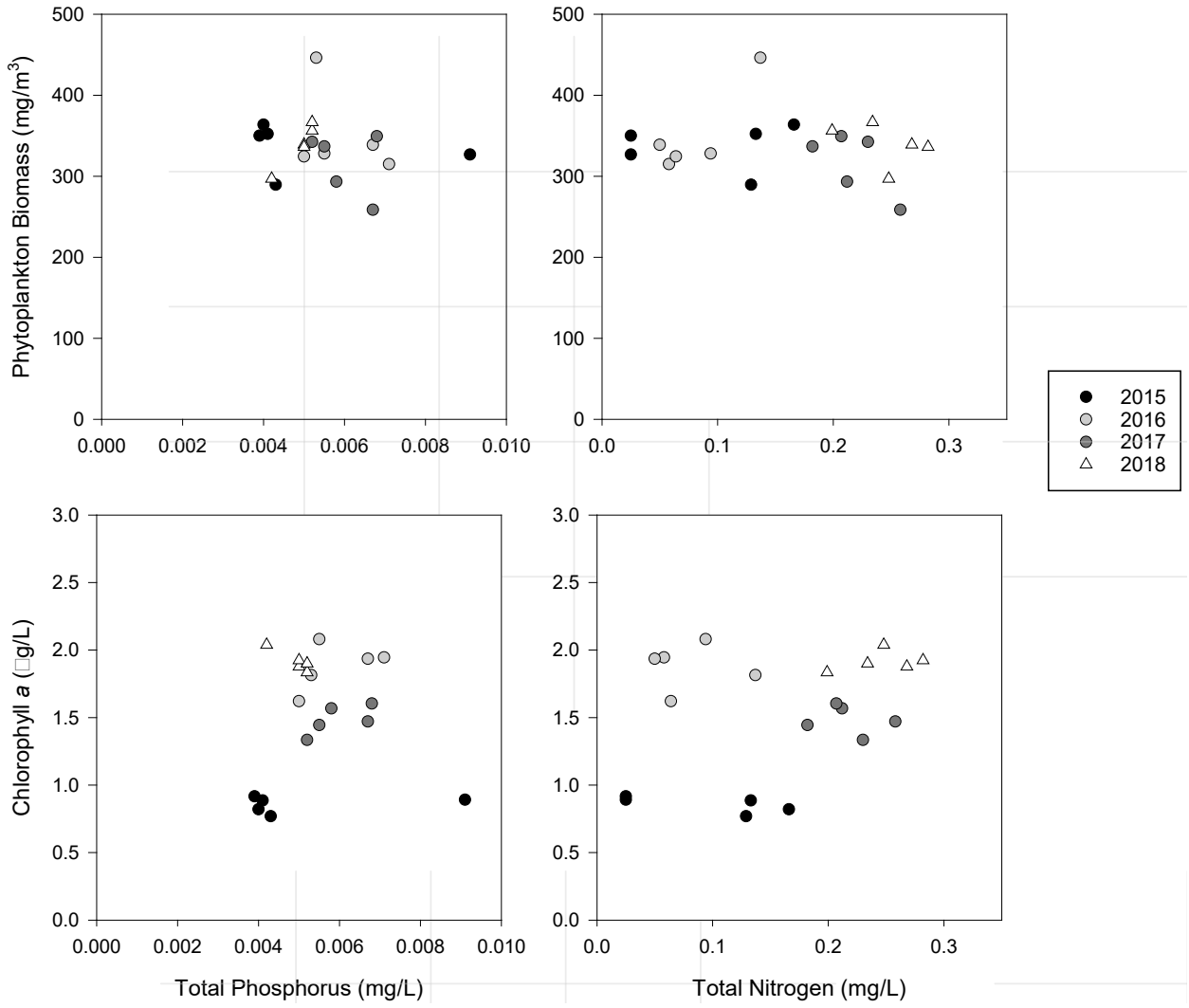
ANOVA= Analysis of Variance; Tukey's= Tukey's Honestly Significant Difference Test; *P*-value = probability value; <= less than; RA = Reference Area.

11.3.1.2 Evaluation of Variability in Phytoplankton Biomass and Chlorophyll a in the Near-field Area Relative to Nutrients

Scatter plots of nutrients, chlorophyll *a*, and phytoplankton biomass were prepared to assess variability of biomass and chlorophyll *a* in relation to variability in nutrient concentrations (i.e., TN and TP) in the Near-field area (Figure 11.3-4). Spatial variability in nutrient concentrations in the Near-field area during each sampling event was generally lower than the variability among years. Temporal variability in concentrations of TN was observed, but not for TP. There was no apparent relationship between nutrient concentrations and phytoplankton biomass or chlorophyll *a*, with the possible exception of TP versus chlorophyll a, where an outlier value for 2015 is inconsistent with a weak overall positive relationship.

The lack of apparent relationships in Figure 11.3-4 suggests that higher concentrations of total phosphorus and total nitrogen did not result in higher phytoplankton biomass or chlorophyll *a,* suggesting that nutrient inputs from treated sewage and Mine effluent in the Near-field area has not resulted in enhanced phytoplankton growth. However, other analyses have shown that chlorophyll *a* concentration and mean phytoplankton abundance and biomass were highest in the Near-field area compared to the Mid-field and reference areas during all years of monitoring, and Mid-field area results for each of these variables were also slightly elevated relative to the reference areas. In addition, TSI based on chlorophyll *a* concentration was highest in the Near-field area, followed by the Mid-field area, and lowest in the three reference areas. These results provide evidence of a gradient in primary productivity in Meliadine Lake, with the highest level in the Near-field area.

The apparent lack of relationships between nutrient concentrations and indicators of primary productivity do not necessarily indicate the lack of an effect on productivity. A relationship with TN is unlikely, because the limiting nutrient in Meliadine Lake is most likely phosphorus and possibly other micronutrients (e.g., silica). Detecting a relationship with TP may be difficult at this time, because the available sample size is small, TP results are near the DL where analytical variation is large, and there is limited variation in TP concentration to date. An increase in TP concentration of approximately 2 µg/L has resulted in a consistent, measurable effect on chlorophyll *a* concentration in parts of Lac de Gras as a result of the Diavik Diamond Mine effluent discharge, as shown by long-term monitoring by the Diavik AEMP (Golder 2017c). Continued monitoring of nutrients and productivity indicators, and periodic re-evaluation of nutrient-productivity relationships is recommended to better understand potential nutrient enrichment-related effects in Meliadine Lake.



Note: µg/L = micrograms per litre; mg/m^3 = milligrams per cubic metre; mg/L = milligrams per litre.

Figure 11.3-4: Nutrients versus Phytoplankton Biomass and Chlorophyll *a* Concentration in August in the Near-field Area, 2015 to 2018

11.3.2 Trophic Status Classification

Concentrations of TP and chlorophyll *a*, and Secchi depth were measured as part of the water quality sampling program and were used to characterize the trophic status of Meliadine Lake. Summary tables for these variables and TSI are provided in Appendix 11C, Tables 11C-1 and 11C-2 for samples collected in August, in 2015 through 2018.

Chlorophyll *a* concentration was within the oligotrophic range throughout Meliadine Lake in 2015 through 2018 according to the general trophic classification systems of lakes (Table 7.1-2; Vollenweider 1968). Mean chlorophyll *a* concentration in 2018 ranged from 0.58 ± 0.03 μg/L in Reference Area 3 to 1.91 ± 0.03 μg/L in the Near-field area. Chlorophyll *a* concentration was within the same range in 2018 as in previous years of sampling (Appendix 11C, Table 11C-1. Table 11C-2).

Concentrations of total phosphorus were also consistent with an oligotrophic (nutrient-poor) classification based on the CCME (2004) trigger ranges (i.e., between 0.004 and 0.010 mg/L) (Table 7.1-3). The mean concentration of total phosphorus in 2018 ranged from 0.0039 ± 0.0007 mg-P/L in Reference Area 1 to 0.0073 ± 0.0015 mg-P/L in the Mid-field area, which is consistent with concentrations of total phosphorus measured in Meliadine Lake in previous years (Appendix 11C, Table 11C-1, Table 11C-2).

Secchi depth measurements throughout Meliadine Lake were also consistent with an oligotrophic classification (Appendix 11C, Table 11C-1, Table 11C-2). During the 2018 sampling program, mean Secchi depth in Meliadine Lake ranged from 6.4 m in the Near-field area to 7.0 m in Reference Area 3. Secchi depths measured in 2018 were consistent with Secchi depths measured in previous years.

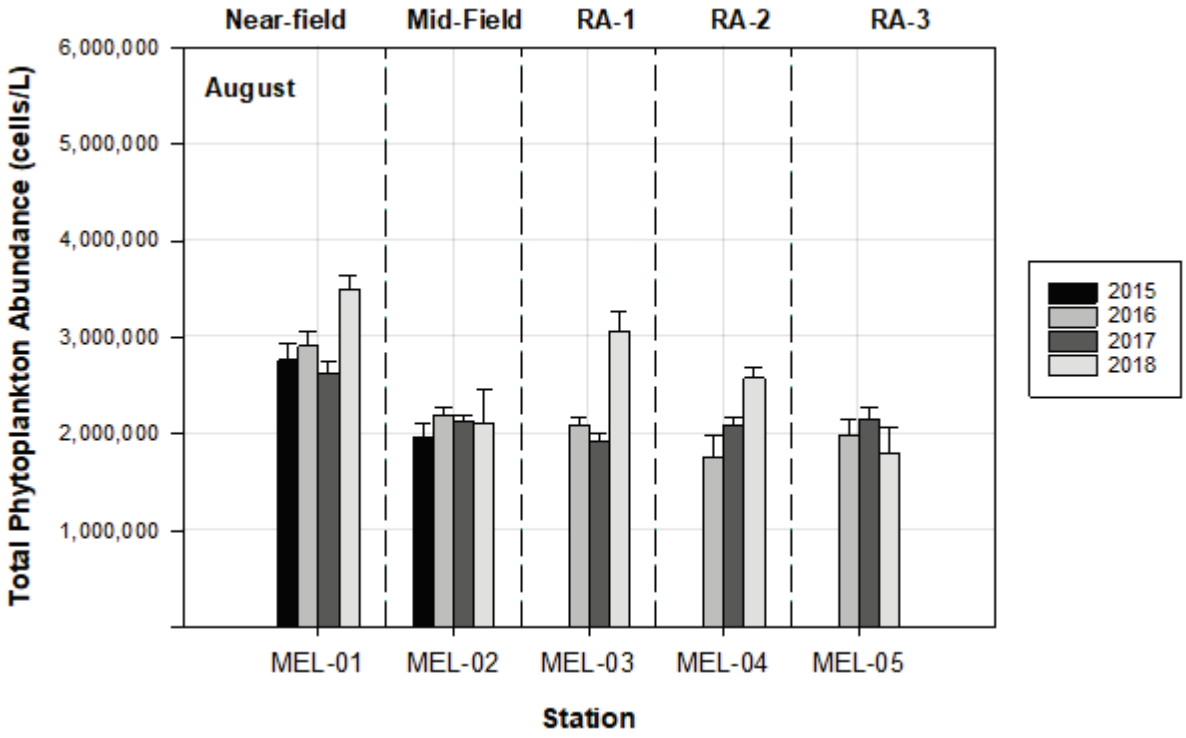
Based on the TSI calculations for chlorophyll *a* in August, the overall trophic status of Meliadine Lake was considered to be oligotrophic (Appendix 11C, Table 11C-2). TSI based on chlorophyll *a* concentration was highest in the Near-field area (37 ± 0.2), followed by the Mid-field area (29.3 ± 0.5), and lowest TSI was calculated at the three reference areas (ranging between 25.3 ± 0.5 and 25.7 ± 0.5). TSI values based on total phosphorus concentrations and Secchi depth were also low, and supported the oligotrophic classification based on the TSI for chlorophyll *a* in Meliadine Lake (Appendix 11C, Table 11C-2).

11.3.3 Phytoplankton

Descriptive statistics that summarize the phytoplankton abundance, biomass, and richness by season, year and area are provided in Appendix 11D, Table 11D-1. Relative abundance of major phytoplankton groups from samples collected in Meliadine Lake is provided in Appendix 11D, Table 11D-2. Raw phytoplankton taxonomic data for Meliadine Lake are provided in Appendix 11D, Tables 11D-3 to 11D-5.

11.3.3.1 Abundance

Phytoplankton abundance was higher in some exposure and reference areas in 2018 than in previous monitoring years but the spatial trend of abundance in 2018 was consistent with the trend observed during previous years (Figure 11.3-5). Mean phytoplankton abundance in the Near-field area in 2018 was 3,503,229 ± 137,000 cells/L, higher than the abundance observed in 2015 to 2017 which ranged between 2,637,110 ± 104,786 cells/L (2017) and 2,909,414 ± 154,628 cells/L (2016). Abundance in the Mid-field area was consistent with previous monitoring years and lower than in the Near-field area. Mean abundance was 2,101,478 ± 366,873 cells/L in the Mid-field area in 2018. Abundance in the reference areas was higher in 2018 than in 2016 or 2017 at Reference Areas 1 and 2, and slightly lower than abundance in previous years at Reference Area 3; mean phytoplankton abundance in the reference areas ranged between 1,803,459 ± 257,821 cells/L and 3,054,288 ± 212,971 cells/L in 2018. Abundance in each of the three reference areas was lower than in the Near-field area in 2018.

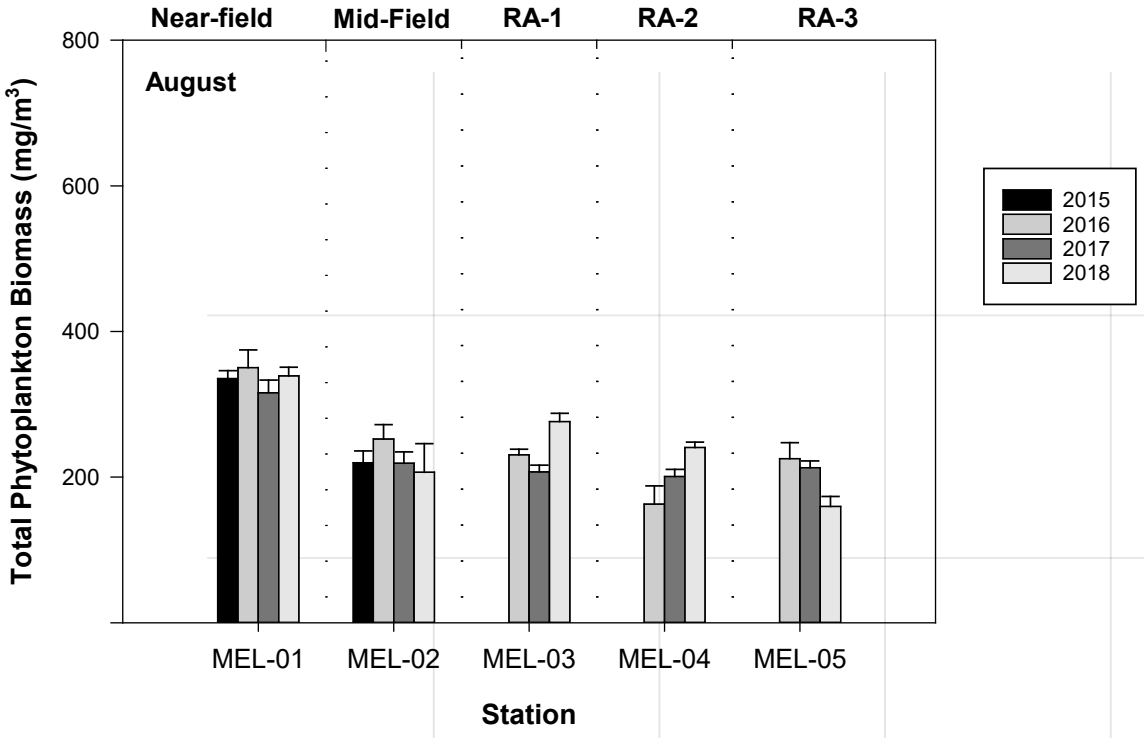


Notes: Mean values are presented for each area. Error bars represent standard error (SE). RA = Reference Area; cells/L = cells per litre.

Figure 11.3-5: Total Phytoplankton Abundance in Meliadine Lake in August, 2015 to 2018

11.3.3.2 Biomass

Phytoplankton biomass generally followed a similar spatial trend as abundance in 2018, while differences among years were less pronounced (Figure 11.3-6). In 2018, biomass was highest in the Near-field area, reaching 339.11 ± 11.93 mg/m^3 compared to 206.53 ± 39.33 mg/m^3 in the Mid-field area, and a range of 159.76 ± 13.52 mg/m^3 (MEL-05) to 276.08 ± 11.43 mg/m^3 (MEL-03) in the reference areas (Appendix 11D, Table 11D-1). Biomass in 2018 was generally consistent with previous years, with only slight increases observed in Reference areas 1 and 2, and a decrease in biomass observed in Reference Area 3 in 2018. The increase in phytoplankton abundance observed in the Near-field area in 2018 did not result in a corresponding increase in biomass, suggesting that the increase in abundance was likely a result of a larger number of smaller phytoplankton taxa in the Near-field area in 2018. Biomass in Reference Areas 1 and 2 was higher in 2018 than in 2016 and 2017, suggesting that the increase in abundance in these areas in 2018 can at least partially be attributed to a greater number of larger phytoplankton taxa.



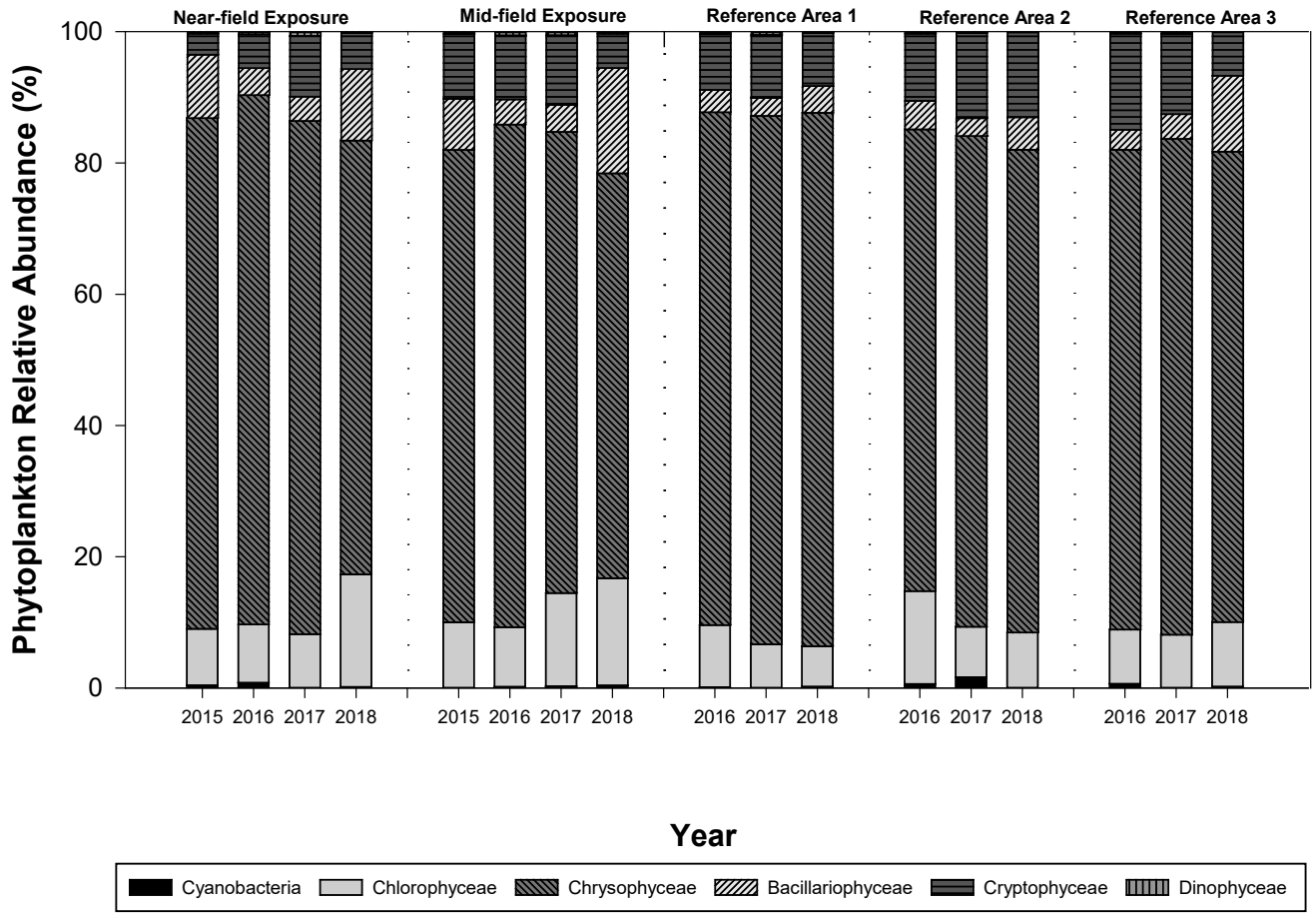
Notes: Mean values are presented for each area. Error bars represent standard error (SE). RA = Reference Area; mg/m^3 = milligrams per cubic metre.

Figure 11.3-6: Total Phytoplankton Biomass in Meliadine Lake in August, 2015 to 2018

11.3.3.3 Community Composition by Abundance

A total of 98 distinct phytoplankton taxa were identified in samples collected in Meliadine Lake in August 2015, 2016, 2017 and 2018. Overall, the relative abundance of major phytoplankton groups was similar throughout Meliadine Lake in 2018 to previous years. The most abundant, or dominant, taxa during each sampling program were golden algae of the group Chrysophyceae (Appendix 11D, Table 11D-2). Abundant taxa in the majority of samples collected included *Uroglena volvox*, *Chrysococcus sp.*, *Chrysochromulina* sp., and *Dinobryon* sp., all from the group Chrysophyceae (Appendix 7D, Tables 7D-3 and 7D-4). Chlorophytes (Chlorophyceae), diatoms (Bacillariophyceae) and cryptomonads (Cryptophyceae) were generally the next most abundant phytoplankton groups, with minor spatial and temporal variation in abundance observed for each group. Cyanobacteria and dinoflagellates (Dinophyceae) were largely absent from the phytoplankton community in Meliadine Lake, making up less than 1% the total relative abundance of phytoplankton in most samples.

The relative abundance of phytoplankton in August 2018 followed a similar spatial trend as in previous years with some minor changes in relative abundance in the exposure areas (Figure 11.3-7). Abundance was dominated by chrysophytes in all areas in 2018, which represented between 62% and 81% of total phytoplankton abundance (Appendix 11D, Table 11D-2). Diatoms contributed slightly more to overall abundance in the Near-field and Mid-field areas in 2018 (11% at MEL-01; 16% at MEL-02) than in previous years (4% to 10%). Chlorophytes also contributed more to overall abundance in 2018 in the exposure areas (17% at MEL-01; 16% at MEL-02) compared to previous years (4 to 14%). In general, higher variability in the relative abundance of chlorophytes, diatoms and dinophytes was observed in the exposure areas, higher relative abundance of chrysophytes was observed in the reference areas, and low relative abundance of cyanophytes was observed in all areas.

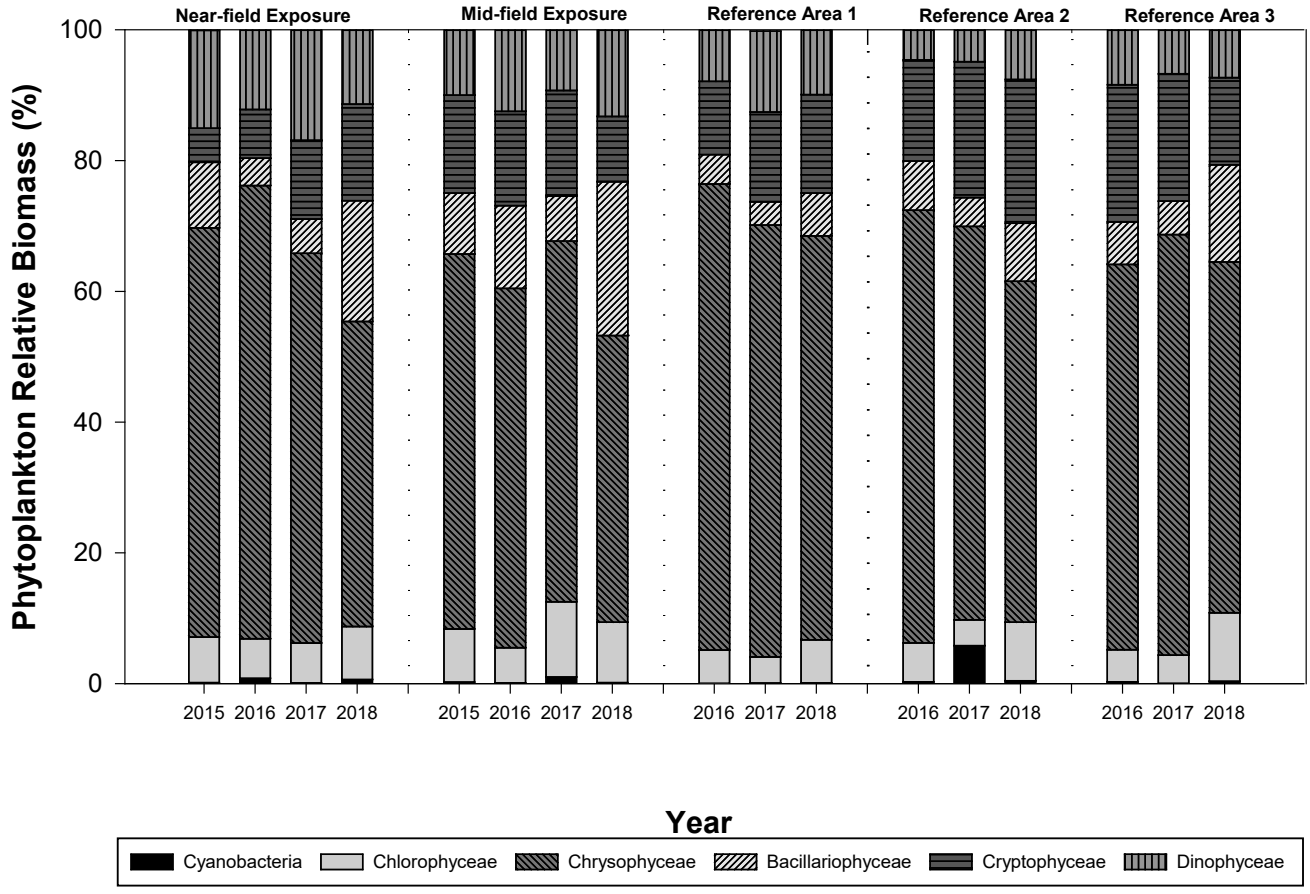


Note: Bars represent mean values for each area.

Figure 11.3-7: Relative Abundance of Major Phytoplankton Groups in Meliadine Lake, 2015 to 2018

11.3.3.4 Community Composition by Biomass

The relative biomass of major phytoplankton groups in Meliadine Lake followed a similar trend as relative abundance, with the only notable differences between 2018 and previous years observed in the exposure areas (Figure 11.3-8). As with abundance, chrysophytes contributed the most to relative biomass in all areas in Meliadine Lake; however, the relative abundance of chrysophytes was lower in the exposure areas (47% at MEL-01; 44% at MEL-02) than in the reference areas (52% to 62%) (Appendix 11D, Table 11D-2). The relative biomass of diatoms was higher in the exposure areas in 2018 (19% to 24%) than in the exposure areas in previous years (4% to 13%) or in the reference areas in all years (4 to 15%). The relative proportions of chlorophytes, cryptomonads and dinoflagellates by biomass showed no discernable trends between exposure and reference areas or among years. Dinoflagellates generally contributed more to relative biomass compared to relative abundance (i.e., larger cells but rare), while the relative biomass of other major groups was generally proportional to their relative abundance (i.e., smaller cells but common).

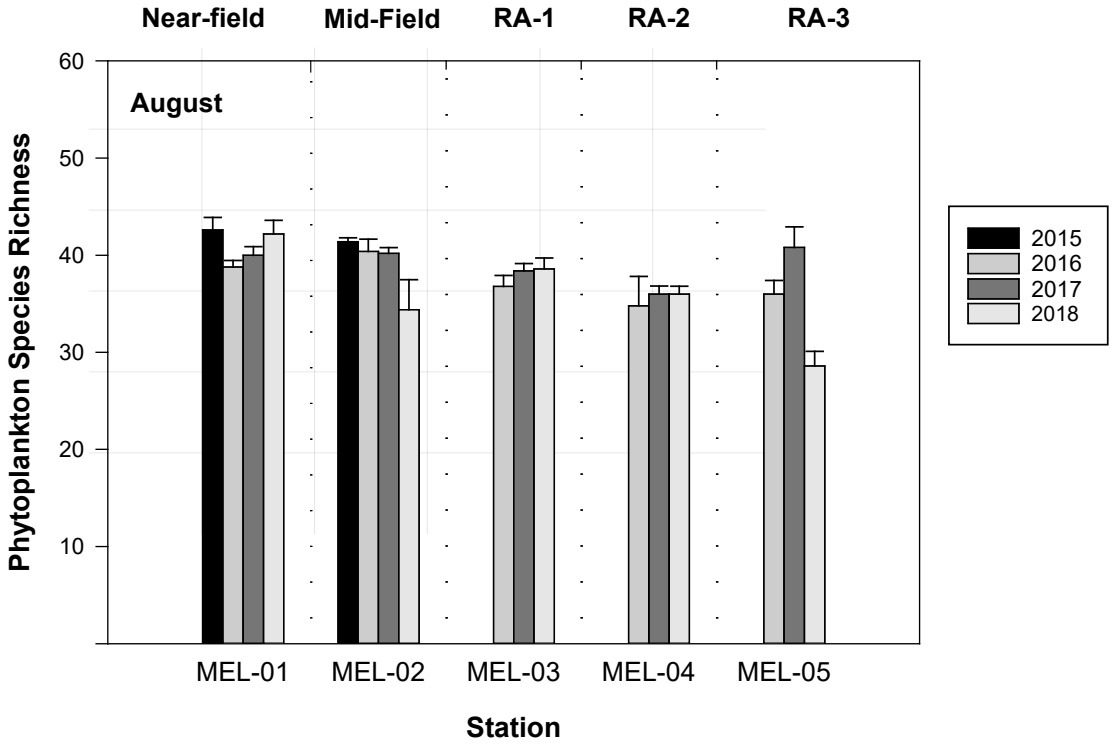


Notes: Bars represent mean values for each area (n=5).

Figure 11.3-8: Relative Biomass of Major Phytoplankton Groups in Meliadine Lake, 2015 to 2018

11.3.3.5 Species Richness

Species richness was relatively consistent throughout much of Meliadine Lake with few observable trends among years or stations (Figure 11.3-9). Richness varied little between the exposure areas and the reference areas in 2018 and among years in any area. In 2018, mean richness was highest in the Near-field area (42 ± 1 taxa) and lowest in Reference Area 3 (29 ± 2 taxa) (Appendix 11D, Table 11D-1). Richness in the Near-field area in 2018 was consistent with richness observed in previous years. Richness in the Mid-field area was lower in 2018 (34 ± 2 taxa) than in previous years, when mean richness ranged between 40 and 41 taxa. Species richness in Reference Area 3 was notably lower than in all other areas (29 ± 2 taxa) and in general was highly variable among years in this area.



Notes: Mean values are presented for each area. Error bars represent standard error (SE). RA=Reference Area.

Figure 11.3-9: Total Phytoplankton Species Richness in Meliadine Lake, 2015 to 2018

11.3.3.6 Statistical Comparisons of Phytoplankton Community Variables

Statistical comparisons of phytoplankton community variables from samples collected in August 2016, 2017 and 2018 were made to evaluate spatial variability among the five areas of Meliadine Lake. Data collected in August 2015 was omitted from statistical comparisons among areas in Meliadine Lake due to a lack of sampling in the reference areas. A summary of statistical comparisons of variables among Near-field and Mid-field areas and the three reference areas in August 2016, 2017 and 2018 is presented in Table 11.3-2.

Differences observed in the abundance, biomass, and richness of the phytoplankton community in August 2016 and August 2017 in Meliadine Lake are summarized below:

- Phytoplankton abundance was significantly different among the five sampling areas in 2016 (P <0.001), 2017 (P = 0.004) and 2018 (P <0.001) (Table 11.3-2). Pairwise comparisons showed that abundance in the Near-field area was significantly higher than in the Mid-field area and each of the three reference areas in 2016 and 2017. In 2018, the Near-field area was significantly different than the Mid-field area and two of the three reference areas, while significant differences were also observed between the Mid-field area and one of the reference areas (Reference Area 1) and among some of the reference areas. There was no significant difference in abundance between the Mid-field exposure area and the reference areas or among the reference areas in 2016 or 2017.
- Phytoplankton biomass was also significantly different (P <0.001) among sampling areas in all years (Table 11.3-2). Pairwise comparisons of biomass estimates showed a similar trend as abundance in all years with significant differences between the Near-field area and all other areas in each year. A significant difference was also observed between the Mid-field area and Reference Area 2 in 2016 (P = 0.068) and between each of the reference areas in 2018.
- Phytoplankton species richness was significantly different among areas overall in 2016 (P = 0.081), 2017 (P = 0.065) and 2018 (P = 0.006); however, comparatively fewer significant differences were observed in pairwise comparisons of exposure and reference areas in 2016 and 2017 (Table 11.3-2). In 2016, no significant differences were observed in pairwise comparisons between areas, while in 2017 the only significant difference observed was between the Mid-field area and Reference Area 2. In 2018, significant differences were observed between the Near-field area and the Mid-field area and reference areas, among the three reference areas, and between the Mid-field area and Reference Area 3.

Table 11.3-2: Results of Statistical Analysis and Pairwise Comparisons for Phytoplankton Community Variables Comparing Areas, August 2016 to 2018

Year	Variable	Transform	Statistical Test	Overall Comparison	Near-field vs. Mid-field	Near-field vs. RA-1	Near-field vs. RA-2	Near-field vs. RA-3	Mid-field vs. RA-1	Mid-field vs. RA-2	Mid-field vs. RA-3	RA-1 vs. RA-2	RA-1 vs. RA-3	RA-2 vs. RA-3
				P-value	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*	*P-value*
2016	Abundance	None	ANOVA /Tukey's	**<0.001****	**0.035****	**0.014****	**<0.001****	**0.008****	0.993	0.151	0.957	0.304	0.999	0.440
	Biomass	None	ANOVA /Tukey's	**<0.001****	**0.062****	**0.016****	**<0.001****	**0.013****	0.967	**0.068****	0.942	0.219	1.000	0.261
	Richness	None	KW / DSCF	**0.081****	0.866	0.554	0.647	0.500	0.259	0.322	0.211	1.000	1.000	1.000
2017	Abundance	None	ANOVA /Tukey's	**0.004****	**0.025****	**0.003****	**0.021****	**0.062****	0.838	1.000	0.992	0.874	0.593	0.984
	Biomass	None	ANOVA /Tukey's	**<0.001****	**0.001****	**<0.001****	**<0.001****	**0.001****	0.930	0.830	0.998	0.999	0.988	0.943
	Richness	None	KW / DSCF	**0.065****	0.993	0.946	0.170	0.880	0.768	**0.105***	0.878	0.219	0.718	0.516
2018	Abundance	None	ANOVA /Tukey's	**<0.001****	**0.007****	0.114	**0.001****	**<0.001****	**0.055****	0.297	0.525	0.111	**0.006****	**0.039****
	Biomass	None	ANOVA /Tukey's	**<0.001****	**0.012****	**0.005****	**<0.001****	**<0.001****	0.128	0.475	0.293	**0.044****	**<0.001****	**0.002****
	Richness	None	KW / DSCF	**0.006****	**0.076****	**0.113***	**0.014****	**0.009****	0.207	0.455	**0.142***	**0.138***	**0.009****	**0.019****

Note: Significant differences (**bold**) are denoted as: * = *P*<0.15, ** = *P*<0.1.

KW= Kruskal Wallis; DSCF= Dwass-Steel-Critchlow-Fligner Test for Pairwise Comparisons; ANOVA= Analysis of Variance; Tukey's= Tukey's Honestly Significant Difference Test; *P*-value = probability value; <= less than.

11.3.3.7 Multivariate Analysis

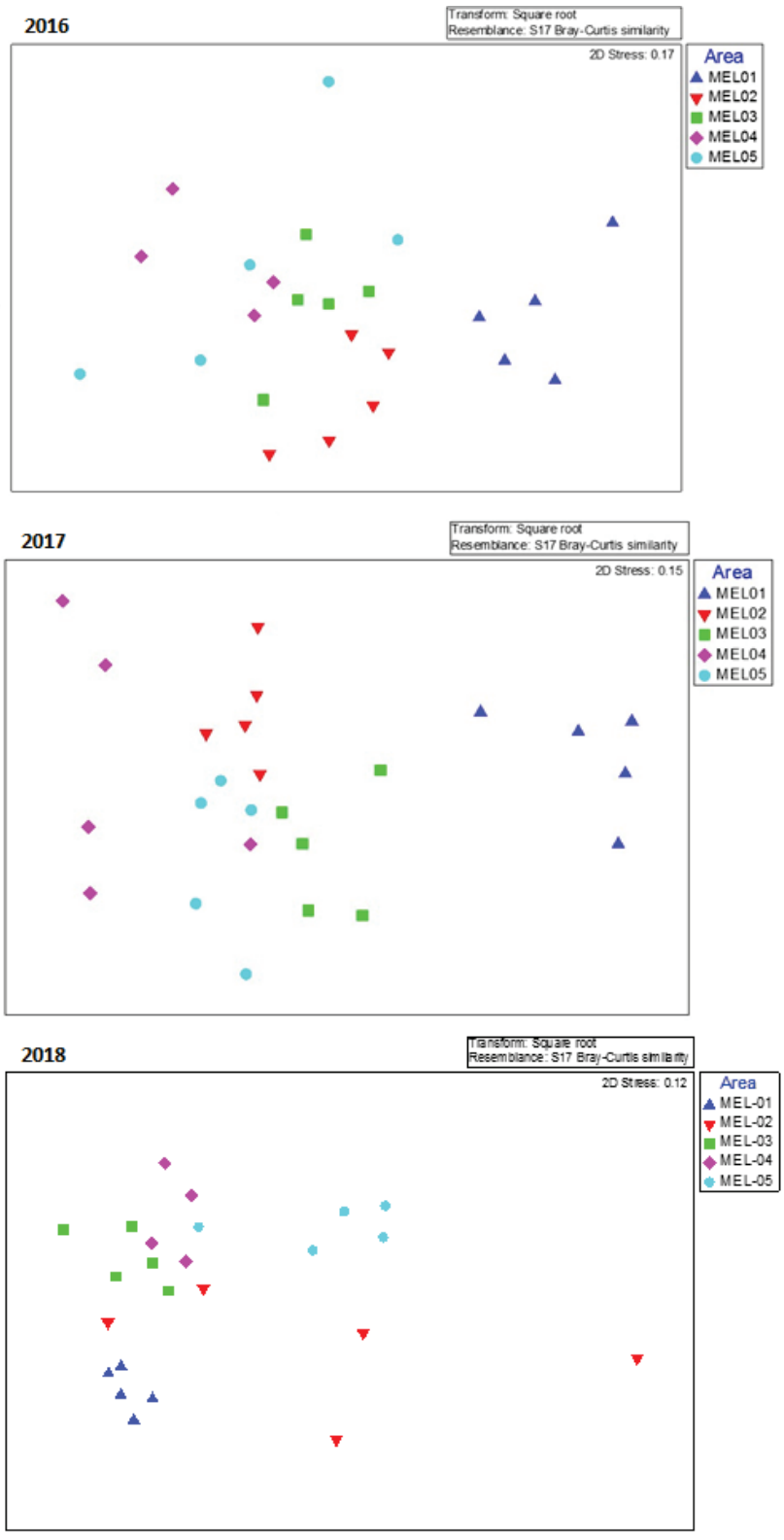
Two nMDS dimensions were derived from the phytoplankton biomass data collected in Meliadine Lake. Phytoplankton biomass in August 2016, 2017 and 2018 were analyzed separately to enable a good fit of the ordination results. The nMDS ordination of the samples by area illustrates the degree of similarity in community composition among stations in each area.

The stress value of the final configuration was 0.17 for August 2016, 0.15 for August 2017, and 0.12 for August 2018, which represent a “fair” fit (<0.2) of the ordination results to the input data in qualitative terms (Clarke 1993). According to the categories provided by Clarke (1993), some interference may be present, which could confound the interpretations made from the plots, so results should be interpreted with caution. One sample from August 2016 (MEL-04-03) was excluded from the analysis due to major differences in phytoplankton community compared to other locations.

The majority of stations in 2016 clustered together by area with more similarities present among the reference areas than among the exposure areas (Figure 11.3-10). Differences in taxonomic composition by biomass were especially apparent between the Near-field area (MEL-01) and all other areas in August 2016. The Mid-field area (MEL-02) more closely resembled the reference areas, and stations clustered relatively close together. Some variability in taxonomic composition was apparent in the reference areas, especially in Reference Area 3 (MEL-05), for which individual stations were not closely related.

In August 2017, most stations were also clustered together by area (Figure 11.3-10). Stations in the Near-field area (MEL-01) were again clustered separately from the Mid-field (MEL-02) and reference areas, indicating taxonomic composition by biomass was different in the Near-field area in 2017. Some variability in community composition was also evident in Reference Area 2 (MEL-04) in August 2017, when the majority of stations did not cluster together with the other reference areas.

In August 2018, generally similar results were observed as in 2016 and 2017, with stations in the Near-field area (MEL-01) clustering closely together despite the change in sampling locations in this area in 2018. In the Mid-field area (MEL-02) in 2018, notably higher variability between stations was observed in 2018 than in previous years, with three Mid-field stations clustering relatively far away from all other stations. The results suggest high variability in community composition in the Mid-field area was present in 2018. The observed differences can be partially explained by changes made to the sampling design in 2018, as two of the Mid-field stations which clustered away from the Near-field and reference stations were the stations which were added in 2018 (MEL-02-06 and MEL-02-08); however, the station clustering farthest from the other locations was MEL-02-02, which was sampled in 2016 and 2017, suggesting that a relatively large amount of natural variability may exist in the Mid-field area. As in previous years, all three reference areas clustered relatively close together in 2018.



Notes: MEL-04-03 in 2016 was excluded from analysis due to major differences in phytoplankton community relative to all other stations.

Figure 11.3-10: Ordination Plot of August Phytoplankton Biomass in Meliadine Lake in 2016 to 2018

11.3.3.8 Comparisons to Normal Ranges

Normal ranges for phytoplankton abundance, biomass, and richness along with concentrations of chlorophyll *a* were calculated using Mid-field area and reference area data collected during the 2015 to 2018 sampling programs. Data collected from Near-field area in all years was excluded from the normal range calculation due to suspected influences on phytoplankton monitoring variables from effluent inputs during these years. A comparison of mean and median values from 2018 was then compared against the normal ranges calculated for each parameter.

Mean and median values for some parameters in 2018 exceeded the upper bounds of the normal ranges (Table 11.3-3). Mean phytoplankton abundance and median phytoplankton biomass and chlorophyll *a* concentration in the Near-field area were higher than their respective normal range upper bounds in 2018. Mean species richness in 2018 fell within the normal range in the Near-field and Mid-field areas and the reference areas. Mean abundance, median biomass and median chlorophyll *a* concentration in the Mid-field area and the reference areas were within the normal range for each parameter.

Table 11.3-3: Normal Ranges for Selected Phytoplankton Parameters in Meliadine Lake, 2018

Parameter	Unit	n	Calculation Method[c]	Normal Range		Mean/Median[a]		
				Lower Bound	Upper Bound	Near-field	Mid-field	Reference Area[b]
Phytoplankton Abundance	cells/L	69	PI(λ)	1,510,476	3,045,764	**3,503,229**	2,101,478	2,479,844
Phytoplankton Biomass	mg/m^3	69	Percentile	161	305	**339**	209	221
Species Richness	No. of taxa	69	PI(λ)	32	43	42	34	34
Chlorophyll *a*	µg/L	139	Percentile	0.52	1.18	**1.94**	0.84	0.60

(a) Lake area means were calculated using the back-transformed mean when the normal range was defined as the prediction interval using Box-Cox transformed data. The median was used when the calculation method was Percentile.

(b) Reference area data were pooled from Reference Areas 1, 2, and 3.

(c) Percentile mean calculated from 30 iterations of Normal Range calculations

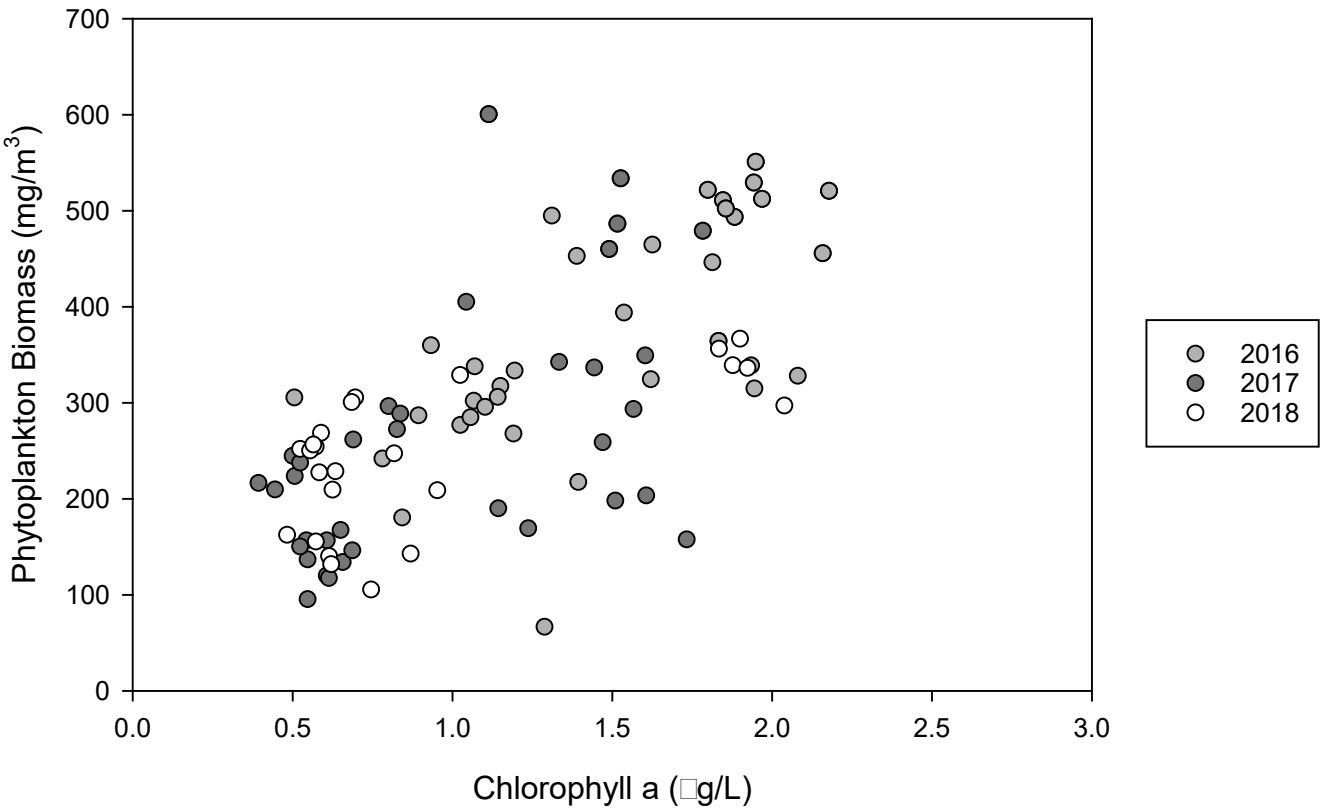
Bolded concentrations exceed the upper bound of the normal range.

Percentile = 2.5th and 97.5th percentiles; PI(λ) = 80% prediction interval on Box-Cox transformed data.

cells/L = cells per litre; mg/m^3 = milligrams per cubic metre; µg/L = micrograms per litre.

11.3.3.9 Relationship Between Phytoplankton Biomass and Chlorophyll a

The correlation between chlorophyll *a* concentration and total phytoplankton biomass calculated from phytoplankton taxonomy samples was examined to evaluate whether chlorophyll *a* can be used as an indicator of phytoplankton biomass. In order to provide the most robust dataset for the analysis with the largest range of potential biomass values, chlorophyll *a* and biomass data from July, August and September in 2016 and July and August in 2017 were included, along with data from August 2018. Data collected in 2015 and September 2017 were excluded from the regression analysis due to reliability concerns (Golder 2018c). Based on data from all years combined, there was a highly significant but weak to moderately strong linear relationship (*P*-value = <0.0001; R^2 = 0.50) between phytoplankton biomass and chlorophyll *a* concentration (Figure 7.3-16). Much of the unexplained variation between the two variables is likely explained by a disproportionate effect by certain phytoplankton groups on the proportion of chlorophyll *a* in phytoplankton wet weight (Kasprzak et al. 2008; Felip and Catalan 2000). For example, dinoflagellates generally have a disproportionately lower amount of chlorophyll *a* for their size when compared with phytoplankton of the groups Chlorophyta and cyanobacteria. Overall, a generally linear trend is apparent, which suggests that chlorophyll *a* is a suitable surrogate for taxonomic estimates of phytoplankton biomass in the future. Additional data points from future monitoring years will help to define the relationship between chlorophyll *a* and phytoplankton biomass in Meliadine Lake.



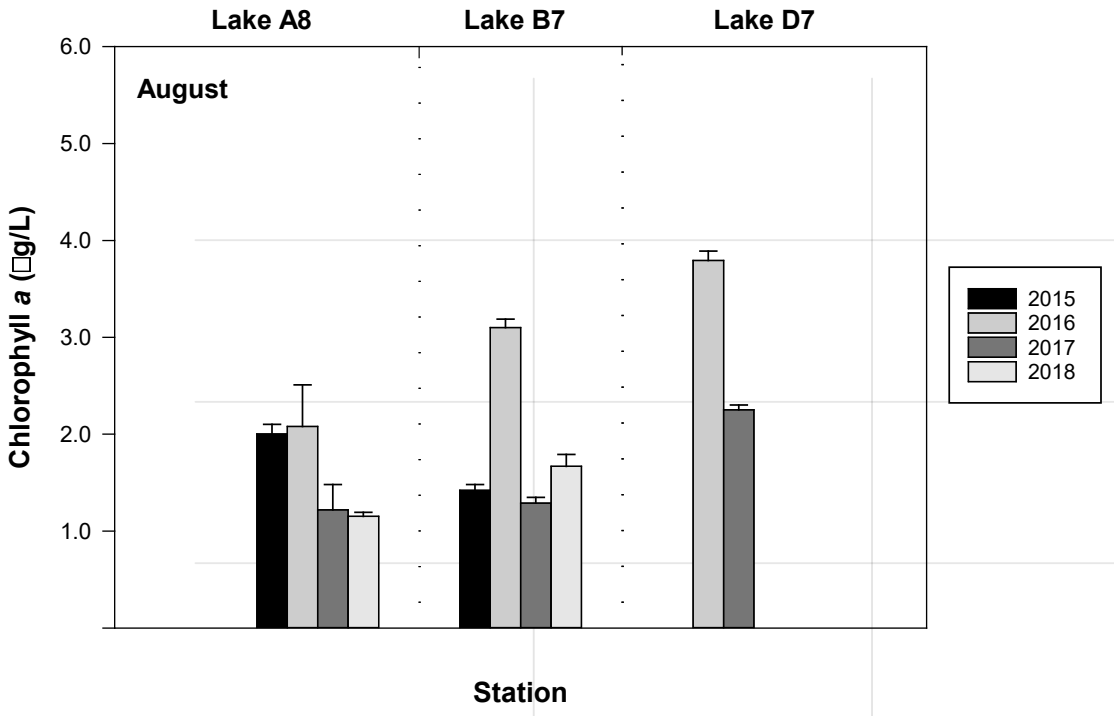
Note: Chlorophyll *a* and biomass data from September 2017 were excluded due to different filters used for field collection.
mg/m^3 = milligrams per cubic metre; µg/L = micrograms per litre.

Figure 11.3-11: Chlorophyll a vs. Phytoplankton Biomass in Meliadine Lake, 2015 to 2018

11.4 Peninsula Lakes

11.4.1 Chlorophyll *a*

Chlorophyll *a* concentrations in the peninsula in lakes A8 and B7 in 2018 were generally similar to concentrations observed in 2017. Overall, chlorophyll *a* concentrations varied by up to two-fold among years and were generally higher in Lake D7 compared to the other two lakes (Figure 11.4-1). Mean chlorophyll *a* concentration in Lake A8 was 1.2 ± 0.04 µg/L in 2018 compared to a mean of 1.2 ± 2.4 µg/L in 2017, 2.1 ± 0.4 µg/L in 2016, and 2.0 ± 0.1 µg/L in 2015. Mean chlorophyll *a* concentration in Lake B7 was 1.7 ± 0.1 µg/L in 2018 compared to a mean of 1.3 ± 0.06 µg/L in 2017, 3.1 ± 0.09 µg/L in 2016, and 1.4 ± 0.06 µg/L in 2015. Samples for chlorophyll *a* analysis were not collected from Lake D7 in 2015 or 2018.



Notes: Mean values are presented for each area. Error bars represent standard error (SE). µg/L = micrograms per litre.

Figure 11.4-1: Mean Chlorophyll *a* Concentrations in the Peninsula Lakes, 2015 to 2018

11.5 Summary

A summary of the key findings from the plankton study is provided below:

- Nutrient concentrations during plankton sampling events in Meliadine Lake were generally low, with variability observed among years and spatial variability observed in TN concentrations in August 2017 and 2018; no clear spatial trend was observed in TP concentration in any year. TN in August 2017 and 2018 was significantly higher in the Near-field area than in the reference areas; however, TP concentrations were not significantly different among areas.
- Chlorophyll *a* exhibited high annual variability and followed a clear spatial trend in 2018 with higher concentrations in the Near-field area than in the Mid-field area and the reference areas. Concentrations of chlorophyll *a* in 2018 were consistent with the highest concentrations observed during the pre-construction phase of the Mine (August 2016).
- Trophic status calculations indicated conditions were oligotrophic in all areas and years. TSI based on chlorophyll *a* concentration was highest in the Near-field area, followed by the Mid-field area, and lowest in the three reference areas.
- Higher phytoplankton abundance and biomass were observed in the Near-field area compared to other areas. Abundance, but not biomass, was higher in the Near-field area in 2018 than in previous years. Spatial trends were consistent with previous years; however, higher variability was observed among years in the reference areas with the inclusion of the 2018 data, which interfered with the evaluation of spatial trends in the phytoplankton community.
- Phytoplankton communities in Meliadine Lake were generally dominated by the Chrysophyceae (golden algae). Limited spatial variability was observed in relative abundance and biomass of major taxonomic groups. However, multivariate analysis indicated differences among areas in community composition at the species level.
- Chlorophyll *a* concentrations had a significant, weak to moderately strong linear relationship with phytoplankton biomass. Given this relationship, the current results suggest chlorophyll *a* is a potentially useful indicator of phytoplankton biomass in Meliadine Lake. The addition of data collected during future studies may help to further refine the relationship.
- Normal ranges were developed for the phytoplankton community using a combination of data obtained in 2015, 2016, 2017 and 2018. Phytoplankton abundance, phytoplankton biomass, and chloroplhyll *a* concentrations in the Near-field area were above the upper bound of the normal range in Meliadine Lake.
- Higher chlorophyll *a* concentration and phytoplankton biomass, and unique phytoplankton community structure (based on multivariate analysis) in the Near-field area indicate potential nutrient enrichment originating from the treated Mine effluent. Biomass and chlorophyll *a* in the Near-field area in 2018 were within the range of results observed during the pre-construction phase of the Mine suggesting that potential nutrient enrichment may have began prior to initiation of the construction phase of the Mine (i.e., from the exploration camp STP discharge).
- Based on the August phytoplankton dataset collected from Meliadine Lake since 2015, late-summer phytoplankton monitoring is considered a useful monitoring tool for Meliadine Lake to detect potential effects resulting from nutrient enrichment.

11.6 Recommendations

The findings of the phytoplankton targeted study suggest that monitoring phytoplankton abundance and biomass as well as chlorophyll *a* could be a useful addition to the AEMP, at least for one additional year in August during operational discharge. This component would assist in assessing nutrient enrichment effects under new discharge conditions (i.e., operational instead of construction). The relationship between phytoplankton biomass and chlorophyll *a* would also be strengthened with another year of monitoring.

11.7 List of Appendices

- Appendix 11A: QA/QC
- Appendix 11B: Depth-Integrated Nutrients and Chlorophyll *a*
- Appendix 11C: Trophic Status
- Appendix 11D: Phytoplankton Community Results

11.8 References

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12.0 OVERALL SUMMARY AND CONCLUSIONS

12.1 EEM

The revised objective of the Cycle 1 EEM study was to assess the effect of the treated mine effluent discharge from MEL-14 on BIC and fish population health in Meliadine Lake. This objective was achieved by evaluating effluent chemistry and toxicity, and by testing if statistical differences in indicators of fish health (e.g., energy storage, energy usage, and survival) and BIC (e.g., density, family-level taxonomic richness, evenness index, and BCI) between exposure and reference areas were present, and greater than CESs. In addition, the manner in which effluent mixes in the receiving environment was studied.

Effluent chemistry met MDMER effluent limits and effluent was not acutely toxic to Rainbow Trout or *Daphnia magna*. Sublethal toxicity was observed on *Lemna minor* growth and *Ceriodaphnia dubia* reproduction, but not on Fathead Minnow survival and growth or *Pseudokirchneriella subcapitata* growth. Further study would be required to extrapolate laboratory results to potential field effects. The results of the effluent plume delineation study indicated that the effluent mixes relatively quickly within the mixing zone, with the maximum effluent concentration observed at 100 m away from the diffuser as less than 2%, and at 250 m as 1%.

Concentrations of several nutrients and metals (i.e., nitrate, nitrate and nitrite, total aluminum, arsenic, lithium, magnesium, and titanium as well as dissolved aluminum, arsenic, cobalt and lithium) in lake water were two times higher in the Near-field area compared to the Reference Area 1. However, concentrations of all water quality parameters with available guidelines were below the CWQG-PAL.

Sediment quality was variable between the exposure and reference areas, which was also observed in 2015 and 2016. Sediments at Near-field area stations were mostly silt-dominated in comparison to sediments sampled at Reference Area 1, which had a higher percentage of sand. Several metals had concentrations that were more than two times higher in the Near-field area than in Reference Area 1. ISQG exceedances for arsenic, cadmium and chromium were identified in both exposure and reference areas. Near-field arsenic concentrations in sediments were also above the PEL, by less than a factor of 2. The arsenic concentration at one reference station was above the PEL, by a factor of 1.4. All other sediment metal concentrations reported in 2018 were below sediment quality guidelines. For metals above sediment quality guidelines in the Near-field area, concentrations in 2018 were lower than those reported under baseline conditions in 2015 and 2016. Higher concentrations of metals and finer sediments in the Near-Field area compared to reference areas was also observed under baseline conditions prior to the Mine effluent discharge; therefore, Near-field area concentrations are considered representative of pre-discharge conditions, and not indicative of a Mine-related effect.

Meliadine Lake benthic invertebrate communities were reflective of typical subarctic communities and were characterized by low densities and low to moderate family level richness. Communities were dominated by the midge family Chironomidae, with fingernail clams (Pisidiidae) subdominant. Snails (Gastropoda) were observed in the Near-field area at higher proportions than in other areas, and amphipods were only present outside of the Near-field area, which likely reflects differences in habitat between the Near-field area and other sampling areas, as a result of taxon-specific habitat preferences. No statistically significant differences in benthic effect and supporting endpoints were detected between Near-field area and Reference Area 1. Total density values were lower in the Near-field area compared to Reference Area 1, but both areas had similar family level richness. Comparisons between the Near-field area and Reference Area 1 showed higher diversity, evenness, and dissimilarity from the reference area median community in the Near-field area. The observed differences in these endpoints likely reflect differences in habitat, particularly differences in sediment composition, that were predent in the sampling areas prior to Mine discharge from MEL-14.

Threespine Stickleback was the only species captured in sufficient abundance from Meliadine Lake to support sample size requirements of the EEM fish population survey. A statistically significant difference between fish captured in the Near-field area and Reference Area 1 was observed for female condition; however, the effect size of 6% was less than the CES of 10%. A similar response was not observed in supporting energy storage endpoints (i.e., relative liver weight and relative egg weight). Statistical analyses were confounded by a lack of a predictive relationship between age and body weight, and Threespine Stickleback being at a variety of reproductive stages at the time of sampling. These factors contributed to low statistical power for some endpoints. Threespine Stickleback were also commonly parasitized by tapeworms, which increased variability in the dataset; however, when infected fish were included in the statistical analysis, increased variability was offset by increased sample sizes resulting in a net increase in statistical power.

In conclusion, there was no evidence of Mine-related effects on the BIC or Threespine Stickleback in the exposure area of Meliadine Lake. Future EEM study designs should continue to consider the influence of habitat variation on benthic invertebrate communities and of high incidence of parasitism on Threespine Stickleback.

12.2 AEMP

12.2.1 Updated Low Action Levels and Response Framework

The AEMP Response Framework links monitoring results to management actions, with the purpose of maintaining the assessment endpoints within acceptable ranges. It is a systematic approach for evaluating AEMP results and responding appropriately, such that potential unexpected effects are identified, and mitigation is undertaken to reduce or reverse them, thereby preventing the occurrence of a significant adverse effect (WLWB 2010). This is accomplished by continually evaluating monitoring data and implementing follow-up actions (e.g., confirmation, further study, mitigation) at pre-defined levels of change in measurement endpoints (i.e., Action Levels).

The low Action Levels are designed to provide an early-warning indication of potential adverse effects to plankton and benthos (i.e., food for fish), fish health, and maintenance of ecological function (including water and sediment quality). They are designed so that changes of sufficient magnitude to trigger a low Action Level are reported, documented, investigated, and ultimately addressed (i.e., mitigation measures or changes to the Mine operation are implemented) before Significance Thresholds would ever be reached. If a low Action Level is reached, then Medium and High Action Levels would be developed to further support adaptive management.

In response to comments made on the 2017 AEMP Annual Report, the Mine committed to updating the low Action Levels for Water Quality in anticipation of comparing the 2018 data to these Action Levels. These updates are described below.

12.2.1.1 Toxicological Impairment – End of Pipe Toxicity

The revised low Action Level for end of pipe toxicity is:

- A persistent sublethal toxic effect is observed on test organisms in end-of-pipe samples.

Persistent is defined as sublethal toxicity observed in the same test organisms in three consecutive end-of-pipe samples. A sublethal toxic effect is defined as an IC25 less than the highest test concentration.

If this low Action Level was reached, then additional investigation may include evaluating the potential extent of sublethal effects in the receiving environment, toxicity identification evaluation and/or toxicity testing at the edge of the mixing zone.

12.2.1.2 Toxicological Impairment – Aquatic Life

Toxicological impairment of aquatic life in the receiving environment will be evaluated using a combination of comparisons of concentrations between the Near-field and reference areas, comparisons to AEMP benchmarks and the normal range, and evaluation of differences temporal trends between reference and exposure areas.

The list of water quality parameters to be assessed for this type of effect is focused on parameters that can affect the suitability of water to support an aquatic ecosystem, namely those parameters that can exert toxicity. These parameters include pH, dissolved oxygen, TSS, TDS (calculated), chloride, fluoride, sulphate, total ammonia, nitrate, nitrite, and metals. A number of parameters were excluded from this list for the following reasons:

- Specific conductivity (field-measured and laboratory-measured) was excluded, because (1) it is not a measure of the concentration of substances in water, and (2) TDS is a more relevant parameter for evaluating effects related to increased dissolved ion concentrations, with extensive toxicological literature to support the assessment.
- Major ions other than those that have water quality guidelines for the protection of aquatic life (i.e., chloride, fluoride, nitrate, nitrite) were excluded, because these parameters are either included in the determination of TDS or are evaluated separately; however, if TDS triggers the low Action Level, then individual ions will be evaluated further.
- Carbonate was excluded because they are not detectable at the pH range encountered in Meliadine Lake.
- Hardness, which is integrated into the calculation of AEMP benchmarks for certain parameters (e.g., copper, lead, nickel), was excluded because it is not a parameter of toxicological concern.
- Total alkalinity and bicarbonate (which is redundant with total alkalinity) were excluded because they are not parameters of toxicological concern
- Nitrate + nitrite were excluded because these ions are evaluated separately as nitrate and nitrite.
- Nutrients that are generally not toxic to aquatic organisms (i.e., phosphorus and some forms of nitrogen) were excluded, but are evaluated under the Nutrient Enrichment hypothesis, with corresponding Action Levels.
- Most dissolved metals were excluded, because water quality guidelines for metals are typically evaluated in terms of the total concentrations, and evaluating total metals is the more conservative approach; dissolved zinc is the exception, because the new CWQG-PAL is for dissolved zinc.
- total cyanide and WAD cyanide, because the biologically important form of cyanide is free cyanide.

The water quality Low Action Level for evaluating toxicological impairment has three conditions:

- concentration in Near-field area is significantly greater compared to the reference areas, and greater than the normal range
- concentration in Near-field area exceeds 75% of the AEMP benchmark
- a divergence of trends in concentration is observed between the Near-field and reference areas

Each condition must be met for the low Action Level to be triggered.

For parameters without an AEMP benchmark, the second criterion is not applicable; for these parameters, the low Action Level trigger is evaluated based on criteria 1 and 3. In the event that a low Action Level trigger is determined for a parameter with no AEMP benchmark, one of the anticipated response actions will be to develop

a benchmark. However, because parameters with no available water quality guidelines or benchmarks are typically not of toxicological concern, a Low Action Level would only be triggered (and an AEMP benchmark developed as a follow-up action) if (1) the Near-field area concentration was greater than five times the analytical detection limit, and (2) the magnitude of difference relative to the reference area was greater than two-fold. Once the benchmark is developed, the low Action Level can be reassessed for these parameters based on all three criteria.

AEMP benchmarks were selected from site-specific surface water quality objectives (SSWQO) developed specifically for the Mine, federal water quality guidelines for the protection of aquatic life (i.e., CWQG-PAL and Federal Environmental Quality Guidelines [FEQG]), and benchmarks developed by other northern mines for tundra lakes (Table 12.2-1).

Table 12.2-1: AEMP Benchmarks for Evaluating the Potential for Toxicological Impairment of Aquatic Life

Parameter	Unit	SSWQO	CWQG-PAL	FEQG	Other Source	Selected AEMP Benchmark	Source
pH	-	-	6.5 - 9.0	-	-	6.5 to 9.0	CWQG-PAL
Dissolved oxygen	mg/L	-	6.5	-	-	6.5	CWQG-PAL
Total dissolved solids	mg/L	-	-	-	500	500	Alaska DEC 2012
Chloride	mg/L	-	120	-	-	120	CWQG-PAL
Sulphate	mg/L	-	-	-	123[(k)]	123[(k)]	BC ENV 2018
Cyanide (free)	mg/L	-	0.005	-	-	0.005	CWQG-PAL
Fluoride	mg/L	2.8	0.12	-	-	2.8	SSWQO
Nitrate	mg-N/L	-	2.93	-	-	2.93	CWQG-PAL
Nitrite	mg-N/L	-	0.06	-	-	0.06	CWQG-PAL
Total ammonia	mg-N/L	-	1.79[(a)]	-	-	1.79[(a)]	CWQG-PAL
Aluminum	µg/L	-	100[(b)]	-	-	100[(b)]	CWQG-PAL
Arsenic	µg/L	25	5	-	-	25	SSWQO
Barium	µg/L	-	-	-	1000	1000	BC ENV 2018
Boron	µg/L	-	1,500	-	-	1,500	CWQG-PAL
Cadmium	µg/L	-	0.04[(c)]	-	-	0.04[(c)]	CWQG-PAL
Chromium	µg/L	-	1.0[(d)]	-	-	1.0	CWQG-PAL
Cobalt	µg/L	-	-	0.78[(e)]	-	0.78[(e)]	FEQG
Copper	µg/L	-	2[(f)]	-	-	2[(f)]	CWQG-PAL
Iron	µg/L	1,060	300	-	-	1,060	SSWQO
Lead	µg/L	-	1[(g)]	-	-	1[(g)]	CWQG-PAL
Mercury	µg/L	-	0.026	-	-	0.026	CWQG-PAL
Molybdenum	µg/L	-	73	-	-	73	CWQG-PAL
Nickel	µg/L	-	25[(h)]	-	-	25[(h)]	CWQG-PAL
Selenium	µg/L	-	1	-	-	1	CWQG-PAL
Silver	µg/L	-	0.25	-	-	0.25	CWQG-PAL

Table 12.2-1: AEMP Benchmarks for Evaluating the Potential for Toxicological Impairment of Aquatic Life

Parameter	Unit	SSWQO	CWQG-PAL	FEQG	Other Source	Selected AEMP Benchmark	Source
Strontium	µg/L	-	-	-	30,000	30,000	Pacholski 2009
Thallium	µg/L	-	0.8	-	-	0.8	CWQG-PAL
Uranium	µg/L	-	15	-	-	15	CWQG-PAL
Vanadium	µg/L	-	-	120(i)	-	120	FEQG
Dissolved zinc	µg/L	-	5.6	-	-	5.6(j)	CWQG-PAL

(a) Total ammonia guideline is pH and temperature dependent. The guideline shown is based on median baseline pH and a water temperature of 11°C (median in 2018 Near-field area). Median/mean Near-field area pH and temperature will be used to derive the AEMP benchmark for Action Level assessment.

(b) Total aluminum guideline is pH dependent. The guideline shown is based on the median baseline pH (7.63). Median/mean Near-field area pH will be used to derive the AEMP benchmark for Action Level assessment.

(c) The cadmium guideline is hardness dependent and can be calculated using the equation: 10^(0.83*(log[hardness])-2.46). Value shown is based on a median baseline hardness (20.7 mg/L as $CaCO_3$). Median/mean Near-field area hardness will be used to derive the AEMP benchmark for Action Level Assessment.

(d) Guideline is for hexavalent chromium.

(e) The cobalt guideline is hardness dependent and can be calculated using the equation: exp{(0.414[ln(hardness)] – 1.887}. This equation is validated within a range of hardness values between 52 and 396 mg/L. The benchmark value shown in the table is based on a hardness of 52 mg/L as $CaCO_3$, because the median baseline hardness is lower than the validated range (i.e., 20.7 mg/L as $CaCO_3$). For Action Level assessment, the median/mean Near-field area hardness will be used to derive the AEMP benchmark. Source: Environment Canada. 2017. Canadian Environmental Protection Act, 1999, Federal Environmental Quality Guidelines, Cobalt. Environment Canada. May 2017.

(f) The copper guideline is hardness dependent; at hardness less than 82 mg/L as $CaCO_3$, the guideline is 2 µg/L. Median/mean Near-field area hardness will be used to derive the AEMP benchmark for Action Level assessment.

(g) The lead guideline is hardness dependent; at hardness less than or equal to 60 mg/L as $CaCO_3$, the guideline is 1 µg/L. Median/mean Near-field area hardness will be used to derive the AEMP benchmark for Action Level assessment.

(h) The nickel guideline is hardness dependent; at hardness less than or equal to 60 mg/L as $CaCO_3$, the guideline is 25 µg/L. Median/mean Near-field area hardness will be used to derive the AEMP benchmark for Action Level assessment.

(i) Source: Environment and Climate Change Canada (ECCC). 2016. Canadian Environmental Protection Act, 1999, Federal Environmental Quality Guidelines, Vanadium. Environment and Climate Change Canada. May 2016.

(j) The zinc guideline is pH, hardness and DOC dependent. The guideline shown is based on the median baseline field pH (7.63) and DOC (2.28 mg/L), and the lowest hardness in the validated range for the guideline (i.e., 23.4 mg/L as $CaCO_3$) because median baseline hardness was lower (i.e., 20.7 mg/L as $CaCO_3$). For Action Level assessment, the median/mean Near-field area hardness, pH, and DOC will be used to derive the AEMP benchmark.

(k) The sulphate guideline is hardness dependent. The guideline shown is based on the lowest hardness in the validated range for the guideline (i.e., 0 to 30 mg/L as $CaCO_3$) to match median baseline hardness in Meliadine Lake (i.e., 20.7 mg/L as $CaCO_3$). Source: BC ENV 2018.

SSWQO = Site-specific Water Quality Objective; CWQG-PAL = Canadian Water Quality Guideline for the Protection of Aquatic Life; FEQG = Federal Environmental Quality Guideline; AEMP = Aquatic Effects Monitoring Program.

12.2.1.3 Toxicological Impairment – Human Consumption

The revised low Action Level for human consumption of water is as follows, based on combination of comparisons of concentrations between the Near-field and reference areas, comparisons to AEMP benchmarks and the normal range, and evaluation of differences temporal trends between reference and exposure areas:

- concentration in Near-field area is significantly greater compared to the reference areas, and greater than the normal range
- concentration in Near-field area exceeds 75% of the AEMP benchmark of the Canadian drinking water quality guideline or aesthetic objective
- a divergence of trends in concentration is observed between the Near-field and reference areas

Each condition must be met for the low Action Level to be triggered. This evaluation is conducted for the parameters listed in Table 12.2-2, which lists available drinking water guidelines and objectives. If this low Action Level is reached, then it is expected that formal human health and/or ecological risk assessments may be needed to evaluate the safety of water for consumption.

Table 12.2-2: Drinking Water Benchmarks for Evaluating the Potential for Impairment of Water Quality for Human Consumption

Parameter[a]	Unit	Drinking Water Objectives and Guidelines[b]		Selected AEMP Benchmark
		Aesthetic Objectives	Water Quality Guidelines	
pH	-	7.0 to 11	-	7.0 to 11
Total dissolved solids	mg/L	500	-	500
Chloride	mg/L	250	-	250
Cyanide (free)	mg/L	-	0.2	0.2
Fluoride	mg/L	-	1.5	1.5
Sodium	mg/L	200	-	200
Sulphate	mg/L	500	-	500
Nitrate	mg-N/L	-	10	10
Nitrite	mg-N/L	-	1	1
Antimony	µg/L	-	6	6
Arsenic	µg/L	-	10	10
Barium	µg/L	-	1000	1000
Boron	µg/L	-	5000	5000
Cadmium	µg/L	-	5	5
Chromium	µg/L	-	50[c]	50
Copper	µg/L	1,000	-	1,000
Iron	µg/L	300	-	300
Lead	µg/L	-	10	10
Manganese	µg/L	50	-	50
Mercury	µg/L	-	1	1
Selenium	µg/L	-	50	50
Uranium	µg/L	-	20	20
Zinc	µg/L	5,000	-	5,000

(a) Water temperature has an aesthetic objective as per Health Canada (2017) but was excluded from this list.
(b) Source = Health Canada (2017) Canadian Drinking Water Quality Guidelines - Summary Table.
(c) Guideline is for hexavalent chromium.

12.2.1.4 Nutrient Enrichment – Water Quality

Nutrient enrichment in the receiving environment will be evaluated using a combination of comparisons of concentrations between the Near-field and reference areas, comparisons to AEMP benchmarks and the normal range, and evaluation of differences temporal trends between reference and exposure areas.

Water quality parameters to be assessed for this component are TP (i.e., the limiting nutrient in Meliadine Lake) and chlorophyll *a* (i.e., a direct indicator of primary productivity used in trophic status assessment).

The revised low Action Level for this component has three conditions:

- concentration in Near-field area is significantly greater compared to the reference areas, and greater than the normal range
- concentration in Near-field area exceeds 75% of the AEMP benchmark
- a divergence of trends in concentration is observed between the Near-field and reference areas

Each condition must be met for the low Action Level to be reached.

The AEMP benchmarks proposed for nutrient enrichment were selected to protect the oligotrophic status of Meliadine Lake and represent the commonly accepted upper limits of the oligotrophic ranges for TP and chlorophyll *a*. For TP, the benchmark is 0.01 mg/L based on CCME (2004) trigger ranges for evaluating trophic status in lakes. For chlorophyll *a*, the benchmark is 4.5 µg/L, based on an evaluation of chlorophyll *a* concentration in relation to trophic status by DDMI (2013), which concluded that based on scientific literature on trophic boundaries for chlorophyll *a*, 4.5 µg/L represents a reasonable and conservative upper boundary for oligotrophic status for northern lakes, although aesthetic qualities are likely to be preserved at chlorophyll *a* concentrations up to 10 µg/L.

12.2.2 Action Level Assessment for the 2018 AEMP Results in Meliadine Lake

This section provides a summary of comparisons of the 2018 AEMP results to Low Action Levels specified above and in Section 8 of the AEMP Design Plan (Golder 2016a). Results of Action Level comparisons are organized in this section according to the two impact hypotheses: toxicological impairment and nutrient enrichment.

12.2.2.1 Toxicological Impairment

The following components of the aquatic environment were evaluated in 2018 to identify toxicological impairment:

- end of pipe toxicity (Section 2.4.2.2)
- water quality in Meliadine Lake (protection of aquatic life and human consumption; Section 6.0)
- benthic invertebrate community (Section 9.0)

Based on the 2018 AEMP results, Low Action Levels for toxicological impairment were not triggered for any components. Additional discussion of each component is provided below.

End of Pipe Toxicity

Persistent sublethal toxicity was not observed in the same test organisms in three consecutive end-of-pipe samples.

Water Quality in Meliadine Lake

The three Low Action Level criteria were not met for toxicologically relevant parameters. Therefore, the Low Action Level for toxicological impairment was not triggered.

All median and mean concentrations in the Near-field area of toxicologically relevant parameters with AEMP Benchmarks were less than 75% of AEMP benchmarks. Therefore, the second condition of the low Action Level was not met for parameters with available benchmarks.

Concentrations of two parameters with no aquatic life benchmarks (total lithium and manganese) in the Near-field area were significantly greater than in the reference areas, and greater than the normal range in 2018. The Near-field area concentration of lithium (1.5 µg/L) was less than five times the analytical DL (0.5 µg/L), which is within the range of analytical uncertainty. Therefore lithium was not considered further in the Action Level assessment. Total manganese concentration in the Near-field area (6 µg/L) was greater than five times the DL (0.05 µg/L) and the magnitude of difference relative to the reference area for manganese was slightly greater than two-fold (Near-field area: 6 µg/L; pooled reference areas: 2.7 µg/L). Because of the small difference between the Near-field and reference area concentrations, and the uncertainty of whether it represents a current effect of the Mine discharge or a persisting effect from the pre-construction period (see below), it is recommended that observed difference for this parameter in 2018 be confirmed during the 2019 AEMP before consideration in the Action Level Assessment.

The Mine has only been discharging for one year, and therefore a temporal trend due to mine effluent discharge cannot be determined. As demonstrated in Appendix 6B, specific conductivity and concentrations of several major ions have been increasing the Near-field area since 2015 (i.e., beginning prior to Mine discharge). The increasing ion concentrations may be related to the input of greywater and treated sewage to Meliadine Lake west of the Near-field area from 2007 to 2017 (see Section 2.6). Because of the monotonic increase observed in the Near-field area since 2015, data post-2015 were not included in the Normal Range calculations, and therefore, it is expected the Near-field area concentrations would be higher than Normal Range for these parameters. With the diversion of STP discharge to CP1, and subsequent treatment in the EWTP prior to discharge through the CP1 diffuser, it is anticipated that, if treated sewage was the source of the increased ions in the Near-field area, then the major ions concentrations will either stabilize or decline in future years. The 2019 AEMP will investigate this possibility.

Finally, as stated above, there is only one year of Mine discharge from CP1 diffuser to the Near-field area, so divergence of trends compared to the reference areas cannot be assessed. As stated in Appendix 6B, the increase in specific conductivity and major ion concentrations in the Near-field and possibly Mid-field area over the past three years has not been observed in the reference areas. Future AEMPs will evaluate whether Near-field area concentrations continue to increase relative to reference areas.

Benthic Invertebrate Community

As indicated in Section 9.6, the Low Action Level for toxicological impairment was not triggered by the 2018 AEMP benthic invertebrate results.

No decreases were observed in 2018 beyond the normal range in the Near-field area in density, richness or densities of dominant taxa. Some divergence of trends in density, richness and dominant taxa were observed compared to the reference area; however, differences in trends observed between the Near-field area and reference areas more likely reflect differences in habitat variation (primarily particle size) as discussed further in Section 9.4.3. That is, these differences among sampling areas were likely due to pre-discharge differences in sediment composition (i.e., not Mine-related) that are accounted for by the normal ranges developed for the AEMP.

12.2.2.2 Nutrient Enrichment

The following components of the aquatic environment were evaluated in 2018 to identify nutrient enrichment:

- water quality in Meliadine Lake (nutrients from Section 6.0 and chlorophyll *a* from Section 11.0)
- benthic invertebrate community (Section 9.0)

Based on the 2018 AEMP results, Low Action Levels for nutrient enrichment were not triggered for any components. Additional discussion of each component is provided below.

Water Quality in Meliadine Lake

The three Low Action Level criteria were not met for TP and chlorophyll *a*. Therefore, the Low Action Level for nutrient enrichment was not triggered.

Median chlorophyll *a* concentration in the Near-field area was higher than the normal range and significantly higher compared to the reference areas. Median TP concentration in the Near-field area was within the normal range and significantly higher only compared to the Reference Area 2. There is evidence of a gradient in primary productivity in Meliadine Lake, with the highest chlorophyll *a* level in the Near-field area. In addition, TSI based on chlorophyll *a* concentration was highest in the Near-field area, followed by the Mid-field area, and lowest in the three reference areas. The pattern in chlorophyll *a* concentrations among sampling areas in 2018 was similar to that observed in previous years.

Mean TP (based on depth-integrated samples) and chlorophyll *a* concentrations were 0.0049 mg/L and 1.91 µg/L in the Near-field area, respectively. These mean values are below the Action Level criterion of 75% of the applicable benchmark values (i.e., TP: 0.0075 mg/L; chlorophyll *a*: 3.38 µg/L).

Phytoplankton biomass and chlorophyll *a* in the Near-field area in 2018 were within the range of results observed in previous years, suggesting that potential nutrient enrichment may have began prior to initiation of Mine construction (i.e., from the exploration camp STP discharge). As stated above, it is anticipated that if treated sewage from the exploration camp was the source of nutrients to the Near-field area, then the diversion of STP discharge to CP1 and subsequent treatment in the EWTP prior to discharge through the CP1 diffuser may either stabilize or decline nutrient concentrations and effects on phytoplankton biomass and chlorophyll *a* in future years. In addition, the Mine has only been discharging for one year, and therefore a temporal trend due to Mine effluent discharge cannot be determined. Future AEMPs will evaluate whether Near-field area nutrient and chlorophyll *a* concentrations continue to increase relative to reference areas.

Benthic Invertebrate Community

As indicated in Section 9.6, the Low Action Level for nutrient enrichment was not triggered by the 2018 AEMP benthic invertebrate results.

No increases were observed in 2018 beyond the normal range in the Near-field area in density, richness or densities of dominant taxa. Some divergence of trends in density, richness and dominant taxa were observed compared to the reference area; however, differences in trends observed between the Near-field area and Reference areas may be influenced by differences in habitat variation (primarily particle size) as discussed further in Section 9.4.3. That is, these results among sampling areas were likely due to pre-discharge differences in sediment composition (i.e., not Mine-related) that are accounted for by the normal ranges developed for the AEMP.

12.2.3 Integrated Summary

Volume 7 of the FEIS for the Meliadine Gold Project (Mine) predicted inputs of nutrients, metals, and major ions to Meliadine and Peninsula Lakes. It was predicted that these inputs would result in minor changes to water and sediment quality in Meliadine Lake, and that any corresponding effects on fish and fish habitat would be negligible (Agnico Eagle 2014). The component sections of the annual AEMP report are designed to characterize changes in measures related to contaminant and nutrient input, and related responses in phytoplankton, benthos, and fish. The purpose of the integrated summary is to synthesize the results for each component to evaluate the overall direction of change to the aquatic ecosystem. The objective of the synthesis is to:

- integrate AEMP findings from all components
- determine the strength of support for each impact hypothesis and effects on the ecosystem
- support decision making for management responses

The integrated summary is part of the overall objective of the AEMP to assess potential mine-related effects on the aquatic ecosystem and to meet regulatory requirements outlined in the Type A Water License (2AM-MEL1631) and MDMER, while also meeting commitments made during the environmental permitting process. The specific objectives of the AEMP are to:

- determine the short- and long-term effects of the Project on the aquatic receiving environment
- evaluate the accuracy of predictions made in the FEIS, including the final significance statements regarding impact to the aquatic ecosystem
- assess the efficacy of planned mitigation incorporated into the Project design
- collect data required to identify the need for potential additional mitigation of Project effects within a management response framework

The 2018 AEMP program consisted of water quality, sediment quality, benthic invertebrate community, and a phytoplankton targeted study in Meliadine Lake, and water quality monitoring in selected peninsula lakes. The 2018 fish health survey was implemented to meet EEM sampling requirements and was not intended to meet the specific requirements of the Mine's AEMP fish health component (Section 10.1). However, the 2018 fish health results are discussed as part of this integrated summary to evaluate potential mine-related effects on biological components, with the understanding that the 2018 fish program was not designed to answer the key questions from the AEMP. The next AEMP fish health and fish tissue chemistry program is scheduled for 2021.

The results of the 2018 AEMP in Meliadine Lake and the Peninsula Lakes (water quality and phytoplankton only) were evaluated in the context of the key questions proposed for each core component in the AEMP Design Plan (Golder 2016a). The key questions and a summary of the results for each component are presented in Table 12.2-3 and discussed below. The results of the effluent chemistry and toxicity testing program are also discussed in the context of the results of the AEMP components, where relevant.

Peninsula Lake Summary and Conclusions

Changes in some water quality parameters over time were observed in Lakes A8, B7, and D7. However, all parameter concentrations were less than their respective water quality guidelines, were within normal ranges, and aligned with FEIS predictions. The water quality dataset for peninsula lakes for the pre-construction and construction phase was limited, and potential factors accounting for temporal trends were not identified in

this report. A phytoplankton targeted study was also conducted in Peninsula Lakes in 2018 with collection of chlorophyll *a* data. No findings of significance were identified as part of the 2018 phytoplankton study of the Peninsula Lakes.

Meliadine Lake Summary

Potential mine-related changes in water quality in Meliadine Lake were observed in the Near-field area in 2018 for specific conductivity, TDS, hardness, several major ions, and a number of total metals; concentrations exceeded the upper bound of their respective normal range and increased in the Near-field and relative to reference areas over time. Water Licence exceedances in the effluent were observed for TDS and total aluminum. However, the exceedance of total aluminum WL limit occurred only in one sample, with other effluent samples noticeably lower in concentration, suggesting that the measured value may be anomalous. In addition, although total aluminum concentrations were higher in the Near-field area, there was no indication of declining concentrations with distance from the diffuser. Concentrations of a few metals in bottom sediments exceeded the upper bound of their respective normal range, but exceedances were marginal and sediment metal concentrations in the Near-field area did not increase relative to the reference areas over time. Concentrations of sediment quality parameters were less than their respective guidelines, with the exception of sediment arsenic, copper, and chromium. However, arsenic, copper, and chromium concentrations in Near-field sediments were within the upper bound of their respective normal ranges. Overall, water and sediment quality in 2018 was generally consistent with FEIS predictions.

The 2018 AEMP results indicated that the benthic community was not measurably affected by potential Mine-related changes in water or sediment quality in Meliadine Lake. Lower density and BCI values were observed in the Near-field area (relative to pooled reference areas), but values were within the normal range. Therefore, differences among these areas may be attributed to pre-discharge differences in sediment composition and natural spatial variation. Effects on fish health were not observed in 2018. There was a statistically significant difference female condition in the Near-field area relative to Reference Area 1. However, the magnitude of difference on female condition did not exceed the 10% critical effect size and a similar difference was not observed in supporting energy storage endpoints. The comprehensive AEMP fish health program was not conducted in 2018 and so an evaluation of fish tissue was not conducted.

Low Action Levels for toxicological impairment or nutrient enrichment were not triggered by the 2018 AEMP results.

Meliadine Lake Conclusions

The results of the water quality monitoring program suggest a Mine-related effect on water quality in the Near-field and Mid-field areas. Baseline (pre-2015) and pre-construction and construction phase (2015 to 2017) water quality data were evaluated as part of the normal range screening (Appendix 6B). The assessment indicated a change in major ion concentrations in the Near-field area, and a potential change in the Mid-field area in the 2015 to 2017 data, relative to pre-2015 data collected periodically between 1995 and 2013 in Meliadine Lake.
This evaluation, in combination with the qualitative temporal analysis conducted as part of the 2018 AEMP water quality program (Section 6.4.5), suggest a potential pre-construction effect on water quality, as well as a potential effect on water quality for selected parameters during treated mine effluent discharge in 2018. However, the changes in water quality in Meliadine Lake were within the conditions predicted by FEIS. Mine-related effects on sediment quality were not observed in 2018.

Observed changes in key water quality parameters in 2018 did not translate into effects in the biological components in 2018, with respect to major ions and total metals. However, the nutrient enrichment effect observed in prior AEMP monitoring years continued to be observed in some biological components in 2018. A phytoplankton targeted study was conducted as part of the 2018 AEMP monitoring program; this program is not a formal component under the AEMP Design Plan (Golder 2016a). Higher chlorophyll *a* concentrations and phytoplankton biomass, and unique phytoplankton community structure were observed in the Near-field area (relative to Mid-field and reference areas), indicating potential nutrient enrichment originating from the exploration camp STP discharge. Chlorophyll *a* and phytoplankton biomass were within the ranges observed during the pre-construction phase of the Mine, suggesting that nutrient enrichment may have begun prior to the discharge of treated mine effluent from MEL-14.

Mine-related effects on the benthic invertebrate community were not observed in 2018. However in 2016, mean density fell outside of the upper bound of the normal range in the Near-field area, potentially due to the influence of exploration camp STP discharge. Total phosphorus loadings approximately doubled in treated sewage effluent in 2016 (corresponding to an increase in Mine population), and held steady in 2017, prior to declining in 2018 (Section 2.6.2). TP loadings did not correspond to observed spatial or temporal TP water quality trends in the Near-field area but median TP concentrations were slightly elevated in 2016 and 2017, relative to 2015 and 2018. A statistically significant difference in female condition factor was observed during the fish health program, which also aligns with potential nutrient enrichment in the Near-field area, however, the magnitude of the difference was within the CES.

Overall, nutrient enrichment in Meliadine Lake may have begun in 2016 with expansion of the Mine population and increased STP nutrient loading into the lake. Effects observed in phytoplankton, benthos and fish biological components are consistent with mild nutrient enrichment. Although effects in benthos were not observed in 2018, effects on phytoplankton were evident in the Near-field area despite a reduction in sewage TP loadings; TP loadings in 2018 were lower relative to 2016/2017 loadings and relative to baseline (i.e., 2013 and 2015). Additionally in 2018, a stimulatory effect on freshwater algae growth (*Pseudokirchneriella subcapitata*) was observed during sublethal toxicity testing with effluent; this further supports the potential for nutrient enrichment in Meliadine Lake as a result of Mine effluent discharge. Lastly, increased major ion and some total metal concentrations in lake water in the Near-field area were observed, and are indicative of a Mine-related effect.

Similar to nutrient enrichment, major ion concentrations and increases in selected total metal concentrations were observed in the Near-field area during pre-construction and continued to increase during the construction phase. It is likely that the exploration camp STP discharge contributed to increases in these parameters. However, concentrations are within the range of FEIS predictions and have not translated into increased concentrations in the sediment, or effects on biological components. Future AEMP monitoring programs will continue to monitor for spatial and temporal trends.

Table 12.2-3: A Summary of the 2018 AEMP Results by Component in the Context of the Key Questions

Component	Key Question	Summary
Peninsula Lakes		
Water Quality	Are concentrations of key parameters in peninsula lakes consistent with FEIS predictions and less than AEMP benchmarks?	• Concentrations of key parameters were below AEMP benchmarks • Water quality in Peninsula Lakes was outside the normal range for selected total metals • Water quality in the Peninsula Lakes was generally consistent with FEIS predictions
	Are concentrations in peninsula lakes increasing over time relative to baseline or reference conditions?	• Increasing concentrations over time for selected parameters were identified in Lakes A8, B7, and D7
Meliadine Lake		
Water Quality	Are concentrations of key parameters in effluent less than Water Licence Limits?	• Key parameter concentrations were below Water Licence Limits, except for total dissolved solids (one sample) and total aluminum (one sample) • Effluent was not acutely toxic to Rainbow Trout
	Are concentrations of key parameters in Meliadine Lake consistent with FEIS predictions and less than AEMP Action Levels?	• Water quality in the Near-field area was generally consistent with FEIS predictions • Concentrations of key parameters in the Near-field area did not trigger the Low Action Level
	Are concentrations in the exposure area increasing over time relative to the reference areas?	• Increasing concentrations over time in the Near-field area in 2018 and relative to temporal variation in reference areas were identified for specific conductivity, hardness, TDS, major ions, organics, and selected total metals. • Observed changes suggest a potential mine-related effect on water quality in the Near-field and Mid-field areas but conditions are within the range predicted by FEIS.
Sediment Quality	Are concentrations of sediment quality parameters in Meliadine Lake greater than benchmarks?	• Concentrations of arsenic, copper, and chromium exceeded Interim Sediment Quality Guidelines • Normal range exceedances occurred in the Near-field area for aluminum, beryllium, cadmium, nickel, silver, thallium, and zinc, and in the Mid-field area for copper.
	Are concentrations in the exposure area increasing over time relative to the reference areas?	• Increasing concentrations over time in the Near-field area in 2018 were identified for select metals but these metals either did not or only slightly exceeded their normal ranges.
Benthic Invertebrate Community	Is the benthic invertebrate community affected by potential Mine-related changes in water and sediment quality in Meliadine Lake?	• Benthic invertebrate communities in the Near-field area had significantly lower density and BCI values (relative to Reference area 3 median) compared to pooled reference areas. However, all mean 2018 AEMP variables for both exposure and reference areas sampled in Meliadine Lake were within their respective normal ranges in the Near-field area • Mine-related effects on the benthic invertebrate community were not observed in 2018

Table 12.2-3: A Summary of the 2018 AEMP Results by Component in the Context of the Key Questions

Component	Key Question	Summary
Fish Health	Is fish health affected by changes in water and sediment quality in Meliadine Lake?[(a)]	• An effect was observed in female condition, which was 6% greater in the Near-field area than Reference area 1. The magnitude of effect was below the 10% critical effect size, and a similar difference was not observed in supporting energy storage endpoints
Fish Tissue Chemistry	Are tissue metal concentrations in fish from Meliadine Lake increasing due to mining activities?	Not assessed as part of the 2018 AEMP and not required under the 2018 EEM program.
	Are tissue metal concentrations in fish from Meliadine Lake increasing relative to reference areas or baseline?	

(a) Fish health was not included as a component of the 2018 AEMP program but is included in the integrated summary to evaluate potential mine-related effects on the biological components.

AEMP = Aquatic Effects Monitoring Program; EEM = Environmental Effects Monitoring; BCI = Bray-Curtis Index; TDS = total dissolved solids; FEIS = Final Environmental Impact Statement.

12.3 Future Monitoring Timelines

12.3.1 EEM

The Cycle 2 EEM Interpretative Report is required to be submitted to the Minister of Environment no later than 36 months after the day on which the previous interpretative report was required to be submitted. As the previous interpretative report was due on June 21, 2019, the next interpretative report is due on or before June 21, 2022. The timelines for the next EEM cycle are provided in Table 12.3-1.

Table 12.3-1: Timelines for the Cycle 2 EEM Study

Item	Timeline Description	Tentative Execution/ Submission Date
Cycle 2 EEM Study Design	At least six months prior to the biological monitoring field program	February 2021
Field Program	At least six months after submission of Study Design	August 2021
Cycle 2 EEM Interpretative Report	Not later than 36 months after the day on which the previous interpretative report was required to be submitted	June 21, 2022

12.3.2 AEMP

The AEMP is an annual program required by the Water Licence, and therefore, the AEMP will be conducted in 2019. As per the AEMP Design Plan, the water quality components in Meliadine Lake and the Peninsula Lakes are conducted annually. Water quality sampling will be conducted in the Near-field and Mid-field areas once in the under-ice season and monthly in the open-water season during mine effluent discharge; monthly in the open-water season in Reference Area 1 during mine effluent discharge; and once in Reference Areas 2 and 3 in the open-water season. Biological monitoring studies of BIC (with supporting sediment quality), fish health, and fish tissue chemistry will be conducted concurrently with the next EEM cycle, which is planned for August 2021.

12.4 References

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13.0 CLOSURE

The reader is referred to the Study Limitations section, which precedes the text and forms an integral part of this report.

GLOSSARY

Term	Definition
Abundance	The number or quantity of cells or organisms in a particular area or volume of sample.
Alkalinity	A measure of the acid-neutralizing capacity carbonates, bicarbonates and hydroxides present in water. Alkalinity is typically reported in units of mg/L calcium carbonate ($CaCO_3$).
Aquatic Effects Monitoring Program	A monitoring program designed to evaluate the effect of mining activities and mitigation on the aquatic environment.
Benthic Invertebrates	Aquatic animals without backbones (e.g., insects, worms, snails, clams, crustaceans) that live on/in the bottom substrate of a waterbody.
Biomass	The mass of all the cells or organisms in a particular area or volume of sample.
Bray-Curtis index	An index used to summarize the overall difference in community structure between reference and exposure areas.
Canadian Water Quality Guidelines for the Protection of Aquatic Life	Guidelines established by the Canadian Council of Ministers of the Environment to protect aquatic life (i.e., fish, aquatic plants, and benthic invertebrates) in Canadian surface waters.
Chlorophyll *a*	A photosynthetic pigment found in plants, responsible for the conversion of inorganic carbon and water into organic carbon. The concentration of chlorophyll *a* is often used as an indicator of algal biomass.
Community	The groups of organisms living together in the same area, usually interacting or depending on each other for existence.
Community composition	The species present and their relative proportions in an assemblage of organisms.
Condition	A measure of the energetic status of fish.
Dominance	The predominance of one or more species in a community.
Drinking Water Quality Guidelines	Health Canada guidelines used to evaluate the suitability of water for human consumption.
Effluent	The out-flow water or wastewater from a water processing system or device, or the final water which is discharged from a treatment plant. For purposes of this document, effluent is the water that is discharged from the water treatment plant to Meliadine Lake.
Ekman grab	A sampling device used to collect a discrete sample of bottom sediment.
Environmental effects monitoring	A science-based performance measurement tool used to evaluate the adequacy of effluent regulation in protecting fish, fish habitats and the usability of fisheries resources
Euphotic zone	The extent of the water column that is exposed to sufficient sunlight for photosynthesis to occur (typically to a depth in the water column where 1% of the irradiance is measured, or two times the Secchi depth).
Exposure area	An area that receives direct discharge from mining activities.
Fecundity	The number of eggs ripening between current and next spawing period in a female (Bagenal and Tesch, 1978).
Homogeneity of variance	Statistical term for the assumption that the variance within each of the groupings/populations is equal.
Inhibition concentration at 25%	The concentration that results in a 25% reduction of a non-lethal endpoint, such as reproduction or growth, in a given time period.
in situ	Refers to measurements or data recorded in the field, at the sampling site.
Interim Sediment Quality Guidelines	In reference to the Canadian sediment quality guidelines (CCME 2001), the concentration above which adverse effects may occur, and below which they are not expected to occur.

Term	Definition
Kemmerer	A plastic or Teflon water sampling device that is opened, lowered into the water to the desired sample collection depth; a weighted messenger device is used to close the Kemmerer and sample water from the desired depth.
Mean	Arithmetic average value.
Metalloid	A class of chemical elements intermediate in properties between metals and non-metals; e.g., arsenic and boron.
Median lethal concentration	The concentration that results in death of 50% of the test population
Metals	A class of chemical elements that are good conductors of electricity and heat and have the capacity to form positive ions in solution; e.g., aluminum, copper, iron, and zinc.
Normal Range	An estimate of natural variability.
Nutrients	Substances (elements or compounds) such as nitrogen or phosphorus, which are necessary for the growth and development of plants and animals.
Nutrient Enrichment	The type of effect resulting from an increase in the nutrients to an ecosystem, which may impact primary productivity.
Oligotrophic	Trophic state classification for lakes characterized by low concentration of nutrients and low organic productivity. OligotrophicTrophic state classification for lakes characterized by low concentration of nutrients and low organic productivity.
Otolith	A calcified structure that can be used to estimate fish age.
P–value	Statistical value used to determine the significance of a relationship or difference, e.g., $P < 0.1$.
Parameter	A particular physical, chemical, or biological property that is being measured.
pH	The negative logarithm of the concentration of the hydronium ion (H^+). The pH is a measure of the acidity or alkalinity of an aqueous solution, expressed on a scale from 0 to 14, where 7 is neutral, values below 7 are acidic, and values over 7 are alkaline.
Phytoplankton	Small, free-floating algae that are suspended in the water column.
Probable Effects Level (PEL)	Canadian sediment quality guideline for the protection of freshwater quality life (CCME 2001), representing the concentration above which adverse effects may but will not always occur.
R^2	A coefficient of determination, a statistical measure of how well a regression line approximates the real data points.
Reference area	An area that is reasonably similar in terms of monitored components and features to the exposure area, though not necessarily identical, but has no potential to be affected by the mine.
Richness	The number of different taxonomic groups present in a given area or sample volume.
Secchi Depth	A parameter used to determine the clarity of surface waters. The measurement is made with a Secchi disk, a black and white disk that is lowered into the water and the depth is recorded at which it is no longer visible. Higher Secchi depth readings indicate clearer water that allows sunlight to penetrate to a greater depth. Lower readings indicate turbid water that can reduce the penetration of sunlight. Limited light penetration can be a factor in diminished aquatic plant growth beneath the surface, thus reducing the biological re-aeration at greater depths.
Sediment	Solid material that is transported by, suspended in, or deposited from water. It originates mostly from disintegrated rocks; it also includes chemical and biochemical precipitates and decomposed organic material.
Standard deviation (SD)	A measure of the variability or spread of the measurements about the mean. It is calculated as the positive square root of the variance.
Simpson's Diversity Index	A measure of the number of taxonomic groups or species present within an area of habitat or in a sample, as well as the abundance of each of those groups. Index values range from 0 to 1; the greater the diversity, the greater the index value.

Term	Definition
Standard error (SE)	The standard deviation (positive square-root of the variation) of the errors associated with a series of measurements.
Simpson's Evenness Index	A measure of how evenly the total invertebrate density is distributed among the taxa in an area or sample. Index values range from 0 to 1; higher numbers indicate a greater equality among all taxa present in a sample and low values represent low evenness (i.e., a high degree of dominance by one or a few organisms).
Specific conductivity	A temperature-corrected measure of a water sample's ability to conduct electricity; measurements are corrected to 25°C. Waters with higher concentrations of dissolved ions conduct electricity more efficiently than waters with low ionic concentrations.
Taxa	A group of organisms of any taxonomic rank (e.g., family, genus, species).
Total dissolved solids	Organic and inorganic substances that are dissolved in water and will pass through a 0.45 micrometre filter.
Total Kjeldahl nitrogen	A measure of ammonia and organic nitrogen. It is used as an indicator of biologically available nitrogen.
Total suspended solids	A measurement of the concentration of particulate matter found in water.
Transformation	The process of converting data through replacement of a variable by a function of that variable.
Variable	A characteristic, number or quantity whose associated value may change or be studied.
Water Column	The water in any waterbody from the surface down to the substrate.
Young-of-the-year	Young fish produced in the current reproductive year.
Zooplankton	Small, sometimes microscopic animals that live suspended in the water column.



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APPENDIX 2A

Daily Discharge Volume from MEL-14 into Meliadine Lake, 2018

Table 1: Daily Discharge Volume from MEL-14 into Meliadine Lake, 2018

Date	Total Daily Volume (m^3)	Total Monthly Volume (m^3)
21-Jun-18	8,000	134,272
22-Jun-18	13,333	
23-Jun-18	12,167	
24-Jun-18	14,420	
25-Jun-18	13,480	
26-Jun-18	15,091	
27-Jun-18	14,366	
28-Jun-18	15,635	
29-Jun-18	12,669	
30-Jun-18	15,111	
Jul-18	not available[(a)]	352,551
01-Aug-18	15,662	153,066
02-Aug-18	14,990	
03-Aug-18	12,910	
04-Aug-18	15,043	
05-Aug-18	14,846	
06-Aug-18	12,876	
07-Aug-18	8,162	
08-Aug-18	0	
09-Aug-18	993	
10-Aug-18	4,270	
11-Aug-18	4,603	
12-Aug-18	2,641	
13-Aug-18	4,302	
14-Aug-18	2,514	
15-Aug-18	2,976	
16-Aug-18	825	
17-Aug-18	7,206	
18-Aug-18	7,070	
19-Aug-18	3,634	
20-Aug-18	6,842	
21-Aug-18	4,007	
22-Aug-18	3,583	
23-Aug-18	1,852	
24-Aug-18	580	
25-Aug-18	439	
26-Aug-18	103	
27-Aug-18	0	
28-Aug-18	0[(b)]	
29-Aug-18	0	
30-Aug-18	0	
31-Aug-18	137	
01-Sep-18	440	2,632
02-Sep-18	1,660	
03-Sep-18	532	
04-Sep-18	0	
05-Sep-18	0	
	Total Annual Volume	**642,521**

Notes:

a) Due to a malfunctioning flowmeter, accurate daily discharge volumes are not available for July.

b) Reverse osmosis system inoperative for approximately 14 hours.

APPENDIX 2B

Effluent Quality Data for MEL-14, 2018

Table 1: Effluent Quality Data for MEL-14, 2018

Parameter	Unit	MDMER	WL	Sampling Date (dd-mm-yyyy)										Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limit	
				01-07-2018	10-07-2018	15-07-2018	23-07-2018	29-07-2018	05-08-2018	13-08-2018	19-08-2018	26-08-2018	03-09-2018								MDMER	WL
Field Measured																						
pH	-	-	6.0 - 9.5	7.4	7.9	-	7.2	8.1	7.8	7.2	7.8	7.5	7.0	7.5	7.5	7.0	8.1	0.35	0	10	-	-
Specific conductivity	µS/cm	-	-	1,510	1,489	1,654	1,605	1,420	1,734	1,925	2,210	1,527	1,998	1,646	1,702	1,420	2,210	246	0	11	-	-
Temperature	°C	-	-	10	14	19	18	15	12	9.2	8.8	14	10	12	12	4.8	19	4.2	0	11	-	-
Conventional Parameters																						
pH	-	-	-	7.1	7.5	7.3	7.3	7.0	7.3	7.4	7.2	6.8	7.1	7.3	7.2	6.8	7.6	0.23	0	11	-	-
Specific conductivity	µS/cm	-	-	1,600	1,700	1,700	1,800	1,900	1,900	2,100	2,300	1,500	2,400	1,800	1,855	1,500	2,400	305	0	11	-	-
Hardness, as $CaCO_3$	mg/L	-	-	398	416	419	462	470	504	478	565	59	510	462	423	59	565	133	0	11	-	-
Total alkalinity, as $CaCO_3$	mg/L	-	-	34	47	42	39	27	32	33	37	<0.1	15	34	32	<0.1	51	14	1	11	-	-
Total dissolved solids	mg/L	-	1,400	930	1,030	1,020	1,070	1,180	1,144	1,260	**1,430**[(W)]	870	1,360	1,144	1,136	870	**1,430**[(W)]	173	0	11	-	9.0
Total suspended solids	mg/L	30	30	10	5.0	9.0	21	8.0	8.0	10	11	<1.0	14	9.0	9.2	<1.0	21	5.3	1	11	-	-
Total organic carbon	mg/L	-	-	5.9	6.4	6.7	13	8.9	8.4	9.1	12	<0.5	9.1	8.4	8.0	<0.5	13	3.4	1	11	-	-
Dissolved organic carbon	mg/L	-	-	4.8	5.7	5.6	7.4	7.3	7.3	8.9	11	<0.5	7.0	7.3	6.6	<0.5	11	2.7	1	11	-	-
Turbidity	NTU	-	-	0.70	0.30	0.70	1.6	0.90	0.30	0.50	1.0	<0.1	0.40	0.70	0.81	<0.1	2.5	0.70	1	11	-	-
Major Ions																						
Bicarbonate, as $CaCO_3$	mg/L	-	-	34	47	42	38	27	32	33	37	6.2	15	34	33	6.2	51	13	0	11	-	-
Calcium	mg/L	-	-	125	129	130	145	144	156	147	173	17	156	144	131	17	173	41	0	11	-	-
Carbonate, as $CaCO_3$	mg/L	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	-	11	11	-	-
Chloride	mg/L	-	-	400	420	440	400	500	530	590	660	400	660	440	482	300	660	117	0	11	-	-
Cyanide	mg/L	2.0	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	-	11	11	-	-
Magnesium	mg/L	-	-	21	23	23	24	27	28	27	32	4.0	29	24	23	4.0	32	7.4	0	11	-	-
Potassium	mg/L	-	-	11	12	12	14	14	15	14	17	14	17	14	14	10	17	2.2	0	11	-	-
Reactive silica, as SiO2	mg/L	-	-	0.28	0.071	0.21	0.21	0.45	0.58	0.96	1.3	0.078	1.2	0.45	0.57	0.071	1.3	0.45	0	11	-	-
Sodium	mg/L	-	-	101	110	117	124	136	144	144	165	236	189	136	142	94	236	42	0	11	-	-
Sulphate	mg/L	-	-	49	51	51	43	48	53	54	60	7.2	53	51	46	7.2	60	14	0	11	-	-
Nutrients																						
Nitrate	mg-N/L	-	-	5.5	5.3	5.0	4.5	3.7	3.0	3.2	3.7	15	5.7	5.0	5.5	3.0	15	3.4	0	11	-	-
Nitrite	mg-N/L	-	-	0.092	0.12	0.18	0.30	0.22	0.13	0.24	0.36	0.19	0.33	0.19	0.21	0.092	0.36	0.093	0	11	-	-
Nitrate + nitrite	mg-N/L	-	-	5.6	5.4	5.2	4.8	3.9	3.1	3.4	4.1	16	6.1	5.2	5.7	3.1	16	3.4	0	11	-	-
Total ammonia	mg-N/L	-	18	2.6	2.2	1.8	0.47	0.095	0.30	0.88	0.80	4.1	0.91	0.91	1.6	0.095	4.1	1.3	0	11	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	2.8	3.2	2.1	1.2	1.2	0.88	1.3	1.4	3.6	1.3	1.4	2.0	0.88	3.6	1.0	0	11	-	-
Total nitrogen (calculated)	mg-N/L	-	-	8.4	8.6	7.3	6.0	5.1	4.0	4.7	5.5	19	7.4	7.3	7.7	4.0	19	4.1	0	11	-	-
Total phosphorus	mg-P/L	-	4.0	0.034	0.022	0.032	0.099	0.037	<0.02	<0.02	0.037	0.021	0.023	0.032	0.038	<0.02	0.099	0.030	2	11	-	-
Orthophosphate	mg-P/L	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.068	-	10	11	-	-
General Organics																						
Total oil and grease	mg/L	-	-	1.3	<0.5	1.0	1.8	<0.5	<0.5	1.2	<0.5	-	-	1.0	-	<0.5	1.8	-	4	8	-	-

Table 1: Effluent Quality Data for MEL-14, 2018

Parameter	Unit	MDMER	WL	Sampling Date (dd-mm-yyyy)										Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limit	
				01-07-2018	10-07-2018	15-07-2018	23-07-2018	29-07-2018	05-08-2018	13-08-2018	19-08-2018	26-08-2018	03-09-2018								MDMER	WL
Total Metals																						
Aluminum	µg/L	-	3,000	1,220	518	1,230	**4,390**[(W)]	811	784	705	1,030	5.0	1,320	811	1,104	5.0	**4,390**[(W)]	1,171	0	11	-	9.0
Antimony	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<5,000	<0.5	<0.5	<5.0	<0.5	<0.5	-	<0.5	<5,000	-	11	11	-	-
Arsenic	µg/L	1,000	600	1.1	1.2	1.3	1.8	1.9	2.1	2.2	3.0	0.28	2.4	1.9	1.7	0.28	3.0	0.73	0	11	-	-
Barium	µg/L	-	-	98	100	99	83	123	124	133	160	4.3	150	100	107	4.3	160	42	0	11	-	-
Beryllium	µg/L	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	11	11	-	-
Bismuth	µg/L	-	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-	-	-	1	1	-	-
Boron	µg/L	-	-	100	115	157	94	135	154	191	190	770	325	154	212	94	770	196	0	11	-	-
Cadmium	µg/L	-	-	0.024	0.018	0.015	0.020	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	0.015	-	<0.01	<0.1	-	6	11	-	-
Chromium	µg/L	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	-	11	11	-	-
Cobalt	µg/L	-	-	-	-	-	-	-	-	-	-	-	0.66	0.66	0.66	-	-	-	0	1	-	-
Copper	µg/L	600	400	1.3	1.4	1.3	2.1	1.0	1.1	8.5	0.99	<0.5	0.62	1.3	1.9	<0.5	8.5	2.3	1	11	-	-
Iron	µg/L	-	-	118	98	90	293	83	79	134	260	<10	153	118	153	<10	374	110	1	11	-	-
Lead	µg/L	400	400	0.33	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	<0.2	<0.2	<0.2	<0.2	-	<0.2	0.33	-	8	11	-	-
Lithium	µg/L	-	-	113	117	118	92	116	144	138	159	133	157	118	127	92	159	21	0	11	-	-
Manganese	µg/L	-	-	309	23	61	190	136	237	381	406	2.4	253	237	213	2.4	406	143	0	11	-	-
Mercury	µg/L	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.010	-	10	11	-	-
Molybdenum	µg/L	-	-	<1.0	<1.0	<1.0	<1.0	1.4	1.8	1.8	2.2	<1.0	1.4	<1.0	-	<1.0	2.2	-	6	11	-	-
Nickel	µg/L	1,000	1,000	2.5	2.5	2.2	2.5	2.3	2.8	3.0	3.4	<1.0	2.7	2.5	2.5	<1.0	3.4	0.75	1	11	-	-
Selenium	µg/L	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	11	11	-	-
Silicon	µg/L	-	-	-	-	-	-	-	-	-	-	-	650	650	650	-	-	-	0	1	-	-
Silver	µg/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	-	11	11	-	-
Strontium	µg/L	-	-	2,410	2,470	2,360	2,180	2,590	3,120	3,530	3,970	401	4,060	2,470	2,682	401	4,060	1,011	0	11	-	-
Thallium	µg/L	-	-	0.026	0.030	0.035	0.022	0.033	<0.01	<0.01	<0.01	0.020	0.015	0.022	-	<0.01	0.035	-	3	11	-	-
Tin	µg/L	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	11	11	-	-
Titanium	µg/L	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	11	11	-	-
Uranium	µg/L	-	-	0.11	0.13	0.20	0.64	0.18	0.13	0.12	0.18	0.10	0.13	0.13	0.23	0.10	0.64	0.19	0	11	-	-
Vanadium	µg/L	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	11	11	-	-
Zinc	µg/L	800	1,000	5.4	5.5	<5.0	8.6	<5.0	<5.0	8.5	6.7	<5.0	<5.0	5.4	-	<5.0	8.6	-	5	11	-	-
Zirconium	µg/L	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	-	-	1	1	-	-
Dissolved Metals																						
Aluminum	µg/L	-	-	17	50	84	99	91	220	56	57	4.3	23	56	65	4.3	220	61	0	11	-	-
Antimony	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<25	<5.0	<0.5	<0.5	<0.5	<0.5	-	<0.5	<25	-	11	11	-	-
Arsenic	µg/L	-	-	0.88	1.1	1.2	1.6	1.8	<5.0	2.1	2.7	0.29	2.0	1.6	1.6	0.29	<5.0	0.72	1	11	-	-
Barium	µg/L	-	-	98	93	93	114	120	126	129	150	4.4	141	114	105	4.4	150	39	0	11	-	-
Beryllium	µg/L	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<5.0	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<5.0	-	11	11	-	-
Bismuth	µg/L	-	-	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0	-	-	-	1	1	-	-
Boron	µg/L	-	-	101	123	146	138	139	<2,500	195	206	723	317	146	313	101	<2,500	358	1	11	-	-
Cadmium	µg/L	-	-	0.021	0.017	0.015	0.010	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	0.010	-	<0.01	<0.5	-	6	11	-	-
Chromium	µg/L	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<50	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<50	-	11	11	-	-
Cobalt	µg/L	-	-	-	-	-	-	-	-	-	-	-	0.58	0.58	0.58	-	-	-	0	1	-	-
Copper	µg/L	-	-	0.99	1.1	1.1	1.2	0.85	<10	0.65	0.65	0.22	0.50	0.99	1.3	0.22	<10	1.3	1	11	-	-
Iron	µg/L	-	-	28	18	48	<5.0	26	<250	43	32	<5.0	41	32	-	<5.0	<250	-	3	11	-	-
Lead	µg/L	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<10	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<10	-	11	11	-	-
Lithium	µg/L	-	-	113	120	125	135	144	140	144	163	134	158	135	135	104	163	18	0	11	-	-
Manganese	µg/L	-	-	302	8.9	29	61	102	225	331	382	2.5	209	209	181	2.5	382	145	0	11	-	-
Mercury	µg/L	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.040	-	10	11	-	-
Molybdenum	µg/L	-	-	<1.0	<1.0	<1.0	1.1	1.4	<50	1.9	2.0	<1.0	1.3	1.1	-	<1.0	<50	-	6	11	-	-
Nickel	µg/L	-	-	2.2	2.3	2.2	2.2	2.2	<50	2.9	3.0	<1.0	2.3	2.3	4.3	<1.0	<50	6.9	2	11	-	-
Selenium	µg/L	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<5.0	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<5.0	-	11	11	-	-
Silicon	µg/L	-	-	-	-	-	-	-	-	-	-	-	590	590	590	-	-	-	0	1	-	-
Silver	µg/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<1.0	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<1.0	-	11	11	-	-
Strontium	µg/L	-	-	2,440	2,730	2,580	2,380	2,600	2,720	3,240	4,100	422	3,310	2,600	2,625	422	4,100	898	0	11	-	-
Thallium	µg/L	-	-	0.027	0.029	0.033	0.033	0.028	<0.5	<0.01	<0.01	0.020	0.016	0.027	-	<0.01	<0.5	-	3	11	-	-
Tin	µg/L	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<250	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<250	-	11	11	-	-

Table 1: Effluent Quality Data for MEL-14, 2018

Parameter	Unit	MDMER	WL	Sampling Date (dd-mm-yyyy)										Median	Mean	Min	Max	SD	nd	Count	% Above Effluent Limit	
				01-07-2018	10-07-2018	15-07-2018	23-07-2018	29-07-2018	05-08-2018	13-08-2018	19-08-2018	26-08-2018	03-09-2018								MDMER	WL
Titanium	µg/L	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<250	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<250	-	11	11	-	-
Uranium	µg/L	-	-	<0.1	<0.1	<0.1	0.12	<0.1	<5.0	<0.1	<0.1	0.11	<0.1	<0.1	-	<0.1	<5.0	-	8	11	-	-
Vanadium	µg/L	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<250	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<250	-	11	11	-	-
Zinc	µg/L	-	-	6.8	5.1	<5.0	<5.0	<5.0	<250	7.1	<5.0	<5.0	<5.0	<5.0	-	<5.0	<250	-	7	11	-	-
Zirconium	µg/L	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	-	-	-	1	1	-	-
Volatile Organics																						
Benzene	µg/L	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	10	10	-	-
Ethylbenzene	µg/L	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	10	10	-	-
Toluene	µg/L	-	-	0.32	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	0.32	-	9	10	-	-
Xylenes	µg/L	-	-	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	-	<0.4	<0.4	-	10	10	-	-
m,p-Xylenes	µg/L	-	-	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	-	<0.4	<0.4	-	10	10	-	-
o-Xylene	µg/L	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	10	10	-	-
F1 (C6-C10)-BTEX	µg/L	-	-	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	<25	<25	-	10	10	-	-
F2 (C10-C16)	µg/L	-	-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	-	<100	<100	-	11	11	-	-
F3 (C16-C34)	µg/L	-	-	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	-	<200	<200	-	11	11	-	-
F1 (C6-C10)	µg/L	-	-	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	-	<25	<25	-	10	10	-	-
F4 (C34-C50)	µg/L	-	-	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	-	<200	<200	-	11	11	-	-
Radionuclides																						
Radium-226	Bq/L	1.1	-	<0.005	<0.005	<0.005	0.0070	<0.005	<0.005	<0.005	0.0080	<0.005	<0.005	<0.005	-	<0.005	0.0080	-	9	11	-	-
Ungrouped Analytes																						
Cyanide (free)	mg/L	-	-	-	-	-	-	-	-	-	-	10	11	10	10	10	11	0.21	0	2	-	-

Notes: Bolded concentrations are higher than effluent limits. Water quality data shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to effluent limits. Therefore, values slightly above effluent limits may be displayed as being equal to the limits and identified as exceedances. Concentrations equal to the limits were not identified as exceedances. In cases where 25% or more of data were <DL, no mean or standard deviation was calculated.

mg/L = milligrams per litre; µg/L = micrograms per litre; µS/cm = microsiemens per centimetre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; Bq/L = becquerels per litre; + = plus; °C = degrees Celsius; NTU = nephelometric turbidity unit; $CaCO_3$ = calcium carbonate; SiO_2 = silicon dioxide; TDS = total dissolved solids; TSS = total suspended solids; TOC = Total organic carbon; DOC = dissolved organic carbon; BTEX = benzene, toluene, ethylbenzene, and xylene; Min = minimum; Max = maximum; SD = standard deviation; nd = not detected; < = less than; DL = detection limit; % = percent; MDMER = Metal and Diamond Mining Effluent Regulations; EEM = Environmental Effects Monitoring; WL = Water Licence; W = concentration is higher than the Water Licence effluent limits or outside the recommended pH range; - = no effluent limit or no data.

APPENDIX 2C

Water Quality Data for MEL-13, 2018

Table 1: Water Quality Data for MEL-13, 2018

Parameter	Unit	Guidelines					Sampling Date (dd-mm-yyyy)				Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q	23-07-2018	20-08-2018	26-08-2018	04-09-2018								A	C	D	S	Q
Field Measured																						
pH	-	-	6.5 - 9.0	-	7.0 - 11	-	7.2	8.2	7.8	8.2	8.0	7.8	7.2	8.2	0.48	0	4	-	-	-	-	-
Specific conductivity	µS/cm	-	-	-	-	-	80	82	84	85	83	83	80	85	2.6	0	4	-	-	-	-	-
Temperature	°C	-	-	-	15	-	**16**[(S)]	11	10	10	10	12	10	**16**[(S)]	2.7	0	4	-	-	-	25	-
Conventional Parameters																						
pH	-	-	6.5 - 9.0	-	7.0 - 11	-	7.0	7.3	7.3	7.4	7.3	7.3	7.0	7.4	0.17	0	4	-	-	-	-	-
Specific conductivity	µS/cm	-	-	-	-	-	88	91	87	84	88	88	84	91	2.9	0	4	-	-	-	-	-
Hardness, as $CaCO_3$	mg/L	-	-	-	-	-	24	25	25	-	25	25	24	25	0.70	0	3	-	-	-	-	-
Total alkalinity, as $CaCO_3$	mg/L	-	-	-	-	-	16	17	15	16	16	16	15	17	0.82	0	4	-	-	-	-	-
Total dissolved solids	mg/L	-	-	-	500	-	15	400	75	100	88	148	15	400	172	0	4	-	-	-	-	-
Total suspended solids	mg/L	-	-	-	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0	0	4	-	-	-	-	-
Total organic carbon	mg/L	-	-	-	-	-	3.1	2.9	3.0	3.0	3.0	3.0	2.9	3.1	0.082	0	4	-	-	-	-	-
Dissolved organic carbon	mg/L	-	-	-	-	-	3.0	2.9	2.8	2.9	2.9	2.9	2.8	3.0	0.082	0	4	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	0.30	0.30	0.30	0.20	0.30	0.28	0.20	0.30	0.050	0	4	-	-	-	-	-
Major Ions																						
Bicarbonate, as $CaCO_3$	mg/L	-	-	-	-	-	16	17	15	16	16	16	15	17	0.82	0	4	-	-	-	-	-
Calcium	mg/L	-	-	-	-	-	7.4	7.7	7.8	7.0	7.5	7.5	7.0	7.8	0.35	0	4	-	-	-	-	-
Carbonate, as $CaCO_3$	mg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	-	4	4	-	-	-	-	-
Chloride	mg/L	640	120	-	250	-	13	13	13	13	13	13	13	13	0	0	4	-	-	-	-	-
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	-	4	4	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.4	0.053	0	4	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	0.91	0.95	0.99	0.90	0.93	0.94	0.90	0.99	0.038	0	4	-	-	-	-	-
Reactive silica, as SiO2	mg/L	-	-	-	-	-	-	0.33	0.29	0.27	0.29	0.30	0.27	0.33	0.031	0	3	-	-	-	-	-
Sodium	mg/L	-	-	-	200	-	5.2	5.7	5.4	5.3	5.4	5.4	5.2	5.7	0.19	0	4	-	-	-	-	-
Sulphate	mg/L	-	-	-	500	-	4.8	4.3	3.7	4.5	4.4	4.3	3.7	4.8	0.46	0	4	-	-	-	-	-
Nutrients																						
Nitrate	mg-N/L	124	2.9	10	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Total ammonia	mg-N/L	-	0.56 - 3.8[(a)]	-	-	-	<0.05	<0.05	0.19	<0.05	<0.05	-	<0.05	0.19	-	3	4	-	-	-	-	-
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.12	0.14	0.27	<0.1	0.13	0.15	<0.1	0.27	0.092	1	4	-	-	-	-	-
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.12	0.14	0.27	<0.1	0.13	0.15	<0.1	0.27	0.092	1	4	-	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	-	4	4	-	-	-	-	-
Orthophosphate	mg-P/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
General Organics																						
Total oil and grease	mg/L	-	-	-	-	-	<0.5	0.60	-	-	0.60	-	<0.5	0.60	-	1	2	-	-	-	-	-

Table 2: Water Quality Data for MEL-13, 2018

Parameter	Unit	Guidelines					Sampling Date (dd-mm-yyyy)				Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q	23-07-2018	20-08-2018	26-08-2018	04-09-2018								A	C	D	S	Q
Total Metals																						
Aluminum	µg/L	-	100[b, c]	-	-	-	**6,640[C]**	12	9.8	8.3	11	**1,667[C]**	8.3	**6,640[C]**	3,315	0	4	4	-	25	-	-	-
Antimony	µg/L	-	-	6.0	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	-	4	4	-	-	-	-	-
Arsenic	µg/L	-	5.0	10	-	25	2.8	0.42	0.46	0.43	0.45	1.0	0.42	2.8	1.2	0	4	-	-	-	-	-
Barium	µg/L	-	-	1,000	-	-	126	8.2	7.7	7.9	8.1	37	7.7	126	59	0	4	-	-	-	-	-
Beryllium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Boron	µg/L	29,000	1,500	5,000	-	-	156	<50	<50	<50	<50	-	<50	156	-	3	4	-	-	-	-	-
Cadmium	µg/L	0.49 - 0.51[d]	0.048 - 0.050[d]	5.0	-	-	0.028	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.028	-	3	4	-	-	-	-	-
Chromium	µg/L	-	1.0	50[e]	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	-	4	4	-	-	-	-	-
Copper	µg/L	-	2.0[d]	-	1,000	-	**2.8[C]**	0.79	0.77	0.76	0.78	1.3	0.76	**2.8[C]**	1.0	0	4	-	25	-	-	-
Iron	µg/L	-	300	-	300	1,060	**405[C, S]**	29	24	19	27	119	19	**405[C, S]**	191	0	4	-	25	-	25	-
Lead	µg/L	-	1.0[d]	10	-	-	0.21	<0.2	<0.2	<0.2	<0.2	-	<0.2	0.21	-	3	4	-	-	-	-	-
Lithium	µg/L	-	-	-	-	-	145	<2.0	<2.0	<2.0	<2.0	-	<2.0	145	-	3	4	-	-	-	-	-
Manganese	µg/L	-	-	-	50	-	**271[S]**	4.8	4.4	4.5	4.7	**71[S]**	4.4	**271[S]**	133	0	4	-	-	-	25	-
Mercury	µg/L	-	0.026	1.0	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
Molybdenum	µg/L	-	73	-	-	-	1.3	<1.0	<1.0	<1.0	<1.0	-	<1.0	1.3	-	3	4	-	-	-	-	-
Nickel	µg/L	-	25[d]	-	-	-	3.3	<1.0	<1.0	<1.0	<1.0	-	<1.0	3.3	-	3	4	-	-	-	-	-
Selenium	µg/L	-	1.0	50	-	-	0.11	<0.1	<0.1	<0.1	<0.1	-	<0.1	0.11	-	3	4	-	-	-	-	-
Silver	µg/L	-	0.25	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	-	4	4	-	-	-	-	-
Strontium	µg/L	-	-	-	-	-	3,800	49	48	49	49	987	48	3,800	1,876	0	4	-	-	-	-	-
Thallium	µg/L	-	0.80	-	-	-	0.036	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.036	-	3	4	-	-	-	-	-
Tin	µg/L	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	4	4	-	-	-	-	-
Titanium	µg/L	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	4	4	-	-	-	-	-
Uranium	µg/L	33	15	20	-	-	0.98	<0.1	<0.1	<0.1	<0.1	-	<0.1	0.98	-	3	4	-	-	-	-	-
Vanadium	µg/L	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	4	4	-	-	-	-	-
Zinc	µg/L	-	-	-	5,000	-	11	<5.0	<5.0	<5.0	<5.0	-	<5.0	11	-	3	4	-	-	-	-	-

Table 2: Water Quality Data for MEL-13, 2018

Parameter	Unit	Guidelines					Sampling Date (dd-mm-yyyy)				Median	Mean	Min	Max	SD	nd	Count	% Above Guideline				
		A	C	D	S	Q	23-07-2018	20-08-2018	26-08-2018	04-09-2018								A	C	D	S	Q
Dissolved Metals																						
Aluminum	µg/L	-	-	-	-	-	12	7.7	5.4	6.0	6.9	7.9	5.4	12	3.1	0	4	-	-	-	-	-
Antimony	µg/L	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	-	4	4	-	-	-	-	-
Arsenic	µg/L	-	-	-	-	-	0.31	0.40	0.40	0.34	0.37	0.36	0.31	0.40	0.045	0	4	-	-	-	-	-
Barium	µg/L	-	-	-	-	-	7.6	7.8	7.6	7.5	7.6	7.6	7.5	7.8	0.13	0	4	-	-	-	-	-
Beryllium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Boron	µg/L	-	-	-	-	-	<50	<50	<50	<50	<50	-	<50	<50	-	4	4	-	-	-	-	-
Cadmium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
Chromium	µg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	-	4	4	-	-	-	-	-
Copper	µg/L	-	-	-	-	-	0.62	0.76	0.75	0.73	0.74	0.72	0.62	0.76	0.065	0	4	-	-	-	-	-
Iron	µg/L	-	-	-	-	-	9.2	11	7.4	5.4	8.3	8.3	5.4	11	2.5	0	4	-	-	-	-	-
Lead	µg/L	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	4	4	-	-	-	-	-
Lithium	µg/L	-	-	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	-	<2.0	<2.0	-	4	4	-	-	-	-	-
Manganese	µg/L	-	-	-	-	-	1.2	<1.0	<1.0	<1.0	<1.0	-	<1.0	1.2	-	3	4	-	-	-	-	-
Mercury	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
Molybdenum	µg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	-	4	4	-	-	-	-	-
Nickel	µg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	-	4	4	-	-	-	-	-
Selenium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Silver	µg/L	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02	<0.02	-	4	4	-	-	-	-	-
Strontium	µg/L	-	-	-	-	-	49	51	49	47	49	49	47	51	1.7	0	4	-	-	-	-	-
Thallium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	-	4	4	-	-	-	-	-
Tin	µg/L	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	4	4	-	-	-	-	-
Titanium	µg/L	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	4	4	-	-	-	-	-
Uranium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	4	4	-	-	-	-	-
Vanadium	µg/L	-	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	-	<5.0	<5.0	-	4	4	-	-	-	-	-
Zinc	µg/L	31 - 32	4.4 - 9.0	-	-	-	<5.0	**<5.0**(C)	<5.0	**<5.0**(C, f)	<5.0	-	<5.0	<5.0	-	4	4	-	-	-	-	-
Volatile Organics																						
Benzene	µg/L	-	370	5.0	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	4	4	-	-	-	-	-
Ethylbenzene	µg/L	-	90	140	1.6	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	4	4	-	-	-	-	-
Toluene	µg/L	-	2.0	60	24	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	4	4	-	-	-	-	-
Xylenes	µg/L	-	-	90	20	-	<0.4	<0.4	<0.4	<0.4	<0.4	-	<0.4	<0.4	-	4	4	-	-	-	-	-
m,p-Xylenes	µg/L	-	-	-	-	-	<0.4	<0.4	<0.4	<0.4	<0.4	-	<0.4	<0.4	-	4	4	-	-	-	-	-
o-Xylene	µg/L	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	4	4	-	-	-	-	-
F1 (C6-C10)-BTEX	µg/L	-	-	-	-	-	<25	<25	<25	<25	<25	-	<25	<25	-	4	4	-	-	-	-	-
F2 (C10-C16)	µg/L	-	-	-	-	-	<100	<100	<100	<100	<100	-	<100	<100	-	4	4	-	-	-	-	-
F3 (C16-C34)	µg/L	-	-	-	-	-	<200	<200	<200	<200	<200	-	<200	<200	-	4	4	-	-	-	-	-
F1 (C6-C10)	µg/L	-	-	-	-	-	<25	<25	<25	<25	<25	-	<25	<25	-	4	4	-	-	-	-	-
F4 (C34-C50)	µg/L	-	-	-	-	-	<200	<200	<200	<200	<200	-	<200	<200	-	4	4	-	-	-	-	-

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		A	C	D	S	Q	23-07-2018	20-08-2018	26-08-2018	04-09-2018								A	C	D	S	Q
Radionuclides																						
Radium-226	Bq/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	-	4	4	-	-	-	-	-
Ungrouped Analytes																						
Cyanide (free)	mg/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	4	4	-	-	-	-	-

Notes: Bolded concentrations are higher than water quality guidelines. Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

[a] = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.5592 mg-N/L) is based on the combination of field pH (8.2) and water temperature (10.0°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH

[b] = guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.2 to 8.2). The guideline is calculated based on the individual pH for each sample.

[c] = guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5.

[d] = guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (24 to 25 mg/L). The guideline is calculated based on the individual hardness value for each sample.

[e] = guideline is for chromium VI.

[f] = Used median for hardness (as $CaCO_3$) because value was unavailable.

[C] = concentration is higher than the Canadian Water Quality Guidelines for the Protection of Aquatic Life – Chronic or outside the recommended pH, DO or total alkalinity range.

[S] = concentration is higher than the Aesthetic Objectives for Canadian Drinking Water Quality or outside the recommended pH range.

mg/L = milligrams per litre; µg/L = micrograms per litre; µS/cm = microsiemens per centimeter; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; Bq/L = becquerels per litre; + = plus; °C = degrees Celsius; NTU = nephelometric turbidity unit; $CaCO_3$ = calcium carbonate; SiO_2 = silicon dioxide; TDS = total dissolved solids; TSS = total suspended solids; TOC = Total organic carbon; DOC = dissolved organic carbon; BTEX = benzene, toluene, ethylbenzene, and xylene; Min = minimum; Max = maximum; SD = standard deviation; nd = not detected; < = less than; % = percent; MDMER = Metal and Diamond Mining Effluent Regulations; WL = Water Licence; - = Parameter below MDMER or WL guideline, or no guideline or no data; A = Canadian Water Quality Guidelines for the Protection of Aquatic Life – Acute; C = Canadian Water Quality Guidelines for the Protection of Aquatic Life – Chronic; D = Guidelines for Canadian Drinking Water Quality; S = Aesthetic Objectives for Canadian Drinking Water Quality; Q = Site-Specific Water Quality Objectives.

APPENDIX 2D

Acute Lethality Toxicology Laboratory Reports

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Certificate of Analysis

Request number: **18-891755**

Date Received: 2018-06-27

Date Certificate Issued: 2018-08-22

Certificate Version: 2

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

H2Lab - Val d' Or

900, 5e Avenue
Val-d'Or, Québec, Canada
J9P 1B9
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Fax : (819) 874-0360

P.O. Number	Your project ID.	Project Manager
NA	76327	M. Roger Turmel

Comments

Version 02: Modification of the reference and sampling of location for sample 3645994 at client's request.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Client: **H2Lab - Val d' Or**

Request Number: 18-891755

P.O. Number	Your Project ID.	Project Manager
NA	76327	M. Roger Turmel

		Sample(s)
Lab. No.		**3645994**
Your Reference		MEL-14b
Matrix		Surface water
Sampled by		J.M.
Site sampled		63*02'15,5"92*13'06,3"
Date sampled		2018-06-24
Date received		2018-06-27
Parameter(s)		
Method Reference		
Daphnia toxicity results	Preparation	-
SA-EN-TOX-PON014-Fed. (Accredited)	Analysis	-
	Sequential No.	NA
LC50-48h	% v/v	>100
% mortality at 100% v/v	% mort 48h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Not lethal
Analysis details		APPENDIX
Trout toxicity results	Preparation	-
SA-EN-TOX-PON008 (Accredited)	Analysis	-
	Sequential No.	NA
LC50-96h	% v/v	>100
% mortality at 100% v/v	% mort 96h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Not lethal
Analysis details		APPENDIX

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Client: **H2Lab - Val d' Or**

Request Number: 18-891755

P.O. Number	Your Project ID.	Project Manager
NA	76327	M. Roger Turmel

Comments:

3645994 MEL-14b Daphnia - Test type : LC50, Trout - Test type : LC50

Note 1: Results and comments, if any, relate only to samples submitted for analysis at the Saint-Augustin-de-Desmaures laboratory (#302).

Linda Bouchard, biologist

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Appendix

Client: H2Lab **Request number:** 18-891755

BIOASSAY Rainbow trout

Lab. No:	3645994	**Sampling method:**	NA
Your reference:	MEL-14b	**Date sampled (date and hour):**	2018-06-24 9:15:00 AM
Matrix:	Surface water	**Date received (date and hour):**	2018-06-27 3:41:00 PM
Sampled by:	J.M.	**State of sampled received:**	Conform
Site sampled:	63*02'15,5"92*13'06,3"		

Date and hour start analysis (0hrs): 2018-06-28 15:00 **Date and hour end analysis (96hrs):** 2018-07-02 15:00

Analysed by: JB

Organisms:	***Oncorhynchus mykiss*** ; Acclimation: ≥ 2 weeks % mortality 7 days before test:<1				
Lot # and origin(1):	PAV180607				
Average weight of control fish (g):	0.36	**Minimum:**	0.27	**Maximum:**	0.44
± std. dev.:	0.06				
Average fork length of control fish (mm):	34.7	**Minimum:**	30	**Maximum:**	38
± std. dev.:	2.7				
Number of fish/container:	10				
Number of repetitions per concentration:	1				
Loading density (g/L):	0.36				
Volume of test solutions (L):	10				
Height of test solutions (cm):	22				
Photoperiod:	16hrs light / 8hrs darkness				
Dilution water:	Dechlorinated municipal water				
Pre-aeration of sample:	30 minutes				
Pre-aeration and aeration rate (mL/min/L ±1):	6.5				
Pre-treatment of sample:	NA				
Protocol / Reference method:	SPE1/RM/13, 2000, mod. 05/2007 et 02/2016 No modification to protocol				

sample concentration (% v/v)	number of fish 0 hrs	volume (L)	atypical or stressed 96hrs (number)	atypical or stressed 96hrs (%)	mortality 96hrs (number)	mortality 96hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
							0hrs	96hrs	0hrs	96hrs	0hrs	96hrs	0hrs
0	10	10	0	0	0	0	15.6	15.4	7.9	7.8	9.5	9.1	305
6.25	10	10	0	0	0	0	15.7	15.4	7.9	7.7	9.4	9.0	394
12.5	10	10	0	0	0	0	15.7	15.4	7.8	7.8	9.4	9.0	487
25	10	10	0	0	0	0	15.7	15.5	7.7	7.6	9.3	9.0	672
50	10	10	0	0	0	0	15.8	15.5	7.6	7.6	9.1	9.0	1023
100	10	10	0	0	1	10	15.9	15.5	7.4	7.6	8.6	9.1	1732
Sample characteristics before analysis			**Appearance**				15.9		7.4		8.1		1728
			Brown, clear										

Reference assay (Phenol)		**Geometric average:**	9.37
Reference assay date:	2018-06-26	**Lower control limit:**	7.11
LC50-96h (mg/L of Phenol):	7.94	**Upper control limit:**	11.63
Lower C.I. at 95%:	7.20		
Upper C.I. at 95%:	8.76		

(1) PAV: Pisciculture des Arpents Verts.
PJC: Pisciculture de la Jacques-Cartier.
PDF: Pisciculture Denis Fournier

Sample stored at 4 ± 2 ° C in the dark.

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Appendix

Client: H2Lab **Request number:** 18-891755

BIOESSAI *Daphnia magna*

Lab. No: 3645994
Your reference: MEL-14b
Matrix: Surface water
Sampled by: J.M.
Site sampled 63*02'15,5"92*13'06,3"

Sampling method: NA
Date sampled (date and hour): 2018-06-24 9:15:00 AM
Date received (date and hour): 2018-06-27 3:41:00 PM
State of sampled received: Conform

Date and hour start analysis (0hrs): 2018-06-28 15:30 **Date and hour end analysis (48hrs):** 2018-06-30 15:30

EC50-48h (% v/v): >100
Lower C.I. at 95%: NA
Upper C.I. at 95%: NA
Calculation method: Aucune méthode utilisée

Analysed by: CGJ NB JG

Organisms: ***Daphnia magna*** (<24 hours) - Culture Eurofins Essais Environnementaux St-Augustin-de-Desmaures
<1% of mortality of brood stock 7 days before test
Average number of neonates per brood: 19
Age at first brood (days): 8
Number of Daphnia/container: 10
Number of repetitions per concentration: 1
Loading density (mL/Daphnia): 30
Volume of test solutions (mL): 300
Photoperiod: 16hrs light / 8hrs darkness
Dilution water: Dechlorinated municipal water, hardness adjusted
Culture and dilution water hardness (mg/L CaCO3): 168
Pre-aeration of sample: 0 minute
Pre-aeration rate (mL/min/L ±1): NA
Sample hardness (mg/L CaCO3): 455
Sample hardness adjusted (mg/L CaCO3): NA
Pre-treatment of sample: NA
Protocol / Reference method: SPE1/RM/14, 2000 et 02/2016
No modification to protocol

sample concentration (% v/v)	number of Daphnia 0hrs	immobility 48hrs (number)	immobility 48hrs (%)	mortality 48hrs (number)	mortality 48hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
						0hrs	48hrs	0hrs	48hrs	0hrs	48hrs	0hrs
0	10	0	0	0	0	21.2	20.7	8.2	8.0	8.5	8.3	533
6.25	10	0	0	0	0	21.1	20.5	8.1	8.0	8.4	8.5	606
12.5	10	0	0	0	0	21.1	20.4	8.0	8.0	8.3	8.8	684
25	10	0	0	0	0	21.2	20.4	7.9	8.0	8.2	8.0	837
50	10	0	0	0	0	21.2	20.4	7.7	7.9	8.2	8.4	1144
100	10	0	0	0	0	21.3	20.4	7.2	7.8	7.9	8.2	1747
Sample characteristics before analysis			**Appearance**			21.0		7.2		7.5		1751
			Beige, clear									

Reference assay (Potassium dichromate):
Reference assay date: 2018-06-26
LC-50-48h (mg/L of Cr): 0.279
Lower C.I. at 95%: 0.247
Upper C.I. at 95%: 0.313

Geometric average: 0.279
Lower control limit: 0.200
Upper control limit: 0.357

Sample stored at 4 ± 2 ° C in the dark.

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Certificate of Analysis

Request number: **18-893091**

Date Received: 2018-07-04

Date Certificate Issued: 2018-08-22

Certificate Version: 2

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

H2Lab - Val d' Or

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J9P 1B9
Telephone : (819) 874-0350
Fax : (819) 874-0360

P.O. Number	Your project ID.	Project Manager
NA	76583	M. Roger Turmel

Comments

Version 02: Modification of the reference and sampling of location for sample 3650775 at client's request.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Client: **H2Lab - Val d' Or**

Request Number: 18-893091

P.O. Number	Your Project ID.	Project Manager
NA	76583	M. Roger Turmel

		Sample(s)
Lab. No.		**3650775**
Your Reference		MEL-14b
Matrix		Surface water
Sampled by		DM / AG
Site sampled		63*02'15,5"92*13'06,3"
Date sampled		2018-07-01
Date received		2018-07-04
Parameter(s)		
Method Reference		
Daphnia toxicity results	Preparation	-
SA-EN-TOX-PON014-Fed. (Accredited)	Analysis	-
	Sequential No.	NA
LC50-48h	% v/v	>100
% mortality at 100% v/v	% mort 48h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Not lethal
Analysis details		APPENDIX
Trout toxicity results	Preparation	-
SA-EN-TOX-PON008 (Accredited)	Analysis	-
	Sequential No.	NA
LC50-96h	% v/v	>100
% mortality at 100% v/v	% mort 96h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Not lethal
Analysis details		APPENDIX

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Client: **H2Lab - Val d' Or**

Request Number: 18-893091

P.O. Number	Your Project ID.	Project Manager
NA	76583	M. Roger Turmel

Comments:

3650775 MEL-14b Daphnia - Test type: LC50, Trout - Test type: LC50.

Note 1: Results and comments, if any, relate only to samples submitted for analysis at the Saint-Augustin-de-Desmaures laboratory (#302).

Linda Bouchard, biologist

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Appendix

Client: H2Lab **Request number:** 18-893091

BIOASSAY Rainbow trout

Lab. No: 3650775
Your reference: MEL-14b
Matrix: Surface water
Sampled by: DM / AG
Site sampled: 63*02'15,5"92*13'06,3"

Sampling method: NA
Date sampled (date and hour): 2018-07-01 4:15:00 PM
Date received (date and hour): 2018-07-04 9:35:00 AM
State of sampled received: Conform

Date and hour start analysis (0hrs): 2018-07-04 14:00
Date and hour end analysis (96hrs): 2018-07-08 14:00

Analysed by: JB, SV, NB

Organisms: ***Oncorhynchus mykiss*** ; Acclimation: ≥ 2 weeks
% mortality 7 days before test:<1

Lot # and origin(1): PAV180607
Average weight of control fish (g): 0.32 **Minimum:** 0.27 **Maximum:** 0.38
± std. dev.: 0.04
Average fork length of control fish (mm): 33.4 **Minimum:** 31 **Maximum:** 35
± std. dev.: 1.4
Number of fish/container: 10
Number of repetitions per concentration: 1
Loading density (g/L): 0.32
Volume of test solutions (L): 10
Height of test solutions (cm): 22
Photoperiod: 16hrs light / 8hrs darkness
Dilution water: Dechlorinated municipal water
Pre-aeration of sample: 30 minutes
Pre-aeration and aeration rate (mL/min/L ±1): 6.5
Pre-treatment of sample: NA
Protocol / Reference method: SPE1/RM/13, 2000, mod. 05/2007 et 02/2016
No modification to protocol

sample concentration (% v/v)	number of fish 0 hrs	volume (L)	atypical or stressed 96hrs (number)	atypical or stressed 96hrs (%)	mortality 96hrs (number)	mortality 96hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
							0hrs	96hrs	0hrs	96hrs	0hrs	96hrs	0hrs
0	10	10	0	0	0	0	14.5	14.2	7.6	7.8	9.6	9.3	282
6.25	10	10	0	0	0	0	14.5	14.2	7.5	7.9	9.5	9.6	373
12.5	10	10	0	0	0	0	14.5	14.1	7.5	7.8	9.8	9.2	456
25	10	10	0	0	1	10	14.4	14.2	7.5	7.8	9.7	9.5	640
50	10	10	0	0	0	0	14.3	14.3	7.3	7.7	9.4	9.3	969
100	10	10	0	0	0	0	14.1	14.3	7.1	7.6	9.5	9.4	1643
Sample characteristics before analysis			**Appearance**				14.0		6.4		8.6		1646
			Beige, clear										

Reference assay (Phenol)
Reference assay date: 2018-06-26
LC50-96h (mg/L of Phenol): 7.94
Lower C.I. at 95%: 7.20
Upper C.I. at 95%: 8.76

Geometric average: 9.37
Lower control limit: 7.11
Upper control limit: 11.63

(1) PAV: Pisciculture des Arpents Verts.
PJC: Pisciculture de la Jacques-Cartier.
PDF: Pisciculture Denis Fournier

Sample stored at 4 ± 2 ° C in the dark.

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Appendix

Client: H2Lab **Request number:** 18-893091

BIOESSAI *Daphnia magna*

Lab. No: 3650775
Your reference: MEL-14b
Matrix: Surface water
Sampled by: DM / AG
Site sampled 63*02'15,5"92*13'06,3"

Sampling method: NA
Date sampled (date and hour): 2018-07-01 4:15:00 PM
Date received (date and hour): 2018-07-04 9:35:00 AM
State of sampled received: Conform

Date and hour start analysis (0hrs): 2018-07-04 15:00 **Date and hour end analysis (48hrs):** 2018-07-06 15:00

EC50-48h (% v/v): >100
Lower C.I. at 95%: NA
Upper C.I. at 95%: NA
Calculation method: Aucune méthode utilisée

Analysed by: JG, NB, CGJ

Organisms: ***Daphnia magna*** (<24 hours) - Culture Eurofins Essais Environnementaux St-Augustin-de-Desmaures
<1% of mortality of brood stock 7 days before test
Average number of neonates per brood: 20
Age at first brood (days): 8
Number of Daphnia/container: 10
Number of repetitions per concentration: 1
Loading density (mL/Daphnia): 30
Volume of test solutions (mL): 300
Photoperiod: 16hrs light / 8hrs darkness
Dilution water: Dechlorinated municipal water, hardness adjusted
Culture and dilution water hardness (mg/L CaCO3): 176
Pre-aeration of sample: 30 minutes
Pre-aeration rate (mL/min/L ±1): 50
Sample hardness (mg/L CaCO3): 436
Sample hardness adjusted (mg/L CaCO3): NA
Pre-treatment of sample: NA
Protocol / Reference method: SPE1/RM/14, 2000 et 02/2016
No modification to protocol

sample concentration (% v/v)	number of Daphnia 0hrs	immobility 48hrs (number)	immobility 48hrs (%)	mortality 48hrs (number)	mortality 48hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
						0hrs	48hrs	0hrs	48hrs	0hrs	48hrs	0hrs
0	10	0	0	0	0	21.0	20.6	8.1	8.0	8.6	8.3	485
6.25	10	0	0	0	0	21.0	20.5	8.0	8.0	8.6	8.4	557
12.5	10	0	0	0	0	21.0	20.4	7.9	8.0	8.6	8.4	634
25	10	0	0	0	0	21.1	20.4	7.7	8.0	8.5	8.4	790
50	10	0	0	0	0	21.3	20.4	7.4	7.9	8.3	8.4	1092
100	10	0	0	0	0	21.7	20.5	7.0	7.7	8.1	8.5	1675
Sample characteristics before analysis			**Appearance**			22.0		6.8		9.3		1676
			Beige, clear									

Reference assay (Potassium dichromate):
Reference assay date: 2018-07-03
LC-50-48h (mg/L of Cr): 0.275
Lower C.I. at 95%: 0.251
Upper C.I. at 95%: 0.302

Geometric average: 0.279
Lower control limit: 0.201
Upper control limit: 0.357

Sample stored at 4 ± 2 ° C in the dark.

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Request number: **18-900725**

Date Received: 2018-08-08

Date Certificate Issued: 2018-09-04

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

H2Lab - Val d' Or

900, 5e Avenue
Val-d'Or, Québec, Canada
J9P 1B9
Telephone : (819) 874-0350
Fax : (819) 874-0360

P.O. Number	Your project ID.	Project Manager
NA	77837	M. Roger Turmel

Comments

This version replaces and cancels all earlier version.

NA : Information Not Available

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Client: **H2Lab - Val d' Or**

Request Number: 18-900725

P.O. Number	Your Project ID.	Project Manager
NA	77837	M. Roger Turmel

		Sample(s)
Lab. No.		**3679295**
Your Reference		MEL-14b
Matrix		Surface water
Sampled by		DM/AG
Site sampled		63*02'15,5"92*13'06,3"
Date sampled		2018-08-05
Date received		2018-08-08
Parameter(s)		
Method Reference		
Daphnia toxicity results	Preparation	-
SA-EN-TOX-PON014-Fed. (Accredited)	Analysis	-
	Sequential No.	NA
LC50-48h	% v/v	>100
% mortality at 100% v/v	% mort 48h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Non létal
Analysis details		ANNEXE
Trout toxicity results	Preparation	-
SA-EN-TOX-PON008 (Accredited)	Analysis	-
	Sequential No.	NA
LC50-96h	% v/v	>100
% mortality at 100% v/v	% mort 96h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Non létal
Analysis details		ANNEXE

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Client: **H2Lab - Val d' Or**

Request Number: 18-900725

P.O. Number	Your Project ID.	Project Manager
NA	77837	M. Roger Turmel

Comments:

3679295 MEL-14b Daphnia - Type d'essai : CL50, Truites - Type d'essai : CL50

Note 1: Results and comments, if any, relate only to samples submitted for analysis at the Saint-Augustin-de-Desmaures laboratory (#302).

Stephan Veilleux, biologist

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Appendix

Client: H2Lab **Request number:** 18-900725

BIOASSAY Rainbow trout

Lab. No: 3679295
Your reference: MEL-14b
Matrix: Surface water
Sampled by: DM/AG
Site sampled: 63*02'15,5"92*13'06,3"

Sampling method: NA
Date sampled (date and hour): 2018-08-05 1:30:00 PM
Date received (date and hour): 2018-08-08 3:14:00 PM
State of sampled received: Échantillon conforme

Date and hour start analysis (0hrs): 2018-08-09 14:00
Date and hour end analysis (96hrs): 2018-08-13 14:00

Analysed by: JC JB

Organisms: ***Oncorhynchus mykiss*** ; Acclimation: ≥ 2 weeks
% mortality 7 days before test:<1

Lot # and origin(1): PAV180712
Average weight of control fish (g): 0.41 **Minimum:** 0.26 **Maximum:** 0.5
± std. dev.: 0.09
Average fork length of control fish (mm): 35.4 **Minimum:** 30 **Maximum:** 43
± std. dev.: 3.6
Number of fish/container: 10
Number of repetitions per concentration: 1
Loading density (g/L): 0.41
Volume of test solutions (L): 10
Height of test solutions (cm): 22
Photoperiod: 16hrs light / 8hrs darkness
Dilution water: Dechlorinated municipal water
Pre-aeration of sample: 30 minutes
Pre-aeration and aeration rate (mL/min/L ±1): 6.5
Pre-treatment of sample: NA
Protocol / Reference method: SPE1/RM/13, 2000, mod. 05/2007 et 02/2016
No modification to protocol

sample concentration (% v/v)	number of fish 0 hrs	volume (L)	atypical or stressed 96hrs (number)	atypical or stressed 96hrs (%)	mortality 96hrs (number)	mortality 96hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
							0hrs	96hrs	0hrs	96hrs	0hrs	96hrs	0hrs
0	10	10	0	0	0	0	14.7	14.4	7.4	7.8	9.3	9.5	286
6.25	10	10	0	0	0	0	15.1	14.4	7.5	7.9	9.4	9.7	437
12.5	10	10	0	0	0	0	15.0	14.4	7.6	7.7	9.2	9.0	529
25	10	10	0	0	0	0	15.1	14.6	7.5	7.7	9.4	8.9	772
50	10	10	0	0	0	0	15.2	14.7	7.5	7.7	9.3	9.2	1249
100	10	10	0	0	0	0	15.1	14.6	7.2	7.5	8.5	9.2	2148
Sample characteristics before analysis			**Appearance**				15.3		7.0		7.7		2146
			Beige, limpide										

Reference assay (Phenol)
Reference assay date: 2018-08-03
LC50-96h (mg/L of Phenol): 7.64
Lower C.I. at 95%: 7.10
Upper C.I. at 95%: 8.22

Geometric average: 9.44
Lower control limit: 7.19
Upper control limit: 11.69

(1) PAV: Pisciculture des Arpents Verts.
PJC: Pisciculture de la Jacques-Cartier.
PDF: Pisciculture Denis Fournier

Sample stored at 4 ± 2 ° C in the dark.

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Appendix

Client: H2Lab **Request number:** 18-900725

BIOESSAI *Daphnia magna*

Lab. No: 3679295
Your reference: MEL-14b
Matrix: Surface water
Sampled by: DM/AG
Site sampled 63*02'15,5"92*13'06,3"

Sampling method: NA
Date sampled (date and hour): 2018-08-05 1:30:00 PM
Date received (date and hour): 2018-08-08 3:14:00 PM
State of sampled received: Echantillon conforme

Date and hour start analysis (0hrs): 2018-08-09 17:00 **Date and hour end analysis (48hrs):** 2018-08-11 17:00

EC50-48h (% v/v): >100
Lower C.I. at 95%: NA
Upper C.I. at 95%: NA
Calculation method: Aucune méthode utilisée

Analysed by: JG NB JC

Organisms: ***Daphnia magna*** (<24 hours) - Culture Eurofins Essais Environnementaux St-Augustin-de-Desmaures
<1% of mortality of brood stock 7 days before test
Average number of neonates per brood: 17
Age at first brood (days): 8
Number of Daphnia/container: 10
Number of repetitions per concentration: 1
Loading density (mL/Daphnia): 30
Volume of test solutions (mL): 300
Photoperiod: 16hrs light / 8hrs darkness
Dilution water: Dechlorinated municipal water, hardness adjusted
Culture and dilution water hardness (mg/L CaCO3): 170
Pre-aeration of sample: 0 minute
Pre-aeration rate (mL/min/L ±1): NA
Sample hardness (mg/L CaCO3): 560
Sample hardness adjusted (mg/L CaCO3): NA
Pre-treatment of sample: NA
Protocol / Reference method: SPE1/RM/14, 2000 et 02/2016
No modification to protocol

sample concentration (% v/v)	number of Daphnia 0hrs	immobility 48hrs (number)	immobility 48hrs (%)	mortality 48hrs (number)	mortality 48hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
						0hrs	48hrs	0hrs	48hrs	0hrs	48hrs	0hrs
0	10	0	0	0	0	21.1	20.3	8.0	8.0	8.3	8.2	474
6.25	10	0	0	0	0	21.2	20.2	8.0	7.9	8.3	8.1	571
12.5	10	0	0	0	0	21.2	20.1	7.9	7.9	8.3	8.3	675
25	10	0	0	0	0	21.2	20.1	7.8	7.8	8.3	8.3	892
50	10	0	0	0	0	21.3	20.1	7.6	7.8	8.3	8.2	1282
100	10	0	0	0	0	21.5	20.2	7.2	7.7	8.2	8.2	2070
Sample characteristics before analysis			**Appearance**			21.4		7.1		8.2		2073
			Beige, limpide									

Reference assay (Potassium dichromate):
Reference assay date: 2018-08-06
LC-50-48h (mg/L of Cr): 0.358
Lower C.I. at 95%: 0.299
Upper C.I. at 95%: 0.407

Geometric average: 0.280
Lower control limit: 0.200
Upper control limit: 0.359

Sample stored at 4 ± 2 ° C in the dark.

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Certificate of Analysis

Request number: **18-906615**

Date Received: 2018-09-05

Date Certificate Issued: 2018-10-09

Certificate Version: 2

☑ Official Certificate of Analysis

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Client

H2Lab - Val d' Or

900, 5e Avenue
Val-d'Or, Québec, Canada
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Telephone : (819) 874-0350
Fax : (819) 874-0360

P.O. Number	Your project ID.	Project Manager
NA	78938	M. Roger Turmel

Comments

Version 02: Modification: Change of sampling location and the name of the sampler and adding the time for sample 3702490 at client's request.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Client: **H2Lab - Val d' Or**

Request Number: 18-906615

P.O. Number	Your Project ID.	Project Manager
NA	78938	M. Roger Turmel

Parameter(s) / Method Reference		Sample(s)
Lab. No.		**3702490**
Your Reference		EWTP MEL-14b 07:30
Matrix		Surface water
Sampled by		Sean Arruda
Site sampled		EWTP MEL-14b GPS: 63"02'15.5 92"13'06.3
Date sampled		2018-09-03
Date received		2018-09-05
Daphnia toxicity results	Preparation	-
SA-EN-TOX-PON014-Fed. (Accredited)	Analysis	-
	Sequential No.	NA
LC50-48h	% v/v	>100
% mortality at 100% v/v	% mort 48h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Not lethal
Analysis details		APPENDIX
Trout toxicity results	Preparation	-
SA-EN-TOX-PON008 (Accredited)	Analysis	-
	Sequential No.	NA
LC50-96h	% v/v	>100
% mortality at 100% v/v	% mort 96h	NA
CI 95% lower		NA
CI 95% upper		NA
Code Statistical method		AUCUN
Toxic units	U.T.	<1.0
Conclusion		Not lethal
Analysis details		APPENDIX

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Client: **H2Lab - Val d' Or**

Request Number: 18-906615

P.O. Number	Your Project ID.	Project Manager
NA	78938	M. Roger Turmel

Comments:

3702490 EWTP MEL-14b 07:30 Daphnia - Type d'essai : CL50, Truites - Type d'essai : CL50

Note 1: Results and comments, if any, relate only to samples submitted for analysis at the Saint-Augustin-de-Desmaures laboratory (#302).

Linda Bouchard, biologist

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Appendix

Client: H2Lab **Request number:** 18-906615

BIOASSAY Rainbow trout

Lab. No: 3702490
Your reference: EWTP MEL-14b 07:30
Matrix: Surface water
Sampled by: Sean Arruda
Site sampled: EWTP MEL-14b GPS: 63"02'15.5 92"13'06.3

Sampling method: NA
Date sampled (date and hour): 2018-09-03 7:30:00 AM
Date received (date and hour): 2018-09-05 10:58:00 AM
State of sampled received: Conform

Date and hour start analysis (0hrs): 2018-09-06 11:30
Date and hour end analysis (96hrs): 2018-09-10 11:30

Analysed by: JC JB

Organisms: ***Oncorhynchus mykiss*** ; Acclimation: ≥ 2 weeks
% mortality 7 days before test:<1

Lot # and origin(1): PAV180813
Average weight of control fish (g): 0.35 **Minimum:** 0.31 **Maximum:** 0.39
± std. dev.: 0.03
Average fork length of control fish (mm): 33.9 **Minimum:** 32 **Maximum:** 36
± std. dev.: 1.4
Number of fish/container: 10
Number of repetitions per concentration: 1
Loading density (g/L): 0.35
Volume of test solutions (L): 10
Height of test solutions (cm): 22
Photoperiod: 16hrs light / 8hrs darkness
Dilution water: Dechlorinated municipal water
Pre-aeration of sample: 30 minutes
Pre-aeration and aeration rate (mL/min/L ±1): 6.5
Pre-treatment of sample: NA
Protocol / Reference method: SPE1/RM/13, 2000, mod. 05/2007 et 02/2016
No modification to protocol

sample concentration (% v/v)	number of fish 0 hrs	volume (L)	atypical or stressed 96hrs (number)	atypical or stressed 96hrs (%)	mortality 96hrs (number)	mortality 96hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
							0hrs	96hrs	0hrs	96hrs	0hrs	96hrs	0hrs
0	10	10	0	0	0	0	14.9	14.5	7.6	8.1	9.5	9.5	352
6.25	10	10	0	0	0	0	15.2	14.4	7.6	8.0	9.3	9.8	547
12.5	10	10	0	0	0	0	15.3	14.6	7.5	8.0	9.4	9.8	694
25	10	10	0	0	0	0	15.4	14.8	7.7	8.0	9.3	9.7	1005
50	10	10	0	0	0	0	15.4	14.8	7.5	7.8	9.2	9.6	1638
100	10	10	0	0	0	0	15.3	14.7	7.2	7.6	9.3	9.9	2843
Sample characteristics before analysis			**Appearance**				15.4		6.8		8.5		2842
			Beige,clear										

Reference assay (Phenol)
Reference assay date: 2018-09-04
LC50-96h (mg/L of Phenol): 10.05
Lower C.I. at 95%: 8.57
Upper C.I. at 95%: 11.63

Geometric average: 9.43
Lower control limit: 7.20
Upper control limit: 11.65

(1) PAV: Pisciculture des Arpents Verts.
PJC: Pisciculture de la Jacques-Cartier.
PDF: Pisciculture Denis Fournier

Sample stored at 4 ± 2 ° C in the dark.

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Appendix

Client: H2Lab **Request number:** 18-906615

BIOESSAI *Daphnia magna*

Lab. No: 3702490
Your reference: EWTP MEL-14b 07:30
Matrix: Surface water
Sampled by: Sean Arruda
Site sampled EWTP MEL-14b GPS: 63"02'15.5 92"13'06.3

Sampling method: NA
Date sampled (date and hour): 2018-09-03 7:30:00 AM
Date received (date and hour): 2018-09-05 10:58:00 AM
State of sampled received: Conform

Date and hour start analysis (0hrs): 2018-09-07 15:15 **Date and hour end analysis (48hrs):** 2018-09-09 15:15

EC50-48h (% v/v): >100
Lower C.I. at 95%: NA
Upper C.I. at 95%: NA
Calculation method: Aucune méthode utilisée

Analysed by: CGJ JB

Organisms: ***Daphnia magna*** (<24 hours) - Culture Eurofins Essais Environnementaux St-Augustin-de-Desmaures
<1% of mortality of brood stock 7 days before test
Average number of neonates per brood: 18
Age at first brood (days): 8
Number of Daphnia/container: 10
Number of repetitions per concentration: 1
Loading density (mL/Daphnia): 30
Volume of test solutions (mL): 300
Photoperiod: 16hrs light / 8hrs darkness
Dilution water: Dechlorinated municipal water, hardness adjusted
Culture and dilution water hardness (mg/L CaCO3): 164
Pre-aeration of sample: 0 minute
Pre-aeration rate (mL/min/L ±1): NA
Sample hardness (mg/L CaCO3): 495
Sample hardness adjusted (mg/L CaCO3): NA
Pre-treatment of sample: NA
Protocol / Reference method: SPE1/RM/14, 2000 et 02/2016
No modification to protocol

sample concentration (% v/v)	number of Daphnia 0hrs	immobility 48hrs (number)	immobility 48hrs (%)	mortality 48hrs (number)	mortality 48hrs (%)	temperature (°C)		pH		dissolved oxygen (mg/L)		conductivity (µS/cm)
						0hrs	48hrs	0hrs	48hrs	0hrs	48hrs	0hrs
0	10	0	0	0	0	20.8	19.6	8.1	8.1	8.7	8.7	464
6.25	10	0	0	0	0	20.8	19.4	8.0	8.0	8.7	8.6	585
12.5	10	0	0	0	0	20.8	19.3	7.9	8.0	8.6	8.8	693
25	10	0	0	0	0	20.9	19.3	7.8	7.9	8.4	8.7	934
50	10	0	0	0	0	20.9	19.3	7.5	7.8	8.6	8.6	1398
100	10	0	0	0	0	21.0	19.4	6.9	7.5	8.6	8.7	2306
Sample characteristics before analysis			**Appearance** Clear			21.2		6.8		8.6		2305

Reference assay (Potassium dichromate):
Reference assay date: 2018-09-04
LC-50-48h (mg/L of Cr): 0.223
Lower C.I. at 95%: 0.196
Upper C.I. at 95%: 0.248

Geometric average: 0.280
Lower control limit: 0.201
Upper control limit: 0.358

Sample stored at 4 ± 2 ° C in the dark.

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APPENDIX 2E

Sublethal Toxicity Toxicology Laboratory Reports

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
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September 07, 2018

Jennifer Brown
Agnico Eagle Mines Limited - Meliadine Project
Meliadine Division
Rankin Inlet NU
X0C 0G0

Dear Jennifer,

Re: Report on Sublethal Toxicity Analysis of Wastewater for MMER - August 2018

Enclosed are the reports for sublethal testing conducted on the sample of MEL-14 collected 2018-08-07. Data are presented in electronic format.

As you are aware, submission of sublethal toxicity data via RISS is a requirement of the MMER regulation. We would be pleased to enter this information on your behalf, for a fee. Please review the attached reports, and in an e-mail to **reporter@aquatox.ca**, provide us with your RISS user name and password (supplied to you by ECCC), along with written permission for AquaTox to access RISS on your behalf. We will then enter your results. In the future, if you would prefer us to enter the data automatically at the time the reports are issued, please indicate this in writing.

If you have any questions about the results, do not hesitate to contact me.

Sincerely,

AQUATOX TESTING & CONSULTING INC.

Martina Rendas
Project Manager

MR/jl

AquaTox Testing & Consulting Inc.
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TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).

7-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	–	–
LC50	>100%	–	–

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-07-31		
Test Duration :	7 days	Analyst(s) :	MV, RD, MR
IC25 Growth (from Biomass) :	0.87 g/L	LC50 :	1.00 g/L
95% Confidence Limits :	0.78 - 0.93 g/L	95% Confidence Limits :	0.93 - 1.07 g/L
Statistical Method :	Non-Linear Regression (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	0.94 g/L	Historical Mean LC50 :	1.10 g/L
Warning Limits (± 2SD) :	0.71 - 1.24 g/L	Warning Limits (± 2SD) :	0.92 - 1.31 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm18-08	Control/Dilution Water :	Well water (no additional chemicals)
Organism Age :	~07:00 - 21:15 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	0.38 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

•No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

•Inflated swim bladders were confirmed in all test organisms used in this test.

Work Order : 236864
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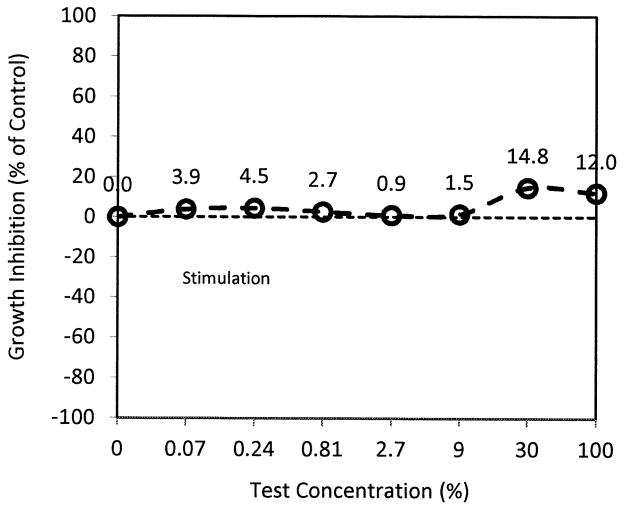
Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b]Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-09-07
yyyy-mm-dd

Approved By : JMdaz
Project Manager

Work Order : 236864
Sample Number : 55841

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2018-08-09	2018-08-10	2018-08-11	2018-08-12	2018-08-13	2018-08-14	2018-08-15	2018-08-16
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 13:45
Initiation Date : 2018-08-09
Completion Date : 2018-08-16

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment Mean Mortality (± SD)
Date :		2018-08-09		2018-08-10		2018-08-11		2018-08-12		2018-08-13		2018-08-14		2018-08-15		2018-08-16		
Analyst(s):		CZN		XD		MW		MV(CG)		CCM		CCM		CCM		XD		
Concentration (%)	Replicate	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	%
Control	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.07	A	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.24	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.81	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2.7	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	1	10	1	10	1	10	6.67 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	
30	A	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	
	B	0	0	0	0	0	0	1	10	1	10	1	10	1	10	1	10	10.00 (±0.00)
	C	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	
100	A	0	0	0	0	0	0	1	10	1	10	1	10	1	10	1	10	
	B	0	0	0	0	0	0	2	20	3	30	3	30	3	30	3	30	16.67 (±11.55)
	C	0	0	0	0	1	10	1	10	1	10	1	10	1	10	1	10	

Aberrant behaviour or swimming impairment : None

Data Reviewed By: JC
Date : 2018-09-07

Work Order : 236864
Sample Number : 55841

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
Control	A	10	0.960	0.979	0.031
	B	10	0.962		
	C	10	1.015		
0.07	A	10	0.884	0.941	0.079
	B	10	0.908		
	C	10	1.031		
0.24	A	10	0.987	0.935	0.101
	B	10	0.819		
	C	10	1.000		
0.81	A	10	1.070	0.953	0.102
	B	10	0.888		
	C	10	0.901		
2.7	A	10	0.853[1]	0.970	0.101
	B	10	1.026		
	C	10	1.031		
9	A	10	0.998	0.964	0.049
	B	10	0.986		
	C	10	0.908		
30	A	10	0.706	0.834	0.134
	B	10	0.822		
	C	10	0.974		
100	A	10	0.884	0.861	0.077
	B	10	0.776		
	C	10	0.924		

NOTES :

- [1]Outlier according to Grubbs Test[b]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.
- Control average dry weight per surviving organism = 0.979 mg

Data Reviewed By: _____
Date : 08-09-07

Work Order : 236864
Sample Number: 55841

Fathead Minnow Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	25.0	7.9	7.2	2033	520

		Day 0 - 1 2018-08-09	Day 1 - 2 2018-08-10	Day 2 - 3 2018-08-11	Day 3 - 4 2018-08-12	Day 4 - 5 2018-08-13	Day 5 - 6 2018-08-14	Day 6 - 7 2018-08-15
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		25.0	24.0	24.0	24.0	24.0	25.0	24.0
Dissolved Oxygen (mg/L)		7.9	8.1	9.1	9.4	9.6	9.4	9.7
Dissolved Oxygen % Sat.[2]		99	98	110	113	116	114	117
pH		7.2	7.2	7.3	7.2	7.2	7.2	7.2
Pre-aeration Time (min)[3]		0	0	20	20	20	20	20
Analyst(s) :	Initial	SK	CCM	MV(CG)	MA	MW	TZL(CG)	TZL(CG)
	Final	XD	MA	MA	CCM	CCM	CCM	XD
Control (0%)								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO % Sat.	Initial	99	100	99	99	100	98	100
DO (mg/L)	Initial	8.2	8.1	8.2	8.2	8.3	8.1	8.3
	Final	7.6	7.5	7.1	6.4	6.5	6.8	6.9
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.3	8.4
	Final	8.2	8.2	8.0	7.9	8.0	8.1	8.0
Cond. (µmhos/cm)	Initial	690	695	694	693	690	732	686
0.07 %								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.2	8.2	8.4	8.2	8.3
	Final	7.6	7.5	7.1	6.6	6.8	6.7	6.9
pH	Initial	8.3	8.4	8.2	8.3	8.3	8.3	8.4
	Final	8.2	8.2	8.0	8.0	8.0	8.0	8.0
Cond. (µmhos/cm)	Initial	696	696	698	700	695	738	691
9 %								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.3	8.3	8.4	8.1	8.3
	Final	7.6	7.5	6.7	6.6	6.5	6.7	6.9
pH	Initial	8.2	8.3	8.3	8.3	8.3	8.3	8.3
	Final	8.1	8.1	7.9	7.9	7.9	8.0	7.9
Cond. (µmhos/cm)	Initial	822	819	821	824	820	854	806
100 %								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	7.8	8.2	8.5	8.7	8.7	8.5	8.8
	Final	7.4	7.5	6.7	6.6	6.5	6.8	6.8
pH	Initial	7.4	7.5	7.5	7.5	7.4	7.4	7.4
	Final	7.4	7.5	7.3	7.2	7.2	7.3	7.3
Cond. (µmhos/cm)	Initial	2052	2044	2039	2050	2045	2041	1917

"–" = not measured

[2] % saturation (adjusted for actual temperature and barometric pressure)

[3] ≤100 bubbles/minute

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TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Test of Reproduction and Survival using the Cladoceran *Ceriodaphnia dubia*. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/21, 2nd ed. (February 2007).

6-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Reproduction)	>100 %	–	–
LC50	>100 %	–	–

The results reported relate only to the sample tested and as received.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-07-31		
Test Duration :	6 days	Analyst(s) :	MW, MR
IC25 Reproduction :	1.09 g/L	LC50 :	2.74 g/L[2]
95% Confidence Limits :	0.90 - 1.30 g/L	95% Confidence Limits :	2.17 - 3.68 g/L
Statistical Method :	Non-linear Regression[1] (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	1.31 g/L	Historical Mean LC50 :	2.21 g/L
Warning Limits (± 2SD) :	1.00 - 1.72 g/L	Warning Limits (± 2SD) :	1.87 - 2.61 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Sample Filtration :	None	Test Volume per Replicate :	15 mL
Test Aeration :	None	Test Vessel :	19 mL polystyrene vial
pH Adjustment :	None	Depth of Test Solution :	4.8 cm
Hardness Adjustment :	None	Number of Replicates :	10
Renewal Frequency :	Once daily (≤24 h)	Organisms per Replicate :	1
Renewal Method :	Transferred to fresh solutions	Number of Concentrations :	7 + 1 Control
Control/Dilution Water :	Well water (no chemicals added)	Test Method Deviation(s) :	None

COMMENTS

[1]Poisson weighting (CETIS)[a] was applied.

[2]Note: The reference toxicant LC50 test result exceeded the 95% warning limits for historical data. No other unusual circumstances were observed and therefore the test result is considered acceptable.

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 236864
Sample Number : 55841

TEST ORGANISMS

Test Organism :	*Ceriodaphnia dubia*	Range of Age (at start of test) :	07:50 h - 19:50 h
Organism Batch :	Cd18-08	Mean Brood Organism Mortality :	0%
Organism Origin :	Single in-house mass culture	Ephippia in Culture :	No
Test Organism Origin :	Individual in-house cultures		

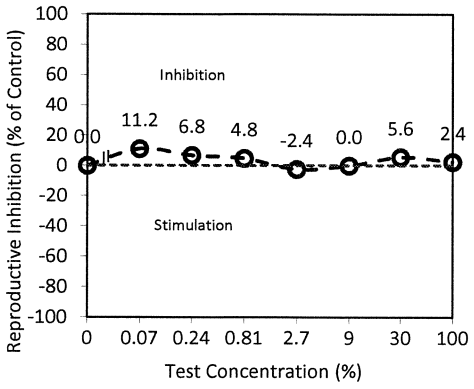
Brood Organism Neonate Production

Replicate :	1	2	3	4	5	6	7	8	9	10	Mean
Total (third or subsequent brood):	12	18	15	12	16	12	12	14	12	15	13.8
Total (first three broods):	25	28	27	25	23	26	27	23	26	25	25.5

No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

TEST DATA

***Ceriodaphnia dubia* Reproductive Inhibition**



Cumulative Daily Test Organism Mortality (%)

		Test Concentration (%)							
Date	**Test Day**	Control	0.07	0.24	0.81	2.7	9	30	100
2018-08-10	1	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0
2018-08-12	3	0	0	0	0	0	0	0	0
2018-08-13	4	0	0	0	0	0	0	0	0
2018-08-14	5	0	0	0	0	0	0	0	0
2018-08-15	6	0	0	0	0	0	0	0	0
Total Mortality (%)		0	0	0	0	0	0	0	0

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b]Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-09-07
yyyy-mm-dd

Approved By : _____
Project Manager

Work Order : 236864
Sample Number : 55841

***Ceriodaphnia dubia* Survival and Reproduction**

Test Initiation Date : 2018-08-09
Initiation Time : 13:50
Test Completion Date : 2018-08-15

Concentration (%) Control	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)	Analyst(s)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0	XD
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0	SEW
2018-08-12	3	5	3	0	0	0	0	0	6	0	2	1.6	SEW
2018-08-13	4	0	0	5	5	4	6	3	0	4	0	2.7	RK
2018-08-14	5	0	9	8	6	9	10	4	8	10	8	7.2	CG
2018-08-15	6	14	12	14	14	13	14	11	14	15	15	13.6	MA
Total		**19**	**24**	**27**	**25**	**26**	**30**	**18**	**28**	**29**	**25**	**25.1 (±4.0)**	

Concentration (%) 2.7	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	5	5	0	0	5	0	0	0	0	1.5
2018-08-13	4	5	0	0	4	7	0	3	3	1	2	2.5
2018-08-14	5	11	9	10	8	11	7	10	6	8	10	9
2018-08-15	6	13	12	12	11	13	14	13	12	13	14	12.7
Total		**29**	**26**	**27**	**23**	**31**	**26**	**26**	**21**	**22**	**26**	**25.7 (±3.1)**

Concentration (%) 0.07	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	0	0	0	0	3	5	0	0	0	0.8
2018-08-13	4	5	6	4	3	3	0	5	6	1	2	3.5
2018-08-14	5	10	7	7	5	10	5	0	6	6	4	6
2018-08-15	6	14	14	10	11	12	12	13	10	11	13	12
Total		**29**	**27**	**21**	**19**	**25**	**20**	**23**	**22**	**18**	**19**	**22.3 (±3.7)**

Concentration (%) 9	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	3	0	0	0	0	0	0	0	0	5	0.8
2018-08-13	4	1	2	5	0	4	4	4	3	5	0	2.8
2018-08-14	5	10	8	9	7	8	8	5	5	6	10	7.6
2018-08-15	6	16	16	11	14	14	13	12	13	14	16	13.9
Total		**30**	**26**	**25**	**21**	**26**	**25**	**21**	**21**	**25**	**31**	**25.1 (±3.5)**

Concentration (%) 0.24	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	2	0	0	0	2	6	0	3	3	4	2
2018-08-13	4	4	5	4	7	0	10	5	0	0	0	3.5
2018-08-14	5	6	6	10	10	7	0	10	5	10	5	6.9
2018-08-15	6	–	11	13	15	12	14	11	11	14	9	11
Total		**12**	**22**	**27**	**32**	**21**	**30**	**26**	**19**	**27**	**18**	**23.4 (±6.1)**

Concentration (%) 30	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	4	0	0	0	0	5	0	0	0	0.9
2018-08-13	4	3	0	4	3	2	0	1	7	2	4	2.6
2018-08-14	5	9	7	5	0	10	6	9	12	5	10	7.3
2018-08-15	6	16	14	9	15	16	7	13	13	12	14	12.9
Total		**28**	**25**	**18**	**18**	**28**	**13**	**28**	**32**	**19**	**28**	**23.7 (±6.2)**

Concentration (%) 0.81	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	2	0	2	0	0	5	4	0	2	0	1.5
2018-08-13	4	0	5	2	6	5	0	0	5	0	3	2.6
2018-08-14	5	7	9	7	6	8	10	6	12	10	9	8.4
2018-08-15	6	14	13	–	12	13	11	12	15	13	11	11.4
Total		**23**	**27**	**11**[3]	**24**	**26**	**26**	**22**	**32**	**25**	**23**	**23.9 (±5.3)**

Concentration (%) 100	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	0	0	3	5	0	0	0	0	0	0.8
2018-08-13	4	6	4	5	0	0	4	5	4	2	5	3.5
2018-08-14	5	11	8	10	9	10	8	9	3	8	10	8.6
2018-08-15	6	10	10	9	11	13	12	14	12	11	14	11.6
Total		**27**	**22**	**24**	**23**	**28**	**24**	**28**	**19**	**21**	**29**	**24.5 (±3.4)**

NOTES : •All young produced by a test organism during its fourth and subsequent broods were discarded and not included in the above counts. The presence of two or more neonates in any test chamber, during any given day of the test, constitutes a brood.

•[3] Outlier according to Grubbs Test [b]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"x"= test organism mortality
"*"= accidental test organism mortality
"–"=4th brood (see 'NOTES')

Data Reviewed By: JL
Date : 2018-09-07

Work Order : 236864
Sample Number: 55841

Ceriodaphnia dubia Water Chemistry Data

	Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
		25.0	7.9	7.2	2033	520

Date :		Day 0 - 1 2018-08-09	Day 1 - 2 2018-08-10	Day 2 - 3 2018-08-11	Day 3 - 4 2018-08-12	Day 4 - 5 2018-08-13	Day 5 - 6 2018-08-14
Sub-sample Used		1	1	1	2	2	3
Temperature (°C)		25.0	24.0	24.0	24.0	24.0	25.0
Dissolved Oxygen (mg/L)		7.9	8.1	9.1	9.4	9.6	9.4
Dissolved Oxygen % Sat.[3]		99	98	110	113	116	114
pH		7.2	7.2	7.3	7.2	7.2	7.2
Pre-aeration Time (min)[4]		0	0	20	20	20	20
Analyst(s)	Initial	SK	CCM	MV(CG)	MA	MW	TZL(CG)
	Final	XD	MA	MA	RK	AS	TZL(CG)
Control (0%)							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO % Sat.[3]	Initial	99	100	99	99	100	98
DO (mg/L)	Initial	8.2	8.1	8.2	8.2	8.3	8.1
	Final	7.3	7.4	7.7	7.4	7.3	7.4
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.3
	Final	8.2	8.2	8.1	8.2	8.1	8.1
Cond. (µmhos/cm)	Initial	690	695	694	693	690	732
0.07 %							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.2	8.2	8.4	8.2
	Final	7.4	7.4	7.8	7.5	7.3	7.4
pH	Initial	8.3	8.4	8.2	8.3	8.3	8.3
	Final	8.2	8.2	8.2	8.2	8.1	8.2
Cond. (µmhos/cm)	Initial	696	696	698	700	695	738
9 %							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.3	8.3	8.4	8.1
	Final	7.4	7.4	7.8	7.5	7.3	7.3
pH	Initial	8.2	8.3	8.3	8.3	8.3	8.3
	Final	8.1	8.1	8.1	8.1	8.0	8.1
Cond. (µmhos/cm)	Initial	822	819	821	824	820	854
100 %							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	7.8	8.2	8.5	8.7	8.7	8.5
	Final	7.2	7.5	7.8	7.5	7.1	7.3
pH	Initial	7.4	7.5	7.5	7.5	7.4	7.4
	Final	7.5	7.5	7.5	7.5	7.4	7.4
Cond. (µmhos/cm)	Initial	2052	2044	2039	2050	2045	2041

"–" = not measured

[3] % saturation (adjusted for actual temperature and barometric pressure)

[4] ≤100 bubbles/minute

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor*. Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

7-DAY TEST RESULTS

Effect	Value (%)	95% Confidence Limits	Statistical Method
IC25 (Frond Yield)	72.3%	36.4 - 86.5	Linear Interpolation (CETIS)[a]
IC25 (Weight)	>97.0	–	–

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-15	Historical Geometric Mean IC25 :	2.04 g/L
Test Duration :	7 days	Warning Limits (± 2SD) :	1.52 - 2.74 g/L
IC25 (Frond Production) :	2.16 g/L	Growth Medium :	Modified APHA
95% Confidence Limits :	1.95 - 2.39 g/L	Analyst(s) :	MA, CZN
Statistical Method :	Non-Linear Regression (CETIS)[a]		

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm18-07	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	10 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	13.33-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	21:15 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4460 - 5250 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

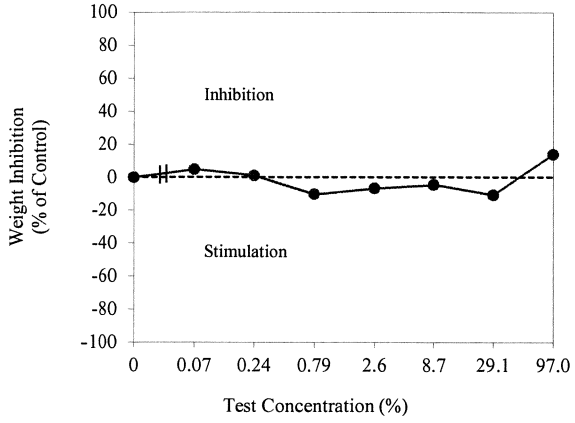
COMMENTS

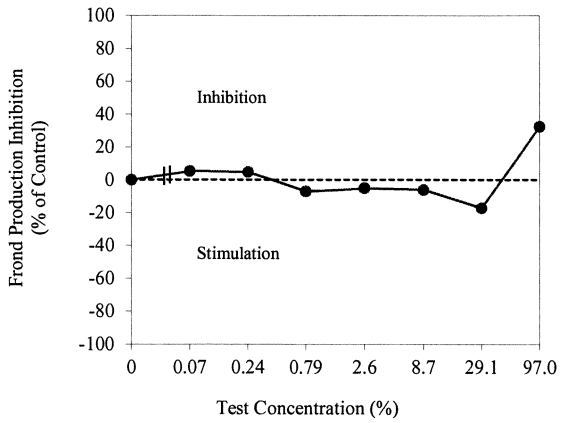
•All test validity criteria as specified in the test method cited above were satisfied.

•Statistical analysis could not be performed using non linear regression, since a suitable model could not be found. Therefore, test results were calculated using Linear Interpolation (CETIS)[a]. In test concentrations where frond production/weights were stimulated (greater than the control), data were replaced with control values for the purposes of statistical analysis, as recommended by Environment Canada (2005).

Work Order : 236864
Sample Number : 55841

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2018-08-10
Intitiation Time : 13:30
Initiated By : MDS

Termination Date : 2018-08-17
Termination Time : 14:00
Terminated By : NK

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2018-08-10	25.0
0	2018-08-10	24.5
1	2018-08-11	25.0
2	2018-08-12	25.0
3	2018-08-13	25.0
4	2018-08-14	25.0
5	2018-08-15	25.0
6	2018-08-16	25.0
7	2018-08-17	25.0

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	7.0	–
Control	8.3	8.4
0.07	8.3	8.4
0.24	–	–
0.79	–	–
2.6	8.3	8.5
8.7	–	–
29.1	–	–
97.0	8.0	8.4

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Environment Canada, 2005. Guidance Document on Statistical Methods for Environmental Toxicity Tests. Environmental Protection Series, Ottawa, Ont., Rept. EPS 1/RM/46.

Date : 2018-09-07
yyyy-mm-dd

Approved By:
Project Manager

Work Order : 236864
Sample Number : 55841

***Lemna minor* Frond Increase**

Test Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
Control	A	6	98	92	79.00	8.87	11.2	Fronds healthy, appearance normal in all replicates.
	B	6	82	76				
	C	6	82	76				
	D	6	78	72				
0.07	A	6	80	74	74.75	0.96	1.3	Fronds healthy, appearance normal in all replicates.
	B	6	81	75				
	C	6	82	76				
	D	6	80	74				
0.24	A	6	83	77	75.25	3.59	4.8	Fronds healthy, appearance normal in all replicates.
	B	6	76	70				
	C	6	84	78				
	D	6	82	76				
0.79	A	6	94	88	84.50	16.60	19.6	Fronds healthy, appearance normal in all replicates.
	B	6	108	102				
	C	6	92	86				
	D	6	68	62				
2.6	A	6	76	70	83.00	15.19	18.3	Fronds healthy, appearance normal in all replicates.
	B	6	110	104				
	C	6	90	84				
	D	6	80	74				
8.7	A	6	102	96	83.75	8.81	10.5	Fronds healthy, appearance normal in all replicates.
	B	6	82	76				
	C	6	85	79				
	D	6	90	84				
29.1	A	6	105	99	92.50	7.51	8.1	Fronds healthy, appearance normal in all replicates.
	B	6	89	83				
	C	6	96	90				
	D	6	104	98				
97.0	A	6	59	53	53.25	1.71	3.2	Fronds healthy, appearance normal in all replicates.
	B	6	57	51				
	C	6	60	54				
	D	6	61	55				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.

•No significant stimulation (α=0.05) of frond increase was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•A 14.2-fold increase in frond number was observed in the control over the testing period.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : JC
Date : 2018-09-07

Work Order : 236864
Sample Number : 55841

Lemna minor Frond Weight Data

Test Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
Control	A	9.41	8.53	0.95
	B	7.22		
	C	9.01		
	D	8.47		
0.07	A	7.66	8.12	0.57
	B	8.51		
	C	7.61		
	D	8.72		
0.24	A	8.62	8.45	0.21
	B	8.35		
	C	8.19		
	D	8.62		
0.79	A	9.75	9.40	1.73
	B	11.49		
	C	9.06		
	D	7.31		
2.6	A	8.68	9.10	0.57
	B	9.93		
	C	8.93		
	D	8.84		
8.7	A	9.54	8.92	0.62
	B	8.23		
	C	8.56		
	D	9.33		
29.1	A	10.37	9.44	1.00
	B	8.27		
	C	8.95		
	D	10.15		
97.0	A	7.41	7.34	0.17
	B	7.27		
	C	7.54		
	D	7.15		

NOTES :

•No significant stimulation (α=0.05) of frond weight was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : JC
Date : 2018-09-07

AquaTox Testing & Consulting Inc.
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TOXICITY TEST REPORT

Pseudokirchneriella subcapitata

EPS 1/RM/25

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007).

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91 %	–	–

The results reported relate only to the sample tested.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2018-08-21	Statistical Method :	Non-Linear Regression (CETIS)[a]
Organism Batch :	Ps18-08	Historical Mean IC25 :	10.4 µg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	4.9 - 22.3 µg/L
IC25 Growth :	8.8 µg/L	Analyst(s) :	AS, MDS, CZN
95% Confidence Limits :	7.5 - 10.2 µg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	9818 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:05 h prior to test initiation
Organism Batch :	Ps18-08	Age (at start of test) :	3 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.
•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

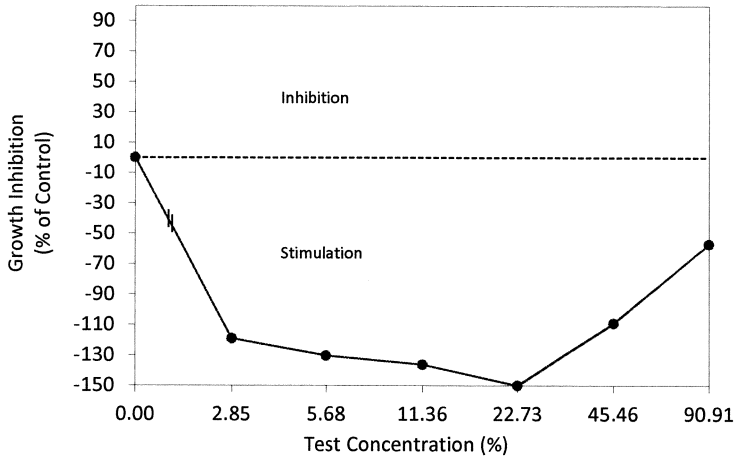
Test Type :	Static	Volume per Replicate :	220 µL
Test Duration :	72 hours	Control Replicates :	10
Mean Temperature (± SD):	24.3°C (± 0.3)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 µm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	3800-4320 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 236864
Sample Number : 55841

***Pseudokirchneriella subcapitata* Growth Inhibition**



CELL ENUMERATION AT 72-HOURS

Initiated By :	SEW	Sample pH (at 0 hours) :	7.0
Completion/Enumeration Date :	2018-08-12	Control pH (at 0 hours) :	7.0
Enumerated By :	RD	Control pH (at 72 hours) :	7.0
Enumeration Method :	Manual (haemocytometer)	Control Cell Increase Factor :	63.2 times growth

Concentration	Cell Concentration (x 10000 cells/mL) Replicate								Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
(%)	1	2	3	4	7	8	9	10				
Control	60.5	59.0	68.5	67.5	62.5	64.5	58.0	56.0	61.08	4.51	7.38	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–	–	–	–	–	–	–	–	–	–
2.85	136.0	125.5	143.0	–	–	–	–	–	133.85	8.81	6.58	119.14
5.68	139.0	144.0	142.0	–	–	–	–	–	140.68	2.52	1.79	130.33
11.36	153.5	138.0	144.5	–	–	–	–	–	144.35	7.78	5.39	136.33
22.73	150.0	153.0	158.0	–	–	–	–	–	152.68	4.04	2.65	149.97
45.46	126.5	128.0	131.5	–	–	–	–	–	127.68	2.57	2.01	109.04
90.91	104.5	95.0	91.0	–	–	–	–	–	95.85	6.93	7.23	56.93

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (α=0.0

- Control replicates 5 and 6 used for pH measurement.
- The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not enumerated/not required

Data Reviewed By : J
Date : 2018-09-07

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Softw LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-09-07 *yyyy-mm-dd*

Approved By : *Project Manager*

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 236864

Shipping Address: AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR #3
Guelph, Ontario Canada N1H 6H9

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	580278
Field Sampler Name (print):	Jennifer Brown
Signature:	
Affiliation:	Agnico Eagle Mines Ltd. - Meliadine Division
Sample Storage (prior to shipping):	Shipped immediately after sampling
Custody Relinquished by:	Jennifer Brown
Date/Time Shipped:	2018-08-07 - 08:00

Client: Agnico Eagle Mines Limited
Meliadine Project
Rankin Inlet, Nunavut, Canada
X0C 0G0
GPS Coordinates 63* 02'15.5" 92* 13'06.3"

Phone: (819) 759-3555

Fax:

Contact: Jennifer Brown

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	RISS Data Entry	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg 2 x 1L, 3 x 10L, etc.)
2018-08-07	07:00	~~EXPP~~ MEL-14 (~~Post-treatment~~)	55841	23.0					✔	✔	✔	✔			✔		3 x 20L

Name change requested by Martin Theriault (email 2018-08-21) JR

For Lab Use Only

Received By:	C2N
Date:	2018-08-09
Time:	10:45
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:
TOXICOLOGY analysis required

Phone number: 819-759-3555 ext 3996

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

September 28, 2018

Jennifer Brown
Agnico Eagle Mines Limited - Meliadine Project
Meliadine Division
Rankin Inlet NU
X0C 0G0

Dear Jennifer,

Re: Report on Sublethal Toxicity Analysis of Wastewater for MMER - August 2018

Enclosed are the reports for sublethal testing conducted with Fathead Minnow, *Lemna minor*, and *Pseudokirchneriella subcapitata* on the sample of MEL-14 collected 2018-08-13. Data are presented in electronic format. The corresponding test with *Ceriodaphnia dubia* was unsuccessful, and requested submission of a sample to retest. Our understanding resampling was not possible at the time of notification.

As you are aware, submission of sublethal toxicity data via RISS is a requirement of the MMER regulation. We would be pleased to enter this information on your behalf, for a fee. Please review the attached reports, and in an e-mail to reporter@aquatox.ca, provide us with your RISS user name and password (supplied to you by ECCC), along with written permission for AquaTox to access RISS on your behalf. We will then enter your results. In the future, if you would prefer us to enter the data automatically at the time the reports are issued, please indicate this in writing.

If you have any questions about the results, do not hesitate to contact me.

Sincerely,

AQUATOX TESTING & CONSULTING INC.

Martina Rendas
Project Manager

MR/jl

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Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 236923
Sample Number : 55913

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-13
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-15
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	21.0 °C
Sampled By :	D. Gorton	Date Tested :	2018-08-16
Sample Description :	Clear, light yellow, odourless.		

Test Method : Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).

7-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	–	–
LC50	>100%	–	–

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-28	Analyst(s) :	MV, RD, MA
Organism Batch :	Fm18-08	Test Duration :	7 days
IC25 Growth (from Biomass) :	0.90 g/L	LC50 :	1.03 g/L
95% Confidence Limits :	0.81 - 0.97 g/L	95% Confidence Limits :	0.96 - 1.11 g/L
Statistical Method :	Non-Linear Regression (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	0.93 g/L	Historical Mean LC50 :	1.09 g/L
Warning Limits (± 2SD) :	0.71 - 1.23 g/L	Warning Limits (± 2SD) :	0.91 - 1.30 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

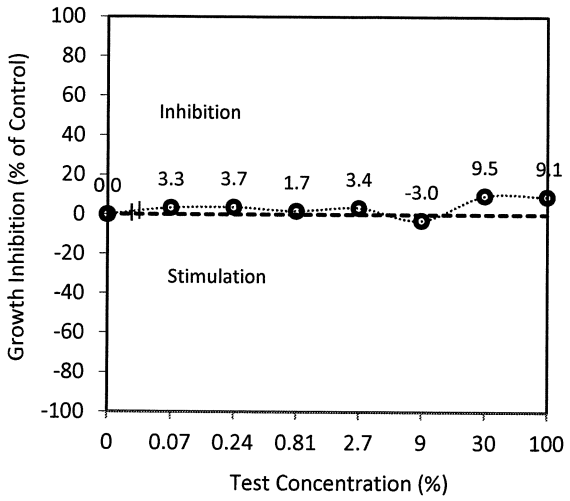
Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm18-08	Control/Dilution Water :	Well water (no additional chemicals)
Organism Age :	~07:00 - 20:35 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	0.77 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

COMMENTS

- All test validity criteria as specified in the test method cited above were satisfied.
- No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.
- Inflated swim bladders were confirmed in all test organisms used in this test.

Work Order : 236923
Sample Number : 55913

Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b] Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-09-27
yyyy-mm-dd

Approved By : Melissa E
Project Manager

AQUATOX

TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 236923
Sample Number : 55913

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2018-08-16	2018-08-17	2018-08-18	2018-08-19	2018-08-20	2018-08-21	2018-08-22	2018-08-23
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 12:15
Initiation Date : 2018-08-16
Completion Date : 2018-08-23

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment Mean Mortality (± SD)
Date :		2018-08-16		2018-08-17		2018-08-18		2018-08-19		2018-08-20		2018-08-21		2018-08-22		2018-08-23		
Analyst(s):		CCM(VC)		CCM(VC)		SEW		CG		SEW		SEW		RK(VC)		CCM(VC)		
Concentration (%)	Replicate	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	%
Control	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.07	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.24	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.81	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2.7	A	0	0	0	0	0	0	0	0	0	0	1	10	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	A	0	0	0	0	0	0	0	0	0	0	0	0	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30	A	0	0	0	0	0	0	0	0	0	0	1	10	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Aberrant behaviour or swimming impairment : None

Data Reviewed By: VC
Date : 2018-09-10

Work Order : 236923
Sample Number : 55913

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
Control	A	10	0.955	0.940	0.015
	B	10	0.926		
	C	10	0.938		
0.07	A	10	0.886	0.909	0.027
	B	10	0.938		
	C	10	0.902		
0.24	A	10	0.871	0.905	0.036
	B	10	0.902		
	C	10	0.943		
0.81	A	10	1.018	0.923	0.085
	B	10	0.897		
	C	10	0.855		
2.7	A	10	0.899	0.908	0.031
	B	10	0.882		
	C	10	0.943		
9	A	10	0.919	0.968	0.045
	B	10	1.007		
	C	10	0.977		
30	A	10	0.799	0.850	0.045
	B	10	0.869		
	C	10	0.883		
100	A	10	0.866	0.854	0.027
	B	10	0.824		
	C	10	0.873		

NOTES :
- No outlying data points were detected according to Grubbs Test[b].
- Control average dry weight per surviving organism = 0.940 mg

Data Reviewed By: VC

Date : 2018-09-10

Work Order : 236923
Sample Number: 55913

Fathead Minnow Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	25.0	8.0	7.2	2021	530

		Day 0 - 1 2018-08-16	Day 1 - 2 2018-08-17	Day 2 - 3 2018-08-18	Day 3 - 4 2018-08-19	Day 4 - 5 2018-08-20	Day 5 - 6 2018-08-21	Day 6 - 7 2018-08-22
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		25.0	24.0	24.0	24.0	25.0	24.0	24.0
Dissolved Oxygen (mg/L)		8.0	8.9	9.2	9.0	9.3	8.9	9.6
Dissolved Oxygen % Sat.[1]		98	109	112	110	112	108	118
pH		7.2	7.3	7.2	7.2	7.2	7.3	7.2
Pre-aeration Time (min)[2]		0	20	20	20	20	20	20
Analyst(s) :	Initial	CCM(VC)	CCM(VC)	RK(VC)	RK(VC)	CCM(VC)	CCM(VC)	SEW
	Final	CCM(VC)	RK(VC)	CG	SEW	SEW	RK(VC)	XD
Control (0%)								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO % Sat.[1]	Initial	100	102	100	102	100	100	100
DO (mg/L)	Initial	8.2	8.5	8.2	8.5	8.3	8.3	8.2
	Final	7.0	6.4	7.1	6.6	6.8	6.8	7.0
pH	Initial	8.3	8.4	8.3	8.4	8.4	8.4	8.4
	Final	8.1	8.0	8.0	7.9	8.1	8.1	8.0
Cond. (µmhos/cm)	Initial	615	611	705	703	615	615	634
0.07 %								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO (mg/L)	Initial	8.3	8.4	8.2	8.4	8.1	8.3	8.2
	Final	6.9	6.5	7.0	6.4	6.8	6.9	7.0
pH	Initial	8.4	8.4	8.4	8.4	8.3	8.4	8.4
	Final	8.1	8.0	8.0	7.9	8.0	8.1	8.0
Cond. (µmhos/cm)	Initial	612	612	710	709	615	614	635
9 %								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO (mg/L)	Initial	8.2	8.6	8.2	8.6	8.3	8.5	8.4
	Final	7.0	6.6	6.9	6.5	6.7	6.8	7.1
pH	Initial	8.3	8.3	8.3	8.3	8.3	8.4	8.3
	Final	8.1	8.0	7.9	7.8	7.9	8.0	8.0
Cond. (µmhos/cm)	Initial	743	739	828	835	746	744	756
100 %								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO (mg/L)	Initial	8.1	8.6	8.9	8.8	8.5	8.6	9.1
	Final	7.3	6.8	7.1	6.5	6.8	7.1	7.1
pH	Initial	7.4	7.5	7.5	7.5	7.4	7.6	7.6
	Final	7.5	7.3	7.4	7.3	7.3	7.4	7.5
Cond. (µmhos/cm)	Initial	2034	2021	2012	2035	2024	1999	1987

"–" = not measured

[1] % saturation (adjusted for actual temperature and barometric pressure)

[2] ≤100 bubbles/minute

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TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 236923
Sample Number : 55913

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-13
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-15
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	21.0 °C
Sampled By :	D. Gorton	Date Tested :	2018-08-16
Sample Description :	Clear, light yellow, odourless.		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor*. Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

7-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Frond Yield)	38.2%	26.6 - 52.1	Non-Linear Regression* (CETIS)[a]
IC25 (Weight)	42.0%	26.5 - 63.2	Non-Linear Regression (CETIS)[a]

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-15	Statistical Method :	Non-Linear Regression (CETIS)[a]
Organism Batch :	Lm18-08	Historical Geometric Mean IC25 :	2.04 g/L
Test Duration :	7 days	Warning Limits (± 2SD) :	1.52 - 2.74 g/L
IC25 (Frond Production) :	2.16 g/L	Growth Medium :	Modified APHA
95% Confidence Limits :	1.95 - 2.39 g/L	Analyst(s) :	MA, CZN

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

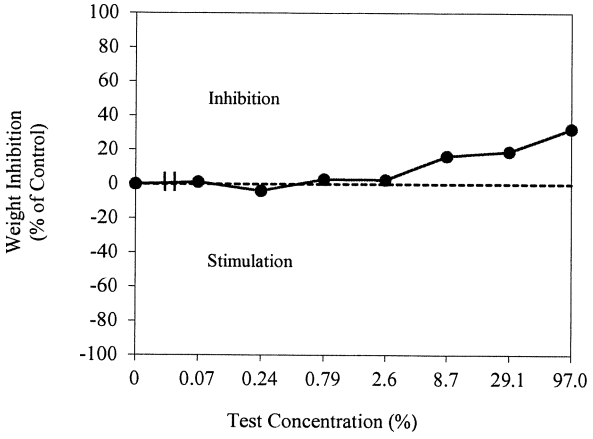
Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm18-08	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	9 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	22.2-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	23:20 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4100 - 5290 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

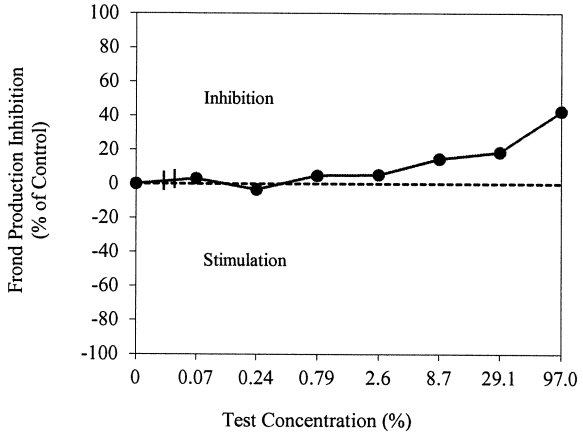
COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.
*Box-Cox weighting (CETIS)[a] was applied.

Work Order : 236923
Sample Number : 55913

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2018-08-16
Intitiation Time : 14:20
Initiated By : CG/MDS

Termination Date : 2018-08-23
Termination Time : 15:00
Terminated By : NK

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2018-08-16	25.0
0	2018-08-16	24.5
1	2018-08-17	24.5
2	2018-08-18	24.0
3	2018-08-19	24.0
4	2018-08-20	24.0
5	2018-08-21	24.0
6	2018-08-22	24.5
7	2018-08-23	24.0

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	7.2	–
Control	8.3	8.5
0.07	8.3	8.6
0.24	–	–
0.79	–	–
2.6	8.3	8.6
8.7	–	–
29.1	–	–
97.0	8.0	8.6

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-09-27
yyyy-mm-dd

Approved By:
Project Manager

Work Order : 236923
Sample Number : 55913

Lemna minor Frond Increase

Test Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
Control	A	6	152	146	125.50	21.67	17.3	Fronds healthy, appearance normal in all replicates.
	B	6	127	121				
	C	6	144	138				
	D	6	103	97[1]				
0.07	A	6	131	125	121.75	2.22	1.8	Fronds healthy, appearance normal in all replicates.
	B	6	127	121				
	C	6	127	121				
	D	6	126	120				
0.24	A	6	139	133	129.75	5.25	4.0	Fronds healthy, appearance normal in all replicates.
	B	6	128	122				
	C	6	139	133				
	D	6	137	131				
0.79	A	6	122	116	119.50	10.91	9.1	Fronds healthy, appearance normal in all replicates.
	B	6	131	125				
	C	6	112	106				
	D	6	137	131				
2.6	A	6	120	114	119.00	5.94	5.0	Fronds healthy, appearance normal in all replicates.
	B	6	133	127				
	C	6	121	115				
	D	6	126	120				
8.7	A	6	120	114	107.25	7.63	7.1	Fronds healthy, appearance normal in all replicates.
	B	6	110	104				
	C	6	119	113				
	D	6	104	98				
29.1	A	6	121	115	102.25	10.24	10.0	Fronds healthy, appearance normal in all replicates.
	B	6	107	101				
	C	6	96	90				
	D	6	109	103				
97.0	A	6	82	76	72.00	6.78	9.4	Fronds healthy, appearance normal in all replicates.
	B	6	85	79				
	C	6	70	64				
	D	6	75	69				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.

•No significant stimulation (α=0.05) of frond increase was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•A 21.9-fold increase in frond number was observed in the control over the testing period.

• [1]Outlier according to Grubbs Test (CETIS)[a]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-09-10

Work Order : 236923
Sample Number : 55913

Lemna minor Frond Weight Data

Test Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
Control	A	13.11	12.54	0.72
	B	12.06		
	C	13.19		
	D	11.79		
0.07	A	13.01	12.41	0.65
	B	11.61		
	C	12.14		
	D	12.87		
0.24	A	13.41	13.03	0.54
	B	12.23		
	C	13.17		
	D	13.30		
0.79	A	12.62	12.19	1.27
	B	12.72		
	C	10.31		
	D	13.12		
2.6	A	12.10	12.23	0.87
	B	13.33		
	C	11.20		
	D	12.29		
8.7	A	11.33	10.49	0.72
	B	10.11		
	C	10.82		
	D	9.71		
29.1	A	11.66	10.16	1.15
	B	9.60		
	C	9.00		
	D	10.39		
97.0	A	9.20	8.49	0.53
	B	8.49		
	C	7.94		
	D	8.32		

NOTES :

- No significant stimulation (α=0.05) of frond weight was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-09-10

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TOXICITY TEST REPORT

Pseudokirchneriella subcapitata

EPS 1/RM/25

Work Order : 236923
Sample Number : 55913

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-13
Location :	Rankin Inlet NU	Time Collected :	7:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-15
Substance :	MEL-14	Time Received :	11:00
Sampling Method :	Grab	Temperature upon Receipt :	21.0 °C
Sampled By :	D. Gorton	Date Tested :	2018-08-16
Sample Description :	Clear, light yellow, odourless.		

Test Method : Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007).

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91 %	–	–

The results reported relate only to the sample tested and as received.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2018-08-21	Statistical Method :	Non-Linear Regression (CETIS)[a]
Organism Batch :	Ps18-08	Historical Mean IC25 :	10.4 µg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	4.9 - 22.3 µg/L
IC25 Growth :	8.8 µg/L	Analyst(s) :	AS, MDS, CZN
95% Confidence Limits :	7.5 - 10.2 µg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	10955 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:10 h prior to test initiation
Organism Batch :	Ps18-08	Age (at start of test) :	3 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.
•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

Test Type :	Static	Volume per Replicate :	220 µL
Test Duration :	72 hours	Control Replicates :	10
Mean Temperature (± SD):	24.1°C (± 0.3)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 µm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	3810-4160 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

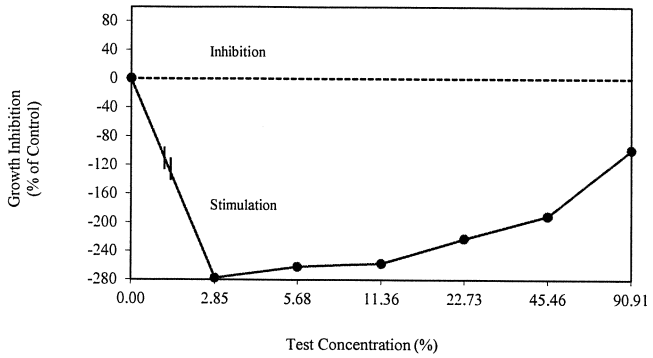
AQUATOX

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata
EPS 1/RM/25

Work Order : 236923
Sample Number : 55913

***Pseudokirchneriella subcapitata* Growth Inhibition**



CELL ENUMERATION AT 72-HOURS

Initiated By : CG/MA
Completion/Enumeration Date : 2018-08-19
Enumerated By : CG
Enumeration Method : Manual (haemocytometer)

Sample pH (at 0 hours) : 7.2
Control pH (at 0 hours) : 7.0
Control pH (at 72 hours) : 7.0
Control Cell Increase Factor : 29.4 times growth

Concentration	Cell Concentration (x 10000 cells/mL) Replicate								Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
(%)	1	2	3	4	7	8	9	10				
Control	26.5	30.5	31.5	38.0	35.5	34.0	30.5	31.0	31.09	3.54	11.40	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–	–	–	–	–	–	–	–	–	–
2.85	122.5	118.5	115.0	–	–	–	–	–	117.57	3.75	3.19	278.14
5.68	116.5	109.0	115.5	–	–	–	–	–	112.57	4.07	3.62	262.06
11.36	118.0	109.0	110.0	–	–	–	–	–	111.24	4.93	4.43	257.77
22.73	96.5	101.0	107.0	–	–	–	–	–	100.40	5.27	5.25	222.93
45.46	101.5	85.0	88.5	–	–	–	–	–	90.57	8.69	9.60	191.30
90.91	54.0	63.5	71.5	–	–	–	–	–	61.90	8.76	14.15	99.10

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (a=0.05).
- Control replicates 5 and 6 used for pH measurement.
- The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not enumerated/not required

Data Reviewed By : VC
Date : 2018-09-10

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-09-27
yyyy-mm-dd

Approved By : *Project Manager*

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 236923

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road,
Puslinch, Ontario, Canada
N0B2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	580278
Field Sampler Name (print):	Dan Gorton
Signature:	
Affiliation:	Agnico Eagle Mines Ltd. - Meliadine Division
Sample Storage (prior to shipping):	Shipped immediately after sampling
Custody Relinquished by:	Dan Gorton
Date/Time Shipped:	2018-08-13 - 08:00

Client: Agnico Eagle Mines Limited
Meliadine Project
Rankin Inlet, Nunavut, Canada
X0C 0G0
GPS Coordinates 63°02'15.5" 92°13'06.3"

Phone: (819) 759-3555

Fax:

Contact: Dan Gorton

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	RISS Data Entry	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2018-08-13	07:00	~~EWTP~~ MEL-14 ~~(Post-treatment)~~	55913	21.0					✓	✓	✓	✓			✓		3 x 20L
		Name change requested by Martin Theriault (email 20180821) JR.															

For Lab Use Only

Received By:	NK/RK
Date:	2018-08-15
Time:	11:00
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:
TOXICOLOGY analysis required

Phone number: 819-759-3555 ext 3996

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

October 16, 2018

Jennifer Brown
Agnico Eagle Mines Limited - Meliadine Project
Meliadine Division
Rankin Inlet NU
X0C 0G0

Dear Jennifer,

Re: Report on Sublethal Toxicity Analysis of Wastewater for MMER - September 2018

Enclosed are the reports for sublethal testing conducted on the sample of MEL-14 collected 2018-09-03. Data are presented in electronic format.

As you are aware, submission of sublethal toxicity data via RISS is a requirement of the MMER regulation. We would be pleased to enter this information on your behalf, for a fee. Please review the attached reports, and in an e-mail to **reporter@aquatox.ca**, provide us with your RISS user name and password (supplied to you by ECCC), along with written permission for AquaTox to access RISS on your behalf. We will then enter your results. In the future, if you would prefer us to enter the data automatically at the time the reports are issued, please indicate this in writing.

If you have any questions about the results, do not hesitate to contact me.

Sincerely,

AQUATOX TESTING & CONSULTING INC.

Martina Rendas
Project Manager

MR/jl

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		
Test Method :	Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).		

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	-	-
LC50	>100%	-	-

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-28		
Test Duration :	7 days	Analyst(s) :	MV, RD, MA
IC25 Growth (from Biomass) :	0.90 g/L	LC50 :	1.03 g/L
95% Confidence Limits :	0.81 - 0.97 g/L	95% Confidence Limits :	0.96 - 1.11 g/L
Statistical Method :	Non-Linear Regression (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	0.93 g/L	Historical Mean LC50 :	1.09 g/L
Warning Limits (± 2SD) :	0.71 - 1.23 g/L	Warning Limits (± 2SD) :	0.91 - 1.30 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

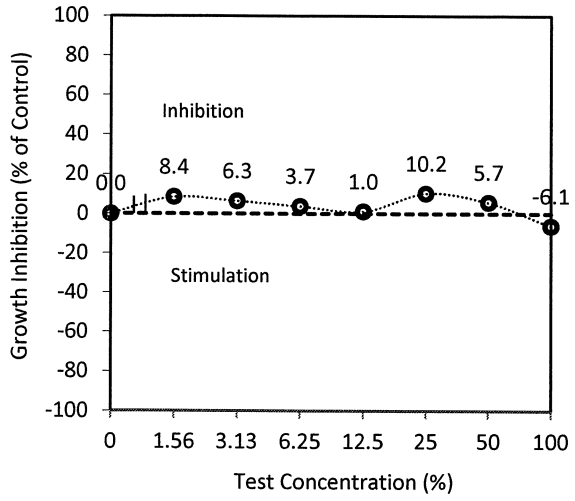
Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm18-09	Control/Dilution Water :	Well water (no chemicals added)
Organism Age :	~07:00 - 23:35 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	1.54 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

COMMENTS

- All test validity criteria as specified in the test method cited above were satisfied.
- No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.
- Inflated swim bladders were confirmed in all test organisms used in this test.

Work Order : 237106
Sample Number : 56153

Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b] Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-10-16
yyyy-mm-dd

Approved By : _____
Project Manager

Work Order : 237106
Sample Number : 56153

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2018-09-06	2018-09-07	2018-09-08	2018-09-09	2018-09-10	2018-09-11	2018-09-12	2018-09-13
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 15:45
Initiation Date : 2018-09-06
Completion Date : 2018-09-13

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment
Date :		2018-09-06		2018-09-07		2018-09-08		2018-09-09		2018-09-10		2018-09-11		2018-09-12		2018-09-13		Mean Mortality (± SD)
Analyst(s):		NK		MV(VC)		RK(VC)		MV(VC)		TL		CCM(VC)		TL		SD(RD)		
Concentration		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	%
(%)	Replicate	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	
Control	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.56	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2*	0	0.00 (±0.00)*
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3.13	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.25	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12.5	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
25	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.67 (±11.55)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	2	20	2	20	2	20	2	20	2	20	
100	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Aberrant behaviour or swimming impairment : None

NOTES : *2018-09-13: Replicate 1.56-A was accidentally spilled. Two test organisms were lost from the test vessel, resulting in accidental mortalities (SD/RD). The test organisms that suffered accidental mortalities were excluded from statistical analysis. All test endpoints were calculated from a total of 8 test organisms exposed in replicate 1.56-A (VC).

Test Data Reviewed By: VC
Date : 2018-10-04

Work Order : 237106
Sample Number : 56153

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
Control	A	10	0.806	0.817	0.022
	B	10	0.802		
	C	10	0.842		
1.56	A	8*	0.758	0.748	0.014
	B	10	0.732		
	C	10	0.755		
3.13	A	10	0.769	0.765	0.042
	B	10	0.805		
	C	10	0.721		
6.25	A	10	0.764	0.786	0.032
	B	10	0.823		
	C	10	0.772		
12.5	A	10	0.843	0.809	0.077
	B	10	0.862		
	C	10	0.721		
25	A	10	0.714[1]	0.733	0.016
	B	10	0.742		
	C	10	0.743		
50	A	10	0.797	0.770	0.070
	B	10	0.823		
	C	10	0.691		
100	A	10	0.875	0.867	0.024
	B	10	0.840		
	C	10	0.885		

NOTES :

- [1]Outlier according to Grubbs Test[b]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.
- Control average dry weight per surviving organism = 0.817 mg

*Two accidental mortalities (see note on pg. 3).

Test Data Reviewed By: VC
Date : 2018-10-04

Work Order : 237106
Sample Number: 56153

WATER CHEMISTRY DATA

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	24.0	8.7	6.8	2184	540

		Day 0 - 1 2018-09-06	Day 1 - 2 2018-09-07	Day 2 - 3 2018-09-08	Day 3 - 4 2018-09-09	Day 4 - 5 2018-09-10	Day 5 - 6 2018-09-11	Day 6 - 7 2018-09-12
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		24.0	24.0	24.0	24.0	25.0	25.0	24.0
Dissolved Oxygen (mg/L)		8.7	8.5	9.1	9.5	9.4	8.9	9.8
Dissolved Oxygen % Sat.[2]		105	103	109	114	113	108	118
pH		6.8	6.9	6.9	6.9	7.0	6.8	6.9
Pre-aeration Time (min)[3]		20	20	20	20	20	20	20
Analyst(s) :	Initial	SD(RD)	SD(RD)	RK(VC)	RK(VC)	SD(RD)	SD(RD)	SD(RD)
	Final	MV(VC)	RK(VC)	MV(VC)	TL	CCM(VC)	SD(RD)	SD(RD)
Control (0%)								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO % Sat.[2]	Initial	100	100	101	100	100	100	98
DO (mg/L)	Initial	8.2	8.3	8.3	8.4	8.4	8.2	8.1
	Final	7.4	7.3	7.1	6.8	6.6	7.0	7.5
pH	Initial	8.4	8.3	8.3	8.3	8.4	8.4	8.4
	Final	8.1	8.0	8.2	8.1	8.0	8.0	8.1
Cond. (µmhos/cm)	Initial	681	678	677	702	693	669	703
1.56 %								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO (mg/L)	Initial	8.4	8.4	8.3	8.4	8.2	8.2	8.2
	Final	7.5	7.5	6.9	6.7	6.7	7.1	7.5
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.4	8.3
	Final	8.1	8.1	8.1	8.0	8.0	8.1	8.1
Cond. (µmhos/cm)	Initial	708	705	698	728	717	746	715
25 %								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO (mg/L)	Initial	8.4	8.4	8.4	8.5	8.3	8.3	8.3
	Final	7.5	7.4	7.2	6.8	6.7	7.0	7.5
pH	Initial	8.1	8.1	8.2	8.2	8.1	8.2	8.2
	Final	8.0	8.0	8.0	7.9	7.9	7.9	8.0
Cond. (µmhos/cm)	Initial	1062	1067	1065	1086	1070	1137	1093
100 %								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO (mg/L)	Initial	8.5	8.5	8.8	8.9	9.0	8.8	9.2
	Final	7.6	7.7	7.3	7.0	6.8	7.6	7.5
pH	Initial	7.1	7.1	7.2	7.2	7.2	7.3	7.1
	Final	7.3	7.3	7.2	7.1	7.0	7.0	7.2
Cond. (µmhos/cm)	Initial	2185	2188	2188	2188	2183	2330	2222

"–" = not measured

[2] % saturation (adjusted for actual temperature and barometric pressure)

[3] ≤100 bubbles/minute

Test Data Reviewed By : VC
Date: 2018-10-04

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		

Test Method : Test of Reproduction and Survival using the Cladoceran *Ceriodaphnia dubia*. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/21, 2nd ed. (February 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
LC50	>100%	-	-
IC25 (Reproduction)	90.1%	23.3-96.3	Linear Interpolation (TOXSTAT) d

The results reported relate only to the sample tested and as received.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-28		
Test Duration :	6 days	Analyst(s) :	MW, MA
IC25 Reproduction :	1.46 g/L	LC50 :	2.32 g/L
95% Confidence Limits :	0.98 - 1.82 g/L	95% Confidence Limits :	1.80 - 3.00 g/L
Statistical Method :	Linear Interpolation (CETIS)[a]	Statistical Method :	Binomial (CETIS)[a]
Historical Mean IC25 :	1.30 g/L	Historical Mean LC50 :	2.23 g/L
Warning Limits (± 2SD) :	0.98 - 1.73 g/L	Warning Limits (± 2SD) :	1.84 - 2.70 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Sample Filtration :	None	Test Volume per Replicate :	15 mL
Test Aeration :	None	Test Vessel :	19 mL polystyrene vial
pH Adjustment :	None	Depth of Test Solution :	4.8 cm
Hardness Adjustment :	None	Organisms per Replicate :	1
Daily Renewal Method :	Transferred to fresh solutions	Number of Replicates :	10
Control/Dilution Water :	Well water (no chemicals added)	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.
•Statistical analysis could not be performed using non linear regression, since a suitable model could not be found. Therefore, test results were calculated using Linear Interpolation (Toxstat)[d]. In test concentrations where reproduction was stimulated (greater than the control), data were replaced with control values for the purposes of statistical analysis, as recommended by Environment Canada (2005).

Work Order : 237106
Sample Number : 56153

TEST ORGANISMS

Test Organism :	*Ceriodaphnia dubia*	Range of Age (at start of test) :	19:40 h - 23:40 h
Organism Batch :	Cd18-09	Mean Brood Organism Mortality :	3.3%
Organism Origin :	Single in-house mass culture	Ephippia in Culture :	No
Test Organism Origin :	Individual in-house cultures		

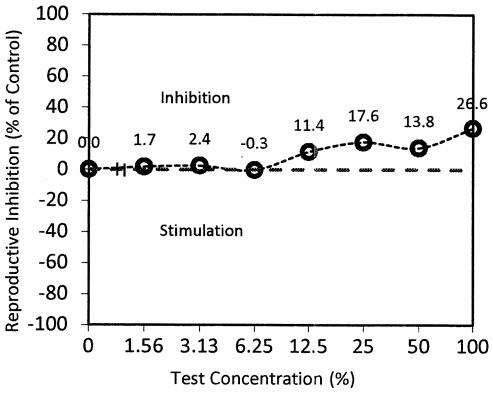
Brood Organism Neonate Production

Replicate :	1	2	3	4	5	6	7	8	9	10	Mean
Total (third or subsequent brood):	16	9	15	15	15	17	12	17	16	15	14.7
Total (first three broods):	23	19	23	19	21	23	21	25	20	23	21.7

No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

TEST DATA

***Ceriodaphnia dubia* Reproductive Inhibition**



Cumulative Daily Test Organism Mortality (%)

		Test Concentration (%)							
Date	**Test Day**	Control	1.56	3.13	6.25	12.5	25	50	100
2018-09-07	1	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0
2018-09-09	3	0	0	0	0	0	0	0	0
2018-09-10	4	0	0	0	0	0	0	10	10
2018-09-11	5	0	0	0	0	10	0	10	10
2018-09-12	6	0	0	0	0	10	0	20	10
Total Mortality (%)		0	0	0	0	10	0	20	10

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[d] West, Inc. and D. Gulley. 1996. Toxstat Release 3.5. Western Ecosystems Technology. Cheyenne, WY, U.S.A.

Environment Canada, 2005. Guidance Document on Statistical Methods for Environmental Toxicity Tests. Environmental Protection Series, Ottawa, Ont., Rept. EPS 1/RM/46.

Date : 2018-10-16
yyyy-mm-dd

Approved By : *Project Manager*

AQUATOX

TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order : 237106
Sample Number : 56153

Ceriodaphnia dubia Survival and Reproduction

Test Initiation Date : 2018-09-06
Initiation Time : 13:40
Test Completion Date : 2018-09-12

Concentration (%) Control	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)	Analyst(s)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0	RD
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0	HR
2018-09-09	3	5	5	6	6	3	6	4	5	7	6	5.3	AW
2018-09-10	4	9	8	8	10	0	12	12	11	8	0	7.8	SK
2018-09-11	5	0	0	0	0	8	0	0	0	0	14	2.2	SK
2018-09-12	6	13	11	11	13	11	14	16	16	14	17	13.6	CCM(VC)
Total		**27**	**24**	**25**	**29**	**22**	**32**	**32**	**32**	**29**	**37**	**28.9 (±4.5)**	

Concentration (%) 12.5	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	5	5	5	4	4	4	5	6	5	4	4.7
2018-09-10	4	10	8	10	8	0	11	9	11	10	0	7.7
2018-09-11	5	0	0	0	0	9	0	0	0	0 x	12	2.1
2018-09-12	6	10	12	11	12	11	13	15	14	0	13	11.1
Total		**25**	**25**	**26**	**24**	**24**	**28**	**29**	**31**	**15**	**29**	**25.6 (±4.4)**

Concentration (%) 1.56	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	4	3	3	6	5	6	5	5	4	5	4.6
2018-09-10	4	0	8	10	7	13	12	13	8	9	1	8.1
2018-09-11	5	11	0	0	0	0	0	0	0	0	11	2.2
2018-09-12	6	12	12	12	13	16	16	11	13	14	16	13.5
Total		**27**	**23**	**25**	**26**	**34**	**34**	**29**	**26**	**27**	**33**	**28.4 (±3.9)**

Concentration (%) 25	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	0	6	3	6	2	1	4	2	4	2	3
2018-09-10	4	9	7	7	10	0	7	10	10	5	12	7.7
2018-09-11	5	0	0	0	0	8	0	0	0	0	0	0.8
2018-09-12	6	14	12	12	15	11	15	13	11	8	12	12.3
Total		**23**	**25**	**22**	**31**	**21**	**23**	**27**	**23**	**17**	**26**	**23.8 (±3.8)**

Concentration (%) 3.13	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	2	6	5	4	4	5	5	4	6	5	4.6
2018-09-10	4	9	10	10	7	0	11	10	11	13	9	9
2018-09-11	5	0	0	0	0	8	0	0	0	0	0	0.8
2018-09-12	6	14	11	14	13	13	16	13	15	16	13	13.8
Total		**25**	**27**	**29**	**24**	**25**	**32**	**28**	**30**	**35**	**27**	**28.2 (±3.4)**

Concentration (%) 50	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	5	2	5	6	4	4	5	4	3	3	4.1
2018-09-10	4	8	11	7	10	8	14	10	9 x	10	11	9.8
2018-09-11	5	0	0	0	0	0	0	0	0	0	0	0
2018-09-12	6	14	15	11	14	12	13	2 x	0	14	15	11
Total		**27**	**28**	**23**	**30**	**24**	**31**	**17**	**13**	**27**	**29**	**24.9 (±5.8)**

Concentration (%) 6.25	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	5	4	3	6	1	5	6	5	4	4	4.3
2018-09-10	4	11	10	9	10	2	13	11	9	11	9	9.5
2018-09-11	5	0	0	0	0	8	0	0	0	0	0	0.8
2018-09-12	6	14	12	15	14	13	14	15	17	14	16	14.4
Total		**30**	**26**	**27**	**30**	**24**	**32**	**32**	**31**	**29**	**29**	**29.0 (±2.6)**

Concentration (%) 100	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	2	6	4	4	4	3	4	4	3	4	3.8
2018-09-10	4	10	10	7	11	12	10	9	0 x	11	12	9.2
2018-09-11	5	0	0	0	0	0	0	0	0	0	0	0
2018-09-12	6	7	3	7	11	13	10	12	0	9	10	8.2
Total		**19**	**19**	**18**	**26**	**29**	**23**	**25**	**4[1]**	**23**	**26**	**21.2 (±7.0)**

NOTES : •All young produced by a test organism during its fourth and subsequent broods were discarded and not included in the above counts. The presence of two or more neonates in any test chamber, during any given day of the test, constitutes a brood.
•[1] Outlier according to Grubbs Test (CETIS)[a]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"x"= test organism mortality
"*"= accidental test organism mortality
"–"=4th brood (see 'NOTES')

Data Reviewed By : VC
Date : 2018-10-04

Work Order : 237106
Sample Number: 56153

Ceriodaphnia dubia Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	24.0	8.7	6.8	2184	540

Date :		Day 0 - 1 2018-09-06	Day 1 - 2 2018-09-07	Day 2 - 3 2018-09-08	Day 3 - 4 2018-09-09	Day 4 - 5 2018-09-10	Day 5 - 6 2018-09-11
Sub-sample Used		1	1	1	2	2	3
Temperature (°C)		24.0	24.0	24.0	24.0	25.0	25.0
Dissolved Oxygen (mg/L)		8.7	8.5	9.1	9.5	9.4	8.9
Dissolved Oxygen % Sat.[2]		105	103	109	114	113	108
pH		6.8	6.9	6.9	6.9	7.0	6.8
Pre-aeration Time (min)[3]		20	20	20	20	20	20
Analyst(s)	Initial	SD(RD)	SD(RD)	RK(VC)	RK(VC)	SD(RD)	SD(RD)
	Final	SD(RD)	HR	AW	SK	SK	CCM(VC)
Control (0%)							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO % Sat.[2]	Initial	100	100	101	100	100	100
DO (mg/L)	Initial	8.2	8.3	8.3	8.4	8.4	8.2
	Final	7.7	7.7	7.4	7.1	6.8	7.2
pH	Initial	8.4	8.3	8.3	8.3	8.4	8.4
	Final	8.2	8.2	8.2	8.2	8.2	8.1
Cond. (µmhos/cm)	Initial	681	678	677	702	693	669
1.56 %							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO (mg/L)	Initial	8.4	8.4	8.3	8.4	8.2	8.2
	Final	7.7	7.6	7.5	7.2	7.1	7.3
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.4
	Final	8.2	8.2	8.2	8.2	8.2	8.2
Cond. (µmhos/cm)	Initial	708	705	698	728	717	746
25 %							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO (mg/L)	Initial	8.4	8.4	8.4	8.5	8.3	8.3
	Final	7.6	7.7	7.4	7.2	6.9	7.2
pH	Initial	8.1	8.1	8.2	8.2	8.1	8.2
	Final	8.1	8.0	8.1	8.0	8.0	8.0
Cond. (µmhos/cm)	Initial	1062	1067	1065	1086	1070	1137
100 %							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO (mg/L)	Initial	8.5	8.5	8.8	8.9	9.0	8.8
	Final	7.8	7.9	7.6	7.5	7.2	7.5
pH	Initial	7.1	7.1	7.2	7.2	7.2	7.3
	Final	7.5	7.5	7.5	7.4	7.4	7.3
Cond. (µmhos/cm)	Initial	2185	2188	2188	2188	2183	2330

"–" = not measured

[2] % saturation (adjusted for actual temperature and barometric pressure)

[3] ≤100 bubbles/minute

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TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor.* Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Weight)	>97.0%	-	-
IC25 (Frond Production)	>97.0%	-	-

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-09-12	Statistical Method :	Non-Linear Regression (CETIS)[a]
Test Duration :	7 days	Historical Geometric Mean IC25 :	2.11 g/L
IC25 (Frond Production) :	2.45 g/L	Warning Limits (± 2SD) :	1.57 - 2.85 g/L
95% Confidence Limits :	1.99 - 2.90 g/L	Growth Medium :	Modified APHA
		Analyst(s) :	MDS

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

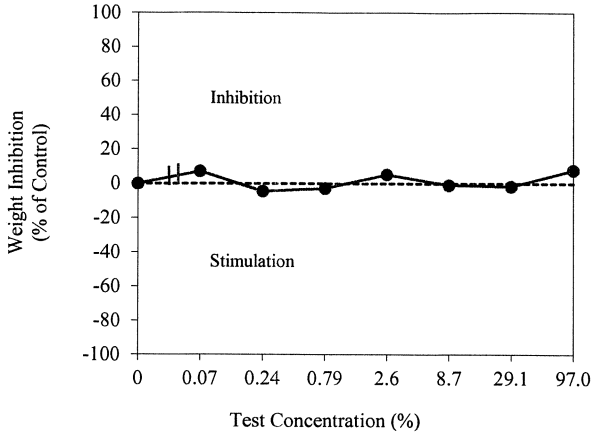
Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm18-08	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	9 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	16.16-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	19:50 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4290 - 5440 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

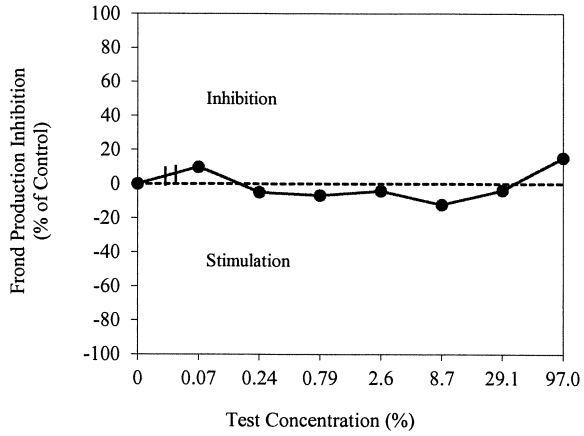
COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 237106
Sample Number : 56153

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2018-09-06
Intitiation Time : 13:15
Initiated By : SEW

Termination Date : 2018-09-13
Termination Time : 13:10
Terminated By : MDS

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2018-09-06	25.0
0	2018-09-06	25.0
1	2018-09-07	24.0
2	2018-09-08	24.0
3	2018-09-09	24.0
4	2018-09-10	24.0
5	2018-09-11	24.0
6	2018-09-12	24.0
7	2018-09-13	24.0

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	6.8	–
Control	8.3	8.4
0.07	8.2	8.4
0.24	–	–
0.79	–	–
2.6	8.3	8.4
8.7	–	–
29.1	–	–
97.0	7.8	9.2

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-10-16
yyyy-mm-dd

Approved By:
Project Manager

Work Order : 237106
Sample Number : 56153

Lemna minor Frond Increase

Test Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
Control	A	6	69	63	66.25	8.06	12.2	Fronds healthy, appearance normal in all replicates.
	B	6	83	77				
	C	6	73	67				
	D	6	64	58				
0.07	A	6	77	71	59.75	9.00	15.1	Fronds healthy, appearance normal in all replicates.
	B	6	58	52				
	C	6	69	63				
	D	6	59	53				
0.24	A	6	65	59	69.50	8.23	11.8	Fronds healthy, appearance normal in all replicates.
	B	6	75	69				
	C	6	77	71				
	D	6	85	79				
0.79	A	6	87	81	70.75	10.01	14.2	Fronds healthy, appearance normal in all replicates.
	B	6	79	73				
	C	6	78	72				
	D	6	63	57				
2.6	A	6	68	62	69.00	11.49	16.7	Fronds healthy, appearance normal in all replicates.
	B	6	68	62				
	C	6	92	86				
	D	6	72	66				
8.7	A	6	78	72	74.25	11.15	15.0	Fronds healthy, appearance normal in all replicates. Solutions very pale green in colour.
	B	6	82	76				
	C	6	67	61				
	D	6	94	88				
29.1	A	6	64	58	68.75	13.20	19.2	Fronds healthy, appearance normal in all replicates. Solutions light green in colour.
	B	6	94	88				
	C	6	70	64				
	D	6	71	65				
97.0	A	6	63	57	56.25	7.50	13.3	Fronds healthy, appearance normal in all replicates. Solutions green in colour with some settled solids.
	B	6	72	66				
	C	6	60	54				
	D	6	54	48				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.

•No significant stimulation (α=0.05) of frond increase was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•A 12.0-fold increase in frond number was observed in the control over the testing period.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-10-04

Work Order : 237106
Sample Number : 56153

Lemna minor Frond Weight Data

Test Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
Control	A	7.26	7.63	0.85
	B	8.85		
	C	7.52		
	D	6.89		
0.07	A	7.20	7.09	0.55
	B	6.54		
	C	7.80		
	D	6.82		
0.24	A	7.10	7.97	0.80
	B	7.80		
	C	7.94		
	D	9.04		
0.79	A	8.39	7.85	0.70
	B	8.02		
	C	8.16		
	D	6.83		
2.6	A	7.00	7.23	1.01
	B	6.22		
	C	8.63		
	D	7.07		
8.7	A	8.05	7.70	1.45
	B	6.79		
	C	6.36		
	D	9.59		
29.1	A	7.29	7.76	0.62
	B	8.56		
	C	7.25		
	D	7.94		
97.0	A	6.70	7.03	0.75
	B	8.10		
	C	6.96		
	D	6.37		

NOTES :

- No significant stimulation (α=0.05) of frond weight was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-10-04

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B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata
EPS 1/RM/25

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		
Test Method :	Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007), with deviation(s) as noted below.		

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91%	-	-

The results reported relate only to the sample tested and as received.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2018-09-24	Statistical Method :	Nonlinear Regression* (CETIS)[a]
Organism Batch :	Ps18-09	Historical Mean IC25 :	10.4 µg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	4.8 - 22.3 µg/L
IC25 Growth :	10.3 µg/L	Analyst(s) :	MA
95% Confidence Limits :	8.6 - 11.9 µg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	10409 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:10 h prior to test initiation
Organism Batch :	Ps18-09	Age (at start of test) :	3 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.

•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

Test Type :	Static	Volume per Replicate :	220 µL
Test Duration :	72 hours	Control Replicates:	10
Mean Temperature (± SD):	24.0°C (± 0.0)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 µm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	4160-4350 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

Noted Deviation(s) : A reference toxicant test was not started within 14 days of the toxicity test, as required by the test method.

•All test validity criteria as specified in the test method cited above were satisfied.

*Box Cox weighting (CETIS)[a] was applied.

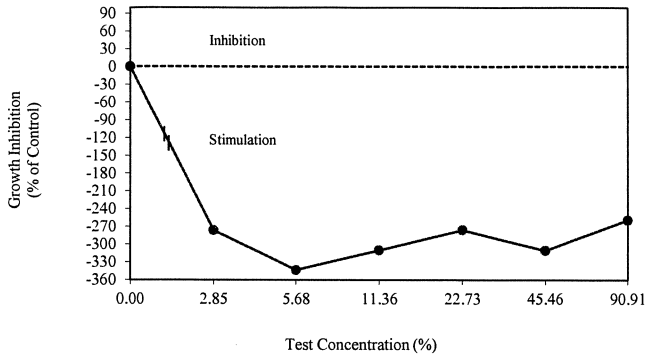
AQUATOX

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata

Work Order : 237106
Sample Number : 56153

***Pseudokirchneriella subcapitata* Growth Inhibition**



CELL ENUMERATION AT 72-HOURS

Initiated By : SEW
Completion/Enumeration Date : 2018-09-09
Enumerated By : SF
Enumeration Method : Manual (haemocytometer)

Sample pH (at 0 hours) : 6.8
Control pH (at 0 hours) : 7.0
Control pH (at 72 hours) : 7.0
Control Cell Increase Factor : 27.6 times growth

Concentration	Cell Concentration (x 10000 cells/mL) Replicate								Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
(%)	1	2	3	4	7	8	9	10				
Control	30.5	22.0	23.5	37.5	27.5	24.5	32.5	32.0	27.71	5.30	19.15	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–	–	–	–	–	–	–	–	–	–
2.85	107.0	110.0	99.0	–	–	–	–	–	104.29	5.69	5.45	276.38
5.68	128.0	123.5	120.5	–	–	–	–	–	122.96	3.77	3.07	343.75
11.36	117.0	118.0	109.0	–	–	–	–	–	113.63	4.93	4.34	310.07
22.73	126.5	111.0	78.0[1]	–	–	–	–	–	104.13	24.77	23.79	275.78
45.46	132.0	107.0	105.5	–	–	–	–	–	113.79	14.89	13.08	310.67
90.91	110.0	94.5	97.0	–	–	–	–	–	99.46	8.32	8.37	258.94

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (a=0.05).
•Control replicates 5 and 6 used for pH measurement.
•The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
• [1]Outlier according to Grubbs Test (CETIS)[a]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"–" = not enumerated/not required

Data Reviewed By : VC
Date : 2018-10-04

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-10-16
yyyy-mm-dd

Approved By :
Project Manager

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 237106

Shipping Address: AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR #3
Guelph, Ontario Canada N1H 6H9

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	580278
Field Sampler Name (print):	Jennifer Brown
Signature:	
Affiliation:	Agnico Eagle Mines Ltd. - Meliadine Division
Sample Storage (prior to shipping):	Shipped immediately after sampling
Custody Relinquished by:	Jennifer Brown
Date/Time Shipped:	2018-09-03 - 08:00

Client: Agnico Eagle Mines Limited
Meliadine Project
Rankin Inlet, Nunavut, Canada
X0C 0G0

Phone: (819) 759-3555

Fax:

Contact: Jennifer Brown

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	RISS Data Entry	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2018-09-03	07:00	EWTP MEL-14b (Post-treatment)	56153	22.0					✓	✓	✓	✓			✓		3 x 20L

For Lab Use Only

Received By: EJS/MJT
Date: 2018-09-06
Time: 0945
Storage Location:
Storage Temp.(°C)

Please list any special requests or instructions:

TOXICOLOGY analysis required

Phone number: 819-759-3555 ext 3996

APPENDIX 2F

Effluent Quality Data at CP1, 2017

Table 1 - Effluent Quality Data at CP1, 2017

Parameters	Units	MDMER	WL	7-Jun-17	14-Jun-17	20-Jun-17	21-Jun-17	28-Jun-17	5-Jul-17	12-Jul-17	18-Jul-17	26-Jul-2017[a]	26-Jul-17	9-Aug-17	27-Aug-17	4-Sep-17	6-Sep-17	11-Sep-17	17-Sep-17	25-Sep-17
Conventional Parameters																				
Alkalinity (Total as $CaCO_3$)	mg/L	-	-	43	45	47	-	52	56	57	57	-	55	55	54	-	56	56	55	57
Bicarbonate Alkalinity (as $CaCO_3$)	mg/L	-	-	43	44	47	-	51	55	57	57	-	54	55	53	-	55	56	54	56
Carbonate Alkalinity (as $CaCO_3$)	mg/L	-	-	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0
Conductivity	µS/cm	-	-	1100	1200	1300	-	1300	1400	1500	1500	-	1500	1900	2200	-	2400	2400	2500	2500
Total Hardness	mg/L	-	-	344	386	365	-	389	380	420	432	439	462	539	572	-	674	636	654	646
Dissolved Hardness	mg/L	-	-	309	363	351	-	405	446	430	439	480	466	541	575	-	639	698	649	648
pH	-	-	Max avg (6.0 to 9.5) max grab (6.0 to 9.5)	7.68	7.67	7.74	-	7.72	7.85	7.83	7.69	-	7.82	7.68	7.56	-	8.02	7.54	7.99	7.74
TDS	mg/L	-	Max Avg (1400 mg/L) Max grab (1400 mg/L)	822	1080	1190	-	1160	1230	908	1040	-	1030	**1600**	**1760**	**-**	**1680**	**1720**	**1880**	**1490**
TSS	mg/L	Max grab (30.00 mg/L)	Max avg (15 mg/L) Max grab (30 mg/L)	16	4	7	-	4	2	4	2	-	**35**	**3**	<10	<10	5	24	13	9
Turbidity	NTU	-	-	9.5	1.6	1.9	-	0.9	0.5	0.8	0.4	-	1.1	0.6	3.5	-	1.9	11	3.1	7.5
Major Ions																				
Dissolved Calcium	mg/L	-	-	102	117	115	-	133	146	140	144	157	152	176	182	-	202	220	206	206
Dissolved Chloride	mg/L	-	-	240	290	290	-	310	330	350	370	-	200	470	580	-	660	650	-	680
Dissolved Magnesium	mg/L	-	-	13.1	17.1	15.7	-	17.8	19.6	19.6	19.3	21.2	21.1	25	29	-	32.5	36.1	32.9	32.7
Dissolved Potassium	mg/L	-	-	7.1	9.07	8.12	-	9.07	10.4	11.1	10.1	11.9	12.1	13.8	14.9	-	17	17.2	16.2	16.9
Dissolved Sodium	mg/L	-	-	51.4	68.3	60.4	-	69.1	77.3	84.7	77.6	85	88.8	115	137	-	159	163	163	153
Dissolved Sulphate	mg/L	-	-	36	38	38	-	45	43	46	47	-	21	52	62	-	63	66	-	71
Reactive Silica	mg/L	-	-	0.31	<0.050	0.07	-	0.11	0.27	0.34	0.37	0.35	0.33	3.6	-	-	0.84	0.22	0.23	0.33
Nutrients																				
DOC	mg/L	-	-	5.7	6.2	6.8	-	7.2	8.1	8.1	8.3	9.1	-	9.5	11	-	11	11	11	12
TOC	mg/L	-	-	6.5	7.1	8	-	7.9	8.9	9.4	9.7	9.9	9.8	11	11	-	13	14	13	13
Total Kjeldahl Nitrogen	mg/L	-	-	5	4.3	4.4	-	4.9	4.5	4.4	3.9	3.3	3.4	3.7	3.9	-	2.8	2.8	2.2	2.6
Total Ammonia	mg/L	-	-	4.3	4.1	3.7	-	4.2	3.9	3.5	3.2	2.8	2.9	3.5	2.9	-	2.1	1.8	1.6	1.1
Nitrite	mg/L	-	-	0.216	0.199	0.182	-	0.165	0.148	0.153	0.156	0.118	0.152	0.172	0.167	-	0.177	0.125	0.134	0.121
Nitrate	mg/L	-	-	4.03	4.44	4.36	-	4.45	4.58	4.74	4.5	3.75	4.47	5.16	5.24	-	5.47	6	6.06	5.68
Nitrite-Nitrate	mg/L	-	-	4.25	4.64	4.54	-	4.61	4.73	4.89	4.65	3.87	4.62	5.33	5.41	-	5.65	6.13	6.19	5.8
Orthophosphate	mg/L	-	-	<0.010	0.013	<0.010	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	<0.010	<0.10	<0.10	<0.010
Total Phosphorus	mg/L	-	Max avg (2 mg/L)	0.042	0.031	0.028	-	0.029	0.02	0.023	0.032	0.036	0.05	0.035	0.029	-	0.05	0.07	0.066	0.07
Total Metals																				
Aluminium	mg/L	-	Max avg (2 mg/L) Max grab (3 mg/L)	0.447	0.0478	0.0565	-	0.0733	0.0148	0.0133	0.083	0.0102	0.0278	0.0198	0.0253	-	0.015	0.479	0.081	<0.015
Antimony	mg/L	-	-	<0.00050	<0.00050	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.0025	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic	mg/L	Max grab (1.00 mg/L)	Max avg (0.3 mg/L) Max grab (0.6 mg/L)	0.00214	0.00204	0.00198	-	0.00172	0.00193	0.00225	0.00201	0.00195	0.00214	0.00201	0.00195	-	0.00187	0.00252	0.00211	0.00201
Barium	mg/L	-	-	0.0935	0.0992	0.102	-	0.107	0.108	0.116	0.12	0.119	0.117	0.14	0.153	-	0.16	0.158	0.170	0.162
Beryllium	mg/L	-	-	<0.00010	<0.00010	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00050	<0.00050	<0.00050	<0.00050
Boron	mg/L	-	-	0.069	0.075	0.077	-	0.075	0.081	0.088	<0.25	0.093	0.088	0.116	0.114	-	<0.25	<0.25	<0.25	<0.25
Cadmium	mg/L	-	-	0.000014	0.000016	0.000013	-	0.000012	0.000012	0.000012	<0.000050	<0.000010	<0.000010	0.000016	0.000014	-	<0.000050	<0.000050	<0.000050	<0.000050
Calcium	mg/L	-	-	114	127	121	-	128	123	138	139	143	151	176	184	-	213	200	204	207
Chromium	mg/L	-	-	0.0014	<0.0010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	-	<0.0050	<0.0050	<0.0050	<0.0050
Copper	mg/L	Max grab (0.60 mg/L)	Max avg (0.2 mg/L) Max grab (0.4 mg/L)	0.00172	0.00143	0.00163	-	0.00152	0.00156	0.00163	<0.0025	0.00177	0.00173	0.00166	0.00168	-	<0.0025	0.0029	<0.0025	<0.0025
Iron	mg/L	-	-	0.983	0.289	0.175	-	0.17	0.057	0.093	0.249	0.051	0.143	0.163	0.158	-	0.186	1.28	0.285	0.182
Lead	mg/L	Max grab (0.40 mg/L)	Max avg (0.2 mg/L) Max grab (0.4 mg/L)	0.00081	0.00024	<0.00020	-	<0.00020	<0.00020	<0.00020	<0.0010	<0.00020	<0.00020	<0.00020	<0.00020	-	<0.0010	<0.0010	<0.0010	<0.0010
Lithium	mg/L	-	-	0.0904	0.102	0.11	-	0.122	0.121	0.128	0.135	0.131	0.131	0.168	0.177	-	0.193	0.196	0.222	0.192
Magnesium	mg/L	-	-	14.5	16.5	15.5	-	17	17.9	18.4	20.6	20.2	20.7	23.9	27.1	-	34.3	33.1	34.9	31.6
Manganese	mg/L	-	-	0.0816	0.0524	0.0368	-	0.0217	0.0162	0.0226	0.0173	0.004	0.0131	0.0202	0.0197	-	0.0216	0.0718	0.0393	0.0503
Mercury	mg/L	-	-	<0.00001	<0.00001	<0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	-	<0.00001	<0.00001	<0.00001	0.00004
Molybdenum	mg/L	-	-	0.0011	0.0012	0.0011	-	0.0012	0.0013	0.0013	<0.0050	0.0012	0.0012	0.0012	0.0011	-	<0.0050	<0.0050	<0.0050	<0.0050
Nickel	mg/L	Max grab (1.00 mg/L)	Max avg (0.5 mg/L) Max grab (1.0 mg/L)	0.0042	0.002	0.0022	-	0.0021	0.0017	0.0019	<0.0050	0.0018	0.0018	0.0019	0.002	-	<0.0050	<0.0050	<0.0050	<0.0050
Selenium	mg/L	-	-	<0.00010	<0.00010	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	0.00011	<0.00010	-	<0.00050	<0.00050	<0.00050	<0.00050
Silver	mg/L	-	-	<0.000020	<0.000020	<0.000020	-	<0.000020	<0.000020	<0.000020	<0.00010	<0.000020	<0.000020	<0.000020	<0.000020	-	<0.00010	<0.00010	<0.00010	<0.00010
Strontium	mg/L	-	-	1.8	1.99	2.11	-	2.27	2.36	2.57	2.55	2.64	2.56	3.23	3.94	-	3.47	3.84	3.96	3.54
Potassium	mg/L	-	-	7.76	9.35	8.46	-	9.83	9.72	10	10.7	11.5	11.8	13.3	14.1	-	16.6	16.4	16.7	16.7
Sodium	mg/L	-	-	54.1	66.8	62.2	-	68.5	74	76.3	79.5	87.6	83	110	129	-	159	159	171	147
Thallium	mg/L	-	-	0.000024	0.000032	0.000037	-	0.000049	0.000047	0.000049	<0.000050	0.000045	0.000045	0.000049	0.000049	-	<0.000050	<0.000050	-	<0.000050
Tin	mg/L	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.025	<0.025	<0.025	<0.025
Titanium	mg/L	-	-	0.0084	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.025	<0.025	<0.025	<0.025
Uranium	mg/L	-	-	0.00057	0.00059	0.00062	-	0.00065	0.00064	0.00066	0.00062	0.00056	0.00057	0.00054	0.00053	-	<0.00050	0.00055	0.00064	0.00055
Vanadium	mg/L	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.025	<0.025	<0.025	<0.025
Zinc	mg/L	Max grab (1.00 mg/L)	Max avg (0.4 mg/L) Max grab (0.8 mg/L)	0.0084	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.025	<0.0050	<0.0050	<0.0050	0.005	-	<0.025	<0.025	<0.025	<0.025

Table 1 - Effluent Quality Data at CP1, 2017

Parameters	Units	MDMER	WL	7-Jun-17	14-Jun-17	20-Jun-17	21-Jun-17	28-Jun-17	5-Jul-17	12-Jul-17	18-Jul-17	26-Jul-2017[a]	26-Jul-17	9-Aug-17	27-Aug-17	4-Sep-17	6-Sep-17	11-Sep-17	17-Sep-17	25-Sep-17
Dissolved Metals																				
Aluminium	mg/L	-	-	0.0082	0.0081	0.0112	-	0.0096	0.0128	0.0076	0.0114	<0.015	<0.030	0.0382	0.0057	-	<0.015	<0.015	0.0103	0.067
Antimony	mg/L	-	-	<0.00050	<0.00050	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.0025	<0.0050	<0.00050	<0.00050	-	<0.0025	<0.0025	<0.00050	<0.0025
Arsenic	mg/L	-	-	0.00147	0.0015	0.00164	-	0.00164	0.00212	0.00212	0.00211	0.00195	0.0023	0.00201	0.00165	-	0.00152	0.00249	0.00167	0.00182
Barium	mg/L	-	-	0.096	0.0942	0.0965	-	0.104	0.115	0.122	0.121	0.121	0.12	0.142	0.145	-	0.163	0.165	0.186	0.159
Beryllium	mg/L	-	-	<0.00010	<0.00010	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.0010	<0.00010	<0.00010	-	<0.00050	<0.00050	<0.00010	<0.00050
Boron	mg/L	-	-	0.062	0.082	0.07	-	0.082	0.091	0.086	0.098	<0.25	<0.50	0.113	0.121	-	<0.25	<0.25	0.142	<0.25
Cadmium	mg/L	-	-	0.000011	<0.000010	<0.000010	-	<0.000010	0.000015	0.00001	0.00001	<0.000050	<0.00010	0.000015	<0.000010	-	<0.000050	<0.000050	0.000016	<0.000050
Chromium	mg/L	-	-	<0.0010	<0.0010	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.010	<0.0010	<0.0010	-	<0.0050	<0.0050	<0.0010	<0.0050
Copper	mg/L	-	-	0.00089	0.00115	0.00107	-	0.00172	0.0017	0.00148	0.00152	0.0019	<0.0020	0.00165	0.00158	-	0.0019	0.0021	0.0014	0.0022
Iron	mg/L	-	-	0.0476	0.0522	0.0407	-	0.0365	0.0351	0.0568	0.0677	0.047	0.104	0.186	0.105	-	0.174	0.158	0.112	0.133
Lead	mg/L	-	-	<0.00020	<0.00020	<0.00020	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.0010	<0.0020	<0.00020	<0.00020	-	<0.0010	<0.0010	<0.00020	<0.0010
Lithium	mg/L	-	-	0.102	0.111	0.115	-	0.116	0.132	0.125	0.135	0.13	0.139	0.173	0.185	-	0.198	0.205	0.225	0.200
Manganese	mg/L	-	-	0.05	0.0185	0.0037	-	0.0052	0.0064	0.0045	0.0067	<0.0050	0.012	0.0174	0.0056	-	<0.0050	0.013	0.0183	0.0273
Mercury	mg/L	-	-	<0.00001	<0.00001	<0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	-	<0.00001	<0.00001	<0.00001	-	<0.00001	<0.00001	<0.00001	0.00002
Molybdenum	mg/L	-	-	0.0049	0.0012	0.0011	-	0.0011	0.0012	0.0014	0.0013	<0.0050	<0.010	0.0012	<0.0010	-	<0.0050	<0.0050	0.0012	<0.0050
Nickel	mg/L	-	-	0.0019	0.0019	0.0017	-	0.0016	0.0019	0.0017	0.0016	<0.0050	<0.010	0.0019	0.0021	-	<0.0050	<0.0050	0.0021	<0.0050
Selenium	mg/L	-	-	<0.00010	<0.00010	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.0010	<0.00010	<0.00010	-	<0.00050	<0.00050	<0.00010	<0.00050
Silver	mg/L	-	-	<0.000020	<0.000020	<0.000020	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.00010	<0.00020	<0.000020	<0.000020	-	<0.00010	<0.00010	<0.000020	<0.00010
Strontium	mg/L	-	-	1.96	2.08	2.19	-	2.19	2.36	2.64	2.8	2.6	2.7	3.27	3.29	-	3.54	3.66	3.9	3.36
Sulphur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	-	-	0.000021	0.000032	0.000038	-	0.000043	0.000048	0.000048	0.000047	0.000052	<0.00010	0.000049	0.00005	-	<0.000050	<0.000050	-	<0.000050
Tin	mg/L	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.025	<0.0050	<0.0050	<0.025	<0.050	<0.0050	<0.0050	-	<0.025	<0.025	<0.0050	<0.025
Titanium	mg/L	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.050	<0.0050	<0.0050	-	<0.025	<0.025	<0.0050	<0.025
Uranium	mg/L	-	-	0.00061	0.00055	0.00061	-	0.0006	0.00062	0.00066	0.00064	0.00059	<0.0010	0.00056	0.00045	-	<0.00050	0.00055	0.00069	0.00056
Vanadium	mg/L	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.050	<0.0050	<0.0050	-	<0.025	<0.025	<0.0050	<0.025
Zinc	mg/L	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.025	<0.050	<0.0050	<0.0050	-	<0.025	<0.025	<0.0050	<0.025
Cyanide																				
Total Cyanide	mg/L	Max grab (2.0 mg/L)	Max avg (0.5 mg/L) Max grab (1.0 mg/L)	-	-	-	-	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050
Free Cyanide	mg/L	-	-	-	-	-	-	-	<0.0010	<0.0010	<0.0010	-	<0.0010	<0.0010	<0.0010	-	<0.0010	0.001	<0.0010	<0.0010
Other parameters																				
Radium-226	Bq/L	Max grab (1.11 Bq/L)	-	<0.50	0.70	<0.50	-	-	-	-	-	-	-	<0.0050	<0.010	-	-	0.007	-	-
General Organics																				
Total Oil & Grease	mg/L	-	-	-	-	-	-	-	<0.50	1.20	<0.50	-	<0.50	-	-	-	<0.50	-	1.2	2.1
Volatile Organics																				
Benzene	ug/L	-	-	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	-	<0.20	-	<0.20	<0.20
Toluene	ug/L	-	-	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	-	<0.20	-	<0.20	<0.20
Ethylbenzene	ug/L	-	-	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	-	<0.20	-	<0.20	<0.20
o-Xylene	ug/L	-	-	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20	<0.20	-	<0.20	-	<0.20	<0.20
m, p-Xylenes	ug/L	-	-	<0.40	<0.40	<0.40	-	<0.40	<0.40	<0.40	<0.40	-	<0.40	<0.20	<0.20	-	<0.20	-	<0.40	<0.40
Xylenes	ug/L	-	-	<0.40	<0.40	<0.40	-	<0.40	<0.40	<0.40	<0.40	-	<0.40	<0.20	<0.20	-	<0.20	-	<0.40	<0.40
F1 (C6-C10)	ug/L	-	-	<25	<25	<25	-	<25	<25	<25	<25	-	<25	<25	<25	-	<25	-	-	<25
F1 (C6-C10) - BTEX	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<25
Hydrocarbons (L) (Fraction F1 (C6-C10)	µg/L	-	-	<25	<25	<25	-	<25	<25	<25	<25	-	<25	<25	<25	-	<25	-	-	-
Hydrocarbons (L) (Fraction F2 - F4)	-	-	TPH : 5 mg/L avg and grab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F2 (C10-C16 Hydrocarbons)	µg/L	-	-	<100	<100	<100	-	<100	<100	<100	<100	-	<100	<100	<100	-	<100	<100	<100	<100
F3 (C16-34 Hydrocarbons)	µg/L	-	-	<200	<200	<200	-	<200	<200	<200	<200	-	<200	<200	<200	-	<200	<200	<200	<200
F4 (C34-50 Hydrocarbons)	µg/L	-	-	<200	<200	<200	-	<200	<200	<200	<200	-	<200	<200	<200	-	<200	<200	<200	<200
Reached Baseline at C50	µg/L	-	-	Yes	Yes	Yes	-	Yes	Yes	yes	yes	-	yes	yes	yes	-	yes	yes	yes	yes
Diesel (C10-C24)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200	-
Diesel (C11-C32)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<200	-
F4G-sg (Grav. Heavy Hydrocarbons)	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: **Bolded** value indicates MMER or WL exceedance.

a) INAC replicate.

mg/L = milligrams per litre; µg/L = microgram per litre; µS/cm = microSiemens per centimetre; Bq/L = becquerel per litre; + = plus; % = percent; °C = degrees Celsius; NTU = nephelometric turbidity unit; U.T. = Toxic Units; $CaCO_3$ = calcium carbonate; SiO_2 = silicon dioxide; TDS = total dissolved solids; TSS = total suspended solids; TOC = Total organic carbon; TPH = Total petroleum hydrocarbons; DOC = dissolved organic carbon; BTEX = benzene, toluene, ethylbenzene, and xylene; grav. = gravimetric; Min = minimum; Max = maximum; SD = standard deviation; nd = not detected; < = less than; % = percent; MDMER = Metal and Diamond Mine Effluent Regulations; WL = Water Licence; INAC = Indigenous and Northern Affairs; - = Parameter below MDMER or WL effluent limit, or no limit or no data; Jun = June; Jul = July; Aug = August; Sep = September; h = hours; % v/v = volume concentration; avg = average

APPENDIX 2G

Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018

Table 1: Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018

Sample Name	Sample Date	Sample Depth	Temperature (°C)	DO (mg/L)	DO (% saturation)	Specific Conductivity (µS/cm)	pH
050-01	10-Aug-2018	0.3	13.03	9.87	94	88.2	8.53
050-01	10-Aug-2018	1	13.03	9.95	94.8	88.3	8.51
050-01	10-Aug-2018	2	12.98	9.96	94.8	90.3	8.51
050-01	10-Aug-2018	3	12.79	9.98	94.6	91.4	8.51
050-01	10-Aug-2018	4	12.77	9.98	94.5	92.6	8.5
050-01	10-Aug-2018	5	12.72	9.98	94.4	96.2	8.5
050-01	10-Aug-2018	6	12.71	9.97	94.3	99.8	8.5
050-01	10-Aug-2018	7	12.65	9.95	94.1	97.1	8.5
050-01	10-Aug-2018	8	12.63	9.95	93.9	90.3	8.52
050-01	10-Aug-2018	9	12.59	9.93	93.7	87.8	8.53
050-03	10-Aug-2018	0.3	13.12	9.82	93.8	87.8	8.55
050-03	10-Aug-2018	1	13.02	9.91	94.5	91	8.54
050-03	10-Aug-2018	2	12.82	9.98	94.7	105.5	8.51
050-03	10-Aug-2018	3	12.76	9.98	94.6	102.2	8.5
050-03	10-Aug-2018	4	12.73	9.98	94.5	99.7	8.5
050-03	10-Aug-2018	5	12.72	9.96	94.3	96.3	8.5
050-03	10-Aug-2018	6	12.7	9.95	94.2	95.9	8.5
050-03	10-Aug-2018	7	12.68	9.94	94	92.5	8.51
050-03	10-Aug-2018	8	12.59	9.95	93.9	87.4	8.52
050-03	10-Aug-2018	9	12.49	9.93	93.5	86.6	8.52
050-03	10-Aug-2018	10	12.48	9.88	93	86.4	8.51
050-03	10-Aug-2018	11	12.48	9.85	92.7	86.4	8.5
100-01	10-Aug-2018	0.3	13.09	9.93	94.7	86.6	8.54
100-01	10-Aug-2018	1	13.07	9.94	94.8	86.7	8.49
100-01	10-Aug-2018	2	12.8	9.97	94.5	93.4	8.47

Table 1: Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018

Sample Name	Sample Date	Sample Depth	Temperature (°C)	DO (mg/L)	DO (% saturation)	Specific Conductivity (µS/cm)	pH
100-01	10-Aug-2018	3	12.72	9.99	94.5	90.3	8.47
100-01	10-Aug-2018	4	12.67	9.99	94.4	89.4	8.47
100-01	10-Aug-2018	5	12.66	9.99	94.4	88.8	8.46
100-01	10-Aug-2018	6	12.66	9.98	94.4	92.1	8.45
100-02	23-Jul-2018	0.025	12.85	11.7	112.1	81.4	7.85
100-02	23-Jul-2018	0.1	12.86	11.73	112.5	81.8	7.83
100-02	23-Jul-2018	0.5	12.86	11.73	112.5	82	7.81
100-02	23-Jul-2018	1	12.86	11.73	112.5	82.2	7.8
100-02	23-Jul-2018	2	12.85	11.73	112.6	84.4	7.77
100-02	23-Jul-2018	3	12.85	11.73	112.5	83.3	7.78
100-02	23-Jul-2018	4	12.85	11.73	112.5	83.3	7.77
100-02	23-Jul-2018	5	12.81	11.72	112.3	86.1	7.76
100-02	23-Jul-2018	6	12.74	11.72	112.1	91.9	7.73
100-02	23-Jul-2018	7	12.64	11.72	111.9	93	7.72
100-02	23-Jul-2018	8	12.26	11.69	110.8	91.9	7.66
100-02	23-Jul-2018	8.2	12.25	11.68	110.5	91.3	7.65
100-03	10-Aug-2018	0.3	13.06	9.92	94.6	87.4	8.47
100-03	10-Aug-2018	1	13.05	9.93	94.7	89.6	8.46
100-03	10-Aug-2018	2	13.02	9.94	94.7	91.6	8.45
100-03	10-Aug-2018	3	12.9	9.98	94.7	104	8.42
100-03	10-Aug-2018	4	12.8	9.98	94.6	102.6	8.42
100-03	10-Aug-2018	5	12.75	9.98	94.6	96.6	8.44
100-03	10-Aug-2018	6	12.7	9.99	94.5	86.9	8.47
100-03	10-Aug-2018	7	12.54	9.99	94.2	86.7	8.47
100-04	10-Aug-2018	0.3	13.09	9.85	94	91.3	8.47

Table 1: Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018

Sample Name	Sample Date	Sample Depth	Temperature (°C)	DO (mg/L)	DO (% saturation)	Specific Conductivity (µS/cm)	pH
100-04	10-Aug-2018	1	13.05	9.91	94.5	92.6	8.46
100-04	10-Aug-2018	2	13.02	9.92	94.5	96.3	8.45
100-04	10-Aug-2018	3	12.84	9.95	94.5	102.6	8.44
100-04	10-Aug-2018	4	12.76	9.97	94.4	90.8	8.46
100-04	10-Aug-2018	5	12.78	9.97	94.3	90.9	8.47
100-04	10-Aug-2018	6	12.67	9.96	94.1	87.6	8.46
100-04	10-Aug-2018	7	12.64	9.94	93.9	87.1	8.46
100-04	10-Aug-2018	8	12.53	9.93	93.6	87	8.45
100-04	10-Aug-2018	9	12.52	9.85	92.9	86.9	8.43
100-05	10-Aug-2018	0.3	13.12	9.84	93.9	89.5	8.47
100-05	10-Aug-2018	1	13.04	9.94	94.8	89.6	8.48
100-05	10-Aug-2018	2	12.76	9.95	94.3	94.6	8.48
100-05	10-Aug-2018	3	12.77	9.92	94	98.2	8.49
100-05	10-Aug-2018	4	12.74	9.93	94	90.1	8.48
100-05	10-Aug-2018	5	12.76	9.92	94	98.9	8.47
100-05	10-Aug-2018	6	12.77	9.92	94	98.8	8.47
100-05	10-Aug-2018	7	12.71	9.92	93.9	90.8	8.5
100-05	10-Aug-2018	8	12.64	9.91	93.8	88.3	8.5
100-05	10-Aug-2018	9	12.58	9.87	93.1	87.2	8.5
100-05	10-Aug-2018	10	12.47	9.83	92.7	86.7	8.48
100-06	10-Aug-2018	0.3	13.1	9.8	93.5	86.8	8.47
100-06	10-Aug-2018	1	13.09	9.91	94.4	86.5	8.47
100-06	10-Aug-2018	2	13.04	9.94	94.7	86.9	8.47
100-06	10-Aug-2018	3	13	9.94	94.7	87.5	8.47
100-06	10-Aug-2018	4	12.87	9.97	94.7	88.5	8.46

Table 1: Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018

Sample Name	Sample Date	Sample Depth	Temperature (°C)	DO (mg/L)	DO (% saturation)	Specific Conductivity (µS/cm)	pH
100-06	10-Aug-2018	5	12.77	9.99	94.6	87.1	8.46
100-06	10-Aug-2018	6	12.65	9.96	94.2	87.1	8.46
100-06	10-Aug-2018	7	12.62	9.93	93.8	86.9	8.46
100-06	10-Aug-2018	8	12.56	9.88	93.3	87.3	8.44
100-06	10-Aug-2018	9	12.5	9.84	92.7	86.7	8.43
100-07	19-Jul-2018	0.025	11.27	11.49	105.6	84.1	7.53
100-07	19-Jul-2018	0.1	11.27	11.87	109.8	84	7.48
100-07	19-Jul-2018	0.5	11.28	11.94	110.6	84	7.45
100-07	19-Jul-2018	1	11.29	11.98	110.9	83.9	7.43
100-07	19-Jul-2018	2	11.29	12.11	112.1	83.9	7.45
100-07	19-Jul-2018	3	11.24	12.16	112.4	84.2	7.45
100-07	19-Jul-2018	4	11.22	12.16	112.5	83.8	7.43
100-07	19-Jul-2018	5	11.21	12.17	112.5	84.4	7.44
100-07	19-Jul-2018	6	11.2	12.19	112.5	85.7	7.45
100-07	19-Jul-2018	7	11.14	12.17	112.3	85.6	7.45
100-07	19-Jul-2018	8	11.12	12.13	112	85	7.46
100-07	19-Jul-2018	9	11.13	12.07	111.3	84.5	7.45
100-07	19-Jul-2018	10	11.09	11.99	110.6	84.5	7.45
100-07	19-Jul-2018	11	11.09	11.64	110	84.3	7.44
100-08	10-Aug-2018	0.3	13.09	9.79	93.3	86.8	8.5
100-08	10-Aug-2018	1	13.02	9.92	94.4	86.9	8.49
100-08	10-Aug-2018	2	12.88	9.94	94.4	87.5	8.48
100-08	10-Aug-2018	3	12.82	9.93	94.2	89.5	8.47
100-08	10-Aug-2018	4	12.7	9.91	93.8	96.6	8.45
100-08	10-Aug-2018	5	12.61	9.9	93.5	88.4	8.46

Table 1: Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018

Sample Name	Sample Date	Sample Depth	Temperature (°C)	DO (mg/L)	DO (% saturation)	Specific Conductivity (µS/cm)	pH
100-08	10-Aug-2018	6	12.62	9.88	93.3	89.2	8.45
100-08	10-Aug-2018	7	12.62	9.87	93.2	89.4	8.44
100-08	10-Aug-2018	8	12.64	9.87	93.2	90.6	8.44
175-01	10-Aug-2018	0.3	13.06	9.84	93.7	86.6	8.5
175-01	10-Aug-2018	1	12.91	9.91	94.1	86.6	8.49
175-01	10-Aug-2018	2	12.77	9.95	94.2	87.1	8.49
175-01	10-Aug-2018	3	12.77	9.96	94.3	89.1	8.48
175-01	10-Aug-2018	4	12.73	9.96	94.3	94.3	8.46
175-01	10-Aug-2018	5	12.7	9.96	94.2	93.5	8.47
175-03	10-Aug-2018	0.3	13.11	9.77	93.3	88.8	8.5
175-03	10-Aug-2018	1	13.07	9.86	94	90.1	8.49
175-03	10-Aug-2018	2	12.98	9.92	94.5	91.2	8.49
175-03	10-Aug-2018	3	12.93	9.96	94.7	90.5	8.49
175-03	10-Aug-2018	4	12.87	9.99	94.9	87.1	8.5
175-03	10-Aug-2018	5	12.72	9.99	94.6	86.8	8.49
175-03	10-Aug-2018	6	12.65	9.95	94	87	8.48
175-03	10-Aug-2018	7	12.6	9.92	93.6	87.2	8.47
175-03	10-Aug-2018	8	12.52	9.88	93	87.3	8.47
175-03	10-Aug-2018	9	12.48	9.82	92.5	87	8.46
175-03	10-Aug-2018	10	12.48	9.76	92	87.1	8.45
250-01	10-Aug-2018	0.3	12.95	9.87	93.9	88.1	8.42
250-01	10-Aug-2018	1	12.91	9.9	94.1	88.2	8.42
250-01	10-Aug-2018	2	12.88	9.9	94.1	87.7	8.42
250-01	10-Aug-2018	3	12.69	9.95	94.1	87.3	8.42
250-01	10-Aug-2018	4	12.55	9.96	93.9	86.7	8.42

Table 1: Field Data in the Near-field Exposure Area at Meliadine Lake Under the Plume Delineation Study, 2018

Sample Name	Sample Date	Sample Depth	Temperature (°C)	DO (mg/L)	DO (% saturation)	Specific Conductivity (µS/cm)	pH
250-01	10-Aug-2018	5	12.52	9.94	93.7	86.7	8.41
250-03	10-Aug-2018	0.3	13.22	9.92	94.9	86.8	8.53
250-03	10-Aug-2018	1	13.16	9.94	95	87	8.51
250-03	10-Aug-2018	2	13.09	9.98	95.2	88.6	8.5
250-03	10-Aug-2018	3	12.95	9.99	95.1	88.2	8.49
250-03	10-Aug-2018	4	12.93	9.99	95	87.4	8.49
250-03	10-Aug-2018	5	12.86	10	95	87	8.49
250-03	10-Aug-2018	6	12.66	9.95	94.1	86.7	8.49
250-03	10-Aug-2018	7	12.54	9.9	93.4	87.2	8.47
250-05	10-Aug-2018	0.3	13.16	9.81	93.6	86.9	8.59
250-05	10-Aug-2018	1	13.08	9.89	94.3	87	8.56
250-05	10-Aug-2018	2	13.04	9.92	94.6	86.9	8.54
250-05	10-Aug-2018	3	12.99	9.96	94.7	86.8	8.53
250-05	10-Aug-2018	4	12.66	10	94.6	87.5	8.51
250-05	10-Aug-2018	5	12.65	9.94	93.9	87.4	8.51
250-05	10-Aug-2018	6	12.63	9.89	93.5	87.7	8.5
250-05	10-Aug-2018	7	12.62	9.86	93.4	87.8	8.48
250-06	10-Aug-2018	0.3	13.04	9.83	93.6	86.6	8.49
250-06	10-Aug-2018	1	12.89	9.96	94.6	86.7	8.5
250-06	10-Aug-2018	2	12.77	9.99	94.7	86.9	8.49
250-06	10-Aug-2018	3	12.73	9.99	94.6	86.9	8.49
250-06	10-Aug-2018	4	12.71	9.99	94.5	86.9	8.48
250-06	10-Aug-2018	5	12.7	9.98	94.4	86.9	8.48

Jul = July; Aug = August; °C = degrees Celsius; mg/L = milligrams per litre; DO = dissolved oxygen; µS/cm = microsiemens per centimetre.

APPENDIX 2H

Spill Reports, 2018

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **2-2-2018**	REPORT TIME **14:30**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 029**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **2-2-2018**	OCCURRENCE TIME **13:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **1** SECONDS **43**	LONGITUDE DEGREES **92** MINUTES **10** SECONDS **9**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION

H	PRODUCT SPILLED **Sewage**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **~120000 L**	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER **NA**
I	SPILL SOURCE **Retention Tank**	SPILL CAUSE **Human Error**	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY **Cold weather, accessibility**	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

On February 2nd, during an inspection of the exploration camp retention tanks it was noticed by a member of the Site Services team that water was flowing on to Meliadine Lake near the discharge area of the sewage treatment plant. The environment department and site services supervisor were notified immediately and an inspection was conducted to determine the source of the water. it was discovered that a valve at the base of one of the retention tanks had been left open, resulting in the draining of the contents of all 4 tanks (connected in series). Discharge from the sewage treatment plant had been suspended since November 2017 due to exceedances. The quality of the substance is to be verified and is likely not deleterious.

Sr. Environmental Coordinator - Dan Gorton: Ext 3996
Sr. Environmental Technician - Justin MacMillan: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY **Dan Gorton**	POSITION **Sr. Env Coordinator**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8197593555**
M	ANY ALTERNATE CONTACT **Justin MacMillan**	POSITION **Sr. Env Technician**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report – February 2nd 2018 MEL-07 Treated Water Discharge

Description of Exceedance:

On February 2nd, during an inspection of the exploration camp retention tanks it was noticed by a member of the Site Services team that water was flowing on to Meliadine Lake near the discharge area of the sewage treatment plant. The environment department and site services supervisor were notified immediately and an inspection was conducted to determine the source of the water. It was discovered that a valve at the base of one of the retention tanks had been left open, resulting in the draining of the contents of all four tanks, which are connected in series. Discharge from the sewage treatment plant had been suspended since November 2017 due to exceedances.

Samples were collected from a melt channel in the ice, and sent for laboratory analysis. A spill report was issued on February 2nd 2018 through the NT-NU Spill Report. As a response to the spill report issued, Christine Wilson (INAC) visited the Meliadine Exploration Camp on February 2nd 2018, and was unable to collect a representative sample, as there was no pooling on the surface of the ice.

Jeff Tulugak (KIA) also inspected the spill area on February 2nd, 2018. A telephone inquiry was received by Craig Broom (Environment Canada) and Dan Gorton provided an account of the spill information available to date on February 5th, 2018.



Picture 1: Channel formed by release water flowing through ice into Meliadine Lake.



Picture 2: Release valve left open causing the spill.



Picture 3: Discharge hose connected to retention tank release valve.

Samples were collected from the STP release valve on February 2nd, shortly after the release occurred. The samples did not arrive at the laboratory within the recommended 24 hours timeframe for fecal coliform analysis. The delay was due to the delivery not being picked up at the airport by the receiving party. Total coliforms were expressed in MPN as opposed to CFU, which are the recommended units in the water license. Although these are not the preferred units, they can be converted.

Table 1: Laboratory analysis of retention tank treated water samples collected at spill site.

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2052826-1 RETENTION TANK							
Sampled By: CLIENT on 02-FEB-18 @ 01:45							
Matrix: WATER							
Miscellaneous Parameters							
Fecal Coliforms	214		1	MPN/100mL		05-FEB-18	R3955854
Heterotrophic Plate Count	>3000		10	CFU/mL		05-FEB-18	R3956754
Total Coliform and E.coli by MPN QT97							
Total Coliforms	>2420		1	MPN/100mL		05-FEB-18	R3955855
Escherichia Coli	285		1	MPN/100mL		05-FEB-18	R3955855

Table 2: Laboratory analysis of retention tank treated water in months leading up to the event.

Station: STP-FINAL (MEL-7)	December				January						February					
DATE	12/4/2017	12/12/2017	12/14/2017	12/18/2017	1/2/2018	1/4/2018	1/8/2018	1/15/2018	1/22/2018	1/29/2018	2/5/2018	2/12/2018	2/19/2018			
Ammonia as N (mg/L)					4.5	3.3	7.3	25	26	14	16	0.05				
Biochemical Oxygen Demand					12	11	6	5	9	4	9	13				
Kjeldahl nitrogen					6	3.7	7.4	25	29	15	17	<2				
pH					6.94	7.15	7.49	6.87	7.72	7.18	6.75	6.82				
Phosphorus (P)-Total					8.5	7.8	6.9	10	11	9.5	10	9.8				
Total Suspended Solids					8	5	7	9	14	5	6	8				
Transmitance %					37	37	39	31	20	36	37	34				
Nitrite-N					0.359	0.332	0.522	0.307	0.173	0.588	0.372	0.312				
Nitrate-N					22.5	20.8	23.5	33.8	36.1	39.5	47.2	41.4				
Nitrate and Nitrite as N					22.9	21.2	24	34.1	36.3	40.1	47.6	41.8				
Oil & Grease-(IR)					1.9	0.6	<0.50	0.6	<0.50	**1.8**	0.6	<0.50				
Total Nitrogen (N)					-	-	-	-	-	-	-	-				
Total Chemical Oxygen Demand (COD)					82	83	83	98	110	68	73	34				
Total Dissolved Solids					430	-	565	495	**710**	465	475	505				
Alkalinity					36	54	74	41	**320**	47	27	37				
Atypical	950	30	170	180	66000		<10	1020	530	10	330	5800	490			
Fecal Coliforms (CFU/100mL)	20	<2	<2	<10	<10		<10	<10	<2	<2	<10	<10	<2			
Heterotrophic Plate Count (AAHB) (CFU/100mL)	4,300	450	500.00	209	21,000		360	1,000	820	430	260	1,330	560			
Total Coliforms (CFU/100mL)	30	90	70	90	<1000		<10	200	10	10	<10	<100	<10			

The sample collected from the retention tank discharge had **214 MPN/100mL fecals** and **285 MPN/100mL E.coli.**

Spill Discharge Location:

The MEL-07 effluent discharges to land at a location situated approximately 65 m from the ordinary high water mark of Meliadine Lake (see Figure 1). Once the effluent reaches the end of the pipe, it travels along a rock channel intended to reduce the flow and prevent erosion. The effluent will then follow the rock channel to Meliadine Lake. It is expected that with the extreme cold temperatures on February 2nd, and the fact that the effluent discharges to land first, the bacteria would likely not have survived.



Figure 1: View from above - MEL-07 discharge configuration with rock channel and flow path to Meliadine Lake

Spill cause:

Investigation into the release was inconclusive. However, it is believed that a water truck operator failed to close the release valve after transferring water to a truck.

Spill response:

The release was deemed to be caused by human error. The release valve is now fitted with a locking mechanism. A supervisor now keeps a register to record which operator is in possession of the key.

Dan Gorton, Environmental Coordinator, AEM

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **10-01-2018**	REPORT TIME **10:41**	[X] ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 409**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **07-23-2018**	OCCURRENCE TIME **15:00**		

C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT [X] NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES **63** MINUTES **2** SECONDS **15**	LONGITUDE DEGREES **92** MINUTES **13** SECONDS **06**
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION **NA**

H	PRODUCT SPILLED **Treated effluent**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **4.39 mg/L (~15,691 m3/d)**	U.N. NUMBER **NA**
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **NA**	U.N. NUMBER **NA**
I	SPILL SOURCE **Mel-14**	SPILL CAUSE **NWB Licence Criteria Exceeded**	AREA OF CONTAMINATION IN SQUARE METRES **NA**
J	FACTORS AFFECTING SPILL OR RECOVERY **NA**	DESCRIBE ANY ASSISTANCE REQUIRED **NA**	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT **NA**

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

A sample of treated water from Mel-14 (final discharge point to Meliadine Lake) was collected on July 23, 2018. Upon receiving the sampling results, the total aluminum concentration was found to be 4.39 mg/L which exceeded the permitted discharge limit of 2 mg/L. When the exceedance was observed, the lab was requested to re-analyze the sample to determine if the result was an outlier; however, the sample had been disposed of and re-analysis was not possible at the date of the request.

This spill is being reported as per the 2AM-MEL1631 Nunavut Water Board License, part F item 3.

A follow up report will be issued.

Environmental Coordinator - Dan Gorton/Jennifer Brown: Ext 4603996

L	REPORTED TO SPILL LINE BY **Jennifer Brown**	POSITION **Sr.Environment Coord**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8198565097**
M	ANY ALTERNATE CONTACT **Dan Gorton**	POSITION **Environment Coord**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

AGNICO EAGLE
MELIADINE

Follow Up Report: #18-409
July 23, 2018 MEL-14 Aluminum Concentration Criteria Exceeded

Description of Incident:

A sample of treated water from MEL-14 (final effluent sampling port prior to discharge to Meliadine Lake) was collected on July 23, 2018. Upon review of the laboratory analysis results, the total aluminum concentration was found to be 4.39 mg/L which exceeded the permitted discharge limit of 2 mg/L.
As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part F, item 3 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess the total metal concentrations and other water quality parameters during final effluent discharge at MEL-14. The laboratory results were received on August 8, 2018, however, the exceeded criteria for the total aluminum concentration was not observed at the initial time of the data review and data input. During the quarterly reporting for MDMER-EEM (RIIS) on October 1, 2018, the exceeded concentration was observed and reported immediately.

Exceedance Cause and Corrective Measures

The exceeded criteria for final effluent discharge criteria for total aluminum concentrations is assumed to be a laboratory error. When the exceeded criteria was observed, the lab was requested to re-analyze the sample to determine if the reported concentration was a result of laboratory error; however, the sample had been disposed of and re-analysis was not possible at the date of the request.

When comparing the total aluminum concentrations from a sample collected and analyzed on the same day from MEL-13 (the discharge location at Meliadine Lake), total aluminum concentrations were also elevated (6.64 mg/L). Results for total aluminum concentration were then compared to results from 2018 sampling events. The results from July 23, 2018 had the maximum concentrations for both MEL-13 and MEL-14. Table 1 presents a summary of laboratory analysis for MEL-13 and MEL-14 in 2018 and includes the minimum, maximum and average total aluminum concentrations for samples collected in 2018. Figure 1 shows the aluminum concentrations for MEL-13 and MEL-14 in 2018. No other samples collected and analyzed in 2018 have exceeded criteria concentrations for total aluminum at MEL-14.

The Environment Department at Meliadine is currently implementing a data management system for laboratory results. Once it has been fully commissioned, it should mitigate delays with reporting criteria exceedances and improve the timing for requests that may be made if re-analysis is required at the laboratory.

Table 1 Summary of MEL-13 and MEL-14 Total Aluminum Analysis:

MEL 13										
Date	**23-Jul-18**	**20-Aug-18**	**26-Aug-18**	**4-Sep-18**						
Total Aluminum (mg/L)	6.64	0.0118	0.0098	0.0083						
Average	1.6675									
Max	6.64									
Min	0.0083									
MEL 14										
Date	**24-Jun-18**	**1-Jul-18**	**10-Jul-18**	**15-Jul-18**	**23-Jul-18**	**29-Jul-18**	**5-Aug-18**	**13-Aug-18**	**19-Aug-18**	**26-Aug-18**
Total Aluminum (mg/L)	0.134	1.22	0.518	1.23	4.39	0.811	0.784	0.705	1.03	0.005
Average	1.0827									
Max	4.39									
Min	0.005									

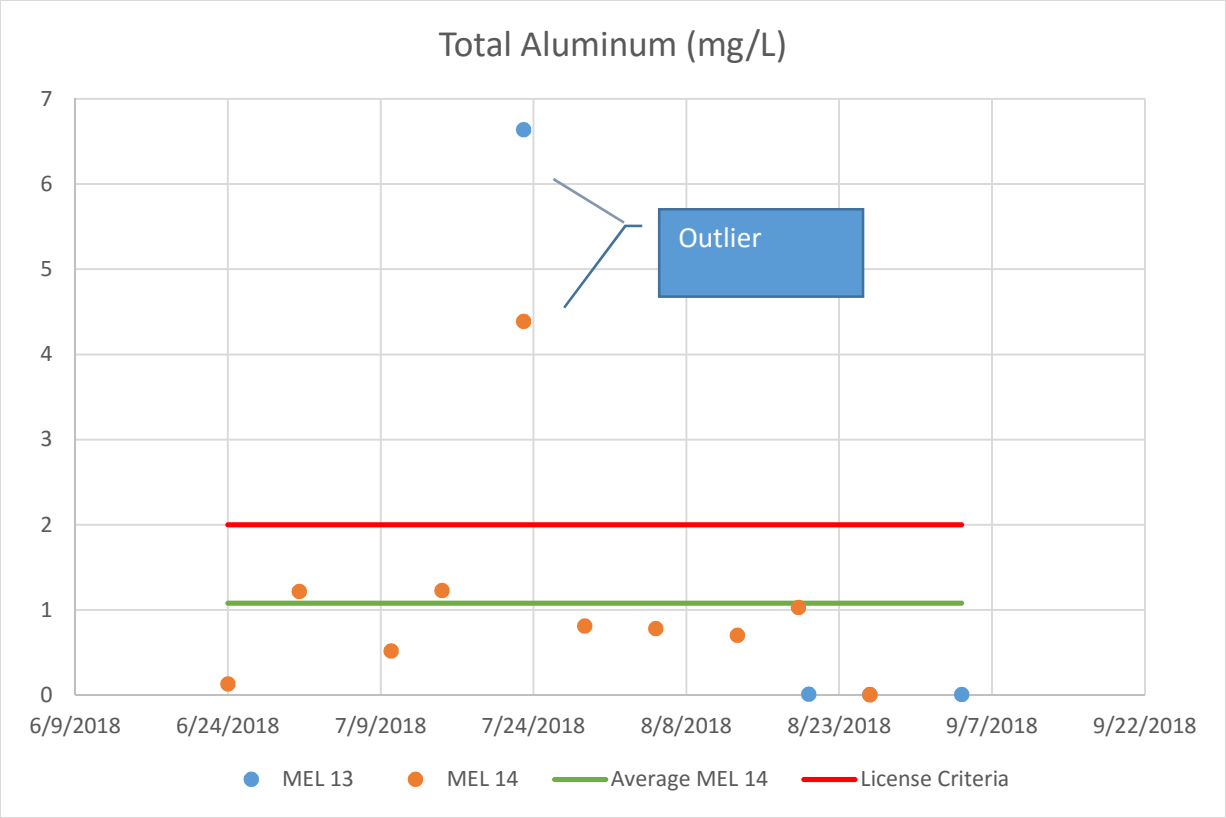


Figure 1: 2018 total aluminum concentrations at MEL-13 and MEL-14

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR **09-15-2018**	REPORT TIME **15:00**	☒ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER **18 - 378**
B	OCCURRENCE DATE: MONTH – DAY – YEAR **8-19-2018**	OCCURRENCE TIME **8:00**		
C	LAND USE PERMIT NUMBER (IF APPLICABLE) **KVPL11D01**	WATER LICENCE NUMBER (IF APPLICABLE) **2AM-MEL1631**		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION **Meliadine Gold Project**	REGION ☐ NWT ☒ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES **63** MINUTES **2** SECONDS **15**	LONGITUDE DEGREES **92** MINUTES **13** SECONDS **06**		
F	RESPONSIBLE PARTY OR VESSEL NAME **Agnico Eagle Mines Ltd.**	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION **Meliadine, Rankin Inlet, Nunavut, X0C 0G0**		
G	ANY CONTRACTOR INVOLVED **None**	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED **Treated effluent**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES **1430 mg/L (~3600 m3/d)**	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE) **None**	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER **NA**	
I	SPILL SOURCE **Mel-14**	SPILL CAUSE **saline water**	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY **N/A**	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	

K — ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS

A sample of treated water from Mel-14 (final discharge point to Meliadine Lake) was collected on August 19th 2018. Upon receiving the sampling results, the TDS was found to be 1430 mg/L which exceeded the permitted discharge limit of 1400 mg/L.

This spill is being reported as per the 2AM-MEL1631 Nunavut Water Board License, part F item 3.

A follow up report will be issued.

Sr. Environmental Coordinator - Dan Gorton/Jennifer Brown: Ext 3996
Environmental Technician - Laura Hanson: Ext 3903 or 3925

L	REPORTED TO SPILL LINE BY **Jessica Huza**	POSITION **Gen. Supervisor Env**	EMPLOYER **Agnico Eagle**	LOCATION CALLING FROM **Meliadine Project**	TELEPHONE **8198565097**
M	ANY ALTERNATE CONTACT **Dan Gorton**	POSITION **Enviro Coordinator**	EMPLOYER **Agnico Eagle**	ALTERNATE CONTACT LOCATION **Meliadine Project**	ALTERNATE TELEPHONE **8197593555**

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Follow Up Report: #18-378
August 19, 2018 MEL-14 TDS Concentration Criteria Exceeded

Description of Incident:

A sample of treated water from MEL-14 (final effluent sampling port prior to discharge to Meliadine Lake) was collected on August 19, 2018. Upon review of the laboratory analysis results, the total dissolved solids (TDS) concentration was found to be 1,430 mg/L which exceeded the permitted discharge limit of 1,400 mg/L.

As per the obligations under the Nunavut Water Board License 2AM-MEL1631, Part F, item 3 pursuant to subsection 12(3) of the Nunavut Waters and Nunavut Surface Rights Tribunal Act., samples were collected for laboratory analysis to assess TDS concentrations and other water quality parameters during final effluent discharge at MEL-14. The laboratory results were received on September 13, 2018 and reviewed and reported on September 15, 2018. With regards to your question on reporting delay, due to the remote location and the extensive list of parameters that we sample for the Mel-14 sample, the delay in receiving results from the lab is generally 3-4 weeks. This is because the lab sub-contracts part of the analysis to their sister lab in Burnaby BC, so it can take a while for the sample to be received and processed.

Cause and Corrective Measures

The sample was collected at 10:30 am on August 19, 2018. During this time, there was an unscheduled power outage and effluent release had stopped at the effluent water treatment plant (EWTP). Water was not pumped through the sampling port located at MEL-14 during this time. The person that conducted the sampling was a summer intern student who has returned to school and the sampling conditions and confirmation of the location that the sample was collected has not been verified. Based on the field parameter monitoring, the power outage, review of laboratory results from previous and post sampling events, the TDS concentrations reported from the laboratory analysis for MEL-14 on August 19, 2019 are assumed to be not representative for the final effluent discharged the sampling port for MEL-14 to Meliadine Lake. It is possible that it was sampled from a port that was not treated and not discharging to Meliadine Lake.

Table 1 presents the operational report, which summarizes the monitoring results at the EWTP on August 19, 2018. Table 2 presents the daily volume effluents discharged at MEL-14 to Meliadine Lake in August 2018.

Training for all personnel responsible has been conducted to ensure that future MEL-14 sampling is always collected from the same location, after treatment when the power and pumps are working. In addition,

the Environment Department at Meliadine is currently implementing a data management system for laboratory results. Once it has been fully commissioned, it should mitigate delays with reporting criteria exceedances and improve the timing for requests that may be made if re-analysis is required at the laboratory.

Agnico eagle understands the importance to meet water quality discharge criteria without exceedances. All departments involved discussed the EWTP changes or updates daily in a morning water management meeting and the monitoring and comparisons of data was an important part of a decision-making process.

Table 1: August 19 EWT Operational Report:

AGNICO EAGLE NUNAVUT

EWTP DAILY OPERATIONAL REPORT

Day Shift Operator:	J. Roussy			**Date:**		Aug 19 2018	
Night Shift Operator:				**Weather Conditions D/S:**			
				Weather Conditions N/S:			
ACTIFLO #1	**7:00**	**8:00**	**10:00**	**12:00**	**14:00**	**16:00**	**18:00**
Flowrate (m3/hr)	400	400	D	250	200	170	
Total Suspended Solids (TSS) (mg/l) Actiflo discharge (limit 15 mg/l)	3.43	4.25	O	3.7	3.6	4.44	
Feed Turbidity (NTU)	50.93	43.9	W	29.18	25.45	23.45	
pH	6.83	6.82	N	6.77	6.67	6.68	
. Turbidity (NTU) Actiflo discharge	3.68	3.83		4.83	3.4	4.51	
Conductivity (ms/cm) EWTP Discharge pump	2073	2078	D	2173	2098	2142	
Cationic Polymer Set Point (mg/l)	1	1	O	1	1	1	
Coagulant Set Point (mg/l)	35	35	W	37	42	50	
Micro-Sand Quantity (g/l)			N				

Production – ACTIFLO #1	**6:00**	**18:00**	**Variances**
Totaliser Flowrate (m3)	726700	729400	2700

D/S COMMENTS :

Unscheduled power outage in the morning.

Cleaned conductivity probe.

Table 2: EWT Volume Compilation for August 2018

AGNICO EAGLE NUNAVUT

EWTP DAILY OPERATIONAL REPORT

Day	D/S Volume			N/S Volume			Day Total Volume			
	CP1 Total Actiflo (m3)	CP1 recirculated	Meliadine Lake (m3)	CP1 Total Actiflo (m3)	CP1 recirculated	Meliadine Lake (m3)	CP1 Total Actiflo (m3)	CP1 recirculated (m3)	Meliadine Lake Dicharge (m3)	
1-Aug	7,397			8,265			15,662		15,662	
2-Aug	7,105			7,885			14,990		14,990	
3-Aug	6,658			6,252			12,910		12,910	
4-Aug	7,075			7,968			15,043		15,043	
5-Aug	7,532			7,314			14,846		14,846	
6-Aug	6,725			6,151			12,876		12,876	
7-Aug	1,000			7,162			8,162		8,162	Numbers are estimated from time running at flow setpoints. Ran for 2 hours at ~ 500m3/hr
8-Aug	0			0			0		0	
9-Aug	5,006	4,013	993	0	0	0	5,006	4,013	993	Total flow for the day was 5006m3 but only 993m3 reported to Meliadine in the afternoon. There was a bit that was discharged in the morning but could not be recorded.
10-Aug	5,305	1,035	4,270	7,490	7,490	0	12,795	8,525	4,270	
11-Aug	3,360	3,360	0	4,621	18	4,603	7,981	3,378	4,603	
12-Aug	4,729	4,148	581	4,756	2,696	2,060	9,485	6,844	2,641	
13-Aug	4,194	2,863	1,331	4,200	1,229	2,971	8,394	4,092	4,302	
14-Aug	5,100	3,993	1,107	2,001	594	1,407	7,101	4,587	2,514	
15-Aug	3,099	1,909	1,190	3,070	1,284	1,786	6,169	3,193	2,976	
16-Aug	2,830	2,234	596	1,126	897	229	3,956	3,131	825	
17-Aug	2,105	1,283	822	6,406	22	6,384	8,511	1,305	7,206	
18-Aug	2,798	728	2,070	5,000	0	5,000	7,798	728	7,070	
19-Aug	2,783	1,076	1,707	2,543	616	1,927	5,326	1,692	3,634	
20-Aug	3,725	383	3,342	3,710	210	3,500	7,435	593	6,842	
21-Aug	3,081	1,062	2,019	3,050	1,062	1,988	6,131	2,124	4,007	Flow totalizer now programmed to reset every morning. 24hr result taken from totalizer Low production on D/S due to RO cleaning and conductivity riding the limit
22-Aug	2,775	899	1,876	2,958	1,251	1,707	5,733	2,150	3,583	RO cleaning 5hrs, CP1 conductivity above 2,300, need both RO's constantly for EWTP to discharge in Mel
23-Aug	1,613	961	652	2,329	1,438	891	3,942	2,399	1,543	RO cleaning 5hrs, CP1 conductivity above 2,300, Actiflow input flow down to 180m3/h
24-Aug	1,772	1,192	580	1,775	1,775	0	3,547	2,967	580	CP1 conductivity 2400, very low permeate production from RO, windy, poor water quality at MF
25-Aug	764	325	439	0	0	0	764	325	439	NO water from CP1, all water reporting to lake is from RO discharge
26-Aug	537	434	103	0	0	0	537	434	103	RO to MEL 103m3/d, Changed to pump RO to CP1 via EWTP pump. Waiting for samples on RO discharge toxicity
27-Aug	301	301	0	301	301	0	601	601	0	RO to CP1 using EWTP discharge pump (recirc) pipe
28-Aug	192	192	0	192	192	0	384	384	0	RO 2 down for ~14hrs,
29-Aug	181	181	0	181	181	0	362	362	0	
30-Aug	59	59	0	59	59	0	117	117	0	Shutdow both RO 8am, permeate conductivity too high. Did not run overnight
31-Aug	638.5	570	68.5	638.5	570	68.5	1,277	1,140	137	
Total Volume (m3	99,800				21,314		207,841	55,084	152,757	Both RO online 4:30pm, Both RO down at 8:30pm issues.

APPENDIX 2I

Summary of Treated Sewage Discharge Quality from MEL-07, 2016 to 2018

Table 1: Summary of Treated Sewage Discharge Quality from MEL-07, 2016 to 2018

Parameter	Unit	Median	Mean	Min	Max	SD	nd	Count
Conventional Parameters								
pH	-	7.2	7.2	5.7	7.9	0.39	0	125
Total alkalinity, as $CaCO_3$	mg/L	80	95	3.6	320	57	0	51
TDS	mg/L	315	326	275	400	56	0	4
TDS (calculated)	mg/L	470	522	265	1,120	236	0	24
TSS	mg/L	5.0	5.9	<1.0	22	3.8	10	125
Nutrients and Biological Indicators								
Nitrate	mg-N/L	22	22	<0.01	69	11	1	125
Nitrite	mg-N/L	1.2	1.6	<0.01	11	1.7	1	125
Nitrate + nitrite	mg-N/L	24	24	0.020	69	11	0	124
Total ammonia	mg-N/L	18	19	<0.01	66	16	9	125
Total Kjeldahl Nitrogen	mg-N/L	22	25	1.8	89	15	0	125
Total nitrogen (calculated)	mg-N/L	47	49	11	98	16	0	124
Total nitrogen	mg-N/L	52	-	-	-	-	0	1
Total phosphorus	mg-P/L	12	12	4.0	17	2.3	0	123
BOD	mg/L	12	17	2.0	58	14	0	120
COD	mg/L	67	68	46	110	12	0	50
General Organics								
Total oil and grease	mg/L	<1.0	-	<0.5	782	-	61	125
Ungrouped Analytes								
Total coliform	CFU/100mL	300	-	5.0	290,000	-	39	103
Fecal coliform	CFU/100mL	<2.0	-	0	7,000	-	88	113
Heterotrophic plate count	CFU/100mL	11,300	41,567	36	400,000	84,583	2	76
BOD, 5 day	mg/L	7.5	14	6.0	33	13	0	4
Transmittance at 254 nm	%	41	40	35	43	3.8	0	4
Heterotrophic bacteria	CFU/100mL	910	-	-	-	-	0	1
Atypical colonies	CFU/100mL	120	-	-	-	-	0	1

Note: In cases where 25% or more of data were <DL, no mean or standard deviation was calculated.

mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; + = plus; nm = nanometre;
CFU = colony forming units; mL = millilire; / = per; $CaCO_3$ = calcium carbonate; TDS = total dissolved solids; TSS = total suspended solids;
BOD = biochemical oxygen demand; COD = chemical oxygen demand; min = minimum; max = maximum; SD = standard deviation;
nd = not detected; < = less than; DL = detection limit; % = percent; - = no data or not applicable

APPENDIX 2J

Monthly Loadings of Select Sewage Quality Parameters Discharged from MEL-07, 2013 and 2015 to 2018

Table 1: Monthly Loadings of Select Sewage Quality Parameters Discharged from MEL-07, 2013 and 2015 to 2018

		Concentration (mg/L)					Volume	Monthly Loading (kg)				
Year	Month	Nitrate	Nitrite	TKN	TN	TP	(m^3)	Nitrate	Nitrite	TKN	TN	TP
2013	January	16.8	0.1	10.5	27.3	6.8	170.38	2.9	0.014	1.8	4.7	1.2
	February	11.6	0.1	11.6	23.3	8.0	137.8	1.6	0.016	1.6	3.2	1.1
	March	12.2	1.3	30.8	44.3	9.4	436.8	5.3	0.581	13.4	19.4	4.1
	April	16.5	0.8	26.2	43.5	12.1	587	9.7	0.471	15.4	25.5	7.1
	May	11.5	1.3	23.6	36.4	11.0	501	5.7	0.661	11.8	18.2	5.5
	June	4.6	3.2	29.7	37.5	11.5	493	2.3	1.583	14.6	18.5	5.7
	July	9.2	2.6	18.7	30.5	12.2	615	5.7	1.602	11.5	18.8	7.5
	August	13.5	0.3	3.9	17.7	11.4	506	6.8	0.138	2.0	9.0	5.8
	September	5.5	0.2	6.5	12.2	7.7	556	3.1	0.107	3.6	6.8	4.3
	October	16.8	0.3	5.6	22.7	10.0	312	5.3	0.081	1.7	7.1	3.1
	November	27.3	0.2	8.5	36.0	10.6	292.8	8.0	0.057	2.5	10.5	3.1
	December	6.2	0.2	17.1	23.6	10.2	392.3	2.4	0.098	6.7	9.3	4.0
2015	January	22.5	0.3	8.1	30.9	8.5	343.4	7.7	0.100	2.8	10.6	2.9
	February	8.7	5.2	25.1	39.0	9.1	252.2	2.2	1.308	6.3	9.8	2.3
	March	14.5	1.8	9.5	25.8	9.9	409.2	5.9	0.735	3.9	10.6	4.0
	April	10.5	0.8	11.0	22.3	8.9	420.6	4.4	0.348	4.6	9.4	3.8
	May	10.6	5.5	15.7	31.8	8.9	417.3	4.4	2.297	6.6	13.3	3.7
	June	9.8	2.4	8.0	20.2	9.1	380.3	3.7	0.906	3.1	7.7	3.4
	July	5.7	0.5	31.8	38.0	13.7	449.8	2.6	0.203	14.3	17.1	6.2
	August	9.5	1.6	32.0	43.0	10.5	468.8	4.4	0.768	15.0	20.2	4.9
	September	5.8	1.0	52.1	58.9	10.6	531.1	3.1	0.542	27.6	31.3	5.6
	October	7.9	2.5	30.2	40.6	12.6	620.5	4.9	1.566	18.7	25.2	7.8
	November	7.9	2.5	40.4	50.8	13.4	611	4.8	1.509	24.7	31.0	8.2
	December	-	-	-	-	-	653.9	-	-	-	-	-
2016	January	18.7	0.2	5.6	24.5	9.5	480.6	9.0	0.078	2.7	11.8	4.6
	February	23.1	0.4	12.6	36.1	10.1	572.7	13.2	0.246	7.2	20.7	5.8
	March	22.6	0.5	6.8	29.9	10.2	545.6	12.4	0.251	3.7	16.3	5.6
	April	18.9	0.7	12.5	32.1	8.7	630.6	11.9	0.444	7.9	20.2	5.5
	May	29.2	1.1	22.2	52.5	13.2	608.2	17.8	0.642	13.5	32.0	8.0
	June	30.5	1.1	17.6	49.2	10.8	452	13.8	0.492	8.0	22.2	4.9
	July	14.9	1.5	28.2	44.5	15.5	620.7	9.2	0.942	17.5	27.6	9.6
	August	11.8	1.7	35.5	49.1	14.1	672.6	7.9	1.176	23.9	33.0	9.5
	September	18.3	1.7	24.0	44.0	13.3	845.4	15.4	1.463	20.3	37.2	11.2
	October	18.7	3.4	29.2	51.3	12.6	850.2	15.9	2.899	24.8	43.6	10.7
	November	14.5	4.4	48.0	66.9	15.4	876.4	12.7	3.853	42.1	58.6	13.5
	December	19.2	1.8	47.8	68.7	14.3	831.8	15.9	1.497	39.7	57.2	11.9

Table 1: Monthly Loadings of Select Sewage Quality Parameters Discharged from MEL-07, 2013 and 2015 to 2018

		Concentration (mg/L)					Volume	Monthly Loading (kg)				
Year	Month	Nitrate	Nitrite	TKN	TN	TP	(m^3)	Nitrate	Nitrite	TKN	TN	TP
2017	January	22.6	2.6	44.0	69.2	13.6	692.7	15.7	1.783	30.5	47.9	9.4
	February	19.2	1.9	46.3	67.3	13.5	888.1	17.1	1.676	41.1	59.8	12.0
	March	19.3	2.7	42.8	64.7	13.0	785.5	15.2	2.099	33.6	50.9	10.2
	April	23.7	2.3	18.4	44.4	12.2	908	21.5	2.101	16.7	40.3	11.1
	May	31.3	3.9	27.2	62.3	13.8	875.7	27.4	3.420	23.8	54.6	12.1
	June	29.7	3.6	16.8	50.1	11.5	710.2	21.1	2.582	11.9	35.6	8.2
	July	21.6	1.9	15.8	39.4	10.4	686.2	14.8	1.336	10.9	27.0	7.2
	August	20.0	2.0	18.3	40.3	12.3	772.4	15.5	1.525	14.1	31.1	9.5
	September	14.5	0.5	18.5	33.5	11.9	630	9.2	0.284	11.7	21.1	7.5
	October	19.6	1.4	35.0	56.0	10.8	409	8.0	0.563	14.3	22.9	4.4
	November	12.6	0.4	27.0	40.0	9.7	466	5.9	0.194	12.6	18.6	4.5
	December	-	-	-	-	-	-	-	-	-	-	-
2018	July	4.8	0.18	2.1	7.1	0.045	425562	2041.8	77.62	893.7	3013.0	19.065
	August	6.3	0.23	1.8	8.3	0.025	153066	961.3	35.36	274.8	1272.0	3.750
	September	5.7	0.33	1.3	7.4	0.023	2632	15.1	0.87	3.4	19.4	0.061

mg/L = milligrams per litre; m^3 = cubic metres; kg = kilograms; TKN = total Kjeldahl nitrogen; TN = total nitrogen; TP = total phosphorus; - = no data

APPENDIX 6A

Water Quality – Quality Assurance and Quality Control

APPENDIX 6A

Water Quality – Quality Assurance and Quality Control

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1.0 INTRODUCTION

Quality assurance and quality control (QA/QC) practices determine data integrity and are relevant to all aspects of the Meliadine AEMP water quality monitoring component. Golder Associates Ltd. (Golder) applied QA/QC practices throughout the program, from sample collection to data analysis and reporting. Quality assurance (QA) is the set of procedures incorporated into standard procedures, so that field sample collection is carried out to an acceptable standard and does not introduce errors or bias; quality control (QC) refers to the system of validation checks performed to measure data quality, to evaluate whether data quality objectives are met. The QA/QC procedures in 2018 followed relevant requirements outlined in the Meliadine AEMP Design Plan (Golder 2016).

This appendix describes QA/QC practices applied during this study, evaluates QC data, and describes the implications of QC results to the interpretation of study results.

2.0 QUALITY ASSURANCE PROCEDURES

Quality assurance applicable to this program covers three areas of internal and external management: field work, laboratory analysis, and office operations.

2.1 Field Work

Golder field crews are trained to be proficient in standardized field sampling procedures, data recording, and equipment operations applicable to water quality sampling. Field work was completed according to approved specific work instructions to field crews and established internal technical procedures. Specific work instructions are standardized forms that reference appropriate technical procedures and provide specific sampling instructions for the work to be undertaken. For example, specific work instructions provide field staff with descriptions of exact sampling locations, equipment needs and calibration requirements, sample handling and storage requirements, sample labelling and shipping protocols, and internal and laboratory contacts. The specific work instructions also provide specific guidelines for field record keeping and sample tracking. Golder technical procedures are consistent with information described in the relevant scientific literature (e.g., Environment Canada 1993; APHA 2012), and outline relevant information regarding protocols for field sample collection and in situ field measurements.

One crew member was responsible for managing the sample documentation process so that:

- required samples are collected or reasons are documented as to why a sample was not collected
- chain-of-custody and analytical request forms are filled out appropriately
- established labelling and documentation procedures are followed

2.2 Laboratory Analyses

ALS Environmental (ALS; Edmonton location), an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA), was used for the analysis of water samples collected during the 2018 field programs. Under CALA's accreditation program, performance evaluations are conducted for laboratory procedures, methods, and internal QC. Therefore, the analytical data reported by ALS were considered reliable.

One member of the water quality monitoring team from Golder was designated as the laboratory liaison to streamline communications with the laboratory.

2.3 Office Operations

Relevant elements of office-based QA were:

- using appropriately trained personnel for each data management, analysis, and reporting task
- using standardized data manipulation and summary tools, where applicable
- filing hard-copy, electronic data, and project information according to standardized protocols
- using a data management system to maintain an organized, consistent system to store, check and export field and laboratory data field and laboratory data storage, QC, and retrieval
- senior review of work at appropriate steps during the data analysis and reporting process

3.0 QUALITY CONTROL PROCEDURES

3.1 Field Procedures

Four types of QC samples were used in this program to evaluate data quality:

- **Field blanks** consist of deionized water provided by the analytical laboratory that is transferred to sample bottles in the field. Field blanks are handled the same way and analyzed for the same constituents as the water samples collected during the field program (e.g., preserved, filtered). Field blanks are used to detect potential sample contamination during sample collection, handling, shipping, and analysis.
- **Equipment blanks** consist of deionized water provided by the analytical laboratory that is transferred into equipment that comes into contact with samples (e.g., the Kemmerer sampler). After being run through the equipment, the water is then transferred into sample bottles. The equipment blanks are handled in the same way (e.g., preserved and filtered) and analyzed for the same constituents as the water samples collected during the field program. Equipment blanks are used to detect potential sample contamination from equipment used during sample collection.
- **Travel blanks** consist of deionized water provided in sampling bottles by the analytical laboratory. Travel blanks accompany the field samples through collection and transportation. They are shipped, handled, stored, and treated in the same way as the collected samples. For this program, travel blanks were opened in the field for the amount of time taken to collect a sample, and then closed. Travel blanks are used to detect potential sample contamination related to ambient conditions or shipping and laboratory analysis.
- **Duplicate samples** are additional samples collected at the same time and location as surface water samples collected during a field program, using the same sampling methods. They are used to check within-station variation, and the precision of field sampling methods and laboratory analysis.

QC samples accounted for approximately 16% of the total number of water samples submitted for analysis. All QC samples were submitted “blind” (i.e., so as to not to identify them as QC samples) to the laboratory to test the validity of the analysis process and were analyzed for the same set of parameters as the collected water samples.

3.2 Field and Laboratory Data Quality Control Procedures

Field-collected data, datasheets and the field notebook were reviewed for completeness and unexpected values and trends. Upon receipt of water quality data from the laboratory, a series of standard checks were performed to screen for potential data quality issues (Sections 3.2.1 to 3.2.8):

- screening of laboratory and field results
- review of detection limits (DLs)
- review of units
- review of holding time exceedances
- checking for contamination in blank samples
- comparison of duplicate samples

3.2.1 Screening of Laboratory and Field Results

The following screening procedures were completed on laboratory and field results in 2018:

- project chain-of-custody (COC) forms and analytical request forms were compared to sampling records, to confirm sampling locations matched assigned sample control numbers and analyses were requested for all required parameters
- laboratory results were reviewed to confirm analysis of all required parameters
- field and laboratory data from the same sample were reviewed to check that data were similar for common parameters
- logic checks were conducted, including checking for presence of zero values, comparisons of TDS and specific conductivity, hardness and alkalinity, total and dissolved phosphorus, total and dissolved organic carbon, and total and dissolved metals
- unusual data relative to previously collected data were identified through a visual comparison of 2018 data to historical data

Laboratory results were considered for re-analyses if:

- values were assessed as substantially higher or lower than expected, based on comparisons to historical concentrations
- parameters were detected in concentrations above five times the DL in a field blank, but similar concentrations were not measured in the travel blank or in samples analyzed during the same sampling event (i.e., contamination during laboratory analyses may have occurred)

If re-analysis confirmed the original analysis result (i.e., RPD less than 20%), the original result was retained. If the re-analysis was notably different than the original result (i.e., RPD greater than 20%), then a decision was made to keep the original or re-analyzed result based on discussions with the laboratory regarding any QC issues of the original and re-analyzed results, holding time exceedances, historical concentrations, concentrations of other parameters within the same sample, and results of the QC samples. The rationale for requesting re-analyses or revising the original result to the re-analyzed result was documented.

3.2.2 Detection Limits

Detection limits were specified for all chemical analyses for the Meliadine AEMP water quality program. The project standard DLs and the DLs provided by the laboratory for individual samples were compared.

If laboratory DLs were higher than the project standard DLs, the laboratory was notified and requested to provide an explanation for the change in DLs. If possible, a parameter was re-analyzed at the project standard DL. Changes in DLs by the laboratory during the program could cause limitations when comparing results with different DLs and results to water quality guidelines. An increase in DL above measured concentrations reduces the ability to detect spatial and temporal patterns; an increase in DL above a water quality guideline reduces the ability to detect guideline exceedances when concentrations are below DLs.

3.2.3 Units

The units reported by the laboratory were compared against the expected units, as coded into the database, for each parameter.

3.2.4 Holding Time

Holding times between sample collection and analysis for each parameter are specified by the laboratory, based on Table 1060: I – Summary of Special Sampling and Handling Requirements, *The Standard Methods for the Examination of Water and Wastewater* (APHA 2012). The laboratory reviews holding times for exceedances and identifies data that may be unreliable due to holding time exceedances. Holding time exceedances are considered when determining the validity of re-analyzed results from the laboratory.

3.2.5 Blank Samples

Concentrations in travel and field blanks were considered notable if they were greater than or equal to five times the corresponding DL. This threshold takes into account the potential for reduced precision when concentrations approach or are below DLs (AENV 2006; APHA 2012). This criterion does not apply to pH, however, because DLs are not applicable to the pH scale.

3.2.6 Duplicate Samples

Differences between concentrations measured in duplicate water samples were calculated as the RPD for each parameter. Before calculating the RPD, concentrations below the DL were replaced with the DL value in cases when only one of the concentrations for a given parameter was detectable. The RPD was calculated as per Equation 1:

$$RPD = (|difference\ in\ concentration\ between\ two\ of\ the\ duplicate\ samples|/mean\ concentration)\ x\ 100$$

[Equation 1]

The RPD value for a given parameter was notable if both conditions apply:

- the RPD was greater than 20%
- concentrations in one or both samples were greater than five times the DL

The number of parameters with exceedances of the evaluation criteria was compared with the total number of parameters analyzed to evaluate analytical precision.

Within-site variability and field sampling precision of duplicate sample results were rated as:

- **low and high**, respectively, if less than 10% of the parameters included in the duplicate sample analysis were notably different from one another
- **moderate**, if 10% to 30% of the parameters included in the duplicate sample analysis were notably different from one another
- **high and low**, respectively, if more than 30% of the parameters included in the duplicate sample analysis were notably different from one another

3.2.7 Comparison of Dissolved and Total Concentrations

Dissolved concentrations were compared to their corresponding total concentrations for nutrient and metal constituents. If the dissolved concentration was 20% greater than the corresponding total concentration, and both (total and dissolved) concentrations were greater than five times the DL, the dissolved concentration was considered notable.

3.3 Office Quality Control Procedures

Office-based QC procedures were as follows:

- saving unaltered field datasheets, field notebooks, and laboratory files (e.g., COC forms, analysis request forms, certificates of analysis) in the Meliadine AEMP water quality monitoring program directory, to document the original and final sources of laboratory and field water quality data from each program
- comparing sample field and laboratory data entered into the Meliadine AEMP water quality monitoring program data management system against field datasheets and final laboratory reports to confirm data accuracy
- creating backup files before each major data processing step
- verifying the accuracy of calculations performed to generate summary statistics and complete guideline comparisons
- documenting the final results for the QA/QC assessment annually in an appendix to the annual report

4.0 2018 FIELD AND LABORATORY DATA QUALITY RESULTS

4.1 Screening of Individual Laboratory and Field Results

4.1.1 Chain-of-Custody Review

A review of the COC forms indicated that Radium-226 was not requested for analysis for the travel blank (T-18-07-01) sample collected on 23 July 2018. The Radium-226 analysis was erroneously omitted from the COC form.

4.1.2 Parameters Requested for Analysis

All requested parameters were analyzed by the laboratory.

4.1.3 Field Data Review

Based on the review of the field data, all field dissolved oxygen (DO) measurements collected in March were further evaluated because the values were outside the expected range. Winkler titrations were performed alongside field measurements at two stations: MEL-01-02 and MEL-02-01. At MEL-01-02 and MEL-02-01, Winkler dissolved oxygen measurements were 6.62 and 5.94 mg/L, compared to corresponding probe measurements of 18.5 and 18.8 mg/L, respectively. As a result, DO meter data were deemed unreliable and excluded from analysis.

Two field pH values in July and twenty field pH values in August were different than expected, relative to laboratory values (Table 6A-1). On 30 August 2018, the field crew noted an issue with the calibration of the field water quality meter and re-calibrated the meter, at which point pH values returned to within the normal range for subsequently samples stations. No issues with the field water quality meter were noted by the field crew during the July program. In all cases, the field values were invalidated because field pH values were outside the range of historical values at these locations, whereas laboratory pH values were within the range of historical values. However, as laboratory pH was measured outside the holding time requirement, it is acknowledged that these laboratory pH data have corresponding uncertainty. Corresponding field pH profile values were also invalidated.

4.1.4 Laboratory Data Review

Thirty-nine laboratory results, which represented less than 1.5% of the 2018 laboratory data, in 65 samples were further evaluated because of reasons outlined in Table 6A-1. Re-analysis of samples for certain parameters was requested when data logic checks indicated a potential problem with the data. In all cases, reanalysis confirmed the original result and the original result was retained, with the following exception. The concentration of dissolved nickel in sample D7-03 collected on 1 September 2018 was notably different upon reanalysis (0.776 µg/L) relative to the original result (1.97 µg/L). The reanalyzed result was closer to the expected value based on comparison to the total nickel concentration (0.88 µg/L); therefore, the original results was revised by the laboratory.

4.2 Analytical Methods

All required parameters under the AEMP Design Plan (Golder 2016) were analyzed by the laboratory using the standard analytical methods requested during the program (Table 6A-2).

4.3 Detection Limits

A few parameters were analyzed by the laboratory using DLs higher than the requested DL (Table 6A-2). Requested DLs were met for most parameters, with the exception of total dissolved solids (70 samples), reactive

silica (17 samples), sodium (2 samples), total vanadium (2 samples), dissolved selenium (20 samples), dissolved thallium (four samples), dissolved tin (13 samples), and dissolved vanadium (2 samples). Generally, detection limits were adjusted due to sample matrix effects (e.g., chemical interference, colour, turbidity).

4.4 Units

The laboratory reported the expected units for each parameter in 2018.

4.5 Holding Time

To maintain sample integrity, water samples for laboratory analyses were submitted as soon as possible after collection. Holding times may be exceeded for samples if there are delays in sample delivery to the laboratory, or if the laboratory is unable to initiate testing promptly following sample receipt. Analytical holding times were met for most constituents, with the exception of laboratory pH (76 samples), total dissolved solids (59 samples), total suspended solids (70 samples), turbidity (76 samples), nitrate (78 samples), nitrite (78 samples), orthophosphate (78 samples), total Kjeldahl nitrogen (11 samples), total dissolved phosphorus (3 samples), total mercury (1 sample), dissolved mercury (3 samples), and total cyanide (17 samples).

Holding times for laboratory pH (15 minutes), turbidity, nitrate, nitrite and orthophosphate (three days) were exceeded in the majority of samples during each program, because the holding times are very short for these constituents. Holding times for the other parameters were exceeded due to a sample backlog at the laboratory that resulted in a delay in initiation of analysis.

Holding time exceedances for pH, nutrients and turbidity are not uncommon. A study on holding time exceedances for these parameters conducted by the Department of Environment and Conservation in Newfoundland and Labrador (2010) found that although parameters concentrations differed between samples processed within and outside recommended holding times (by up to 21 days), the results were not significantly different (at $P<0.05$). Therefore, they concluded that the data were still valid, even with a delay in processing beyond the holding time. Holding times for the 2018 Meliadine dataset for these parameters were not exceeded by more than 21 days. Holding times for total and dissolved mercury and total cyanide were only exceeded by one day, and therefore data quality was considered acceptable.

4.6 Blank Samples

Six blank samples (four travel blanks and two equipment blanks) were collected and analyzed during the 2018 program (Table 6A-3). The frequency of detectable concentrations (i.e., above the DL) in the blank samples was 13%. However, only 1% of concentrations in blank samples were reportable detections (i.e., greater than five times the DL); therefore, no parameters were detected at a frequency or magnitude that were likely to influence the results of the water quality samples.

4.7 Duplicate Samples

Six duplicate water quality samples were collected during the 2018 program: two replicates were collected for each program (Table 6A-4).

A small percentage (i.e., 3%) of the paired duplicate concentrations had an RPD of more than 20% when one or both concentrations were above five times the DL (Table 6A-5). The site variability and field precision for the 2018 dataset was rated as low and high, respectively.

4.8 Internal Laboratory Quality Control

No issues were identified in the review of internal laboratory quality control results.

5.0 SUMMARY OF DATA QUALITY

The results of the review of field and laboratory data indicated that field measurements and laboratory data were of acceptable quality. Key findings from the 2018 QA/QC results are:

- In general, field measurements and results of laboratory samples collected during the 2018 sampling program were within the ranges that would be expected for the Meliadine water quality program, with the exception of two field pH measurements collected in July and several field pH measurements collected in August. These field pH measurements were invalidated, because the values were far outside the range of historical variation at these stations.
- No issues were identified in analytical methods used or units reported by the laboratory.
- Holding times recommended by the laboratory were exceeded for some parameters. Holding time exceedances were not expected to have affected data quality for the Meliadine water quality program.
- Evaluation of the water quality QC samples indicated that:
  - No notable contamination occurred in the blank samples.
  - Site variability and field precision for the 2018 dataset were rated as low and high, respectively.

The overall quality of the water quality data was rated high. Therefore, the results reported in the report are considered reliable and meet the needs of the program.

REFERENCES

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TABLES

Table 6A-1: Summary of Re-evaluated Data for Field and Laboratory Results, Meliadine, 2018

Station Name	Station Sample ID	Lab ID	Sample Date	Parameter	Reason for Evaluation	Result	Unit	Decision
Field Data								
MEL-01-01	MEL-01-01	-	02-Mar-18	Dissolved oxygen	Outside of acceptable range	18.4	mg/L	Winkler titration data were reviewed because dissolved oxygen probe measurements fell outside of the acceptable range. Winkler titration measurements collected alongside field probe measurements for March 2018 were much lower than probe readings (5.94 mg/L at MEL-02-01 and 6.62 mg/L at MEL-01-02). As result, dissolved oxygen measurements were invalidated.
MEL-01-02	MEL-01-02	-	05-Mar-18			18.5		
MEL-01-03	MEL-01-03	-	02-Mar-18			18.0		
MEL-01-04	MEL-01-04	-	05-Mar-18			19.4		
MEL-01-05	MEL-01-05	-	02-Mar-18			18.5		
MEL-02-01	MEL-02-01	-	06-Mar-18			18.8		
MEL-02-02	MEL-02-02	-	05-Mar-18			20.0		
MEL-02-03	MEL-02-03	-	05-Mar-18			19.1		
MEL-02-04	MEL-02-04	-	06-Mar-18			19.3		
MEL-02-05	MEL-02-05	-	06-Mar-18			18.9		
Lake B7	B-07-01	-	22-Jul-18	Field pH	Field pH was higher than expected relative to laboratory pH (7.54)	8.63	unitless	Field pH data invalidated. Field pH was greater than one pH unit different from laboratory pH and outside of the historical field pH range at this station.
	B-07-02	-	22-Jul-18		Field pH was higher than expected relative to laboratory pH (7.53)	8.56		
Lake A8	A8-01	-	17-Aug-18		Field pH was higher than expected relative to laboratory pH (7.80)	9.08		
	A8-02	-	17-Aug-18		Field pH was higher than expected relative to laboratory pH (7.82)	9.09		
	A8-03	-	17-Aug-18		Field pH was higher than expected relative to laboratory pH (7.85)	9.13		
Lake B7	B7-01	-	17-Aug-18		Field pH was higher than expected relative to laboratory pH (7.67)	8.87		
	B7-02	-	17-Aug-18		Field pH was higher than expected relative to laboratory pH (7.79)	8.9		
	B7-03	-	17-Aug-18		Field pH was higher than expected relative to laboratory pH (7.67)	8.93		
MEL-01-01	MEL-01-01	-	22-Aug-18		Field pH was higher than expected relative to laboratory pH (7.35)	8.64		
MEL-01-06	MEL-01-06	-	22-Aug-18		Field pH was higher than expected relative to laboratory pH (7.36)	8.63		
MEL-01-07	MEL-01-07	-	21-Aug-18		Field pH was higher than expected relative to laboratory pH (7.36)	8.59		
MEL-01-08	MEL-01-08	-	22-Aug-18		Field pH was higher than expected relative to laboratory pH (7.36)	8.62		
MEL-01-09	MEL-01-09	-	22-Aug-18		Field pH was higher than expected relative to laboratory pH (7.36)	8.62		
MEL-02-03	MEL-02-03	-	18-Aug-18		Field pH was higher than expected relative to laboratory pH (7.43)	8.57		
MEL-02-05	MEL-02-05	-	18-Aug-18		Field pH was higher than expected relative to laboratory pH (7.46)	8.63		
MEL-03-01	MEL-03-01	-	20-Aug-18		Field pH was higher than expected relative to laboratory pH (7.42)	8.52		
MEL-03-02	MEL-03-02	-	26-Aug-18		Field pH was higher than expected relative to laboratory pH (7.48)	8.51		
MEL-03-03	MEL-03-03	-	20-Aug-18		Field pH was higher than expected relative to laboratory pH (7.42)	8.64		
MEL-03-04	MEL-03-04	-	26-Aug-18		Field pH was higher than expected relative to laboratory pH (7.44)	8.47		
MEL-03-05	MEL-03-05	-	26-Aug-18		Field pH was higher than expected relative to laboratory pH (7.45)	8.56		
MEL-05-03	MEL-05-03		29-Aug-18		Field pH was higher than expected relative to laboratory pH (7.46)	8.62		
MEL-05-05	MEL-05-05		29-Aug-18		Field pH was higher than expected relative to laboratory pH (7.51)	8.63		

Table 6A-1: Summary of Re-evaluated Data for Field and Laboratory Results, Meliadine, 2018

Station Name	Station Sample ID	Lab ID	Sample Date	Parameter	Reason for Evaluation	Result	Unit	Decision
Water Chemistry Data								
MEL-01-02	MEL-01-02	L2064973-4	05-Mar-18	Total lead	Greater than 20% RPD between replicates	0.055	µg/L	Concentrations were confirmed by re-analysis; original result was retained.
MEL-01-02	R-18-01	L2064973-11	05-Mar-18	Total lead	Greater than 20% RPD between replicates	0.074	µg/L	
MEL-03-03	MEL-03-03	L2139293-3	25-Jul-18	Total nickel	Concentration was greater than five times the method detection limit and exceeded their relative total/dissolved metal concentration by more than 20%.	0.46	µg/L	
				Dissolved nickel		0.70	µg/L	
MEL-03-01	MEL-03-01	L2139293-1	25-Jul-18	Total dissolved solids	Non-linear relationship between TDS and laboratory specific conductivity	33	mg/L	
				Laboratory specific conductivity		68	µS/cm	
MEL-02-05	MEL-02-05	L2137049-2	21-Jul-18	Total dissolved solids	Non-linear relationship between TDS and laboratory specific conductivity	35	mg/L	
				Laboratory specific conductivity		74.3	µS/cm	
MEL-01-09	MEL-01-09	L2139293-7	24-Jul-18	Total aluminum	Greater than 20% RPD between replicates	29.1	µg/L	
				Dissolved aluminum		22.2	µg/L	
				Radium-226		100	Bq/L	
	R-18-07-02	L2139293-12	24-Jul-18	Total aluminum		20.6	µg/L	
				Dissolved aluminum		17.1	µg/L	
				Radium-226		<4.1	Bq/L	
MEL-01-07	MEL-01-07	L2139293-6	24-Jul-18	Dissolved manganese		2.71	µg/L	
	R-18-07-01	L2139293-8				1.73	µg/L	
MEL-03-01	MEL-03-01	L2153439-2	20-Aug-18	Total nickel	Concentration was greater than five times the method detection limit and exceeded their relative total/dissolved metal concentration by more than 20%.	0.412	µg/L	
				Dissolved nickel		0.499	µg/L	
MEL-03-01	MEL-03-01	L2153439-2	20-Aug-18	Total dissolved solids	Greater than 20% RPD between replicates	48	mg/L	
				Total iron		17.8	µg/L	
				Dissolved iron		4.2	µg/L	
	R-18-01	L2153439-1		Total dissolved solids		35	mg/L	
				Total iron		12	µg/L	
				Dissolved iron		6.1	µg/L	
Lake B7	B-07-01	L2137049-11	22-Jul-18	Total aluminum	Concentration was greater than five times the method detection limit and exceeded their relative total/dissolved metal concentration by more than 20%.	3.33	µg/L	
				Dissolved aluminum		4.33	µg/L	
Lake A8	A8-02	L2139293-10	24-Jul-18	Total nickel		0.69	µg/L	
				Dissolved nickel		0.90	µg/L	
Lake A8	A8-03	L2139293-11		Total nickel		0.86	µg/L	Concentrations were confirmed by re-analysis; original result was retained.
				Dissolved nickel		1.14	µg/L	
Lake D7	D7-03	L2161089-3	01-Sep-18	Total copper		0.89	µg/L	
				Dissolved copper		1.4	µg/L	
		L2161089-3		Total nickel		0.88	µg/L	
				Dissolved nickel		1.97	µg/L	Result revised to 0.776 µg/L upon reanalysis
	D7-01	L2161089-1		Total lead		0.019	µg/L	Concentrations were confirmed by re-analysis; original result was retained.
				Dissolved lead		0.083	µg/L	
	D7-02	L2161089-2		Total uranium		0.066	µg/L	
				Dissolved uranium		0.081	µg/L	

µg/L = micrograms per litre; µS/cm = microSiemens per centimeter; mg/L = milligrams per litre; Bq/L = Becquerels per litre.

Table 6A-2: Summary of Analytical Methods and Detection Limits, Meliadine Mine, 2018

Parameter	Unit	Total Number of Samples	Standard Project Analytic Methodologies	Method Description	Standard ALS Detection Limit	MDMER Required Detection Limit
Conventional Parameters						
pH (laboratory)	unitless	65	APHA 4500H	Meter	0.1	n/a
Specific conductivity	µS/cm	65	APHA 2510B	Meter	1	1
Hardness (as $CaCO_3$)	mg/L	65	APHA 2340B	Calculation	0.2	1
Total alkalinity (as $CaCO_3$)	mg/L	65	APHA 2320B	Potentiometric titration; Colourimetric	1	2
Total dissolved solids	mg/L	65	APHA 2540 SOLIDS C,E	Gravimetric	4	n/a
Total suspended solids	mg/L	65	APHA 2540D		1	2
Turbidity (laboratory)	NTU	65	APHA 2130B (modified)	Meter	0.1	n/a
Major Ions						
Bicarbonate	mg/L	65	Calculation	Calculation	1.2	n/a
Carbonate	mg/L	65	Calculation		0.6	n/a
Calcium	mg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	n/a
Chloride	mg/L	65	EPA 300.1 (mod)	Ion chromotography	0.1	60
Fluoride	mg/L	65	EPA 300.1 (mod)	Ion chromotography	0.02	n/a
Magnesium	mg/L	65	APHA 3125 ICP-MS	ICPMS	0.004	n/a
Potassium	mg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	n/a
Reactive silica, as SiO_2	mg/L	65	APHA 4500	Colourimetric	0.01	n/a
Sodium	mg/L	65	APHA 3125 ICP-MS	ICPMS	0.005	n/a
Sulphate	mg/L	65	EPA 300.1 (mod)	Ion chromotography	0.3	0.6
Nutrients						
Nitrate	mg-N/L	65	EPA 300.1 (mod)	Ion chromotography	0.005	1.5
Nitrite	mg-N/L	65	EPA 300.1 (mod)	Ion chromotography	0.005	n/a
Nitrate and nitrite	mg-N/L	65	APHA 4500	Calculation	0.005	n/a
Total ammonia	mg-N/L	65	APHA 4500	Colourimetric	0.005	0.05
Total Kjeldahl nitrogen	mg-N/L	65	APHA 4500	Fluorescence	0.05	n/a
Total nitrogen	mg-N/L	65	APHA 4500	Fluorescence	0.05	n/a
Total phosphorus	mg-P/L	65	APHA 4500	Colourimetric	0.001	0.05
Dissolved phosphorus	mg-P/L	65	APHA 4500	Colourimetric	0.001	n/a
Orthophosphate	mg-P/L	65	APHA 4500	Colourimetric	0.001	n/a
Total organic carbon	mg/L	65	APHA 5310 B-WP	Combustion-infrared	0.5	n/a
Dissolved organic carbon	mg/L	65	APHA 5310 B-WP	Combustion-infrared	0.5	n/a
Total Metals[(b)]						
Aluminum	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.3	5
Antimony	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	n/a
Arsenic	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	10
Barium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Beryllium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Bismuth	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Boron	µg/L	65	APHA 3125 ICP-MS	ICPMS	1	n/a
Cadmium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.005	0.045

Table 6A-2: Summary of Analytical Methods and Detection Limits, Meliadine Mine, 2018

Parameter	Unit	Total Number of Samples	Standard Project Analytic Methodologies	Method Description	Standard ALS Detection Limit	MDMER Required Detection Limit
Total Metals[(b)] (cont'd)						
Chromium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.06	4.45
Cobalt	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	1.25
Copper	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.1	10
Iron	µg/L	65	APHA 3125 ICP-MS	ICPMS	1	150
Lead	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	30
Lithium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.5	n/a
Manganese	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	5
Mercury	µg/L	65	EPA 1631 T (mod)	CVAFS	0.0005	0.01
Molybdenum	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	36.5
Nickel	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.06	20
Selenium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	0.5
Silver	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.005	n/a
Strontium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Thallium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.005	0.4
Tin	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Titanium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.1	n/a
Uranium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	7.5
Vanadium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Zinc	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.8	10
Dissolved Metals[(b)]						
Aluminum	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.3	n/a
Antimony	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	n/a
Arsenic	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	n/a
Barium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Beryllium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Bismuth	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Boron	µg/L	65		ICPMS	1.0	n/a
Cadmium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.005	n/a
Chromium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.06	n/a
Cobalt	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Copper	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.1	n/a
Iron	µg/L	65	APHA 3125 ICP-MS	ICPMS	1.0	n/a
Lead	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Lithium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Manganese	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Mercury	µg/L	65	EPA 1631 D (mod)	CVAFS	0.0005	n/a
Molybdenum	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Nickel	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.06	n/a
Selenium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.02	n/a

Table 6A-2: Summary of Analytical Methods and Detection Limits, Meliadine Mine, 2018

Parameter	Unit	Total Number of Samples	Standard Project Analytic Methodologies	Method Description	Standard ALS Detection Limit	MDMER Required Detection Limit
Dissolved Metals[(b)] (cont'd)						
Silver	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.005	n/a
Strontium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Thallium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.005	n/a
Titanium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.10	n/a
Tin	µg/L	65		ICPMS	0.05	n/a
Uranium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.01	n/a
Vanadium	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.05	n/a
Zinc	µg/L	65	APHA 3125 ICP-MS	ICPMS	0.8	n/a
Other						
Total cyanide	mg/L	65	ISO 14403-2	Colourimetric	0.001	n/a
Free cyanide	mg/L	65	ASTM D7237		0.001	n/a
Weak acid dissolved cyanide	mg/L	65	APHA 4500-CN-I		0.001	n/a
Radium-226	Bq/L	65	EPA8260B	Alpha-spectrometry of Gross-Alpha Counting	0.01	n/a

(a) As per Schedule 3 of the MDMER (Government of Canada 2002).

(b) The list of elements reported for metals analysis includes metalloids such as arsenic and non-metals such as selenium, which are collectively referred to as "metals" in this table.

µS/cm = microSiemens per centimetre; $CaCO_3$ = calcium carbonate; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; µg/L = micrograms per litre; Bq/L = Becquerels per litre; NTU = nephelometric turbidity unit; ICPMS = Inductively Coupled Plasma Mass Spectrometry; CVAFS = Cold Vapour Atomic Fluorescence Spectrophotometry.

Table 6A-3: Quality Control Blank Samples Results, Meliadine, 2018

Parameter	Unit	Travel Blanks				Equipment Blanks	
		F-18-01	T-18-07-01	BLANK[a]	T-18-08-01	E18-07-01	E-18-08-01
		5-Mar-18	23-Jul-18	26-Jul-18	20-Aug-18	22-Jul-18	20-Aug-18
Conventional Parameters							
pH (laboratory)	µS/cm	5.87	5.72	5.76	5.61	5.57	6.08
Specific conductivity (laboratory)	unitless	7	<1	<1	<1	<1	1.8
Hardness (as $CaCO_3$)	mg/L	0.42	<0.053	<0.2	<0.2	<0.053	<0.2
Total alkalinity (as $CaCO_3$)	mg/L	<1	<1	<1	<1	<1	<1
Total dissolved solids	mg/L	6.3	<4	<4	<4	<4	<4
Total suspended solids	mg/L	<1	<1	<1	<1	<1	<1
Turbidity (laboratory)	NTU	0.25	<0.1	<0.1	<0.1	<0.1	<0.1
Major Ions							
Bicarbonate	mg/L	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Calcium	mg/L	0.162	<0.02	<0.02	<0.02	<0.02	<0.02
Carbonate	mg/L	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoride	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	mg/L	0.0047	<0.004	<0.004	<0.004	<0.004	<0.004
Potassium	mg/L	0.051	<0.02	<0.02	<0.02	<0.02	<0.02
Reactive silica, as SiO_2	mg/L	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	0.025	<0.008	<0.014	<0.005	0.0084	<0.005
Sulphate	mg/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nutrients							
Nitrate	mg-N/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.0095
Nitrite	mg-N/L	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate and nitrite	mg-N/L	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	0.0095
Total ammonia	mg-N/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total phosphorus	mg-P/L	0.0017	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved phosphorus	mg-P/L	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001
Orthophosphate	mg-P/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total organic carbon	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved organic carbon	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Metals[b]							
Aluminum	µg/L	2.71	0.83	<0.3	0.96	0.88	<0.3
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	µg/L	<0.05	0.051	<0.05	<0.05	<0.05	<0.05
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	<1	1.9	2.1	1.3	2.2	<1

Table 6A-3: Quality Control Blank Samples Results, Meliadine, 2018

Parameter	Unit	Travel Blanks				Equipment Blanks	
		F-18-01	T-18-07-01	BLANK[a]	T-18-08-01	E18-07-01	E-18-08-01
		5-Mar-18	23-Jul-18	26-Jul-18	20-Aug-18	22-Jul-18	20-Aug-18
Total Metals[b] (cont'd)							
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	<0.06	<0.06	<0.06	0.081	<0.06	<0.06
Cobalt	µg/L	<0.01	<0.01	<0.01	0.011	<0.01	<0.01
Copper	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	µg/L	<1	<1	<1	6.2	1.6	3
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Lithium	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/L	<0.05	<0.05	<0.05	0.114	0.051	0.073
Mercury	µg/L	<0.0005	<0.0005	0.0009	<0.0005	0.0005	<0.0005
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	<0.06	<0.06	<0.06	0.189	<0.06	0.097
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	0.057	<0.05	<0.05	<0.05	0.059	<0.05
Thallium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1
Zinc	µg/L	<0.8	<0.8	<0.8	<0.8	<0.8	0.86
Dissolved Metals[b]							
Aluminum	µg/L	0.65	1.09	<0.3	0.83	<0.3	<0.3
Antimony	µg/L	0.119	<0.02	0.082	<0.02	0.268	<0.02
Arsenic	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	µg/L	0.191	0.053	<0.05	0.123	<0.05	<0.05
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iron	µg/L	<1	1.2	1.3	2.7	<1	1.7
Lead	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	µg/L	<0.005	<0.005	0.009	<0.0005	0.005	0.0005
Molybdenum	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Table 6A-3: Quality Control Blank Samples Results, Meliadine, 2018

Parameter	Unit	Travel Blanks				Equipment Blanks	
		F-18-01	T-18-07-01	BLANK[a]	T-18-08-01	E18-07-01	E-18-08-01
		5-Mar-18	23-Jul-18	26-Jul-18	20-Aug-18	22-Jul-18	20-Aug-18
Dissolved Metals[b] (cont'd)							
Nickel	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06	0.071
Selenium	µg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	0.124	<0.05	<0.05	<0.05	<0.05	0.059
Thallium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Titanium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05
Zinc	µg/L	1.6	<0.8	<0.8	<0.8	<0.8	<0.8
Other							
Cyanide	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Radium-226	Bq/L	-[c]	-[d]	<6.4	<0.006	<4.7	<0.0045

(a) Field crew confirmed this sample was collected as a travel blank.

(b) The list of elements reported for metals analysis includes metalloids such as arsenic and non-metals such as selenium, which are collectively referred to as "metals" in this table.

(c) Radium-226 was not included in analysis during the under-ice program.

(d) Due to a technical error by the field crew, Radium-226 was not requested for analysis.

Grey shading indicates the concentration was greater than 5 times the detection limit.

All results that exceeded their detection limit by greater than 5-times were confirmed by reanalysis.

µS/cm = microSiemens per centimetre; $CaCO_3$ = calcium carbonate; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; µg/L = micrograms per litre; Bq/L = Becquerels per litre; NTU = nephelometric turbidity unit; < = less than.

Table 6A-4: Quality Control Duplicate Sample Results, Meliadine, 2018

Parameter	Unit	MEL-01-02		MEL-02-02		MEL-01-07		MEL-01-09		MEL-03-01		MEL-01-09	
		Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate
		05-Mar-18		05-Mar-18		23-Jul-18		24-Jul-18		20-Aug-18		22-Aug-18	
Conventional Parameters													
pH (laboratory)	µS/cm	7.27	7.38	7.22	7.27	7.36	7.39	7.41	7.41	7.42	7.38	7.36	7.35
Specific conductivity (laboratory)	unitless	117	117	98.7	98.5	89.1	90.9	86.0	86.4	71.7	73.0	84.1	83.6
Hardness (as $CaCO_3$)	mg/L	34.6	35.1	30.1	29.3	25.7	26.3	26	25.5	20.4	20.9	23.8	23.9
Total alkalinity (as $CaCO_3$)	mg/L	27.2	27	24.9	24.8	15.8	15.7	15.1	15.5	17.5	16.9	16.7	16.2
Total dissolved solids	mg/L	68	69	58	56	55	53	51	53	48	35	53	49
Total suspended solids	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Turbidity (laboratory)	NTU	0.24	0.2	0.12	0.12	0.4	0.39	0.43	0.39	0.23	0.27	0.59	0.42
Major Ions													
Bicarbonate	mg/L	33.2	32.9	30.4	30.3	19.3	19.2	18.4	18.9	21.4	20.6	20.4	19.8
Calcium	mg/L	10.8	11	9.51	9.06	7.92	8.1	7.99	7.9	6.40	6.56	7.32	7.35
Carbonate	mg/L	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	14.7	14.7	11.6	11.5	13.7	14.2	13.1	13.1	8.28	8.29	12.3	12.3
Fluoride	mg/L	0.028	0.028	0.025	0.025	0.021	0.021	0.021	0.021	0.024	0.026	0.024	0.023
Magnesium	mg/L	1.86	1.87	1.54	1.64	1.45	1.48	1.46	1.4	1.08	1.09	1.34	1.35
Potassium	mg/L	1.44	1.38	1.27	1.26	0.984	1.01	1.01	0.987	0.900	0.914	0.993	0.993
Reactive silica, as SiO_2	mg/L	0.706	0.696	0.485	0.496	0.423	0.42	0.411	0.402	0.233	0.234	0.356	0.352
Sodium	mg/L	7.72	7.18	6.15	6.19	6.1	6.22	6.15	5.78	4.63	4.47	5.66	5.59
Sulphate	mg/L	5.82	5.79	4.46	4.42	4.27	4.31	4.19	4.2	3.75	3.83	4.33	4.31
Nutrients													
Nitrate	mg-N/L	0.0054	0.005	0.0156	0.0166	0.0223	0.0274	0.0117	0.0123	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	<0.001	0.001	<0.001	<0.001	0.0016	0.002	0.0012	0.0012	<0.001	<0.001	<0.001	<0.001
Nitrate and nitrite	mg-N/L	0.0054	0.006	0.0156	0.0166	0.0239	0.0294	0.0129	0.0135	<0.0051	<0.0051	<0.0051	<0.0051
Total ammonia	mg-N/L	<0.005	<0.005	0.0106	0.0104	<0.005	<0.005	<0.005	0.0055	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	0.117	0.215	0.067	0.106	0.175	0.246	0.236	0.235	0.226	0.276	0.223	0.221
Total nitrogen	mg-N/L	0.123	0.221	0.082	0.122	0.199	0.275	0.249	0.249	0.199	0.275	0.249	0.249
Total phosphorus	mg-P/L	0.0057	0.0056	0.0032	0.0030	0.0021	0.0032	0.0025	0.002	0.0042	0.0045	0.0075	0.0083

Table 6A-4: Quality Control Duplicate Sample Results, Meliadine, 2018

Parameter	Unit	MEL-01-02		MEL-02-02		MEL-01-07		MEL-01-09		MEL-03-01		MEL-01-09	
		Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate
		05-Mar-18		05-Mar-18		23-Jul-18		24-Jul-18		20-Aug-18		22-Aug-18	
Nutrients (cont'd)													
Dissolved phosphorus	mg-P/L	0.0027	0.0025	0.0022	0.0017	<0.001	<0.001	<0.001	<0.001	0.0021	0.0021	0.0029	0.0033
Orthophosphate	mg-P/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total organic carbon	mg/L	3.97	3.98	3.00	3.01	2.96	2.99	2.95	3.01	2.20	2.24	3.18	3.02
Dissolved organic carbon	mg/L	3.85	3.89	2.9	2.91	2.92	2.93	2.97	3.00	2.32	2.25	3.06	3.04
Total Metals[(a)]													
Aluminum	µg/L	0.50	0.63	0.64	0.46	23.2	28	29.1	20.6	2.83	3.28	8.21	6.60
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.542	0.541	0.281	0.314	0.364	0.319	0.342	0.346	0.209	0.213	0.42	0.402
Barium	µg/L	11.5	11.7	11.2	10.9	8.66	8.88	8.88	8.53	8.21	7.36	7.88	7.78
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	5.4	5.8	4.8	5.5	5.1	5.2	5.0	4.6	3.0	3.2	5.1	5.0
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	µg/L	10,900	11,400	9,300	10,500	8,060	8,080	8,080	7,670	6,400	6,610	7,550	7,760
Chromium	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06	0.069	<0.06	<0.06	0.555	<0.06	<0.06	<0.06
Cobalt	µg/L	0.012	0.013	<0.01	<0.01	0.027	0.03	0.027	0.027	0.015	0.011	0.019	0.023
Copper	µg/L	1.08	1.13	0.89	0.86	0.82	0.73	0.86	0.70	0.64	0.63	0.83	0.76
Iron	µg/L	6	5.8	2.8	2.8	27.1	28.6	26.3	23.3	17.8	12.0	19.9	21.2
Lead	µg/L	0.055	0.074	0.039	0.033	0.010	<0.01	0.01	<0.01	0.01	<0.01	0.018	0.016
Lithium	µg/L	<0.5	<0.5	<0.5	0.52	1.83	1.94	1.82	1.76	0.64	0.7	1.32	1.33
Magnesium	µg/L	1,910	1,930	1,590	1,650	1,450	1,460	1,460	1,380	1,090	1,100	1,330	1,310
Manganese	µg/L	2.14	2.04	1.21	1.23	7.11	7.70	7.27	6.70	2.58	2.66	4.31	4.60
Mercury	µg/L	0.001	0.001	0.0008	0.0013	0.0011	0.0011	0.0010	0.0015	0.0006	0.0007	0.0008	0.0006
Molybdenum	µg/L	0.096	0.194	0.083	0.079	0.059	0.078	0.067	0.057	0.064	0.073	0.081	0.085
Nickel	µg/L	0.79	0.77	0.576	0.569	0.707	0.738	0.694	0.639	0.412	0.394	0.607	0.578
Potassium	µg/L	1440	1450	1280	1280	998	999	1010	992	902	900	934	947

Table 6A-4: Quality Control Duplicate Sample Results, Meliadine, 2018

Parameter	Unit	MEL-01-02		MEL-02-02		MEL-01-07		MEL-01-09		MEL-03-01		MEL-01-09	
		Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate
		05-Mar-18		05-Mar-18		23-Jul-18		24-Jul-18		20-Aug-18		22-Aug-18	
Total Metals[a] (cont'd)													
Selenium	µg/L	0.058	0.045	0.049	0.047	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	µg/L	7,580	7,530	6,100	6,050	5,920	6,060	6,000	5,700	4,500	4,470	5,360	5,500
Strontium	µg/L	49.5	53.7	42.5	49	58.2	61.4	59.0	55.9	30.5	32.1	45.1	45.7
Thallium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	0.18	<0.1	<0.1	<0.1	0.22	0.22
Uranium	µg/L	0.018	0.018	0.015	0.016	0.021	0.019	0.018	0.016	0.014	0.013	0.017	0.015
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.051	<0.05	<0.05	<0.1	<0.1	<0.05	<0.05
Zinc	µg/L	0.85	1.33	<0.8	<0.8	<0.8	<0.8	<0.8	1.4	<0.8	<0.8	<0.8	<0.8
Dissolved Metals[a]													
Aluminum	µg/L	<0.3	<0.3	0.35	0.44	18.7	21.8	22.2	17.1	1.43	1.34	3.23	2.73
Antimony	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.104	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	0.53	0.499	0.334	0.303	0.341	0.33	0.329	0.323	0.204	0.201	0.403	0.413
Barium	µg/L	11.5	11.5	11.0	10.9	8.8	8.65	8.37	8.58	7.7	7.43	8.03	8.24
Beryllium	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.083	<0.06	0.173	<0.06	<0.06
Cobalt	µg/L	<0.01	<0.01	<0.01	<0.01	0.022	0.015	0.012	0.011	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	1.02	1.00	0.86	0.85	0.65	0.69	0.64	0.7	0.57	0.62	0.89	0.70
Iron	µg/L	1.7	1.8	<1	<1	9.3	8.8	8.5	10.3	4.2	6.1	5.7	4.9
Lead	µg/L	0.039	0.041	0.035	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	0.86	1.06	0.67	0.69	1.86	2.06	2.01	2.01	0.64	0.78	1.23	1.29
Manganese	µg/L	0.215	0.195	0.224	0.232	2.71	1.73	1.37	1.4	0.442	0.453	0.366	0.325
Mercury	µg/L	0.0005	0.0006	<0.0005	<0.0005	0.0013	0.0013	0.0013	0.0013	0.0005	<0.0005	0.0005	0.0005

Table 6A-4: Quality Control Duplicate Sample Results, Meliadine, 2018

Parameter	Unit	MEL-01-02		MEL-02-02		MEL-01-07		MEL-01-09		MEL-03-01		MEL-01-09	
		Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate	Sample	Duplicate
		05-Mar-18		05-Mar-18		23-Jul-18		24-Jul-18		20-Aug-18		22-Aug-18	
Dissolved Metals[a] (cont'd)													
Molybdenum	µg/L	0.104	0.091	0.075	0.076	0.054	0.064	0.071	0.087	0.064	0.081	0.101	0.101
Nickel	µg/L	0.799	0.736	0.563	0.538	0.647	0.655	0.64	0.669	0.499	0.406	0.562	0.556
Selenium	µg/L	0.057	0.052	<0.04	0.041	0.041	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	51.7	51.4	45.9	42.4	55.6	60.4	56.4	52.5	32.5	32.6	44.6	45.1
Thallium	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Titanium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.018	0.018	0.014	0.015	0.019	0.019	0.020	0.015	0.011	0.014	0.014	0.014
Vanadium	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05	<0.05
Zinc	µg/L	<0.8	0.98	<0.8	<0.8	<0.8	<0.8	<0.8	1.55	<0.8	<0.8	<0.8	<0.8
Other													
Cyanide	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Radium-226	Bq/L	-[b]	-[b]	-[b]	-[b]	<0.0078	<0.0072	0.1	<0.0041	<0.0074	<0.0057	<0.0063	<0.0053

(a) The list of elements reported for metals analysis includes metalloids such as arsenic and non-metals such as selenium, which are collectively referred to as "metals" in this table.
(b) Radium-226 analysis was not included as an analyte for this station.
Grey shading indicates a greater than 20% relative percent difference between replicates, when both sample concentrations were 5-times greater than the detection limit.
Light grey shading indicates a greater than 20% relative percent difference between replicates, when at least one sample concentration was 5-times greater than the detection limit.
µS/cm = microSiemens per centimetre; $CaCO_3$ = calcium carbonate; mg/L = milligrams per litre; mg-N/L = milligrams nitrogen per litre; mg-P/L = milligrams phosphorus per litre; µg/L = micrograms per litre; Bq/L = Becquerels per litre; NTU = nephelometric turbidity unit; < = less than.

Table 6A-5: Summary of Relative Percent Differences Between Water Quality Duplicate Samples, Meliadine, 2018

Station Number	Date	Total Number of Parameters	Relative Percent Difference Above 20% (when one parameter was above five times the detection limit)		Relative Percent Difference Above 20% (when both parameters were above five times the detection limit)		Relative Percent Difference Above 20% (when one or both parameters were above five times the detection limit)	
			Number of Parameters	Percent of Total Parameters (%)	Number of Parameters	Percent of Parameter (%)	Number of Parameters	Percent of Parameter (%)
MEL-01-02	05-Mar-18	85	0	0	1	1	1	1
MEL-02-02	5-Mar-18	85	0	0	0	0	0	0
MEL-01-07	23-Jul-18	86	0	0	3	3	3	3
MEL-01-09	24-Jul-18	86	2	2	3	3	5	6
MEL-03-01	20-Aug-18	86	1	1	4	5	5	6
MEL-01-09	22-Aug-18	86	0	0	3	3	3	3
Total		**514**	**3**	**1**	**14**	**3**	**17**	**3**

APPENDIX 6B

Normal Range Data Screening

Data collected between 1995 and 2013 (i.e., pre-2015 data) were compiled and compared to AEMP monitoring data (collected between 2015 to 2018) to evaluate if Near-field and Mid-field area AEMP datasets are suitable for inclusion in normal range calculation. An analysis conducted as part of the FEIS (Agnico Eagle 2014; in Appendix 7.4-A) concluded that the 2013 dataset was comparable to baseline data collected at Meliadine Mine prior to 2013. Prior to pooling the pre-2015 dataset, it was reviewed further to evaluate the suitability of including these data in the normal range calculation. Data were initially assessed for representativeness of the current AEMP sampling areas. During the assessment, sampling station DI4 was (located approximately 10 kilometres southeast of the Mine site removed from the dataset due to its distance from other sampling areas, and limited connection to other areas of Meliadine Lake.

For the historical stations retained in the pre-2015 dataset, the laboratory data were evaluated to determine if the detection limits (DL; where available) were comparable to AEMP detection limits, and if a sufficient percentage of results was above the DL. For conventional parameters, major ions and selected nutrients, the detection limits were similar to the current AEMP DLs, or most of the data were above the detection limit. Metals and nitrogen parameters were not retained due to large number of non-detects, and DLs generally being at least one order of magnitude higher than AEMP DLs. The inclusion of such results would artificially increase the range of baseline results and compromise normal range calculation. Historical field data were retained and included in the normal range calculation.

Sample sizes were comparable among datasets, with a pre-2015 sample size of approximately 21 and AEMP samples sizes ranging between approximately 14 (2015 and 2018) to 25 (2017).

The screening procedure for potential inclusion of data in the normal range calculation for open-water conditions was as follows:

- Near-field area data collected between 2015 and 2017 were qualitatively compared to data (i.e., pre-2015 data) collected at stations located in the vicinity of the AEMP Near-field area between 1995 and 2013). Pre-2015 data were pooled and compared to AEMP Near-field data using box-and-whisker plots. Total metals were excluded from this comparison because the detection limits were not comparable to the AEMP dataset. The 2015 to 2017 Near-field dataset differed from the pre-2015 dataset for several major ions (Figure 6B-1), suggesting that some aspects of water quality in the Near-field area were affected by pre-construction exploration activities.
- Mid-field area data collected between 2016 and 2017 during open-water conditions were compared to Near-field and reference area data collected at the same time, to evaluate whether a spatial pattern among areas was visually evident. Spatial patterns with increasing divergence in concentrations among areas were observed for several ions (Appendix 6F). Therefore, the Mid-field area AEMP data were then qualitatively compared to pre-2015 baseline data collected in the vicinity of the Near-field and reference areas using box-and-whisker plots; baseline data were not collected in the vicinity of the Mid-field area. Total metals were excluded from this analysis because the detection limits were not comparable to the AEMP dataset. A visual difference in the variation of the 2015 to 2017 Mid-field area dataset was observed relative to the pre-2015 pooled dataset for several parameters (Figure 6B-2), suggesting that Mid-field area water quality was also influenced by pre-construction exploration activities.

- Reference area data collected during the AEMP monitoring program (2015 to 2018) did not show the same spatial patterns as the Near-field and Mid-field areas, and so was included in the normal range calculation. Additionally, pre-2015 data were included in the normal range calculation because the FEIS (Agnico Eagle 2014) assessment of the data concluded that the pre-2015 data were appropriate as baseline.

Normal ranges were not calculated for ice-covered conditions for the following reasons:

- During ice-cover conditions, AEMP sampling occurs at the Mid-field and Near-field areas. Therefore, AEMP reference area data were not available for inclusion in the normal range calculation.
- Near-field area data collected under-ice between 2016 and 2018 were not suitable for inclusion in the normal range calculation, because temporal trends were observed for several ions, indicating potential changes in water quality in the Near-field area during pre-construction (Figure 6B-3), which was also suggested by open-water season data.
- Mid-field area data collected under-ice between 2016 and 2018 were also not suitable for inclusion in normal range calculation. Mid-field area data were plotted as box-and-whisker plots alongside pre-2015 data collected in the vicinity of the Near-field and reference areas during winter. The Mid-field area AEMP data visually differed from the pre-2015 dataset for several parameters (Figure 6B-4), resulting in uncertainty in whether this difference was due to a mine-related influence or natural spatial heterogeneity.
- Pre-2015 data were not used to calculate the normal range because after evaluation of the dataset (i.e., DLs) only conventional parameters and major ion data were available and the sample size was limited (n = 4 to 8).

Therefore, due to lack of ice-cover season pre-2015 data, AEMP monitoring program reference area data, and the potential for a mine-related influence on the available pre-construction Near-field and Mid-field area datasets, normal range calculation was not completed for ice-covered conditions.

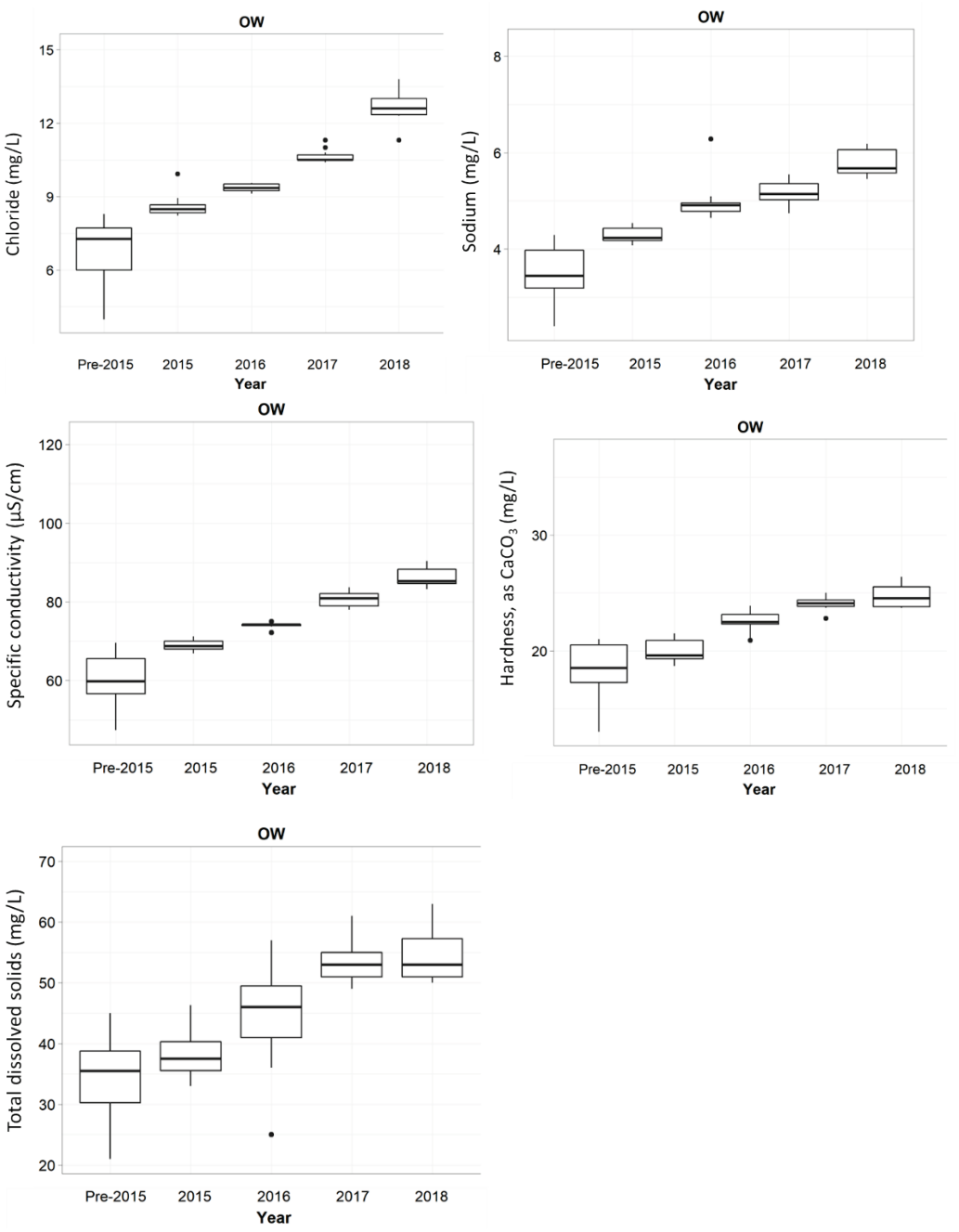

Figure 6B-1: Chloride, Sodium, Specific Conductivity, Hardness and Total Dissolved Solids in the Near-field area between 2015 to 2018 during Open-water Conditions, relative to pre-2015 data

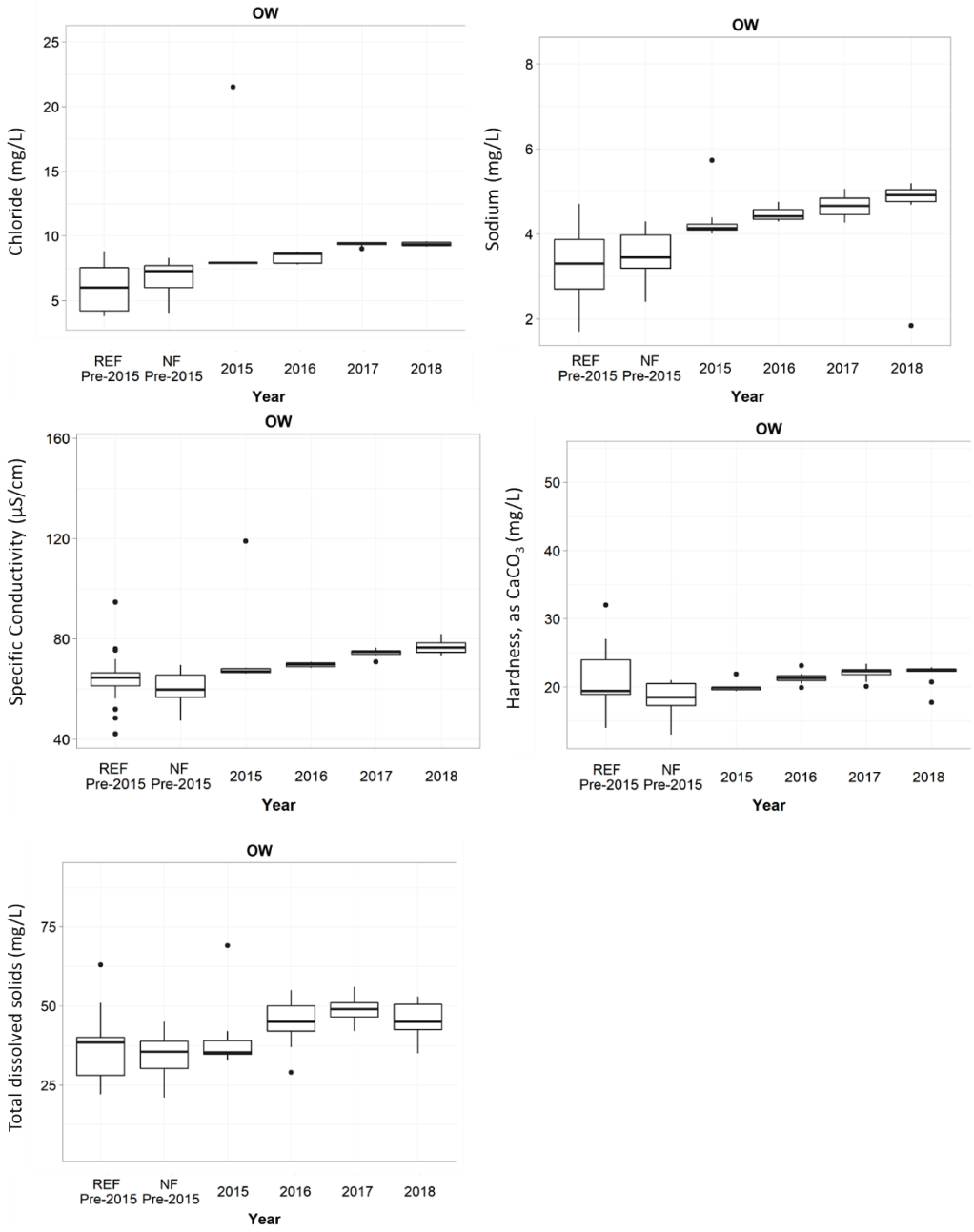

Figure 6B-2: **Chloride, Sodium, Specific Conductivity, Hardness and Total Dissolved Solids in the Mid-field area between 2015 to 2018 during Open-water Conditions, relative to pre-2015 data for the Near-field (NF) and reference areas (REF)**

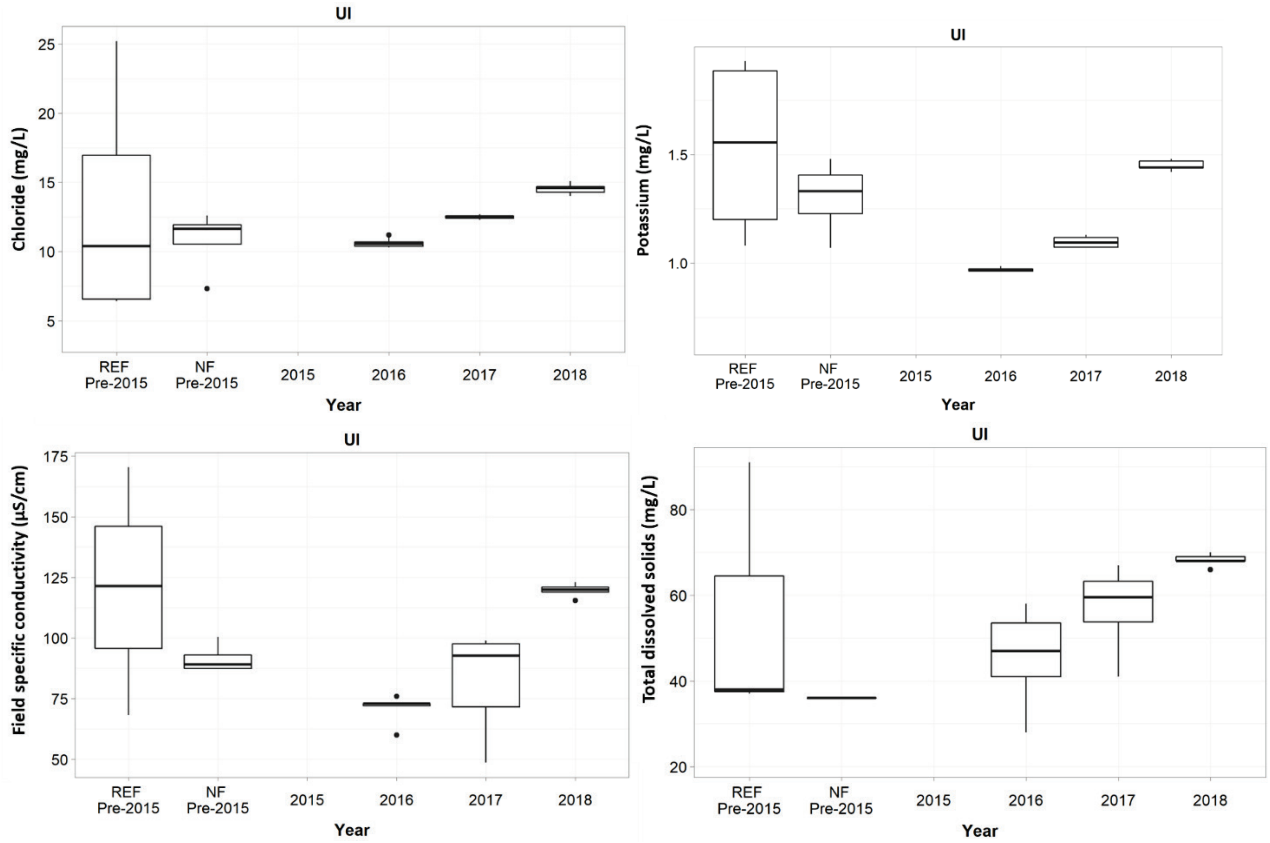

Figure 6B-3: Chloride, Potassium, Specific Conductivity, and Total Dissolved Solids in the Near-field area between 2016 to 2018 during Ice-covered Conditions, relative to pre-2015 data for the Near-field (NF) and reference areas (REF)

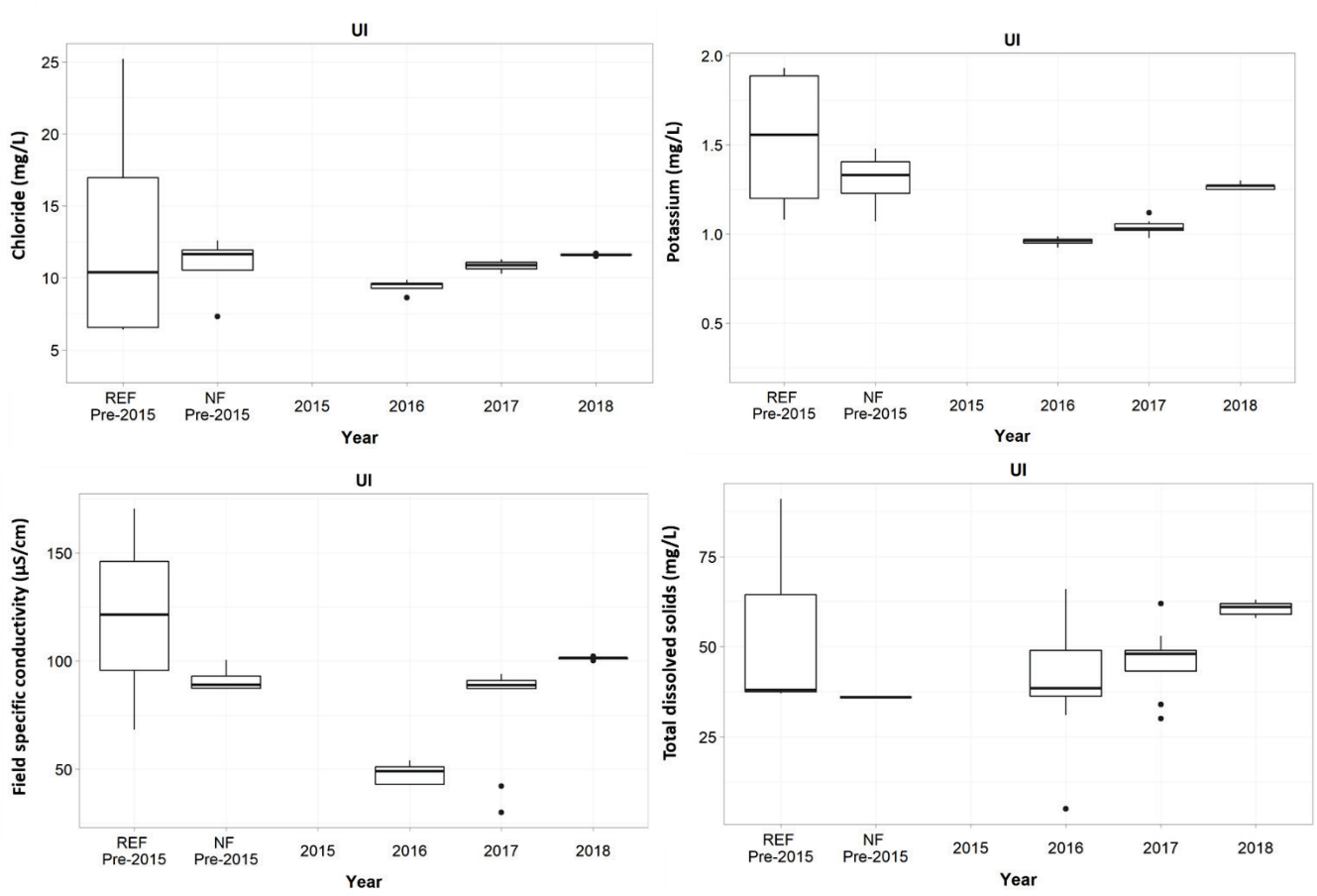

Figure 6B-4: **Chloride, Potassium, Specific Conductivity, and Total Sissolved Solids in the Mid-field area between 2016 to 2018 during Ice-covered Conditions, relative to pre-2015 data for the Near-field (NF) and reference areas (REF)**

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Agnico Eagle (Agnico Eagle Mines Ltd.). 2014. Meliadine Gold Project, Nunavut. Final Environmental Impact Statement. Submitted to the Nunavut Impact Review Board. April 2014.

Golder (Golder Associates Ltd.). 2017. Meliadine Gold Mine EEM Cycle 1 Study Design. Submitted to Agnico Eagle Mines Limited. August 2017.

APPENDIX 6C

Field Water Profile Measurements

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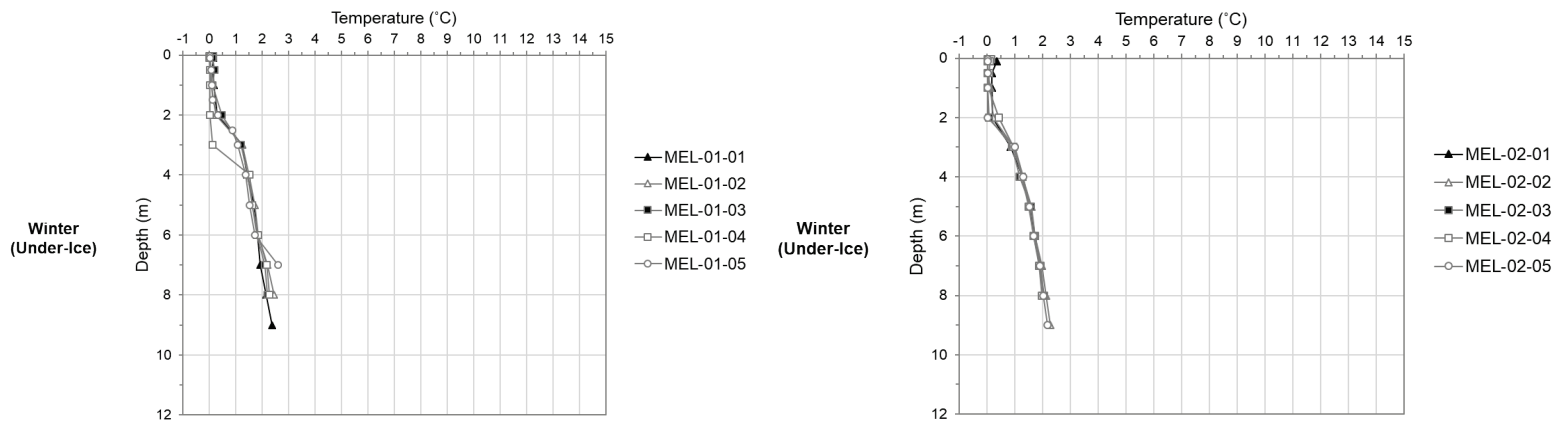
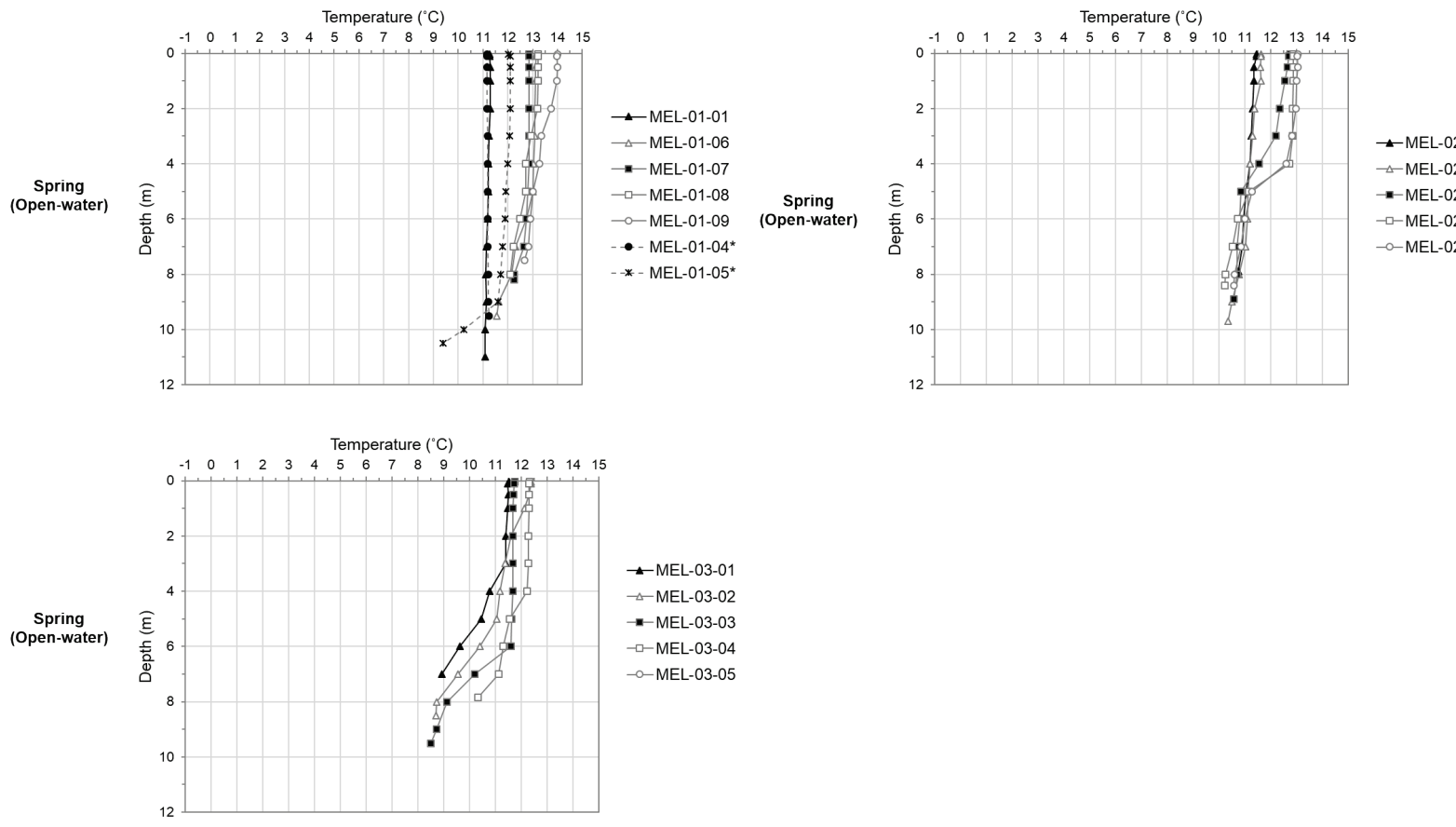
6C.1.0 FIELD PROFILE PLOTS

6C.1.1 Temperature



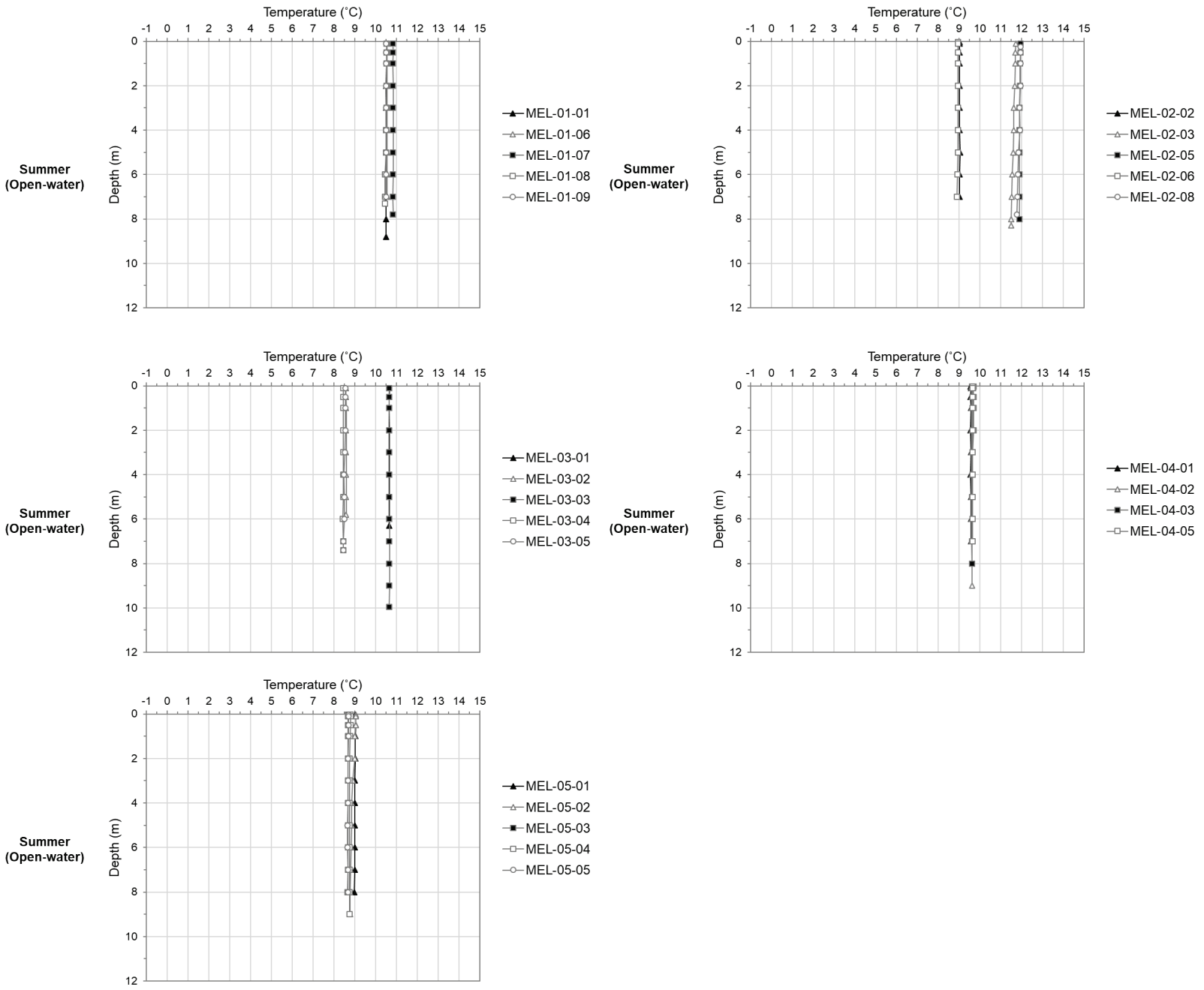
m = metre; °C = degrees Celsius; MEL-01 = Near-field; MEL-02 = Mid-field.

Figure 6C.1-1: Temperature Profiles at Stations on Meliadine Lake, Under-ice (March) 2018



m = metre; °C = degrees Celsius; MEL-01 = Near-field; MEL-02 = Mid-field; MEL-03 = Reference Area 1; * = a field profile was conducted at these stations but water quality samples were not collected.

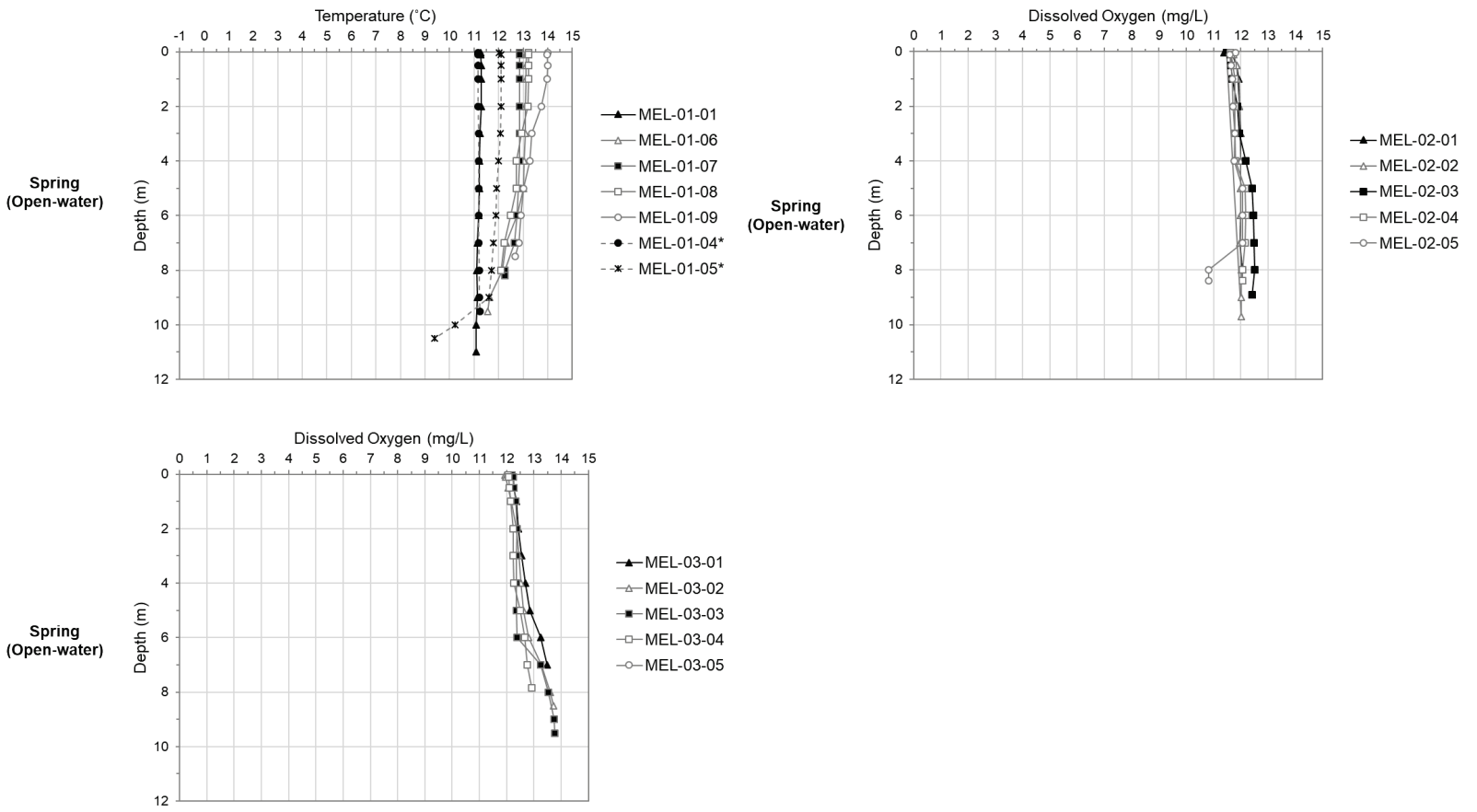
Figure 6C.1-2: Temperature Profiles at Stations on Meliadine Lake, Open-water (July) 2018



m = metre; °C = degrees Celsius; MEL-01 = Near-field; MEL-02 = Mid-field; MEL-03 = Reference Area 1; MEL-04 = Reference Area 2; MEL-05 = Reference Area 3.

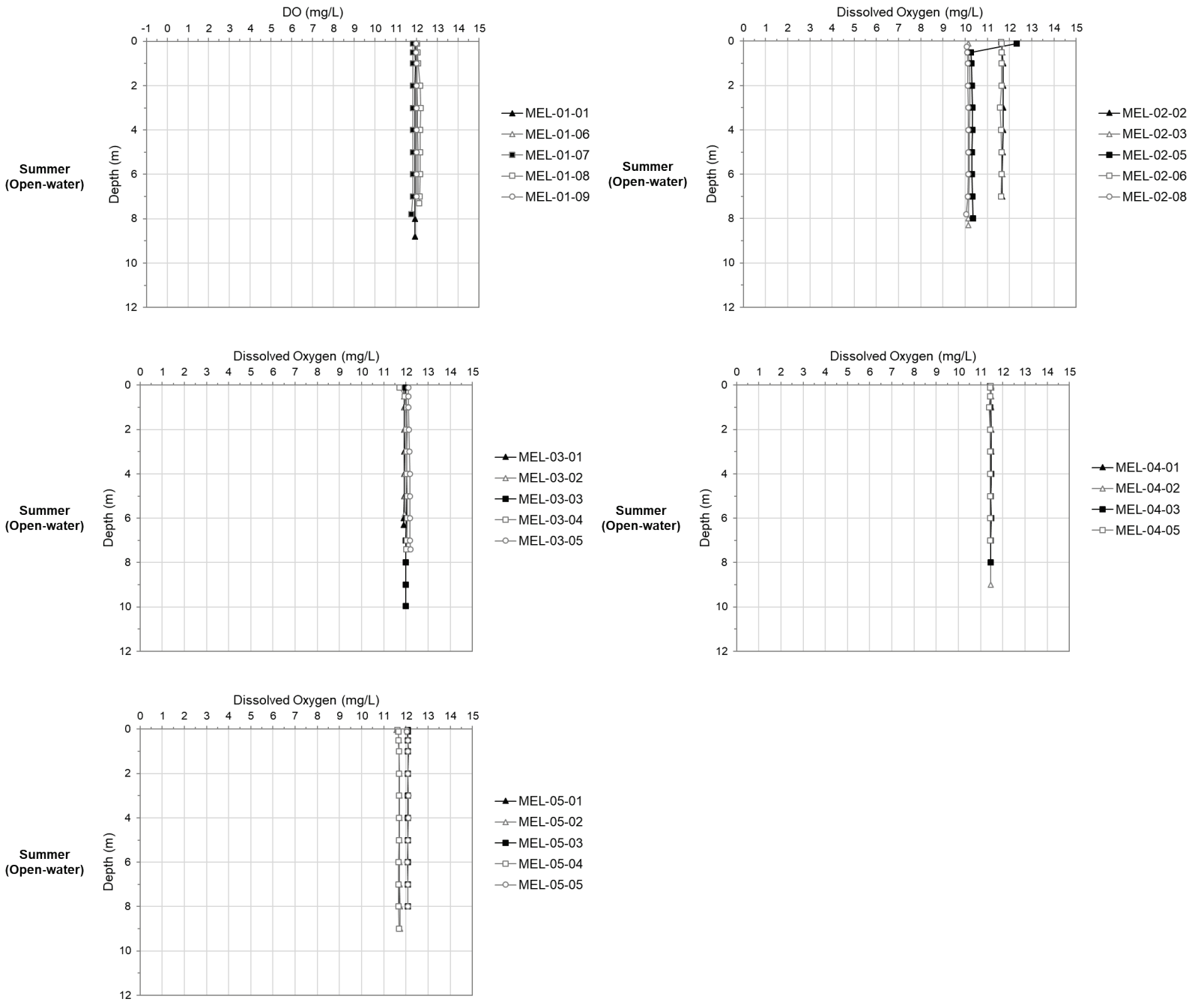
Figure 6C.1-3: Temperature Profiles at Stations on Meliadine Lake, Open-water (August) 2018

6C.1.2 Dissolved Oxygen



m = metre; mg/L = milligrams per litre; MEL-01 = Near-field; MEL-02 = Mid-field; MEL-03 = Reference Area 1; * = a field profile was conducted at these stations but water quality samples were not collected.

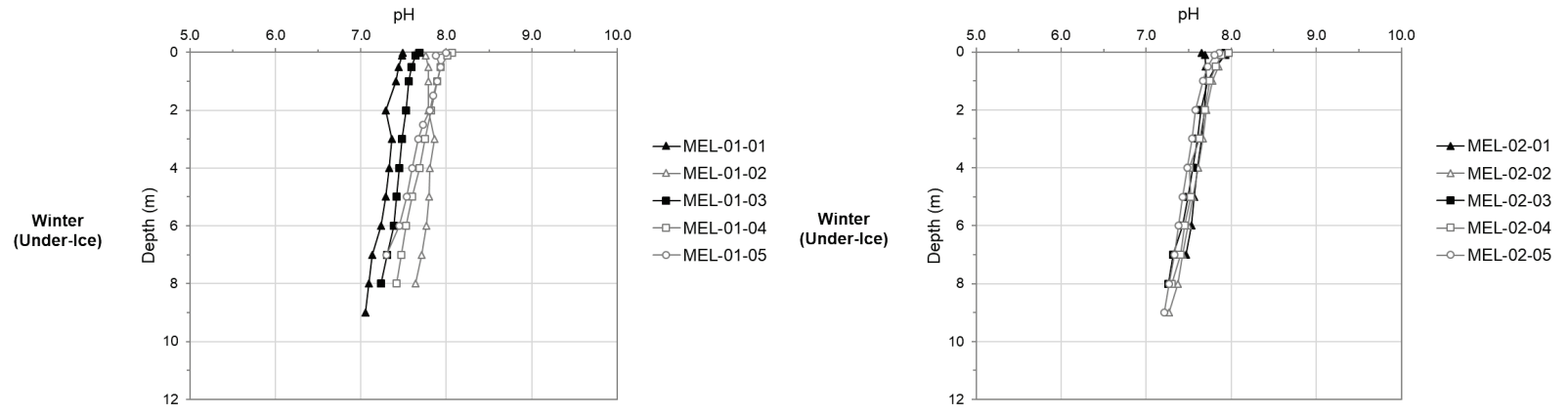
Figure 6C.1-5: Dissolved Oxygen Profiles at Stations on Meliadine Lake, Open-water (July) 2018



m = metre; mg/L = milligrams per litre; MEL-01 = Near-field; MEL-02 = Mid-field; MEL-03 = Reference Area 1; MEL-04 = Reference Area 2; MEL-05 = Reference Area 3.

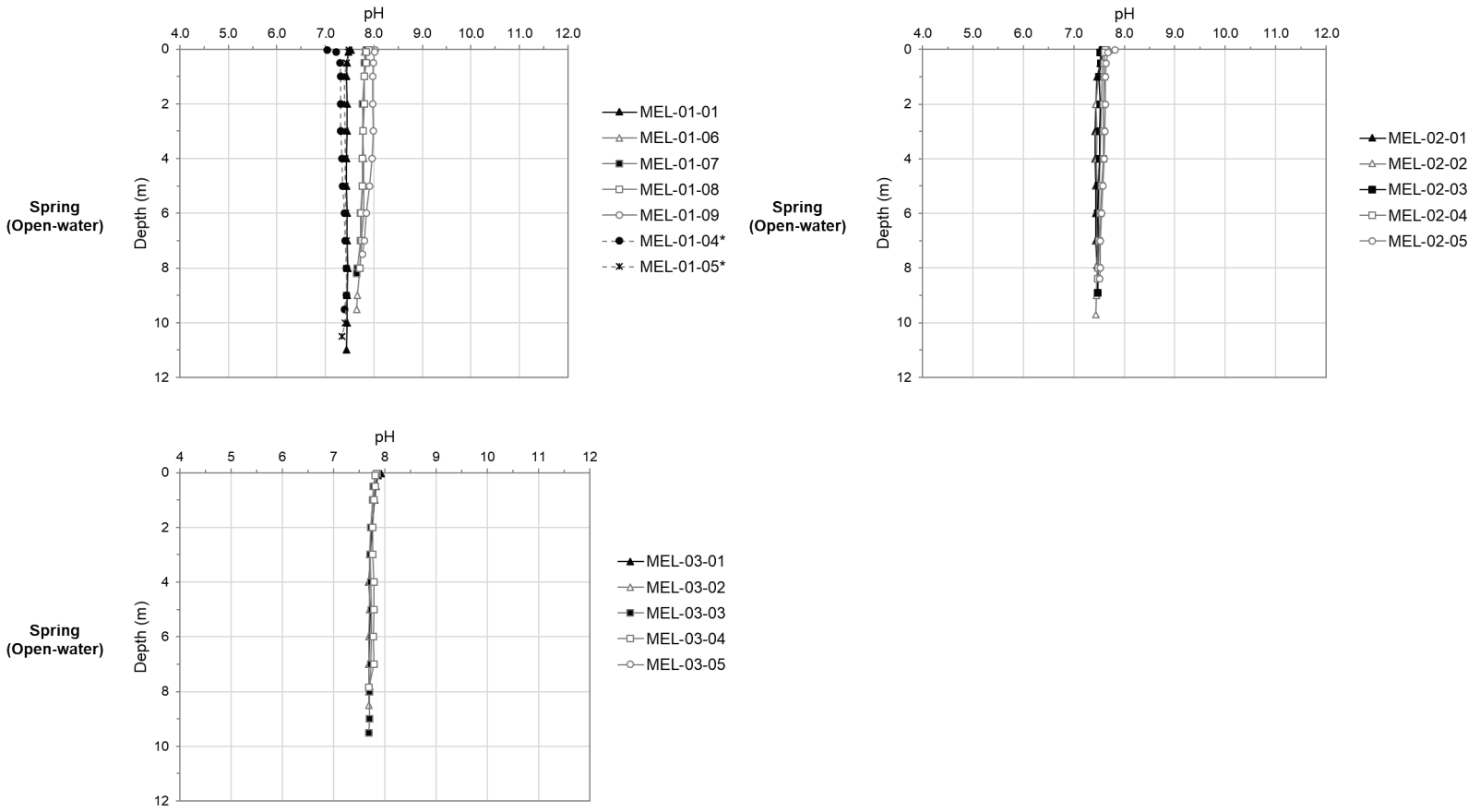
Figure 6C.1-6: Dissolved Oxygen Profiles at Stations on Meliadine Lake, Open-water (August) 2018

6C.1.3 pH



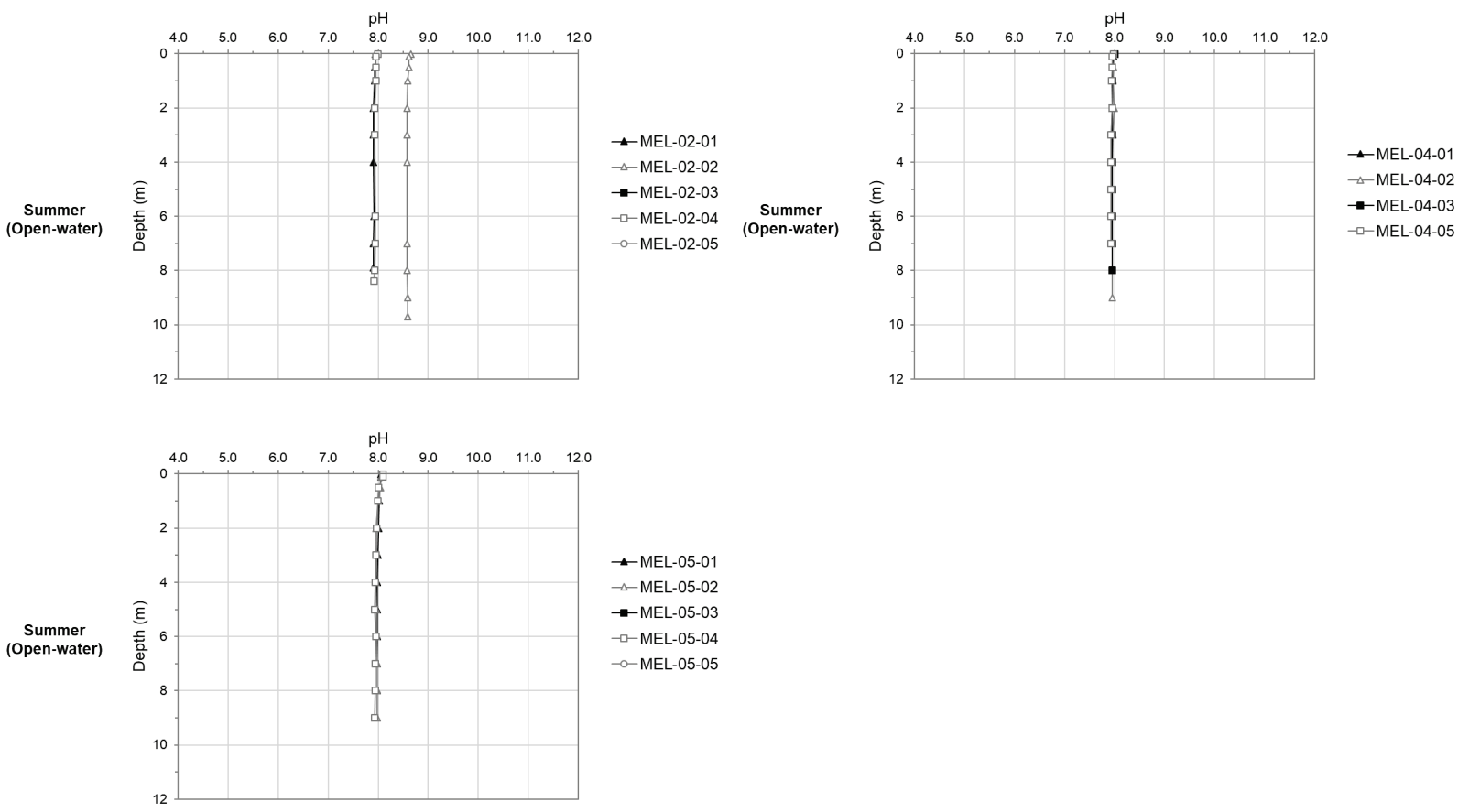
m = metre; MEL-01 = near-field; MEL-02 = mid-field.

Figure 6C.1-7: pH Profiles at Stations on Meliadine Lake, Under-ice (March) 2018



m = metre; MEL-01 = Near-field; MEL-02 = Mid-field; MEL-03 = Reference Area 1; * = a field profile was conducted at these stations but water quality samples were not collected.

Figure 6C.1-8: pH Profiles at Stations on Meliadine Lake, Open-water (July) 2018

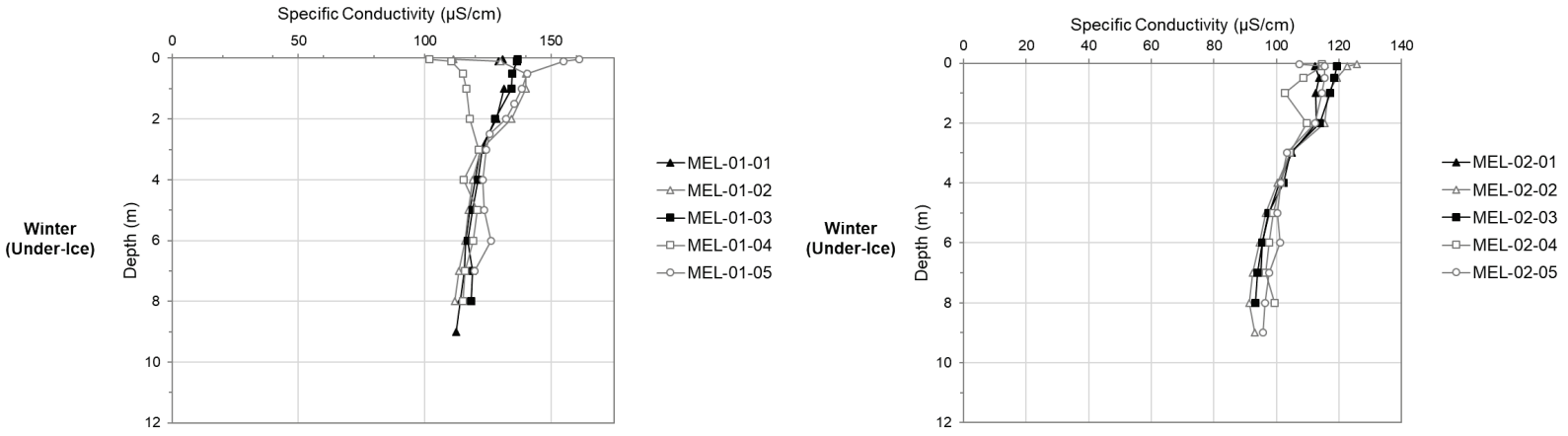


m = metre; MEL-02 = mid-field; MEL-04 = reference area 2; MEL-05 = reference area 3.

Note: pH measured during open-water conditions in August were outside the acceptable range at all MEL-01 (Near-field) and MEL-03 (Reference Area 1) stations as well as at selected MEL-02 (Mid-field), and MEL-05 (Reference Area 3) stations. Data was deemed unreliable and invalidated.

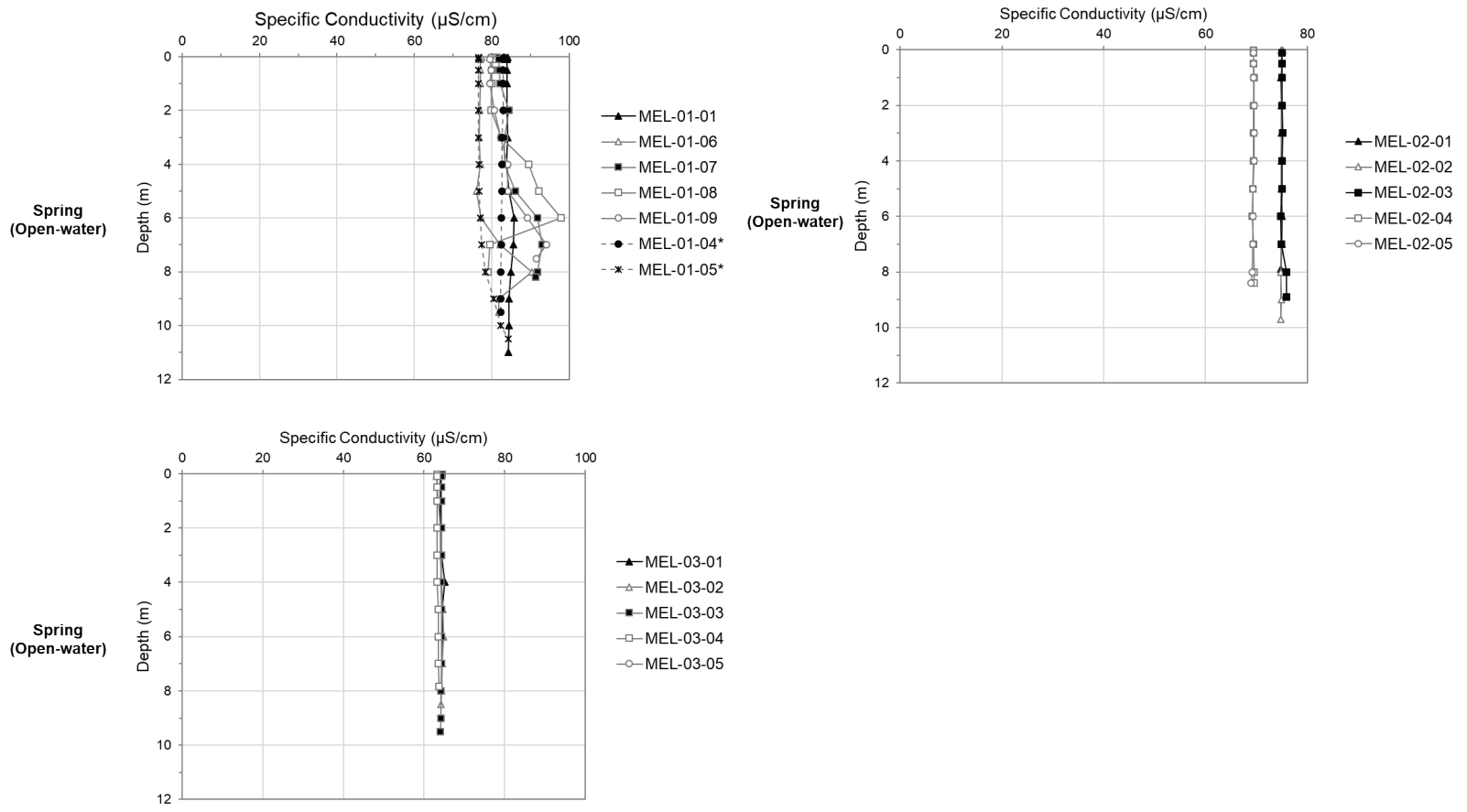
Figure 6C.1-9: pH Profiles at Stations on Meliadine Lake, Open-water (August) 2018

6C.1.4 Specific Conductivity



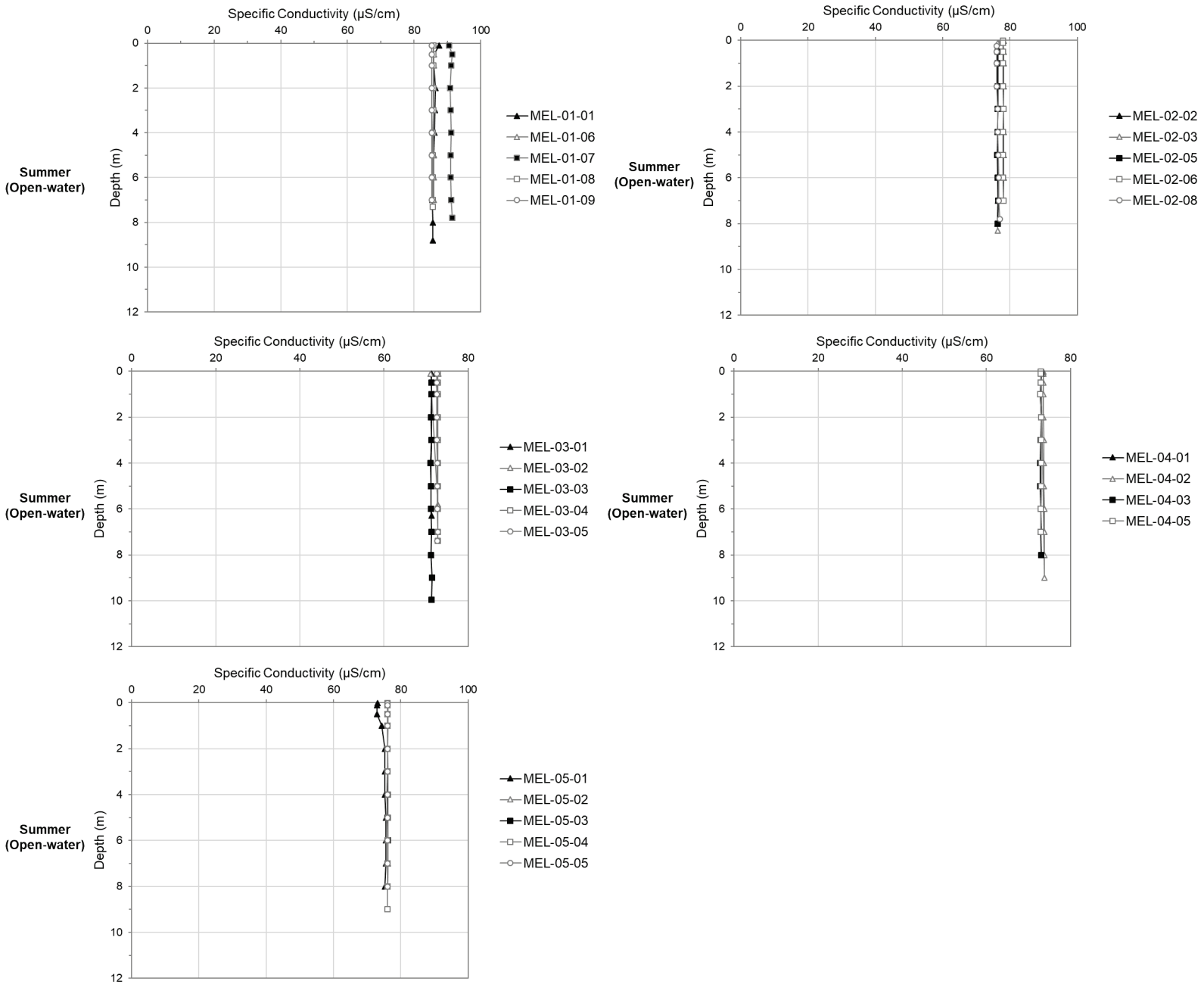
m = metre; µS/cm = microSiemens per centimetre; MEL-01 = Near-field; MEL-02 = Mid-field.

Figure 6C.1-10: Specific Conductivity Profiles at Stations on Meliadine Lake, Under-ice (March) 2018



m = metre; µS/cm = microSiemens per centimetre; MEL-01 = Near-field; MEL-02 = Mid-field; MEL-03 = Reference Area 1; * = a field profile was conducted at these stations but water quality samples were not collected.

Figure 6C.1-11: Specific Conductivity Profiles at Stations on Meliadine Lake, Open-water (July) 2018



m = metre; µS/cm = microSiemens per centimetre; MEL-01 = Near-field; MEL-02 = Mid-field; MEL-03 = Reference Area 1; MEL-04 = Reference Area 2; MEL-05 = Reference Area 3.

Figure 6C.1-12: Specific Conductivity Profiles at Stations on Meliadine Lake, Open-water (August) 2018

6C.2.0 FIELD PROFILE TABLES

6C.2.1 Near-field Field Measurements, 2018

Table 6C.2-1: Field Profiles at Meliadine Near-Field Area, March 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-01-01							
MEL-01-01	2-Mar-18	0.025	0.15	-(a)	-(a)	131	7.5
MEL-01-01	2-Mar-18	0.1	0.14	-(a)	-(a)	129	7.5
MEL-01-01	2-Mar-18	0.5	0.12	-(a)	-(a)	-(a)	7.4
MEL-01-01	2-Mar-18	1.0	0.17	-(a)	-(a)	131	7.4
MEL-01-01	2-Mar-18	2.0	0.30	-(a)	-(a)	128	7.3
MEL-01-01	2-Mar-18	3.0	1.24	-(a)	-(a)	122	7.4
MEL-01-01	2-Mar-18	4.0	1.44	-(a)	-(a)	120	7.3
MEL-01-01	2-Mar-18	5.0	1.70	-(a)	-(a)	118	7.3
MEL-01-01	2-Mar-18	6.0	1.84	-(a)	-(a)	116	7.2
MEL-01-01	2-Mar-18	7.0	1.92	-(a)	-(a)	116	7.1
MEL-01-01	2-Mar-18	8.0	2.16	-(a)	-(a)	114	7.1
MEL-01-01	2-Mar-18	9.0	2.37	-(a)	-(a)	113	7.1
MEL-01-02							
MEL-01-02	5-Mar-18	0.025	0.02	-(a)	-(a)	111	7.6
MEL-01-02	5-Mar-18	0.1	0.02	-(a)	-(a)	130	7.8
MEL-01-02	5-Mar-18	0.5	0.02	-(a)	-(a)	140	7.8
MEL-01-02	5-Mar-18	1.0	0.1	-(a)	-(a)	140	7.8
MEL-01-02	5-Mar-18	2.0	0.3	-(a)	-(a)	134	7.8
MEL-01-02	5-Mar-18	3.0	1.3	-(a)	-(a)	122	7.9
MEL-01-02	5-Mar-18	4.0	1.5	-(a)	-(a)	119	7.8
MEL-01-02	5-Mar-18	5.0	1.7	-(a)	-(a)	117	7.8
MEL-01-02	5-Mar-18	6.0	1.9	-(a)	-(a)	116	7.8
MEL-01-02	5-Mar-18	7.0	2.2	-(a)	-(a)	113	7.7
MEL-01-02	5-Mar-18	8.0	2.5	-(a)	-(a)	112	7.6
MEL-01-03							
MEL-01-03	2-Mar-18	0.025	0.2	-(a)	-(a)	137	7.7
MEL-01-03	2-Mar-18	0.1	0.1	-(a)	-(a)	136	7.6
MEL-01-03	2-Mar-18	0.5	0.2	-(a)	-(a)	135	7.6
MEL-01-03	2-Mar-18	1.0	0.1	-(a)	-(a)	134	7.6
MEL-01-03	2-Mar-18	2.0	0.5	-(a)	-(a)	128	7.5
MEL-01-03	2-Mar-18	3.0	1.2	-(a)	-(a)	123	7.5
MEL-01-03	2-Mar-18	4.0	1.5	-(a)	-(a)	121	7.5
MEL-01-03	2-Mar-18	5.0	1.6	-(a)	-(a)	119	7.4

Table 6C.2-1: Field Profiles at Meliadine Near-Field Area, March 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-01-03	2-Mar-18	6.0	1.8	-(a)	-(a)	117	7.4
MEL-01-03	2-Mar-18	7.0	2.1	-(a)	-(a)	119	7.3
MEL-01-03	2-Mar-18	8.0	2.2	-(a)	-(a)	118	7.2
MEL-01-04							
MEL-01-04	5-Mar-18	0.025	0.01	-(a)	-(a)	102	8.1
MEL-01-04	5-Mar-18	0.1	0.01	-(a)	-(a)	111	8.0
MEL-01-04	5-Mar-18	0.5	0.02	-(a)	-(a)	115	7.9
MEL-01-04	5-Mar-18	1.0	0.02	-(a)	-(a)	116	7.9
MEL-01-04	5-Mar-18	2.0	0.02	-(a)	-(a)	118	7.8
MEL-01-04	5-Mar-18	3.0	0.1	-(a)	-(a)	121	7.8
MEL-01-04	5-Mar-18	4.0	1.5	-(a)	-(a)	116	7.7
MEL-01-04	5-Mar-18	5.0	1.6	-(a)	-(a)	121	7.6
MEL-01-04	5-Mar-18	6.0	1.9	-(a)	-(a)	119	7.5
MEL-01-04	5-Mar-18	7.0	2.2	-(a)	-(a)	116	7.5
MEL-01-04	5-Mar-18	8.0	2.3	-(a)	-(a)	115	7.4
MEL-01-05							
MEL-01-05	2-Mar-18	0.025	0.02	-(a)	-(a)	161	8.0
MEL-01-05	2-Mar-18	0.1	0.02	-(a)	-(a)	155	7.9
MEL-01-05	2-Mar-18	0.5	0.1	-(a)	-(a)	141	7.9
MEL-01-05	2-Mar-18	1.0	0.1	-(a)	-(a)	139	7.9
MEL-01-05	2-Mar-18	1.5	0.1	-(a)	-(a)	136	7.9
MEL-01-05	2-Mar-18	2.0	0.3	-(a)	-(a)	132	7.8
MEL-01-05	2-Mar-18	2.5	0.9	-(a)	-(a)	126	7.7
MEL-01-05	2-Mar-18	3.0	1.1	-(a)	-(a)	124	7.7
MEL-01-05	2-Mar-18	4.0	1.4	-(a)	-(a)	123	7.6
MEL-01-05	2-Mar-18	5.0	1.5	-(a)	-(a)	124	7.5
MEL-01-05	2-Mar-18	6.0	1.7	-(a)	-(a)	126	7.5
MEL-01-05	2-Mar-18	7.0	2.6	-(a)	-(a)	120	7.3

(a) value was invalidated following data quality checks.

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 6.C.2-2: Field Profiles at Meliadine Near-Field Area, July 2018

Station[(a)]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-01-01							
MEL-01-01	19-Jul-18	0.025	11.27	106	11	84	7.5
MEL-01-01	19-Jul-18	0.1	11.27	110	12	84	7.5
MEL-01-01	19-Jul-18	0.5	11.28	111	12	84	7.5
MEL-01-01	19-Jul-18	1.0	11.29	111	12	84	7.4
MEL-01-01	19-Jul-18	2.0	11.29	112	12	84	7.5
MEL-01-01	19-Jul-18	3.0	11.24	112	12	84	7.5
MEL-01-01	19-Jul-18	4.0	11.22	113	12	84	7.4
MEL-01-01	19-Jul-18	5.0	11.21	113	12	84	7.4
MEL-01-01	19-Jul-18	6.0	11.20	113	12	86	7.5
MEL-01-01	19-Jul-18	7.0	11.14	112	12	86	7.5
MEL-01-01	19-Jul-18	8.0	11.12	112	12	85	7.5
MEL-01-01	19-Jul-18	9.0	11.13	111	12	85	7.5
MEL-01-01	19-Jul-18	10.0	11.09	111	12	85	7.5
MEL-01-01	19-Jul-18	11.0	11.09	110	12	84	7.4
MEL-01-04							
MEL-01-04	18-Jul-18	0.025	11.2	110	12	83	7.0
MEL-01-04	18-Jul-18	0.1	11.2	111	12	83	7.2
MEL-01-04	18-Jul-18	0.5	11.2	111	12	83	7.3
MEL-01-04	18-Jul-18	1.0	11.2	112	12	83	7.3
MEL-01-04	18-Jul-18	2.0	11.2	113	12	83	7.3
MEL-01-04	18-Jul-18	3.0	11.2	113	12	83	7.3
MEL-01-04	18-Jul-18	4.0	11.2	113	12	83	7.3
MEL-01-04	18-Jul-18	5.0	11.2	113	12	83	7.4
MEL-01-04	18-Jul-18	6.0	11.2	113	12	83	7.4
MEL-01-04	18-Jul-18	7.0	11.2	112	12	83	7.4
MEL-01-04	18-Jul-18	8.0	11.2	113	12	82	7.4
MEL-01-04	18-Jul-18	9.0	11.2	112	12	82	7.4
MEL-01-04	18-Jul-18	9.5	11.2	111	12	82	7.4
MEL-01-05							
MEL-01-05	18-Jul-18	0.025	12.0	110	12	77	7.5
MEL-01-05	18-Jul-18	0.1	12.1	110	12	77	7.5
MEL-01-05	18-Jul-18	0.5	12.1	111	12	77	7.4
MEL-01-05	18-Jul-18	1.0	12.1	111	12	77	7.4
MEL-01-05	18-Jul-18	2.0	12.1	111	12	77	7.4
MEL-01-05	18-Jul-18	3.0	12.1	111	12	77	7.4
MEL-01-05	18-Jul-18	4.0	12.0	111	12	77	7.4

Table 6.C.2-2: Field Profiles at Meliadine Near-Field Area, July 2018

Station[(a)]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-01-05	18-Jul-18	5.0	11.9	111	12	77	7.4
MEL-01-05	18-Jul-18	6.0	11.9	111	12	77	7.4
MEL-01-05	18-Jul-18	7.0	11.8	111	12	77	7.4
MEL-01-05	18-Jul-18	8.0	11.7	111	12	78	7.4
MEL-01-05	18-Jul-18	9.0	11.6	111	12	81	7.4
MEL-01-05	18-Jul-18	10.0	10.2	110	12	82	7.4
MEL-01-05	18-Jul-18	10.5	9.4	111	13	84	7.3
MEL-01-06							
MEL-01-06	22-Jul-18	0.025	13.1	114	12	77	7.9
MEL-01-06	22-Jul-18	0.1	13.1	115	12	77	7.8
MEL-01-06	22-Jul-18	0.5	13.1	115	12	77	7.8
MEL-01-06	22-Jul-18	1.0	13.1	115	12	77	7.8
MEL-01-06	22-Jul-18	2.0	13.1	115	12	77	7.8
MEL-01-06	22-Jul-18	3.0	13.1	115	12	77	7.8
MEL-01-06	22-Jul-18	4.0	13.0	115	12	77	7.8
MEL-01-06	22-Jul-18	5.0	13.0	115	12	76	7.8
MEL-01-06	22-Jul-18	6.0	12.7	115	12	77	7.8
MEL-01-06	22-Jul-18	7.0	12.3	114	12	82	7.7
MEL-01-06	22-Jul-18	8.0	12.2	114	12	90	7.7
MEL-01-06	22-Jul-18	9.0	11.6	113	12	82	7.7
MEL-01-06	22-Jul-18	9.5	11.6	112	12	82	7.7
MEL-01-07							
MEL-01-07	23-Jul-18	0.025	12.9	112	12	81	7.9
MEL-01-07	23-Jul-18	0.1	12.9	113	12	82	7.8
MEL-01-07	23-Jul-18	0.5	12.9	113	12	82	7.8
MEL-01-07	23-Jul-18	1.0	12.9	113	12	82	7.8
MEL-01-07	23-Jul-18	2.0	12.9	113	12	84	7.8
MEL-01-07	23-Jul-18	3.0	12.9	113	12	83	7.8
MEL-01-07	23-Jul-18	4.0	12.9	113	12	83	7.8
MEL-01-07	23-Jul-18	5.0	12.8	112	12	86	7.8
MEL-01-07	23-Jul-18	6.0	12.7	112	12	92	7.7
MEL-01-07	23-Jul-18	7.0	12.6	112	12	93	7.7
MEL-01-07	23-Jul-18	8.0	12.3	111	12	92	7.7
MEL-01-07	23-Jul-18	8.2	12.3	111	12	91	7.7
MEL-01-08							
MEL-01-08	23-Jul-18	0.025	13.2	113	12	80	7.9
MEL-01-08	23-Jul-18	0.1	13.2	113	12	80	7.8

Table 6.C.2-2: Field Profiles at Meliadine Near-Field Area, July 2018

Station[(a)]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-01-08	23-Jul-18	0.5	13.2	113	12	80	7.8
MEL-01-08	23-Jul-18	1.0	13.2	114	12	80	7.8
MEL-01-08	23-Jul-18	2.0	13.2	114	12	80	7.8
MEL-01-08	23-Jul-18	3.0	12.9	114	12	83	7.8
MEL-01-08	23-Jul-18	4.0	12.7	114	12	90	7.8
MEL-01-08	23-Jul-18	5.0	12.7	113	12	92	7.8
MEL-01-08	23-Jul-18	6.0	12.5	113	12	98	7.7
MEL-01-08	23-Jul-18	7.0	12.2	112	12	80	7.8
MEL-01-08	23-Jul-18	8.0	12.1	112	12	79	7.7
MEL-01-09							
MEL-01-09	23-Jul-18	0.025	14.0	115	12	80	8.0
MEL-01-09	23-Jul-18	0.1	14.0	115	12	80	8.0
MEL-01-09	23-Jul-18	0.5	14.0	115	12	80	8.0
MEL-01-09	23-Jul-18	1.0	14.0	115	12	80	8.0
MEL-01-09	23-Jul-18	2.0	13.8	115	12	81	8.0
MEL-01-09	23-Jul-18	3.0	13.4	115	12	82	8.0
MEL-01-09	23-Jul-18	4.0	13.3	115	12	84	8.0
MEL-01-09	23-Jul-18	5.0	13.0	114	12	84	7.9
MEL-01-09	23-Jul-18	6.0	12.9	113	12	89	7.8
MEL-01-09	23-Jul-18	7.0	12.8	113	12	94	7.8
MEL-01-09	23-Jul-18	8.0	12.7	114	12	92	7.8

(a) Several new stations were added to the near-field exposure area during the July program and MEL-01-02, MEL-01-03, MEL-01-04, and MEL-01-05 were discontinued. However, field measurements were collected at MEL-01-04 and MEL-01-05.

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 6C.2-3: Field Profiles at Meliadine Near-Field Area, August 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-01-01							
MEL-01-01	22-Aug-18	0.1[a]	10.5	109	11.9	88	-[b]
MEL-01-01	22-Aug-18	0.5	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	1.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	2.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	3.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	4.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	5.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	6.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	7.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	8.0	10.5	109	11.9	86	-[b]
MEL-01-01	22-Aug-18	8.8	10.5	109	11.9	86	-[b]
MEL-01-06							
MEL-01-06	22-Aug-18	0.1[a]	10.6	110	12.0	86	-[b]
MEL-01-06	22-Aug-18	0.5	10.6	110	12.0	86	-[b]
MEL-01-06	22-Aug-18	1.0	10.6	110	12.0	86	-[b]
MEL-01-06	22-Aug-18	2.0	10.6	110	12.0	86	-[b]
MEL-01-06	22-Aug-18	3.0	10.6	110	12.0	86	-[b]
MEL-01-06	22-Aug-18	4.0	10.6	110	12.1	86	-[b]
MEL-01-06	22-Aug-18	5.0	10.6	110	12.1	86	-[b]
MEL-01-06	22-Aug-18	6.0	10.6	110	12.1	86	-[b]
MEL-01-06	22-Aug-18	7.0	10.6	110	12.1	86	-[b]
MEL-01-07							
MEL-01-07	21-Aug-18	0.1[a]	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	0.5	10.8	109	11.8	92	-[b]
MEL-01-07	21-Aug-18	1.0	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	2.0	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	3.0	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	4.0	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	5.0	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	6.0	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	7.0	10.8	109	11.8	91	-[b]
MEL-01-07	21-Aug-18	7.8	10.8	108	11.7	92	-[b]
MEL-01-08							
MEL-01-08	22-Aug-18	0.1[a]	10.5	110	12.0	86	-[b]
MEL-01-08	22-Aug-18	0.5	10.5	110	12.0	86	-[b]
MEL-01-08	22-Aug-18	1.0	10.5	110	12.1	86	-[b]
MEL-01-08	22-Aug-18	2.0	10.5	111	12.2	86	-[b]
MEL-01-08	22-Aug-18	3.0	10.5	111	12.2	86	-[b]
MEL-01-08	22-Aug-18	4.0	10.5	111	12.2	86	-[b]
MEL-01-08	22-Aug-18	5.0	10.5	111	12.2	86	-[b]
MEL-01-08	22-Aug-18	6.0	10.5	111	12.2	86	-[b]

Table 6C.2-3: Field Profiles at Meliadine Near-Field Area, August 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-01-08	22-Aug-18	7.0	10.5	111	12.1	86	-[(b)]
MEL-01-08	22-Aug-18	7.3	10.5	110	12.1	86	-[(b)]
MEL-01-09							
MEL-01-09	22-Aug-18	0.1[(a)]	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	0.5	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	1.0	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	2.0	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	3.0	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	4.0	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	5.0	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	6.0	10.5	109	12.0	85	-[(b)]
MEL-01-09	22-Aug-18	7.0	10.5	109	12.0	85	-[(b)]

(a) A depth reading at 0.025 m could not be taken due to wave action.
(b) Data were invalidated based on quality checks (Appendix 6A).
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

6C.2.2 Mid-field Field Measurements, 2018

Table 6C.2-4: Field Profiles at Meliadine Mid-Field Area, March 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-01							
MEL-02-01	06-Mar-18	0.025	0.1	-[(a)]	-[(a)]	115	7.7
MEL-02-01	06-Mar-18	0.1	0.3	-[(a)]	-[(a)]	112	7.7
MEL-02-01	06-Mar-18	0.5	0.2	-[(a)]	-[(a)]	114	7.7
MEL-02-01	06-Mar-18	1.0	0.2	-[(a)]	-[(a)]	113	7.7
MEL-02-01	06-Mar-18	2.0	0.2	-[(a)]	-[(a)]	113	7.7
MEL-02-01	06-Mar-18	3.0	0.8	-[(a)]	-[(a)]	105	7.7
MEL-02-01	06-Mar-18	4.0	1.3	-[(a)]	-[(a)]	101	7.6
MEL-02-01	06-Mar-18	5.0	1.5	-[(a)]	-[(a)]	98	7.6
MEL-02-01	06-Mar-18	6.0	1.7	-[(a)]	-[(a)]	96	7.5
MEL-02-01	06-Mar-18	7.0	1.9	-[(a)]	-[(a)]	95	7.5
MEL-02-02							
MEL-02-02	05-Mar-18	0.025	0.02	-[(a)]	-[(a)]	126	7.9
MEL-02-02	05-Mar-18	0.1	0.02	-[(a)]	-[(a)]	123	7.9
MEL-02-02	05-Mar-18	0.5	0.02	-[(a)]	-[(a)]	119	7.9
MEL-02-02	05-Mar-18	1.0	0.1	-[(a)]	-[(a)]	117	7.8
MEL-02-02	05-Mar-18	2.0	0.2	-[(a)]	-[(a)]	115	7.7
MEL-02-02	05-Mar-18	3.0	0.9	-[(a)]	-[(a)]	104	7.7

Table 6C.2-4: Field Profiles at Meliadine Mid-Field Area, March 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-02	05-Mar-18	4.0	1.3	-[a]	-[a]	100	7.6
MEL-02-02	05-Mar-18	5.0	1.6	-[a]	-[a]	97	7.6
MEL-02-02	05-Mar-18	6.0	1.7	-[a]	-[a]	95	7.5
MEL-02-02	05-Mar-18	7.0	2.0	-[a]	-[a]	93	7.4
MEL-02-02	05-Mar-18	8.0	2.1	-[a]	-[a]	91	7.4
MEL-02-02	05-Mar-18	9.0	2.3	-[a]	-[a]	93	7.3
MEL-02-03							
MEL-02-03	05-Mar-18	0.025	0.01	-[a]	-[a]	121	7.9
MEL-02-03	05-Mar-18	0.1	0.02	-[a]	-[a]	119	7.9
MEL-02-03	05-Mar-18	0.5	0.02	-[a]	-[a]	118	7.8
MEL-02-03	05-Mar-18	1.0	0.02	-[a]	-[a]	117	7.7
MEL-02-03	05-Mar-18	2.0	0.1	-[a]	-[a]	114	7.6
MEL-02-03	05-Mar-18	3.0	0.9	-[a]	-[a]	105	7.6
MEL-02-03	05-Mar-18	4.0	1.2	-[a]	-[a]	102	7.6
MEL-02-03	05-Mar-18	5.0	1.6	-[a]	-[a]	97	7.5
MEL-02-03	05-Mar-18	6.0	1.7	-[a]	-[a]	96	7.4
MEL-02-03	05-Mar-18	7.0	1.9	-[a]	-[a]	94	7.3
MEL-02-03	05-Mar-18	8.0	2.1	-[a]	-[a]	93	7.3
MEL-02-04							
MEL-02-04	06-Mar-18	0.025	0.1	-[a]	-[a]	115	8.0
MEL-02-04	06-Mar-18	0.1	0.1	-[a]	-[a]	115	7.9
MEL-02-04	06-Mar-18	0.5	0.1	-[a]	-[a]	109	7.8
MEL-02-04	06-Mar-18	1.0	0.1	-[a]	-[a]	103	7.8
MEL-02-04	06-Mar-18	2.0	0.4	-[a]	-[a]	110	7.7
MEL-02-04	06-Mar-18	3.0	0.9	-[a]	-[a]	104	7.6
MEL-02-04	06-Mar-18	4.0	1.3	-[a]	-[a]	101	7.5
MEL-02-04	06-Mar-18	5.0	1.5	-[a]	-[a]	99	7.5
MEL-02-04	06-Mar-18	6.0	1.7	-[a]	-[a]	98	7.5
MEL-02-04	06-Mar-18	7.0	1.9	-[a]	-[a]	97	7.4
MEL-02-04	06-Mar-18	8.0	2.0	-[a]	-[a]	99	7.3
MEL-02-05							
MEL-02-05	06-Mar-18	0.025	0.02	-[a]	-[a]	107	7.9
MEL-02-05	06-Mar-18	0.1	0.02	-[a]	-[a]	115	7.8
MEL-02-05	06-Mar-18	0.5	0.02	-[a]	-[a]	115	7.7
MEL-02-05	06-Mar-18	1.0	0.02	-[a]	-[a]	115	7.7
MEL-02-05	06-Mar-18	2.0	0.02	-[a]	-[a]	112	7.6
MEL-02-05	06-Mar-18	3.0	1.0	-[a]	-[a]	103	7.5

Table 6C.2-4: Field Profiles at Meliadine Mid-Field Area, March 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-05	06-Mar-18	4.0	1.3	-(a)	-(a)	101	7.5
MEL-02-05	06-Mar-18	5.0	1.5	-(a)	-(a)	100	7.4
MEL-02-05	06-Mar-18	6.0	1.7	-(a)	-(a)	101	7.4
MEL-02-05	06-Mar-18	7.0	1.9	-(a)	-(a)	98	7.3
MEL-02-05	06-Mar-18	8.0	2.0	-(a)	-(a)	96	7.3
MEL-02-05	06-Mar-18	9.0	2.2	-(a)	-(a)	96	7.2

(a) value was invalidated following data quality checks.

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 6.C.2-5: Field Profiles at Meliadine Mid-Field Area, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-01							
MEL-02-01	23-Jul-18	0.0	11.4	106	11.4	75	7.6
MEL-02-01	23-Jul-18	0.1	11.4	108	11.7	75	7.6
MEL-02-01	23-Jul-18	0.5	11.3	110	11.9	75	7.5
MEL-02-01	23-Jul-18	1.0	11.4	111	11.9	75	7.5
MEL-02-01	23-Jul-18	2.0	11.3	111	11.9	75	7.4
MEL-02-01	23-Jul-18	3.0	11.2	111	12.0	75	7.4
MEL-02-01	23-Jul-18	4.0	11.2	111	12.0	75	7.4
MEL-02-01	23-Jul-18	5.0	11.0	111	12.0	75	7.4
MEL-02-01	23-Jul-18	6.0	11.0	110	12.0	75	7.4
MEL-02-01	23-Jul-18	7.0	10.9	110	12.0	75	7.4
MEL-02-01	23-Jul-18	7.9	10.7	110	12.1	75	7.5
MEL-02-02							
MEL-02-02	20-Jul-18	0.0	11.6	107	11.5	75	7.7
MEL-02-02	20-Jul-18	0.1	11.6	109	11.7	75	7.6
MEL-02-02	20-Jul-18	0.5	11.6	111	11.9	75	7.5
MEL-02-02	20-Jul-18	1.0	11.6	111	11.9	75	7.5
MEL-02-02	20-Jul-18	2.0	11.4	111	11.9	75	7.4
MEL-02-02	20-Jul-18	3.0	11.3	111	12.0	75	7.5
MEL-02-02	20-Jul-18	4.0	11.2	111	12.0	75	7.5
MEL-02-02	20-Jul-18	5.0	11.1	111	12.0	75	7.5
MEL-02-02	20-Jul-18	6.0	11.1	111	12.0	75	7.5
MEL-02-02	20-Jul-18	7.0	11.0	110	12.0	75	7.5
MEL-02-02	20-Jul-18	8.0	10.8	110	12.0	75	7.5
MEL-02-02	20-Jul-18	9.0	10.5	109	12.0	75	7.5

Table 6.C.2-5: Field Profiles at Meliadine Mid-Field Area, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-02	20-Jul-18	9.7	10.4	109	12.0	75	7.4
MEL-02-03							
MEL-02-03	20-Jul-18	0.0	12.8	104	11.5	75	7.6
MEL-02-03	20-Jul-18	0.1	12.7	104	11.6	75	7.5
MEL-02-03	20-Jul-18	0.5	12.7	104	11.6	75	7.5
MEL-02-03	20-Jul-18	1.0	12.6	104	11.7	75	7.5
MEL-02-03	20-Jul-18	2.0	12.4	104	11.9	75	7.5
MEL-02-03	20-Jul-18	3.0	12.2	105	11.9	75	7.5
MEL-02-03	20-Jul-18	4.0	11.6	105	12.2	75	7.5
MEL-02-03	20-Jul-18	5.0	10.9	105	12.4	75	7.5
MEL-02-03	20-Jul-18	6.0	10.8	105	12.5	75	7.5
MEL-02-03	20-Jul-18	7.0	10.7	114	12.5	75	7.5
MEL-02-03	20-Jul-18	8.0	10.7	114	12.5	76	7.5
MEL-02-03	20-Jul-18	8.9	10.6	113	12.4	76	7.5
MEL-02-04							
MEL-02-04	21-Jul-18	0.0	12.9	112	11.6	70	7.6
MEL-02-04	21-Jul-18	0.1	12.9	112	11.6	70	7.6
MEL-02-04	21-Jul-18	0.5	12.9	113	11.7	70	7.6
MEL-02-04	21-Jul-18	1.0	12.9	113	11.8	70	7.6
MEL-02-04	21-Jul-18	2.0	12.9	113	11.8	70	7.6
MEL-02-04	21-Jul-18	3.0	12.9	113	11.8	69	7.6
MEL-02-04	21-Jul-18	4.0	12.7	113	11.8	70	7.6
MEL-02-04	21-Jul-18	5.0	11.2	112	12.2	69	7.6
MEL-02-04	21-Jul-18	6.0	10.7	111	12.2	69	7.5
MEL-02-04	21-Jul-18	7.0	10.5	111	12.2	69	7.5
MEL-02-04	21-Jul-18	8.0	10.3	109	12.1	70	7.5
MEL-02-04	21-Jul-18	8.4	10.2	109	12.1	70	7.5
MEL-02-05							
MEL-02-05	23-Jul-18	0.0	13.1	106	11.8	69	7.8
MEL-02-05	23-Jul-18	0.1	13.0	112	11.6	69	7.7
MEL-02-05	23-Jul-18	0.5	13.1	112	11.6	69	7.6
MEL-02-05	23-Jul-18	1.0	13.0	113	11.7	70	7.6
MEL-02-05	23-Jul-18	2.0	13.0	113	11.7	70	7.6
MEL-02-05	23-Jul-18	3.0	12.8	113	11.8	70	7.6
MEL-02-05	23-Jul-18	4.0	12.6	112	11.8	70	7.6
MEL-02-05	23-Jul-18	5.0	11.3	112	12.1	69	7.6
MEL-02-05	23-Jul-18	6.0	11.0	111	12.1	69	7.6

Table 6.C.2-5: Field Profiles at Meliadine Mid-Field Area, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-05	23-Jul-18	7.0	10.9	111	12.1	69	7.5
MEL-02-05	23-Jul-18	8.0	10.6	110	10.8	69	7.5
MEL-02-05	23-Jul-18	8.4	10.6	110	10.8	69	7.5

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 6C.2-6: Field Profiles at Meliadine Mid-Field Area, August 2018

Station[a]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-02							
MEL-02-02	31-Aug-18	0.025	9.0	102	11.6	78	7.9
MEL-02-02	31-Aug-18	0.1	9.0	103	11.7	78	8.0
MEL-02-02	31-Aug-18	0.5	9.0	103	11.7	78	7.9
MEL-02-02	31-Aug-18	1.0	9.0	103	11.7	78	7.9
MEL-02-02	31-Aug-18	2.0	9.0	103	11.7	78	7.9
MEL-02-02	31-Aug-18	3.0	9.0	103	11.7	78	7.9
MEL-02-02	31-Aug-18	4.0	9.0	103	11.7	78	7.9
MEL-02-02	31-Aug-18	5.0	9.1	103	11.7	78	7.9
MEL-02-02	31-Aug-18	6.0	9.0	103	11.7	78	7.9
MEL-02-02	31-Aug-18	7.0	9.0	103	11.7	78	7.9
MEL-02-03							
MEL-02-03	18-Aug-18	0.1[b]	11.7	95	10.1	77	-[c]
MEL-02-03	18-Aug-18	0.5	11.7	95	10.2	77	-[c]
MEL-02-03	18-Aug-18	1.0	11.7	95	10.2	77	-[c]
MEL-02-03	18-Aug-18	2.0	11.7	95	10.2	77	-[c]
MEL-02-03	18-Aug-18	3.0	11.6	95	10.2	77	-[c]
MEL-02-03	18-Aug-18	4.0	11.6	95	10.2	76	-[c]
MEL-02-03	18-Aug-18	5.0	11.6	95	10.2	77	-[c]
MEL-02-03	18-Aug-18	6.0	11.6	95	10.2	76	-[c]
MEL-02-03	18-Aug-18	7.0	11.5	94	10.2	76	-[c]
MEL-02-03	18-Aug-18	8.0	11.5	94	10.1	76	-[c]
MEL-02-03	18-Aug-18	8.3	11.5	94	10.1	76	-[c]
MEL-02-05							
MEL-02-05	18-Aug-18	0.1[b]	12.0	96	12.3	76	-[c]
MEL-02-05	18-Aug-18	0.5	11.9	97	10.3	76	-[c]
MEL-02-05	18-Aug-18	1.0	11.9	97	10.3	76	-[c]
MEL-02-05	18-Aug-18	2.0	11.9	97	10.3	76	-[c]
MEL-02-05	18-Aug-18	3.0	11.9	97	10.3	76	-[c]

Table 6C.2-6: Field Profiles at Meliadine Mid-Field Area, August 2018

Station[a]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-02-05	18-Aug-18	4.0	11.9	97	10.3	76	-[c]
MEL-02-05	18-Aug-18	5.0	11.9	97	10.3	76	-[c]
MEL-02-05	18-Aug-18	6.0	11.9	97	10.3	76	-[c]
MEL-02-05	18-Aug-18	7.0	11.9	97	10.3	77	-[c]
MEL-02-05	18-Aug-18	8.0	11.9	97	10.3	76	-[c]
MEL-02-06							
MEL-02-06	31-Aug-18	0.025	9.0	102	11.6	78	8.0
MEL-02-06	31-Aug-18	0.1	9.0	102	11.6	78	8.0
MEL-02-06	31-Aug-18	0.5	9.0	102	11.6	78	8.0
MEL-02-06	31-Aug-18	1.0	9.0	102	11.6	78	8.0
MEL-02-06	31-Aug-18	2.0	9.0	102	11.7	78	7.9
MEL-02-06	31-Aug-18	3.0	9.0	102	11.6	78	7.9
MEL-02-06	31-Aug-18	4.0	9.0	102	11.6	78	7.9
MEL-02-06	31-Aug-18	5.0	9.0	102	11.6	78	7.9
MEL-02-06	31-Aug-18	6.0	8.9	102	11.6	78	7.9
MEL-02-06	31-Aug-18	7.0	8.9	102	11.6	78	7.9
MEL-02-08							
MEL-02-08	15-Aug-18	0.25[b]	12.0	95	10.1	76	8.8
MEL-02-08	15-Aug-18	0.5	12.0	95	10.1	76	8.6
MEL-02-08	15-Aug-18	1	12.0	95	10.1	76	8.6
MEL-02-08	15-Aug-18	2	12.0	95	10.1	76	8.5
MEL-02-08	15-Aug-18	3	11.9	95	10.1	76	8.5
MEL-02-08	15-Aug-18	4	11.9	95	10.1	76	8.6
MEL-02-08	15-Aug-18	5	11.9	95	10.1	77	8.6
MEL-02-08	15-Aug-18	6	11.8	95	10.1	77	8.6
MEL-02-08	15-Aug-18	7	11.8	95	10.1	77	8.5
MEL-02-08	15-Aug-18	7.8	11.8	94	10.0	77	8.5

(a) During the August open water program, water quality samples were not collected at MEL-02-01 or 02-04. Instead, samples were collected at MEL-02-06 and 02-08, which were sediment sample locations.

(b) A depth reading at 0.025 m could not be taken due to wave action.

(c) Data were invalidated based on quality checks (Appendix 6A).

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

6C.2.3 Reference Area 1 Field Measurements, 2018

Table 6.C.2-7: Field Profiles at Meliadine Reference Area 1, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (uS/cm)	pH
MEL-03-01							
MEL-03-01	25-Jul-18	0.025	11.5	114	12.2	64	7.9
MEL-03-01	25-Jul-18	0.1	11.5	114	12.2	64	7.9
MEL-03-01	25-Jul-18	0.5	11.5	113	12.3	64	7.8
MEL-03-01	25-Jul-18	1.0	11.5	115	12.4	64	7.8
MEL-03-01	25-Jul-18	2.0	11.4	115	12.4	64	7.8
MEL-03-01	25-Jul-18	3.0	11.4	116	12.5	64	7.7
MEL-03-01	25-Jul-18	4.0	10.8	116	12.7	65	7.7
MEL-03-01	25-Jul-18	5.0	10.5	117	12.8	65	7.7
MEL-03-01	25-Jul-18	6.0	9.6	118	13.3	65	7.7
MEL-03-01	25-Jul-18	7.0	8.9	118	13.5	64	7.7
MEL-03-02							
MEL-03-02	25-Jul-18	0.025	12.4	113	11.9	63	7.9
MEL-03-02	25-Jul-18	0.1	12.4	114	12.0	63	7.8
MEL-03-02	25-Jul-18	0.5	12.3	114	12.1	63	7.8
MEL-03-02	25-Jul-18	1.0	12.1	115	12.2	64	7.8
MEL-03-02	25-Jul-18	2.0	11.6	115	12.4	64	7.7
MEL-03-02	25-Jul-18	3.0	11.4	116	12.5	64	7.7
MEL-03-02	25-Jul-18	4.0	11.2	116	12.5	64	7.7
MEL-03-02	25-Jul-18	5.0	11.1	116	12.6	65	7.7
MEL-03-02	25-Jul-18	6.0	10.4	116	12.8	65	7.7
MEL-03-02	25-Jul-18	7.0	9.6	117	13.3	65	7.7
MEL-03-02	25-Jul-18	8.0	8.7	118	13.6	64	7.7
MEL-03-02	25-Jul-18	8.5	8.7	119	13.7	64	7.7
MEL-03-03							
MEL-03-03	25-Jul-18	0.025	11.8	114	12.2	65	7.9
MEL-03-03	25-Jul-18	0.1	11.7	114	12.2	64	7.8
MEL-03-03	25-Jul-18	0.5	11.7	115	12.3	64	7.8
MEL-03-03	25-Jul-18	1.0	11.7	115	12.3	64	7.8
MEL-03-03	25-Jul-18	2.0	11.7	116	12.4	64	7.7
MEL-03-03	25-Jul-18	3.0	11.7	116	12.4	64	7.7
MEL-03-03	25-Jul-18	4.0	11.7	115	12.4	64	7.7
MEL-03-03	25-Jul-18	5.0	11.6	115	12.4	64	7.7
MEL-03-03	25-Jul-18	6.0	11.6	115	12.4	64	7.7
MEL-03-03	25-Jul-18	7.0	10.2	119	13.3	64	7.7

Table 6.C.2-7: Field Profiles at Meliadine Reference Area 1, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (uS/cm)	pH
MEL-03-03	25-Jul-18	8.0	9.1	119	13.5	64	7.7
MEL-03-03	25-Jul-18	9.0	8.7	120	13.7	64	7.7
MEL-03-03	25-Jul-18	9.5	8.5	120	13.8	64	7.7
MEL-03-04							
MEL-03-04	25-Jul-18	0.025	12.3	114	12.1	63	7.8
MEL-03-04	25-Jul-18	0.1	12.3	115	12.1	63	7.8
MEL-03-04	25-Jul-18	0.5	12.3	115	12.1	63	7.8
MEL-03-04	25-Jul-18	1.0	12.3	115	12.2	63	7.8
MEL-03-04	25-Jul-18	2.0	12.3	116	12.3	63	7.8
MEL-03-04	25-Jul-18	3.0	12.3	116	12.2	63	7.8
MEL-03-04	25-Jul-18	4.0	12.2	116	12.3	63	7.8
MEL-03-04	25-Jul-18	5.0	11.6	117	12.5	64	7.8
MEL-03-04	25-Jul-18	6.0	11.3	117	12.7	64	7.8
MEL-03-04	25-Jul-18	7.0	11.1	118	12.8	64	7.8
MEL-03-04	25-Jul-18	7.9	10.3	117	12.9	64	7.7
MEL-03-05							
MEL-03-05	26-Jul-18	0.025	14.1	111	11.3	74	7.7
MEL-03-05	26-Jul-18	0.1	14.1	111	11.3	74	7.7
MEL-03-05	26-Jul-18	0.5	14.0	111	11.3	74	7.7
MEL-03-05	26-Jul-18	1.0	14.0	112	11.3	74	7.7
MEL-03-05	26-Jul-18	2.0	14.0	112	11.4	74	7.7
MEL-03-05	26-Jul-18	3.0	13.9	112	11.4	74	7.6
MEL-03-05	26-Jul-18	4.0	13.8	112	11.4	74	7.7
MEL-03-05	26-Jul-18	5.0	13.7	112	11.5	74	7.7
MEL-03-05	26-Jul-18	6.0	13.4	113	11.6	74	7.7
MEL-03-05	26-Jul-18	7.0	13.2	113	11.7	74	7.7
MEL-03-05	26-Jul-18	8.0	12.5	114	12.0	73	7.7
MEL-03-05	26-Jul-18	9.0	11.7	116	12.4	74	7.8

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 6C.2-8: Field Profiles at Meliadine Reference Area 1, August 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-03-01							
MEL-03-01	20-Aug-18	0.1[a]	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	0.5	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	1.0	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	2.0	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	3.0	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	4.0	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	5.0	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	6.0	10.7	109	11.9	71	-[b]
MEL-03-01	20-Aug-18	6.3	10.7	109	11.9	71	-[b]
MEL-03-02							
MEL-03-02	26-Aug-18	0.1[a]	8.6	110	11.9	73	-[b]
MEL-03-02	26-Aug-18	0.5	8.6	104	12.0	72	-[b]
MEL-03-02	26-Aug-18	1.0	8.6	104	12.0	73	-[b]
MEL-03-02	26-Aug-18	2.0	8.6	104	12.0	73	-[b]
MEL-03-02	26-Aug-18	3.0	8.6	104	12.0	73	-[b]
MEL-03-02	26-Aug-18	4.0	8.6	104	12.0	73	-[b]
MEL-03-02	26-Aug-18	5.0	8.6	104	12.0	73	-[b]
MEL-03-02	26-Aug-18	5.8	8.6	104	12.0	73	-[b]
MEL-03-03							
MEL-03-03	20-Aug-18	0.1[a]	10.6	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	0.5	10.6	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	1.0	10.6	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	2.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	3.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	4.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	5.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	6.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	7.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	8.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	9.0	10.7	110	12.0	71	-[b]
MEL-03-03	20-Aug-18	10.0	10.6	110	12.0	71	-[b]
MEL-03-04							
MEL-03-04	26-Aug-18	0.1[a]	8.5	101	11.7	73	-[b]
MEL-03-04	26-Aug-18	0.5	8.5	104	12.0	73	-[b]
MEL-03-04	26-Aug-18	1.0	8.5	104	12.0	73	-[b]
MEL-03-04	26-Aug-18	2.0	8.5	104	12.0	73	-[b]

Table 6C.2-8: Field Profiles at Meliadine Reference Area 1, August 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-03-04	26-Aug-18	3.0	8.4	104	12.0	73	-[b]
MEL-03-04	26-Aug-18	4.0	8.4	105	12.1	73	-[b]
MEL-03-04	26-Aug-18	5.0	8.5	105	12.1	73	-[b]
MEL-03-04	26-Aug-18	6.0	8.4	105	12.1	73	-[b]
MEL-03-04	26-Aug-18	7.0	8.4	105	12.1	73	-[b]
MEL-03-04	26-Aug-18	7.4	8.4	104	12.0	73	-[b]
MEL-03-05							
MEL-03-05	26-Aug-18	0.1[a]	8.6	105	12.1	73	-[b]
MEL-03-05	26-Aug-18	0.5	8.6	106	12.1	73	-[b]
MEL-03-05	26-Aug-18	1.0	8.6	106	12.1	73	-[b]
MEL-03-05	26-Aug-18	2.0	8.5	106	12.1	73	-[b]
MEL-03-05	26-Aug-18	3.0	8.5	106	12.2	73	-[b]
MEL-03-05	26-Aug-18	4.0	8.5	106	12.2	73	-[b]
MEL-03-05	26-Aug-18	5.0	8.5	106	12.2	73	-[b]
MEL-03-05	26-Aug-18	6.0	8.5	106	12.2	73	-[b]
MEL-03-05	26-Aug-18	7.0	8.5	106	12.2	73	-[b]
MEL-03-05	26-Aug-18	7.4	8.5	106	12.2	73	-[b]

(a) A depth reading at 0.025 m could not be taken due to wave action.
(b) Data were invalidated based on quality checks (Appendix 6A).
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

6C.2.4 Reference Area 2 Field Measurements, 2018

Table 6.C.2-9: Field Profiles at Meliadine Reference Area 2, August 2018

Station[a]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-04-01							
MEL-04-01	02-Sep-18	0.025	9.6	103	11.5	73	8.0
MEL-04-01	02-Sep-18	0.1	9.6	102	11.5	73	8.0
MEL-04-01	02-Sep-18	0.5	9.6	102	11.5	73	8.0
MEL-04-01	02-Sep-18	1.0	9.6	102	11.5	73	8.0
MEL-04-01	02-Sep-18	2.0	9.6	102	11.5	73	8.0
MEL-04-01	02-Sep-18	3.0	9.6	102	11.5	73	7.9
MEL-04-01	02-Sep-18	4.0	9.6	102	11.5	73	7.9
MEL-04-01	02-Sep-18	5.0	9.6	102	11.5	73	7.9
MEL-04-01	02-Sep-18	6.0	9.6	102	11.5	73	7.9
MEL-04-01	02-Sep-18	7.0	9.6	102	11.4	73	7.9

Table 6.C.2-9: Field Profiles at Meliadine Reference Area 2, August 2018

Station[a]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-04-02							
MEL-04-02	02-Sep-18	0.025	9.6	103	11.5	74	8.0
MEL-04-02	02-Sep-18	0.1	9.6	103	11.5	74	8.0
MEL-04-02	02-Sep-18	0.5	9.6	103	11.5	74	8.0
MEL-04-02	02-Sep-18	1.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	2.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	3.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	4.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	5.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	6.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	7.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	8.0	9.6	102	11.5	74	8.0
MEL-04-02	02-Sep-18	9.0	9.6	102	11.5	74	8.0
MEL-04-03							
MEL-04-03	02-Sep-18	0.025	9.7	102	11.4	73	8.0
MEL-04-03	02-Sep-18	0.1	9.7	102	11.4	73	8.0
MEL-04-03	02-Sep-18	0.5	9.7	102	11.4	73	8.0
MEL-04-03	02-Sep-18	1.0	9.7	102	11.4	73	8.0
MEL-04-03	02-Sep-18	2.0	9.7	102	11.4	73	8.0
MEL-04-03	02-Sep-18	3.0	9.7	102	11.5	73	8.0
MEL-04-03	02-Sep-18	4.0	9.6	102	11.5	73	8.0
MEL-04-03	02-Sep-18	5.0	9.6	102	11.5	73	8.0
MEL-04-03	02-Sep-18	6.0	9.6	103	11.5	73	8.0
MEL-04-03	02-Sep-18	7.0	9.6	102	11.5	73	8.0
MEL-04-03	02-Sep-18	8.0	9.6	102	11.5	73	8.0
MEL-04-05							
MEL-04-05	02-Sep-18	0.025	9.7	102	11.5	73	8.0
MEL-04-05	02-Sep-18	0.1	9.7	102	11.4	73	8.0
MEL-04-05	02-Sep-18	0.5	9.7	102	11.4	73	8.0
MEL-04-05	02-Sep-18	1.0	9.7	102	11.4	73	7.9
MEL-04-05	02-Sep-18	2.0	9.7	102	11.4	73	8.0
MEL-04-05	02-Sep-18	3.0	9.7	102	11.4	73	7.9
MEL-04-05	02-Sep-18	4.0	9.7	102	11.4	73	7.9
MEL-04-05	02-Sep-18	5.0	9.7	102	11.4	73	7.9
MEL-04-05	02-Sep-18	6.0	9.7	102	11.4	73	7.9
MEL-04-05	02-Sep-18	7.0	9.7	102	11.4	73	7.9

(a) MEL-04-04 was not visited during the August program due to time constraints.

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

6C.2.5 Reference Area 3 Field Measurements, 2018

Table 6.C.2-10: Field Profiles at Meliadine Reference Area 3, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-05-01							
MEL-05-01	26-Jul-18	0.0	14.1	111	11.3	74	7.7
MEL-05-01	26-Jul-18	0.1	14.1	111	11.3	74	7.7
MEL-05-01	26-Jul-18	0.5	14.0	111	11.3	74	7.7
MEL-05-01	26-Jul-18	1.0	14.0	112	11.3	74	7.7
MEL-05-01	26-Jul-18	2.0	14.0	112	11.4	74	7.7
MEL-05-01	26-Jul-18	3.0	13.9	112	11.4	74	7.6
MEL-05-01	26-Jul-18	4.0	13.8	112	11.4	74	7.7
MEL-05-01	26-Jul-18	5.0	13.7	112	11.5	74	7.7
MEL-05-01	26-Jul-18	6.0	13.4	113	11.6	74	7.7
MEL-05-01	26-Jul-18	7.0	13.2	113	11.7	74	7.7
MEL-05-01	26-Jul-18	8.0	12.5	114	12.0	73	7.7
MEL-05-01	26-Jul-18	9.0	11.7	116	12.4	74	7.8
MEL-05-02							
MEL-05-02	26-Jul-18	0.0	14.0	111	11.3	74	7.8
MEL-05-02	26-Jul-18	0.1	14.0	111	11.3	74	7.7
MEL-05-02	26-Jul-18	0.5	20.0	111	11.3	74	7.7
MEL-05-02	26-Jul-18	1.0	14.0	112	11.4	74	7.7
MEL-05-02	26-Jul-18	2.0	14.0	112	11.4	74	7.7
MEL-05-02	26-Jul-18	3.0	13.9	112	11.4	74	7.7
MEL-05-02	26-Jul-18	4.0	13.8	112	11.4	74	7.7
MEL-05-02	26-Jul-18	5.0	13.9	112	11.4	74	7.7
MEL-05-02	26-Jul-18	6.0	13.5	112	11.5	74	7.7
MEL-05-02	26-Jul-18	7.0	13.2	113	11.7	74	7.7
MEL-05-02	26-Jul-18	8.0	12.9	113	11.8	74	7.7
MEL-05-02	26-Jul-18	9.0	11.9	114	12.1	74	7.7
MEL-05-02	26-Jul-18	9.1	11.7	111	11.9	74	7.6
MEL-05-03							
MEL-05-03	26-Jul-18	0.0	14.0	111	11.3	74	7.8
MEL-05-03	26-Jul-18	0.1	14.0	112	11.3	74	7.7
MEL-05-03	26-Jul-18	0.5	14.0	112	11.3	74	7.7
MEL-05-03	26-Jul-18	1.0	14.0	112	11.4	74	7.7
MEL-05-03	26-Jul-18	2.0	13.9	112	11.4	74	7.7
MEL-05-03	26-Jul-18	3.0	13.8	113	11.5	74	7.7
MEL-05-03	26-Jul-18	4.0	13.8	113	11.5	74	7.7

Table 6.C.2-10: Field Profiles at Meliadine Reference Area 3, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-05-03	26-Jul-18	5.0	13.4	113	11.6	73	7.7
MEL-05-03	26-Jul-18	6.0	13.4	113	11.6	73	7.7
MEL-05-03	26-Jul-18	7.0	13.2	113	11.7	74	7.7
MEL-05-03	26-Jul-18	8.0	12.7	115	12.0	74	7.7
MEL-05-03	26-Jul-18	8.2	12.8	112	11.7	74	7.6
MEL-05-04							
MEL-05-04	26-Jul-18	0.0	14.6	108	10.9	74	7.8
MEL-05-04	26-Jul-18	0.1	14.4	110	11.1	74	7.8
MEL-05-04	26-Jul-18	0.5	14.2	111	11.2	74	7.7
MEL-05-04	26-Jul-18	1.0	14.1	111	11.3	74	7.7
MEL-05-04	26-Jul-18	2.0	14.0	112	11.4	74	7.7
MEL-05-04	26-Jul-18	3.0	13.9	112	11.4	74	7.7
MEL-05-04	26-Jul-18	4.0	13.8	112	11.4	74	7.7
MEL-05-04	26-Jul-18	5.0	13.7	112	11.4	74	7.7
MEL-05-04	26-Jul-18	6.0	13.3	112	11.6	73	7.7
MEL-05-04	26-Jul-18	7.0	13.3	112	11.6	74	7.7
MEL-05-04	26-Jul-18	8.0	12.6	113	11.8	74	7.7
MEL-05-04	26-Jul-18	9.0	12.0	115	12.3	74	7.7
MEL-05-04	26-Jul-18	9.8	11.3	116	12.5	73	7.7
MEL-05-05							
MEL-05-05	26-Jul-18	0.0	14.5	110	11.0	74	7.8
MEL-05-05	26-Jul-18	0.1	14.5	112	11.3	74	7.8
MEL-05-05	26-Jul-18	0.5	14.4	112	11.3	74	7.7
MEL-05-05	26-Jul-18	1.0	14.3	112	11.3	74	7.7
MEL-05-05	26-Jul-18	2.0	14.0	113	11.4	74	7.7
MEL-05-05	26-Jul-18	3.0	14.0	113	11.5	74	7.7
MEL-05-05	26-Jul-18	4.0	13.8	113	11.5	74	7.7
MEL-05-05	26-Jul-18	5.0	13.7	113	11.5	73	7.7
MEL-05-05	26-Jul-18	6.0	13.3	113	11.6	74	7.7
MEL-05-05	26-Jul-18	7.0	12.8	113	11.8	74	7.7
MEL-05-05	26-Jul-18	7.4	12.8	113	11.8	74	7.7

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 6.C.2-11: Field Profiles at Meliadine Reference Area 3, August 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-05-01							
MEL-05-01	01-Sep-18	0.025	9.0	103	11.7	73	8.1
MEL-05-01	01-Sep-18	0.1	9.0	103	11.7	73	8.1
MEL-05-01	01-Sep-18	0.5	9.0	103	11.7	73	8.0
MEL-05-01	01-Sep-18	1.0	9.0	103	11.7	74	8.0
MEL-05-01	01-Sep-18	2.0	9.0	103	11.7	75	8.0
MEL-05-01	01-Sep-18	3.0	9.0	103	11.7	75	8.0
MEL-05-01	01-Sep-18	4.0	9.0	103	11.7	75	8.0
MEL-05-01	01-Sep-18	5.0	9.0	103	11.7	76	8.0
MEL-05-01	01-Sep-18	6.0	9.0	103	11.7	76	8.0
MEL-05-01	01-Sep-18	7.0	9.0	103	11.7	76	8.0
MEL-05-01	01-Sep-18	8.0	9.0	103	11.7	75	8.0
MEL-05-02							
MEL-05-02	30-Aug-18	0.025	9.0	102	11.6	76	8.1
MEL-05-02	30-Aug-18	0.1	9.0	102	11.6	76	8.1
MEL-05-02	30-Aug-18	0.5	9.1	102	11.7	76	8.0
MEL-05-02	30-Aug-18	1.0	9.0	103	11.7	76	8.0
MEL-05-02	30-Aug-18	2.0	9.0	103	11.7	76	8.0
MEL-05-02	30-Aug-18	3.0	8.9	103	11.7	76	8.0
MEL-05-02	30-Aug-18	4.0	8.9	103	11.7	76	8.0
MEL-05-02	30-Aug-18	5.0	8.9	103	11.7	76	8.0
MEL-05-02	30-Aug-18	6.0	8.8	103	11.7	76	8.0
MEL-05-02	30-Aug-18	7.0	8.8	103	11.7	76	8.0
MEL-05-02	30-Aug-18	8.0	8.8	103	11.7	76	8.0
MEL-05-02	30-Aug-18	9.0	8.8	103	11.7	76	8.0
MEL-05-03							
MEL-05-03	29-Aug-18	0.025	8.7	106	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	0.1	8.7	106	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	0.5	8.7	106	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	1.0	8.7	105	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	2.0	8.7	106	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	3.0	8.7	106	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	4.0	8.7	105	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	5.0	8.7	106	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	6.0	8.7	105	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	7.0	8.7	106	12.1	76	-[(a)]
MEL-05-03	29-Aug-18	8.0	8.7	105	12.1	76	-[(a)]

Table 6.C.2-11: Field Profiles at Meliadine Reference Area 3, August 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
MEL-05-04							
MEL-05-04	30-Aug-18	0.025	8.8	101	11.6	76	8.1
MEL-05-04	30-Aug-18	0.1	8.8	102	11.7	76	8.1
MEL-05-04	30-Aug-18	0.5	8.8	102	11.7	76	8.0
MEL-05-04	30-Aug-18	1.0	8.8	102	11.7	76	8.0
MEL-05-04	30-Aug-18	2.0	8.8	102	11.7	76	8.0
MEL-05-04	30-Aug-18	3.0	8.8	102	11.7	76	8.0
MEL-05-04	30-Aug-18	4.0	8.8	102	11.7	76	7.9
MEL-05-04	30-Aug-18	5.0	8.8	102	11.7	76	7.9
MEL-05-04	30-Aug-18	6.0	8.8	102	11.7	76	8.0
MEL-05-04	30-Aug-18	7.0	8.8	102	11.7	76	7.9
MEL-05-04	30-Aug-18	8.0	8.8	102	11.7	76	7.9
MEL-05-04	30-Aug-18	9.0	8.7	102	11.7	76	7.9
MEL-05-05							
MEL-05-05	29-Aug-18	0.025	8.7	105	12.0	76	-[(a)]
MEL-05-05	29-Aug-18	0.1	8.7	105	12.0	76	-[(a)]
MEL-05-05	29-Aug-18	0.5	8.7	106	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	1.0	8.7	106	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	2.0	8.7	106	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	3.0	8.7	106	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	4.0	8.7	106	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	5.0	8.7	106	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	6.0	8.7	105	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	7.0	8.7	105	12.1	76	-[(a)]
MEL-05-05	29-Aug-18	8.0	8.7	105	12.1	76	-[(a)]

(a) Data were invalidated based on quality checks (Appendix 6A).
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

APPENDIX 6D

2018 Water Chemistry Tables, Meliadine Lake

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Table 6D-1: Water Quality Results at Meliadine Lake in the Near-Field Area, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations														
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-01-01	MEL-01-01	MEL-01-01	MEL-01-02	MEL-01-03	MEL-01-04	MEL-01-05	MEL-01-06	MEL-01-06	MEL-01-07	MEL-01-07	MEL-01-08	MEL-01-08	MEL-01-09	MEL-01-09
		Acute	Chronic				02-Mar-18	19-Jul-18	22-Aug-18	05-Mar-18	02-Mar-18	05-Mar-18	02-Mar-18	22-Jul-18	22-Aug-18	23-Jul-18	21-Aug-18	23-Jul-18	22-Aug-18	24-Jul-18	22-Aug-18
Field Measured																					
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.4	-	7.8	7.5	7.7	7.6	7.8	-	7.8	-	7.8	-	8.0	-
Specific conductivity	µS/cm	-	-	-	-	-	120	84	86	119	121	116	123	77	86	83	91	90	86	84	85
Temperature	°C	-	-	-	15	-	1.4	11	11	1.5	1.5	1.5	1.4	13	11	13	11	13	11	13	11
Dissolved oxygen	mg/L	-	6.5	-	-	-	18	12	12	19	18	19	19	12	12	12	12	12	12	12	12
Dissolved oxygen	%	-	-	-	-	-	132	113	109	134	130	139	134	115	110	113	109	114	111	115	109
Conventional Parameters																					
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.4	7.4	7.3	7.3	7.2	7.2	7.4	7.4	7.4	7.4	7.5	7.4	7.4	7.4
Specific conductivity	µS/cm	-	-	-	-	-	122	83	85	117	118	115	120	85	85	89	90	90	85	86	84
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	36	25	24	35	36	37	36	24	24	26	25	26	24	26	24
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	28	15	16	27	27	27	28	16	17	16	17	17	16	15	17
Total dissolved solids	mg/L	-	-	-	500	-	66	50	50	68	69	70	68	63	51	55	60	58	53	51	53
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	59	42	42	59	59	59	61	40	42	44	44	43	42	43	42
Total suspended solids	mg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	-	-	0.28	0.51	0.36	0.24	0.20	0.25	0.20	0.40	0.31	0.40	0.41	0.46	0.38	0.43	0.59
Major Ions																					
Bicarbonate	mg/L	-	-	-	-	-	34	19	20	33	33	32	34	19	20	19	20	20	20	18	20
Calcium	mg/L	-	-	-	-	-	11	7.7	7.3	11	11	12	11	7.5	7.3	7.9	7.6	8.2	7.3	8.0	7.3
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	640	120	-	250	-	15	12	13	15	14	14	15	11	13	14	14	13	13	13	12
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.030	0.021	0.024	0.028	0.029	0.027	0.029	0.021	0.024	0.021	0.024	<0.02	0.024	0.021	0.024
Magnesium	mg/L	-	-	-	-	-	1.9	1.4	1.3	1.9	2.0	2.0	2.0	1.4	1.3	1.5	1.4	1.5	1.4	1.5	1.3
Potassium	mg/L	-	-	-	-	-	1.4	0.95	0.97	1.4	1.5	1.4	1.5	0.95	0.97	0.98	1.0	1.0	0.98	1.0	0.99
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.72	0.43	0.36	0.71	0.68	0.68	0.77	0.43	0.35	0.42	0.37	0.42	0.35	0.41	0.36
Sodium	mg/L	-	-	-	200	-	7.8	5.7	5.5	7.7	8.3	7.7	7.9	5.5	5.6	6.1	5.9	6.2	5.6	6.2	5.7
Sulphate	mg/L	-	-	-	500	-	5.8	4.1	4.4	5.8	5.9	5.7	5.9	4.0	4.4	4.3	4.5	3.8	4.3	4.2	4.3
Nutrients																					
Nitrate	mg-N/L	124	2.9	10	-	-	0.0089	0.017	<0.005	0.0054	0.0061	0.0091	0.012	<0.005	<0.005	0.022	0.011	0.022	<0.005	0.012	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	0.0012	<0.001	<0.001	<0.001	<0.001	0.0017	<0.001	<0.001	0.0016	<0.001	0.0017	<0.001	0.0012	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	-	-	0.0089	0.019	<0.0051	0.0054	0.0061	0.0091	0.014	<0.0051	<0.0051	0.024	0.011	0.023	<0.0051	0.013	<0.0051
Total ammonia	mg-N/L	-	0.73 to 7.9[a]	-	-	-	0.0078	0.0094	<0.005	<0.005	0.0063	0.010	0.012	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.14	0.25	0.24	0.12	0.11	0.21	0.15	0.23	0.22	0.18	0.26	0.21	0.30	0.24	0.22
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.15	0.26	0.24	0.12	0.12	0.22	0.17	0.23	0.22	0.20	0.27	0.24	0.30	0.25	0.22
Total nitrogen	mg-N/L	-	-	-	-	-	0.15	-	-	0.12	0.12	0.22	0.17	-	-	-	-	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	-	0.0048	0.0025	0.010	0.0057	0.0039	0.0046	0.0044	0.0038	0.0062	0.0021	0.020	0.0022	0.0051	0.0025	0.0075
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0022	<0.001	0.0032	0.0027	0.0021	0.0020	0.0020	<0.001	0.0033	<0.001	0.0031	<0.001	0.0034	<0.001	0.0029
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0010	<0.001	<0.001
Total organic carbon	mg/L	-	-	-	-	-	4.0	3.6	3.5	4.0	4.0	3.9	4.2	2.9	3.2	3.0	3.2	2.9	3.1	3.0	3.2
Dissolved organic carbon	mg/L	-	-	-	-	-	3.7	3.4	3.1	3.9	3.8	3.7	4.0	2.9	3.2	2.9	3.2	3.0	3.0	3.0	3.1

Table 6D-1: Water Quality Results at Meliadine Lake in the Near-Field Area, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations													
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-01-01	MEL-01-01	MEL-01-01	MEL-01-02	MEL-01-03	MEL-01-04	MEL-01-05	MEL-01-06	MEL-01-06	MEL-01-07	MEL-01-07	MEL-01-08	MEL-01-08	MEL-01-09	MEL-01-09
		Acute	Chronic				02-Mar-18	19-Jul-18	22-Aug-18	05-Mar-18	02-Mar-18	05-Mar-18	02-Mar-18	22-Jul-18	22-Aug-18	23-Jul-18	21-Aug-18	23-Jul-18	22-Aug-18	24-Jul-18	22-Aug-18
Total Metals																				
Aluminum	µg/L	-	100[b, c]	-	-	-	0.69	14	7.7	0.50	0.39	0.55	0.49	8.4	7.4	23	7.8	24	7.0	29	8.2
Antimony	µg/L	-	-	6.0	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	25	0.53	0.34	0.45	0.54	0.54	0.52	0.52	0.36	0.41	0.36	0.39	0.37	0.42	0.34	0.42
Barium	µg/L	-	-	1,000	-	-	12	9.0	7.9	12	12	11	12	8.2	8.0	8.7	8.2	8.7	7.9	8.9	7.9
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	5.5	4.8	4.8	5.4	5.1	5.1	5.5	4.5	5.0	5.1	5.3	5.0	4.9	5.0	5.1
Cadmium	µg/L	0.49 to 0.77[d]	0.048 to 0.070[d]	5.0	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1.0	50[e]	-	-	<0.06	0.10	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	0.013	0.027	0.022	0.012	0.010	0.010	0.013	0.025	0.025	0.027	0.025	0.028	0.019	0.027	0.019
Copper	µg/L	-	2.0[d]	-	1,000	-	1.1	1.3	0.73	1.1	1.1	1.0	1.2	0.70	0.73	0.82	0.75	0.85	0.71	0.86	0.83
Iron	µg/L	-	300	-	300	1,060	5.7	40	21	6.0	5.2	4.4	6.6	28	22	27	20	26	21	26	20
Lead	µg/L	-	1.0[d]	10	-	-	0.057	<0.01	0.016	0.055	0.060	0.035	0.11	<0.01	0.010	0.010	0.024	<0.01	0.019	0.010	0.018
Lithium	µg/L	-	-	-	-	-	0.98	1.6	1.3	<0.5	<0.5	<0.5	<0.5	1.2	1.3	1.8	1.7	1.8	1.3	1.8	1.3
Manganese	µg/L	-	-	-	50	-	2.0	8.6	4.4	2.1	1.8	1.7	2.2	6.7	4.5	7.1	5.1	7.3	4.6	7.3	4.3
Mercury	µg/L	-	0.026	1.0	-	-	0.0010	0.0013	0.00070	0.0010	0.00090	0.00090	0.0011	0.00090	0.00080	0.0011	0.00060	0.0010	0.00090	0.0010	0.00080
Molybdenum	µg/L	-	73	-	-	-	0.098	0.055	0.090	0.096	0.11	0.099	0.11	0.062	0.10	0.059	0.091	0.078	0.087	0.067	0.081
Nickel	µg/L	-	25[d]	-	-	-	0.79	0.69	0.64	0.79	0.81	0.78	0.82	0.75	0.66	0.71	0.64	0.67	0.66	0.69	0.61
Selenium	µg/L	-	1.0	50	-	-	0.057	0.047	<0.04	0.058	0.050	0.041	0.070	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	51	53	45	50	51	48	51	46	45	58	52	58	45	59	45
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	0.15	0.20	<0.1	<0.1	<0.1	<0.1	<0.1	0.23	<0.1	0.21	0.10	0.24	0.18	0.22
Uranium	µg/L	33	15	20	-	-	0.017	0.017	0.016	0.018	0.019	0.017	0.018	0.017	0.016	0.021	0.016	0.019	0.017	0.018	0.017
Vanadium	µg/L	-	-	-	-	-	<0.05	0.057	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.056	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	-	<0.8	1.4	<0.8	0.85	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Dissolved Metals																				
Aluminum	µg/L	-	-	-	-	-	0.42	8.1	3.3	<0.3	2.8	<0.3	<0.3	6.0	3.3	19	4.2	19	2.9	22	3.2
Antimony	µg/L	-	-	-	-	-	<0.02	0.080	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.10	<0.02
Arsenic	µg/L	-	-	-	-	-	0.53	0.32	0.41	0.53	0.56	0.54	0.52	0.33	0.41	0.34	0.41	0.35	0.39	0.33	0.40
Barium	µg/L	-	-	-	-	-	12	8.3	8.0	12	12	12	12	8.1	7.9	8.8	8.4	8.7	8.0	8.4	8.0
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	5.4	4.7	4.5	5.4	5.3	5.6	6.3	4.5	4.6	4.8	5.0	5.0	4.4	4.8	4.4
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	-	-	-	-	<0.06	0.079	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.18	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	<0.01	0.013	<0.01	<0.01	0.010	<0.01	<0.01	0.010	<0.01	0.022	<0.01	0.010	<0.01	0.012	<0.01

Table 6D-1: Water Quality Results at Meliadine Lake in the Near-Field Area, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations													
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-01-01	MEL-01-01	MEL-01-01	MEL-01-02	MEL-01-03	MEL-01-04	MEL-01-05	MEL-01-06	MEL-01-06	MEL-01-07	MEL-01-07	MEL-01-08	MEL-01-08	MEL-01-09	MEL-01-09
		Acute	Chronic				02-Mar-18	19-Jul-18	22-Aug-18	05-Mar-18	02-Mar-18	05-Mar-18	02-Mar-18	22-Jul-18	22-Aug-18	23-Jul-18	21-Aug-18	23-Jul-18	22-Aug-18	24-Jul-18	22-Aug-18
Dissolved Metals (cont'd)																				
Copper	µg/L	-	-	-	-	-	1.1	1.0	0.68	1.0	1.1	1.0	1.1	0.68	0.70	0.65	0.71	0.82	0.70	0.64	0.89
Iron	µg/L	-	-	-	-	-	2.1	11	5.6	1.7	2.5	1.4	2.1	10	6.0	9.3	10	8.9	5.8	8.5	5.7
Lead	µg/L	-	-	-	-	-	0.056	<0.01	<0.01	0.039	0.072	0.036	0.078	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	0.69	1.7	1.3	0.86	0.77	1.0	0.88	1.4	1.4	1.9	1.6	2.0	1.2	2.0	1.2
Manganese	µg/L	-	-	-	-	-	0.22	2.7	0.38	0.22	0.24	0.28	0.23	1.6	0.43	2.7	0.59	1.6	0.33	1.4	0.37
Mercury	µg/L	-	-	-	-	-	0.00060	0.0015	0.00050	0.00050	0.00050	0.00060	0.00060	0.0012	<0.0005	0.0013	0.00050	0.0012	0.00060	0.0013	0.00050
Molybdenum	µg/L	-	-	-	-	-	0.096	0.066	0.095	0.10	0.10	0.096	0.11	0.063	0.10	0.054	0.10	0.064	0.098	0.071	0.10
Nickel	µg/L	-	-	-	-	-	0.82	0.64	0.56	0.80	0.81	0.77	0.79	0.65	0.55	0.65	0.64	0.62	0.58	0.64	0.56
Selenium	µg/L	-	-	-	-	-	0.051	<0.04	<0.04	0.057	0.060	0.044	0.048	0.042	<0.04	0.041	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	52	52	44	52	52	52	54	46	45	56	51	56	45	56	45
Thallium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	0.019	0.016	0.016	0.018	0.016	0.019	0.017	0.018	0.017	0.019	0.014	0.019	0.014	0.020	0.014
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.063	<0.05	<0.05	<0.05	<0.05	0.054	<0.05	<0.05
Zinc	µg/L	31 to 47[f]	5.2 to 13[g]	-	-	-	<0.8	1.6	<0.8	<0.8	0.86	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Other																				
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Radium-226	Bq/L	-	-	-	-	-	-	<0.0053	<0.0062	-	-	-	-	<0.0066	0.0072	<0.0078	0.0057	<0.0081	<0.0076	0.10	<0.0063

(a) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.73 mg-N/L) is based on the combination of field pH (8.0) and water temperature (13.3°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.3 to 8.0). The guideline is calculated based on the individual pH for each sample.

(c) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5.

(d) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (23.7 to 37.1 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (23.7 to 37.1 mg/L as $CaCO_3$) and DOC (2.89 to 3.96 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.3 to 8.0), hardness (23.7 to 37.1 mg/L as $CaCO_3$) and DOC (2.89 to 3.96 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range of pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L). When field pH was not available laboratory pH was used.

Note:

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; - = no guideline or data not measured.

Table 6D-2: Water Quality Results at Meliadine Lake in the Mid-Field Area, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations														
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-02-01	MEL-02-01	MEL-02-02	MEL-02-02	MEL-02-02	MEL-02-03	MEL-02-03	MEL-02-03	MEL-02-04	MEL-02-04	MEL-02-05	MEL-02-05	MEL-02-05	MEL-02-06	MEL-02-08	MEL-02-08
		Acute	Chronic				06-Mar-18	23-Jul-18	05-Mar-18	20-Jul-18	31-Aug-18	05-Mar-18	20-Jul-18	18-Aug-18	06-Mar-18	21-Jul-18	06-Mar-18	23-Jul-18	18-Aug-18	31-Aug-18	15-Aug-18	18-Aug-18
Field Measured																					
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.6	7.4	7.6	7.5	7.9	7.6	7.5	-	7.5	7.6	7.5	7.6	-	7.9	8.6	-
Specific conductivity	µS/cm	-	-	-	-	-	101	75	100	75	78	102	75	76	101	70	101	70	76	78	76	77
Temperature	°C	-	-	-	15	-	1.3	11	1.3	11	9.0	1.2	12	12	1.3	13	1.3	13	12	9.0	12	12
Dissolved oxygen	mg/L	-	6.5	-	-	-	19	12	20	12	12	19	12	10	19	12	19	12	10	12	10	10
Dissolved oxygen	%	-	-	-	-	-	135	111	144	111	103	136	105	95	138	113	136	112	97	102	95	96
Conventional Parameters																					
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.4	7.2	7.4	7.5	7.3	7.5	7.4	7.3	7.5	7.3	7.5	7.5	7.5	7.6	-
Specific conductivity	µS/cm	-	-	-	-	-	98	74	99	73	80	100	76	77	99	76	100	74	78	82	79	-
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	29	23	30	23	23	29	22	21	30	22	30	23	18	23	-	-
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	25	17	25	17	17	25	20	17	25	17	25	16	18	18	21	-
Total dissolved solids	mg/L	-	-	-	500	-	61	42	58	49	53	62	41	45	59	44	63	35	51	45	53	-
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	49	37	50	37	38	50	39	37	49	37	50	37	32	38	-	-
Total suspended solids	mg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	2.8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-
Turbidity	NTU	-	-	-	-	-	0.16	0.28	0.12	0.38	0.25	0.14	0.30	0.28	0.16	0.46	0.14	0.36	0.30	0.24	0.27	-
Major Ions																					
Bicarbonate	mg/L	-	-	-	-	-	30	20	30	20	21	31	24	21	30	21	30	20	21	22	25	-
Calcium	mg/L	-	-	-	-	-	9.1	7.0	9.5	7.0	7.0	9.2	6.9	6.3	9.5	7.0	9.2	7.0	5.0	7.2	-	7.0
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	-
Chloride	mg/L	640	120	-	250	-	12	9.2	12	9.2	9.5	12	9.3	9.5	12	9.3	12	9.3	9.6	9.4	9.6	-
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.025	0.022	0.025	0.022	0.028	0.025	0.023	0.024	0.025	0.023	0.025	0.022	0.024	0.027	0.024	-
Magnesium	mg/L	-	-	-	-	-	1.6	1.2	1.5	1.3	1.2	1.5	1.3	1.2	1.5	1.2	1.7	1.3	0.45	1.2	-	1.2
Potassium	mg/L	-	-	-	-	-	1.3	0.92	1.3	0.94	0.95	1.3	0.92	0.95	1.3	0.90	1.3	0.92	0.25	0.97	-	0.96
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.45	0.37	0.49	0.37	0.29	0.47	0.37	0.32	0.46	0.36	0.46	0.40	0.32	0.28	0.33	-
Sodium	mg/L	-	-	-	200	-	6.1	5.0	6.2	5.2	4.7	6.2	5.1	4.9	6.2	4.9	6.4	5.1	1.8	4.7	-	4.9
Sulphate	mg/L	-	-	-	500	-	4.4	3.8	4.5	3.8	4.0	4.5	3.8	3.8	4.5	3.8	4.5	3.8	3.8	4.0	4.1	-
Nutrients																					
Nitrate	mg-N/L	124	2.9	10	-	-	0.011	<0.005	0.016	<0.005	<0.005	0.012	<0.005	<0.005	0.012	<0.005	0.012	<0.005	<0.005	<0.005	<0.005	-
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Nitrate + nitrite	mg-N/L	-	-	-	-	-	0.011	<0.0051	0.016	<0.0051	<0.0051	0.012	<0.0051	<0.0051	0.012	<0.0051	0.012	<0.0051	<0.0051	<0.0051	<0.0051	-
Total ammonia	mg-N/L	-	0.22 to 5.7[(a)]	-	-	-	0.014	<0.005	0.011	<0.005	0.0077	0.013	<0.005	0.018	0.012	<0.005	0.012	<0.005	<0.005	0.014	<0.005	-
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.054	0.20	0.067	0.18	0.29	0.055	0.28	0.34	<0.05	0.25	0.23	0.17	0.21	0.27	0.15	-
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.065	0.20	0.083	0.18	0.29	0.067	0.28	0.34	0.037	0.25	0.24	0.17	0.21	0.27	0.15	-
Total nitrogen	mg-N/L	-	-	-	-	-	0.065	-	0.082	-	-	0.067	-	-	<0.05	-	0.24	-	-	-	-	-
Total phosphorus	mg-P/L	-	-	-	-	-	0.0037	0.0011	0.0032	0.0017	0.0040	0.0040	<0.001	0.0061	0.0038	0.0017	0.0046	0.0013	0.0052	0.0033	0.0044	-
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0020	<0.001	0.0022	<0.001	0.0022	0.0020	<0.001	0.0019	0.0016	<0.001	0.0019	<0.001	0.0019	0.0029	0.0023	-

Table 6D-2: Water Quality Results at Meliadine Lake in the Mid-Field Area, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations														
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-02-01	MEL-02-01	MEL-02-02	MEL-02-02	MEL-02-02	MEL-02-03	MEL-02-03	MEL-02-03	MEL-02-04	MEL-02-04	MEL-02-05	MEL-02-05	MEL-02-05	MEL-02-06	MEL-02-08	MEL-02-08
		Acute	Chronic				06-Mar-18	23-Jul-18	05-Mar-18	20-Jul-18	31-Aug-18	05-Mar-18	20-Jul-18	18-Aug-18	06-Mar-18	21-Jul-18	06-Mar-18	23-Jul-18	18-Aug-18	31-Aug-18	15-Aug-18	18-Aug-18
Nutrients (cont'd)																					
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Total organic carbon	mg/L	-	-	-	-	-	3.0	2.8	3.0	2.8	2.6	3.1	2.8	2.5	3.1	2.8	3.0	2.8	2.5	2.7	2.3	-
Dissolved organic carbon	mg/L	-	-	-	-	-	3.1	2.9	2.9	2.9	2.6	3.0	3.1	2.6	2.9	2.8	3.0	2.9	2.6	2.6	2.3	-
Total Metals																					
Aluminum	µg/L	-	100[b, c]	-	-	-	0.70	3.0	0.64	2.9	2.8	0.69	3.3	3.9	0.87	2.9	0.46	2.6	3.3	2.9	-	3.9
Antimony	µg/L	-	-	6.0	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.02
Arsenic	µg/L	-	5.0	10	-	25	0.31	0.25	0.28	0.26	0.25	0.33	0.27	0.24	0.34	0.25	0.31	0.27	0.25	0.25	-	0.29
Barium	µg/L	-	-	1,000	-	-	11	8.6	11	8.6	7.8	11	8.6	7.6	11	8.6	11	8.5	7.8	7.8	-	7.7
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	4.1	4.1	4.8	4.0	4.0	5.3	3.7	4.6	4.5	3.8	5.3	3.9	4.5	4.1	-	4.4
Cadmium	µg/L	0.36 to 0.62[d]	0.038 to 0.059[d]	5.0	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
Chromium	µg/L	-	1.0	50[e]	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.065	<0.06	<0.06	0.065	<0.06	<0.06	<0.06	<0.06	-	<0.06
Cobalt	µg/L	-	-	-	-	-	<0.01	0.019	<0.01	0.020	0.013	<0.01	0.027	0.012	<0.01	0.019	<0.01	0.020	0.018	0.013	-	0.015
Copper	µg/L	-	2.0[d]	-	1,000	-	0.86	0.92	0.89	0.70	0.71	0.88	0.81	0.65	0.89	0.76	0.86	0.71	0.66	0.70	-	0.65
Iron	µg/L	-	300	-	300	1,060	2.1	26	2.8	25	10	2.1	32	14	3.2	25	2.2	23	13	9.8	-	14
Lead	µg/L	-	1.0[d]	10	-	-	0.027	<0.01	0.039	0.027	<0.01	0.042	<0.01	<0.01	0.039	<0.01	0.045	<0.01	<0.01	<0.01	-	<0.01
Lithium	µg/L	-	-	-	-	-	<0.5	0.57	<0.5	0.62	0.69	0.63	0.60	1.3	<0.5	0.59	0.61	0.62	1.3	0.65	-	1.3
Manganese	µg/L	-	-	-	50	-	1.0	5.2	1.2	5.1	3.2	1.0	4.8	3.7	1.1	4.7	1.0	4.7	3.7	3.1	-	4.0
Mercury	µg/L	-	0.026	1.0	-	-	0.0010	0.0014	0.00080	0.0013	0.00050	0.00090	0.0013	0.00090	0.00080	0.0013	0.00070	0.0013	0.00090	<0.0005	-	0.0010
Molybdenum	µg/L	-	73	-	-	-	0.12	0.056	0.083	0.055	0.078	0.085	0.083	0.10	0.071	0.061	0.11	0.060	0.11	0.077	-	0.11
Nickel	µg/L	-	25[d]	-	-	-	0.55	0.73	0.58	0.69	0.47	0.59	0.97	0.52	0.57	0.72	0.55	0.65	0.56	0.47	-	0.54
Selenium	µg/L	-	1.0	50	-	-	0.043	<0.04	0.049	<0.04	<0.04	0.064	0.046	<0.04	0.063	<0.04	<0.04	<0.04	<0.04	<0.04	-	<0.04
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
Strontium	µg/L	-	-	-	-	-	41	35	43	35	35	47	34	44	45	35	49	35	44	36	-	44
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1
Uranium	µg/L	33	15	20	-	-	0.015	0.017	0.015	0.014	0.013	0.015	0.016	0.017	0.015	0.016	0.015	0.016	0.016	0.013	-	0.016
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Zinc	µg/L	-	-	-	5,000	-	<0.8	<0.8	<0.8	<0.8	<0.8	0.86	<0.8	<0.8	<0.8	<0.8	0.81	<0.8	<0.8	<0.8	-	<0.8
Dissolved Metals																					
Aluminum	µg/L	-	-	-	-	-	0.34	1.5	0.35	1.3	1.5	0.40	1.5	2.7	0.46	1.1	<0.3	1.4	0.68	1.6	-	3.4
Antimony	µg/L	-	-	-	-	-	<0.02	0.025	<0.02	0.024	0.021	<0.02	<0.02	<0.02	<0.02	0.13	<0.02	0.057	<0.02	0.24	-	<0.02
Arsenic	µg/L	-	-	-	-	-	0.30	0.25	0.33	0.25	0.24	0.31	0.25	0.24	0.29	0.24	0.32	0.25	0.10	0.23	-	0.27
Barium	µg/L	-	-	-	-	-	11	8.4	11	8.3	7.5	11	8.4	7.9	11	8.2	11	8.4	3.1	7.4	-	7.6
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01

Table 6D-2: Water Quality Results at Meliadine Lake in the Mid-Field Area, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations														
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-02-01	MEL-02-01	MEL-02-02	MEL-02-02	MEL-02-02	MEL-02-03	MEL-02-03	MEL-02-03	MEL-02-04	MEL-02-04	MEL-02-05	MEL-02-05	MEL-02-05	MEL-02-06	MEL-02-08	MEL-02-08
		Acute	Chronic				06-Mar-18	23-Jul-18	05-Mar-18	20-Jul-18	31-Aug-18	05-Mar-18	20-Jul-18	18-Aug-18	06-Mar-18	21-Jul-18	06-Mar-18	23-Jul-18	18-Aug-18	31-Aug-18	15-Aug-18	18-Aug-18
Dissolved Metals (cont'd)																					
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01
Boron	µg/L	-	-	-	-	-	4.5	3.9	4.6	4.0	3.9	5.1	3.9	3.0	4.7	3.9	4.4	3.9	2.5	4.1	-	3.8
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
Chromium	µg/L	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.084	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	<0.06
Cobalt	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.011
Copper	µg/L	-	-	-	-	-	0.85	0.92	0.86	0.63	0.75	0.81	0.72	0.68	0.85	0.65	0.89	0.68	0.19	0.73	-	0.68
Iron	µg/L	-	-	-	-	-	<1.0	9.9	<1.0	9.8	5.2	<1.0	12	<1.0	<1.0	8.7	<1.0	8.9	2.0	4.8	-	6.2
Lead	µg/L	-	-	-	-	-	0.029	0.010	0.035	<0.01	<0.01	0.040	<0.01	<0.01	0.044	<0.01	0.043	<0.01	<0.01	<0.01	-	<0.01
Lithium	µg/L	-	-	-	-	-	<0.5	0.71	0.67	0.72	0.94	0.51	0.74	0.93	0.86	0.78	0.59	0.74	0.80	0.94	-	1.0
Manganese	µg/L	-	-	-	-	-	0.23	1.6	0.22	1.3	0.62	0.18	1.5	0.43	0.19	1.2	0.23	1.1	0.24	0.42	-	0.57
Mercury	µg/L	-	-	-	-	-	0.00050	0.0013	<0.0005	0.0012	0.00050	<0.0005	0.0014	0.00050	0.00060	0.0013	0.00050	0.0012	<0.0005	0.00050	-	0.00050
Molybdenum	µg/L	-	-	-	-	-	0.073	0.064	0.075	0.071	0.085	0.080	0.067	0.071	0.080	0.063	0.076	0.062	0.058	0.095	-	0.085
Nickel	µg/L	-	-	-	-	-	0.56	0.68	0.56	0.67	0.50	0.55	0.77	0.54	0.56	0.62	0.56	0.65	0.19	0.49	-	0.52
Selenium	µg/L	-	-	-	-	-	0.051	<0.04	<0.04	<0.04	<0.04	0.055	<0.04	<0.04	<0.04	<0.04	0.051	<0.04	<0.04	0.045	-	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
Strontium	µg/L	-	-	-	-	-	44	35	46	35	35	45	35	32	44	35	43	36	26	35	-	36
Thallium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	0.14	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1
Uranium	µg/L	-	-	-	-	-	0.015	0.016	0.014	0.015	0.012	0.016	0.015	0.013	0.015	0.015	0.016	0.016	0.010	0.013	-	0.016
Vanadium	µg/L	-	-	-	-	-	<0.05	0.053	<0.05	<0.05	0.051	<0.05	0.052	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
Zinc	µg/L	23 to 37[f]	4.6 to 8.9[g]	-	-	-	<0.8	1.5	<0.8	0.92	<0.8	<0.8	1.5	1.4	<0.8	3.0	<0.8	0.86	<0.8	1.2	-	2.2

(a) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.22 mg-N/L) is based on the combination of field pH (8.6) and water temperature (11.9°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.4 to 8.6). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(d) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (17.7 to 30.1 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (17.7 to 30.1 mg/L as $CaCO_3$) and DOC (2.28 to 3.07 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.3 to 7.9), hardness (17.7 to 30.1 mg/L as $CaCO_3$) and DOC (2.28 to 3.07 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines that fell outside the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as CaCO3) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated guideline range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

Half of the detection limit value was used for total Kjeldahl nitrogen to calculate total nitrogen concentrations.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; - = no guideline or data not measured.

Reference:

CCME. 2018. Canadian Water Quality Guideline for the Protection of Aquatic Life: Zinc (Dissolved) 2018 Fact Sheet. Canadian Council of Ministers of the Environment. Gatineau, QC.

Table 6D-3: Water Quality Results at Meliadine Lake in Reference Area 1, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations									
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-03-01	MEL-03-01	MEL-03-01	MEL-03-02	MEL-03-02	MEL-03-03	MEL-03-03	MEL-03-04	MEL-03-04	MEL-03-05
		Acute	Chronic				25-Jul-18	20-Aug-18	15-Sep-18	25-Jul-18	26-Aug-18	25-Jul-18	20-Aug-18	25-Jul-18	26-Aug-18	26-Aug-18
Field Measured																
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.7	-	7.3	7.7	-	7.7	-	7.8	-	-
Specific conductivity	µS/cm	-	-	-	-	-	65	71	85	64	73	64	71	63	73	73
Temperature	°C	-	-	-	15	-	11	11	10	11	8.6	12	11	12	8.4	8.5
Dissolved oxygen	mg/L	-	6.5	-	-	-	13	12	12	13	12	12	12	12	12	12
Dissolved oxygen	%	-	-	-	-	-	116	109	-	116	104	115	110	116	105	106
Conventional Parameters																
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.4	7.4	7.4	7.4	7.5	7.5	7.4	7.5	7.4	7.5
Specific conductivity	µS/cm	-	-	-	-	-	68	72	75	67	74	68	70	67	72	71
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	21	20	39	21	21	21	21	21	21	21
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	16	18	18	16	17	17	18	16	17	17
Total dissolved solids	mg/L	-	-	-	500	-	33	48	54	41	20	46	44	42	29	29
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	40	36	37	33	36	34	35	34	36	36
Total suspended solids	mg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	-	-	0.26	0.23	0.23	0.23	0.22	0.22	0.20	0.25	0.22	0.33
Major Ions																
Bicarbonate	mg/L	-	-	-	-	-	20	21	22	20	21	20	21	20	21	21
Calcium	mg/L	-	-	-	-	-	6.6	6.4	12	6.4	6.5	6.7	6.5	6.6	6.4	6.6
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	640	120	-	250	-	8.1	8.3	8.7	8.0	8.7	8.0	8.4	7.9	8.7	8.7
Fluoride	mg/L	-	0.12	1.5	-	2.8	<0.02	0.024	0.026	0.023	0.026	0.023	0.025	0.022	0.026	0.026
Magnesium	mg/L	-	-	-	-	-	1.1	1.1	2.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Potassium	mg/L	-	-	-	-	-	0.85	0.90	1.3	0.84	0.89	0.87	0.89	0.87	0.90	0.90
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.27	0.23	0.22	0.26	0.23	0.28	0.24	0.26	0.23	0.24
Sodium	mg/L	-	-	-	200	-	4.2	4.6	8.5	4.1	4.3	4.5	4.3	4.4	4.3	4.3
Sulphate	mg/L	-	-	-	500	-	3.6	3.8	3.8	3.3	3.6	3.3	3.5	3.2	3.6	3.6
Nutrients																
Nitrate	mg-N/L	124	2.9	10	-	-	-[a]	<0.005	0.0073	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	-	-[a]	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	-	-	-[a]	<0.0051	0.0073	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
Total ammonia	mg-N/L	-	1.2 to 4.6[b]	-	-	-	<0.005	<0.005	<0.005	<0.005	0.019	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.16	0.23	0.16	0.11	0.17	0.14	0.25	0.19	0.18	0.23
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	1.5	0.23	0.16	0.11	0.17	0.14	0.25	0.19	0.18	0.23
Total phosphorus	mg-P/L	-	-	-	-	-	0.0013	0.0042	0.0044	<0.001	0.0031	0.0021	0.0037	<0.001	0.0039	0.0039
Dissolved phosphorus	mg-P/L	-	-	-	-	-	<0.001	0.0021	0.0028	<0.001	0.0023	0.0016	0.0021	<0.001	0.0025	0.0022
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total organic carbon	mg/L	-	-	-	-	-	2.3	2.2	2.3	2.2	2.4	2.3	2.5	2.2	2.4	2.4
Dissolved organic carbon	mg/L	-	-	-	-	-	2.3	2.3	2.7	2.3	2.4	2.3	2.3	2.2	2.4	2.4

Table 6D-3: Water Quality Results at Meliadine Lake in Reference Area 1, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations									
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-03-01	MEL-03-01	MEL-03-01	MEL-03-02	MEL-03-02	MEL-03-03	MEL-03-03	MEL-03-04	MEL-03-04	MEL-03-05
		Acute	Chronic				25-Jul-18	20-Aug-18	15-Sep-18	25-Jul-18	26-Aug-18	25-Jul-18	20-Aug-18	25-Jul-18	26-Aug-18	26-Aug-18
Total Metals																
Aluminum	µg/L	-	100[c, d]	-	-	-	3.6	2.8	2.9	4.7	3.6	3.0	3.1	2.5	2.7	3.3
Antimony	µg/L	-	-	6.0	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	25	0.20	0.21	0.19	0.21	0.19	0.20	0.19	0.20	0.19	0.19
Barium	µg/L	-	-	1,000	-	-	7.9	8.2	7.5	7.8	7.2	7.8	7.4	7.7	7.2	7.1
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	3.9	3.0	2.8	3.5	4.0	3.6	3.9	3.6	3.9	3.8
Cadmium	µg/L	0.42 to 0.80[d]	0.042 to 0.072[e]	5.0	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1.0	50[f]	-	-	<0.06	0.56	<0.06	0.086	<0.06	<0.06	0.25	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	0.024	0.015	0.024	0.027	0.012	0.015	0.014	0.012	0.011	0.011
Copper	µg/L	-	2.0[e]	-	1,000	-	0.77	0.64	0.88	0.82	0.71	0.62	0.63	0.64	0.64	0.73
Iron	µg/L	-	300	-	300	1,060	24	18	7.1	25	12	15	13	15	11	11
Lead	µg/L	-	1.0[e]	10	-	-	<0.01	0.010	<0.01	0.015	0.015	<0.01	0.012	<0.01	<0.01	0.098
Lithium	µg/L	-	-	-	-	-	0.51	0.64	<0.5	0.55	0.58	<0.5	0.51	<0.5	0.60	0.66
Manganese	µg/L	-	-	-	50	-	3.3	2.6	3.4	3.4	2.3	3.2	2.5	3.0	2.3	2.1
Mercury	µg/L	-	0.026	1.0	-	-	0.00080	0.00060	<0.0005	0.00080	0.00050	0.00070	0.00060	0.00080	0.00050	0.00050
Molybdenum	µg/L	-	73	-	-	-	0.083	0.064	0.067	0.093	0.078	0.058	0.11	0.057	0.078	0.079
Nickel	µg/L	-	25[e]	-	-	-	0.71	0.41	0.54	0.78	0.39	0.46	0.56	0.41	0.37	0.35
Selenium	µg/L	-	1.0	50	-	-	0.050	<0.04	<0.04	<0.04	<0.04	0.049	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	33	31	33	32	32	33	31	33	32	33
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	0.14	<0.1
Uranium	µg/L	33	15	20	-	-	0.016	0.014	0.048	0.017	0.014	0.015	0.012	0.015	0.012	0.013
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	-	1.0	<0.8	<0.8	0.91	<0.8	<0.8	0.84	<0.8	<0.8	<0.8
Dissolved Metals																
Aluminum	µg/L	-	-	-	-	-	1.4	1.4	1.7	0.98	1.4	1.3	1.4	1.2	1.3	1.3
Antimony	µg/L	-	-	-	-	-	<0.02	<0.02	<0.02	0.14	<0.02	0.13	<0.02	0.17	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	0.18	0.20	0.24	0.19	0.19	0.19	0.20	0.20	0.19	0.20
Barium	µg/L	-	-	-	-	-	7.6	7.7	11	7.6	7.6	7.6	7.6	7.5	7.4	7.4
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	3.7	3.0	9.5	3.4	3.3	3.6	3.3	3.5	3.2	3.2
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	-	-	-	-	0.065	<0.06	<0.06	0.068	<0.06	<0.06	0.13	0.076	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	0.013	<0.01	0.076	0.011	<0.01	0.011	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	-	-	-	-	-	0.72	0.57	0.82	0.67	0.63	0.70	0.60	0.63	0.63	0.73
Iron	µg/L	-	-	-	-	-	13	4.2	7.4	11	5.2	13	5.0	6.3	3.5	4.4

Table 6D-3: Water Quality Results at Meliadine Lake in Reference Area 1, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations									
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-03-01	MEL-03-01	MEL-03-01	MEL-03-02	MEL-03-02	MEL-03-03	MEL-03-03	MEL-03-04	MEL-03-04	MEL-03-05
		Acute	Chronic				25-Jul-18	20-Aug-18	15-Sep-18	25-Jul-18	26-Aug-18	25-Jul-18	20-Aug-18	25-Jul-18	26-Aug-18	26-Aug-18
Dissolved Metals (cont'd)																
Lead	µg/L	-	-	-	-	-	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	0.62	0.64	4.4	0.53	<0.5	0.64	<0.5	0.55	<0.5	<0.5
Manganese	µg/L	-	-	-	-	-	1.3	0.44	16	1.2	0.38	1.3	0.48	1.1	0.32	0.40
Mercury	µg/L	-	-	-	-	-	0.0010	0.00050	0.00080	0.0010	0.0015	0.0010	<0.0005	0.0010	0.0010	0.0011
Molybdenum	µg/L	-	-	-	-	-	0.075	0.064	0.18	0.078	0.089	0.074	0.10	0.063	0.075	0.083
Nickel	µg/L	-	-	-	-	-	0.67	0.50	0.67	0.61	0.45	0.70	0.38	0.39	0.36	0.37
Selenium	µg/L	-	-	-	-	-	<0.04	<0.04	0.042	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	32	33	122	31	31	32	31	32	30	31
Thallium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	0.33	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	0.014	0.011	0.11	0.015	0.013	0.014	0.013	0.015	0.014	0.014
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.1	0.087	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	26 to 45[f]	4.8 to 13[h]	-	-	-	<0.8	<0.8	2.9	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Other																
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Radium-226	Bq/L	-	-	-	-	-	<0.0067	<0.0074	<0.0097	<0.0065	<0.0083	<0.0066	<0.0034	0.011	<0.0093	<0.01

(a) Data were invalidated because they fell well outside historical range.

(b) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (1.16 mg-N/L) is based on the combination of field pH (7.8) and water temperature (12.2°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.3 to 7.8). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(d) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(e) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (20.4 to 38.7 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(f) Guideline is for chromium VI.

(g) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (20.4 to 38.7 mg/L as $CaCO_3$) and DOC (2.21 to 2.66 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(h) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.3 to 7.8), hardness (20.4 to 38.7 mg/L as $CaCO_3$) and DOC (2.21 to 2.66 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines that fell outside the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as CaCO3) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated guideline range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

Grey shaded concentrations are higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units;
mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; - = no guideline or data not measured.

Reference:

CCME. 2018. Canadian Water Quality Guideline for the Protection of Aquatic Life: Zinc (Dissolved) 2018 Fact Sheet. Canadian Council of Ministers of the Environment. Gatineau, QC.

Table 6D-4: Water Quality Results at Meliadine Lake in Reference Area 2, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations			
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-04-01	MEL-04-02	MEL-04-03	MEL-04-05
		Acute	Chronic				02-Sep-18	02-Sep-18	02-Sep-18	02-Sep-18
Field Measured										
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.9	8.0	8.0	7.9
Specific conductivity	µS/cm	-	-	-	-	-	73	74	73	73
Temperature	°C	-	-	-	15	-	9.6	9.6	9.6	9.7
Dissolved oxygen	mg/L	-	6.5	-	-	-	11	11	11	11
Dissolved oxygen	%	-	-	-	-	-	102	102	102	102
Conventional Parameters										
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.6	7.5	7.5	7.5
Specific conductivity	µS/cm	-	-	-	-	-	75	75	74	74
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	22	22	21	22
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	20	17	17	17
Total dissolved solids	mg/L	-	-	-	500	-	48	43	48	50
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	37	36	35	35
Total suspended solids	mg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	-	-	0.18	0.84	0.16	0.17
Major Ions										
Bicarbonate	mg/L	-	-	-	-	-	24	21	20	21
Calcium	mg/L	-	-	-	-	-	6.9	6.9	6.7	6.8
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	640	120	-	250	-	8.4	8.3	8.3	8.4
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.028	0.028	0.028	0.028
Magnesium	mg/L	-	-	-	-	-	1.2	1.1	1.1	1.1
Potassium	mg/L	-	-	-	-	-	0.95	0.94	0.90	0.93
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.25	0.25	0.24	0.22
Sodium	mg/L	-	-	-	200	-	4.3	4.4	4.4	4.3
Sulphate	mg/L	-	-	-	500	-	3.6	3.6	3.6	3.6
Nutrients										
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	<0.001	<0.001	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	<0.0051	<0.0051	<0.0051
Total ammonia	mg-N/L	-	0.97 to 1.0[(a)]	-	-	-	<0.005	<0.005	0.0095	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.24	0.14	0.22	0.12
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.24	0.14	0.22	0.12
Total phosphorus	mg-P/L	-	-	-	-	-	0.0033	0.0034	0.0035	0.0035
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0022	0.0027	0.0030	0.0025
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	0.0033	<0.001
Total organic carbon	mg/L	-	-	-	-	-	2.2	2.3	2.3	2.2
Dissolved organic carbon	mg/L	-	-	-	-	-	2.3	2.2	2.2	2.3

Table 6D-4: Water Quality Results at Meliadine Lake in Reference Area 2, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations			
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-04-01	MEL-04-02	MEL-04-03	MEL-04-05
		Acute	Chronic				02-Sep-18	02-Sep-18	02-Sep-18	02-Sep-18
Total Metals										
Aluminum	µg/L	-	100[b, c]	-	-	-	2.1	1.8	2.0	1.9
Antimony	µg/L	-	-	6.0	-	-	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	25	0.18	0.20	0.20	0.21
Barium	µg/L	-	-	1,000	-	-	7.7	7.6	7.6	7.6
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	4.0	3.9	4.0	3.8
Cadmium	µg/L	0.43 to 0.45[d]	0.044 to 0.045[d]	5.0	-	-	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1.0	50[e]	-	-	0.096	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	-	2.0[d]	-	1,000	-	0.68	0.66	0.64	0.66
Iron	µg/L	-	300	-	300	1,060	7.7	5.5	6.0	6.0
Lead	µg/L	-	1.0[d]	10	-	-	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	0.60	0.59	0.57	0.55
Manganese	µg/L	-	-	-	50	-	2.2	2.1	2.1	2.2
Mercury	µg/L	-	0.026	1.0	-	-	<0.0005	<0.0005	<0.0005	0.00050
Molybdenum	µg/L	-	73	-	-	-	0.072	0.073	0.060	0.070
Nickel	µg/L	-	25[d]	-	-	-	0.35	0.35	0.38	0.37
Selenium	µg/L	-	1.0	50	-	-	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	32	32	32	32
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	0.19	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	33	15	20	-	-	0.011	0.013	0.012	0.014
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	-	<0.8	<0.8	<0.8	<0.8
Dissolved Metals										
Aluminum	µg/L	-	-	-	-	-	1.9	1.4	0.92	1.3
Antimony	µg/L	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	0.22	0.19	0.20	0.19
Barium	µg/L	-	-	-	-	-	7.3	7.3	7.3	7.4
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	3.6	3.5	3.1	3.6
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	-	-	-	-	-	0.68	0.65	0.61	0.62
Iron	µg/L	-	-	-	-	-	3.0	3.2	4.2	4.5

Table 6D-4: Water Quality Results at Meliadine Lake in Reference Area 2, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations			
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-04-01	MEL-04-02	MEL-04-03	MEL-04-05
		Acute	Chronic				02-Sep-18	02-Sep-18	02-Sep-18	02-Sep-18
Dissolved Metals (cont'd)										
Lead	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	0.72	0.69	0.66	0.76
Manganese	µg/L	-	-	-	-	-	0.51	0.49	0.54	0.47
Mercury	µg/L	-	-	-	-	-	0.0011	0.0010	<0.0005	<0.0005
Molybdenum	µg/L	-	-	-	-	-	0.082	0.078	0.078	0.085
Nickel	µg/L	-	-	-	-	-	0.37	0.39	0.42	0.42
Selenium	µg/L	-	-	-	-	-	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	32	32	32	32
Thallium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	0.011	0.013	0.014	0.012
Vanadium	µg/L	-	-	-	-	-	0.052	<0.05	<0.05	<0.05
Zinc	µg/L	26 to 27[f]	4.2 to 4.4[g]	-	-	-	1.0	0.93	<0.8	<0.8
Other										
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001

(a) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.97 mg-N/L) is based on the combination of field pH (8.0) and water temperature (9.6°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.9 to 8.0). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(d) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (21.2 to 22 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (21.2 to 22 mg/L as $CaCO_3$) and DOC (2.23 to 2.27 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.9 to 8.0), hardness (21.2 to 22 mg/L as $CaCO_3$) and DOC (2.23 to 2.27 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines that fell outside the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as CaCO3) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated guideline range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

Reference:

CCME. 2018. Canadian Water Quality Guideline for the Protection of Aquatic Life: Zinc (Dissolved) 2018 Fact Sheet. Canadian Council of Ministers of the Environment. Gatineau, QC.

Table 6D-5: Water Quality Results at Meliadine Lake in Reference Area 3, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations				
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-05-01	MEL-05-02	MEL-05-03	MEL-05-04	MEL-05-05
		Acute	Chronic				01-Sep-18	30-Aug-18	29-Aug-18	30-Aug-18	29-Aug-18
Field Measured											
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	8.0	8.0	-	7.9	-
Specific conductivity	µS/cm	-	-	-	-	-	75	76	76	76	76
Temperature	°C	-	-	-	15	-	9.0	8.9	8.7	8.8	8.7
Dissolved oxygen	mg/L	-	6.5	-	-	-	12	12	12	12	12
Dissolved oxygen	%	-	-	-	-	-	103	103	105	102	106
Conventional Parameters											
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.5	7.5	7.5	7.5	7.5
Specific conductivity	µS/cm	-	-	-	-	-	78	81	80	77	77
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	23	22	23	23	23
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	21	20	20	20	18
Total dissolved solids	mg/L	-	-	-	500	-	51	44	50	52	48
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	38	38	38	38	37
Total suspended solids	mg/L	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	1.0
Turbidity	NTU	-	-	-	-	-	0.18	0.21	0.23	0.19	0.19
Major Ions											
Bicarbonate	mg/L	-	-	-	-	-	25	25	25	25	22
Calcium	mg/L	-	-	-	-	-	7.3	7.1	7.2	7.2	7.1
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	640	120	-	250	-	8.5	8.5	8.6	8.3	8.5
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.028	0.028	0.028	0.027	0.028
Magnesium	mg/L	-	-	-	-	-	1.1	1.1	1.2	1.1	1.1
Potassium	mg/L	-	-	-	-	-	0.93	0.91	0.92	0.93	0.94
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.26	0.26	0.26	0.26	0.27
Sodium	mg/L	-	-	-	200	-	4.4	4.3	4.4	4.4	4.6
Sulphate	mg/L	-	-	-	500	-	3.6	3.7	3.6	3.6	3.6
Nutrients											
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
Total ammonia	mg-N/L	-	0.97 to 3.3[(a)]	-	-	-	0.029	<0.005	0.012	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.21	0.12	0.26	0.14	0.15
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.21	0.12	0.26	0.14	0.15
Total phosphorus	mg-P/L	-	-	-	-	-	0.0031	0.0043	0.0033	0.0039	0.0041
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0026	0.0023	0.0019	0.0020	0.0024
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
Total organic carbon	mg/L	-	-	-	-	-	2.2	2.3	2.6	2.3	2.3
Dissolved organic carbon	mg/L	-	-	-	-	-	2.4	2.3	2.3	2.3	2.4

Table 6D-5: Water Quality Results at Meliadine Lake in Reference Area 3, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations				
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-05-01	MEL-05-02	MEL-05-03	MEL-05-04	MEL-05-05
		Acute	Chronic				01-Sep-18	30-Aug-18	29-Aug-18	30-Aug-18	29-Aug-18
Total Metals											
Aluminum	µg/L	-	100[b, c]	-	-	-	2.5	10	2.3	1.8	2.9
Antimony	µg/L	-	-	6.0	-	-	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	25	0.26	0.24	0.24	0.25	0.25
Barium	µg/L	-	-	1,000	-	-	7.8	7.8	7.9	7.7	7.8
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	3.2	3.8	4.0	3.9	3.9
Cadmium	µg/L	0.46 to 0.47[d]	0.046 to 0.046[d]	5.0	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1.0	50[e]	-	-	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	0.018	0.010	0.015	0.010	0.014
Copper	µg/L	-	2.0[d]	-	1,000	-	0.86	0.69	0.70	0.71	0.66
Iron	µg/L	-	300	-	300	1,060	14	8.1	7.8	8.0	9.8
Lead	µg/L	-	1.0[d]	10	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	0.55	0.58	0.63	0.61	0.59
Manganese	µg/L	-	-	-	50	-	2.8	2.8	2.8	2.8	2.9
Mercury	µg/L	-	0.026	1.0	-	-	0.00050	0.00050	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	73	-	-	-	0.088	0.083	0.081	0.078	0.086
Nickel	µg/L	-	25[d]	-	-	-	0.59	0.37	0.35	0.39	0.37
Selenium	µg/L	-	1.0	50	-	-	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	28	33	34	33	34
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	33	15	20	-	-	<0.01	0.013	0.013	0.011	0.012
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	-	-	-	5,000	-	1.4	<0.8	<0.8	<0.8	<0.8
Dissolved Metals											
Aluminum	µg/L	-	-	-	-	-	1.5	1.4	1.5	0.94	1.2
Antimony	µg/L	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	0.23	0.22	0.24	0.22	0.25
Barium	µg/L	-	-	-	-	-	7.4	7.3	7.6	7.4	8.3
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	3.8	3.8	3.8	3.7	3.5
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	µg/L	-	-	-	-	-	0.65	0.65	0.65	0.71	0.71

Table 6D-5: Water Quality Results at Meliadine Lake in Reference Area 3, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations				
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	MEL-05-01	MEL-05-02	MEL-05-03	MEL-05-04	MEL-05-05
		Acute	Chronic				01-Sep-18	30-Aug-18	29-Aug-18	30-Aug-18	29-Aug-18
Dissolved Metals (cont'd)											
Iron	µg/L	-	-	-	-	-	3.5	3.4	3.3	6.1	4.5
Lead	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	0.90	0.91	0.92	0.86	0.67
Manganese	µg/L	-	-	-	-	-	0.40	0.47	0.43	0.45	0.40
Mercury	µg/L	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum	µg/L	-	-	-	-	-	0.089	0.081	0.088	0.096	0.086
Nickel	µg/L	-	-	-	-	-	0.37	0.34	0.40	0.46	0.44
Selenium	µg/L	-	-	-	-	-	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	33	32	33	32	33
Thallium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	0.11	0.19	0.39
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	0.012	0.012	0.012	0.012	0.015
Vanadium	µg/L	-	-	-	-	-	<0.05	0.052	<0.05	0.050	<0.05
Zinc	µg/L	28[f]	4.3 to 6.4[g]	-	-	-	1.2	<0.8	<0.8	<0.8	<0.8
Other											
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001	<0.001

(a) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.97 mg-N/L) is based on the combination of field pH (8.0) and water temperature (9.0°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.5 to 8.0). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(d) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (22.4 to 22.8 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (22.4 to 22.8 mg/L as $CaCO_3$) and DOC (2.27 to 2.37 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines were calculated within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.5 to 8.0), hardness (22.4 to 22.8 mg/L as $CaCO_3$) and DOC (2.27 to 2.37 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines that fell outside the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as CaCO3) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated guideline range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

Reference:

CCME. 2018. Canadian Water Quality Guideline for the Protection of Aquatic Life: Zinc (Dissolved) 2018 Fact Sheet. Canadian Council of Ministers of the Environment. Gatineau, QC.

APPENDIX 6E

Statistical Outliers

Table 6E-1: Outliers Identified in the Water Quality Datasets during Spatial Statistical Analysis

Parameter	Unit	Year	Month	Area	Station	Outlier	SR Value	P-value with Outlier included
2018 Spatial Analysis Under-ice								
Sodium	mg/L	2018	March	Near-field	MEL-01-03	8.27	4.19	**<0.001**
Reactive silica (as SiO_2)	mg/L	2018	March	Near-field	MEL-01-05	0.767	3.79	**<0.001**
Total Kjeldahl nitrogen	mg/L	2018	March	Mid-field	MEL-02-05	0.227	4.94	0.168
Total lead	µg/L	2018	March	Near-field	MEL-01-05	0.107	5.46	**0.082**
Total uranium	µg/L	2018	March	Near-field	MEL-01-03	0.019	3.55	**<0.001**
2018 Spatial Analysis Open-water								
Total dissolved solids	mg/L	2018	August	Reference 1	MEL-03-02	20	-3.72	**<0.001**
Dissolved organic carbon	mg/L	2018	August	Mid-field	MEL-02-08	2.28	-3.95	**<0.001**
Turbidity	NTU	2018	September	Reference Area 2	MEL-04-02	0.84	10.01	**<0.001**
Calcium	mg/L	2018	August	Mid-field	MEL-02-05	5.03	-6.19	**<0.001**
Chloride	mg/L	2018	July	Near-field	MEL-01-06	11.3	-4.31	**<0.001**
Fluoride	mg/L	2018	July	Near-field	MEL-01-08	0.01[(a)]	-3.60	**0.004**
		2018	July	Reference Area 1	MEL-03-01	0.01[(a)]	-5.55	
Potassium	mg/L	2018	August	Mid-field	MEL-02-05	0.252	-24.24	**<0.001**
Sodium	mg/L	2018	August	Mid-field	MEL-02-05	1.84	-15.55	**<0.001**
Sulphate	mg/L	2018	July	Near-field	MEL-01-08	3.77	-3.66	**<0.001**
Total phosphorus	mg/L	2018	August	Near-field	MEL-01-07	0.0202	7.74	0.223
Total aluminum	µg/L	2018	July	Near-field	MEL-01-09	29.1	4.54	**<0.001**
Total copper	µg/L	2018	July	Near-field	MEL-01-01	1.34	7.53	**0.005**
Total mercury	µg/L	2018	August	Mid-field	MEL-02-06	0.00025[(a)]	-3.53	**<0.001**
Total uranium	µg/L	2018	September	Reference Area 3	MEL-05-01	0.005[(a)]	-5.03	**<0.001**

(a) measurement was less than the detection limit and set as one-half the detection limit for statistical analysis.

Note:

Outliers were identified during statistical testing as those having SR values greater than or equal to an absolute value of 3.5.

Bold values indicate statistical significance. Tests were considered significant at P <0.1.

Underlined values indicate that the results of the analysis were influenced by the outlier.

SR = studentized residual; mg/L = milligrams per litre; µg/L = micrograms per litre; NTU = nephelometric turbidity unit; calc = calculated; $CaCO_3$ = calcium carbonate; SiO_2 = silicon dioxide.

APPENDIX 6F

Time-series Plots

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1.0 ICE-COVERED CONDITIONS

Note: parameters with all samples below detection were not included. An open symbol on the plot represents a measurement that is below detection.

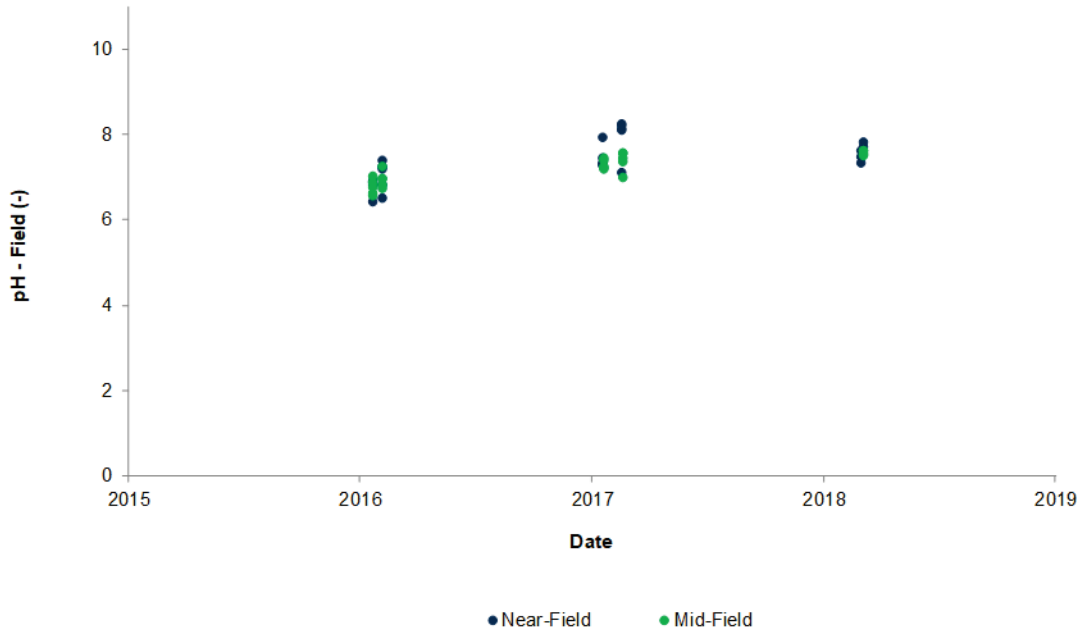


Figure 6F.1-1: Field Ph Under ice In Meliadine Lake, 2016 To 2016

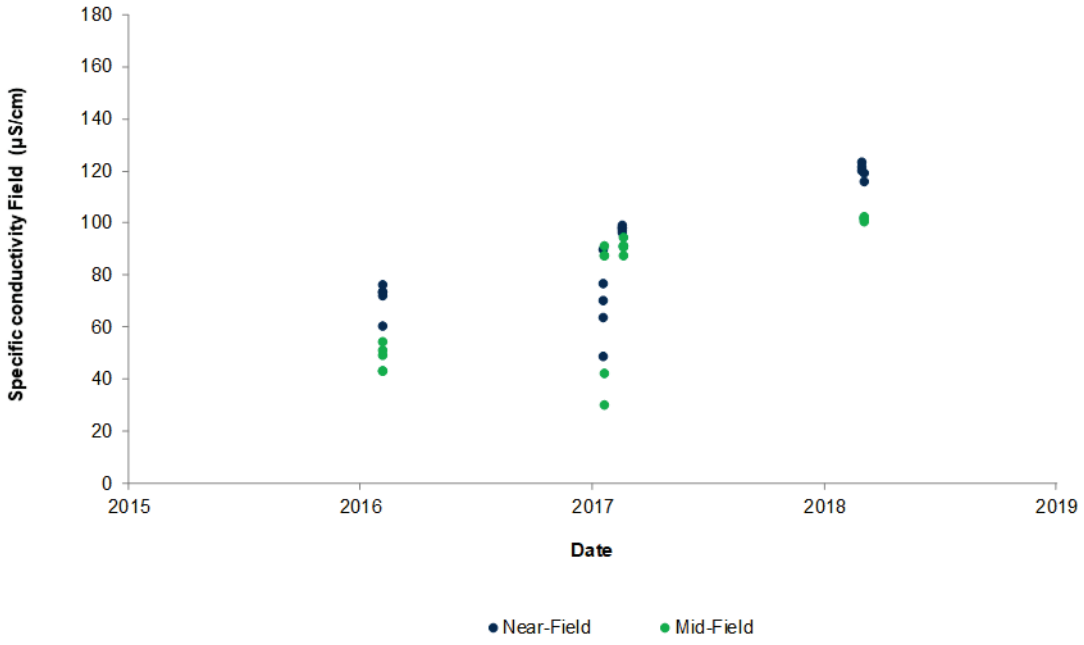


Figure 6F.1-2: Specific Conductivity Under ice In Meliadine Lake, 2016 To 2016

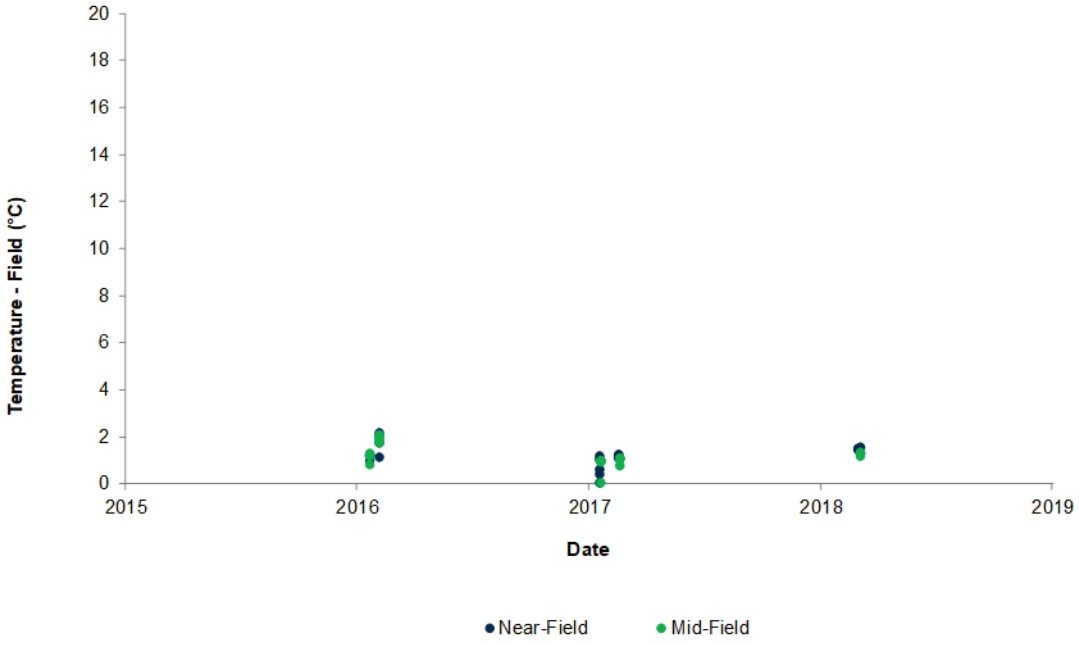


Figure 6F.1-3: Temperature Under ice In Meliadine Lake, 2016 To 2016

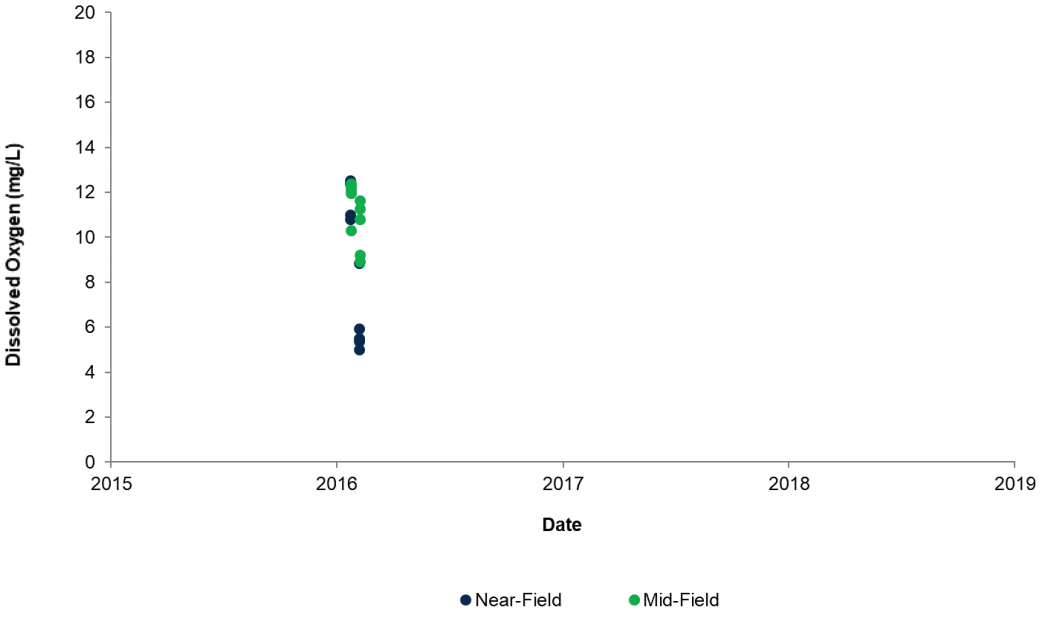


Figure 6F.1-4: Dissolved Oxygen Under ice In Meliadine Lake, 2016 To 2016

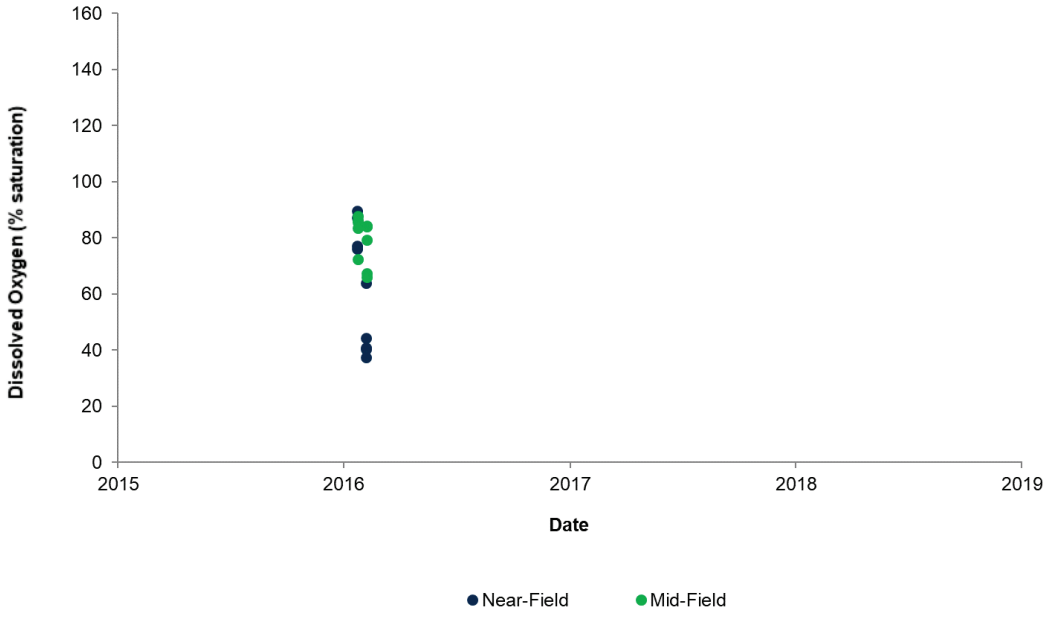


Figure 6F.1-5: Dissolved Oxygen Under ice In Meliadine Lake, 2016 To 2016

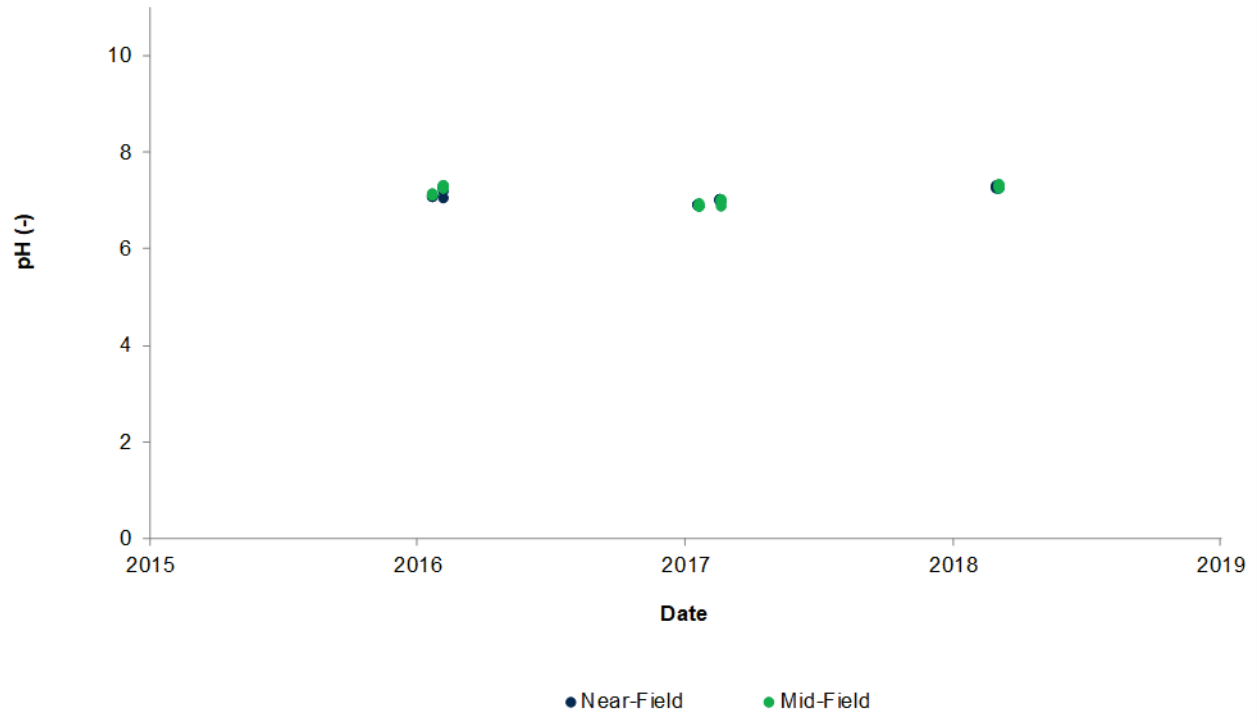


Figure 6F.1-6: Laboratory Ph Under ice In Meliadine Lake, 2016 To 2016

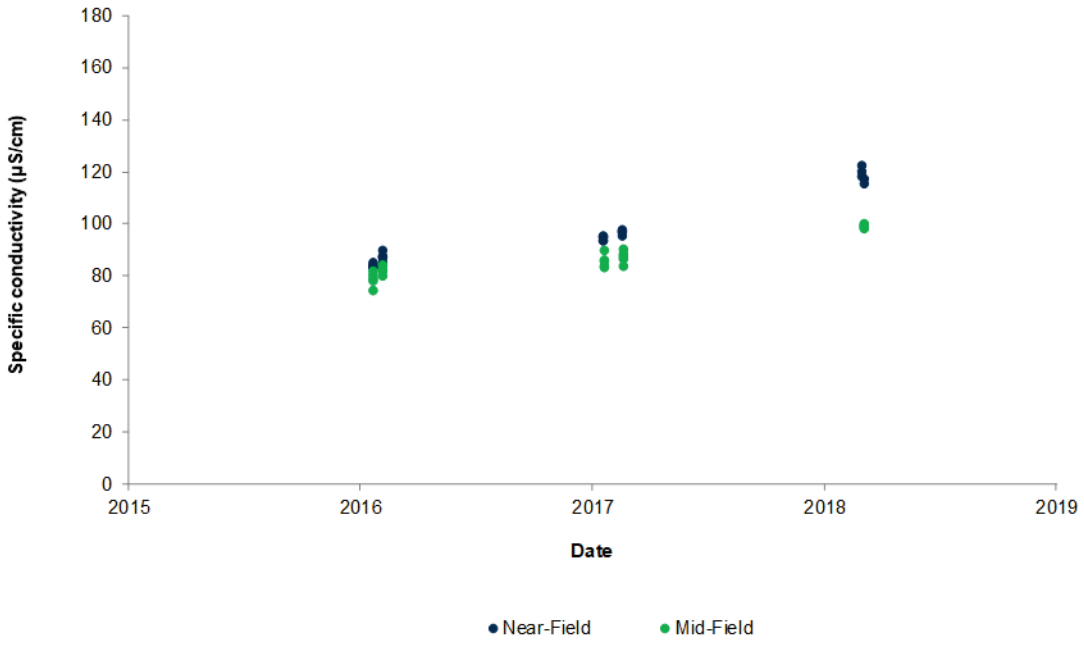


Figure 6F.1-7: Laboratory Specific Conductivity Under ice In Meliadine Lake, 2016 To 2016

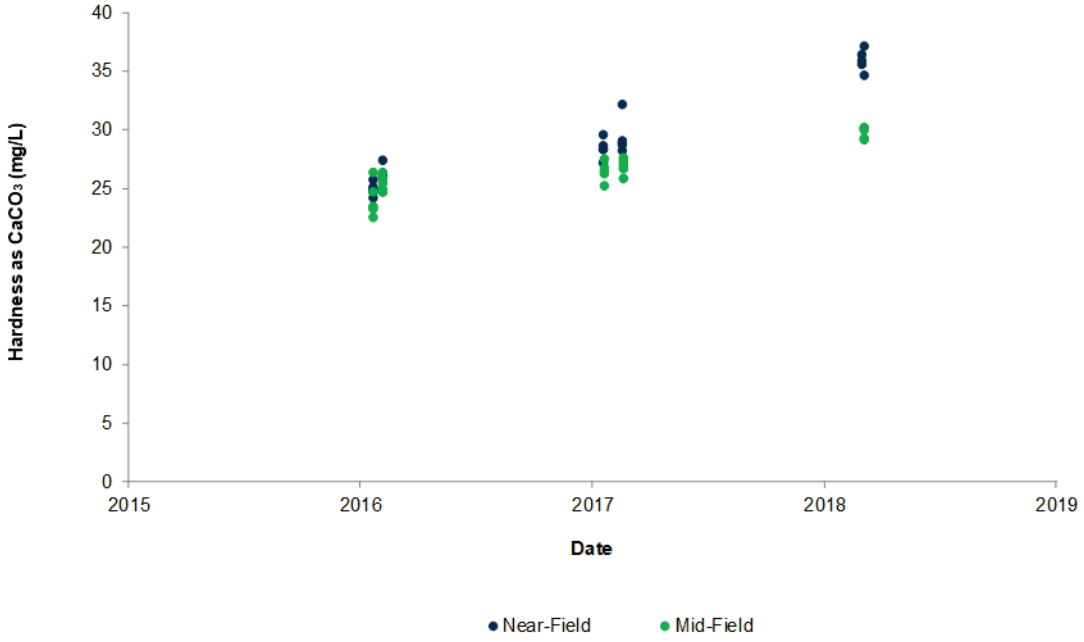


Figure 6F.1-8: Hardness Under ice In Meliadine Lake, 2016 To 2016

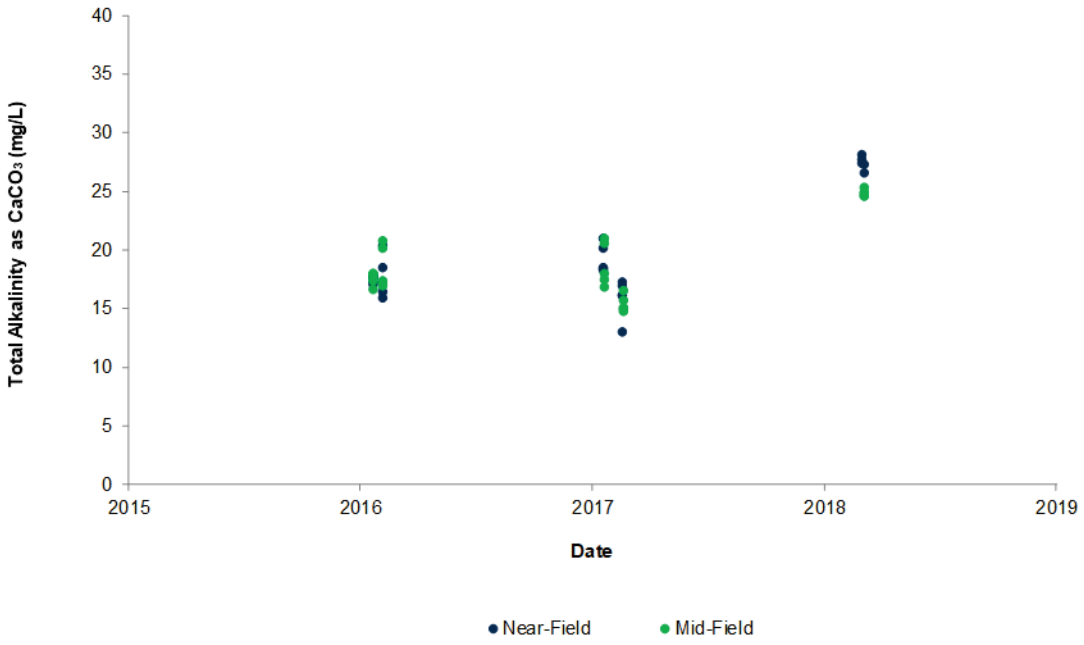


Figure 6F.1-9: Total Alkalinity Under ice In Meliadine Lake, 2016 To 2016

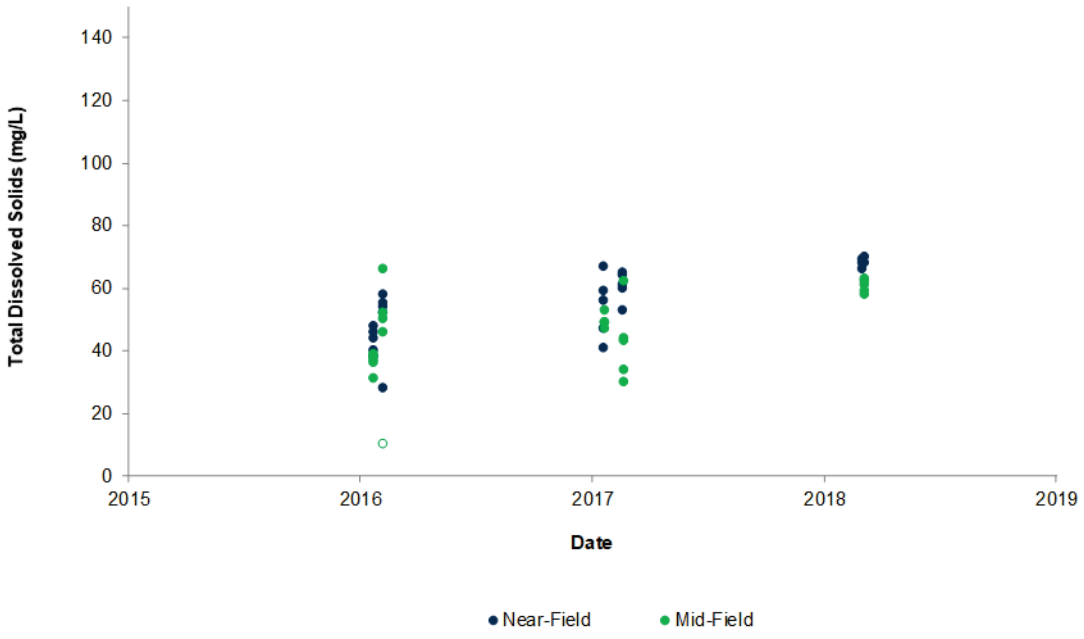


Figure 6F.1-10: Total Dissolved Solids Under ice In Meliadine Lake, 2016 To 2016

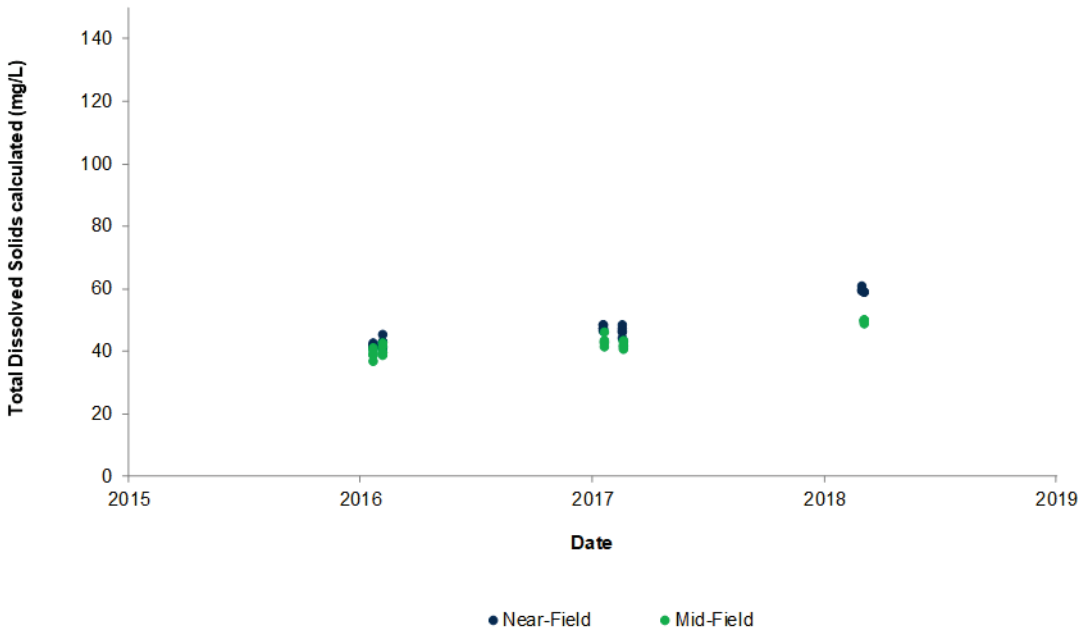


Figure 6F.1-11: Total Dissolved Solids (Calculated) Under ice In Meliadine Lake, 2016 To 2016

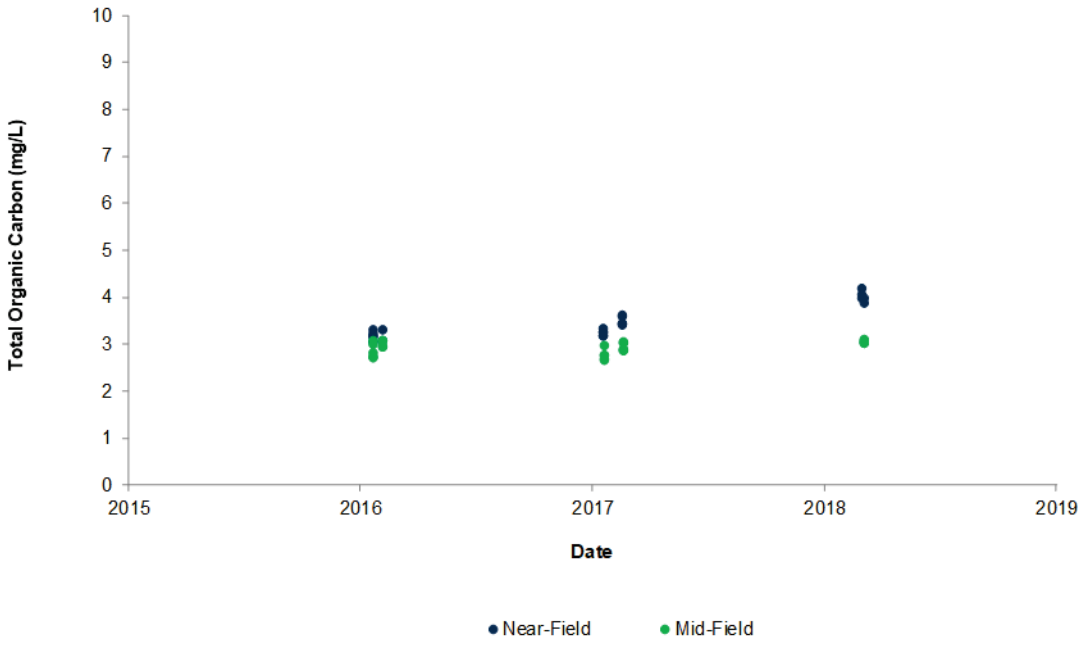


Figure 6F.1-12: Total Organic Carbon Under ice In Meliadine Lake, 2016 To 2016

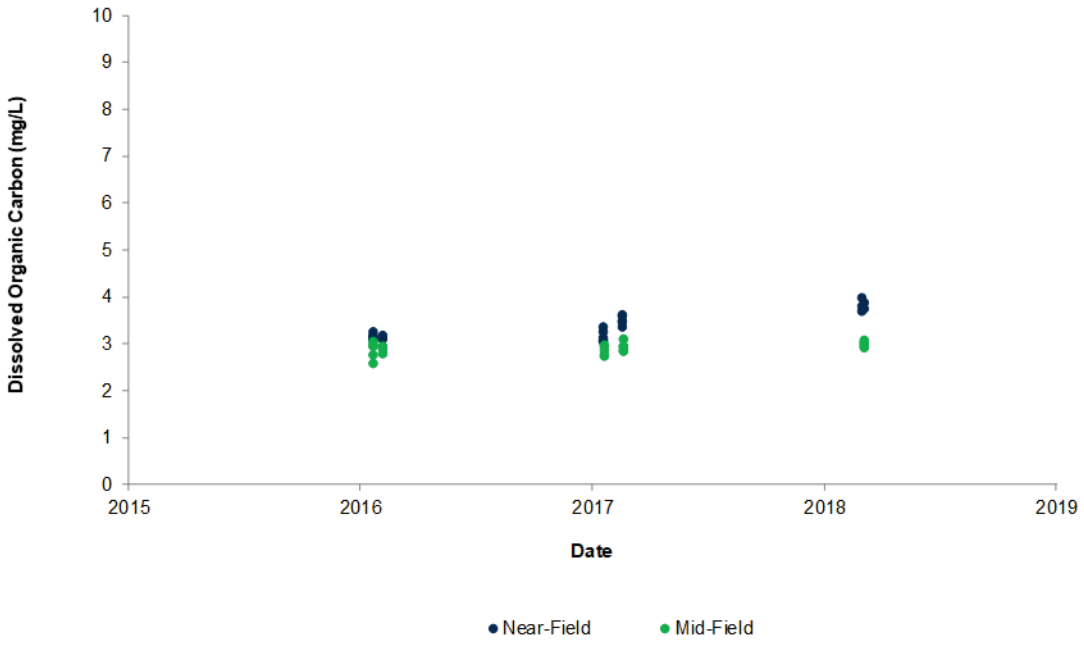


Figure 6F.1-13: Dissolved Organic Carbon Under ice In Meliadine Lake, 2016 To 2016

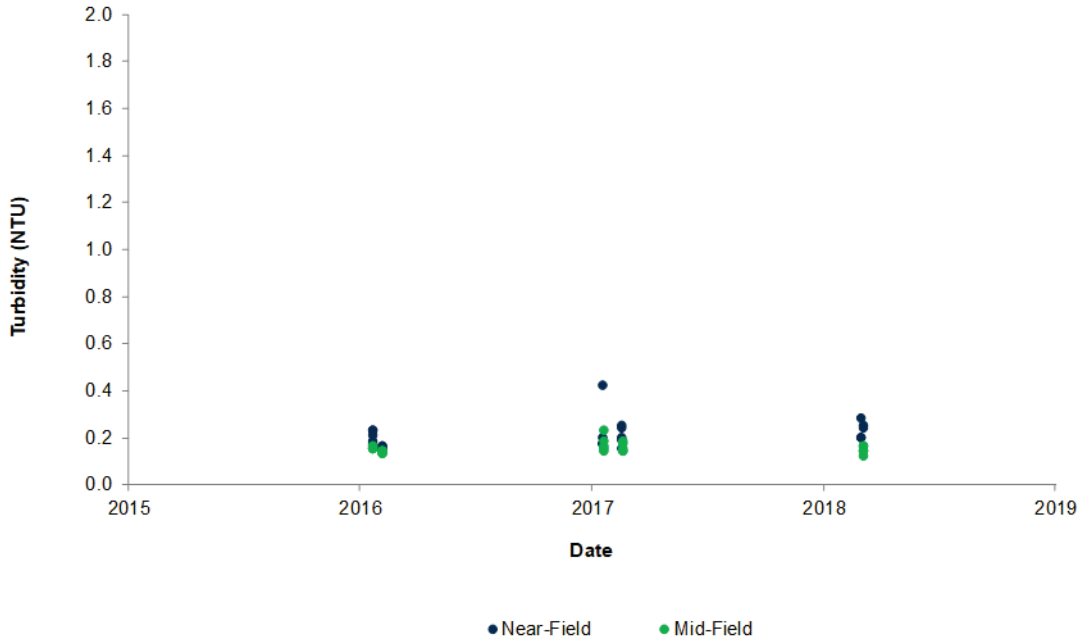


Figure 6F.1-14: Turbidity Under ice In Meliadine Lake, 2016 To 2016

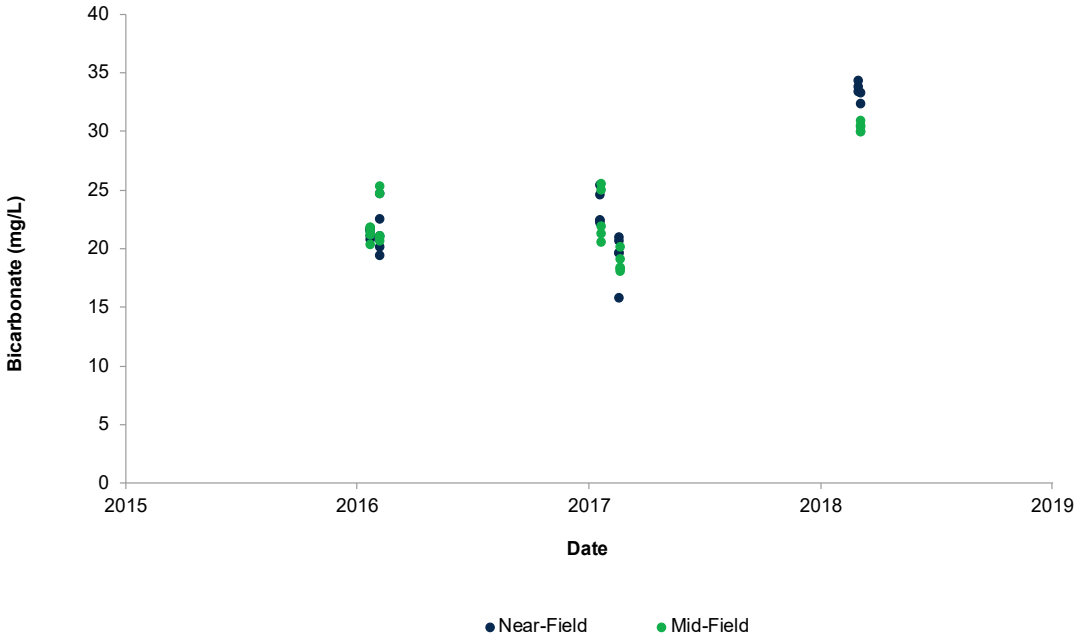


Figure 6F.1-15: Bicarbonate Under ice In Meliadine Lake, 2016 To 2016

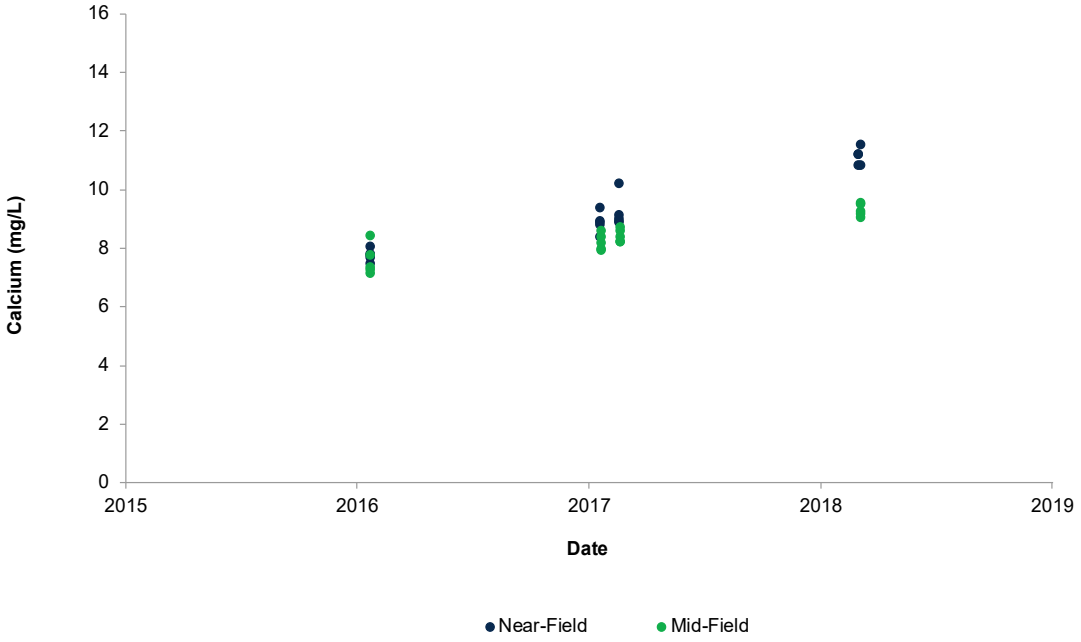


Figure 6F.1-16: Calcium Under ice In Meliadine Lake, 2016 To 2016

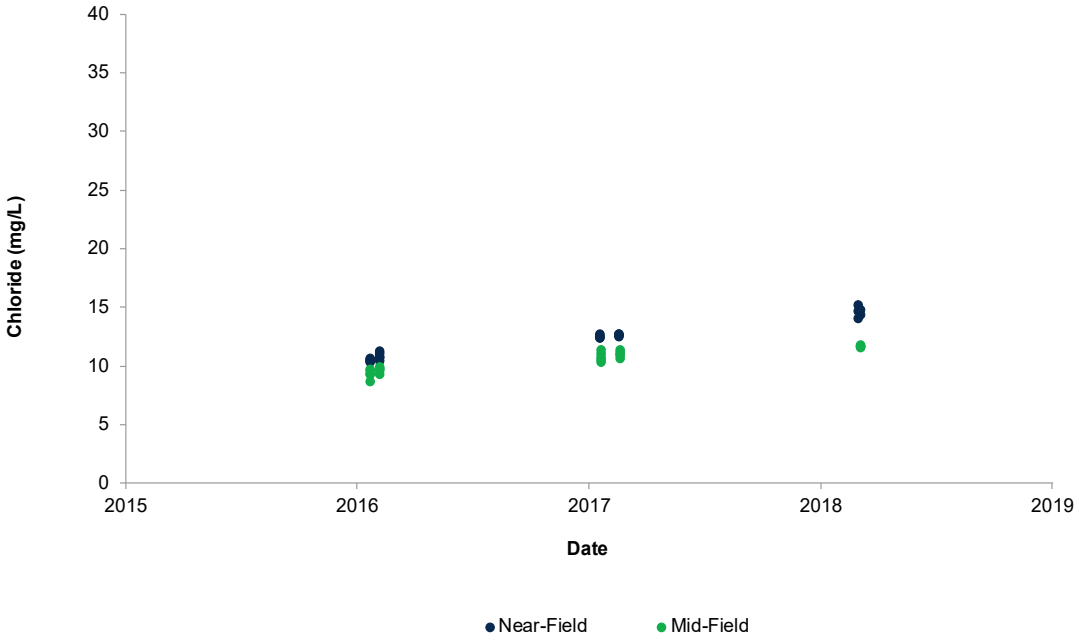


Figure 6F.1-17: Chloride Under ice In Meliadine Lake, 2016 To 2016

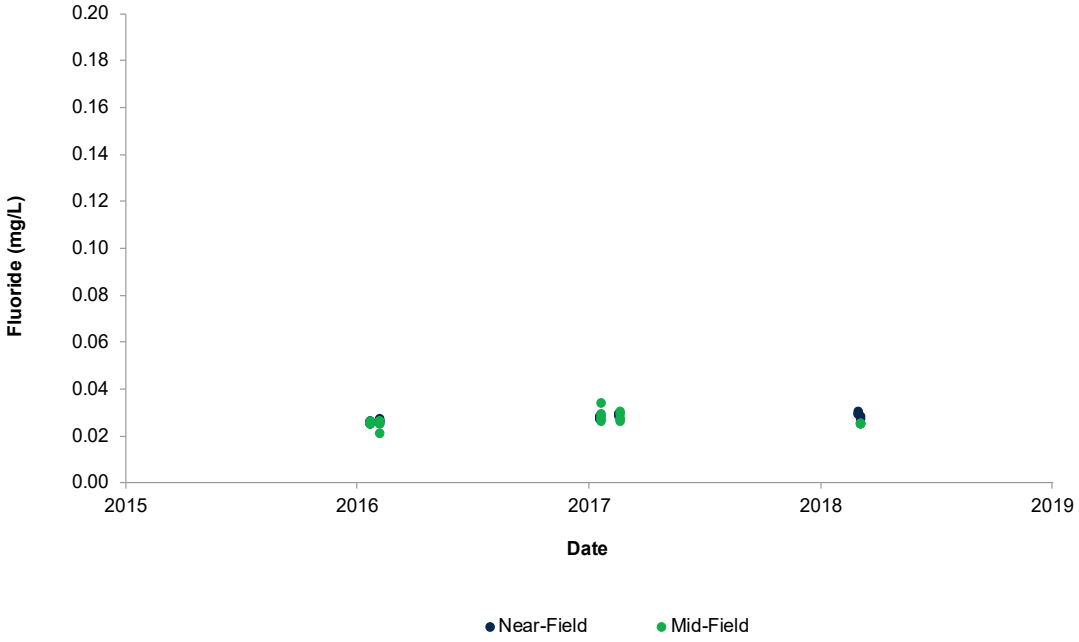


Figure 6F.1-18: Fluoride Under ice In Meliadine Lake, 2016 To 2016

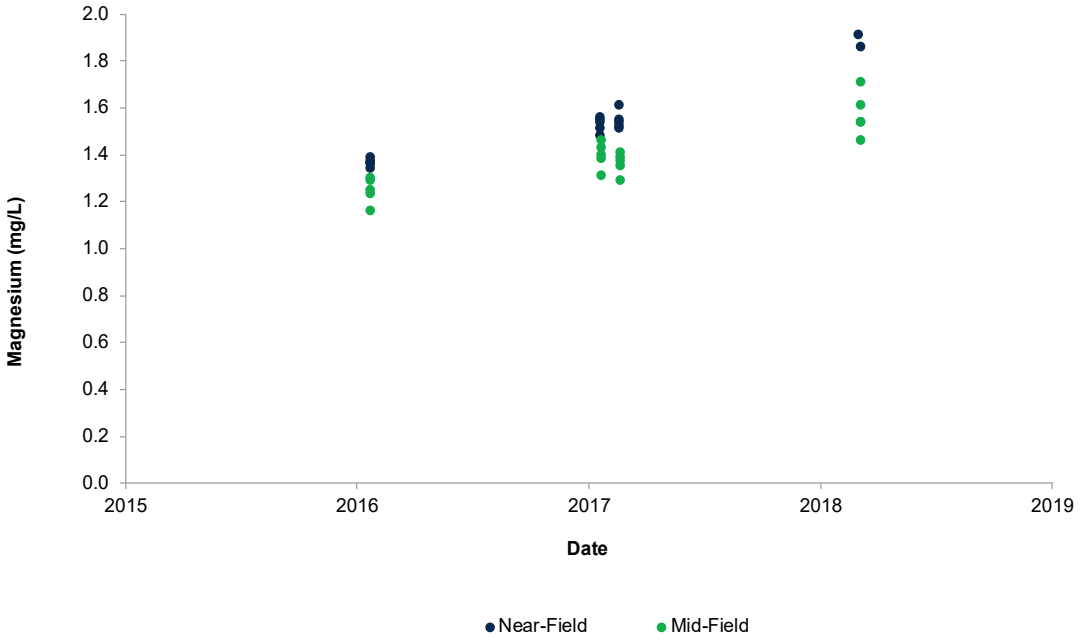


Figure 6F.1-19: Magnesium Under ice In Meliadine Lake, 2016 To 2016

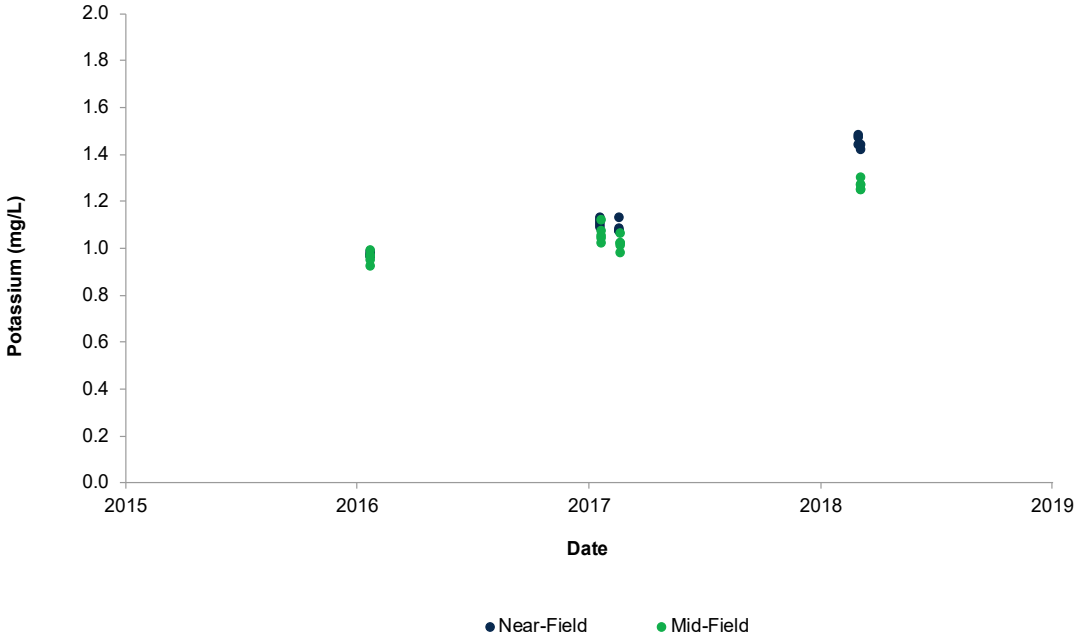


Figure 6F.1-20: Potassium Under ice In Meliadine Lake, 2016 To 2016

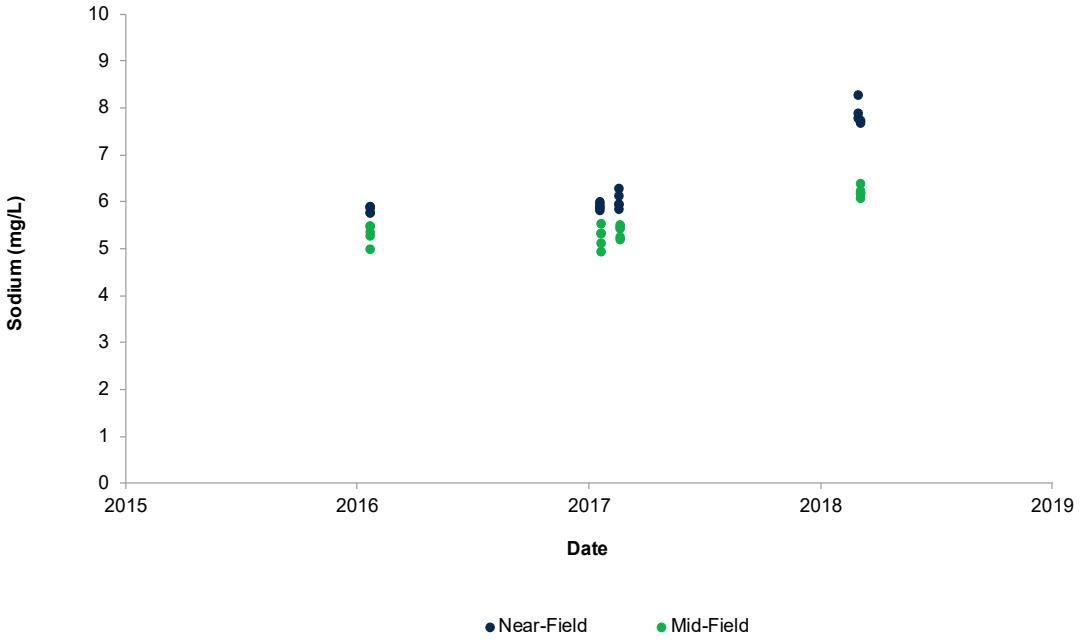


Figure 6F.1-21: Sodium Under ice In Meliadine Lake, 2016 To 2016

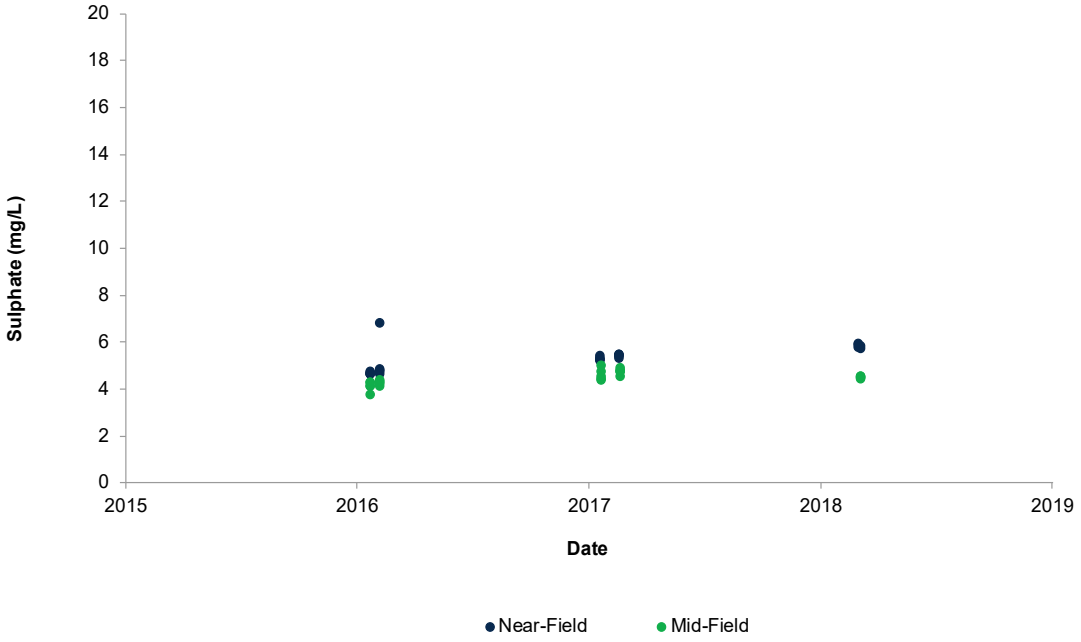


Figure 6F.1-22: Sulphate Under ice In Meliadine Lake, 2016 To 2016

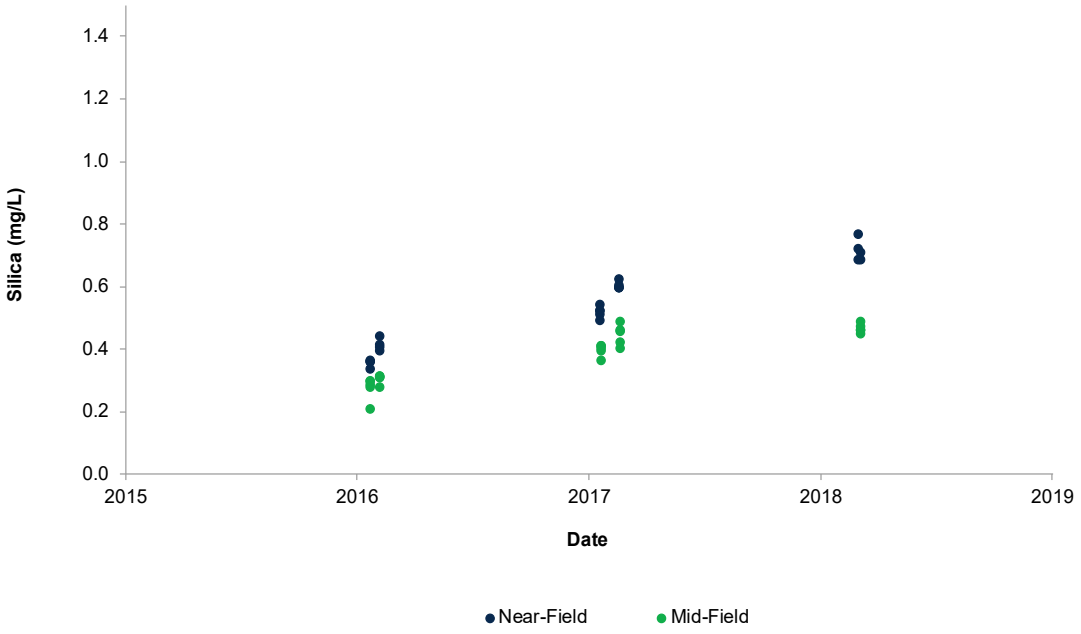


Figure 6F.1-23: Reactive Silica Under ice In Meliadine Lake, 2016 To 2016

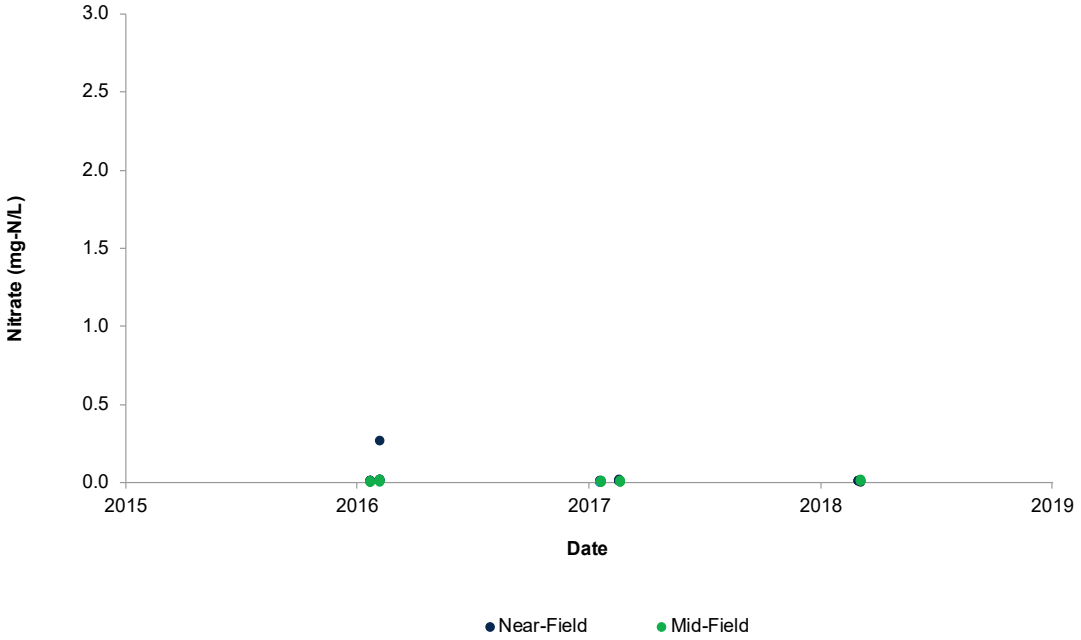


Figure 6F.1-24: Nitrate As N Under ice In Meliadine Lake, 2016 To 2016

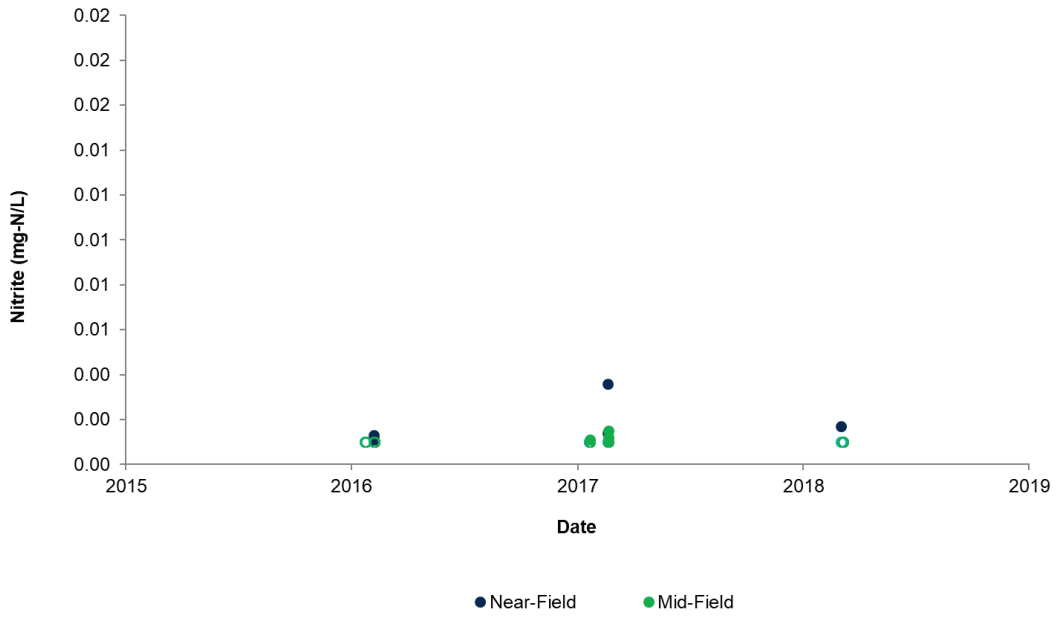


Figure 6F.1-25: Nitrite As N Under ice In Meliadine Lake, 2016 To 2016

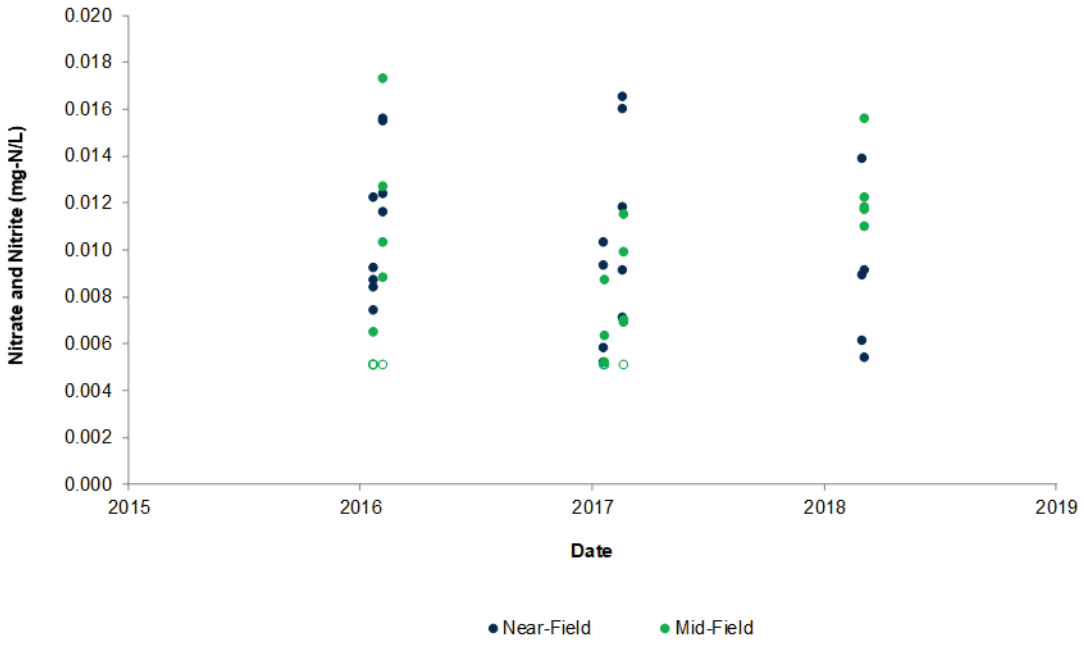


Figure 6F.1-26: Nitrate And Nitrite Under ice In Meliadine Lake, 2016 To 2016

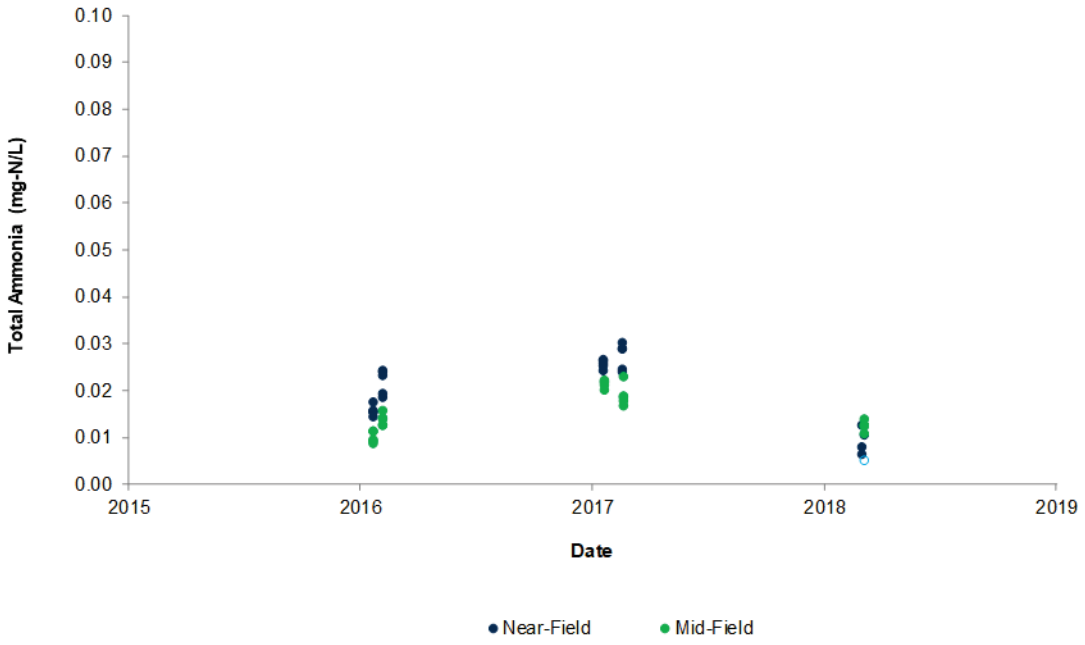


Figure 6F.1-27: Total Ammonia Under ice In Meliadine Lake, 2016 To 2016

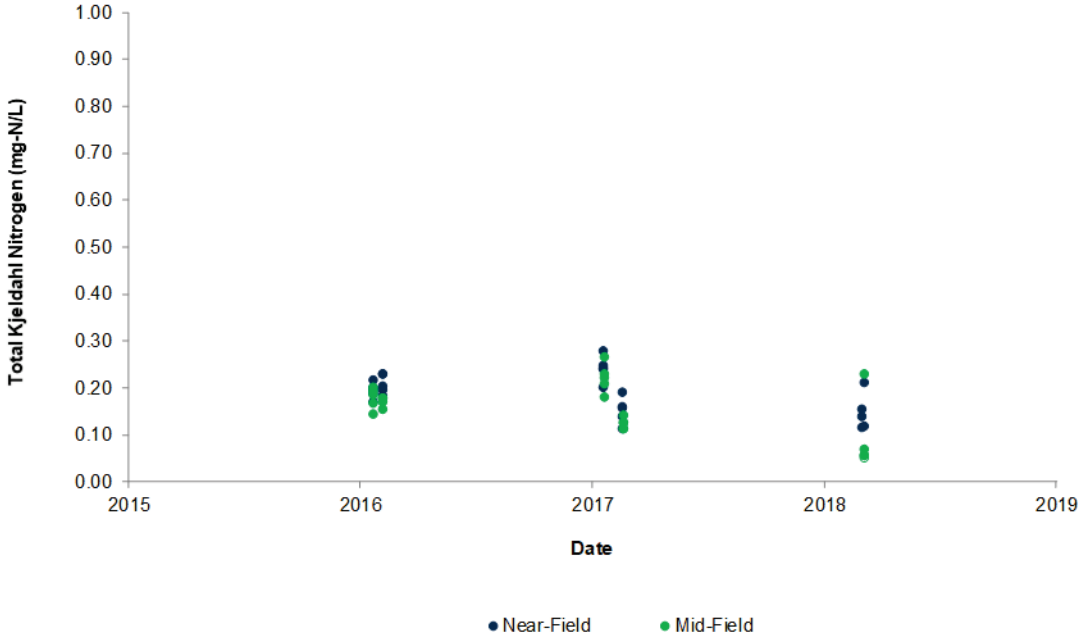


Figure 6F.1-28: Total Kjeldahl Nitrogen Under ice In Meliadine Lake, 2016 To 2016

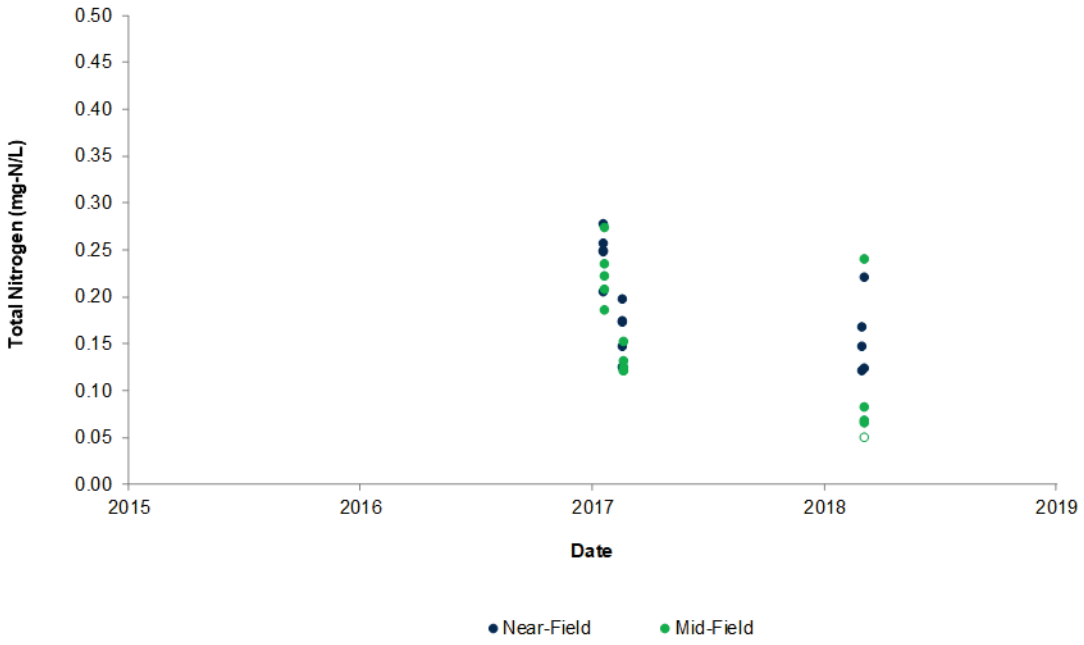


Figure 6F.1-29: Total Nitrogen Under ice In Meliadine Lake, 2016 To 2016

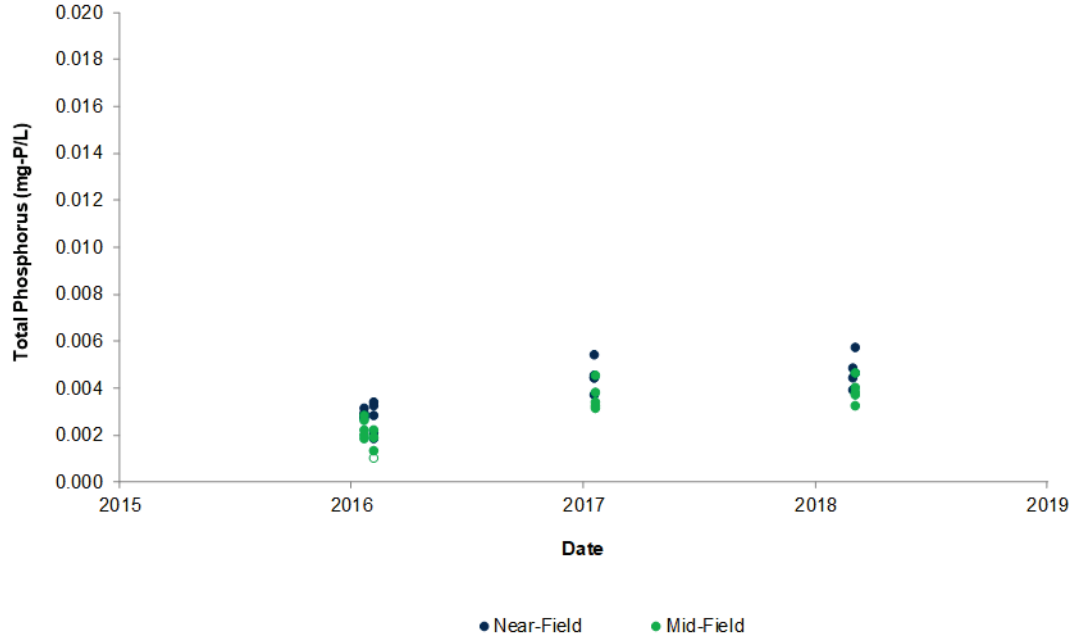


Figure 6F.1-30: Total Phosphorus Under ice In Meliadine Lake, 2016 To 2016

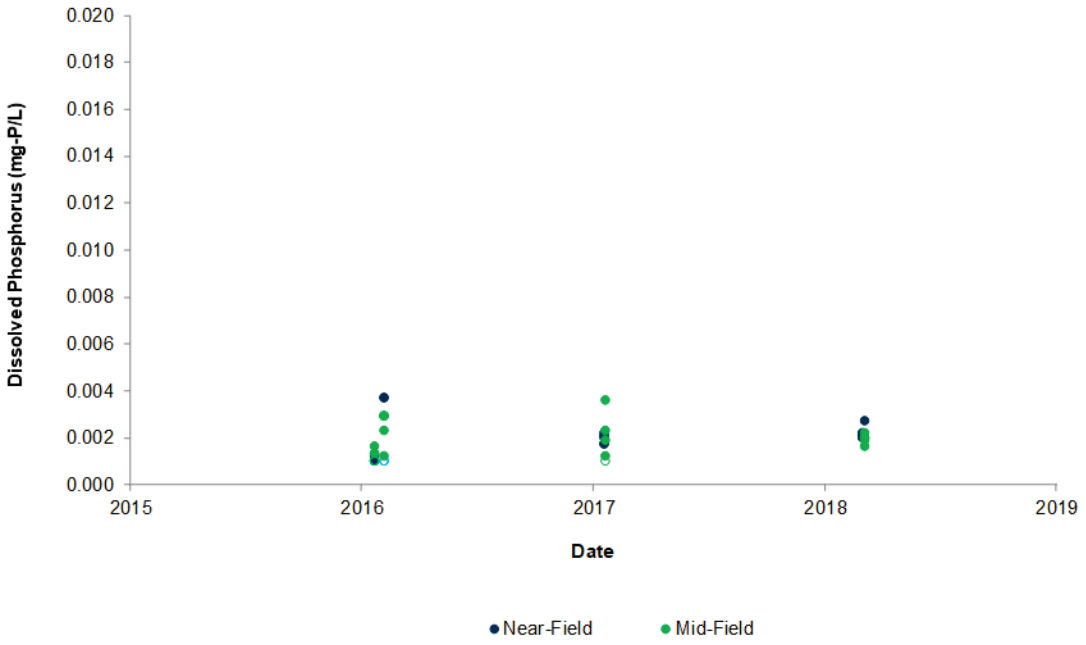


Figure 6F.1-31: Dissolved Phosphorus Under ice In Meliadine Lake, 2016 To 2016

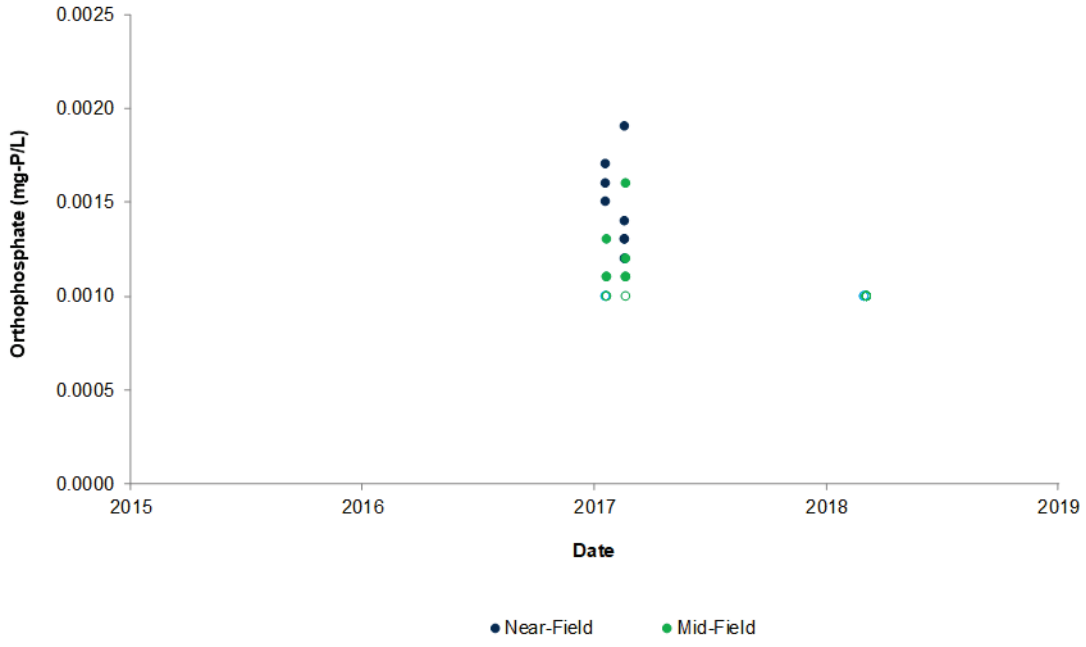


Figure 6F.1-32: Orthophosphate Under ice In Meliadine Lake, 2016 To 2016

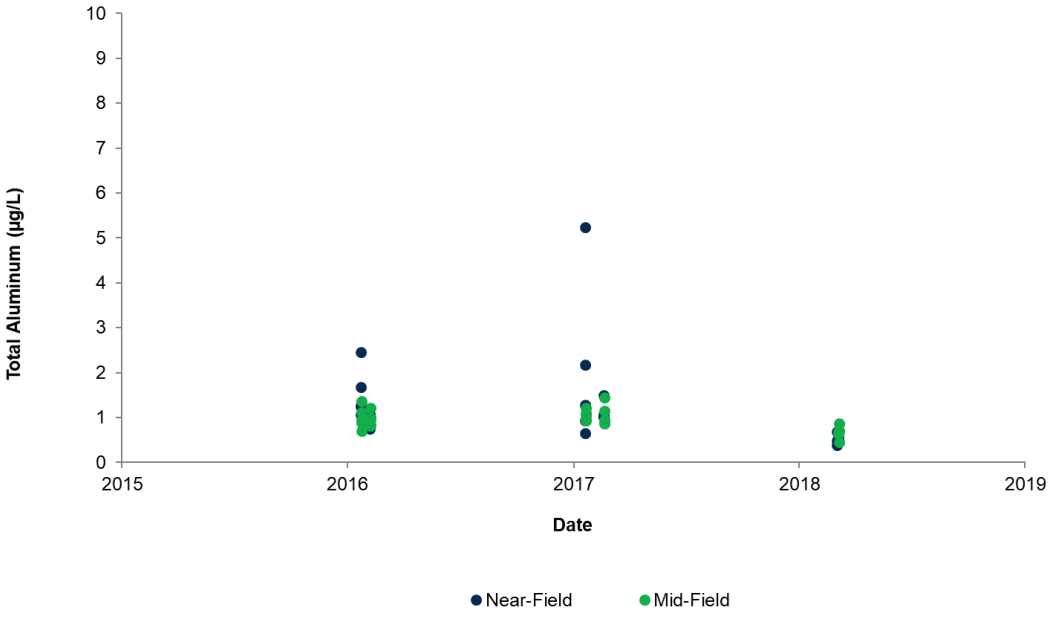


Figure 6F.1-33: Total Aluminum Under ice In Meliadine Lake, 2016 To 2016

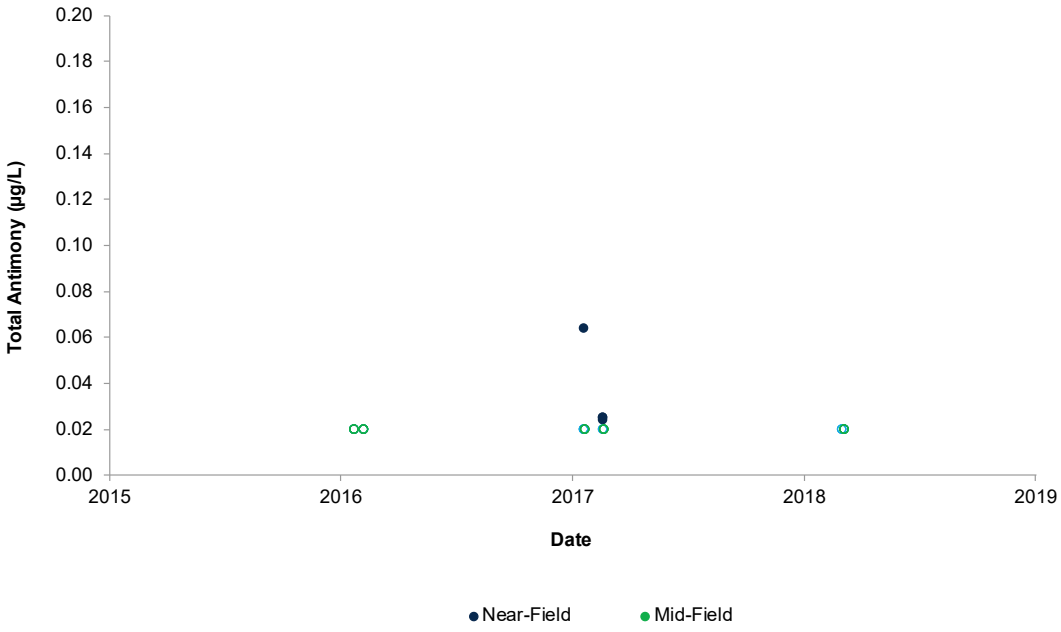


Figure 6F.1-34: Total Antimony Under ice In Meliadine Lake, 2016 To 2016

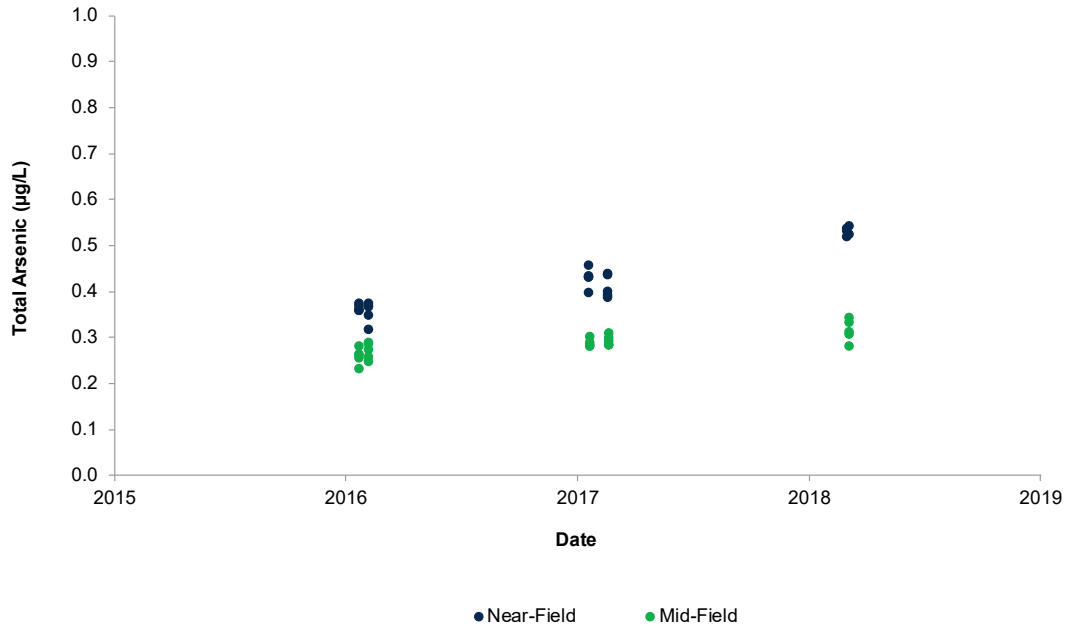


Figure 6F.1-35: Total Arsenic Under ice In Meliadine Lake, 2016 To 2016

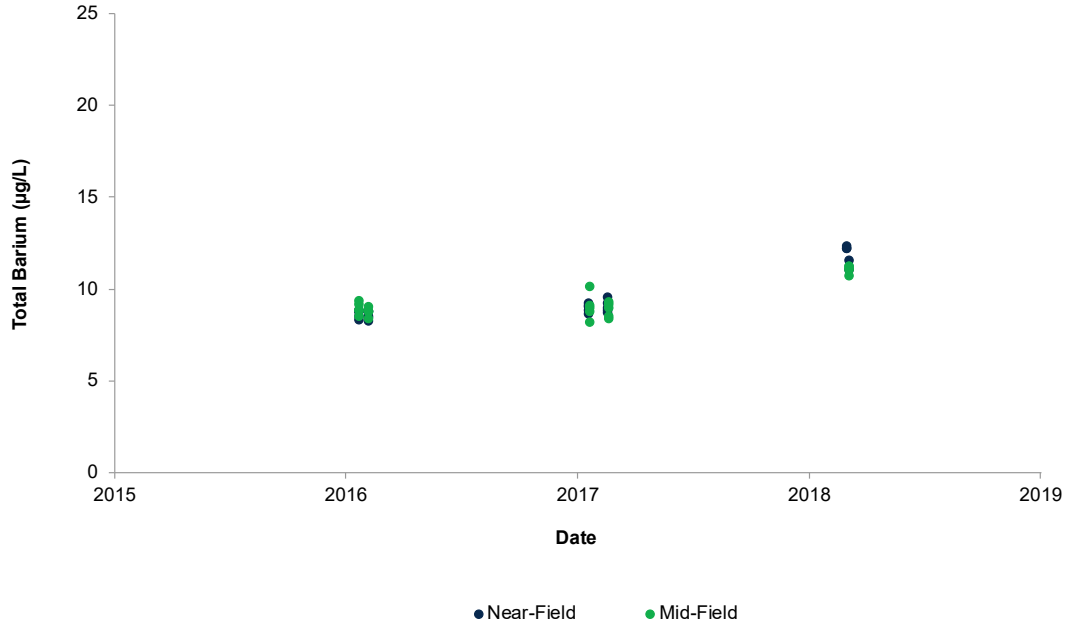


Figure 6F.1-36: Total Barium Under ice In Meliadine Lake, 2016 To 2016

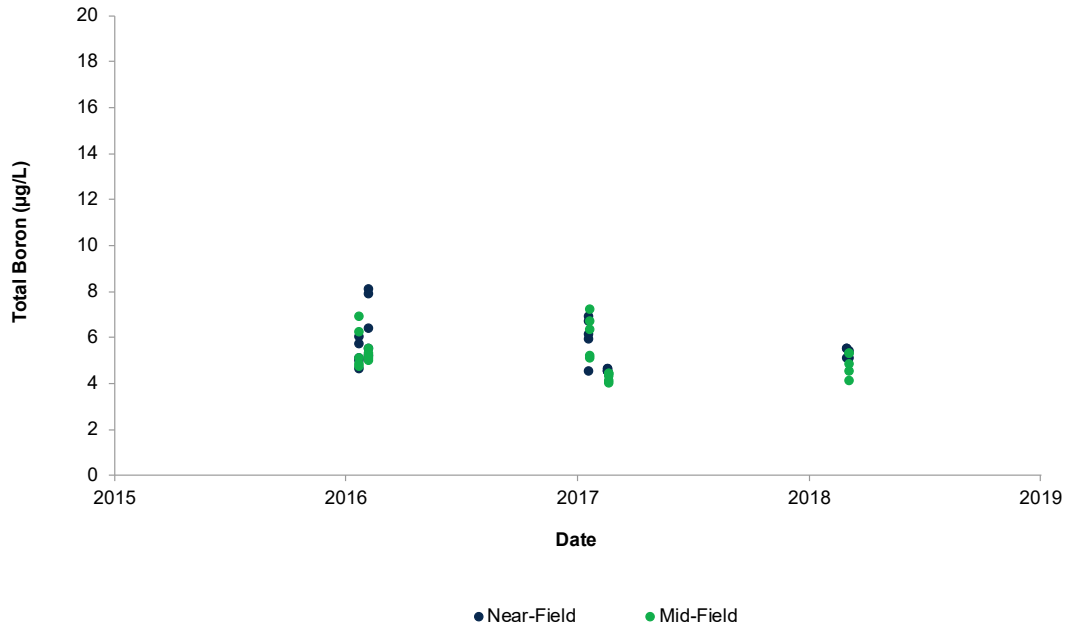


Figure 6F.1-37: Total Boron Under ice In Meliadine Lake, 2016 To 2016

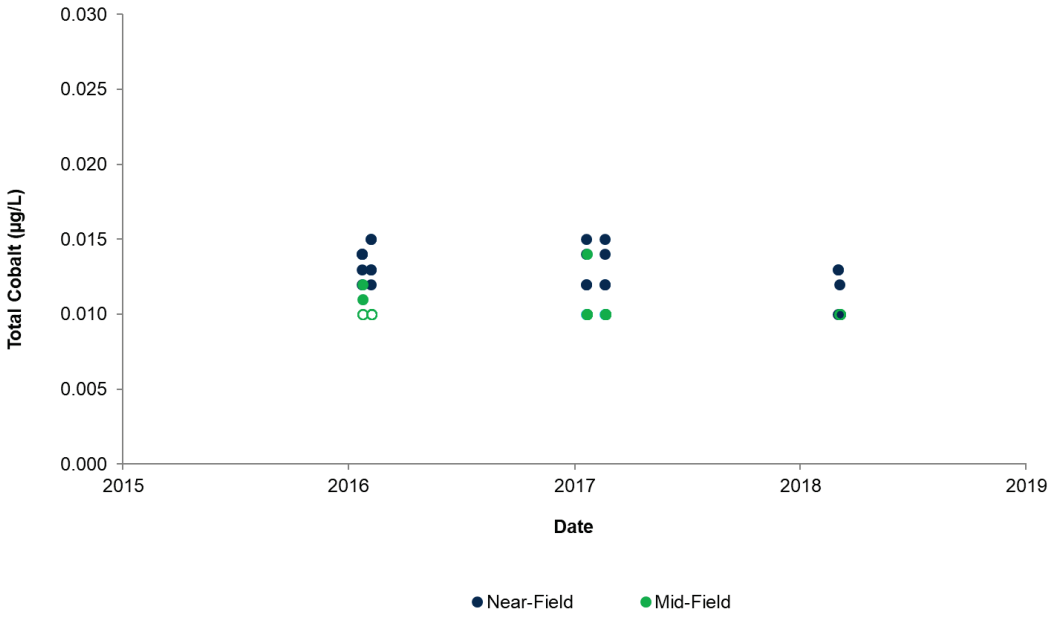


Figure 6F.1-38: Total Cobalt Under ice In Meliadine Lake, 2016 To 2016

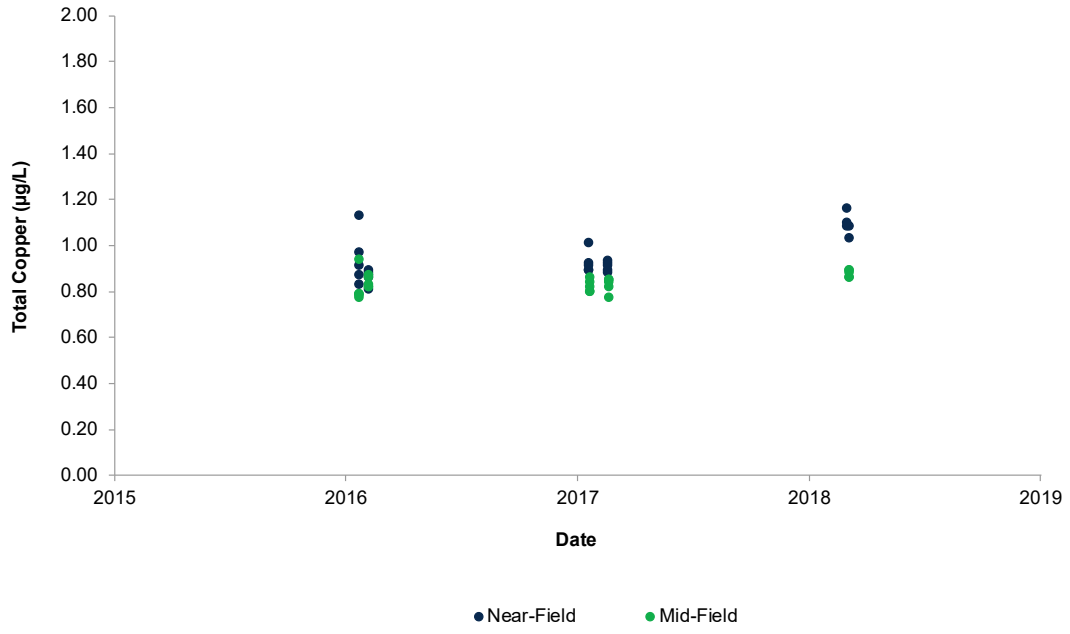


Figure 6F.1-39: Total Copper Under ice In Meliadine Lake, 2016 To 2016

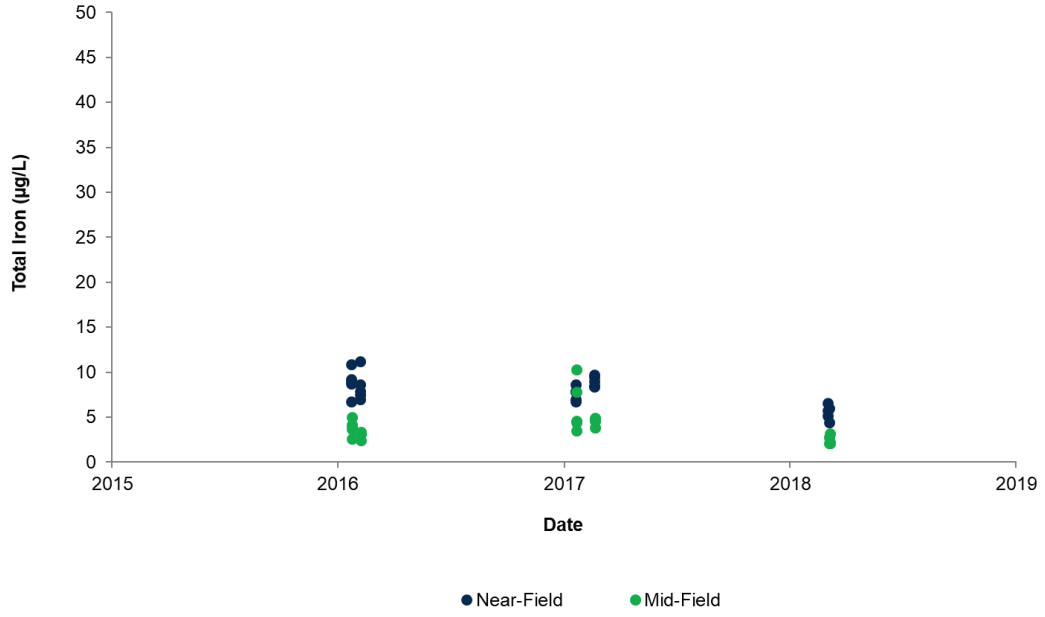


Figure 6F.1-40: Total Iron Under ice In Meliadine Lake, 2016 To 2016

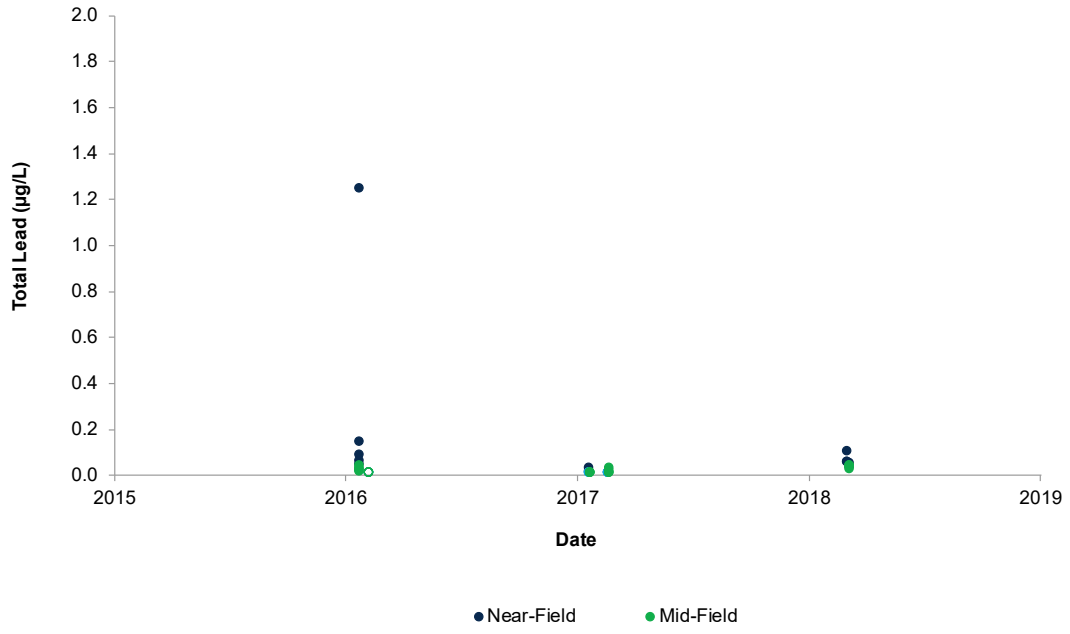


Figure 6F.1-41: Total Lead Under ice In Meliadine Lake, 2016 To 2016

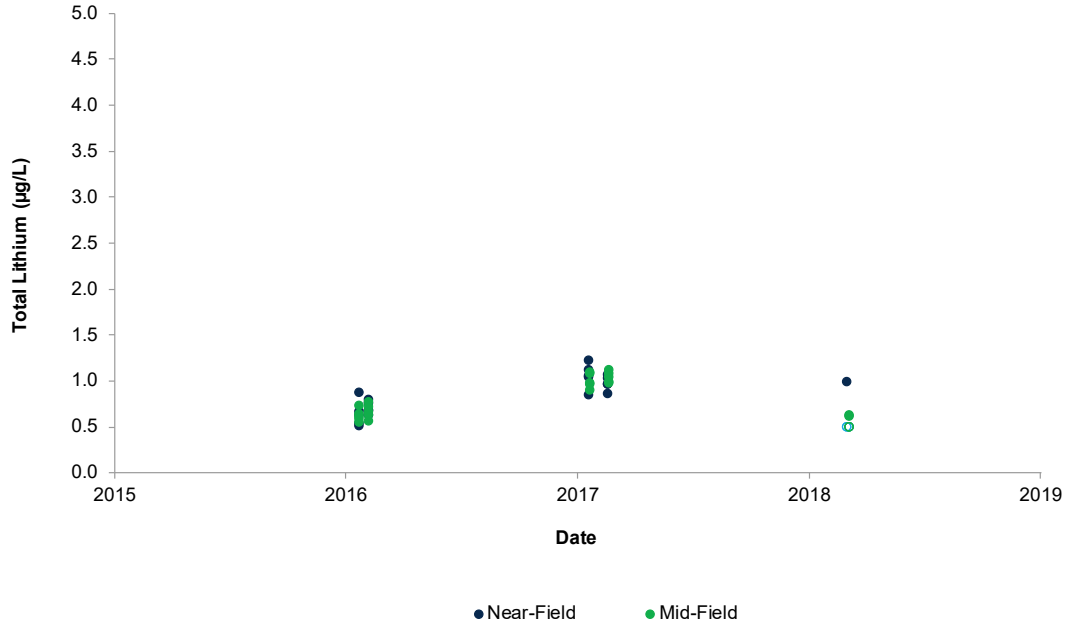


Figure 6F.1-42: Total Lithium Under ice In Meliadine Lake, 2016 To 2016

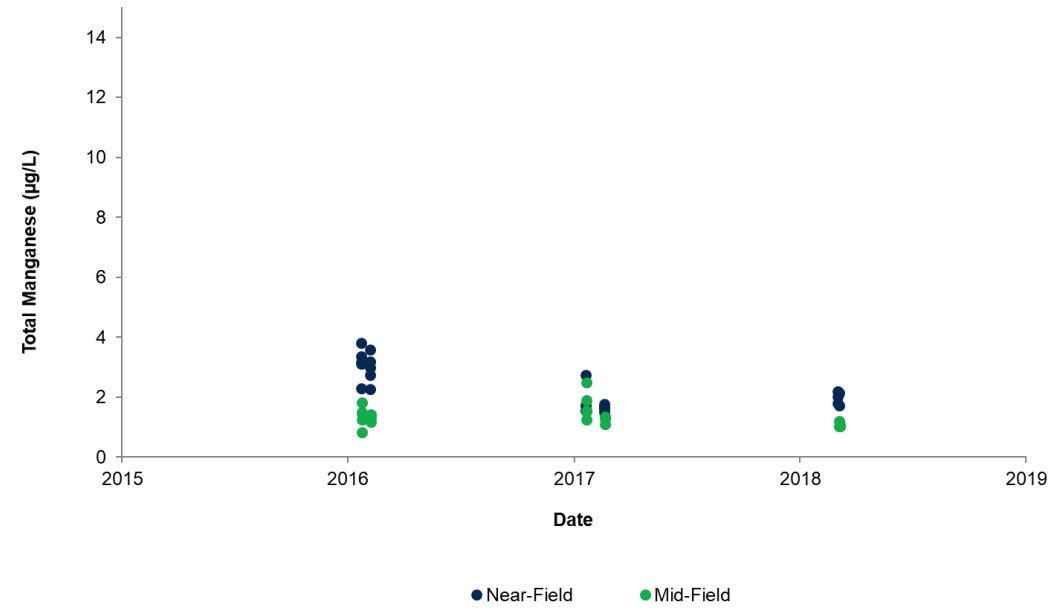


Figure 6F.1-43: Total Manganese Under ice In Meliadine Lake, 2016 To 2016

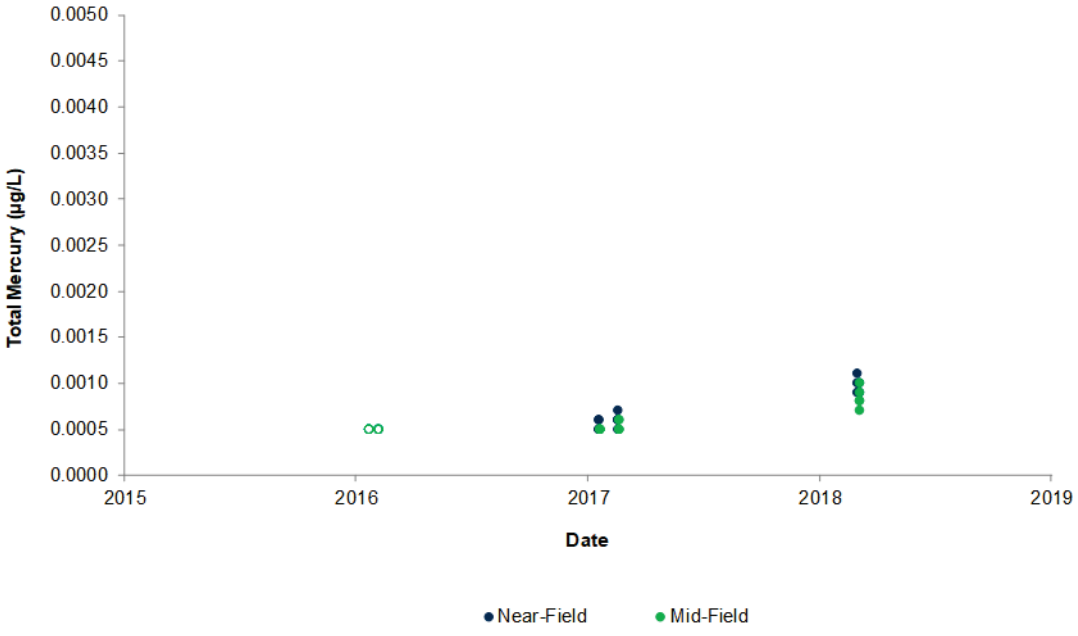


Figure 6F.1-44: Total Mercury Under ice In Meliadine Lake, 2016 To 2016

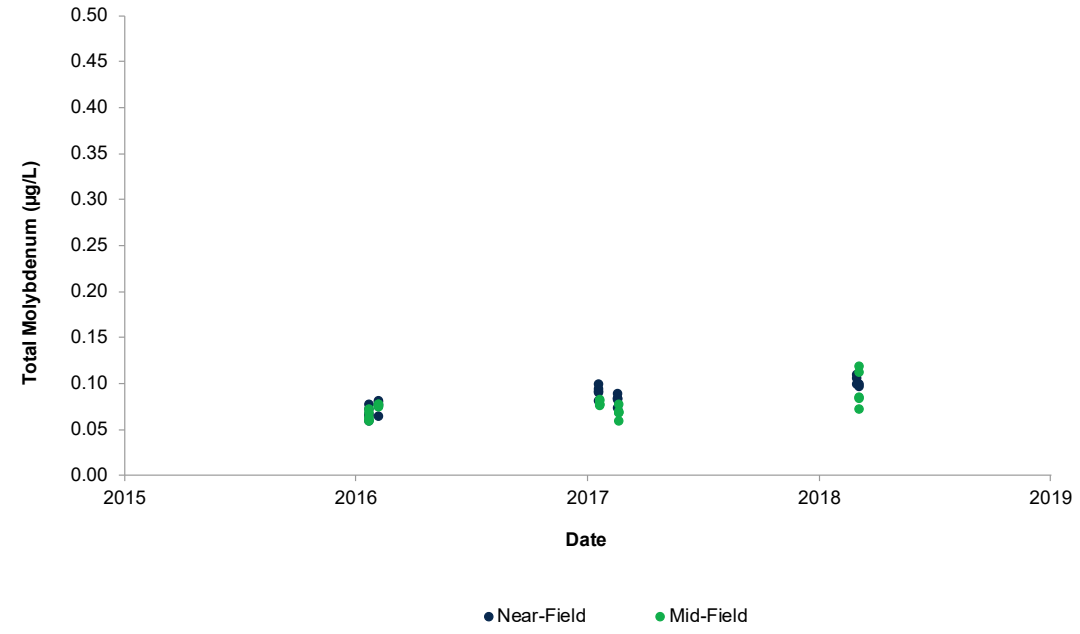


Figure 6F.1-45: Total Molybdenum Under ice In Meliadine Lake, 2016 To 2016

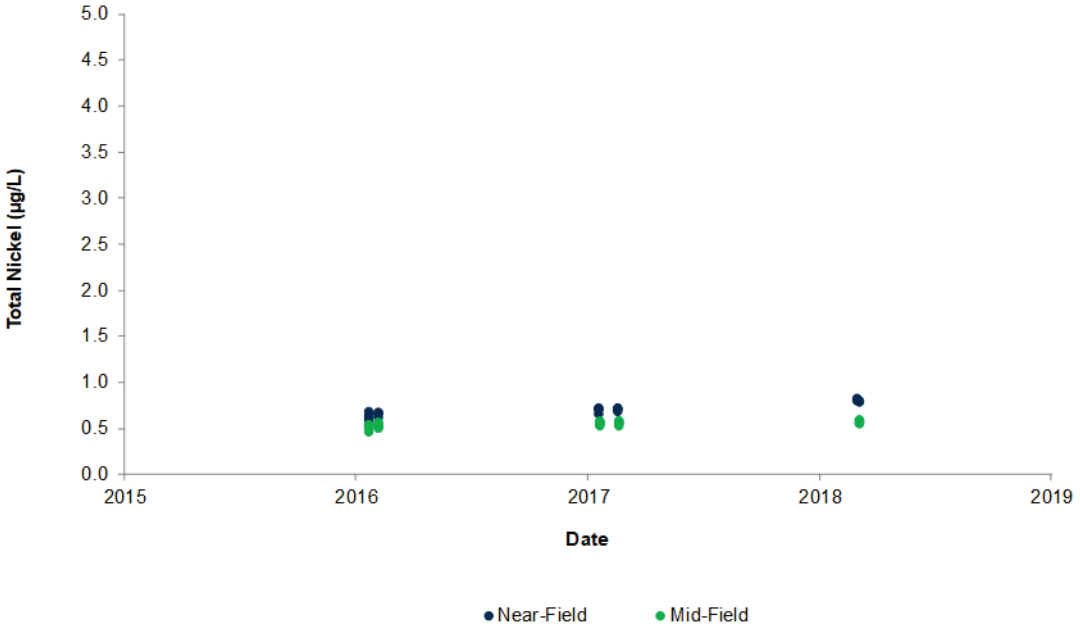


Figure 6F.1-46: Total Nickel Under ice In Meliadine Lake, 2016 To 2016

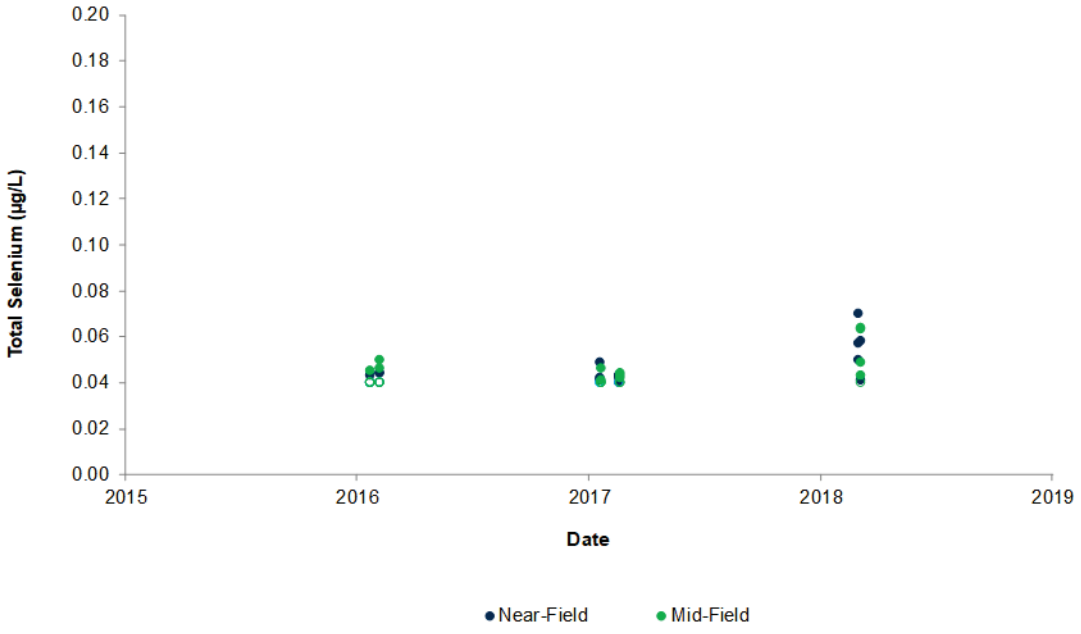


Figure 6F.1-47: Total Selenium Under ice In Meliadine Lake, 2016 To 2016

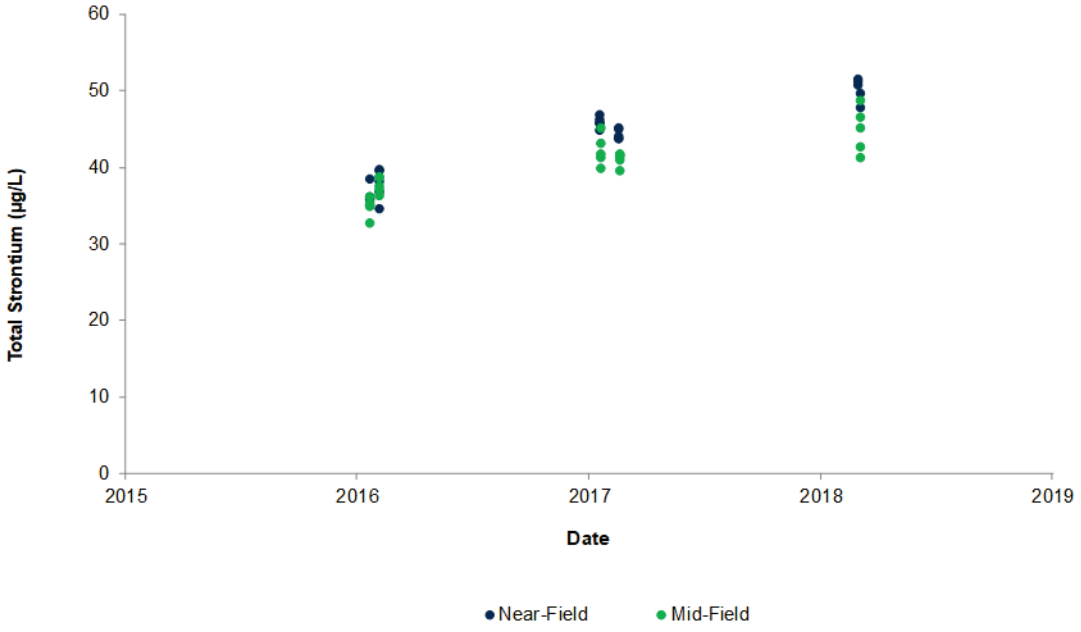


Figure 6F.1-48: Total Strontium Under ice In Meliadine Lake, 2016 To 2016

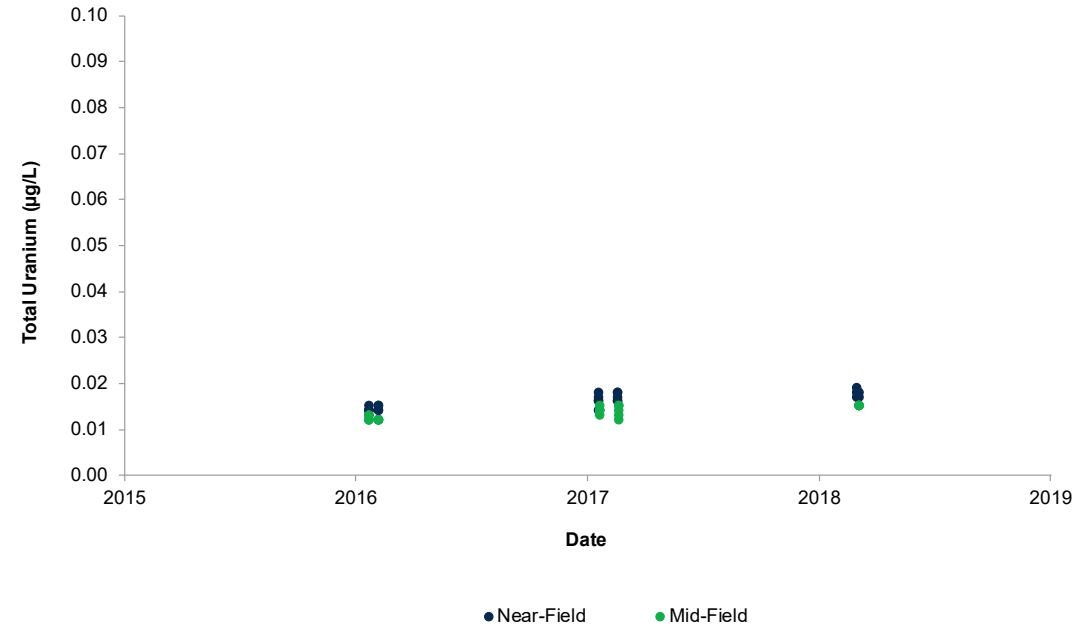


Figure 6F.1-49: Total Uranium Under ice In Meliadine Lake, 2016 To 2016

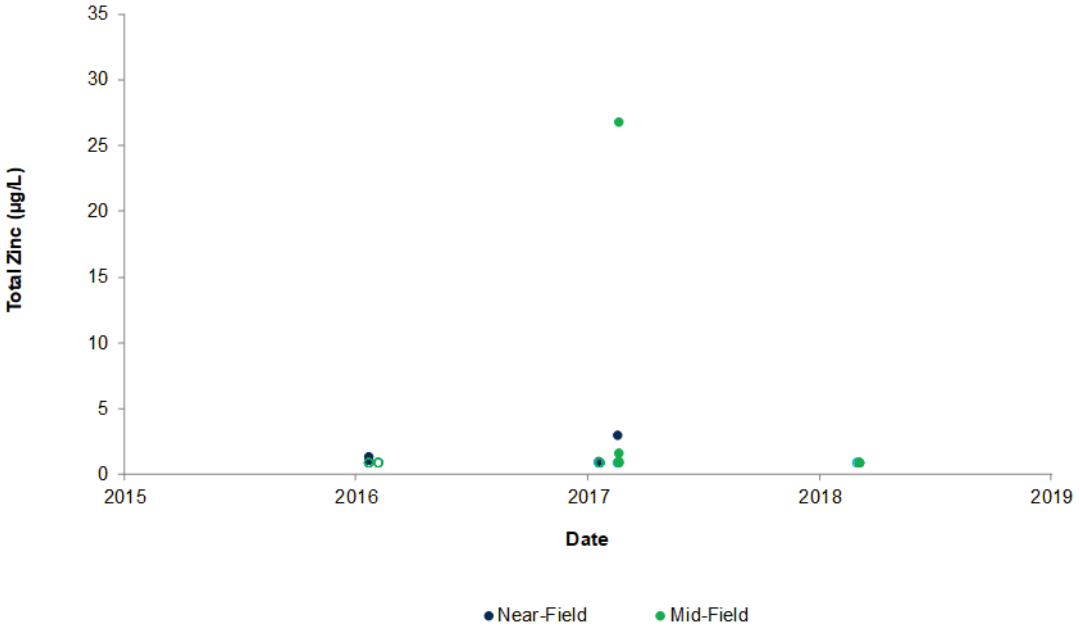


Figure 6F.1-50: Total Zinc Under ice In Meliadine Lake, 2016 To 2016

2.0 OPEN-WATER CONDITIONS

Note: parameters with all samples below detection were not included. An open symbol on the plot represents a measurement that is below detection.

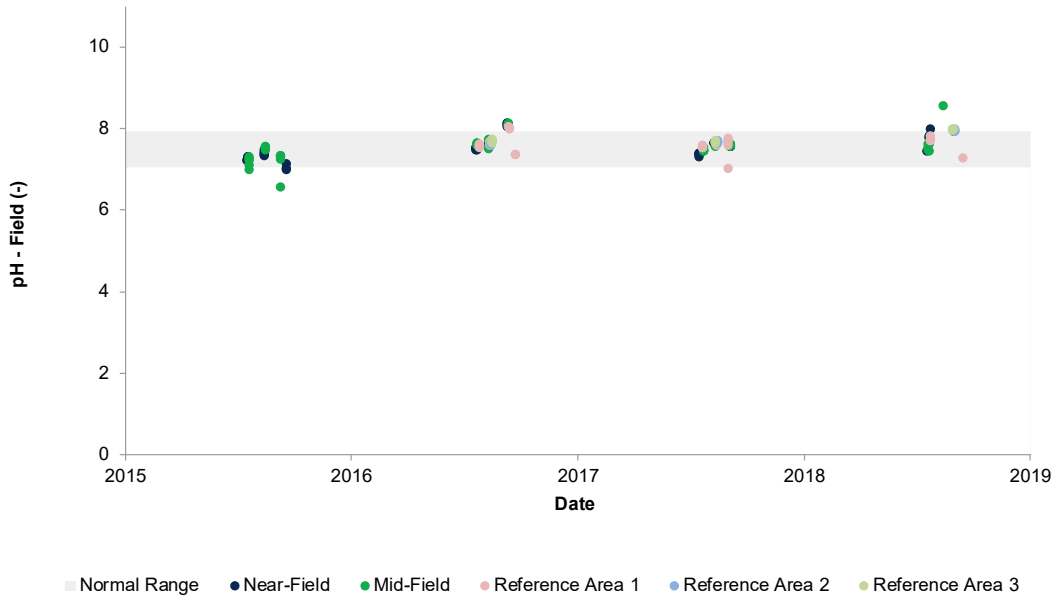


Figure 6F.2-1: Field pH During Open-water Conditions in Meliadine Lake, 2015 to 2018

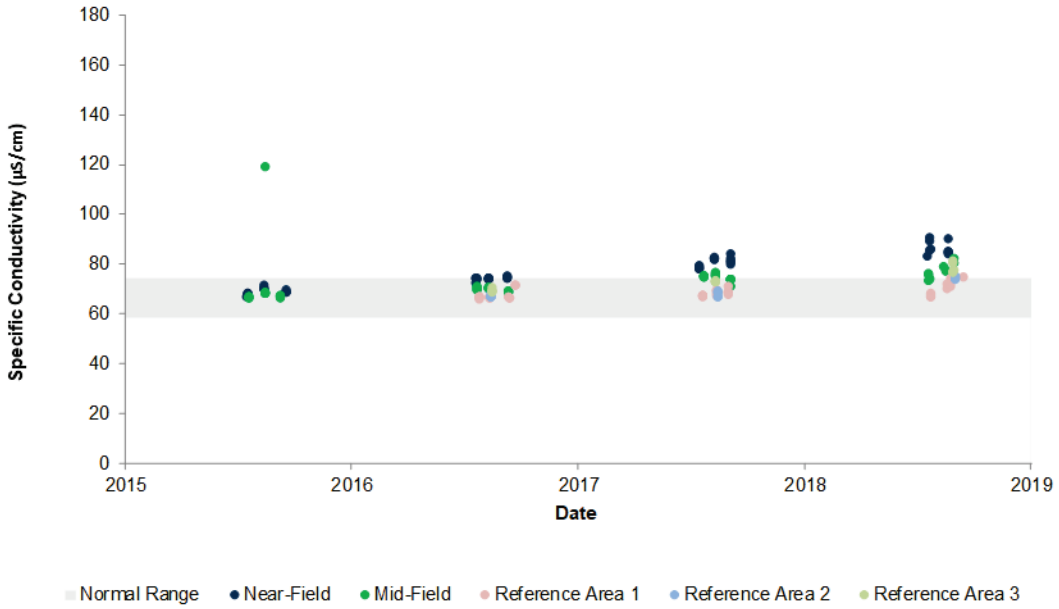
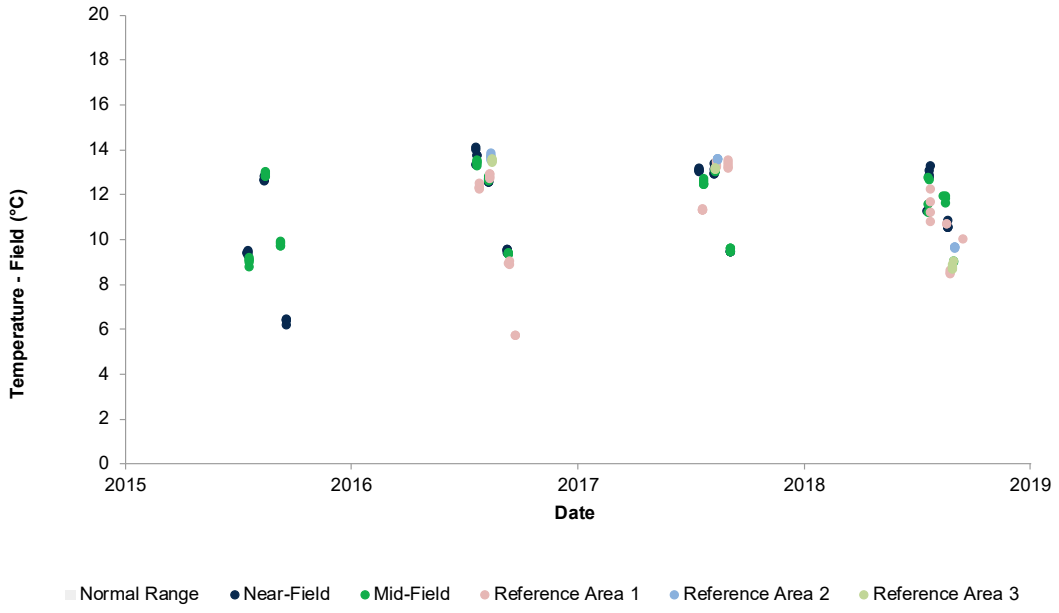
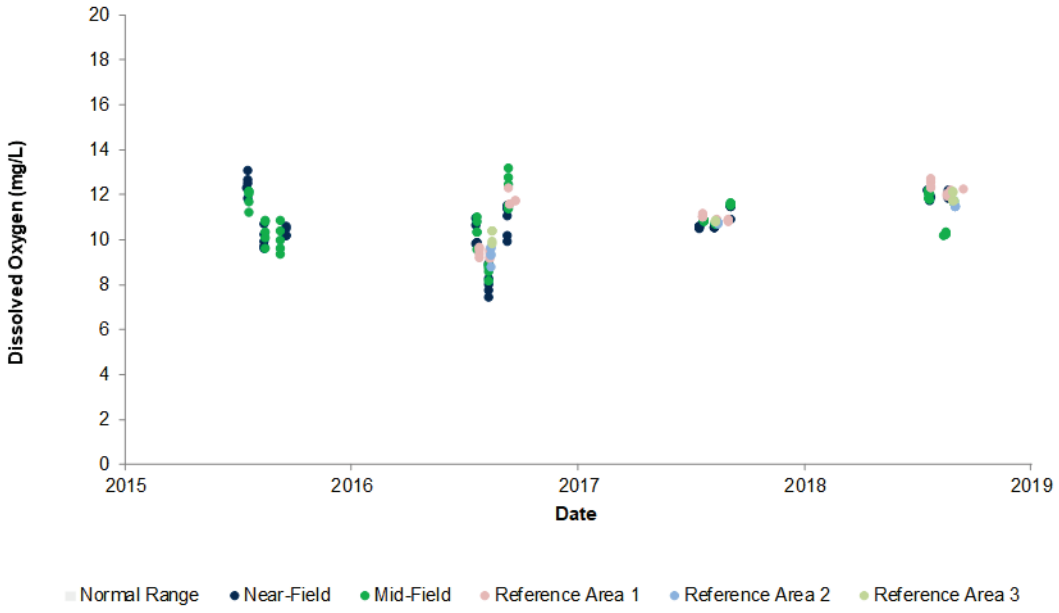


Figure 6F.2-2: Specific Conductivity During Open-water Conditions in Meliadine Lake, 2015 to 2018



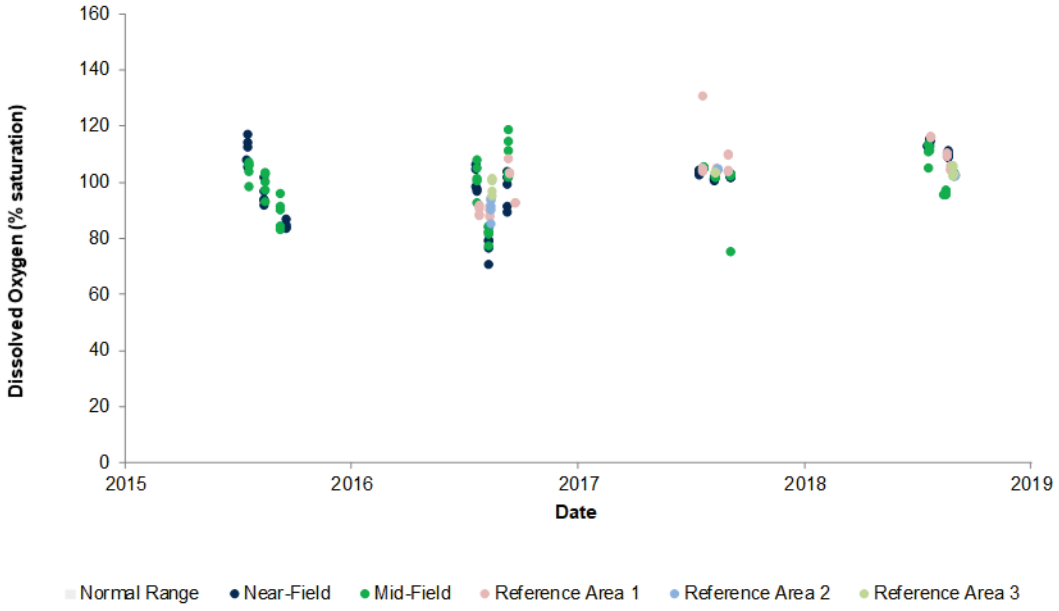
Note: normal range was not calculated for field temperature.

Figure 6F.2-3: Temperature During Open-water Conditions in Meliadine Lake, 2015 to 2018



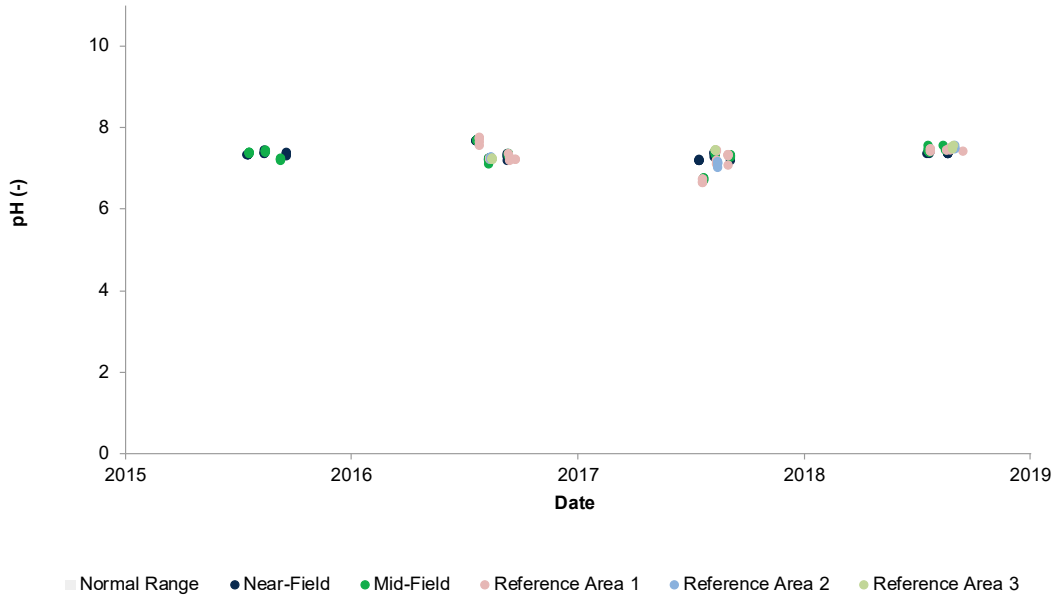
Note: normal range was not calculated for field dissolved oxygen.

Figure 6F.2-4: Dissolved Oxygen During Open-water Conditions in Meliadine Lake, 2015 to 2018



Note: normal range was not calculated for field dissolved oxygen.

Figure 6F.2-5: Dissolved Oxygen During Open-water Conditions in Meliadine Lake, 2015 to 2018



Note: normal range was not calculated for laboratory pH.

Figure 6F.2-6: Laboratory pH During Open-water Conditions in Meliadine Lake, 2015 to 2018

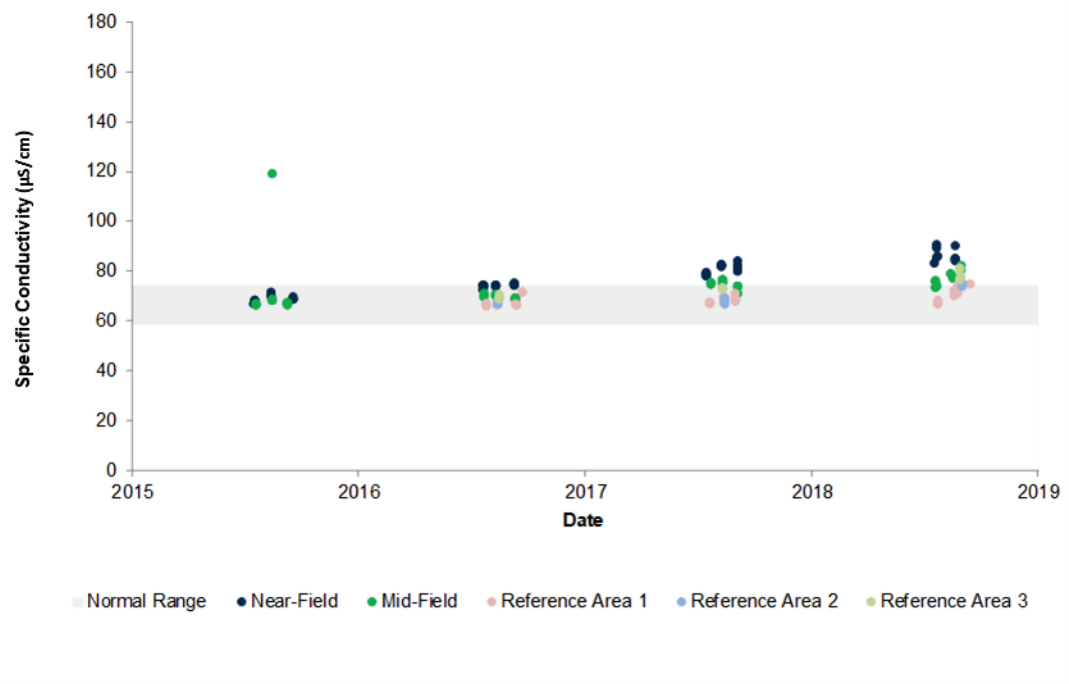


Figure 6F.2-7: Laboratory Specific Conductivity During Open-water Conditions in Meliadine Lake, 2015 to 2018

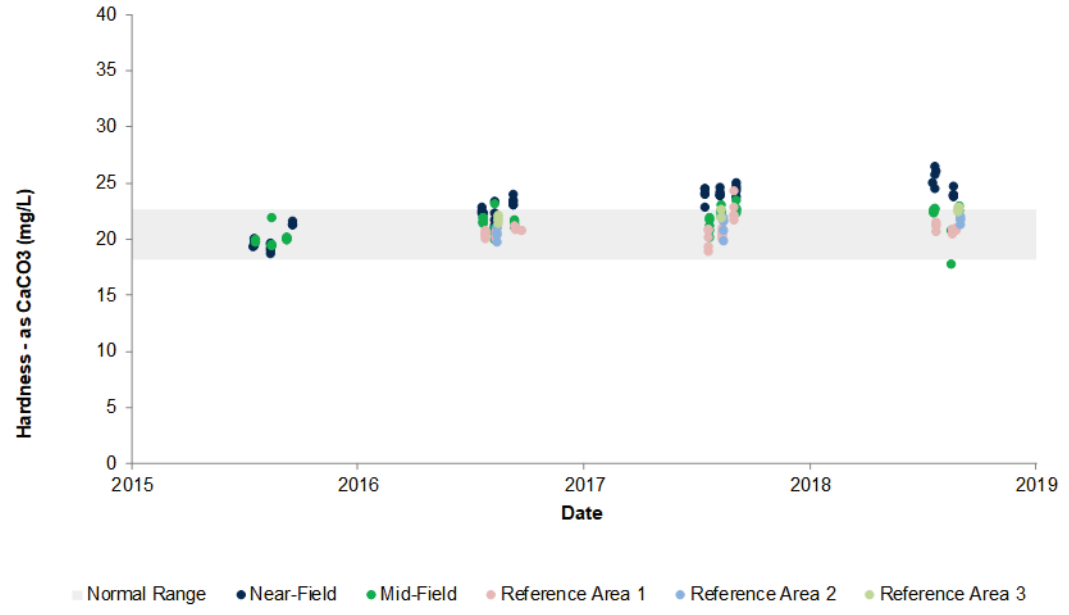


Figure 6F.2-8: Hardness During Open-water Conditions in Meliadine Lake, 2015 to 2018

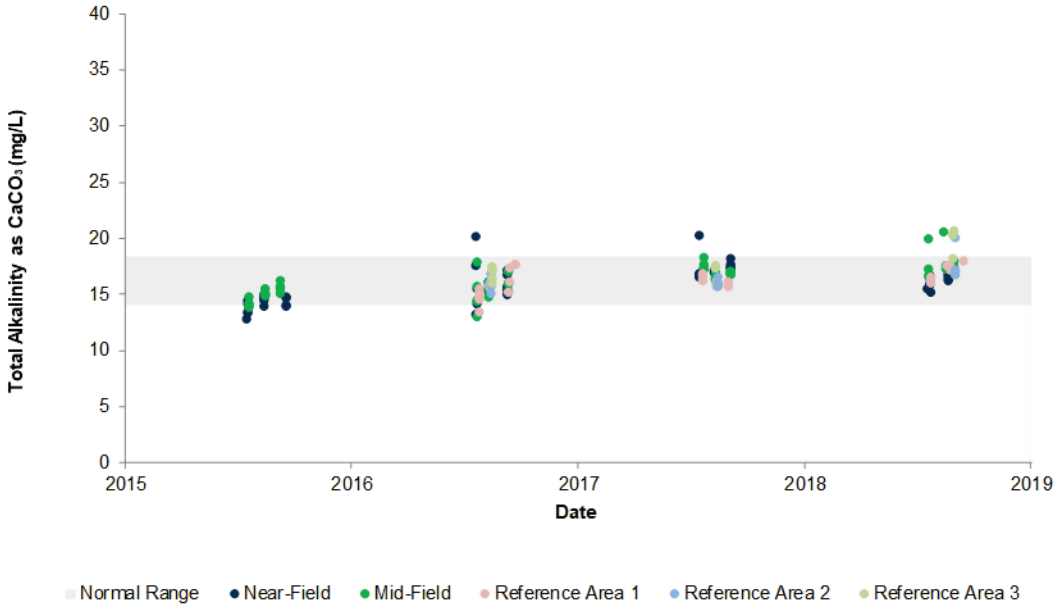


Figure 6F.2-9: Total Alkalinity During Open-water Conditions in Meliadine Lake, 2015 to 2018

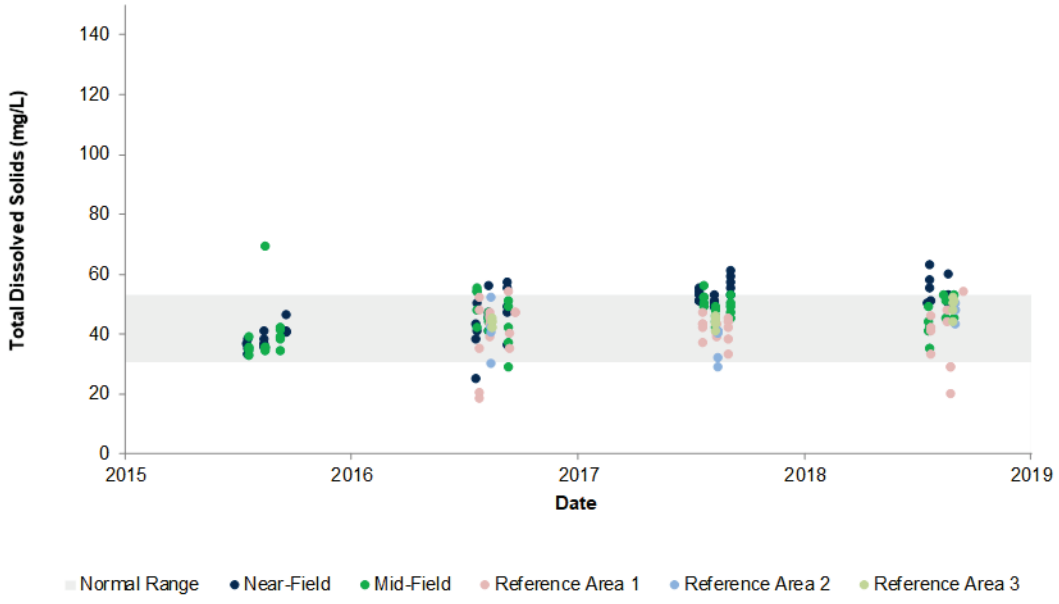


Figure 6F.2-10: Total Dissolved Solids During Open-water Conditions in Meliadine Lake, 2015 to 2018

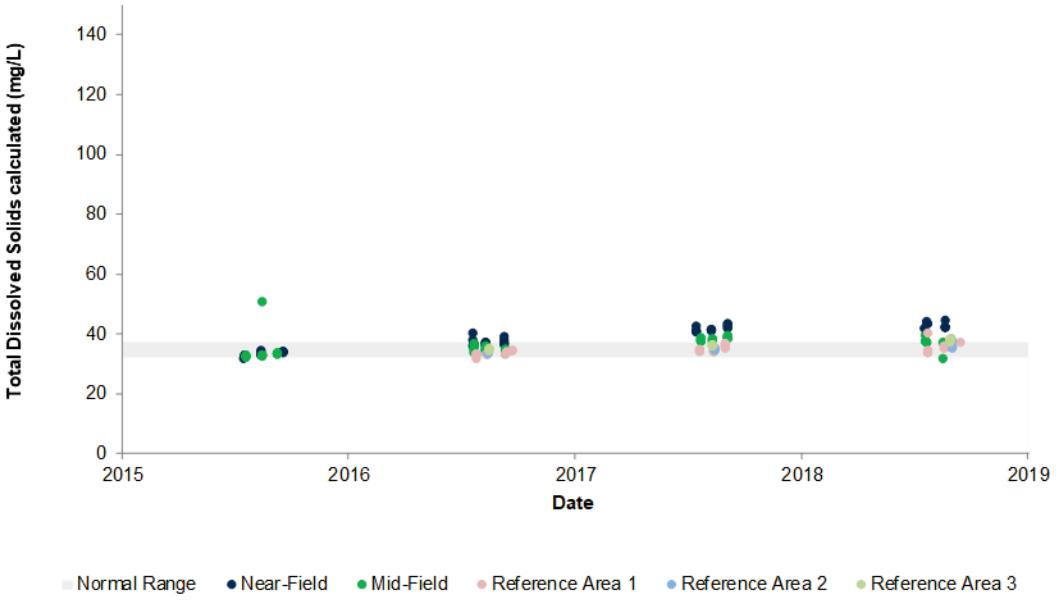


Figure 6F.2-11: Total Dissolved Solids (calculated) During Open-water Conditions in Meliadine Lake, 2015 to 2018

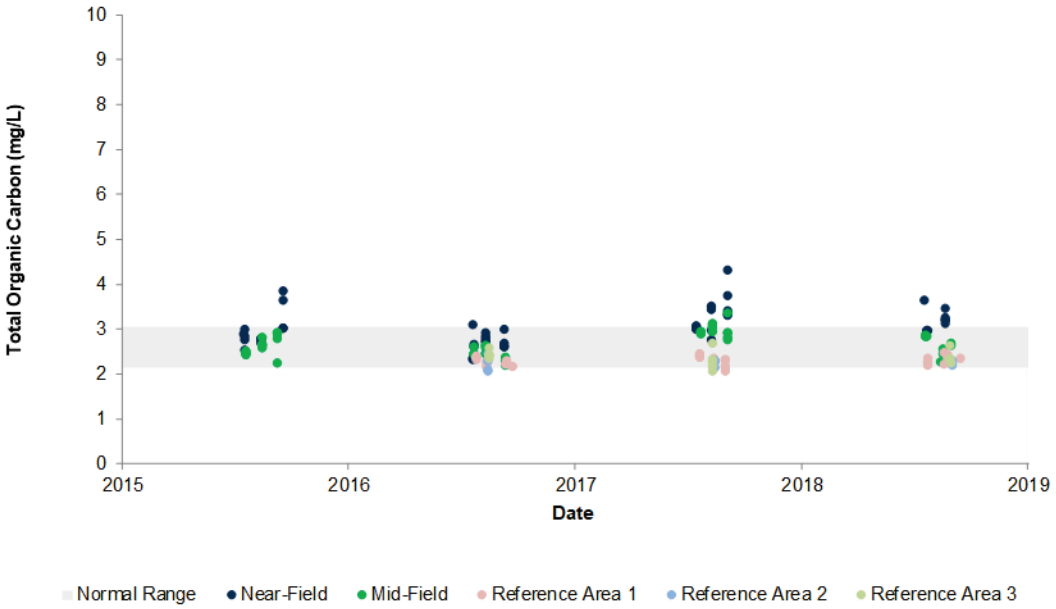


Figure 6F.2-12: Total Organic Carbon During Open-water Conditions in Meliadine Lake, 2015 to 2018

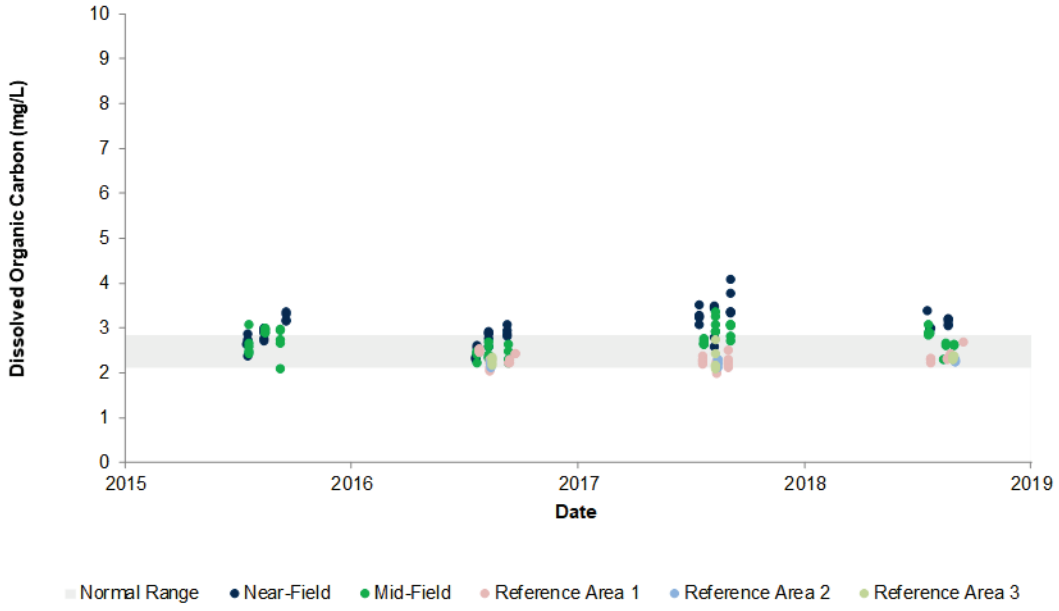
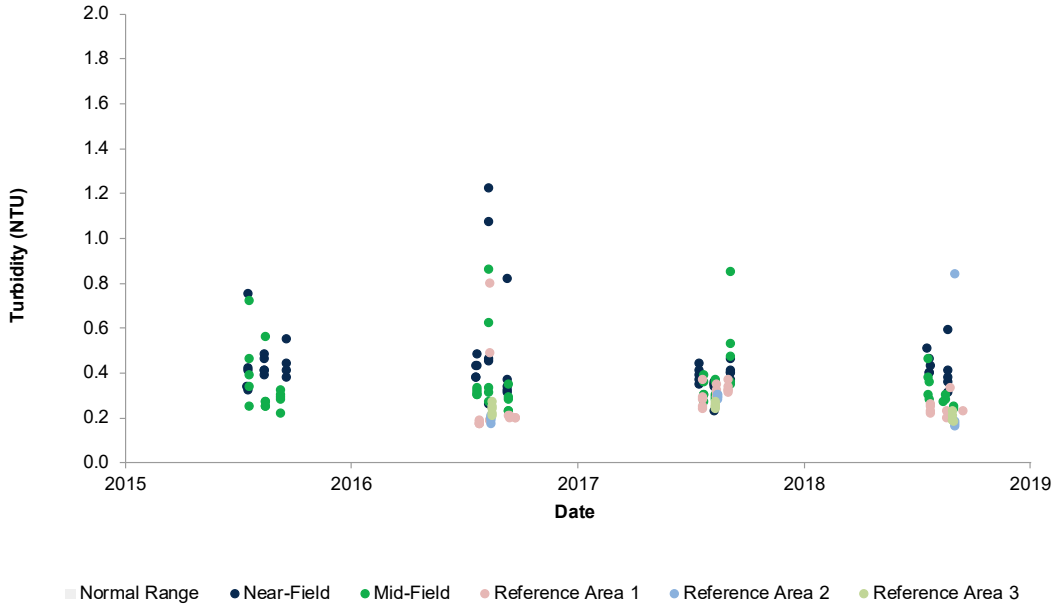


Figure 6F.2-13: Dissolved Organic Carbon During Open-water Conditions in Meliadine Lake, 2015 to 2018



Note: a normal range for turbidity was not calculated because it is represented by Total suspended solids.

Figure 6F.2-14: Turbidity During Open-water Conditions in Meliadine Lake, 2015 to 2018

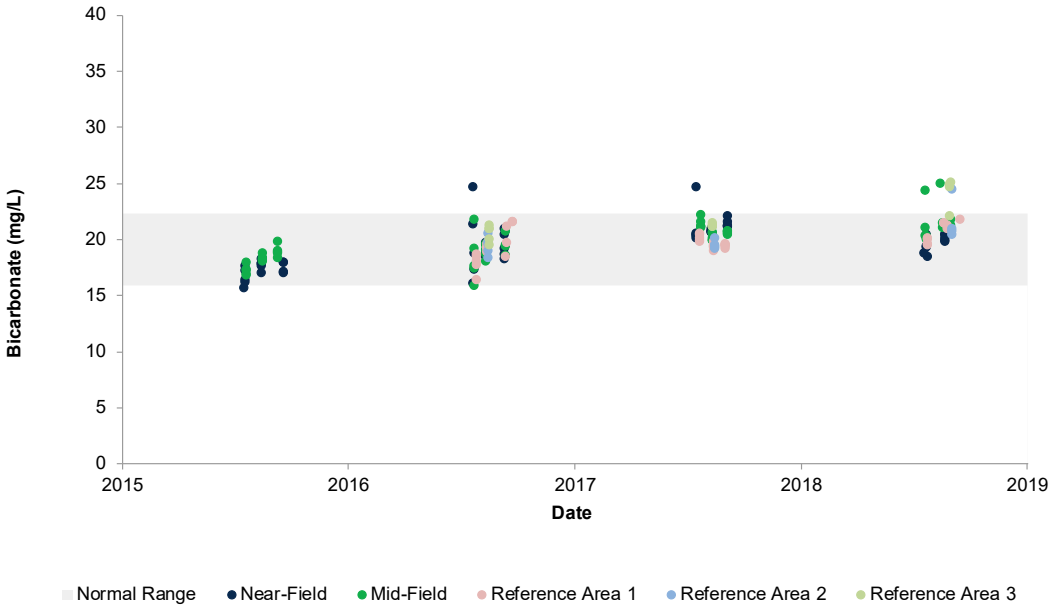


Figure 6F.2-15: Bicarbonate During Open-water Conditions in Meliadine Lake, 2015 to 2018

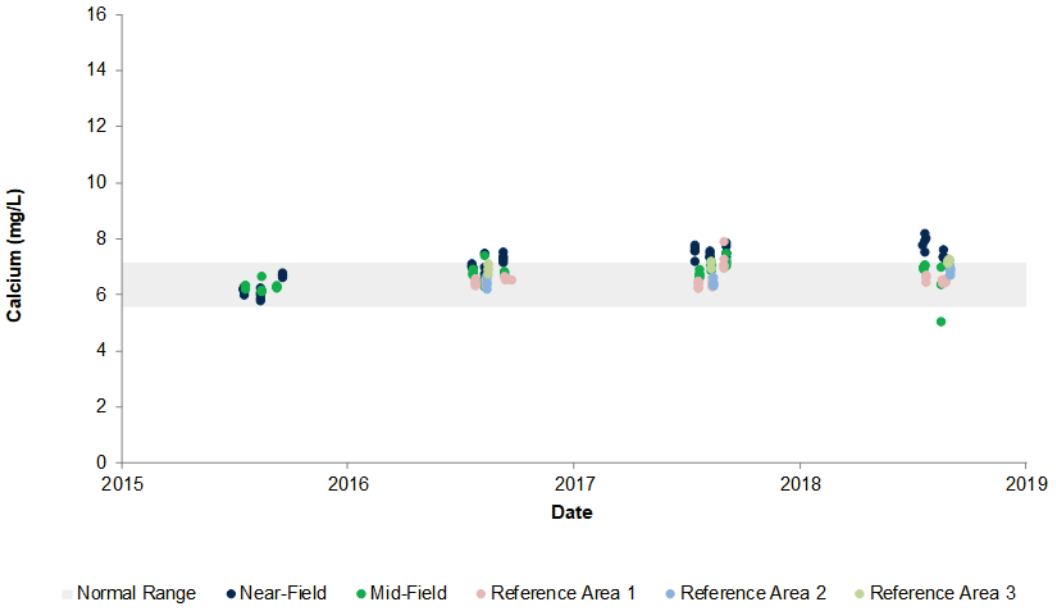


Figure 6F.2-16: Calcium During Open-water Conditions in Meliadine Lake, 2015 to 2018

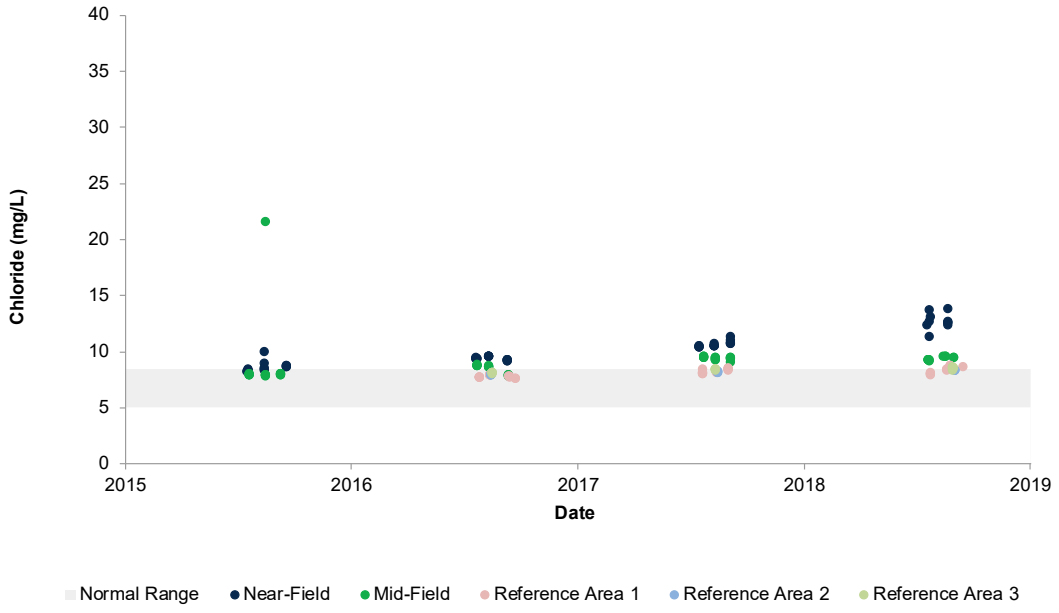


Figure 6F.2-17: Chloride During Open-water Conditions in Meliadine Lake, 2015 to 2018

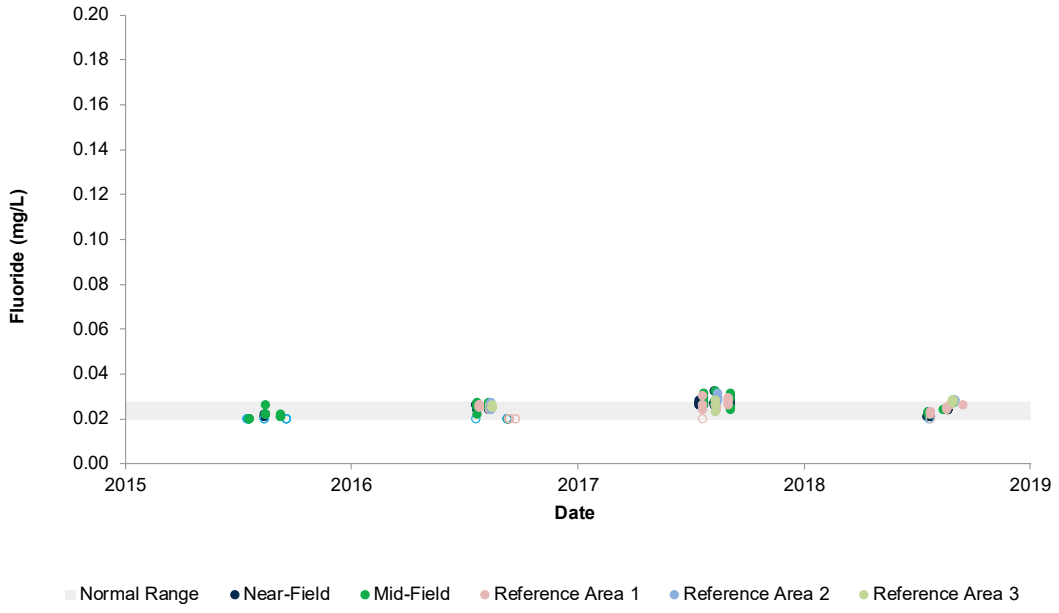


Figure 6F.2-18: Fluoride During Open-water Conditions in Meliadine Lake, 2015 to 2018

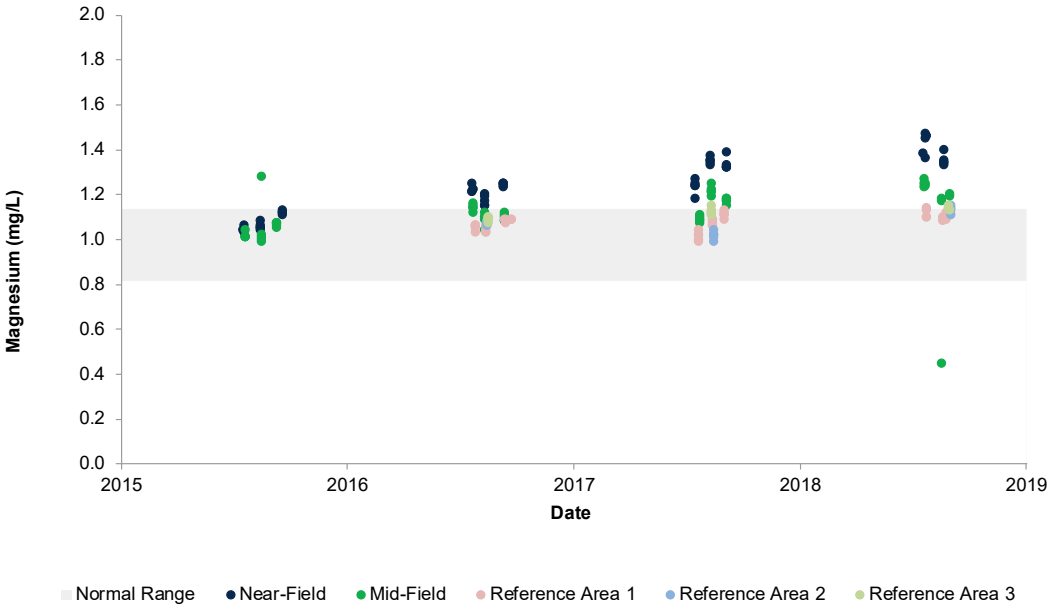


Figure 6F.2-19: Magnesium During Open-water Conditions in Meliadine Lake, 2015 to 2018

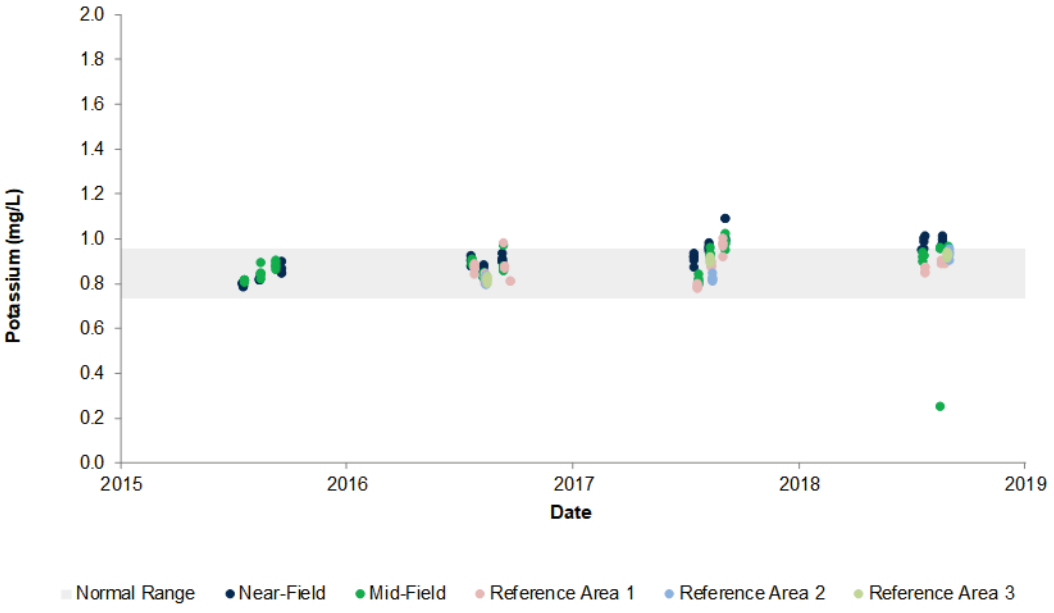


Figure 6F.2-20: Potassium During Open-water Conditions in Meliadine Lake, 2015 to 2018

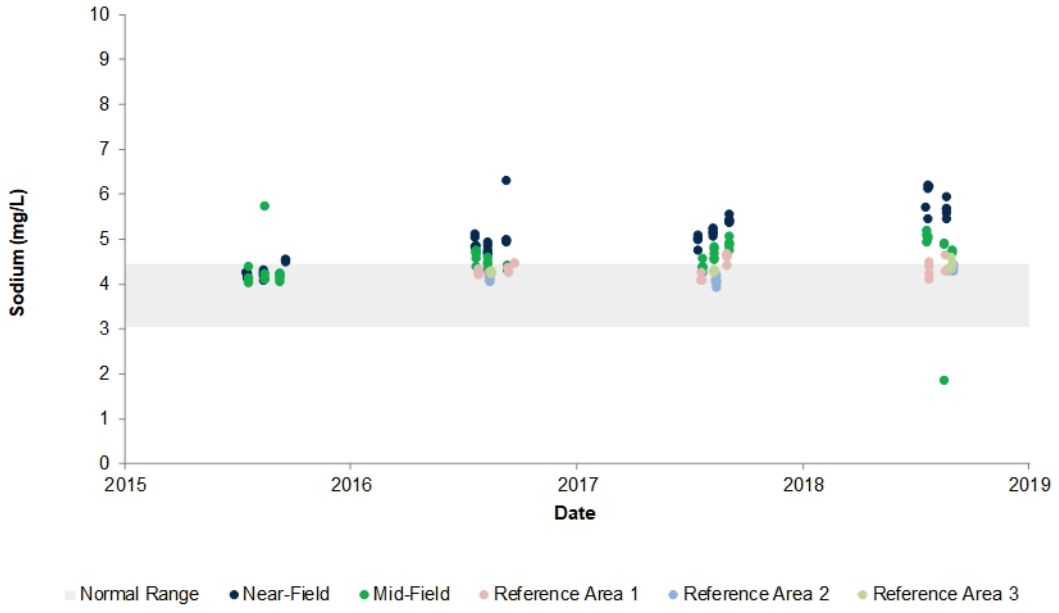


Figure 6F.2-21: Sodium During Open-water Conditions in Meliadine Lake, 2015 to 2018

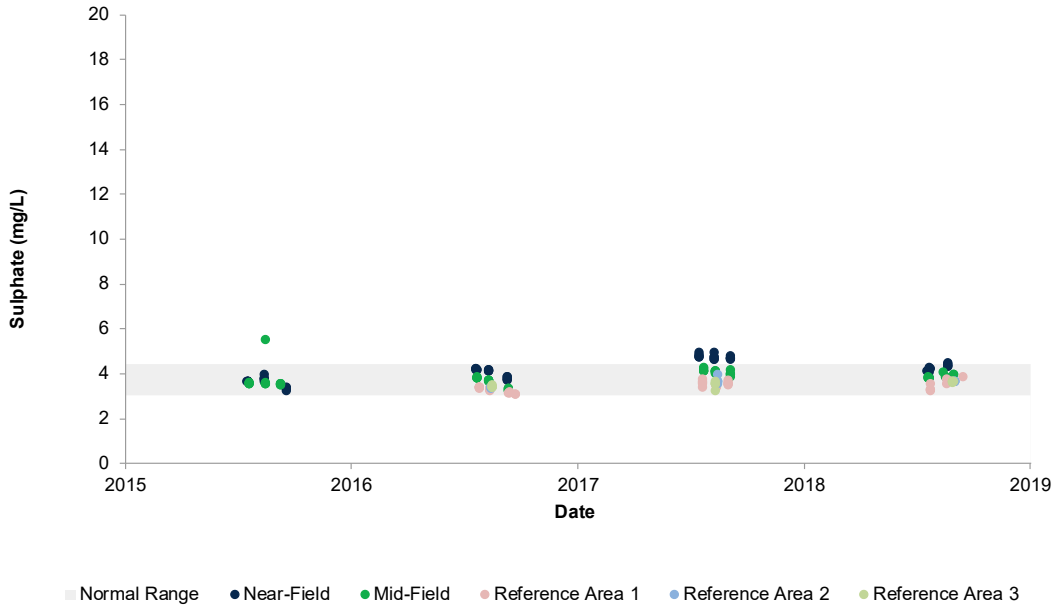


Figure 6F.2-22: Sulphate During Open-water Conditions in Meliadine Lake, 2015 to 2018

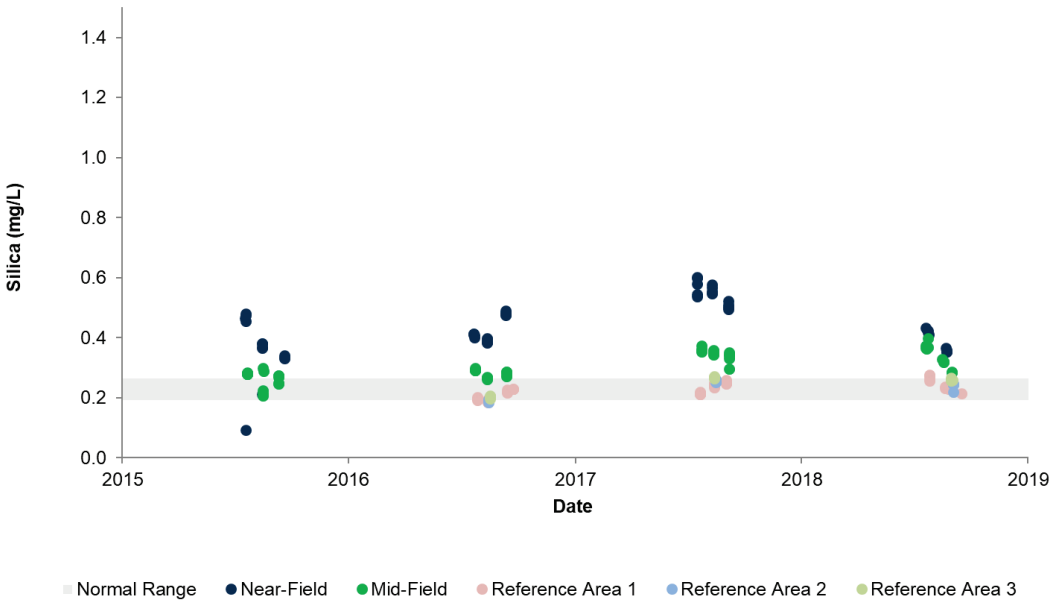


Figure 6F.2-23: Reactive Silica During Open-water Conditions in Meliadine Lake, 2015 to 2018

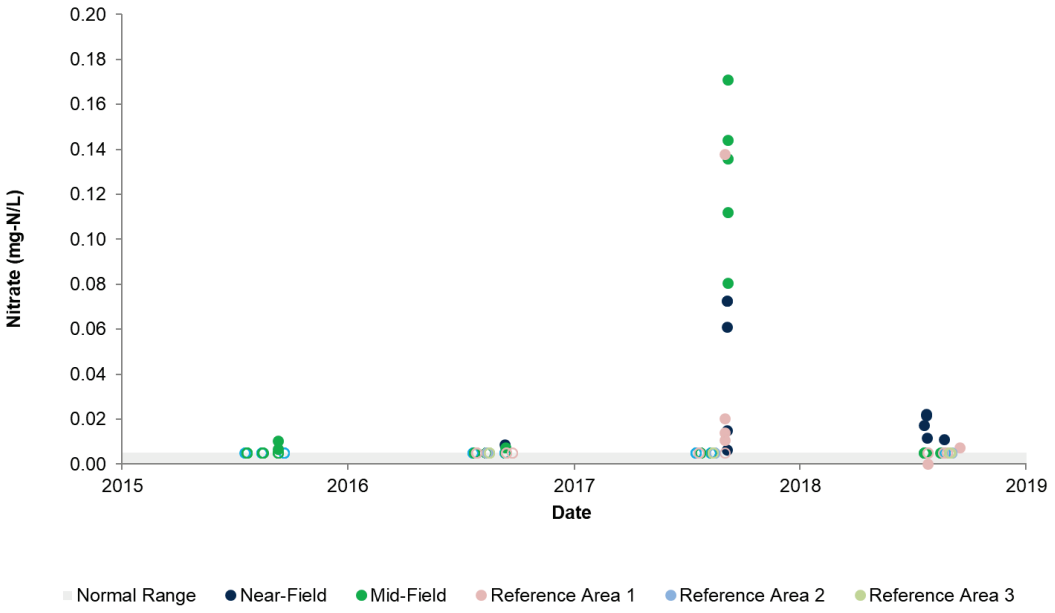


Figure 6F.2-24: Nitrate as N During Open-water Conditions in Meliadine Lake, 2015 to 2018

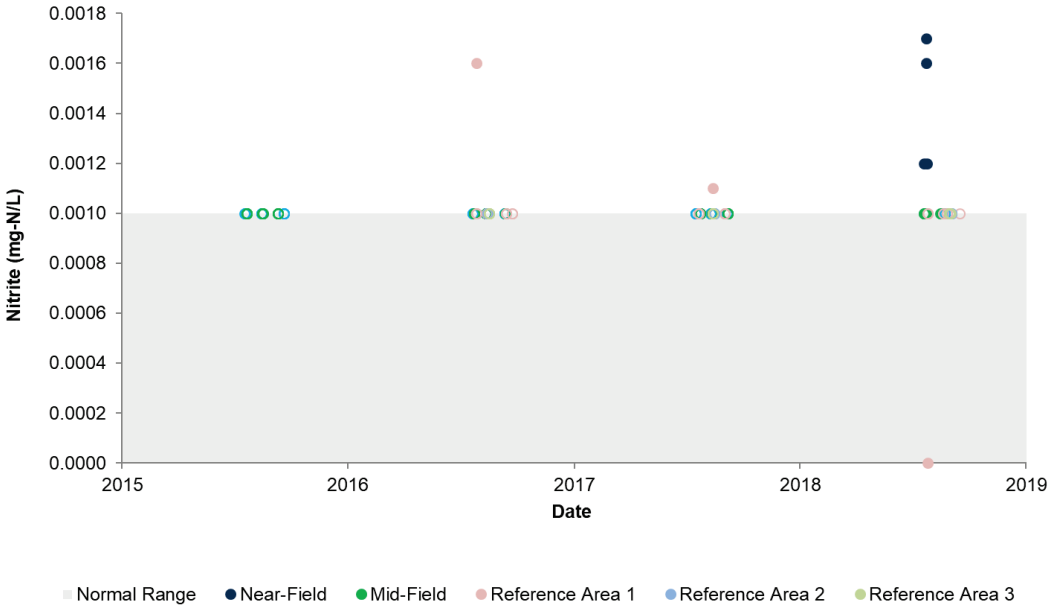
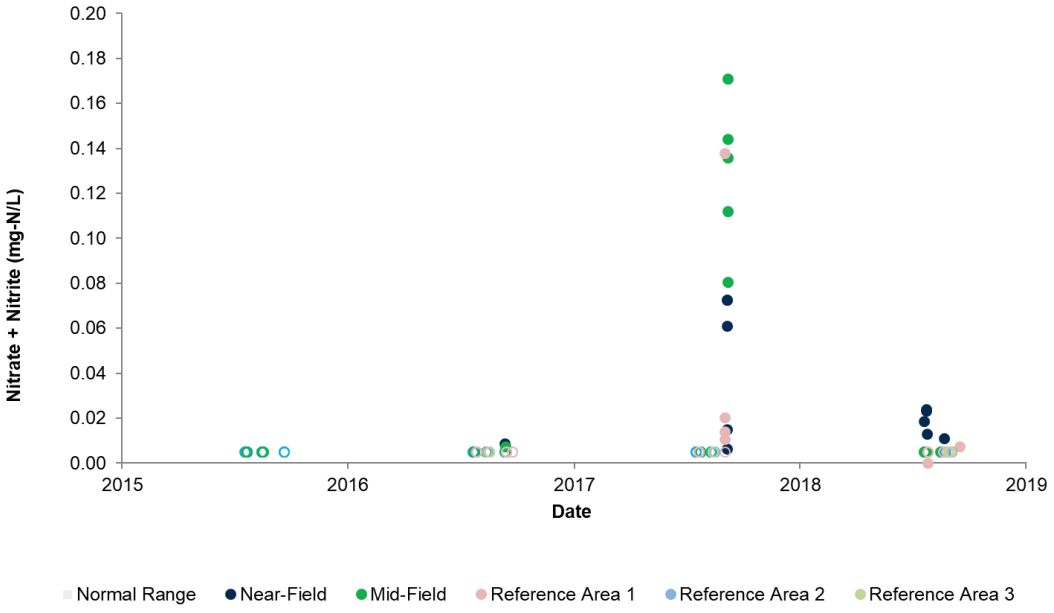


Figure 6F.2-25: Nitrite as N During Open-water Conditions in Meliadine Lake, 2015 to 2018



Note: normal range was not calculated for nitrate + nitrite

Figure 6F.2-26: Nitrate and Nitrite During Open-water Conditions in Meliadine Lake, 2015 to 2018

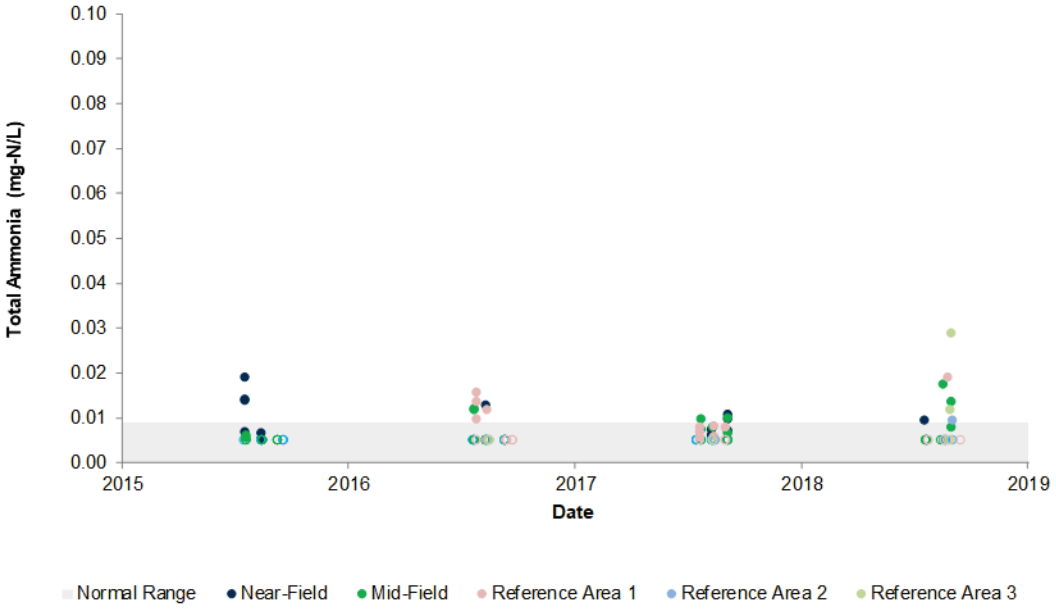


Figure 6F.2-27: Total Ammonia During Open-water Conditions in Meliadine Lake, 2015 to 2018

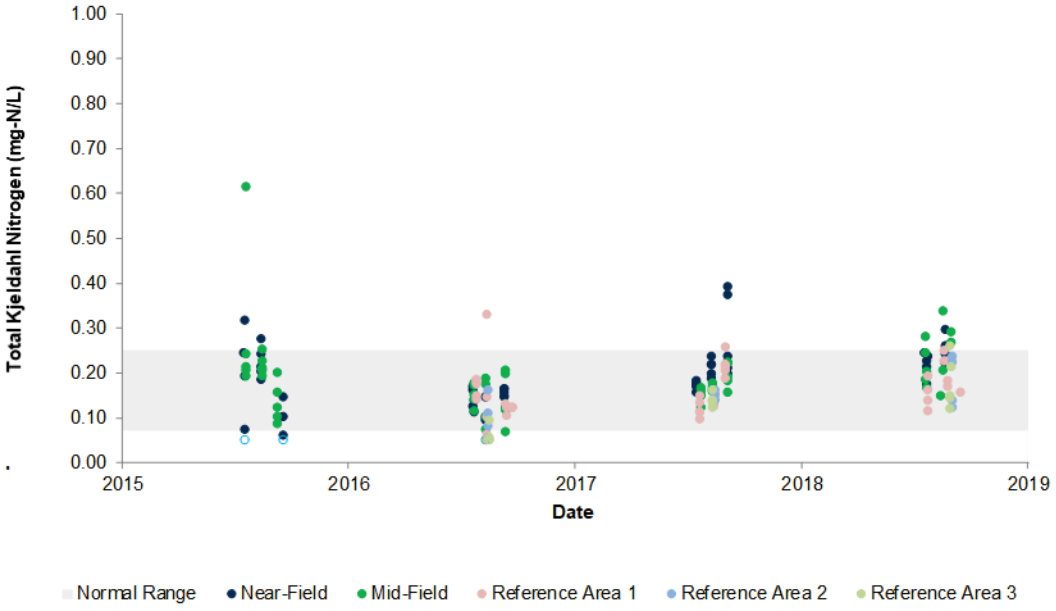


Figure 6F.2-28: Total Kjeldahl Nitrogen During Open-water Conditions in Meliadine Lake, 2015 to 2018

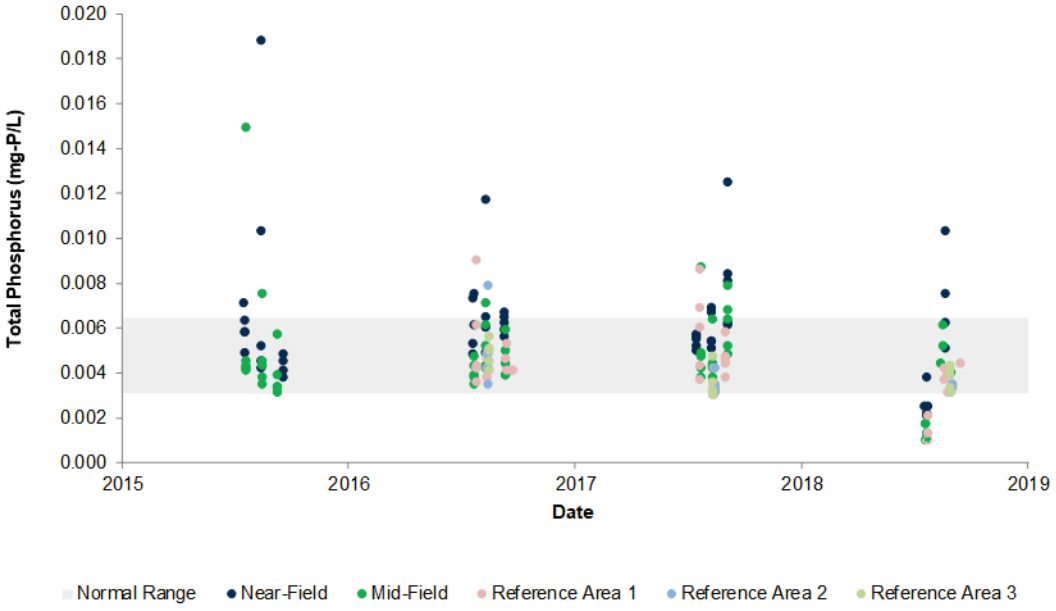


Figure 6F.2-29: Total Phosphorus During Open-water Conditions in Meliadine Lake, 2015 to 2018

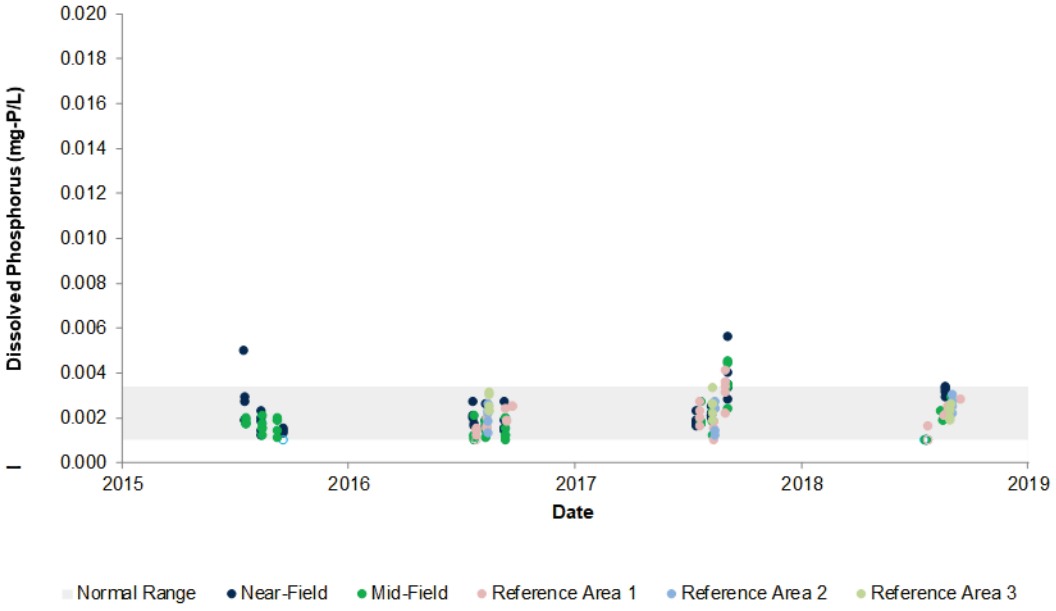


Figure 6F.2-30: Dissolved Phosphorus During Open-water Conditions in Meliadine Lake, 2015 to 2018

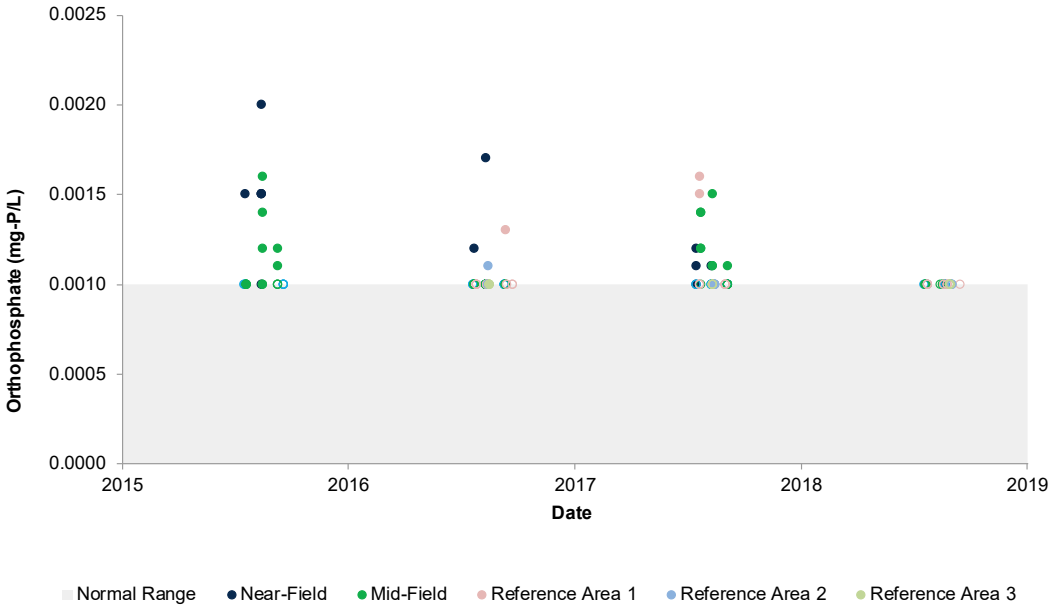


Figure 6F.2-31: Orthophosphate During Open-water Conditions in Meliadine Lake, 2015 to 2018

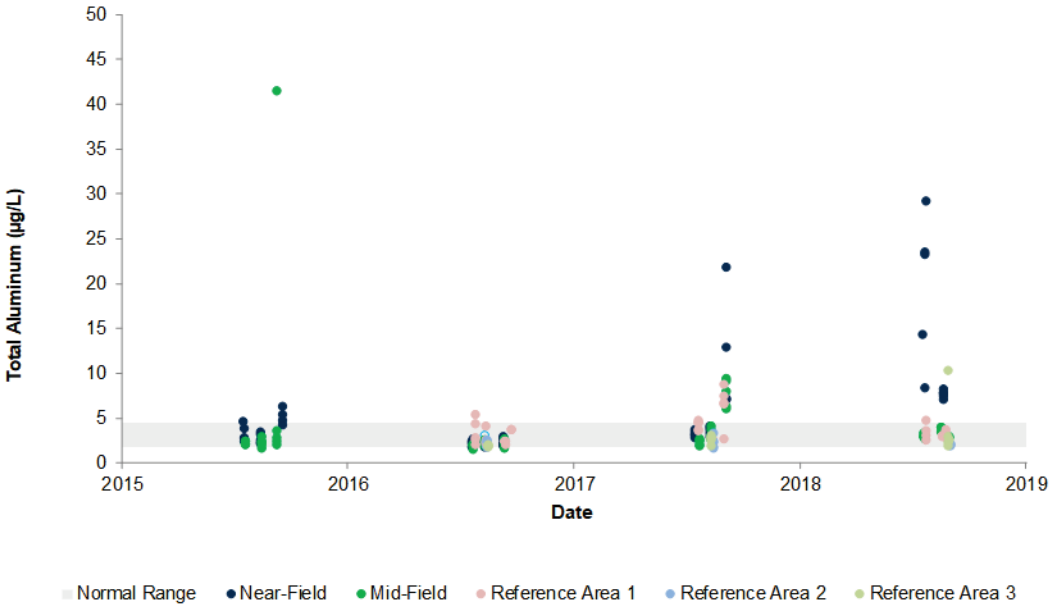


Figure 6F.2-32: Total Aluminum During Open-water Conditions in Meliadine Lake, 2015 to 2018

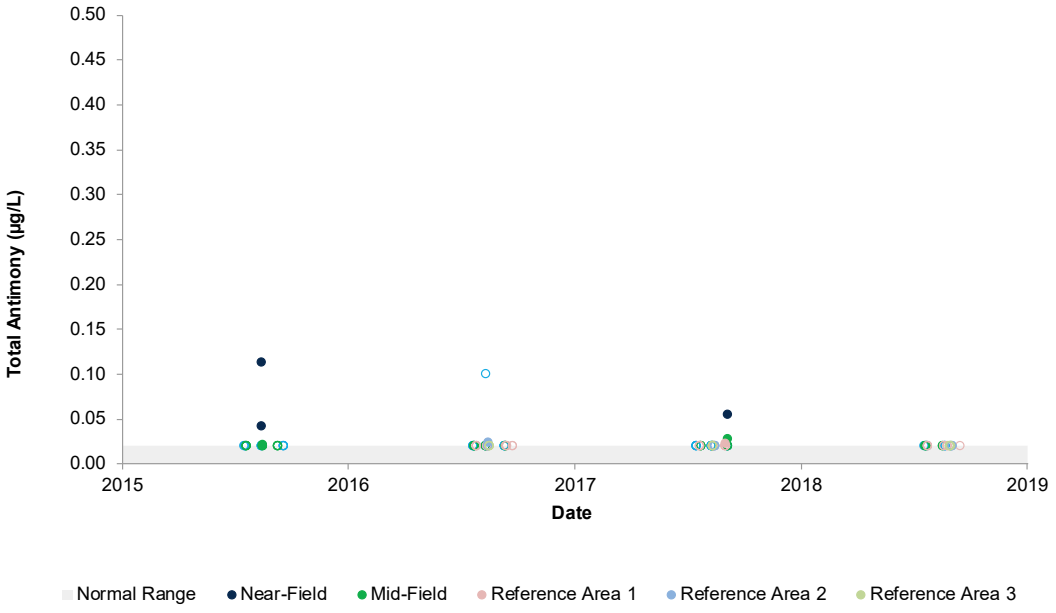


Figure 6F.2-33: Total Antimony During Open-water Conditions in Meliadine Lake, 2015 to 2018

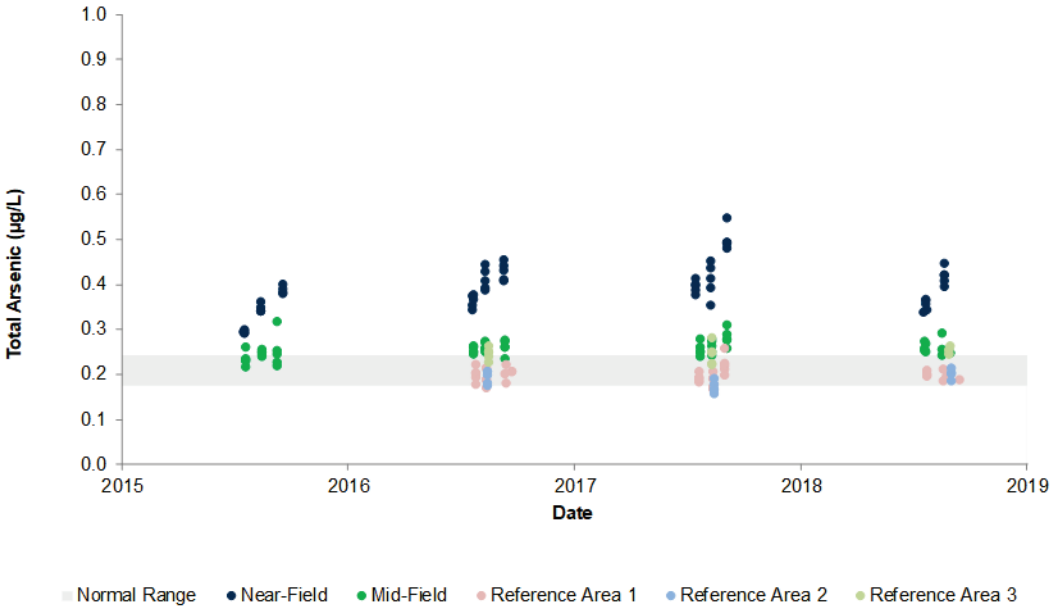


Figure 6F.2-34: Total Arsenic During Open-water Conditions in Meliadine Lake, 2015 to 2018

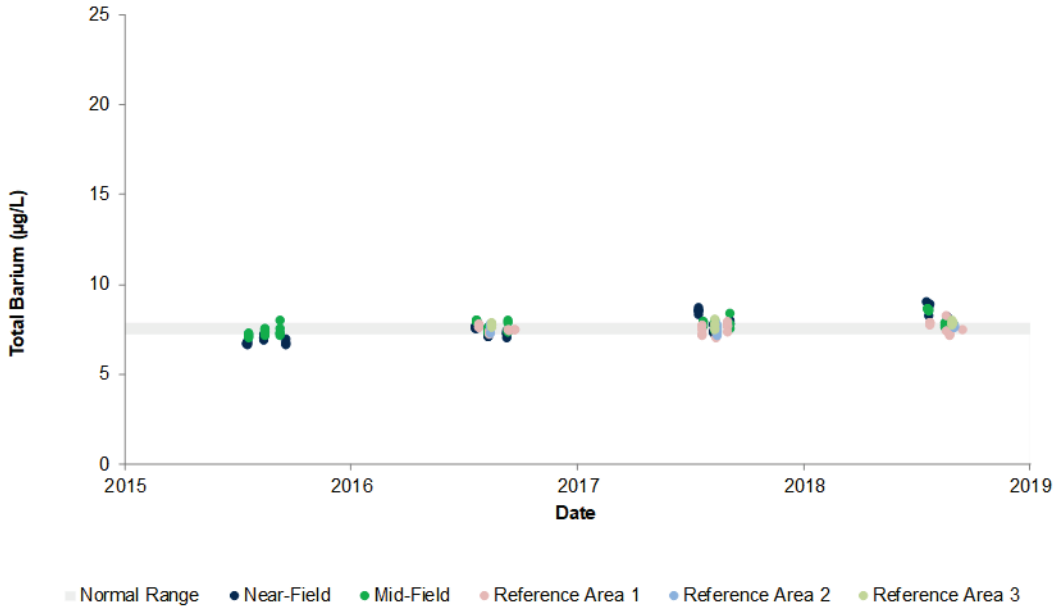


Figure 6F.2-35: Total Barium During Open-water Conditions in Meliadine Lake, 2015 to 2018

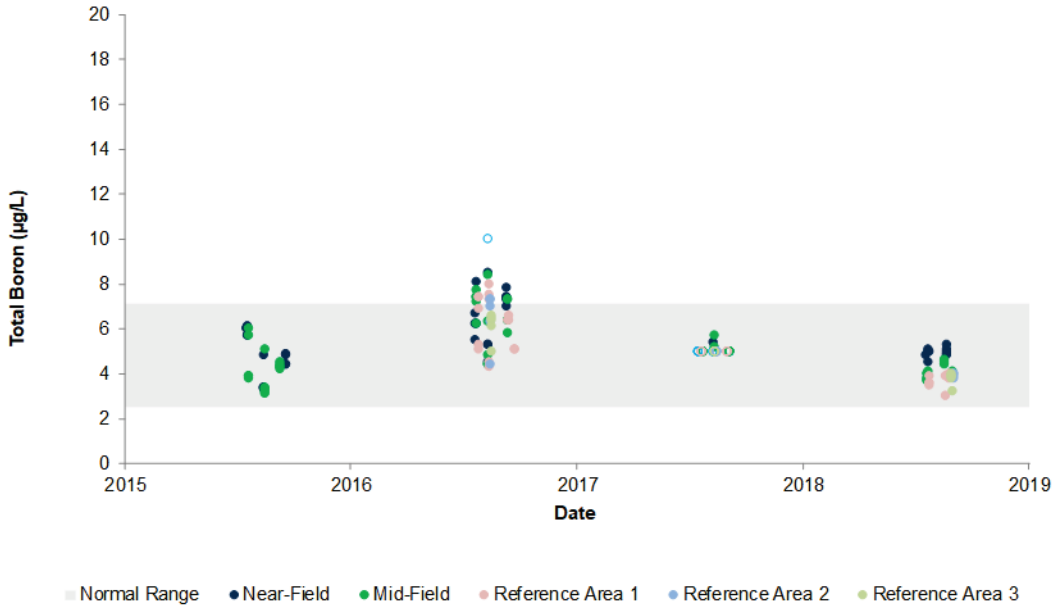


Figure 6F.2-36: Total Boron During Open-water Conditions in Meliadine Lake, 2015 to 2018

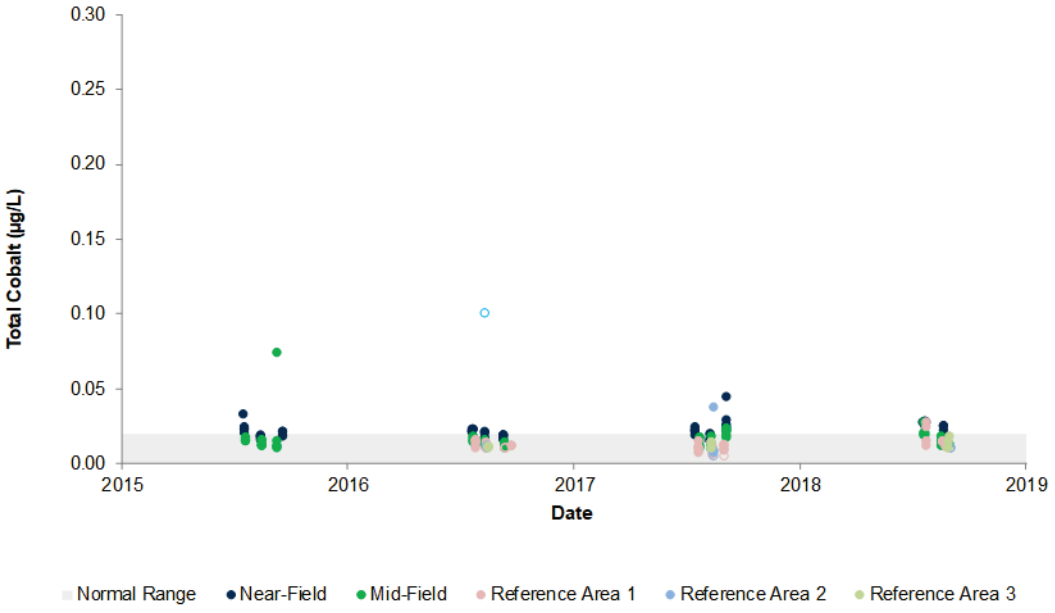


Figure 6F.2-37: Total Cobalt During Open-water Conditions in Meliadine Lake, 2015 to 2018

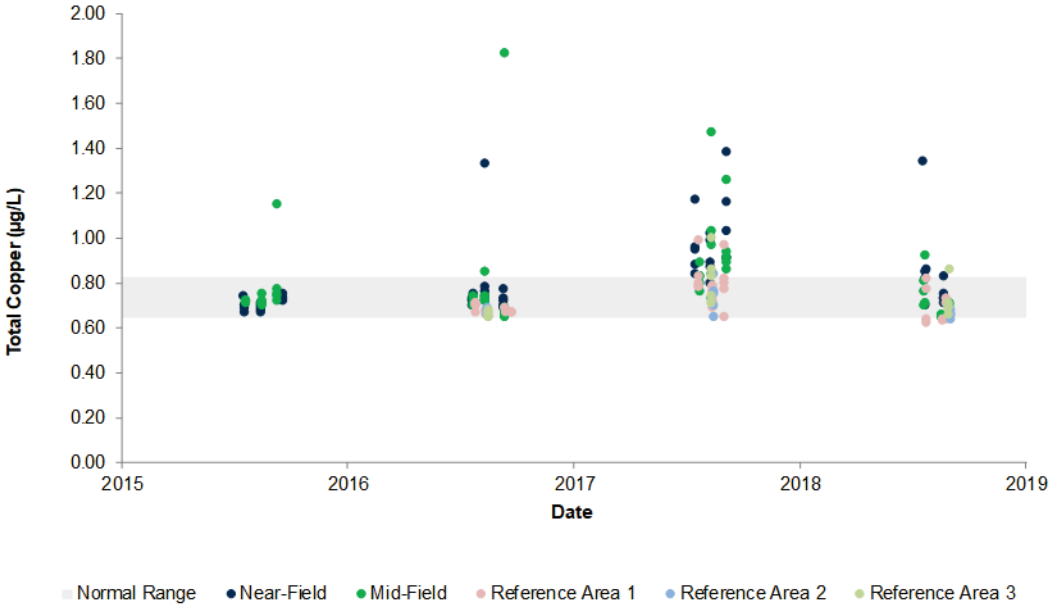


Figure 6F.2-38: Total Copper During Open-water Conditions in Meliadine Lake, 2015 to 2018

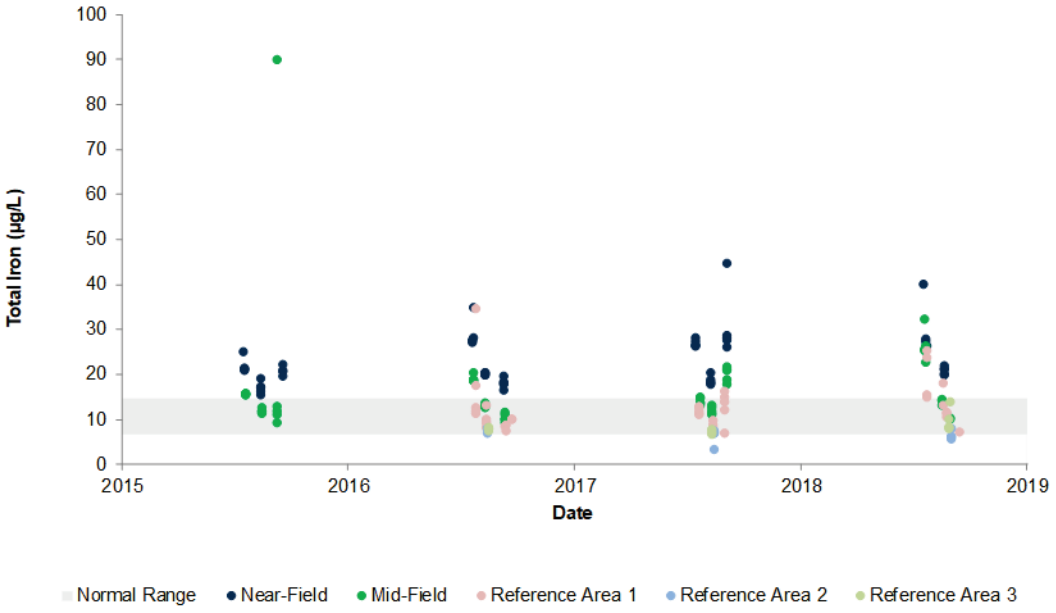


Figure 6F.2-39: Total Iron During Open-water Conditions in Meliadine Lake, 2015 to 2018

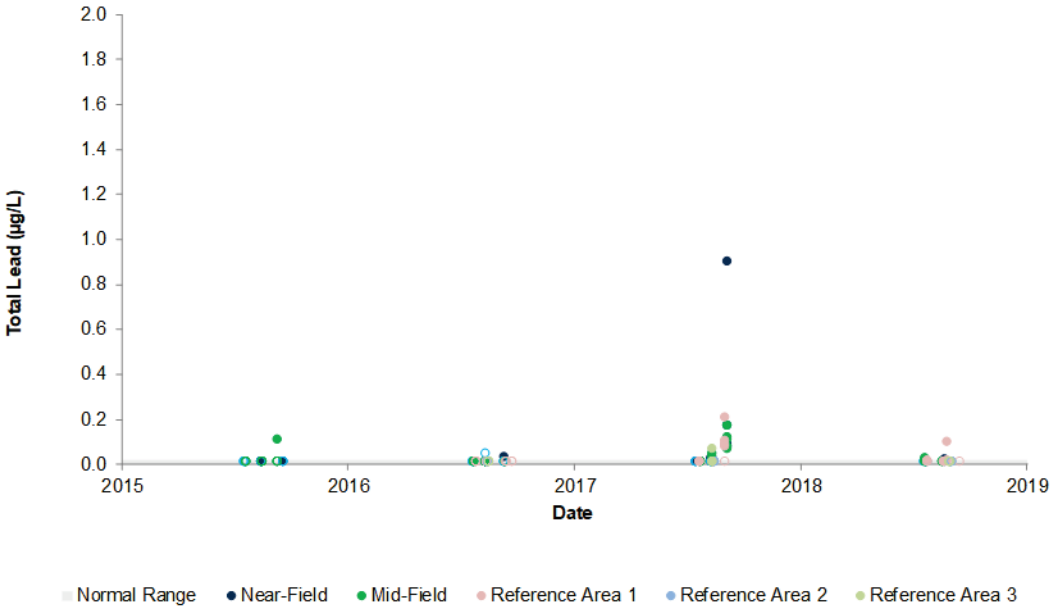


Figure 6F.2-40: Total Lead During Open-water Conditions in Meliadine Lake, 2015 to 2018

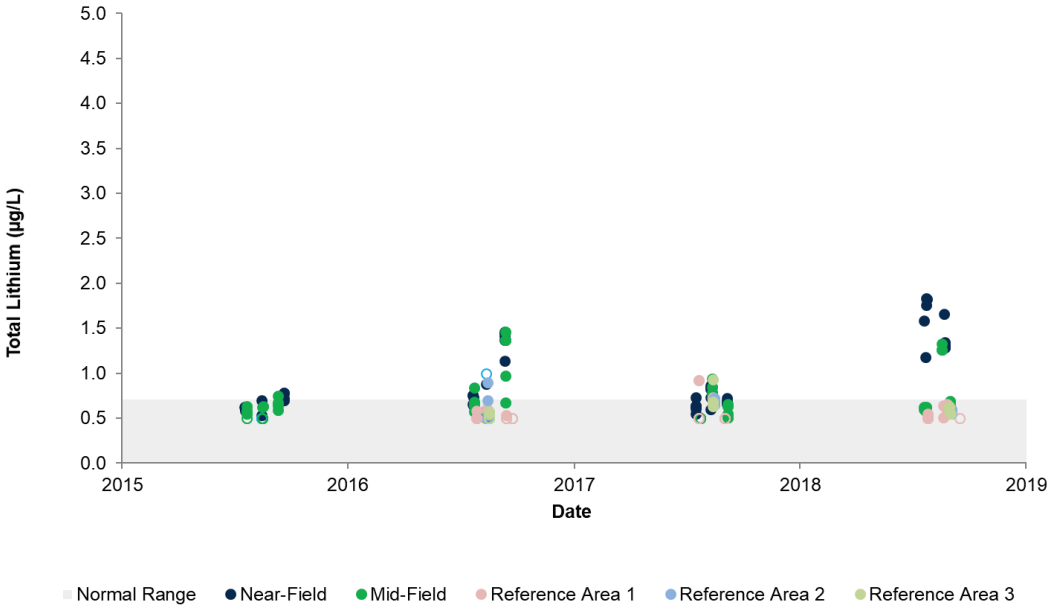


Figure 6F.2-41: Total Lithium During Open-water Conditions in Meliadine Lake, 2015 to 2018

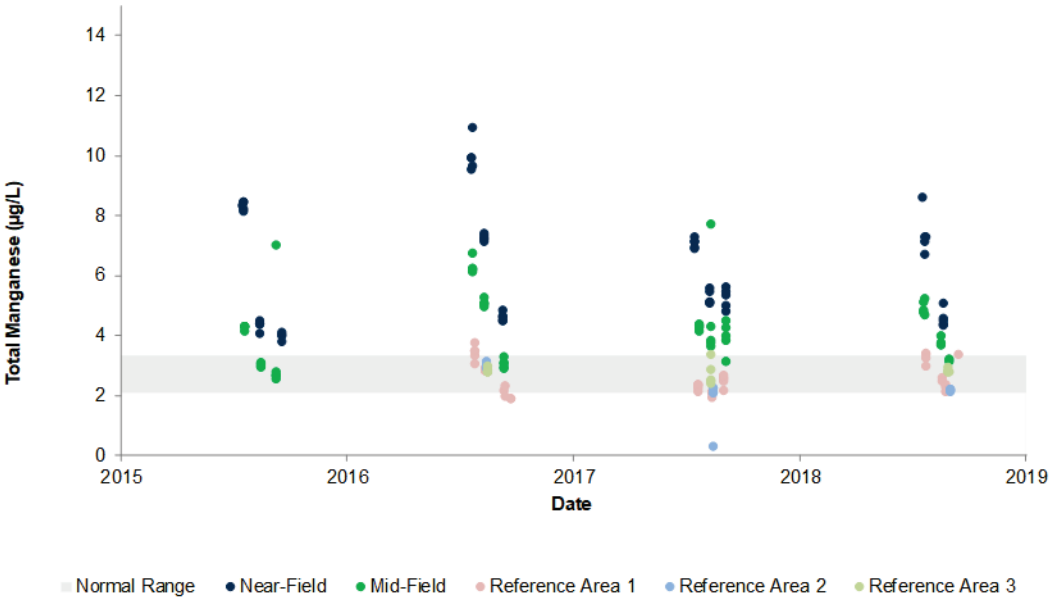


Figure 6F.2-42: Total Manganese During Open-water Conditions in Meliadine Lake, 2015 to 2018

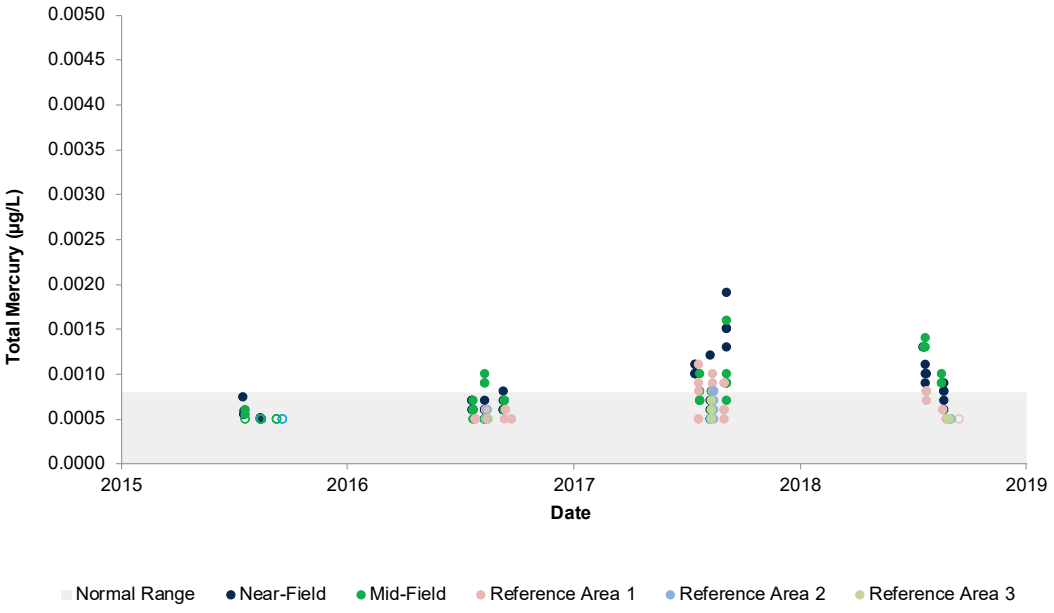


Figure 6F.2-43: Total Mercury During Open-water Conditions in Meliadine Lake, 2015 to 2018

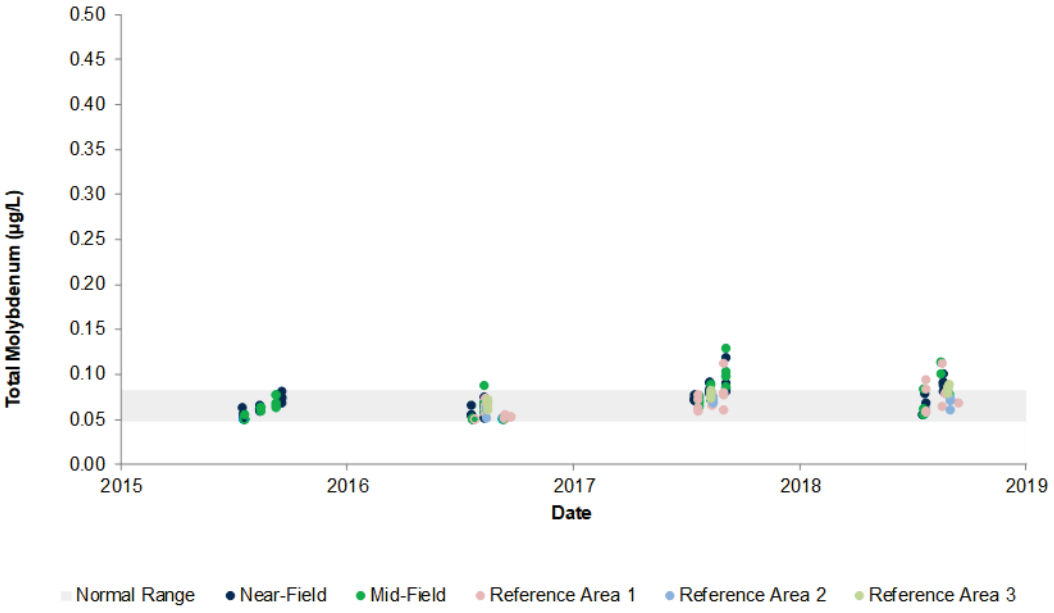


Figure 6F.2-44: Total Molybdenum During Open-water Conditions in Meliadine Lake, 2015 to 2018

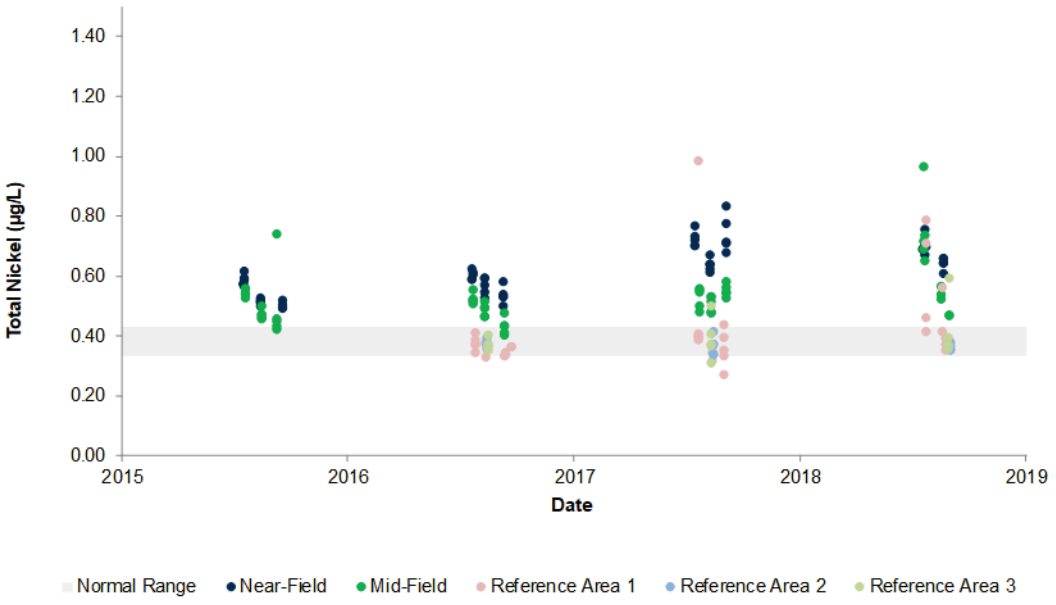


Figure 6F.2-45: Total Nickel During Open-water Conditions in Meliadine Lake, 2015 to 2018

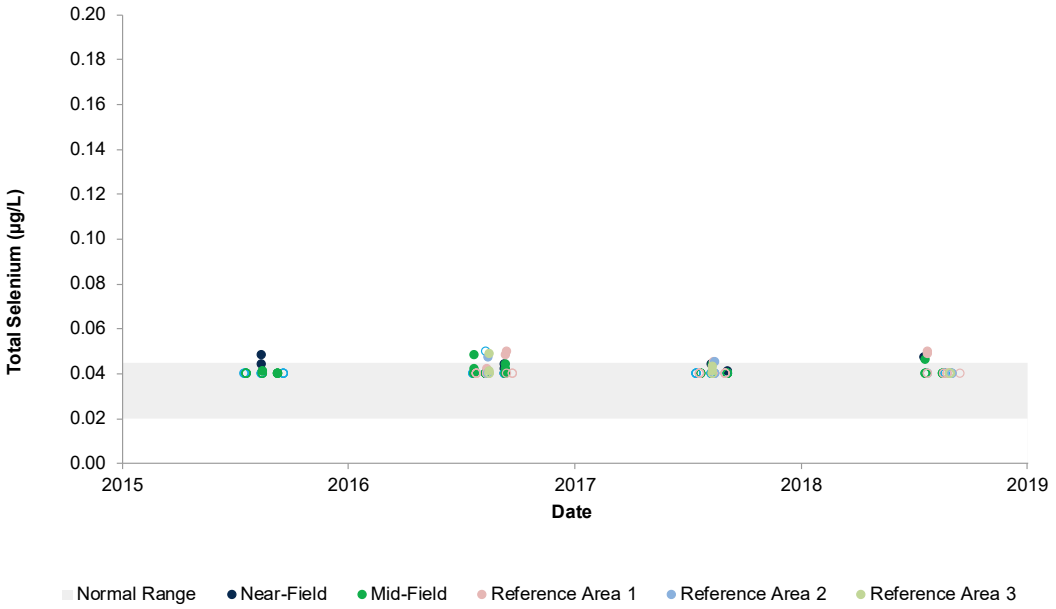


Figure 6F.2-46: Total Selenium During Open-water Conditions in Meliadine Lake, 2015 to 2018

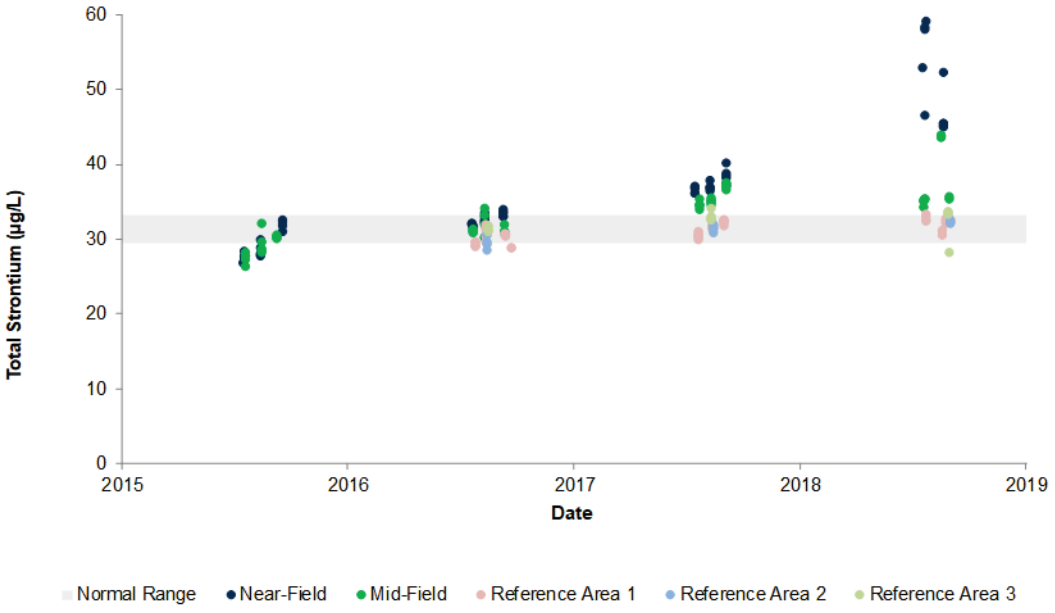


Figure 6F.2-47: Total Strontium During Open-water Conditions in Meliadine Lake, 2015 to 2018

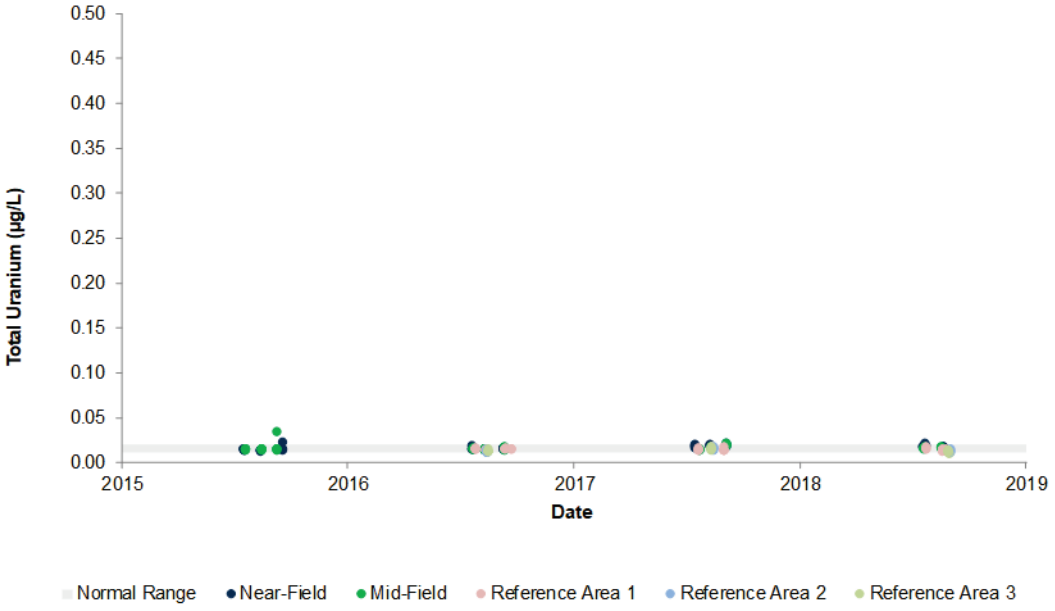


Figure 6F.2-48: Total Uranium During Open-water Conditions in Meliadine Lake, 2015 to 2018

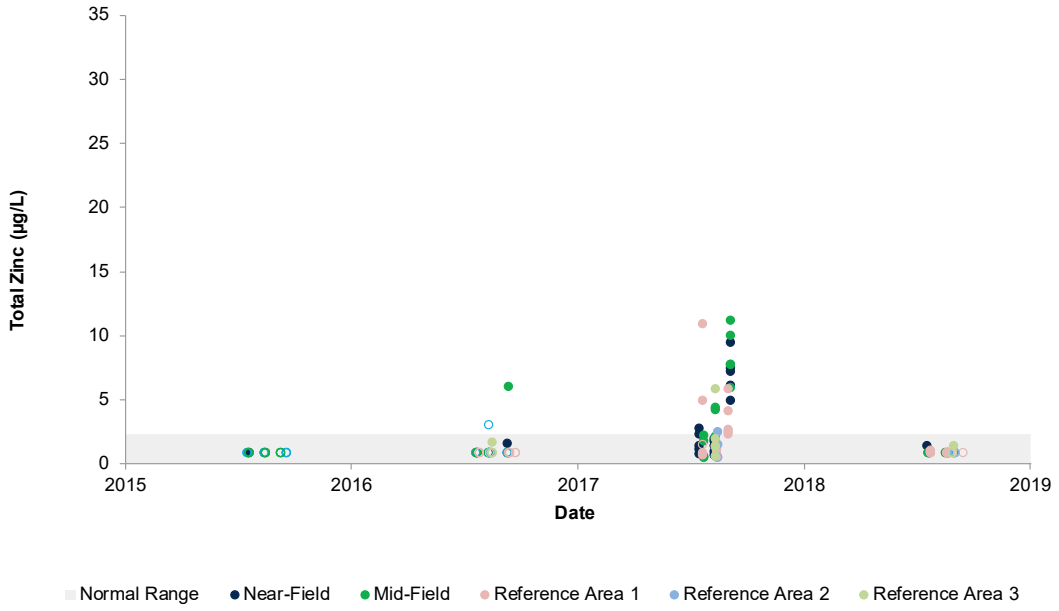


Figure 6F.2-49: Total Zinc During Open-water Conditions in Meliadine Lake, 2015 to 2018

APPENDIX 6G

Temporal Box-and-Whisker Plots by Area

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Figure 6G.1-2: Temporal box plots of key nutrient parameters measured in the Near-field and Mid-field areas during ice-covered conditions, 2016 to 2018. 2

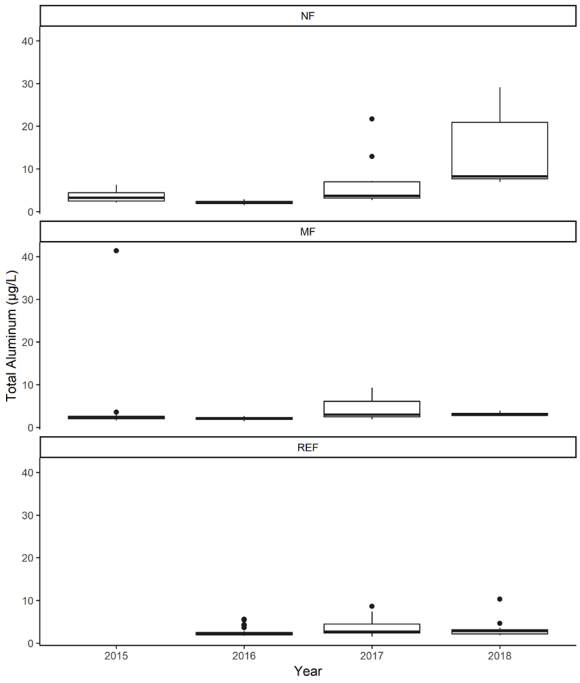
Figure 6G.1-3: Temporal box plots of key major ion parameters measured in the Near-field and Mid-field areas during ice-covered conditions, 2016 to 2018 3

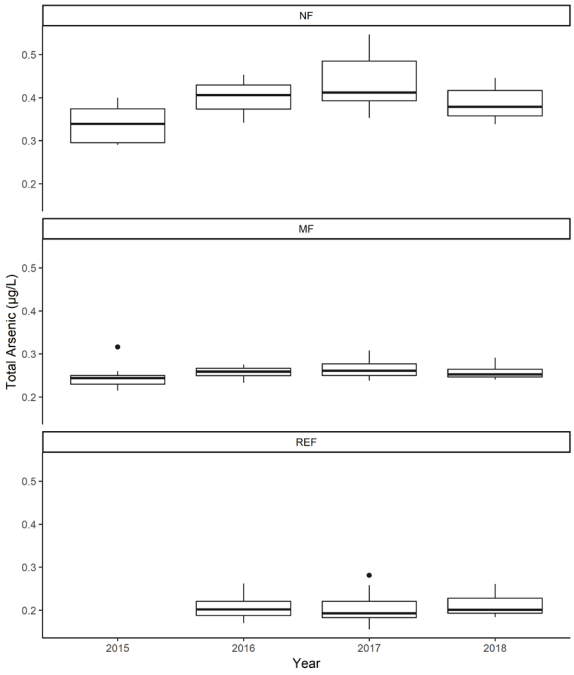
Figure 6G.1-4: Temporal box plots of key total metal parameters measured in the Near-field and Mid-field areas during ice-covered conditions, 2016 to 2018 4

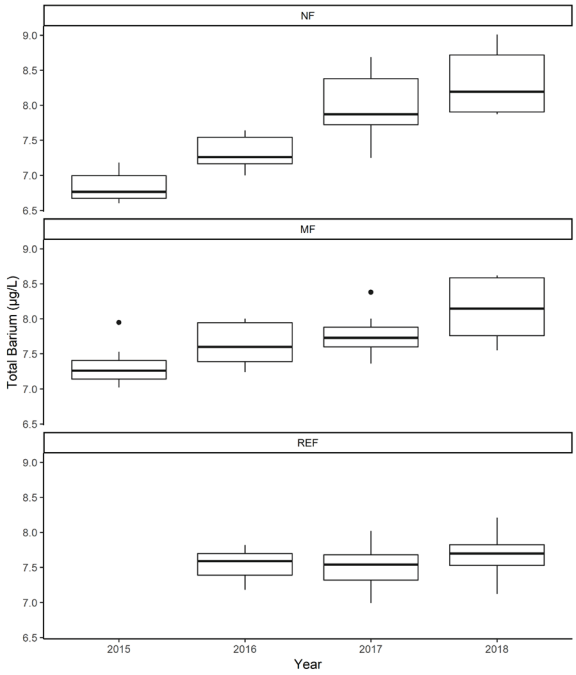
Figure 6G.2-1: Temporal box plots of key conventional parameters measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018 5

Figure 6G.2-2: Temporal box plots of key nutrient parameters measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018 6

Figure 6G2-3: Temporal box plots of key major ion parameters measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018 7


NF
MF
REF
Total Aluminum (µg/L)
0
10
20
30
40
2015
2016
2017
2018
Year


NF
MF
REF
Total Arsenic (µg/L)
0.2
0.3
0.4
0.5
2015
2016
2017
2018
Year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MF
REF
Total Barium (µg/L)
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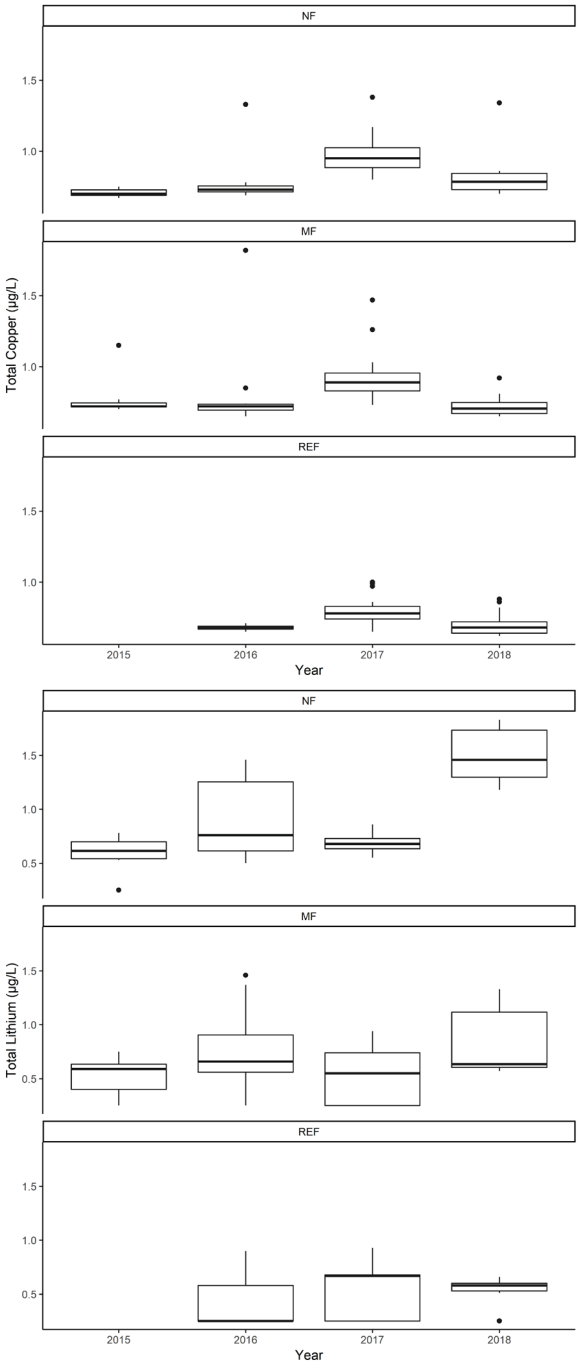
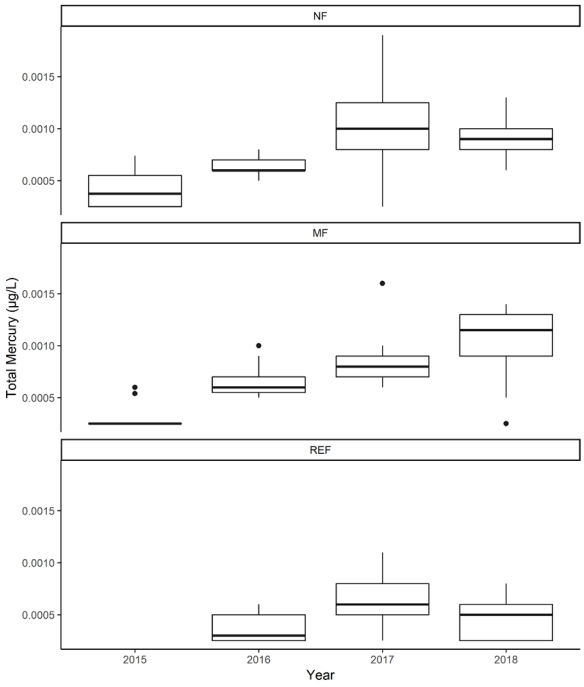
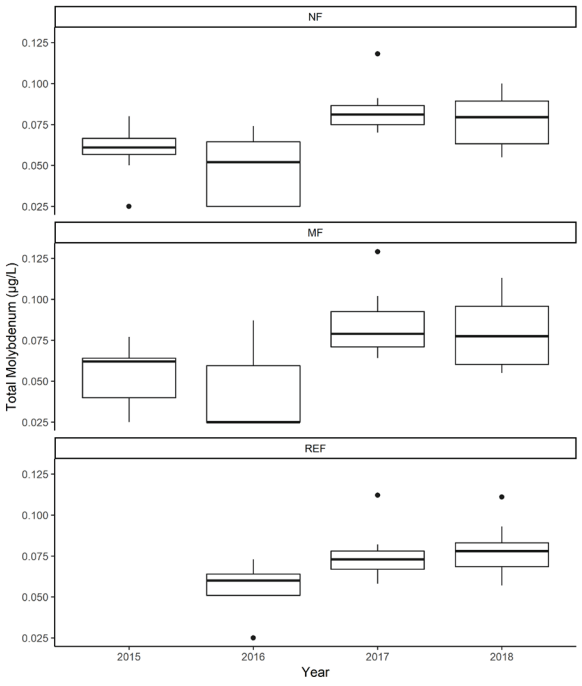
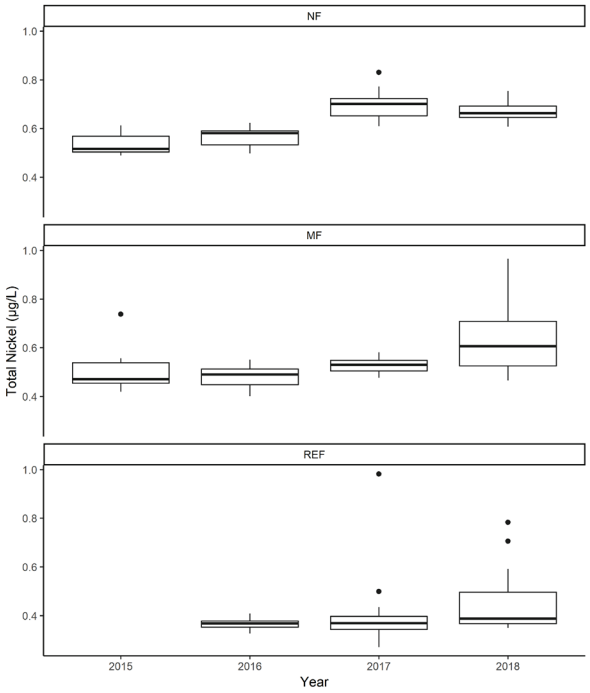
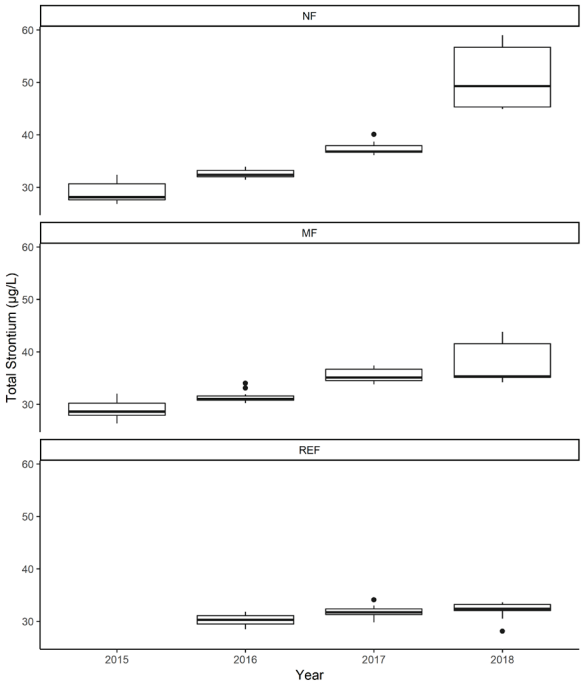
7.0
7.5
8.0
8.5
9.0
2015
2016
2017
2018
Year

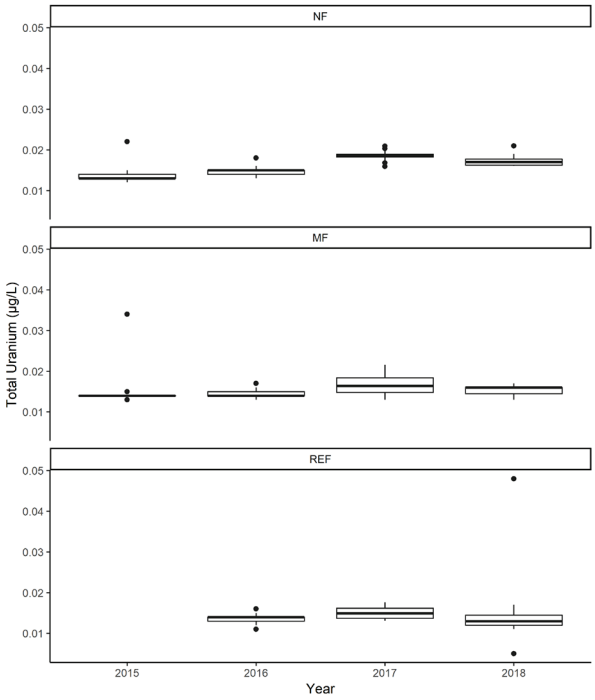

NF
MF
REF
Total Copper (µg/L)
1.5
1.0
2015
2016
2017
2018
Year
NF
MF
REF
Total Lithium (µg/L)
1.5
1.0
0.5
2015
2016
2017
2018
Year


NF
MF
REF
Total Mercury (µg/L)
0.0015
0.0010
0.0005
2015
2016
2017
2018
Year


NF
MF
REF
Total Molybdenum (µg/L)
0.125
0.100
0.075
0.050
0.025
2015
2016
2017
2018
Year


NF
MF
REF
Total Nickel (µg/L)
1.0
0.8
0.6
0.4
2015
2016
2017
2018
Year

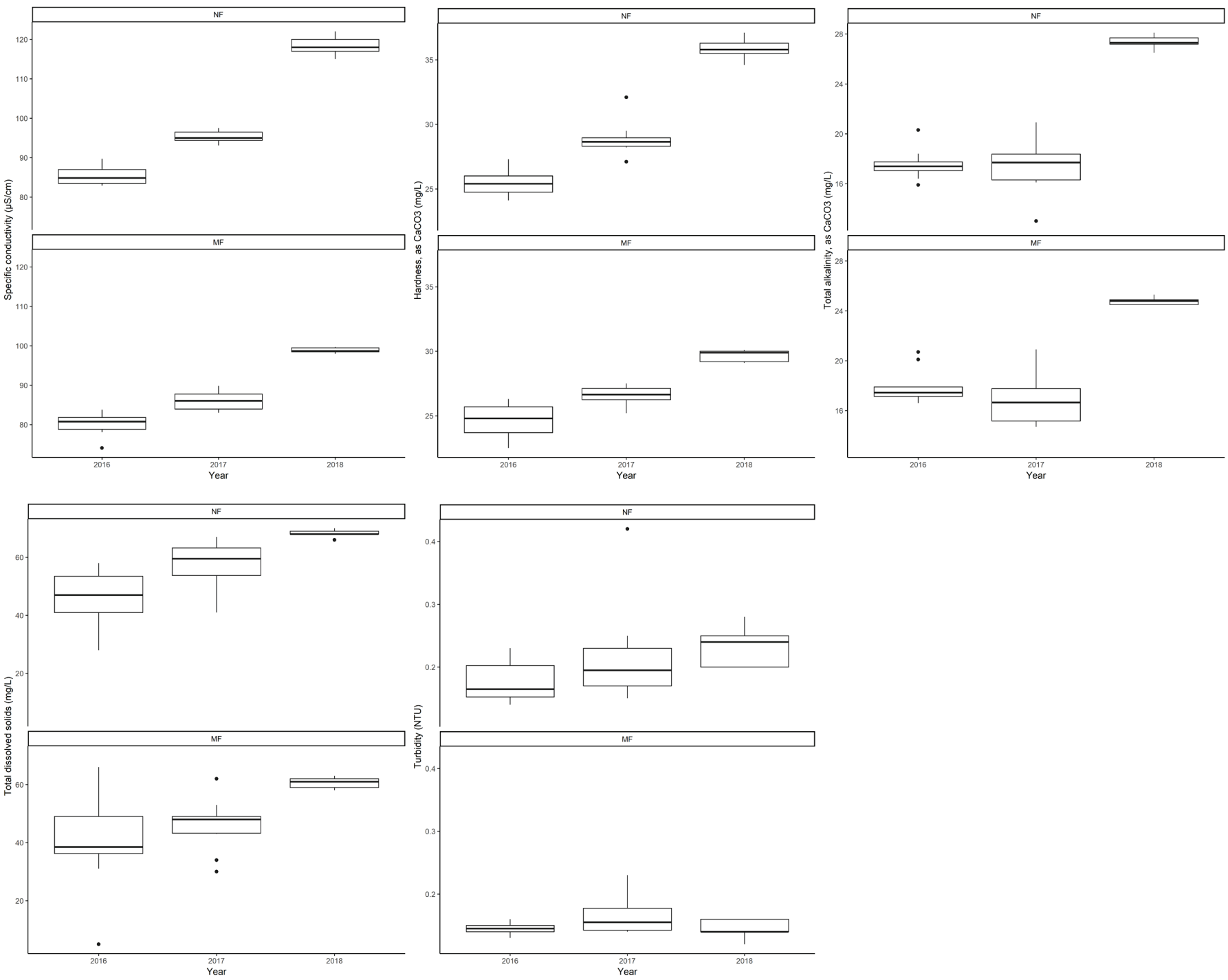

NF
MF
REF
Total Strontium (µg/L)
60
50
40
30
2015
2016
2017
2018
Year



.....8

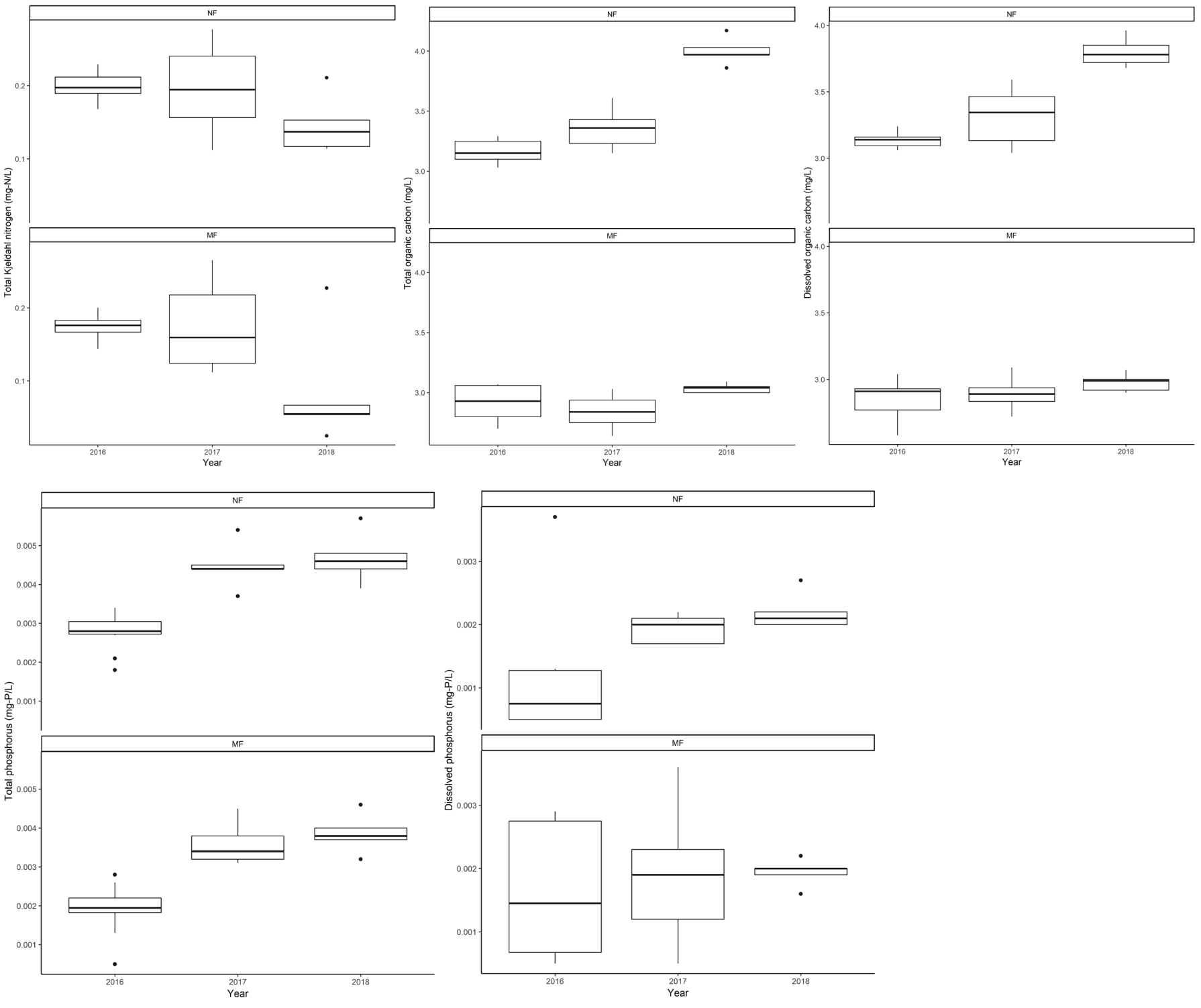
Figure 6G.2-4: Temporal box plots of key total metals measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018.....9

1.0 ICE-COVER SEASON BOX PLOTS



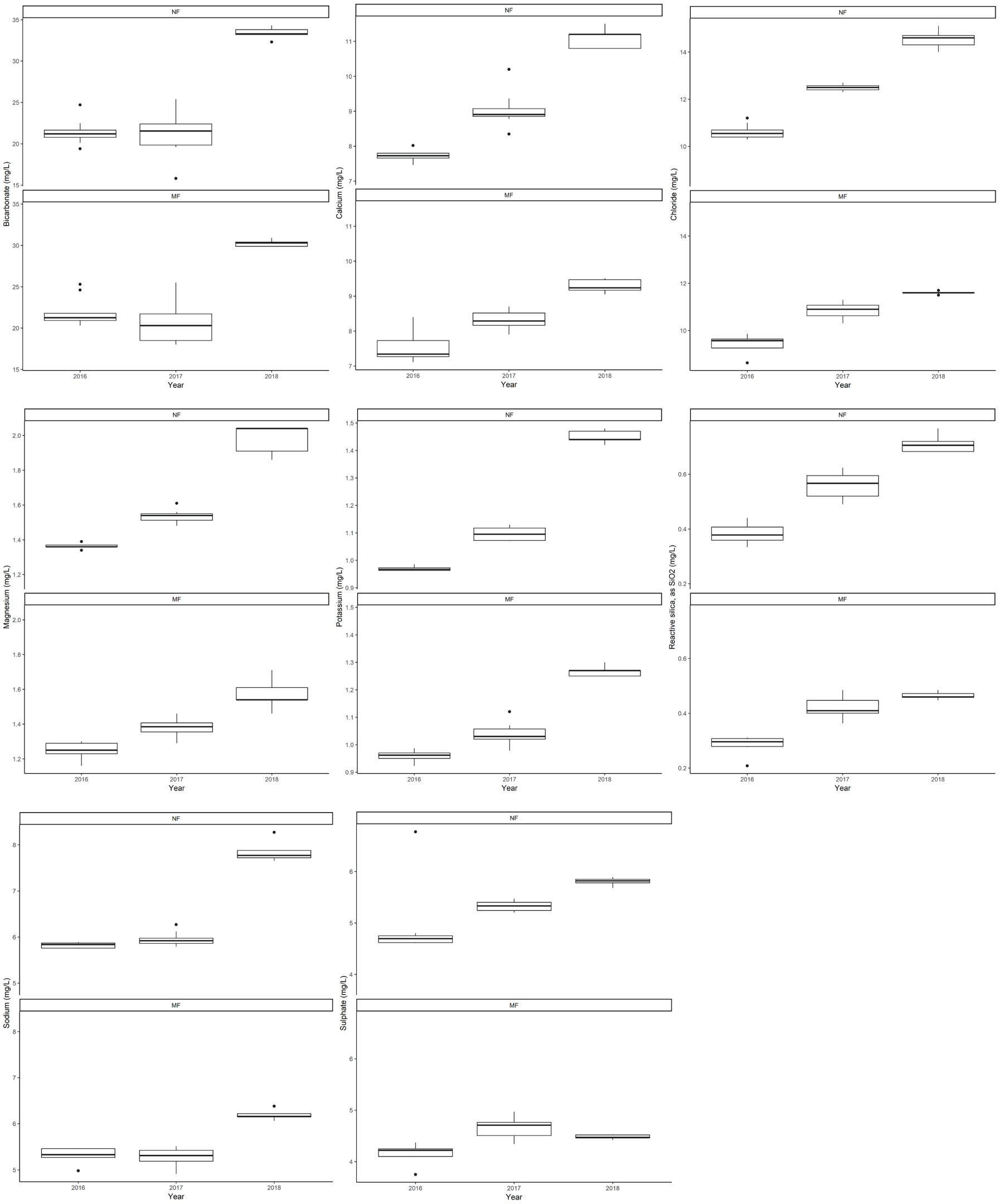
NF = near-field; MF = mid-field; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; µS/cm = microSiemens per centimetre.

Figure 6G.1-1: Temporal box plots of key conventional parameters measured in the Near-field and Mid-field areas during ice-covered conditions, 2016 to 2018



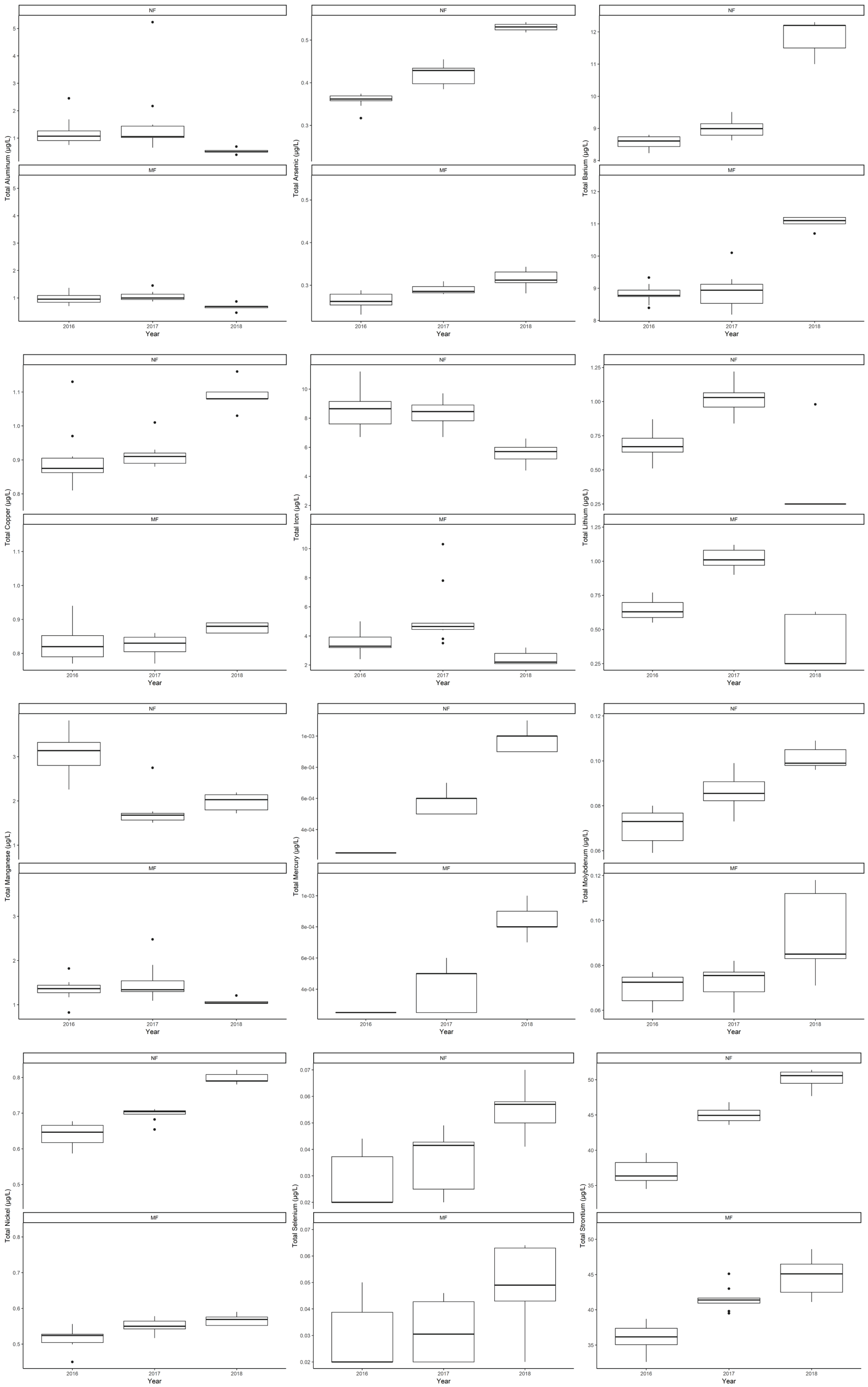
NF = near-field; MF = mid-field; mg/L = milligrams per litre.

Figure 6G.1-2: Temporal box plots of key nutrient parameters measured in the Near-field and Mid-field areas during ice-covered conditions, 2016 to 2018.



NF = near-field; MF = mid-field; mg/L = milligrams per litre.

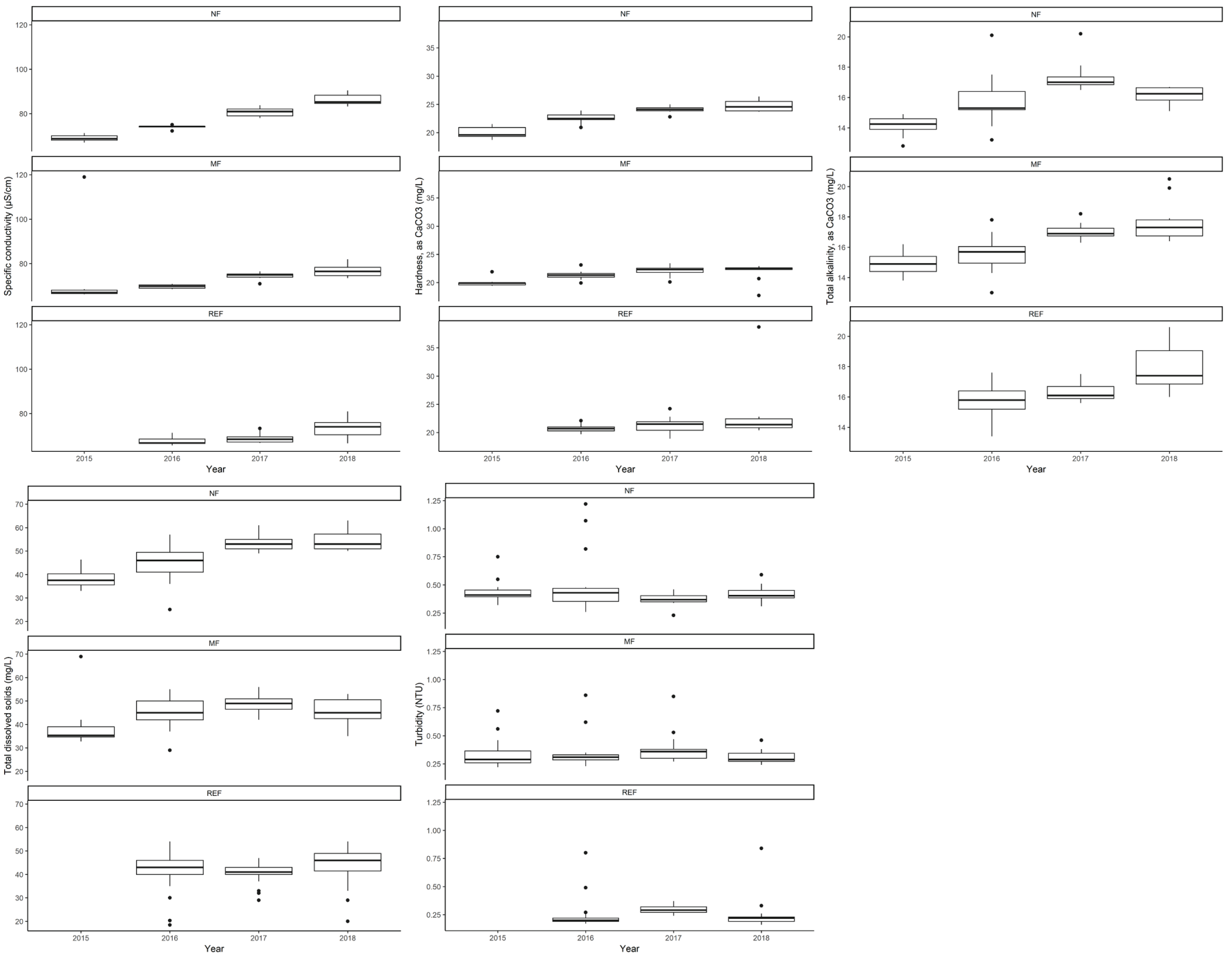
Figure 6G.1-3: Temporal box plots of key major ion parameters measured in the Near-field and Mid-field areas during ice-covered conditions, 2016 to 2018



NF = near-field; MF = mid-field; REF = pooled reference area; µg/L = micrograms per litre.

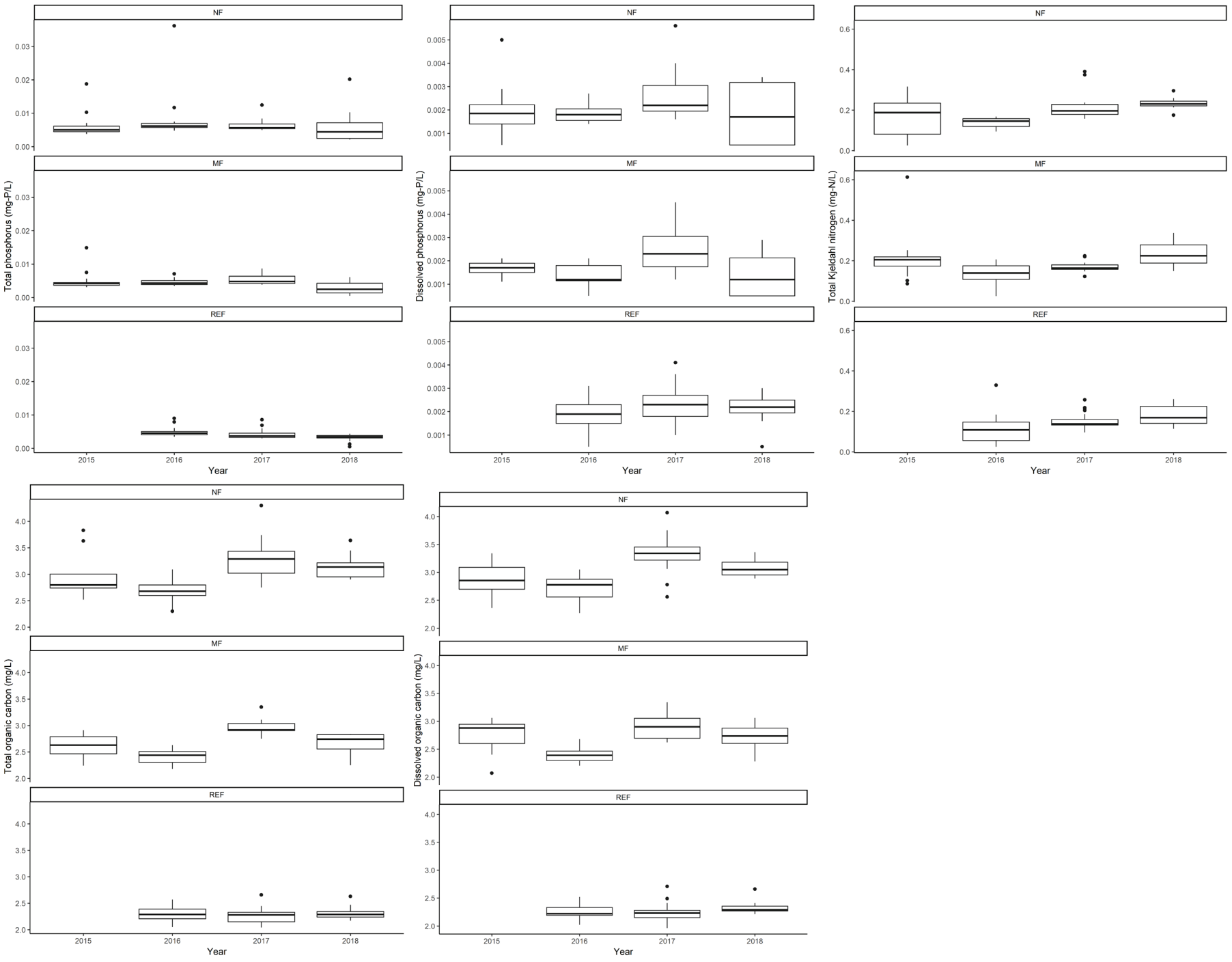
Figure 6G.1-4: Temporal box plots of key total metal parameters measured in the Near-field and Mid-field areas during ice-covered conditions, 2016 to 2018

2.0 OPEN-WATER SEASON BOX PLOTS



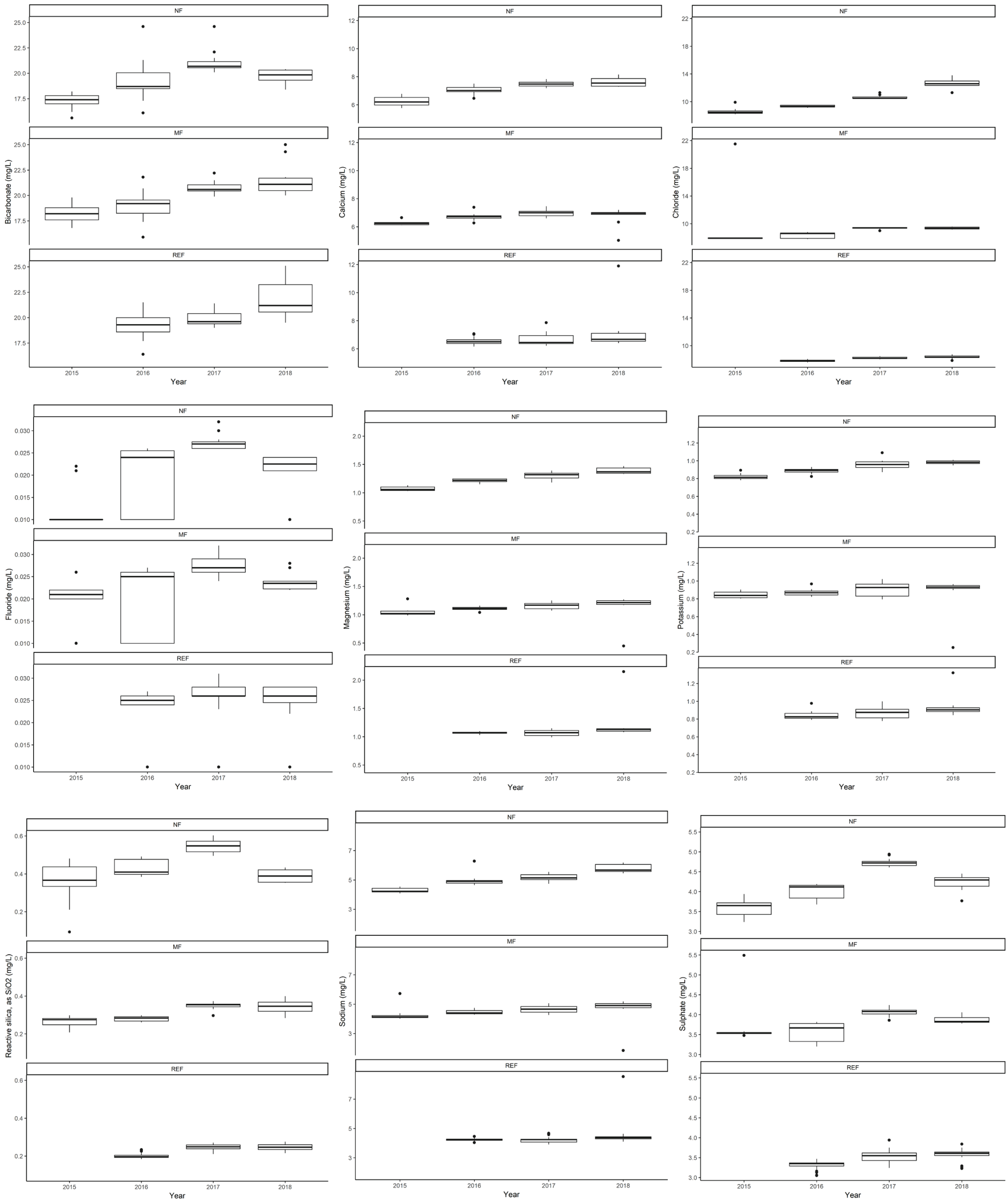
NF = near-field; MF = mid-field; REF = pooled reference area; mg/L = milligrams per litre; NTU = nephelometric turbidity unit; µS/cm = microSiemens per centimetre.

Figure 6G.2-1: Temporal box plots of key conventional parameters measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018



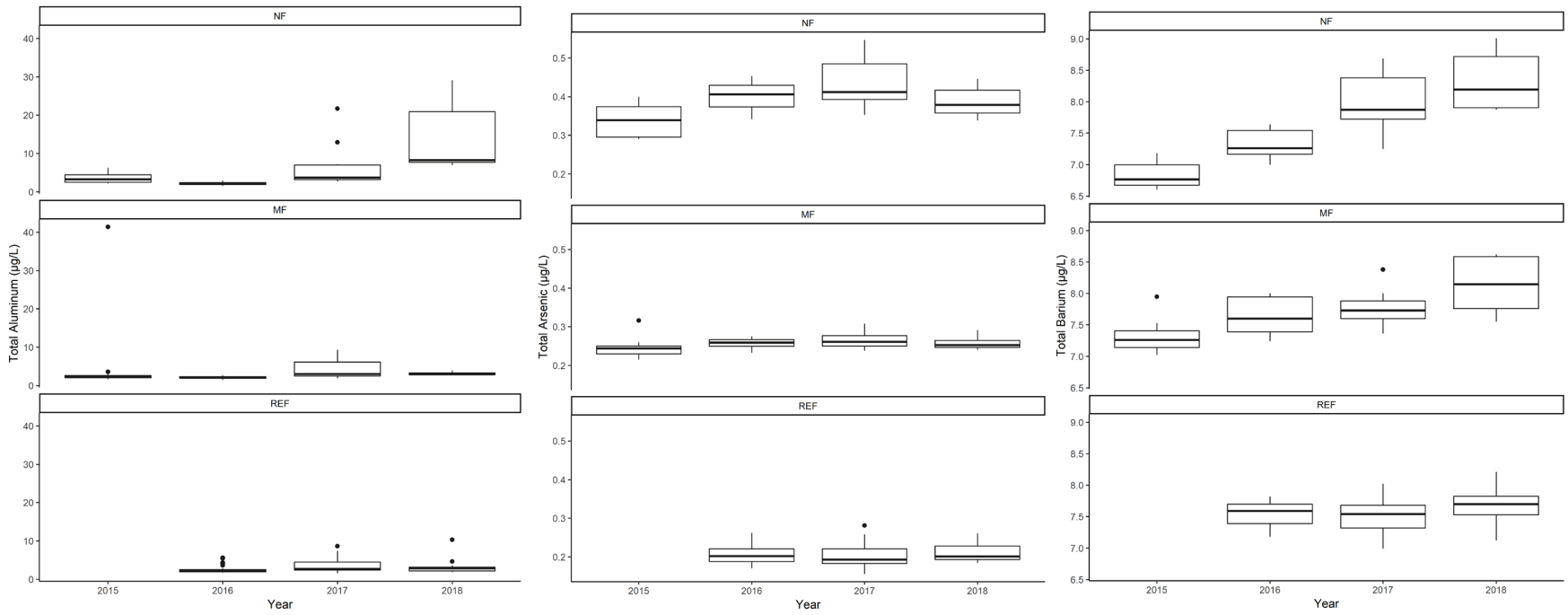
NF = near-field; MF = mid-field; REF = pooled reference area; mg/L = milligrams per litre.

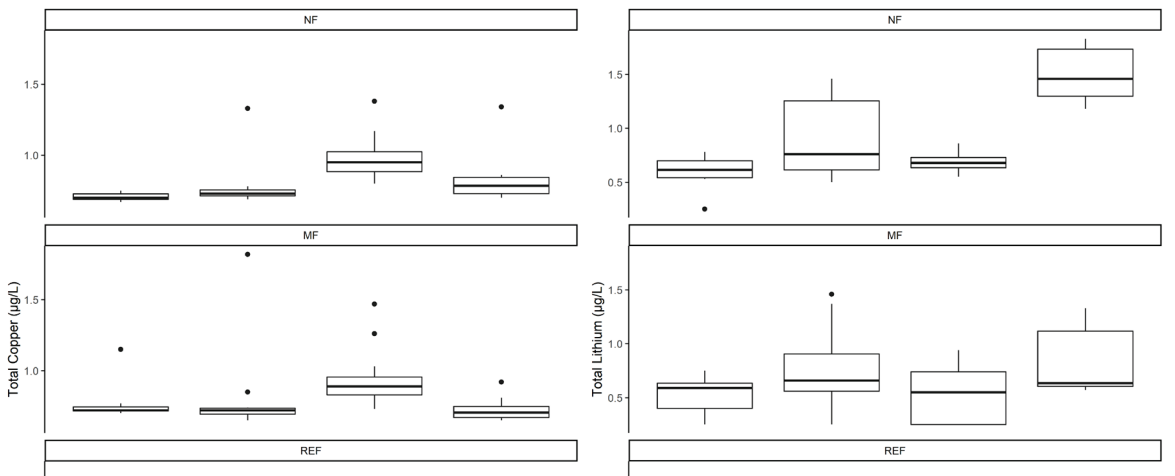
Figure 6G.2-2: Temporal box plots of key nutrient parameters measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018

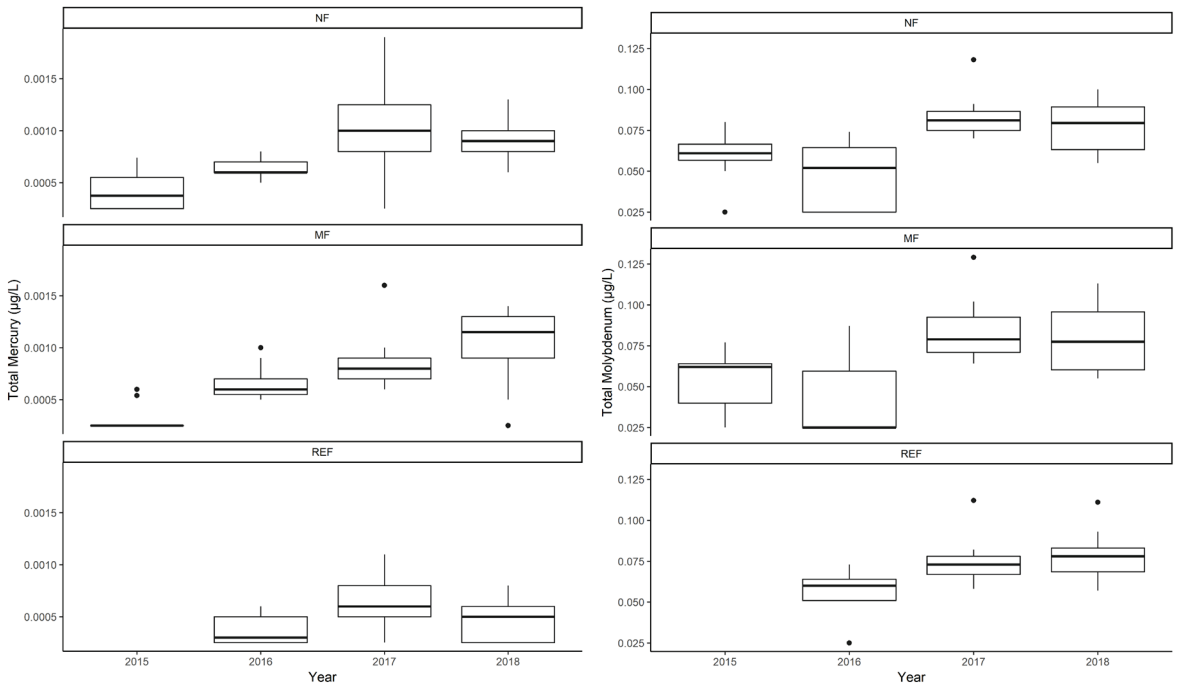


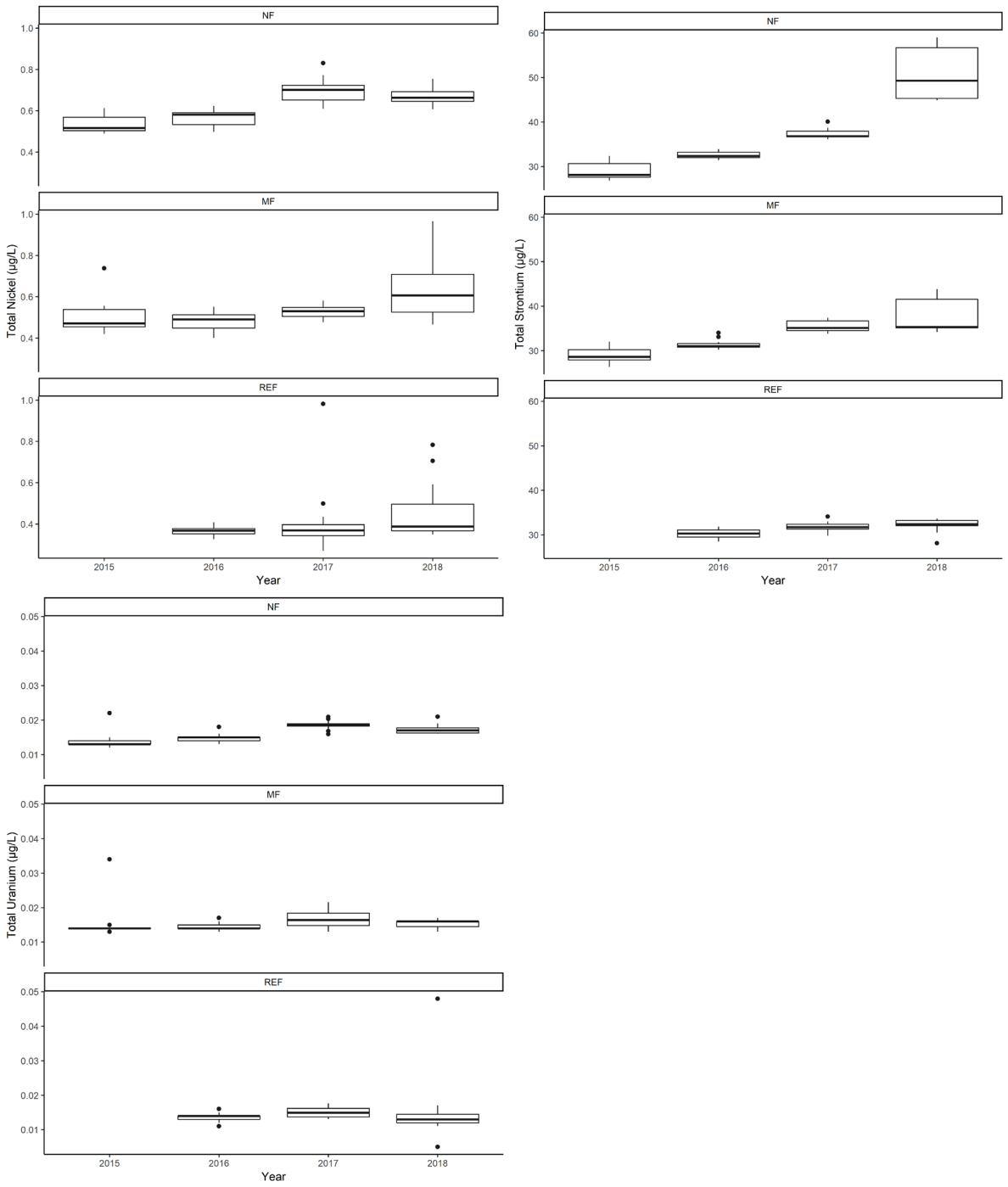
NF = near-field; MF = mid-field; REF = pooled reference area; mg/L = milligrams per litre.

Figure 6G2-3: Temporal box plots of key major ion parameters measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018


NF
MF
REF
Total Aluminum (µg/L)
Total Arsenic (µg/L)
Total Barium (µg/L)
Year
2015
2016
2017
2018


NF
MF
REF
Total Copper (µg/L)
Total Lithium (µg/L)
Year
2015
2016
2017
2018


NF
MF
REF
Total Mercury (µg/L)
Total Molybdenum (µg/L)
Year
2015
2016
2017
2018



Note: total arsenic and total boron box-plots are not provided in this appendix because temporal trends in the Near-field area were variable (see Appendix 6F for temporal plots).

NF = near-field; MF = mid-field; REF = pooled reference area; µg/L = micrograms per litre.

Figure 6G.2-4: Temporal box plots of key total metals measured in the Near-field, Mid-field and Reference Areas during open-water conditions, 2015 to 2018

APPENDIX 6H

Historical Summary Statistics for the Near-field

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Table 6H-1: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2015

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2015						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Field Measured													
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.3	7.0	7.5	0.15	0	13
Specific conductivity	µS/cm	-	-	-	-	-	67	66	64	68	1.8	0	12
Temperature	°C	-	-	-	15	-	9	10	6.2	13	2.6	0	14
Dissolved oxygen	mg/L	-	6.5	-	-	-	11	11	9.6	13	1.2	0	14
Dissolved oxygen	%	-	-	-	-	-	95	98	83	117	12	0	14
Conventional Parameters													
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.4	7.3	7.3	7.4	0.03	0	14
Specific conductivity	µS/cm	-	-	-	-	-	69	69	67	71	1.2	0	14
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	20	20	19	22	0.9	0	14
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	14	14	13	15	0.6	0	14
Total dissolved solids	mg/L	-	-	-	500	-	38	38	33	46	3.6	0	14
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	33	33	32	34	0.8	0	14
Total suspended solids	mg/L	-	-	-	-	-	<5.0	-	<5.0	<5.0	-	14	14
Total organic carbon	mg/L	-	-	-	-	-	2.8	2.9	2.5	3.8	0.36	0	14
Dissolved organic carbon	mg/L	-	-	-	-	-	2.9	2.9	2.4	3.3	0.28	0	14
Turbidity	NTU	-	-	-	-	-	0.41	0.44	0.32	0.8	0.11	0	14
Major Ions													
Bicarbonate	mg/L	-	-	-	-	-	17	17	16	18	0.7	0	14
Calcium	mg/L	-	-	-	-	-	6.2	6.2	5.8	6.8	0.33	0	14
Carbonate	mg/L	-	-	-	-	-	<5.0	-	<5.0	<5.0	-	14	14
Chloride	mg/L	640	120	-	250	-	8.5	8.6	8.2	9.9	0.43	0	14
Fluoride	mg/L	-	0.12	1.5	-	2.8	<0.02	-	<0.02	0.022	-	11	14
Magnesium	mg/L	-	-	-	-	-	1.1	1.1	1.0	1.1	0.036	0	14
Potassium	mg/L	-	-	-	-	-	0.81	0.82	0.78	0.89	0.031	0	14
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.37	0.36	0.093	0.48	0.106	0	14
Sodium	mg/L	-	-	-	200	-	4.2	4.3	4.1	4.5	0.16	0	14
Sulphate	mg/L	-	-	-	500	-	3.7	3.6	3.2	3.9	0.21	0	14
Nutrients													
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	-	<0.005	<0.0050	-	14	14
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	-	<0.001	<0.001	-	14	14
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	-	<0.0051	<0.0051	-	14	14
Total ammonia	mg-N/L	-	2.4 - 12[(a)]	-	-	-	<0.005	-	<0.005	0.019	-	8	14
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.19	0.16	<0.05	0.32	0.094	2	14
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.19	0.16	<0.05	0.32	0.094	2	14
Total nitrogen	mg-N/L	-	-	-	-	-	-	-	-	-	-	0	0
Total phosphorus	mg-P/L	-	-	-	-	-	0.0051	0.0064	0.0038	0.019	0.0039	0	14
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0019	0.0020	<0.001	0.0050	0.00107	1	14
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	-	<0.001	0.0020	-	8	14

Table 6H-1: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2015

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2015						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Total Metals													
Aluminum	µg/L	-	100[b, c]	-	-	-	3.3	3.6	2.1	6.3	1.3	0	14
Antimony	µg/L	-	-	6.0	-	-	<0.02	-	<0.02	0.11	-	12	14
Arsenic	µg/L	-	5.0	10	-	25	0.34	0.34	0.29	0.40	0.040	0	14
Barium	µg/L	-	-	1,000	-	-	6.8	6.8	6.6	7.2	0.19	0	14
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	14	14
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	14	14
Boron	µg/L	29,000	1,500	5,000	-	-	4.8	4.7	3.3	6.1	1.1	0	14
Cadmium	µg/L	0.38 to 0.44[d]	0.039 to 0.044[d]	5.0	-	-	<0.005	-	<0.005	<0.005	-	14	14
Chromium	µg/L	-	1.0	50[e]	-	-	<0.06	-	<0.06	<0.06	-	14	14
Cobalt	µg/L	-	-	-	-	-	0.020	0.021	0.016	0.033	0.0043	0	14
Copper	µg/L	-	2.0[d]	-	1,000	-	0.70	0.71	0.67	0.75	0.025	0	14
Iron	µg/L	-	300	-	300	1,060	21	20	15	25	2.6	0	14
Lead	µg/L	-	1.0[d]	10	-	-	<0.01	-	<0.01	0.014	-	10	14
Lithium	µg/L	-	-	-	-	-	0.62	0.57	<0.5	0.78	0.19	3	14
Manganese	µg/L	-	-	-	50	-	4.4	5.6	3.8	8.4	2.1	0	14
Mercury	µg/L	-	0.026	1.0	-	-	0.00050	-	<0.0005	0.00074	-	7	14
Molybdenum	µg/L	-	73	-	-	-	0.061	0.060	<0.05	0.080	0.013	1	14
Nickel	µg/L	-	25[d]	-	-	-	0.52	0.53	0.49	0.61	0.041	0	14
Selenium	µg/L	-	1.0	50	-	-	<0.04	-	<0.04	0.048	-	12	14
Silver	µg/L	-	0.25	-	-	-	<0.005	-	<0.005	0.0071	-	13	14
Strontium	µg/L	-	-	-	-	-	28	29	27	32	2.0	0	14
Thallium	µg/L	-	0.80	-	-	-	<0.005	-	<0.005	0.0068	-	13	14
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	14	14
Titanium	µg/L	-	-	-	-	-	0.13	0.13	<0.1	0.25	0.078	5	14
Uranium	µg/L	33	15	20	-	-	0.013	0.014	0.012	0.022	0.0024	0	14
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	14	14
Zinc	µg/L	-	-	-	5,000	-	<0.8	-	<0.8	0.81	-	13	14
Dissolved Metals													
Aluminum	µg/L	-	-	-	-	-	1.0	1.4	0.48	4	1.0	0	13
Antimony	µg/L	-	-	-	-	-	<0.02	-	<0.02	0.16	-	10	14
Arsenic	µg/L	-	-	-	-	-	0.31	0.31	0.26	0.37	0.038	0	14
Barium	µg/L	-	-	-	-	-	6.9	6.9	6.5	7.2	0.20	0	14
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	14	14
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	14	14
Boron	µg/L	-	-	-	-	-	5.5	5.2	3.4	7.0	1.4	0	14
Cadmium	µg/L	-	-	-	-	-	<0.005	-	<0.005	0.0084	-	13	14
Chromium	µg/L	-	-	-	-	-	<0.06	-	<0.06	<0.06	-	14	14
Cobalt	µg/L	-	-	-	-	-	<0.01	-	<0.01	0.025	-	8	14
Copper	µg/L	-	-	-	-	-	0.67	0.83	0.55	2.6	0.54	0	13

Table 6H-1: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2015

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2015						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Dissolved Metals (cont'd)													
Iron	µg/L	-	-	-	-	-	5.7	5.9	2.6	8.3	1.5	0	14
Lead	µg/L	-	-	-	-	-	<0.01	-	<0.01	0.16	-	8	14
Lithium	µg/L	-	-	-	-	-	0.61	0.61	<0.5	1.1	0.20	2	14
Manganese	µg/L	-	-	-	-	-	0.88	1.8	0.44	4.3	1.5	0	14
Mercury	µg/L	-	-	-	-	-	<0.0005	-	<0.0005	0.0005	-	13	14
Molybdenum	µg/L	-	-	-	-	-	0.066	0.069	<0.05	0.15	0.027	1	14
Nickel	µg/L	-	-	-	-	-	0.52	0.53	0.46	0.6	0.04	0	13
Selenium	µg/L	-	-	-	-	-	<0.04	-	<0.04	<0.040	-	14	14
Silver	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	14	14
Strontium	µg/L	-	-	-	-	-	28	29	27	31	1.6	0	14
Thallium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	14	14
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	3.1	-	11	14
Titanium	µg/L	-	-	-	-	-	<0.1	-	<0.1	0.20	-	11	14
Uranium	µg/L	-	-	-	-	-	0.012	0.011	<0.01	0.014	0.0029	2	14
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	14	14
Zinc	µg/L	25 to 29[f]	7.1 to 11[g]	-	-	-	<0.8	-	<0.8	17	-	9	14
Other													
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.002	-	<0.002	<0.0020	-	14	14
Cyanide (free)	mg/L	-	-	-	-	-	<0.005	-	<0.001	<0.0050	-	14	14
Cyanide (wad)	mg/L	-	-	-	-	-	<0.002	-	<0.001	<0.0050	-	14	14
Radium-226	Bq/L	-	-	-	-	-	-	-	-	-	-	0	0

(a) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (2.3699 mg-N/L) is based on the combination of field pH (7.5) and water temperature (12.8°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) = guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.0 to 7.5). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(d) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (18.7 to 21.5 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (18.7 to 21.5 mg/L as $CaCO_3$) and DOC (2.3 to 3.3 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.0 to 7.5), hardness (18.7 to 21.5 mg/L as $CaCO_3$) and DOC (2.3 to 3.3 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines that fell outside of the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

In cases where 50% or more of data were <DL, no mean or standard deviation was calculated.

Half of the detection limit value was used for total Kjeldahl nitrogen to calculate total nitrogen concentrations.

Grey shaded concentrations are higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units;
mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; Bq/L = Becquerel per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; - = no guideline or data not measured.

Reference:

CCME. 2018. Canadian Water Quality Guideline for the Protection of Aquatic Life: Zinc (Dissolved) 2018 Fact Sheet. Canadian Council of Ministers of the Environment. Gatineau, QC.

Table 6H-2: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2016

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2016						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Field Measured													
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.6	7.7	7.5	8.1	0.26	0	15
Specific conductivity	µS/cm	-	-	-	-	-	72	72	70	73	1.0	0	15
Temperature	°C	-	-	-	15	-	13	12	9.4	14	1.9	0	15
Dissolved oxygen	mg/L	-	6.5	-	-	-	10	10	7.4	12	1.3	0	15
Dissolved oxygen	%	-	-	-	-	-	97	92	71	106	11	0	15
Conventional Parameters													
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.4	7.2	7.7	0.22	0	15
Specific conductivity	µS/cm	-	-	-	-	-	74	74	72	75	0.6	0	15
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	23	23	21	24	0.8	0	15
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	15	16	13	20	1.6	0	15
Total dissolved solids	mg/L	-	-	-	500	-	46	45	25	57	8.4	0	15
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	37	37	36	40	1.2	0	15
Total suspended solids	mg/L	-	-	-	-	-	<1.0	-	<1.0	2.9	-	14	15
Total organic carbon	mg/L	-	-	-	-	-	2.7	2.7	2.3	3.1	0.21	0	15
Dissolved organic carbon	mg/L	-	-	-	-	-	2.8	2.7	2.3	3.1	0.25	0	14
Turbidity	NTU	-	-	-	-	-	0.43	0.51	0.26	1.2	0.29	0	15
Major Ions													
Bicarbonate	mg/L	-	-	-	-	-	18	18	16	25	1.8	0	29
Calcium	mg/L	-	-	-	-	-	6.7	6.6	5.8	7.5	0.51	0	29
Carbonate	mg/L	-	-	-	-	-	<5.0	-	<5.0	<5.0	-	29	29
Chloride	mg/L	640	120	-	250	-	9.2	9.0	8.2	9.9	0.49	0	29
Fluoride	mg/L	-	0.12	1.5	-	2.8	<0.02	-	<0.02	0.026	-	17	29
Magnesium	mg/L	-	-	-	-	-	1.2	1.1	1.0	1.3	0.081	0	29
Potassium	mg/L	-	-	-	-	-	0.85	0.85	0.78	0.93	0.044	0	29
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.40	0.39	0.093	0.49	0.085	0	29
Sodium	mg/L	-	-	-	200	-	4.7	4.6	4.1	6.3	0.45	0	29
Sulphate	mg/L	-	-	-	500	-	3.8	3.8	3.2	4.2	0.29	0	29
Nutrients													
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	-	<0.005	0.0087	-	28	29
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	-	<0.001	<0.001	-	29	29
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	-	<0.0051	0.0087	-	28	29
Total ammonia	mg-N/L	-	0.66 to 12[(a)]	-	-	-	<0.005	-	<0.005	0.019	-	22	29
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.15	0.15	<0.05	0.32	0.068	2	29
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.15	0.15	<0.05	0.32	0.068	2	29
Total nitrogen	mg-N/L	-	-	-	-	-	0.15	0.14	0.094	0.17	0.026	0	15
Total phosphorus	mg-P/L	-	-	-	-	-	0.0059	0.0075	0.0038	0.036	0.0062	0	29
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0018	0.0019	<0.001	0.0050	0.00079	1	29
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	-	<0.001	0.0020	-	21	29

Table 6H-2: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2016

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2016						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Total Metals													
Aluminum	µg/L	-	100[b, c]	-	-	-	2.3	2.2	1.7	<3.0	0.4	1	15
Antimony	µg/L	-	-	6.0	-	-	<0.02	-	<0.02	<0.10	-	15	15
Arsenic	µg/L	-	5.0	10	-	25	0.41	0.40	0.34	0.45	0.035	0	15
Barium	µg/L	-	-	1,000	-	-	7.3	7.3	7.0	7.6	0.23	0	15
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.1	-	15	15
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.05	-	15	15
Boron	µg/L	29,000	1,500	5,000	-	-	7.0	6.5	4.5	<10	1.2	1	15
Cadmium	µg/L	0.38 to 0.49[d]	0.039 to 0.048[d]	5.0	-	-	<0.005	-	<0.005	<0.005	-	15	15
Chromium	µg/L	-	1.0	50[e]	-	-	<0.06	-	<0.06	<0.1	-	15	15
Cobalt	µg/L	-	-	-	-	-	0.020	0.022	0.016	<0.1	0.0082	1	15
Copper	µg/L	-	2.0[d]	-	1,000	-	0.73	0.77	0.69	1.3	0.16	0	15
Iron	µg/L	-	300	-	300	1,060	20	22	16	35	5.2	0	15
Lead	µg/L	-	1.0[d]	10	-	-	<0.01	-	<0.01	<0.05	-	14	15
Lithium	µg/L	-	-	-	-	-	0.76	0.89	0.5	1.5	0.36	1	15
Manganese	µg/L	-	-	-	50	-	7.2	7.3	4.5	11	2.3	0	15
Mercury	µg/L	-	0.026	1.0	-	-	0.00060	0.00063	0.0005	0.00080	0.00008	0	15
Molybdenum	µg/L	-	73	-	-	-	0.052	0.048	<0.05	0.074	0.018	5	15
Nickel	µg/L	-	25[d]	-	-	-	0.58	0.57	0.50	0.62	0.037	0	15
Selenium	µg/L	-	1.0	50	-	-	<0.04	-	<0.04	<0.05	-	12	15
Silver	µg/L	-	0.25	-	-	-	<0.005	-	<0.005	<0.01	-	15	15
Strontium	µg/L	-	-	-	-	-	32	33	31	34	0.8	0	15
Thallium	µg/L	-	0.80	-	-	-	<0.005	-	<0.005	<0.01	-	15	15
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.1	-	15	15
Titanium	µg/L	-	-	-	-	-	<0.1	-	<0.1	<0.3	-	14	15
Uranium	µg/L	33	15	20	-	-	0.015	0.015	0.013	0.018	0.0012	0	15
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.5	-	15	15
Zinc	µg/L	-	-	-	5,000	-	<0.8	-	<0.8	<3.0	-	14	15
Dissolved Metals													
Aluminum	µg/L	-	-	-	-	-	1.1	1.5	0.75	4	0.8	0	13
Antimony	µg/L	-	-	-	-	-	<0.02	-	<0.02	0.02	-	14	15
Arsenic	µg/L	-	-	-	-	-	0.37	0.37	0.32	0.44	0.035	0	15
Barium	µg/L	-	-	-	-	-	7.2	7.2	6.6	7.8	0.34	0	15
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	15	15
Bismuth	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	15	15
Boron	µg/L	-	-	-	-	-	6.3	6.1	4.5	8.0	1.0	0	15
Cadmium	µg/L	-	-	-	-	-	<0.005	-	<0.005	0.0080	-	13	15
Chromium	µg/L	-	-	-	-	-	0.07	0.0822	<0.06	0.23	0.064303077	7	15
Cobalt	µg/L	-	-	-	-	-	<0.01	-	<0.01	0.016	-	9	15
Copper	µg/L	-	-	-	-	-	0.79	0.80	0.69	1.1	0.13	0	8

Table 6H-2: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2016

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2016						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Dissolved Metals (cont'd)													
Iron	µg/L	-	-	-	-	-	6.0	6.5	3.9	9.4	1.8	0	15
Lead	µg/L	-	-	-	-	-	<0.01	-	<0.01	0.05	-	12	14
Lithium	µg/L	-	-	-	-	-	0.76	1.04	<0.5	2.7	0.73	2	15
Manganese	µg/L	-	-	-	-	-	0.95	1.0	0.46	1.8	0.4	0	15
Mercury	µg/L	-	-	-	-	-	0.0005	0.00077	<0.0005	0.0018	0.000592151	5	15
Molybdenum	µg/L	-	-	-	-	-	0.058	0.056	<0.05	0.08	0.018	3	15
Nickel	µg/L	-	-	-	-	-	0.56	0.57	0.53	0.6	0.03	0	14
Selenium	µg/L	-	-	-	-	-	<0.04	-	<0.04	0.044	-	14	15
Silver	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	15	15
Strontium	µg/L	-	-	-	-	-	32	32	31	33	0.9	0	15
Thallium	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	15	15
Tin	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.1	-	15	15
Titanium	µg/L	-	-	-	-	-	<0.1	-	<0.1	0.12	-	14	15
Uranium	µg/L	-	-	-	-	-	0.013	0.013	0.01	0.016	0.0012	0	15
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	-	15	15
Zinc	µg/L	27 to 31[(f)]	4.1 to 6.7[(g)]	-	-	-	<0.8	-	<0.8	10	-	9	14
Other													
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.002	-	<0.002	0.0023	-	14	15
Cyanide (free)	mg/L	-	-	-	-	-	<0.005	-	<0.001	<0.0050	-	15	15
Cyanide (wad)	mg/L	-	-	-	-	-	<0.001	-	<0.001	<0.0020	-	15	15
Radium-226	Bq/L	-	-	-	-	-	-	-	-	-	-	0	0

(a) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (2.3699 mg-N/L) is based on the combination of field pH (7.5) and water temperature (12.8°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.0 to 8.1). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(d) = guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (19 to 22 mg/L). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (20.9 to 23.9 mg/L as CaCO3) and DOC (2.3 to 3.3 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.5 to 8.1), hardness (20.9 to 23.9 mg/L as $CaCO_3$) and DOC (2.3 to 3.1 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines that fell outside of the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

In cases where 50% or more of data were <DL, no mean or standard deviation was calculated.

Half of the detection limit value was used for total Kjeldahl nitrogen to calculate total nitrogen concentrations.

Grey shaded concentrations are higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units;
mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; Bq/L = Becquerel per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; - = no guideline or data not measured.

Reference:

CCME. 2018. Canadian Water Quality Guideline for the Protection of Aquatic Life: Zinc (Dissolved) 2018 Fact Sheet. Canadian Council of Ministers of the Environment. Gatineau, QC.

Table 6H-3: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2017

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2017						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Field Measured													
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.6	7.5	7.3	7.6	0.13	0	15
Specific conductivity	µS/cm	-	-	-	-	-	82	81	80	82	0.91	0	15
Temperature	°C	-	-	-	15	-	13	12	9.4	13	1.8	0	15
Dissolved oxygen	mg/L	-	6.5	-	-	-	11	11	10	11	0.43	0	15
Dissolved oxygen	%	-	-	-	-	-	102	102	100	104	1.3	0	15
Conventional Parameters													
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.3	7.3	7.2	7.4	0.074	0	15
Specific conductivity	µS/cm	-	-	-	-	-	81	81	78	84	1.8	0	15
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	24	24	23	25	0.52	0	15
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	17	17	17	20	0.90	0	15
Total dissolved solids	mg/L	-	-	-	500	-	53	53	49	61	3.5	0	15
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	41	41	41	43	0.85	0	15
Total suspended solids	mg/L	-	-	-	-	-	1.1	1.4	<1.0	3.7	1.1	6	15
Total organic carbon	mg/L	-	-	-	-	-	3.3	3.3	2.8	4.3	0.39	0	15
Dissolved organic carbon	mg/L	-	-	-	-	-	3.3	3.3	2.6	4.1	0.36	0	15
Turbidity	NTU	-	-	-	-	-	0.37	0.38	0.23	0.46	0.053	0	15
Major Ions													
Bicarbonate	mg/L	-	-	-	-	-	21	21	20	25	1.1	0	15
Calcium	mg/L	-	-	-	-	-	7.5	7.5	7.2	7.8	0.18	0	15
Carbonate	mg/L	-	-	-	-	-	<5.0	-	<5.0	<5.0	-	15	15
Chloride	mg/L	640	120	-	250	-	11	11	10	11	0.25	0	15
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.027	0.027	0.026	0.032	0.0017	0	15
Magnesium	mg/L	-	-	-	-	-	1.3	1.3	1.2	1.4	0.058	0	15
Potassium	mg/L	-	-	-	-	-	0.96	0.97	0.87	1.1	0.062	0	15
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.55	0.55	0.50	0.60	0.035	0	15
Sodium	mg/L	-	-	-	200	-	5.1	5.2	4.7	5.6	0.21	0	15
Sulphate	mg/L	-	-	-	500	-	4.7	4.7	4.6	4.9	0.099	0	15
Nutrients													
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	-	<0.005	0.073	-	10	15
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	-	<0.001	<0.001	-	15	15
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	-	<0.0051	0.073	-	10	15
Total ammonia	mg-N/L	-	1.5 to 3.4[(a)]	-	-	-	<0.005	-	<0.005	0.011	-	10	15
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.20	0.22	0.16	0.39	0.070	0	15
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.22	0.24	0.16	0.40	0.077	0	15
Total nitrogen	mg-N/L	-	-	-	-	-	0.22	0.24	0.16	0.40	0.077	0	15
Total phosphorus	mg-P/L	-	-	-	-	-	0.0057	0.0065	0.0050	0.013	0.0020	0	15
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0022	0.0026	0.0016	0.0056	0.0011	0	15
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	-	<0.001	0.0012	-	11	15

Table 6H-3: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2017

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2017						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Total Metals													
Aluminum	µg/L	-	100[b, c]	-	-	-	3.7	6.0	2.7	22	5.1	0	15
Antimony	µg/L	-	-	6.0	-	-	<0.02	-	<0.02	0.054	-	14	15
Arsenic	µg/L	-	5.0	10	-	25	0.41	0.43	0.35	0.55	0.055	0	15
Barium	µg/L	-	-	1,000	-	-	7.9	7.9	7.3	8.7	0.46	0	15
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	15	15
Bismuth	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	15	15
Boron	µg/L	29,000	1,500	5,000	-	-	<5.0	-	<5.0	5.4	-	14	15
Cadmium	µg/L	0.47 to 0.51[d]	0.046 to 0.050[d]	5.0	-	-	<0.005	-	<0.005	0.0082	-	13	15
Chromium	µg/L	-	1.0	50[e]	-	-	<0.1	-	<0.1	<0.1	-	15	15
Cobalt	µg/L	-	-	-	-	-	0.022	0.023	0.015	0.044	0.0072	0	15
Copper	µg/L	-	2.0[d]	-	1,000	-	0.95	0.98	0.80	1.4	0.15	0	15
Iron	µg/L	-	300	-	300	1,060	26	25	18	45	6.8	0	15
Lead	µg/L	-	1.0[d]	10	-	-	0.011	0.094	<0.01	0.90	0.23	6	15
Lithium	µg/L	-	-	-	-	-	0.68	0.70	0.55	0.86	0.091	0	15
Manganese	µg/L	-	-	-	50	-	5.5	5.8	4.8	7.3	0.92	0	15
Mercury	µg/L	-	0.026	1.0	-	-	0.0010	0.0010	<0.0005	0.0019	0.00042	1	15
Molybdenum	µg/L	-	73	-	-	-	0.081	0.083	0.070	0.12	0.012	0	15
Nickel	µg/L	-	25[d]	-	-	-	0.70	0.70	0.61	0.83	0.061	0	15
Selenium	µg/L	-	1.0	50	-	-	<0.04	-	<0.04	0.044	-	13	15
Silver	µg/L	-	0.25	-	-	-	<0.005	-	<0.005	<0.005	-	15	15
Strontium	µg/L	-	-	-	-	-	37	37	36	40	1.1	0	15
Thallium	µg/L	-	0.80	-	-	-	<0.002	-	<0.002	0.0021	-	14	15
Tin	µg/L	-	-	-	-	-	<0.02	-	<0.02	0.052	-	12	15
Titanium	µg/L	-	-	-	-	-	<0.5	-	<0.5	0.81	-	14	15
Uranium	µg/L	33	15	20	-	-	0.019	0.019	0.016	0.021	0.0013	0	15
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	0.11	-	14	15
Zinc	µg/L	-	-	-	5,000	-	1.9	3.3	0.62	9.5	2.9	0	15
Dissolved Metals													
Aluminum	µg/L	-	-	-	-	-	1.7	2.7	0.88	15	3.6	0	15
Antimony	µg/L	-	-	-	-	-	<0.02	-	<0.02	0.048	-	13	15
Arsenic	µg/L	-	-	-	-	-	0.41	0.39	0.30	0.48	0.056	0	15
Barium	µg/L	-	-	-	-	-	7.5	7.5	7.0	7.9	0.22	0	15
Beryllium	µg/L	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	15	15
Bismuth	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	15	15
Boron	µg/L	-	-	-	-	-	<10	-	<10	<10	-	15	15
Cadmium	µg/L	-	-	-	-	-	<0.005	-	<0.005	0.0086	-	13	15
Chromium	µg/L	-	-	-	-	-	<0.1	-	<0.1	0.16	-	13	15
Cobalt	µg/L	-	-	-	-	-	0.012	0.019	<0.005	0.054	0.015	2	15
Copper	µg/L	-	-	-	-	-	1.1	1.1	0.81	1.5	0.22	0	15

Table 6H-3: Water Quality Summary during Open-water Conditions in the Near-Field Area, 2017

Parameter	Unit	Water Quality Guidelines					Summary						
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	2017						
		Acute	Chronic				Median	Mean	Min	Max	Standard Deviation	nd	Count
Dissolved Metals (cont'd)													
Iron	µg/L	-	-	-	-	-	7.4	7.2	4.1	12	2.1	0	15
Lead	µg/L	-	-	-	-	-	0.014	0.052	0.0062	0.18	0.063	0	15
Lithium	µg/L	-	-	-	-	-	0.74	0.75	0.57	0.96	0.12	0	15
Manganese	µg/L	-	-	-	-	-	0.72	0.69	0.51	0.87	0.11	0	15
Mercury	µg/L	-	-	-	-	-	0.00080	0.00082	0.00060	0.0011	0.00014	0	15
Molybdenum	µg/L	-	-	-	-	-	0.12	0.11	0.074	0.18	0.035	0	15
Nickel	µg/L	-	-	-	-	-	0.62	0.63	0.57	0.71	0.047	0	15
Selenium	µg/L	-	-	-	-	-	<0.04	-	<0.04	0.052	-	14	15
Silver	µg/L	-	-	-	-	-	<0.005	-	<0.005	<0.005	-	15	15
Strontium	µg/L	-	-	-	-	-	36	36	34	38	1.2	0	15
Thallium	µg/L	-	-	-	-	-	<0.002	-	<0.002	0.0032	-	9	15
Tin	µg/L	-	-	-	-	-	0.013	0.021	<0.01	0.073	0.020	7	15
Titanium	µg/L	-	-	-	-	-	<0.3	-	<0.3	<0.3	-	15	15
Uranium	µg/L	-	-	-	-	-	0.017	0.017	0.014	0.019	0.0016	0	15
Vanadium	µg/L	-	-	-	-	-	<0.05	-	<0.05	0.086	-	14	15
Zinc	µg/L	30 to 34[f]	6.0 to 8.8[g]	-	-	-	1.3	3.3	<0.5	11	3.9	3	15
Other													
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	-	<0.001	<0.001	-	15	15
Radium-226	Bq/L	-	-	-	-	-	-	-	-	-	-	0	0

(a) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (1.53 mg-N/L) is based on the combination of field pH (7.6) and water temperature (13.4°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(b) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.3 to 7.6). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(d) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (22.8 to 25 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(e) Guideline is for chromium VI.

(f) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (22.8 to 25 mg/L as $CaCO_3$) and DOC (2.56 to 4.07 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(g) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.3 to 7.6), hardness (22.8 to 25 mg/L as $CaCO_3$) and DOC (2.56 to 4.07 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines that fell outside of the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as CaCO3) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

In cases where 50% or more of data were <DL, no mean or standard deviation was calculated.

Half of the detection limit value was used for total Kjeldahl nitrogen to calculate total nitrogen concentrations.

Grey shaded concentrations are higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; Bq/L = Becquerel per litre; DOC = dissolved organic carbon; $CaCO_3$ = calcium carbonate; - = no guideline or data not measured.

Reference:

CCME. 2018. Canadian Water Quality Guideline for the Protection of Aquatic Life: Zinc (Dissolved) 2018 Fact Sheet. Canadian Council of Ministers of the Environment. Gatineau, QC.

APPENDIX 7A

Field Plots

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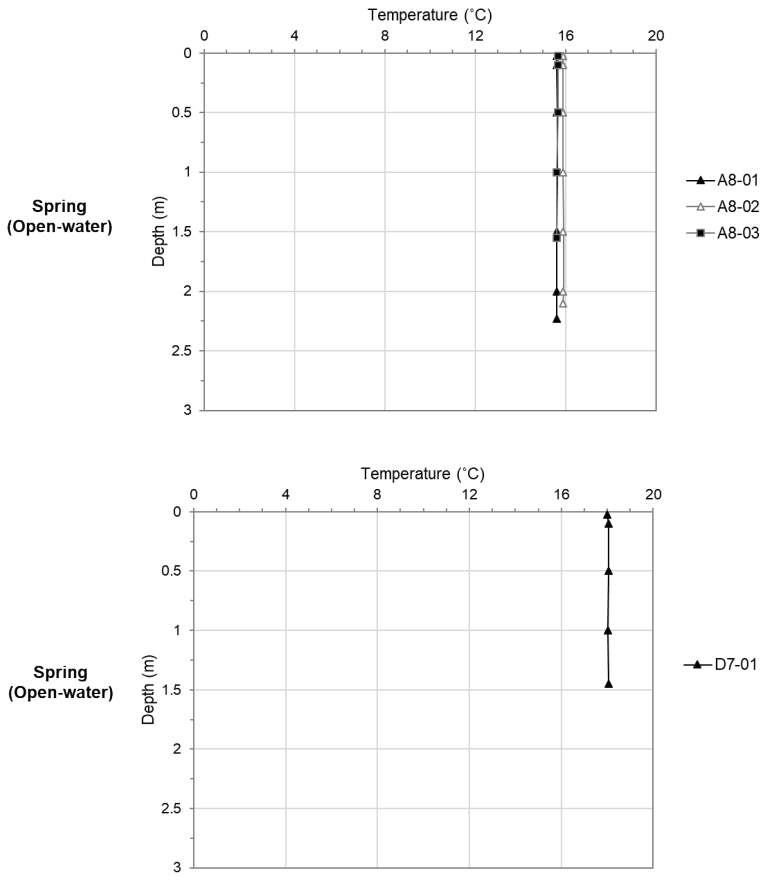
7A.1.0 FIELD PROFILE PLOTS

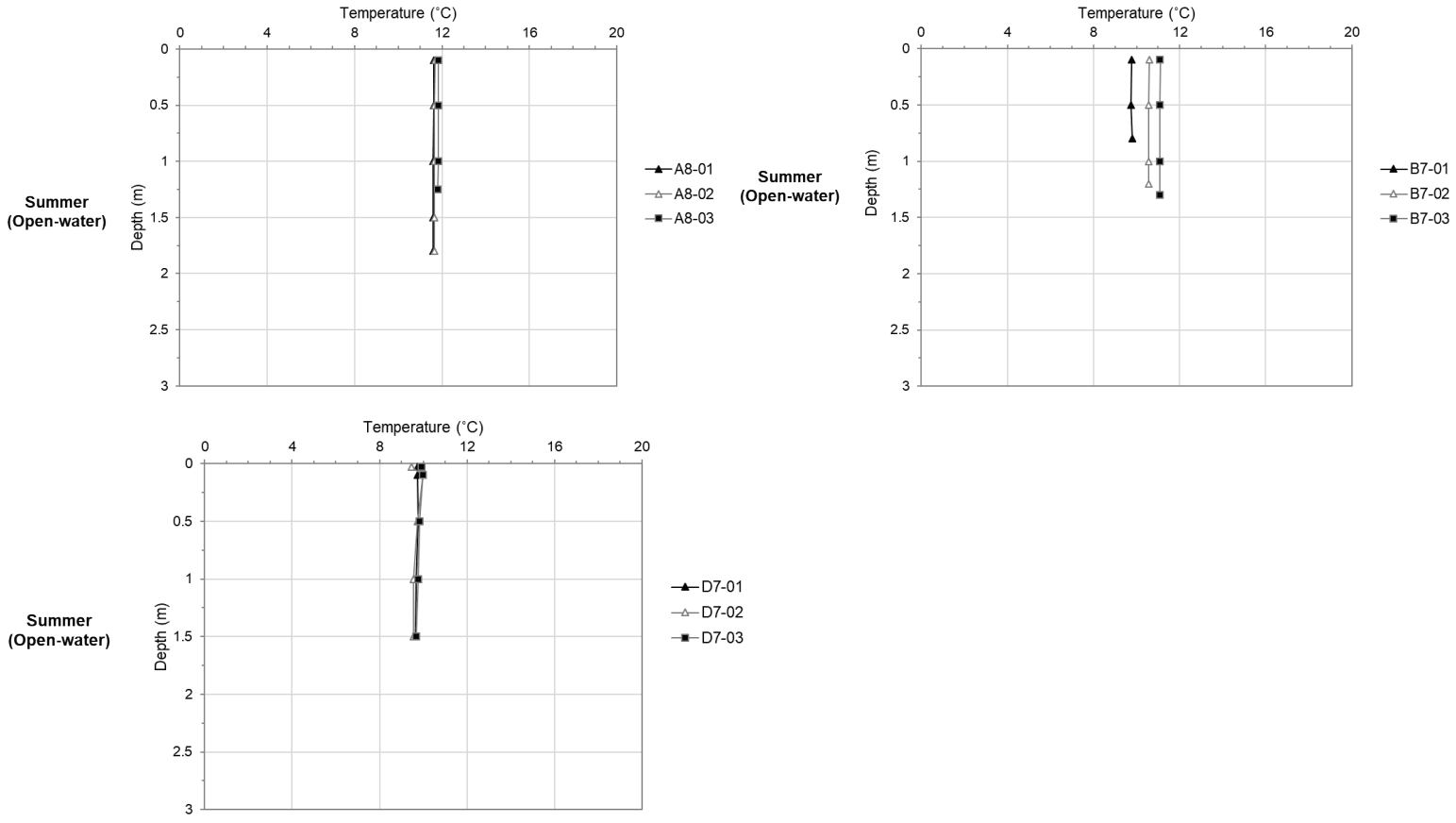
7A.1.1 Temperature



m = metre; °C = degrees Celsius.

Note: Stations D7-02 and D7-03 were not visited during the July program.

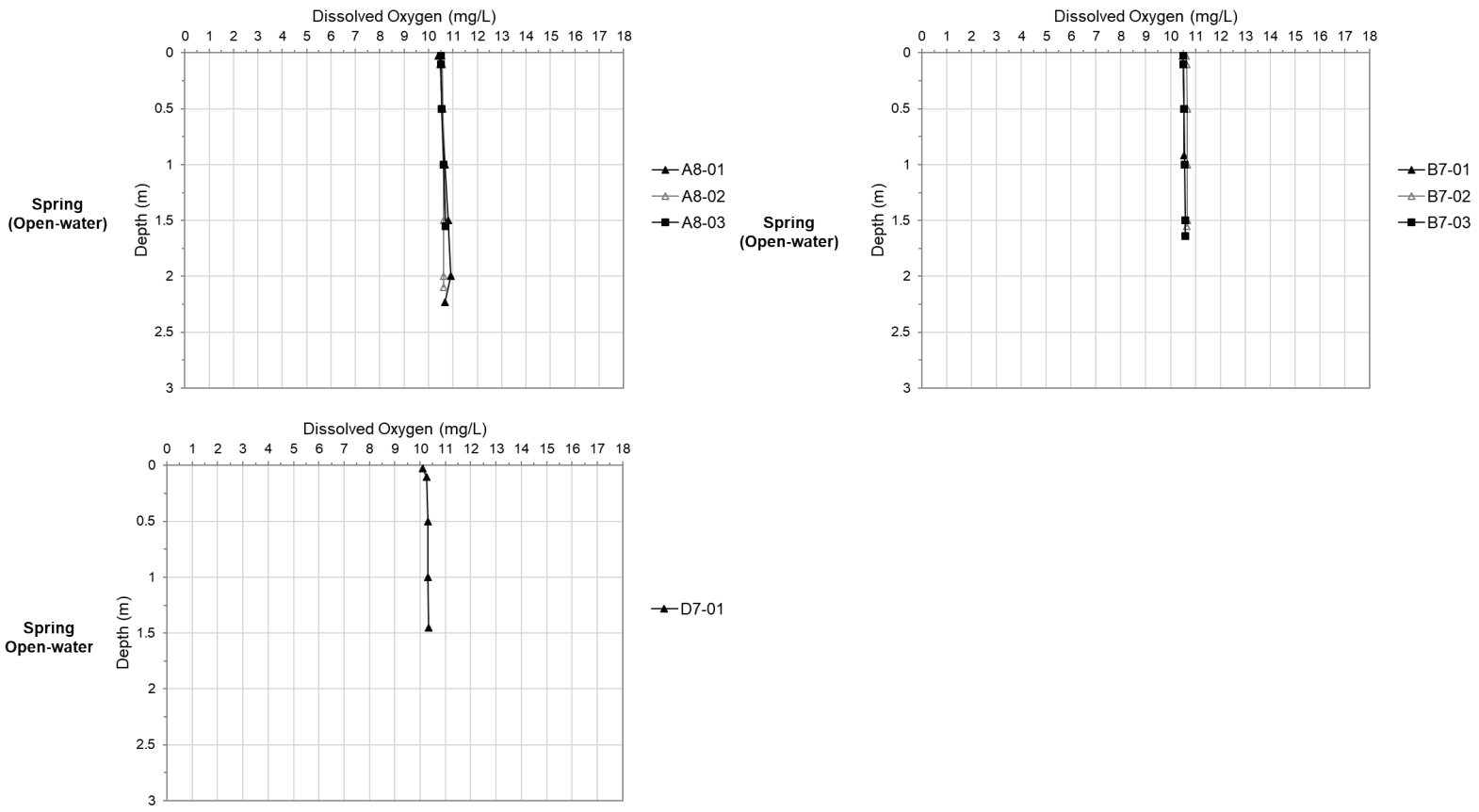
Figure 7A.1-1: Temperature Profiles at Stations on Peninsula Lakes A8, B7 and D7, Open-water (July) 2018



m = metre; °C = degrees Celsius.

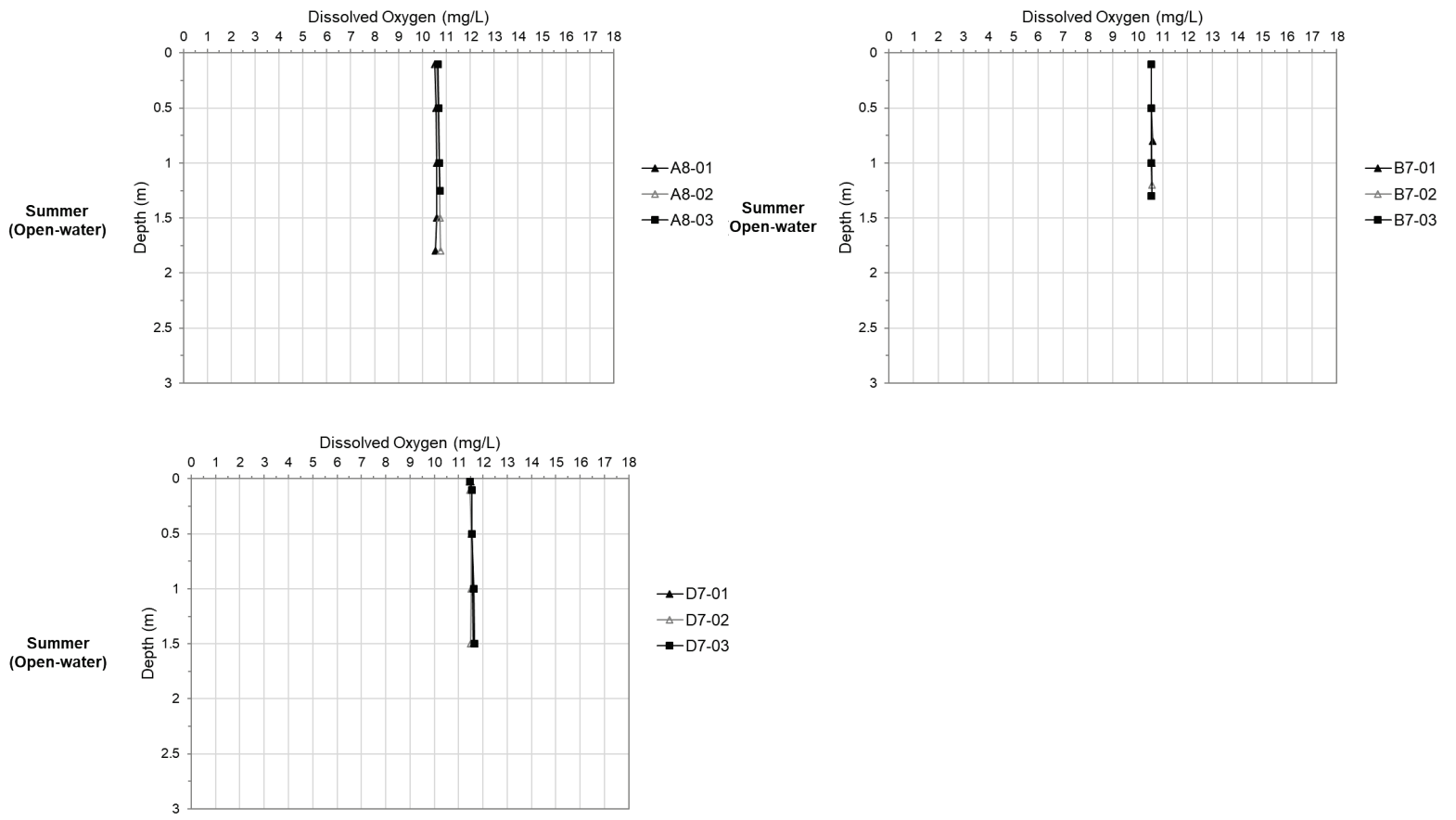
Figure 7A.1-2: Temperature Profiles at Stations on Peninsula Lakes A8, B7 and D7, Open-water (August) 2018

7A.1.2 Dissolved Oxygen



m = metre; mg/L = milligrams per litre.
Note: Stations D7-02 and D7-03 were not visited during the July program.

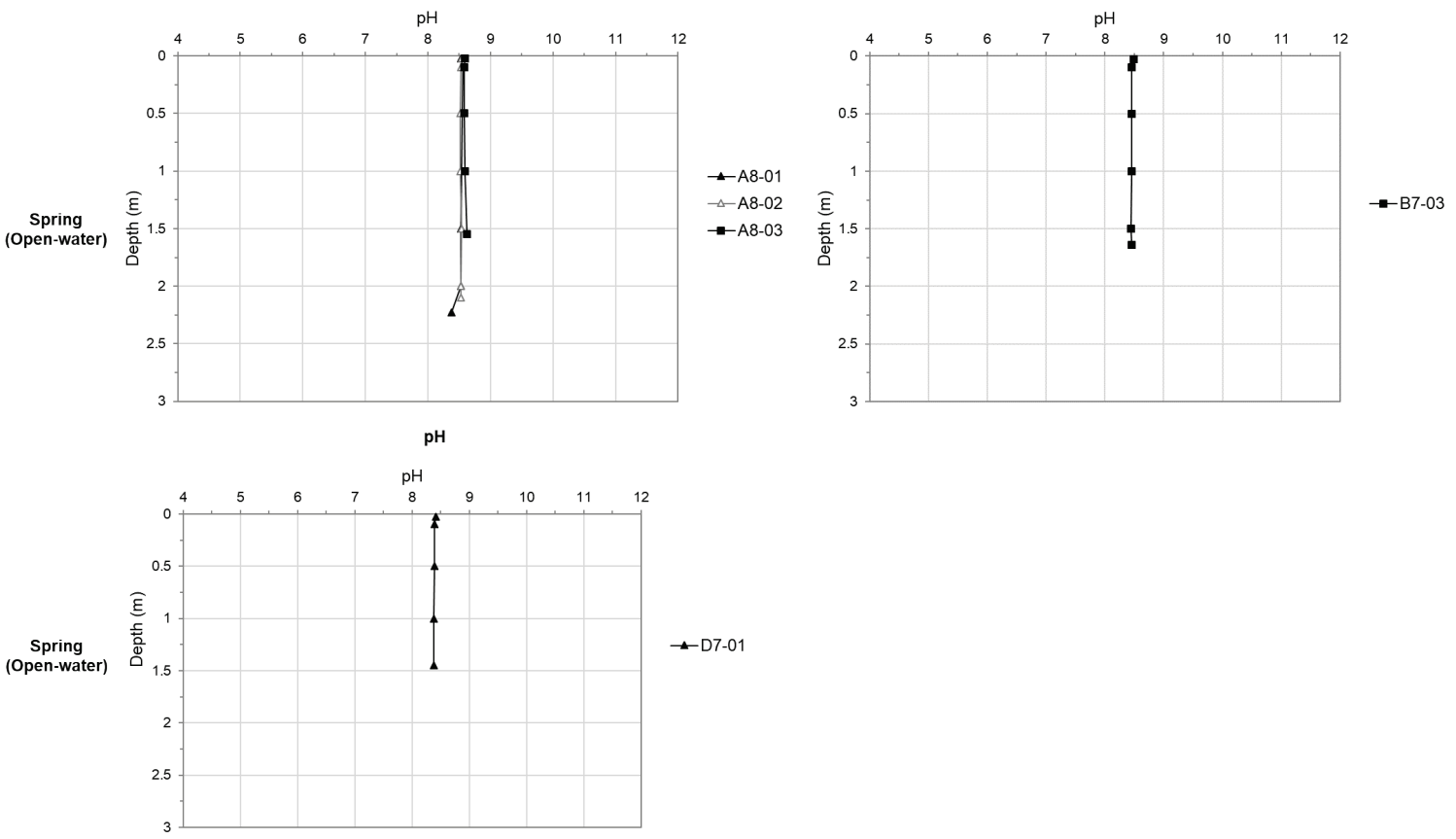
Figure 7A.1-3: Dissolved Oxygen Profiles at Stations on Peninsula Lakes A8, B7, and D7, Open-water (July) 2018



m = metre; mg/L = milligrams per litre.

Figure 7A.1-4: Dissolved Oxygen Profiles at Stations on Peninsula Lakes, Open-water (August) 2018

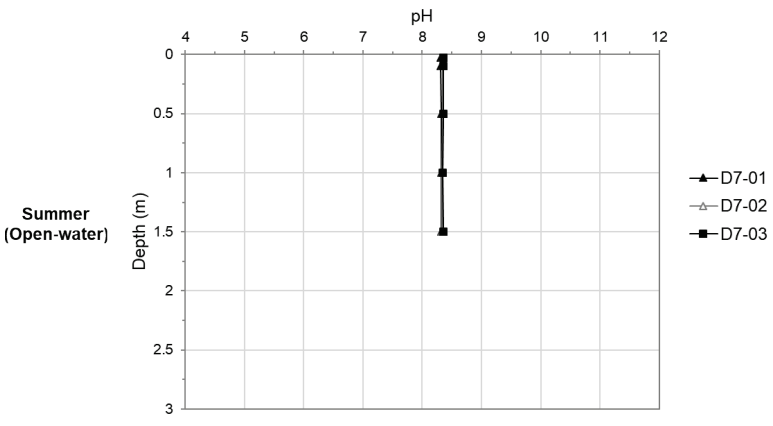
7A.1.3 pH



m = metre; mg/L = milligrams per litre.

Note: pH measured during open-water conditions in July were outside the acceptable range at stations B7-01 and B7-02. Data were deemed unreliable and invalidated. Stations D7-02 and D7-03 were not visited during the July program.

Figure 7A.1-5: pH Profiles at Stations on Peninsula Lakes A8, B7, and D7, Open-water (July) 2018

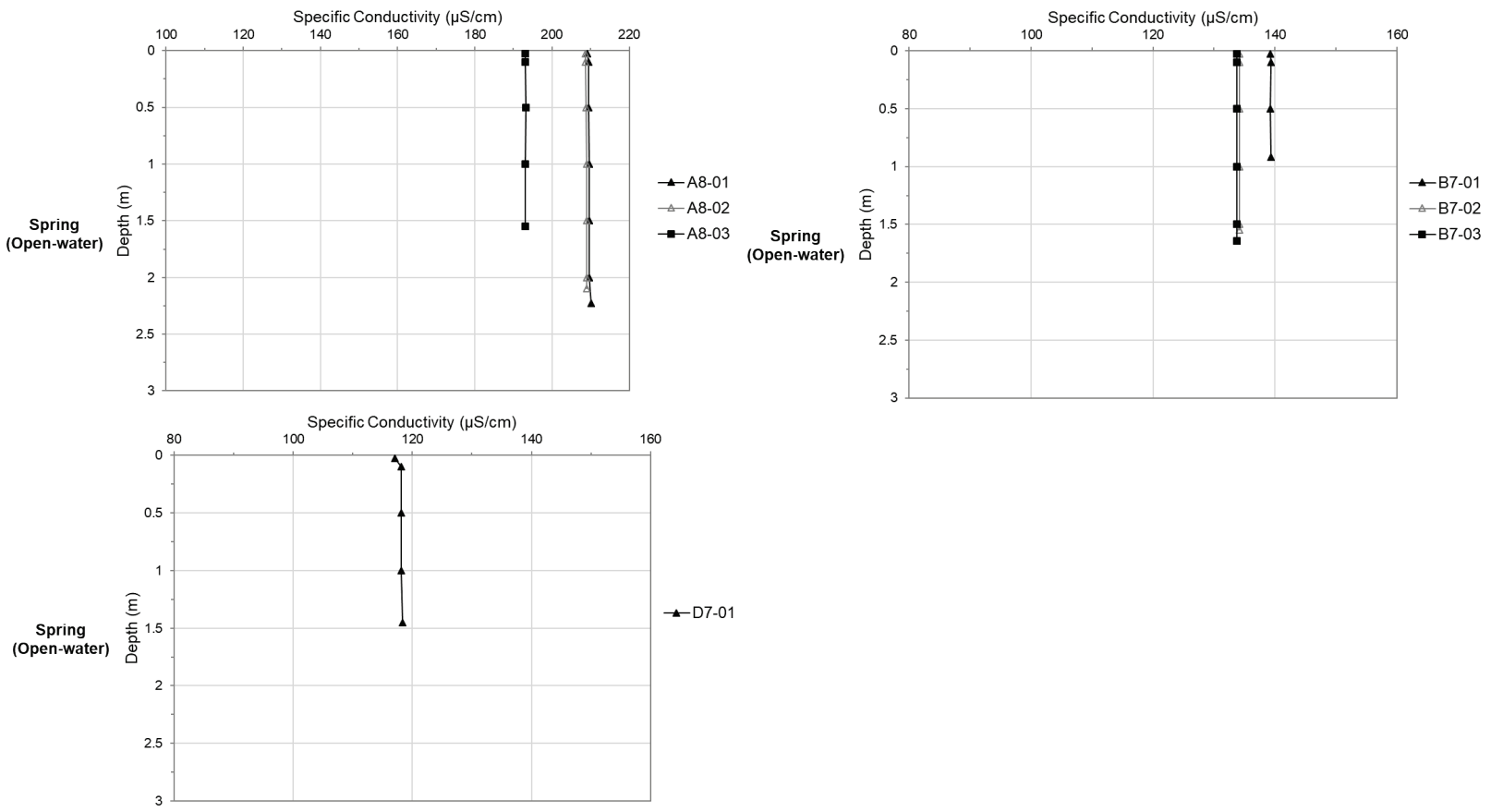


m = metre; mg/L = milligrams per litre.

Note: pH measured during open-water conditions in August were outside the acceptable range at all A8 and B7 stations. Data was deemed unreliable and invalidated.

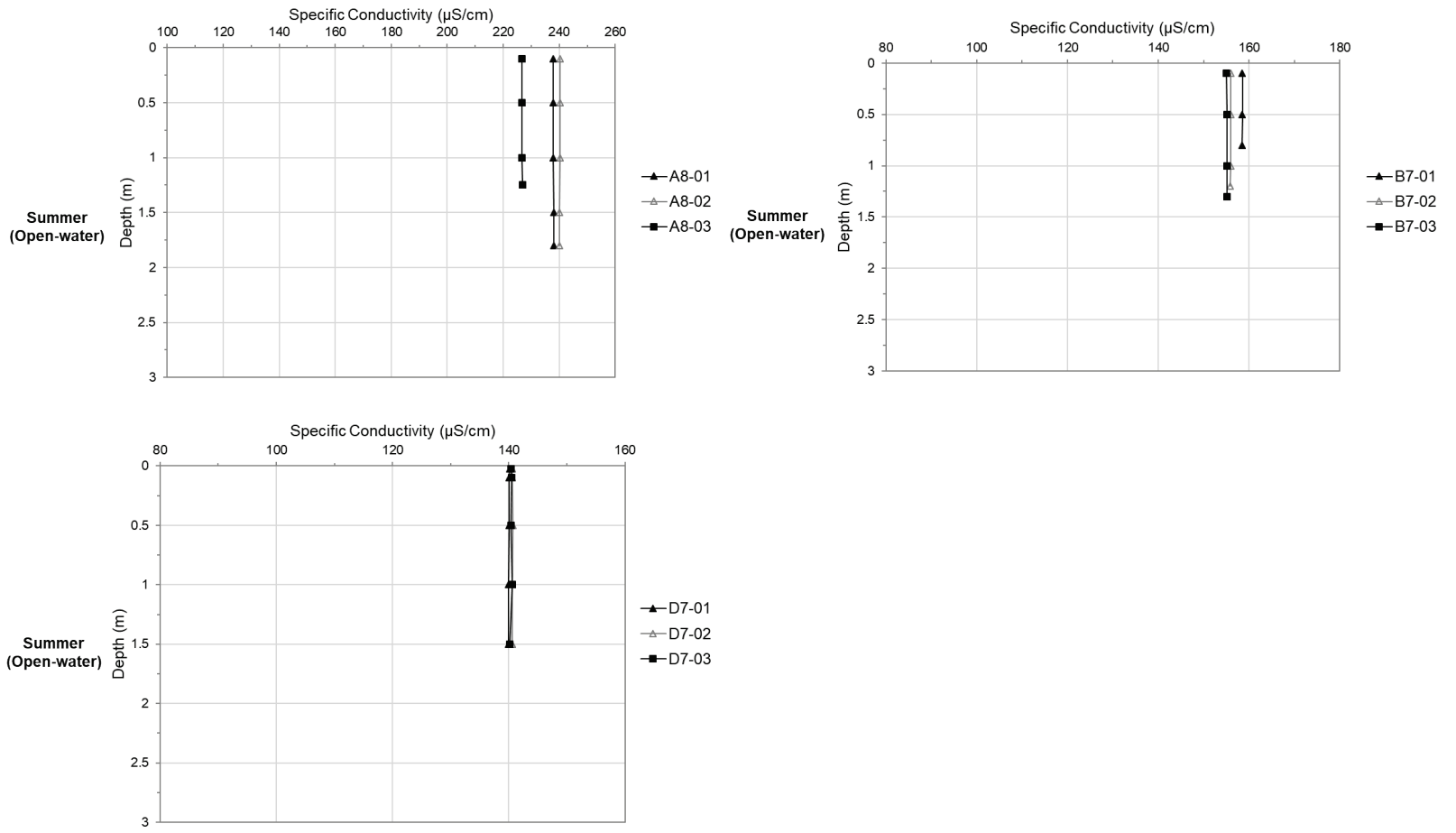
Figure 7A.1-6: pH Profiles at Stations on Peninsula Lakes A8, B7, and D7, Open-water (August) 2018

7A.1.4 Specific Conductivity



m = metre; µS/cm = microSiemens per centimetre.
Note: Stations D7-02 and D7-03 were not visited during the July program.

Figure 7A.1-7: Specific Conductivity Profiles at Stations on Peninsula Lakes A8, B7, and D7, Open-water (July) 2018



m = metre; µS/cm = microSiemens per centimetre.

Figure 7A.1-8: Specific Conductivity Profiles at Stations on Peninsula Lakes A8, B7, and D7, Open-water (August) 2018

7A.2.0 FIELD PROFILE TABLES

7A.2.1 Lake A8 Field Measurements, 2018

Table 7A.2-1: Field Profiles at Peninsula Lake A8, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
A8-01							
A8-01	24-Jul-18	0.025	15.6	106	10.4	209	8.5
A8-01	24-Jul-18	0.1	15.6	107	10.5	210	8.6
A8-01	24-Jul-18	0.5	15.6	108	10.6	210	8.6
A8-01	24-Jul-18	1.0	15.6	109	10.7	210	8.5
A8-01	24-Jul-18	1.5	15.6	110	10.8	210	8.5
A8-01	24-Jul-18	2.0	15.6	111	10.9	210	8.5
A8-01	24-Jul-18	2.2	15.6	109	10.7	210	8.4
A8-02							
A8-02	24-Jul-18	0.025	15.9	108	10.5	209	8.5
A8-02	24-Jul-18	0.1	15.9	108	10.6	209	8.5
A8-02	24-Jul-18	0.5	15.9	109	10.6	209	8.5
A8-02	24-Jul-18	1.0	15.9	109	10.6	209	8.5
A8-02	24-Jul-18	1.5	15.9	109	10.6	209	8.5
A8-02	24-Jul-18	2.0	15.9	109	10.6	209	8.5
A8-02	24-Jul-18	2.1	15.9	109	10.6	209	8.5
A8-03							
A8-03	24-Jul-18	0.025	15.7	107	10.5	193	8.6
A8-03	24-Jul-18	0.1	15.7	107	10.5	193	8.6
A8-03	24-Jul-18	0.5	15.7	108	10.5	193	8.6
A8-03	24-Jul-18	1.0	15.6	108	10.6	193	8.6
A8-03	24-Jul-18	1.6	15.6	109	10.7	193	8.6

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 7A.2-2: Field Profiles at Peninsula Lake A8, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
A8-01							
A8-01	17-Aug-18	0.1	11.6	98	10.5	238	-[(a)]
A8-01	17-Aug-18	0.5	11.6	99	10.6	238	-[(a)]
A8-01	17-Aug-18	1.0	11.6	99	10.6	238	-[(a)]
A8-01	17-Aug-18	1.5	11.6	99	10.6	238	-[(a)]
A8-01	17-Aug-18	1.8	11.6	98	10.5	238	-[(a)]
A8-02							
A8-02	17-Aug-18	0.1	11.7	99	10.6	240	-[(a)]
A8-02	17-Aug-18	0.5	11.7	99	10.7	240	-[(a)]
A8-02	17-Aug-18	1.0	11.6	100	10.7	240	-[(a)]
A8-02	17-Aug-18	1.5	11.7	100	10.7	240	-[(a)]
A8-02	17-Aug-18	1.8	11.7	101	10.8	240	-[(a)]
A8-03							
A8-03	17-Aug-18	0.1	11.8	100	10.7	227	-[(a)]
A8-03	17-Aug-18	0.5	11.8	100	10.7	227	-[(a)]
A8-03	17-Aug-18	1	11.8	100	10.7	227	-[(a)]
A8-03	17-Aug-18	1.3	11.8	101	10.7	227	-[(a)]

(a) Data were invalidated based on quality checks (Appendix 6A).
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

7A.2.2 Lake B7 Field Measurements, 2018

Table 7A.2-3: Field Profiles at Peninsula Lake B7, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
B7-01							
B7-01	22-Jul-18	0.025	17.4	111	10.5	139	-[(a)]
B7-01	22-Jul-18	0.1	17.4	111	10.5	139	-[(a)]
B7-01	22-Jul-18	0.5	17.4	111	10.5	139	-[(a)]
B7-01	22-Jul-18	0.9	17.4	112	10.5	139	-[(a)]
B7-02							
B7-02	22-Jul-18	0.025	17.0	112	10.6	134	-[(a)]
B7-02	22-Jul-18	0.1	17.1	112	10.7	134	-[(a)]
B7-02	22-Jul-18	0.5	17.1	112	10.7	134	-[(a)]
B7-02	22-Jul-18	1.0	17.1	112	10.7	134	-[(a)]
B7-02	22-Jul-18	1.5	17.0	112	10.7	134	-[(a)]
B7-02	22-Jul-18	1.6	17.1	112	10.6	134	-[(a)]
B7-03							
B7-03	22-Jul-18	0.025	17.0	110	10.5	134	8.5
B7-03	22-Jul-18	0.1	17.0	110	10.5	134	8.5
B7-03	22-Jul-18	0.5	17.0	111	10.5	134	8.5
B7-03	22-Jul-18	1.0	17.0	111	10.6	134	8.5
B7-03	22-Jul-18	1.5	17.0	111	10.6	134	8.4
B7-03	22-Jul-18	1.6	17.0	111	10.6	134	8.5

(a) Data were invalidated based on quality checks (Appendix 6A).
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 7A.2-4: Field Profiles at Peninsula Lake B7, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
B7-01							
B7-01	17-Aug-18	0.1	9.8	94	10.6	159	-[(a)]
B7-01	17-Aug-18	0.5	9.7	94	10.6	159	-[(a)]
B7-01	17-Aug-18	0.8	9.8	95	10.6	158	-[(a)]
B7-02							
B7-02	17-Aug-18	0.1	10.6	96	10.6	156	-[(a)]
B7-02	17-Aug-18	0.5	10.6	96	10.6	156	-[(a)]
B7-02	17-Aug-18	1.0	10.6	96	10.6	156	-[(a)]
B7-02	17-Aug-18	1.2	10.6	96	10.6	156	-[(a)]
B7-03							
B7-03	17-Aug-18	0.1	11.1	97	10.5	155	-[(a)]
B7-03	17-Aug-18	0.5	11.1	97	10.6	155	-[(a)]
B7-03	17-Aug-18	1.0	11.1	97	10.6	155	-[(a)]
B7-03	17-Aug-18	1.3	11.1	97	10.6	155	-[(a)]

(a) Data were invalidated based on quality checks (Appendix 6A).
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

7A.2.3 Lake D7 Field Measurements, 2018

Table 7A.2-5: Field Profiles at Peninsula Lake D7, July 2018

Station[(a)]	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
D7-01							
D7-01	22-Jul-18	0.025	18.0	108	10.1	117	8.4
D7-01	22-Jul-18	0.1	18.1	110	10.3	118	8.4
D7-01	22-Jul-18	0.5	18.1	111	10.3	118	8.4
D7-01	22-Jul-18	1.0	18.0	111	10.3	118	8.4
D7-01	22-Jul-18	1.5	18.1	111	10.3	118	8.4

(a) Stations D7-02 and D7-03 were not visited during the July program due to weather delays (i.e., high wind).
mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

Table 7A.2-6: Field Profiles at Peninsula Lake D7, July 2018

Station	Date	Depth (m)	Temperature (˚C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
D7-01							
D7-01	01-Sep-18	0.025	9.7	103	11.5	140	8.3
D7-01	01-Sep-18	0.1	9.7	103	11.5	140	8.3
D7-01	01-Sep-18	0.5	9.8	104	11.6	140	8.3
D7-01	01-Sep-18	1.0	9.7	104	11.6	140	8.3
D7-01	01-Sep-18	1.5	9.6	104	11.6	140	8.3
D7-02							
D7-02	01-Sep-18	0.025	9.5	103	11.4	141	8.4
D7-02	01-Sep-18	0.1	10.0	103	11.5	141	8.4
D7-02	01-Sep-18	0.5	9.7	103	11.5	141	8.4
D7-02	01-Sep-18	1	9.5	103	11.5	141	8.3
D7-02	01-Sep-18	1.5	9.5	103	11.5	141	8.3
D7-03							
D7-03	01-Sep-18	0.025	9.9	103	11.5	140	8.4
D7-03	01-Sep-18	0.1	10.0	104	11.5	141	8.4
D7-03	01-Sep-18	0.5	9.8	104	11.6	140	8.4
D7-03	01-Sep-18	1.0	9.8	104	11.6	141	8.4
D7-03	01-Sep-18	1.5	9.7	104	11.7	140	8.4

mg/L = milligrams per litre; µS/cm = microSiemens per centimetre.

APPENDIX 7B

2018 Water Chemistry Tables

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Table 7B-1: Water Quality Results at Peninsula Lake A8, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations					
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	A8-01	A8-02	A8-03	A8-01	A8-02	A8-03
		Acute	Chronic				24-Jul-18	24-Jul-18	24-Jul-18	17-Aug-18	17-Aug-18	17-Aug-18
Field Measured												
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	8.5	8.5	8.6	-	-	-
Specific conductivity	µS/cm	-	-	-	-	-	210	209	193	238	240	227
Temperature	°C	-	-	-	15	-	16[(a)]	16[(a)]	16[(a)]	12	12	12
Dissolved oxygen	mg/L	-	6.5	-	-	-	11	11	11	11	11	11
Dissolved oxygen	%	-	-	-	-	-	109	109	108	99	100	100
Conventional Parameters												
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.8	7.8	7.9	7.8	7.8	7.9
Specific conductivity	µS/cm	-	-	-	-	-	220	220	204	239	239	230
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	84	84	80	84	86	85
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	40	40	45	43	43	49
Total dissolved solids	mg/L	-	-	-	500	-	170	183	163	189	167	177
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	109	106	102	114	117	111
Total suspended solids	mg/L	-	-	-	-	-	1.2	<1.0	<1.0	<1.0	<1.0	1.2
Total organic carbon	mg/L	-	-	-	-	-	3.4	3.3	4.1	3.5	3.7	4.3
Dissolved organic carbon	mg/L	-	-	-	-	-	3.5	3.3	4.1	3.2	3.5	4.0
Turbidity	NTU	-	-	-	-	-	0.49	0.49	0.63	0.51	0.56	0.66
Major Ions												
Bicarbonate	mg/L	-	-	-	-	-	48	49	55	53	53	59
Calcium	mg/L	-	-	-	-	-	28	28	26	28	29	28
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	640	120	-	250	-	40	38	33	42	43	37
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.027	0.025	0.027	0.030	0.029	0.032
Magnesium	mg/L	-	-	-	-	-	3.7	3.5	3.4	3.7	3.7	3.7
Potassium	mg/L	-	-	-	-	-	1.6	1.6	1.5	1.7	1.8	1.7
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.70	0.71	0.94	0.74	0.74	0.71
Sodium	mg/L	-	-	-	200	-	6.6	6.3	5.8	6.8	8.0	6.5
Sulphate	mg/L	-	-	-	500	-	5.5	4.9	4.4	6.2	6.3	5.5
Nutrients												
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
Total ammonia	mg-N/L	-	0.16 to 1.2[(b)]	-	-	-	0.0062	<0.005	0.011	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.40	0.41	0.36	0.34	0.48	0.40
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.40	0.41	0.36	0.34	0.48	0.40
Total phosphorus	mg-P/L	-	-	-	-	-	0.0032	0.0017	0.0024	0.0062	0.0070	0.0071
Dissolved phosphorus	mg-P/L	-	-	-	-	-	<0.001	<0.001	0.0011	0.0032	0.0031	0.0038
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Metals												
Aluminum	µg/L	-	100[(c, d)]	-	-	-	2.4	2.7	3.0	3.3	7.9	6.8
Antimony	µg/L	-	-	6.0	-	-	0.020	<0.02	<0.02	<0.02	0.02	<0.020
Arsenic	µg/L	-	5.0	10	-	25	2.7	2.5	2.9	2.3	2.2	2.4
Barium	µg/L	-	-	1,000	-	-	24	24	23	25	23	25
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	3.1	3.0	2.5	2.7	3.1	2.8
Cadmium	µg/L	1.7 to 1.8[(e)]	0.13 to 0.14[(e)]	5.0	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1.0	50[(f)]	-	-	<0.06	<0.06	<0.06	<0.06	0.15	<0.06
Cobalt	µg/L	-	-	-	-	-	0.046	0.048	0.066	0.046	0.032	0.052
Copper	µg/L	-	2.0 to 2.1[(e)]	-	1,000	-	0.64	0.82	0.84	0.64	0.57	0.69
Iron	µg/L	-	300	-	300	1,060	83	76	97	61	58	95
Lead	µg/L	-	2.4 to 2.6[(e)]	10	-	-	<0.01	0.018	0.017	0.021	0.016	0.043
Lithium	µg/L	-	-	-	-	-	6.6	6.5	5.4	7.1	7.6	6.7
Manganese	µg/L	-	-	-	50	-	15	15	19	7.5	6.5	10.5
Mercury	µg/L	-	0.026	1.0	-	-	0.0010	0.00090	0.0012	0.0010	0.0010	0.0011
Molybdenum	µg/L	-	73	-	-	-	0.20	0.19	0.18	0.29	0.33	0.30
Nickel	µg/L	-	81 to 85[(e)]	-	-	-	0.73	0.69	0.86	0.88	0.78	1.08
Selenium	µg/L	-	1.0	50	-	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	208	202	173	230	246	215
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	0.12	0.10	0.26
Uranium	µg/L	33	15	20	-	-	0.034	0.033	0.030	0.041	0.048	0.040
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.07
Zinc	µg/L	-	-	-	5,000	-	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8

Table 7B-1: Water Quality Results at Peninsula Lake A8, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations					
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	A8-01	A8-02	A8-03	A8-01	A8-02	A8-03
		Acute	Chronic				24-Jul-18	24-Jul-18	24-Jul-18	17-Aug-18	17-Aug-18	17-Aug-18
Dissolved Metals												
Aluminum	µg/L	-	-	-	-	-	1.6	1.5	1.9	2.1	2.1	2.0
Antimony	µg/L	-	-	-	-	-	0.024	0.13	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	2.2	2.2	2.5	1.9	1.9	1.9
Barium	µg/L	-	-	-	-	-	23	24	24	24	24	23
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	3.1	2.8	2.4	2.5	2.5	2.0
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	-	-	-	-	0.11	<0.06	0.16	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	0.022	0.024	0.033	0.016	0.018	0.017
Copper	µg/L	-	-	-	-	-	0.60	0.73	0.84	0.57	0.56	0.58
Iron	µg/L	-	-	-	-	-	34	37	51	27	26	36
Lead	µg/L	-	-	-	-	-	<0.01	0.017	0.011	0.014	0.011	0.011
Lithium	µg/L	-	-	-	-	-	6.6	6.8	5.6	6.4	6.6	5.8
Manganese	µg/L	-	-	-	-	-	1.9	1.7	1.2	1.3	2.0	1.6
Mercury	µg/L	-	-	-	-	-	0.0010	0.0012	0.0013	0.00050	<0.00050	0.0009
Molybdenum	µg/L	-	-	-	-	-	0.21	0.20	0.21	0.24	0.27	0.25
Nickel	µg/L	-	-	-	-	-	0.77	0.90	1.1	0.73	0.72	0.89
Selenium	µg/L	-	-	-	-	-	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	204	192	171	205	209	179
Thallium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.008	<0.008	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	0.037	0.034	0.031	0.038	0.048	0.036
Vanadium	µg/L	-	-	-	-	-	0.051	0.061	<0.05	<0.05	<0.05	<0.05
Zinc	µg/L	90 to 95[g]	15 to 20[h]	-	-	-	1.3	0.85	1.5	0.95	<0.8	<0.8
Other												
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

(a) Temperature for some samples fell above the aesthetic guideline of 15˚C but were not flagged in this table because the guideline is not relevant.

(b) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.16 mg-N/L) is based on the combination of field pH (8.6) and water temperature (15.6°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.8 to 8.6). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(d) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available, the laboratory pH was used.

(e) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (79.8 to 86.2 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(f) Guideline is for chromium VI.

(g) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (79.8 to 86.2 mg/L as $CaCO_3$) and DOC (3.23 to 4.12 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(h) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.8 to 8.6), hardness (79.8 to 86.2 mg/L as $CaCO_3$) and DOC (3.23 to 4.12 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L). When field pH was not available laboratory pH was used.

Note:

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

Table 7B-2: Water Quality Results at Peninsula Lake B7, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations					
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	B7-01	B7-02	B7-03	B-07-01	B-07-02	B-07-03
		Acute	Chronic				17-Aug-18	17-Aug-18	17-Aug-18	22-Jul-18	22-Jul-18	22-Jul-18
Field Measured												
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	-	-	-	-	-	8.5
Specific conductivity	µS/cm	-	-	-	-	-	158	156	155	139	134	134
Temperature	°C	-	-	-	15	-	9.8	11	11	17[(a)]	17[(a)]	17[(a)]
Dissolved oxygen	mg/L	-	6.5	-	-	-	11	11	11	11	11	11
Dissolved oxygen	%	-	-	-	-	-	95	96	97	111	112	111
Conventional Parameters												
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.7	7.8	7.7	7.5	7.5	7.5
Specific conductivity	µS/cm	-	-	-	-	-	160	157	156	145	140	142
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	58	58	57	57	55	55
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	34	43	33	30	30	29
Total dissolved solids	mg/L	-	-	-	500	-	113	112	99	102	100	100
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	77	82	75	72	71	71
Total suspended solids	mg/L	-	-	-	-	-	1.4	1.7	1.5	1.0	1.2	1.2
Total organic carbon	mg/L	-	-	-	-	-	4.1	4.1	3.9	4.2	3.9	3.8
Dissolved organic carbon	mg/L	-	-	-	-	-	4.0	4.0	3.9	4.1	3.9	3.8
Turbidity	NTU	-	-	-	-	-	0.50	0.59	0.56	0.40	0.43	0.46
Major Ions												
Bicarbonate	mg/L	-	-	-	-	-	41	53	40	37	36	36
Calcium	mg/L	-	-	-	-	-	20	20	19	20	19	19
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	640	120	-	250	-	25	24	24	23	23	24
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.025	0.026	0.026	0.024	0.023	0.023
Magnesium	mg/L	-	-	-	-	-	2.1	2.1	2.1	2.1	2.0	2.0
Potassium	mg/L	-	-	-	-	-	1.4	1.3	1.4	1.3	1.3	1.2
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.46	0.50	0.54	0.68	0.64	0.62
Sodium	mg/L	-	-	-	200	-	3.7	3.7	3.7	3.5	3.3	3.2
Sulphate	mg/L	-	-	-	500	-	5.2	5.0	4.9	4.5	4.9	4.9
Nutrients												
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
Total ammonia	mg-N/L	-	0.19 to 1.8[(b)]	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.42	0.50	0.40	0.33	0.34	0.30
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.42	0.50	0.40	0.33	0.34	0.30
Total phosphorus	mg-P/L	-	-	-	-	-	0.0079	0.0079	0.0076	0.0062	0.0027	0.0036
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0039	0.0049	0.0037	<0.001	0.0010	<0.001
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	0.0011	<0.001
Total Metals												
Aluminum	µg/L	-	100[(c, d)]	-	-	-	3.3	3.1	4.5	3.3	7.1	2.9
Antimony	µg/L	-	-	6.0	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	25	1.4	1.4	1.5	1.7	1.8	1.7
Barium	µg/L	-	-	1,000	-	-	20	21	20	20	20	20
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	10	11	11	10	11	10
Cadmium	µg/L	1.1 to 1.2[(e)]	0.097 to 0.10[(e)]	5.0	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1.0	50[(f)]	-	-	<0.06	<0.06	<0.06	<0.06	0.066	0.061
Cobalt	µg/L	-	-	-	-	-	0.041	0.039	0.042	0.032	0.061	0.052
Copper	µg/L	-	2.0[(e)]	-	1,000	-	0.66	0.66	0.64	0.80	0.85	0.75
Iron	µg/L	-	300	-	300	1,060	69	65	67	54	90	85
Lead	µg/L	-	1.0[(e)]	10	-	-	0.027	0.024	0.023	0.018	0.032	0.021
Lithium	µg/L	-	-	-	-	-	15	14	15	15	14	14
Manganese	µg/L	-	-	-	50	-	5.7	6.2	6.8	2.3	11	10.0
Mercury	µg/L	-	0.026	1.0	-	-	0.0011	0.0011	0.0010	0.0010	0.0009	0.0010
Molybdenum	µg/L	-	73	-	-	-	0.25	0.20	0.24	0.15	0.15	0.15
Nickel	µg/L	-	25[(e)]	-	-	-	1.00	0.98	0.99	0.87	0.90	0.91
Selenium	µg/L	-	1.0	50	-	-	<0.04	<0.04	<0.04	0.042	<0.04	<0.04
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	248	223	251	216	213	206
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	0.14	0.21	<0.1	0.29	<0.1
Uranium	µg/L	33	15	20	-	-	0.025	0.024	0.027	0.025	0.019	0.018
Vanadium	µg/L	-	-	-	-	-	<0.05	0.074	0.073	0.071	0.092	0.082
Zinc	µg/L	-	-	-	5,000	-	<0.8	1.3	0.95	0.97	0.87	<0.8

Table 7B-2: Water Quality Results at Peninsula Lake B7, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations					
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	B7-01	B7-02	B7-03	B-07-01	B-07-02	B-07-03
		Acute	Chronic				17-Aug-18	17-Aug-18	17-Aug-18	22-Jul-18	22-Jul-18	22-Jul-18
Dissolved Metals												
Aluminum	µg/L	-	-	-	-	-	3.1	1.3	2.2	4.3	2.4	2.1
Antimony	µg/L	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02	0.10	0.25
Arsenic	µg/L	-	-	-	-	-	1.2	1.3	1.3	1.8	1.6	1.5
Barium	µg/L	-	-	-	-	-	19	19	19	20	19	19
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	8.4	9.0	8.6	10	11	10
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	-	-	-	-	<0.06	0.085	<0.06	0.061	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	0.018	0.018	0.014	0.061	0.022	0.022
Copper	µg/L	-	-	-	-	-	0.63	0.69	0.57	0.82	0.65	0.63
Iron	µg/L	-	-	-	-	-	36	29	26	89	44	47
Lead	µg/L	-	-	-	-	-	0.022	0.018	<0.01	0.021	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	14	13	13	14	14	14
Manganese	µg/L	-	-	-	-	-	2.1	0.71	0.66	11	1.5	1.5
Mercury	µg/L	-	-	-	-	-	0.0005	0.0006	0.0007	0.0013	0.0012	0.0012
Molybdenum	µg/L	-	-	-	-	-	0.19	0.19	0.19	0.15	0.15	0.15
Nickel	µg/L	-	-	-	-	-	0.89	0.89	0.88	0.93	0.83	0.83
Selenium	µg/L	-	-	-	-	-	<0.04	<0.04	<0.04	<0.04	0.046	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	211	203	206	218	208	209
Thallium	µg/L	-	-	-	-	-	<0.008	0.0050	0.0080	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	0.024	0.024	0.024	0.022	0.019	0.020
Vanadium	µg/L	-	-	-	-	-	<0.05	<0.05	0.050	0.081	0.085	0.072
Zinc	µg/L	66 to 70[(g)]	10 to 18[(h)]	-	-	-	3.6	0.94	0.97	<0.8	<0.8	1.1
Other												
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

(a) Temperature for some samples fell above the aesthetic guideline of 15˚C but were not flagged in this table because the guideline is not relevant.

(b) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.19 mg-N/L) is based on the combination of field pH (8.5) and water temperature (17.0°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample. When field pH was not available laboratory pH was used.

(c) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (7.5 to 8.5). The guideline is calculated based on the individual pH for each sample. When field pH was not available laboratory pH was used.

(d) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5. When field pH was not available laboratory pH was used.

(e) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (55.2 to 58.4 mg/L as $CaCO_3$). The guideline is calculated based on the individual hardness value for each sample.

(f) Guideline is for chromium VI.

(g) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (55.2 to 58.4 mg/L as $CaCO_3$) and DOC (3.85 to 4.05 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. All guidelines fell within the validated range for hardness (13.8 to 250.5 mg/L as $CaCO_3$) and DOC (0.3 to 17.3 mg/L).

(h) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.5 to 8.6), hardness (55.2 to 58.4 mg/L as $CaCO_3$) and DOC (3.85 to 4.05 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guideline that fell outside the validated range for pH (6.5 to 8.13), hardness (23.4 to 399 mg/L as $CaCO_3$) and DOC (0.3 to 22.9 mg/L) were constrained to within the validated guideline range as per CCME (2018) guidance. When field pH was not available laboratory pH was used.

Note:

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

Table 7B-3: Water Quality Results at Peninsula Lake D7, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations			
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	D7-01	D7-01	D7-02	D7-03
		Acute	Chronic				22-Jul-18	01-Sep-18	01-Sep-18	01-Sep-18
Field Measured										
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	8.4	8.3	8.3	8.4
Specific conductivity	µS/cm	-	-	-	-	-	118	140	141	141
Temperature	°C	-	-	-	15	-	18[(a)]	9.7	9.5	9.8
Dissolved oxygen	mg/L	-	6.5	-	-	-	10	12	12	12
Dissolved oxygen	%	-	-	-	-	-	111	104	103	104
Conventional Parameters										
pH	unitless	-	6.5 to 9.0	-	7.0 to 11	-	7.8	7.8	7.8	7.8
Specific conductivity	µS/cm	-	-	-	-	-	117	141	142	142
Hardness (as $CaCO_3$)	mg/L	-	-	-	-	-	44	48	49	50
Total alkalinity (as $CaCO_3$)	mg/L	-	-	-	-	-	44	51	50	50
Total dissolved solids	mg/L	-	-	-	500	-	71	74	80	84
Total dissolved solids (calculated)	mg/L	-	-	-	500	-	62	73	73	73
Total suspended solids	mg/L	-	-	-	-	-	1.6	1.8	<1.0	<1.0
Total organic carbon	mg/L	-	-	-	-	-	4.0	4.9	4.8	4.8
Dissolved organic carbon	mg/L	-	-	-	-	-	4.0	4.7	4.7	4.7
Turbidity	NTU	-	-	-	-	-	0.73	0.56	0.69	0.77
Major Ions										
Bicarbonate	mg/L	-	-	-	-	-	53	62	61	61
Calcium	mg/L	-	-	-	-	-	14	15	15	15
Carbonate	mg/L	-	-	-	-	-	<0.6	<0.6	<0.6	<0.6
Chloride	mg/L	640	120	-	250	-	9.0	11	11	11
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001
Fluoride	mg/L	-	0.12	1.5	-	2.8	0.039	0.045	0.045	0.047
Magnesium	mg/L	-	-	-	-	-	2.4	2.7	2.8	2.8
Potassium	mg/L	-	-	-	-	-	1.1	1.3	1.3	1.3
Reactive silica (as SiO_2)	mg/L	-	-	-	-	-	0.20	0.22	0.21	0.21
Sodium	mg/L	-	-	-	200	-	7.1	7.8	8.1	8.3
Sulphate	mg/L	-	-	-	500	-	3.2	5.1	5.2	5.2
Nutrients										
Nitrate	mg-N/L	124	2.9	10	-	-	<0.005	<0.005	<0.005	<0.005
Nitrite	mg-N/L	-	0.060	1.0	-	-	<0.001	<0.001	<0.001	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	-	-	<0.0051	<0.0051	<0.0051	<0.0051
Total ammonia	mg-N/L	-	0.21 to 0.43[(b)]	-	-	-	<0.005	0.067	0.0066	0.0091
Total Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0.24	0.36	0.42	0.34
Total nitrogen (calculated)	mg-N/L	-	-	-	-	-	0.24	0.36	0.42	0.34
Total phosphorus	mg-P/L	-	-	-	-	-	0.0074	0.017	0.019	0.014
Dissolved phosphorus	mg-P/L	-	-	-	-	-	0.0069	0.0061	0.0064	0.0058
Orthophosphate	mg-P/L	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001
Total Metals										
Aluminum	µg/L	-	100[(c, d)]	-	-	-	4.1	5.6	5.0	5.7
Antimony	µg/L	-	-	6.0	-	-	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	5.0	10	-	25	1.4	0.95	0.91	0.90
Barium	µg/L	-	-	1,000	-	-	16	18	18	18
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	29,000	1,500	5,000	-	-	11	12	13	13
Cadmium	µg/L	0.90 to 1.0[(e)]	0.080 to 0.088[(e)]	5.0	-	-	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	1.0	50[(f)]	-	-	<0.06	<0.06	0.33	<0.06
Cobalt	µg/L	-	-	-	-	-	0.051	0.069	0.069	0.066
Copper	µg/L	-	2.0[(e)]	-	1,000	-	0.86	0.99	0.97	0.89
Iron	µg/L	-	300	-	300	1,060	100	57	57	52
Lead	µg/L	-	1.0[(e)]	10	-	-	0.019	0.019	0.019	0.015
Lithium	µg/L	-	-	-	-	-	1.3	1.4	1.4	1.4
Manganese	µg/L	-	-	-	50	-	18	17	15	14
Mercury	µg/L	-	0.026	1.0	-	-	0.0013	0.00050	0.00050	0.00050
Molybdenum	µg/L	-	73	-	-	-	0.43	0.58	0.55	0.55
Nickel	µg/L	-	25[(e)]	-	-	-	0.73	0.85	0.80	0.88
Selenium	µg/L	-	1.0	50	-	-	<0.04	<0.04	<0.04	0.042
Silver	µg/L	-	0.25	-	-	-	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	68	76	76	76
Thallium	µg/L	-	0.80	-	-	-	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	0.12	0.28	0.30	0.23
Uranium	µg/L	33	15	20	-	-	0.048	0.074	0.066	0.073
Vanadium	µg/L	-	-	-	-	-	0.073	0.064	0.080	0.066
Zinc	µg/L	-	-	-	5,000	-	<0.8	<0.8	<0.8	<0.8

Table 7B-3: Water Quality Results at Peninsula Lake D7, 2018

Parameter	Unit	Water Quality Guidelines					Sampling Stations			
		CCME Aquatic Life		Health Canada Drinking Water	Aesthetic	SSWQO	D7-01	D7-01	D7-02	D7-03
		Acute	Chronic				22-Jul-18	01-Sep-18	01-Sep-18	01-Sep-18
Dissolved Metals										
Aluminum	µg/L	-	-	-	-	-	4.8	1.8	2.1	2.4
Antimony	µg/L	-	-	-	-	-	<0.02	<0.02	<0.02	<0.02
Arsenic	µg/L	-	-	-	-	-	1.1	0.79	0.80	0.80
Barium	µg/L	-	-	-	-	-	16	21	17	17
Beryllium	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Bismuth	µg/L	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Boron	µg/L	-	-	-	-	-	11	12	13	13
Cadmium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Chromium	µg/L	-	-	-	-	-	<0.06	<0.06	<0.06	<0.06
Cobalt	µg/L	-	-	-	-	-	0.023	0.021	0.022	0.024
Copper	µg/L	-	-	-	-	-	0.79	0.78	0.78	-
Iron	µg/L	-	-	-	-	-	45	20	21	27
Lead	µg/L	-	-	-	-	-	0.013	0.083	<0.01	<0.01
Lithium	µg/L	-	-	-	-	-	1.5	1.4	1.7	1.7
Manganese	µg/L	-	-	-	-	-	1.9	0.84	0.75	0.80
Mercury	µg/L	-	-	-	-	-	0.0014	0.00060	0.00070	0.00060
Molybdenum	µg/L	-	-	-	-	-	0.42	0.59	0.57	0.56
Nickel	µg/L	-	-	-	-	-	0.70	0.81	0.79	0.776
Selenium	µg/L	-	-	-	-	-	<0.04	<0.04	0.046	<0.04
Silver	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Strontium	µg/L	-	-	-	-	-	65	68	77	77
Thallium	µg/L	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Tin	µg/L	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
Titanium	µg/L	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	-	-	-	-	-	0.051	0.082	0.081	0.076
Vanadium	µg/L	-	-	-	-	-	0.057	<0.05	0.065	0.068
Zinc	µg/L	55 - 63[g]	11 - 13[h]	-	-	-	2.4	0.84	<0.8	<0.8
Other										
Cyanide	mg/L	-	0.0050	0.20	-	-	<0.001	<0.001	<0.001	<0.001

(a) Temperature for some samples fell above the aesthetic guideline of 15˚C but were not flagged in this table because the guideline is not relevant.

(b) The ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.2058 mg-N/L) is based on the combination of field pH (8.4) and water temperature (18.0°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample.

(c) Guideline is pH dependent. The guideline range shown is based on the pH range observed in the dataset (8.3 to 8.4). The guideline is calculated based on the individual pH for each sample.

(d) Guideline is pH dependent: 5 µg/L at pH < 6.5 and 100 µg/L at pH ≥ 6.5.

(e) Guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (44 to 50 mg/L). The guideline is calculated based on the individual hardness value for each sample.

(f) Guideline is for chromium VI.

(g) Guideline is hardness and DOC dependent. The guideline range shown is based on the hardness (43.6 to 49.5 mg/L) and DOC (4.02 to 4.73 mg/L) range observed in the dataset. The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines calculated with hardness and DOC values falling outside the validated range (i.e., hardness 13.8 to 250.5 mg/L as CaCO3 and DOC 0.3 to 17.3 mg/L) were constrained to within the validated range as per CCME guidance (CCME 2018).

(h) Guideline is pH, hardness and DOC dependent. The guideline range shown is based on the of field pH (7.79 to 7.8), Hardness (43.6 to 49.5 mg/L) and DOC (4.02 to 4.73 mg/L). The guideline is calculated based on the individual hardness and DOC for each sample. Guidelines calculated with pH, Hardness and DOC values falling outside of the validated range (i.e., pH 6.5 to 8.13, hardness 23.4 to 399 mg/L and DOC 0.3 to 22.9 mg/L) were constrained to within the validated range as per CCME guidance (CCME 2018). The minimum guideline is 2 µg/L based on minimum Hardness of 23.4 mg/L, DOC of 0.3 mg/L and maximum pH of 8.13. Zinc toxicity increases as the pH increases, when field pH was not available laboratory pH was used.

No concentrations were higher than water quality guidelines.

Water quality data and guidelines shown in this table were rounded to reflect laboratory or field instrument precision *after* comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Concentrations equal to the guideline values were not identified as exceedances.

CCME = Canadian Council of Ministers of the Environment; SSWQO = site-specific water quality objective; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

Table 7B-4: Historical Water Quality Results at Peninsula Lake A8, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Field Measured																						
pH	-	7.8	7.8	7.6	8.1	0.27	0	3	8.2	8.2	8.2	8.2	0.013	0	4	8.1	8.1	7.9	8.4	0.24	0	6
Specific conductivity	µS/cm	259	235	183	264	45	0	3	293	293	289	296	4.0	0	4	306	291	255	306	23	0	6
Temperature	°C	12	13	12	14	0.96	0	3	14	14	14	14	0.31	0	4	14	14	14	14	0.12	0	6
Dissolved oxygen	mg/L	9.8	9.9	9.3	11	0.61	0	3	8.9	8.7	7.6	9.7	1.1	0	4	10	10	10.0	11	0.38	0	6
Dissolved oxygen	%	92	95	88	104	8.1	0	3	90	89	79	96	8.8	0	4	103	104	101	107	2.6	0	6
Conventional Parameters																						
pH	-	7.8	7.8	7.8	7.9	0.046	0	3	7.8	7.8	7.6	8.1	0.26	0	4	7.7	7.7	7.7	7.9	0.075	0	6
Specific conductivity	µS/cm	264	239	188	264	44	0	3	286	285	279	289	4.2	0	4	303	292	250	318	26	0	6
Hardness, as $CaCO_3$	mg/L	104	94	73	106	19	0	3	109	109	107	109	1.0	0	4	109	108	98	115	6.3	0	6
Total alkalinity, as $CaCO_3$	mg/L	38	38	36	41	3.3	0	2	44	44	43	45	1.1	0	2	49	49	47	51	1.5	0	4
Total dissolved solids	mg/L	172	158	120	181	33	0	3	221	221	197	246	27	0	4	205	203	166	229	22	0	6
Total dissolved solids (calculated)	mg/L	128	115	90	128	22	0	3	140	140	139	141	1.2	0	4	149	144	127	152	11	0	6
Total suspended solids	mg/L	<5.0	-	<5.0	<5.0	-	3	3	<1.0	-	<1.0	<1.0	-	4	4	1.5	1.6	<1.0	3.4	1.1	2	6
Turbidity	NTU	0.67	0.81	0.53	1.2	0.38	0	3	0.47	0.47	0.36	0.59	0.11	0	4	0.48	0.47	0.38	0.61	0.084	0	6
Major Ions																						
Bicarbonate	mg/L	44	46	44	50	3.3	0	3	53	53	50	54	2.1	0	4	58	58	55	62	2.7	0	6
Calcium	mg/L	35	32	24	35	6.5	0	3	36	36	36	36	0.34	0	4	36	35	32	37	2.1	0	6
Carbonate	mg/L	<5.0	-	<5.0	<5.0	-	3	3	<5.0	-	<5.0	<5.0	-	4	4	<5.0	-	<5.0	<5.0	-	6	6
Chloride	mg/L	51	44	28	51	13	0	3	57	57	57	58	0.49	0	4	60	56	43	61	7.9	0	6
Cyanide	mg/L	<0.002	-	<0.002	<0.002	-	3	3	<0.002	-	<0.002	<0.002	-	4	4	<0.001	-	<0.001	<0.001	-	6	6
Fluoride	mg/L	0.028	0.029	0.027	0.031	0.0021	0	3	0.032	0.032	0.030	0.034	0.0017	0	4	0.036	0.036	0.034	0.039	0.0019	0	6
Magnesium	mg/L	4.1	3.8	3.1	4.2	0.61	0	3	4.5	4.5	4.3	4.7	0.15	0	4	4.8	4.7	4.3	5.0	0.28	0	6
Potassium	mg/L	1.9	1.7	1.4	2.0	0.32	0	3	2.0	2.0	2.0	2.1	0.067	0	4	2.1	2.1	1.9	2.2	0.15	0	6
Reactive silica, as SiO2	mg/L	0.27	0.44	0.25	0.80	0.31	0	3	0.54	0.42	<0.01	0.58	0.28	1	4	0.69	0.86	0.59	1.4	0.35	0	6
Sodium	mg/L	6.7	6.1	4.6	7.0	1.3	0	3	7.8	7.8	7.7	7.9	0.090	0	4	8.2	7.8	6.8	8.4	0.70	0	6
Sulphate	mg/L	6.9	6.1	4.6	6.9	1.3	0	3	6.5	6.5	6.5	6.6	0.048	0	4	8.3	7.8	6.6	8.6	0.92	0	6
Nutrients and Organics																						
Nitrate	mg-N/L	0.015	0.012	<0.005	0.017	0.0079	1	3	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6
Nitrite	mg-N/L	<0.001	-	<0.001	<0.001	-	3	3	<0.001	-	<0.001	<0.001	-	4	4	<0.001	-	<0.001	<0.001	-	6	6
Nitrate + nitrite	mg-N/L	0.015	0.012	<0.0051	0.017	0.0079	1	3	<0.0051	-	<0.0051	<0.0051	-	4	4	<0.0051	-	<0.0051	<0.0051	-	6	6
Total ammonia	mg-N/L	<0.005	-	<0.005	<0.005	-	3	3	0.0060	-	<0.005	0.0086	-	2	4	0.0071	0.0079	<0.005	0.015	0.0047	1	6
Total Kjeldahl nitrogen	mg-N/L	0.39	0.40	0.36	0.44	0.040	0	3	0.31	0.29	0.21	0.33	0.055	0	4	0.31	0.32	0.30	0.38	0.030	0	6
Dissolved Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0	0	-	-	-	-	-	0	0	0.28	0.31	0.25	0.43	0.064	0	6
Total nitrogen (calculated)	mg-N/L	0.40	0.41	0.36	0.46	0.048	0	3	0.31	0.29	0.21	0.33	0.055	0	4	0.31	0.32	0.30	0.38	0.030	0	6
Total nitrogen	mg-N/L	-	-	-	-	-	0	0	0.31	0.29	0.21	0.33	0.055	0	4	0.31	0.32	0.30	0.38	0.030	0	6
Dissolved nitrogen	mg-N/L	-	-	-	-	-	0	0	-	-	-	-	-	0	0	0.28	0.31	0.25	0.43	0.064	0	6
Total phosphorus	mg-P/L	0.0062	0.0066	0.0059	0.0078	0.0010	0	3	0.0061	0.0060	0.0056	0.0064	0.00035	0	4	0.0067	0.0067	0.0046	0.0097	0.0019	0	6
Dissolved phosphorus	mg-P/L	0.0027	0.0026	0.0023	0.0027	0.00023	0	3	0.0025	0.0025	0.0017	0.0032	0.00074	0	4	0.0023	0.0022	0.0017	0.0025	0.00031	0	6
Orthophosphate	mg-P/L	<0.001	-	<0.001	0.0013	-	2	3	0.0011	-	<0.001	0.0011	-	2	4	<0.001	-	<0.001	0.0012	-	5	6
Total organic carbon	mg/L	4.2	4.3	3.8	4.9	0.53	0	3	3.9	3.9	3.6	4.2	0.27	0	4	4.2	4.2	3.6	4.8	0.47	0	6
Dissolved organic carbon	mg/L	4.4	4.6	4.4	5.1	0.45	0	3	3.8	3.8	3.5	4.1	0.30	0	4	4.1	4.3	3.9	5.0	0.46	0	6

Table 7B-4: Historical Water Quality Results at Peninsula Lake A8, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Total Metals																						
Aluminum	µg/L	2.1	2.1	1.7	2.4	0.31	0	3	1.5	1.4	0.99	1.7	0.30	0	4	1.7	2.0	1.1	4.5	1.3	0	6
Antimony	µg/L	<0.02	-	<0.02	0.021	-	2	3	<0.02	-	<0.02	<0.02	-	4	4	0.026	-	<0.02	0.41	-	3	6
Arsenic	µg/L	1.8	1.8	1.5	2.0	0.27	0	3	2.1	2.1	1.9	2.3	0.17	0	4	2.2	2.1	1.9	2.5	0.23	0	6
Barium	µg/L	25	23	20	26	3.0	0	3	29	29	29	29	0.25	0	4	29	29	26	31	2.1	0	6
Beryllium	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	<0.01	-	4	4	<0.01	-	<0.01	<0.01	-	6	6
Bismuth	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	<0.01	-	4	4	<0.005	-	<0.005	<0.005	-	6	6
Boron	µg/L	2.9	3.4	2.5	4.7	1.2	0	3	5.0	5.3	4.2	6.9	1.1	0	4	<5.0	-	<5.0	<5.0	-	6	6
Cadmium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	0.0051	-	5	6
Chromium	µg/L	<0.06	-	<0.06	<0.06	-	3	3	<0.06	-	<0.06	0.12	-	3	4	<0.1	-	<0.1	<0.1	-	6	6
Cobalt	µg/L	0.034	0.034	0.017	0.051	0.017	0	3	0.033	0.033	0.020	0.048	0.011	0	4	0.028	0.030	0.021	0.045	0.0090	0	6
Copper	µg/L	0.77	0.83	0.73	0.98	0.13	0	3	0.59	0.65	0.57	0.84	0.13	0	4	0.69	0.70	0.61	0.85	0.089	0	6
Iron	µg/L	41	41	15	68	27	0	3	46	46	19	72	22	0	4	38	40	28	59	12	0	6
Lead	µg/L	0.015	0.018	<0.01	0.034	0.015	1	3	<0.01	-	<0.01	<0.01	-	4	4	<0.01	-	<0.01	0.030	-	4	6
Lithium	µg/L	9.8	8.6	6.0	10	2.3	0	3	10.0	10.0	9.2	11	0.60	0	4	9.8	9.3	7.4	10	1.3	0	6
Manganese	µg/L	7.9	7.1	0.61	13	6.1	0	3	8.9	8.3	2.9	13	4.0	0	4	7.7	8.5	6.0	12	2.4	0	6
Mercury	µg/L	<0.0005	-	<0.0005	0.00055	-	2	3	0.00080	0.00080	0.00060	0.0010	0.00023	0	4	0.00095	0.00093	0.00060	0.0013	0.00023	0	6
Molybdenum	µg/L	0.18	0.19	0.17	0.22	0.024	0	3	0.19	0.19	0.17	0.21	0.025	0	4	0.22	0.22	0.22	0.23	0.0038	0	6
Nickel	µg/L	0.84	0.85	0.79	0.93	0.073	0	3	0.79	0.79	0.77	0.80	0.013	0	4	0.85	0.85	0.77	0.94	0.060	0	6
Selenium	µg/L	<0.04	-	<0.04	<0.04	-	3	3	<0.04	-	<0.04	<0.04	-	4	4	<0.04	-	<0.04	<0.04	-	6	6
Silver	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6
Strontium	µg/L	238	209	152	238	50	0	3	258	258	256	260	1.7	0	4	266	249	200	270	31	0	6
Thallium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	4	4	0.0034	0.0034	0.0029	0.0040	0.00043	0	6
Tin	µg/L	<0.05	-	<0.05	<0.05	-	3	3	<0.05	-	<0.05	<0.05	-	4	4	<0.02	-	<0.02	0.030	-	5	6
Titanium	µg/L	<0.1	-	<0.1	<0.1	-	3	3	<0.1	-	<0.1	<0.1	-	4	4	<0.5	-	<0.5	<0.5	-	6	6
Uranium	µg/L	0.025	0.025	0.023	0.026	0.0015	0	3	0.043	0.043	0.042	0.043	0.00050	0	4	0.050	0.050	0.048	0.054	0.0024	0	6
Vanadium	µg/L	<0.05	-	<0.05	<0.05	-	3	3	<0.05	-	<0.05	<0.05	-	4	4	<0.05	-	<0.05	<0.05	-	6	6
Zinc	µg/L	<0.8	-	<0.8	1.1	-	2	3	<0.8	-	<0.8	<0.8	-	4	4	1.2	1.3	<0.5	2.8	0.84	1	6
Dissolved Metals																						
Aluminum	µg/L	1.5	1.5	0.93	2.0	0.74	0	2	0.65	0.89	0.62	1.4	0.44	0	3	2.5	3.2	1.8	7.2	2.0	0	6
Antimony	µg/L	<0.02	-	<0.02	0.027	-	2	3	<0.02	-	<0.02	<0.02	-	4	4	0.020	-	<0.02	0.096	-	3	6
Arsenic	µg/L	1.7	1.7	1.6	1.7	0.076	0	3	1.8	1.9	1.7	2.3	0.29	0	4	1.8	1.9	1.8	2.2	0.19	0	6
Barium	µg/L	25	24	20	26	3.1	0	3	29	29	29	30	0.43	0	4	29	28	25	29	1.9	0	6
Beryllium	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	<0.01	-	4	4	<0.01	-	<0.01	<0.01	-	6	6
Bismuth	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	0.010	-	3	4	<0.005	-	<0.005	<0.005	-	6	6
Boron	µg/L	3.2	3.3	2.7	4.0	0.66	0	3	5.4	5.3	4.9	5.6	0.36	0	3	<10	-	<10	<10	-	6	6
Cadmium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6
Chromium	µg/L	<0.06	-	<0.06	0.074	-	2	3	<0.06	-	<0.06	0.16	-	3	4	<0.1	-	<0.1	0.17	-	5	6
Cobalt	µg/L	0.020	0.024	0.019	0.033	0.0078	0	3	0.015	0.021	0.012	0.040	0.013	0	4	0.038	0.037	0.017	0.058	0.017	0	6
Copper	µg/L	0.84	0.84	0.73	0.94	0.15	0	2	0.58	0.58	0.55	0.61	0.030	0	3	0.91	0.92	0.75	1.1	0.13	0	6
Iron	µg/L	25	25	22	28	3.7	0	2	4.7	8.8	2.2	20	9.4	0	3	17	20	15	29	6.7	0	6
Lead	µg/L	0.035	0.094	0.015	0.23	0.12	0	3	<0.01	-	<0.01	<0.01	-	4	4	0.025	0.043	0.0092	0.15	0.054	0	6
Lithium	µg/L	9.9	8.6	5.7	10	2.5	0	3	9.7	9.6	9.1	9.9	0.33	0	4	9.6	9.0	6.8	10	1.4	0	6
Manganese	µg/L	0.74	0.74	0.61	0.86	0.18	0	2	0.37	0.45	0.064	0.92	0.43	0	3	1.6	1.9	1.1	2.9	0.75	0	6

Table 7B-4: Historical Water Quality Results at Peninsula Lake A8, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Dissolved Metals (cont'd)																						
Mercury	µg/L	<0.0005	-	<0.0005	<0.0005	-	3	3	<0.0005	-	<0.0005	0.00050	-	3	4	0.00095	0.00097	0.00090	0.0011	0.000082	0	6
Molybdenum	µg/L	0.18	0.18	0.17	0.19	0.013	0	3	0.19	0.20	0.16	0.23	0.032	0	4	0.24	0.24	0.21	0.29	0.028	0	6
Nickel	µg/L	0.81	0.82	0.79	0.87	0.039	0	3	0.81	0.80	0.71	0.87	0.067	0	4	0.81	0.85	0.73	1.2	0.17	0	6
Selenium	µg/L	<0.04	-	<0.04	<0.04	-	3	3	<0.04	-	<0.04	<0.04	-	4	4	<0.04	-	<0.04	<0.04	-	6	6
Silver	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6
Strontium	µg/L	240	211	141	251	61	0	3	255	254	249	257	3.6	0	4	252	239	194	271	31	0	6
Thallium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	4	4	0.0039	0.0040	0.0037	0.0047	0.00039	0	6
Tin	µg/L	<0.05	-	<0.05	<0.05	-	3	3	<0.05	-	<0.05	<0.05	-	4	4	0.011	-	<0.01	0.016	-	3	6
Titanium	µg/L	<0.1	-	<0.1	<0.1	-	3	3	<0.1	-	<0.1	<0.1	-	4	4	<0.3	-	<0.3	<0.3	-	6	6
Uranium	µg/L	0.027	0.025	0.022	0.027	0.0029	0	3	0.044	0.044	0.043	0.045	0.00096	0	4	0.053	0.052	0.046	0.056	0.0037	0	6
Vanadium	µg/L	<0.05	-	<0.05	<0.05	-	3	3	<0.05	-	<0.05	<0.05	-	4	4	<0.05	-	<0.05	0.055	-	5	6
Zinc	µg/L	<0.8	-	<0.8	16	-	2	3	<0.8	-	<0.8	<0.8	-	4	4	1.9	2.8	0.71	8.3	2.7	0	6
Other																						
Cyanide (free)	mg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.001	<0.005	-	6	6
Cyanide (wad)	mg/L	<0.002	-	<0.002	<0.002	-	3	3	<0.002	-	<0.002	<0.002	-	4	4	<0.001	-	<0.001	<0.001	-	6	6

SD = standard deviation; µS/cm = microsiemens per centimetre; NTU = nephelometric turbidity unit; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

Table 7B-5: Historical Water Quality Results at Peninsula Lake B7, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Field Measured																						
pH	-	7.5	7.5	7.2	7.8	0.30	0	4	8.1	8.1	7.9	8.3	0.13	0	6	8.0	8.0	7.9	8.2	0.17	0	6
Specific conductivity	µS/cm	149	151	149	156	3.5	0	4	164	163	158	167	3.4	0	6	159	159	157	160	1.2	0	6
Temperature	°C	10	10	9.9	11	0.70	0	4	14	14	14	14	0.26	0	6	11	11	9.4	12	1.3	0	6
Dissolved oxygen	mg/L	9.6	9.7	9.0	11	0.74	0	4	8.6	8.3	6.3	9.8	1.5	0	6	11	11	11	12	0.26	0	6
Dissolved oxygen	%	86	88	80	99	8.0	0	4	85	82	61	97	15	0	6	104	104	102	106	1.6	0	6
Conventional Parameters																						
pH	-	7.5	7.5	7.4	7.7	0.12	0	4	7.8	7.8	7.6	8.1	0.25	0	6	7.6	7.6	7.6	7.7	0.022	0	6
Specific conductivity	µS/cm	163	163	161	164	1.3	0	4	165	164	161	166	2.1	0	6	162	162	161	163	0.89	0	6
Hardness, as $CaCO_3$	mg/L	63	65	63	69	2.8	0	4	66	66	62	68	2.5	0	6	62	63	60	65	1.7	0	6
Total alkalinity, as $CaCO_3$	mg/L	34	34	32	35	1.5	0	4	37	37	35	38	1.3	0	6	37	37	37	38	0.35	0	6
Total dissolved solids	mg/L	109	108	103	111	3.6	0	4	116	114	102	120	7.2	0	6	100	100	95	109	5.1	0	6
Total dissolved solids (calculated)	mg/L	79	79	79	80	0.49	0	4	81	80	78	82	2.2	0	6	79	79	77	81	1.6	0	6
Total suspended solids	mg/L	<5.0	-	<5.0	<5.0	-	4	4	<1.0	-	<1.0	1.2	-	4	6	1.1	1.3	<1.0	2.2	0.78	2	6
Turbidity	NTU	0.54	0.55	0.47	0.64	0.072	0	4	0.41	0.39	0.32	0.45	0.052	0	6	0.40	0.39	0.33	0.45	0.052	0	6
Major Ions																						
Bicarbonate	mg/L	42	42	39	43	1.8	0	4	45	45	42	46	1.6	0	6	46	46	45	46	0.45	0	6
Calcium	mg/L	22	22	21	23	1.0	0	4	23	22	21	23	0.99	0	6	21	20	20	21	0.21	0	6
Carbonate	mg/L	<5.0	-	<5.0	<5.0	-	4	4	<5.0	-	<5.0	<5.0	-	6	6	<5.0	-	<5.0	<5.0	-	6	6
Chloride	mg/L	25	25	25	26	0.49	0	4	24	24	24	25	0.41	0	6	22	22	20	23	1.3	0	6
Cyanide	mg/L	<0.002	-	<0.002	<0.002	-	4	4	<0.002	-	<0.002	<0.002	-	6	6	<0.001	-	<0.001	<0.001	-	6	6
Fluoride	mg/L	0.027	0.027	0.026	0.028	0.00096	0	4	0.031	0.031	0.031	0.031	0	0	6	0.030	0.026	<0.02	0.037	0.013	2	6
Magnesium	mg/L	2.4	2.4	2.3	2.5	0.090	0	4	2.4	2.4	2.3	2.4	0.046	0	6	2.5	2.5	2.4	2.6	0.065	0	6
Potassium	mg/L	1.3	1.3	1.3	1.3	0.022	0	4	1.3	1.3	1.3	1.4	0.049	0	6	1.4	1.3	1.2	1.4	0.064	0	6
Reactive silica, as SiO2	mg/L	1.0	1.0	0.99	1.1	0.056	0	4	0.86	0.88	0.76	1.00	0.090	0	6	0.35	0.34	0.30	0.37	0.027	0	6
Sodium	mg/L	3.6	3.6	3.4	3.8	0.14	0	4	3.9	3.9	3.7	4.0	0.11	0	6	4.1	4.1	4.0	4.4	0.16	0	6
Sulphate	mg/L	4.6	4.6	4.5	4.6	0.073	0	4	4.2	4.2	4.1	4.2	0.018	0	6	5.4	5.3	4.7	6.0	0.63	0	6
Nutrients and Organics																						
Nitrate	mg-N/L	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	0.018	-	4	6	<0.005	-	<0.005	<0.005	-	6	6
Nitrite	mg-N/L	<0.001	-	<0.001	<0.001	-	4	4	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	6	6
Nitrate + nitrite	mg-N/L	<0.0051	-	-	-	-	1	1	<0.0051	-	<0.0051	0.018	-	4	6	<0.0051	-	<0.0051	<0.0051	-	6	6
Total ammonia	mg-N/L	<0.005	-	<0.005	<0.005	-	4	4	0.0086	0.0083	<0.005	0.013	0.0041	1	6	0.0090	0.015	<0.005	0.042	0.015	2	6
Total Kjeldahl nitrogen	mg-N/L	0.29	0.32	0.26	0.46	0.093	0	4	0.31	0.32	0.25	0.40	0.048	0	6	0.38	0.38	0.33	0.44	0.045	0	6
Dissolved Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0	0	-	-	-	-	-	0	0	0.37	0.38	0.32	0.47	0.057	0	6
Total nitrogen (calculated)	mg-N/L	0.46	-	-	-	-	0	1	0.31	0.32	0.27	0.40	0.043	0	6	0.38	0.38	0.33	0.44	0.045	0	6
Total nitrogen	mg-N/L	-	-	-	-	-	0	0	0.31	0.32	0.27	0.40	0.043	0	6	0.38	0.38	0.33	0.44	0.045	0	6
Dissolved nitrogen	mg-N/L	-	-	-	-	-	0	0	-	-	-	-	-	0	0	0.37	0.38	0.32	0.47	0.057	0	6
Total phosphorus	mg-P/L	0.0066	0.0066	0.0064	0.0068	0.00017	0	4	0.0070	0.0075	0.0061	0.0094	0.0015	0	6	0.0060	0.0061	0.0056	0.0069	0.00052	0	6
Dissolved phosphorus	mg-P/L	0.0022	0.0022	0.0015	0.0029	0.00064	0	4	0.0023	0.0021	0.0016	0.0024	0.00034	0	6	0.0032	0.0032	0.0028	0.0036	0.00035	0	6
Orthophosphate	mg-P/L	<0.001	-	<0.001	<0.001	-	4	4	<0.001	-	<0.001	0.0013	-	5	6	<0.001	-	<0.001	0.0012	-	5	6
Total organic carbon	mg/L	5.1	17	4.9	53	24	0	4	5.1	5.1	5.0	5.4	0.20	0	6	5.4	5.3	4.8	5.5	0.26	0	6
Dissolved organic carbon	mg/L	5.2	4.7	2.9	5.5	1.2	0	4	5.2	5.1	4.9	5.3	0.18	0	6	5.2	5.3	5.1	5.6	0.19	0	6

Table 7B-5: Historical Water Quality Results at Peninsula Lake B7, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Total Metals																						
Aluminum	µg/L	1.6	1.6	1.3	1.8	0.18	0	4	1.7	3.4	1.5	12	4.1	0	6	3.0	3.4	1.9	5.7	1.3	0	6
Antimony	µg/L	<0.02	-	<0.02	<0.02	-	4	4	<0.02	-	<0.02	<0.02	-	6	6	<0.02	-	<0.02	<0.02	-	6	6
Arsenic	µg/L	1.4	1.4	1.4	1.5	0.046	0	4	1.7	1.7	1.6	2.0	0.15	0	6	1.3	1.3	1.3	1.4	0.043	0	6
Barium	µg/L	19	19	18	19	0.45	0	4	20	20	19	20	0.41	0	6	19	18	18	19	0.70	0	6
Beryllium	µg/L	<0.01	-	<0.01	<0.01	-	4	4	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6
Bismuth	µg/L	<0.01	-	<0.01	<0.01	-	4	4	<0.01	-	<0.01	<0.01	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Boron	µg/L	3.8	4.4	3.6	6.5	1.4	0	4	7.7	7.4	5.7	8.4	0.97	0	6	<5.0	-	<5.0	<5.0	-	6	6
Cadmium	µg/L	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	0.019	-	5	6	<0.005	-	<0.005	0.0070	-	5	6
Chromium	µg/L	<0.06	-	<0.06	<0.06	-	4	4	<0.06	-	<0.06	<0.06	-	6	6	<0.1	-	<0.1	<0.1	-	6	6
Cobalt	µg/L	0.042	0.042	0.037	0.047	0.0041	0	4	0.048	0.076	0.038	0.23	0.076	0	6	0.035	0.036	0.034	0.039	0.0020	0	6
Copper	µg/L	0.70	0.70	0.69	0.73	0.019	0	4	0.62	0.66	0.59	0.91	0.12	0	6	0.77	0.84	0.72	1.1	0.17	0	6
Iron	µg/L	88	87	78	95	6.9	0	4	89	89	67	110	19	0	6	58	59	55	66	4.1	0	6
Lead	µg/L	0.014	0.013	<0.01	0.020	0.0064	1	4	<0.01	-	<0.01	0.086	-	5	6	0.013	0.023	<0.01	0.084	0.030	2	6
Lithium	µg/L	6.1	7.6	6.0	12	3.0	0	4	5.4	5.4	5.2	5.6	0.20	0	6	4.4	4.4	3.9	5.1	0.52	0	6
Manganese	µg/L	8.5	8.5	7.5	9.5	0.85	0	4	7.6	7.1	5.4	8.5	1.4	0	6	4.4	4.4	4.1	4.9	0.29	0	6
Mercury	µg/L	<0.0005	-	<0.0005	0.00050	-	3	4	0.00080	0.00083	0.00060	0.0012	0.00021	0	6	0.00075	0.0011	0.00050	0.0021	0.00070	0	6
Molybdenum	µg/L	0.16	0.17	0.15	0.18	0.013	0	4	0.15	0.16	0.13	0.21	0.031	0	6	0.17	0.17	0.16	0.18	0.0070	0	6
Nickel	µg/L	0.86	0.87	0.84	0.92	0.034	0	4	0.91	0.98	0.81	1.5	0.27	0	6	1.0	1.1	0.93	1.3	0.14	0	6
Selenium	µg/L	<0.04	-	<0.04	<0.04	-	4	4	0.040	-	<0.04	0.049	-	3	6	<0.04	-	<0.04	<0.04	-	6	6
Silver	µg/L	<0.005	-	<0.005	0.0062	-	3	4	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Strontium	µg/L	153	152	149	154	2.4	0	4	148	148	142	156	6.0	0	6	139	140	136	148	4.3	0	6
Thallium	µg/L	<0.005	-	<0.005	0.0064	-	3	4	<0.005	-	<0.005	0.0054	-	5	6	0.0030	0.0031	0.0027	0.0035	0.00030	0	6
Tin	µg/L	<0.05	-	<0.05	<0.05	-	4	4	<0.05	-	<0.05	0.078	-	5	6	<0.02	-	<0.02	<0.02	-	6	6
Titanium	µg/L	<0.1	-	<0.1	<0.1	-	4	4	<0.1	-	<0.1	0.33	-	4	6	<0.5	-	<0.5	<0.5	-	6	6
Uranium	µg/L	0.024	0.024	0.020	0.029	0.0040	0	4	0.026	0.027	0.025	0.029	0.0019	0	6	0.026	0.026	0.025	0.029	0.0016	0	6
Vanadium	µg/L	<0.05	-	<0.05	<0.05	-	4	4	<0.05	-	<0.05	0.050	-	5	6	<0.05	-	<0.05	<0.05	-	6	6
Zinc	µg/L	<0.8	-	<0.8	<0.8	-	4	4	<0.8	-	<0.8	40	-	5	6	1.2	2.6	0.54	10	3.7	0	6
Dissolved Metals																						
Aluminum	µg/L	1.1	1.1	0.73	1.5	0.32	0	4	1.2	1.2	1.1	1.5	0.17	0	6	2.5	2.5	1.5	3.8	1.1	0	6
Antimony	µg/L	<0.02	-	<0.02	<0.02	-	4	4	<0.02	-	<0.02	<0.02	-	6	6	<0.02	-	<0.02	0.036	-	5	6
Arsenic	µg/L	1.3	1.3	1.3	1.3	0.019	0	4	1.4	1.4	1.4	1.5	0.042	0	6	1.2	1.2	1.2	1.2	0.029	0	6
Barium	µg/L	18	18	17	19	0.66	0	4	19	19	18	20	0.50	0	6	18	18	17	18	0.45	0	6
Beryllium	µg/L	<0.01	-	<0.01	<0.01	-	4	4	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6
Bismuth	µg/L	<0.01	-	<0.01	<0.01	-	4	4	<0.01	-	<0.01	<0.01	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Boron	µg/L	3.1	3.1	2.7	3.7	0.43	0	4	6.6	6.6	6.4	6.8	0.16	0	6	<10	-	<10	19	-	5	6
Cadmium	µg/L	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Chromium	µg/L	<0.06	-	<0.06	<0.06	-	4	4	0.11	0.11	<0.06	0.18	0.069	2	6	<0.1	-	<0.1	0.19	-	4	6
Cobalt	µg/L	0.021	0.021	0.017	0.027	0.0043	0	4	0.021	0.021	0.019	0.022	0.0010	0	6	0.038	0.044	0.035	0.064	0.012	0	6
Copper	µg/L	0.68	0.71	0.65	0.84	0.088	0	4	-	-	-	-	-	0	0	1.0	1.0	0.77	1.3	0.19	0	6
Iron	µg/L	35	38	31	51	9.0	0	4	30	30	24	36	5.5	0	6	33	32	22	38	6.2	0	6
Lead	µg/L	0.022	0.025	0.014	0.043	0.013	0	4	0.013	-	<0.01	0.025	-	3	6	0.036	0.073	0.010	0.24	0.095	0	5
Lithium	µg/L	6.0	7.6	5.9	12	3.2	0	4	5.4	5.4	5.1	5.5	0.16	0	6	4.6	4.6	4.5	4.6	0.037	0	6
Manganese	µg/L	2.2	2.8	0.93	5.6	2.0	0	4	0.89	0.90	0.74	1.1	0.13	0	6	0.88	1.3	0.82	2.7	0.79	0	6
Mercury	µg/L	<0.0005	-	<0.0005	<0.0005	-	4	4	0.00060	0.00057	0.00050	0.00060	0.000052	0	6	0.00060	0.00062	0.00050	0.00070	0.000075	0	6

Table 7B-5: Historical Water Quality Results at Peninsula Lake B7, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Dissolved Metals (cont'd)																						
Molybdenum	µg/L	0.14	0.14	0.14	0.15	0.0071	0	4	0.16	0.17	0.14	0.22	0.030	0	6	0.20	0.21	0.17	0.27	0.040	0	6
Nickel	µg/L	0.86	0.86	0.82	0.89	0.034	0	4	0.87	0.87	0.82	0.91	0.033	0	6	1.0	1.0	0.96	1.1	0.039	0	6
Selenium	µg/L	<0.04	-	<0.04	<0.04	-	4	4	<0.04	-	<0.04	<0.04	-	6	6	<0.04	-	<0.04	<0.04	-	6	6
Silver	µg/L	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Strontium	µg/L	148	148	144	151	3.3	0	4	147	146	138	154	6.9	0	6	134	134	129	139	3.8	0	6
Thallium	µg/L	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6	0.0033	0.0032	0.0026	0.0039	0.00044	0	6
Tin	µg/L	<0.05	-	<0.05	<0.05	-	4	4	<0.05	-	<0.05	<0.05	-	6	6	0.015	-	<0.01	0.088	-	3	6
Titanium	µg/L	<0.1	-	<0.1	<0.1	-	4	4	<0.1	-	<0.1	<0.1	-	6	6	<0.3	-	<0.3	<0.3	-	6	6
Uranium	µg/L	0.026	0.025	0.019	0.027	0.0037	0	4	0.026	0.026	0.025	0.027	0.00089	0	6	0.029	0.029	0.027	0.032	0.0021	0	6
Vanadium	µg/L	<0.05	-	<0.05	<0.05	-	4	4	<0.05	-	<0.05	<0.05	-	6	6	<0.05	-	<0.05	<0.05	-	6	6
Zinc	µg/L	<0.8	-	<0.8	<0.8	-	4	4	<0.8	-	<0.8	1.2	-	5	6	1.5	1.6	<0.5	3.2	1.0	1	6
Other																						
Free cyanide	mg/L	<0.005	-	<0.005	<0.005	-	4	4	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.001	<0.005	-	6	6
Cyanide (wad)	mg/L	<0.002	-	<0.002	<0.002	-	4	4	<0.002	-	<0.002	<0.002	-	6	6	<0.001	-	<0.001	<0.001	-	6	6

SD = standard deviation; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

Table 7B-6: Historical Water Quality Results at Peninsula Lake D7, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Field Measured																						
pH	-	7.9	7.9	7.8	7.9	0.069	0	3	8.3	8.3	8.2	8.3	0.029	0	6	8.2	8.2	8.2	8.4	0.094	0	6
Specific conductivity	µS/cm	110	110	110	111	0.58	0	3	144	144	139	147	3.7	0	6	153	153	151	154	1.3	0	6
Temperature	°C	13	13	13	13	0.15	0	3	14	14	14	15	0.32	0	6	13	13	12	13	0.34	0	6
Dissolved oxygen	mg/L	11	11	11	11	0.16	0	3	7.7	7.9	6.2	9.8	1.8	0	6	11	11	11	11	0.16	0	6
Dissolved oxygen	%	103	103	101	104	1.4	0	3	77	79	62	98	18	0	6	107	106	103	108	2.4	0	6
Conventional Parameters																						
pH	-	7.8	7.8	7.8	7.8	0.0058	0	3	8.0	7.9	7.7	8.2	0.26	0	6	7.6	7.6	7.3	7.9	0.31	0	6
Specific conductivity	µS/cm	111	111	111	112	0.58	0	3	145	145	143	147	1.9	0	6	155	155	151	160	3.8	0	6
Hardness, as $CaCO_3$	mg/L	42	42	41	42	0.42	0	3	52	52	51	54	1.2	0	6	54	54	52	58	2.4	0	6
Total alkalinity, as $CaCO_3$	mg/L	40	39	38	40	1.2	0	3	49	50	48	54	2.5	0	6	55	55	54	55	0.55	0	6
Total dissolved solids	mg/L	65	61	52	67	8.1	0	3	96	95	83	103	7.7	0	6	91	92	89	100	4.4	0	6
Total dissolved solids (calculated)	mg/L	57	57	56	58	0.75	0	3	73	74	72	77	2.2	0	6	79	79	78	81	1.4	0	6
Total suspended solids	mg/L	<3.0	-	<3.0	<3.0	-	3	3	<1.0	-	<1.0	1.3	-	5	6	1.0	-	<1.0	2.2	-	3	6
Total organic carbon	mg/L	3.5	3.5	3.4	3.6	0.071	0	3	4.7	4.7	4.4	5.0	0.26	0	6	5.1	5.0	4.8	5.2	0.21	0	6
Dissolved organic carbon	mg/L	3.3	2.9	1.9	3.6	0.87	0	3	4.6	4.5	4.2	4.8	0.20	0	6	4.8	4.8	4.4	5.1	0.35	0	6
Turbidity	NTU	0.85	0.85	0.84	0.86	0.010	0	3	0.56	0.58	0.41	0.82	0.17	0	6	0.89	0.90	0.79	1.0	0.099	0	6
Major Ions																						
Bicarbonate	mg/L	48	48	46	49	1.4	0	3	59	61	58	66	3.1	0	6	67	67	66	68	0.70	0	6
Calcium	mg/L	13	13	13	13	0.100	0	3	16	16	16	17	0.50	0	6	16	16	15	17	0.72	0	6
Carbonate	mg/L	<5.0	-	<5.0	<5.0	-	3	3	<5.0	-	<5.0	<5.0	-	6	6	<5.0	-	<5.0	<5.0	-	6	6
Chloride	mg/L	8.6	8.6	8.6	8.7	0.036	0	3	11	11	11	12	0.28	0	6	12	12	12	12	0.23	0	6
Cyanide	mg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.002	-	<0.002	<0.002	-	6	6	<0.001	-	<0.001	<0.001	-	6	6
Fluoride	mg/L	0.031	0.031	0.030	0.031	0.00058	0	3	0.043	0.043	0.042	0.045	0.0013	0	6	0.044	0.045	0.043	0.052	0.0036	0	6
Magnesium	mg/L	2.3	2.2	2.2	2.3	0.040	0	3	2.9	2.9	2.8	2.9	0.028	0	6	3.1	3.1	2.9	3.4	0.21	0	6
Potassium	mg/L	1.0	1.0	1.00	1.0	0.0064	0	3	1.3	1.3	1.3	1.3	0.026	0	6	1.4	1.4	1.3	1.5	0.12	0	6
Reactive silica, as SiO2	mg/L	0.18	0.18	0.17	0.19	0.0098	0	3	0.27	0.27	0.27	0.28	0.0032	0	6	0.14	0.14	0.13	0.14	0.0025	0	6
Sodium	mg/L	5.9	6.0	5.9	6.0	0.061	0	3	8.0	8.0	7.9	8.1	0.072	0	6	8.3	8.3	7.8	8.7	0.37	0	6
Sulphate	mg/L	2.9	2.9	2.9	3.0	0.025	0	3	4.2	4.2	4.2	4.3	0.054	0	6	5.0	4.8	3.8	5.2	0.51	0	6
Nutrients and Organics																						
Nitrate	mg-N/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Nitrite	mg-N/L	<0.001	-	<0.001	<0.001	-	3	3	<0.001	-	<0.001	<0.001	-	6	6	<0.001	-	<0.001	<0.001	-	6	6
Nitrate + nitrite	mg-N/L	<0.0051	-	<0.0051	<0.0051	-	3	3	<0.0051	-	<0.0051	<0.0051	-	6	6	<0.0051	-	<0.0051	<0.0051	-	6	6
Total ammonia	mg-N/L	0.0070	0.0068	0.0064	0.0071	0.00038	0	3	0.0050	-	<0.005	0.0071	-	3	6	0.0064	0.0072	0.0056	0.012	0.0023	0	6
Total Kjeldahl nitrogen	mg-N/L	0.36	0.35	0.33	0.37	0.017	0	3	0.36	0.36	0.32	0.39	0.028	0	6	0.31	0.32	0.24	0.45	0.084	0	6
Dissolved Kjeldahl nitrogen	mg-N/L	-	-	-	-	-	0	0	-	-	-	-	-	0	0	0.28	0.28	0.19	0.38	0.077	0	6
Total nitrogen (calculated)	mg-N/L	0.36	0.35	0.33	0.37	0.017	0	3	0.36	0.36	0.32	0.39	0.028	0	6	0.31	0.32	0.24	0.45	0.084	0	6
Total nitrogen	mg-N/L	-	-	-	-	-	0	0	0.36	0.36	0.32	0.39	0.028	0	6	0.31	0.32	0.24	0.45	0.084	0	6
Dissolved nitrogen	mg-N/L	-	-	-	-	-	0	0	-	-	-	-	-	0	0	0.28	0.28	0.19	0.38	0.077	0	6
Total phosphorus	mg-P/L	0.013	0.013	0.012	0.013	0.00075	0	3	0.013	0.016	0.012	0.033	0.0081	0	6	0.013	0.013	0.011	0.017	0.0022	0	6
Dissolved phosphorus	mg-P/L	0.0039	0.0044	0.0039	0.0054	0.00087	0	3	0.0032	0.0033	0.0024	0.0043	0.00074	0	6	0.0047	0.0050	0.0040	0.0064	0.0011	0	6
Orthophosphate	mg-P/L	<0.001	-	<0.001	<0.001	-	3	3	0.0019	0.0021	0.0012	0.0042	0.0011	0	6	<0.001	-	<0.001	0.0018	-	4	6

Table 7B-6: Historical Water Quality Results at Peninsula Lake D7, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Total Metals																						
Aluminum	µg/L	4.1	4.0	3.1	4.8	0.82	0	3	5.4	5.6	4.7	7.1	0.82	0	6	5.3	5.5	4.2	6.7	0.98	0	6
Antimony	µg/L	<0.02	-	<0.02	<0.02	-	3	3	<0.02	-	<0.02	0.035	-	4	6	<0.02	-	<0.02	<0.02	-	6	6
Arsenic	µg/L	1.0	1.0	1.0	1.1	0.025	0	3	1.1	1.1	0.97	1.2	0.085	0	6	0.96	0.97	0.90	1.1	0.055	0	6
Barium	µg/L	15	15	15	15	0.20	0	3	16	16	16	17	0.69	0	6	16	16	15	17	0.50	0	6
Beryllium	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6
Bismuth	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	<0.01	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Boron	µg/L	9.7	9.7	9.0	10	0.65	0	3	16	16	14	18	1.2	0	6	12	12	11	13	0.89	0	6
Cadmium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	0.011	-	5	6
Chromium	µg/L	<0.06	-	<0.06	<0.06	-	3	3	<0.06	-	<0.06	0.067	-	5	6	<0.1	-	<0.1	<0.1	-	6	6
Cobalt	µg/L	0.046	0.046	0.046	0.047	0.00058	0	3	0.040	0.041	0.035	0.047	0.0057	0	6	0.043	0.043	0.039	0.047	0.0030	0	6
Copper	µg/L	0.60	0.59	0.58	0.60	0.012	0	3	0.74	0.73	0.69	0.76	0.028	0	6	0.94	0.95	0.79	1.2	0.15	0	6
Iron	µg/L	126	125	122	127	2.6	0	3	61	60	46	75	12	0	6	47	47	42	52	4.3	0	6
Lead	µg/L	<0.01	-	<0.01	0.013	-	2	3	<0.01	-	<0.01	0.012	-	5	6	0.017	-	<0.01	0.023	-	3	6
Lithium	µg/L	1.3	1.3	1.2	1.4	0.10	0	3	1.6	1.7	1.5	2.0	0.17	0	6	1.7	1.6	1.3	1.8	0.27	0	6
Manganese	µg/L	12	12	12	12	0.20	0	3	9.8	9.6	8.4	11	0.88	0	6	11	11	9.2	13	1.5	0	6
Mercury	µg/L	0.00055	0.00055	0.00054	0.00057	0.000015	0	3	0.00070	0.00067	0.00060	0.00070	0.000052	0	6	0.00080	0.00079	<0.0005	0.0011	0.00031	1	6
Molybdenum	µg/L	0.25	0.25	0.24	0.25	0.0057	0	3	0.41	0.41	0.35	0.46	0.047	0	6	0.44	0.45	0.41	0.48	0.027	0	6
Nickel	µg/L	0.56	0.55	0.54	0.57	0.016	0	3	0.65	0.64	0.58	0.68	0.034	0	6	0.69	0.70	0.64	0.80	0.057	0	6
Selenium	µg/L	<0.04	-	<0.04	<0.04	-	3	3	0.047	0.044	<0.04	0.056	0.013	1	6	0.045	0.040	<0.04	0.059	0.016	2	6
Silver	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Strontium	µg/L	57	56	55	58	1.3	0	3	75	76	72	81	3.2	0	6	81	81	78	82	1.6	0	6
Thallium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	6	6	<0.002	-	<0.002	0.0042	-	4	6
Tin	µg/L	<0.05	-	<0.05	<0.05	-	3	3	<0.05	-	<0.05	<0.05	-	6	6	<0.02	-	<0.02	<0.02	-	6	6
Titanium	µg/L	0.20	0.21	0.16	0.28	0.061	0	3	0.21	0.24	0.14	0.45	0.11	0	6	<0.5	-	<0.5	<0.5	-	6	6
Uranium	µg/L	0.057	0.058	0.056	0.062	0.0032	0	3	0.081	0.081	0.077	0.086	0.0030	0	6	0.094	0.093	0.084	0.10	0.0076	0	6
Vanadium	µg/L	0.060	0.061	0.059	0.065	0.0032	0	3	0.056	0.053	<0.05	0.070	0.015	1	6	0.056	0.053	<0.05	0.069	0.015	1	6
Zinc	µg/L	<0.8	-	<0.8	<0.8	-	3	3	<0.8	-	<0.8	<0.8	-	6	6	1.9	1.7	0.57	<3.0	0.79	1	6
Dissolved Metals																						
Aluminum	µg/L	2.0	1.9	1.8	2.0	0.13	0	3	2.0	2.1	1.6	3.0	0.47	0	6	3.4	3.6	2.0	5.7	1.4	0	6
Antimony	µg/L	<0.02	-	<0.02	<0.02	-	3	3	0.021	-	<0.02	0.047	-	3	6	<0.02	-	<0.02	<0.02	-	6	6
Arsenic	µg/L	0.82	0.82	0.81	0.83	0.010	0	3	0.93	0.92	0.86	0.97	0.044	0	6	0.84	0.84	0.79	0.91	0.052	0	6
Barium	µg/L	16	16	15	16	0.17	0	3	16	16	15	16	0.54	0	6	16	16	15	16	0.48	0	6
Beryllium	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	<0.01	-	6	6	<0.01	-	<0.01	<0.01	-	6	6
Bismuth	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	0.011	-	5	6	<0.005	-	<0.005	<0.005	-	6	6
Boron	µg/L	11	11	11	13	1.0	0	3	14	15	13	16	1.0	0	6	11	11	10	12	0.63	0	6
Cadmium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Chromium	µg/L	<0.06	-	<0.06	<0.06	-	3	3	0.12	0.11	<0.06	0.17	0.051	1	6	<0.1	-	<0.1	0.19	-	5	6
Cobalt	µg/L	0.013	0.013	0.012	0.014	0.0010	0	3	0.016	0.016	0.013	0.022	0.0034	0	6	0.056	0.052	0.034	0.065	0.012	0	6
Copper	µg/L	0.58	0.58	0.56	0.60	0.020	0	3	0.77	-	-	-	-	0	1	0.97	0.96	0.79	1.1	0.13	0	6
Iron	µg/L	45	44	41	47	3.1	0	3	14	14	13	15	0.93	0	6	18	21	12	36	8.7	0	6
Lead	µg/L	<0.01	-	<0.01	<0.01	-	3	3	<0.01	-	<0.01	0.024	-	4	6	0.020	0.044	0.0081	0.17	0.061	0	6
Lithium	µg/L	1.3	1.3	1.3	1.3	0.0058	0	3	1.6	1.6	1.4	1.7	0.16	0	6	1.7	1.7	1.5	1.9	0.15	0	6
Manganese	µg/L	1.1	1.1	0.91	1.3	0.17	0	3	0.60	0.61	0.51	0.74	0.089	0	6	1.2	2.1	0.63	5.7	2.0	0	6
Mercury	µg/L	<0.0005	-	<0.0005	<0.0005	-	3	3	0.0015	0.0015	0.00050	0.0026	0.0011	0	6	0.0011	0.0012	0.00090	0.0016	0.00031	0	6

Table 7B-6: Historical Water Quality Results at Peninsula Lake D7, 2015 to 2017

Parameter	Unit	Yearly Summary																			
		2015							2016							2017						
		Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count	Median	Mean	Min	Max	SD	nd	Count
Dissolved Metals (cont'd)																						
Molybdenum	µg/L	0.25	0.25	0.25	0.26	0.0056	0	3	0.39	0.39	0.34	0.44	0.046	0	6	0.46	0.46	0.39	0.52	0.061	0	6
Nickel	µg/L	0.57	0.56	0.54	0.58	0.022	0	3	0.64	0.64	0.61	0.69	0.030	0	6	0.64	0.64	0.60	0.68	0.030	0	6
Selenium	µg/L	<0.04	-	<0.04	<0.04	-	3	3	0.047	-	<0.04	0.067	-	3	6	0.043	0.036	<0.04	0.047	0.013	2	6
Silver	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.005	<0.005	-	6	6
Strontium	µg/L	56	56	55	58	1.5	0	3	74	74	71	76	1.9	0	6	73	73	67	78	4.5	0	6
Thallium	µg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	0.013	-	5	6	<0.002	-	<0.002	0.0027	-	4	6
Tin	µg/L	<0.05	-	<0.05	<0.05	-	3	3	<0.05	-	<0.05	<0.05	-	6	6	0.012	-	<0.01	0.020	-	3	6
Titanium	µg/L	<0.1	-	<0.1	<0.1	-	3	3	<0.1	-	<0.1	<0.1	-	6	6	<0.3	-	<0.3	<0.3	-	6	6
Uranium	µg/L	0.049	0.049	0.047	0.050	0.0015	0	3	0.081	0.081	0.080	0.083	0.0012	0	6	0.098	0.098	0.093	0.10	0.0036	0	6
Vanadium	µg/L	<0.05	-	<0.05	<0.05	-	3	3	<0.05	-	<0.05	0.052	-	5	6	<0.05	-	<0.05	<0.05	-	6	6
Zinc	µg/L	<0.8	-	<0.8	<0.8	-	3	3	<0.8	-	<0.8	<0.8	-	6	6	1.2	1.1	<0.5	1.5	0.46	1	6
Other																						
Free cyanide	mg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.005	-	<0.005	<0.005	-	6	6	<0.005	-	<0.001	<0.005	-	6	6
Cyanide (wad)	mg/L	<0.005	-	<0.005	<0.005	-	3	3	<0.002	-	<0.002	<0.002	-	6	6	<0.001	-	<0.001	<0.001	-	6	6

SD = standard deviation; µS/cm = microsiemens per centimeter; NTU = nephelometric turbidity units; mg/L = milligrams per litre; mg-P/L = milligrams phosphorus per litre; mg-N/L = milligrams nitrogen per litre; µg/L = micrograms per litre; DOC = dissolved organic carbon; - = no guideline or data not measured.

APPENDIX 7C

Time-series Plots

Note: parameters with all samples below detection were not included. An open symbol on the plot represents a measurement that is below detection.

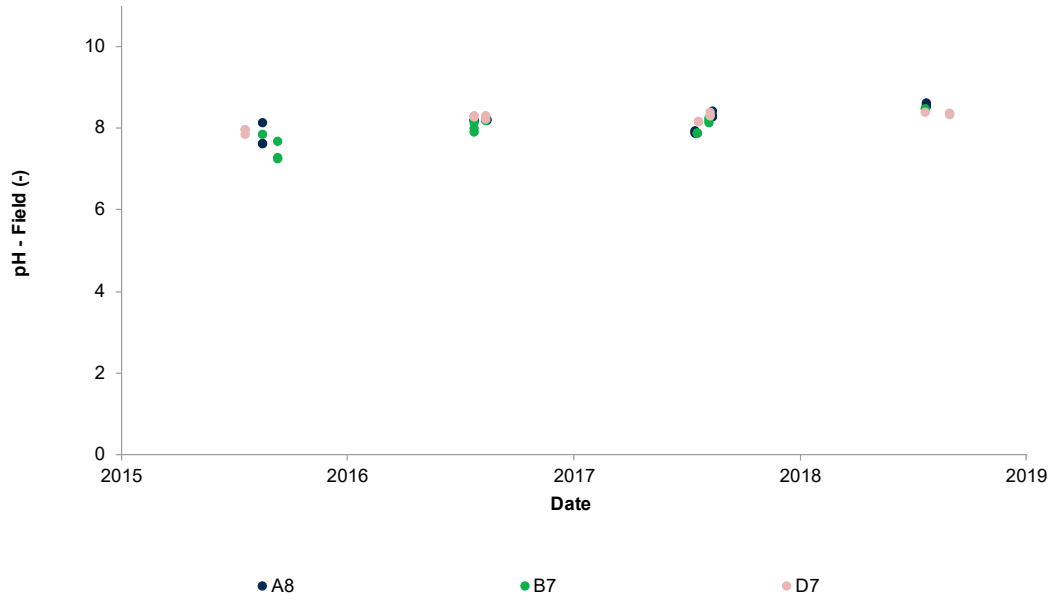


Figure 7C-1: Field pH in Peninsula Lakes, 2015 to 2018

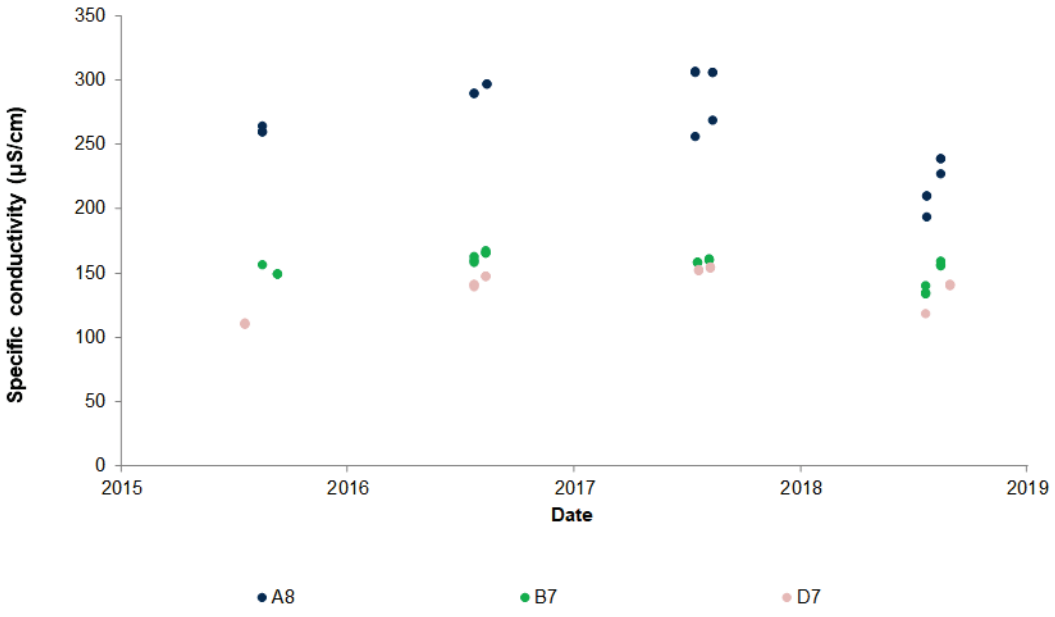


Figure 7C-2: Specific Conductivity in Peninsula Lakes, 2015 to 2018

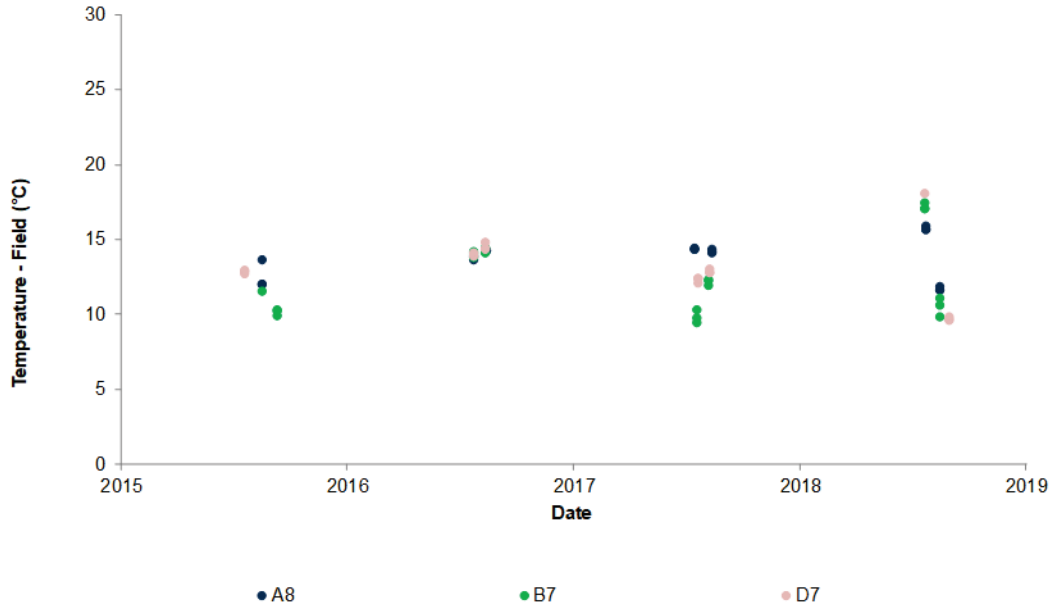


Figure 7C-3: Temperature in Peninsula Lakes, 2015 to 2018

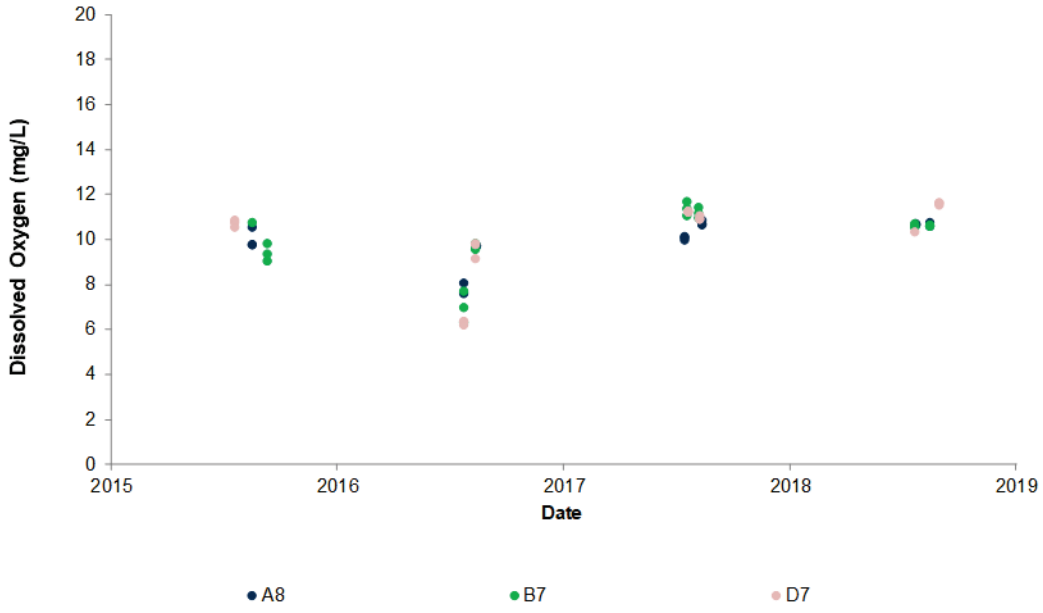


Figure 7C-4: Dissolved Oxygen in Peninsula Lakes, 2015 to 2018



Figure 7C-5: Dissolved Oxygen in Peninsula Lakes, 2015 to 2018

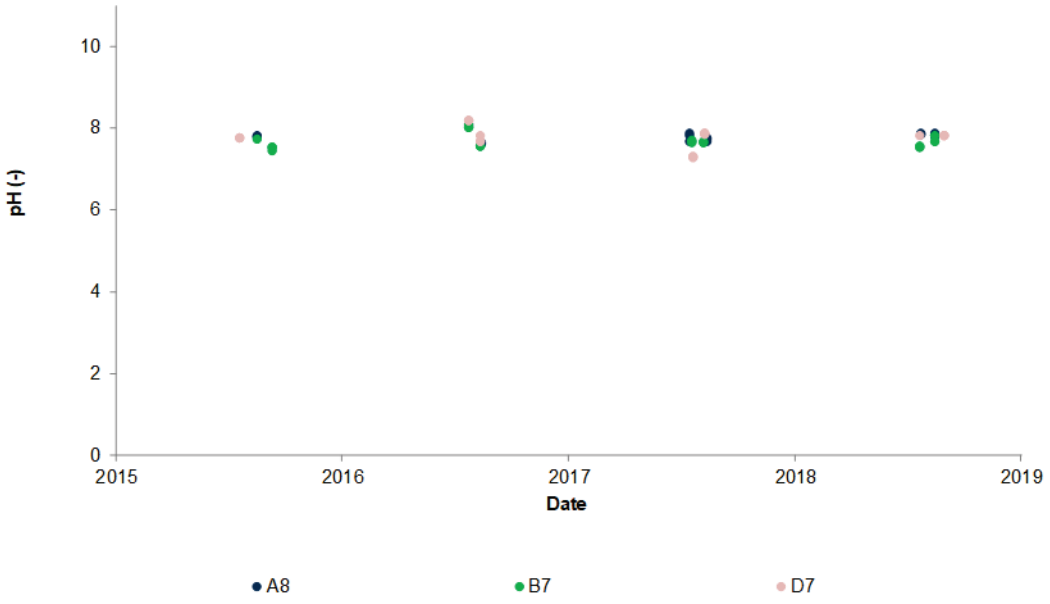


Figure 7C-6: Laboratory pH in Peninsula Lakes, 2015 to 2018

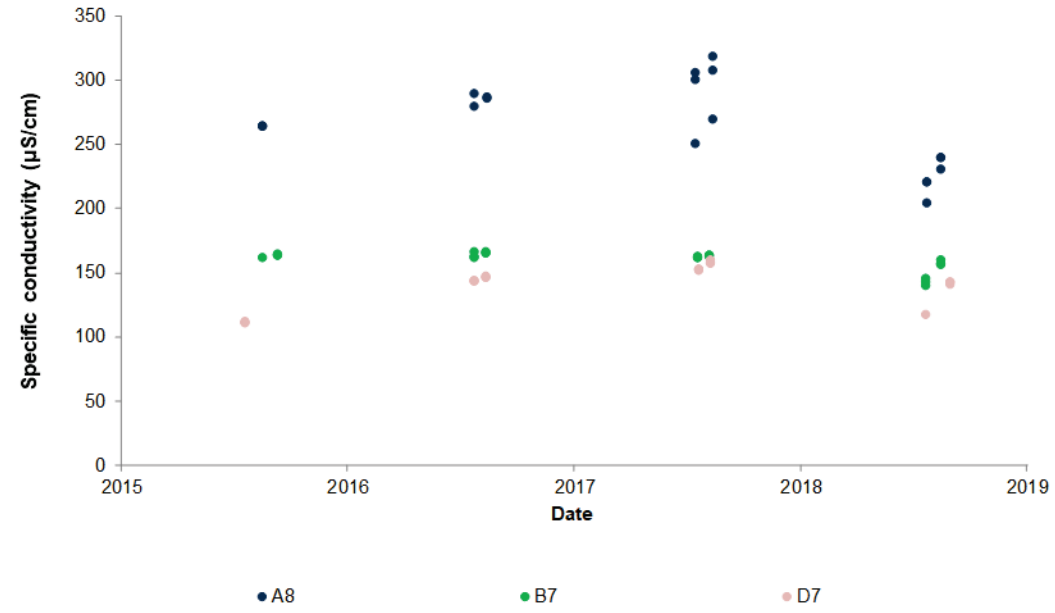


Figure 7C-7: Laboratory Specific Conductivity in Peninsula Lakes, 2015 to 2018

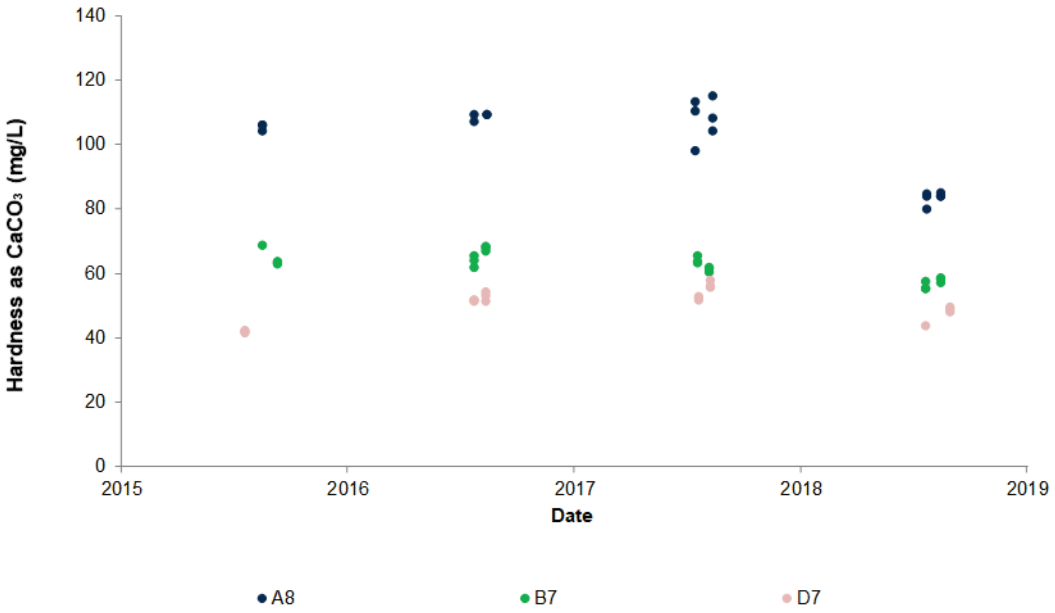


Figure 7C-8: Hardness in Peninsula Lakes, 2015 to 2018

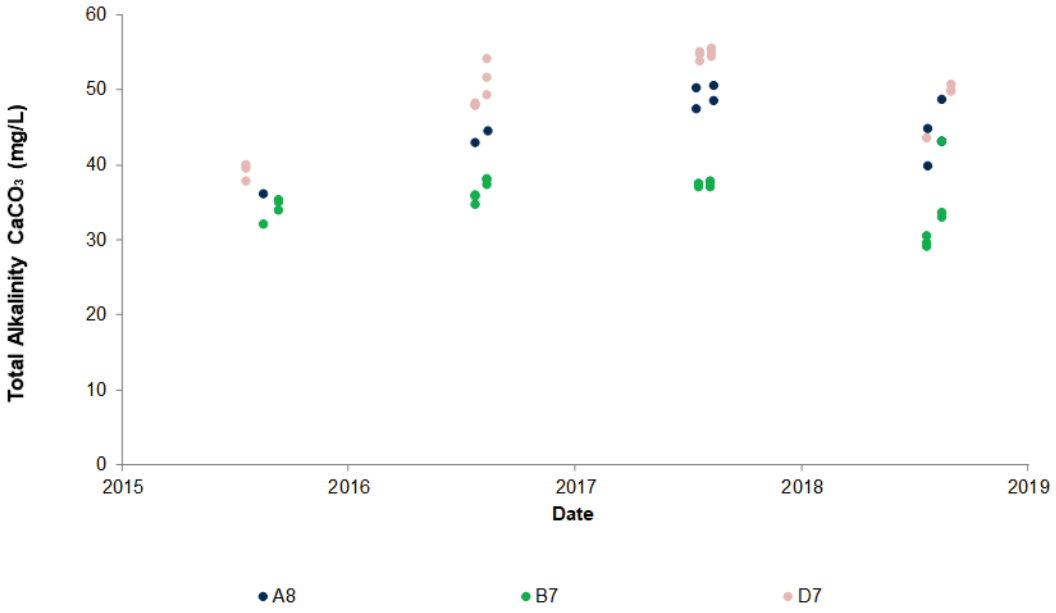


Figure 7C-9: Total Alkalinity in Peninsula Lakes, 2015 to 2018

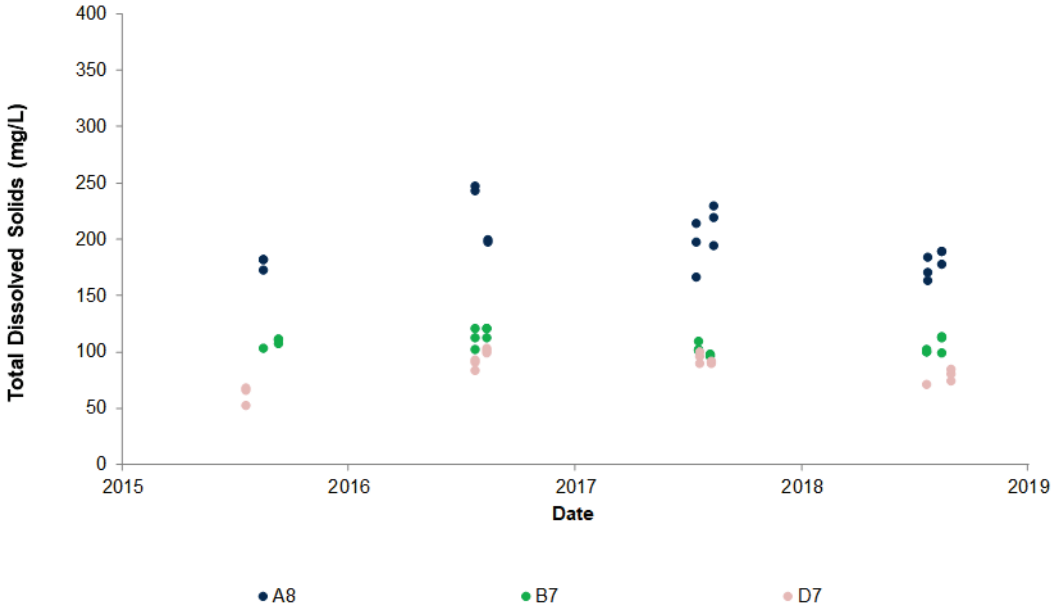


Figure 7C-10: Total Dissolved Solids in Peninsula Lakes, 2015 to 2018

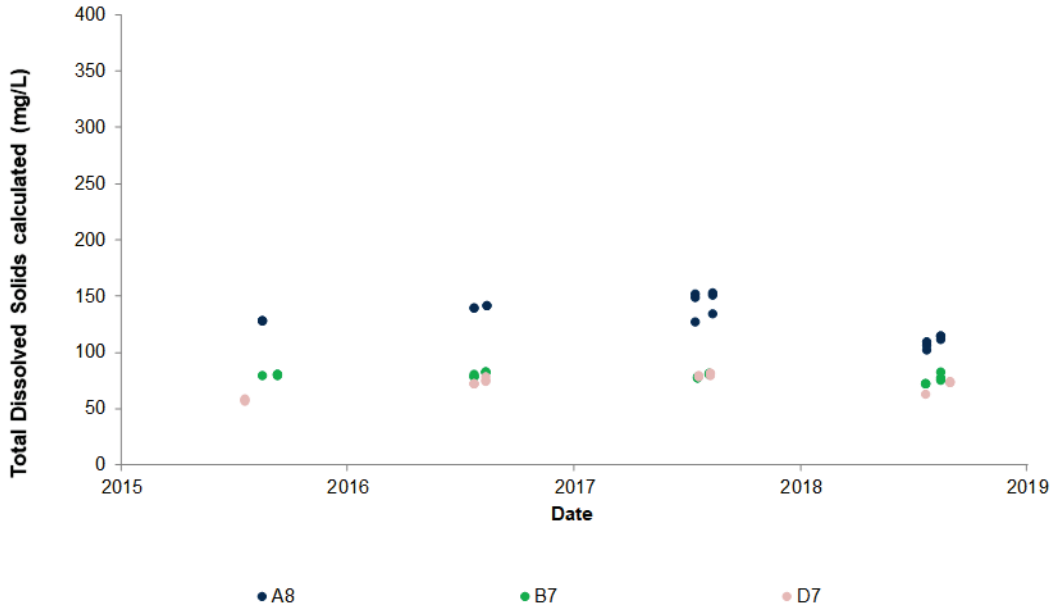


Figure 7C-11: Total Dissolved Solids (Calculated) in Peninsula Lakes, 2015 to 2018

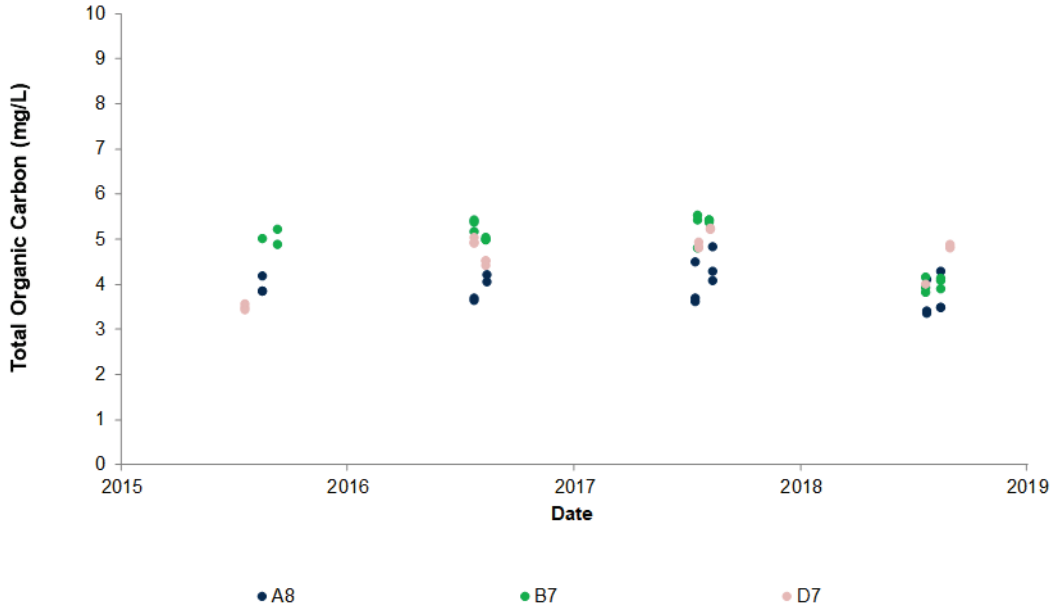


Figure 7C-12: Total Organic Carbon in Peninsula Lakes, 2015 to 2018

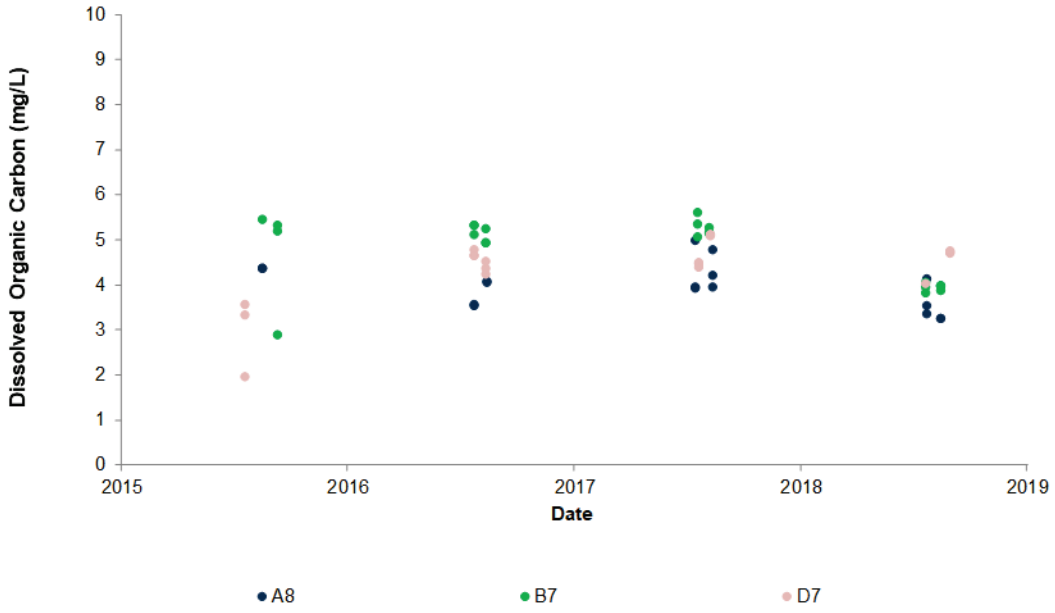


Figure 7C-13: Dissolved Organic Carbon in Peninsula Lakes, 2015 to 2018

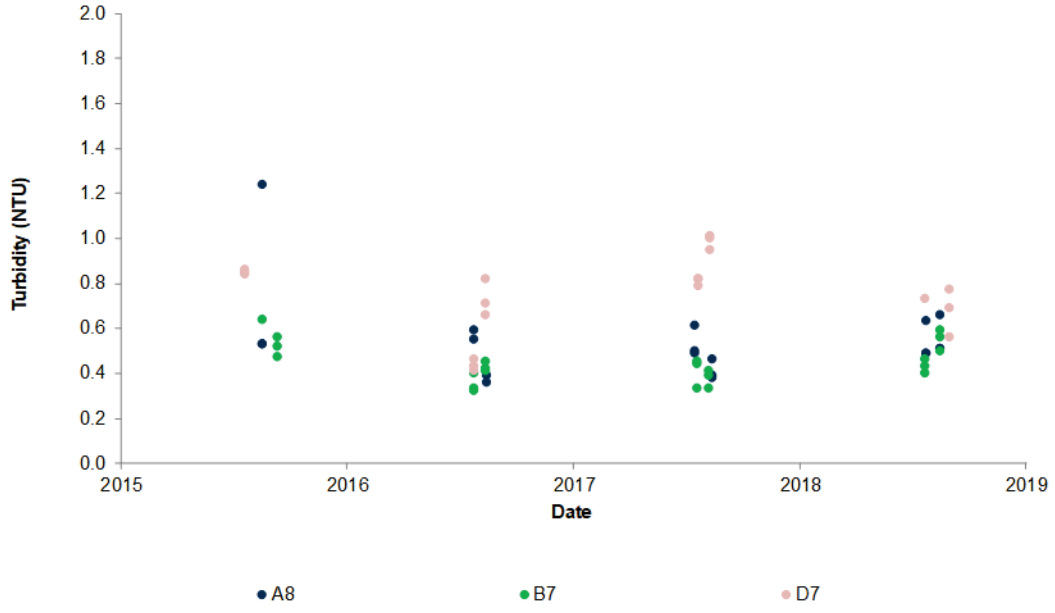


Figure 7C-14: Turbidity in Peninsula Lakes, 2015 to 2018

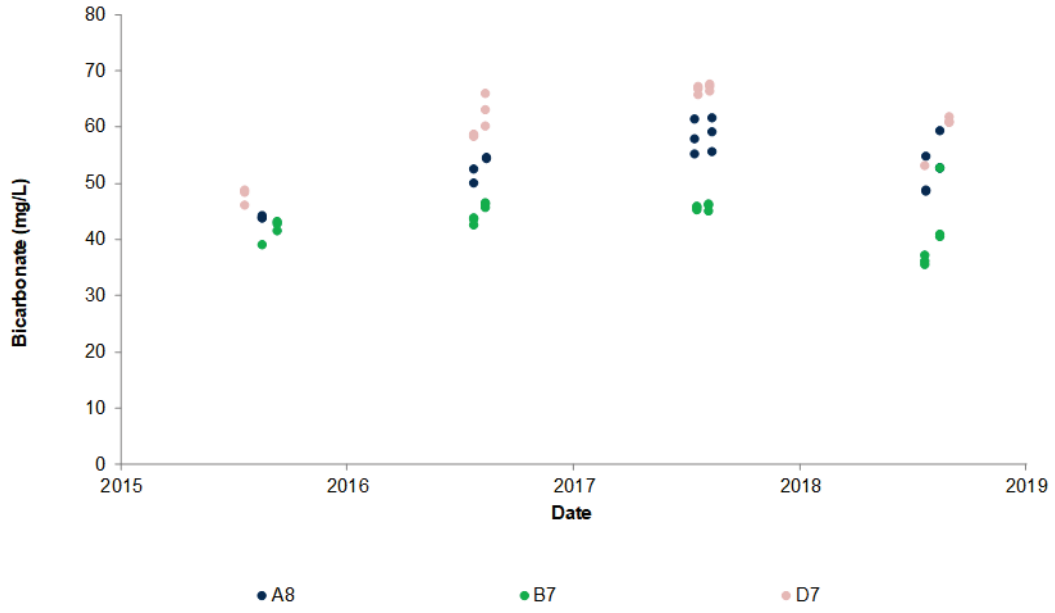


Figure 7C-15: Bicarbonate in Peninsula Lakes, 2015 to 2018

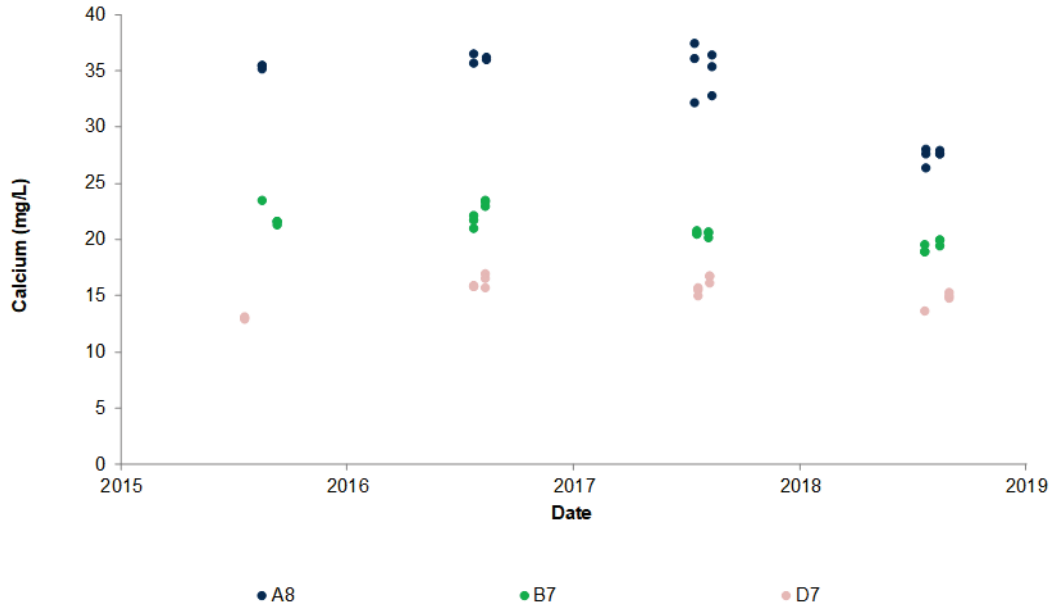


Figure 7C-16: Calcium in Peninsula Lakes, 2015 to 2018

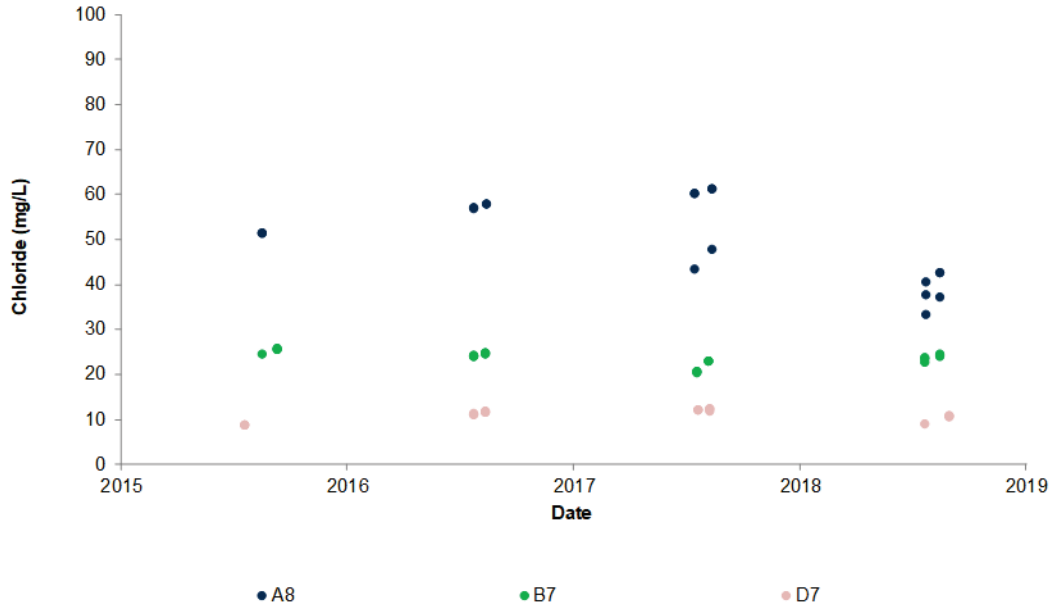


Figure 7C-17: Chloride in Peninsula Lakes, 2015 to 2018

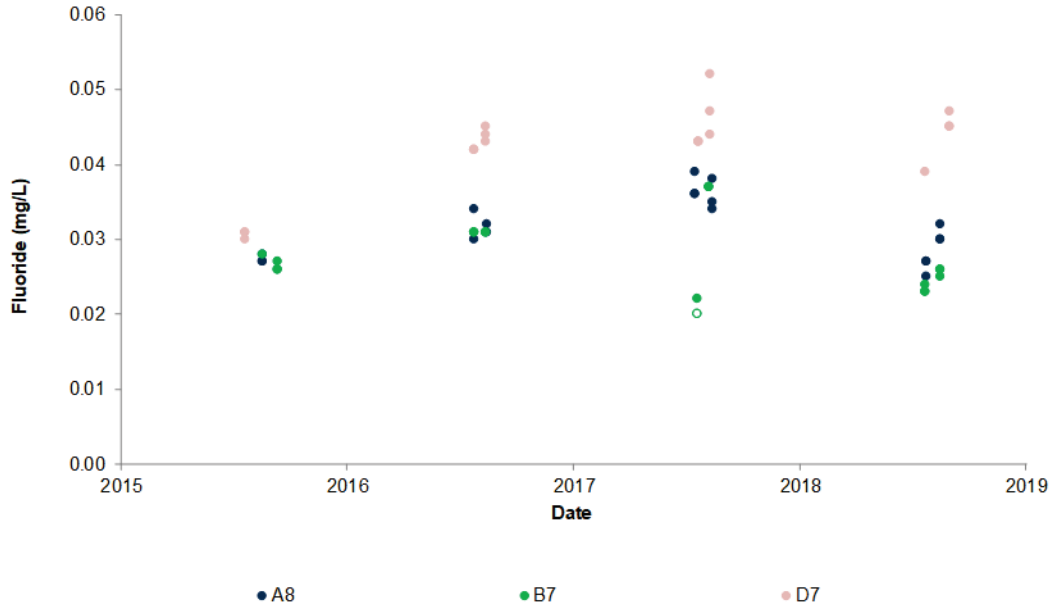


Figure 7C-18: Fluoride in Peninsula Lakes, 2015 to 2018

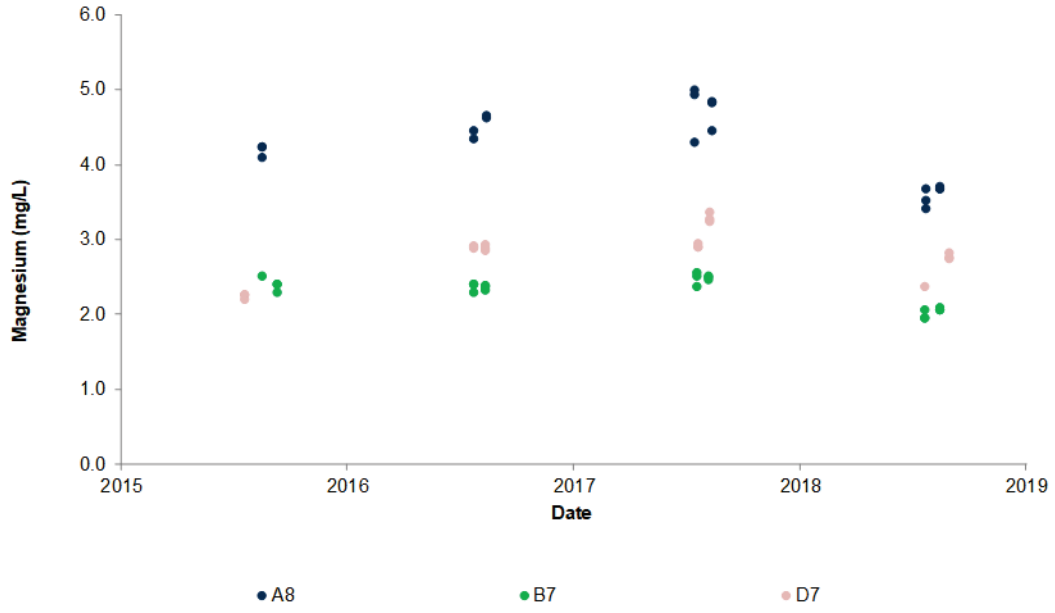


Figure 7C-19: Magnesium in Peninsula Lakes, 2015 to 2018

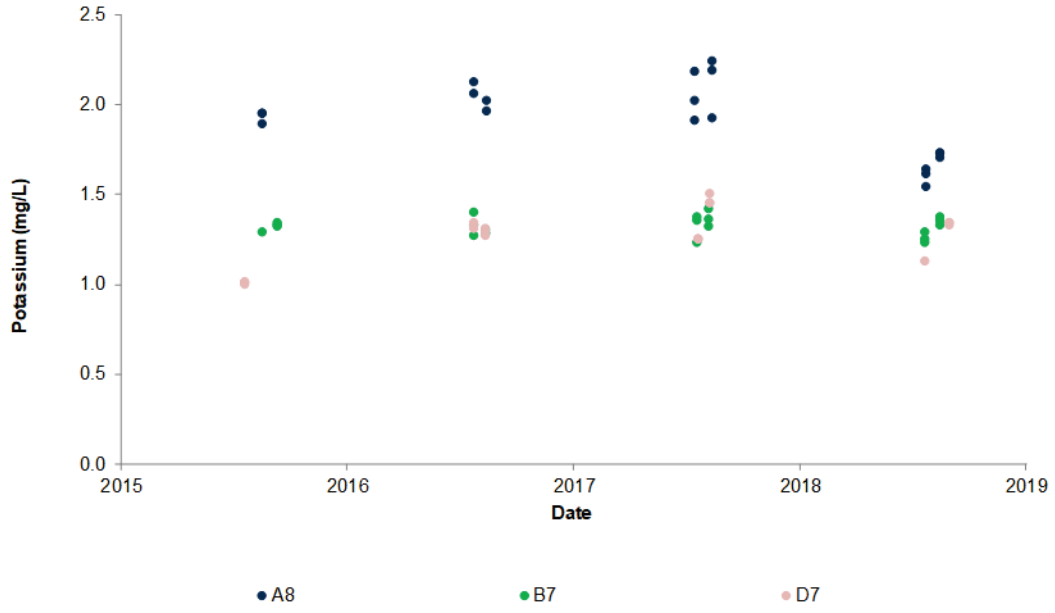


Figure 7C-20: Potassium in Peninsula Lakes, 2015 to 2018

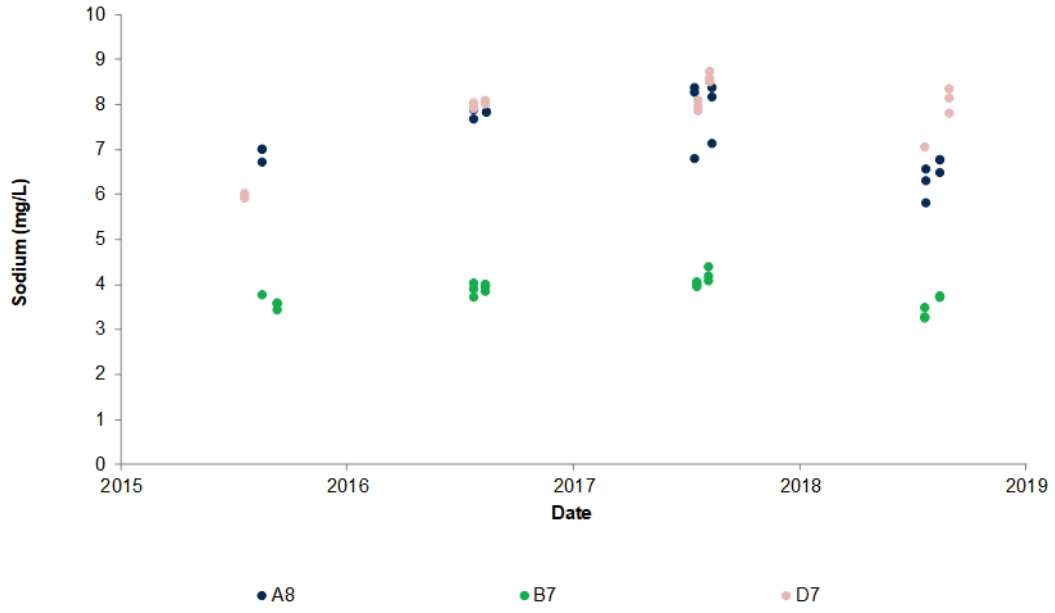


Figure 7C-21: Sodium in Peninsula Lakes, 2015 to 2018

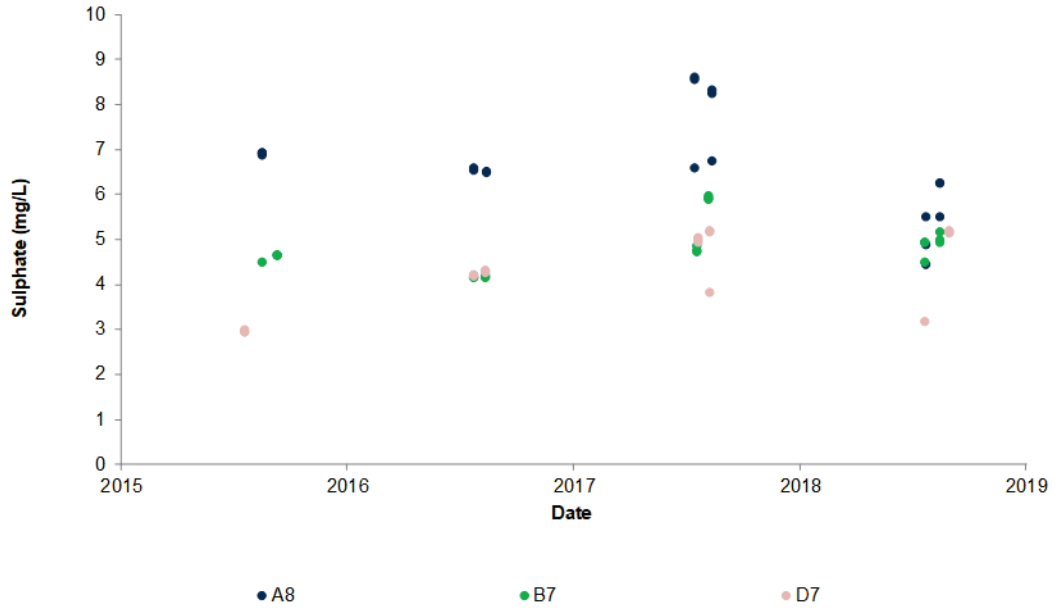


Figure 7C-22: Sulphate in Peninsula Lakes, 2015 to 2018

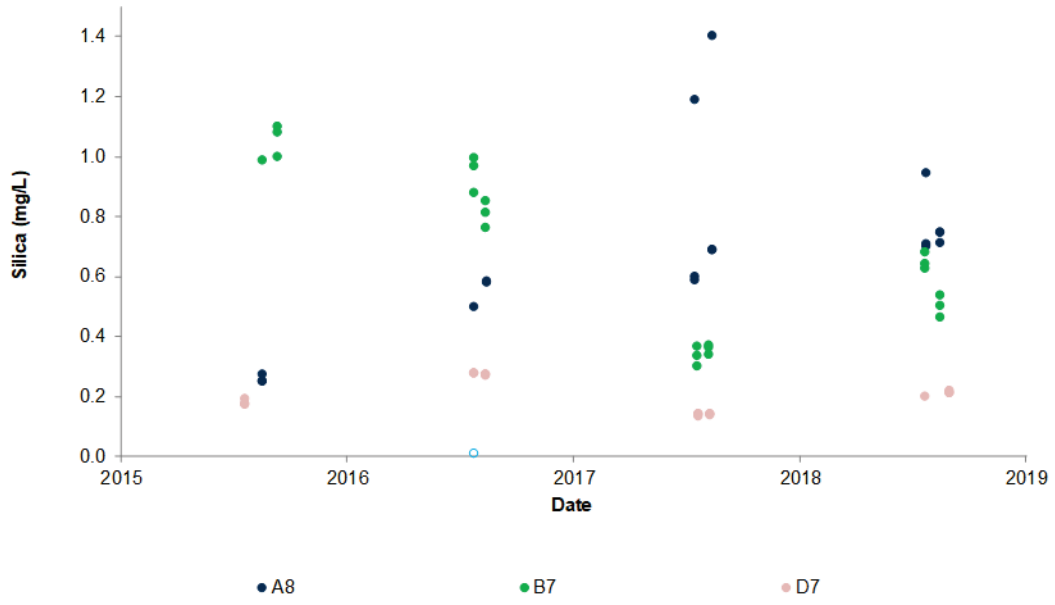


Figure 7C-23: Reactive Silica in Peninsula Lakes, 2015 to 2018

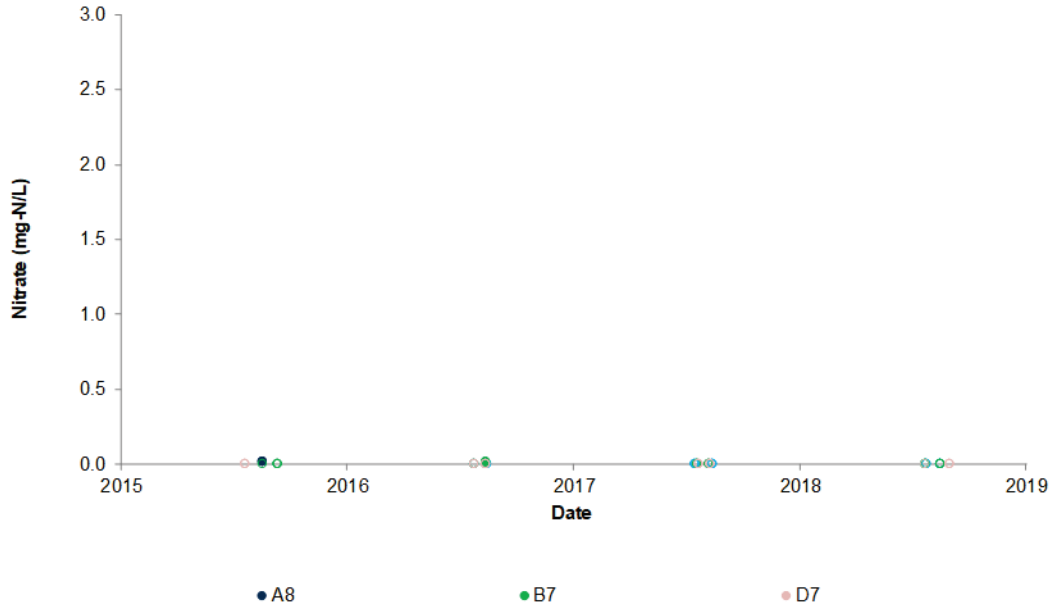


Figure 7C-24: Nitrate As N in Peninsula Lakes, 2015 to 2018

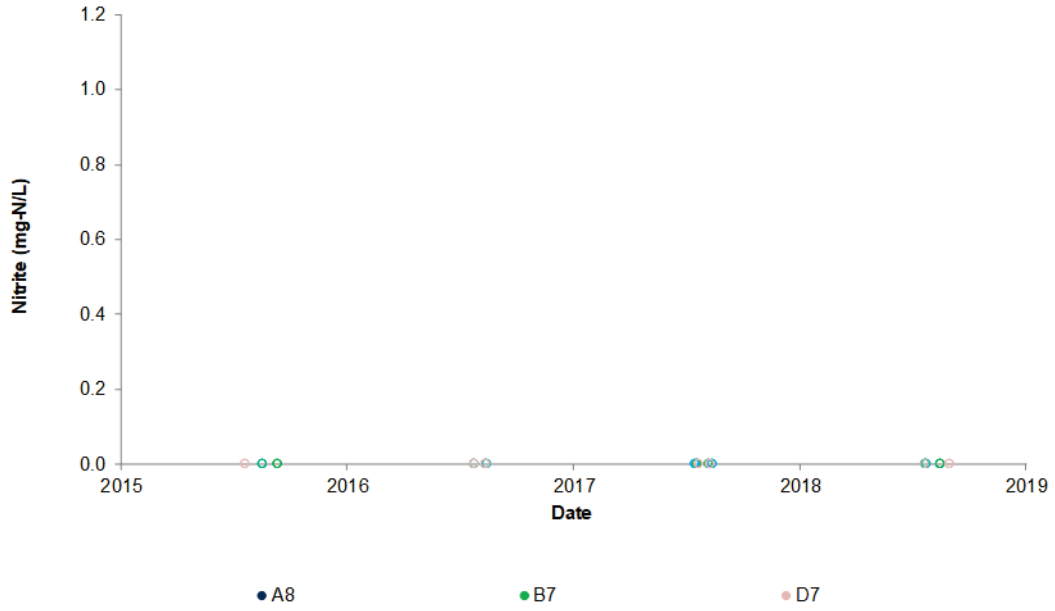


Figure 7C-25: Nitrite As N in Peninsula Lakes, 2015 to 2018



Figure 7C-26: Nitrate And Nitrite in Peninsula Lakes, 2015 to 2018

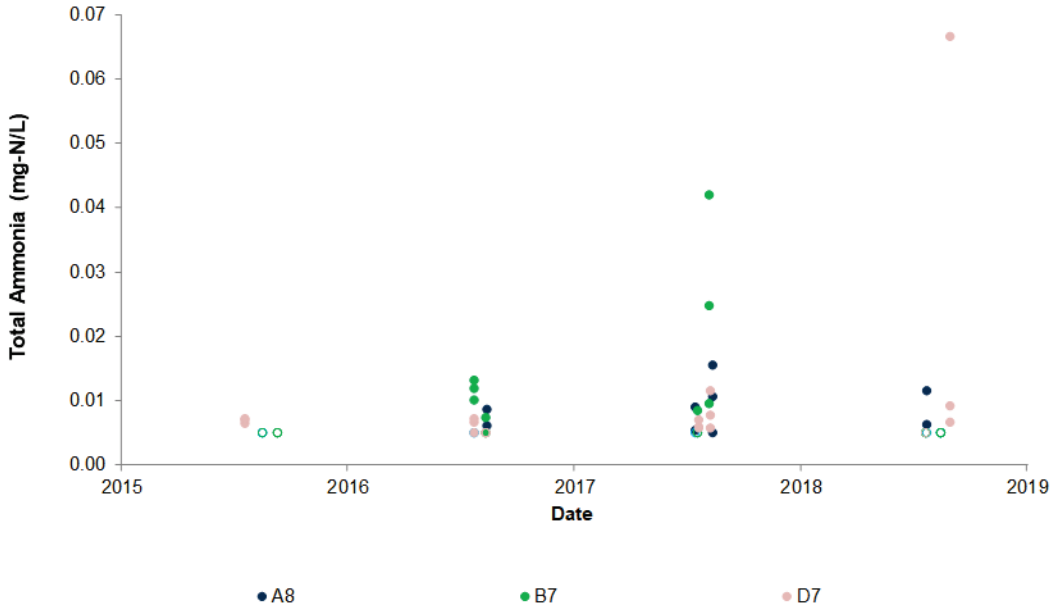


Figure 7C-27: Total Ammonia in Peninsula Lakes, 2015 to 2018

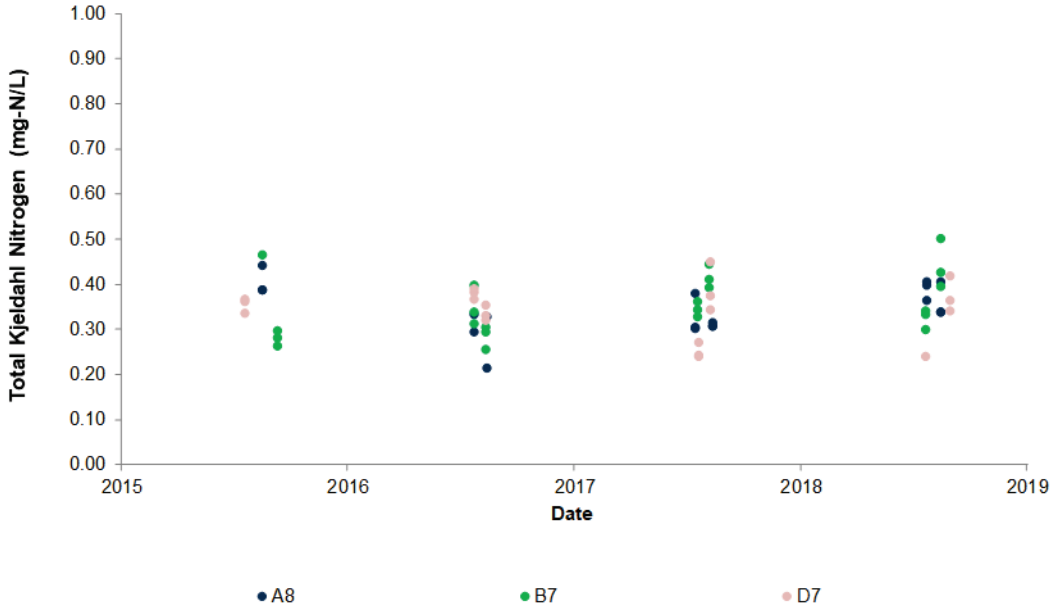


Figure 7C-28: Total Kjeldahl Nitrogen in Peninsula Lakes, 2015 to 2018

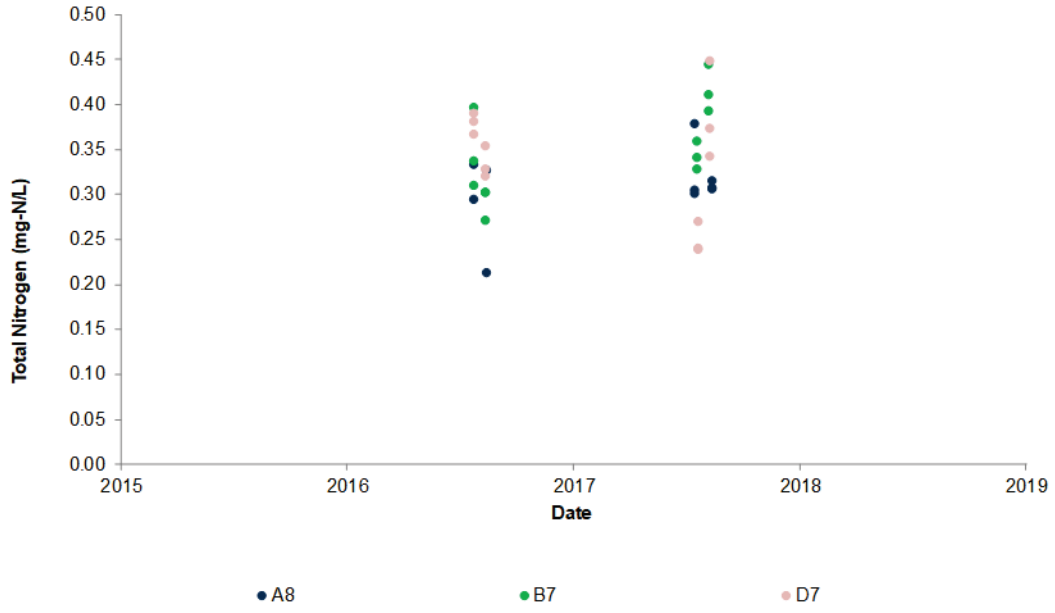


Figure 7C-29: Total Nitrogen in Peninsula Lakes, 2015 to 2018

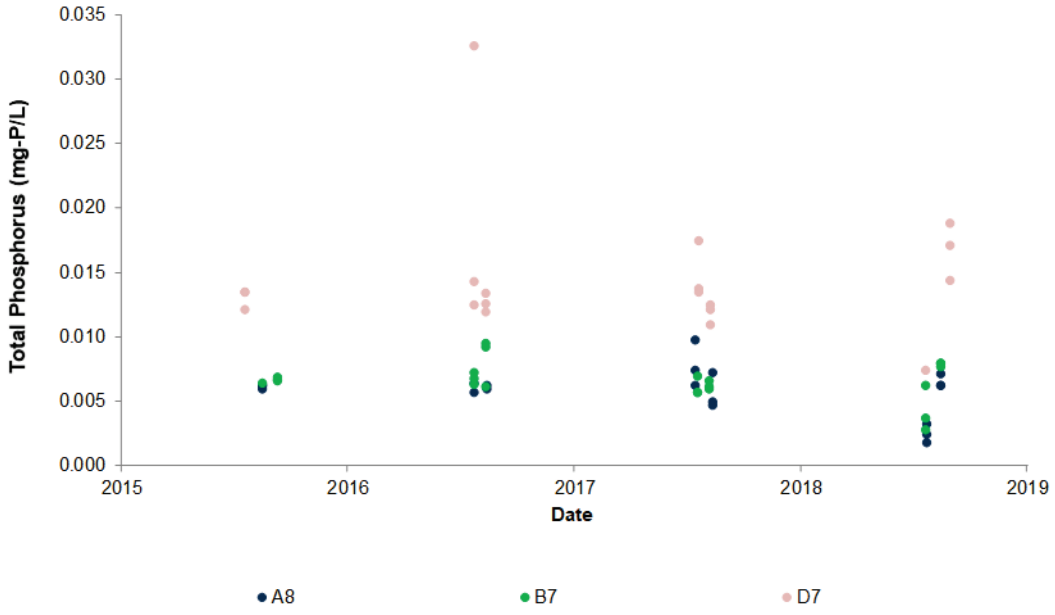


Figure 7C-30: Total Phosphorus in Peninsula Lakes, 2015 to 2018

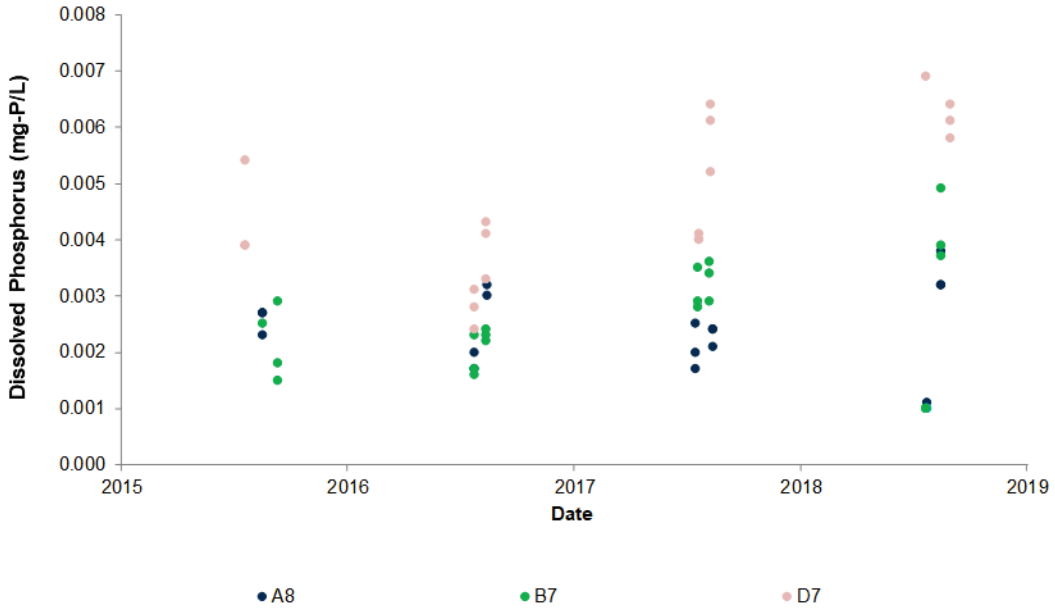


Figure 7C-31: Dissolved Phosphorus in Peninsula Lakes, 2015 to 2018

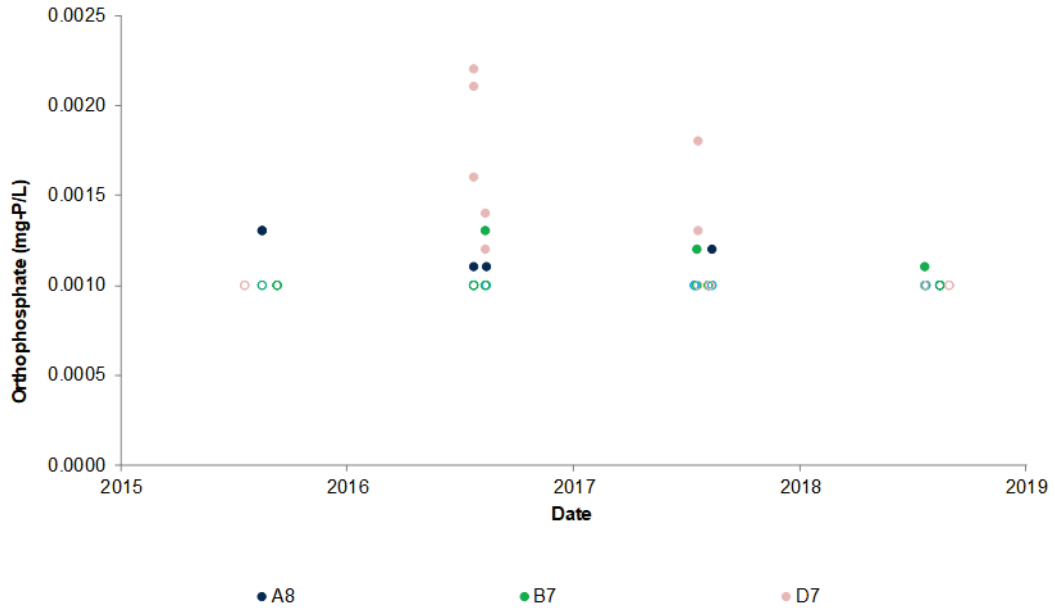


Figure 7C-32: Orthophosphate in Peninsula Lakes, 2015 to 2018

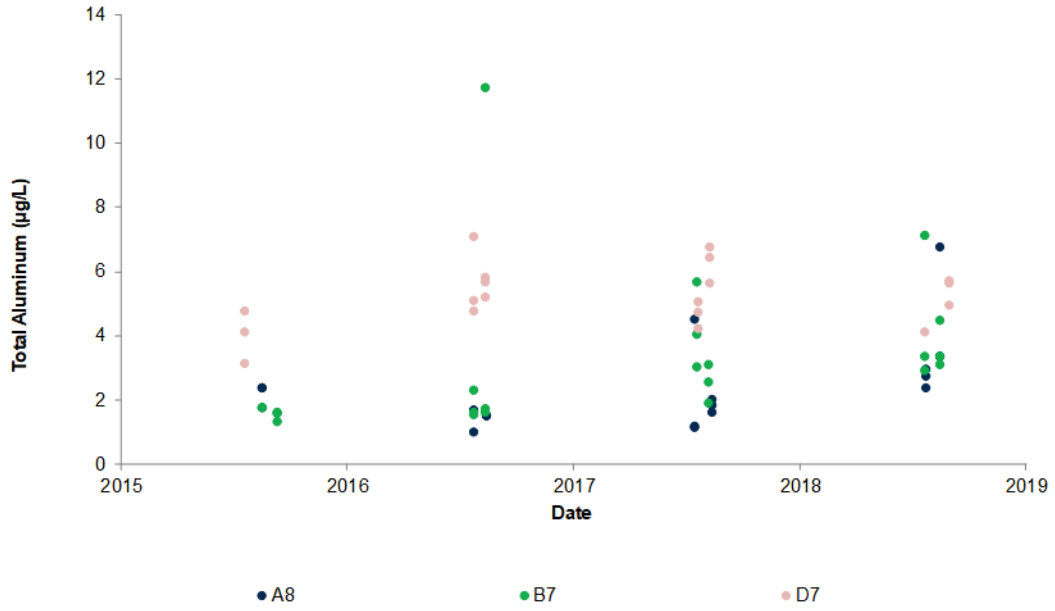


Figure 7C-33: Total Aluminum in Peninsula Lakes, 2015 to 2018

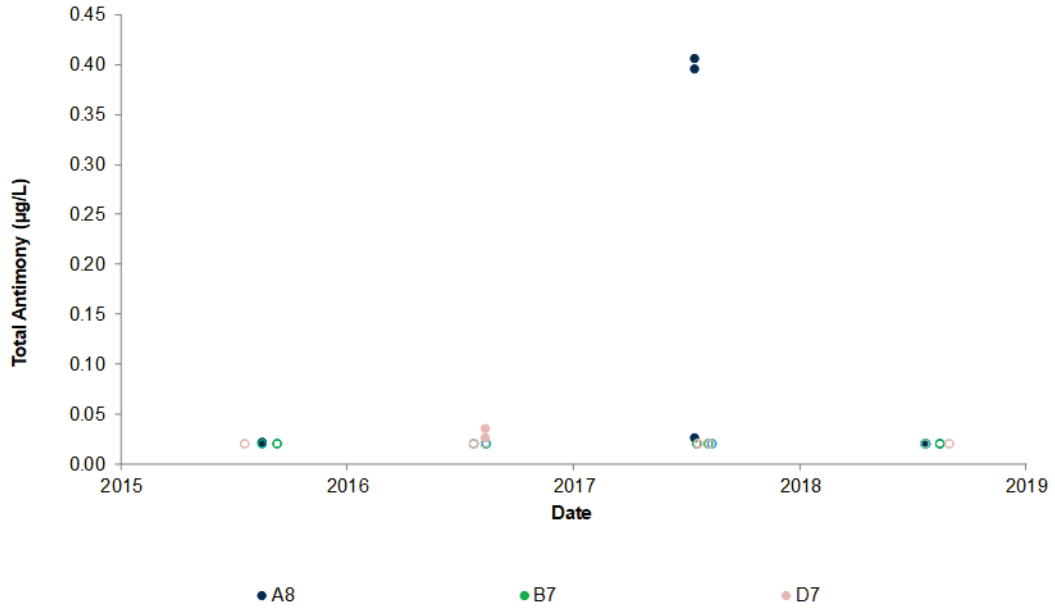


Figure 7C-34: Total Antimony in Peninsula Lakes, 2015 to 2018

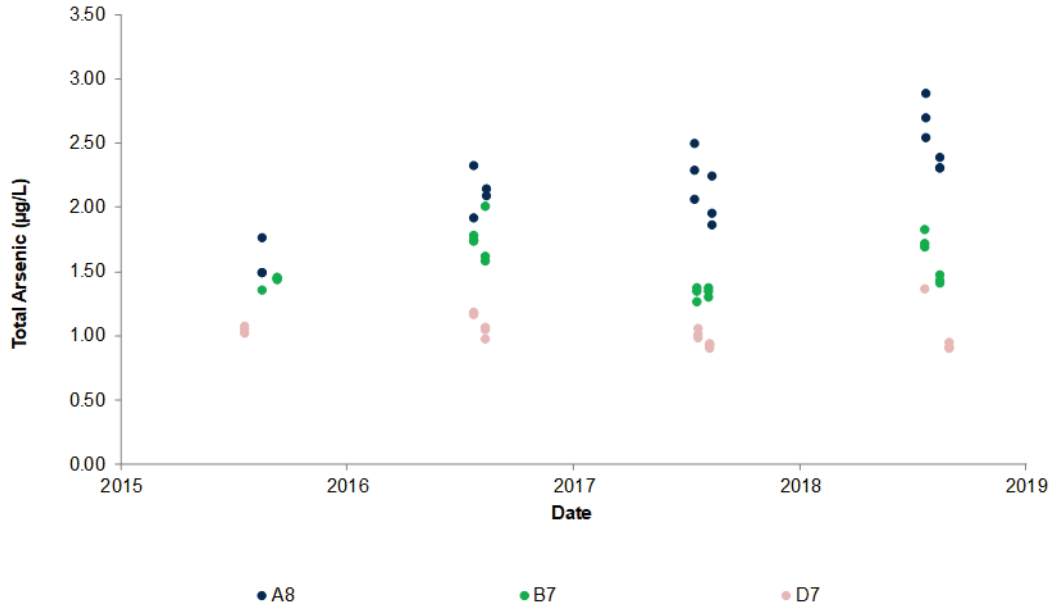


Figure 7C-35: Total Arsenic in Peninsula Lakes, 2015 to 2018

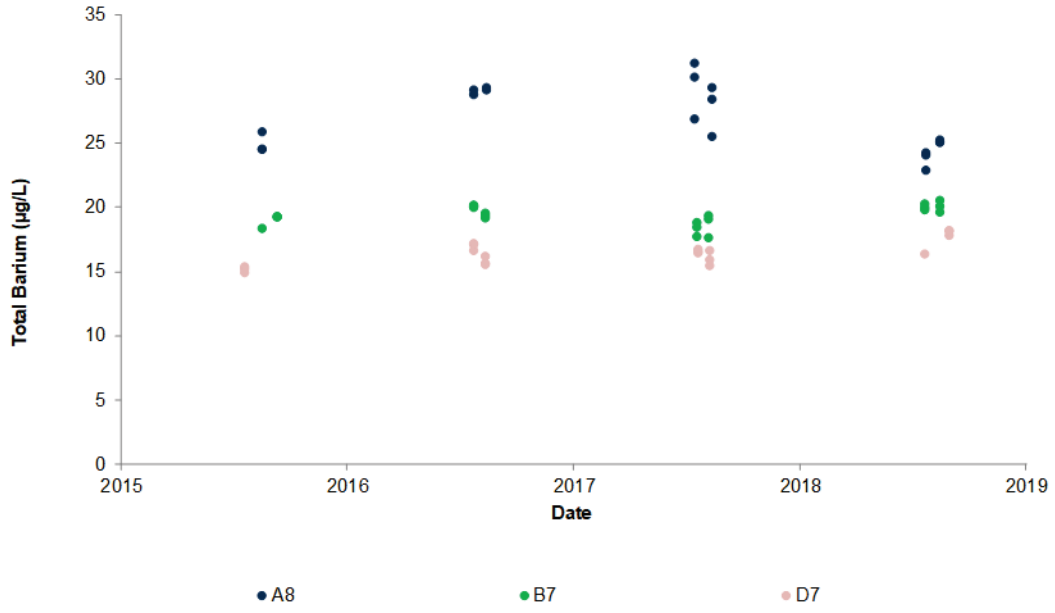


Figure 7C-36: Total Barium in Peninsula Lakes, 2015 to 2018

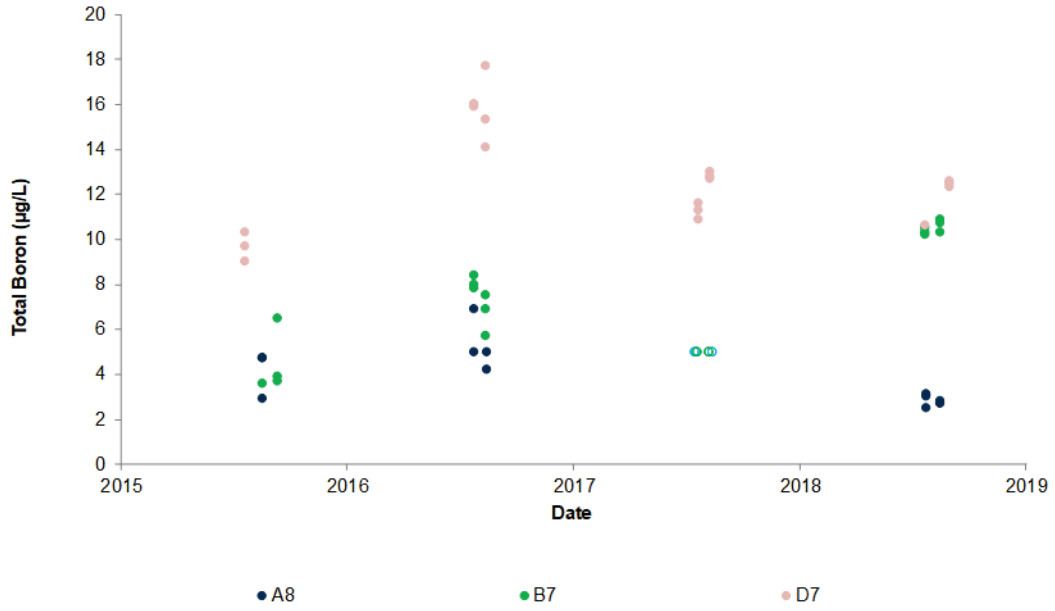


Figure 7C-37: Total Boron in Peninsula Lakes, 2015 to 2018

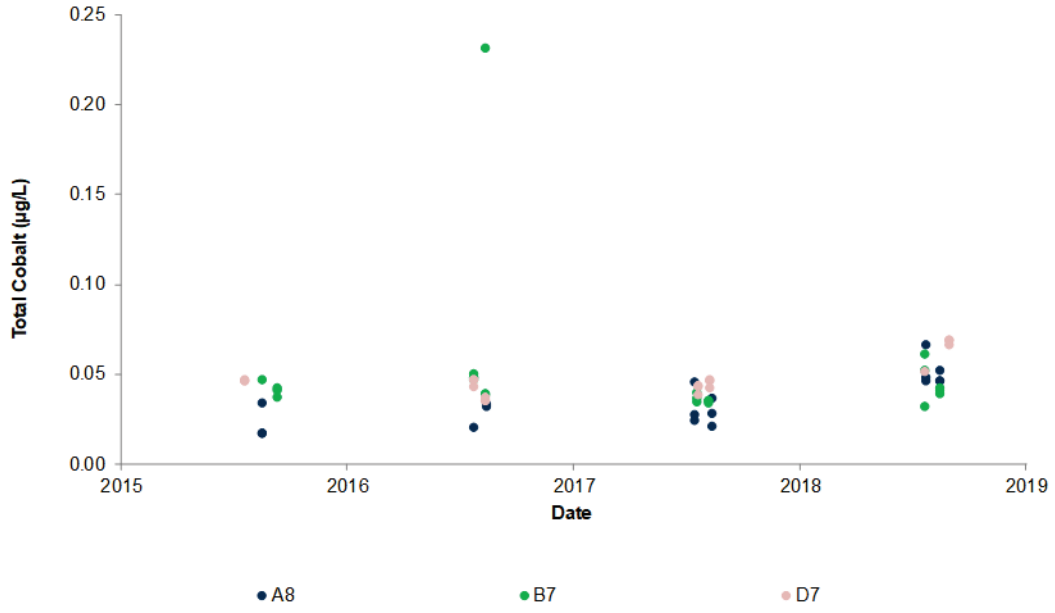


Figure 7C-38: Total Cobalt in Peninsula Lakes, 2015 to 2018

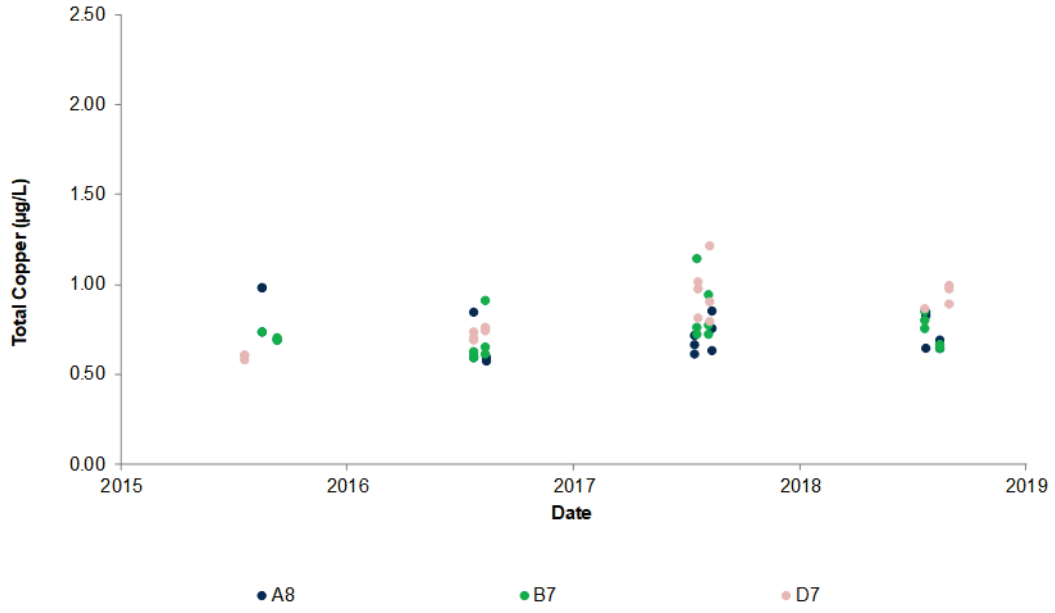


Figure 7C-39: Total Copper in Peninsula Lakes, 2015 to 2018

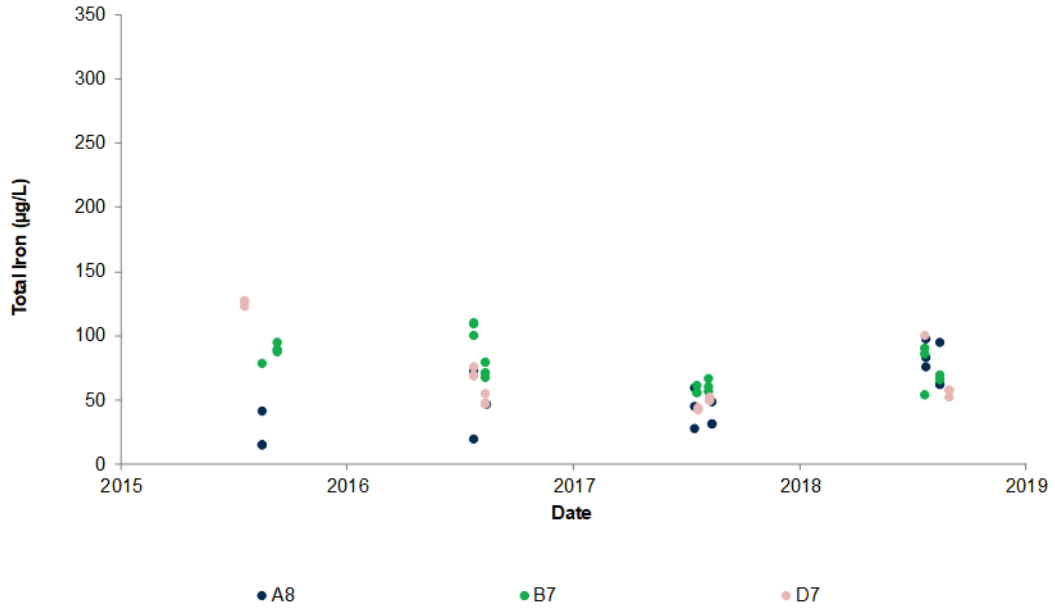


Figure 7C-40: Total Iron in Peninsula Lakes, 2015 to 2018

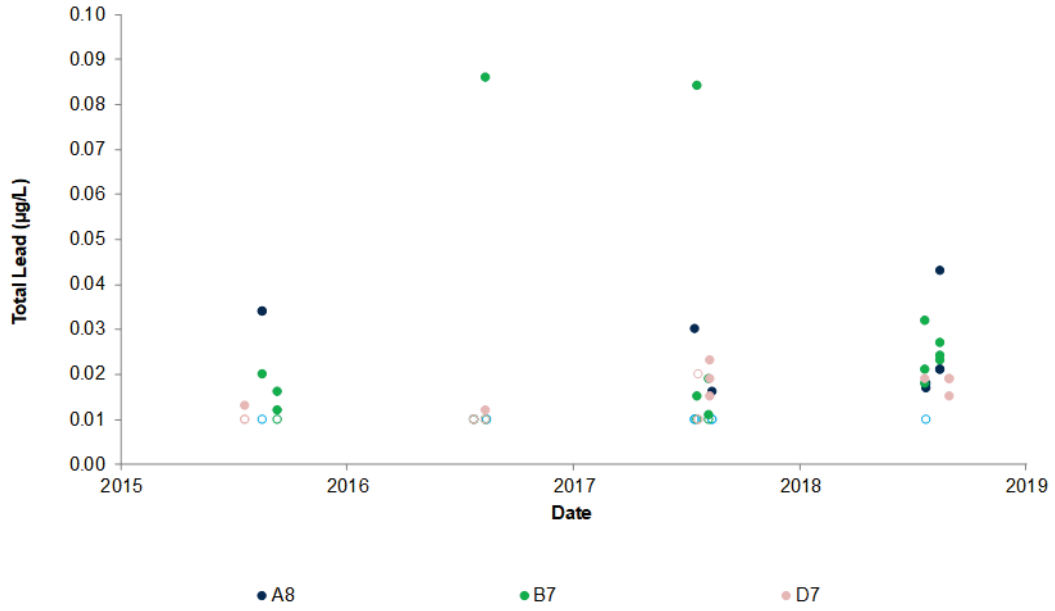


Figure 7C-41: Total Lead in Peninsula Lakes, 2015 to 2018

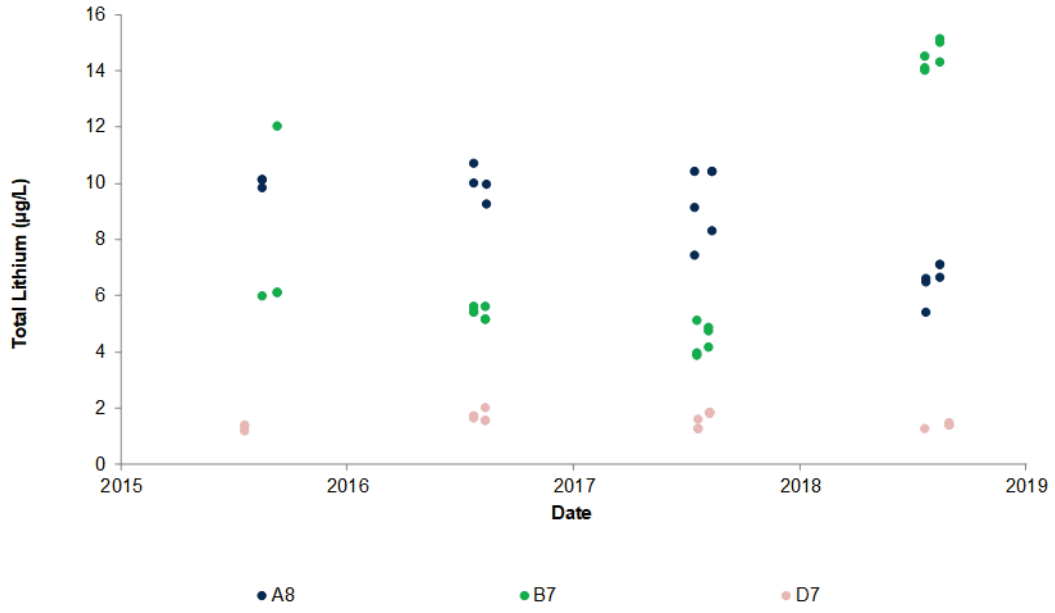


Figure 7C-42: Total Lithium in Peninsula Lakes, 2015 to 2018

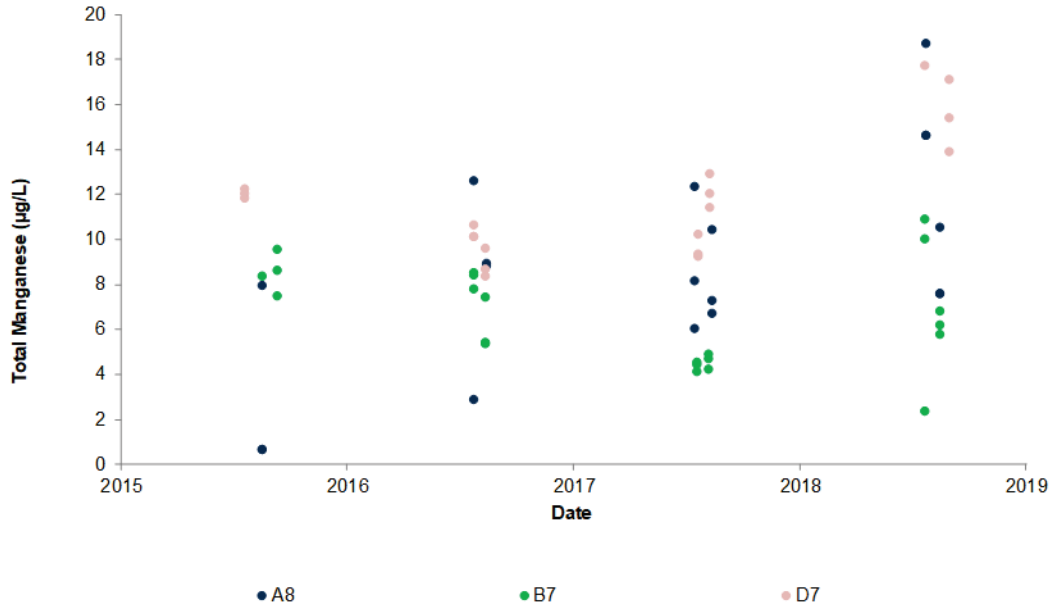


Figure 7C-43: Total Manganese in Peninsula Lakes, 2015 to 2018

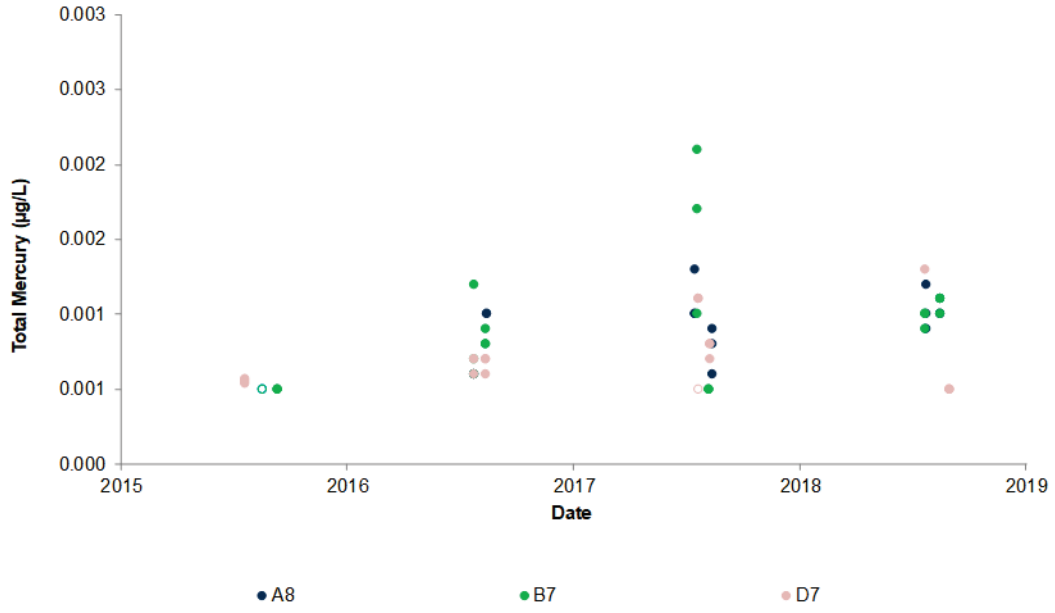


Figure 7C-44: Total Mercury in Peninsula Lakes, 2015 to 2018

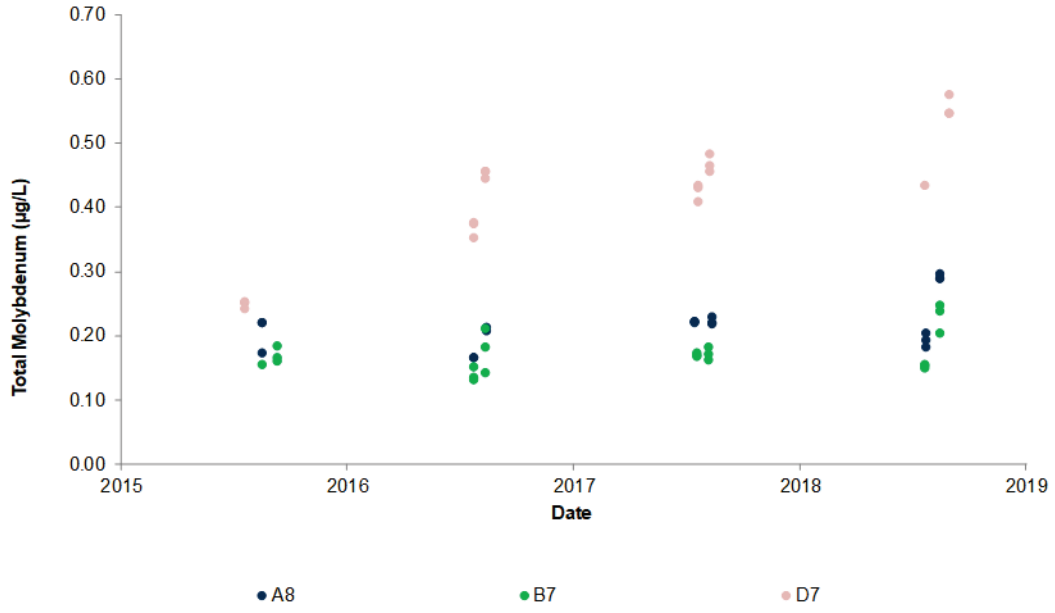


Figure 7C-45: Total Molybdenum in Peninsula Lakes, 2015 to 2018



Figure 7C-46: Total Nickel in Peninsula Lakes, 2015 to 2018

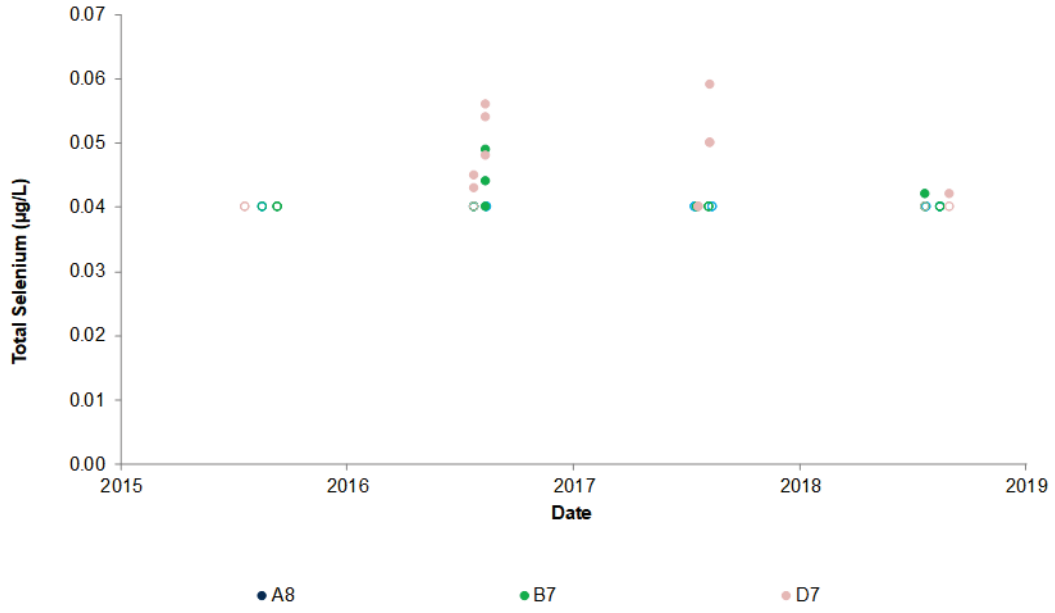


Figure 7C-47: Total Selenium in Peninsula Lakes, 2015 to 2018

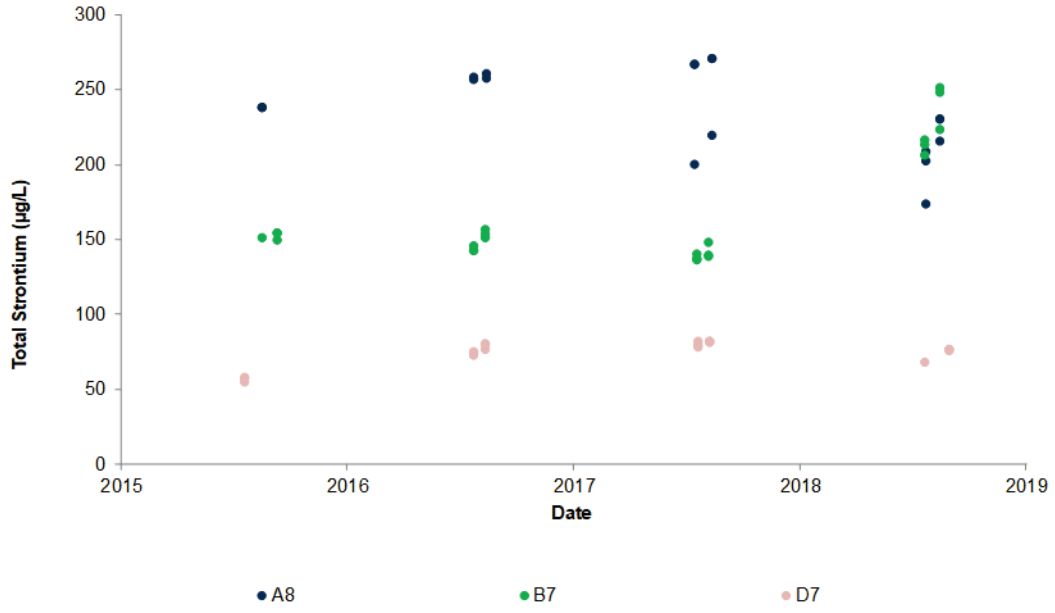


Figure 7C-48: Total Strontium in Peninsula Lakes, 2015 to 2018

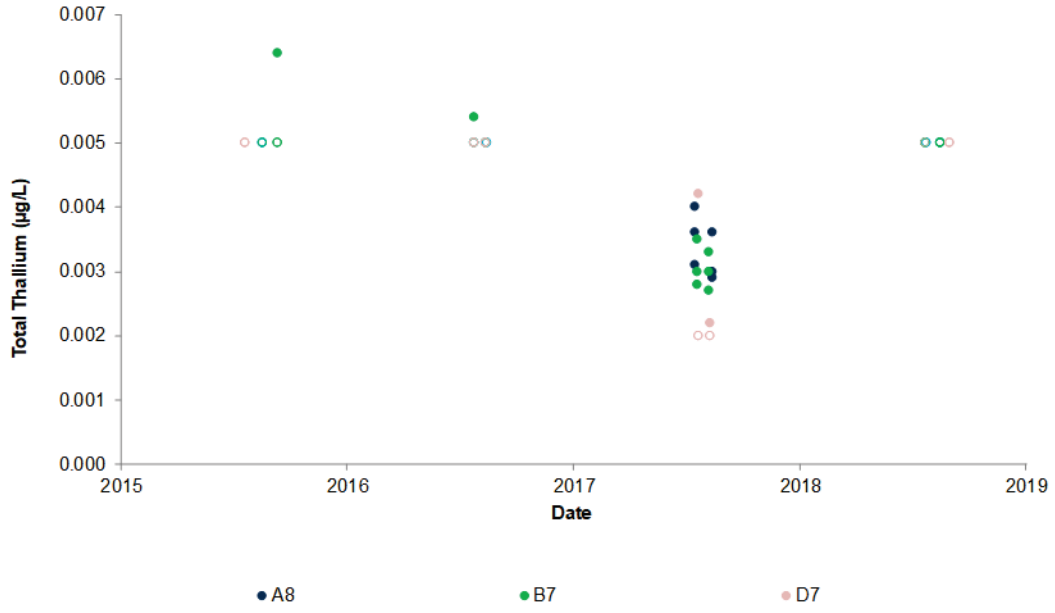


Figure 7C-49: Total Thallium in Peninsula Lakes, 2015 to 2018

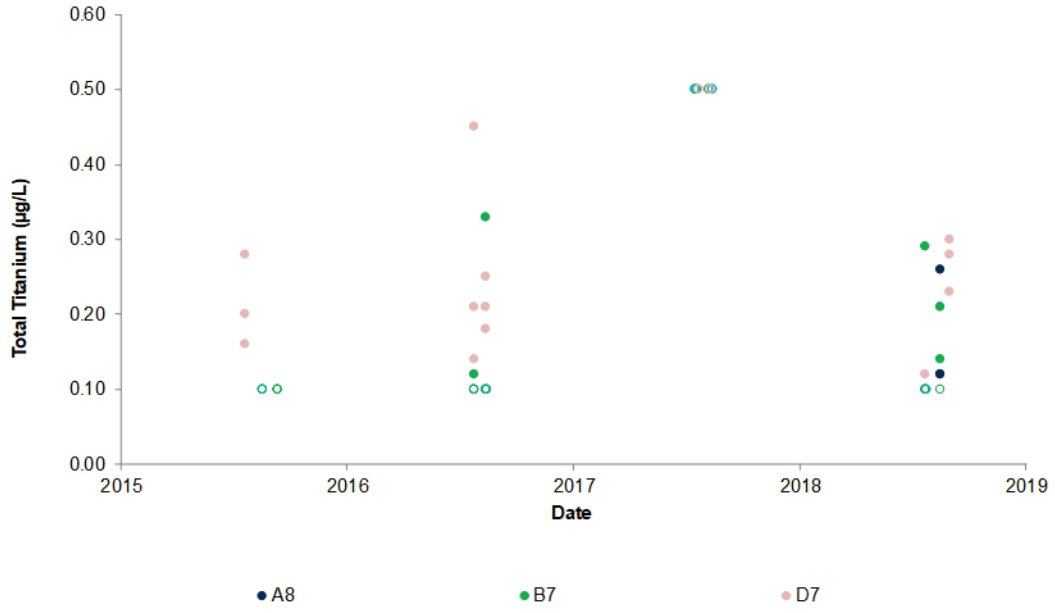


Figure 7C-50: Total Titanium in Peninsula Lakes, 2015 to 2018

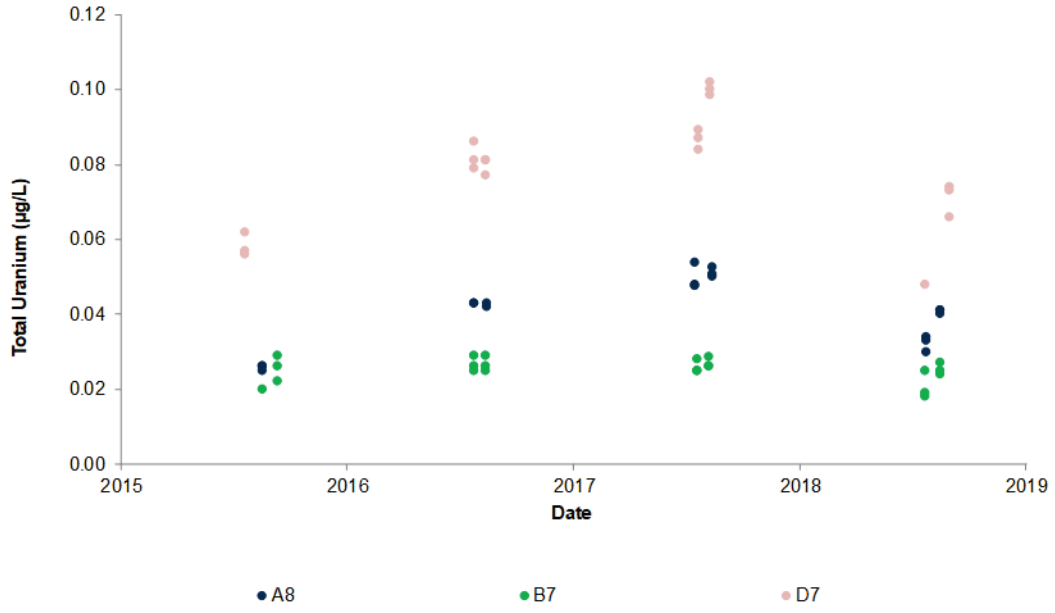


Figure 7C-51: Total Uranium in Peninsula Lakes, 2015 to 2018

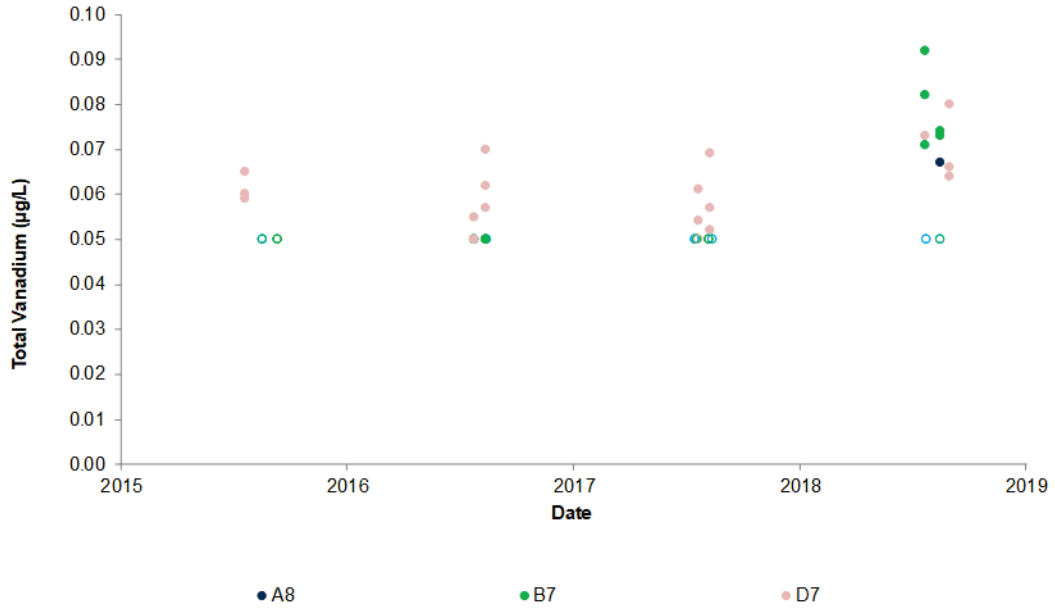
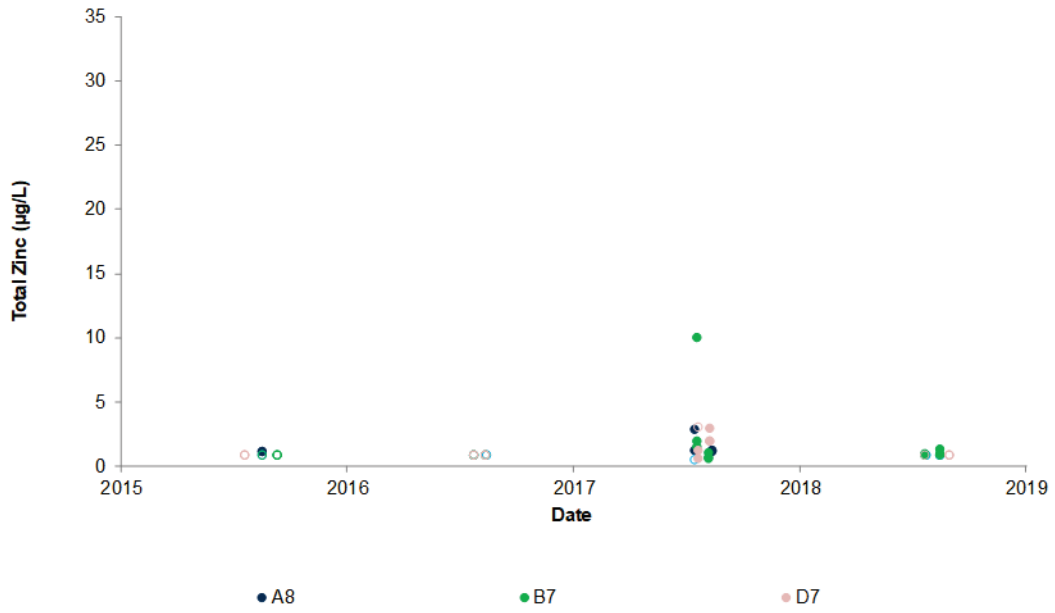


Figure 7C-52: Total Vanadium in Peninsula Lakes, 2015 to 2018



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APPENDIX 8A

Sediment Quality - Quality Assurance, Quality Control

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8A.1.0 INTRODUCTION

Quality assurance and quality control (QA/QC) practices determine data integrity and are relevant to all aspects of the Meliadine AEMP sediment quality monitoring program. Golder Associates Ltd. (Golder) applied these practices throughout the activities, from sample collection to data analysis, and reporting. Quality Assurance (QA) is the set of procedures incorporated into the program's standard procedures, so that the field sample collection is carried out to a high standard which does not introduce errors or bias. Quality Control (QC) is the system of validation checks performed to measure quality to determine if the data quality objectives have been met. The QA/QC procedures in 2018 followed relevant requirements outlined in the Meliadine AEMP Design Plan (Golder 2016).

This appendix describes QA/QC practices applied during sediment quality monitoring, evaluates QC data, and describes the implications of QC results to the interpretation of results.

8A.2.0 QUALITY ASSURANCE PROCEDURES

Quality assurance applicable to this monitoring component of the AEMP covers three areas of internal and external management: field work, laboratory analysis, and office operations.

8A.2.1 Field Work

Golder field crews are trained to be proficient in standardized field sampling procedures, data recording, and equipment operations applicable to sediment quality sampling. Field work during the 2018 sediment program was completed according to approved specific work instructions and established technical procedures. Specific work instructions are standardized forms that reference appropriate technical procedures and provide specific sampling instructions for the work to be undertaken. For example, specific work instructions provide field staff with descriptions of exact sampling locations, equipment needs and acceptance criteria, sample handling and storage requirements, sample labelling and shipping protocols, and internal and laboratory contacts. Specific work instructions also provide specific guidelines for field record keeping and sample tracking. Golder technical procedures are consistent with information described in the relevant scientific literature and regulatory guidance documents (e.g., Environment Canada 1993; APHA 2012), and outline relevant information regarding protocols for field sample collection and in situ field measurements.

One crew member was responsible for managing the sample documentation process so that:

- required samples were collected or reasons were documented as to why a sample was not collected
- chain-of-custody and analytical request forms were filled out appropriately
- established labelling and documentation procedures were followed

8A.2.2 Laboratory Analyses

A Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory, ALS Environmental (ALS; Edmonton location), was used for the analysis of sediment samples collected by Golder for the 2018 field program. Under CALA's accreditation program, performance evaluation assessments are conducted for laboratory procedures, methods, and internal QC. Therefore, the analytical data reported by ALS were considered reliable.

One member of the sediment quality monitoring team from Golder was designated as the laboratory liaison to streamline communications with the laboratory.

8A.2.3 Office Operations

Relevant elements of office-based QA were:

- using appropriately trained personnel for each data management, analysis, and reporting task
- senior review of work
- using standardized data manipulation and summary tools, where applicable
- filing hard-copy, electronic data, and project information according to standardized protocols
- using a data management system to maintain an organized, consistent system to store, check and export field and laboratory data field and laboratory data storage, QC, and retrieval

8A.3.0 QUALITY CONTROL PROCEDURES

8A.3.1 Field Control Procedures

One QC sample type was used in this program to evaluate data quality from samples collected in the field:

- **Duplicate samples** are additional samples collected at the same time and location as original sediment samples collected during a field program, using the same sampling methods. They are used to check within-site variation, and the precision of field sampling methods and laboratory analysis.

QC samples (i.e., duplicates) accounted for approximately 10% of the total number of sediment samples submitted for analysis. All QC samples were submitted “blind” (i.e., so not to identify them as QC samples) to the laboratory to test the validity of the analysis process. These samples were analyzed for the same set of parameters as the original collected sediment samples.

8A.3.2 Field and Laboratory Data Quality Control Procedures

Field datasheets and the field notebook were reviewed for completeness and unexpected values and trends. Upon receipt of sediment quality data from the laboratory, a series of seven standard checks were performed to screen for potential data quality issues (Sections 3.2.1 to 3.2.5):

- verified that all samples were analyzed
- review of detection limits (DLs)
- review of units
- review of holding times exceedances
- compare duplicates

8A.3.2.1 Screening of Individual Laboratory Results

The following screening procedures were completed for individual laboratory results in 2018:

- Project chain-of-custody (COC) forms and analytical request forms were compared to sampling records to confirm sampling locations, matched assigned sample control numbers (SCNs), and analysis requests for all required parameters.
- Laboratory results were reviewed to confirm analysis of all required parameters.
- Field and laboratory data from the same sample were reviewed to check that field and laboratory data were similar.
- Logic checks were conducted, including a check for the presence of zero values
- Outliers from historical data were identified through a visual comparison of 2018 data to historical data.

Laboratory results were considered for re-analyses if:

- Values were assessed as higher or lower than expected, based on comparisons to historical concentrations.

If re-analysis confirmed the original analysis result (i.e., RPD less than 30%), the original result was retained. If the re-analysis was notably different than the original result (i.e., RPD greater than 30%), then a decision was made to keep the original or re-analyzed result based on discussions with the laboratory regarding any QC issues of the original and re-analyzed results, holding time exceedances, historical concentrations, concentrations of other parameters within the same sample, results of the QC samples, or a combination of these factors. The rationale for requesting re-analyses or revising the original result to the re-analyzed result was documented.

8A.3.2.2 Detection Limits

Detection limits were specified for all chemical analyses required by the 2018 sediment program. Project standard DLs and the DLs provided by the laboratory for individual samples were compared.

If laboratory DLs were higher than the project standard DLs, the laboratory was notified and requested to provide an explanation for the change in DLs. If possible, a parameter was re-analyzed at the project standard DL. Changes in DLs by the laboratory during the program can limit the analysis and interpretation of sediment quality data. Limitations can occur when comparing results with different DLs and results to sediment quality guidelines. Specifically, an increase in DL above measured concentrations reduces the ability to detect spatial and temporal patterns; whereas an increase in DL above a sediment guideline reduces the ability to detect guideline exceedances when concentrations are below DLs.

8A.3.2.3 Units

For each parameter, the units reported by the laboratory were compared against expected units, as coded into the database.

8A.3.2.4 Holding Time

For each parameter the holding time between sample collection and analysis was specified by the laboratory based on Sample Holding Time Re-evaluation (US EPA 2005). The laboratory reviewed holding times for any exceedances and identified any data that may have been unreliable due to holding time exceedances. Holding time exceedances were considered when determining the validity of re-analyzed results from the laboratory.

8A.3.2.5 Duplicate Samples

Differences between concentrations measured in duplicate sediment samples were calculated as the RPD for each parameter. Before calculating the RPD, concentrations below the DL were replaced with the DL value in cases when only one of the concentrations for a given parameter was detectable. The RPD was calculated as per Equation 1:

$$RPD = (|difference\ in\ concentration\ between\ two\ of\ the\ duplicate\ samples|/mean\ concentration)\ x\ 100$$

[Equation 1]

The RPD value for a given parameter was notable if both conditions apply:

- The RPD was greater than 30%.
- Concentrations in one or both samples were greater than five times the DL.

The number of parameters with exceedances of the evaluation criteria was compared with the total number of parameters analyzed to evaluate analytical precision.

Within-site variability and field sampling precision of duplicate sample results were rated as:

- **Low and high**, respectively, if less than 10% of the parameters included in the duplicate sample analysis were notably different from one another
- **Moderate**, if 10% to 30% of the parameters included in the duplicate sample analysis were notably different from one another
- **High and low**, respectively, if more than 30% of the parameters included in the duplicate sample analysis were notably different from one another

8A.3.3 Office Quality Control Procedures

Office-based QC procedures followed by the 2018 sediment study were:

- Saving unaltered field datasheets, field notebooks, and laboratory files (e.g., COC forms, analysis request forms, certificates of analysis) in the Meliadine AEMP sediment quality monitoring program directory to document the original and final sources of laboratory and field sediment quality data from each program.
- Comparing sample field and laboratory data entered into the Meliadine AEMP sediment quality monitoring program data management system against field datasheets and final laboratory reports to confirm data accuracy.
- Creating backup files before each major data processing step.
- Verifying the accuracy of calculations performed to generate summary statistics and complete guideline comparisons.
- Documenting the final results for the QA/QC assessment annually in the Annual Environmental Effects Monitoring and Aquatic Effects Monitoring Program report.

8A.4.0 2018 LABORATORY DATA QUALITY RESULTS

8A.4.1 Screening of Individual Laboratory Results

8A.4.1.1 Chain-of-Custody Review

No issues were found in the COC forms.

8A.4.1.2 Parameters Requested for Analysis

All requested parameters were analyzed by the laboratory.

8A.4.1.3 Laboratory Data Review

Thirty-nine laboratory results, which represented less than 1.5% of the 2018 laboratory dataset were further evaluated because of reasons outlined in Table 8A-1. Re-analysis of samples for certain parameters was requested when data logic checks indicated a potential problem with the data. In all cases, re-analysis confirmed the original result and the original result was retained.

8A.4.2 Analytical Methods

All required parameters under the AEMP Design Plan (Golder 2016) were analyzed by the laboratory using the standard analytical methods requested during the program (Table 8A-2).

8A.4.3 Detection Limits

Requested DLs (Table 8A-2) were met for all parameters with exception of total organic carbon in one sample, MEL-05-01 where the DL was 0.075%, however, this did not impact the outcome of the analysis.

8A.4.4 Units

The laboratory reported the expected units for each parameter in 2018.

8A.4.5 Holding Time

To maintain sample integrity, sediment samples for laboratory analyses were submitted as soon as possible after collection.

Holding times were exceeded for samples where the laboratory was unable to initiate testing promptly following sample receipt or there were delays in sample delivery to the laboratory. Analytical holding times were met for most constituents, with the exception of laboratory mercury (3 samples) and total organic carbon (3 samples).

8A.4.6 Duplicate Samples

Two duplicate sediment quality samples were collected during the 2018 program (Table 8A-3).

A small percentage (i.e., 4%) of the paired duplicate concentrations had an RPD of more than 30% when one or both parameter concentrations were above five times the DL. The site variability and field precision for the 2018 dataset was rated as low and high, respectively.

8A.4.7 Internal Laboratory Quality Control

ALS flagged three samples as having failed the internal QC evaluation for beryllium and lithium, MEL-03-03, MEL-05-02 and its replicate MEL-05-02B. After contacting ALS for clarification, ALS stated that failure for lithium was a method blank failure for lithium, reporting 0.57 mg/kg when the allowable limit is 0.50 mg/kg, with explanation qualifier B. This qualifier indicates that the method blank had slightly more lithium detected than

normal. This trace amount (0.07 mg/kg) may be significant if sample results are between 0.5 mg/kg and 2.5 mg/kg. Samples with levels higher than 2.5 mg/kg (as in all 3 of the above samples) would not be significantly affected, and would be reported as observed. When typical measurement uncertainty is allowed for these observed results, the reported increased lithium concentration is insignificant.

For beryllium, ALS clarified that the recovery in the in-house prepared Laboratory Control Sample (LCS) of 121.5%, was greater than the limit of 120%, with qualifier MES ( ). When several metals are measured in one QC sample, the chances of random failure increase. CCME (1999) recognizes that measurement uncertainty may occasionally cause a metal recovery to fail, and if that failure is low (less than 10% outside allowable limits) for no more than 1 metal in a list of 10 metals or more, this is more likely due to random uncertainty rather than laboratory preparation or measurement failure. As beryllium was the only metal that had a high recovery, the recovery exceedance was less than 10% over the limit, and the list of metals was 28 elements long, this does not indicate analytical failure.

In both cases, review of the QC data assured ALS that results were acceptable and should be reported, and hence these were included in the report dataset.

8A.5.0 SUMMARY OF DATA QUALITY

The review of field and laboratory data indicated that field measurements and laboratory data were of high quality. Key findings from the 2018 QA/QC results are as follows:

- No issues were identified in analytical methods used or units reported by the laboratory.
- Holding times recommended by the laboratory were exceeded for a few parameters. These holding time exceedances were not expected to have affected data quality for the Meliadine sediment quality program.
- Evaluation of the sediment quality QC samples indicated that within-site variability and field precision for the 2018 dataset were rated as low and high, respectively.

The overall quality of the sediment quality data was rated high. Therefore, the results reported in the report are considered reliable and meet the needs of the program.

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TABLES

Table 8A-1: Summary of Re-evaluated Sediment Quality Laboratory Data, Meliadine Mine, 2018

Station Name	Station Sample ID	Lab ID	Sample Date	Parameter	Reason for Evaluation	Result	Unit	Decision
MEL-01-09	MEL-01-09	L2161109-4	22-Aug-18	% Sand	Greater than 30% RPD between replicates	56.8	%	Concentrations were confirmed by re-analysis; original result was retained.
				% Silt[(a)]		36.0	%	
				% Clay		7.2	%	
MEL-01-02	R-18-01	L2161120-2	22-Aug-18	% Sand	Greater than 30% RPD between replicates	54.0	%	
				% Silt[(a)]		40.3	%	
				% Clay		5.6	%	
MEL-05-02	MEL-05-02A	L2161128-4	30-Aug-18	Total lead	Greater than 30% RPD between replicates	0.178	µg/g	
MEL-05-02	MEL-05-02B	L2161128-5	30-Aug-18	Total lead	Greater than 30% RPD between replicates	0.254	µg/g	

(a) Given that particle-size parameters are interdependent, re-analysis was requested for all three categories.

µg/g = micrograms per gram.

Table 8A-2: Summary of Analytical Methods and Detection Limits, Meliadine Mine, 2018

Parameter	Unit (dry wt.)	Total Number of Samples	Analysis Method	Method Description	Standard ALS Detection Limit
Physical Parameters					
% Sand	%	22	SSIR-51 Method 3.2.1	Particle size - Pipette removal OM & CO3	1
% Silt	%	22	SSIR-51 Method 3.2.1	Particle size - Pipette removal OM & CO3	1
% Clay	%	22	SSIR-51 Method 3.2.1	Particle size - Pipette removal OM & CO3	1
Total Organic Carbon	%	22	CSSS (2008) P216-217 / CSSS (2008) 21.2	Total Organic Carbon Calculation	0.05
Metals[(a)]					
Aluminum	mg/kg[(b)]	22	EPA 200.2/6020A (mod)	CRC ICPMS	50
Antimony	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.1
Arsenic	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.1
Barium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.5
Beryllium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.1
Bismuth	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.2
Boron	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	5
Cadmium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.02
Calcium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	100
Chromium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.5
Cobalt	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.1
Copper	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.5
Iron	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	50
Lead	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.5
Lithium	mg/kg	22	EPA 200.2/6020A	CRC ICPMS	0.5
Magnesium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	20
Manganese	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	1
Mercury	mg/kg	22	EPA 200.2/1631E (Mod)	CVAAS	0.0050
Molybdenum	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.1
Nickel	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.5
Potassium	mg/kg	22	EPA 200.2/6020A	CRC ICPMS	50
Selenium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.2
Silver	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.1
Sodium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	100
Strontium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.5
Thallium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.05
Tin	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	2
Titanium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	1
Uranium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.05
Vanadium	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	0.2
Zinc	mg/kg	22	EPA 200.2/6020A (mod)	CRC ICPMS	2

(a) The list of elements reported for metals analysis includes metalloids such as arsenic and non-metals such as selenium, which are collectively referred to as “metals” in this table.

(b) µg/g and mg/kg are equivalent units.

mg/kg = miligrams per kilogram; µg/g = micrograms per gram; CRC ICPMS = collision/reaction cell inductively coupled plasma mass spectrometry; CVAAS = cold vapour atomic absorption spectrophotometry.

Table 8A-3: Quality Control Duplicate Sample Results, Meliadine Mine, 2018

Parameter	Unit (dry wt.)	MEL-01-09			MEL-05-02		
		Sample	Duplicate	RPD	Sample	Duplicate	RPD
		22-Aug-18			30-Aug-18		
Particle-size and Organic Carbon							
% Sand	%	24.2	10.4	79.8%	56.8	54	5.1%
% Silt	%	61.3	82.1	29.0%	36	40.3	11.3%
% Clay	%	14.5	7.5	63.6%	7.2	5.6	25.0%
Total Organic Carbon	%	5.3	5.59	5.3%	6.5	7.8	18.2%
Metals[(a)]							
Aluminum	µg/g	12,700	12,700	0.0%	8,570	9,720	12.6%
Antimony	µg/g	0.18	0.18	0.0%	0.11	0.14	24.0%
Arsenic	µg/g	28.8	29.4	2.1%	6.99	9.13	26.6%
Barium	µg/g	101	104	2.9%	66.3	80.3	19.1%
Beryllium	µg/g	0.31	0.3	3.3%	0.19	0.21	10.0%
Bismuth	µg/g	0.32	0.3	6.5%	<0.2	<0.2	-
Boron	µg/g	8.2	6.1	29.4%	<5	6.1	19.8%
Cadmium	µg/g	0.411	0.425	3.3%	0.178	0.254	35.2%
Calcium	µg/g	4,380	4,270	2.5%	3,710	4,380	16.6%
Chromium	µg/g	50.6	51.4	1.6%	46.4	43.2	7.1%
Cobalt	µg/g	27.1	25.6	5.7%	8.01	9.22	14.0%
Copper	µg/g	77.8	78.30	0.6%	65.2	84.50	25.8%
Iron	µg/g	29,400	30,100	2.4%	13,900	15,500	10.9%
Lead	µg/g	10.8	10.7	0.9%	5.49	7.11	25.7%
Lithium	µg/g	14.1	14	0.7%	10.4	11.5	10.0%
Magnesium	µg/g	7,180	7,230	0.7%	5,650	6,300	10.9%
Manganese	µg/g	332	336	1.2%	163	186	13.2%
Mercury	µg/g	0.028	0.0289	3.2%	0.0116	0.0155	28.8%
Molybdenum	µg/g	9.44	8.61	9.2%	2.38	2.7	12.6%
Nickel	µg/g	85.4	83.2	2.6%	37.7	41.3	9.1%
Potassium	µg/g	2,290	2,310	0.9%	1,190	1,410	16.9%
Selenium	µg/g	0.92	0.94	2.2%	0.56	0.77	31.6%
Silver	µg/g	0.2	0.21	4.9%	<0.1	0.1	0.0%
Sodium	µg/g	330	320	3.1%	170	210	21.1%
Strontium	µg/g	24.8	23.8	4.1%	18.5	21.4	14.5%
Thallium	µg/g	0.333	0.335	0.6%	0.145	0.177	19.9%
Tin	µg/g	<2	<2	-	<2	<2	-
Titanium	µg/g	768	716	7.0%	507	515	1.6%
Uranium	µg/g	4.22	4.07	3.6%	1.85	2.28	20.8%
Vanadium	µg/g	56.8	56.7	0.2%	36.1	41.4	13.7%
Zinc	µg/g	93.9	95.4	1.6%	49.4	59.4	18.4%

(a) The list of elements reported for metals analysis includes metalloids such as arsenic and non-metals such as selenium, which are collectively referred to as “metals” in this table.

Grey shading indicates a greater than 30% relative percent difference between replicates, when at least one replicate sample concentration was 5-times greater than the detection limit.

Light grey shading indicates a greater than 30% relative percent difference between replicates, but replicate sample concentrations were not 5-times greater than the detection limit.

RPD = Relative Percent Difference; µg/g = micrograms per gram; < = less than.

APPENDIX 8B

Sediment Quality Dataset in 2018

Table 8B-1: Sediment Quality Data from the Meliadine Lake 2018 Samping Program

Parameter	Unit (Dry Weight)	Guidelines		Sampling Sites									
		ISQG	PEL	MEL-01-01	MEL-01-06	MEL-01-07	MEL-01-08	MEL-01-09	MEL-02-02	MEL-02-03	MEL-02-05	MEL-02-06	MEL-02-08
				22-Aug-18	22-Aug-18	21-Aug-18	22-Aug-18	22-Aug-18	31-Aug-18	18-Aug-18	31-Aug-18	31-Aug-18	15-Aug-18
Particle-size and organic carbon													
Sand	%	-	-	25	42	6.3	8.4	24	68	46	33	38	63
Silt	%	-	-	64	55	82	81	61	24	44	51	48	29
Clay	%	-	-	12	3.3	11	10	15	8.6	9.5	17	13	7.3
Fines (silt + clay)	%	-	-	75	58	94	92	76	32	54	67	62	37
Total Organic Carbon	%	-	-	4.0	3.0	5.7	4.5	5.3	4.6	6.2	9.0	7.4	6.2
Metals and Metalloids													
Aluminum	µg/g	-	-	12,600	11,100	13,900	14,500	12,700	9,350	12,000	10,500	11,300	7,560
Antimony	µg/g	-	-	0.13	0.15	0.16	0.14	0.18	<0.1	<0.1	0.14	0.13	0.11
Arsenic	µg/g	5.9	17	**19**$^{(I, P)}$	**15**$^{(I)}$	**33**$^{(I, P)}$	**23**$^{(I, P)}$	**29**$^{(I, P)}$	**8.4**$^{(I)}$	**12**$^{(I)}$	**16**$^{(I)}$	**11**$^{(I)}$	**8.9**$^{(I)}$
Barium	µg/g	-	-	115	90	132	136	101	92	117	120	115	91
Beryllium	µg/g	-	-	0.33	0.28	0.33	0.37	0.31	0.23	0.29	0.28	0.28	0.22
Bismuth	µg/g	-	-	0.32	0.25	0.35	0.37	0.32	<0.2	0.25	0.25	0.23	<0.2
Boron	µg/g	-	-	6.1	5.9	6.9	7.1	8.2	<5.0	7.2	8.2	7.0	5.4
Cadmium	µg/g	0.6	3.5	0.52	0.54	0.52	**0.6**$^{(I)}$	0.41	0.22	0.34	0.45	0.35	0.3
Calcium	µg/g	-	-	4,460	3,760	4,540	4,700	4,380	3,840	5,130	5,070	5,250	4,170
Chromium	µg/g	37	90	**50**$^{(I)}$	**43**$^{(I)}$	**56**$^{(I)}$	**57**$^{(I)}$	**51**$^{(I)}$	**39**$^{(I)}$	**54**$^{(I)}$	**45**$^{(I)}$	**50**$^{(I)}$	31
Cobalt	µg/g	-	-	13	8.5	17	16	27	8.8	11	12	10	7.6
Copper	µg/g	36	197	**81**$^{(I)}$	**61**$^{(I)}$	**89**$^{(I)}$	**95**$^{(I)}$	**78**$^{(I)}$	**56**$^{(I)}$	**88**$^{(I)}$	**99**$^{(I)}$	**91**$^{(I)}$	**69**$^{(I)}$
Iron	µg/g	-	-	24,300	20,200	31,600	29,600	29,400	16,000	21,700	20,400	19,000	12,900
Lead	µg/g	35	91	11	8.8	13	12	11	6.1	9.4	10	8.7	7.4
Lithium	µg/g	-	-	15	13	17	17	14	11	15	12	13	10
Magnesium	µg/g	-	-	7,130	6,160	7,770	8,030	7,180	5,930	7,010	5,740	6,550	4,370
Manganese	µg/g	-	-	351	273	375	471	332	240	333	400	300	193
Mercury	µg/g	0.17	0.49	0.027	0.019	0.044	0.031	0.028	0.013	0.02	0.029	0.018	0.016
Molybdenum	µg/g	-	-	4.0	3.0	5.9	4.4	9.4	2.6	3.7	5.2	3.9	3.4
Nickel	µg/g	-	-	61	47	69	73	85	38	54	60	50	39
Potassium	µg/g	-	-	2,240	1,940	2,520	2,530	2,290	1,550	2,040	1,840	1,910	1,320
Selenium	µg/g	-	-	0.94	0.69	1.1	1.2	0.92	0.55	0.92	1.1	0.91	0.75
Silver	µg/g	-	-	0.18	0.14	0.22	0.22	0.2	<0.1	0.16	0.17	0.15	0.12
Sodium	µg/g	-	-	300	250	360	350	330	200	300	290	310	190
Strontium	µg/g	-	-	24	20	26	27	25	20	28	28	27	23
Thallium	µg/g	-	-	0.42	0.26	0.37	0.45	0.33	0.18	0.25	0.29	0.27	0.22
Tin	µg/g	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	µg/g	-	-	698	641	739	786	768	613	677	490	599	419
Uranium	µg/g	-	-	4.4	3.6	4.2	5.1	4.2	1.9	3.5	3.8	3.2	2.6
Vanadium	µg/g	-	-	57	47	61	66	57	36	48	46	48	32
Zinc	µg/g	123	315	89	71	100	101	94	68	92	96	91	68

Bolded values are higher than sediment quality guidelines. ISQG = Interim Sediment Quality Guideline; PEL = Probable Effect Level.
$^{(I)}$ = value higher than the Interim Sediment Quality Guideline.
$^{(P)}$ = value higher than the Probable Effect Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
- = no guideline or data.

Table 8B-1: Sediment Quality Data from the Meliadine Lake 2018 Samping Program

Parameter	Unit (Dry Weight)	Guidelines		Sampling Sites									
		ISQG	PEL	MEL-03-01	MEL-03-02	MEL-03-03	MEL-03-04	MEL-03-05	MEL-05-01	MEL-05-02	MEL-05-03	MEL-05-04	MEL-05-05
				20-Aug-18	28-Aug-18	28-Aug-18	26-Aug-18	28-Aug-18	01-Sep-18	30-Aug-18	29-Aug-18	30-Aug-18	29-Aug-18
Particle-size and organic carbon													
Sand	%	-	-	78	67	26	47	70	92	57	52	42	13
Silt	%	-	-	20	32	67	49	27	7.5	36	38	42	77
Clay	%	-	-	2.1	1.5	6.9	4.6	3.1	<1.0	7.2	9.4	16	9.8
Fines (silt + clay)	%	-	-	22	33	74	53	30	8.0	43	48	59	87
Total Organic Carbon	%	-	-	1.9	0.29	7.7	5.4	3.0	0.76	6.5	7.0	7.2	6.9
Metals and Metalloids													
Aluminum	µg/g	-	-	5,160	5,490	11,500	7,780	6,410	5,590	8,570	7,860	9,500	13,600
Antimony	µg/g	-	-	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	0.11	0.1	<0.1	0.27
Arsenic	µg/g	5.9	17	4.6	5.9	**7.2**[(I)]	5.0	3.4	3.6	**7.0**[(I)]	**9.8**[(I)]	**10**[(I)]	**23**[(I, P)]
Barium	µg/g	-	-	38	31	104	88	63	22	66	61	79	132
Beryllium	µg/g	-	-	0.12	0.14	0.27	0.2	0.15	<0.1	0.19	0.19	0.21	0.26
Bismuth	µg/g	-	-	<0.2	<0.2	0.21	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.35
Boron	µg/g	-	-	<5.0	<5.0	6.9	5.4	<5.0	<5.0	<5.0	5.1	6.7	8.0
Cadmium	µg/g	0.6	3.5	0.061	<0.02	0.28	0.18	0.18	0.033	0.18	0.2	0.21	0.43
Calcium	µg/g	-	-	2,670	2,660	5,880	4,250	3,300	1,530	3,710	3,780	4,610	6,080
Chromium	µg/g	37	90	19	20	**49**[(I)]	32	24	21	**46**[(I)]	34	**48**[(I)]	**65**[(I)]
Cobalt	µg/g	-	-	3.7	3.6	9.0	6.7	5.8	3.9	8.0	7.8	7.6	15
Copper	µg/g	36	197	14	7.6	**92**[(I)]	**58**[(I)]	**41**[(I)]	7.4	**65**[(I)]	**65**[(I)]	**72**[(I)]	**76**[(I)]
Iron	µg/g	-	-	9,000	10,700	16,600	11,900	9,350	10,900	13,900	13,400	14,700	28,300
Lead	µg/g	35	91	2.8	3.2	6.9	4.4	3.4	1.8	5.5	5.3	6.4	10
Lithium	µg/g	-	-	7.9	9.1	17	12	9.6	6.4	10	8.9	10	15
Magnesium	µg/g	-	-	2,930	3,090	6,500	4,540	3,840	3,840	5,650	4,780	5,820	8,800
Manganese	µg/g	-	-	104	107	251	158	123	109	163	158	200	285
Mercury	µg/g	0.17	0.49	<0.005	<0.005	0.015	0.0092	0.0064	<0.005	0.012	0.0087	0.013	0.011
Molybdenum	µg/g	-	-	1.4	1.7	2.8	2.5	1.5	0.5	2.4	2.8	2.4	9.5
Nickel	µg/g	-	-	15	15	46	32	24	12	38	34	43	65
Potassium	µg/g	-	-	1,040	1,110	2,200	1,590	1,330	654	1,190	1,200	1,430	3,160
Selenium	µg/g	-	-	<0.2	<0.2	0.79	0.48	0.34	<0.2	0.56	0.59	0.7	1.2
Silver	µg/g	-	-	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.17
Sodium	µg/g	-	-	140	130	350	230	190	<100	170	190	230	360
Strontium	µg/g	-	-	13	12	31	20	16	8.3	19	19	23	29
Thallium	µg/g	-	-	0.078	0.058	0.21	0.17	0.15	0.056	0.15	0.13	0.14	0.31
Tin	µg/g	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Titanium	µg/g	-	-	486	503	787	547	525	350	507	465	517	819
Uranium	µg/g	-	-	0.91	1.1	3.1	1.8	1.4	0.46	1.9	1.8	2.1	7.2
Vanadium	µg/g	-	-	22	25	45	32	25	20	36	34	39	77
Zinc	µg/g	123	315	24	20	70	51	41	22	49	47	51	64

Bolded values are higher than sediment quality guidelines. ISQG = Interim Sediment Quality Guideline; PEL = Probable Effect Level.
[(I)] = value higher than the Interim Sediment Quality Guideline.
[(P)] = value higher than the Probable Effect Level.

Sediment quality data shown in this table were rounded to reflect laboratory precision after comparisons to guidelines. Therefore, values slightly above guidelines may be displayed as being equal to the guidelines and identified as exceedances. Measured concentrations equal to the guideline values were not identified as exceedances.
- = no guideline or data.

APPENDIX 8C

Time-series Plots with Normal Ranges

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1.0 PARTICLE-SIZE AND ORGANIC CARBON

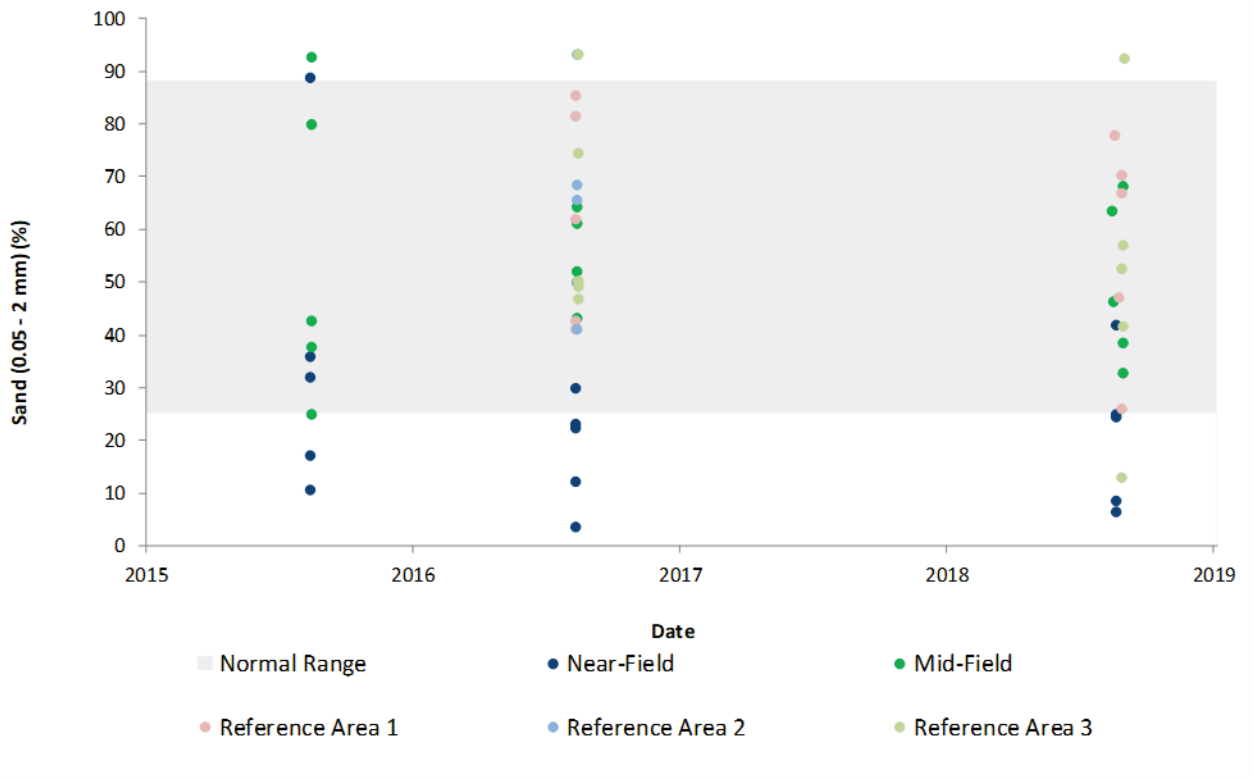

Figure 8C.1-1: Sand (%) in Meliadine Lake, 2015 to 2018

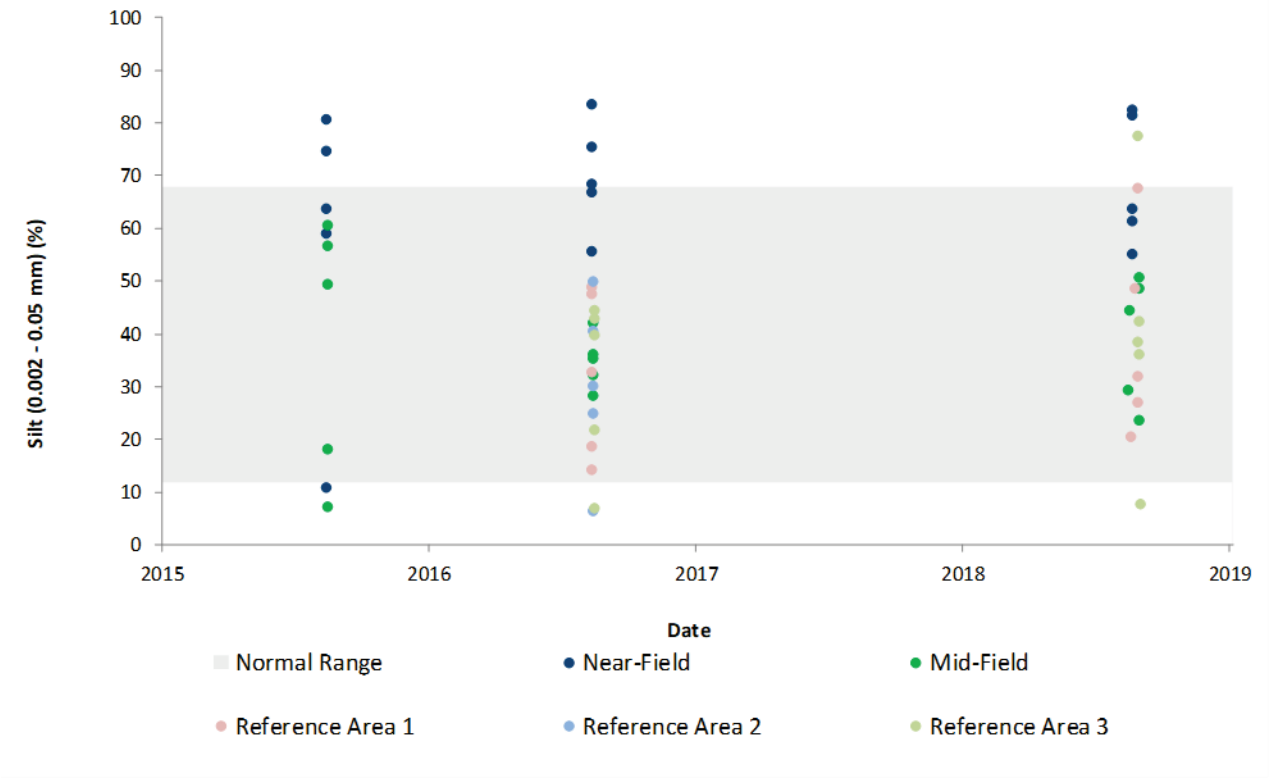

Figure 8C.1-2: Silt (%) in Meliadine Lake, 2015 to 2018

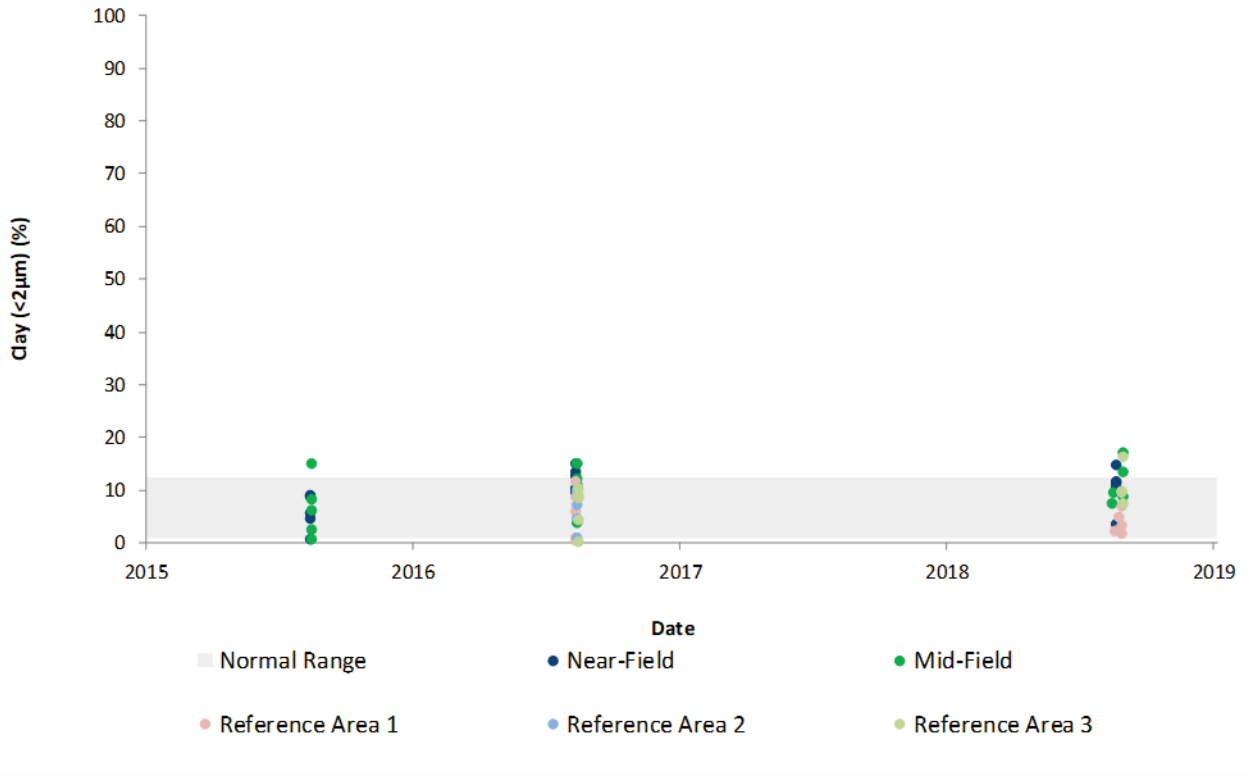

Figure 8C.1-3: Clay (%) in Meliadine Lake, 2015 to 2018



Figure 8C.1-4: Fines (Silt + Clay %) in Meliadine Lake, 2015 to 2018

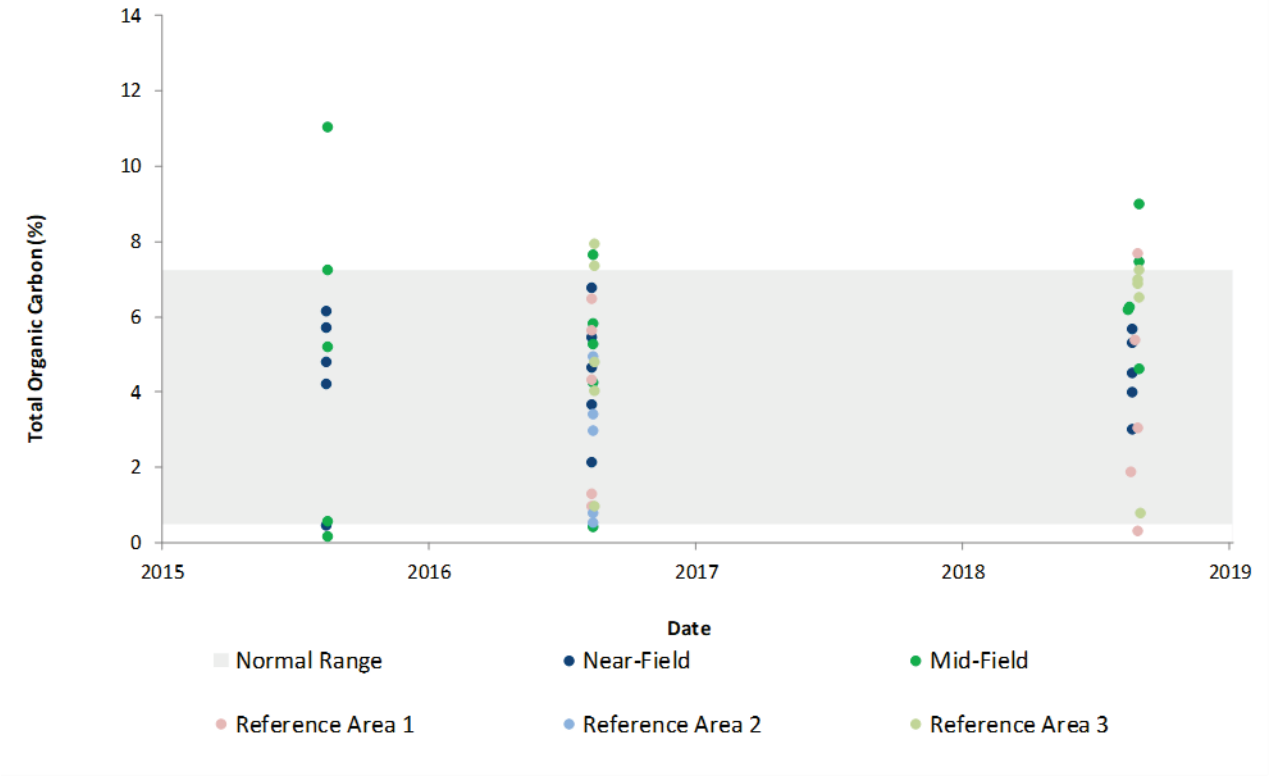

Figure 8C.1-5: Total Organic Carbon in Meliadine Lake, 2015 to 2018

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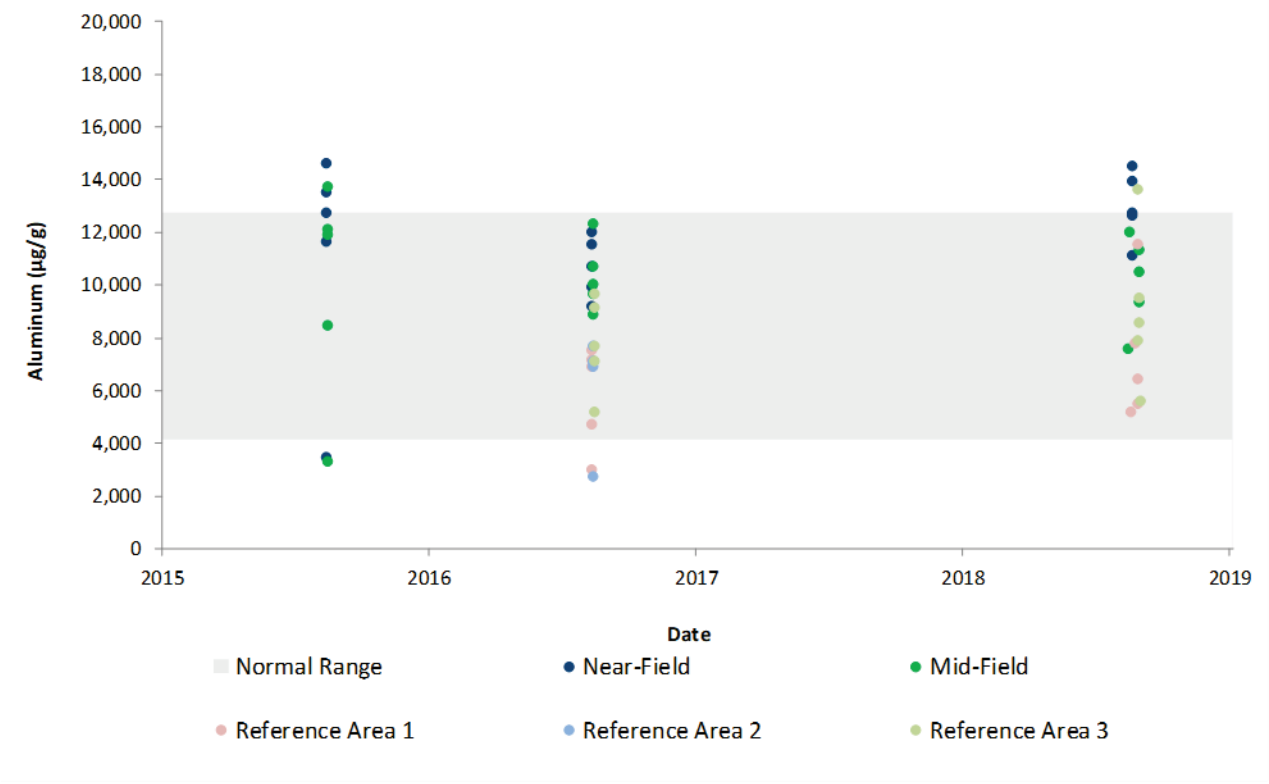
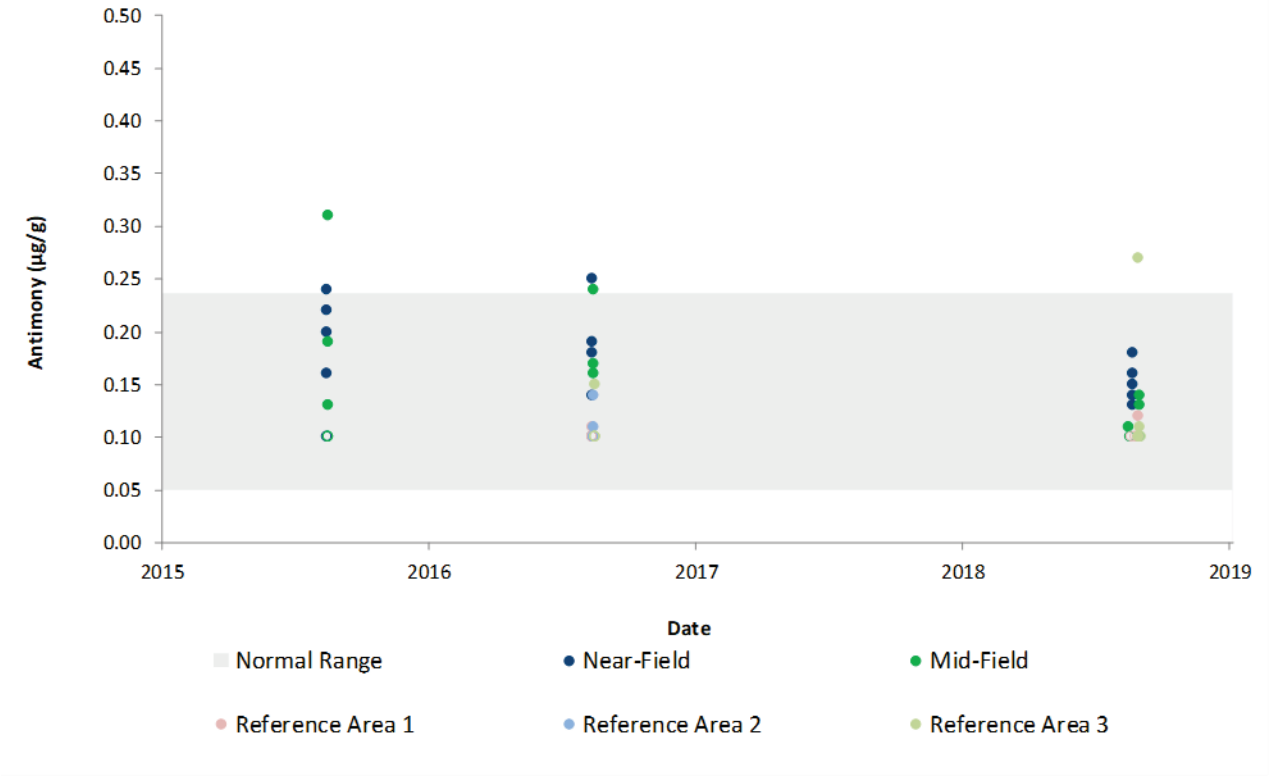


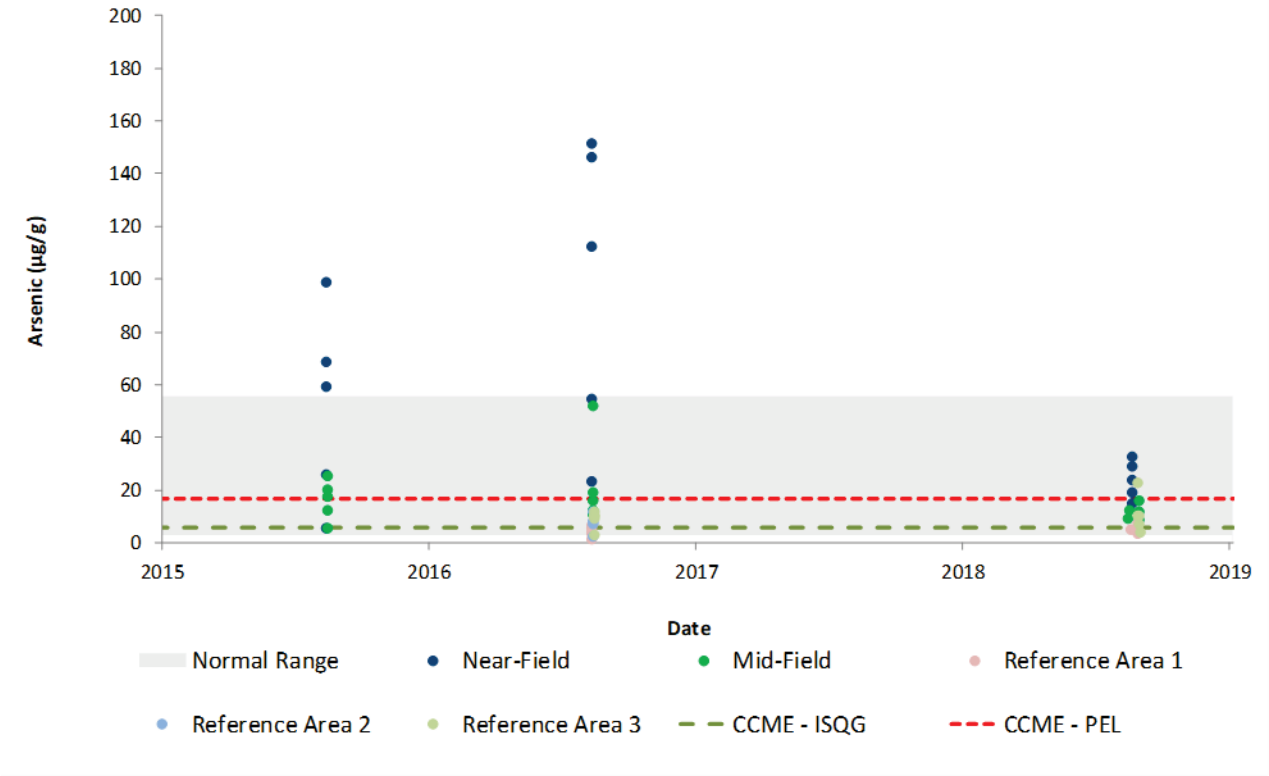
Note: µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-1: Concentrations of Aluminum in Meliadine Lake, 2015 to 2018



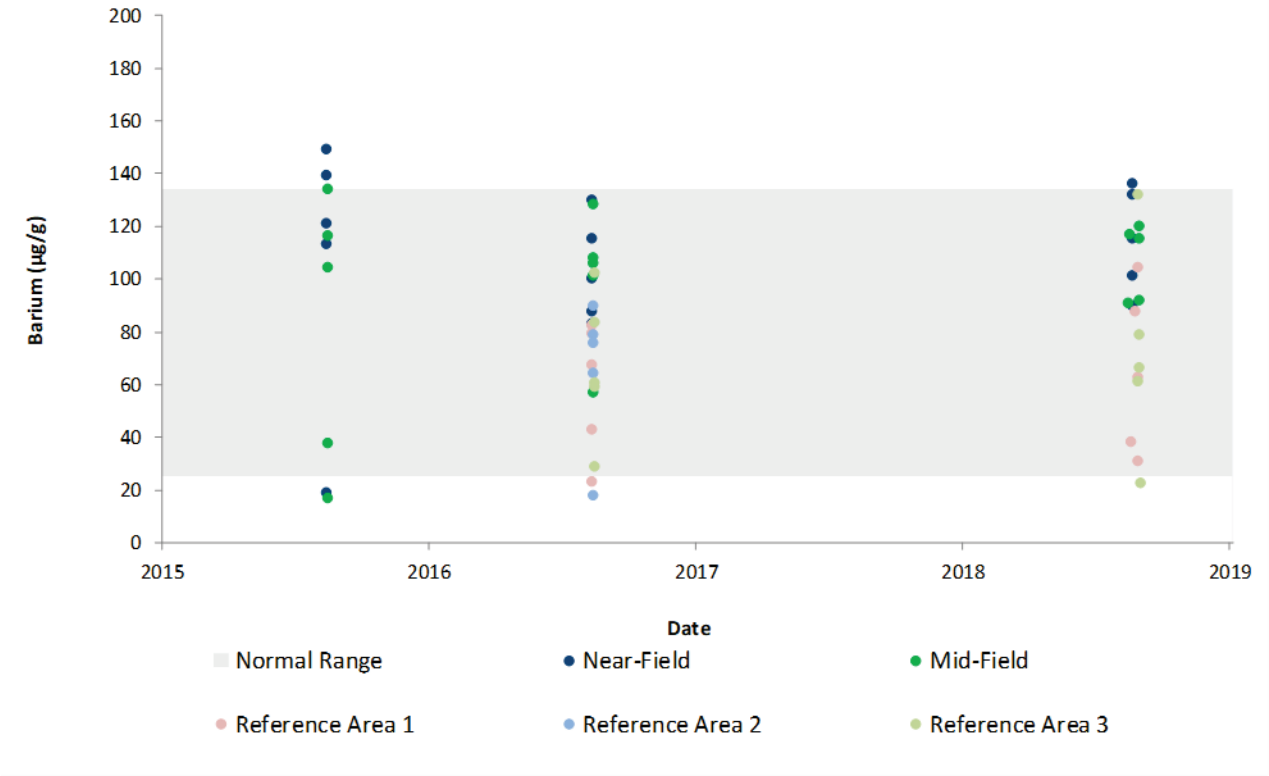
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-2: Concentrations of Antimony in Meliadine Lake, 2015 to 2018



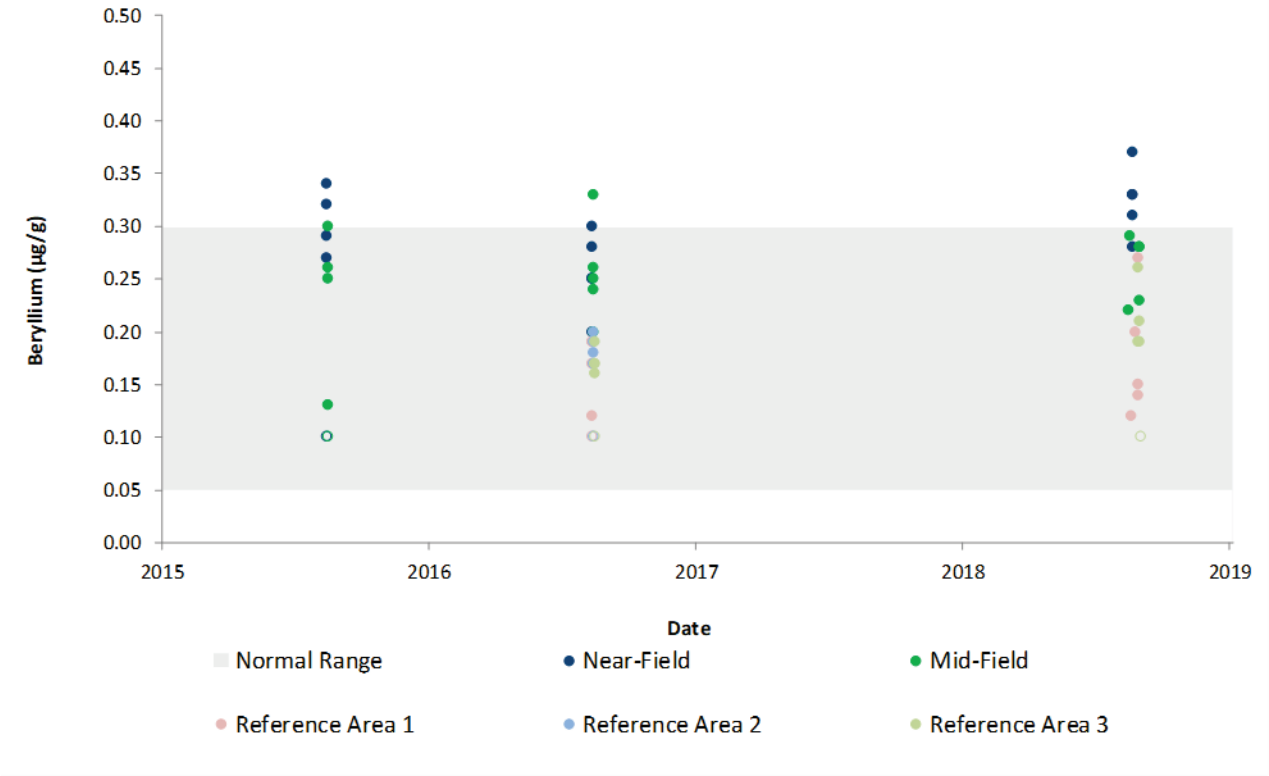
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-3: Concentrations of Arsenic in Meliadine Lake, 2015 to 2018



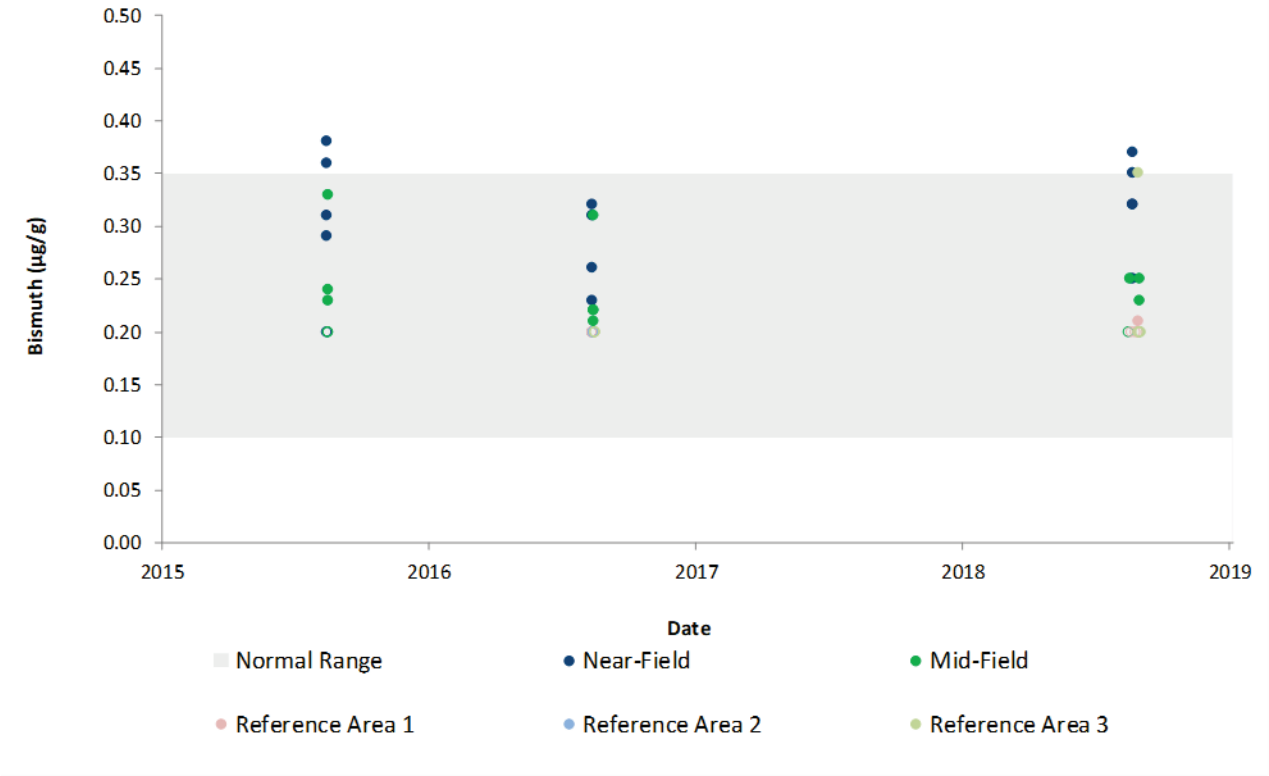
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-4: Concentrations of Barium in Meliadine Lake, 2015 to 2018



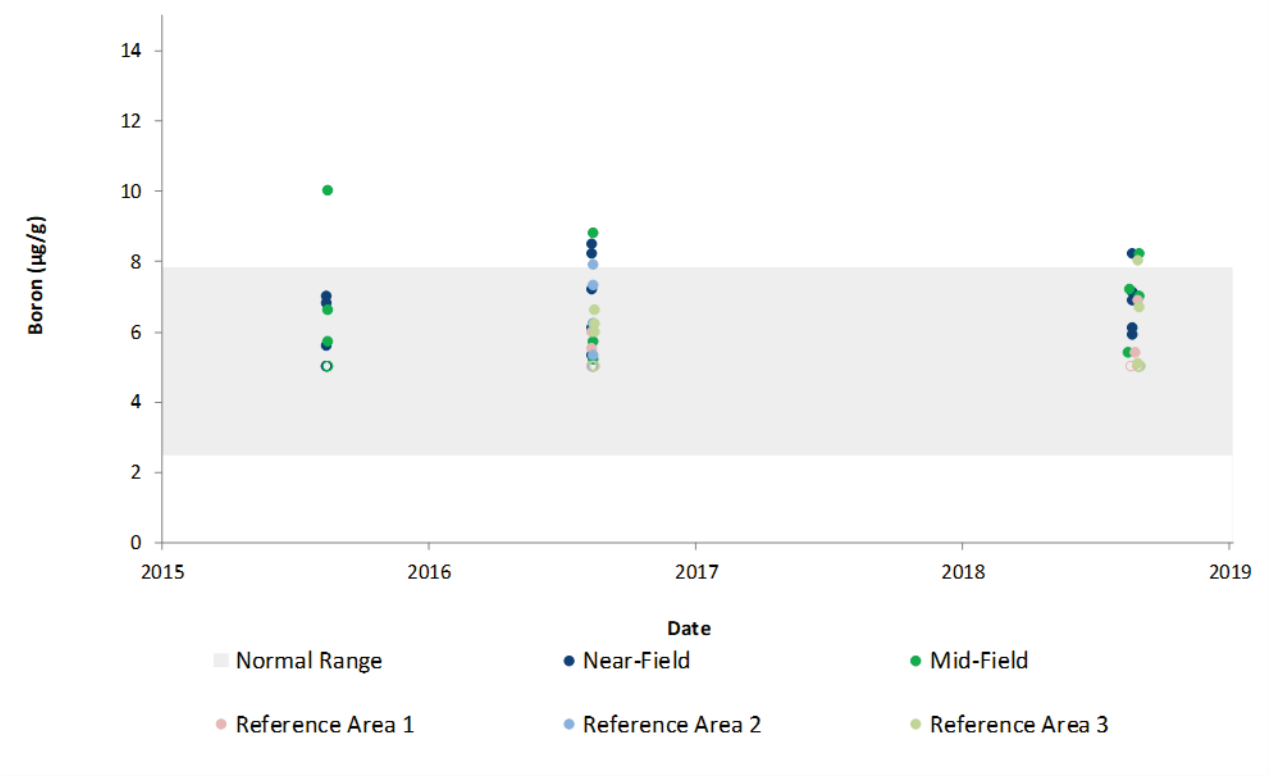
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-5: Concentrations of Beryllium in Meliadine Lake, 2015 to 2018



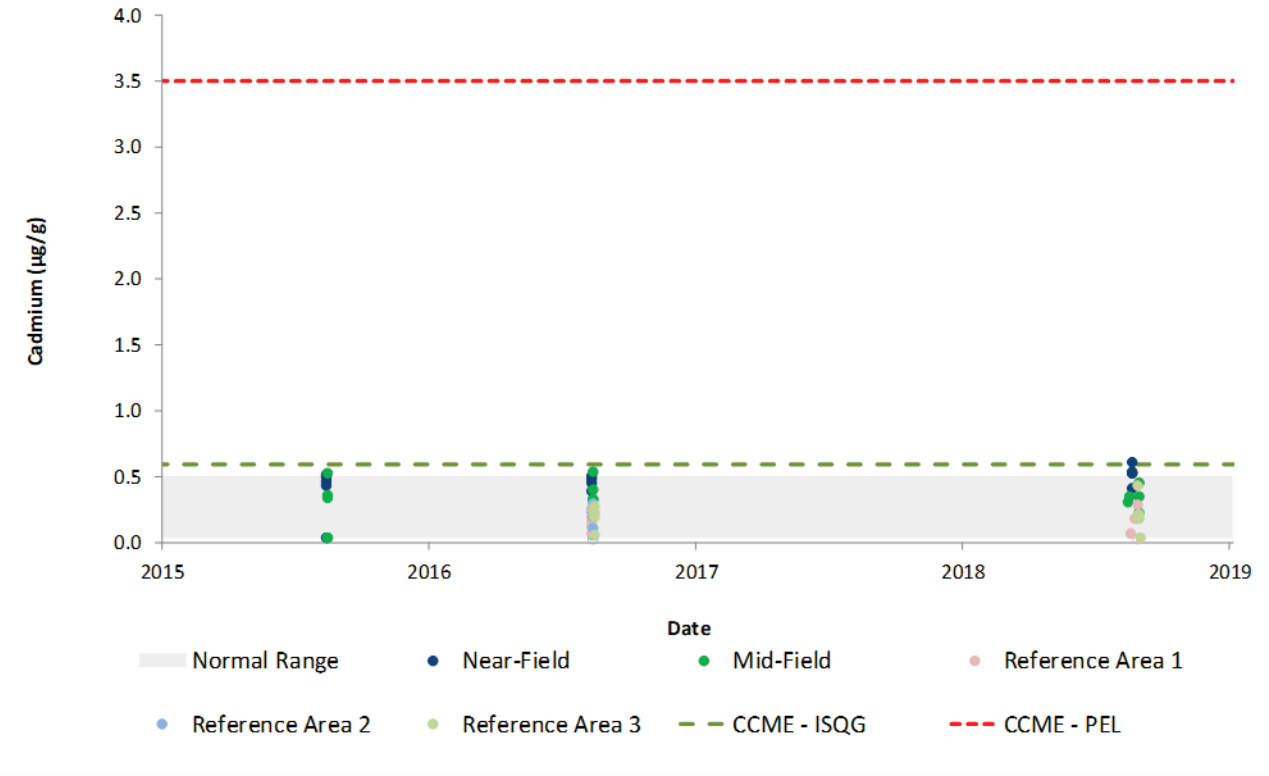
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-6: Concentrations of Bismuth in Meliadine Lake, 2015 to 2018



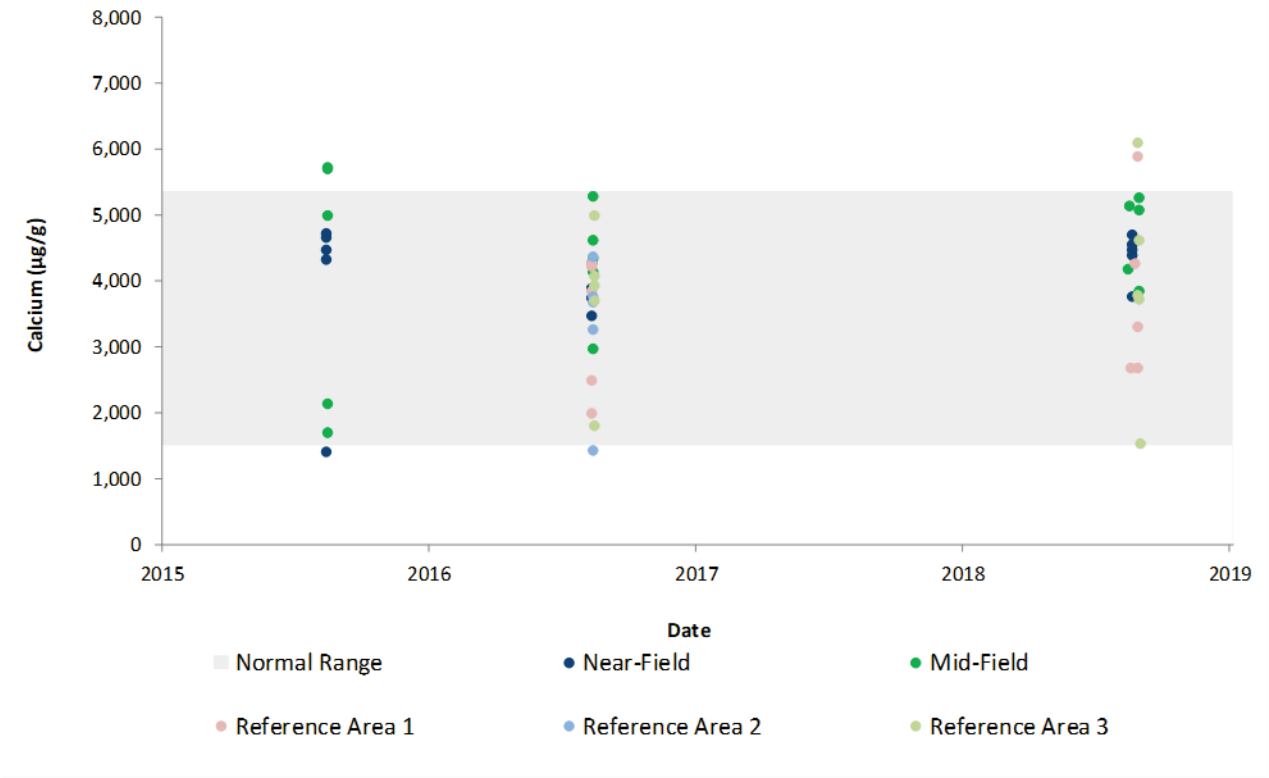
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-7: Concentrations of Boron in Meliadine Lake, 2015 to 2018



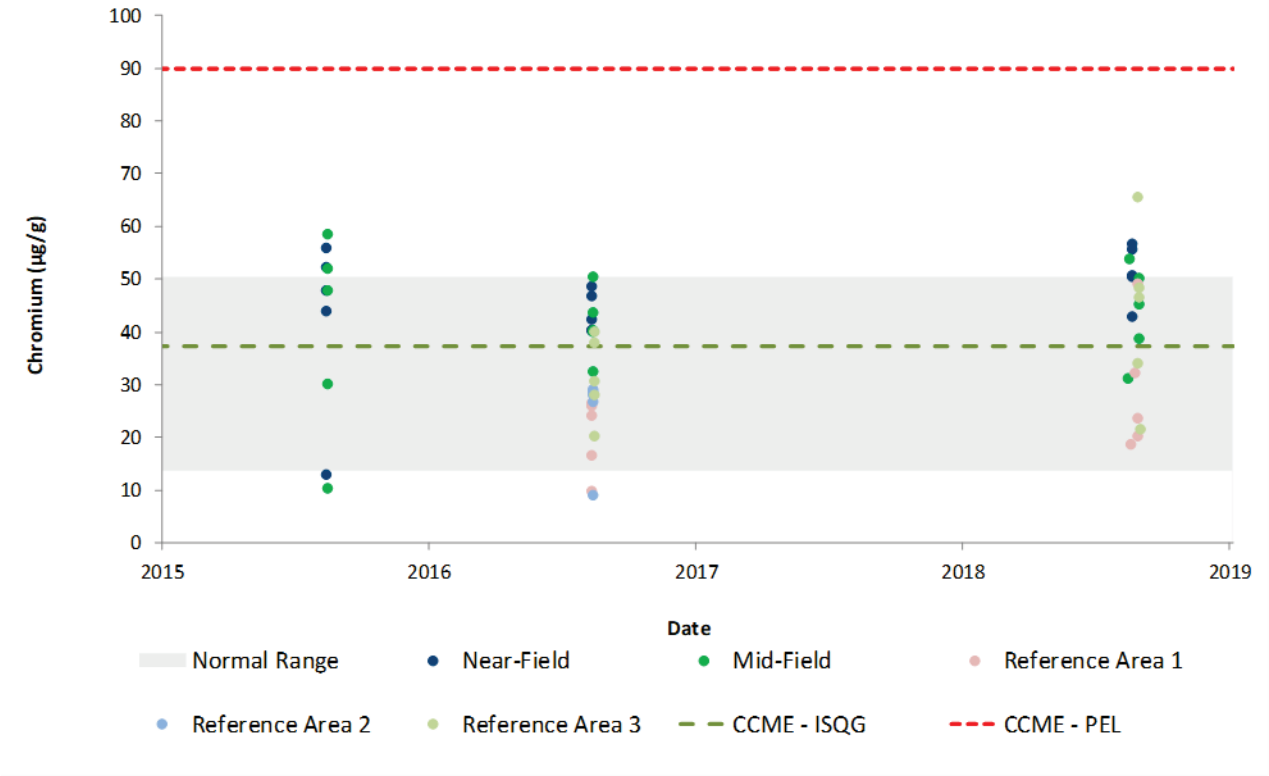
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-8: Concentrations of Cadmium in Meliadine Lake, 2015 to 2018



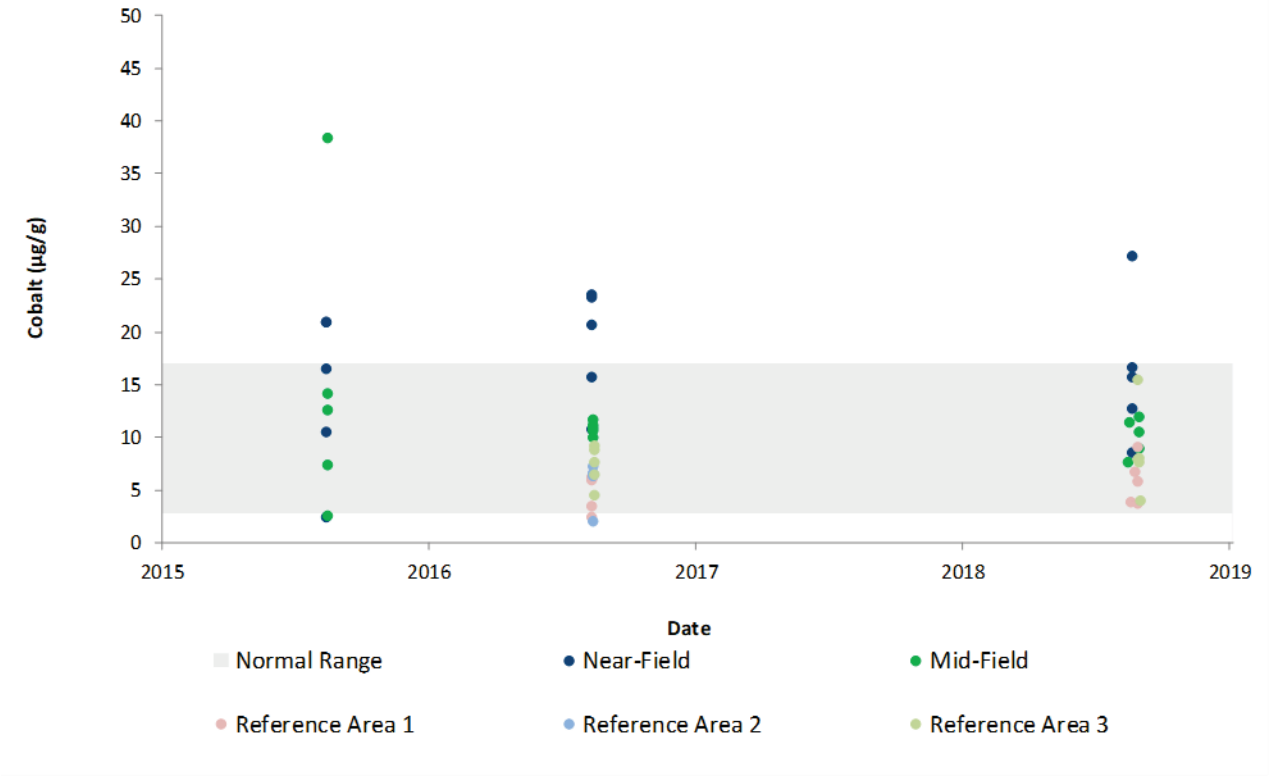
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-9: Concentrations of Calcium in Meliadine Lake, 2015 to 2018



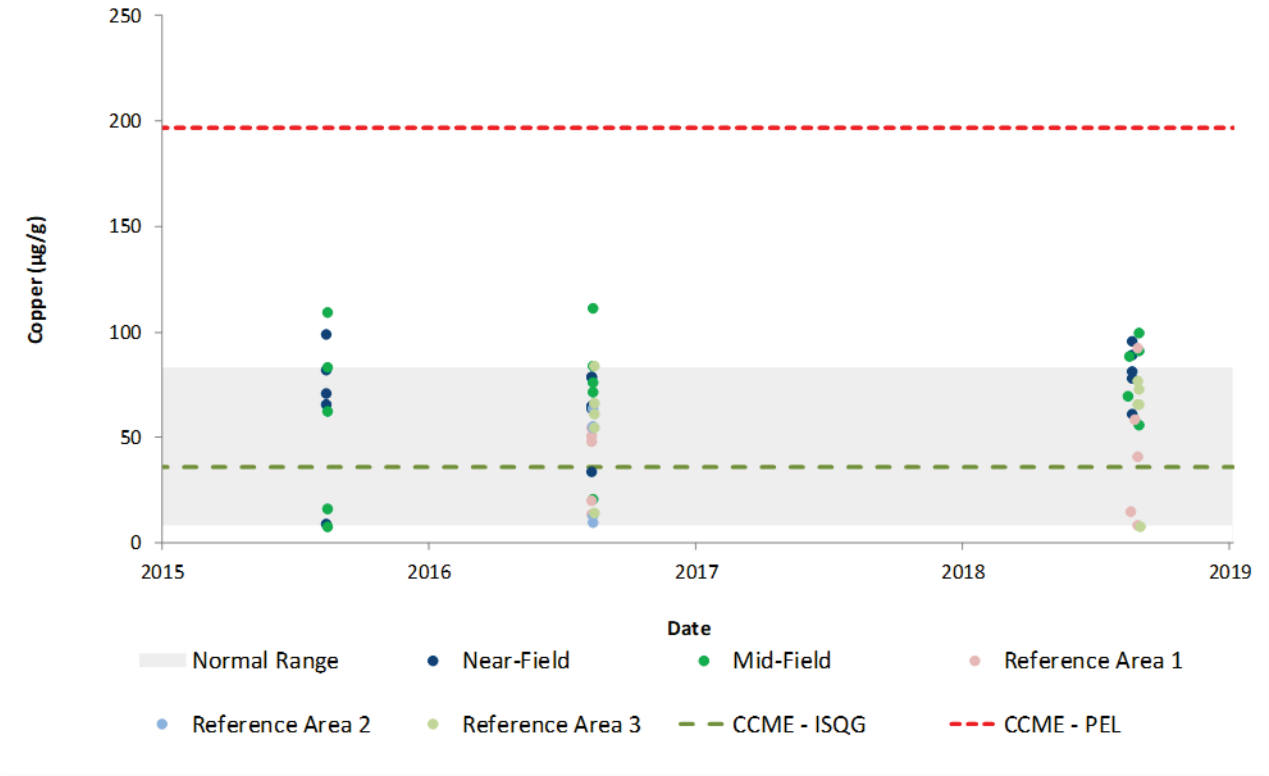
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-10: Concentrations of Chromium in Meliadine Lake, 2015 to 2018



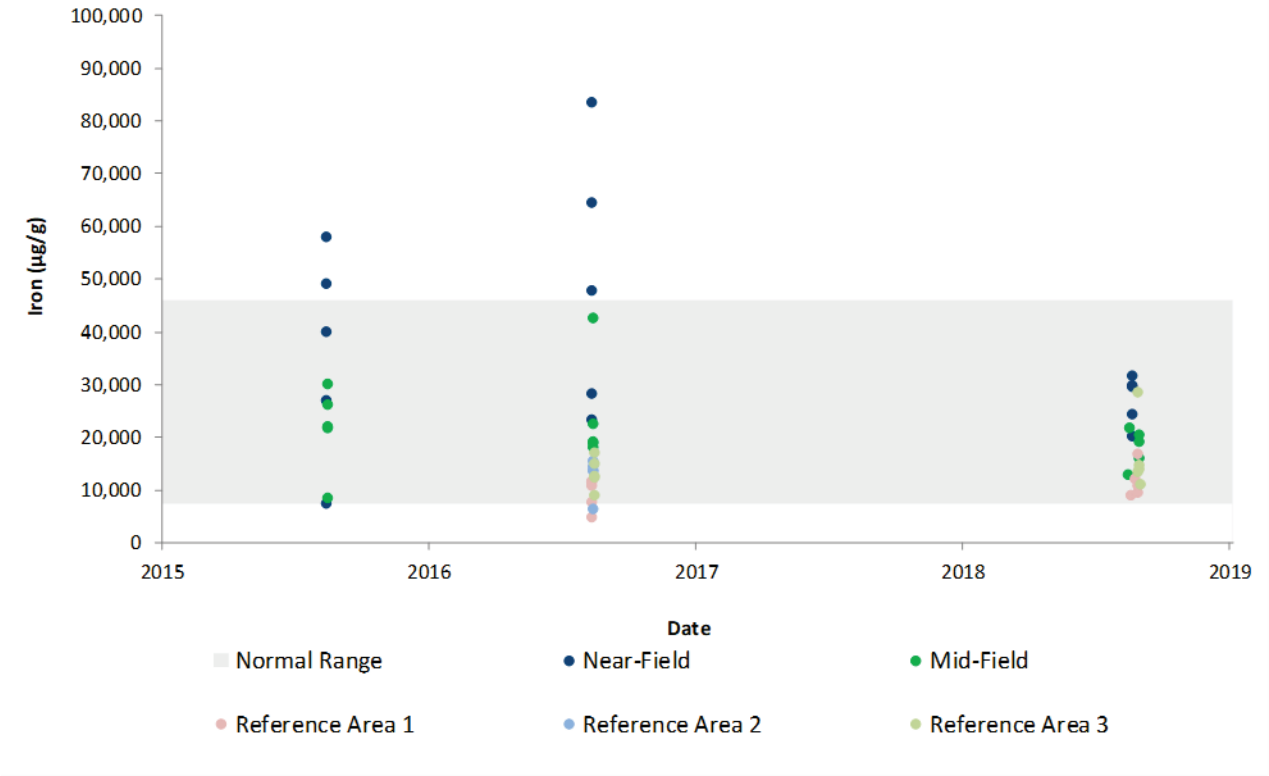
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-11: Concentrations of Cobalt in Meliadine Lake, 2015 to 2018



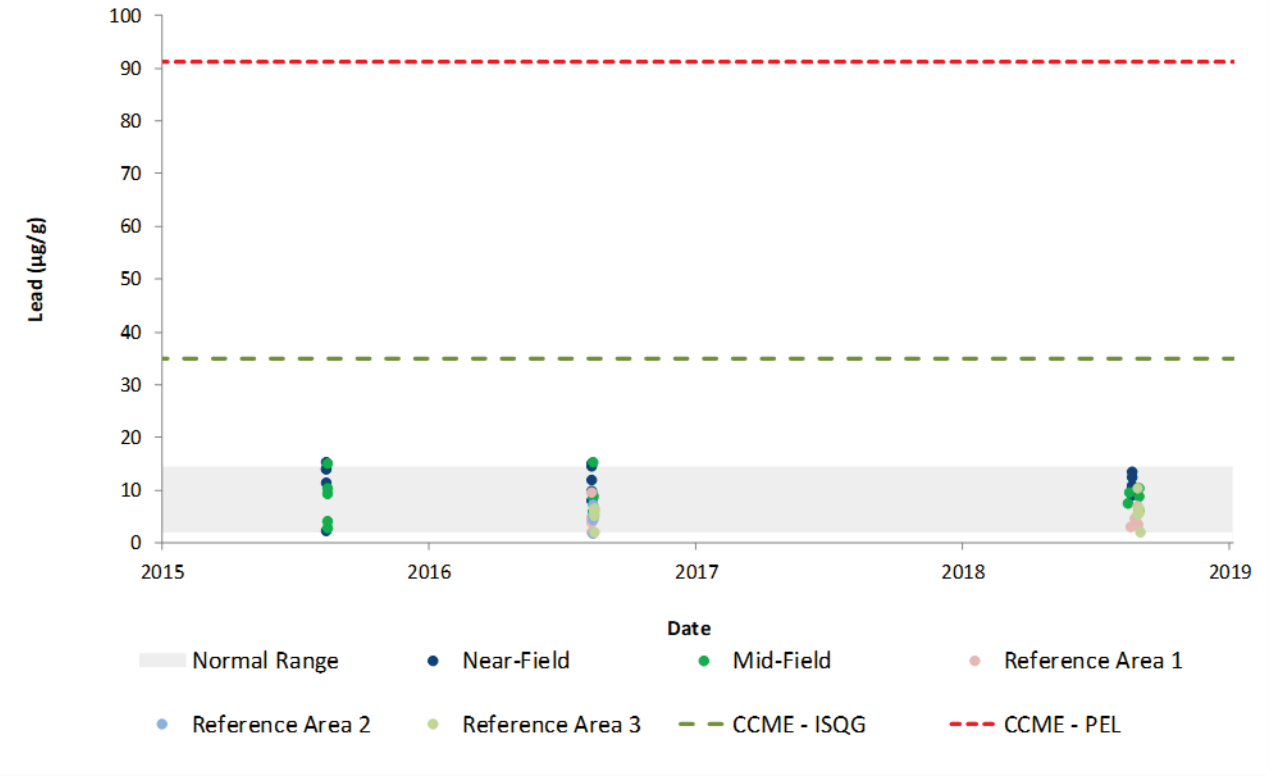
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-12: Concentrations of Copper in Meliadine Lake, 2015 to 2018



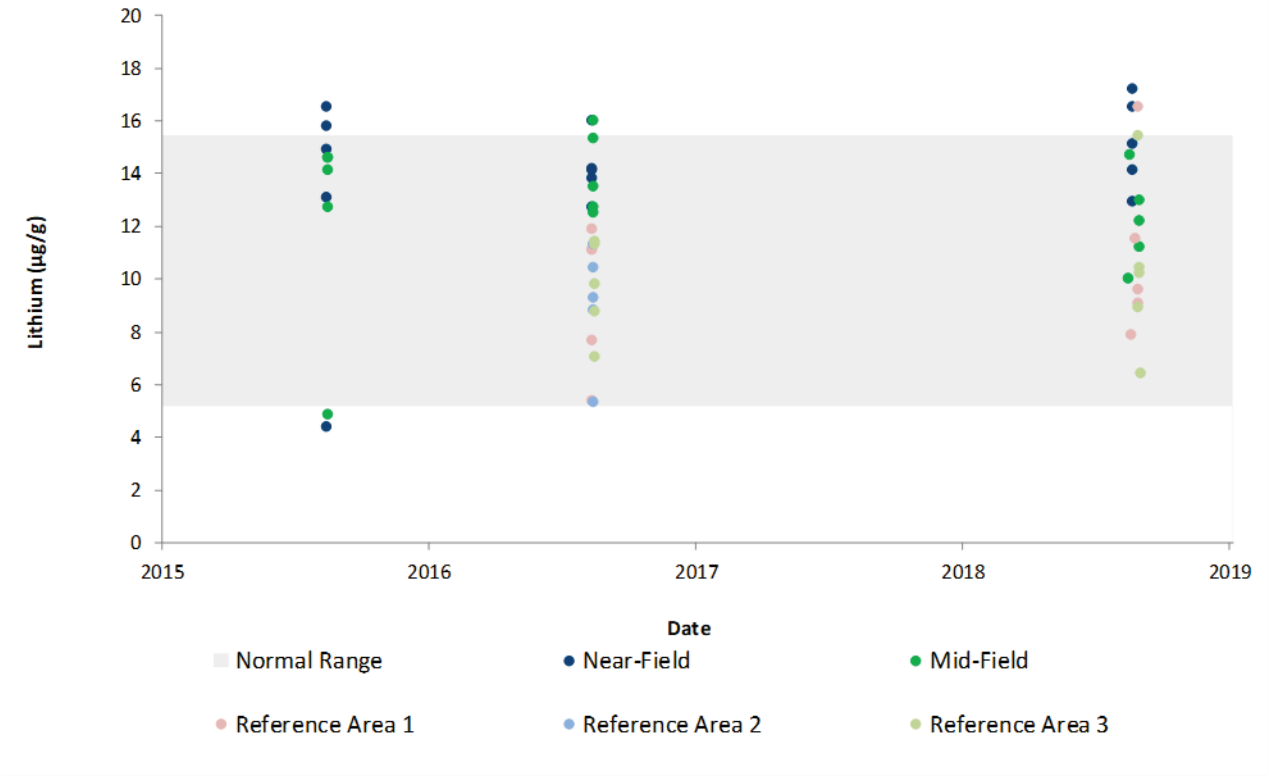
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-13: Concentrations of Iron in Meliadine Lake, 2015 to 2018



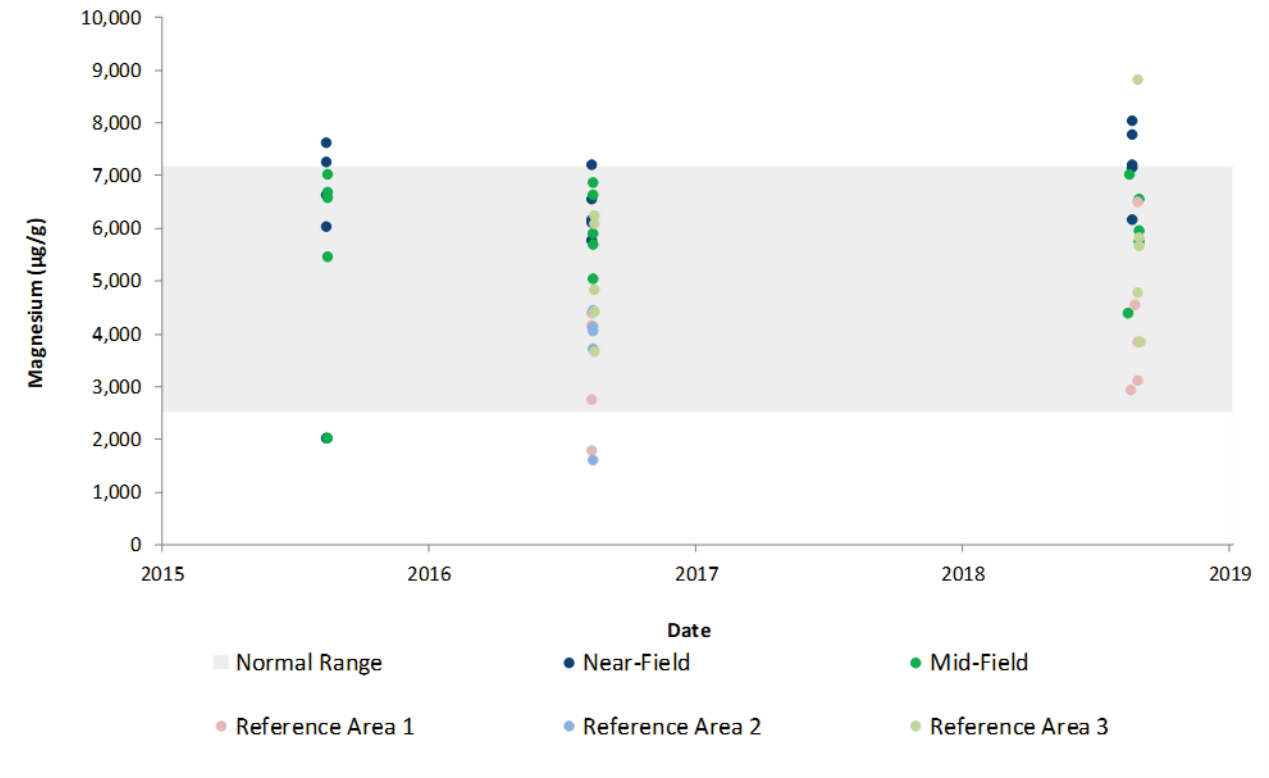
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-14: Concentrations of Lead in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-15: Concentrations of Lithium in Meliadine Lake, 2015 to 2018



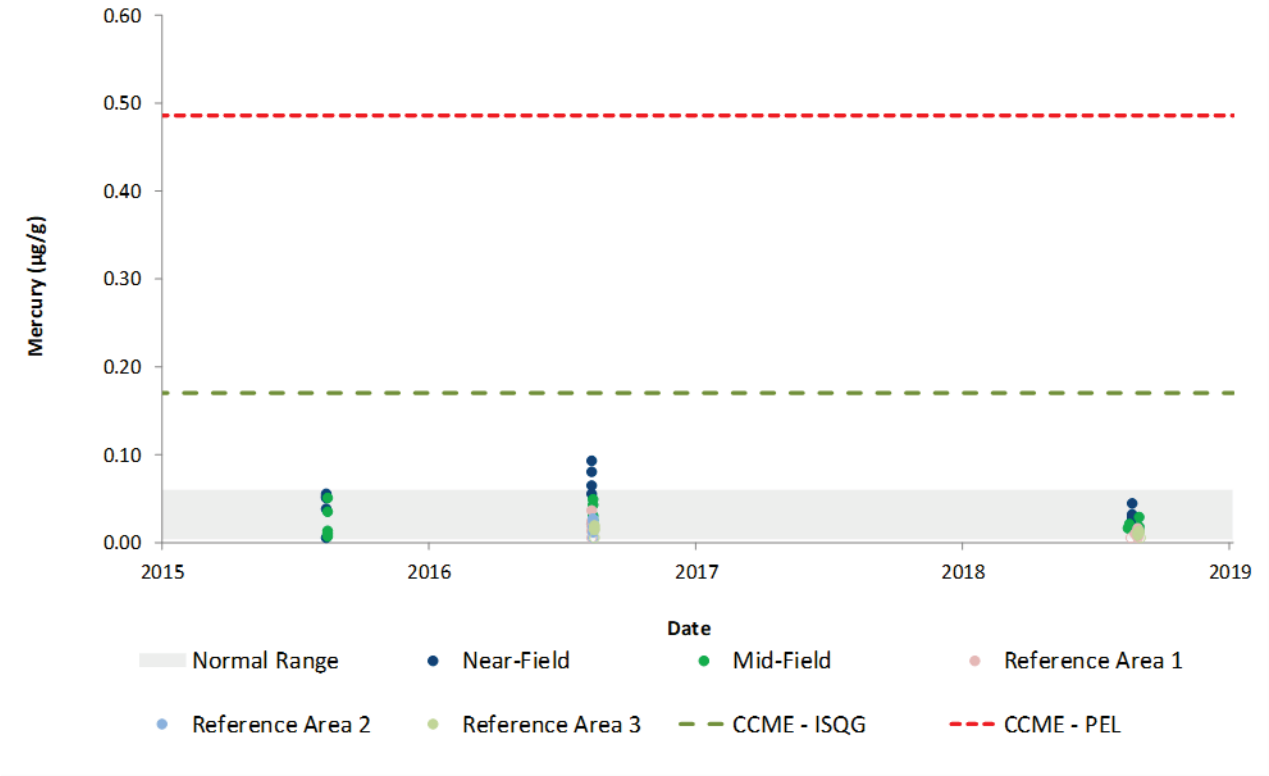
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-16: Concentrations of Magnesium in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-17: Concentrations of Manganese in Meliadine Lake, 2015 to 2018



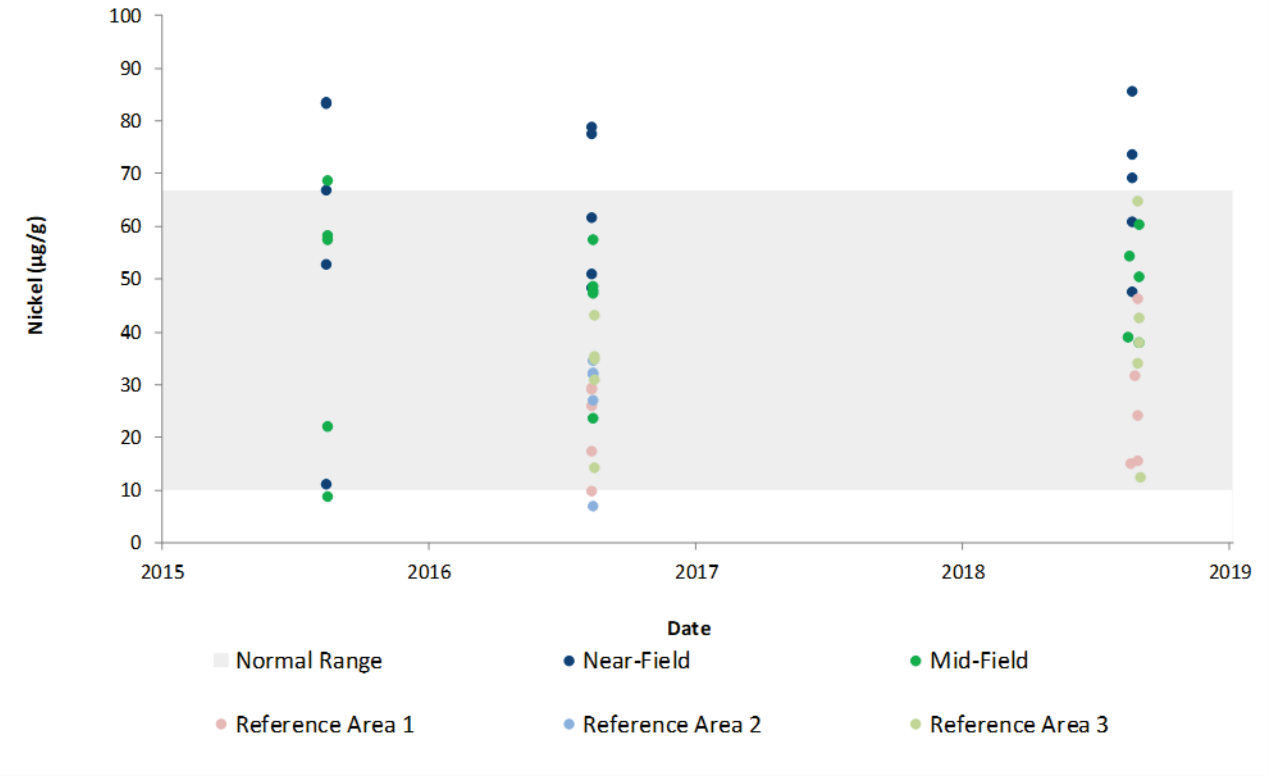
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-18: Concentrations of Mercury in Meliadine Lake, 2015 to 2018



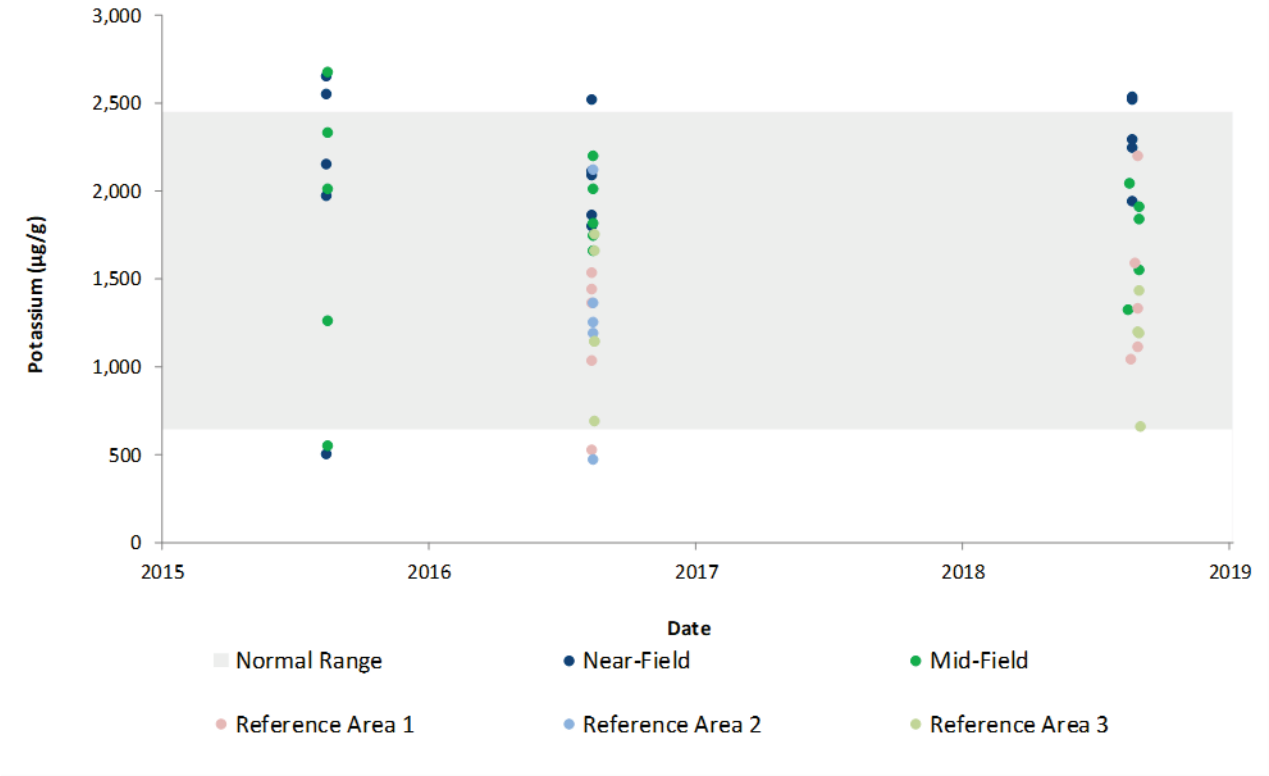
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-19: Concentrations of Molybdenum in Meliadine Lake, 2015 to 2018



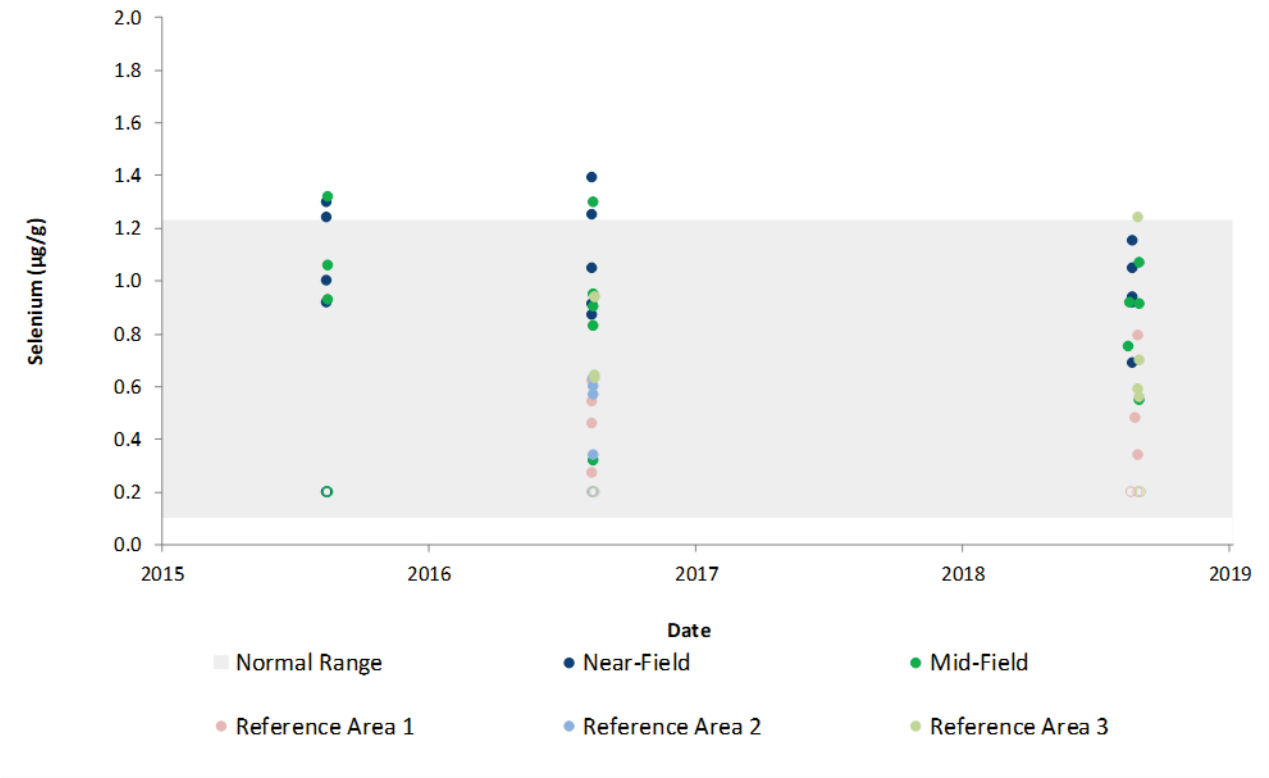
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-20: Concentrations of Nickel in Meliadine Lake, 2015 to 2018



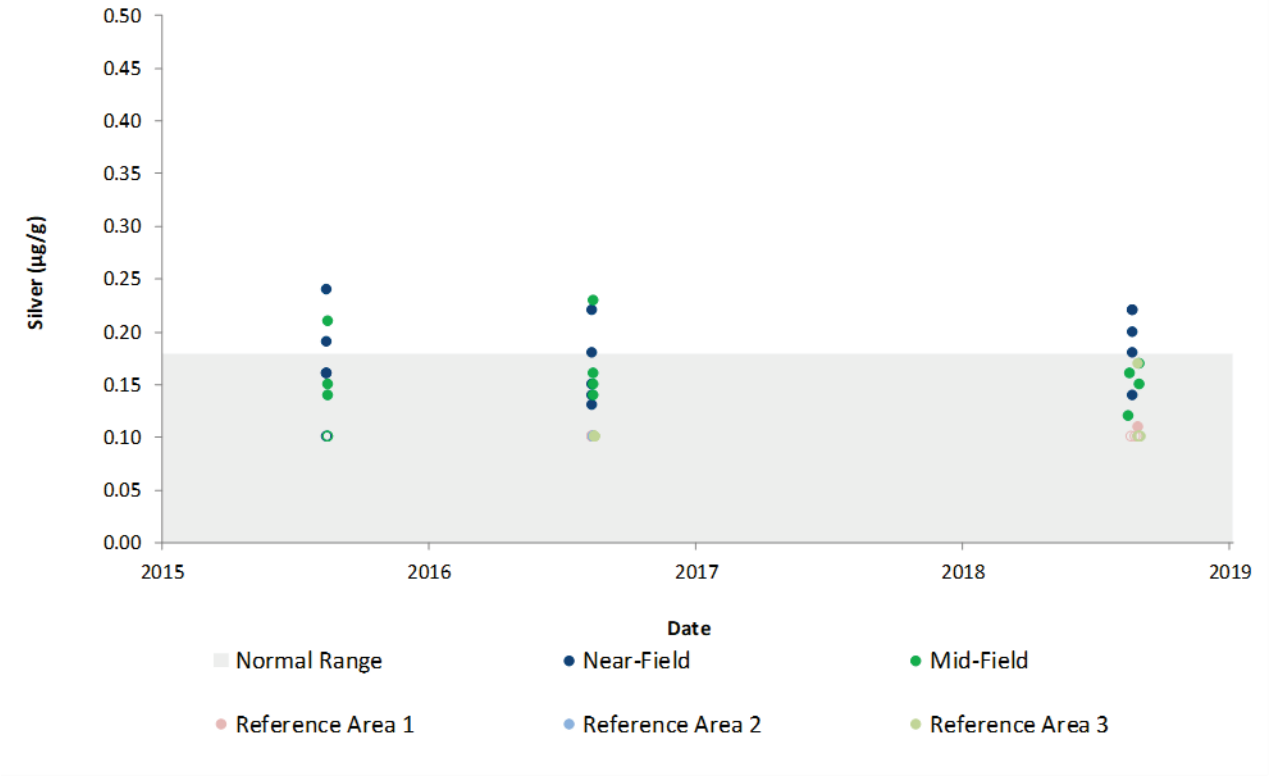
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-21: Concentrations of Potassium in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-22: Concentrations of Selenium in Meliadine Lake, 2015 to 2018



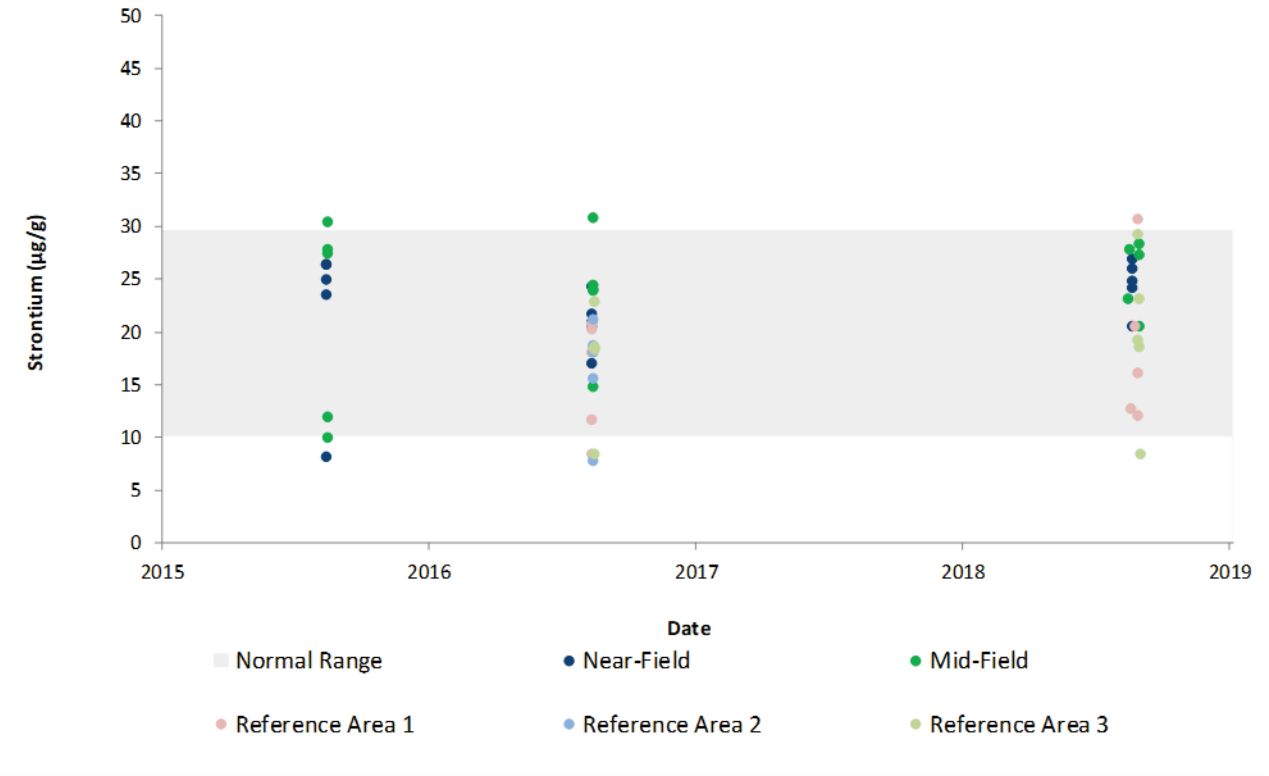
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-23: Concentrations of Silver in Meliadine Lake, 2015 to 2018



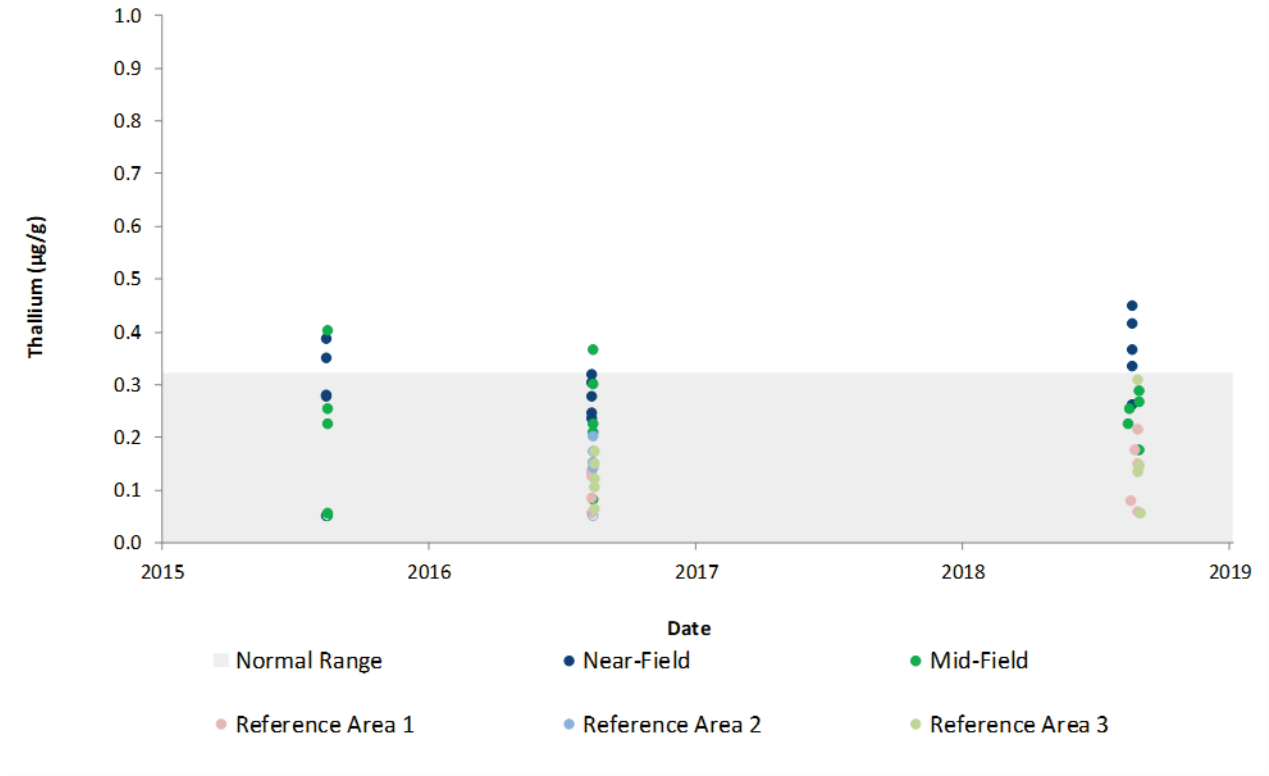
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-24: Concentrations of Sodium in Meliadine Lake, 2015 to 2018



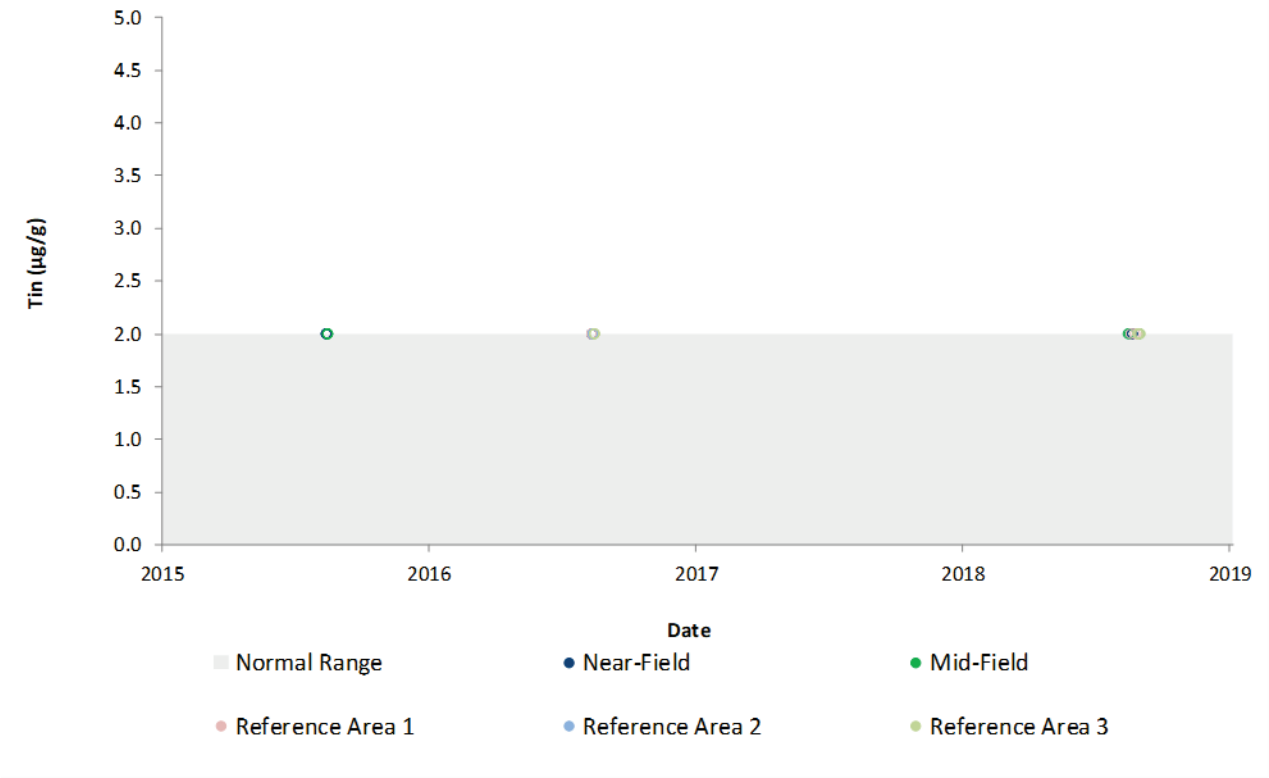
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.1-25: Concentrations of Strontium in Meliadine Lake, 2015 to 2018



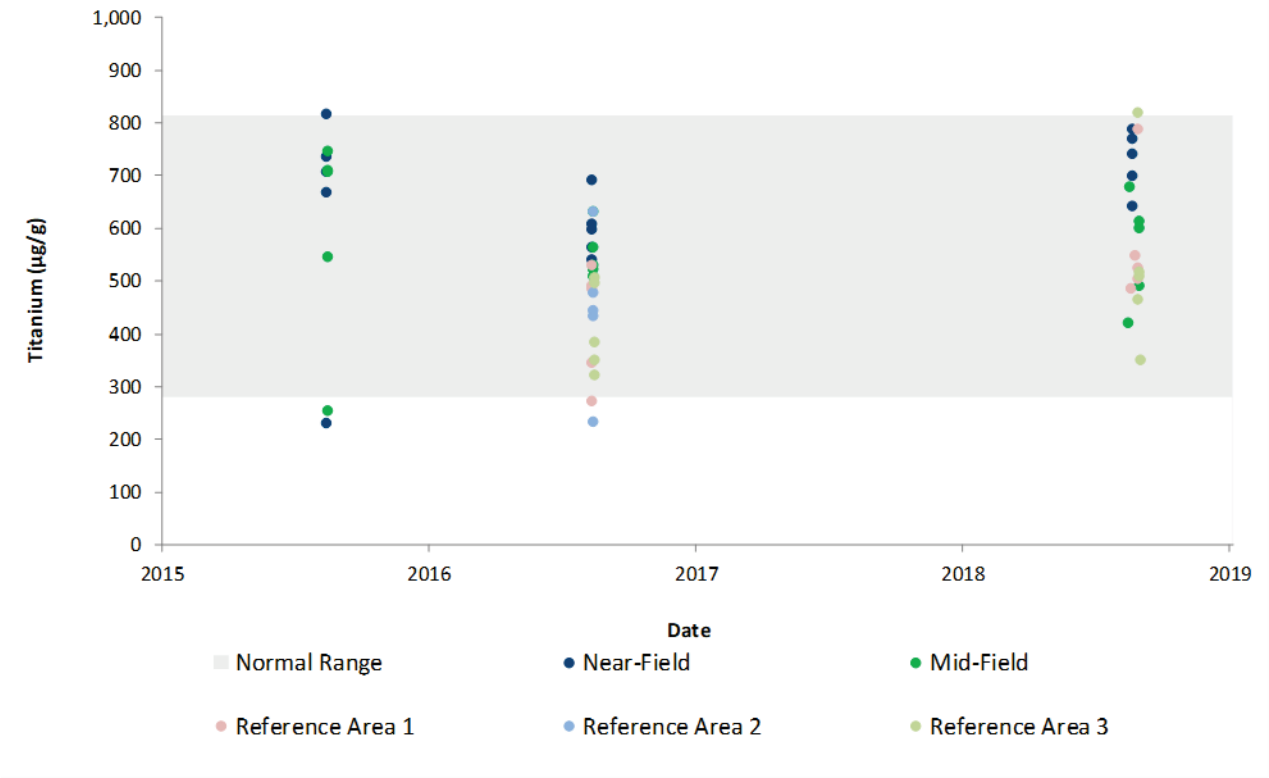
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-26: Concentrations of Thallium in Meliadine Lake, 2015 to 2018



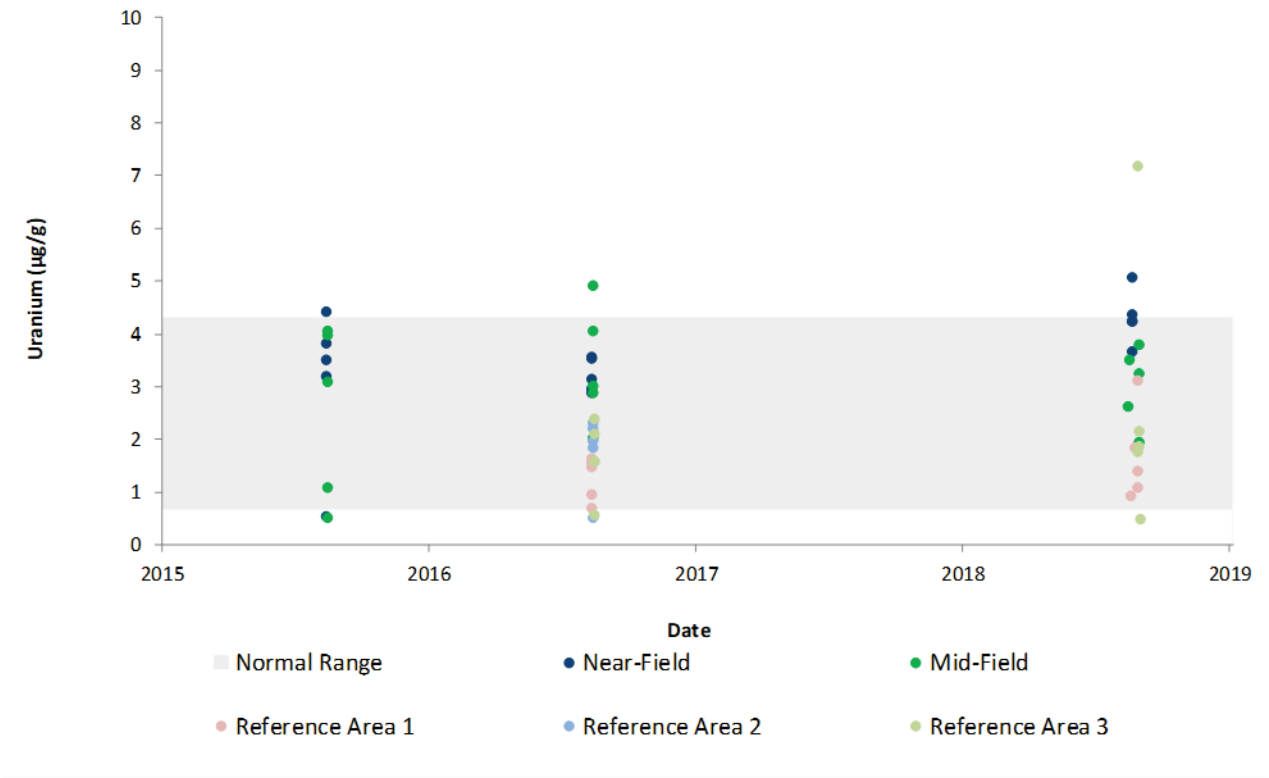
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-27: Concentrations of Tin in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-28: Concentrations of Titanium in Meliadine Lake, 2015 to 2018



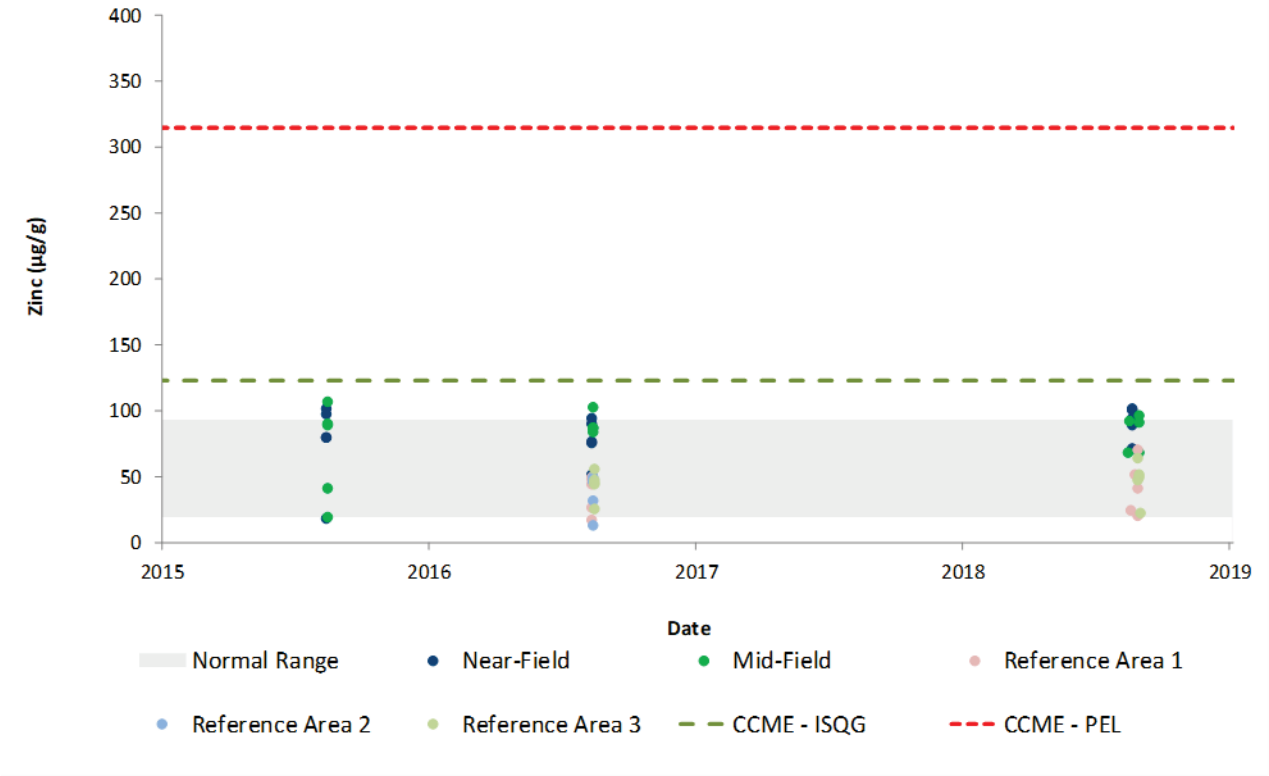
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-29: Concentrations of Uranium in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8C.2-30: Concentrations of Vanadium in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; Open symbols represent results that are less than the detection limit.

Figure 8C.2-31: Concentrations of Zinc in Meliadine Lake, 2015 to 2018

APPENDIX 8D

Box-and-Whisker Plots Comparing Areas

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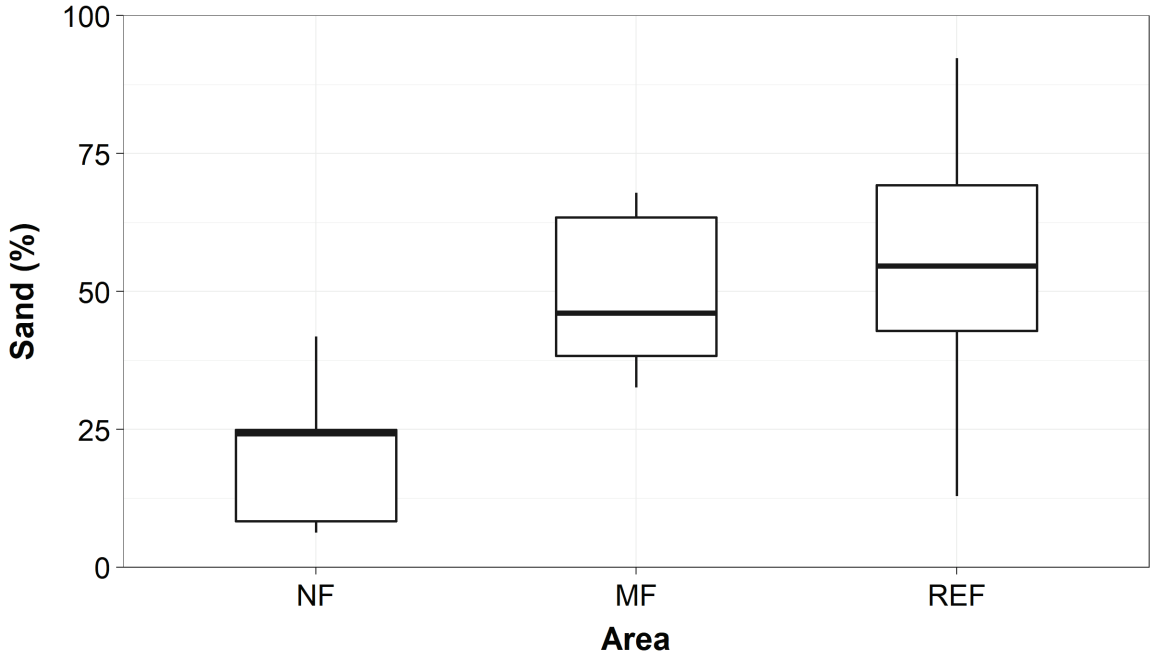
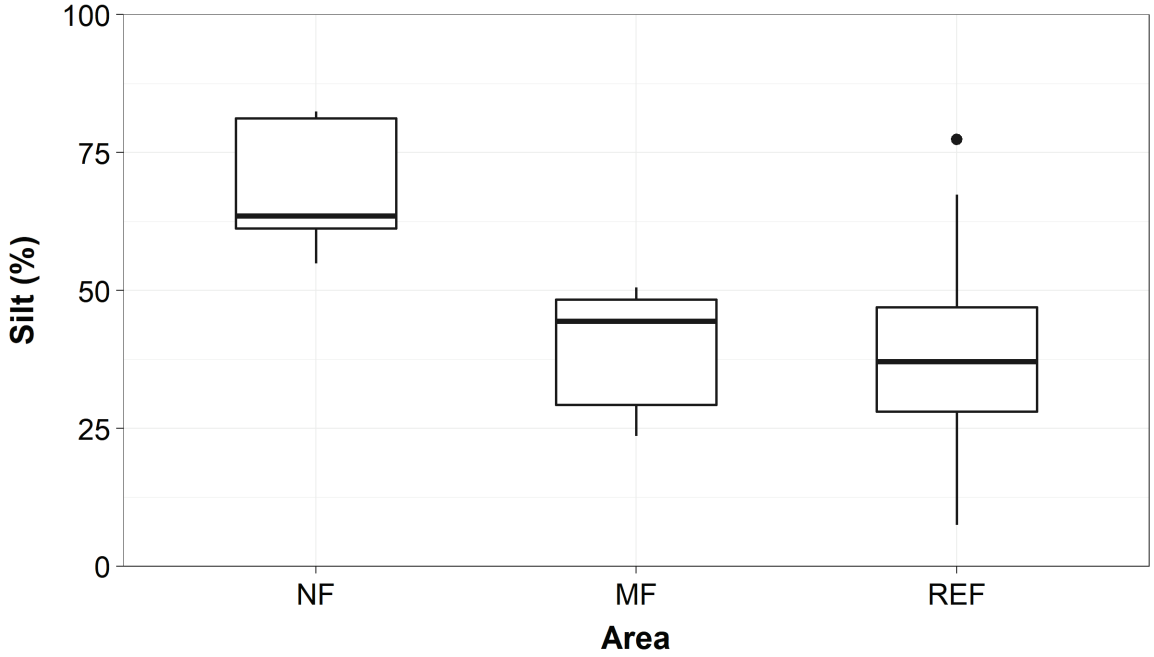
Figure 8D.2-31: Box-and-whisker Plots of Zinc Concentrations in Meliadine Lake, 2018 34

1.0 PARTICLE-SIZE AND ORGANIC CARBON



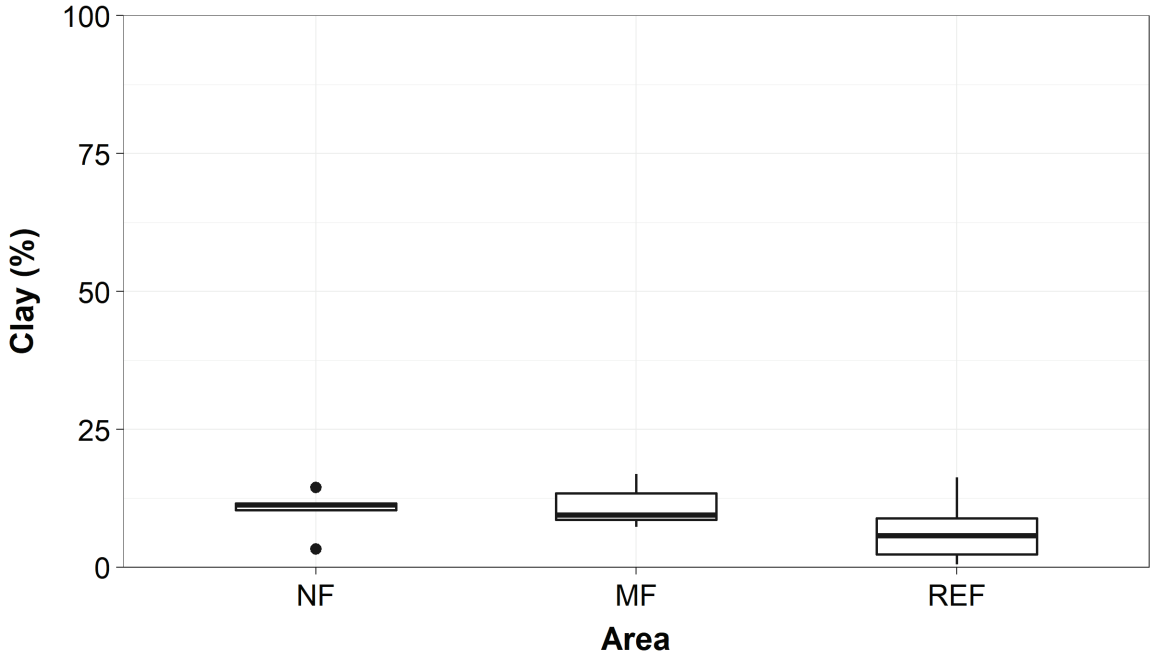
NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.1-1: Box-and-whisker Plots of Sand (%) in Meliadine Lake, 2018



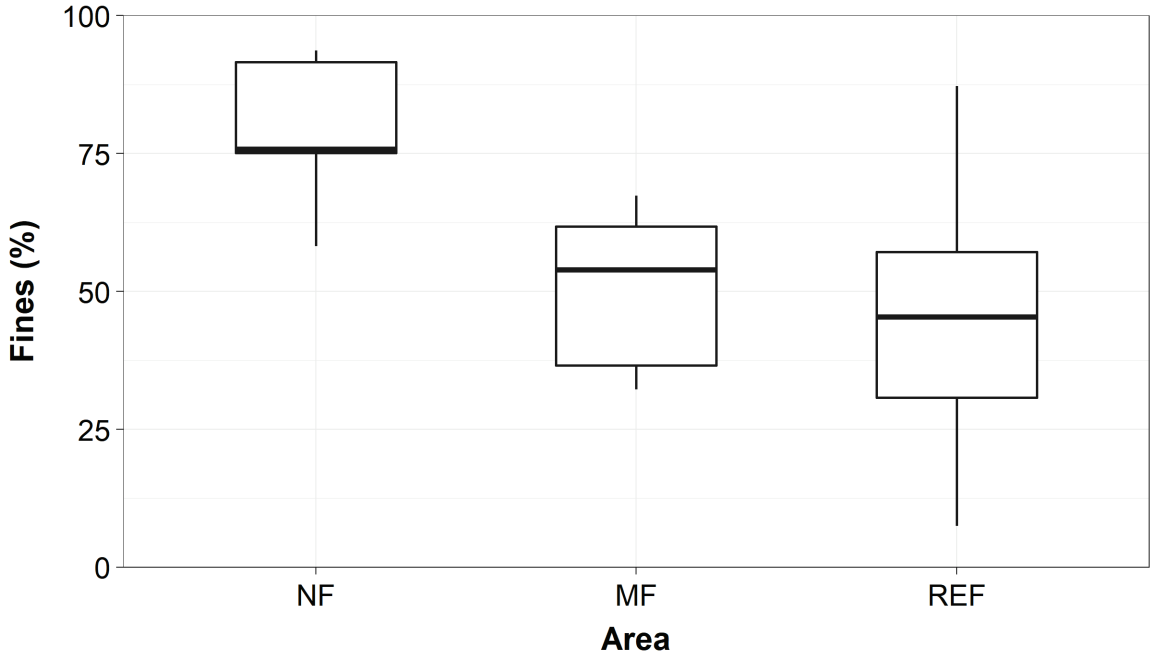
NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.1-2: Box-and-whisker Plots of Silt (%) in Meliadine Lake, 2018



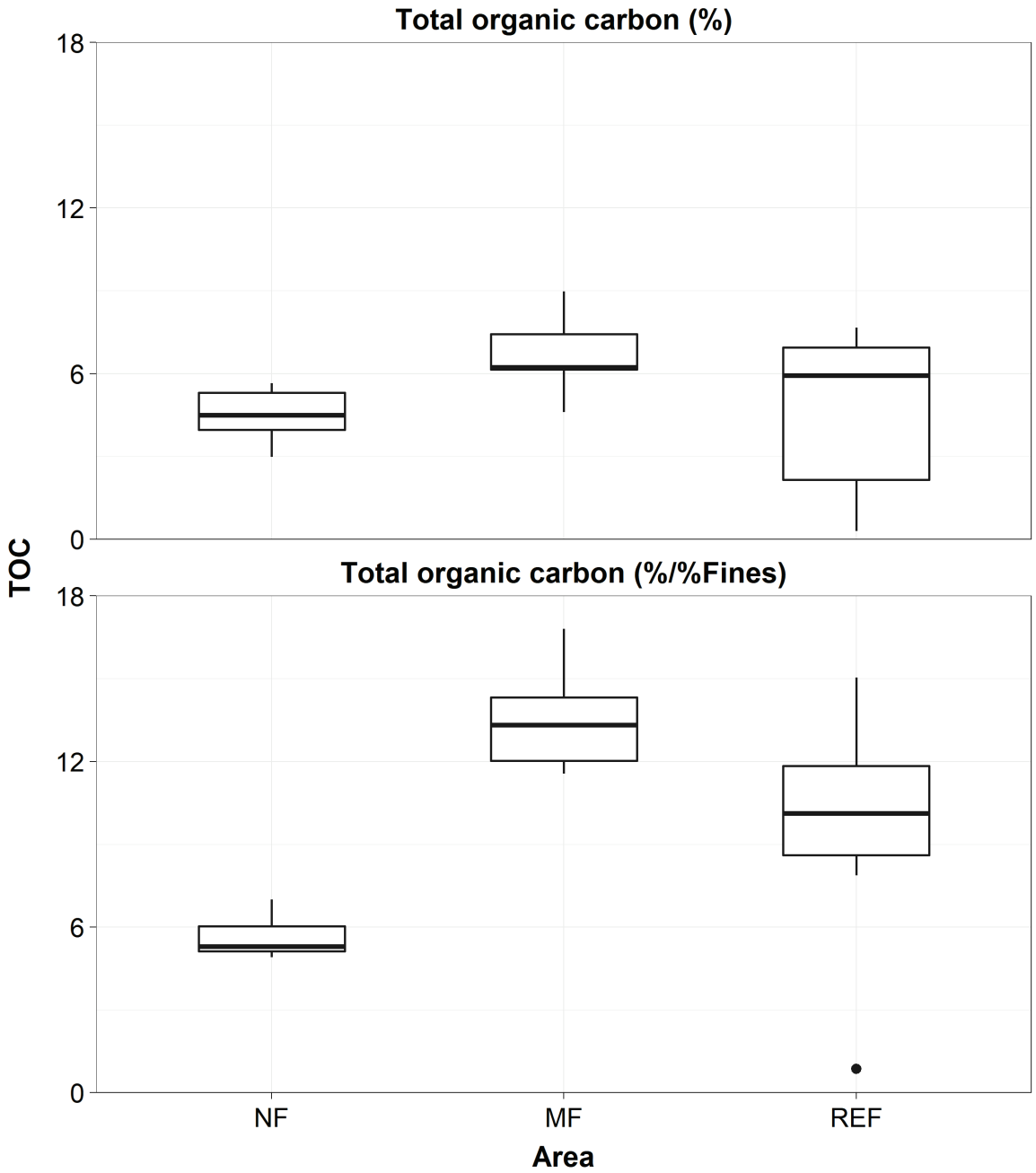
NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.1-3: Box-and-whisker Plots of Clay (%) in Meliadine Lake, 2018



NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

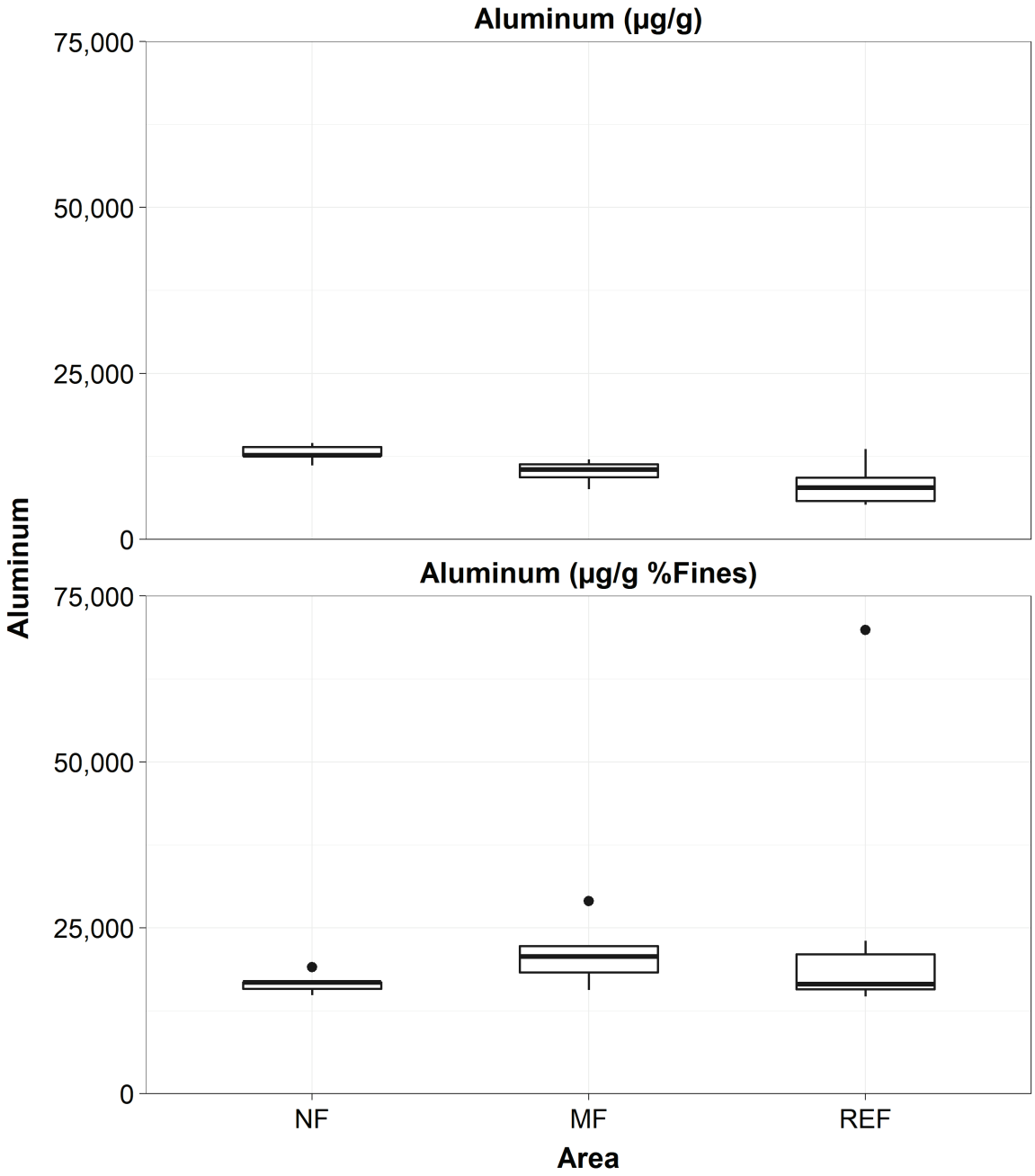
Figure 8D.1-4: Box-and-whisker Plots of Fines (Silt + Clay %) in Meliadine Lake, 2018



Note: top: non-normalized data; bottom: data normalized to % fines.
NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

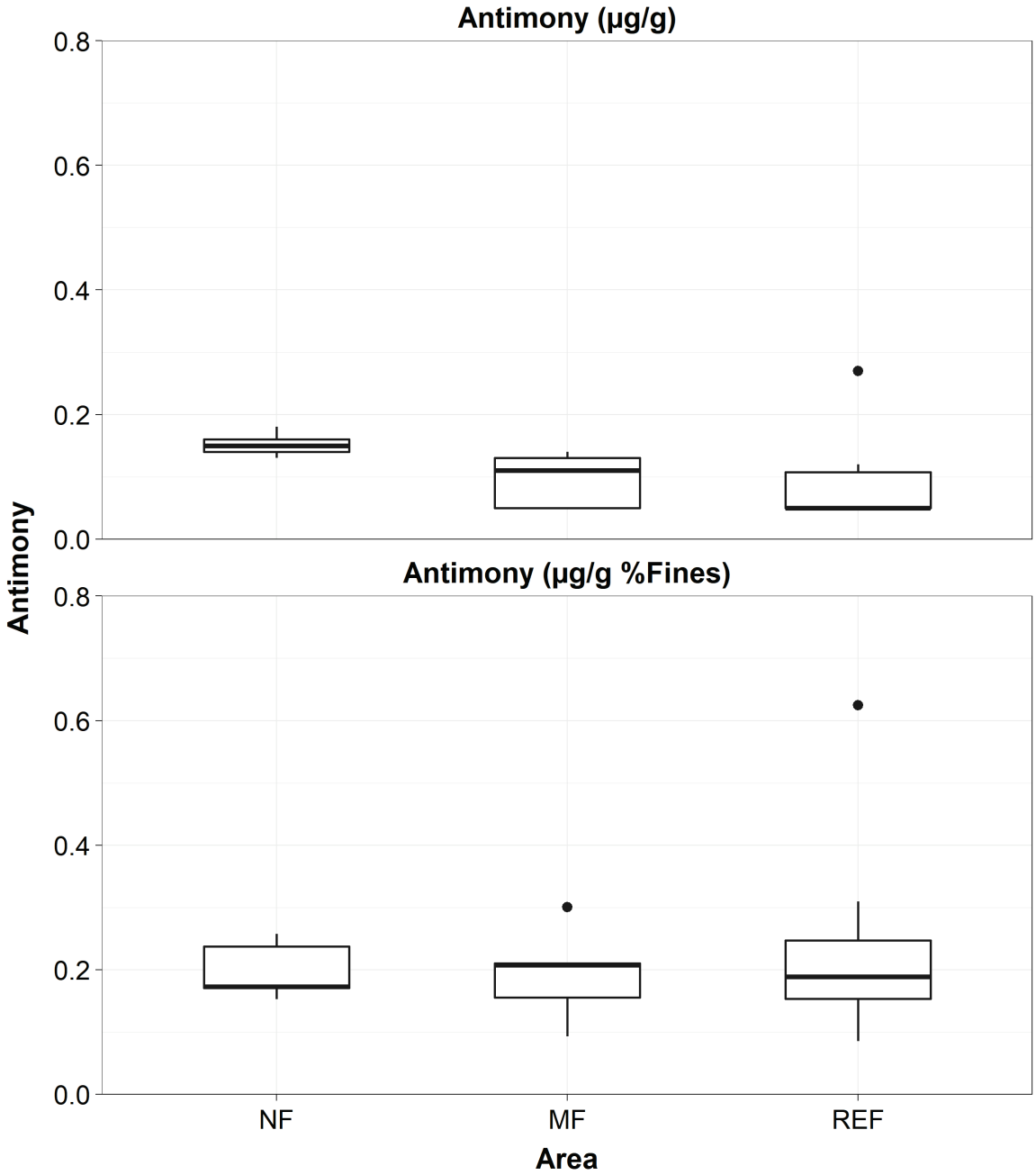
Figure 8D.1-5: Box-and-whisker Plots of Total Organic Carbon Concentrations in Meliadine Lake, 2018

2.0 METALS



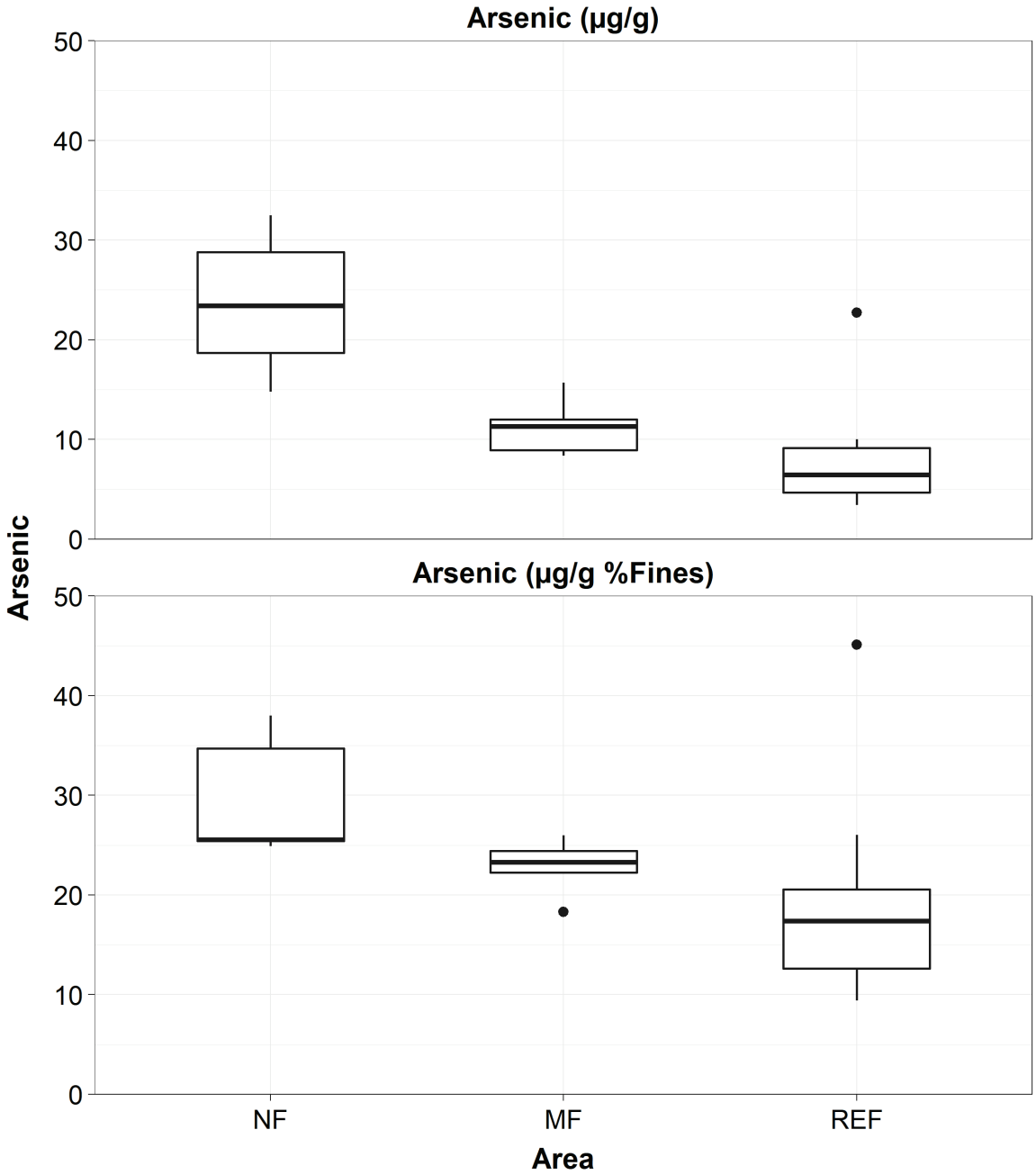
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-1: Box-and-whisker Plots of Aluminum Concentrations in Meliadine Lake, 2018



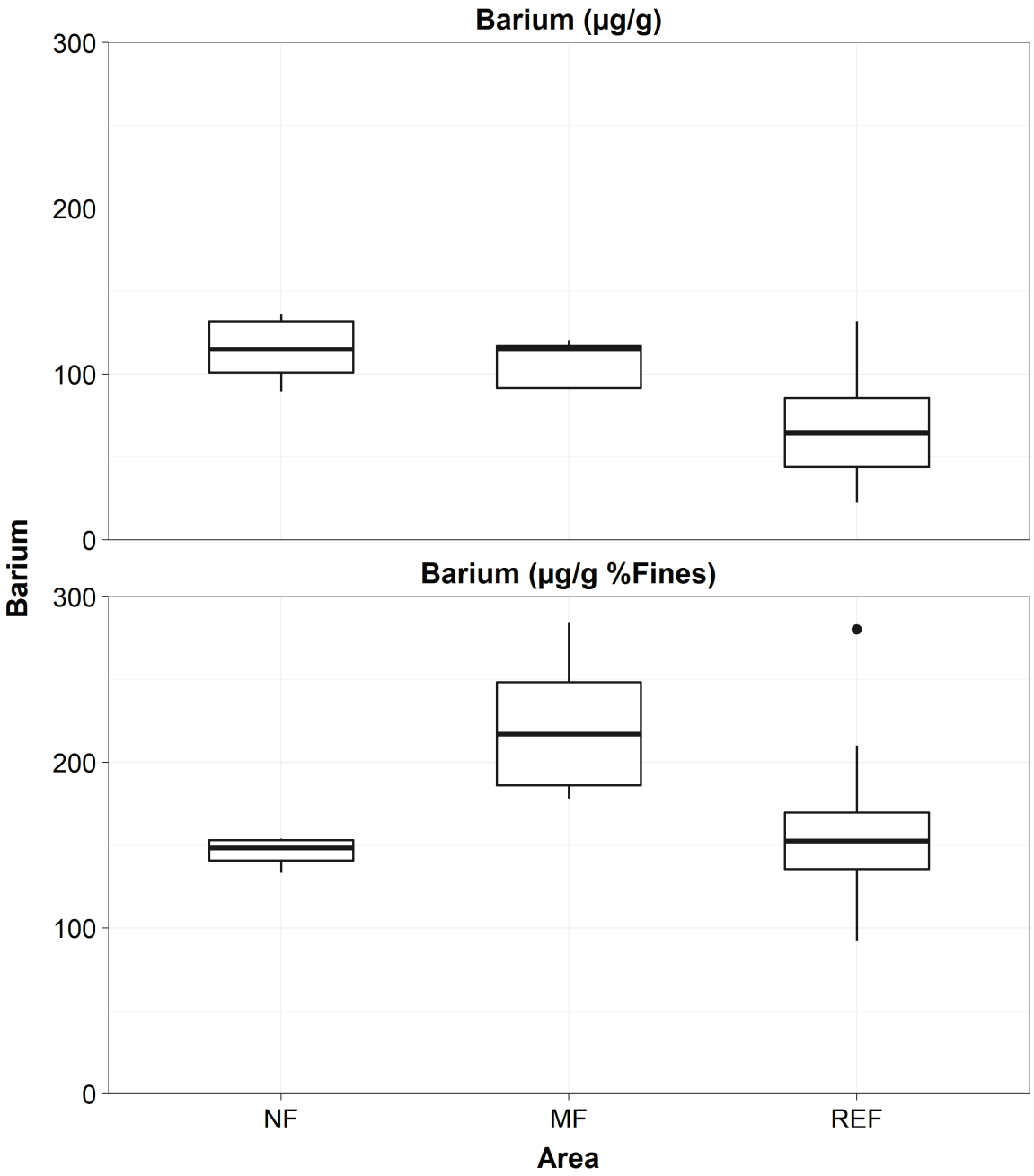
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-2: Box-and-whisker Plots of Antimony Concentrations in Meliadine Lake, 2018



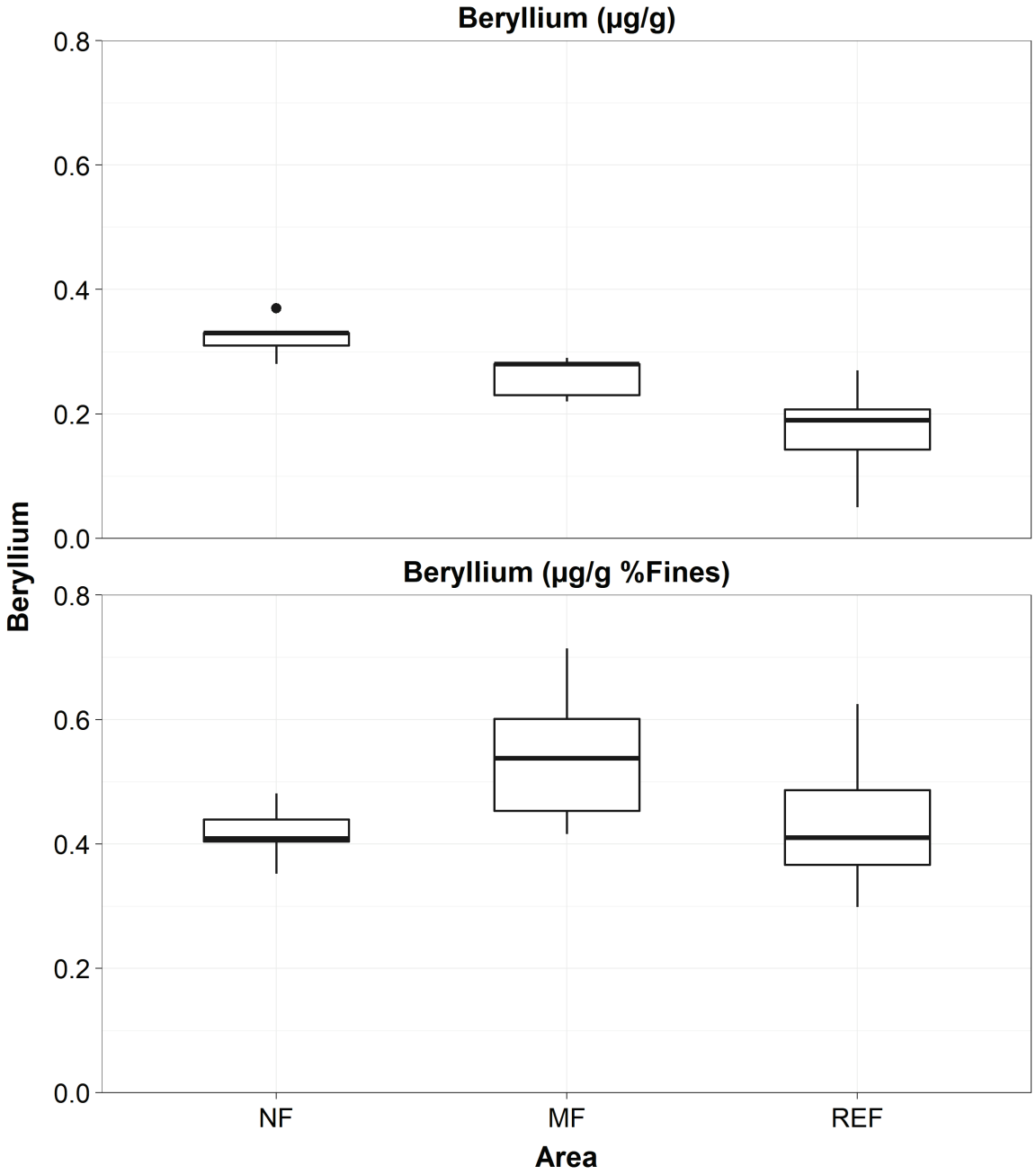
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-3: Box-and-whisker Plots of Arsenic Concentrations in Meliadine Lake, 2018



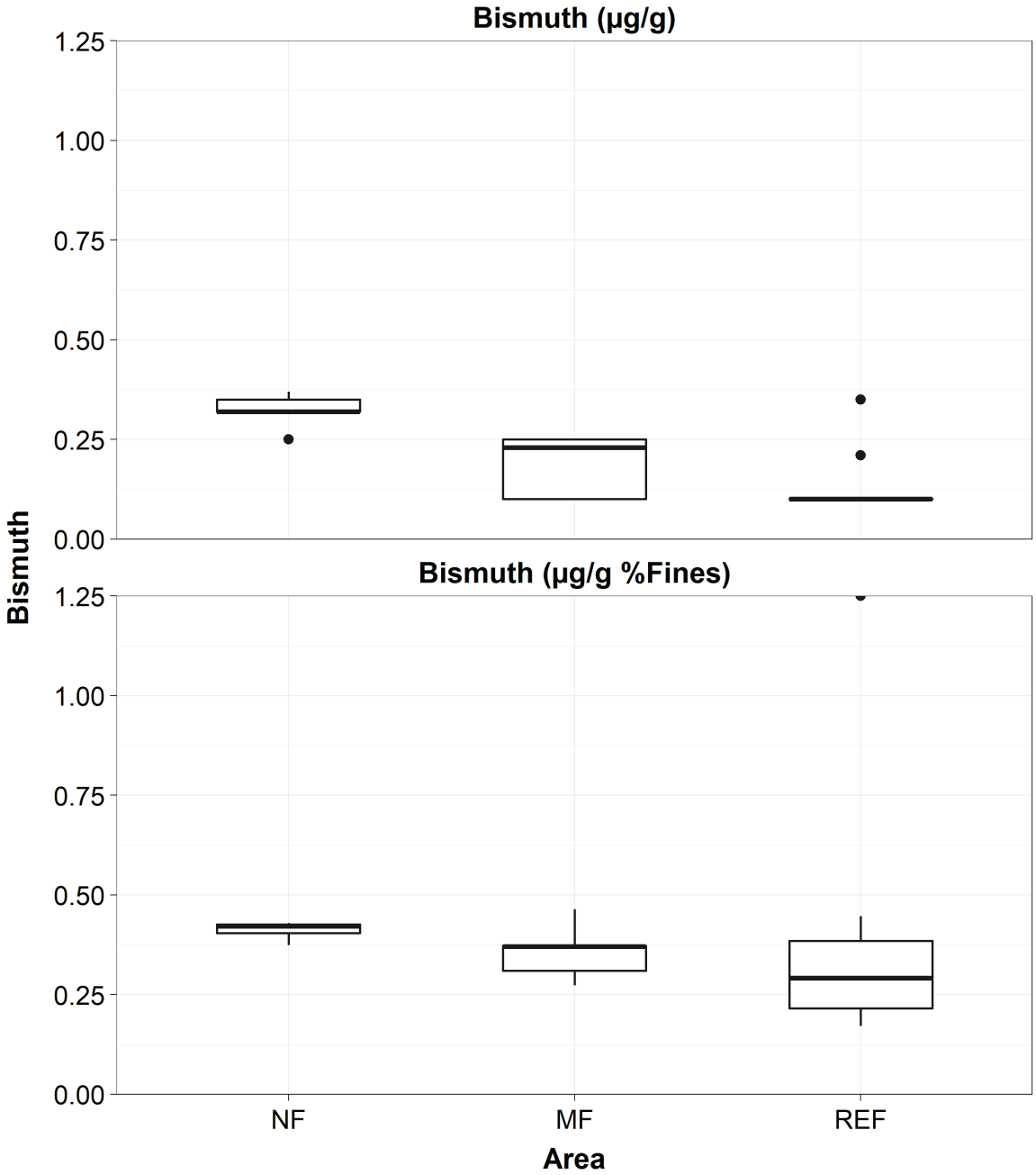
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-4: Box-and-whisker Plots of Barium Concentrations in Meliadine Lake, 2018



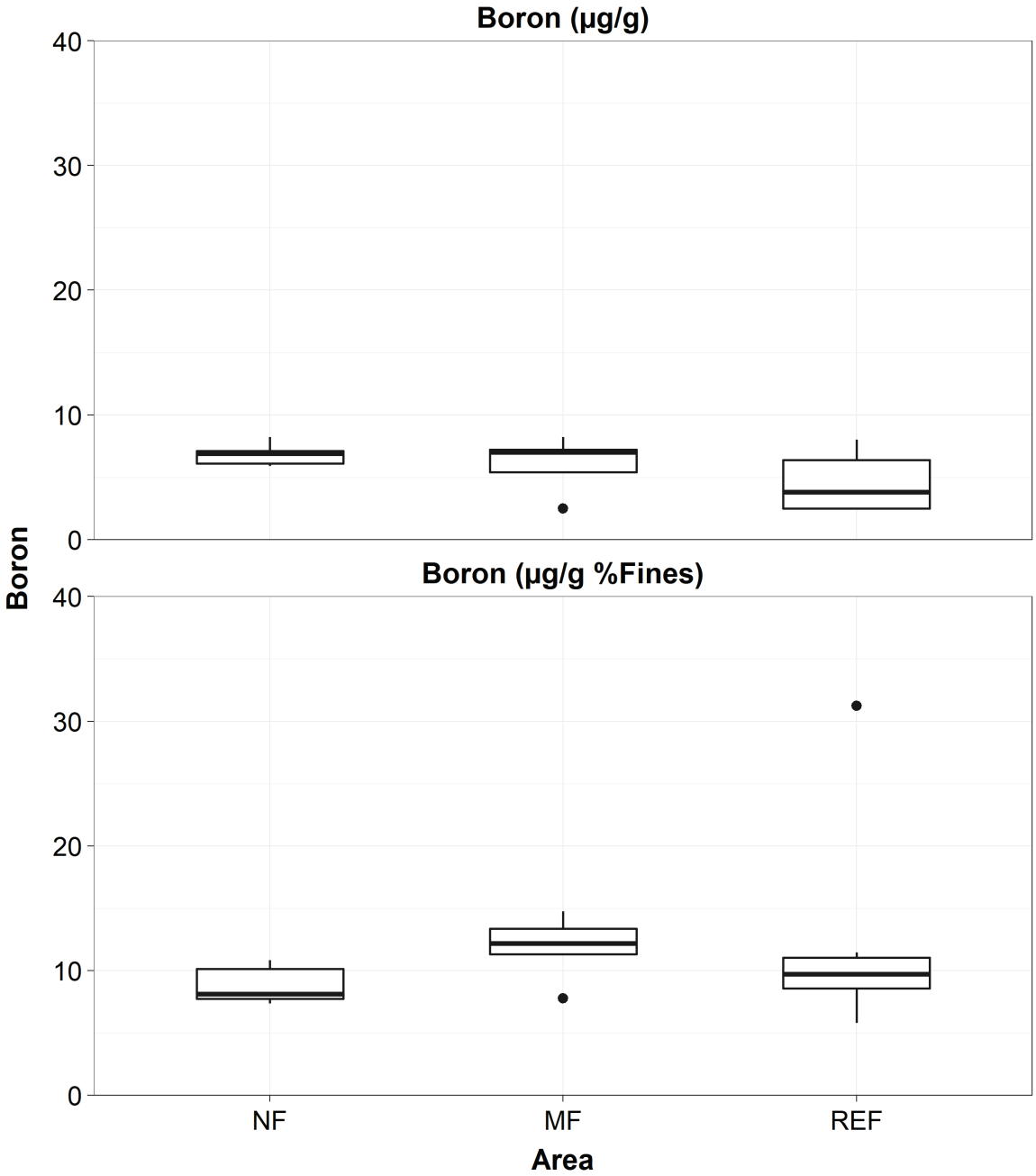
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-5: Box-and-whisker Plots of Beryllium Concentrations in Meliadine Lake, 2018



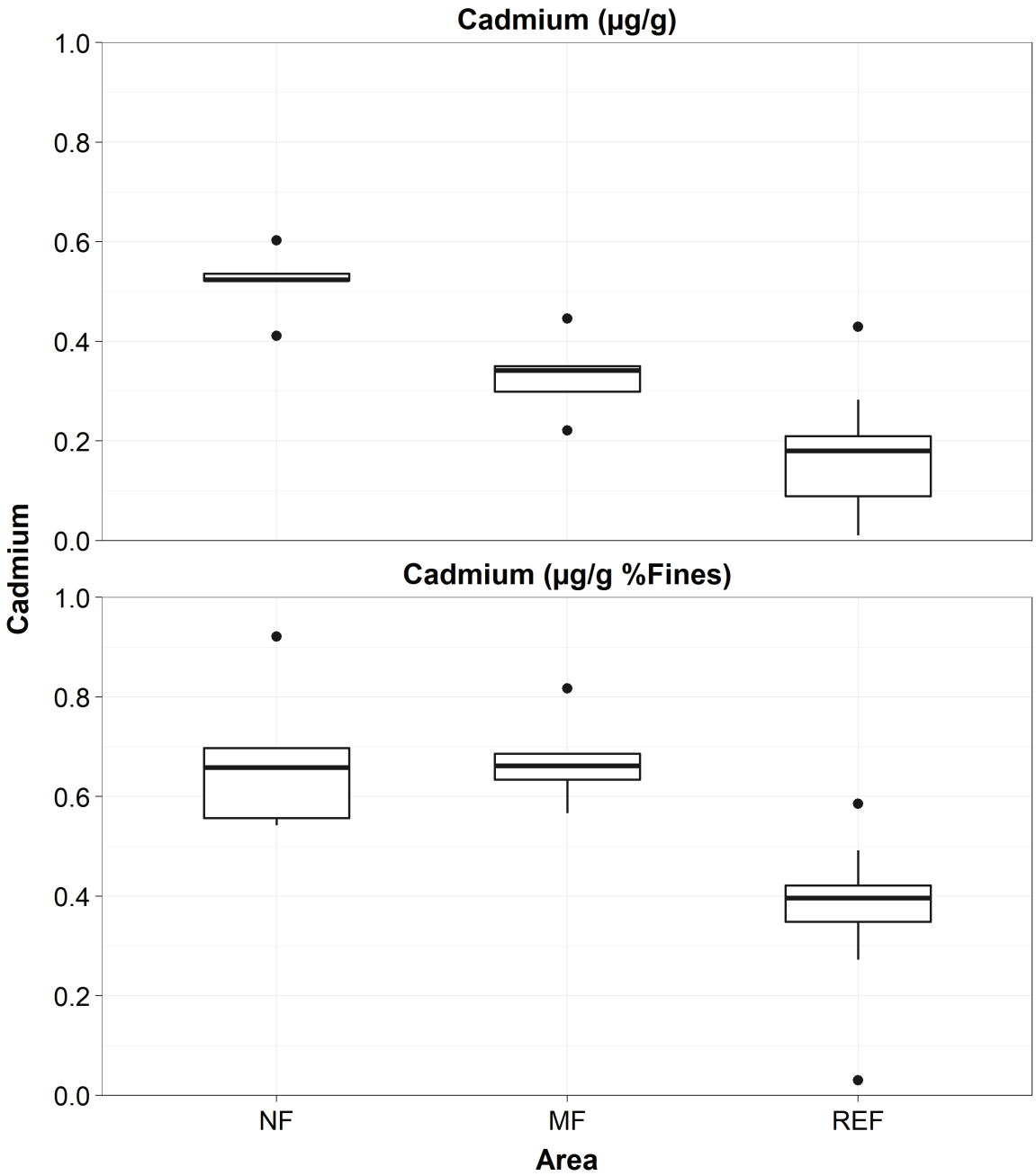
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-6: Box-and-whisker Plots of Bismuth Concentrations in Meliadine Lake, 2018



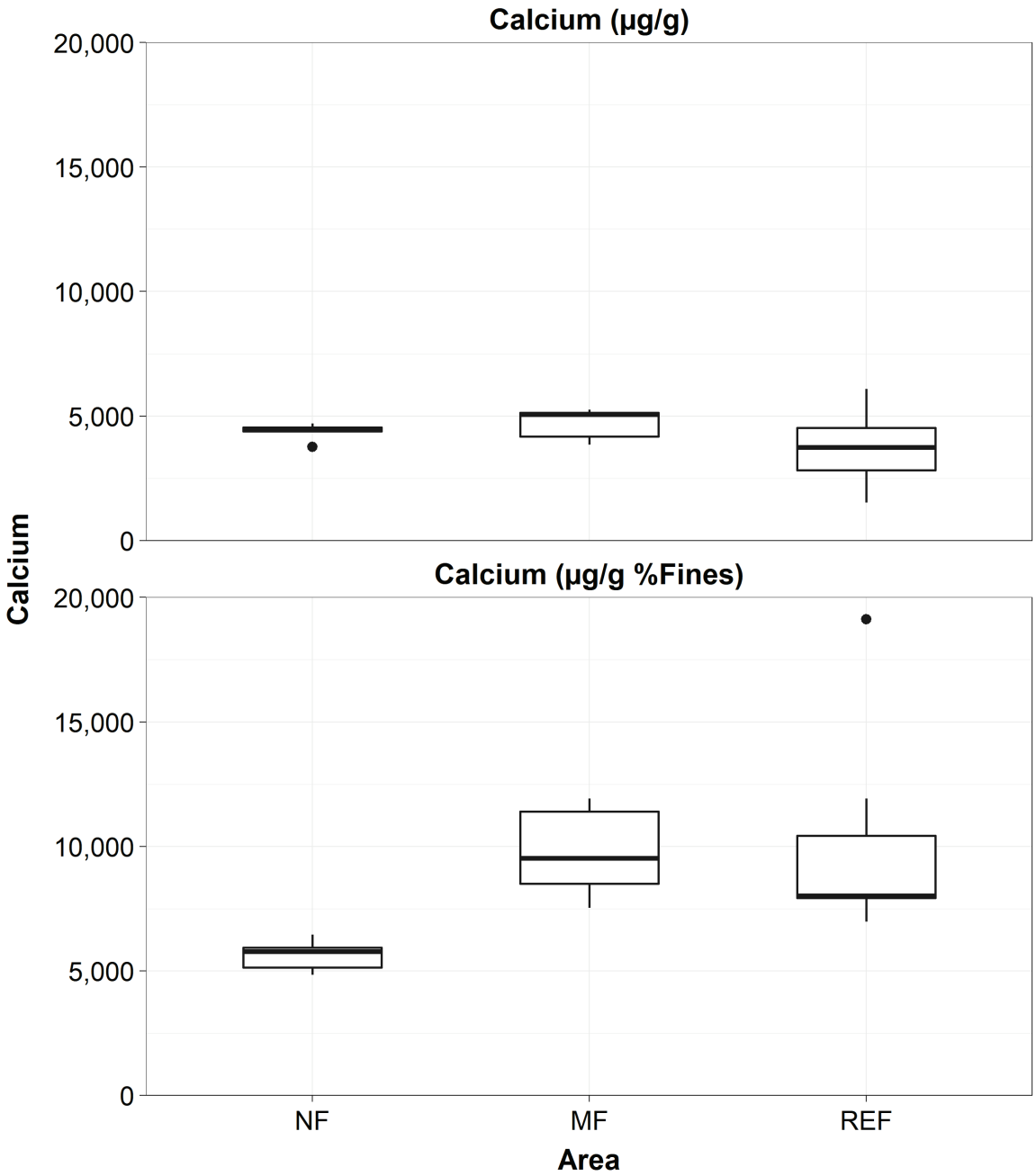
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-7: Box-and-whisker Plots of Boron Concentrations in Meliadine Lake, 2018



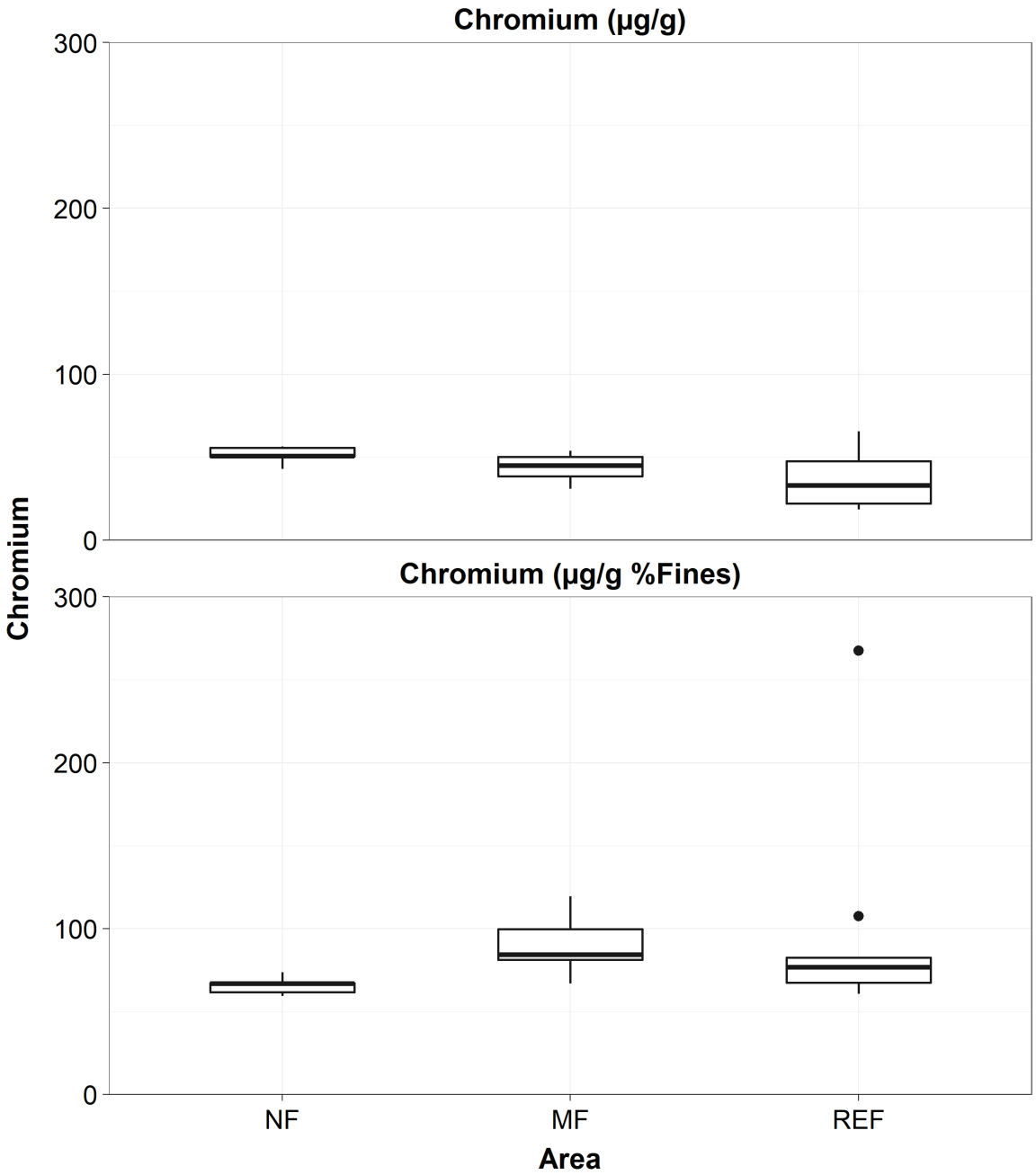
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-8: Box-and-whisker Plots of Cadmium Concentrations in Meliadine Lake, 2018



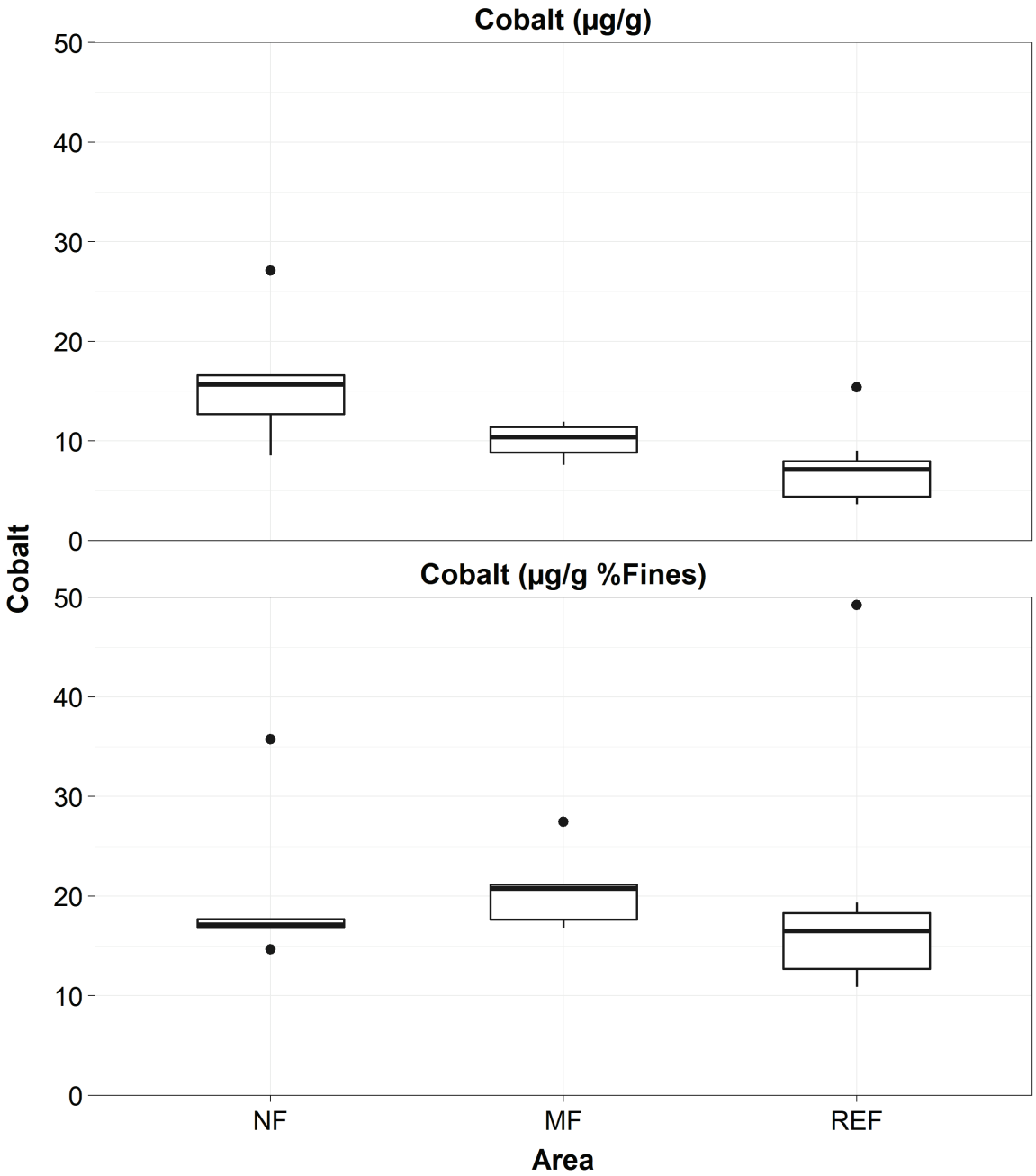
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-9: Box-and-whisker Plots of Calcium Concentrations in Meliadine Lake, 2018



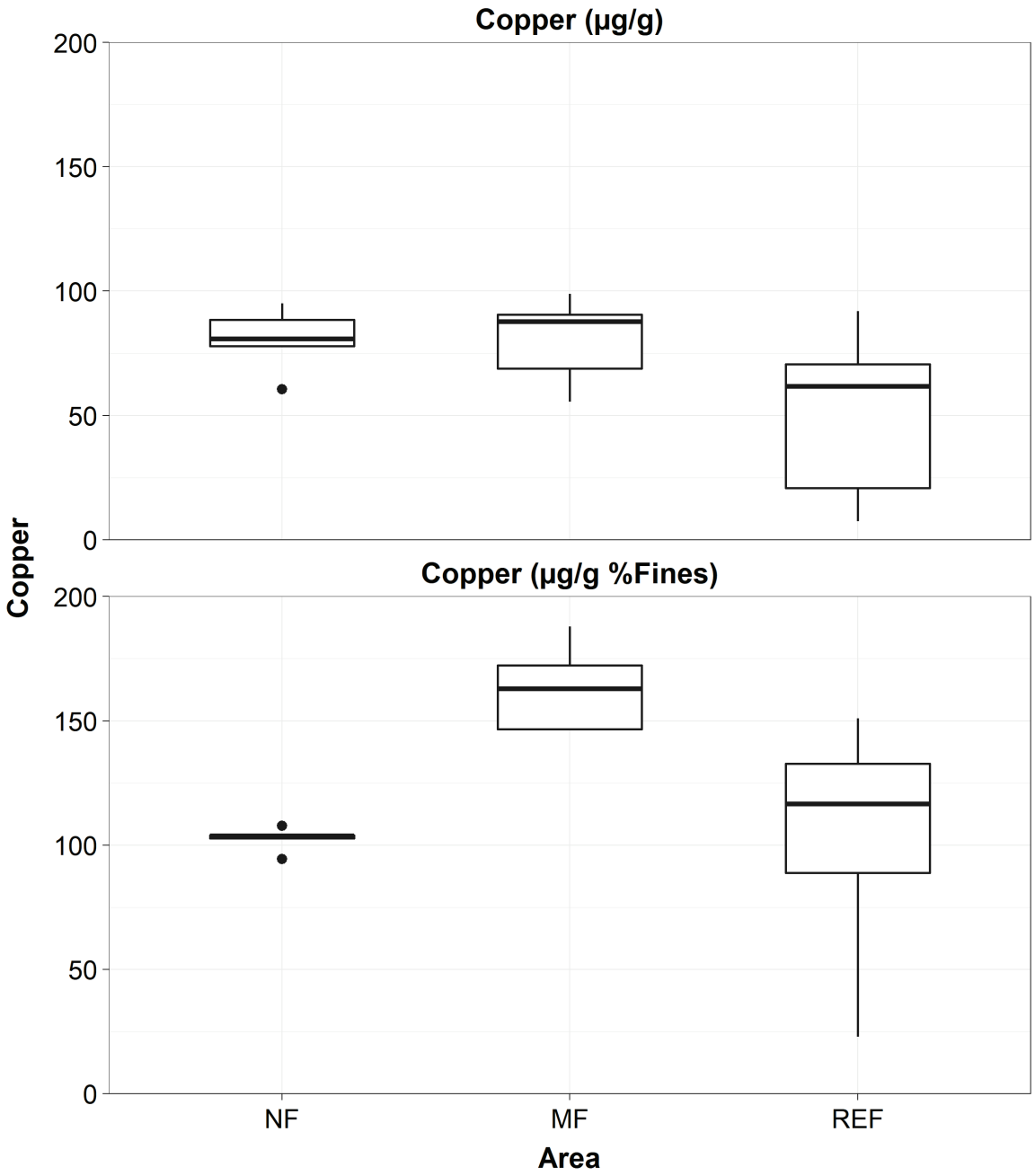
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-10: Box-and-whisker Plots of Chromium Concentrations in Meliadine Lake, 2018



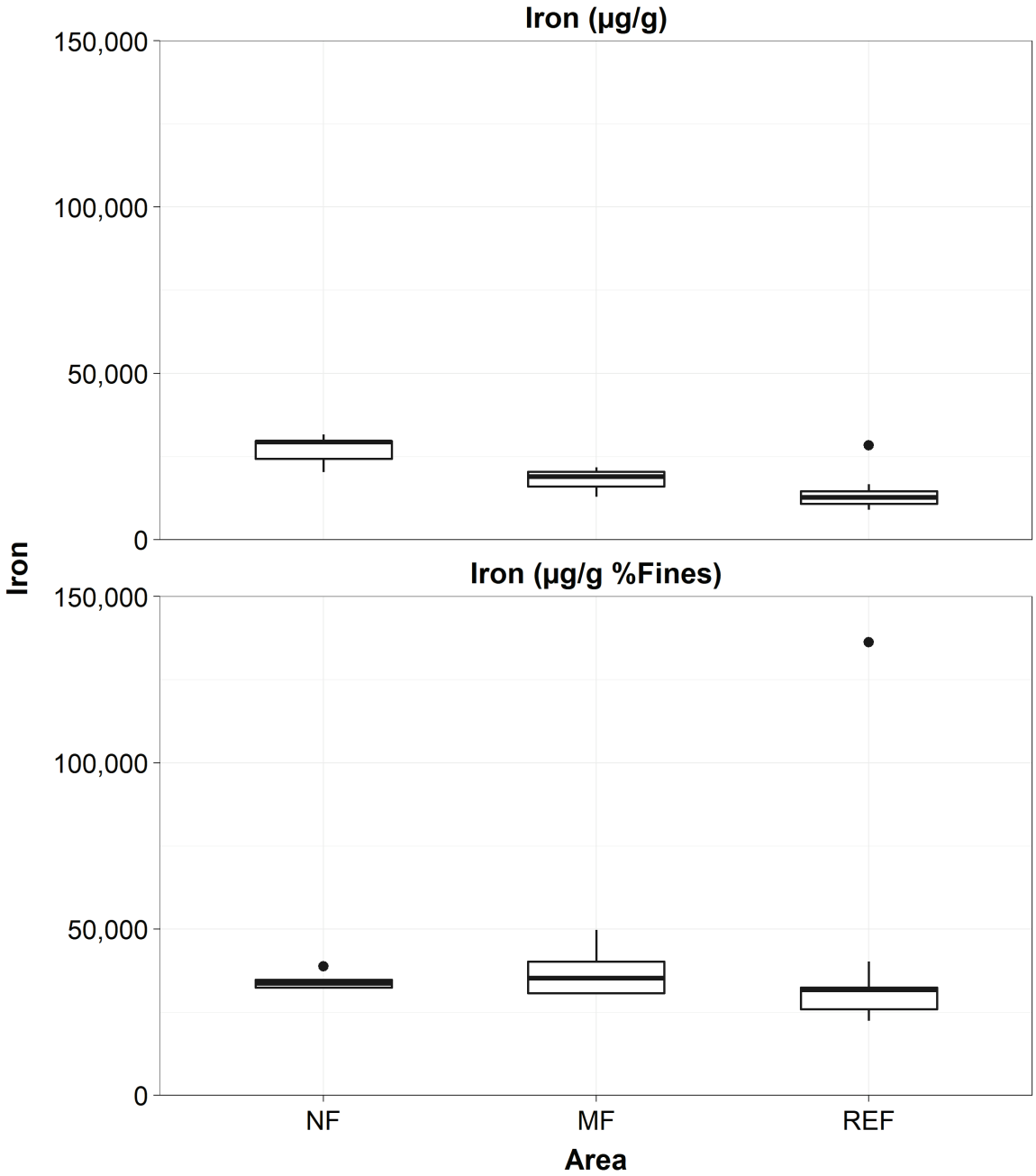
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-11: Box-and-whisker Plots of Cobalt Concentrations in Meliadine Lake, 2018



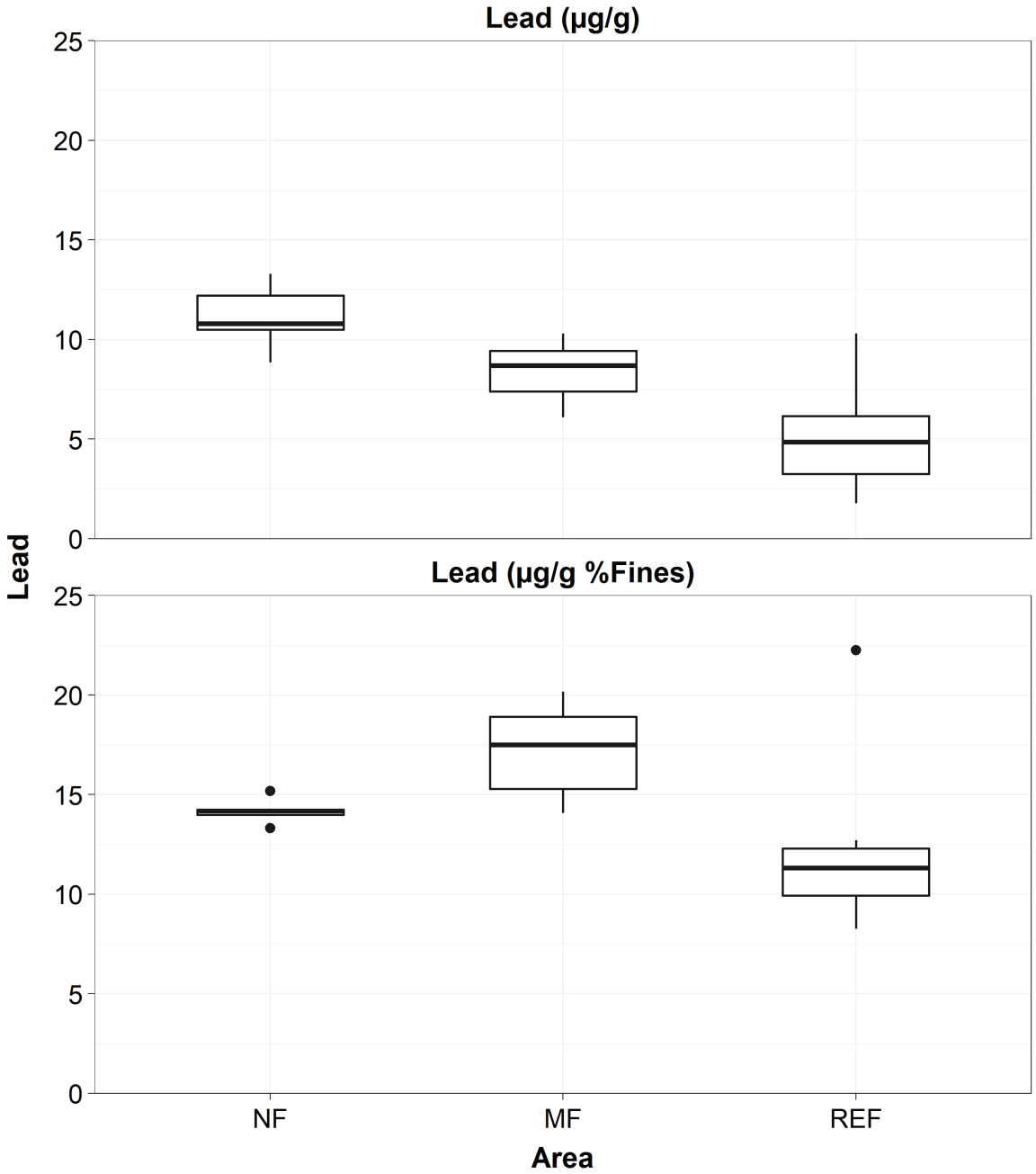
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-12: Box-and-whisker Plots of Copper Concentrations in Meliadine Lake, 2018



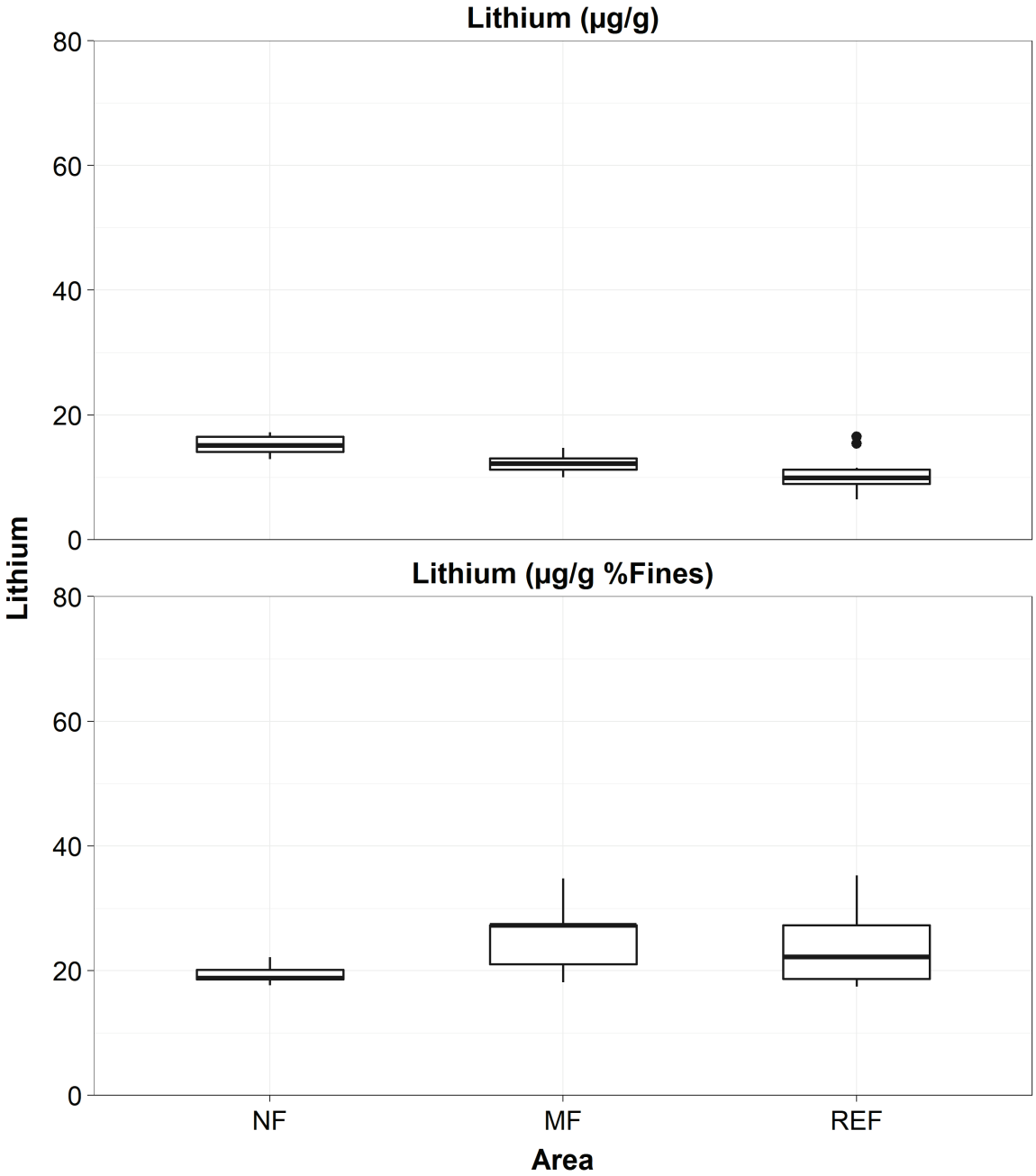
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-13: Box-and-whisker Plots of Iron Concentrations in Meliadine Lake, 2018



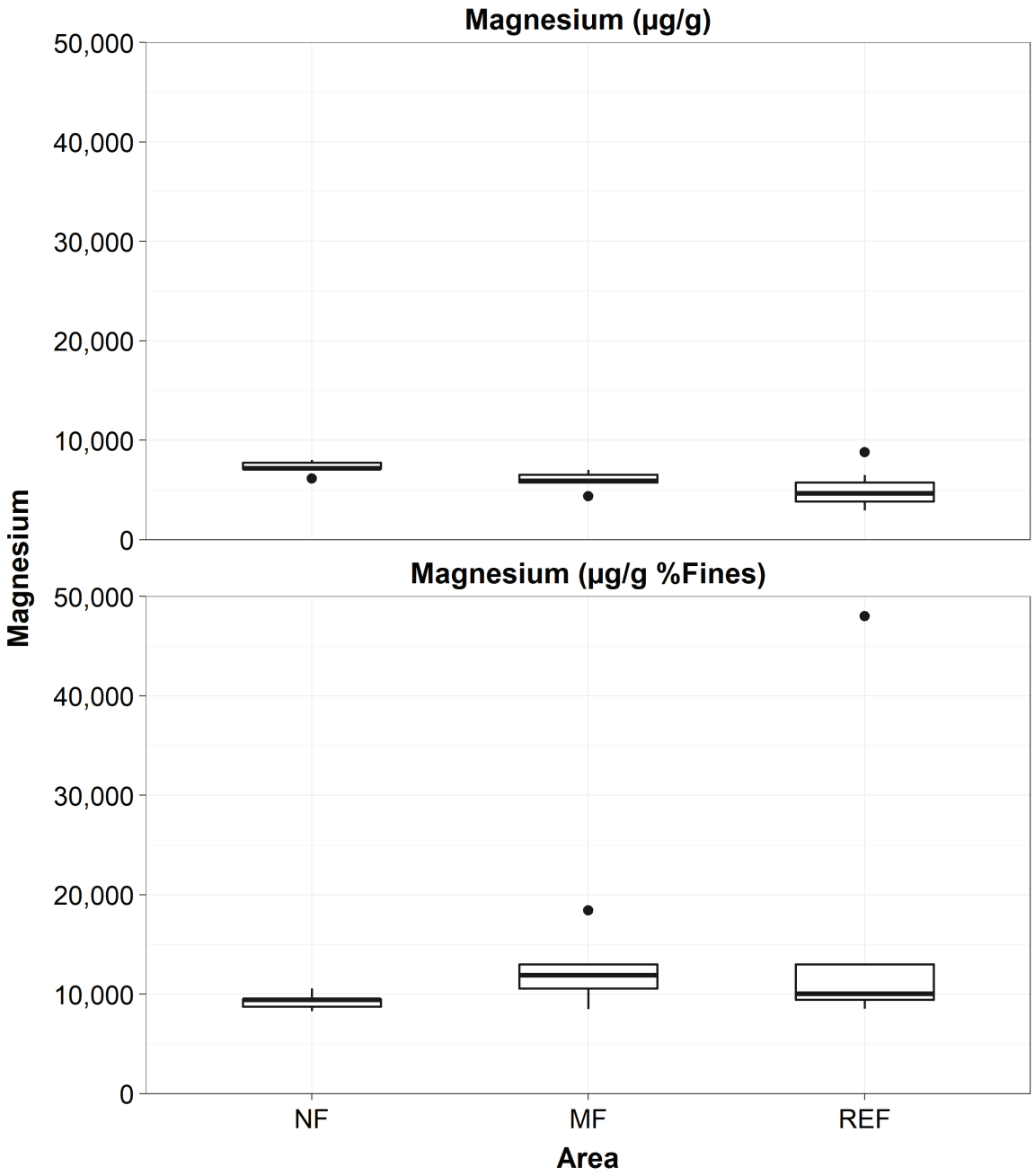
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-14: Box-and-whisker Plots of Lead Concentrations in Meliadine Lake, 2018



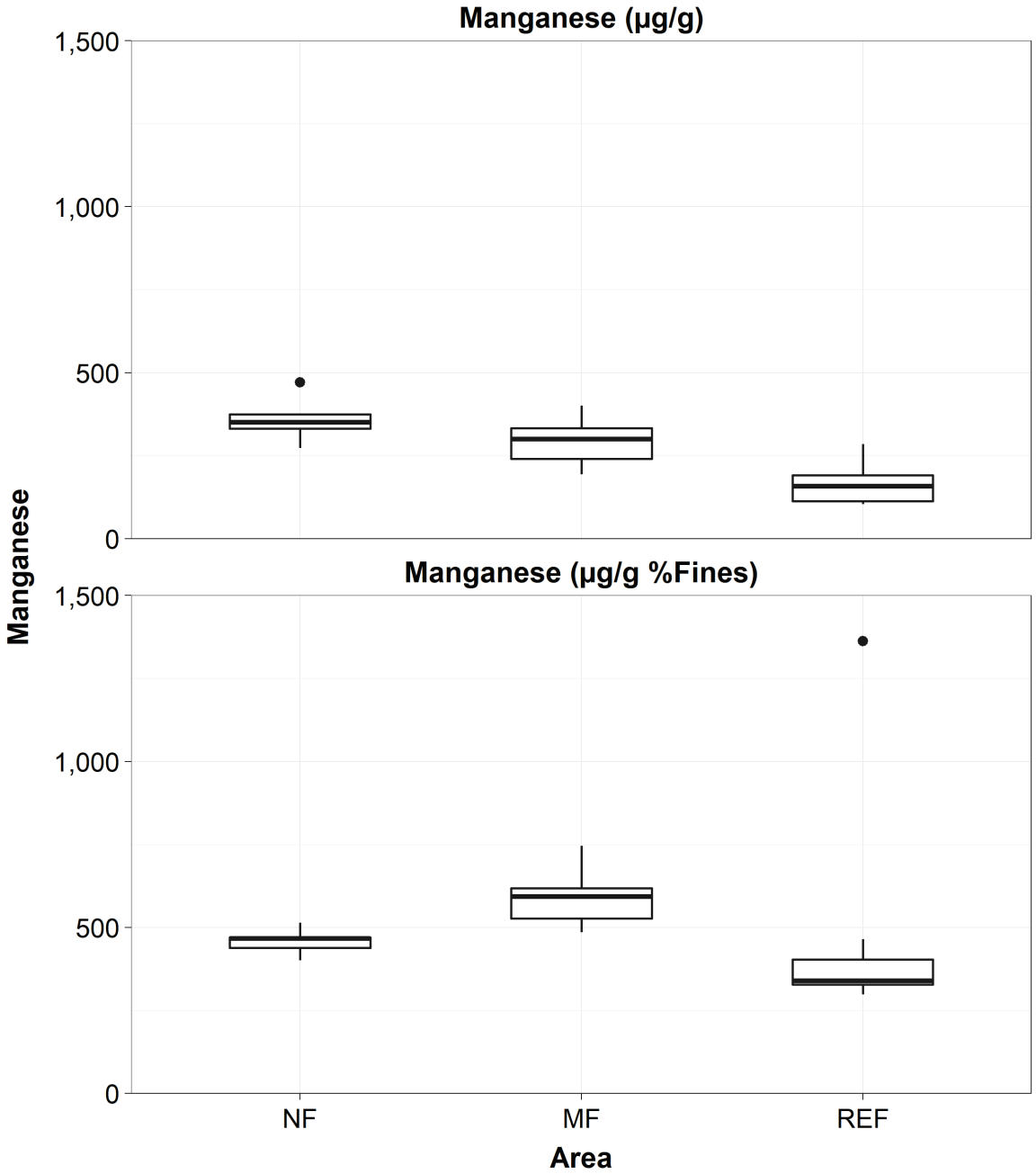
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-15: Box-and-whisker Plots of Lithium Concentrations in Meliadine Lake, 2018



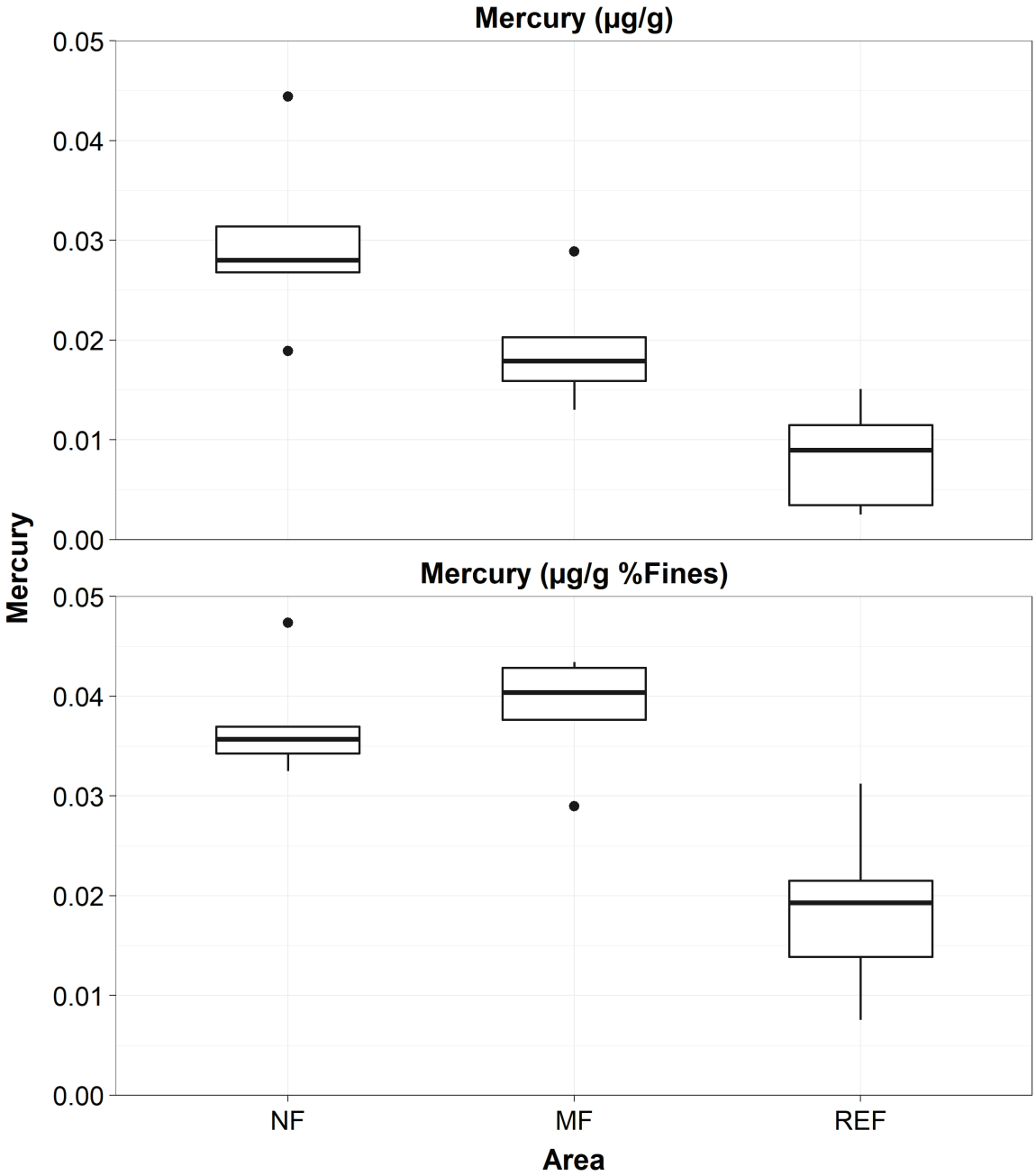
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-16: Box-and-whisker Plots of Magnesium Concentrations in Meliadine Lake, 2018



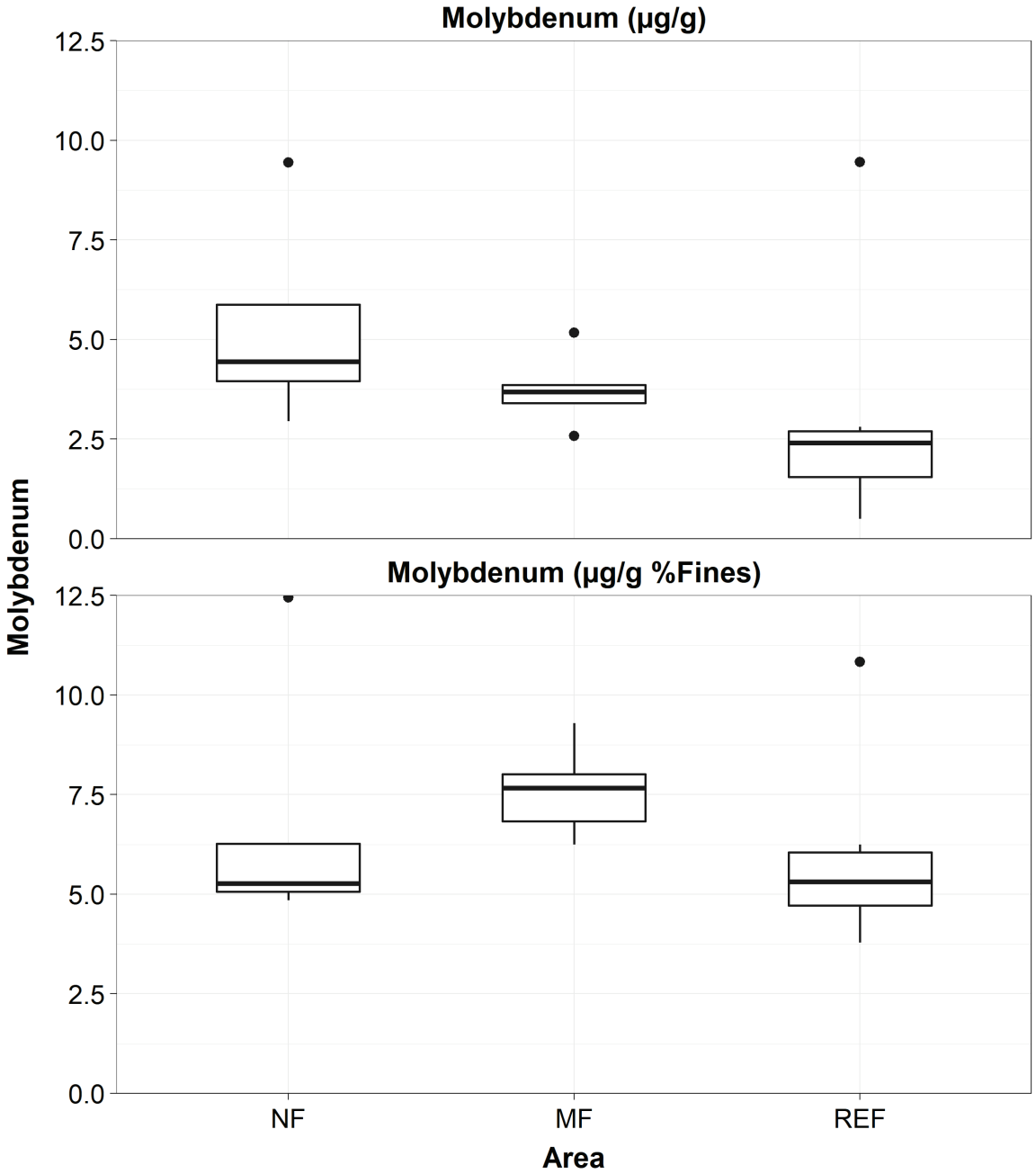
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-17: Box-and-whisker Plots of Manganese Concentrations in Meliadine Lake, 2018



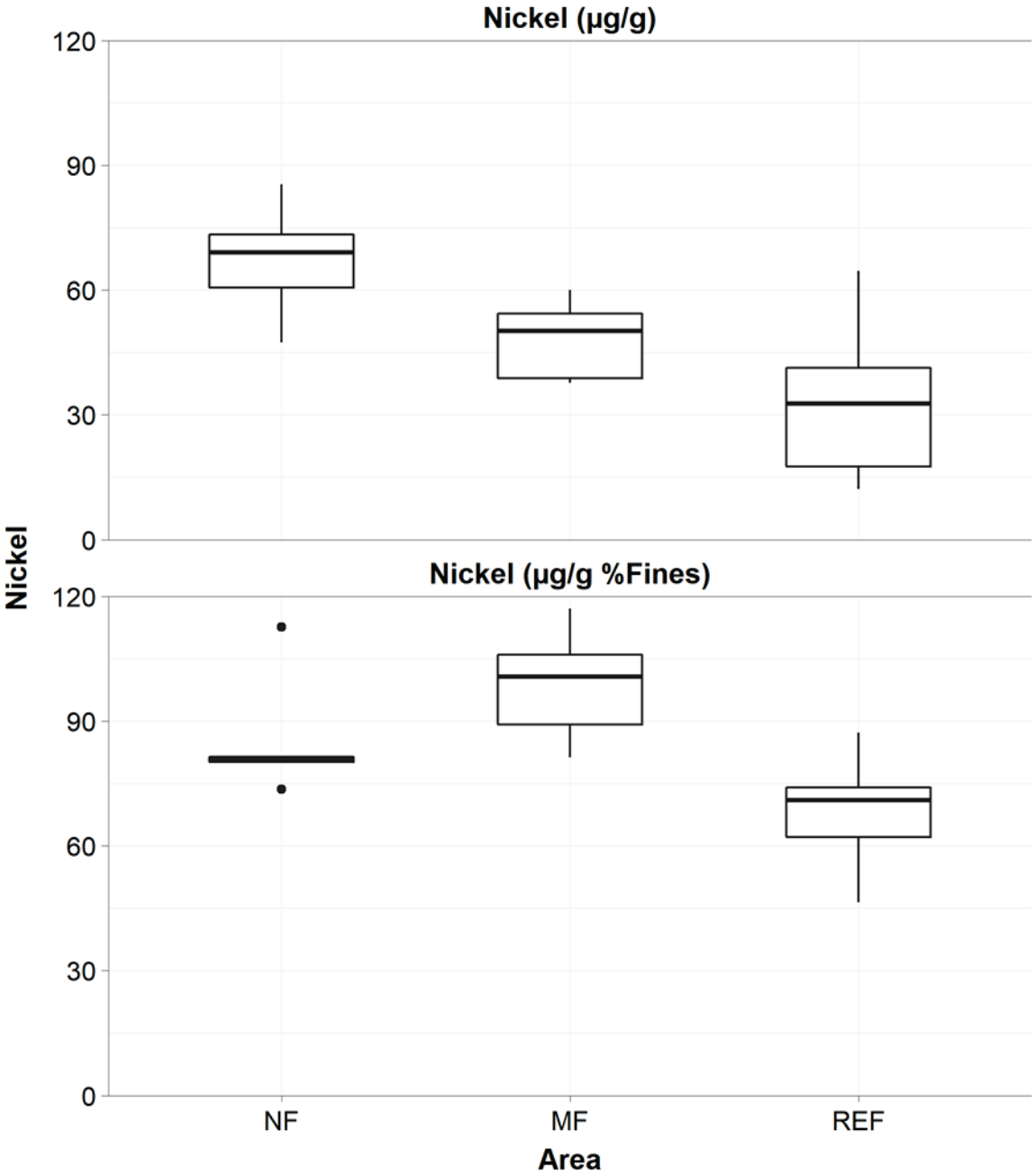
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-18: Box-and-whisker Plots of Mercury Concentrations in Meliadine Lake, 2018



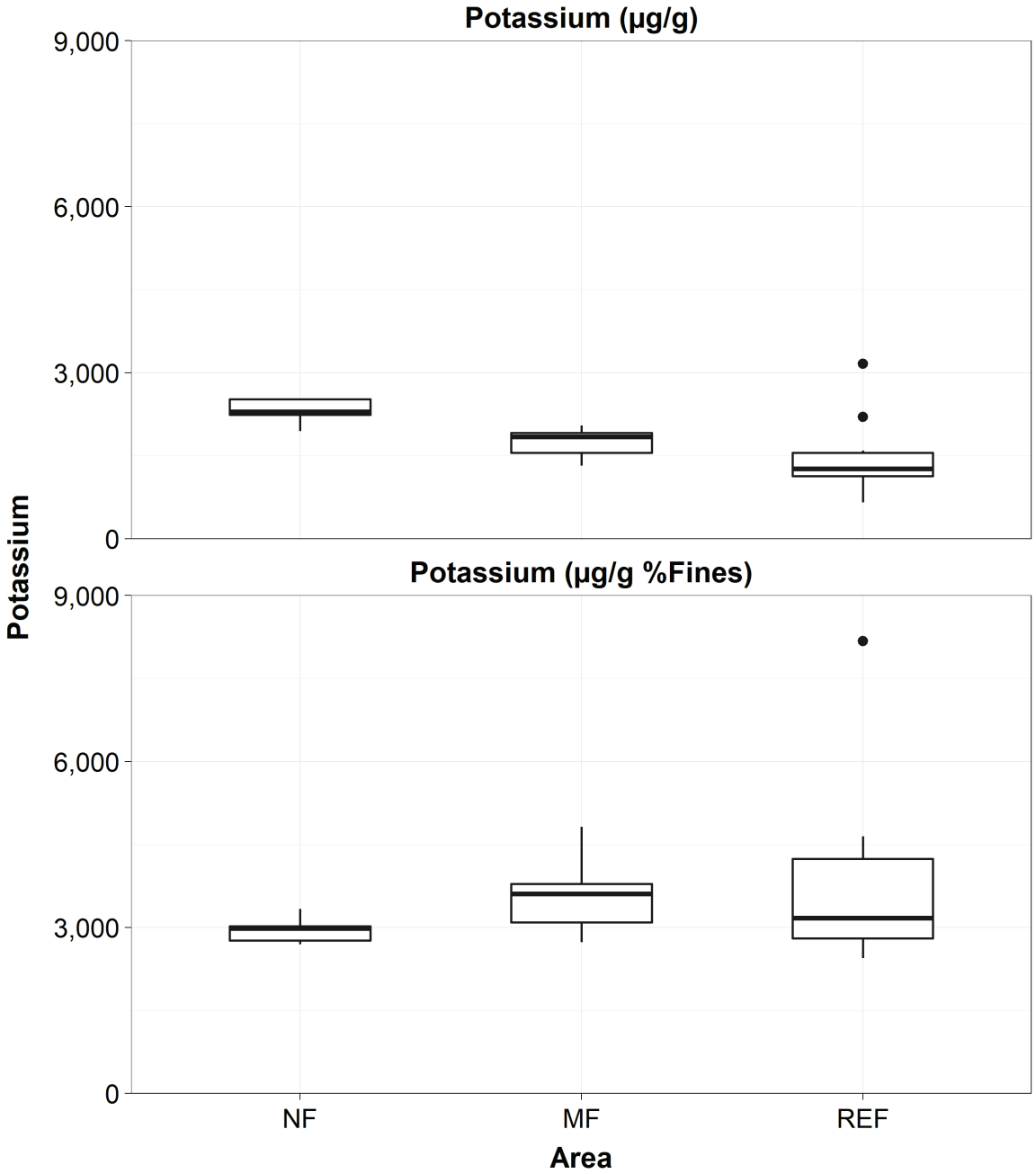
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-19: Box-and-whisker Plots of Molybdenum Concentrations in Meliadine Lake, 2018



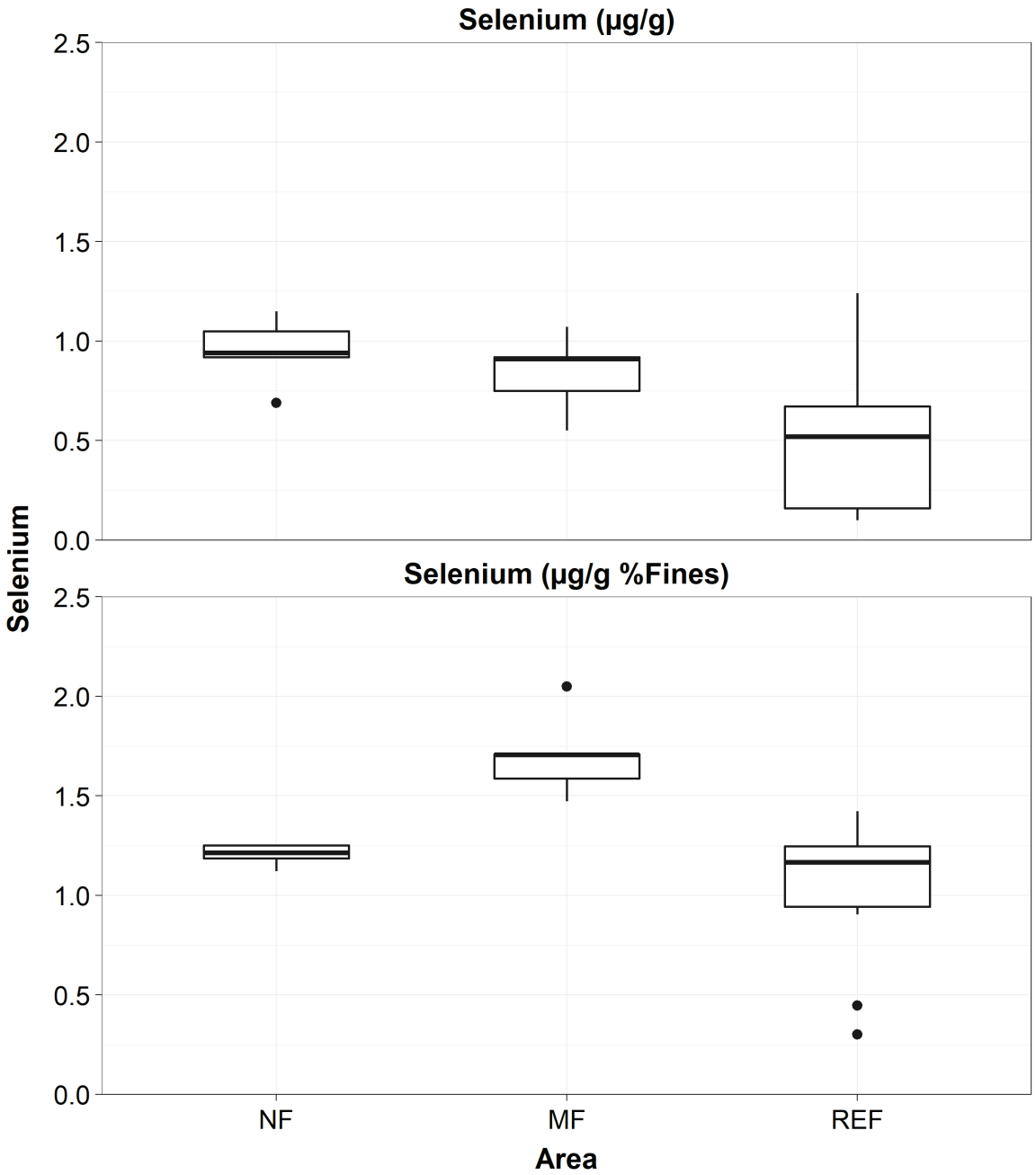
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-20: Box-and-whisker Plots of Nickel Concentrations in Meliadine Lake, 2018



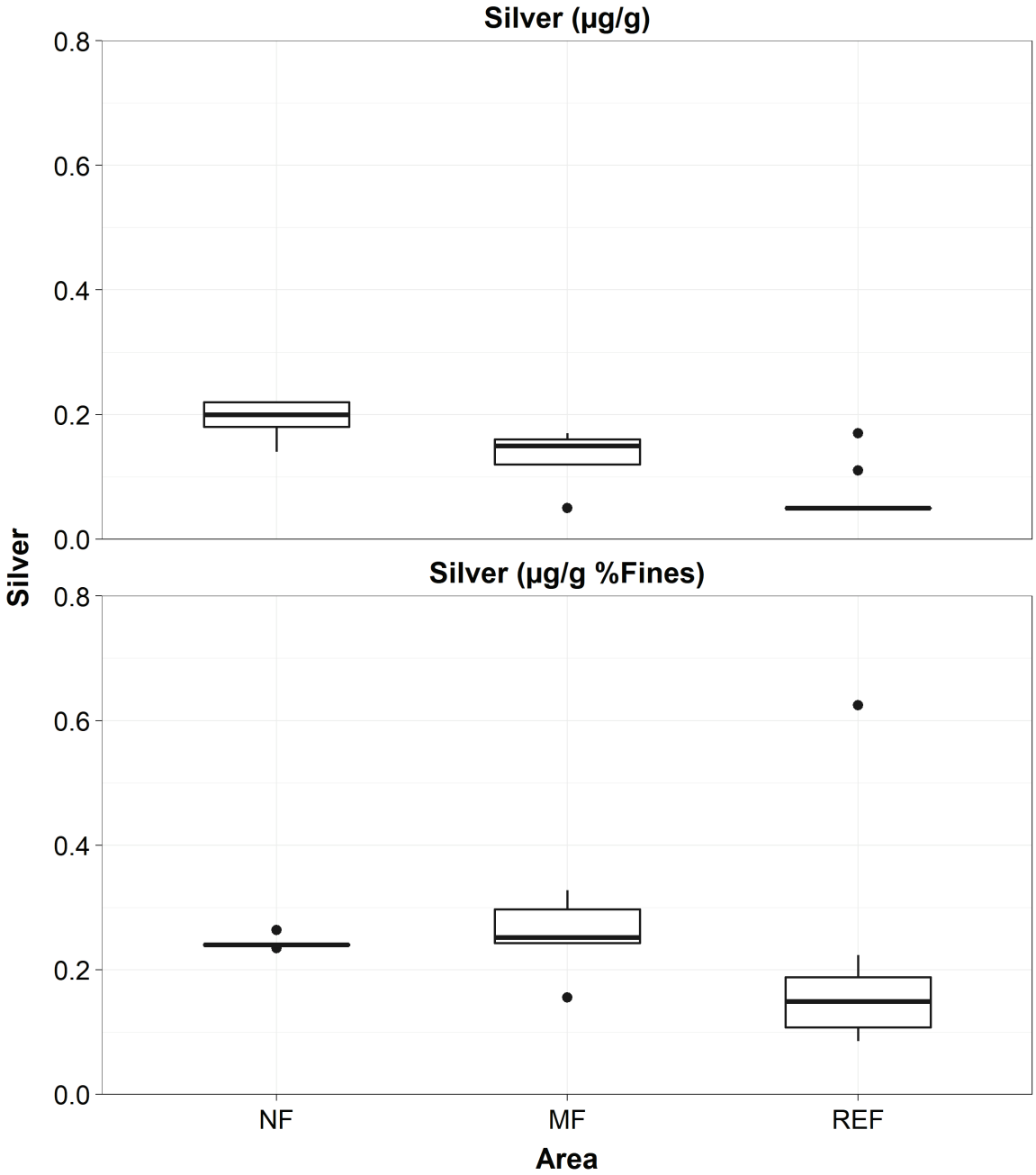
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-21: Box-and-whisker Plots of Potassium Concentrations in Meliadine Lake, 2018



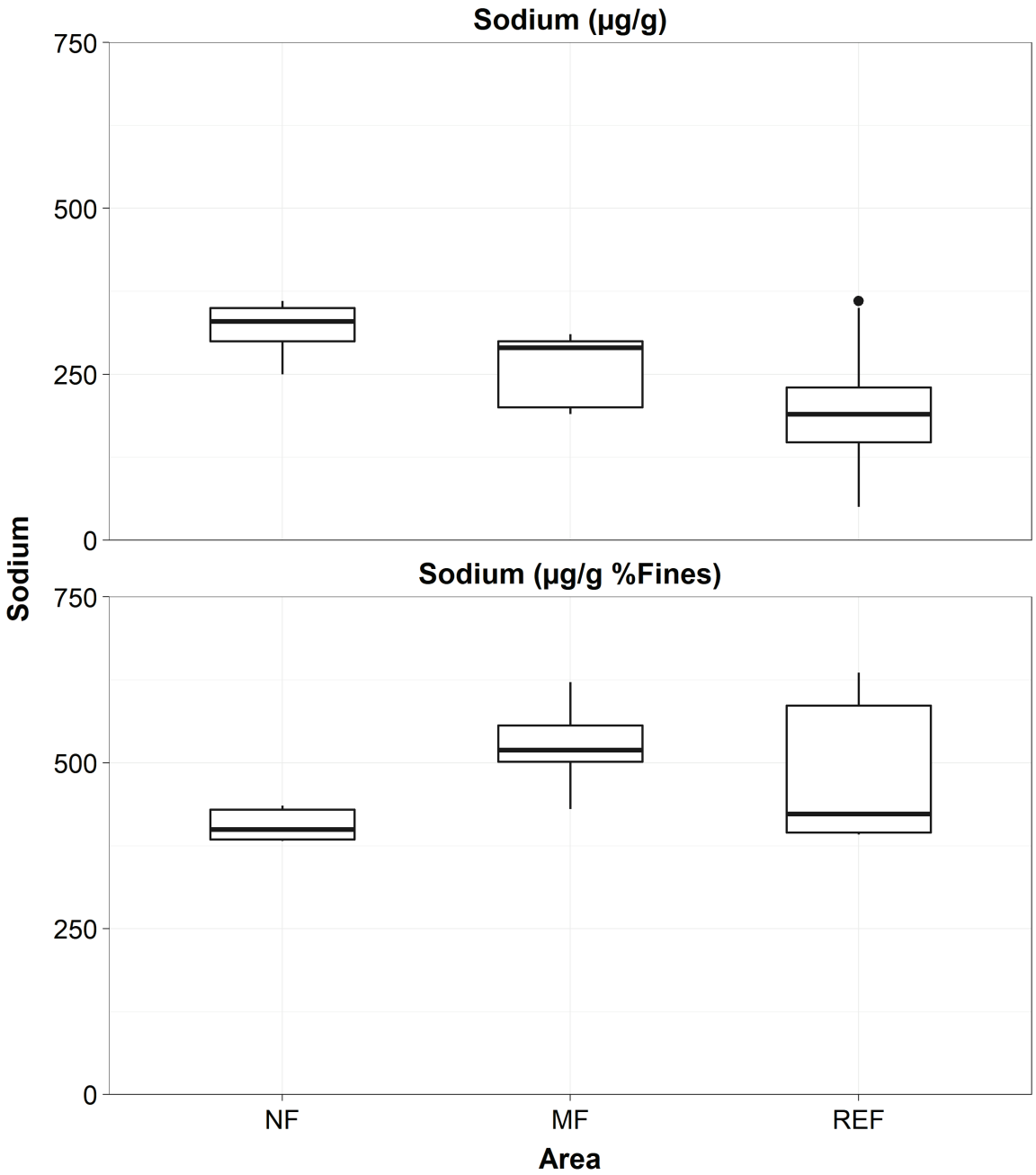
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-22: Box-and-whisker Plots of Selenium Concentrations in Meliadine Lake, 2018



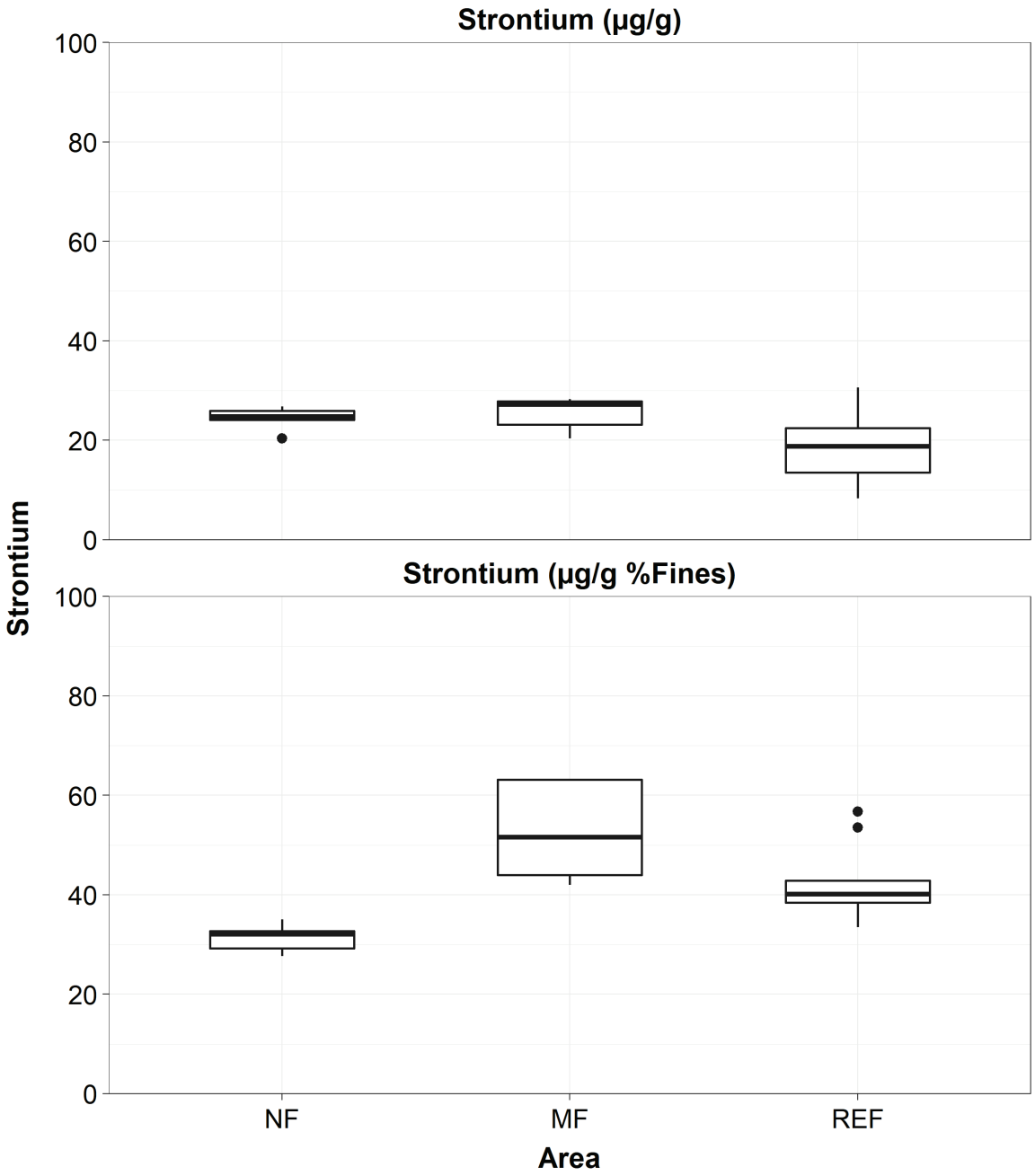
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-23: Box-and-whisker Plots of Silver Concentrations in Meliadine Lake, 2018



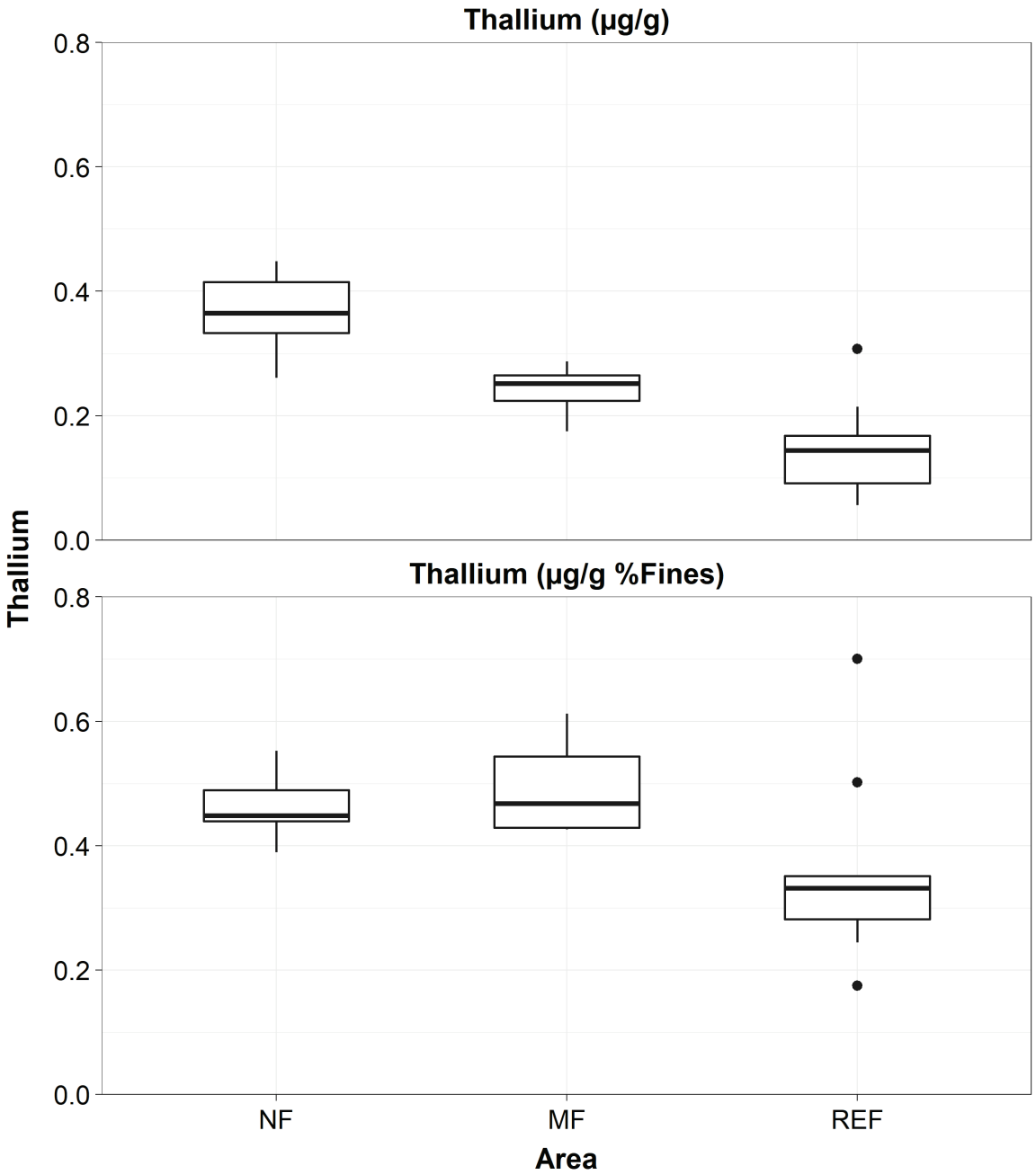
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-24: Box-and-whisker Plots of Sodium Concentrations in Meliadine Lake, 2018



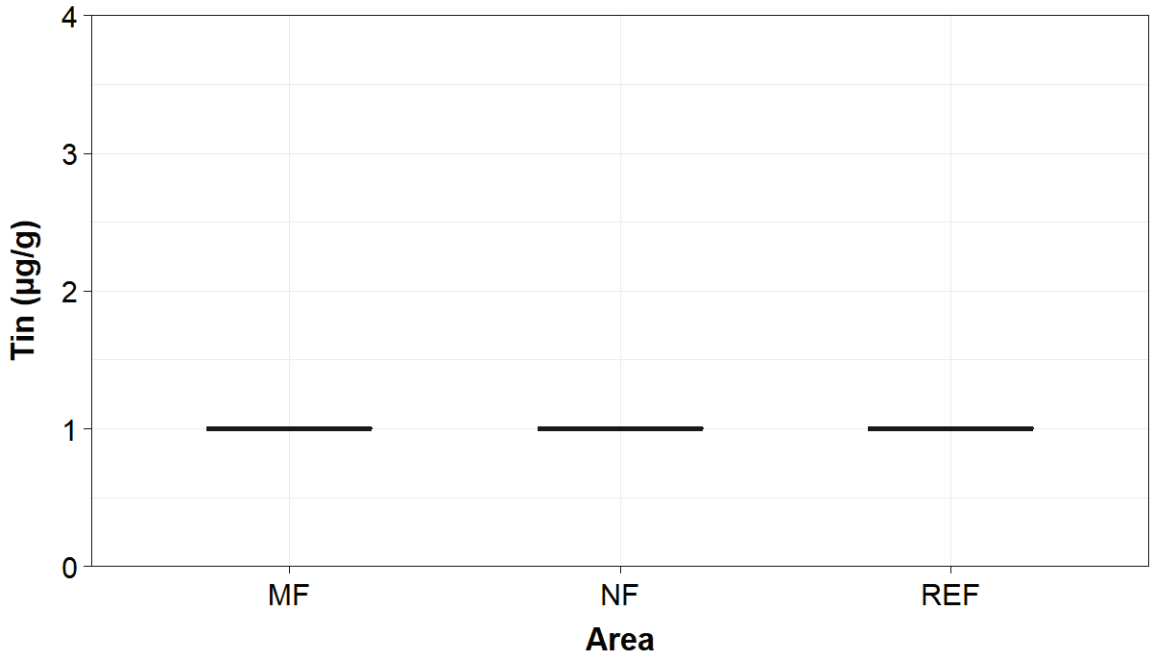
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.1-25: Box-and-whisker Plots of Strontium Concentrations in Meliadine Lake, 2018



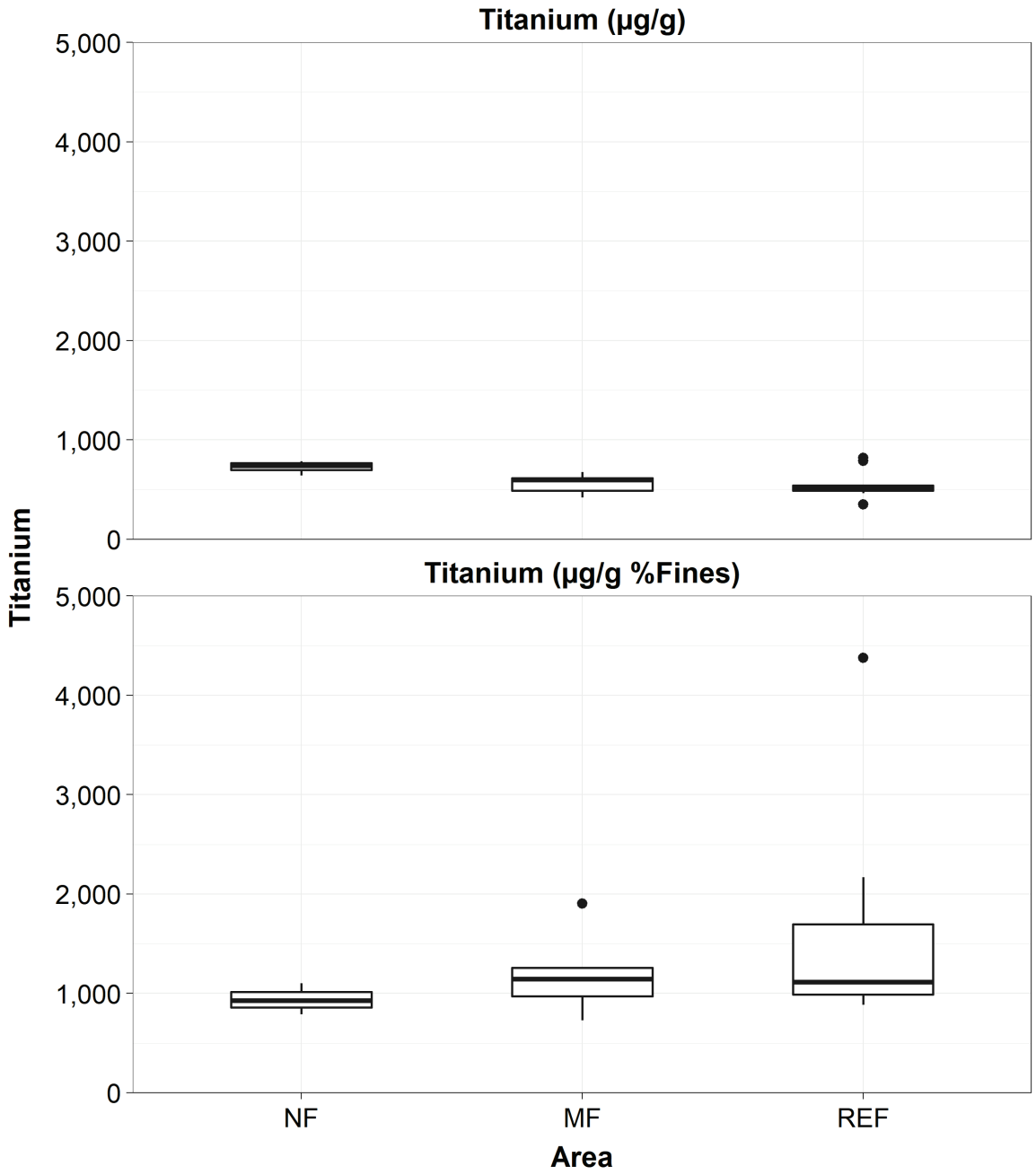
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-26: Box-and-whisker Plots of Thallium Concentrations in Meliadine Lake, 2018



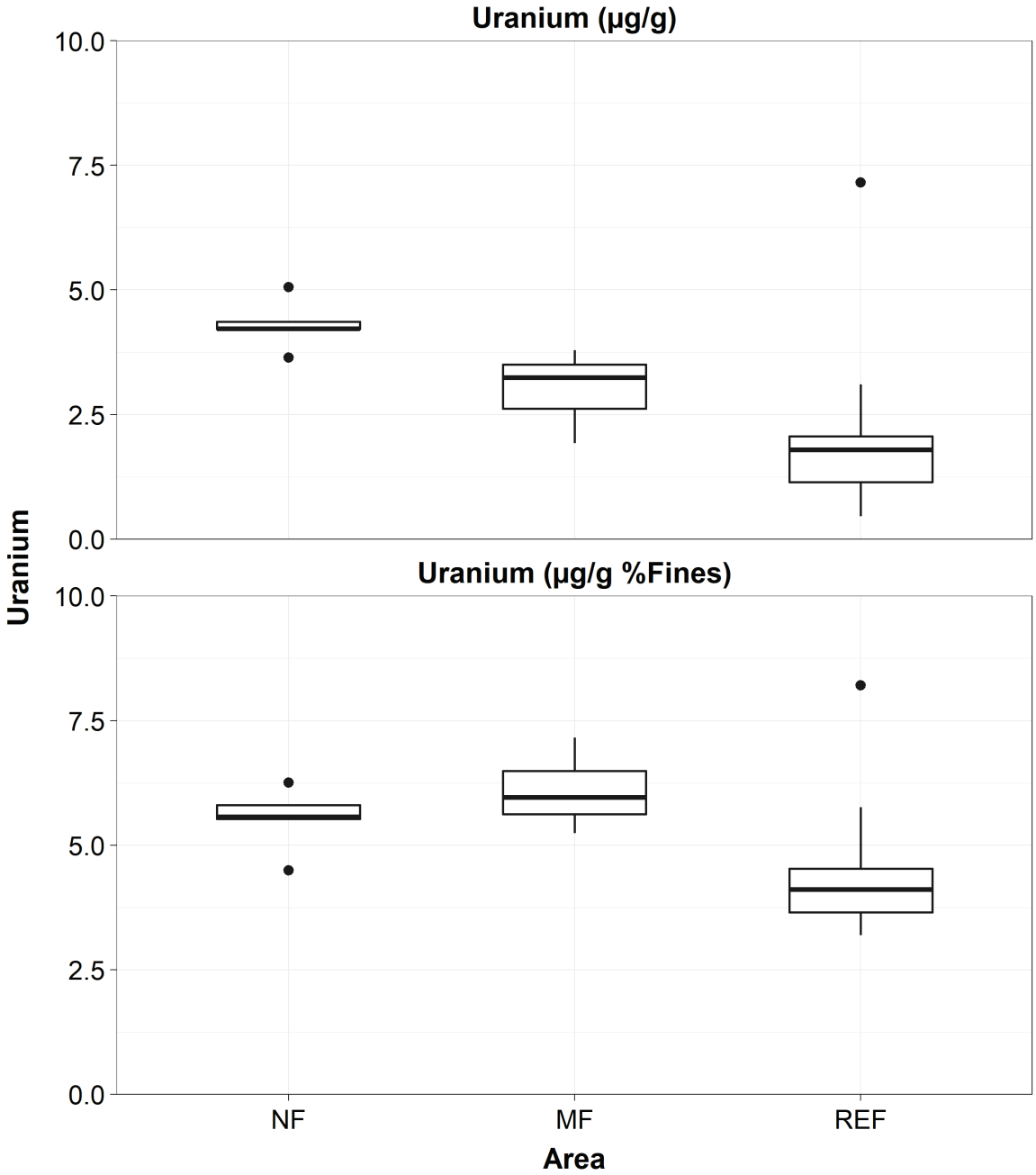
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-27: Box-and-whisker Plots of Tin Concentrations in Meliadine Lake, 2018



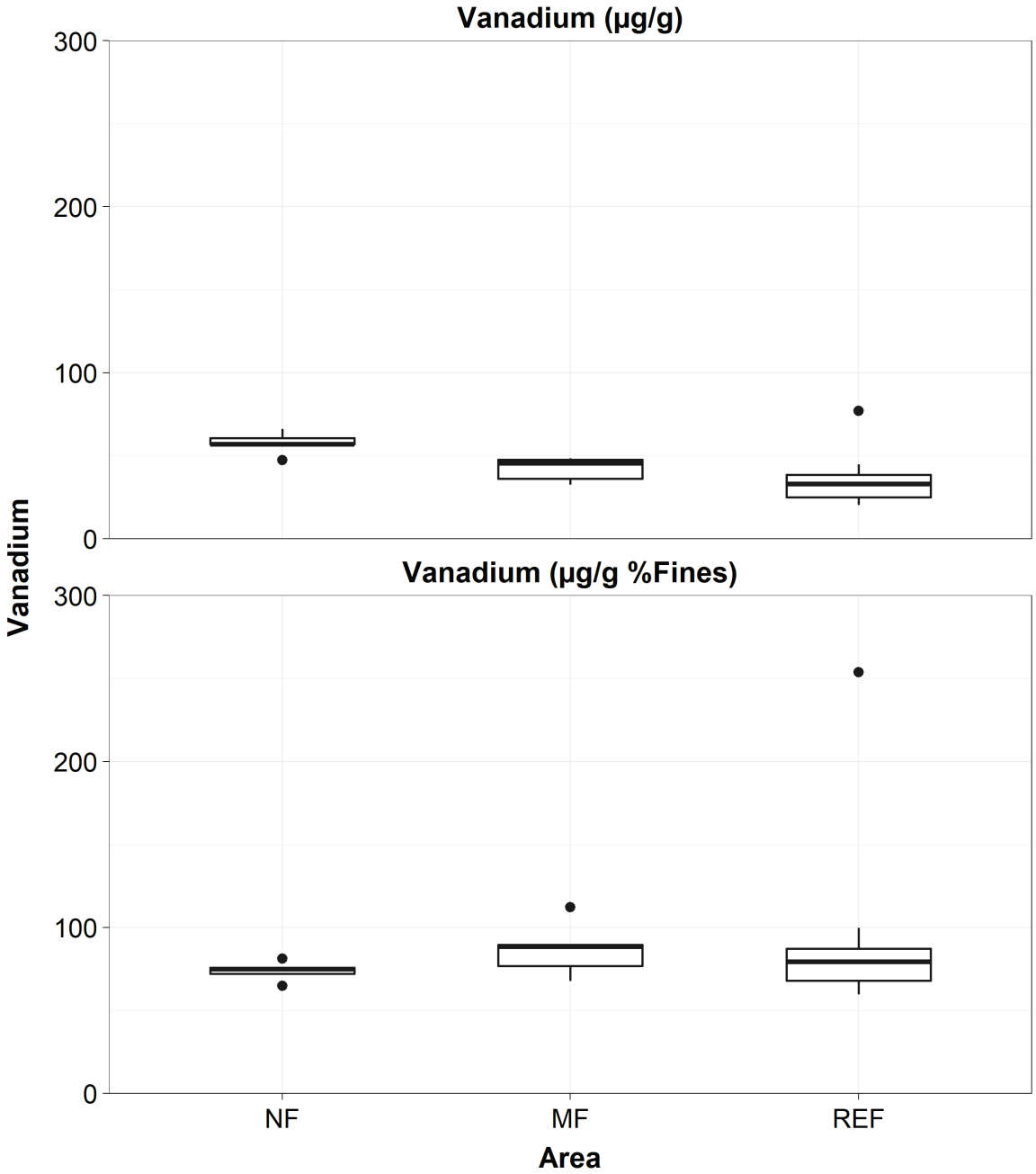
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-28: Box-and-whisker Plots of Titanium Concentrations in Meliadine Lake, 2018



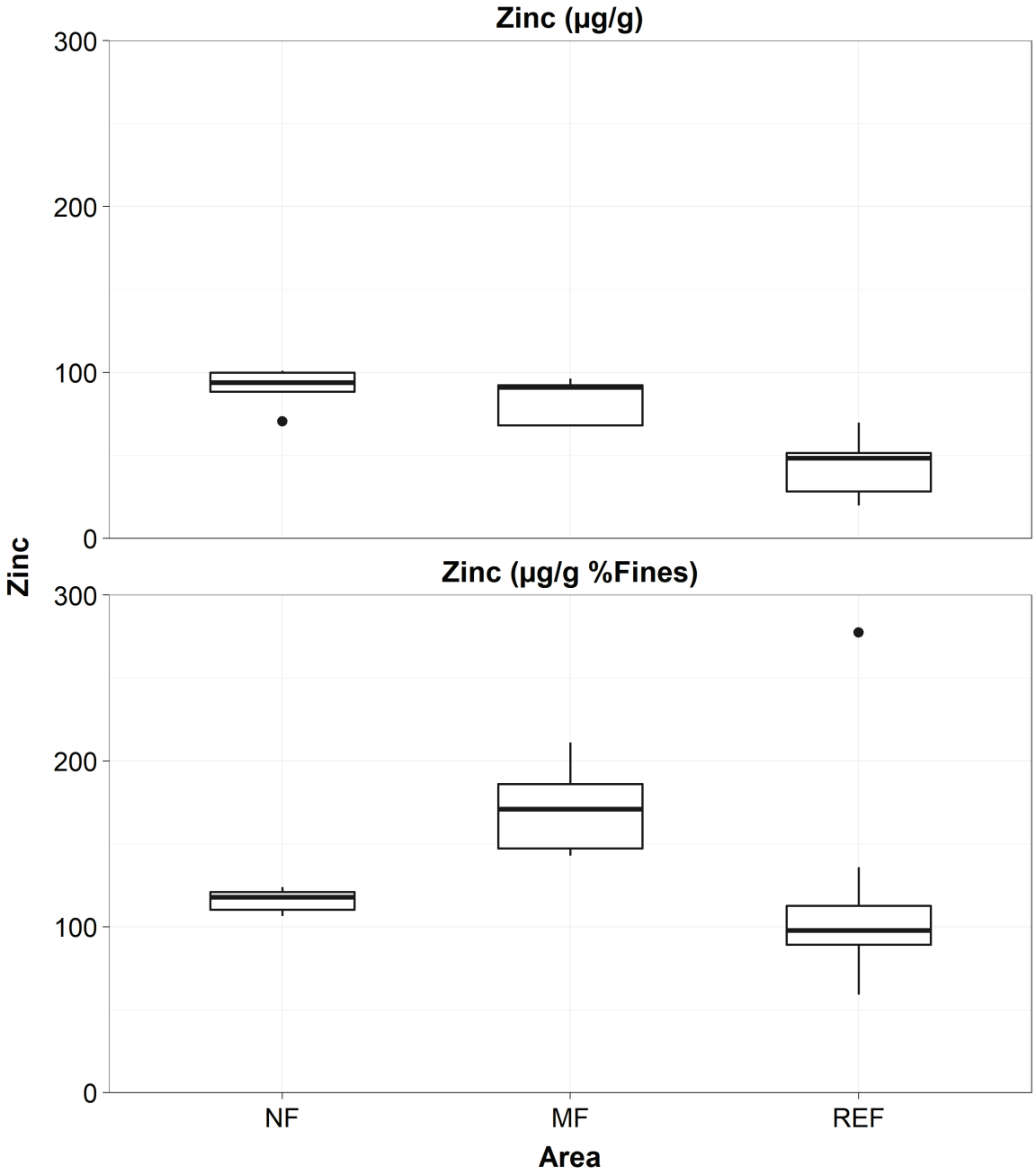
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-29: Box-and-whisker Plots of Uranium Concentrations in Meliadine Lake, 2018



Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-30: Box-and-whisker Plots of Vanadium Concentrations in Meliadine Lake, 2018



Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram; NF = Near-field; MF = Mid-field; REF = Pooled Reference areas.

Figure 8D.2-31: Box-and-whisker Plots of Zinc Concentrations in Meliadine Lake, 2018

APPENDIX 8E

Scatter Plots of Sediment Quality Parameters versus Fines

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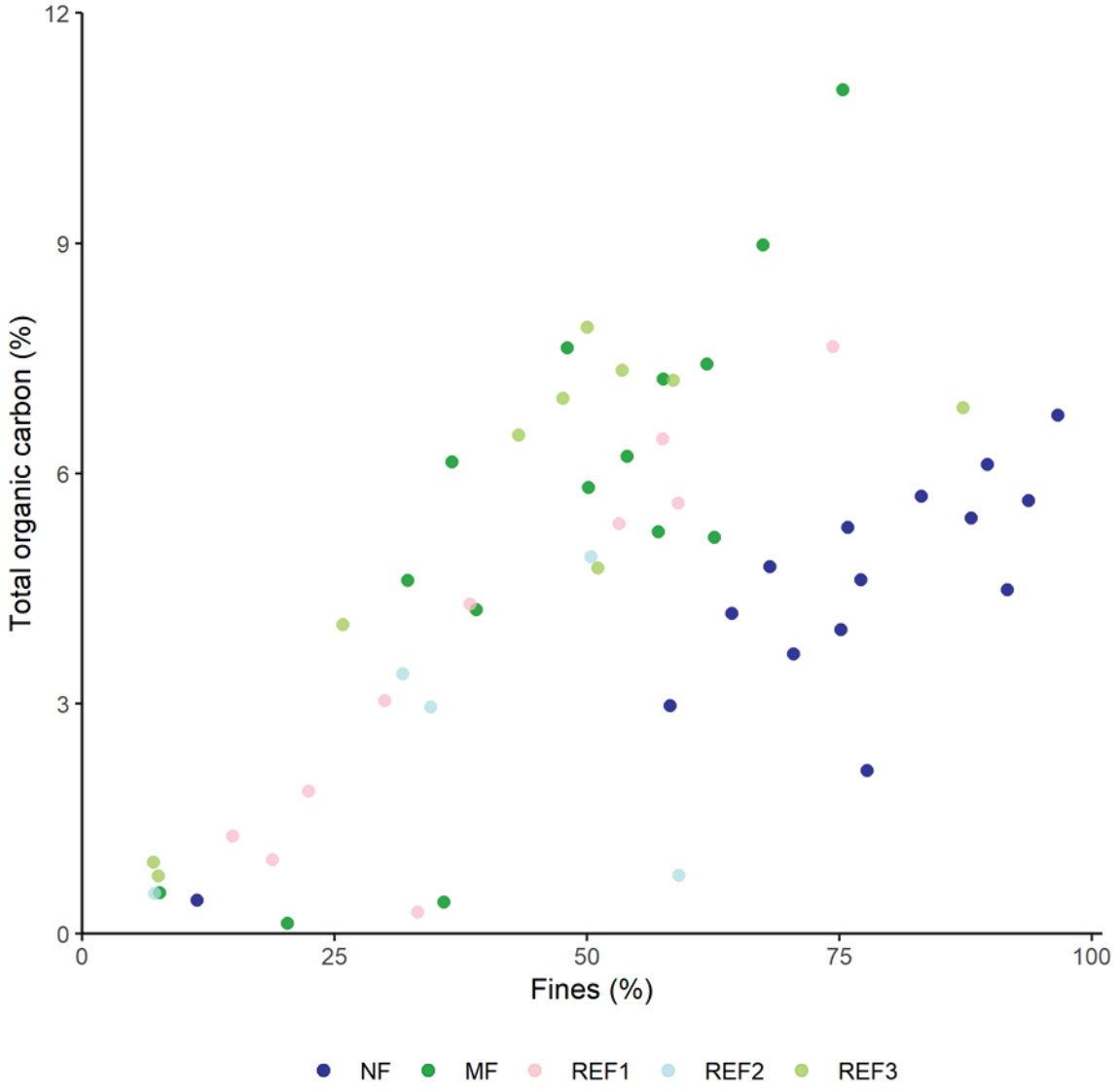
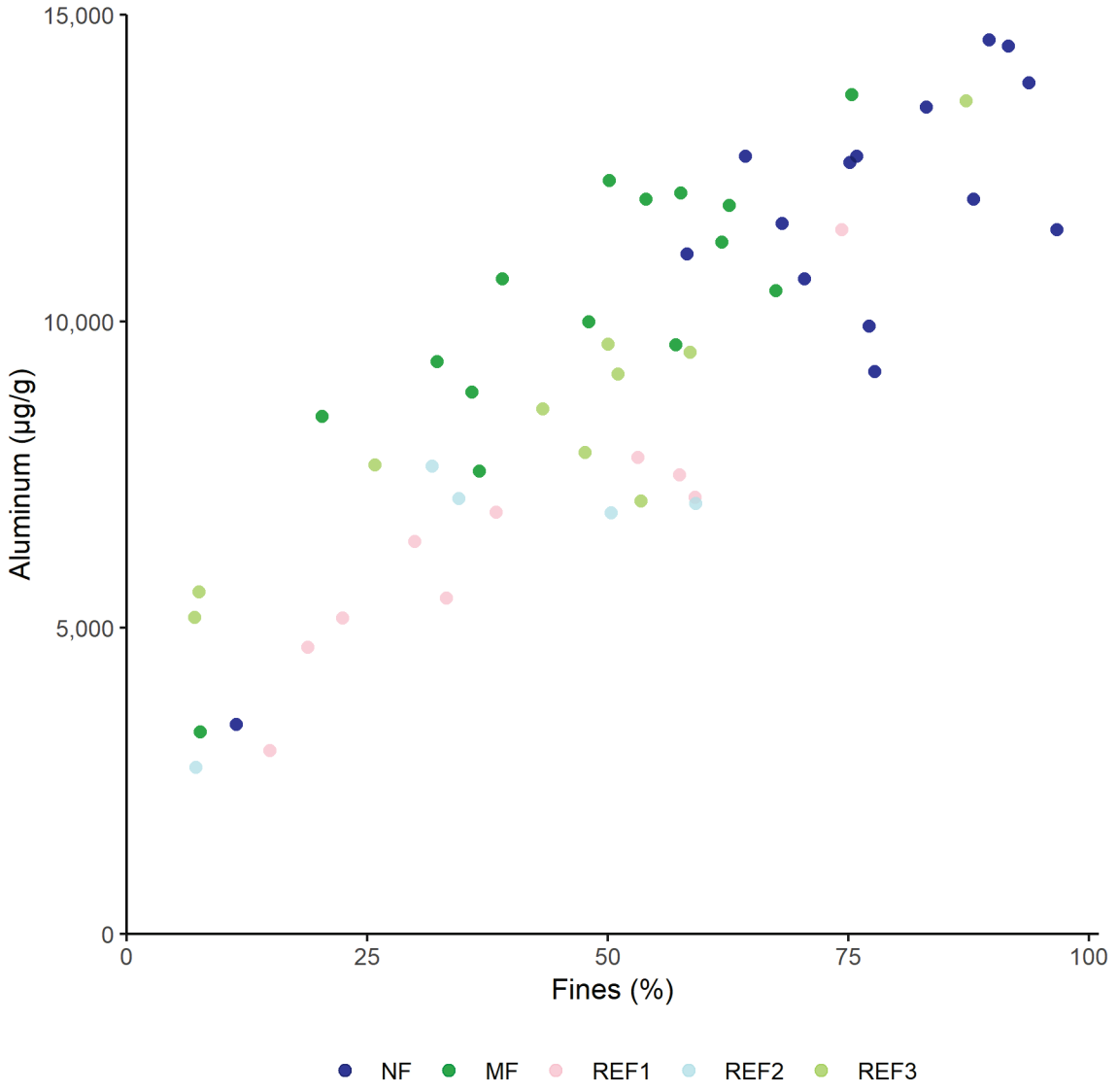
1.0 ORGANIC CARBON AND METALS VERSUS PERCENT FINES



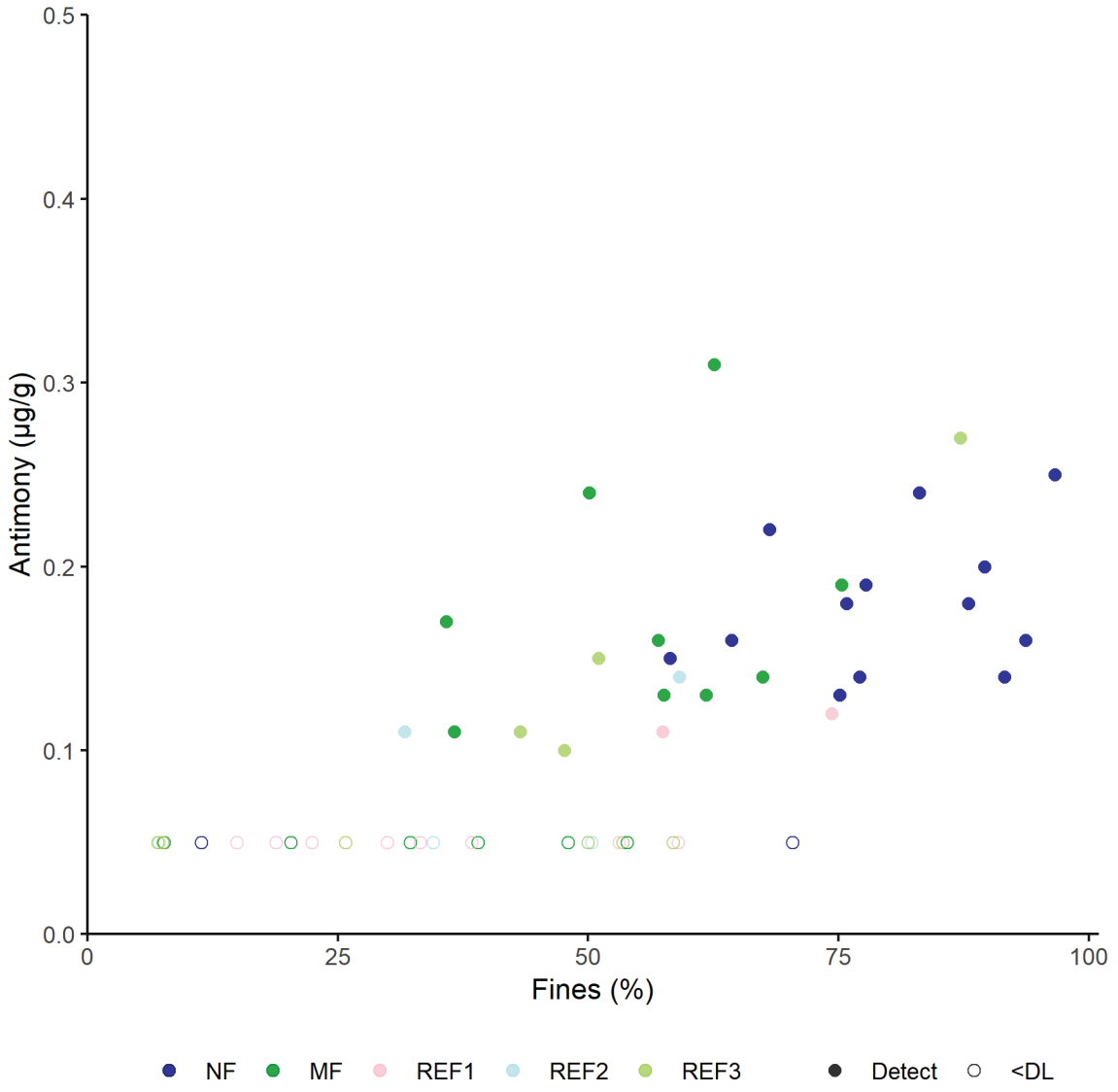
Open symbols represent results that are less than the detection limit.

Figure 8E.1-1: Concentrations of Total Organic Carbon Versus Fines in Meliadine Lake, 2015 to 2018



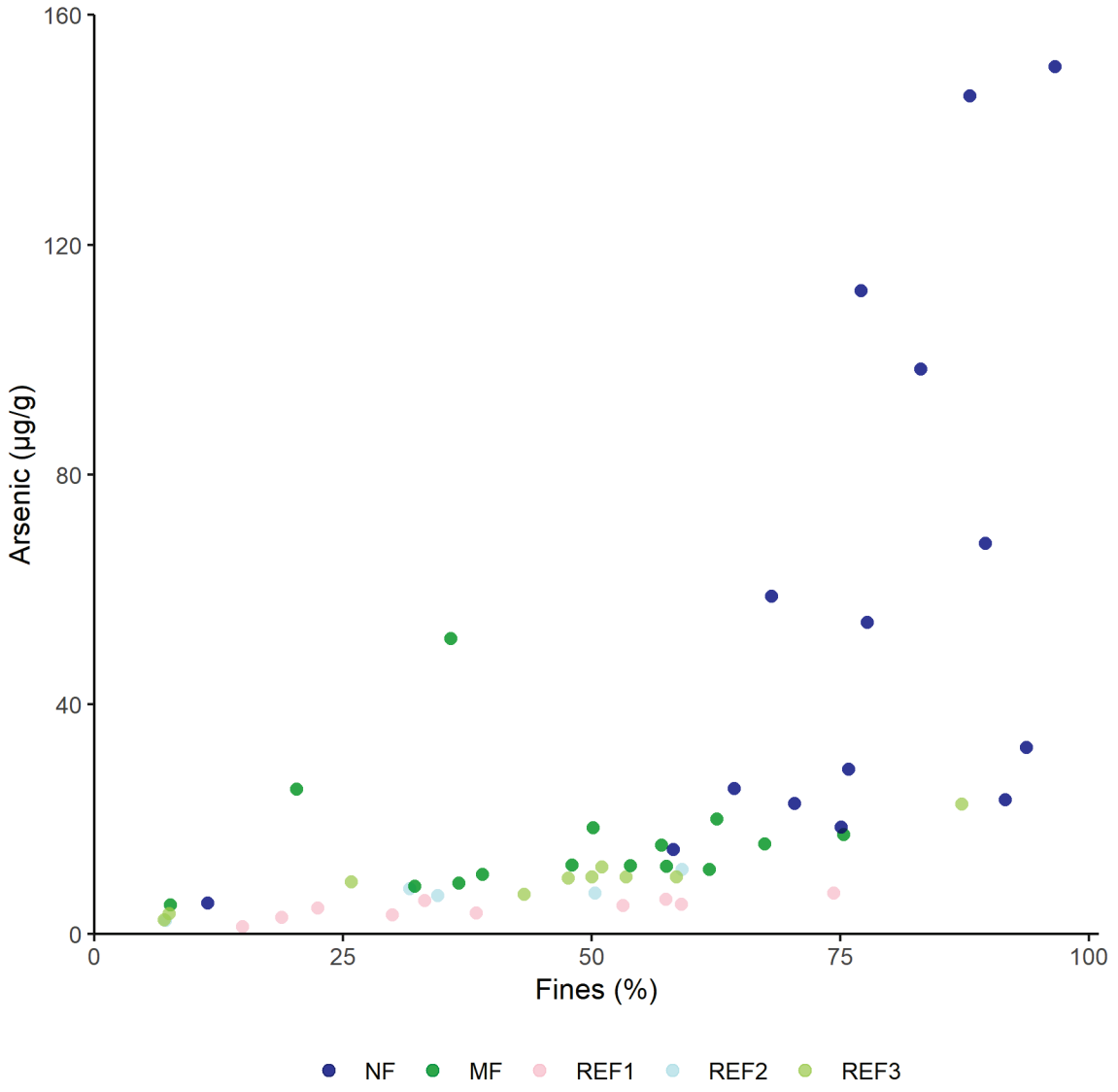
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-2: Concentrations of Aluminum Versus Fines in Meliadine Lake, 2015 to 2018



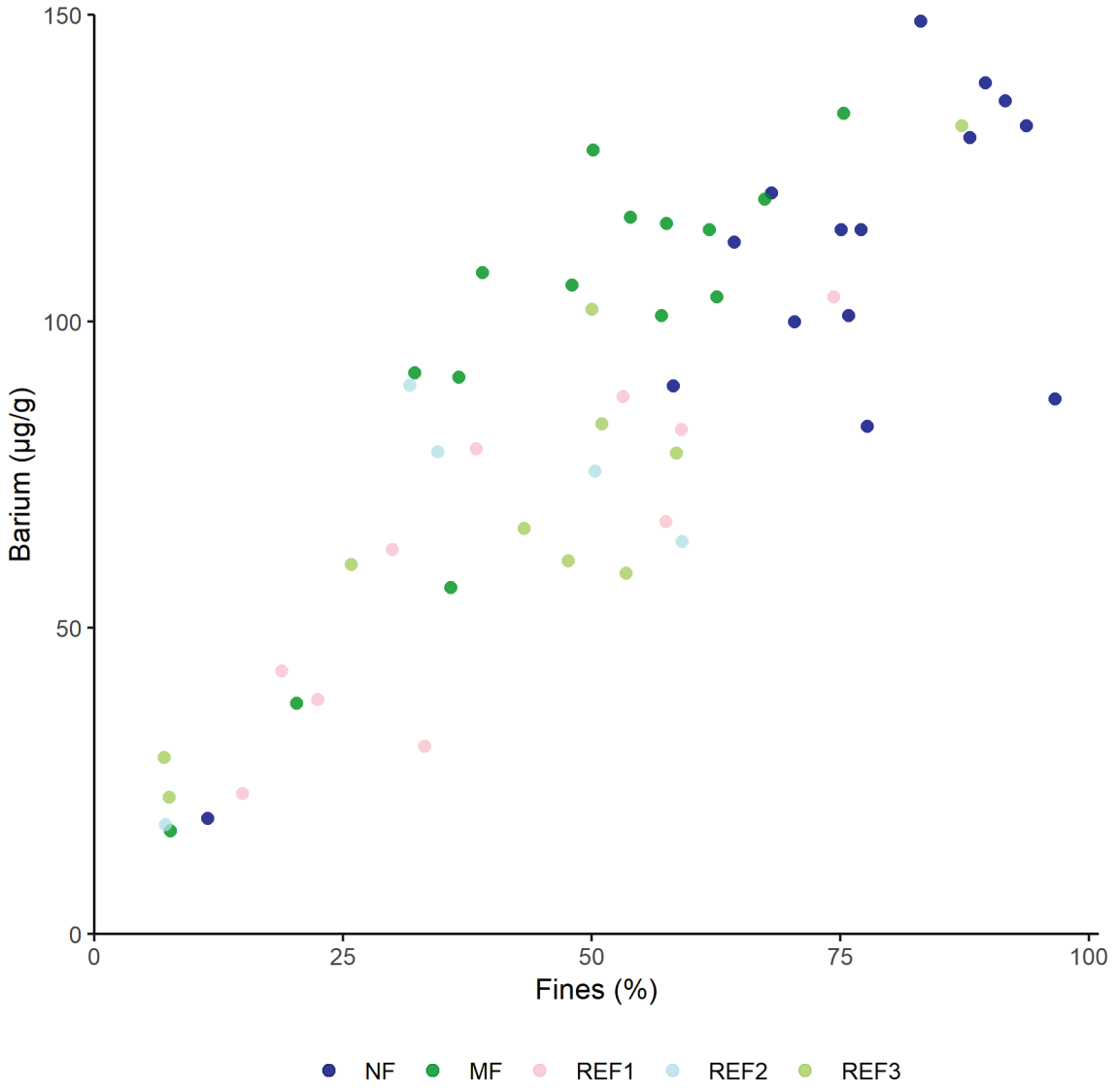
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-3: Concentrations of Antimony Versus Fines in Meliadine Lake, 2015 to 2018



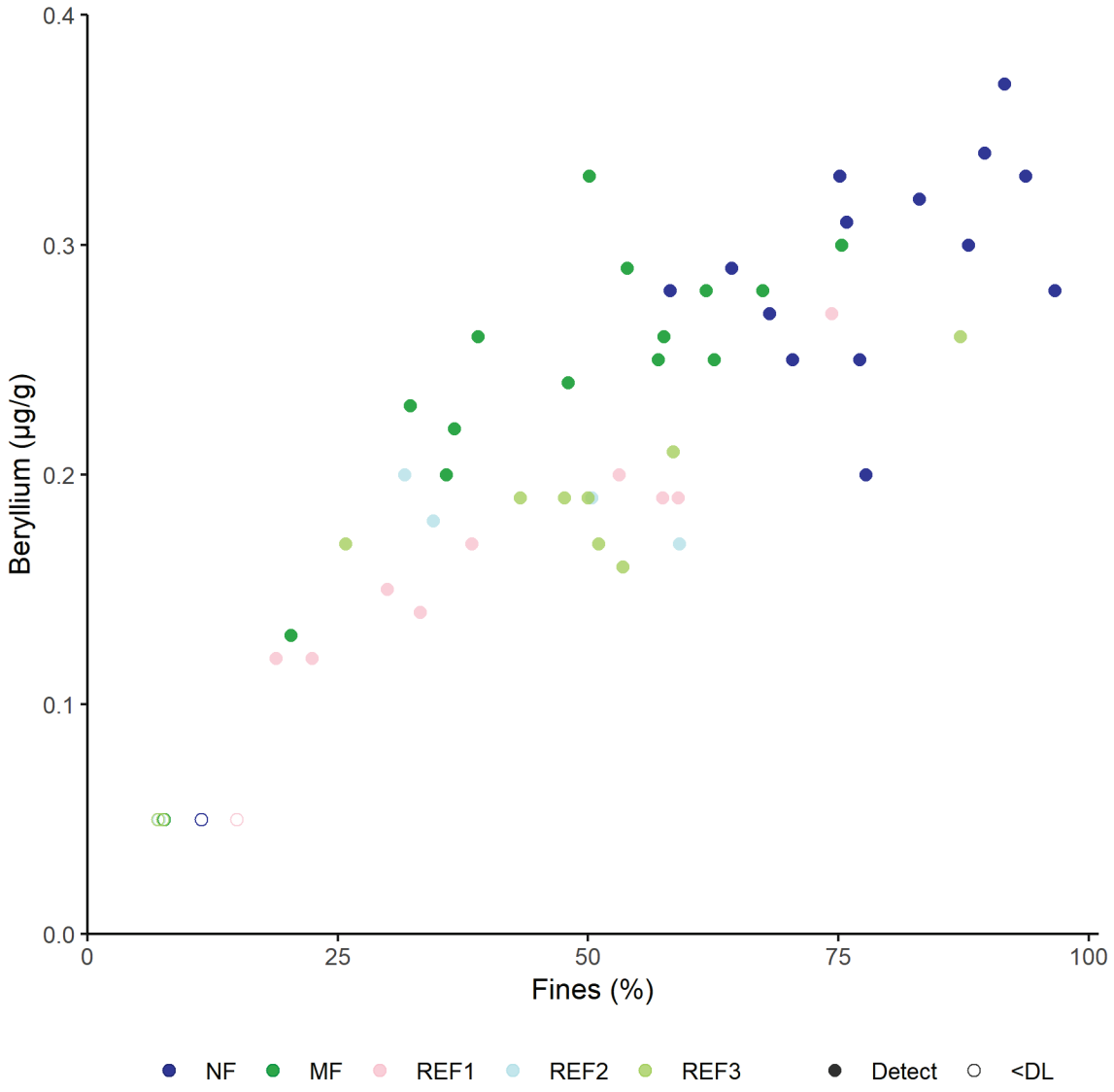
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-4: Concentrations of Arsenic Versus Fines in Meliadine Lake, 2015 to 2018



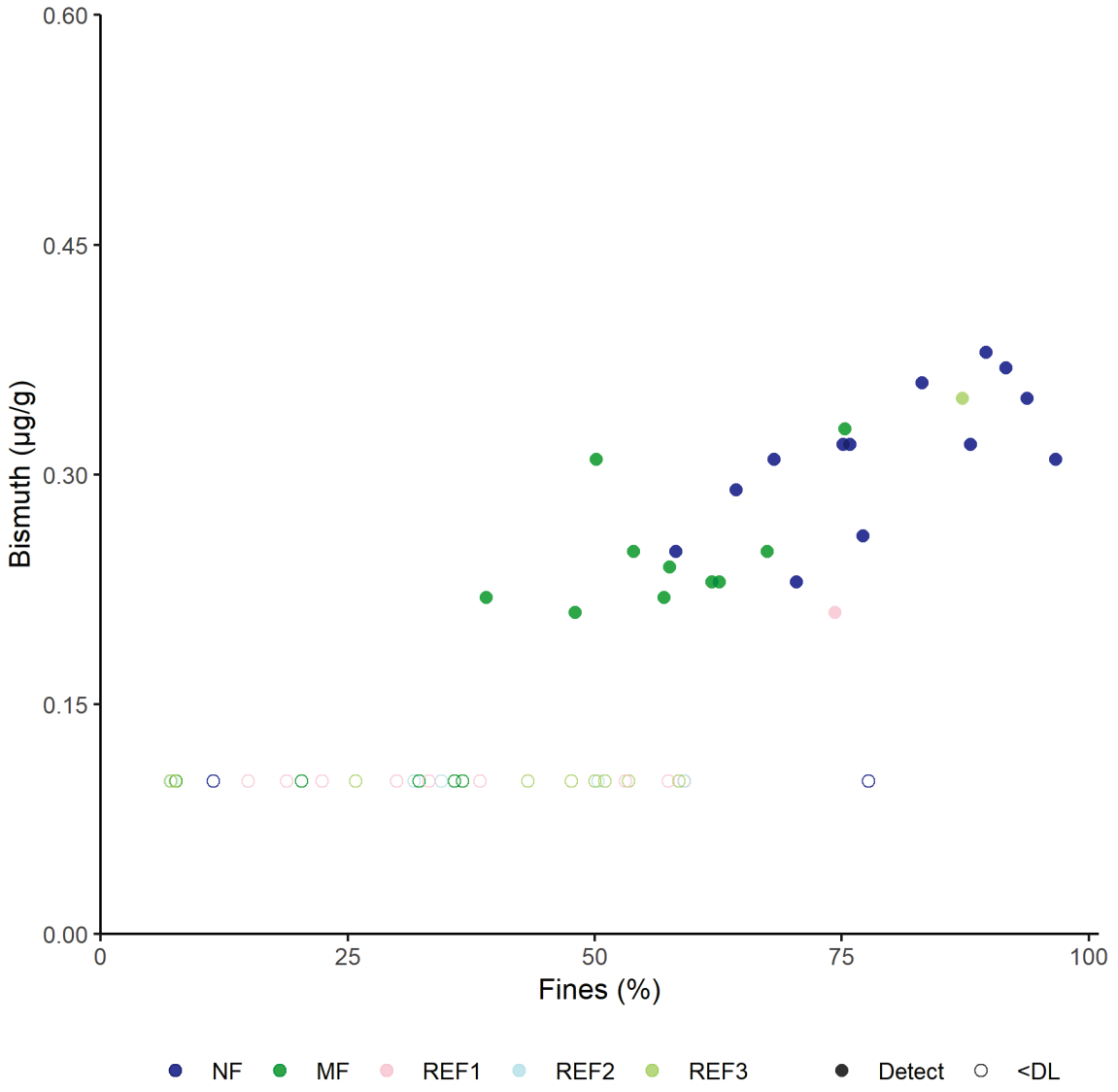
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-5: Concentrations of Barium Versus Fines in Meliadine Lake, 2015 to 2018



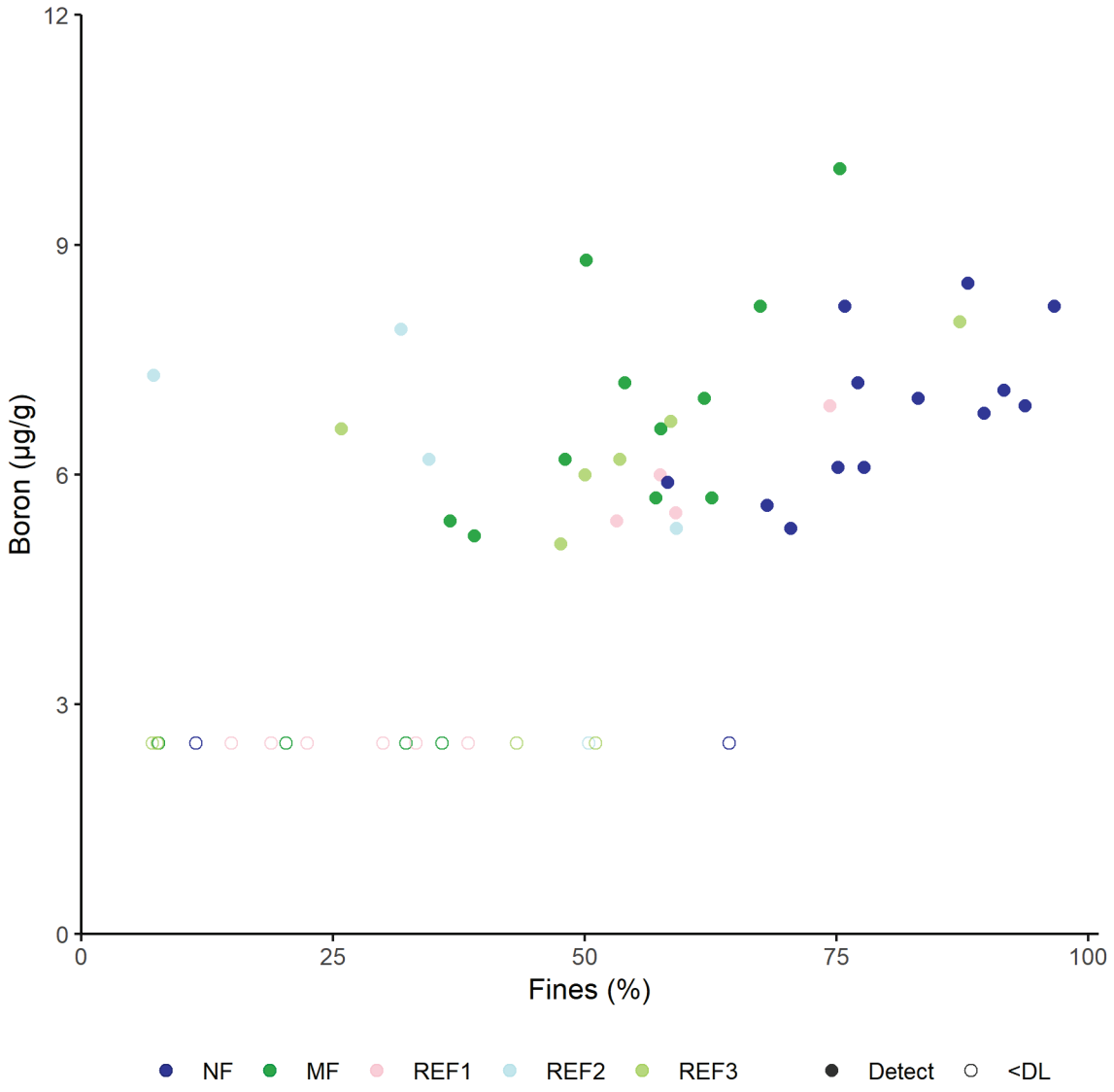
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-6: Concentrations of Beryllium Versus Fines in Meliadine Lake, 2015 to 2018



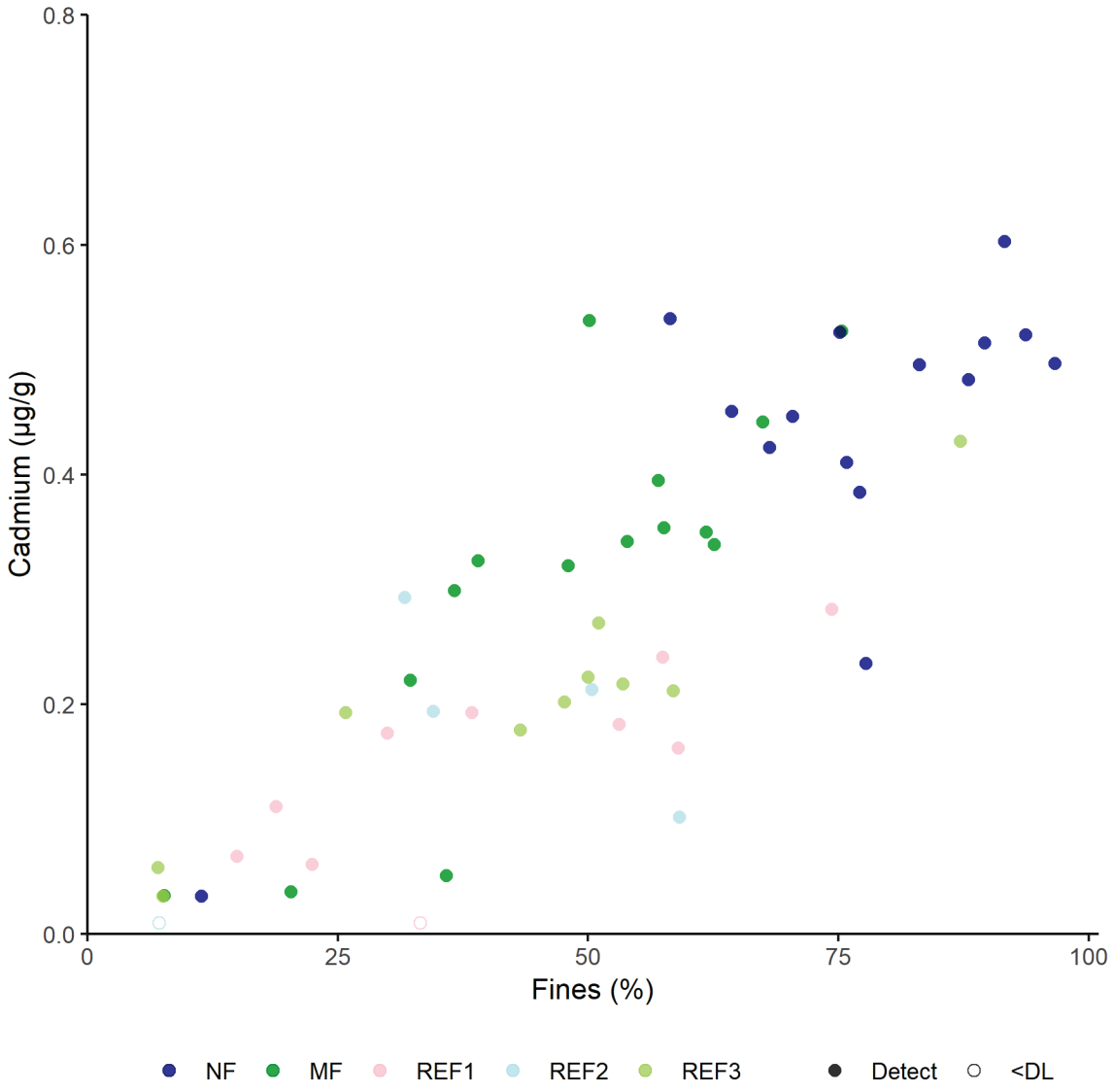
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-7: Concentrations of Bismuth Versus Fines in Meliadine Lake, 2015 to 2018



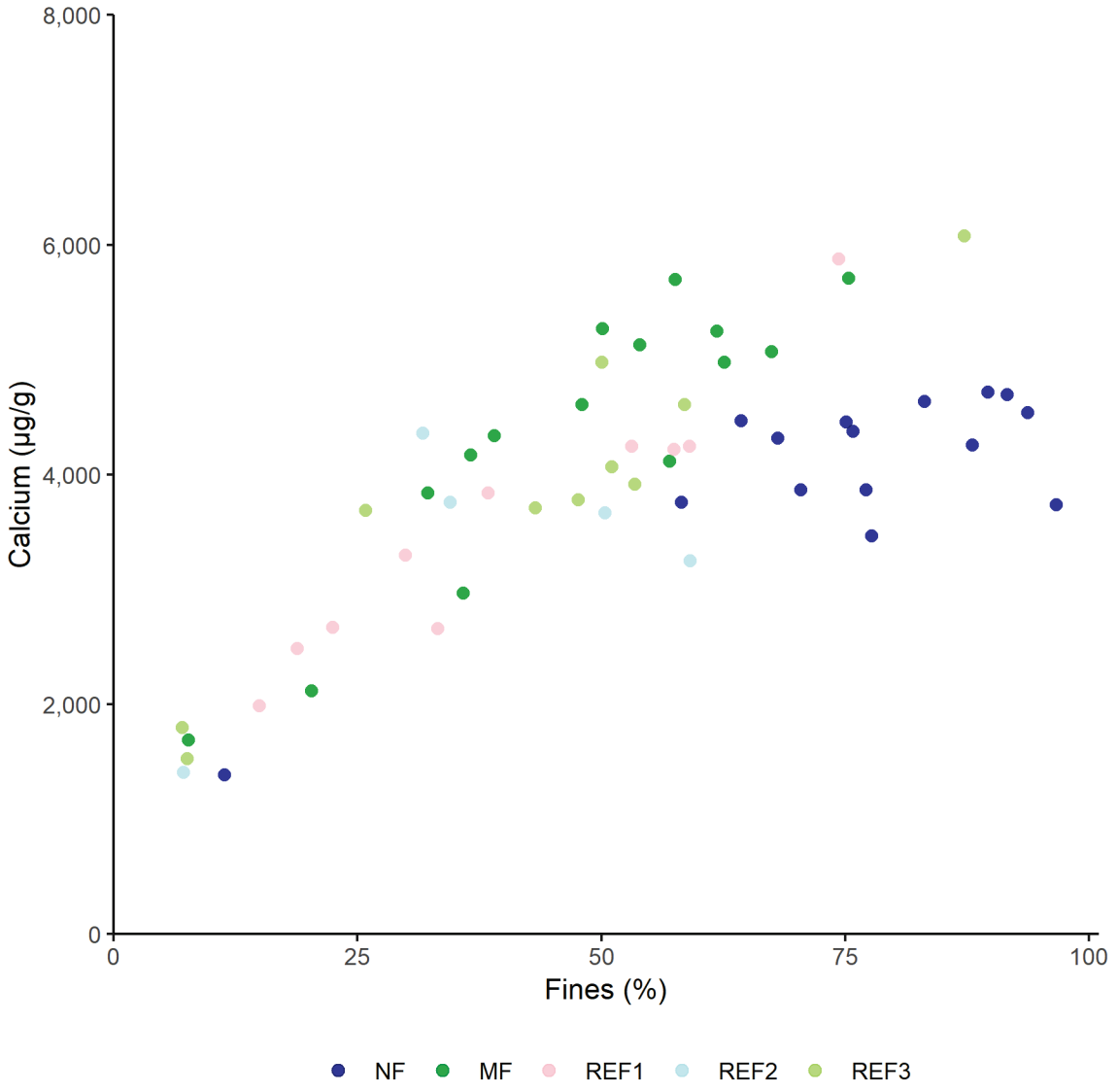
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-8: Concentrations of Boron Versus Fines in Meliadine Lake, 2015 to 2018



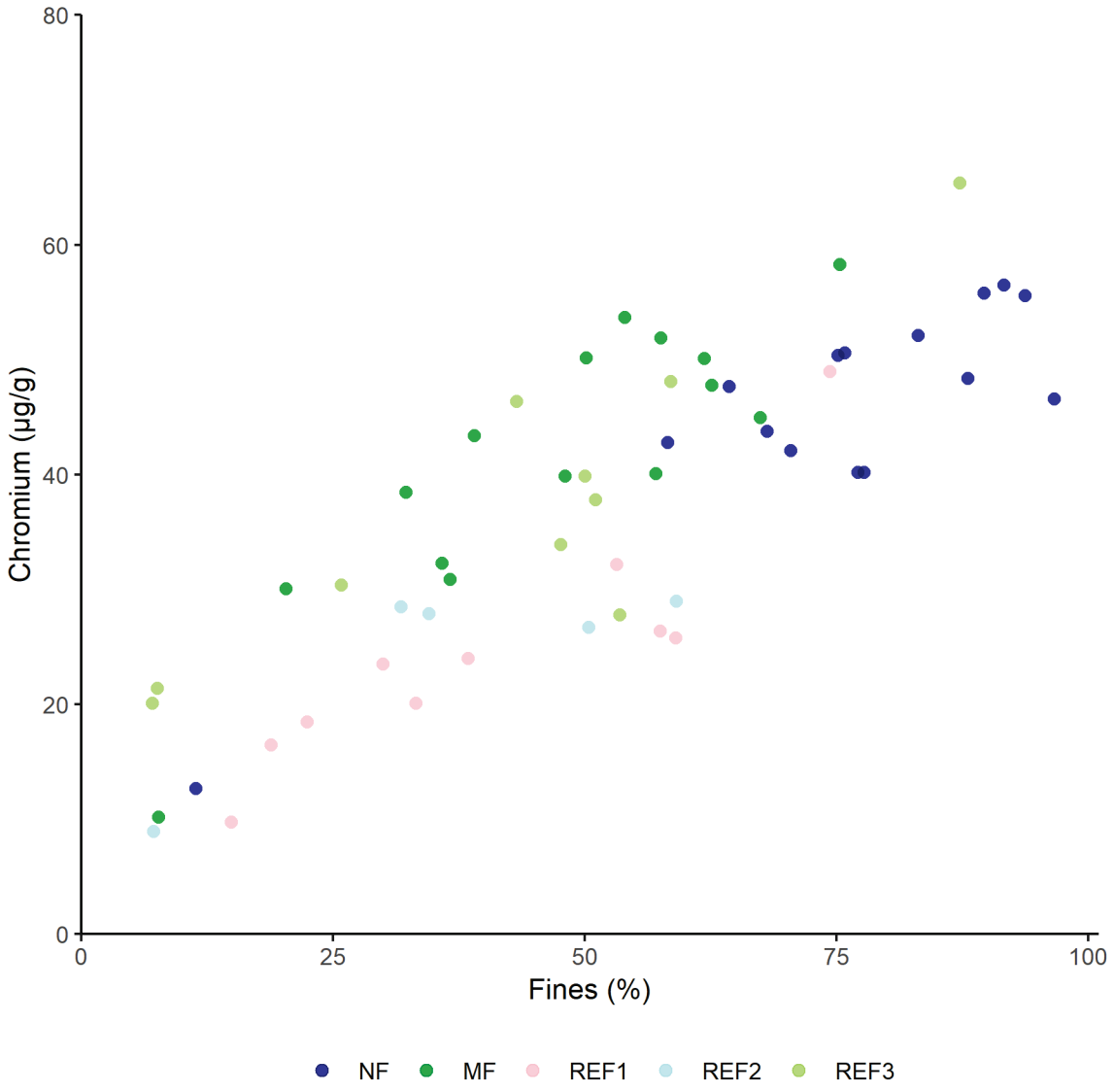
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-9: Concentrations of Cadmium Versus Fines in Meliadine Lake, 2015 to 2018



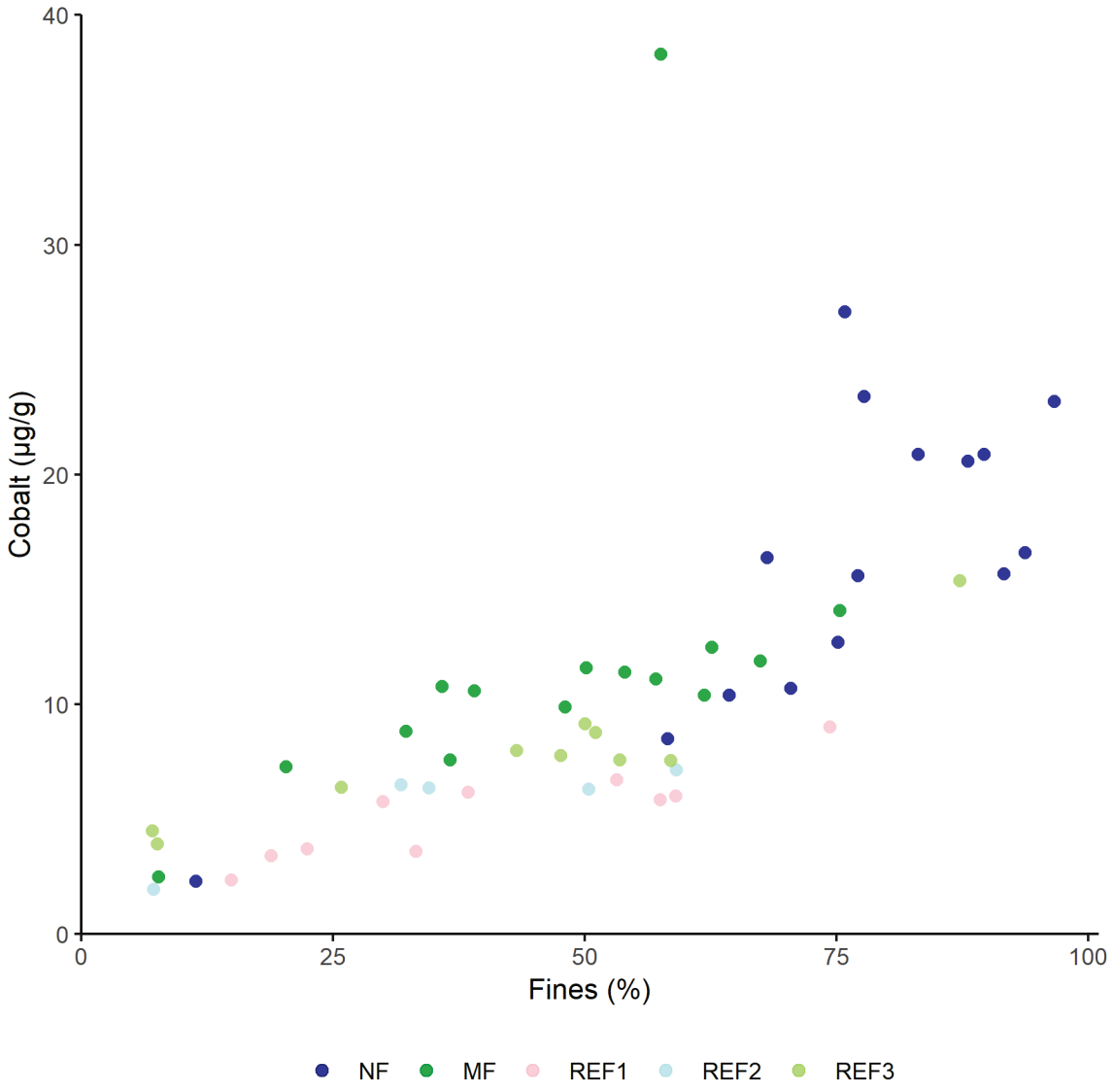
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-10: Concentrations of Calcium Versus Fines in Meliadine Lake, 2015 to 2018



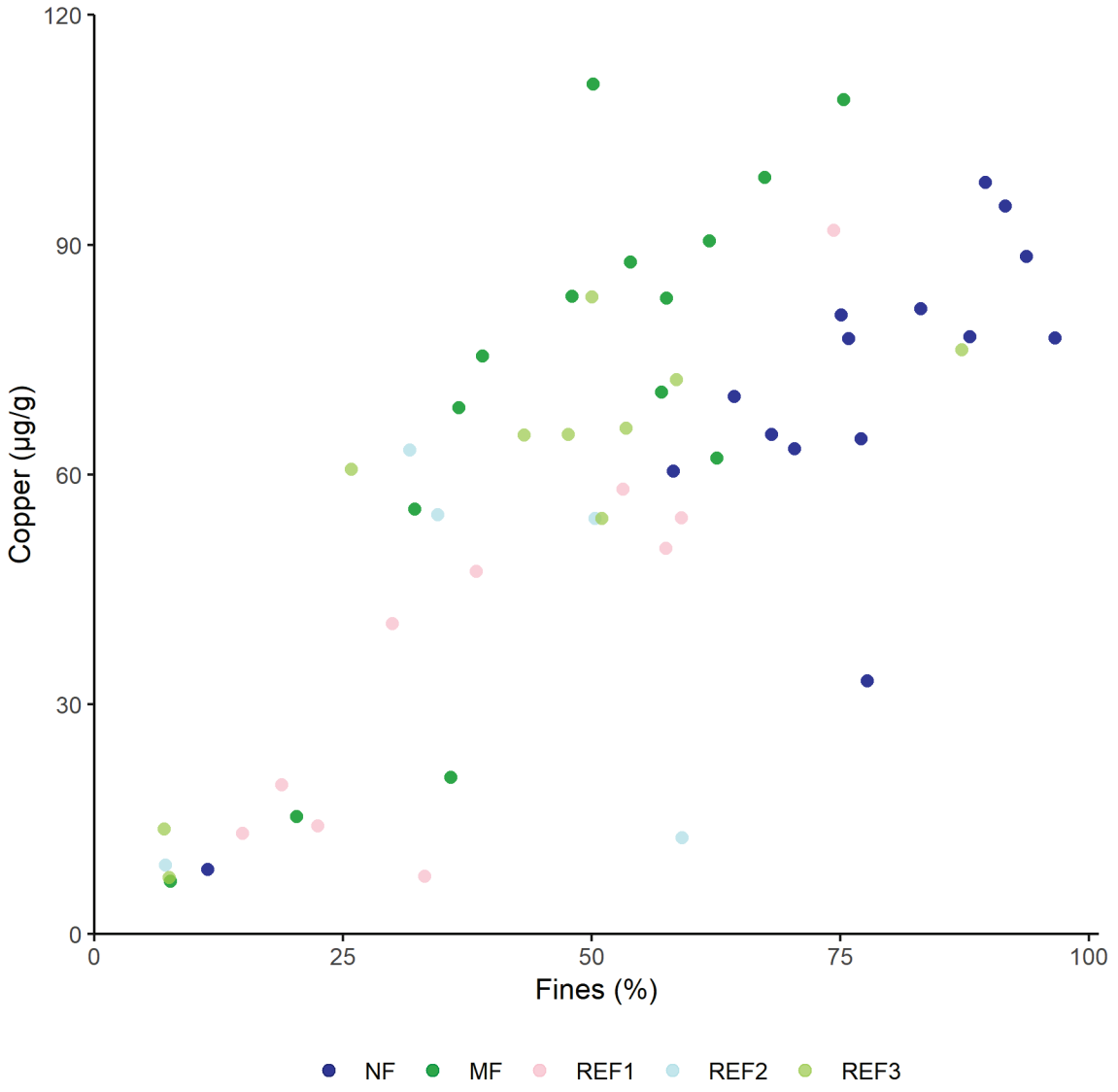
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-11: Concentrations of Chromium Versus Fines in Meliadine Lake, 2015 to 2018



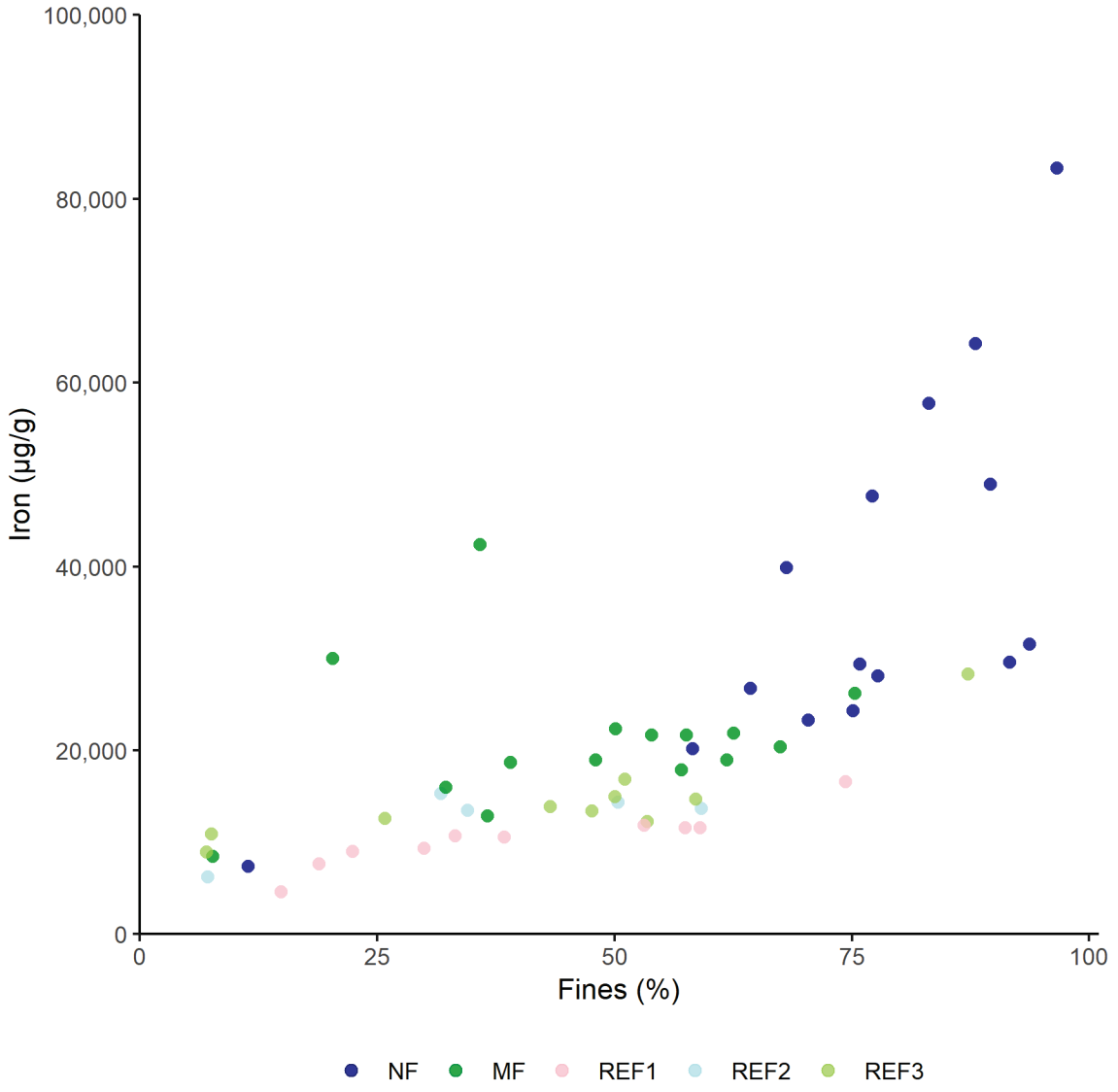
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-12: Concentrations of Cobalt Versus Fines in Meliadine Lake, 2015 to 2018



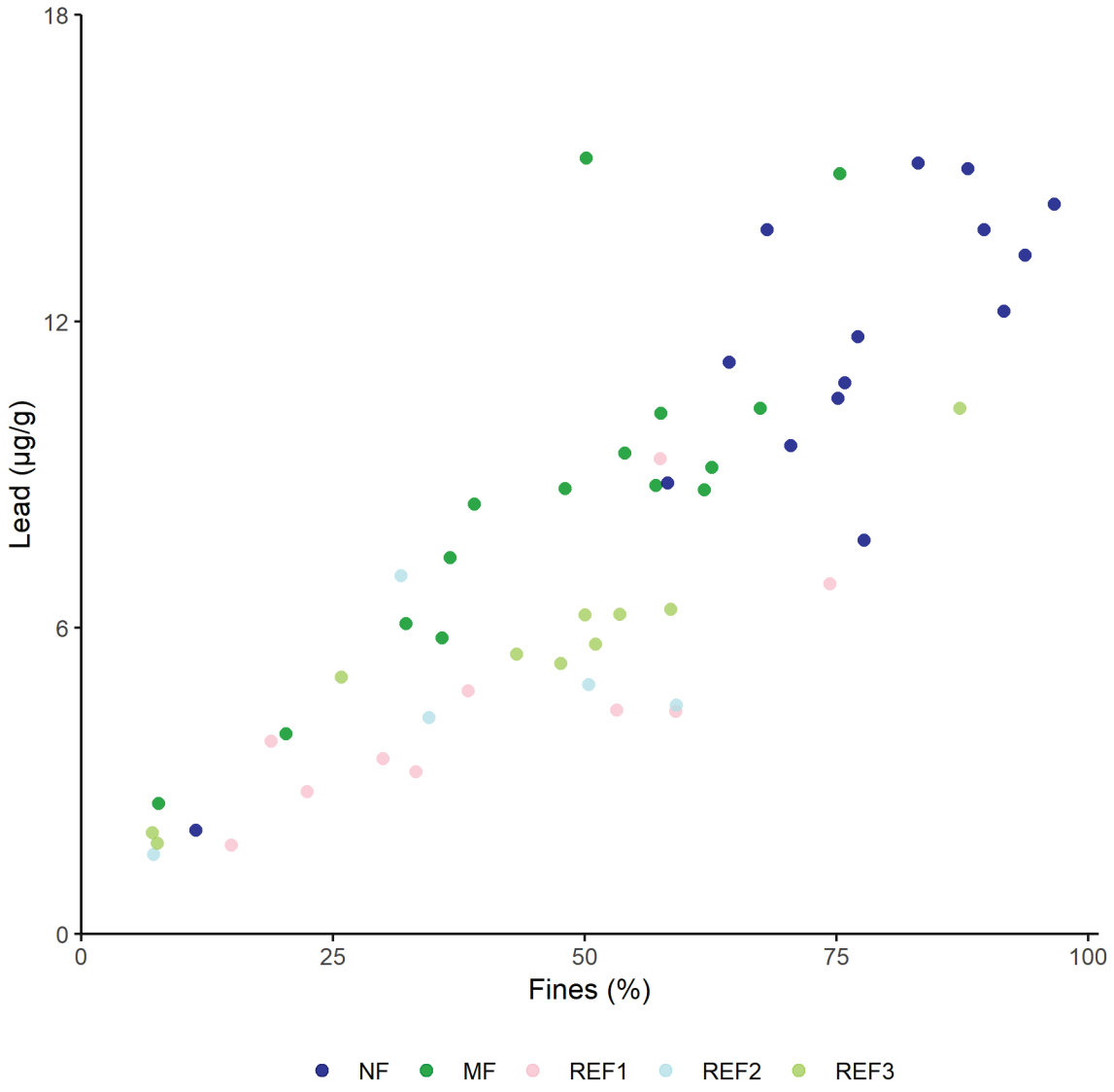
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-13: Concentrations of Copper Versus Fines in Meliadine Lake, 2015 to 2018



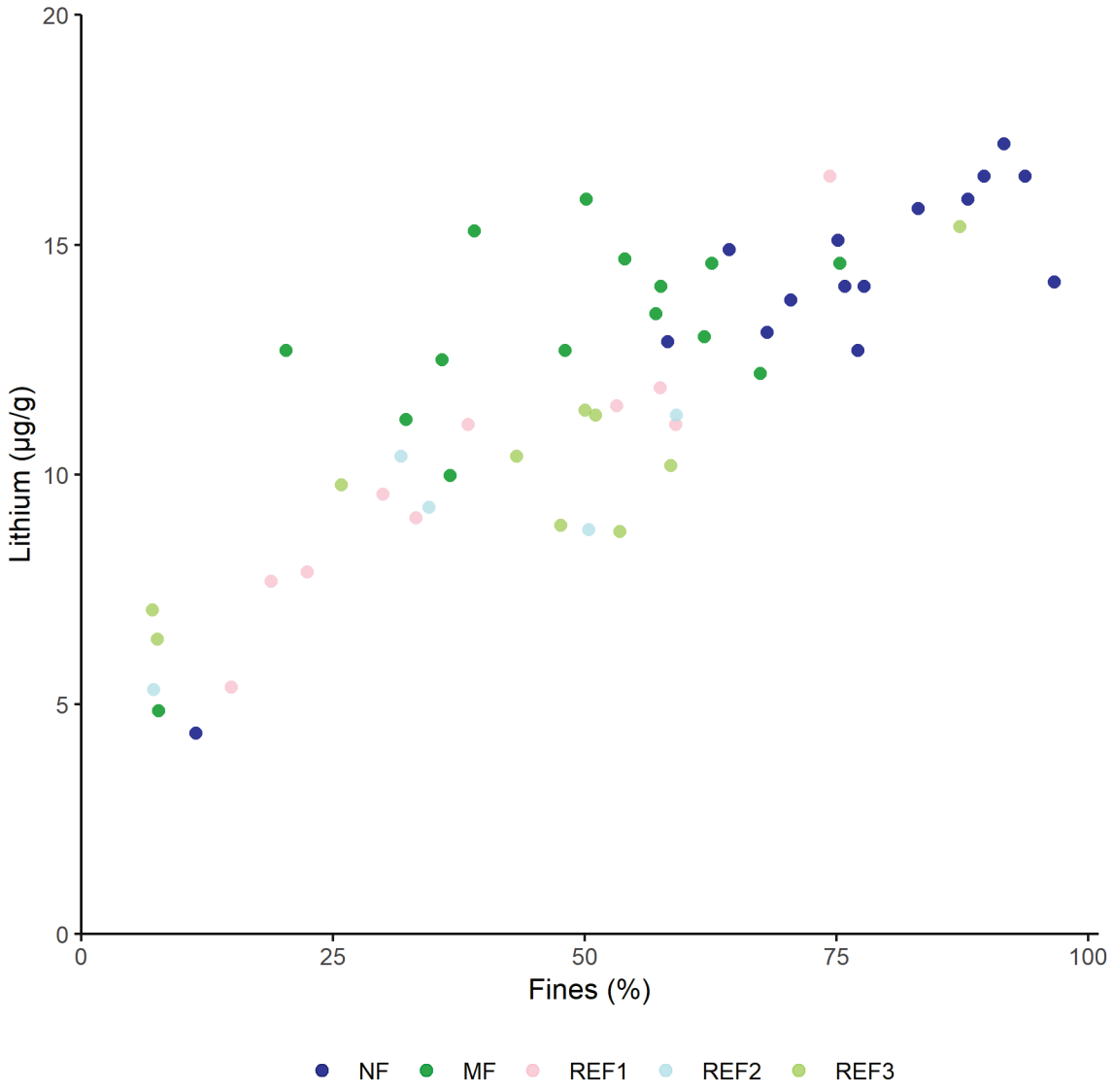
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-14: Concentrations of Iron Versus Fines in Meliadine Lake, 2015 to 2018



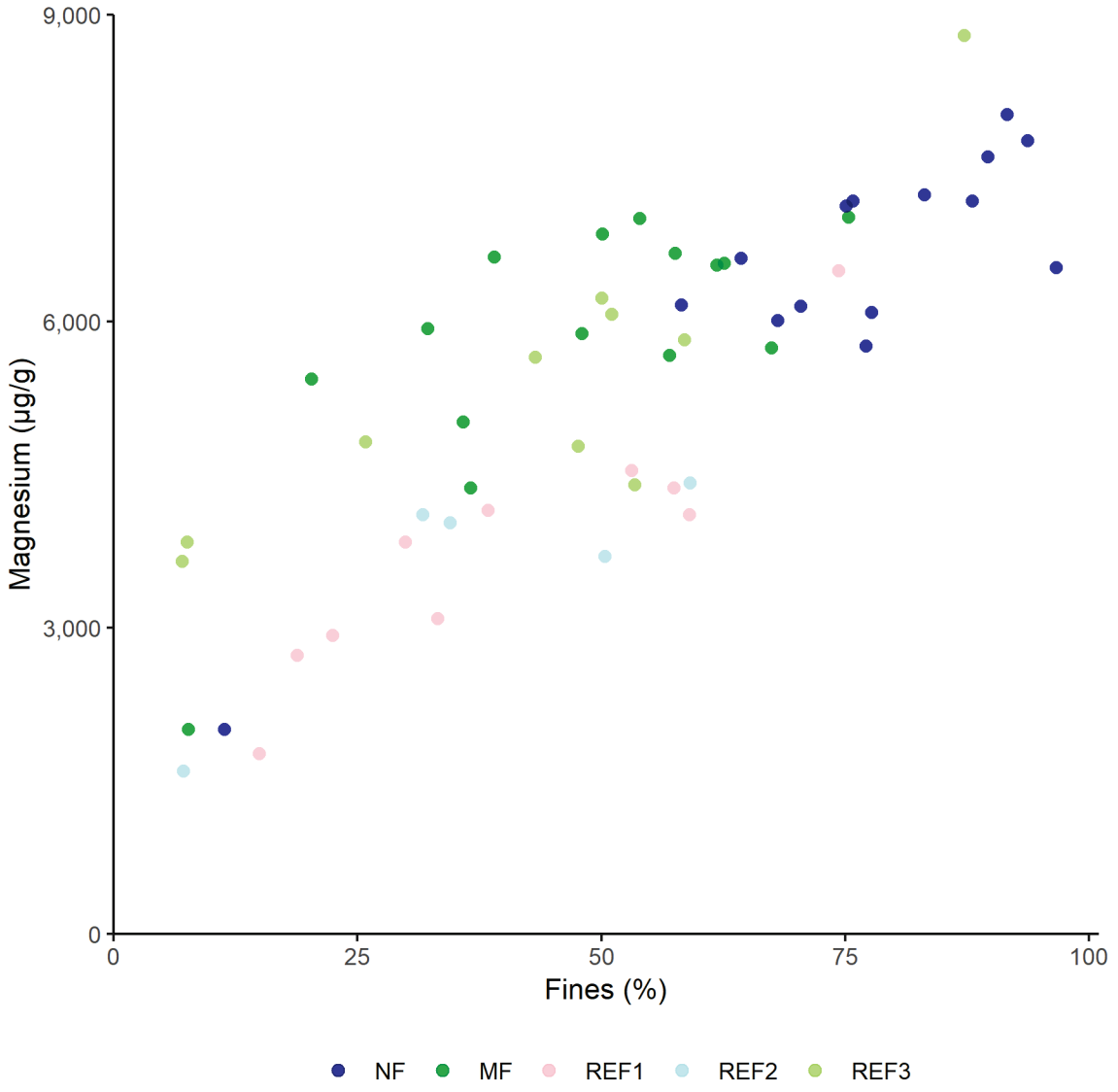
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-15: Concentrations of Lead Versus Fines in Meliadine Lake, 2015 to 2018



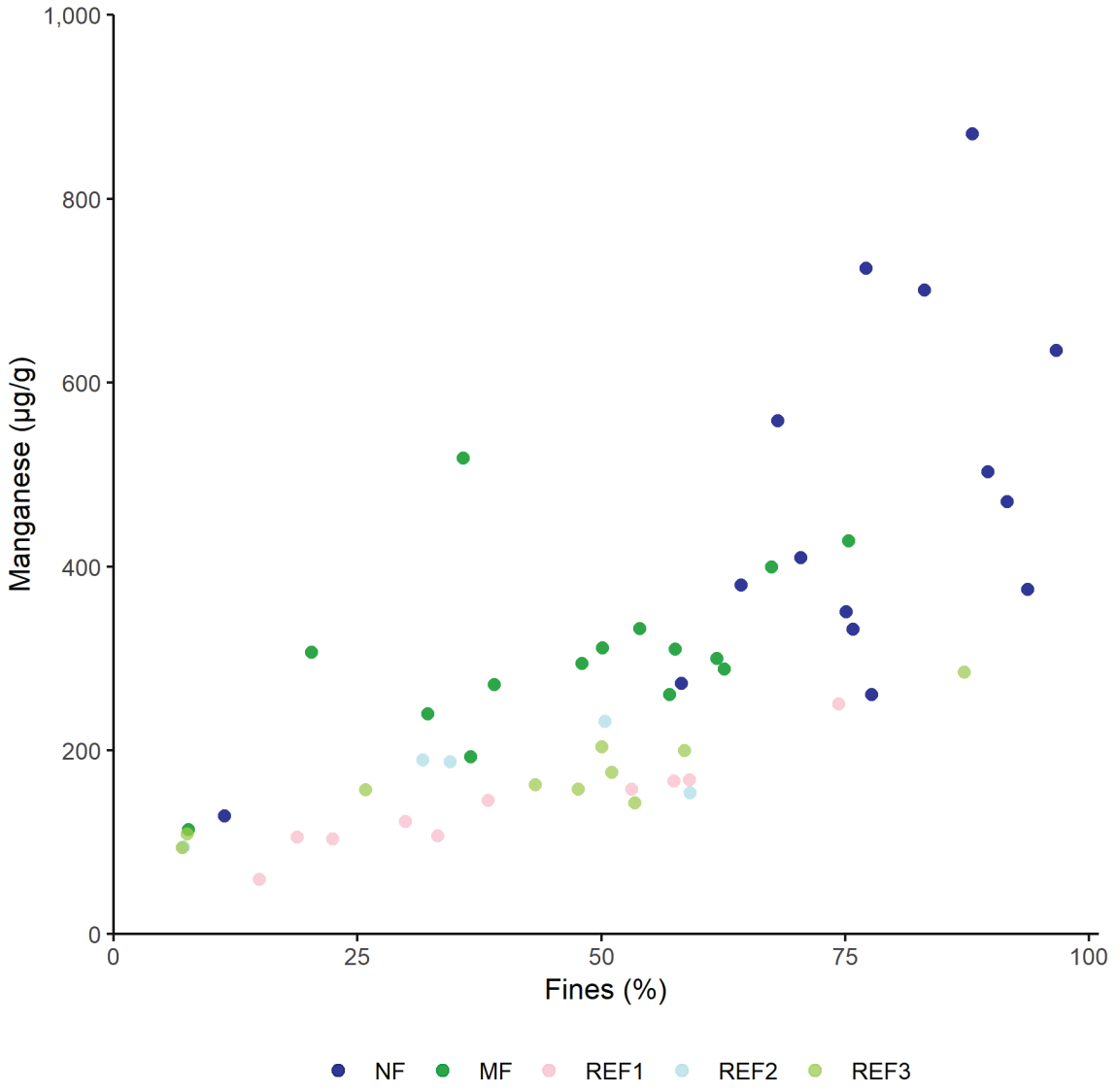
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-16: Concentrations of Lithium Versus Fines in Meliadine Lake, 2015 to 2018



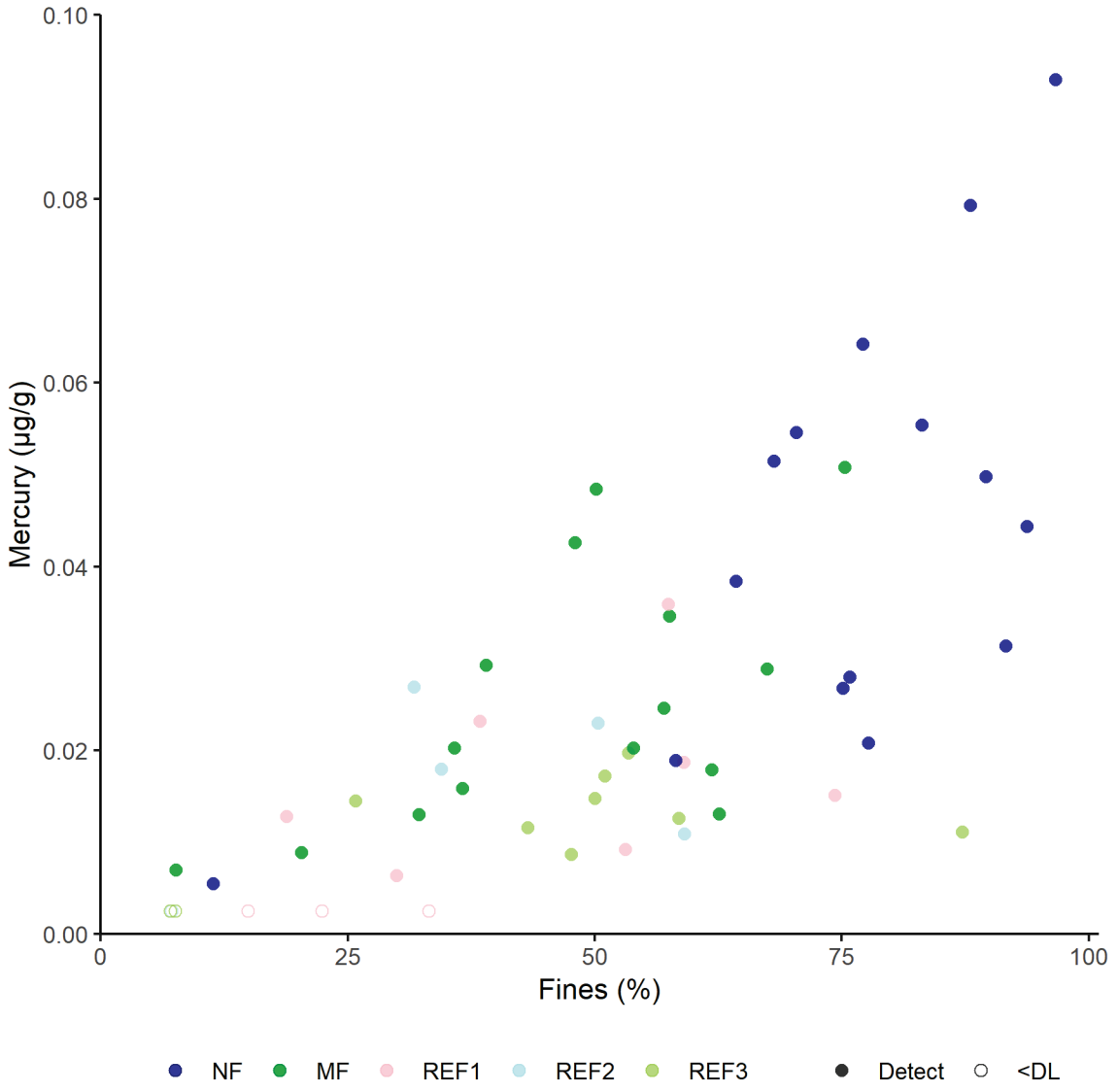
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-17: Concentrations of Magnesium Versus Fines in Meliadine Lake, 2015 to 2018



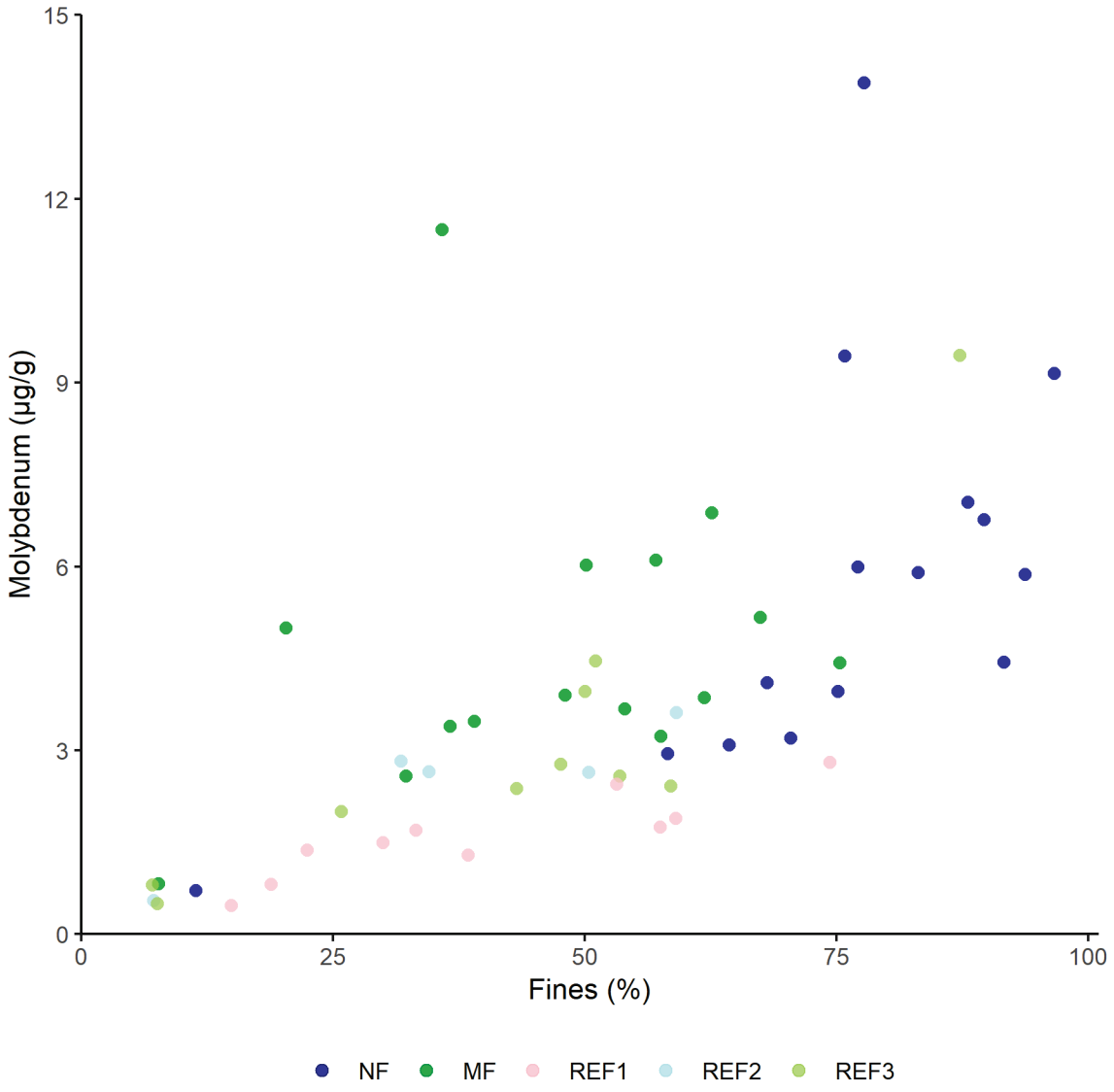
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-18: Concentrations of Manganese Versus Fines in Meliadine Lake, 2015 to 2018



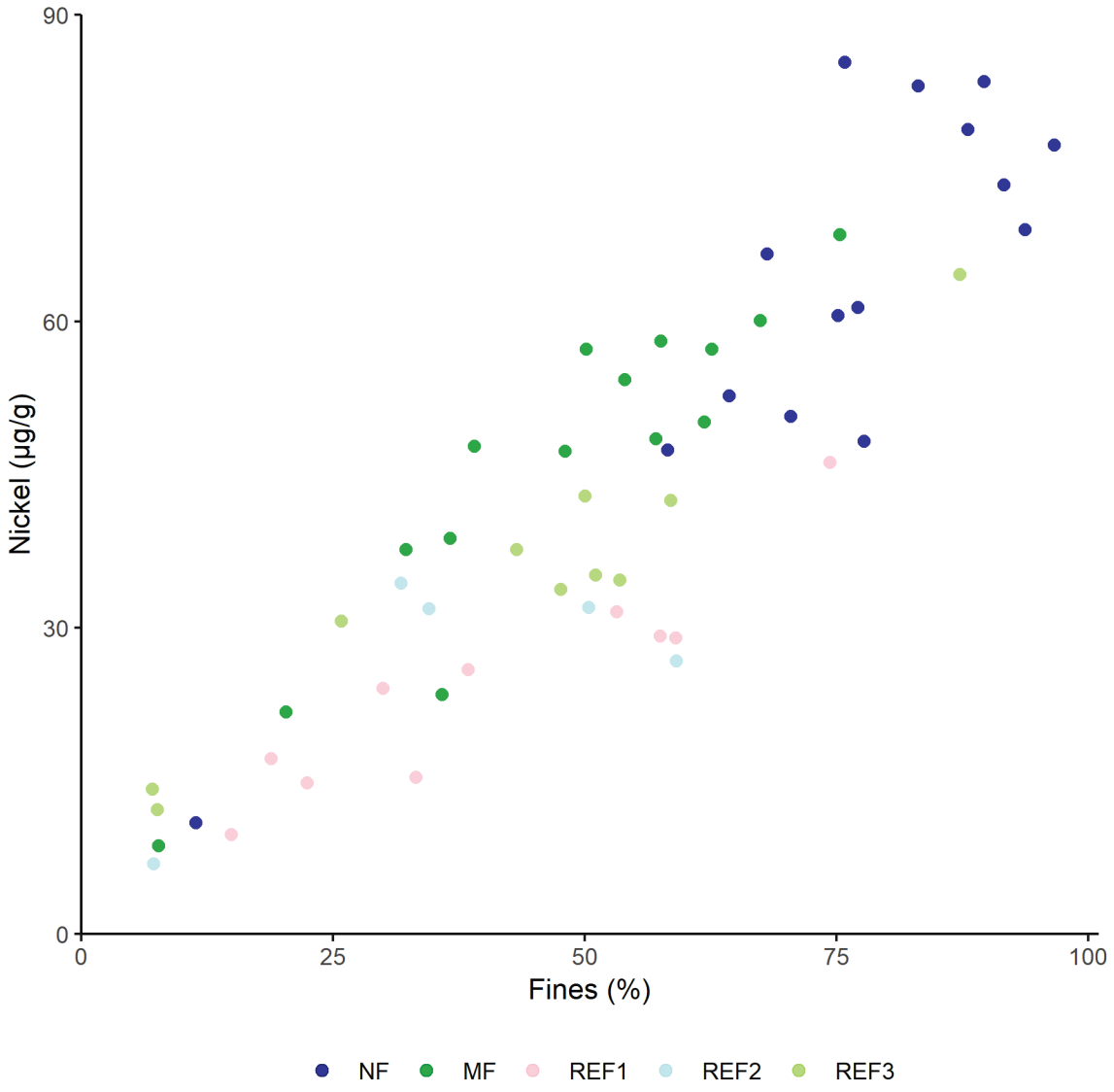
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-19: Concentrations of Mercury Versus Fines in Meliadine Lake, 2015 to 2018



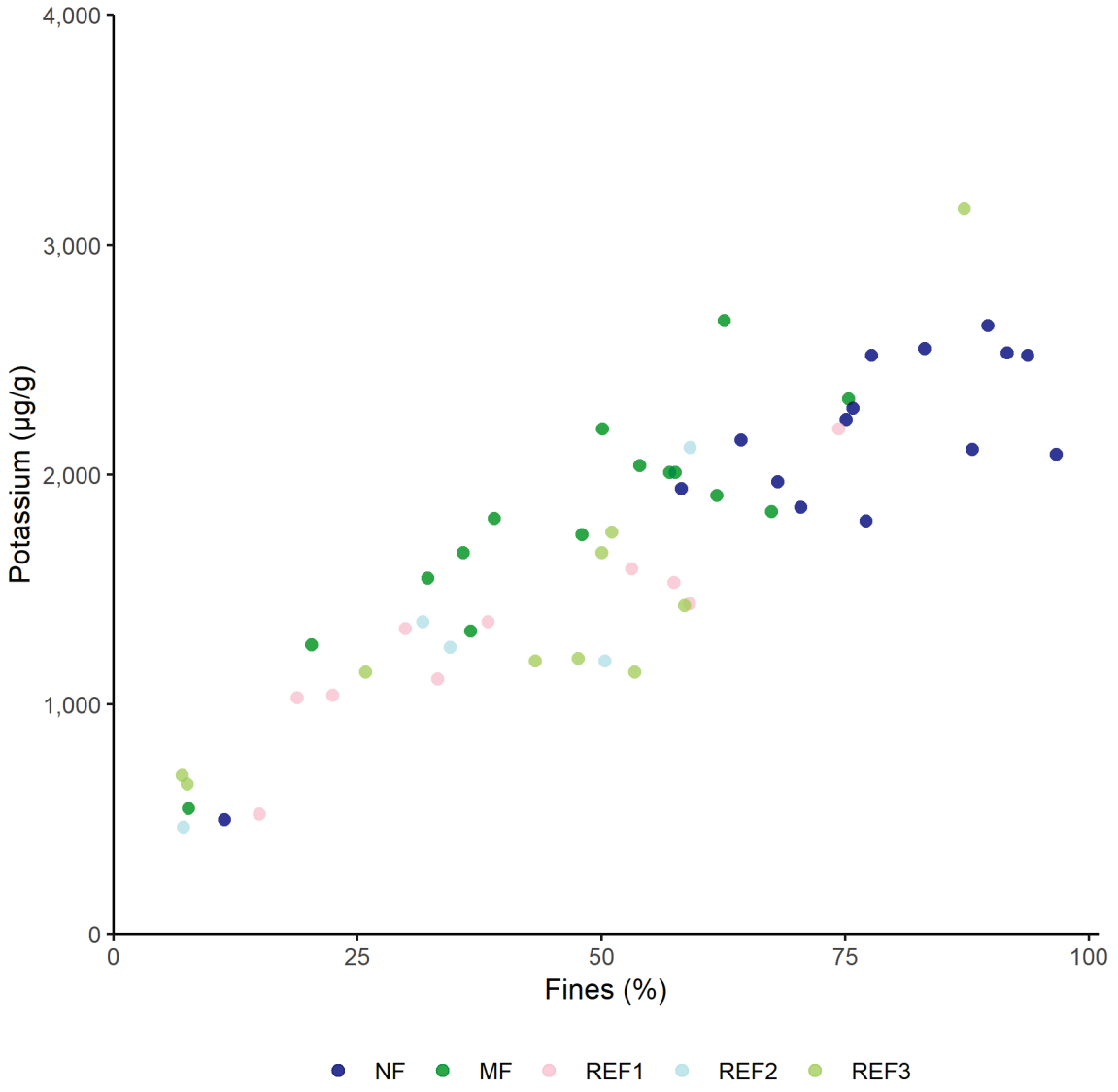
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-20: Concentrations of Molybdenum Versus Fines in Meliadine Lake, 2015 to 2018



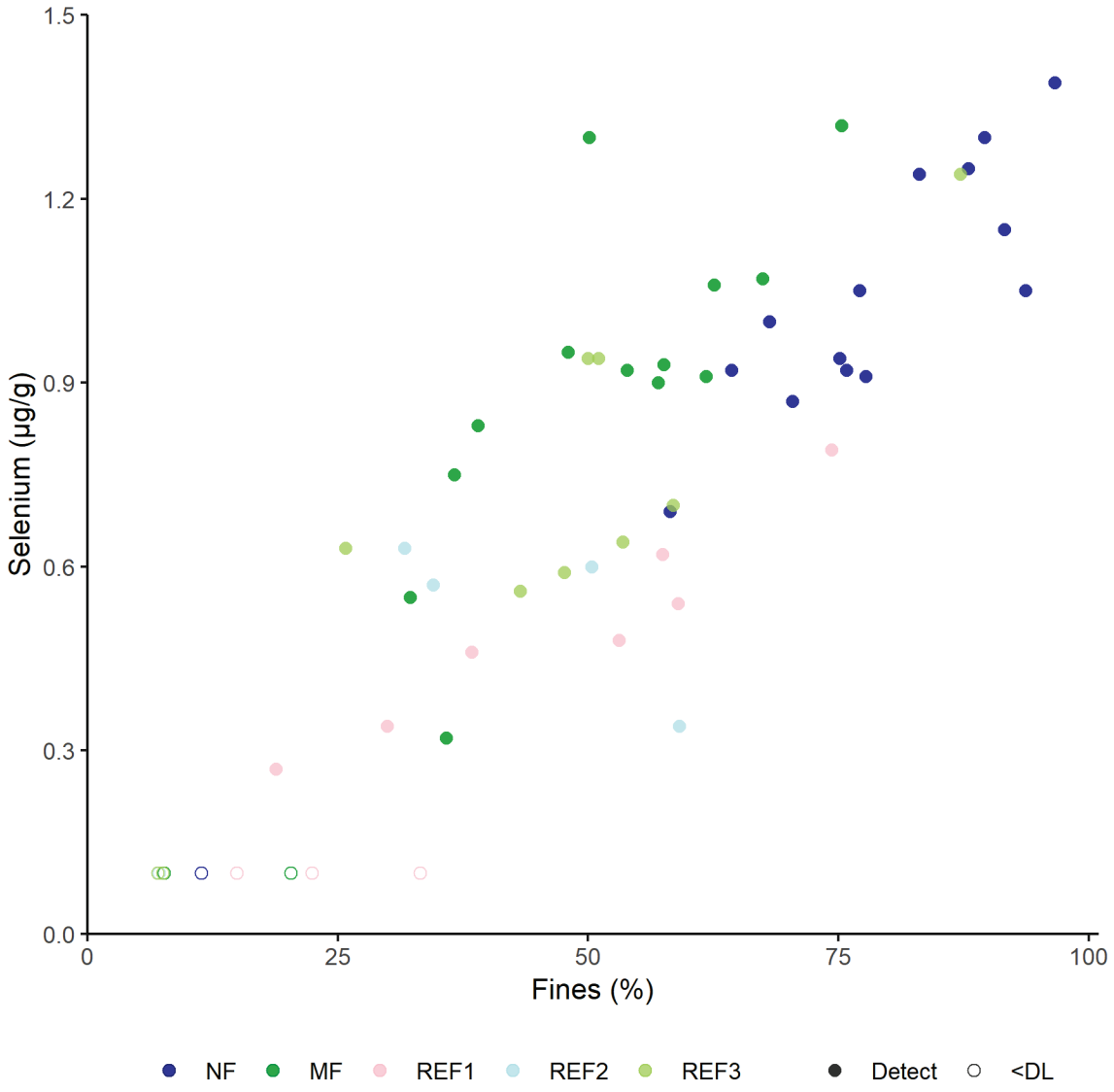
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-21: Concentrations of Nickel Versus Fines in Meliadine Lake, 2015 to 2018



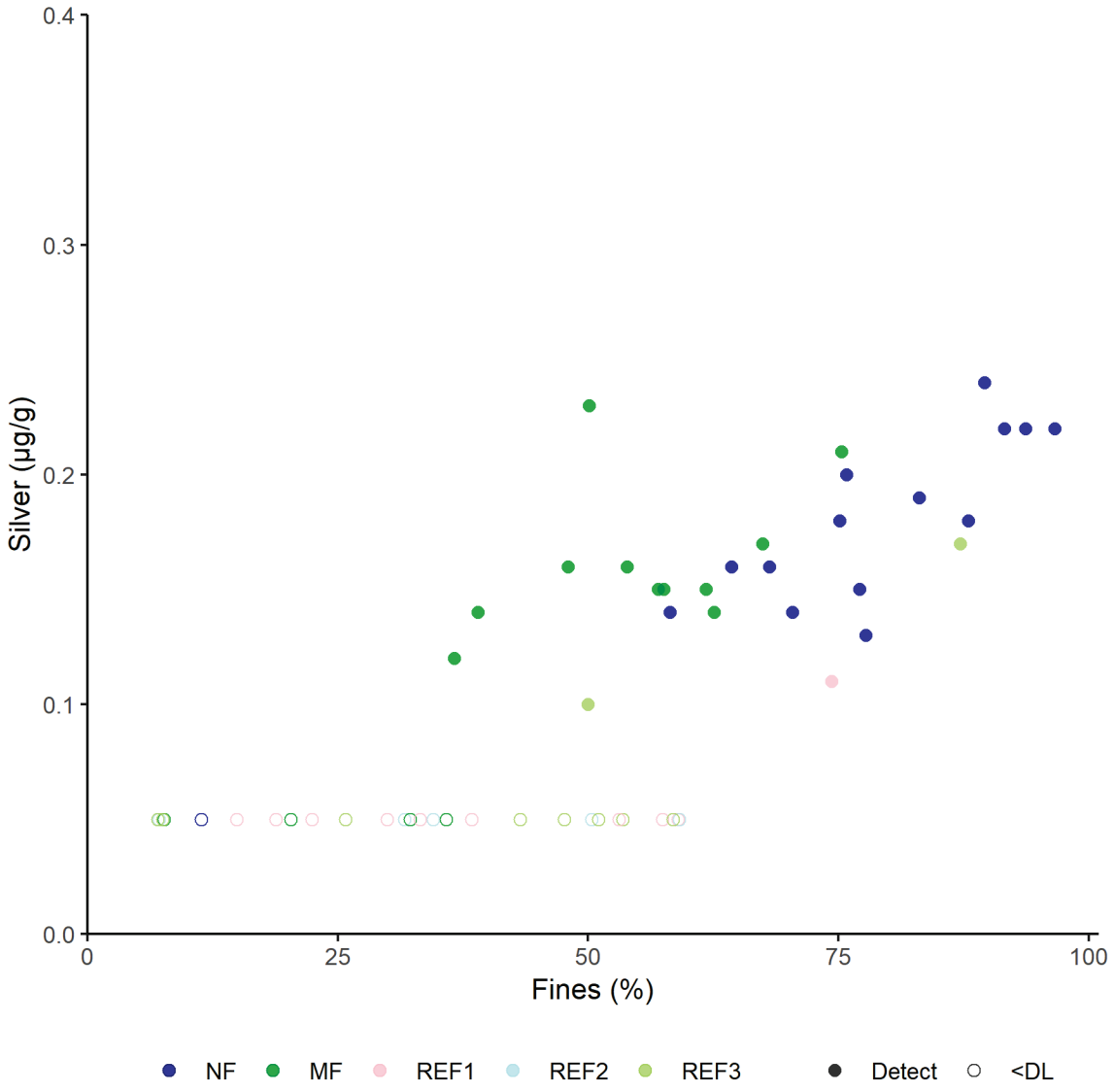
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-22: Concentrations of Potassium Versus Fines in Meliadine Lake, 2015 to 2018



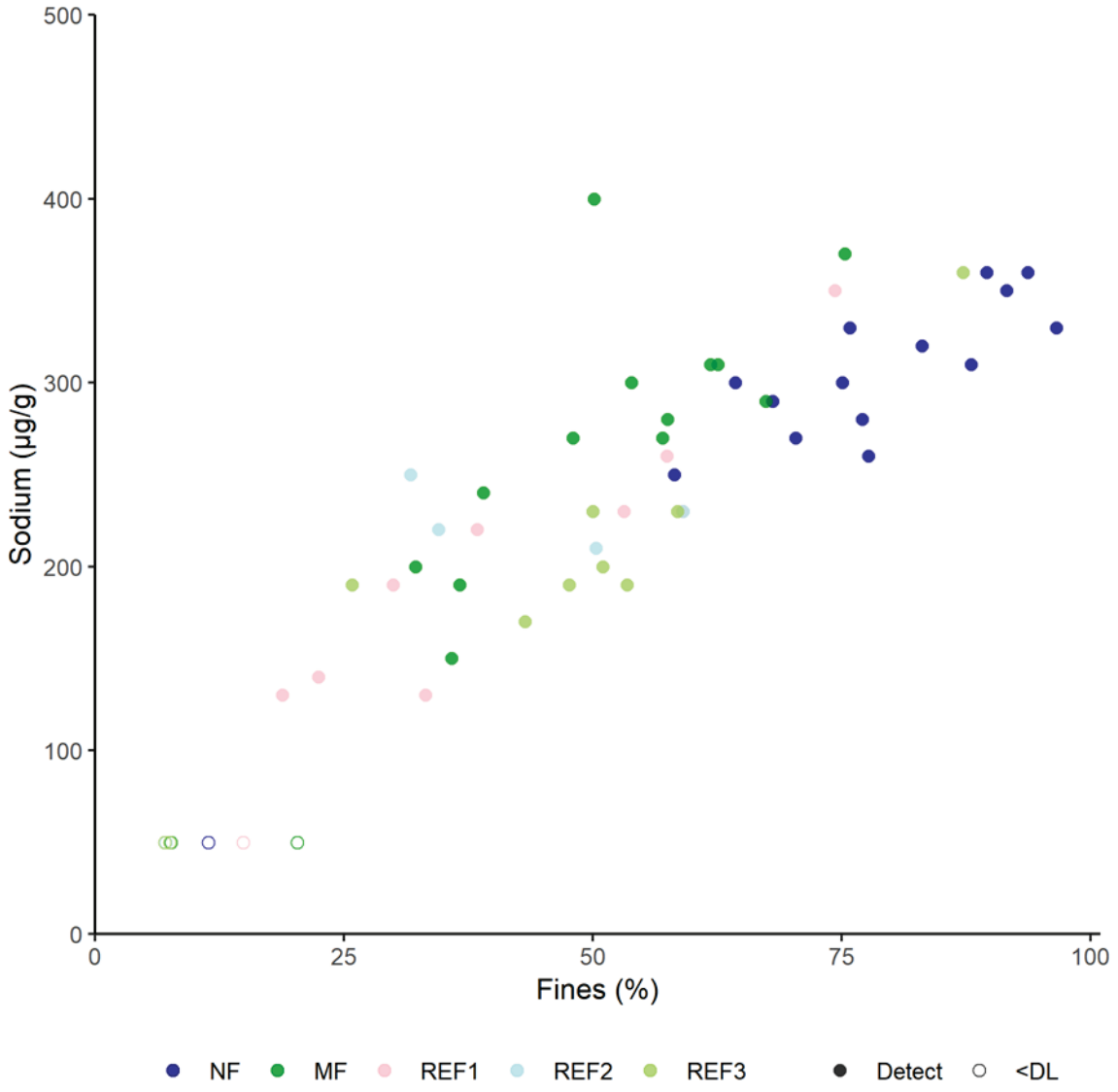
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-23: Concentrations of Selenium Versus Fines in Meliadine Lake, 2015 to 2018



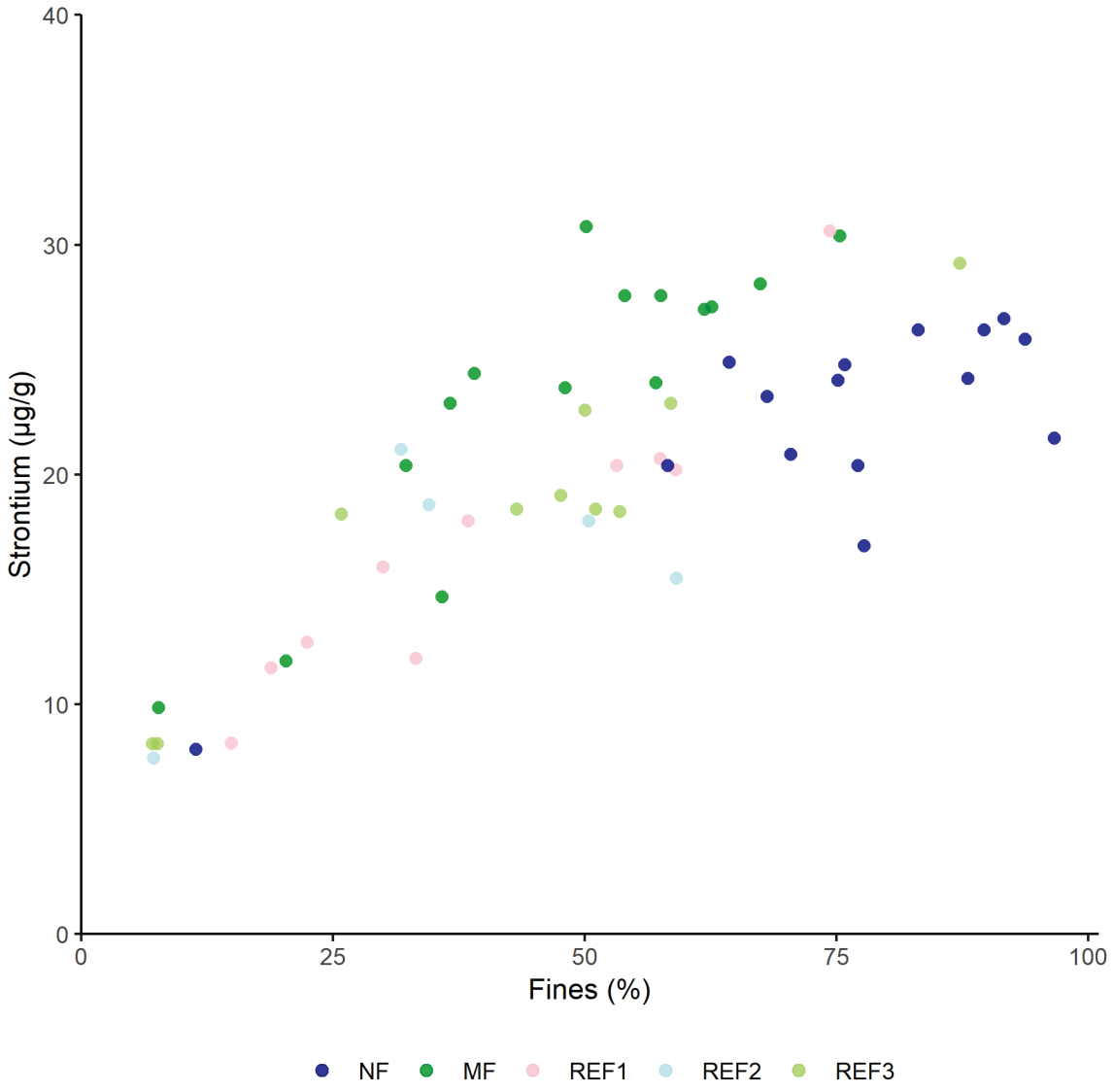
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-24: Concentrations of Silver Versus Fines in Meliadine Lake, 2015 to 2018



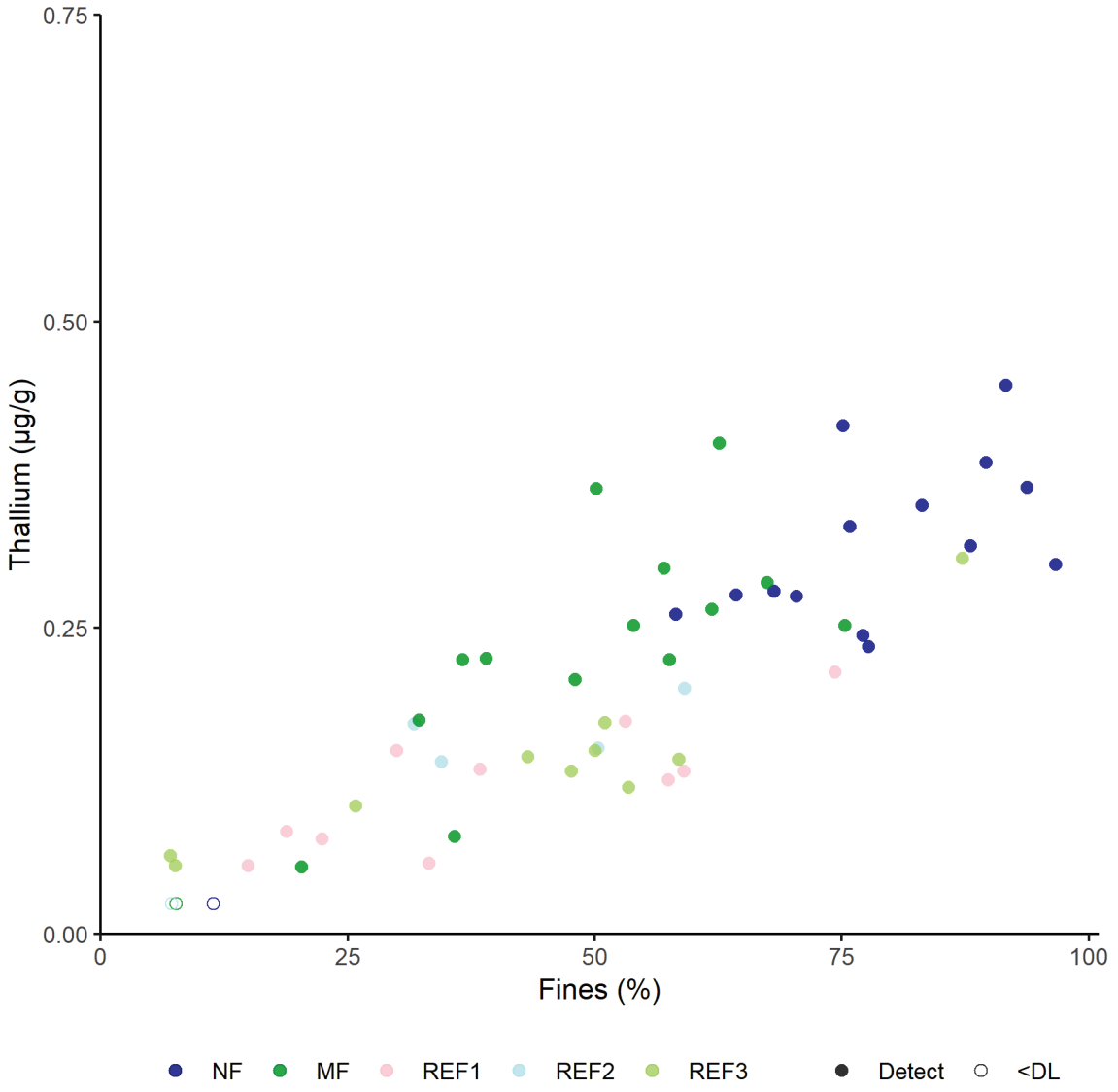
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-25: Concentrations of Sodium Versus Fines in Meliadine Lake, 2015 to 2018



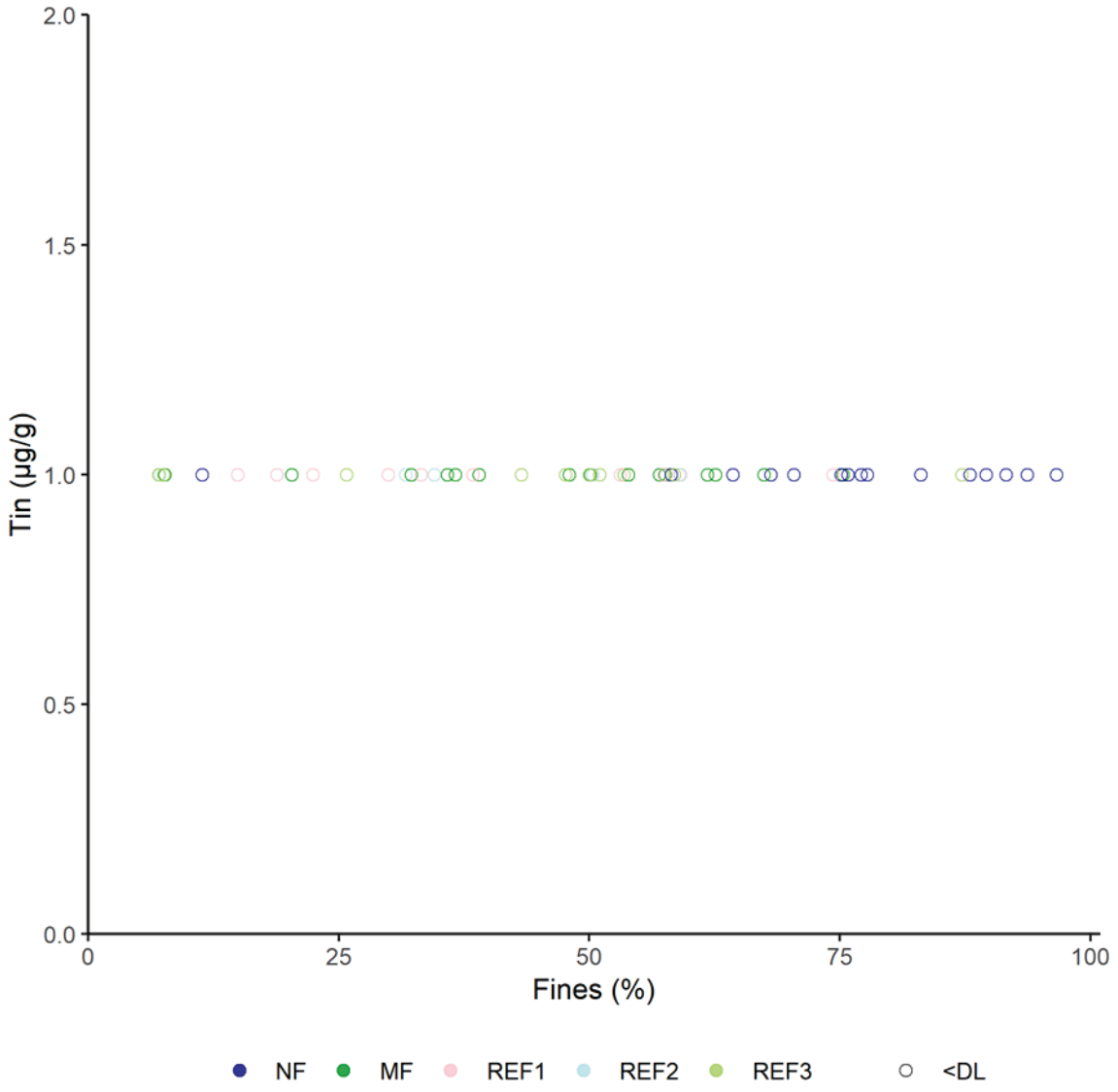
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-26: Concentrations of Strontium Versus Fines in Meliadine Lake, 2015 to 2018



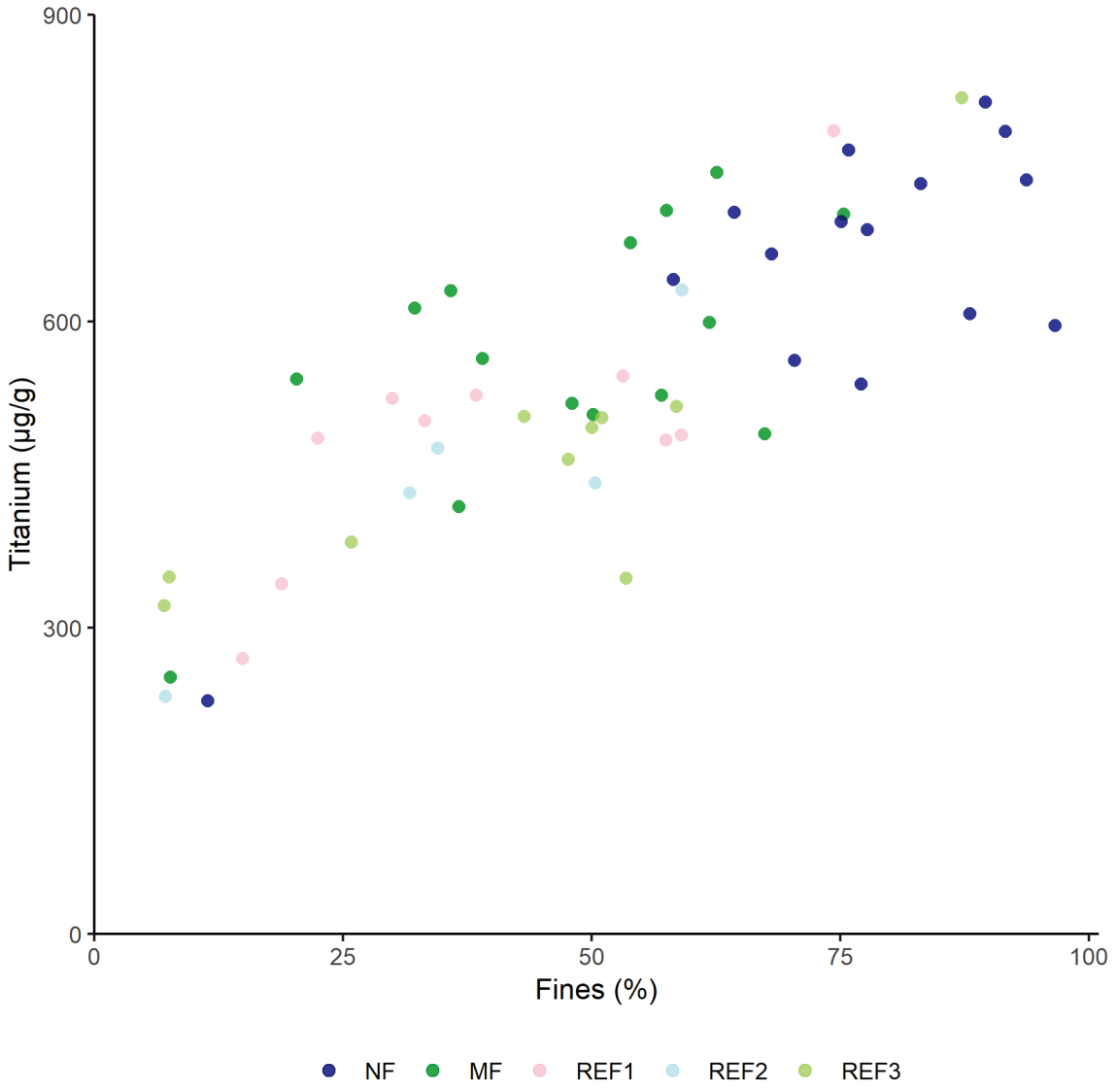
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-27: Concentrations of Thallium Versus Fines in Meliadine Lake, 2015 to 2018



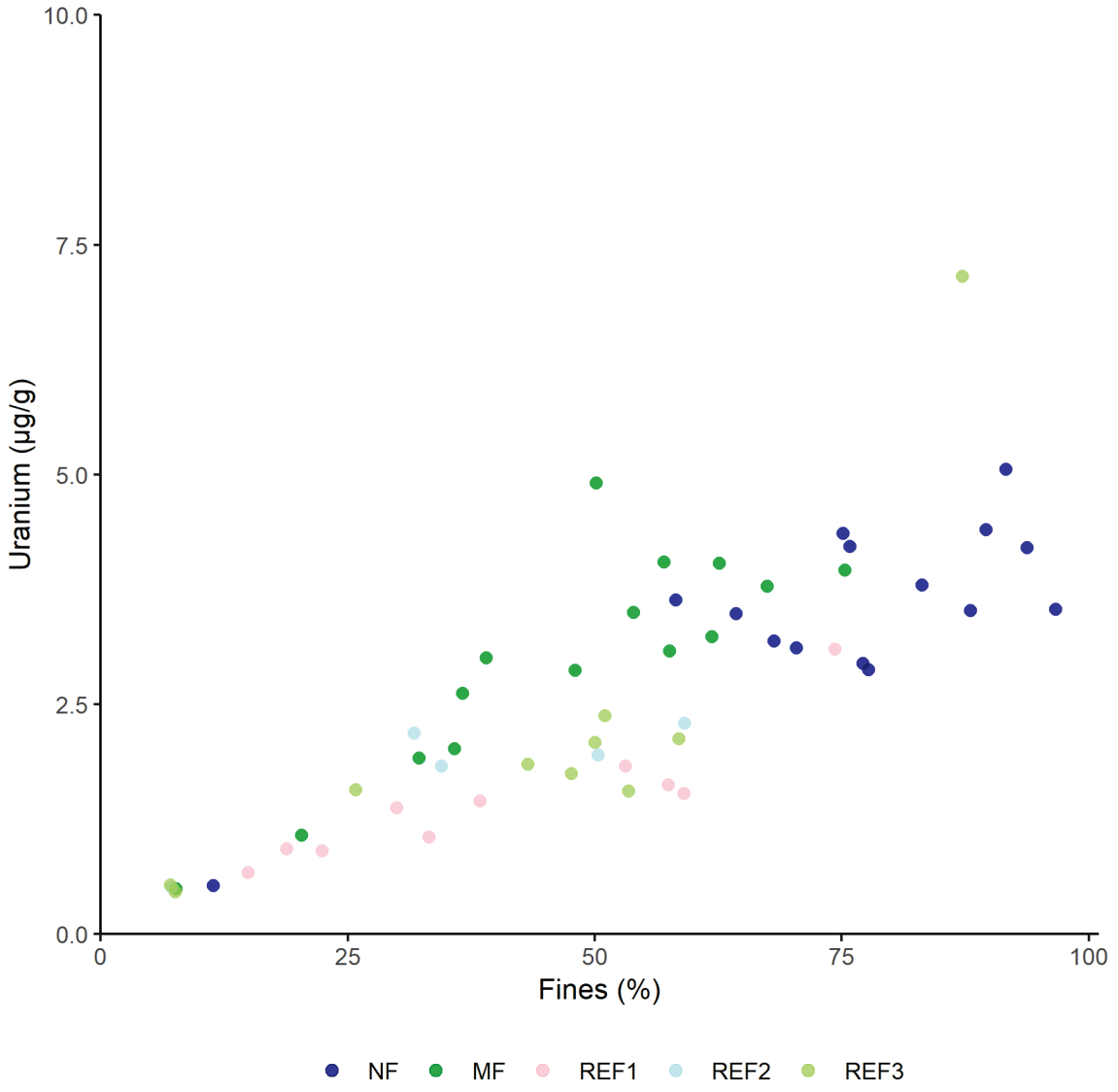
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-28: Concentrations of Tin Versus Fines in Meliadine Lake, 2015 to 2018



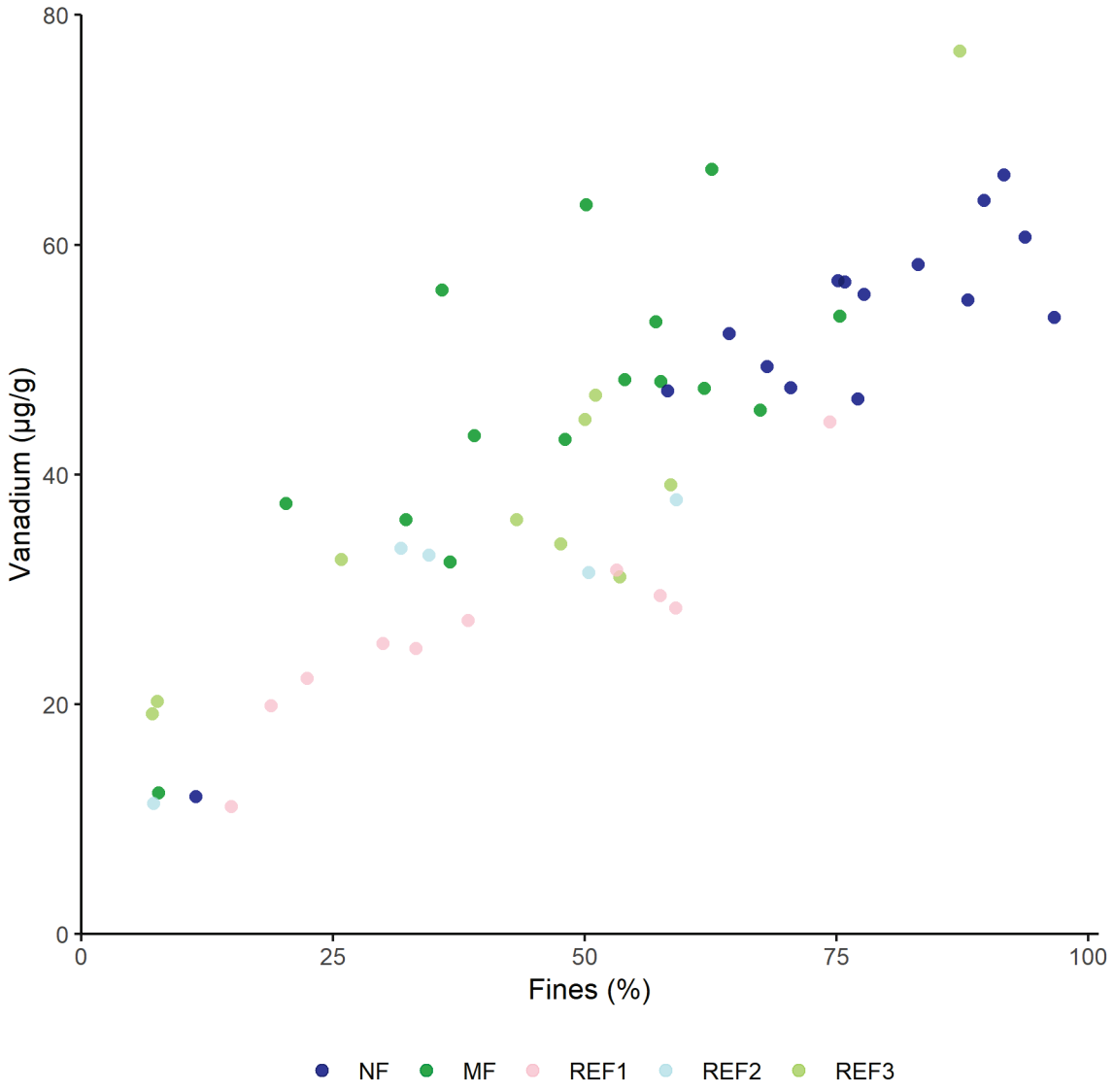
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-29: Concentrations of Titanium Versus Fines in Meliadine Lake, 2015 to 2018



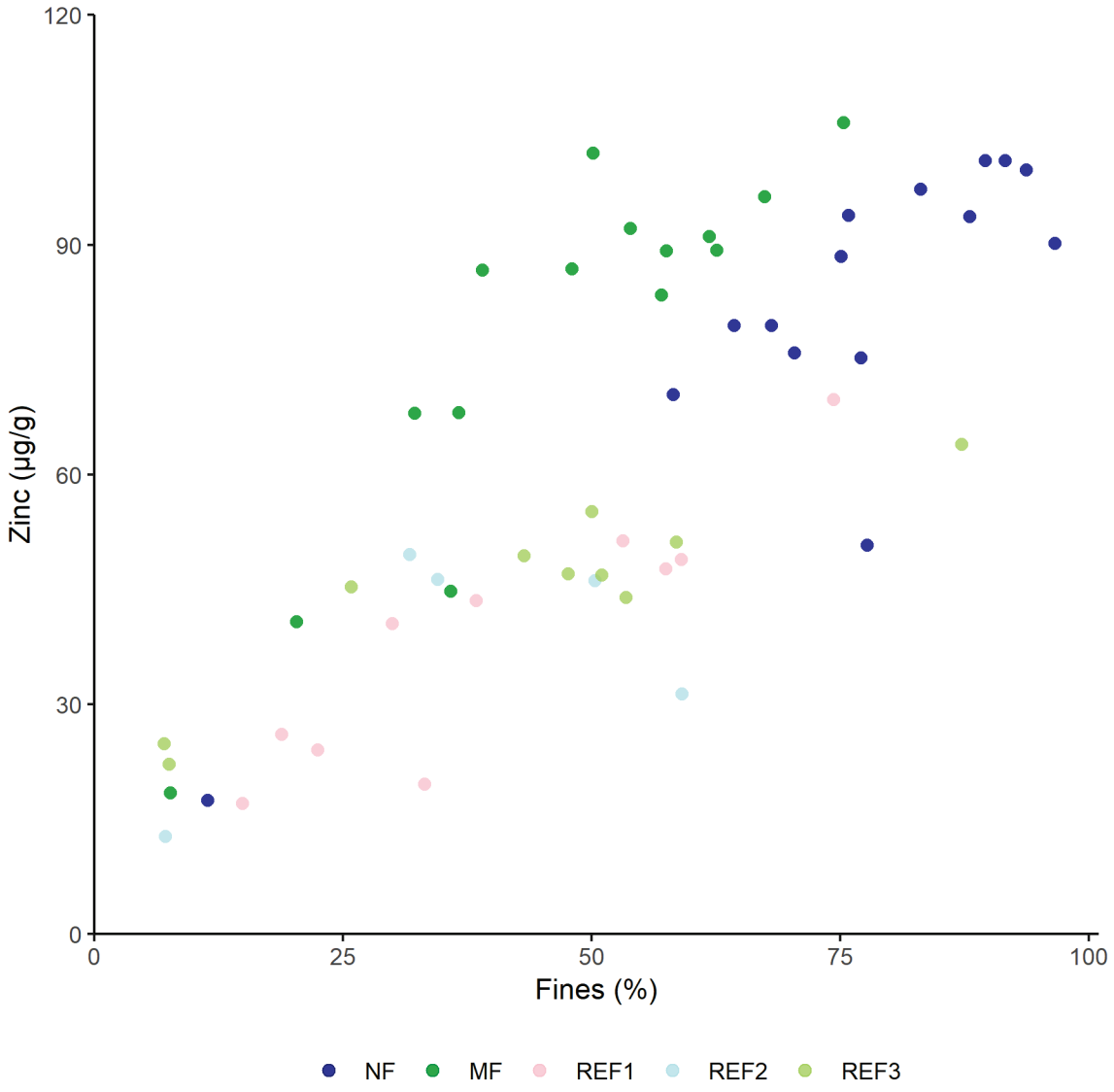
µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-30: Concentrations of Uranium Versus Fines in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-31: Concentrations of Vanadium Versus Fines in Meliadine Lake, 2015 to 2018



µg/g = micrograms per gram; open symbols represent results that are less than the detection limit.

Figure 8E.1-32: Concentrations of Zinc Versus Fines in Meliadine Lake, 2015 to 2018

APPENDIX 8F

Statistical Outliers

Table 8F-1: Outliers Identified in the Sediment Quality Dataset During Statistical Analysis

Parameter	Unit	Year	Area	Station	Outlier	SR Value	*P*-value with Outlier included	Change in Analysis	Data Entry Error
2018 Spatial Analysis									
Total Organic Carbon	% / %Fines	2018	Reference Area 1	MEL-03-02	0.86	-4.454	**0.003**	N	N
Arsenic	µg/g %Fines	2018	Reference Area 3	MEL-05-01	45.1	5.217	0.104	**Y**	N
Barium	µg/g %Fines	2018	Reference Area 3	MEL-05-01	280	3.845	**0.026**	N	N
Calcium	µg/g %Fines	2018	Reference Area 3	MEL-05-01	19125	6.476	**0.038**	N	N
Cobalt	µg/g %Fines	2018	Reference Area 3	MEL-05-01	49.3	6.106	0.214	**Y**	N
Copper	µg/g %Fines	2018	Reference Area 1	MEL-03-02	22.9	-3.941	**0.007**	N	N
Lead	µg/g %Fines	2018	Reference Area 3	MEL-05-01	22.3	6.425	**0.006**	N	N
Molybdenum	µg/g %Fines	2018	Near-field	MEL-01-09	12.5	3.93	**0.064**	N	N
Nickel	µg/g %Fines	2018	Reference Area 3	MEL-05-01	152.5	5.887	0.263	**Y**	N
Strontium	µg/g %Fines	2018	Reference Area 3	MEL-05-01	103.8	7.65	**0.097**	N	N
Thallium	µg/g %Fines	2018	Reference Area 3	MEL-05-01	0.7	4.479	**0.085**	N	N
Uranium	µg/g %Fines	2018	Reference Area 3	MEL-05-05	8.2	5.3150	**0.060**	N	N
Zinc	µg/g %Fines	2018	Reference Area 3	MEL-05-01	277.5	7.981	**0.090**	N	N

Note:
Outliers were identified during statistical testing as those having SR values greater than or equal to an absolute value of 3.5.
Bold values indicate statistical significance. Tests were considered significant at $P < 0.1$.
Underlined values indicate that the results of the analysis was influenced by the outlier.
SR = studentized residual; µg/g = micrograms per gram.

APPENDIX 8G

Box-and-Whisker Plots from the Near-field Comparing Years

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1.0 PARTICLE-SIZE AND ORGANIC CARBON

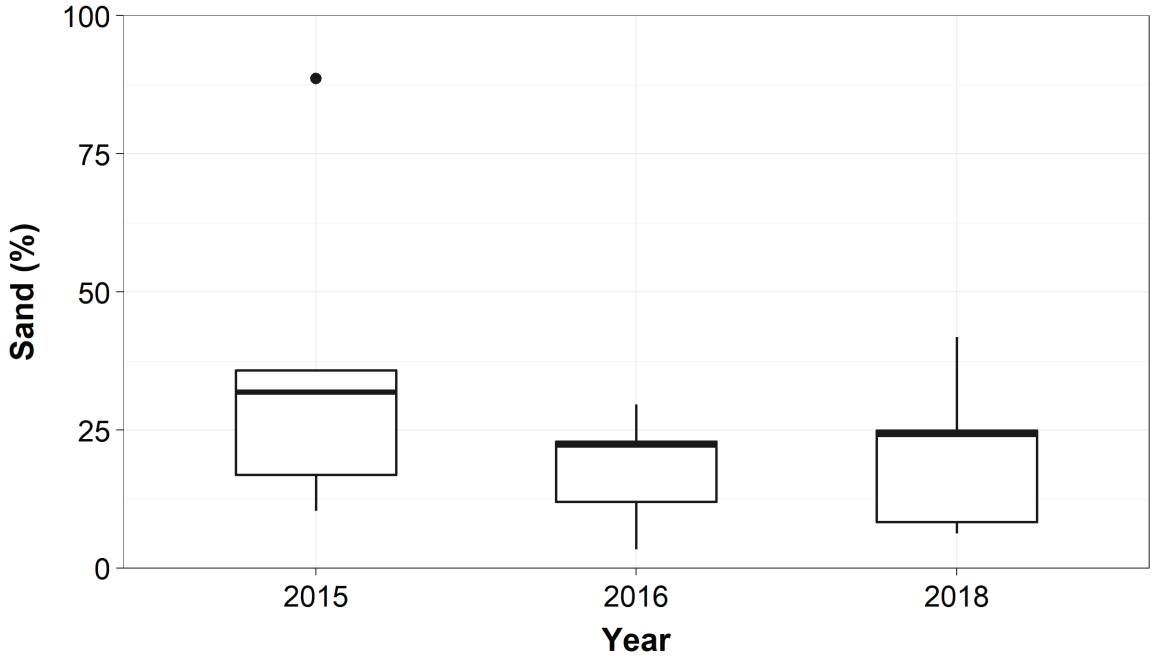


Figure 8G.1-1: Box-and-whisker Plots of Sand (%) Concentrations in Meliadine Lake Near-field Area, 2018

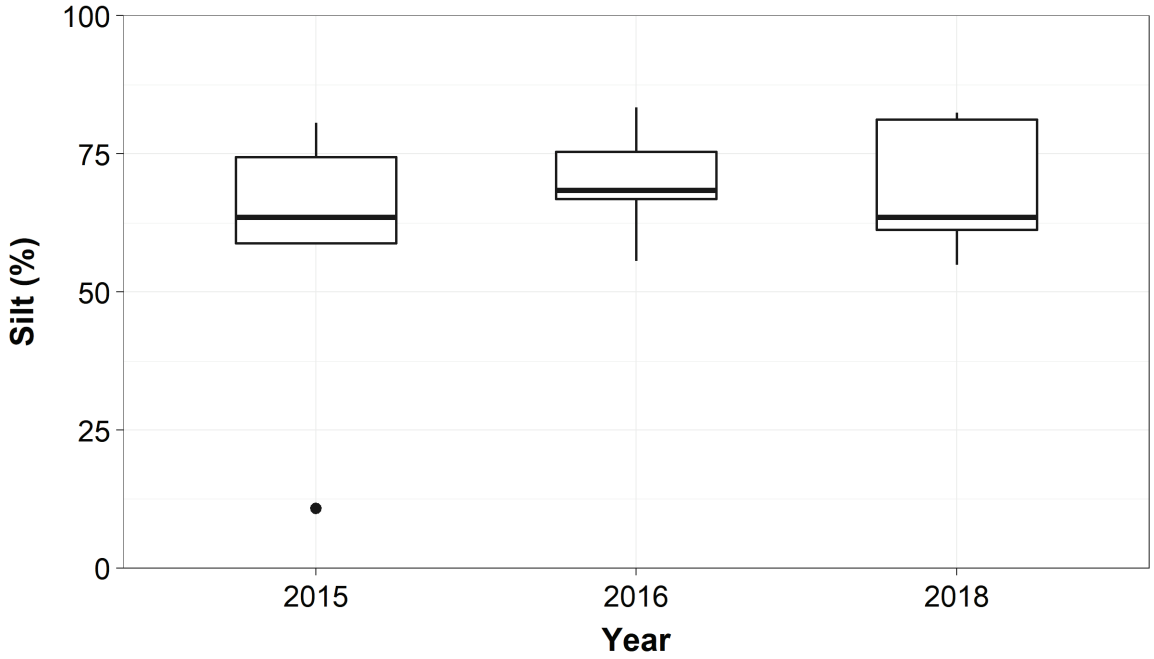


Figure 8G.1-2: Box-and-whisker Plots of Silt (%) Concentrations in Meliadine Lake Near-field Area, 2018

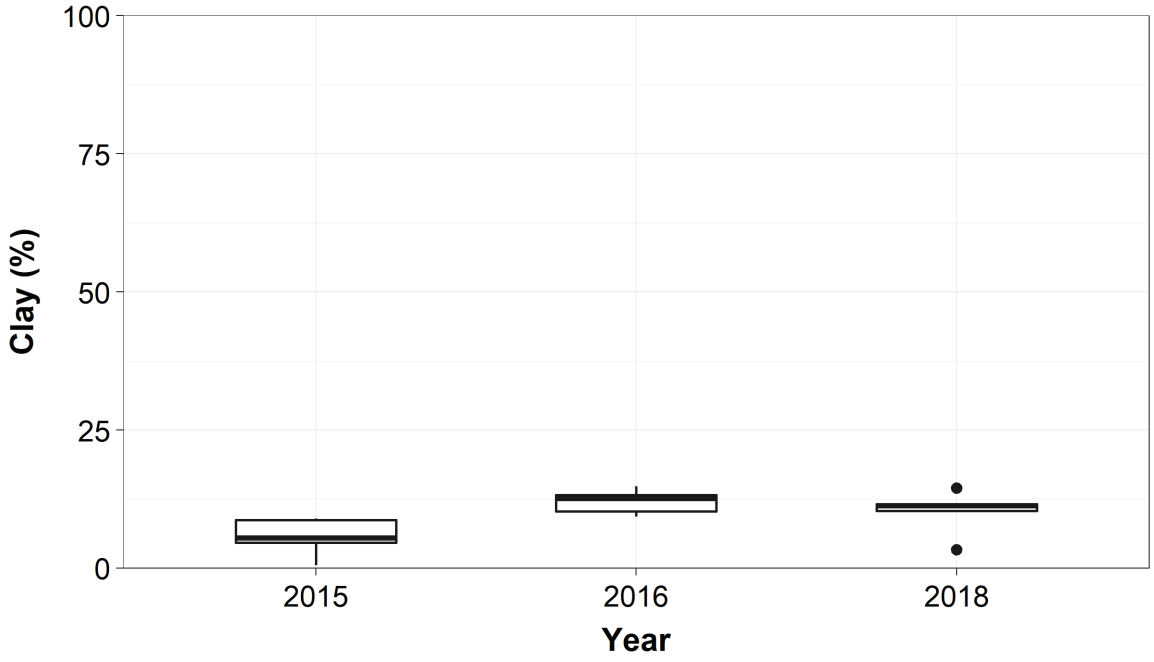


Figure 8G.1-3: Box-and-whisker Plots of Clay (%) Concentrations in Meliadine Lake Near-field Area, 2018

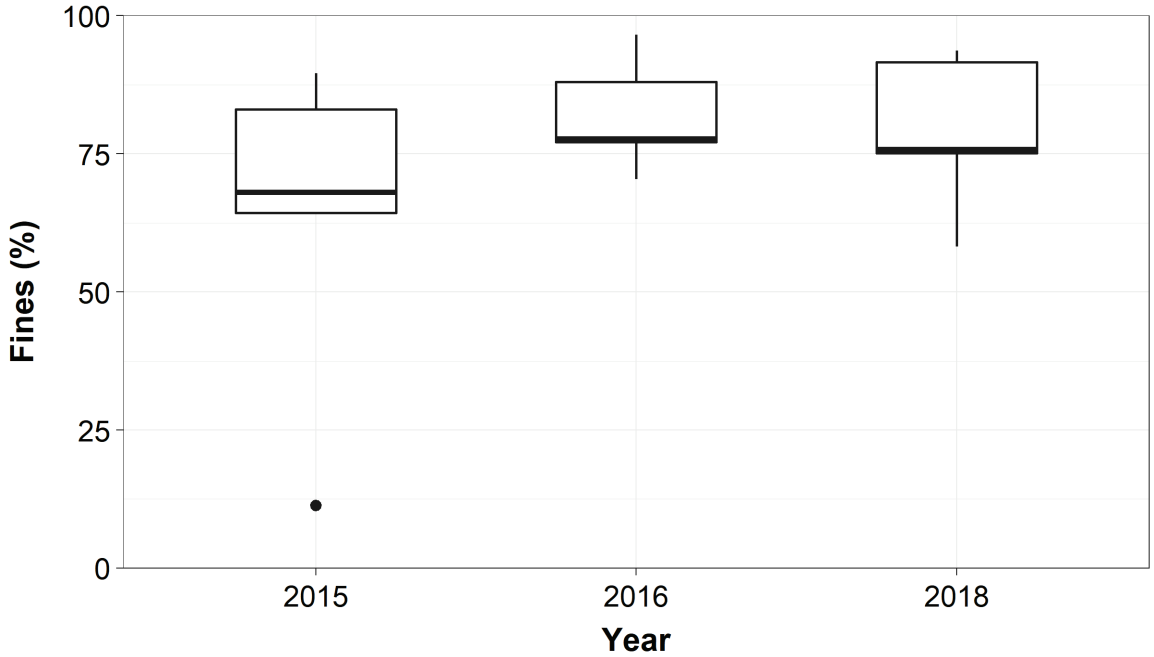
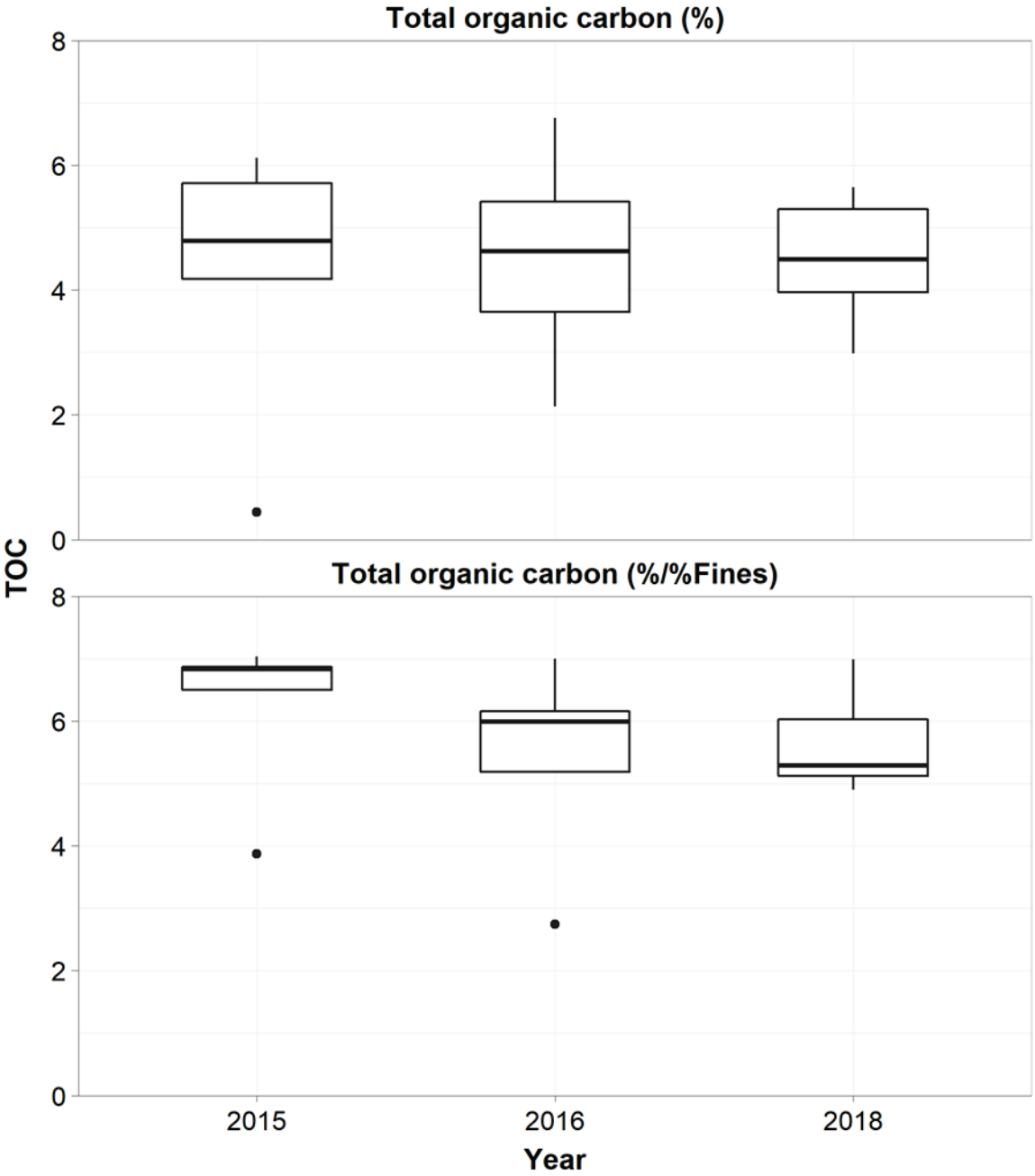


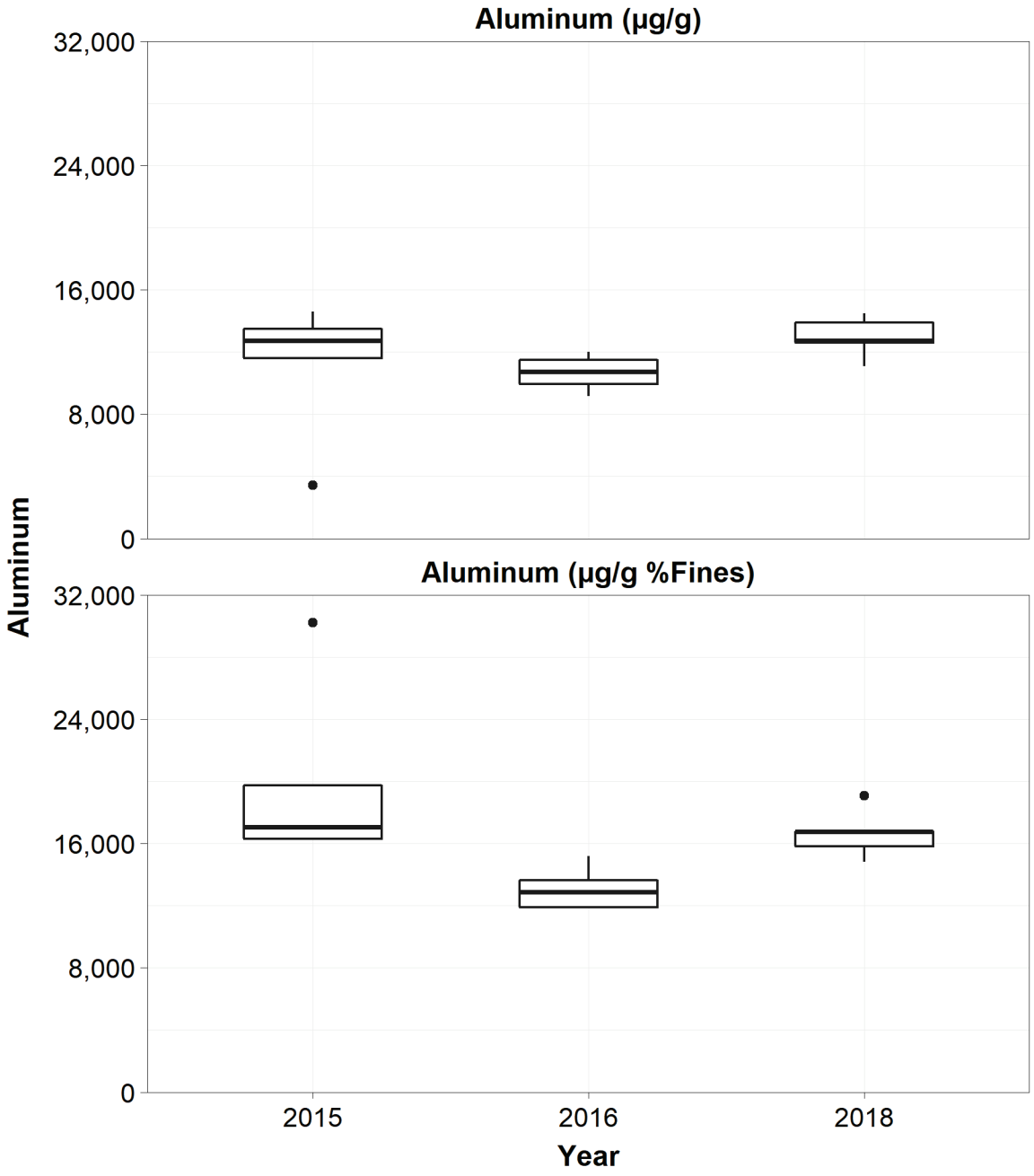
Figure 8G.1-4: Box-and-whisker Plots of Fines (Silt + Clay %) Concentrations in Meliadine Lake Near-field Area, 2018



Note: top: non-normalized data; bottom: data normalized to % fines.

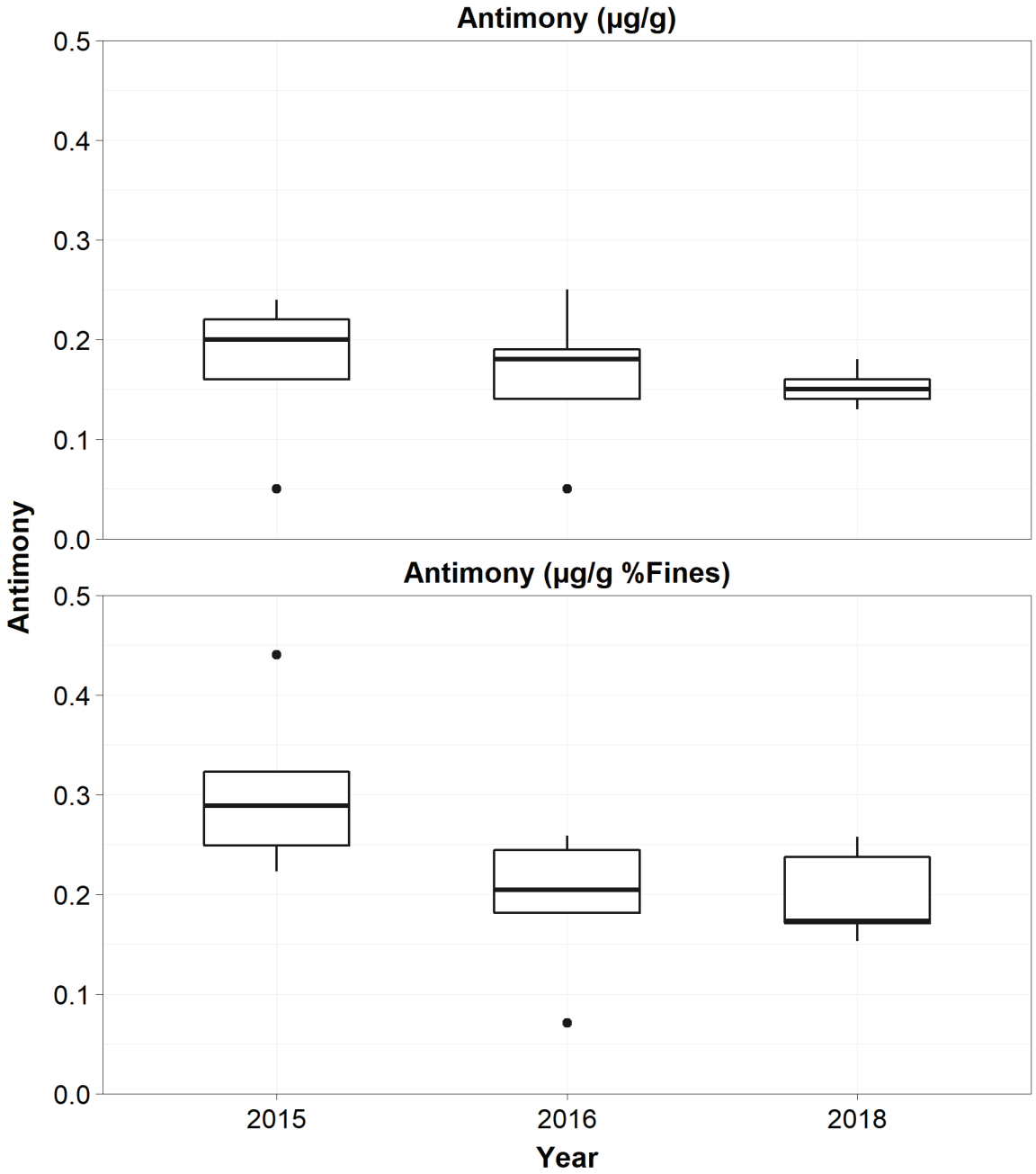
Figure 8G.1-5: Box-and-whisker Plots of Total Organic Carbon Concentrations in Meliadine Lake Near-field Area, 2018

2.0 METALS



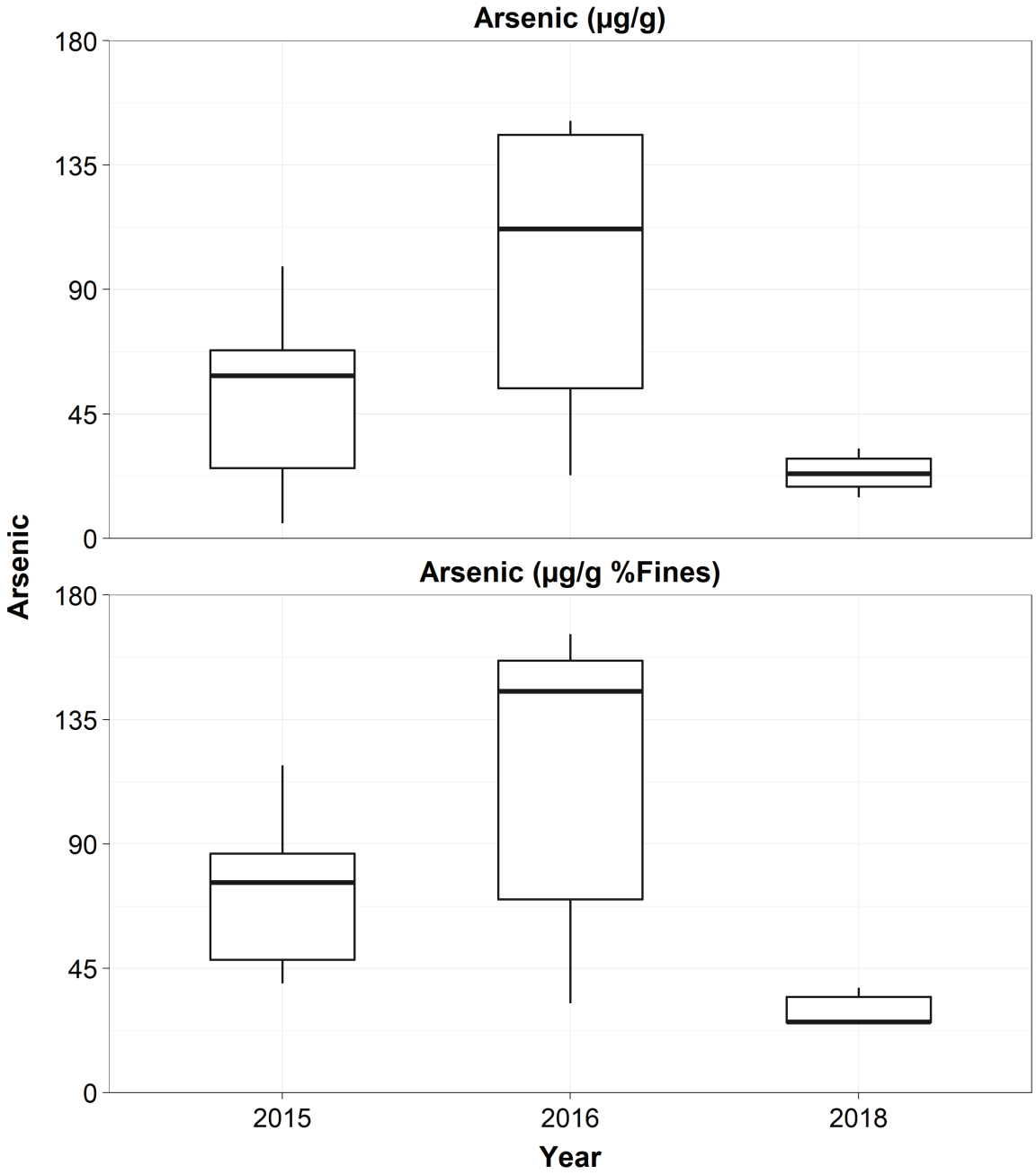
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.;

Figure 8G.2-1: Box-and-whisker Plots of Aluminum Concentrations in Meliadine Lake Near-field Area, 2018



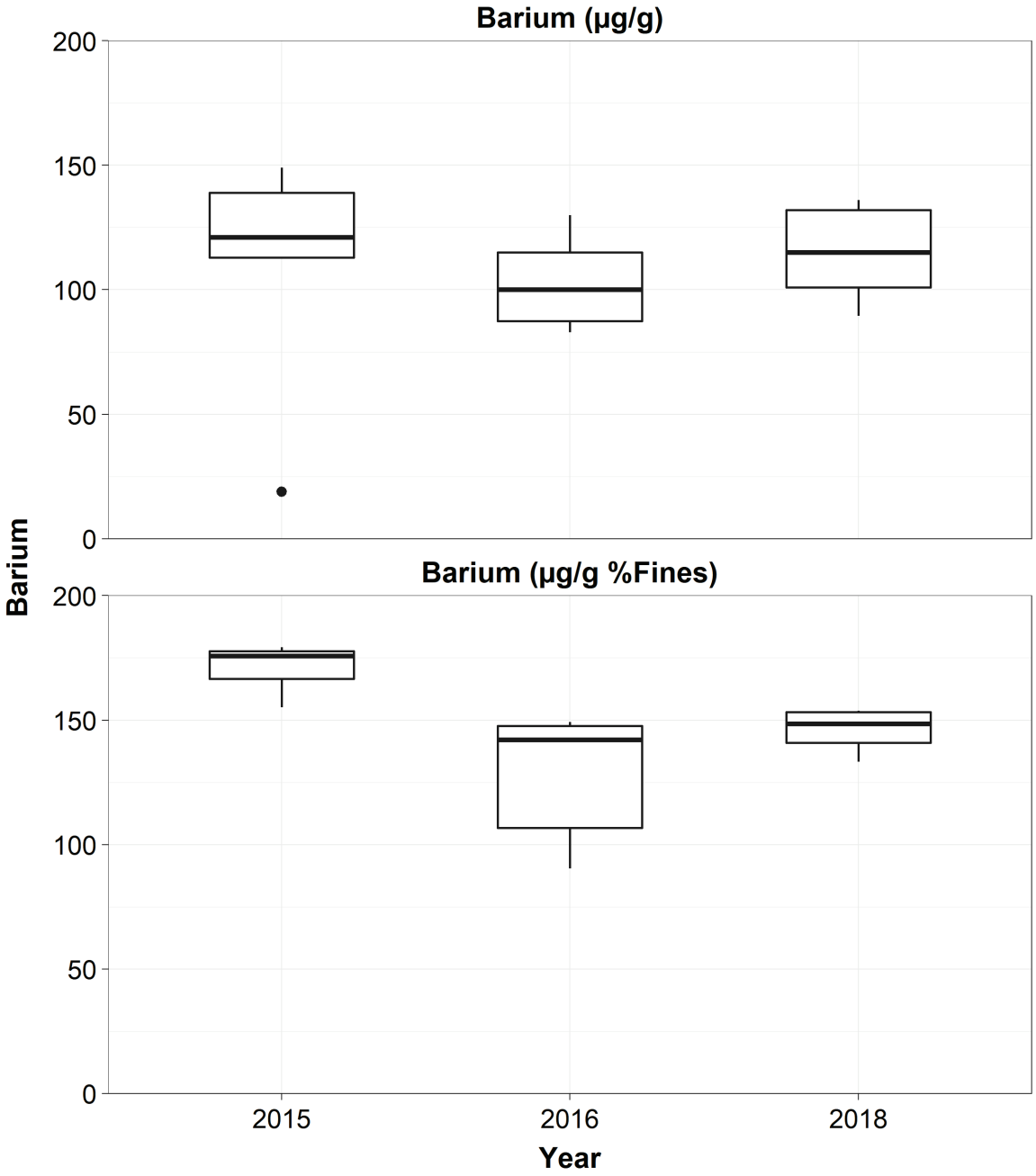
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-2: Box-and-whisker Plots of Antimony Concentrations in Meliadine Lake Near-field Area, 2018



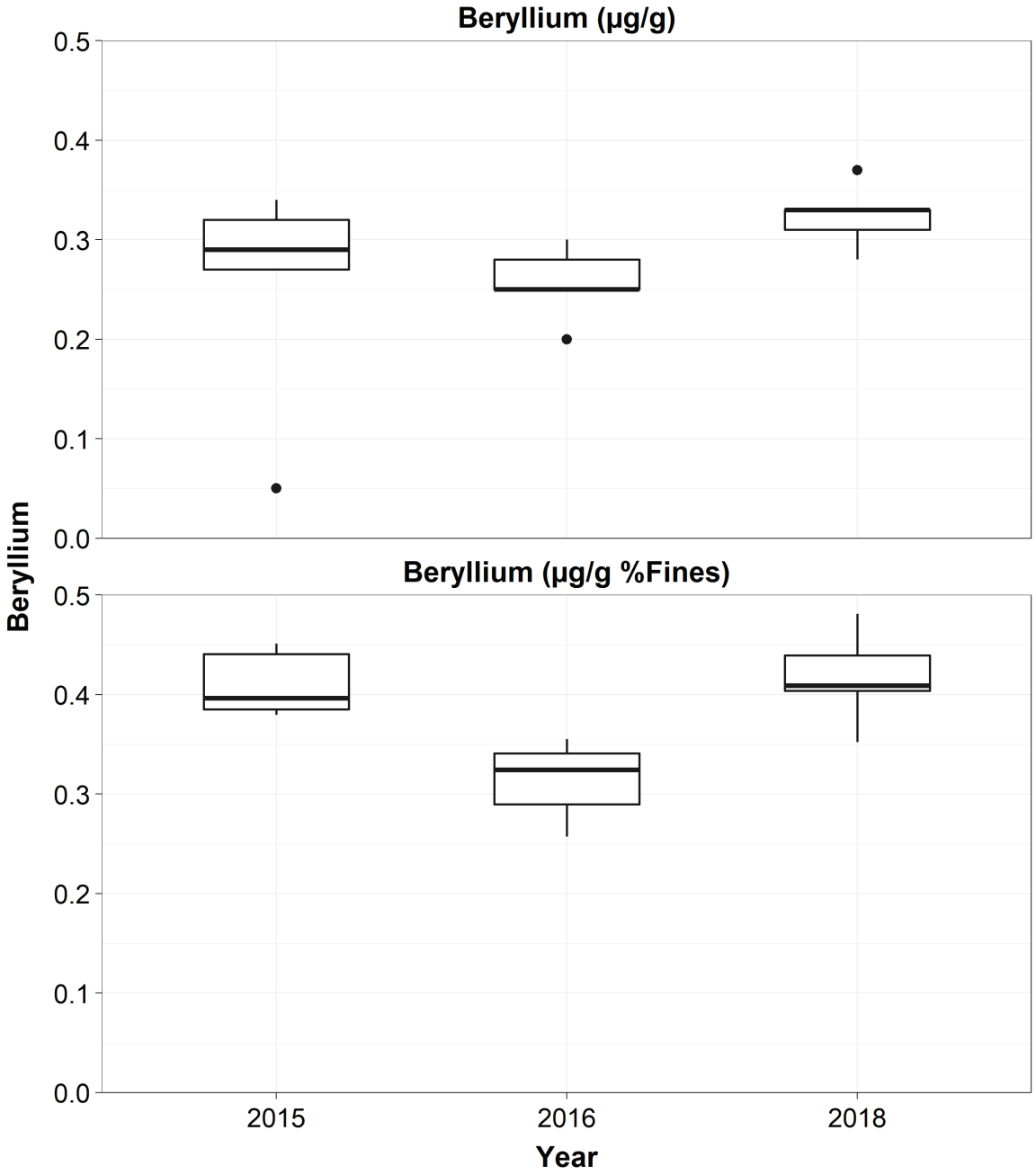
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-3: Box-and-whisker Plots of Arsenic Concentrations in Meliadine Lake Near-field Area, 2018



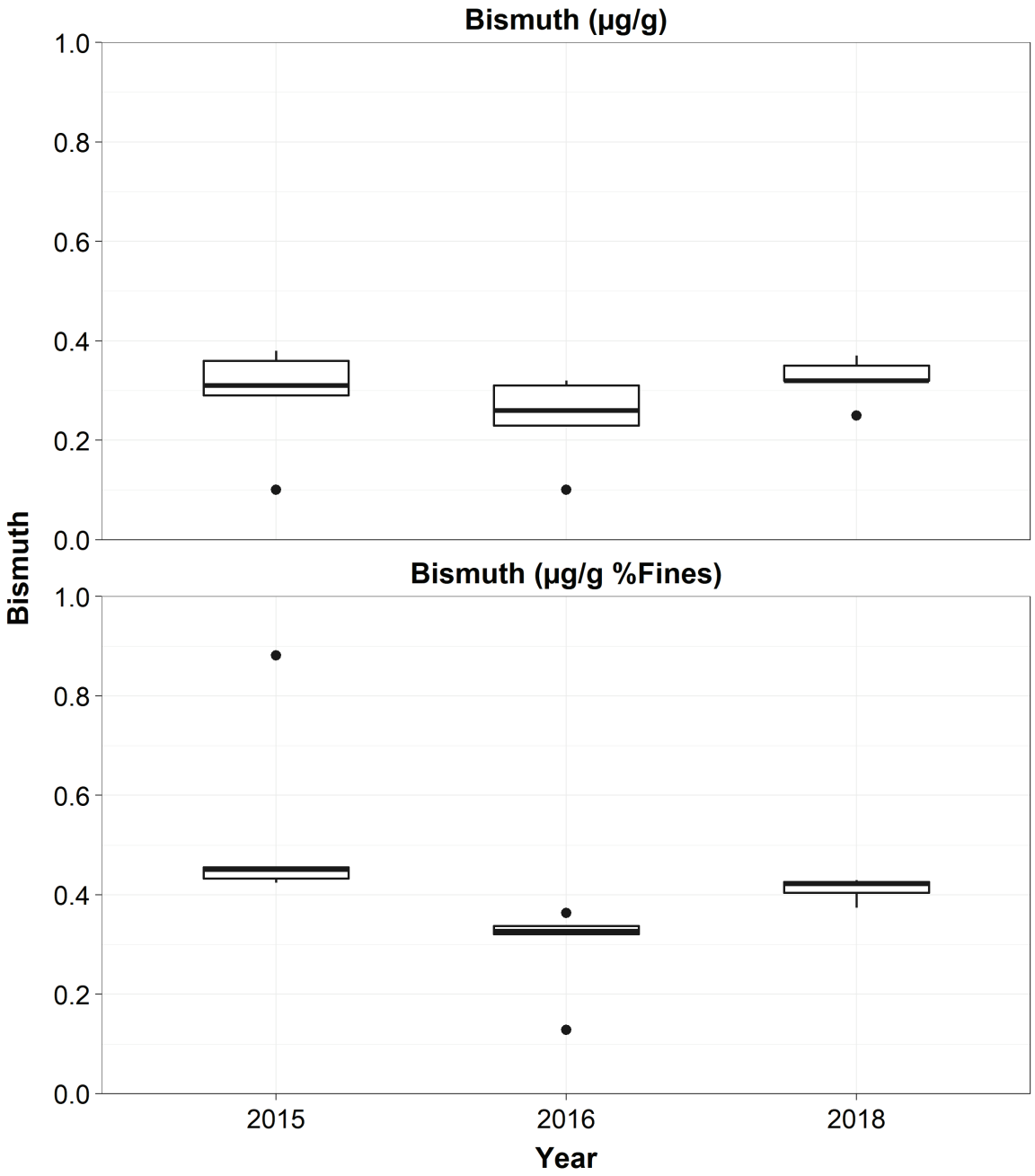
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-4: Box-and-whisker Plots of Barium Concentrations in Meliadine Lake Near-field Area, 2018



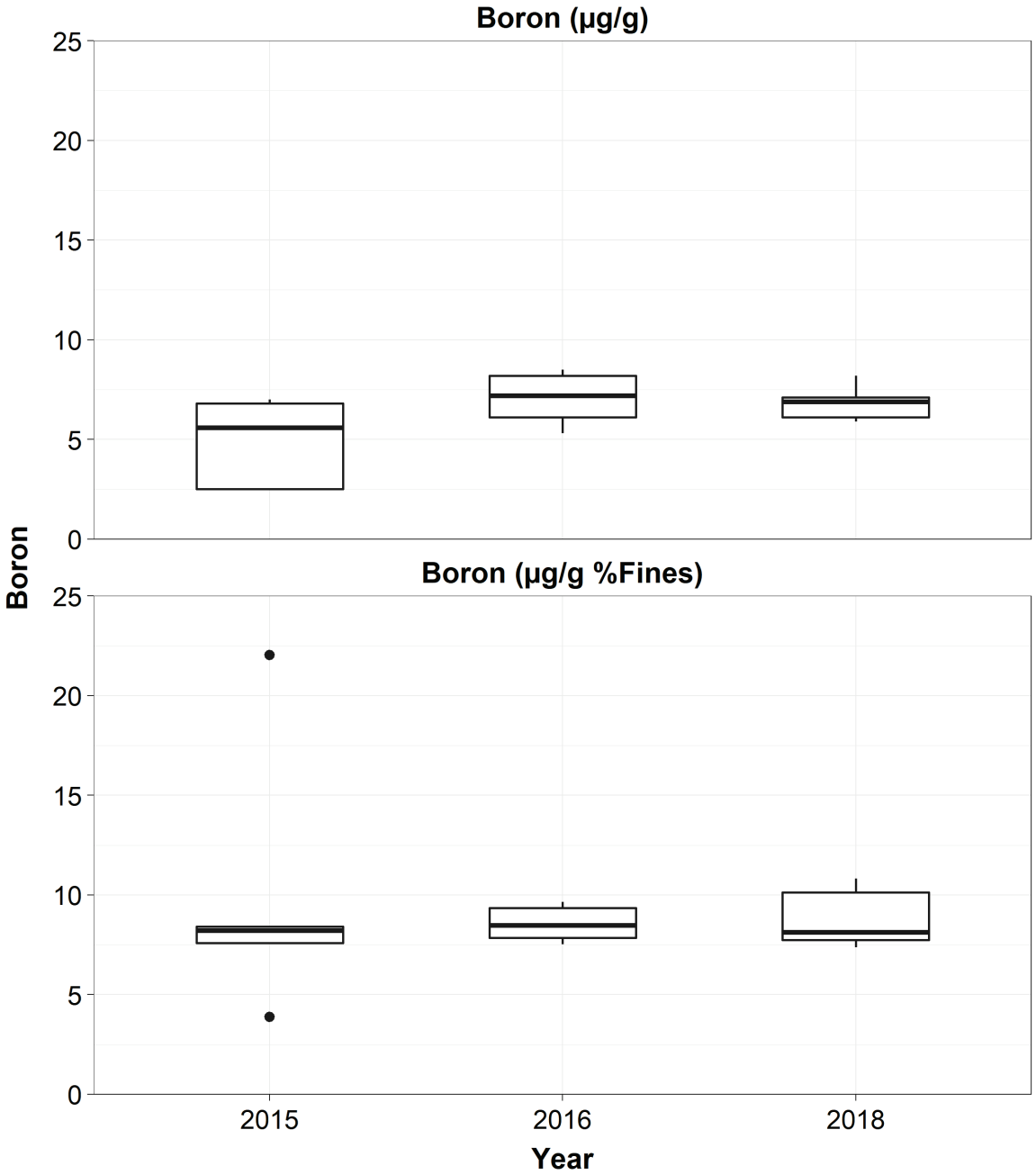
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-5: Box-and-whisker Plots of Beryllium Concentrations in Meliadine Lake Near-field Area, 2018



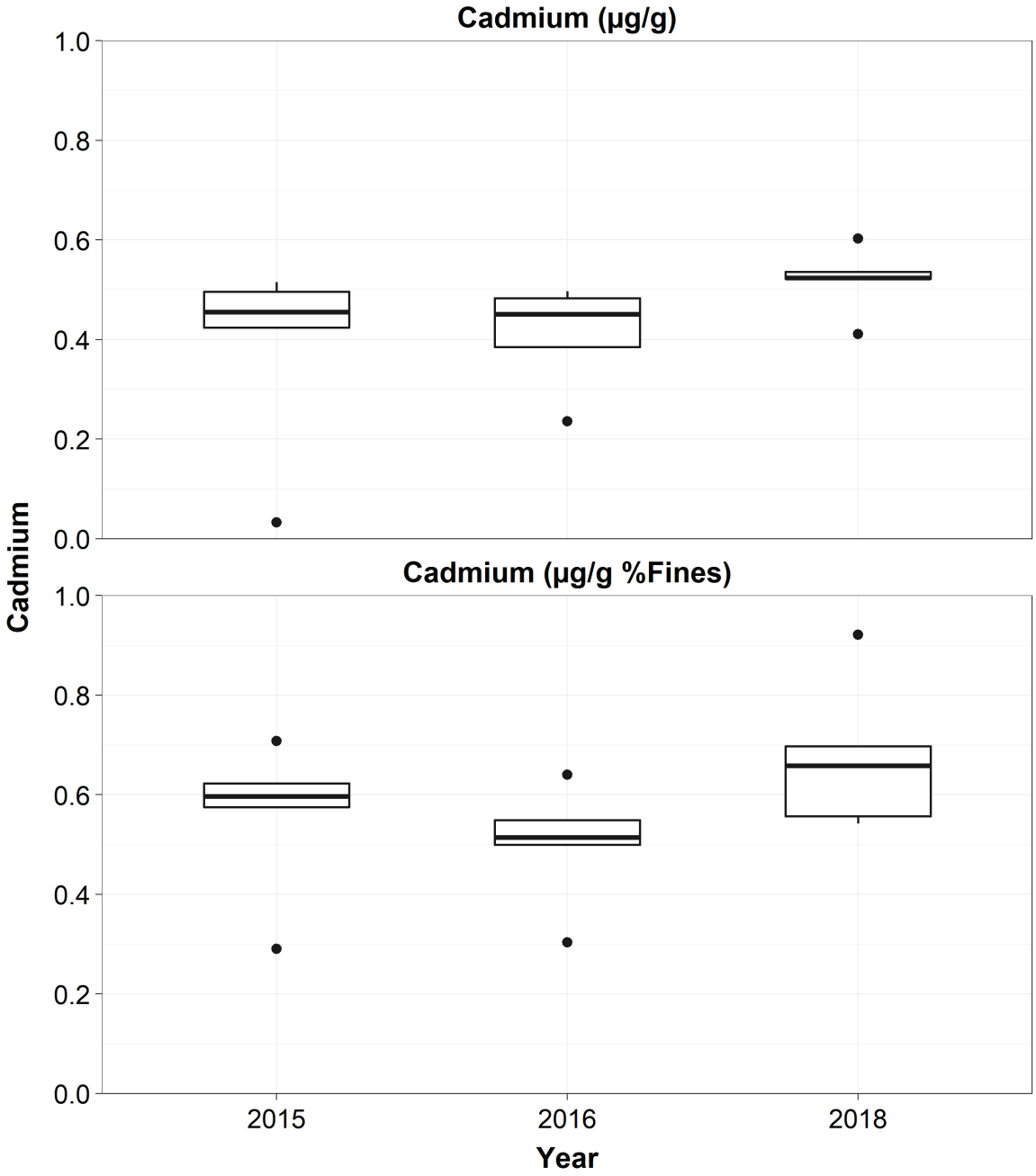
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-6: Box-and-whisker Plots of Bismuth Concentrations in Meliadine Lake Near-field Area, 2018



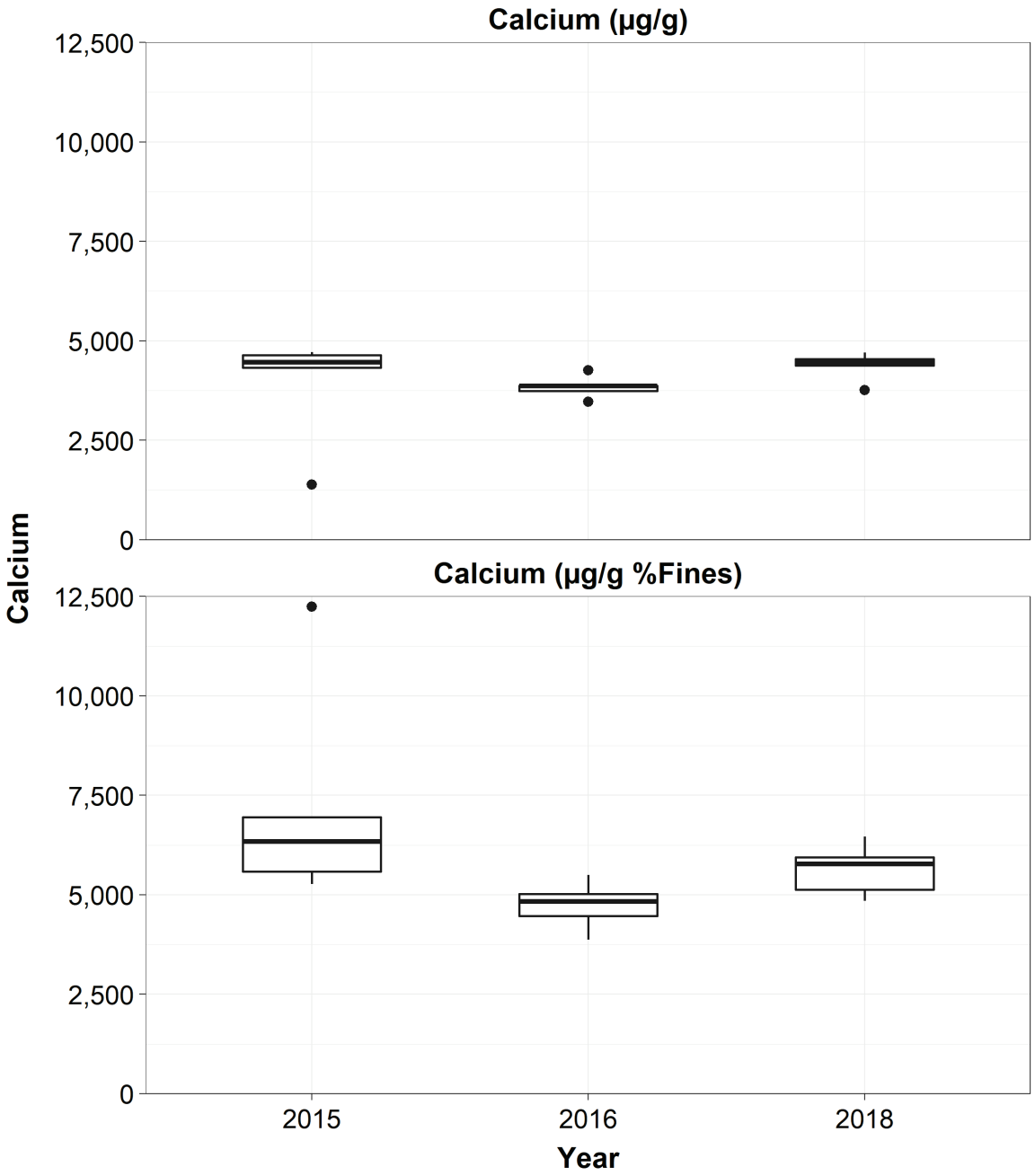
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-7: Box-and-whisker Plots of Boron Concentrations in Meliadine Lake Near-field Area, 2018



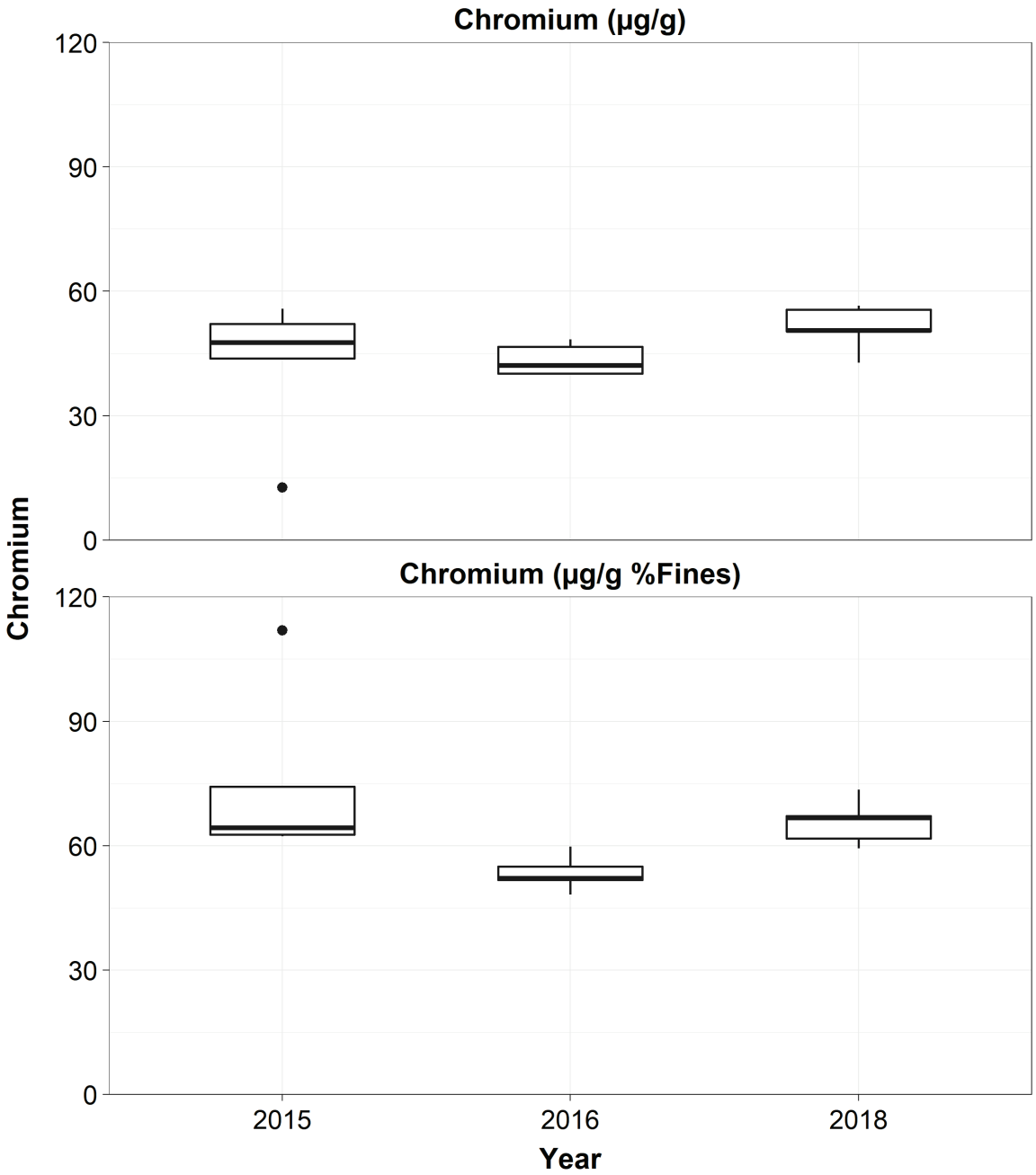
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-8: Box-and-whisker Plots of Cadmium Concentrations in Meliadine Lake Near-field Area, 2018



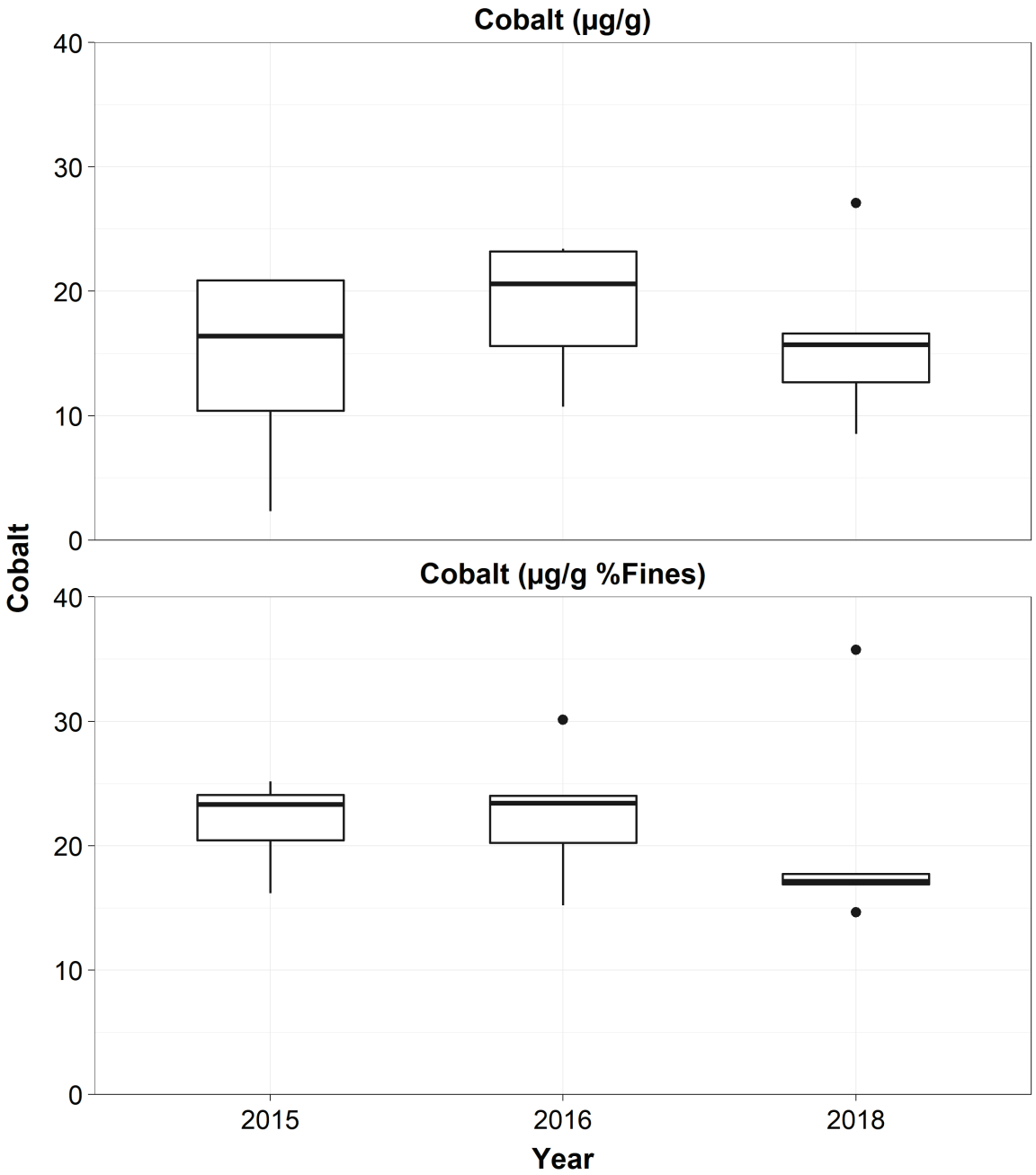
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-9: Box-and-whisker Plots of Calcium Concentrations in Meliadine Lake Near-field Area, 2018



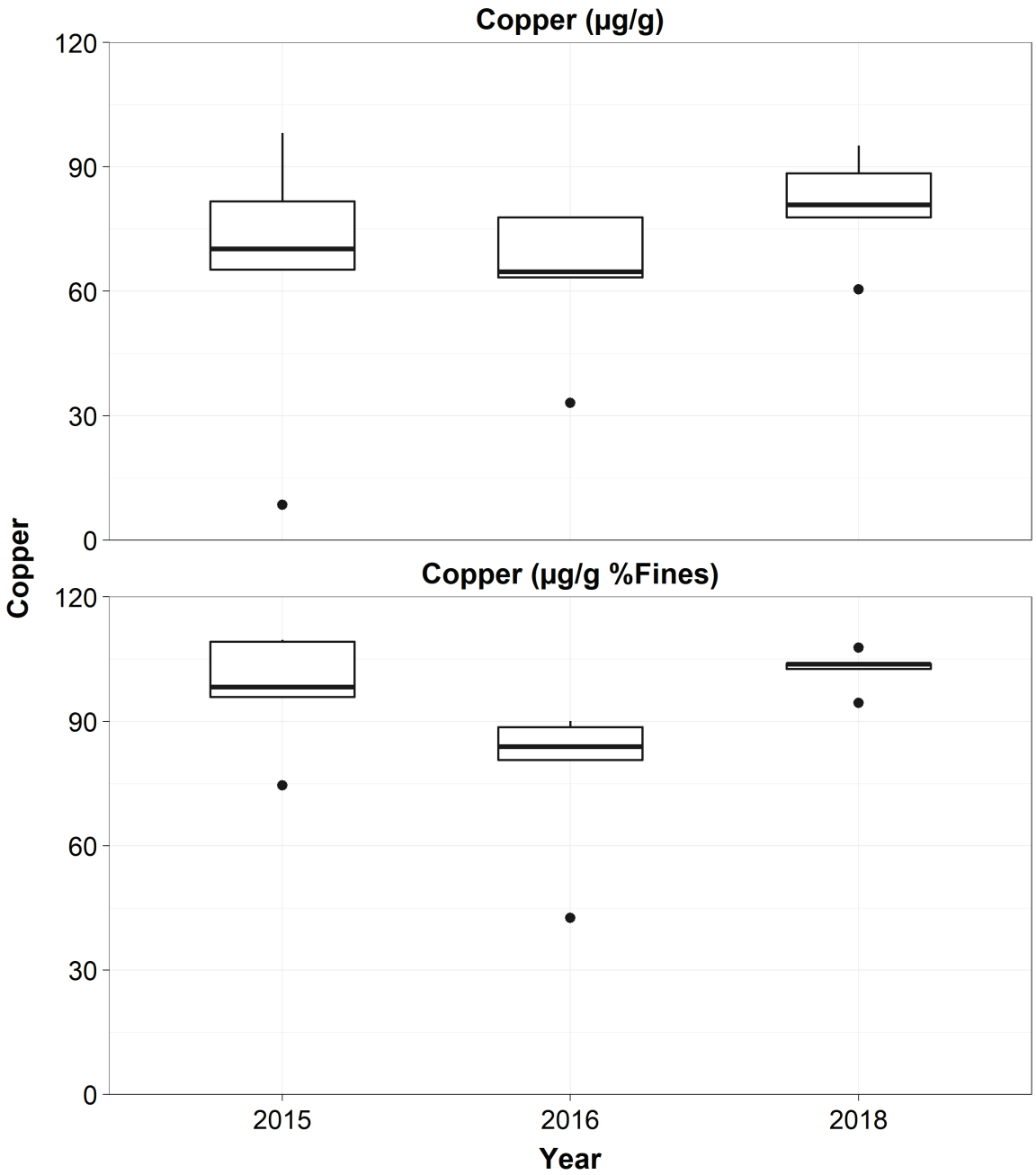
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-10: Box-and-whisker Plots of Chromium Concentrations in Meliadine Lake Near-field Area, 2018



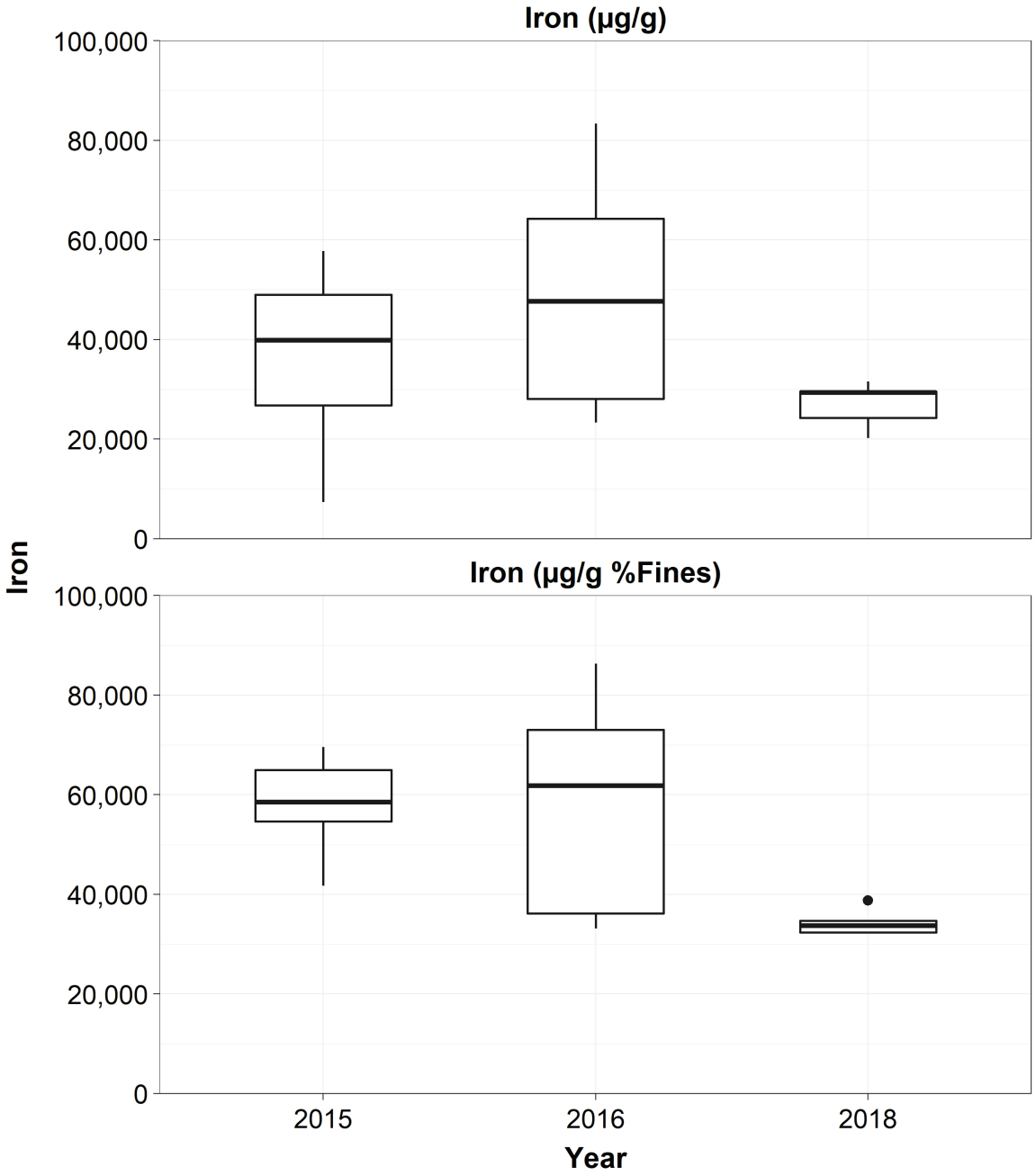
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-11: Box-and-whisker Plots of Cobalt Concentrations in Meliadine Lake Near-field Area, 2018



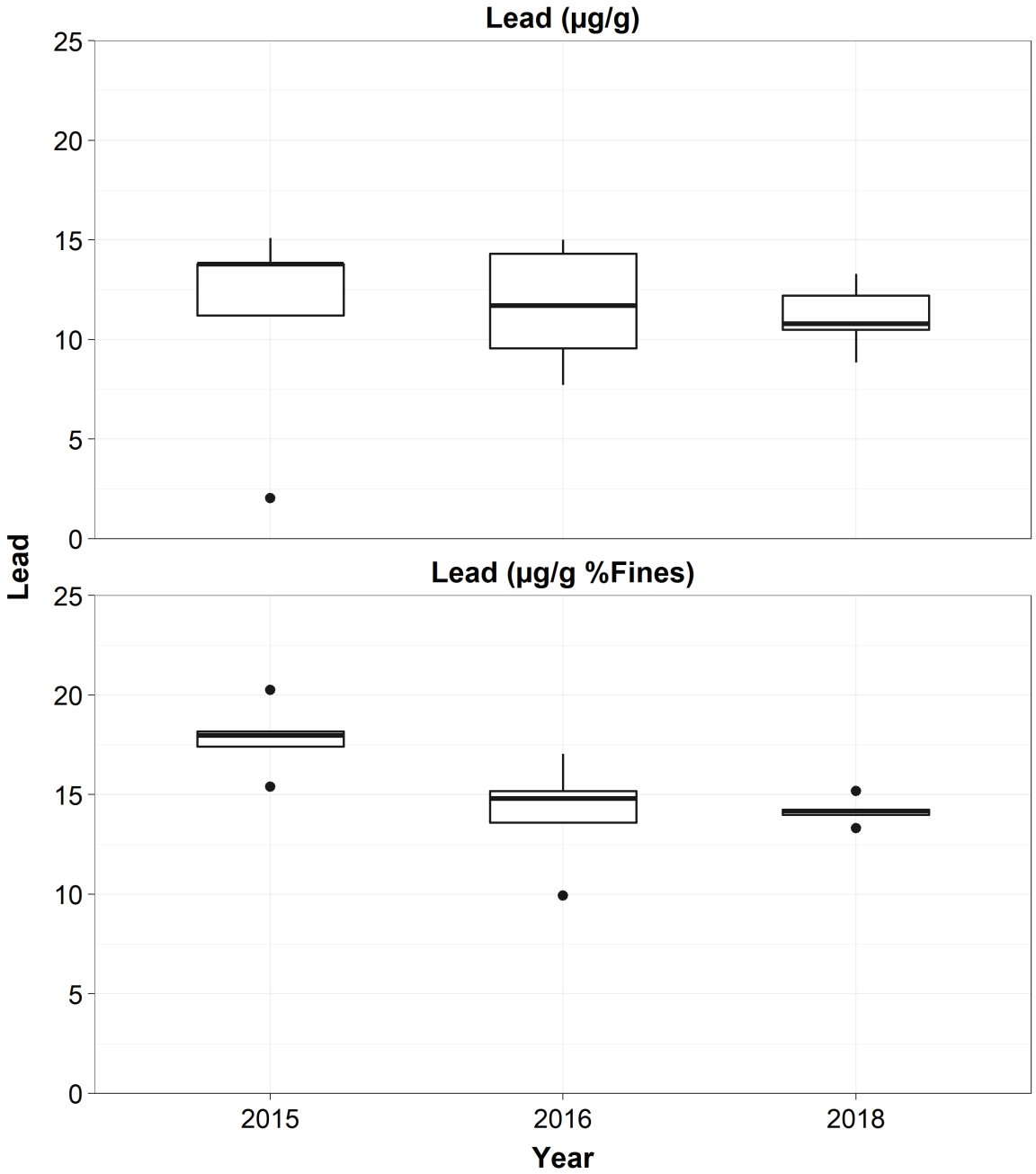
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-12: Box-and-whisker Plots of Copper Concentrations in Meliadine Lake Near-field Area, 2018



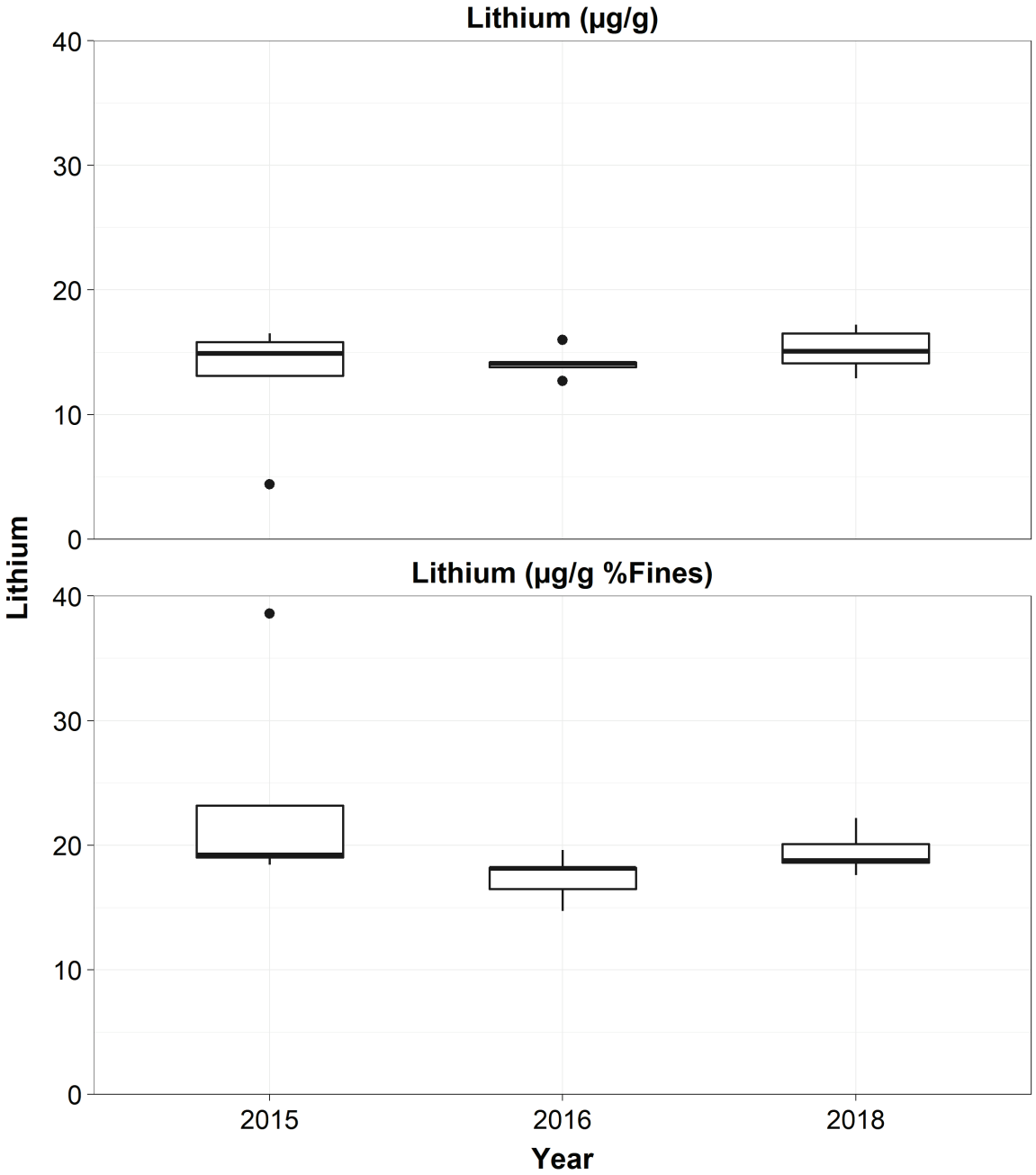
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-13: Box-and-whisker Plots of Iron Concentrations in Meliadine Lake Near-field Area, 2018



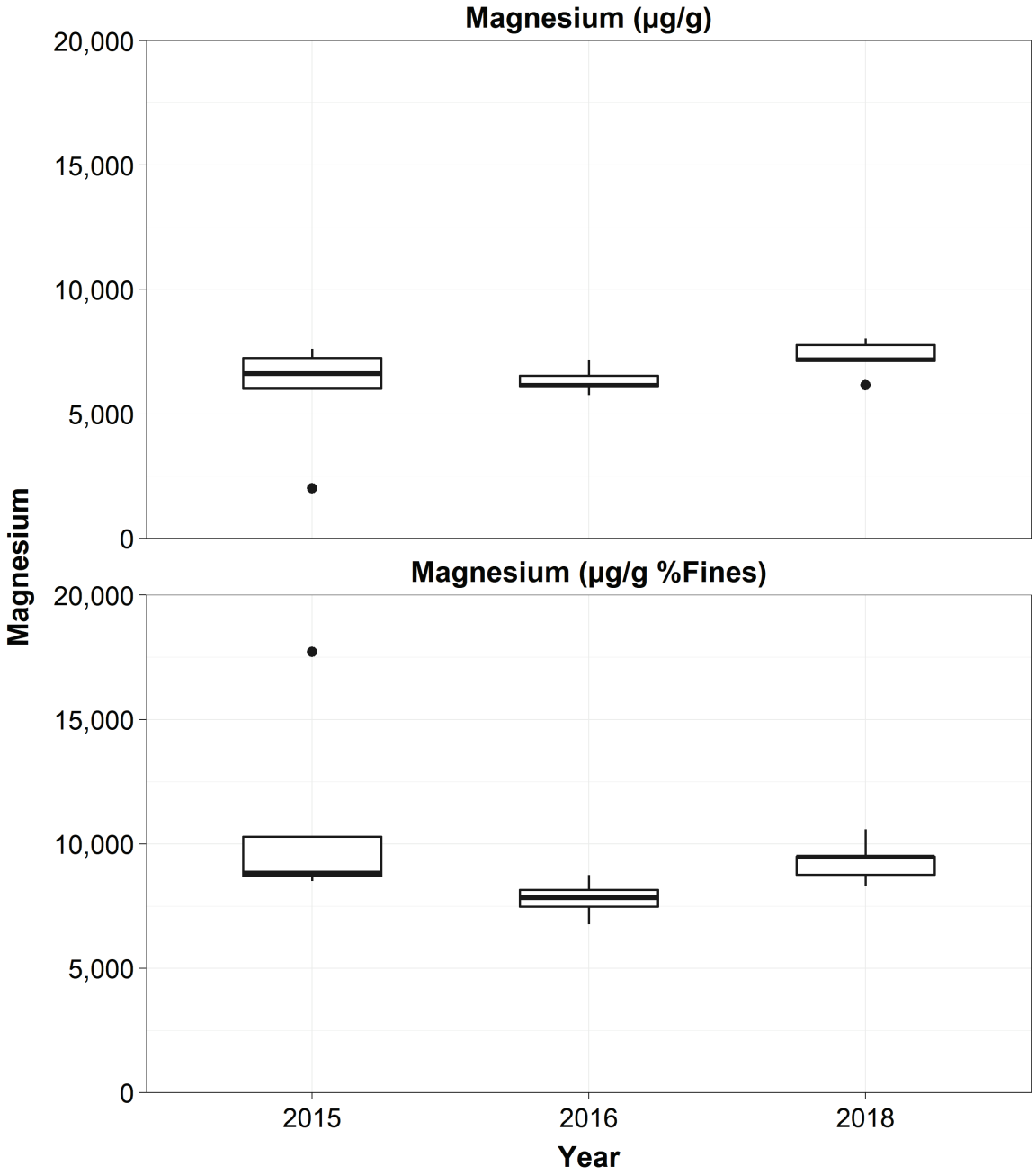
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-14: Box-and-whisker Plots of Lead Concentrations in Meliadine Lake Near-field Area, 2018



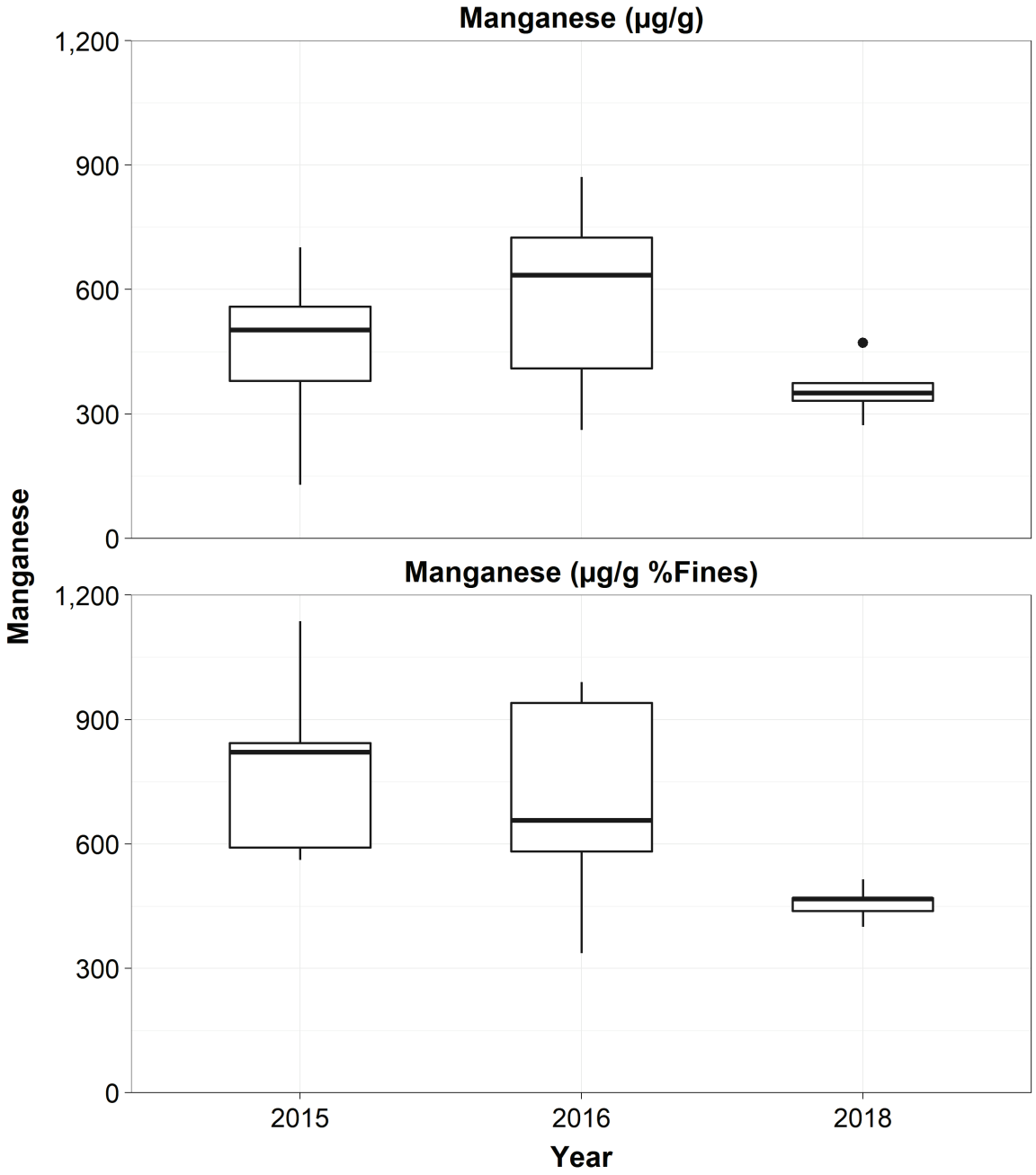
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-15: Box-and-whisker Plots of Lithium Concentrations in Meliadine Lake Near-field Area, 2018



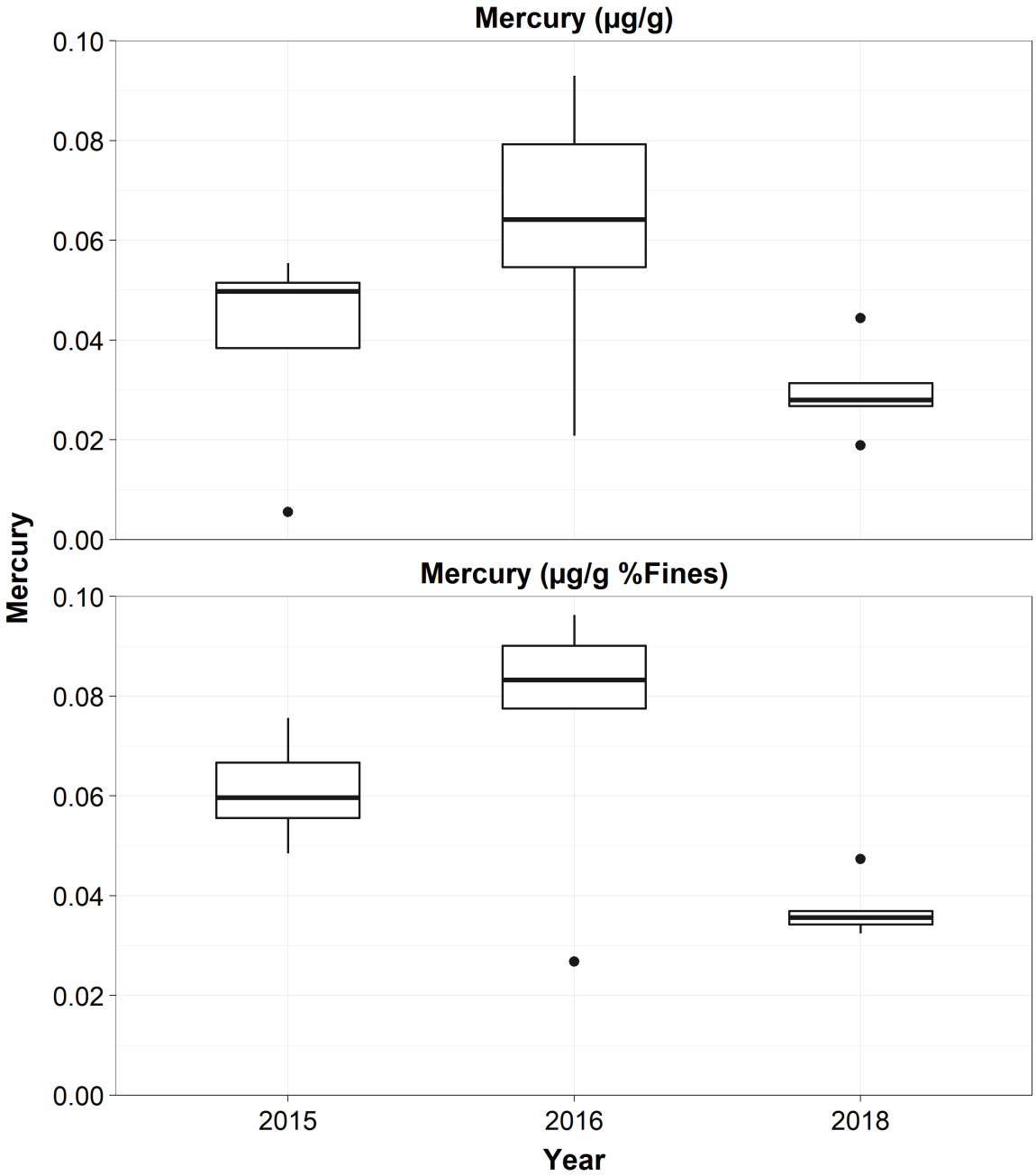
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-16: Box-and-whisker Plots of Magnesium Concentrations in Meliadine Lake Near-field Area, 2018



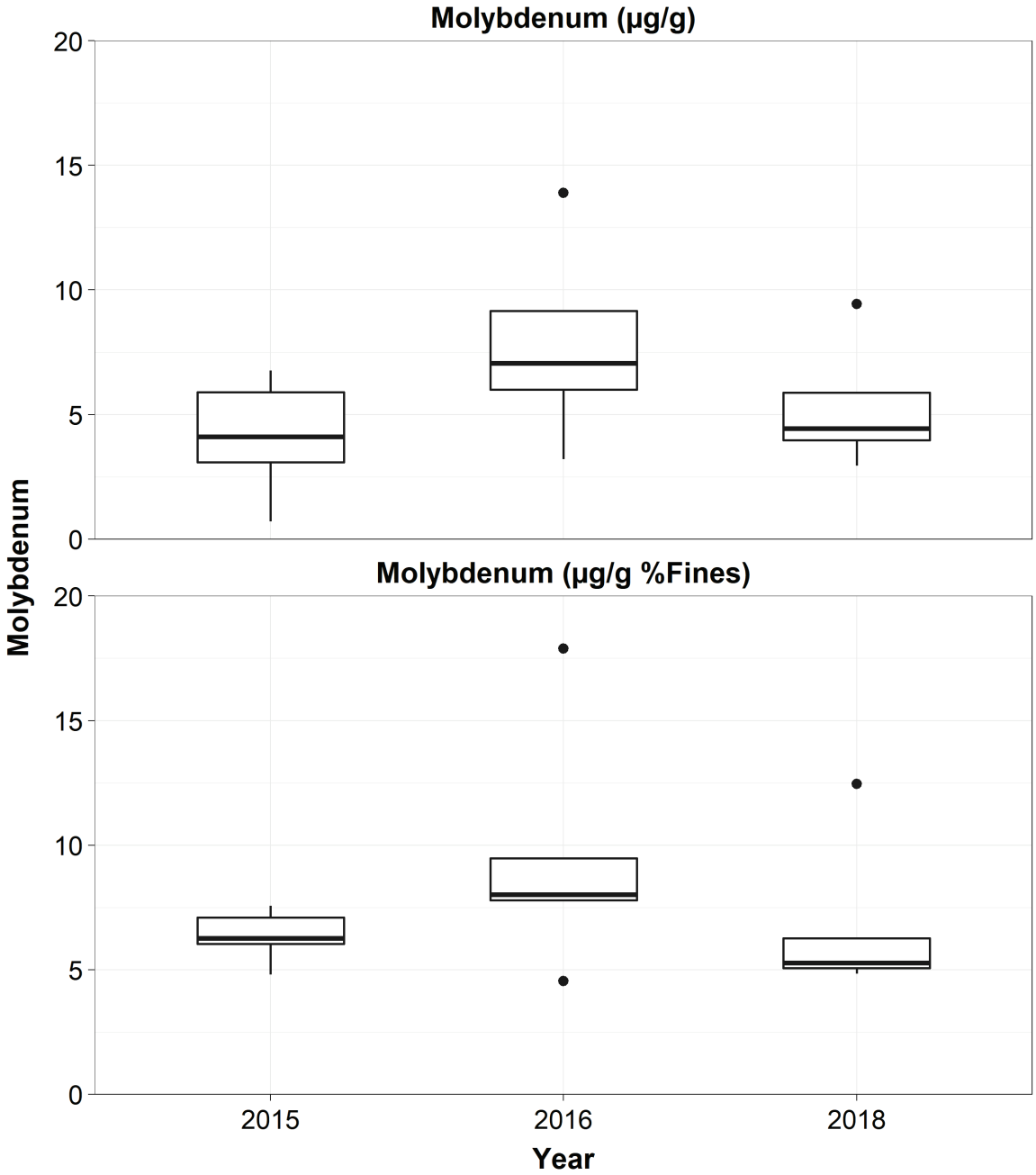
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-17: Box-and-whisker Plots of Manganese Concentrations in Meliadine Lake Near-field Area, 2018



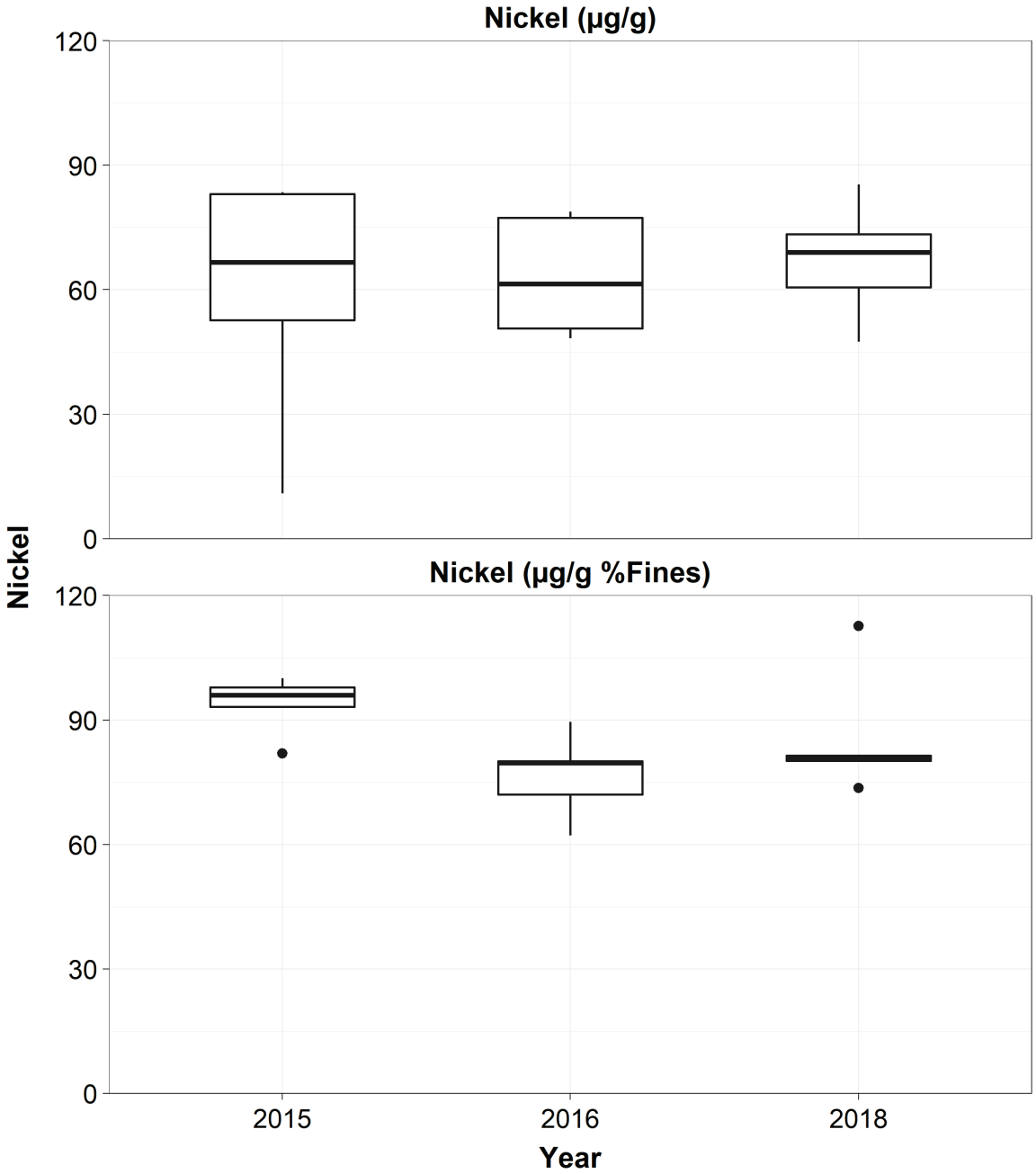
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-18: Box-and-whisker Plots of Mercury Concentrations in Meliadine Lake Near-field Area, 2018



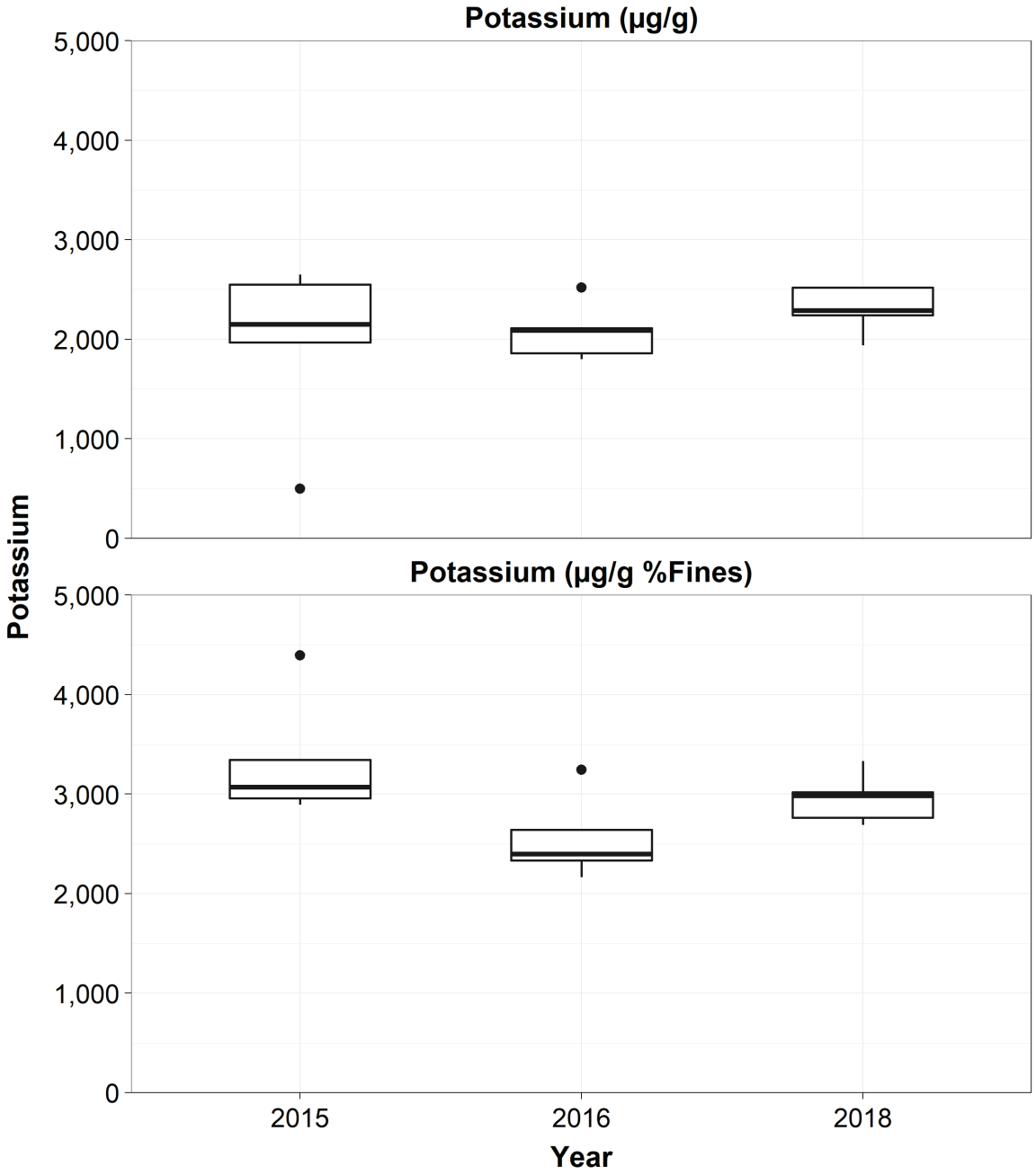
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-19: Box-and-whisker Plots of Molybdenum Concentrations in Meliadine Lake Near-field Area, 2018



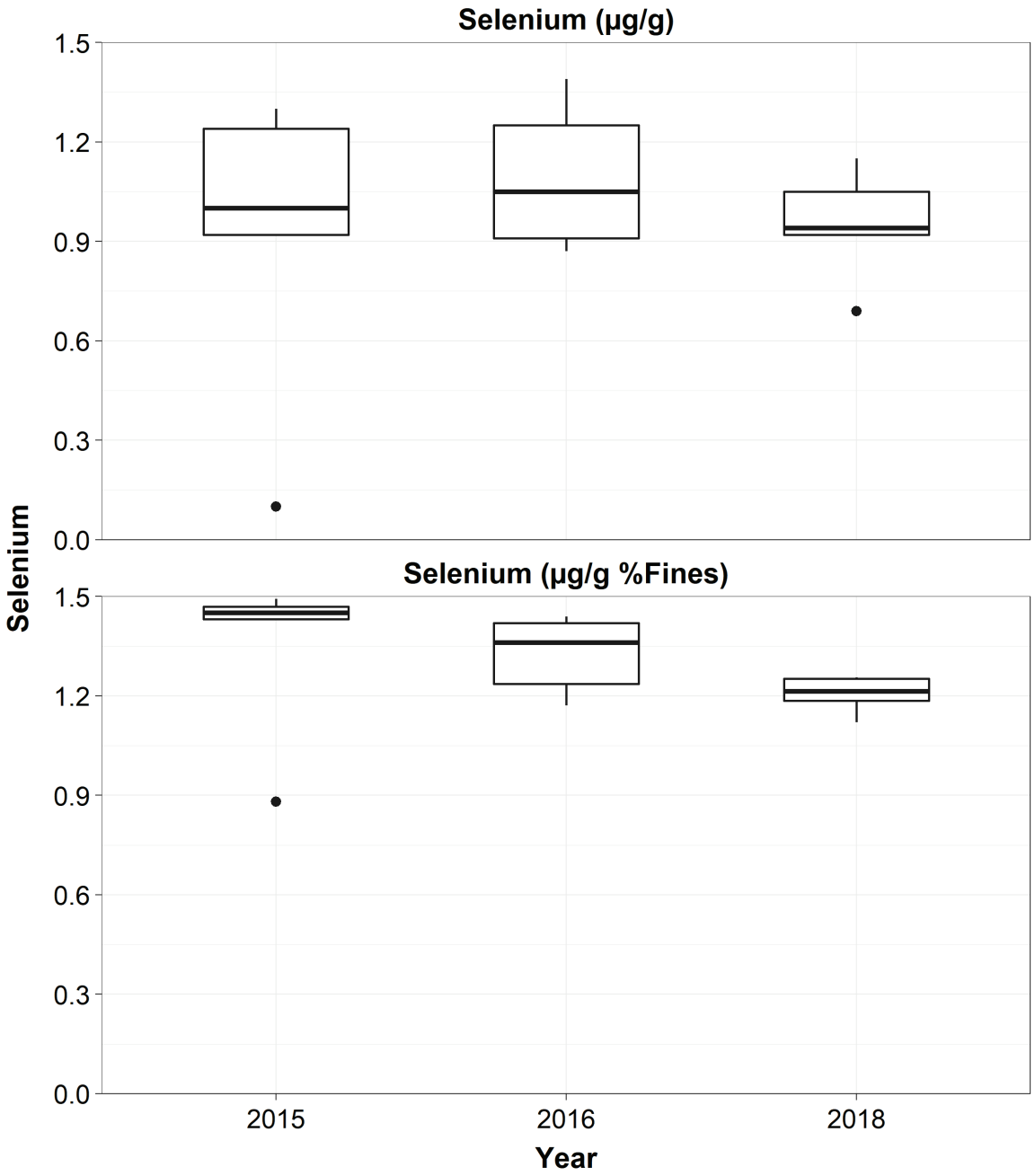
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-20: Box-and-whisker Plots of Nickel Concentrations in Meliadine Lake Near-field Area, 2018



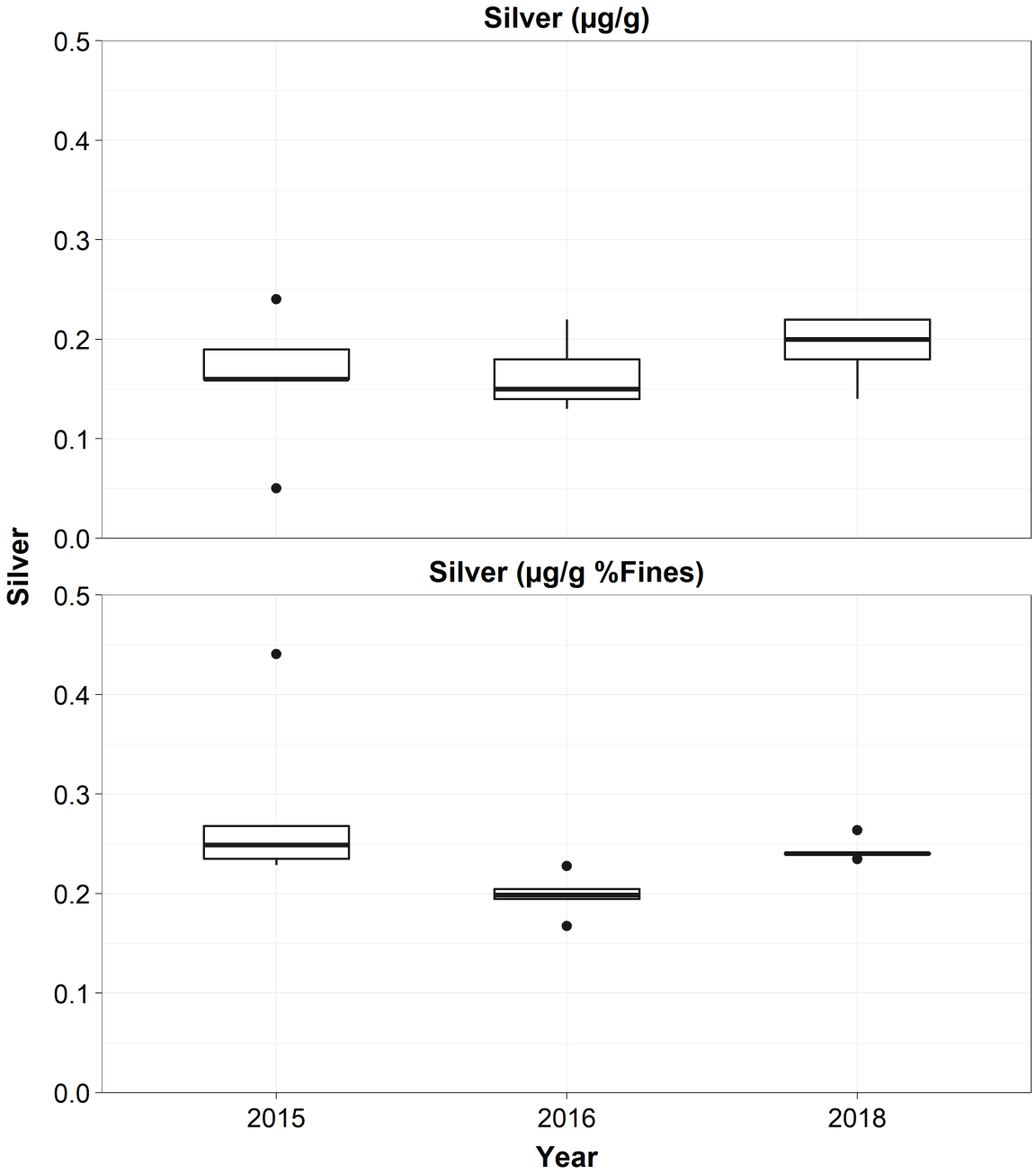
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-21: Box-and-whisker Plots of Potassium Concentrations in Meliadine Lake Near-field Area, 2018



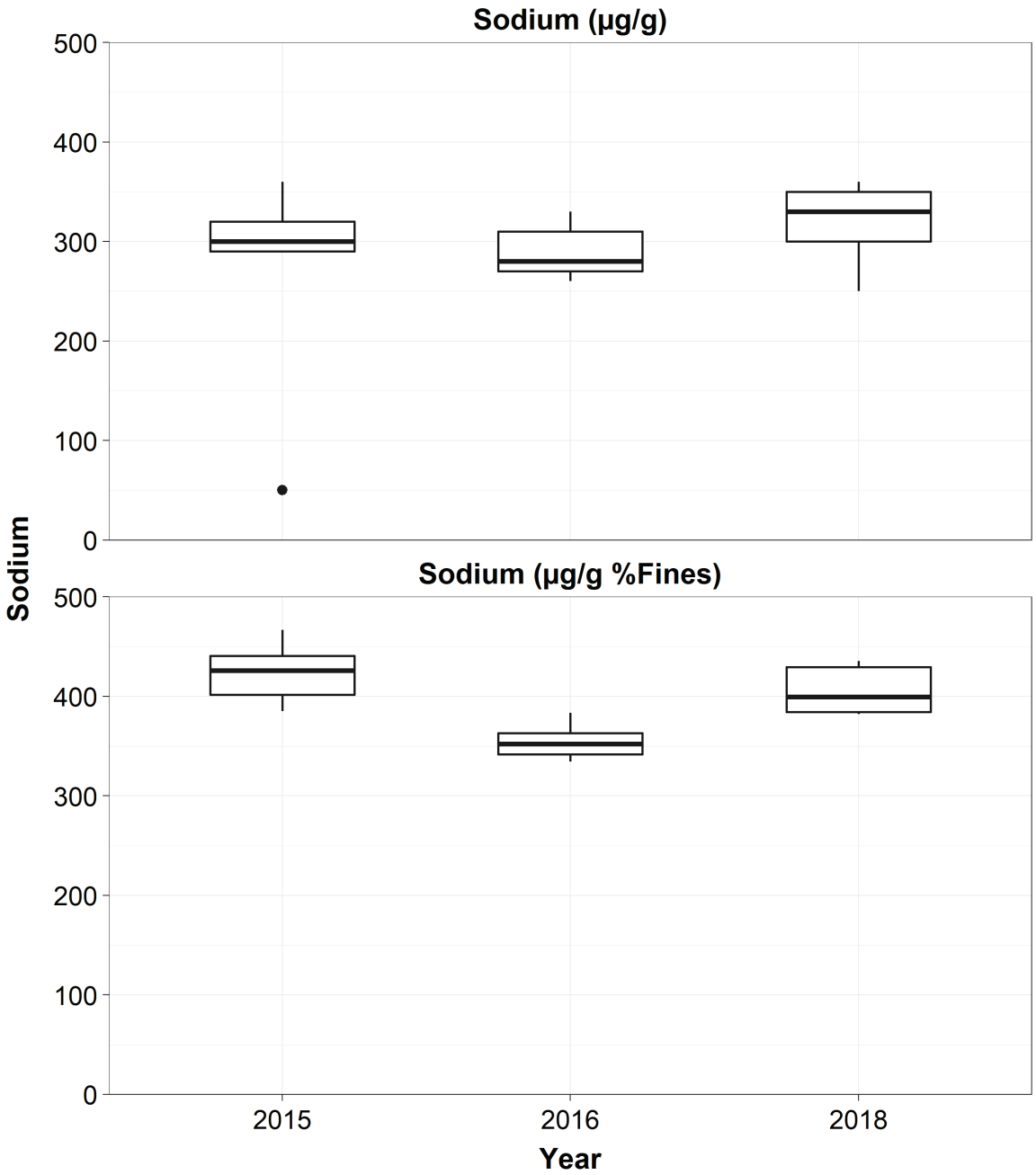
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-22: Box-and-whisker Plots of Selenium Concentrations in Meliadine Lake Near-field Area, 2018



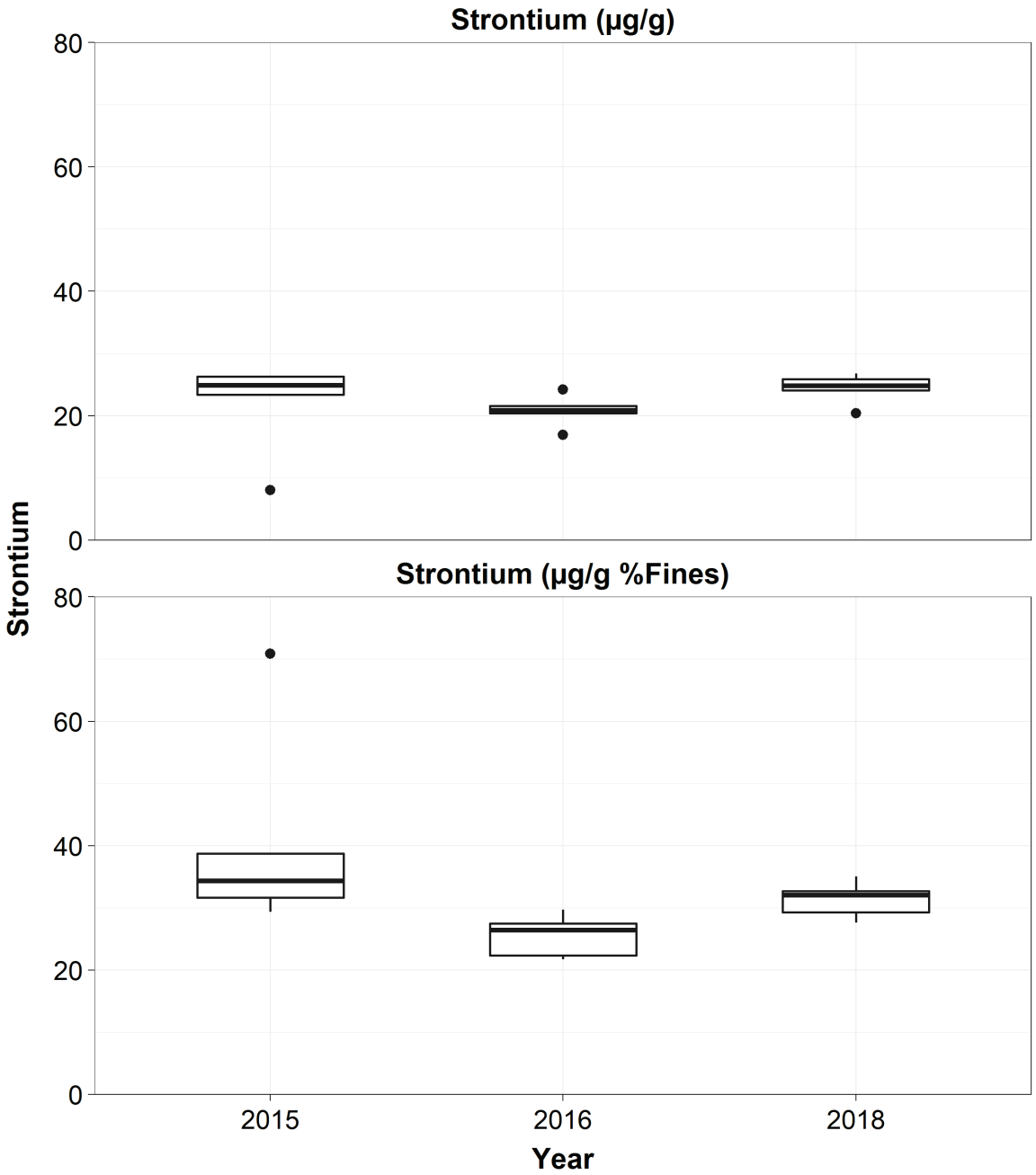
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-23: Box-and-whisker Plots of Silver Concentrations in Meliadine Lake Near-field Area, 2018



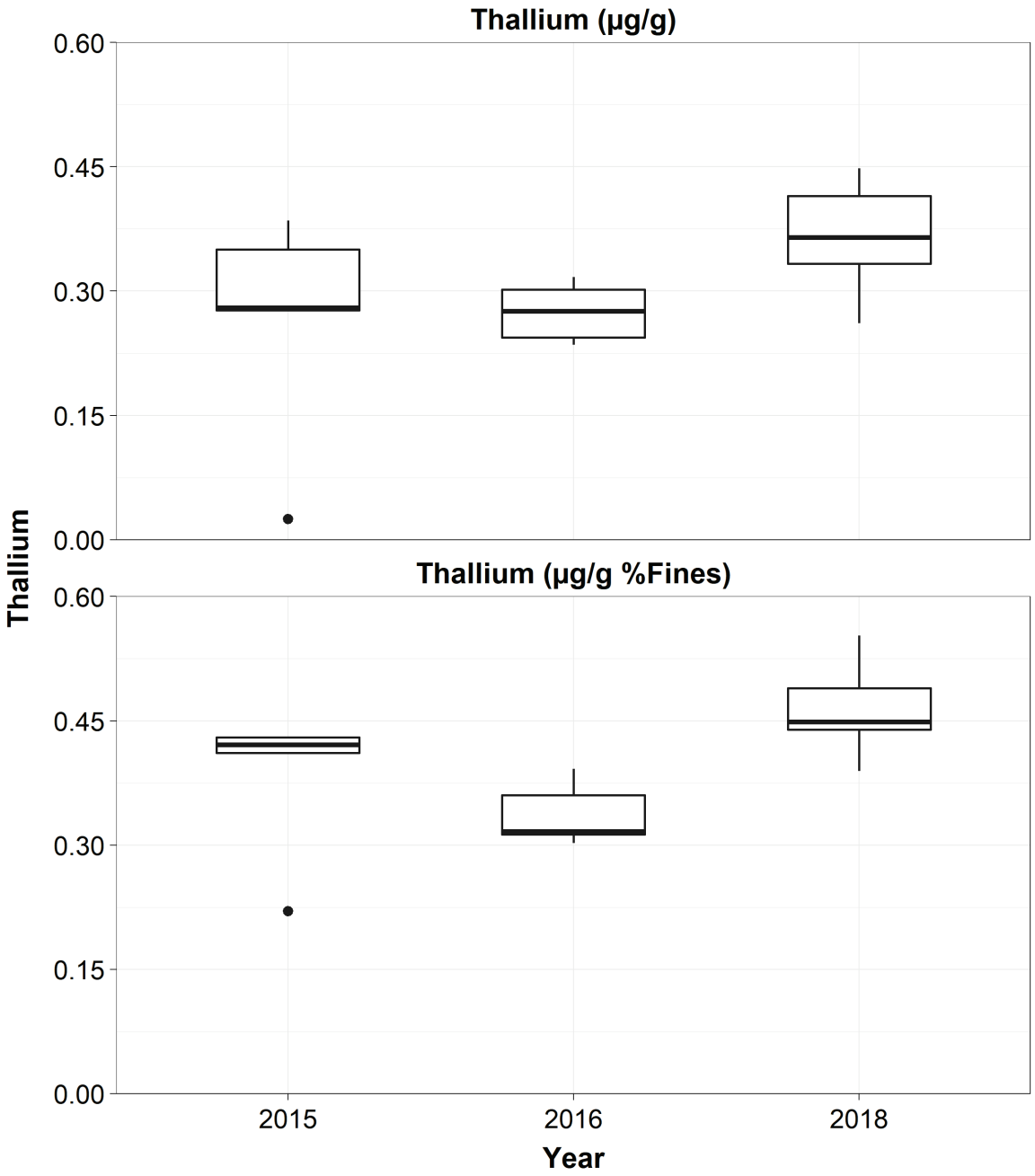
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-24: Box-and-whisker Plots of Sodium Concentrations in Meliadine Lake Near-field Area, 2018



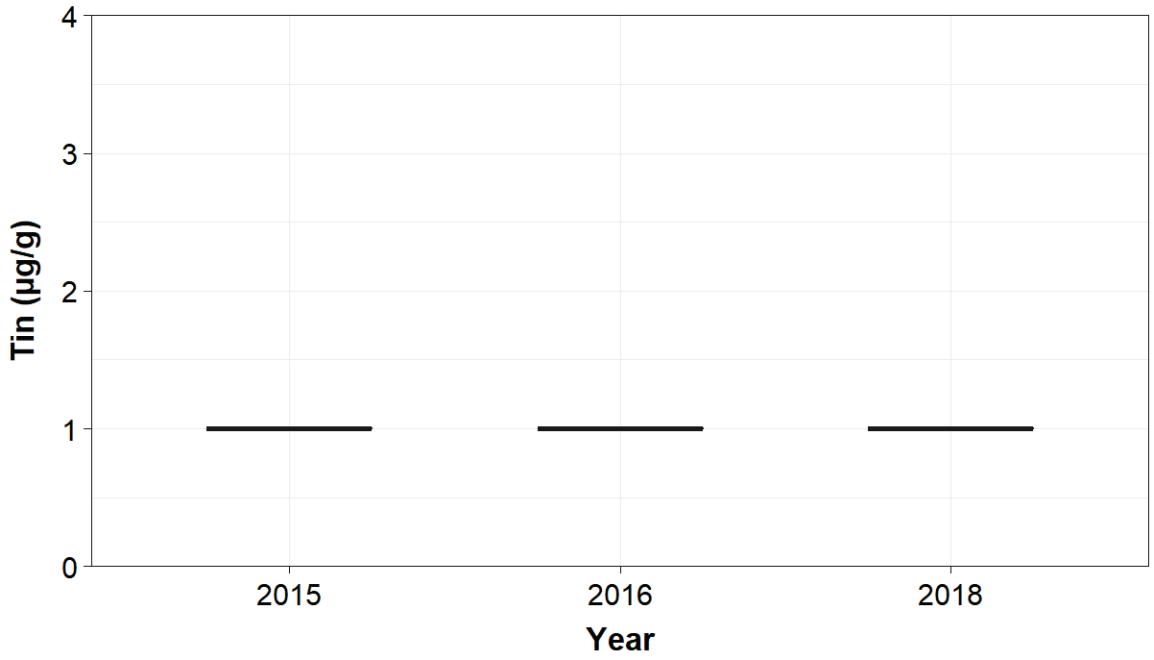
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.1-25: Box-and-whisker Plots of Strontium Concentrations in Meliadine Lake Near-field Area, 2018



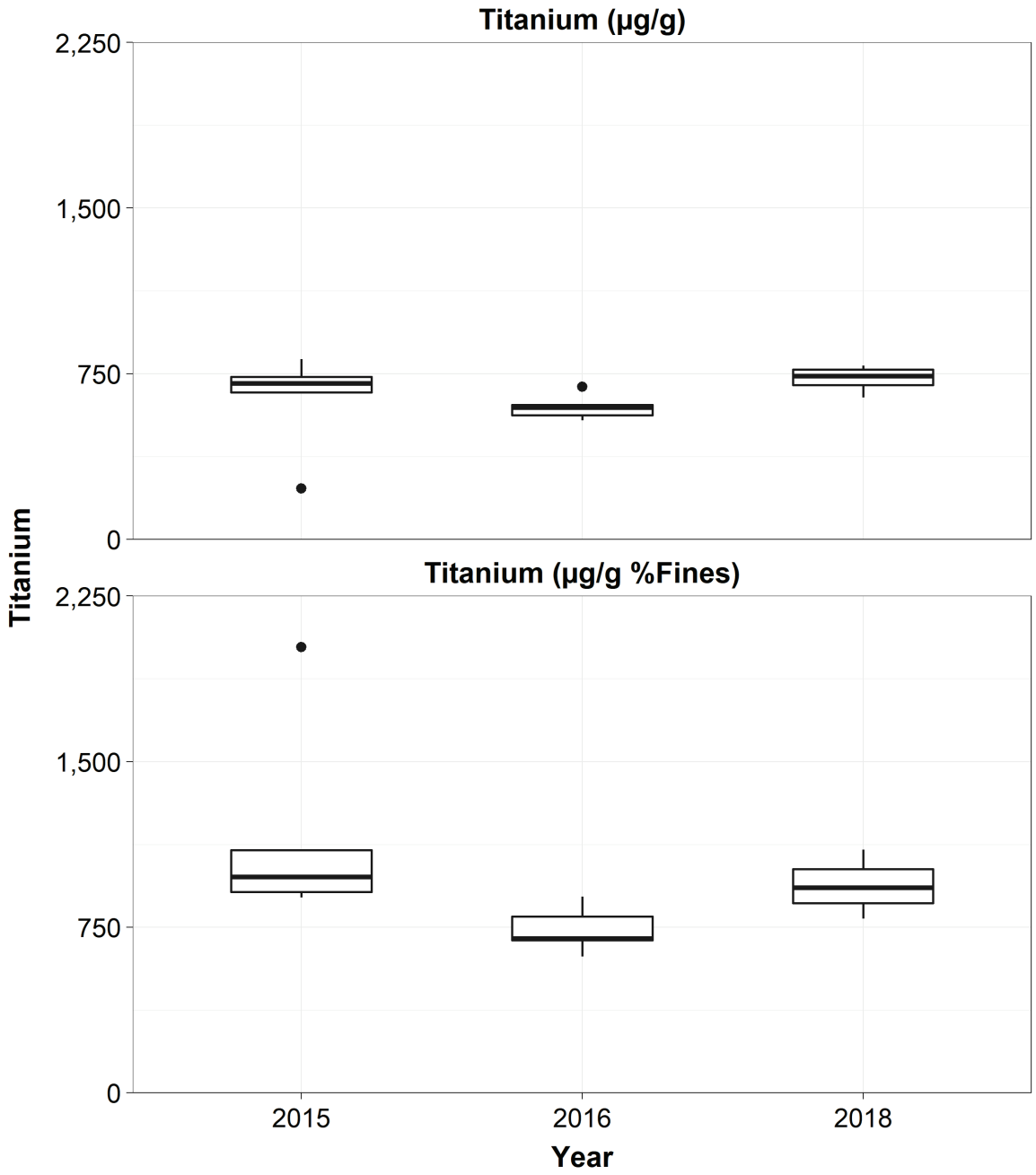
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-26: Box-and-whisker Plots of Thallium Concentrations in Meliadine Lake Near-field Area, 2018



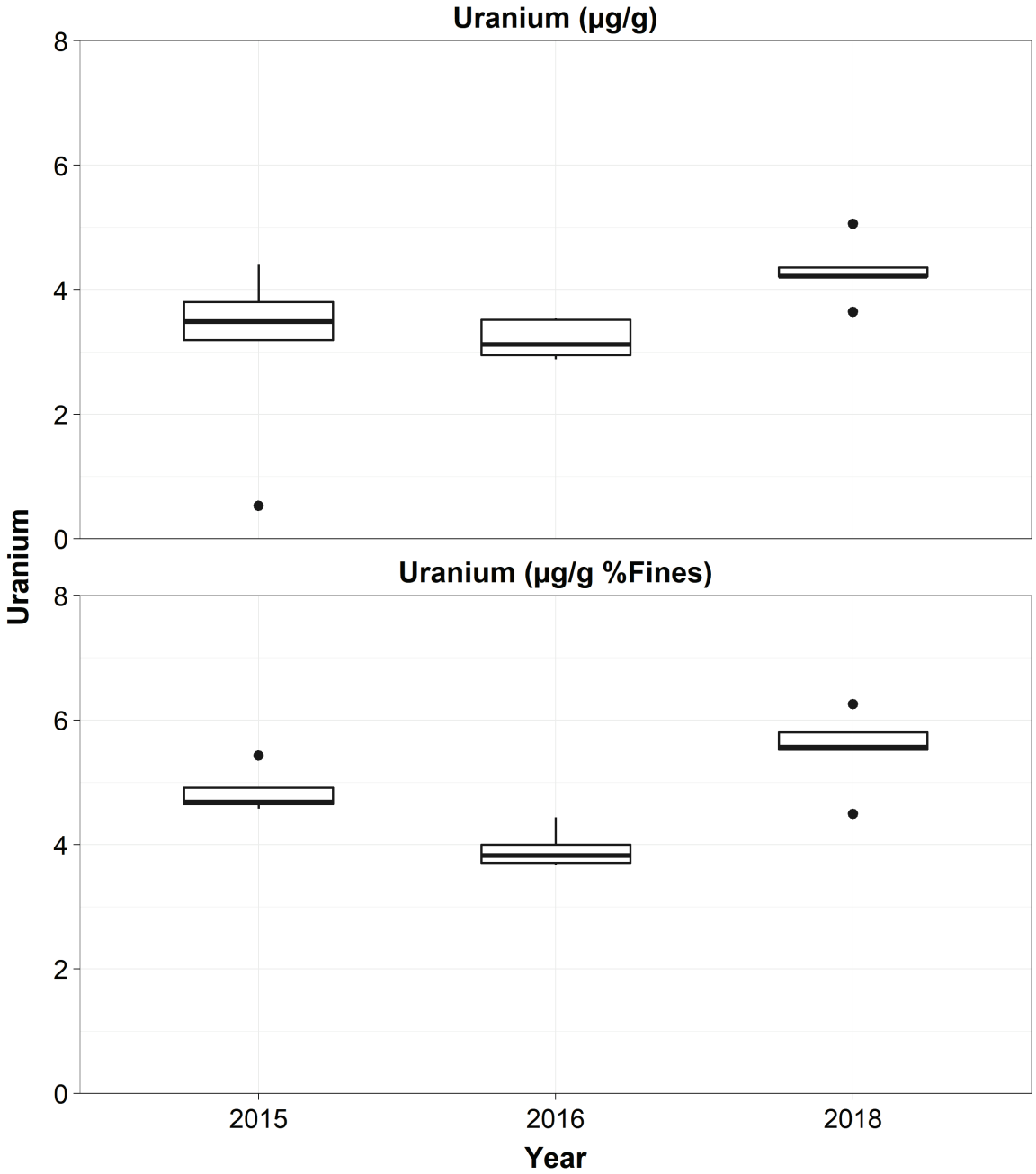
µg/g = micrograms per gram.

Figure 8G.2-27: Box-and-whisker Plots of Tin Concentrations in Meliadine Lake Near-field Area, 2018



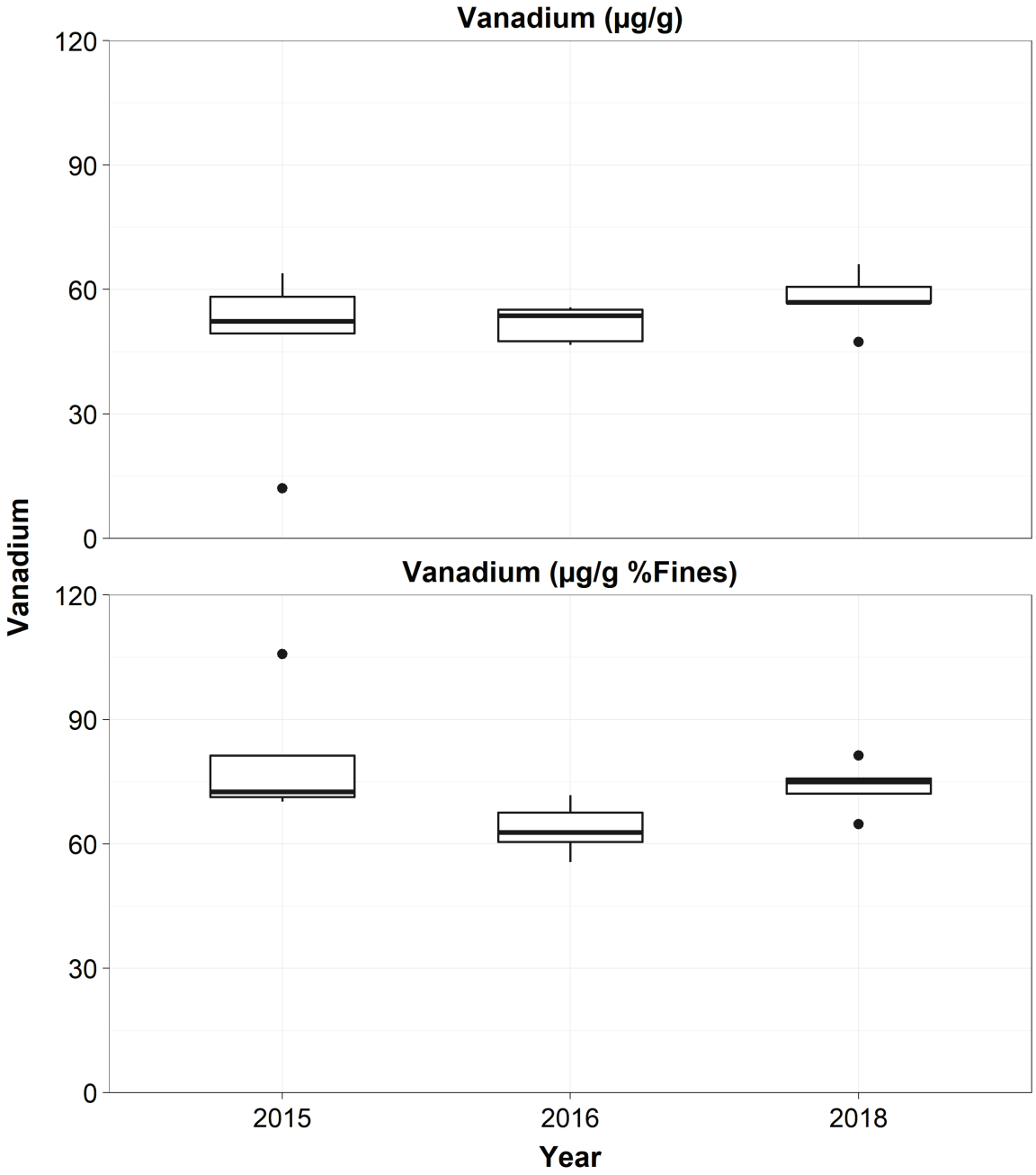
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-28: Box-and-whisker Plots of Titanium Concentrations in Meliadine Lake Near-field Area, 2018



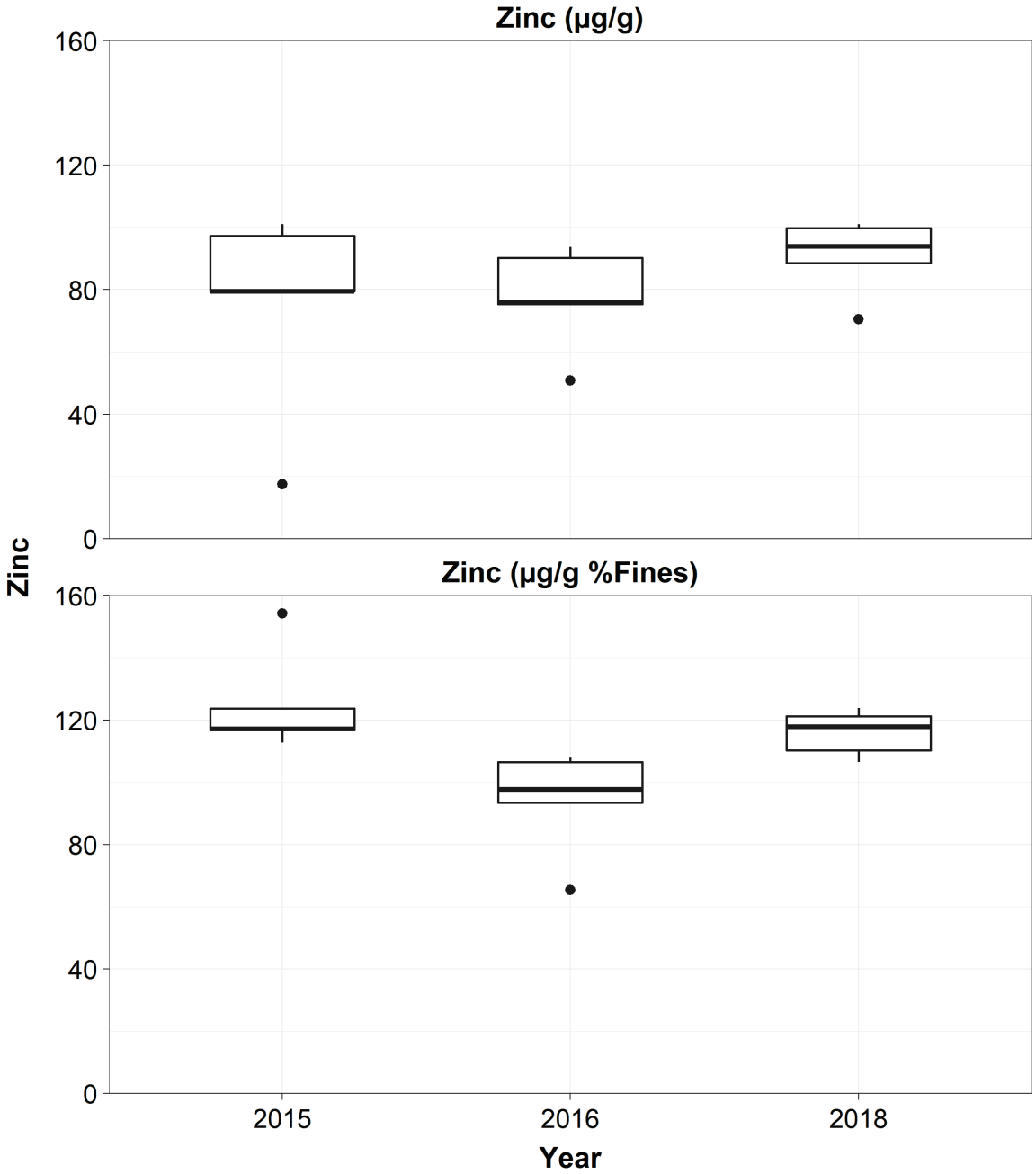
Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-29: Box-and-whisker Plots of Uranium Concentrations in Meliadine Lake Near-field Area, 2018



Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-30: Box-and-whisker Plots of Vanadium Concentrations in Meliadine Lake Near-field Area, 2018



Note: top: non-normalized data; bottom: data normalized to % fines.
µg/g = micrograms per gram.

Figure 8G.2-31: Box-and-whisker Plots of Zinc Concentrations in Meliadine Lake Near-field Area, 2018

APPENDIX 9A

Sediment Reconnaissance Survey

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1.0 INTRODUCTION

Meliadine Lake sediments were characterized under baseline conditions as having a higher proportion of sand compared to silt, and limited amounts of clay (Golder 2014). However, the 2015 and 2016 sampling programs carried out under baseline conditions identified variability in substrate composition as a potential confounding factor for the combined 2018 Environmental Effects Monitoring (EEM) Program/Aquatic Effects Monitoring Program (AEMP) for the Mine (Golder 2018a). Specifically, the Near-field area had a higher proportion of fines (clay and silt) compared to the Mid-field area and reference areas, where bottom sediments consisted predominantly of sand. This study design consideration was also acknowledged by Agnico Eagle Mines Limited, in response to review comments from Environment and Climate Change Canada (ECCC), Indigenous and Northern Affairs Canada (INAC) and Kivalliq Inuit Association (KIA) on the 2017 AEMP Annual Report (Golder 2018b).

Prior to the 2018 EEM/AEMP benthic invertebrate and sediment sampling event, a Sediment Reconnaissance Survey was conducted in Meliadine Lake to assess substrate composition in greater detail in planned sampling areas. The reconnaissance survey was intended to collect information that could be used to optimize sampling station locations to further limit substrate variability between stations and areas, to the extent possible during field work.

The 2018 survey is documented in this appendix with respect to field methods, substrate analysis, and reporting of the data/information collected. Recommendations are also made to optimize 2018 station selection for the Sediment Quality and Benthic Invertebrate Community EEM/AEMP components. The recommendations consider results from both the 2018 Sediment Reconnaissance Survey and the 2018 Plume Delineation Study (Section 2.4.4 of the main report).

2.0 METHODS

2.1 Field Survey

Sediment quality samples were collected from Meliadine Lake from 17 to 27 July 2018, at or close to the existing Near-field, Mid-field, and Reference area stations previously sampled in 2015 and 2016 (see Figure 9A-1 and for stations sampled in July 2018). Existing stations and new reconnaissance stations were sampled in July 2018. Locations of all stations sampled for sediment since 2015 are listed in Table 9A-1. Some stations were relocated from the originally intended coordinates because of unfavourable sampling conditions that resulted in poor sampling efficiency, or to confirm suitable substrates at stations that align with the new permanent CP1 diffuser, which became operational in 2018.

Field crews were provided with the following sampling criteria, as listed in Specific Work Instructions (unpublished file information), to provide consistency among sampling stations and areas:

- Water depth of 7 to 10 m
- Grab sampler fullness of >40%
- High retrieval success

Retrieval success was defined as: (1) the grab sampler penetrated the sediments, without displacing/disturbing the sediments and upon retrieval; (2) the jaws of the sampler were fully closed and free from debris (e.g., rocks or vegetation); (3) sediment was not “overflowing” the top of the sampler; and (4) sampling success, as defined by the three previous criteria, was repeatable over three grab samples.

If the above sampling criteria could not be achieved at a station previously sampled in 2015 or 2016, sampling was repeated within the general location of the station for a sampling effort of up to three grabs. The stations were then adjusted to within a 5 to 10 m radius of the original sample locations for additional attempts (while maintaining the original station code).

At each station, sediment samples were collected using a petite Ponar grab (15.24 cm x 15.24 cm). Three grabs were composited for sample submission, with the exception of stations MEL-02-07 and MEL05-04, where four grabs were composited. Supporting environmental data and observations were recorded during each sampling attempt to facilitate data interpretation and station selection for the 2018 EEM/AEMP. Specifically, the following information was recorded at each station:

- water depth
- sediment composition based on visual observation (% sand,% fines)
- sediment odour/colour
- sampler fullness
- sampling success rate/ease of collection
- presence of coarse substrates (gravel/cobble/bedrock)
- presence of vegetation

The total sampling effort undertaken comprised 248 grab attempts at the stations shown in Figure 9A-1. In total, 21 composite sediment samples were collected and submitted to ALS Environmental (ALS) for particle size and total organic carbon (TOC) analysis. Samples were stored in food grade polyethylene bags and kept cool before being submitted to ALS.

2.2 Data Evaluation

A desktop analysis was conducted to evaluate the information available for each station, in terms of water depth, grab sample fullness (as% fullness), and consistency of particle size/TOC relative to other stations/areas. The findings informed the optimization of station selection for the 2018 EEM/AEMP field program in August, along with findings from the 2018 Plume Delineation Study and information available from the 2018 water quality monitoring program.

525000
530000
535000
540000
545000
7000000
6995000
6990000
6985000

REFERENCE AREA 2 (Mel-04)

REFERENCE AREA 1 (Mel-03)

Mel-03-03
Mel-03-04

Mel-02-01
Mel-02-05
Mel-02-06
Mel-02-02
Mel-02-04
Mel-02-07
Mel-02-03
Mel-02-08

MID-FIELD EXPOSURE AREA (Mel-02)

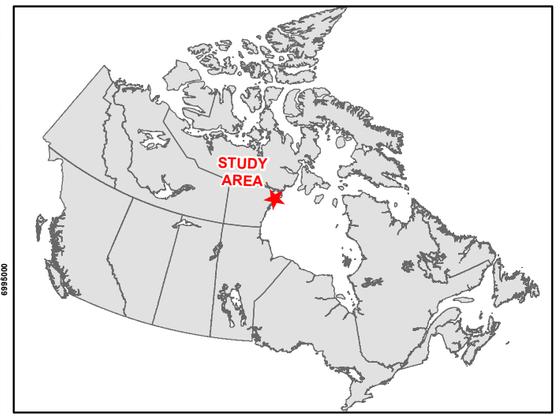
Mel-05-03
Mel-05-04
Mel-05-05
Mel-05-02

REFERENCE AREA 3 (Mel-05)

Mel-01-10
Mel-01-09
Mel-01-07
Mel-01-12
Mel-01-08
Mel-01-01
Mel-01-06

LEGEND

- SEDIMENT RECONNAISSANCE
- DE-WATERING EFFLUENT DISCHARGE
- DIFFUSOR LOCATION
- DIRECTION OF FLOW AT WATERSHED
- MINE FOOTPRINT
- WATERSHED BOUNDARY
- BATHYMETRIC CONTOUR (0.5 AND 2m
- WATERCOURSE
- WATERBODY



DRAFT

0 1.5 3
1:75,000 KILOMETRES

REFERENCE(S)
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED

PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
STATIONS SAMPLED DURING JULY 2018 SEDIMENT RECONNAISSANCE SURVEY

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-23
DESIGNED	CP
PREPARED	MH
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
1899052	1000	A	9A-1

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Table 9A-1: Sediment Sampling Stations in 2015 and 2016 AEMP Sampling Events, and the 2018 Sediment Reconnaissance Survey

Area	Station	2015 AEMP		2016 AEMP		2018 Reconnaissance	
		Easting (m)	Northing (m)	Easting (m)	Northing (m)	Easting (m)	Northing (m)
Near-field area	Mel-01-01	542691	6989132	542681	6989147	542692	6989141
	Mel-01-02	542665	6989282	542663	6989292	-	-
	Mel-01-03	542638	6988979	542624	6988989	-	-
	Mel-01-04	543145	6989086	543158	6989086	-	-
	Mel-01-05	542140	6989358	542093	6989369	-	-
	Mel-01-06	-	-	-	-	542907	6988773
	Mel-01-07	-	-	-	-	542877	6989199
	Mel-01-08	-	-	-	-	543044	6989067
	Mel-01-09	-	-	-	-	542555	6899188
	Mel-01-10	-	-	-	-	542752	6989286
	Mel-01-12	-	-	-	-	543280	6989106
Mid-field area	Mel-02-01	537511	6992932	537470	6993003	537536	6993197
	Mel-02-02	537093	6992642	537092	6992635	537082	6992609
	Mel-02-03	540730	6990162	537499	6992324	537500	6992327
	Mel-02-04	537961	6992341	537962	6992347	537750	6992528
	Mel-02-05	537831	6992692	537826	6992705	537850	6992828
	Mel-02-06	-	-	-	-	536926	6992848
	Mel-02-07	-	-	-	-	537794	6992140
	Mel-02-08	-	-	-	-	538338	6991953
Reference area 1	Mel-03-01	533305	6998519	533311	6998501	-	-
	Mel-03-02	533265	6998567	533268	6998695	-	-
	Mel-03-03	532974	6998835	532979	6998850	532954	6998860
	Mel-03-04	533624	6998668	533637	6998694	533629	6998660
	Mel-03-05	533999	6998628	534001	6998290	-	-
Reference area 2	Mel-04-01	525647	7000880	525651	7000873	-	-
	Mel-04-02	526149	7001520	526159	7001527	-	-
	Mel-04-03	525351	7001360	525350	7001359	-	-
	Mel-04-04	525401	7001080	525406	7001079	-	-
	Mel-04-05	525735	7001130	525757	7001140	-	-
Reference area 3	Mel-05-01	530926	6990860	530941	6990853	-	-
	Mel-05-02	530669	6990880	530665	6990896	530699	6990881
	Mel-05-03	530735	6991370	530742	6991380	530728	5991366
	Mel-05-04	530570	6991220	530568	6991227	530571	6991216
	Mel-05-05	530240	6991160	530237	6991177	530234	6991158

Note: UTM coordinates are shown, NAD 83, Zone 15V.

UTM = Universal transverse Mercator; AEMP = Aquatic Effects Monitoring Program.

3.0 RESULTS

3.1 Field Sampling and Sediment Characterization

Due to inclement weather and resulting unsafe conditions that occurred during the July sampling event, preference was given to the two exposure areas (Near-field and Mid-field) and two of the three reference areas (Reference area 1 and Reference area 3). Of the two reference areas, priority was given to Reference area 3, because the 2016 data indicated the substrates in this area were most similar to Near-field area substrates. Reference area 1 was sampled because it was identified as the reference area for the 2018 EEM program.

All reconnaissance stations sampled were located within the profundal zone of the lake. Most locations sampled were within the 7 to 10 m depth range, which was targeted the 2018 EEM/AEMP survey.

Results from the field survey and the subsequent laboratory determination of particle size and TOC for a subset of stations are summarized in Table 9A-1. The following observations suggest that sediment composition is inherently variable in the EEM and AEMP sampling areas of Meliadine Lake, both within and among areas, to various degrees.

- Sampling efficiency (i.e., the effort required to obtain the minimum of three sediment samples) differed both within and across areas, but was generally lowest in the Mid-field area, where up to 36 attempts were needed for successful grabs, followed by the Near-field area. Sampling at Reference area 3 stations was the most efficient, with three of four samples having a 100% success rate. The two stations sampled in Reference area 1 had lower retrieval success (i.e., 50% and 60%), but still met acceptability criteria.
- Sediments at the Near-field area stations were primarily composed of silt (mean = 76%) with some sand present up to a maximum of 26%.
- Sediments in the Mid-field area and reference areas had a more even mix of sand and silt. Of these areas, the Mid-field area and Reference area 3 had proportionally more sand, whereas Reference area 1 had proportionally more silt.
- Clay content was relatively low in all samples, ranging from 1.2% to 6.1% across all areas sampled; however, the field crews noted that the Ponar grab frequently encountered bedrock or hard-packed clay substrates when sampling in some EEM and AEMP areas.
- TOC varied from 1.5% to 9.9% across all areas sampled during the reconnaissance survey; the average across all areas and stations was 5.3%.

Table 9A-2: Summary of Field Data from 2015 and 2016 AEMP Sampling Events, and the July 2018 Sediment Reconnaissance Survey

Area	Station	2015							2016									2018								
		Depth (m)	Sand (%)	Silt (%)	Clay (%)	TOC (%)	Grab Fullness[b] (%)	Grabs / Sample	Depth (m)	Sand (%)	Silt (%)	Clay (%)	TOC (%)	Grab Fullness[b] (%)	Grabs / Sample	Grab Attempts	Efficiency[c] (%)	Depth (m)	Sand (%)	Silt (%)	Clay (%)	TOC (%)	Grab Fullness[b] (%)	Grabs / Sample	Grab Attempts	Efficiency[c] (%)
Near-field area	Mel-01-01[a]	8.6	35.8	58.8	5.5	4.2	70	3	8.6	29.6	55.6	14.8	3.7	85-100	5	7	71.4	10.0	30.2	67.0	2.8	4.0	90	3	8	37.5
	Mel-01-02	7.7	16.9	74.4	8.7	5.7	60-70	3	7.7	12.0	75.4	12.6	5.4	60-90	5	12	41.7	-	-	-	-	-	-	-	-	-
	Mel-01-03	8.8	31.9	63.5	4.6	4.8	70	3	8.8	22.9	66.8	10.3	4.6	85-95	5	14	35.7	-	-	-	-	-	-	-	-	-
	Mel-01-04	8.8	10.4	80.6	9.0	6.1	60-70	3	8.8	3.4	83.4	13.2	6.8	80-95	5	6	83.3	-	-	-	-	-	-	-	-	-
	Mel-01-05	8.2	88.6	10.8	0.6	0.4	5	5	8.2	22.3	68.4	9.3	2.1	85-90	5	23	21.7	-	-	-	-	-	-	-	-	-
	Mel-01-06[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	32.6	64.8	2.6	3.1	80 - 90	3	14	21.4
	Mel-01-07[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0	15.7	80.1	4.3	5.0	80	3	12	25.0
	Mel-01-08[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.1	18.3	76.0	5.7	4.4	70	3	11	27.3
	Mel-01-09[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	9.6	86.1	4.3	5.3	80	3	6	50.0
	Mel-01-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.8	16.3	79.3	4.4	4.5	90	3	4	75.0
	Mel-01-12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	16.3	77.8	5.9	5.6	70	3	17	17.6
Mid-field area	Mel-02-01[a]	7.9	37.5	56.5	6.1	5.2	60	3	7.9	64.2	32.2	3.6	0.4	60-75	5	35	14.3	9.7	27.0	66.9	6.1	9.9	80	3	36	8.3
	Mel-02-02[a]	9.0	24.7	60.4	14.9	11.0	80	3	9.0	51.9	35.9	12.1	7.6	90-100	5	5	100.0	8.6	74.1	24.6	1.3	4.6	-	3	10	30.0
	Mel-02-03[a]	9.0	42.5	49.3	8.2	7.2	70	3	9.0	61.0	28.1	10.9	4.2	90-100	5	13	38.5	9.0	86.5	13.0	<1.0	3.4	-	3	6	50.0
	Mel-02-04[a]	9.3	92.4	7.2	0.4	0.5	5	8	9.3	43.0	42.0	15.0	5.2	60-75	5	12	41.7	9.3	53.9	44.7	1.4	1.5	60-70	3	24	12.5
	Mel-02-05[a]	10.1	79.7	17.9	2.4	0.1	5	12	10.1	49.9	35.2	14.9	5.8	60-75	5	5	100.0	8.6	60.3	38.3	1.4	8.9	100	3	21	14.3
	Mel-02-06$_a$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.6	30.7	65.8	3.5	9.5	60-70	3	12	25.0
	Mel-02-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	78.9	19.9	1.2	5.4	60-80	4	36	11.1
	Mel-02-08[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	86.4	12.8	<1.0	4.6	90-100	3	4	75.0
Reference area 1	Mel-03-01	7.2	85.2	14.1	0.8	-	-	-	7.2	85.2	14.1	0.8	1.3	85-100	5	6	83.3	-	-	-	-	-	-	-	-	-
	Mel-03-02	9.5	81.2	18.5	0.3	-	-	-	9.5	81.2	18.5	0.3	1.0	70-80	5	9	55.6	-	-	-	-	-	-	-	-	-
	Mel-03-03[a]	9.8	42.6	48.7	8.7	-	-	-	9.8	42.6	48.7	8.7	6.5	100	5	9	55.6	9.5	28.4	67.5	4.1	6.8	100	3	5	60.0
	Mel-03-04[a]	7.8	41.0	47.5	11.5	-	-	-	7.8	14.0	47.5	11.5	5.6	90-95	5	5	100.0	7.8	48.4	49.1	2.5	6.1	100	3	6	50.0
	Mel-03-05	7.6	61.7	32.7	5.7	-	-	-	7.6	61.7	32.7	5.7	4.3	90	5	9	55.6	-	-	-	-	-	-	-	-	-
Reference area 2	Mel-04-01	8.2	65.5	30.1	4.4	-	-	-	8.2	65.5	30.1	4.4	3.0	80-95	5	6	83.3	-	-	-	-	-	-	-	-	-
	Mel-04-02	10.5	40.9	49.7	9.4	-	-	-	10.5	40.9	49.7	9.4	0.8	65-80	5	25	20.0	-	-	-	-	-	-	-	-	-
	Mel-04-03	9.7	68.3	24.7	7.0	-	-	-	9.7	68.3	24.7	7.0	3.4	75-100	5	12	41.7	-	-	-	-	-	-	-	-	-
	Mel-04-04	9.1	49.7	40.4	9.9	-	-	-	9.1	49.7	40.4	9.9	4.9	90-10	5	8	62.5	-	-	-	-	-	-	-	-	-
	Mel-04-05	7.4	92.9	6.3	0.9	-	-	-	7.4	92.9	6.3	1.0	0.5	70-75	5	10	50.0	-	-	-	-	-	-	-	-	-

Table 9A-2: Summary of Field Data from 2015 and 2016 AEMP Sampling Events, and the July 2018 Sediment Reconnaissance Survey

Area	Station	2015							2016									2018								
		Depth (m)	Sand (%)	Silt (%)	Clay (%)	TOC (%)	Grab Fullness[b] (%)	Grabs / Sample	Depth (m)	Sand (%)	Silt (%)	Clay (%)	TOC (%)	Grab Fullness[b] (%)	Grabs / Sample	Grab Attempts	Efficiency[c] (%)	Depth (m)	Sand (%)	Silt (%)	Clay (%)	TOC (%)	Grab Fullness[b] (%)	Grabs / Sample	Grab Attempts	Efficiency[c] (%)
Reference area 3	Mel-05-01	9.2	93.0	6.9	0.1	-	-	-	9.2	93.0	6.9	0.1	0.9	10-90	5	16	31.3	-	-	-	-	-	-	-	-	-
	Mel-05-02[a]	9.2	49.0	42.7	8.3	-	-	-	9.2	49.0	42.7	8.3	4.8	75-95	5	8	62.5	9.1	63.1	34.5	2.4	6.1	10	3	3	100.0
	Mel-05-03[a]	8.3	46.6	44.4	9.0	-	-	-	8.3	46.6	44.4	9.0	7.4	90-100	5	8	62.5	8.2	66.6	31.2	2.2	6.3	100	3	3	100.0
	Mel-05-04[a]	9.9	74.2	21.6	4.2	-	-	-	9.9	74.2	21.6	4.2	4.0	90-100	5	8	62.5	9.8	80.2	19.1	<1.0	2.6	100	4	4	100.0
	Mel-05-05	8.4	50.0	39.7	10.3	-	-	-	8.4	50.0	39.7	10.3	7.9	70-90	5	11	45.5	7.4	23.2	70.9	5.9	4.5	100	3	6	50.0

a) Indicates that the station will also be used for water quality sampling.

b) Fullness values only include grabs that were retained for sediment analysis (i.e., successful grabs).

c) Efficiency is the% of successful grabs out of the total attempts for that station.

Note: Grab attempts and efficiency are not available for 2015. TOC = total organic carbon; - = not applicable or not available.

3.2 Sampling Station Optimization for the EEM/AEMP 2018 August Program

In consideration of the results of the Sediment Reconnaissance Survey (Section 3.1) and Plume Delineation Study (Section 2.4.4 of the main report) results, five stations within each of the EEM and AEMP areas were selected for sampling during the August 2018 EEM/AEMP program, as summarized below:

- **Near-field Stations (EEM/AEMP):** MEL-01-01 was retained because it was also retained as part of the water quality component Near-field station re-alignment, after review of the 2018 Plume Delineation Study results. Furthermore, sampling in July 2018 confirmed that sampling efficiency and grab fullness at this station were acceptable. The other four stations confirmed by the water quality re-alignment (i.e., MEL01-06, MEL01-07, MEL01-08 and MEL01-09) were adopted as 2018 sediment and benthic monitoring stations, because they also had acceptable sampling efficiency and grab fullness. Furthermore, substrate composition was relatively consistent among the five 2018 Near-field water quality stations.
- **Mid-field Stations**: 2018 sediment stations were selected to maintain alignment with water quality but to also avoid excessive sampling effort in retrieving acceptable grab samples. Therefore, MEL-02-06 and MEL-02-08 were chosen to replace MEL-02-01 and MEL-02-04, because of difficulty retrieving acceptable samples from MEL-02-01 and MEL-02-04. For stations that were re-sampled for consistency with previous years, locations were adjusted to within 5 to 10 m of the original sample locations based on sampling success.
- **Reference Area Stations (EEM/AEMP):** Stations were selected to align monitoring stations between water quality and the benthic invertebrate community surveys. Reconnaissance data at these areas were limited, but served as a confirmation of the characteristics of these sampling stations compared to previous years, and whether they are suitable as a reference to the exposure areas. For stations that were resampled for consistency with previous years, some stations were adjusted to within 5 to 10 m of the original sample locations.

References

Golder. 2014. Final Environmental Impact Statement, Meliadine Gold Project. Nunavut. April 2017.

Golder. 2018a. Meliadine Gold Project, Nunavut Aquatic Effects Monitoring Program (AEMP) – 2017 Annual Report. Prepared for Agnico Eagle Mines Limited, Rouyn Noranda, Quebec.

Golder. 2018b. Response to Comments on the Cycle 1 EEM Study Design for Meliadine Mine. Technical Memorandum. May 2018.

APPENDIX 9B

Laboratory Methods and Reference Collection

Methods and QC Report 2018

Project ID: Meliadine AEMP (1787610)

Client: Golder Associates Inc.

Prepared by:
Cordillera Consulting Inc.
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Taxonomic Keys 6

Sample Reception

On September 14, 2018, Cordillera Consulting received 24 samples from Golder Associates Inc. When samples arrived to Cordillera Consulting, exterior packaging was initially inspected for damage or wet spots that would have indicated damage to the interior containers.

Next, samples were logged into a proprietary software database (INSTAR1) where the clients assigned sample name was recorded along with a Cordillera Consulting (CC) number for cross-reference. Each sample was checked to ensure that all sites and replicates recorded on field sheets or packing lists were delivered intact and with adequate preservative. Any missing, mislabelled or extra samples were reported to the client immediately to confirm the total numbers and correct names on the sample jars. The client representative was notified of the arrival of the shipment and provided a sample inventory once intake was completed.
See table below for sample inventory:

Table 1: Summary of sample information including Cordillera Consulting (CC) number

Site	Sample	CC#	Date	Size	# of Jars
MEL-01	MEL-01-01	CC190795	8/22/2018	500µM	2
MEL-01	MEL-01-06	CC190796	8/22/2018	500µM	1
MEL-01	MEL-01-07	CC190797	8/22/2018	500µM	1
MEL-01	MEL-01-08	CC190798	8/22/2018	500µM	1
MEL-01	MEL-01-09	CC190799	8/22/2018	500µM	1
MEL-02	MEL-02-02	CC190800	8/31/2018	500µM	1
MEL-02	MEL-02-03	CC190801	8/18/2018	500µM	1
MEL-02	MEL-02-05	CC190802	8/31/2018	500µM	1
MEL-02	MEL-02-06	CC190803	8/31/2018	500µM	1
MEL-02	MEL-02-08	CC190804	8/15/2018	500µM	1
MEL-03	MEL-03-01	CC190805	8/28/2018	500µM	1
MEL-03	MEL-03-02	CC190806	8/28/2018	500µM	1
MEL-03	MEL-03-03	CC190807	8/26/2018	500µM	1
MEL-03	MEL-03-04	CC190808	8/20/2018	500µM	1
MEL-03	MEL-03-05	CC190809	8/28/2018	500µM	2
MEL-05	MEL-05-01	CC190810	9/1/2018	500µM	2
MEL-05	MEL-05-02	CC190811	8/30/2018	500µM	1

MEL-05	MEL-05-03	CC190812	8/29/2018	500µM	1
MEL-05	MEL-05-04-A	CC190813	8/30/2018	500µM	1
MEL-05	MEL-05-04-B	CC190814	8/30/2018	500µM	1
MEL-05	MEL-05-04-C	CC190815	8/30/2018	500µM	1
MEL-05	MEL-05-04-D	CC190816	8/30/2018	500µM	1
MEL-05	MEL-05-04-E	CC190817	8/30/2018	500µM	1
MEL-05	MEL-05-05	CC190818	8/29/2018	500µM	1

Sample Sorting

- Using a gridded Petri dish, fine forceps and a low power stereo-microscope (Olympus, Nikon, Leica) the sorting technicians removed the invertebrates and sorted them into family/orders.
- The sorting technician kept a running tally of total numbers excluding organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids. These organisms were marked for their presence (given a value of 1) only and left in the sample. They were not included towards the 300-organism subsample count.
- Where specimens are broken or damaged, only heads were counted.
- Subsampling was conducted with the use of a Marchant Box.
- When using the Marchant box, cells were extracted at the same time in the order indicated by a random number table. If the 300th organism was found part way into sorting a cell then the balance of that cell was sorted. If the organism count had not reached 300 by the 50th cell then the entire sample was sorted.
- The total number of cells sorted and the number of organisms removed were recorded manually on a bench sheet and then recorded into INSTAR1
- Organisms were stored in vials containing 80% ethanol and an interior label indicating the site names, date of sampling, site code numbers and portion subsampled. This information was also recorded on the laboratory bench sheet and on INSTAR1.
- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency (Sorting Quality Control – Sorting Efficiency). The unsorted portion was also labeled and preserved in separate jars.

Percent sub-sampled and total countable invertebrates pulled from the samples were summarized in the table below.

Table 2: Percent sub-sample and invertebrate count for each sample

Sample	Date	EMS	CC#	500 micron fraction	
				% Sampled	# Invertebrates
MEL-01-01	22-Aug-18		CC190795	100%	101
MEL-01-06	22-Aug-18		CC190796	100%	34
MEL-01-07	22-Aug-18		CC190797	100%	148
MEL-01-08	22-Aug-18		CC190798	100%	93
MEL-01-09	22-Aug-18		CC190799	100%	27
MEL-02-02	31-Aug-18		CC190800	100%	168
MEL-02-03	18-Aug-18		CC190801	100%	56
MEL-02-05	31-Aug-18		CC190802	100%	32

MEL-02-06	31-Aug-18		CC190803	100%	94
MEL-02-08	15-Aug-18		CC190804	100%	149
MEL-03-01	28-Aug-18		CC190805	100%	144
MEL-03-02	28-Aug-18		CC190806	100%	151
MEL-03-03	26-Aug-18		CC190807	100%	268
MEL-03-04	20-Aug-18		CC190808	100%	28
MEL-03-05	28-Aug-18		CC190809	100%	144
MEL-05-01	01-Sep-18		CC190810	100%	252
MEL-05-02	30-Aug-18		CC190811	100%	127
MEL-05-03	29-Aug-18		CC190812	100%	181
MEL-05-04-A	30-Aug-18		CC190813	100%	19
MEL-05-04-B	30-Aug-18		CC190814	100%	61
MEL-05-04-C	30-Aug-18		CC190815	100%	15
MEL-05-04-D	30-Aug-18		CC190816	100%	57
MEL-05-04-E	30-Aug-18		CC190817	100%	39
MEL-05-05	29-Aug-18		CC190818	100%	1

Sorting Quality Control - Sorting Efficiency

As a part of Cordillera's laboratory policy, all projects undergo sorting efficiency checks.

- As sorting progresses, 10% of samples were randomly chosen by senior members of the sorting team for resorting.
- All sorters working on a project had at least 1 sample resorted by another sorter.
- An efficiency of 90 % was expected (95% for CABIN samples).
- If 90/95% efficiency was not met, samples from that sorter were resorted.
- To calculated sorting efficiency the following formula was used:

$$\frac{\#OrganismsMissed}{TotalOrganismsFound} * 100 = \%OM$$

In sample CC191382, the subsample fell below the threshold for sorting efficiency. This was a result of a new sorter not understanding the difference between an anterior end and a posterior end of an Oligochaete. All samples by this individual were reanalyzed and to ensure proper sample enumeration.

Table 3: Summary of sorting efficiency

CC #	Number of Organisms Recovered (initial sort)	Number of Organisms in Re-sort	Percent Recovery
CC190804	149	0	100%
190816	57	2	96%
		Average Recovery	98%

Taxonomic Effort

The next procedure was the identification to genus-species level where possible of all the organisms in the sample.

- Identifications were made at the genus/species level for all insect organisms found including Chironomidae (Based on CABIN protocol).
- Non-insect organisms (except those not included in CABIN count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens.
- The Standard Taxonomic Effort lists compiled by the CABIN manual[1], SAFIT[2] , and PNAMP[3] were used as a guide line for what level of identification to achieve where the condition and maturity of the organism enabled.
- Organisms from the same families/order were kept in separate vials with 80% ethanol and an interior label of printed laser paper.
- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slide.
- Oligochaetes was identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide.
- Other Annelida (leeches, polychaetes) were identified to the family/genus/species level with undamaged, mature specimens.
- Mollusca was identified to family and genus/species where possible
- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.
- Bryozoans and Nemata remained at the phylum level
- Hydrachnidae and Cnidaria were identified at the family/genus level where possible.
- When requested, reference collections were made containing at least one individual from each taxa listed. Organisms represented will have been identified to the lowest practical level.
- Reference collection specimens were stored in 55 mm glass vials with screw-cap lids with polyseal inserts (museum quality). They were labeled with taxa name, site code, date identified and taxonomist name. The same information was applied to labels on the slide mounts.

Taxonomy Staff

The taxonomists for this project were certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program at level 2 which is the required certification for CABIN projects:

Scott Finlayson: Group 1 General Arthropods (West); Group 2 EPT (East/West); Group 3 Chironomidae (East/West); Group 4 Oligochaeta

Adam Bliss: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae (East/West)

Rita Avery: Group 1 General Arthropods (East/West); Group 2 EPT (East/West)

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[3] Pacific Northwest Aquatic Monitoring Partnership (Accessed 2015). www.pnamp.org

Taxonomic Keys

Below is a reference list of taxonomic keys utilized by taxonomists at Cordillera Consulting. Cordillera taxonomists routinely seek out new literature to ensure the most accurate identification keys are being utilized. This is not reflective of the exhaustive list of resources that we use for identification. A more complete list of taxonomic resources can be found at Southwest Association of Freshwater Invertebrate Taxonomists. (2015). http://www.safit.org/Docs/SAFIT_Taxonomic_Literature_Database_1_March_2011.enl

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info@cordilleraconsulting.ca
Ph: 250 494 7553

Reference Collection
Golder
Meliadine Lake

Vial #	Identification	Year	Site Code	CC Number	Client	Project
1	Valvata	12-Aug-16	MEL-01-02	CC170193	Golder	Meliadine Lake
2	Pisidium	12-Aug-16	MEL-01-02	CC170193	Golder	Meliadine Lake
3	Gammarus	12-Aug-16	MEL-01-03	CC170194	Golder	Meliadine Lake
4	Sphaerium	12-Aug-16	MEL-01-03	CC170194	Golder	Meliadine Lake
5	Lebertia	12-Aug-16	MEL-01-04	CC170195	Golder	Meliadine Lake
6	Oxus	12-Aug-16	MEL-01-05-D5	CC170200	Golder	Meliadine Lake
7	Piona	13-Aug-16	MEL-02-05	CC170205	Golder	Meliadine Lake
8	Grensia praeterita	11-Aug-16	MEL-03-01-D2	CC170207	Golder	Meliadine Lake
9	Bezzia/ Palpomyia	22-Aug-16	B7-02	CC170419	Golder	Meliadine Lake
10	Baetis	30-Aug-18	MEL-05-02	CC190811	Golder	Meliadine Lake
11	Zapada columbiana	30-Aug-18	MEL-05-02	CC190811	Golder	Meliadine Lake
12	Limnephilus	30-Aug-18	MEL-05-02	CC190811	Golder	Meliadine Lake
13	Brachycentrus occidentalis	26-Aug-18	MEL-03-03	CC190807	Golder	Meliadine Lake
14	Lepidurus	22-Aug-18	MEL-01-08	CC190798	Golder	Meliadine Lake
15	Hydra	22-Aug-18	MEL-01-01	CC190795	Golder	Meliadine Lake
1	Tubifex	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
2a	Protanypus	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
2b	Procladius	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
2c	Zavrelimyia	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
3a	Microtendipes	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
4a	Tanytarsus	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
4b	Micropsectra	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
5a	Stictochironomus	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
6	Pagastiella	12-Aug-16	MEL-01-01	CC170192	Golder	Meliadine Lake
7a	Ablabesmyia	12-Aug-16	MEL-01-02	CC170193	Golder	Meliadine Lake
8a	Paracladius	12-Aug-16	MEL-01-02	CC170193	Golder	Meliadine Lake
8b	Heterotrissocladius	12-Aug-16	MEL-01-02	CC170193	Golder	Meliadine Lake
9a	Lumbriculus	12-Aug-16	MEL-01-03	CC170174	Golder	Meliadine Lake
10a	Paratanytarsus	12-Aug-16	MEL-01-03	CC170194	Golder	Meliadine Lake
10b	Stempellinella	12-Aug-16	MEL-01-03	CC170194	Golder	Meliadine Lake
11a	Corynocera	12-Aug-16	MEL-01-04	CC170195	Golder	Meliadine Lake
11b	Cryptochironomus	12-Aug-16	MEL-01-04	CC170195	Golder	Meliadine Lake
12a	Chironomus	12-Aug-16	MEL-01-04	CC170195	Golder	Meliadine Lake
13a	Phaenopsectra	12-Aug-16	MEL-01-04	CC170195	Golder	Meliadine Lake
13b	Polypedilum	12-Aug-16	MEL-01-04	CC170195	Golder	Meliadine Lake
14	Psectrocladius	12-Aug-16	MEL-01-04	CC170195	Golder	Meliadine Lake
15	Cladopelma	12-Aug-16	MEL-01-05-D5	CC170200	Golder	Meliadine Lake
16	Monodiamesa	13-Aug-16	MEL-02-01	CC170201	Golder	Meliadine Lake
17	Zalutschia	14-Aug-16	MEL-04-03	CC170217	Golder	Meliadine Lake
18	Thienemannimyia group	14-Aug-16	MEL-04-04	CC170218	Golder	Meliadine Lake
19a	Dicrotendipes	22-Aug-16	B7-02	CC170419	Golder	Meliadine Lake
20	Pseudosmittia	22-Aug-16	B7-02	CC170419	Golder	Meliadine Lake
21	Cladotanytarsus	31-Aug-18	MEL-02-02	CC190800	Golder	Meliadine Lake
22	Slavina appendiculata	15-Aug-18	MEL-02-08	CC190804	Golder	Meliadine Lake
23	Limnophyes	15-Aug-18	MEL-02-08	CC190804	Golder	Meliadine Lake
24	Sergentia	28-Aug-18	MEL-03-01	CC190805	Golder	Meliadine Lake
25	Nais	1-Sep-18	MEL-05-01	CC190810	Golder	Meliadine Lake

APPENDIX 9C

QC Results for Variability and Outlier Detection

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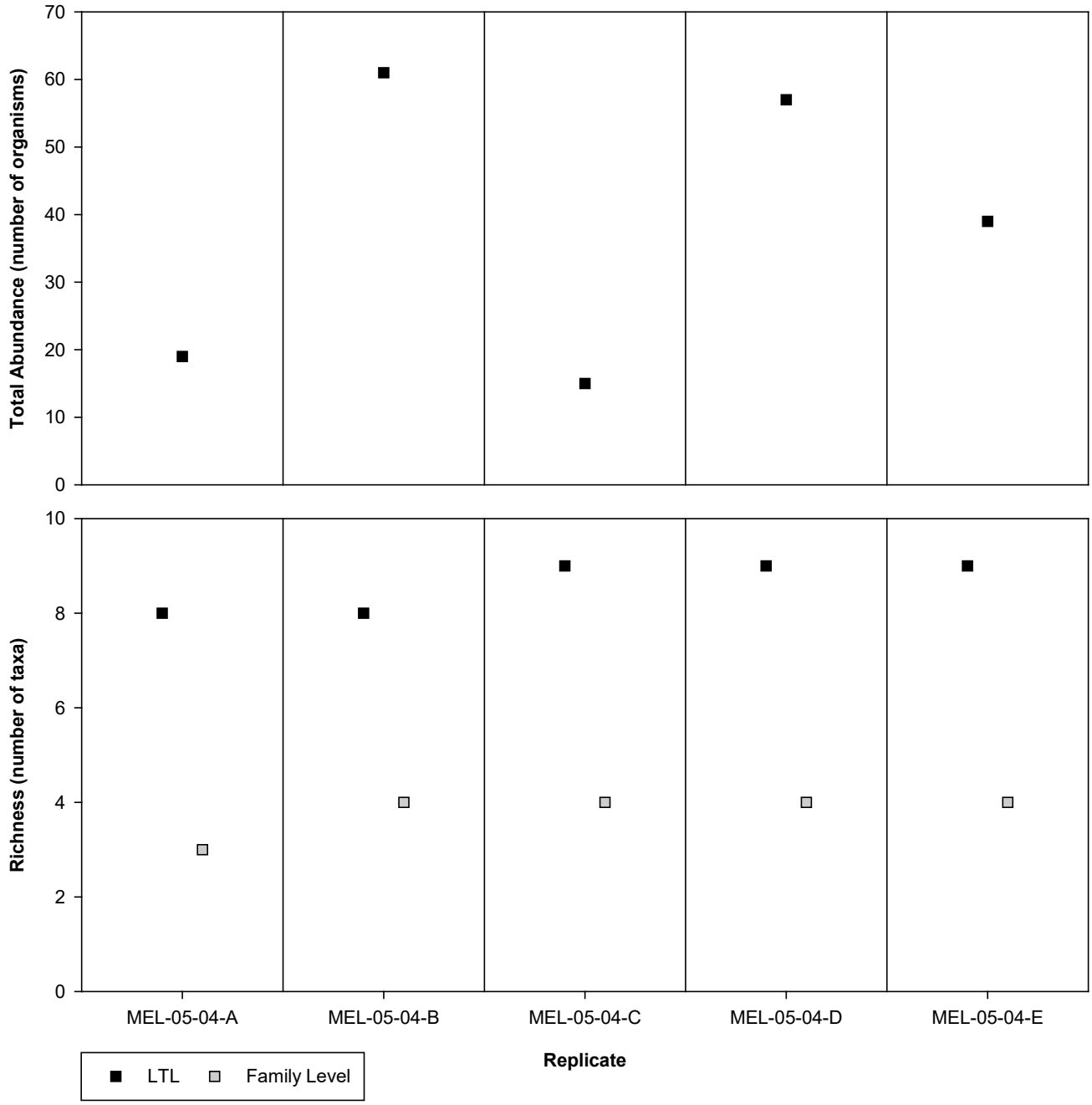
1.0 WITHIN-STATION VARIABILITY

Benthic invertebrate subsamples collected at Reference area Station MEL-05-04 were analyzed separately to provide information on the variability of benthic invertebrate endpoints within a single station, and the suitability of pooling subsamples in the field. Within-station estimates of variability for total invertebrate density and richness were summarized as the mean, summary statistics, and the % standard error (%SE = standard error expressed as the percentage of the mean) (Table 9C-1), and data for individual subsamples were plotted. Visual evaluation of the data for individual subsamples indicated a moderate degree of within-station variation (Figure 9C-1).

Values of %SE greater than 20% indicate a moderate level of variation at the subsample level and are slightly higher than desirable for benthic invertebrate data (Elliott 1971). At MEL-05-04, within-station variability was very low for richness and moderate for total abundance (Table 9C-1). These results are similar to those reported for other Arctic lakes in Northern Canada that are characterized by low invertebrate densities (e.g., Lac de Gras; Golder 2014) and where similar sampling methods were used for monitoring of benthic invertebrate communities under an Aquatic Effects Monitoring Program (AEMP).

Table 9C-1: Within-Station Variation in Benthic Community Variables in Meliadine Lake, 2018

Station-Replicate	Total Abundance (organisms/subsample)	Richness (no. of taxa/subsample)
MEL-05-04-A	19	8
MEL-05-04-B	61	8
MEL-05-04-C	15	9
MEL-05-04-D	57	9
MEL-05-04-E	39	9
Mean	**38.2**	**8.6**
% Standard error	**24.7**	**2.8**
Median	*39*	*9*
Maximum	*61*	*9*
Minimum	*15*	*8*
Standard deviation	*21.1*	*0.5*
Standard error	*9.4*	*0.2*

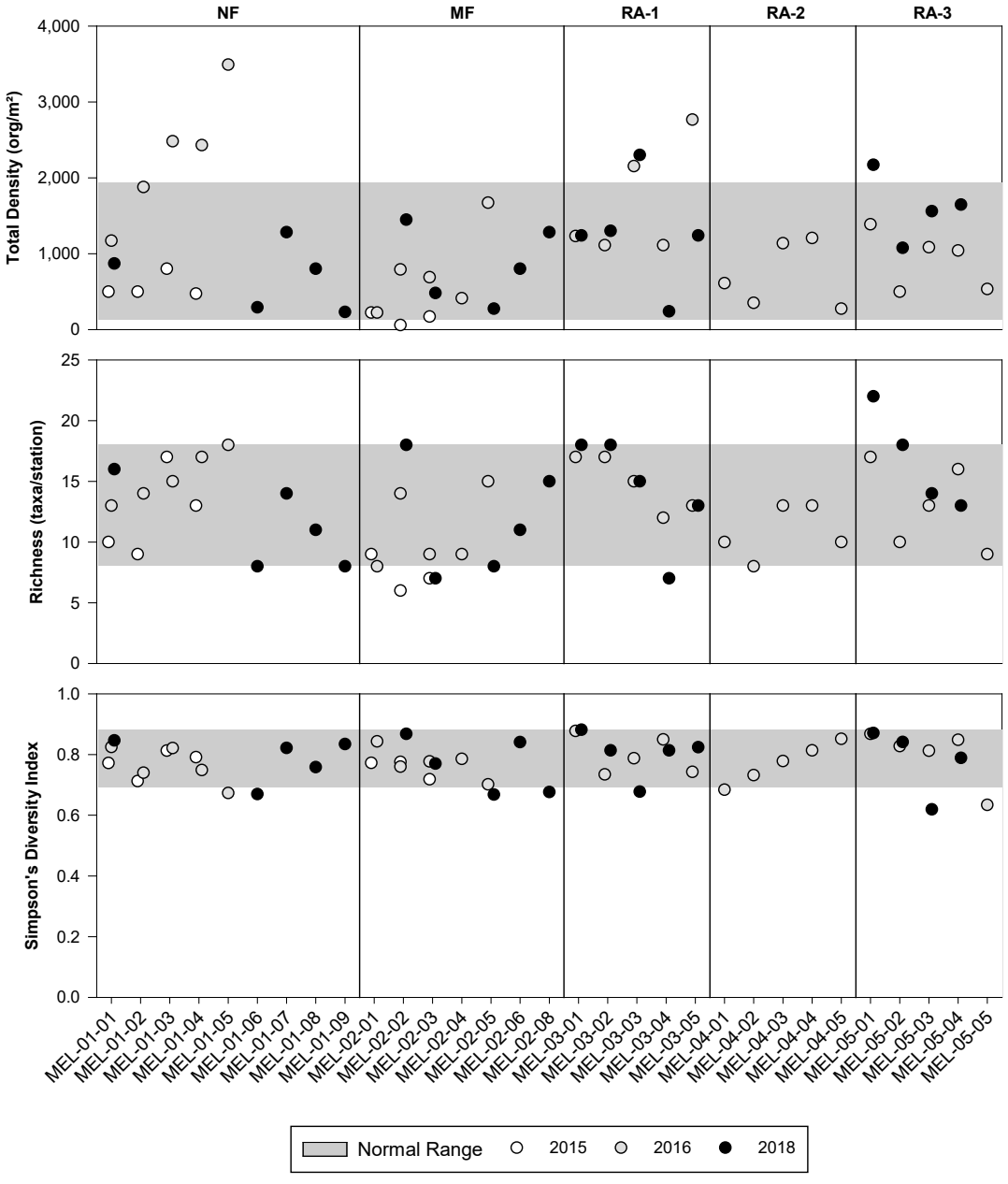


LTL = lowest taxonomic level.

Figure 9C-1: Within-station Variability for Total Abundance and Richness in Meliadine Lake, August 2018

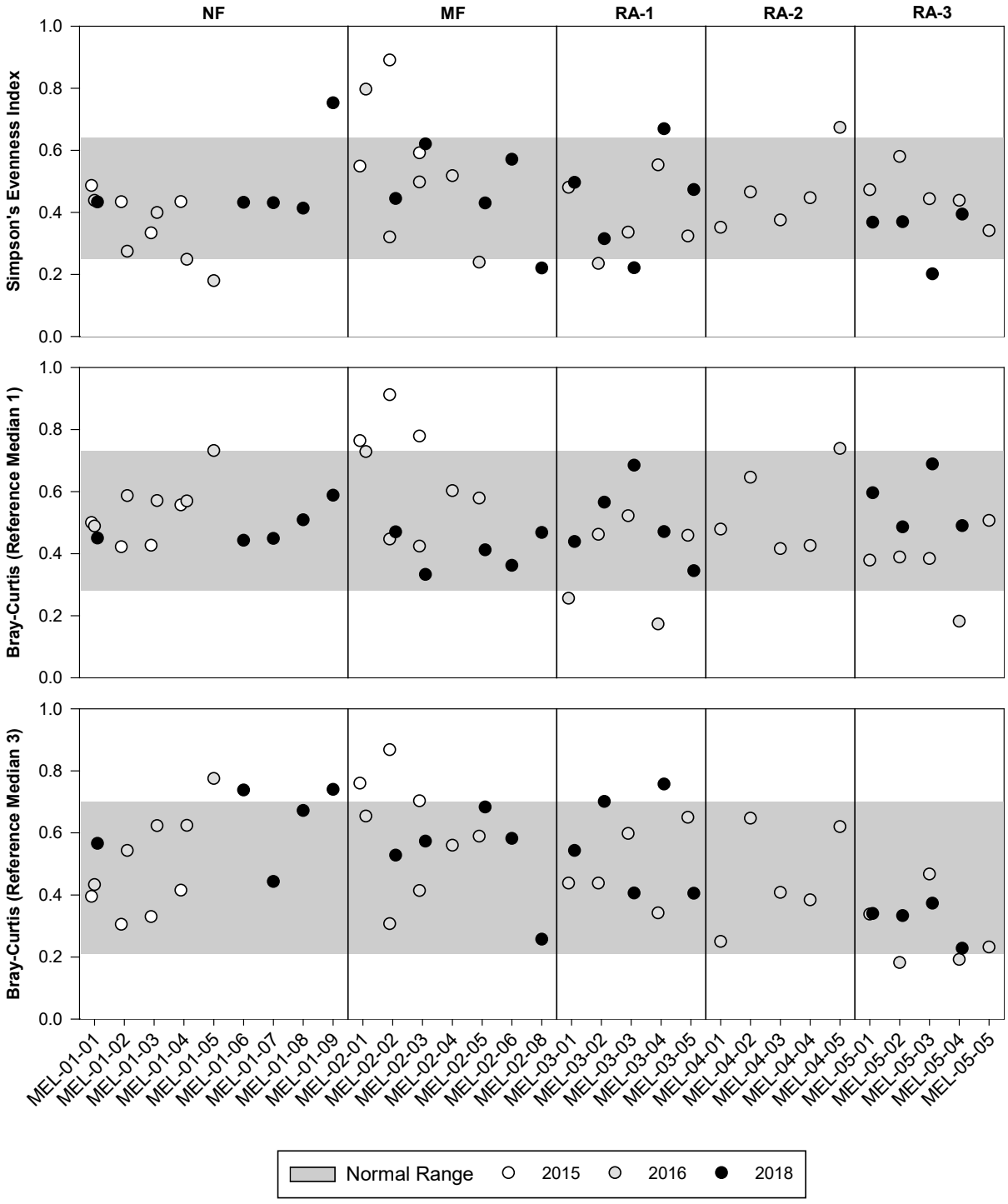
2.0 TEMPORAL VARIABILITY

Temporal variability within benthic invertebrate community sampling areas was plotted to provide information on the variability of benthic invertebrate variables, at the lowest taxonomic level, over the sampling years 2015, 2016 and 2018. Visual evaluation of the data for individual areas indicate a moderate degree of within-station variation (Figure 9C-2 to Figure 9C-4). The majority of the data fell within the normal range calculated for each of the benthic invertebrate variables.



NF = Near-field; MF = Mid-field; RA-1 = Reference area 1; RA-3 = Reference area 3.

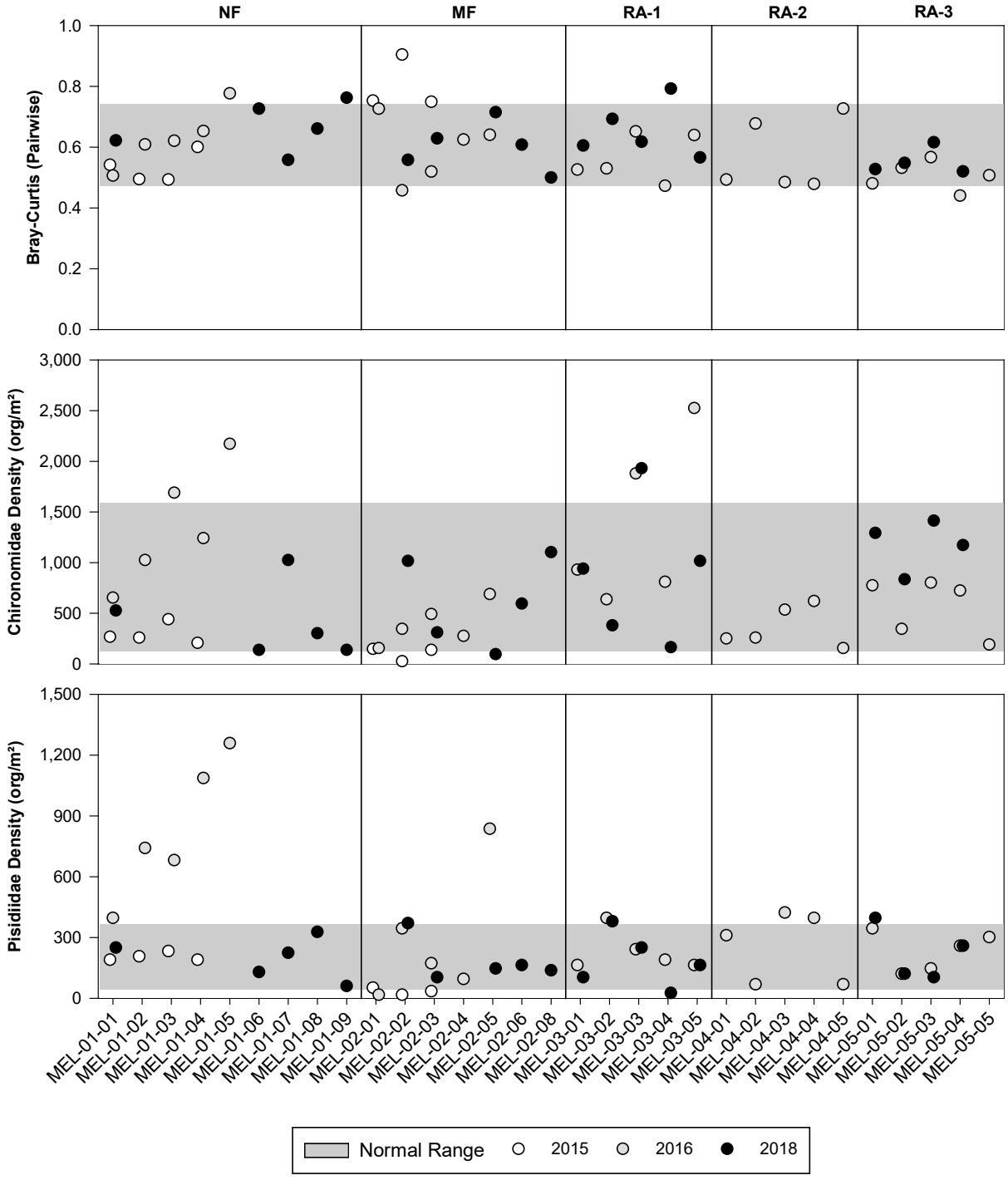
Figure 9C-2: Temporal Variability in Each Sampling Area for Total Benthic Invertebrate Density, Richness, Simpson's Diversity Index, Meliadine Lake 2015, 2016 and 2018



NF = Near-field; MF = Mid-field; RA-1 = Reference area 1; RA-3 = Reference area 3.

Note: BCI (Reference 1 Median and Reference 3 Median) were calculated using the EEM method.

Figure 9C-3: Temporal Variability in Each Sampling Area for Simpson's Evenness Index, Bray Curtis Index (EEM Reference 1 Median) and Bray Curtis Index (EEM Reference 3 Median), Meliadine Lake 2015, 2016 and 2018



NF = Near-field; MF = Mid-field; RA-1 = Reference area 1; RA-3 = Reference area 3.

Figure 9C-4: Temporal Variability in Each Sampling Area for Bray Curtis Index (Pairwise Method), Chironomidae Density and Pisidiidae Density, Meliadine Lake 2015, 2016 and 2018

3.0 OUTLIER SCREENING

Benthic invertebrate endpoint data for 2018 were displayed as box-and-whisker plots for visual assessment to identify potential outliers (Figure 9C-5) as per EEM TGD (EC 2012). The results for station MEL-05-05 resulted in an outlier for total density, richness, diversity and evenness. Only one invertebrate was present in the sample from MEL-05-05, which consisted of a composite of five grabs. The sample met all sampling criteria for grab sampler fullness and sediment particle size. However, based on initial data screening, MEL-05-05 was excluded from the statistical analysis, because the unusually low abundance in this sample suggested a data quality issue potentially related to improper sample preservation. Outliers from other stations were also examined, but there was no indication that the data were suspect, and the differences relative to station means were minor. Therefore, no other samples were excluded prior to statistical analysis.

Prior to statistical analyses, statistical outliers were identified using standardized residuals, which provide a measure of the difference between observed and expected values (i.e., residuals), normalized to the variance of the dataset, and were calculated as follows:

Standardized Residual: $x_z = \frac{x_i}{\sigma}$

Where:

x_z is the standardized residual

x_i is the residual of a data point

σ is the sample standard deviation

Data points with standardized residuals greater than |3.5| (i.e., more than 3.5 standard deviations from the sample mean), were identified as observations that may be unusual and were omitted from the statistical analysis. When an outlier was detected, the validity of the data point was examined. If the outlier was determined to be the result of a data entry error, it was corrected. If the outlier was not the result of data entry errors and could not be resolved otherwise, the analysis was completed with and without the outlier included.

Based on the above analysis, no statistical outliers were identified in the 2018 benthic invertebrate dataset.

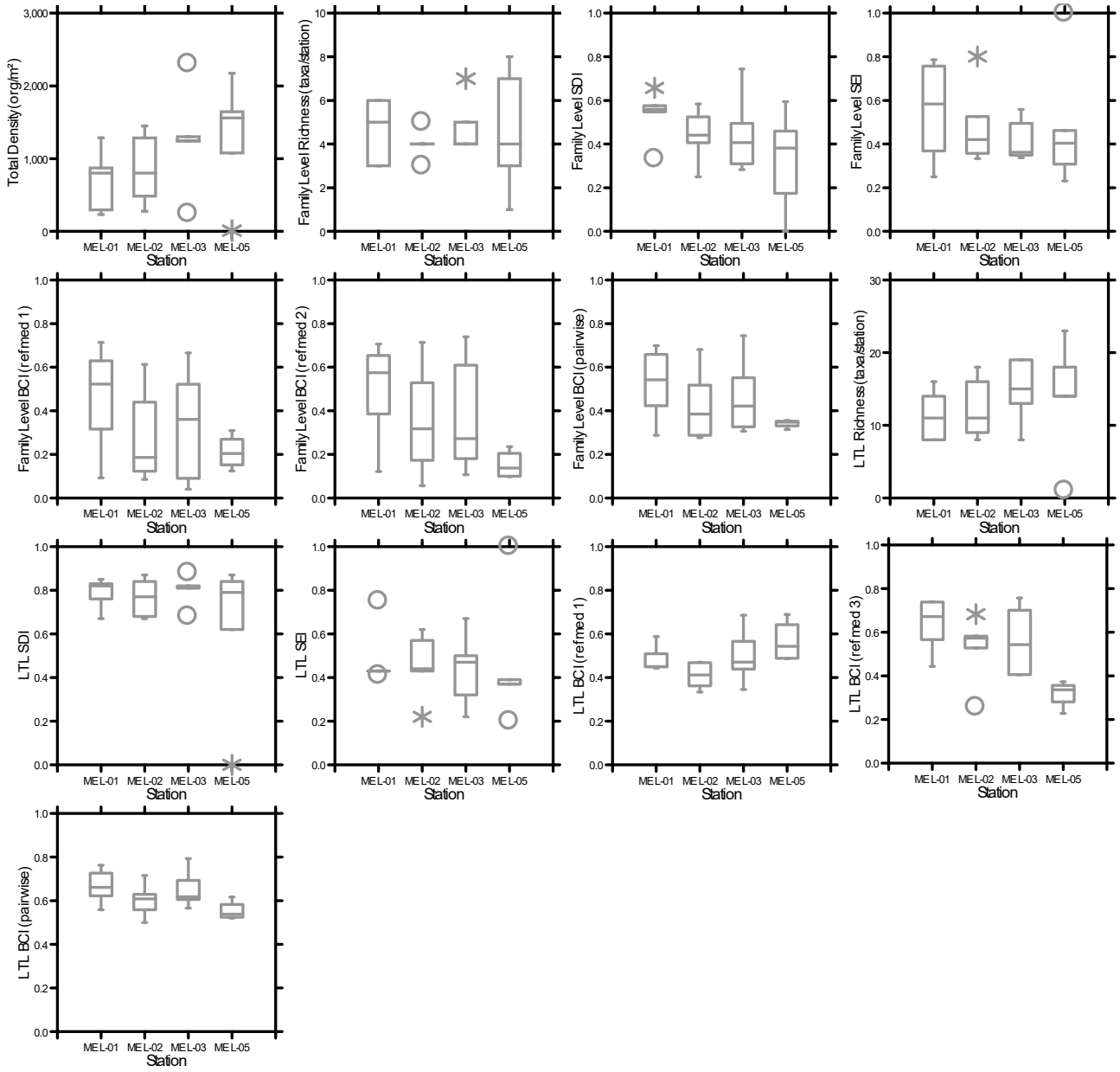


Figure 9C-5: Box and Whisker plots for Benthic Invertebrate Endpoints in Meliadine Lake, August 2018

APPENDIX 9D

Supporting Habitat Variables and Benthic Invertebrate Community Data Analysis Results

Table 9D-1: Summary of Habitat Variables for Meliadine Lake - Meliadine Mine Cycle 1 EEM and 2018 AEMP, Fall 2018

Area	Station	Sampling Date	Water Depth	Water Temperature	Dissolved Oxygen	pH	Specific Conductivity	Sediment Total Organic Carbon	Sediment Particle Size			
									Sand	Silt	Clay	Fines (Silt + Clay)
			(m)	(ºC)	(mg/L)		(µS/cm)	(%)	(%)	(%)	(%)	(%)
Near-field Area	MEL-01-01	22-Aug-18	9.0	10.5	11.9	8.6	86.1	4.0	24.9	63.5	11.6	75.1
	MEL-01-06	22-Aug-18	7.2	10.6	12.1	8.6	85.8	3.0	41.8	54.9	3.3	58.2
	MEL-01-07	21-Aug-18	8.0	10.8	11.8	8.6	91.1	5.7	6.3	82.4	11.3	93.7
	MEL-01-08	22-Aug-18	7.5	10.5	12.2	8.6	85.7	4.5	8.4	81.2	10.4	91.6
	MEL-01-09	22-Aug-18	7.2	10.5	12.0	8.6	85.4	5.3	24.2	61.3	14.5	75.8
		Mean	7.8	10.6	12.0	8.6	86.8	4.5	21.1	68.7	10.2	78.9
		Median	7.5	10.5	12.0	8.6	85.8	4.5	24.2	63.5	11.3	75.8
		Minimum	7.2	10.5	11.8	8.6	85.4	3.0	6.3	54.9	3.3	58.2
		Maximum	9.0	10.8	12.2	8.6	91.1	5.7	41.8	82.4	14.5	93.7
		Count	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
		SD	0.8	0.1	0.2	0.0	2.4	1.1	14.4	12.4	4.2	14.4
		SE	0.3	0.1	0.1	0.0	1.1	0.5	6.5	5.6	1.9	6.5
Mid-Field Area	MEL-02-02	31-Aug-18	7.0	9.0	11.7	7.9	78.0	4.6	67.9	23.6	8.6	32.2
	MEL-02-03	18-Aug-18	8.6	11.6	10.2	8.6	76.2	6.2	46.1	44.4	9.5	53.9
	MEL-02-05	18-Aug-18	8.5	11.9	10.3	8.6	76.4	9.0	32.6	50.5	16.9	67.4
	MEL-02-06	31-Aug-18	7.3	9.0	11.6	7.9	77.9	7.4	38.3	48.4	13.4	61.8
	MEL-02-08	15-Aug-18	9.0	11.9	10.1	8.6	76.3	6.2	63.4	29.3	7.3	36.6
		Mean	8.1	10.7	10.8	8.3	77.0	6.7	49.7	39.2	11.1	50.4
		Median	8.5	11.6	10.3	8.6	76.4	6.2	46.1	44.4	9.5	53.9
		Minimum	7.0	9.0	10.1	7.9	76.2	4.6	32.6	23.6	7.3	32.2
		Maximum	9.0	11.9	11.7	8.6	78.0	9.0	67.9	50.5	16.9	67.4
		Count	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
		SD	0.9	1.5	0.8	0.4	0.9	1.6	15.4	12.0	3.9	15.4
		SE	0.4	0.7	0.4	0.2	0.4	0.7	6.9	5.4	1.8	6.9

Table 9D-1: Summary of Habitat Variables for Meliadine Lake - Meliadine Mine Cycle 1 EEM and 2018 AEMP, Fall 2018

Area	Station	Sampling Date	Water Depth	Water Temperature	Dissolved Oxygen	pH	Specific Conductivity	Sediment Total Organic Carbon	Sediment Particle Size			
									Sand	Silt	Clay	Fines (Silt + Clay)
			(m)	(ºC)	(mg/L)		(µS/cm)	(%)	(%)	(%)	(%)	(%)
Reference Area 1	MEL-03-01	20-Aug-18	6.8	10.7	11.9	8.5	71.2	1.9	77.7	20.3	2.1	22.4
	MEL-03-02	26-Aug-18	6.9	8.6	12.0	8.5	72.8	0.3	66.8	31.7	1.5	33.2
	MEL-03-03	20-Aug-18	9.5	10.7	12.0	8.6	71.1	7.7	25.8	67.4	6.9	74.3
	MEL-03-04	26-Aug-18	6.6	8.4	12.1	8.5	72.8	5.4	46.9	48.5	4.6	53.1
	MEL-03-05	26-Aug-18	6.1	8.5	12.2	8.6	72.7	3.0	70.1	26.8	3.1	29.9
		Mean	7.2	9.4	12.0	8.5	72.1	3.7	57.5	38.9	3.6	42.6
		Median	6.8	8.6	12.0	8.5	72.7	3.0	66.8	31.7	3.1	33.2
		Minimum	6.1	8.4	11.9	8.5	71.1	0.3	25.8	20.3	1.5	22.4
		Maximum	9.5	10.7	12.2	8.6	72.8	7.7	77.7	67.4	6.9	74.3
		Count	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
		SD	1.3	1.2	0.1	0.1	0.9	2.9	21.0	19.0	2.2	21.1
		SE	0.6	0.5	0.1	0.0	0.4	1.3	9.4	8.5	1.0	9.4
Reference Area 3	MEL-05-01	01-Sep-18	9.0	9.0	11.7	8.0	75.3	0.8	92.3	7.5	<1	7.7
	MEL-05-02	30-Aug-18	9.3	8.9	11.7	8.0	75.9	7.8	54.0	40.3	5.6	45.9
	MEL-05-03	29-Aug-18	8.5	8.7	12.1	8.6	76.1	7.0	52.4	38.2	9.4	47.6
	MEL-05-04	30-Aug-18	9.5	8.8	11.7	7.9	76.2	7.2	41.5	42.2	16.3	58.5
	MEL-05-05	29-Aug-18	8.5	8.7	12.1	8.6	76.1	6.9	12.9	77.4	9.8	87.2
		Mean	9.0	8.8	11.9	8.2	75.9	5.9	50.6	41.1	10.3	49.4
		Median	9.0	8.8	11.7	8.0	76.1	7.0	52.4	40.3	9.6	47.6
		Minimum	8.5	8.7	11.7	7.9	75.3	0.8	12.9	7.5	5.6	7.7
		Maximum	9.5	9.0	12.1	8.6	76.2	7.8	92.3	77.4	16.3	87.2
		Count	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0
		SD	0.5	0.1	0.2	0.3	0.4	2.9	28.5	24.8	4.4	28.6
		SE	0.2	0.1	0.1	0.2	0.2	1.3	12.8	11.1	2.2	12.8

µS/cm = microSiemens per centimetre; SD= standard deviation; SE = standard error.

Table 9D-2: Benthic Invertebrate Abundance Data (per composite sample) - Meliadine Mine Cycle 1 EEM and 2018 AEMP, Fall 2018

Major Taxonomic Group	Family	Subfamily / Tribe	Genus/Species	MEL-01					MEL-02					MEL-03					MEL-05							
				MEL-01-01	MEL-01-06	MEL-01-07	MEL-01-08	MEL-01-09	MEL-02-02	MEL-02-03	MEL-02-05	MEL-02-06	MEL-02-08	MEL-03-01	MEL-03-02	MEL-03-03	MEL-03-04	MEL-03-05	MEL-05-01	MEL-05-02	MEL-05-03	MEL-05-04-A	MEL-05-04-B	MEL-05-04-C	MEL-05-04-D	MEL-05-04-E	MEL-05-05
Hydrozoa	Hydridae	-	*Hydra* sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turbellaria	-	-	-	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nematoda	-	-	-	1	0	1	0	0	1	0	0	1	1	1	1	1	1	0	1	1	1	1	0	1	1	0
Oligochaeta	Lumbriculidae	-	*Lumbriculus* sp.	0	0	0	0	0	0	1	0	0	0	3	13	0	0	0	7	2	0	0	0	0	0	0
	Naididae	Tubificinae	Tubificinae with chaetae	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Naidinae	*Nais* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
			Slavina appendiculata	0	0	0	0	0	0	0	0	0	1	3	0	7	0	0	0	0	0	0	0	0	0	0
Bivalvia	Pisidiidae	-	(i/d)	3	5	3	3	3	14	5	4	6	1	6	13	1	3	2	20	4	2	1	2	4	2	2	0
			Pisidium sp.	20	7	21	25	4	27	7	9	13	12	5	27	21	0	14	25	8	7	3	0	1	2	7	0
			Sphaerium sp.	6	3	2	10	0	2	0	4	0	3	1	4	7	0	3	1	2	3	0	1	1	0	4	0
Gastropoda	Valvatidae	-	*Valvata* sp.	7	3	1	17	4	0	0	0	0	0	0	0	7	0	0	4	3	5	3	6	1	2	3	0
Hydracarina	Pionidae	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Lebertiidae	-	*Lebertia* sp.	2	0	0	2	0	2	0	0	1	0	0	2	0	0	2	0	6	0	0	0	0	0	0	0
	Oxidae	-	*Oxus* sp.	1	0	1	0	0	1	0	0	0	0	0	4	0	0	0	9	0	0	0	0	0	0	0	0
Notostraca	Triopsidae	-	*Lepidurus* sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladocera	-	-	(i/d)	1	0	1	0	0	1	1	0	0	1	1	1	1	0	0	1	1	1	1	0	0	1	1	0
	Bosminidae	-	-	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copepoda	-	-	-	1	1	1	1	0	1	0	0	1	1	1	1	1	0	0	1	1	1	1	0	0	1	0	0
Ostracoda	-	-	-	0	0	1	1	0	0	1	0	3	0	0	1	1	1	1	1	0	8	1	0	0	0	1	0
Amphipoda	-	-	(i/d)	0	0	0	0	0	0	1	1	0	1	1	16	0	1	0	1	0	0	0	1	1	0	1	0
	Gammaridae	-	*Gammarus* sp.	0	0	0	0	0	4	6	3	4	3	15	26	0	4	5	31	2	0	0	3	0	3	1	0
Ephemeroptera	Baetidae	-	*Baetis* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Plecoptera	Nemouridae	-	*Zapada columbiana*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Trichoptera	Brachycentridae	-	*Brachycentrus occidentalis*	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Limnephilidae	-	(i/d)	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0
			Limnephilus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Diptera	Chironomidae	-	(i/d)	0	0	4	0	0	0	18	0	0	4	0	0	1	1	0	0	2	0	0	24	0	0	0	0
		Chironomini	*Chironomus* sp.	1	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0
			Cladopelma sp.	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
			Dicrotendipes sp.	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0
			Microtendipes sp.	0	1	22	10	5	19	9	2	26	16	35	3	8	5	9	9	8	2	2	4	0	4	2	1
			Pagastiella sp.	8	1	0	0	0	11	1	2	0	2	3	1	1	0	10	43	4	8	1	3	0	10	4	0
			Parachironomus sp.	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Paratendipes sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Phaenopsectra sp.	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	1	1	2	0	0	0	0	0	0
			Sergentia sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
			Stictochironomus sp.	16	12	10	15	1	25	1	5	10	5	14	11	0	8	41	6	2	0	1	4	1	1	2	0
		Tanytarsini	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	6	14	68	0	2	0	0	0	0
			Cladotanytarsus sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
			Corynocera sp.	11	0	38	0	2	12	7	0	8	78	17	0	127	3	35	47	30	54	6	9	3	31	11	0
			Micropsectra sp.	14	0	31	4	3	15	0	0	7	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
			Paratanytarsus sp.	0	0	0	0	0	3	0	0	0	5	10	1	16	0	1	13	17	13	1	2	0	0	0	0
			Stempellinella sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
			Tanytarsus sp.	0	0	7	0	0	18	0	0	9	9	10	0	29	0	0	4	12	2	1	0	1	0	0	0
		Diamesinae	*Protanypus* sp.	1	1	1	3	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0
		Orthocladiinae	(i/d)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
			Corynoneura sp.	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0
			Heterotrissocladius sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Orthocladius complex	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
			Psectrocladius sp.	4	0	1	0	1	2	0	0	0	1	0	1	1	0	7	1	1	2	0	0	1	1	0	0
		Prodiamesinae	*Monodiamesa* sp.	1	0	0	0	0	0	0	0	4	2	0	1	0	0	0	4	0	3	0	0	0	0	0	0
		Tanypodinae	*Ablabesmyia* sp.	0	0	0	0	0	1	0	0	0	2	9	2	1	0	2	4	0	0	0	0	0	0	0	0
		Pentaneurini	*Thienemannimyia* group	0	0	0	0	0	2	0	0	0	1	0	0	0	1	0	1	1	2	0	0	0	0	0	0
		Procladiini	*Procladius* sp.	4	1	5	2	4	6	0	1	3	3	3	10	5	1	10	8	4	7	0	0	0	1	2	0
			TOTAL	**104**	**35**	**153**	**95**	**27**	**171**	**58**	**32**	**101**	**152**	**147**	**155**	**272**	**30**	**145**	**256**	**130**	**192**	**23**	**61**	**16**	**60**	**42**	**1**

i/d = indeterminate or damaged specimen; - = not applicable.

Table 9D-3: Presence/Absence of Benthic Invertebrate Taxa in Meliadine Lake - Meliadine Mine Cycle 1 EEM and 2018 AEMP, Fall 2018

Major Taxonomic Group	Family	Subfamily / Tribe	Genus/Species	Near-field (MEL-01)	Mid-Field (MEL-02)	Reference Area 1 (MEL-03)	Reference Area 3 (MEL-05)
Hydrozoa	Hydridae	-	*Hydra* sp.	X	-	-	-
Turbellaria	-	-	-	X	-	-	-
Oligochaeta	Lumbriculidae	-	*Lumbriculus* sp.	-	X	X	X
	Naididae	Tubificinae	Tubificinae with chaetae	X	-	X	-
		-	*Nais* sp.	-	-	-	X
			Slavina appendiculata	-	X	X	-
Bivalvia	Pisidiidae		*Pisidium* sp.	X	X	X	X
			Sphaerium sp.	X	X	X	X
Gastropoda	Valvatidae	-	*Valvata* sp.	X	-	X	X
Hydracarina	Pionidae	-	(i/d)	-	-	X	-
	Lebertiidae	-	*Lebertia* sp.	X	X	X	X
	Oxidae	-	*Oxus* sp.	X	X	X	X
Notostraca	Triopsidae	-	*Lepidurus* sp.	X	-	-	-
Amphipoda	Gammaridae	-	*Gammarus* sp.	-	X	X	X
Trichoptera	Limnephilidae	-	(i/d)	-	-	X	X
			Limnephilus sp.	-	-	-	X
Chironomidae	Chironomidae	Chironomini	*Chironomus* sp.	X	-	X	-
			Cladopelma sp.	-	X	-	X
			Dicrotendipes sp.	-	-	X	X
			Microtendipes sp.	X	X	X	X
			Pagastiella sp.	X	X	X	X
			Parachironomus sp.	-	X	-	-
			Paratendipes sp.	-	X	-	-
			Phaenopsectra sp.	-	-	X	X
			Sergentia sp.	-	-	X	-
			Stictochironomus sp.	X	X	X	X

Table 9D-3: Presence/Absence of Benthic Invertebrate Taxa in Meliadine Lake - Meliadine Mine Cycle 1 EEM and 2018 AEMP, Fall 2018

Major Taxonomic Group	Family	Subfamily / Tribe	Genus/Species	Near-field (MEL-01)	Mid-Field (MEL-02)	Reference Area 1 (MEL-03)	Reference Area 3 (MEL-05)
Chironomidae	Chironomidae	Tanytarsini	*Cladotanytarsus* sp.	-	X	X	X
			Corynocera sp.	X	X	X	X
			Micropsectra sp.	X	X	X	-
			Paratanytarsus sp.	-	X	X	X
			Stempellinella sp.	-	-	X	-
			Tanytarsus sp.	X	X	X	X
		Diamesinae	*Protanypus* sp.	X	-	X	X
		Orthocladiinae	*Corynoneura* sp.	-	-	X	-
			Heterotrissocladius sp.	X	-	-	-
			Orthocladius complex	X	-	-	X
			Psectrocladius sp.	X	X	X	X
		Prodiamesinae	*Monodiamesa* sp.	X	X	X	X
		Tanypodinae	*Ablabesmyia* sp.	-	X	X	X
		Pentaneurini	*Thienemannimyia* group	-	X	X	X
		Procladiini	*Procladius* sp.	X	X	X	X
			Total Taxa	**22**	**23**	**31**	**27**

- = not applicable.

Table 9D-4: Summary Statistics for Benthic Invertebrate Community Variables in Meliadine Lake - Meliadine Mine Cycle 1 EEM and 2018 AEMP, Fall 2018

Area	Station	Total Density (org/m^2)	Family Level						Lowest Taxonomic Level					
			Richness (taxa/station)	Simpson's Diversity Index	Simpson's Evenness Index	Bray-Curtis Index (Median-Ref1)	Bray-Curtis Index (Median-Ref3)	Bray-Curtis Index (Pairwise)	Richness (taxa/station)	Simpson's Diversity Index	Simpson's Evenness Index	Bray-Curtis Index (Median-Ref1)	Bray-Curtis Index (Median-Ref3)	Bray-Curtis Index (Pairwise)
Near-field Exposure Area	MEL-01-01	871	6	0.55	0.37	0.32	0.39	0.42	16	0.85	0.43	0.45	0.57	0.62
	MEL-01-06	293	3	0.58	0.79	0.63	0.65	0.66	8	0.67	0.43	0.44	0.74	0.73
	MEL-01-07	1,284	6	0.33	0.25	0.09	0.12	0.29	14	0.82	0.43	0.45	0.44	0.56
	MEL-01-08	802	5	0.66	0.58	0.52	0.57	0.54	11	0.76	0.41	0.51	0.67	0.66
	MEL-01-09	233	3	0.56	0.76	0.71	0.71	0.70	8	0.83	0.75	0.59	0.74	0.76
	Mean	697	5	0.53	0.55	0.45	0.49	0.52	11	0.79	0.49	0.49	0.63	0.67
	Median	802	5	0.56	0.58	0.52	0.57	0.54	11	0.82	0.43	0.45	0.67	0.66
	Minimum	233	3	0.33	0.25	0.09	0.12	0.29	8	0.67	0.41	0.44	0.44	0.56
	Maximum	1,284	6	0.66	0.79	0.71	0.71	0.70	16	0.85	0.75	0.59	0.74	0.76
	Count	5	5	5	5	5	5	5	5	5	5	5	5	5
	SD	437	2	0.12	0.24	0.25	0.24	0.17	4	0.07	0.15	0.06	0.13	0.08
	SE	196	1	0.05	0.11	0.11	0.11	0.08	2	0.03	0.07	0.03	0.06	0.04
Mid-field Exposure Area	MEL-02-02	1,448	5	0.44	0.36	0.12	0.17	0.29	18	0.87	0.44	0.47	0.53	0.56
	MEL-02-03	483	4	0.52	0.53	0.44	0.53	0.52	7	0.77	0.62	0.33	0.57	0.63
	MEL-02-05	276	3	0.58	0.80	0.61	0.71	0.68	8	0.67	0.43	0.41	0.68	0.72
	MEL-02-06	802	4	0.41	0.42	0.19	0.32	0.38	11	0.84	0.57	0.36	0.58	0.61
	MEL-02-08	1,284	4	0.25	0.33	0.09	0.06	0.28	15	0.68	0.22	0.47	0.26	0.50
	Mean	859	4	0.44	0.49	0.29	0.36	0.43	12	0.76	0.46	0.41	0.52	0.60
	Median	802	4	0.44	0.42	0.19	0.32	0.38	11	0.77	0.44	0.41	0.57	0.61
	Minimum	276	3	0.25	0.33	0.09	0.06	0.28	7	0.67	0.22	0.33	0.26	0.50
	Maximum	1,448	5	0.58	0.80	0.61	0.71	0.68	18	0.87	0.62	0.47	0.68	0.72
	Count	5	5	5	5	5	5	5	5	5	5	5	5	5
	SD	503	1	0.13	0.19	0.23	0.27	0.17	5	0.09	0.16	0.06	0.16	0.08
	SE	225	0	0.06	0.09	0.10	0.12	0.08	2	0.04	0.07	0.03	0.07	0.04
Reference Area 1	MEL-03-01	1,241	5	0.41	0.34	0.09	0.18	0.33	18	0.88	0.50	0.44	0.54	0.61
	MEL-03-02	1,302	7	0.74	0.56	0.52	0.61	0.55	18	0.81	0.32	0.57	0.70	0.69
	MEL-03-03	2,302	4	0.28	0.35	0.36	0.27	0.42	15	0.73	0.25	0.69	0.41	0.62
	MEL-03-04	241	4	0.49	0.49	0.67	0.74	0.74	7	0.81	0.67	0.47	0.76	0.79
	MEL-03-05	1,241	4	0.31	0.36	0.04	0.11	0.31	13	0.82	0.44	0.35	0.41	0.57
	Mean	1,266	5	0.45	0.42	0.34	0.38	0.47	14	0.81	0.43	0.50	0.56	0.65
	Median	1,241	4	0.41	0.36	0.36	0.27	0.42	15	0.81	0.44	0.47	0.54	0.62
	Minimum	241	4	0.28	0.34	0.04	0.11	0.31	7	0.73	0.25	0.35	0.41	0.57
	Maximum	2,302	7	0.74	0.56	0.67	0.74	0.74	18	0.88	0.67	0.69	0.76	0.79
	Count	5	5	5	5	5	5	5	5	5	5	5	5	5
	SD	729	1	0.19	0.10	0.27	0.28	0.18	5	0.05	0.16	0.13	0.16	0.09
	SE	326	1	0.08	0.04	0.12	0.12	0.08	2	0.02	0.07	0.06	0.07	0.04

Table 9D-4: Summary Statistics for Benthic Invertebrate Community Variables in Meliadine Lake - Meliadine Mine Cycle 1 EEM and 2018 AEMP, Fall 2018

Area	Station	Total Density (org/m^2)	Family Level						Lowest Taxonomic Level					
			Richness (taxa/station)	Simpson's Diversity Index	Simpson's Evenness Index	Bray-Curtis Index (Median-Ref1)	Bray-Curtis Index (Median-Ref3)	Bray-Curtis Index (Pairwise)	Richness (taxa/station)	Simpson's Diversity Index	Simpson's Evenness Index	Bray-Curtis Index (Median-Ref1)	Bray-Curtis Index (Median-Ref3)	Bray-Curtis Index (Pairwise)
Reference Area 3	MEL-05-01	2,172	8	0.59	0.31	0.31	0.24	0.35	22	0.88	0.37	0.60	0.34	0.53
	MEL-05-02	1,078	7	0.38	0.23	0.12	0.17	0.36	18	0.88	0.44	0.49	0.33	0.55
	MEL-05-03	1,560	3	0.17	0.40	0.23	0.10	0.35	14	0.76	0.29	0.69	0.37	0.62
	MEL-05-04	1,647	4	0.46	0.46	0.18	0.10	0.31	13	0.80	0.38	0.49	0.23	0.52
	MEL-05-05	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean		1,614	6	0.40	0.35	0.21	0.15	0.34	17	0.83	0.37	0.57	0.32	0.55
Median		1,603	6	0.42	0.36	0.20	0.14	0.35	16	0.84	0.38	0.54	0.34	0.54
Minimum		1,078	3	0.17	0.23	0.12	0.10	0.31	13	0.76	0.29	0.49	0.23	0.52
Maximum		2,172	8	0.59	0.46	0.31	0.24	0.36	22	0.88	0.44	0.69	0.37	0.62
Count		4	4	4	4	4	4	4	4	4	4	4	4	4
SD		449	2	0.18	0.10	0.08	0.07	0.02	4	0.06	0.06	0.10	0.06	0.04
SE		224	1	0.09	0.05	0.04	0.03	0.01	2	0.03	0.03	0.05	0.03	0.02
Discreet Samples from Reference Area 3	MEL-05-04-A	819	3	0.53	0.71	-	-	-	8	0.81	0.65	-	-	-
	MEL-05-04-B	2,629	4	0.36	0.39	-	-	-	8	0.84	0.71	-	-	-
	MEL-05-04-C	647	4	0.61	0.65	-	-	-	9	0.77	0.55	-	-	-
	MEL-05-04-D	2,457	4	0.28	0.35	-	-	-	9	0.66	0.33	-	-	-
	MEL-05-04-E	1,681	4	0.59	0.61	-	-	-	9	0.78	0.57	-	-	-
Mean		1,647	4	0.48	0.54	-	-	-	9	0.77	0.56	-	-	-
Median		1,681	4	0.53	0.61	-	-	-	9	0.78	0.57	-	-	-
Minimum		647	3	0.28	0.35	-	-	-	8	0.66	0.33	-	-	-
Maximum		2,629	4	0.61	0.71	-	-	-	9	0.84	0.71	-	-	-
Count		5	5	5	5	-	-	-	5	5	5	-	-	-
SD		909	0	0.15	0.16	-	-	-	1	0.07	0.15	-	-	-
SE		407	0	0.07	0.07	-	-	-	0	0.03	0.07	-	-	-

org/m^2 = organisms per metre squared; SD= standard deviation; SE = standard error; - = not applicable.

APPENDIX 10A

Fishing Effort

Table 10A-1: Sampling Effort for the Meliadine Lake Fish Health Program, 2018

Sampling Area	Effort Number	Gear Type	Start				End				Habitat Description	Minimum Depth (m)	Max Depth (m)	Set Date (dd/mm/yy)	Lift Date (dd/mm/yy)	Duration (h)	Number of Traps Set	Effort[a]	Fish Captured				
			Latitude	Longitude	Easting	Northing	Latitude	Longitude	Easting	Northing									THST	NNST	BURB	SLSC	Total
NF	MEL18FHNFMT4200	Minnow Trap	63°01'54.15	92°09'40.42	542439	6989399	63°01'56.60	92°09'40.06	542443	6989475	Large gravel/small cobble	0.3	0.5	07/08/18	08/08/18	17.90	6	107	79	0	0	0	79
NF	MEL18FHNFMT4201	Minnow Trap	63°01'58.80	92°09'51.17	542286	6989541	63°01'58.92	92°09'54.66	542237	6989544	Medium/large cobble and some boulder	0.2	1.0	07/08/18	08/08/18	17.63	6	106	29	0	0	0	29
NF	MEL18FHNFMT4202	Minnow Trap	63°01'52.44	92°10'12.84	541984	6989340	63°01'52.11	92°10'11.93	541997	6989330	Boulder - near shore	0.2	0.5	07/08/18	08/08/18	17.47	6	105	11	0	0	0	11
NF	MEL18FHNFMT4203	Minnow Trap	63°01'50.29	92°09'54.40	542244	6989277	63°01'49.88	92°09'56.55	542214	6989264	Boulder/cobble near camp	0.3	0.9	08/08/18	09/08/18	15.82	6	95	51	0	0	0	51
NF	MEL18FHNFMT4204	Minnow Trap	63°01'42.41	92°09'43.74	542397	6989035	-	-	-	-	Cobble/boulder near camp	0.3	0.7	08/08/18	09/08/18	15.85	6	95	45	0	0	0	45
NF	MEL18FHNFMT4206	Minnow Trap	63°01'42.30	92°09'04.24	542109	6989028	-	-	-	-	Boulder/cobble shoreline	0.3	0.4	12/08/18	13/08/18	15.47	6	93	54	0	0	0	54
NF	MEL18FHNFMT4207	Minnow Trap	63°01'36.19	92°09'09.32	542040	6988838	-	-	-	-	Sand/gravel	0.3	0.4	12/08/18	13/08/18	15.27	6	92	28	0	0	0	28
NF	MEL18FHNFMT4208	Minnow Trap	63°01'41.13	92°09'31.02	541733	6988987	-	-	-	-	Boulder/sand/bit of vegetation	0.3	0.5	13/08/18	14/08/18	25.73	3	77	19	2	0	0	21
NF	MEL18FHNFMT4208	Minnow Trap	63°01'41.13	92°09'31.02	541733	6988987	-	-	-	-	Boulder/sand/bit of vegetation	0.3	0.5	14/08/18	15/08/18	19.60	3	59	24	2	0	0	26
NF	MEL18FHNFMT4209	Minnow Trap	63°01'41.23	92°09'36.00	541663	6988989	-	-	-	-	Boulder	0.2	1.0	15/08/18	16/08/18	20.50	6	123	32	0	0	0	32
NF	MEL18FHNFMT4210	Minnow Trap	63°01'29.38	92°09'48.88	542330	6988631	-	-	-	-	Sand	0.3	0.4	15/08/18	16/08/18	20.28	5	101	43	0	0	0	43
NF	MEL18FHNFMT4211	Minnow Trap	63°01'47.06	92°09'17.33	541923	6989173	-	-	-	-	Cobble/boulder - near water intake for camp	0.3	0.4	15/08/18	16/08/18	20.18	7	141	22	0	0	0	22
NF	MEL18FHNFMT4212	Minnow Trap	63°01'41.50	92°09'05.54	542091	6989003	-	-	-	-	Cobble/gravel with algae near water runoff from camp	0.3	0.5	17/08/18	18/08/18	21.38	6	128	80	0	0	0	80
NF	MEL18FHNFMT4213	Minnow Trap	63°01'36.52	92°09'09.60	542036	6988848	-	-	-	-	Sand/boulder	0.3	0.5	17/08/18	18/08/18	22.22	6	133	51	0	0	0	51
NF	MEL18FHNFMT4214	Minnow Trap	63°01'49.66	92°09'51.43	542286	6989258	-	-	-	-	Boulder/cobble	0.3	0.4	17/08/18	18/08/18	20.95	6	126	107	1	0	0	108
NF	MEL18FHNFMT4215	Minnow Trap	63°01'43.13	92°10'23.63	541836	6989050	-	-	-	-	Cobble/sand	0.3	0.4	18/08/18	19/08/18	21.03	7	147	62	0	0	0	62
NF	MEL18FHNFMT4216	Minnow Trap	63°01'33.66	92°10'02.70	542134	6988761	-	-	-	-	Cobble/boulder	0.3	1.0	18/08/18	19/08/18	20.98	6	126	56	0	0	0	56
NF	MEL18FHNFMT4217	Minnow Trap	63°01'41.25	92°10'06.19	542082	6988995	-	-	-	-	Cobble/sand	0.3	0.5	18/08/18	19/08/18	20.53	6	123	25	0	0	0	25
NF	MEL18FHNFMT4218	Minnow Trap	63°01'41.57	92°10'05.97	542085	6989005	-	-	-	-	Cobble/sand with algae	0.3	0.5	19/08/18	20/08/18	23.75	3	71	81	1	0	0	82
RA1	MEL18FHRA1MT5200	Minnow Trap	63°06'44.79	92°20'34.74	533151	6998287	-	-	-	-	Boulder/cobble along shoreline	0.3	0.4	09/08/18	10/08/18	20.72	6	124	9	0	0	0	9
RA1	MEL18FHRA1MT5200	Minnow Trap	63°06'44.79	92°20'34.74	533151	6998287	-	-	-	-	Boulder/cobble along shoreline	0.3	0.4	10/08/18	11/08/18	26.57	6	159	7	3	0	0	10
RA1	MEL18FHRA1MT5201	Minnow Trap	63°07'14.81	92°20'33.71	533156	6999216	-	-	-	-	Cobble/boulder along shoreline	0.3	0.4	09/08/18	10/08/18	19.92	5	100	18	1	0	0	19
RA1	MEL18FHRA1MT5201	Minnow Trap	63°07'14.81	92°20'33.71	533156	6999216	-	-	-	-	Cobble/boulder along shoreline	0.3	0.4	10/08/18	11/08/18	26.58	5	133	26	2	0	0	28
RA1	MEL18FHRA1MT5202	Minnow Trap	63°07'09.35	92°20'07.57	533524	6999051	-	-	-	-	Boulder/cobble along shoreline	0.3	0.5	09/08/18	10/08/18	19.70	6	118	7	5	0	0	12
RA1	MEL18FHRA1MT5202	Minnow Trap	63°07'09.35	92°20'07.57	533524	6999051	-	-	-	-	Boulder/cobble along shoreline	0.3	0.5	10/08/18	11/08/18	26.63	6	160	10	0	0	0	10
RA1	MEL18FHRA1MT5203	Minnow Trap	63°06'41.69	92°20'27.61	533252	6998192	-	-	-	-	Cobble/boulder along shoreline	0.3	0.5	11/08/18	12/08/18	21.30	6	128	3	0	0	0	3
RA1	MEL18FHRA1MT5204	Minnow Trap	63°06'40.16	92°20'38.70	533097	6998143	-	-	-	-	Boulder/cobble along shoreline	0.3	0.5	11/08/18	12/08/18	21.53	6	129	2	0	0	0	2
RA1	MEL18FHRA1MT5205	Minnow Trap	63°06'50.82	92°20'51.16	532919	6998471	-	-	-	-	Cobble/boulder	0.3	0.4	11/08/18	12/08/18	20.87	6	125	1	0	0	0	1
RA1	MEL18FHRA1MT5206	Minnow Trap	63°06'57.75	92°21'17.27	532551	6998682	-	-	-	-	Boulder/cobble shoreline of esker	0.3	0.5	13/08/18	14/08/18	25.25	6	152	70	2	1	0	73
RA1	MEL18FHRA1MT5207	Minnow Trap	63°06'41.10	92°21'44.11	532180	6998163	-	-	-	-	Boulder/cobble	0.3	0.5	13/08/18	14/08/18	23.85	6	143	9	0	0	0	9
RA1	MEL18FHRA1MT5208	Minnow Trap	63°06'24.39	92°21'35.41	532307	6997647	-	-	-	-	Cobble/boulder	0.3	0.5	13/08/18	14/08/18	24.02	4	96	13	1	0	1	15
RA1	MEL18FHRA1MT5209	Minnow Trap	63°06'33.11	92°19'49.14	533794	6997932	-	-	-	-	Boulder/cobble	0.3	1.0	14/08/18	15/08/18	22.83	6	137	23	1	0	0	24
RA1	MEL18FHRA1MT5210	Minnow Trap	63°06'12.23	92°19'34.07	534012	6997288	-	-	-	-	Boulder/cobble	0.3	0.5	14/08/18	15/08/18	23.00	5	115	3	0	0	0	3
RA1	MEL18FHRA1MT5211	Minnow Trap	63°06'23.32	92°20'01.85	533619	6997627	-	-	-	-	Boulder/cobble	0.3	0.5	14/08/18	15/08/18	23.10	5	116	8	0	0	0	8
RA1	MEL18FHRA1MT5212	Minnow Trap	63°05'43.17	92°19'04.01	534443	6996393	-	-	-	-	Cobble/boulder	0.3	0.5	16/08/18	17/08/18	21.47	7	150	6	0	0	0	6
RA1	MEL18FHRA1MT5213	Minnow Trap	63°05'39.83	92°18'53.89	534586	6996291	-	-	-	-	Boulder/cobble	0.3	1.0	16/08/18	17/08/18	21.17	6	127	12	0	0	0	12
RA1	MEL18FHRA1MT5214	Minnow Trap	63°05'37.51	92°18'43.60	534731	6996221	-	-	-	-	Boulder/cobble	0.4	1.0	16/08/18	17/08/18	21.33	5	107	34	0	0	0	34
RA1	MEL18FHRA1DP5215	Dipnet	63°01'41.50	92°10'05.54	542091	6989003	63°01'49.66	92°09'51.43	542286	6989258	Cobble/boulder	0.1	0.2	17/08/18	17/08/18	1.00	-	3600	3	0	0	0	3
RA1	MEL18FHRA1MT5216	Minnow Trap	63°01'45.20	92°18'12.01	535252	6998036	-	-	-	-	Boulder/sand	0.3	0.5	19/08/18	20/08/18	23.10	5	116	16	0	0	0	16
RA1	MEL18FHRA1MT5217	Minnow Trap	63°06'40.67	92°18'02.01	535293	6998182	-	-	-	-	Silt with vegetation	0.3	1.0	19/08/18	20/08/18	23.33	5	117	20	1	0	0	21
RA1	MEL18FHRA1MT5218	Minnow Trap	63°06'35.66	92°17'54.00	535407	6998028	-	-	-	-	Boulder/cobble	0.3	0.5	19/08/18	20/08/18	23.63	6	142	1	1	0	0	2

Note: Samples were collected during daylight hours.
a) Minnow Trap = trap hours; Dipnet = seconds.
NF = Near-field; RA1 = Reference Area 1; m = metre; d = day; m = month; y = year; h = hour; s = second; THST = Threespine Stickleback; NNST = Ninespine Stickleback; BURB = Burbot; SLSC = Slimy Sculpin; - = not recorded or not applicable.

Table 10A-2: Supporting Environmental Data for the Meliadine Lake Fish Health Program, 2018

Effort Number	Air Temperature (°C)	Cloud Cover (%)	Wind Direction	Wind Speed (km/h)	Precipitation	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductivity (µS/cm)	pH
MEL18FHNFMT4200	9	95	SE	15	0	12.7	9.86	93.0	87	6.18
MEL18FHNFMT4201	9	95	SE	15	0	12.7	9.86	93.0	87	6.18
MEL18FHNFMT4202	9	95	SE	15	0	12.7	9.86	93.0	87	6.18
MEL18FHNFMT4203	12	95	N	10	0	12.5	9.92	93.2	86	6.79
MEL18FHNFMT4204	17	90	N	10	0	12.5	9.92	93.2	86	6.79
MEL18FHNFMT4206	10	70	NE	60	0	12.4	11.39	106.8	93	7.37
MEL18FHNFMT4207	10	70	NE	60	0	12.4	11.39	106.8	93	7.37
MEL18FHNFMT4208	10	0	W	20	0	12.2	10.83	100.9	94	5.93
MEL18FHNFMT4209	10	100	NW	20	0	12.7	10.57	99.6	89	6.22
MEL18FHNFMT4210	10	100	NW	20	0	12.7	10.57	99.6	89	6.22
MEL18FHNFMT4211	10	100	NW	20	0	12.7	10.57	99.6	89	6.22
MEL18FHNFMT4212	14	10	W	25	0	12.6	9.87	93.4	92	6.97
MEL18FHNFMT4213	14	10	W	25	0	12.6	9.87	93.4	92	6.97
MEL18FHNFMT4214	14	10	W	25	0	12.6	9.87	93.4	92	6.97
MEL18FHNFMT4215	12	50	SE	15	0	10.2	10.20	90.8	89	7.05
MEL18FHNFMT4216	12	50	SE	15	0	10.2	10.20	90.8	89	7.05
MEL18FHNFMT4217	12	50	SE	15	0	10.2	10.20	90.8	89	7.05
MEL18FHNFMT4218	8	75	N	55	0	10.9	11.00	99.3	106	6.79
MEL18FHRA1MT5200	15	60	-	0	0	12.60	10.48	98.4	72	7.25
MEL18FHRA1MT5201	15	60	-	0	0	12.60	10.48	98.4	72	7.25
MEL18FHRA1MT5202	15	60	-	0	0	12.60	10.48	98.4	72	7.25
MEL18FHRA1MT5203	10	100	-	35	light	11.50	10.56	97.2	79	7.34
MEL18FHRA1MT5204	10	100	-	35	light	11.50	10.56	97.2	79	7.34
MEL18FHRA1MT5205	10	100	-	35	light	11.50	10.56	97.2	79	7.34
MEL18FHRA1MT5206	10	0	W	20	0	10.80	12.00	108.4	71	7.24
MEL18FHRA1MT5207	10	0	W	20	0	10.80	12.00	108.4	71	7.24
MEL18FHRA1MT5208	10	0	W	20	0	10.80	12.00	108.4	71	7.24
MEL18FHRA1MT5209	10	60	SE	20	0	11.30	11.01	100.5	72	6.09
MEL18FHRA1MT5210	10	60	SE	20	0	11.30	11.01	100.5	72	6.09
MEL18FHRA1MT5211	10	60	SE	20	0	11.30	11.01	100.5	72	6.09
MEL18FHRA1MT5212	10	100	NW	50	0	11.20	10.28	93.6	75	6.47
MEL18FHRA1MT5213	10	100	NW	50	0	11.20	10.28	93.6	75	6.47
MEL18FHRA1MT5214	10	100	NW	50	0	11.20	10.28	93.6	75	6.47
MEL18FHRA1DP5215	12	10	W	25	0	10.40	11.29	101.1	76	6.4
MEL18FHRA1MT5216	8	10	N	60	0	9.00	9.19	85.7	77	6.81
MEL18FHRA1MT5217	8	10	N	60	0	9.00	9.19	85.7	77	6.81
MEL18FHRA1MT5218	8	10	N	60	0	9.00	9.19	85.7	77	6.81

°C = degree Celsius; % = percent; km/h = kilometre per hour; mg/L = milligram per litre; µS/cm = microsiemen per centimetre; N = north; NE = northeast; NW = northwest; S = south; - = not recorded or not applicable.

APPENDIX 10B

Survey Data

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4018	62	1.884	0.79
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4019	45	0.711	0.78
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4020	52	1.111	0.79
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4021	68	3.427	1.09
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4022	36	0.491	1.05
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4023	66	2.490	0.87
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4024	47	1.014	0.98
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4025	47	1.020	0.98
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4026	45	0.758	0.83
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4027	46	1.005	1.03
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4028	63	2.825	1.13
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4029	58	1.922	0.99
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4030	54	0.969	0.62
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4031	54	1.078	0.68
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4032	65	2.475	0.90
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4033	58	1.579	0.81
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4034	50	1.051	0.84
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4035	56	1.455	0.83
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4036	52	1.084	0.77
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4037	50	1.120	0.90
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4038	46	0.972	1.00
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4039	42	0.645	0.87
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4040	61	2.258	0.99
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4041	73	3.477	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4042	46	1.016	1.04
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4043	54	1.379	0.88
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4044	41	0.670	0.97
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4045	55	1.393	0.84
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4046	50	0.970	0.78

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4047	57	1.539	0.83
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4048	65	2.876	1.05
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4049	66	2.593	0.90
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4050	46	0.998	1.03
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4051	52	1.418	1.01
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4052	46	0.891	0.92
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4053	62	2.168	0.91
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4054	67	2.257	0.75
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4055	64	2.592	0.99
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4056	44	0.851	1.00
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4057	54	1.420	0.90
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4058	43	0.705	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4059	63	2.334	0.93
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4060	46	0.813	0.84
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4061	43	0.664	0.84
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4062	65	2.018	0.73
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4063	52	1.266	0.90
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4064	46	0.976	1.00
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4065	51	1.137	0.86
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4066	42	0.710	0.96
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4067	48	0.968	0.88
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4068	65	2.329	0.85
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4069	58	1.701	0.87
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4070	47	0.922	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4071	47	0.842	0.81
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4072	50	1.121	0.90
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4073	60	1.854	0.86
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4074	54	1.699	1.08
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4075	46	0.822	0.84

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4076	61	2.670	1.18
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4077	50	0.937	0.75
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4078	56	1.561	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4079	45	0.920	1.01
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4080	47	0.844	0.81
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4081	63	1.991	0.80
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4082	39	0.587	0.99
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4083	49	0.920	0.78
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4084	56	1.307	0.74
08/08/18	NF	Minnow Trap	ML18FHNFMT4200	ML18UNFTHST4085	45	0.876	0.96
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4086	66	2.363	0.82
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4087	48	0.997	0.90
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4088	63	2.567	1.03
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4089	62	2.628	1.10
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4090	56	1.691	0.96
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4091	63	2.350	0.94
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4092	67	2.691	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4093	45	0.807	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4094	51	1.043	0.79
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4095	55	1.551	0.93
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4096	67	2.823	0.94
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4097	65	2.358	0.86
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4098	43	0.824	1.04
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4099	55	1.661	1.00
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4100	42	0.712	0.96
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4101	47	0.879	0.85
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4102	61	1.960	0.86
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4103	45	0.809	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4104	41	0.644	0.93

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4105	44	0.706	0.83
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4106	52	1.120	0.80
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4107	53	1.216	0.82
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4108	43	0.705	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4109	65	1.973	0.72
08/08/18	NF	Minnow Trap	ML18FHNFMT4201	ML18UNFTHST4110	62	2.418	1.01
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4111	71	3.391	0.95
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4112	73	3.542	0.91
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4113	49	0.892	0.76
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4114	73	3.450	0.89
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4115	71	3.295	0.92
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4116	55	1.256	0.75
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4117	62	2.385	1.00
08/08/18	NF	Minnow Trap	ML18FHNFMT4202	ML18UNFTHST4118	64	2.372	0.90
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4134	63	1.867	0.75
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4135	63	2.685	1.07
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4136	64	2.538	0.97
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4137	59	2.103	1.02
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4138	60	2.332	1.08
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4139	75	4.909	1.16
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4140	60	1.803	0.83
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4141	60	2.776	1.29
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4142	65	2.881	1.05
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4143	65	2.330	0.85
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4144	70	3.262	0.95
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4145	45	1.080	1.19
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4146	66	2.820	0.98
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4147	55	1.417	0.85
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4148	44	0.843	0.99

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4149	64	2.935	1.12
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4150	51	1.305	0.98
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4151	63	2.593	1.04
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4152	52	1.518	1.08
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4153	55	1.558	0.94
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4154	64	2.616	1.00
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4155	56	1.856	1.06
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4156	71	2.760	0.77
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4157	53	1.324	0.89
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4158	72	3.647	0.98
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4159	65	3.123	1.14
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4160	70	2.611	0.76
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4161	61	2.053	0.90
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4162	56	1.499	0.85
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4163	60	1.713	0.79
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4164	50	1.027	0.82
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4165	52	1.025	0.73
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4166	48	1.059	0.96
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4167	51	1.025	0.77
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4168	51	-	-
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4169	51	1.092	0.82
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4170	41	0.631	0.92
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4171	46	0.817	0.84
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4172	45	0.828	0.91
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4173	49	0.977	0.83
09/08/18	NF	Minnow Trap	ML18FHNFMT4203	ML18UNFTHST4174	45	0.769	0.84
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4199	58	1.658	0.85
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4200	46	1.142	1.17
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4201	66	2.819	0.98

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4202	57	1.920	1.04
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4203	38	0.589	1.07
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4204	63	2.095	0.84
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4205	65	3.165	1.15
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4206	62	2.240	0.94
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4207	52	1.326	0.94
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4208	48	0.975	0.88
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4209	55	1.600	0.96
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4210	41	0.613	0.89
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4211	49	1.064	0.90
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4212	39	0.580	0.98
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4213	46	0.846	0.87
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4214	46	0.713	0.73
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4215	43	0.643	0.81
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4216	44	0.654	0.77
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4217	51	1.178	0.89
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4218	43	0.682	0.86
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4219	44	0.835	0.98
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4220	56	1.816	1.03
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4221	44	1.027	1.21
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4222	47	1.269	1.22
13/08/18	NF	Minnow Trap	ML18FHNFMT4207	ML18UNFTHST4223	42	0.813	1.10
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4224	69	2.996	0.91
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4225	48	0.921	0.83
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4226	66	2.879	1.00
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4227	51	1.194	0.90
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4228	69	3.078	0.94
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4229	48	0.856	0.77
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4230	71	3.265	0.91

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4231	52	0.963	0.68
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4232	62	2.393	1.00
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4233	49	0.966	0.82
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4234	73	3.205	0.82
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4235	44	0.752	0.88
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4236	47	0.872	0.84
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4237	69	2.968	0.90
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4238	45	0.740	0.81
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4239	70	2.714	0.79
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4240	47	0.954	0.92
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4241	67	2.961	0.98
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4242	56	1.835	1.04
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4243	44	0.828	0.97
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4244	56	1.419	0.81
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4245	70	2.965	0.86
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4246	41	0.750	1.09
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4247	40	0.720	1.13
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4248	54	1.294	0.82
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4249	43	0.794	1.00
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4250	48	0.813	0.74
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4251	53	1.028	0.69
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4252	44	0.823	0.97
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4253	47	0.845	0.81
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4254	52	0.825	0.59
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4255	55	1.367	0.82
13/08/18	NF	Minnow Trap	ML18FHNFMT4206	ML18UNFTHST4256	44	0.695	0.82
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4271	60	1.819	0.84
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4273	64	2.503	0.95
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4274	60	2.159	1.00

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4275	65	2.470	0.90
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4276	69	3.593	1.09
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4277	51	1.586	1.20
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4282	57	1.668	0.90
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4284	39	0.518	0.87
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4285	38	0.526	0.96
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4286	41	0.591	0.86
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4287	62	2.203	0.92
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4289	63	2.225	0.89
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4290	66	2.445	0.85
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4291	62	2.222	0.93
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4292	62	2.209	0.93
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4293	56	2.216	1.26
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4294	63	2.404	0.96
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4295	51	0.823	0.62
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4296	53	1.061	0.71
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4297	58	1.755	0.90
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4298	61	2.631	1.16
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4299	63	1.993	0.80
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4300	60	1.814	0.84
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4301	63	2.273	0.91
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4302	54	1.299	0.82
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	ML18UNFTHST4303	53	1.282	0.86
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4314	47	0.741	0.71
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4315	45	0.800	0.88
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4316	71	3.083	0.86
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4317	66	2.507	0.87
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4318	50	0.898	0.72
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4319	60	1.834	0.85

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4320	68	-	-
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4321	47	1.023	0.99
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4322	64	1.981	0.76
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4323	48	0.960	0.87
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4324	52	1.496	1.06
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4325	66	2.530	0.88
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4326	47	0.839	0.81
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4327	47	0.918	0.88
16/08/18	NF	Minnow Trap	ML18FHNFMT4210	ML18UNFTHST4328	48	0.915	0.83
18/08/18	NF	Minnow Trap	ML18FHNFMT4212	ML18UNFTHST4329	57	1.626	0.88
18/08/18	NF	Minnow Trap	ML18FHNFMT4212	ML18UNFTHST4330	61	2.080	0.92
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4331	64	2.228	0.85
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4332	70	2.934	0.86
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4333	63	2.685	1.07
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4334	64	2.563	0.98
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4335	65	3.214	1.17
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4336	67	3.039	1.01
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4337	68	2.023	0.64
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4338	65	2.509	0.91
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4339	53	1.223	0.82
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4340	65	2.014	0.73
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4341	52	1.156	0.82
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4342	50	1.090	0.87
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4343	57	1.323	0.71
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4344	70	2.711	0.79
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4345	67	2.476	0.82
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4346	57	1.531	0.83
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4347	69	2.834	0.86
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4348	62	2.318	0.97

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4349	60	2.105	0.97
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4350	71	2.903	0.81
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4351	59	2.209	1.08
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4352	60	1.700	0.79
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4353	62	2.151	0.90
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4354	59	1.344	0.65
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4355	49	0.921	0.78
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4356	51	0.920	0.69
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4357	62	1.908	0.80
18/08/18	NF	Minnow Trap	ML18FHNFMT4214	ML18UNFTHST4358	64	2.087	0.80
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4386	47	0.684	0.68
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4389	64	2.622	1.00
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4390	64	2.085	0.80
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4391	65	2.384	0.87
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4392	66	2.411	0.84
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4393	47	1.032	0.99
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4394	54	1.540	0.98
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4395	62	2.121	0.89
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4396	60	1.781	0.82
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4397	54	1.408	0.89
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4398	64	2.516	0.96
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4399	65	2.780	1.01
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4400	52	1.373	0.98
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4401	66	2.833	0.99
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4402	69	2.782	0.85
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4403	64	2.465	0.94
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4404	59	2.398	1.17
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4405	56	1.932	1.10
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4406	65	2.311	0.84

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4407	60	2.137	0.99
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4408	50	1.036	0.83
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4409	51	1.271	0.96
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4410	69	2.427	0.74
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4411	67	2.609	0.87
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4412	65	2.563	0.93
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4413	57	2.092	1.13
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4414	48	1.088	0.98
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4415	58	1.824	0.93
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4416	63	2.328	0.93
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4417	49	1.256	1.07
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4418	47	1.109	1.07
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4419	60	-	-
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4420	60	1.889	0.87
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4421	59	2.062	1.00
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4422	51	1.039	0.78
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4423	70	3.019	0.88
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4424	66	2.760	0.96
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4425	65	2.086	0.76
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4426	60	2.116	0.98
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4427	50	1.104	0.88
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4428	51	1.161	0.88
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4429	47	0.910	0.88
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4430	62	1.882	0.79
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4431	40	0.667	1.04
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4432	39	0.569	0.96
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4433	41	0.782	1.13
19/08/18	NF	Minnow Trap	ML18FHNFMT4215	ML18UNFTHST4434	50	0.996	0.80
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4440	56	1.700	0.97

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4441	59	2.010	0.98
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4442	57	1.811	0.98
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4443	65	2.760	1.01
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4444	55	1.230	0.74
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4445	64	2.682	1.02
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4446	63	2.530	1.01
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4447	70	3.521	1.03
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4448	63	2.174	0.87
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4449	67	3.073	1.02
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4450	59	2.141	1.04
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4451	55	1.281	0.77
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4452	46	0.934	0.96
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4453	49	0.964	0.82
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4454	67	2.568	0.85
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4455	60	1.950	0.90
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4456	61	1.855	0.82
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4457	46	1.105	1.14
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4458	70	3.401	0.99
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4459	51	1.179	0.89
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4460	52	1.306	0.93
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4461	47	0.921	0.89
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4462	49	1.041	0.88
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4463	41	0.711	1.03
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4464	48	0.977	0.88
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4465	55	1.411	0.85
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4466	63	2.576	1.03
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4467	59	2.356	1.15
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4468	64	2.633	1.00
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4469	59	2.001	0.97

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4470	62	2.791	1.17
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4471	53	1.805	1.21
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4472	56	1.864	1.06
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4473	40	-	-
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4474	42	0.724	0.98
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4475	41	0.820	1.19
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4476	37	0.570	1.13
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4477	38	0.703	1.28
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4478	39	0.605	1.02
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4479	44	0.763	0.90
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4480	49	0.840	0.71
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4481	50	0.958	0.77
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4482	55	1.385	0.83
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4483	60	2.043	0.95
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4484	55	1.402	0.84
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4485	65	1.967	0.72
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4486	54	1.407	0.89
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4487	54	1.133	0.72
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4488	50	1.019	0.82
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4489	59	2.191	1.07
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4490	60	1.928	0.89
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4491	59	1.948	0.95
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4492	44	0.744	0.87
19/08/18	NF	Minnow Trap	ML18FHNFMT4216	ML18UNFTHST4493	45	0.853	0.94
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4494	45	0.880	0.97
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4495	55	1.456	0.88
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4496	47	0.746	0.72
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4497	56	1.573	0.90
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4498	55	1.673	1.01

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4499	66	2.596	0.90
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4500	66	3.029	1.05
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4501	56	1.441	0.82
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4502	48	0.814	0.74
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4503	63	2.044	0.82
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4504	56	1.754	1.00
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4505	65	2.892	1.05
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4506	63	1.976	0.79
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4507	47	0.908	0.87
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4508	45	0.802	0.88
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4509	56	1.706	0.97
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4510	45	0.765	0.84
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4511	56	-	-
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4512	47	0.855	0.82
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4513	66	2.451	0.85
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4514	55	1.230	0.74
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4515	68	2.350	0.75
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4516	46	1.006	1.03
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4517	65	2.066	0.75
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4518	52	1.284	0.91
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4519	68	2.471	0.79
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4520	62	2.001	0.84
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4521	47	0.926	0.89
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4522	58	1.404	0.72
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4523	70	2.864	0.83
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4524	52	1.224	0.87
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4525	60	1.833	0.85
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4526	49	0.924	0.79
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4527	48	0.984	0.89

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4528	48	0.883	0.80
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4529	58	1.655	0.85
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4530	67	2.873	0.96
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4531	45	0.742	0.81
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4532	46	-	-
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4533	68	2.953	0.94
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4534	46	0.940	0.97
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4535	47	0.894	0.86
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4536	63	2.195	0.88
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4537	47	0.785	0.76
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4538	52	1.090	0.78
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4539	58	1.785	0.91
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4540	50	0.914	0.73
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4541	51	1.206	0.91
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4542	50	1.156	0.92
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4543	46	-	-
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4544	46	0.682	0.70
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4545	46	0.733	0.75
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4546	50	0.856	0.68
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4547	64	2.012	0.77
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4548	55	1.254	0.75
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4549	46	0.837	0.86
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4550	45	0.846	0.93
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4551	45	0.726	0.80
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4552	58	1.540	0.79
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4553	38	0.533	0.97
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4554	52	1.170	0.83
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4555	51	1.170	0.88
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4556	50	0.982	0.79

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4557	46	0.823	0.85
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4559	53	1.215	0.82
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4560	46	0.838	0.86
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4569	44	0.706	0.83
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4570	43	0.753	0.95
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4571	42	0.706	0.95
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4572	41	0.698	1.01
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4573	45	0.565	0.62
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	ML18UNFTHST4574	44	0.743	0.87
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5059	68	2.844	0.90
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5060	64	2.473	0.94
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5061	57	1.425	0.77
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5062	69	2.201	0.67
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5063	41	0.526	0.76
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5064	50	0.911	0.73
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5065	50	0.935	0.75
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5066	54	1.053	0.67
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5067	47	0.850	0.82
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5068	65	2.390	0.87
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5069	59	1.621	0.79
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5070	46	0.786	0.81
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5071	45	0.909	1.00
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5072	47	-	-
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5073	51	0.954	0.72
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5074	49	0.861	0.73
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5075	46	1.037	1.07
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	ML18URA1THST5076	54	1.104	0.70
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	ML18URA1THST5079	49	0.958	0.81
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	ML18URA1THST5080	50	1.029	0.82

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	ML18URA1THST5081	47	0.842	0.81
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	ML18URA1THST5082	47	1.076	1.04
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	ML18URA1THST5083	44	0.746	0.88
12/08/18	RA1	Minnow Trap	ML18FHRA1MT5204	ML18URA1THST5091	52	1.424	1.01
12/08/18	RA1	Minnow Trap	ML18FHRA1MT5205	ML18URA1THST5092	43	0.896	1.13
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5093	46	0.888	0.91
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5094	66	2.360	0.82
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5095	44	0.727	0.85
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5096	54	1.201	0.76
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5097	41	0.654	0.95
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5098	38	0.483	0.88
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5099	63	2.305	0.92
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5100	68	3.093	0.98
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5101	48	0.954	0.86
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5103	61	1.948	0.86
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5104	66	2.271	0.79
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5105	51	1.174	0.89
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5106	46	0.784	0.81
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5107	42	0.593	0.80
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5108	59	1.744	0.85
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5109	46	0.864	0.89
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5110	45	0.832	0.91
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5111	46	0.821	0.84
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5112	45	0.742	0.81
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5113	47	1.188	1.14
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5114	45	0.819	0.90
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5115	45	0.851	0.93
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5116	47	0.756	0.73
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5118	62	2.717	1.14

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5119	47	0.962	0.93
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5120	42	0.634	0.86
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5121	52	1.150	0.82
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5122	59	1.897	0.92
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5123	47	0.866	0.83
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5124	57	1.412	0.76
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5125	47	1.016	0.98
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5126	53	1.358	0.91
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5127	41	0.717	1.04
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5128	42	0.734	0.99
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5129	59	1.755	0.85
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5130	57	1.805	0.97
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5131	44	0.824	0.97
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5132	41	0.719	1.04
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5133	51	1.281	0.97
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5134	46	0.865	0.89
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5135	47	1.235	1.19
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5136	47	0.933	0.90
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5137	50	1.164	0.93
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5138	44	0.760	0.89
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5139	47	0.929	0.89
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5140	44	0.726	0.85
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5141	47	1.067	1.03
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5142	42	0.681	0.92
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5143	41	0.625	0.91
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5144	42	0.656	0.89
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5145	44	0.870	1.02
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5146	47	1.053	1.01
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5147	46	0.712	0.73

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5148	42	0.743	1.00
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5149	41	0.571	0.83
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5150	44	0.870	1.02
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5151	50	1.007	0.81
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5152	45	-	-
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5153	44	1.092	1.28
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5154	49	-	-
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5155	42	0.677	0.91
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5156	40	0.674	1.05
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5157	38	0.530	0.97
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5158	42	0.733	0.99
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5159	45	0.831	0.91
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5160	45	0.794	0.87
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5161	33	0.316	0.88
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5162	41	0.660	0.96
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5163	41	0.681	0.99
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	ML18URA1THST5164	46	0.900	0.92
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5166	42	0.705	0.95
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5167	70	3.971	1.16
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5168	42	0.737	0.99
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5169	66	2.416	0.84
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5170	66	-	-
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5171	50	1.013	0.81
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5172	49	1.086	0.92
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5173	65	2.353	0.86
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5207	ML18URA1THST5174	44	0.867	1.02
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5175	45	0.976	1.07
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5176	57	1.585	0.86
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5177	69	2.512	0.76

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5178	67	2.756	0.92
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5179	52	1.092	0.78
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5180	47	0.874	0.84
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5181	47	1.046	1.01
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5182	72	3.166	0.85
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5183	67	2.378	0.79
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5184	71	3.041	0.85
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5185	48	0.972	0.88
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5186	45	0.773	0.85
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	ML18URA1THST5187	41	0.560	0.81
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5201	47	-	-
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5202	64	2.486	0.95
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5203	63	2.287	0.91
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5205	60	2.060	0.95
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5206	50	1.092	0.87
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5207	47	1.069	1.03
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5208	67	2.521	0.84
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5209	49	1.161	0.99
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5210	51	1.188	0.90
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5211	56	1.618	0.92
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5212	54	1.377	0.87
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	ML18URA1THST5213	45	0.806	0.88
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5210	ML18URA1THST5214	52	1.197	0.85
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5210	ML18URA1THST5215	43	0.732	0.92
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5210	ML18URA1THST5216	45	0.738	0.81
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5217	51	1.396	1.05
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5218	48	0.992	0.90
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5219	44	0.792	0.93
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5220	46	0.922	0.95

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5221	46	0.918	0.94
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5222	51	1.035	0.78
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5223	47	0.860	0.83
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5211	ML18URA1THST5224	45	0.844	0.93
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5212	ML18URA1THST5226	47	0.893	0.86
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5212	ML18URA1THST5243	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5212	ML18URA1THST5244	46	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5212	ML18URA1THST5245	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5212	ML18URA1THST5246	45	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5247	57	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5248	52	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5249	57	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5250	74	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5251	71	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5252	58	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5253	53	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5254	45	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	ML18URA1THST5255	51	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5256	66	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5257	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5258	56	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5259	48	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5260	45	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5261	62	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5262	79	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5263	55	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5264	55	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5265	67	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5266	45	-	-

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5267	46	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5268	54	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5269	65	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5270	51	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5271	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5272	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5273	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5274	64	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5275	55	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5276	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5277	47	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5278	48	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5214	ML18URA1THST5279	45	-	-
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5215	ML18URA1THST5280	47	-	-
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5286	49	1.048	0.89
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5287	62	2.197	0.92
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5288	49	1.102	0.94
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5289	49	1.027	0.87
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5290	48	0.912	0.82
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5291	63	2.040	0.82
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5293	49	1.075	0.91
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5294	65	2.494	0.91
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5295	42	0.650	0.88
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5296	53	1.369	0.92
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5297	49	1.071	0.91
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5298	49	1.056	0.90
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5299	55	1.418	0.85
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5300	47	1.126	1.08
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	ML18URA1THST5301	55	1.305	0.78

Table 10B-1: Survey Data for Threespine Stickleback Sampled Using Non-Lethal Methods During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5304	45	1.018	1.12
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5305	51	1.114	0.84
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5306	64	2.608	0.99
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5307	49	1.065	0.91
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5308	47	0.895	0.86
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5309	47	0.922	0.89
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5310	62	1.971	0.83
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5311	59	1.393	0.68
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5312	60	1.983	0.92
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5313	55	1.527	0.92
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5314	44	0.958	1.12
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5315	47	0.897	0.86
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5316	51	1.000	0.75
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5317	45	0.903	0.99
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5318	47	0.968	0.93
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5216	ML18URA1THST5319	47	0.759	0.73

d = day; m = month; y = year; NF = Near-field; RA1 = Reference Area 1; mm = millimetre; g = gram; - = not recorded.

Table 10B-2: Survey Data for Bycatch Captured During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Gear	Effort Number	Species	Fish Identification Number	Total Length (mm)	Body Weight (g)	Condition Factor
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	NNST	ML18UNFNNST4259	59.7	1.471	0.69
14/08/18	NF	Minnow Trap	ML18FHNFMT4208	NNST	ML18UNFNNST4272	59.0	1.044	0.51
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	NNST	ML18UNFNNST4283	52.0	1.077	0.77
15/08/18	NF	Minnow Trap	ML18FHNFMT4208	NNST	ML18UNFNNST4288	60.0	1.220	0.56
20/08/18	NF	Minnow Trap	ML18FHNFMT4218	NNST	ML18UNFNNST4558	56.0	1.080	0.61
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5200	NNST	ML18URA1NNST5084	52.0	0.950	0.68
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5200	NNST	ML18URA1NNST5085	56.0	0.981	0.56
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5200	NNST	ML18URA1NNST5086	52.0	0.864	0.61
10/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	NNST	ML18URA1NNST5038	64.0	1.406	0.54
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	NNST	ML18URA1NNST5077	59	1.198	0.58
11/08/18	RA1	Minnow Trap	ML18FHRA1MT5201	NNST	ML18URA1NNST5078	67	1.497	0.50
10/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	NNST	ML18URA1NNST5033	46.0	0.760	0.78
10/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	NNST	ML18URA1NNST5034	55.0	0.999	0.60
10/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	NNST	ML18URA1NNST5035	63.0	1.294	0.52
10/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	NNST	ML18URA1NNST5036	56.0	0.924	0.53
10/08/18	RA1	Minnow Trap	ML18FHRA1MT5202	NNST	ML18URA1NNST5037	61.0	1.199	0.53
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	NNST	ML18URA1NNST5102	54.0	0.962	0.61
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	NNST	ML18URA1NNST5117	56.0	0.994	0.57
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5206	BURB	ML18URA1BURB5165	128.0	11.407	0.54
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	NNST	ML18URA1NNST5188	56	0.959	0.55
14/08/18	RA1	Minnow Trap	ML18FHRA1MT5208	SLSC	ML18URA1SLSC5189	88.0	6.771	0.99
15/08/18	RA1	Minnow Trap	ML18FHRA1MT5209	NNST	ML18URA1NNST5204	65.0	1.395	0.51
17/08/18	RA1	Minnow Trap	ML18FHRA1MT5213	NNST	ML18URA1NNST5242	54.0	1.049	0.67
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5217	NNST	ML18URA1NNST5292	56.0	1.170	0.67
20/08/18	RA1	Minnow Trap	ML18FHRA1MT5218	NNST	ML18URA1NNST5302	62.0	1.299	0.55

d = day; m = month; y = year; NF = Near-field; RA1 = Reference Area 1; NNST = Ninespine Stickleback; BURB = Burbot; SLSC = Slimy Sculpin; mm = millimetre; g = gram; - = not recorded or not applicable.

Table 10B-3: Survey Data for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Parasite Weight[(a)] (g)	Condition Factor	Age[(b)]	Sex	Life Stage	Maturity[(c)]	Liver Weight (g)	Gonad Weight (g)	Fecundity	Mean Egg Weight (mg)	Mean Egg Diameter (µm)
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4000	71.2	3.603	2.420	0.482	1.00	3	F	A	13	0.077	0.242	2750	0.088	608.000
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4001	61.1	2.142	1.521	0.347	0.94	4	F	A	12	0.063	0.036	715	0.050	319.000
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4002	59.4	1.815	1.279	0.292	0.87	-	M	A	25	0.027	0.010	-	-	-
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4003	48.5	0.874	0.720	-	0.77	2	F	A	12	0.023	0.010	-	-	-
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4004	65.1	2.725	1.957	0.412	0.99	-	M	A	23	0.047	0.020	-	-	-
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4005	49.6	1.065	0.744	0.175	0.87	2	M	A	22	0.030	-	-	-	-
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4006	69.6	3.045	2.133	0.444	0.90	4	F	A	13	0.082	0.104	3140	0.033	320.000
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4007	67.1	2.512	1.841	0.343	0.83	-	F	A	12	0.059	0.038	-	-	-
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4008	60.8	2.121	1.484	0.407	0.94	-	M	A	25	0.043	0.016	-	-	-
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4009	52.2	1.410	0.917	0.311	0.99	-	M	A	25	0.028	0.006	-	-	-
08/08/18	NF	ML18FHNFMT4200	ML18UNFTHST4010	53.3	1.275	1.137	-	0.84	3	M	A	25	0.018	0.007	-	-	-
08/08/18	NF	ML18FHNFMT4201	ML18UNFTHST4011	63.0	2.118	1.564	0.331	0.85	-	M	A	22	0.057	0.016	-	-	-
08/08/18	NF	ML18FHNFMT4201	ML18UNFTHST4012	67.3	2.695	1.968	0.309	0.88	-	F	A	13	0.068	0.097	2362	0.041	333.000
08/08/18	NF	ML18FHNFMT4201	ML18UNFTHST4013	66.0	2.798	1.946	0.316	0.97	-	F	A	13	0.122	0.143	2888	0.050	316.000
08/08/18	NF	ML18FHNFMT4201	ML18UNFTHST4014	43.1	0.709	0.462	0.132	0.89	-	M	A	22	0.011	0.007	-	-	-
08/08/18	NF	ML18FHNFMT4202	ML18UNFTHST4015	73.7	3.649	2.611	0.436	0.91	-	F	A	13	0.082	0.102	3845	0.027	339.000
08/08/18	NF	ML18FHNFMT4202	ML18UNFTHST4016	62.4	2.461	1.587	0.370	1.01	-	F	A	13	0.045	0.193	2906	0.066	274.000
08/08/18	NF	ML18FHNFMT4202	ML18UNFTHST4017	52.4[(d)]	1.059	0.846	-	0.74	-	F	A	12	0.047	0.016	-	-	-
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4119	69.6	3.084	2.092	0.361	0.91	4	F	A	16	0.119	0.179	2592	0.069	306.000
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4120	65.6	2.669	2.031	-	0.94	1	F	A	13	0.129	0.155	1502	0.103	438.000
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4121	61.9	1.714	1.391	-	0.72	3	M	A	23	0.069	0.013	-	-	-
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4122	57.0	1.523	1.062	0.203	0.82	-	F	A	12	0.072	0.015	-	-	-
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4123	58.1	1.869	1.429	0.217	0.95	-	M	A	23	0.095	0.005	-	-	-
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4124	60.2	1.859	1.605	-	0.85	4	M	A	25	0.038	0.006	-	-	-
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4125	65.5	2.352	1.714	0.356	0.84	-	M	A	23	0.037	0.014	-	-	-
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4126	60.4	2.050	1.342	0.305	0.93	-	F	A	13	0.052	0.032	2081	0.016	338.000
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4127	57.4	1.489	1.290	-	0.79	5	M	A	23	0.032	0.011	-	-	-
09/08/18	NF	ML18FHNFMT4203	ML18UNFTHST4128	59.2	1.956	1.341	0.358	0.94	-	F	A	13	0.049	0.052	2206	0.024	398.000
09/08/18	NF	ML18FHNFMT4204	ML18UNFTHST4129	40.0	0.518	0.318	0.114	0.81	-	F	J	11	0.012	0.004	-	-	-
09/08/18	NF	ML18FHNFMT4204	ML18UNFTHST4130	62.4	2.656	1.718	0.552	1.09	-	M	A	23	0.063	0.013	-	-	-
09/08/18	NF	ML18FHNFMT4204	ML18UNFTHST4131	53.7	1.411	1.166	-	0.91	2	F	A	16	0.053	0.023	1337	0.017	250.000
09/08/18	NF	ML18FHNFMT4204	ML18UNFTHST4132	68.1	2.853	2.051	0.303	0.90	-	F	A	13	0.071	0.146	1990	0.074	305.000
09/08/18	NF	ML18FHNFMT4204	ML18UNFTHST4133	39.1	0.480	0.394	-	0.80	2	M	J	21	0.018	-	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4175	69.8	3.036	2.153	0.395	0.89	-	F	A	13	0.066	0.102	2724	0.038	298.000
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4176	67.0	2.667	1.867	0.306	0.89	-	F	A	13	0.069	0.091	2785	0.033	309.000
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4177	56.4	1.595	1.402	-	0.89	3	M	A	25	0.025	0.007	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4178	50.4	1.073	0.871	-	0.84	2	F	A	12	0.045	0.012	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4179	44.9	0.667	0.547	-	0.74	2	M	J	21	0.016	0.002	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4180	54.2	1.297	1.087	-	0.81	4	M	A	24	0.036	0.011	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4181	60.5	2.050	1.529	0.265	0.93	-	M	A	23	0.075	0.006	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4182	54.9	1.334	1.087	-	0.81	3	M	A	22	0.052	0.021	-	-	-

Table 10B-3: Survey Data for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Parasite Weight[(a)] (g)	Condition Factor	Age[(b)]	Sex	Life Stage	Maturity[(c)]	Liver Weight (g)	Gonad Weight (g)	Fecundity	Mean Egg Weight (mg)	Mean Egg Diameter (µm)
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4183	35.5	0.378	0.298	-	0.85	1	F	J	11	0.013	0.002	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4184	42.6	0.673	0.460	0.141	0.87	-	F	A	12	0.012	0.007	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4185	66.6	2.826	2.037	0.417	0.96	-	M	A	23	0.067	0.019	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4186	46.1	1.056	0.688	0.239	1.08	-	M	A	22	0.024	0.012	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4187	44.3	0.778	0.487	0.180	0.90	2	F	J	11	0.015	0.006	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4188	53.3	1.082	0.879	0.028	0.71	-	F	A	12	0.039	0.018	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4189	65.3	2.707	1.784	0.494	0.97	-	F	A	13	0.066	0.090	3274	0.027	307.000
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4190	62.8	2.299	1.681	0.381	0.93	-	M	A	23	0.035	0.011	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4191	42.0	0.699	0.459	0.157	0.95	-	F	J	11	0.014	0.006	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4192	58.6	1.689	1.458	-	0.84	4	M	A	23	0.056	0.010	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4193	58.4	1.816	1.291	0.255	0.91	-	F	A	13	0.044	0.040	2561	0.016	296.000
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4194	44.0	0.653	0.552	-	0.77	2	M	J	21	0.032	0.001	-	-	-
13/08/18	NF	ML18FHNFMT4207	ML18UNFTHST4195	48.7	1.068	0.838	-	0.93	1	F	A	12	0.049	0.019	-	-	-
13/08/18	NF	ML18FHNFMT4206	ML18UNFTHST4196	55.4	1.718	1.093	0.448	1.01	-	M	A	23	0.022	0.008	-	-	-
13/08/18	NF	ML18FHNFMT4207	ML18UNFTHST4197	41.7	0.688	0.443	0.153	0.95	-	U	J	01	0.015	0.007	-	-	-
13/08/18	NF	ML18FHNFMT4207	ML18UNFTHST4198	61.2	2.542	1.692	0.550	1.11	-	M	A	23	0.054	0.014	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4257	63.7	1.899	1.571	-	0.73	-	M	A	24	0.053	0.014	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4258	58.9	1.626	1.431	-	0.80	3	M	A	23	0.044	0.006	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4260	48.3	0.816	0.681	-	0.73	2	F	A	12	0.027	0.014	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4261	60.0	1.661	1.444	-	0.77	4	M	A	25	0.024	0.006	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4262	60.6	1.835	1.567	-	0.83	3	M	A	22	0.059	0.035	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4263	48.7	0.847	0.695	-	0.73	2	F	A	12	0.027	0.012	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4264	59.1	1.518	1.305	-	0.74	3	M	A	23	0.048	0.012	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4265	35.4	0.361	0.282	-	0.81	2	M	J	21	0.012	-	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4266	48.7	1.003	0.733	0.193	0.87	-	M	A	27	0.022	0.009	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4267	47.6	0.978	0.655	0.200	0.91	-	F	A	12	0.020	0.009	-	-	-
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4268	69.3	2.996	2.139	0.339	0.90	-	F	A	13	0.081	0.143	3013	0.048	321.000
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4269	67.7	2.438	1.852	0.182	0.79	-	F	A	13	0.063	0.1026[(f)]	3427	0.030	344.000
14/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4270	61.7	1.987	1.310	0.428	0.84	-	F	A	12	0.036	0.030	-	-	-
15/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4278	61.0	1.749	1.478	-	0.77	4	M	A	24	0.034	0.012	-	-	-
15/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4279	43.9	0.732	-	-	0.87	2	M	J	21	0.023	0.001	-	-	-
15/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4280	45.4	0.750	0.620	-	0.80	2	F	A	12	0.025	0.007	-	-	-
15/08/18	NF	ML18FHNFMT4208	ML18UNFTHST4281	49.1	0.991[(e)]	0.730	0.131	0.84	2	F	A	12	0.027	0.010	-	-	-
16/08/18	NF	ML18FHNFMT4209	ML18UNFTHST4304	51.8	1.020	0.845	-	0.73	1	F	A	12	0.030	0.015	1338	0.011	255.000
16/08/18	NF	ML18FHNFMT4209	ML18UNFTHST4305	65.1	2.234	1.998	-	0.81	4	M	A	23	0.066	0.018	-	-	-
16/08/18	NF	ML18FHNFMT4211	ML18UNFTHST4306	56.8	1.768	1.371	0.275	0.97	-	M	A	23	0.026	0.010	-	-	-
16/08/18	NF	ML18FHNFMT4211	ML18UNFTHST4307	49.2	0.886	0.756	-	0.74	3	F	A	12	0.029	0.013	-	-	-
16/08/18	NF	ML18FHNFMT4211	ML18UNFTHST4308	60.8	1.730	1.510	-	0.77	4	M	A	25	0.025	0.013	-	-	-
16/08/18	NF	ML18FHNFMT4210	ML18UNFTHST4309	44.1	0.803	0.532	0.195	0.93	2	F	J	11	0.016	0.006	-	-	-
16/08/18	NF	ML18FHNFMT4210	ML18UNFTHST4310	36.0	0.486	0.275	0.155	1.04	2	M	J	21	0.009	-	-	-	-
16/08/18	NF	ML18FHNFMT4210	ML18UNFTHST4311	43.2	0.754	0.463	0.212	0.93	-	F	A	12	0.017	0.007	-	-	-

Table 10B-3: Survey Data for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Parasite Weight[(a)] (g)	Condition Factor	Age[(b)]	Sex	Life Stage	Maturity[(c)]	Liver Weight (g)	Gonad Weight (g)	Fecundity	Mean Egg Weight (mg)	Mean Egg Diameter (µm)
16/08/18	NF	ML18FHNFMT4210	ML18UNFTHST4312	39.9	0.474	0.305	0.124	0.75	2	U	J	01	0.006	-	-	-	-
16/08/18	NF	ML18FHNFMT4210	ML18UNFTHST4313	39.5	0.588	0.360	0.162	0.95	-	F	J	11	0.011	-	-	-	-
18/08/18	NF	ML18FHNFMT4214	ML18UNFTHST4359	40.0	0.413	0.334	-	0.65	2	F	J	11	0.013	0.002	-	-	-
18/08/18	NF	ML18FHNFMT4214	ML18UNFTHST4360	42.5	0.637	0.406	0.170	0.83	-	F	J	11	0.011	0.006	-	-	-
18/08/18	NF	ML18FHNFMT4214	ML18UNFTHST4361	42.5	0.746	0.454	0.177	0.97	-	F	A	12	0.017	0.006	-	-	-
18/08/18	NF	ML18FHNFMT4214	ML18UNFTHST4362	40.0	0.427	0.361	-	0.67	2	F	J	11	0.014	-	-	-	-
18/08/18	NF	ML18FHNFMT4214	ML18UNFTHST4363	51.9	1.156	0.941	-	0.83	2	F	A	12	0.046	-	-	-	265.000
18/08/18	NF	ML18FHNFMT4214	ML18UNFTHST4364	40.9	0.659	0.425	0.125	0.97	-	F	J	11	0.019	0.006	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4365	36.5	0.459	0.368	-	0.95	1	M	J	21	0.012	-	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4366	39.8	0.429	0.367	-	0.68	1	F	J	11	0.014	0.001	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4367	36.5	0.521	0.310	0.143	1.07	-	U	J	01	0.008	0.003	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4368	38.3	0.375	0.306	-	0.67	1	F	J	11	0.013	0.004	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4369	38.6	0.430	0.347	-	0.75	1	F	J	11	0.014	0.004	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4370	41.9	0.606	0.385	0.146	0.82	-	U	J	01	0.014	0.006	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4371	38.8	0.612	0.358	0.175	1.05	2	F	J	11	0.010	0.006	-	-	-
18/08/18	NF	ML18FHNFMT4212	ML18UNFTHST4372	42.1	0.658	0.460	0.131	0.88	2	M	J	21	0.020	0.001	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4373	39.9	0.437	0.344	0.005	0.69	-	F	J	11	0.015	0.004	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4374	38.0	0.403	0.352	-	0.74	1	U	J	01	0.013	-	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4375	41.7	0.626	0.410	0.141	0.87	-	F	J	11	0.010	0.005	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4376	42.8	0.692	0.447	0.189	0.89	-	M	J	21	0.014	0.005	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4377	42.8	0.660	0.428	0.156	0.84	-	U	J	01	0.012	0.005	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4378	43.0	0.679	0.440	0.157	0.86	-	F	J	11	0.019	-	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4379	39.2	0.625	0.345	0.200	1.04	2	F	J	11	0.009	0.005	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4380	40.6	0.626	0.412	-	0.94	2	F	J	11	0.015	0.006	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4381	43.9	0.789	0.531	0.134	0.94	2	M	J	21	0.020	-	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4382	45.0	0.738	0.557	0.129	0.81	2	M	A	22	0.014	-	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4383	42.9	0.741	0.519	0.124	0.94	2	M	J	21	0.016	0.001	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4384	43.6	0.801	0.505	0.245	0.97	-	F	J	11	0.015	0.006	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4385	45.5	0.687	0.582	-	0.73	2	M	J	21	0.016	0.003	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4387	46.8	0.918	0.626	0.161	0.89	2	F	A	12	0.026	0.010	-	-	-
19/08/18	NF	ML18FHNFMT4215	ML18UNFTHST4388	46.6	0.882	0.645	0.129	0.87	-	M	A	22	0.025	0.007	-	-	-
19/08/18	NF	ML18FHNFMT4217	ML18UNFTHST4435	59.3	1.907	1.611	-	0.91	3	M	A	23	0.064	0.016	-	-	-
19/08/18	NF	ML18FHNFMT4217	ML18UNFTHST4436	56.0	1.546	1.346	-	0.88	4	M	A	23	0.069	0.022	-	-	-
19/08/18	NF	ML18FHNFMT4217	ML18UNFTHST4437	58.6	1.768	1.506	-	0.88	4	M	A	23	0.060	0.021	-	-	-
19/08/18	NF	ML18FHNFMT4216	ML18UNFTHST4438	49.9	0.903	0.742	-	0.73	2	F	A	12	0.036	0.013	709	0.018	216.000
19/08/18	NF	ML18FHNFMT4216	ML18UNFTHST4439	46.7	0.824	0.684	0.020	0.81	-	F	A	12	0.018	0.013	-	-	-
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4561	39.1	0.430	0.352	-	0.72	2	F	J	11	0.011	0.004	-	-	-
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4562	42.2	0.653	0.497	0.095	0.87	2	M	J	21	0.022	0.001	-	-	-
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4563	42.5	0.722	0.461	0.171	0.94	-	U	J	01	0.015	0.009	-	-	-
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4564	39.5	0.558	0.377	0.136	0.91	-	U	J	01	0.015	0.004	-	-	-
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4565	41.0	0.616	0.403	0.138	0.89	-	U	J	01	0.013	0.007	-	-	-

Table 10B-3: Survey Data for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Parasite Weight[(a)] (g)	Condition Factor	Age[(b)]	Sex	Life Stage	Maturity[(c)]	Liver Weight (g)	Gonad Weight (g)	Fecundity	Mean Egg Weight (mg)	Mean Egg Diameter (µm)
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4566	41.7	0.686	0.438	0.152	0.94	-	U	J	01	0.016	0.008	-	-	-
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4567	39.9	0.601	0.392	0.143	0.95	2	M	J	21	0.010	-	-	-	-
20/08/18	NF	ML18FHNFMT4218	ML18UNFTHST4568	38.1	0.464	0.308	0.130	0.84	1	M	J	21	0.009	0.001	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5000	67.3	2.380	1.755	0.031	0.78	-	F	A	13	0.067	0.114	1706	0.067	325.000
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5001	65.8	2.180	1.866	-	0.77	3	M	A	24	0.054	0.012	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5002	38.2	0.604	0.318	0.209	1.08	2	M	J	21	0.010	0.001	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5003	55.5	1.248	0.826	0.250	0.73	-	M	A	27	0.042	0.002	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5004	42.4	0.807	0.425	0.223	1.06	1	M	J	21	0.016	0.001	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5005	44.4	0.956	0.530	0.329	1.10	-	U	J	01	-	-	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5006	43.0	0.725	0.466	0.141	0.91	1	U	J	01	0.013	-	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5007	47.4	0.954	0.529	0.308	0.89	2	M	J	21	0.018	0.001	-	-	-
10/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5008	58.1	1.558	1.296	-	0.80	1	M	A	25	0.031	0.012	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5009	74.1	3.259	2.111	0.633	0.80	2	F	A	13	0.071	0.156	1785	0.088	533.000
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5010	59.3	1.837	1.286	0.264	0.88	4	F	A	12	0.055	0.033	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5011	63.1	1.891	1.489	0.249	0.75	4	M	A	23	0.048	0.011	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5012	64.2	2.419	1.863	0.272	0.91	4	M	A	23	0.066	0.016	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5013	51.2	1.075	0.879	-	0.80	2	F	A	12	0.038	0.018	1772	0.010	247.000
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5014	62.1	1.877	1.560	-	0.78	1	M	A	24	0.059	0.012	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5015	43.9	0.697	0.529	0.023	0.82	-	M	A	22	0.023	0.008	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5016	55.7	1.633	1.096	0.368	0.94	-	M	A	23	0.030	0.015	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5017	64.9	2.325	1.763	-	0.85	4	F	A	16	0.108	0.137	1759	0.078	468.000
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5018	55.6	1.525	0.959	0.329	0.89	-	F	A	12	0.033	0.022	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5019	60.1	2.281	1.683	0.276	1.05	4	M	A	23	0.047	0.008	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5020	45.6	0.793	0.513	0.192	0.84	-	F	A	16	0.026	0.007	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5021	58.2	1.671	1.040	0.415	0.85	-	F	A	12	0.025	0.020	1277	0.016	217.000
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5022	45.3	0.706	0.584	-	0.76	2	M	A	22	0.017	0.010	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5023	49.0	0.863	0.700	-	0.73	2	F	A	12	0.023	0.013	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5024	55.1	1.460	0.947	0.329	0.87	4	M	A	23	0.025	0.007	-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5025	39.9	0.583	0.292	0.186	0.92	-	M	J	21	0.006		-	-	-
10/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5026	48.3	0.841	0.679	-	0.75	3	M	A	22	0.029	0.027	-	-	-
10/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5027	50.9	0.979	0.780	-	0.74	2	F	A	12	0.042	0.021	1001	0.021	197.000
10/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5028	44.9	1.025	0.630	0.253	1.13	2	M	A	22	0.014	0.009	-	-	-
10/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5029	48.4	1.136	0.730	0.229	1.00	-	M	A	27	0.025	0.006	-	-	-
10/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5030	62.4	2.596	1.710	0.398	1.07	4	M	A	24	0.069	0.029	-	-	-
10/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5031	73.0	4.222	2.383	0.902	1.09	-	F	A	14	0.106	0.404	1477	0.274	888.000
10/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5032	58.6	1.890	1.209	0.436	0.94	2	F	A	12	0.044	0.052	1070	0.048	337.000
11/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5039	68.3	3.207	1.894	0.373	1.01	-	F	A	14	0.073	0.616	1592	0.387	918.000
11/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5040	60.3	1.799	1.203	0.361	0.82	4	F	A	12	0.037	0.030	-	-	-
11/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5041	63.1	2.223	1.657	0.266	0.88	-	M	A	25	0.062	0.012	-	-	-
11/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5042	65.0	2.408	1.537	0.551	0.88	3	F	A	12	0.053	0.037	-	-	-
11/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5043	39.5	0.568	0.360	0.124	0.93	2	U	J	01	0.015	-	-	-	-

Table 10B-3: Survey Data for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Parasite Weight[(a)] (g)	Condition Factor	Age[(b)]	Sex	Life Stage	Maturity[(c)]	Liver Weight (g)	Gonad Weight (g)	Fecundity	Mean Egg Weight (mg)	Mean Egg Diameter (µm)
11/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5044	43.7	0.670	0.457	0.109	0.80	2	F	A	12	0.018	0.006	-	-	-
11/08/18	RA1	ML18FHRA1MT5200	ML18URA1THST5045	50.6	1.186	0.810	0.149	0.92	2	F	A	12	0.035	0.011	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5046	51.5	1.211	1.001	-	0.89	2	M	A	22	0.046	0.026	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5047	43.7	0.768	0.510	-	0.92	2	F	J	11	0.020	0.006	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5048	61.2	2.194	1.640	-	0.96	-	M	A	25	0.055	0.013	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5049	41.3	0.730	0.456	0.147	1.03	-	F	J	11	0.017	0.006	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5050	55.2	1.355	1.138	-	0.80	2	F	A	12	0.053	0.018	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5051	51.8	1.097	0.916	-	0.79	2	F	A	12	0.038	0.011	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5052	61.7	2.102	1.486	0.301	0.89	4	F	A	12	0.058	0.043	-	-	-
11/08/18	RA1	ML18FHRA1MT5201	ML18URA1THST5053	56.0	1.327	1.124	-	0.76	3	M	A	25	0.039	0.021	-	-	-
11/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5054	62.8	1.882	1.317	0.303	0.76	4	F	A	12	0.056	0.031	-	-	-
11/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5055	54.2	1.572	1.001	0.356	0.99	-	M	A	27	0.031	0.004	-	-	-
11/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5056	49.6	0.773	0.648	-	0.63	2	F	A	12	0.027	0.012	431	0.027	173.000
11/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5057	61.4	2.096	1.454	0.395	0.91	3	M	A	23	0.039	0.007	-	-	-
11/08/18	RA1	ML18FHRA1MT5202	ML18URA1THST5058	54.9	1.311	0.985	0.209	0.79	-	M	A	23	0.039	0.005	-	-	-
12/08/18	RA1	ML18FHRA1MT5204	ML18URA1THST5087	60.2	1.508	1.277	-	0.69	4	M	A	23	0.019	0.005	-	-	-
12/08/18	RA1	ML18FHRA1MT5203	ML18URA1THST5088	58.5	1.554	1.058	0.298	0.78	-	F	A	12	0.034	0.027	-	-	-
12/08/18	RA1	ML18FHRA1MT5203	ML18URA1THST5089	62.6	2.587	1.915	0.347	1.05	3	M	A	25	0.064	0.013	-	-	-
12/08/18	RA1	ML18FHRA1MT5203	ML18URA1THST5090	66.4	2.808	1.890	0.502	0.96	-	F	A	13	0.072	0.119	1378	0.086	397.000
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5190	39.9	0.491	0.306	0.101	0.77	-	M	A	22	0.009	-	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5191	42.2	0.642	0.427	0.117	0.85	2	M	J	21	0.019	0.001	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5192	54.5	1.166	0.997	-	0.72	2	M	A	23	0.041	0.023	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5193	52.7	1.071	0.877	-	0.73	3	F	A	13	0.041	0.024	683	0.034	255.000
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5194	48.3	0.802	0.682	-	0.71	2	M	A	22	0.023	0.008	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5195	52.1	1.014	0.834	-	0.72	2	M	A	22	0.029	0.018	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5196	62.6	1.829	1.444	0.038	0.74	-	F	A	13	0.066	0.063	900	0.070	468.000
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5197	45.4	0.795	0.655	0.014	0.85	-	M	A	22	0.022	0.008	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5198	49.1	0.992	0.724	0.153	0.84	2	M	A	23	0.028	0.004	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5199	61.4	1.775	1.496	-	0.77	3	M	A	23	0.038	0.008	-	-	-
15/08/18	RA1	ML18FHRA1MT5209	ML18URA1THST5200	52.4	1.092	0.924	-	0.76	-	M	A	22	0.031	0.023	-	-	-
17/08/18	RA1	ML18FHRA1MT5212	ML18URA1THST5225	41.1[(d)]	0.670	0.451	0.114	0.96	2	M	J	21	0.014	-	-	-	-
17/08/18	RA1	ML18FHRA1MT5213	ML18URA1THST5227	61.0	1.943	1.634	-	0.86	4	M	A	23	0.053	0.014	-	-	-
17/08/18	RA1	ML18FHRA1MT5213	ML18URA1THST5228	42.7	0.609	0.415	0.132	0.78	1	F	J	11	0.018	0.007	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5229	36.6	0.496	0.293	0.127	1.02	2	U	J	01	0.007	-	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5230	41.8	0.651	0.414	0.186	0.89	2	M	J	21	0.015	-	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5231	36.9	0.544	0.335	0.123	1.09	2	F	J	11	0.016	0.005	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5232	40.3	0.559	0.339	0.142	0.86	2	F	J	11	0.009	0.004	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5233	41.2	0.613	0.408	0.122	0.88	2	F	J	11	0.011	0.005	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5234	41.6	0.631	0.397	0.164	0.88	2	U	J	01	0.010	-	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5235	43.9	0.796	0.472	0.192	0.94	-	M	A	22	0.014	0.007	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5236	43.0	0.738	0.479	0.160	0.93	-	M	J	21	0.024	-	-	-	-

Table 10B-3: Survey Data for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Date (dd/mm/yy)	Sampling Area	Effort Number	Fish Identification Number	Total Length (mm)	Body Weight (g)	Carcass Weight (g)	Parasite Weight[(a)] (g)	Condition Factor	Age[(b)]	Sex	Life Stage	Maturity[(c)]	Liver Weight (g)	Gonad Weight (g)	Fecundity	Mean Egg Weight (mg)	Mean Egg Diameter (µm)
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5237	44.9	0.798	0.509	0.186	0.88	-	F	A	12	0.025	0.006	-	-	-
17/08/18	RA1	ML18FHRA1MT5214	ML18URA1THST5238	44.9	0.735	0.513	0.153	0.81	2	M	J	21	0.017	0.001	-	-	-
17/08/18	RA1	ML18FHRA1MT5213	ML18URA1THST5239	47.9	0.780	0.662	-	0.71	2	F	A	12	0.017	0.011	-	-	-
17/08/18	RA1	ML18FHRA1DN5215	ML18URA1THST5240	40.8	0.646	0.400	0.153	0.95	2	M	J	21	0.012	-	-	-	-
17/08/18	RA1	ML18FHRA1DN5215	ML18URA1THST5241	41.4	0.580	0.360	0.146	0.82	-	F	J	11	0.013	0.005	-	-	-
20/08/18	RA1	ML18FHRA1MT5217	ML18URA1THST5281	43.1	0.433	0.395	-	0.54	2	F	A	12	0.006	0.003	-	-	-
20/08/18	RA1	ML18FHRA1MT5217	ML18URA1THST5282	39.8	0.459	0.349	0.068	0.73	1	F	J	11	0.011	0.004	-	-	-
20/08/18	RA1	ML18FHRA1MT5217	ML18URA1THST5283	45.7	0.787	0.514	0.171	0.83	2	M	J	21	0.015	-	-	-	-
20/08/18	RA1	ML18FHRA1MT5217	ML18URA1THST5284	37.3	0.460	0.344	0.055	0.89	-	F	J	11	0.007	0.004	-	-	-
20/08/18	RA1	ML18FHRA1MT5217	ML18URA1THST5285	44.7	0.621	0.548	-	0.70	1	F	A	12	0.017	0.009	-	-	-
20/08/18	RA1	ML18FHRA1MT5218	ML18URA1THST5303	42.8	0.674	0.436	0.162	0.86	-	U	J	01	0.010	0.006	-	-	-

a) Suspected to be Schistocephalus solidus.
b) Derived using otoliths.
c) Refer to Table 2 for maturity codes designations.
d) Calculated value: regression completed for standard and total length, equation y=0.893x -0.392 (r^2= 0.990).
e) Calculated value: regression completed for carcass and total weight, equation y=0.7035x + 0.033 (r^2=0.951).
f) Calculated value: regression completed using histology plus fecundity subsample weights and total gonad weight, equation y=0.9792x - 0.0009 (r^2=0.999).
d = day; m = month; y = year; NF = Near-field; RA1 = Reference Area 1; mm = millimetre; g = gram; F = female; M = male; U = unknown; A = adult; J = juvenile; mg = milligram; µm = micrometre; - = not recorded or not applicable.

Table 10B-4: Statistical Outliers Excluded from Statistical Analysis for the Meliadine Lake Fish Health Program, 2018

Sex	Parasites	Parameter	Dependent	Covariate	Statistical Test	Fish Identification Number	Studentized Residual
Female	Included	Relative gonad size	Gonad weight	Body weight	$ANCOVA_{log}$	ML18URA1THST5039	4.0
Female	Included	Relative liver size	Liver weight	Body length	ANCOVAlog	ML18URA1THST5281	-4.6
Male	Included	Relative body weight	Body weight	Total weight	$ANCOVA_{log}$	ML18URA1THST5028	3.3[(a)]
Female	Excluded	Weight-at-age	Body weight	Age	ANCOVA	ML18UNFTHST4120	5.5
Female	Excluded	Weight-at-age	Body weight	Age	ANCOVA	ML18URA1THST5017	3.6[(a)]
Female	Excluded	Relative liver weight	Liver weight	Total length	$ANCOVA_{log}$	ML18URA1THST5281	-2.9[(a)]
Population	Included	Relative body weight	Body weight	Total length	$ANCOVA_{rank}$	ML18URA1THST5153	4.2

Note: Outlier threshold defined as a studentized residual greater than |4.0|.

a) Value removed due to high leverage.

ANOVA = analysis of variance; ANCOVA = analysis of covariance; log = logarithm base 10; rank = rank transformed data; - = not applicable.

Table 10B-5: Abnormality Assessment for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Fish Identification Number	External Assessment										Internal Assessment					
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills[a]	Pseudo-branchs	Fins[b]	Vent	Parasites	Liver[c]	Spleen[d]	Gall Bladder	Mesentaric Fat[e]	Parasites[f]	Kidney[g]
ML18UNFTHST4000	N	N	0	0	0	N	N	0	0	0	A	B	0	0	2	M
ML18UNFTHST4001	N	N	0	0	0	N	N	1	0	0	C	B	0	1	2	N
ML18UNFTHST4002	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	G
ML18UNFTHST4003	N	N	0	0	0	P	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4004	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4005	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	M
ML18UNFTHST4006	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	M
ML18UNFTHST4007	N	N	0	0	0	N	N	0	0	0	C	B	0	2	2	N
ML18UNFTHST4008	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4009	N	N	0	0	0	P	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4010	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4011	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4012	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4013	N	N	0	0	0	N	N	1	0	0	C	B	0	1	2	N
ML18UNFTHST4014	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4015	N	N	0	0	0	P	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4016	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4017	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18UNFTHST4119	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18UNFTHST4120	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4121	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	S
ML18UNFTHST4122	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4123	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	-
ML18UNFTHST4124	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4125	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18UNFTHST4126	N	N	0	0	0	P	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4127	N	N	0	0	0	M	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4128	N	N	0	0	0	M	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4129	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4130	N	N	0	0	0	M	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4131	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18UNFTHST4132	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4133	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4175	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18UNFTHST4176	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N

Table 10B-5: Abnormality Assessment for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Fish Identification Number	External Assessment										Internal Assessment					
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills[a]	Pseudo-branchs	Fins[b]	Vent	Parasites	Liver[c]	Spleen[d]	Gall Bladder	Mesentaric Fat[e]	Parasites[f]	Kidney[g]
ML18UNFTHST4177	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4178	N	N	0	0	0	N	N	0	0	0	C	B	0	3	0	N
ML18UNFTHST4179	N	N	0	0	0	C	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4180	N	N	0	0	0	C	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4181	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4182	N	N	0	0	0	N	N	0	0	0	C	B	0	3	0	N
ML18UNFTHST4183	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4184	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4185	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4186	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4187	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18UNFTHST4188	N	N	0	0	0	C	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4189	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18UNFTHST4190	N	N	0	0	0	N	N	0	0	0	A	B	0	3	2	N
ML18UNFTHST4191	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18UNFTHST4192	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18UNFTHST4193	N	N	0	0	0	C	N	0	0	0	A	B	0	2	2	N
ML18UNFTHST4194	N	N	0	0	0	C	N	0	0	0	C	B	0	3	0	N
ML18UNFTHST4195	N	N	0	0	0	C	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4196	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18UNFTHST4197	N	N	0	0	0	P	N	0	0	0	C	B	0	2	2	N
ML18UNFTHST4198	N	N	0	0	0	N	N	0	0	0	C	B	0	3	2	N
ML18UNFTHST4257	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4258	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4260	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4261	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4262	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4263	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4264	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4265	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4266	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4267	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4268	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4269	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4270	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N

Table 10B-5: Abnormality Assessment for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Fish Identification Number	External Assessment										Internal Assessment					
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills[a]	Pseudo-branchs	Fins[b]	Vent	Parasites	Liver[c]	Spleen[d]	Gall Bladder	Mesentaric Fat[e]	Parasites[f]	Kidney[g]
ML18UNFTHST4278	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4279	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4280	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4281	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4304	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18UNFTHST4305	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4306	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4307	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4308	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4309	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4310	N	N	0	0	0	N	N	0	0	0	A	B	0	0	3	N
ML18UNFTHST4311	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4312	N	N	0	0	0	N	N	0	0	0	A	B	0	2	2	N
ML18UNFTHST4313	N	N	0	0	0	N	N	0	0	0	A	B	0	2	2	N
ML18UNFTHST4359	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4360	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18UNFTHST4361	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18UNFTHST4362	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4363	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18UNFTHST4364	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4365	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4366	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4367	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18UNFTHST4368	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4369	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4370	N	N	0	0	0	N	N	0	0	0	A	B	0	0	2	N
ML18UNFTHST4371	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4372	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4373	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18UNFTHST4374	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18UNFTHST4375	N	N	0	0	0	N	N	0	0	0	A	B	0	0	2	N
ML18UNFTHST4376	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4377	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18UNFTHST4378	N	N	0	0	0	N	N	0	0	0	C	B	0	2	2	N
ML18UNFTHST4379	N	N	0	0	0	N	N	0	0	0	C	B	0	1	3	N

Table 10B-5: Abnormality Assessment for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Fish Identification Number	External Assessment										Internal Assessment					
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills[a]	Pseudo-branchs	Fins[b]	Vent	Parasites	Liver[c]	Spleen[d]	Gall Bladder	Mesentaric Fat[e]	Parasites[f]	Kidney[g]
ML18UNFTHST4380	N	N	0	0	0	N	N	0	0	0	A	B	0	1	0	N
ML18UNFTHST4381	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4382	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4383	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4384	N	N	0	0	0	N	N	0	0	0	C	B	0	1	3	N
ML18UNFTHST4385	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4387	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4388	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4435	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4436	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4437	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4438	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18UNFTHST4439	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4561	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18UNFTHST4562	N	N	0	0	0	N	N	0	0	0	C	B	0	2	2	N
ML18UNFTHST4563	N	N	0	0	0	N	N	0	0	0	C	B	0	2	2	N
ML18UNFTHST4564	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4565	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4566	N	N	0	0	0	N	N	0	0	0	C	B	0	2	2	N
ML18UNFTHST4567	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18UNFTHST4568	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5000	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18URA1THST5001	N	N	0	0	0	N	N	0	0	0	A	B	0	0	0	N
ML18URA1THST5002	N	N	0	0	0	N	N	0	0	0	C	B	0	0	3	N
ML18URA1THST5003	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5004	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5005	N	N	0	0	0	N	N	0	0	0	C	B	0	1	3	M
ML18URA1THST5006	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5007	N	N	0	0	0	N	N	0	0	0	C	B	0	0	3	N
ML18URA1THST5008	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18URA1THST5009	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5010	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5011	N	N	0	0	0	M	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5012	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5013	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N

Table 10B-5: Abnormality Assessment for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Fish Identification Number	External Assessment										Internal Assessment					
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills[a]	Pseudo-branchs	Fins[b]	Vent	Parasites	Liver[c]	Spleen[d]	Gall Bladder	Mesentaric Fat[e]	Parasites[f]	Kidney[g]
ML18URA1THST5014	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18URA1THST5015	N	N	0	0	0	N	N	0	0	0	C	B	0	2	2	N
ML18URA1THST5016	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5017	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5018	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5019	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5020	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5021	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5022	N	N	0	0	0	P	N	0	0	0	C	B	0	0	0	N
ML18URA1THST5023	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5024	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5025	N	N	0	0	0	N	N	0	0	0	C	B	0	1	3	N
ML18URA1THST5026	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5027	N	N	0	0	0	F	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5028	N	N	0	0	0	F	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5029	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5030	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5031	N	N	0	0	0	F	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5032	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5039	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5040	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18URA1THST5041	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	M
ML18URA1THST5042	N	N	0	0	0	F	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5043	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18URA1THST5044	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5045	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5046	N	N	0	0	0	N	N	0	0	0	A	B	0	1	0	N
ML18URA1THST5047	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18URA1THST5048	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5049	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18URA1THST5050	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5051	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5052	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18URA1THST5053	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18URA1THST5054	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N

Table 10B-5: Abnormality Assessment for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Fish Identification Number	External Assessment										Internal Assessment					
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills[a]	Pseudo-branchs	Fins[b]	Vent	Parasites	Liver[c]	Spleen[d]	Gall Bladder	Mesentaric Fat[e]	Parasites[f]	Kidney[g]
ML18URA1THST5055	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5056	N	N	0	0	0	P	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5057	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5058	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5087	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18URA1THST5088	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5089	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5090	N	N	0	0	0	C	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5190	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5191	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5192	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5193	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5194	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5195	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5196	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5197	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5198	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5199	N	N	0	0	0	N	N	0	0	0	A	B	0	1	0	N
ML18URA1THST5200	N	N	0	0	0	N	N	0	0	0	C	B	0	2	0	N
ML18URA1THST5225	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5227	N	N	0	0	0	N	N	0	0	0	C	B	0	1	0	N
ML18URA1THST5228	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5229	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5230	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5231	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5232	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5233	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5234	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5235	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5236	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5237	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18URA1THST5238	N	N	0	0	0	N	N	0	0	0	C	B	0	2	2	N
ML18URA1THST5239	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18URA1THST5240	N	N	0	0	0	N	N	0	0	0	C	B	0	0	2	N
ML18URA1THST5241	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N

Table 10B-5: Abnormality Assessment for Threespine Stickleback Lethally Sampled During the Meliadine Lake Fish Health Program, 2018

Fish Identification Number	External Assessment										Internal Assessment					
	Body Deformity	Eyes	Skin	Thymus	Opercula	Gills[a]	Pseudo-branchs	Fins[b]	Vent	Parasites	Liver[c]	Spleen[d]	Gall Bladder	Mesentaric Fat[e]	Parasites[f]	Kidney[g]
ML18URA1THST5281	N	N	0	0	0	N	N	0	0	0	C	B	0	0	0	N
ML18URA1THST5282	N	N	0	0	0	N	N	0	0	0	C	B	0	1	2	N
ML18URA1THST5283	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N
ML18URA1THST5284	N	N	0	0	0	N	N	0	0	0	A	B	0	0	2	N
ML18URA1THST5285	N	N	0	0	0	N	N	0	0	0	C	B	0	3	0	N
ML18URA1THST5303	N	N	0	0	0	N	N	0	0	0	A	B	0	1	2	N

a) F = frayed, erosion of tips of gill lamellae resulting in "ragged" gills; C = clubbed, swelling of the tips of the gill lamellae; M = marginate, gills with light/discoloured margin along tips of lamellae; P = pale
b) 1 = minor erosion.
c) A = normal; C = "fatty" liver.
d) B = normal.
e) 0 = none; 1 = <50%; 2 = 50%; 3 = >50%.
f) 1 = few observed parasites; 2 = moderate parasite infestation; 3 = numerous parasites.
g) B = normal; S = swollen; M = mottled, gray discolouration; G = granular appearance and texture
% = percent; N or 0 = normal, no deformities or aberrations observed.

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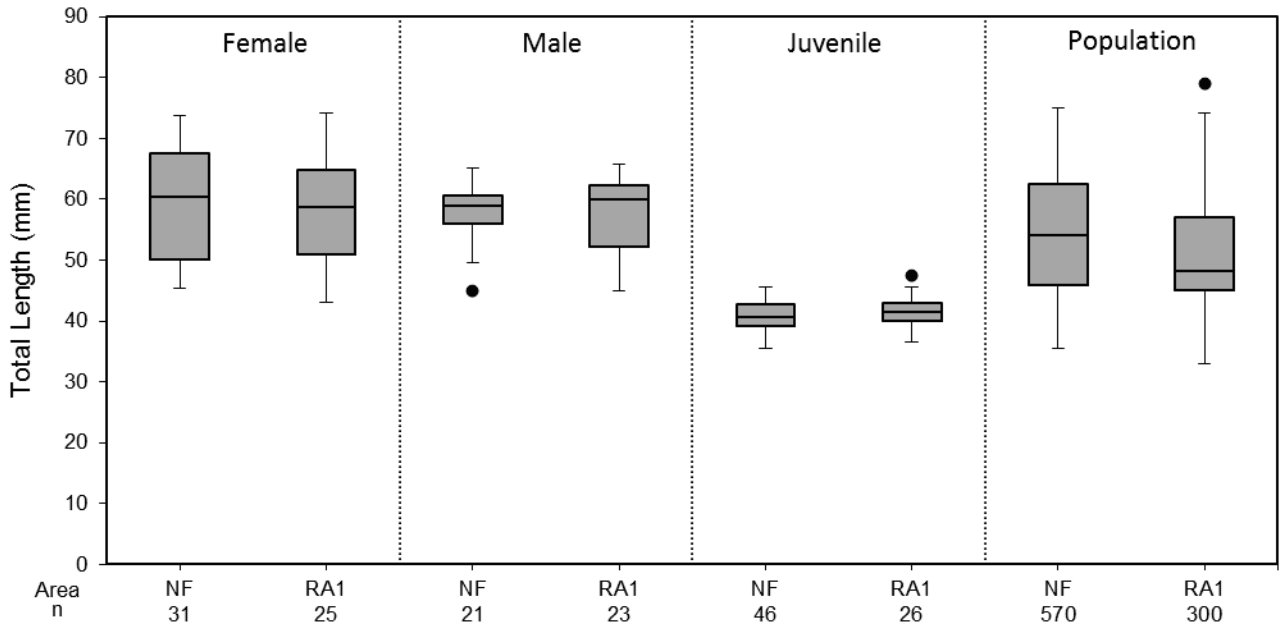
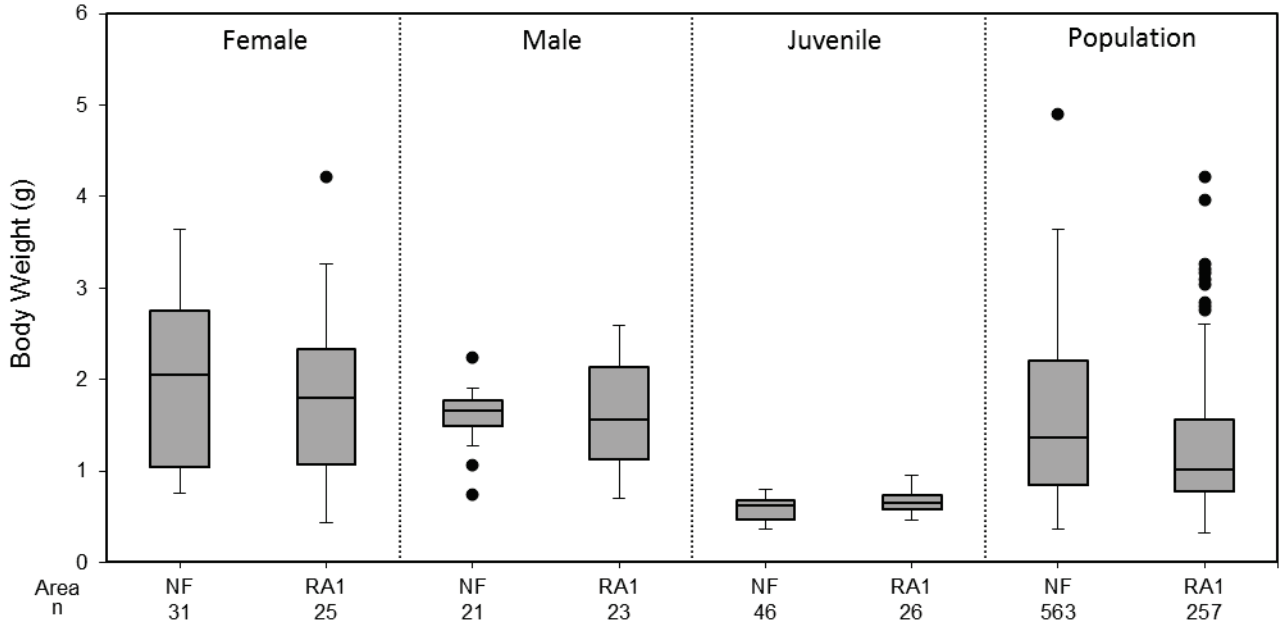


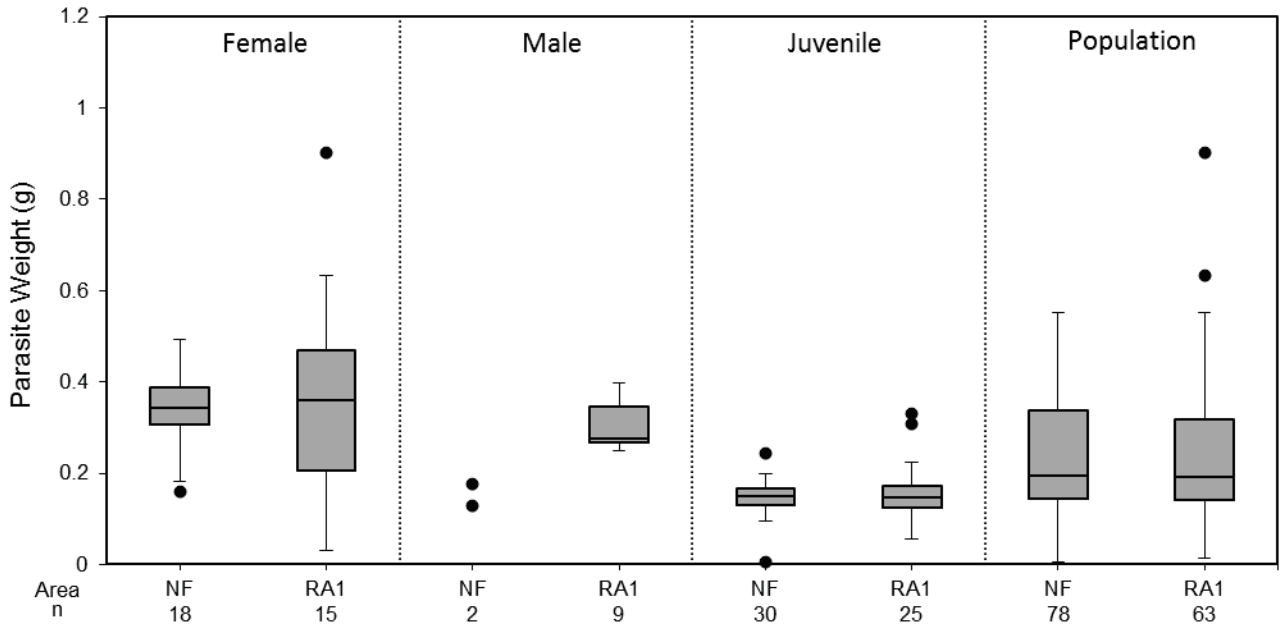
NF = Near-field; RA1 = Reference Area 1; mm= millimetre; n = sample size.

Figure 10C-1: Total Length of Threespine Stickleback Captured During the Lethal and Population Surveys at Meliadine Lake, 2018



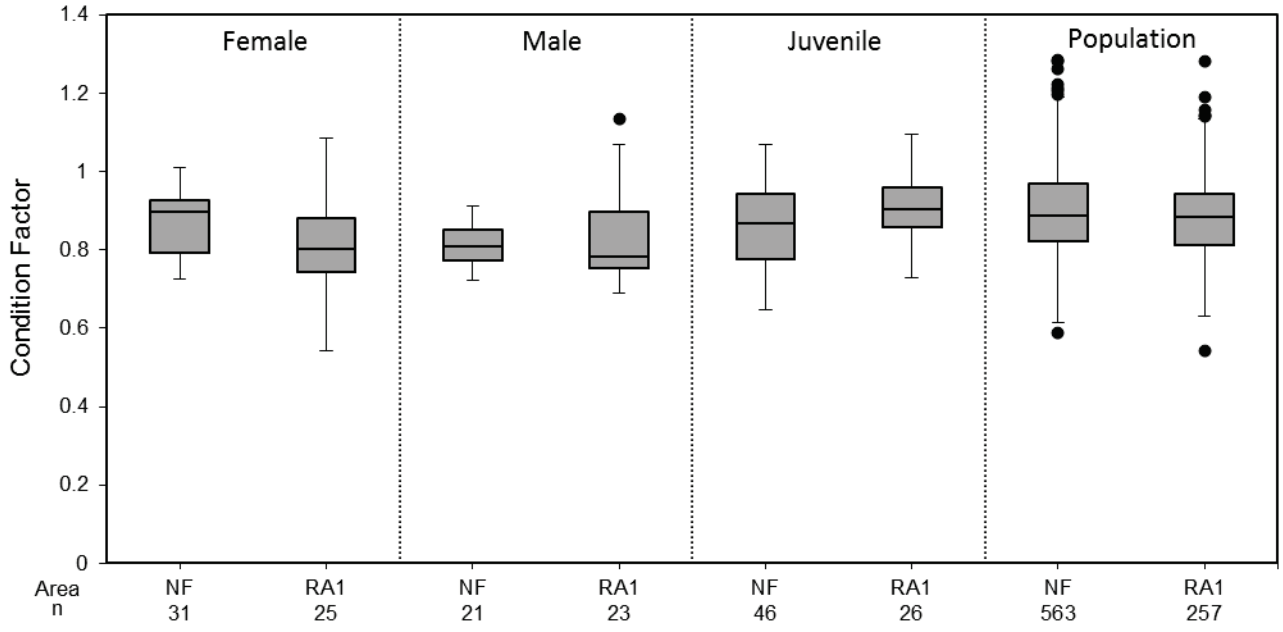
NF = Near-field; RA1 = Reference Area 1; g = gram; n = sample size.

Figure 10C-2: Body Weight of Threespine Stickleback Captured During the Lethal and Population Surveys at Meliadine Lake, 2018



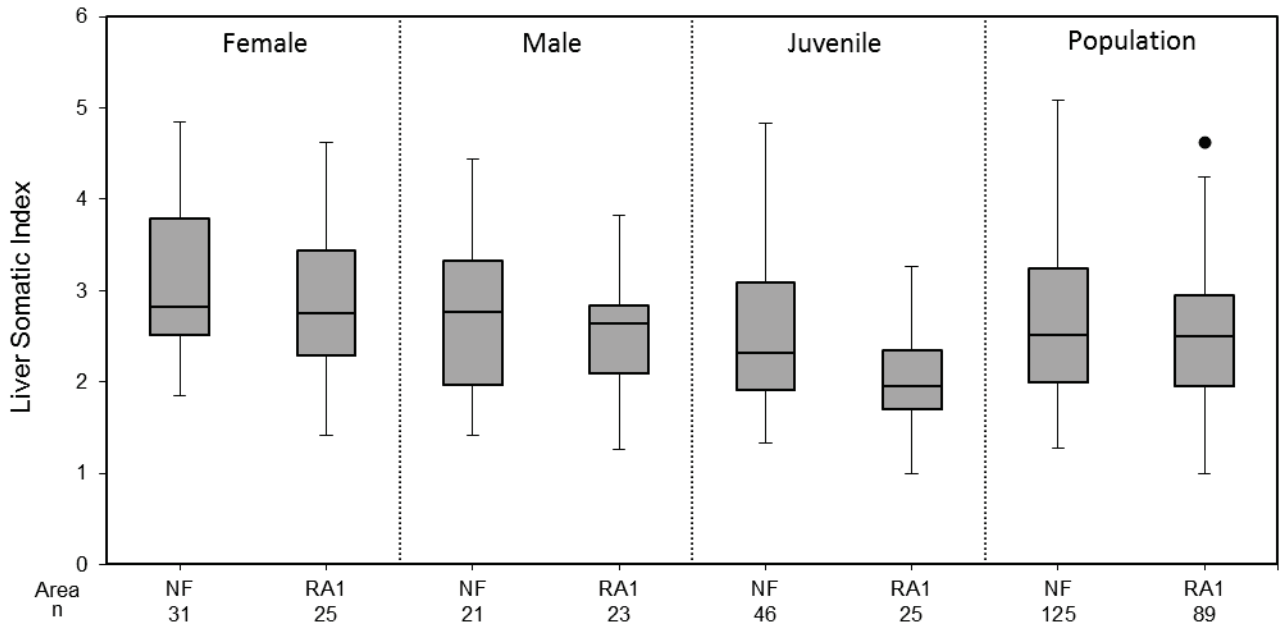
NF = Near-field; RA1 = Reference Area 1; g = gram; n = sample size.

Figure 10C-3: Parasite Weight of Threespine Stickleback Captured During the Lethal and Population Surveys at Meliadine Lake, 2018



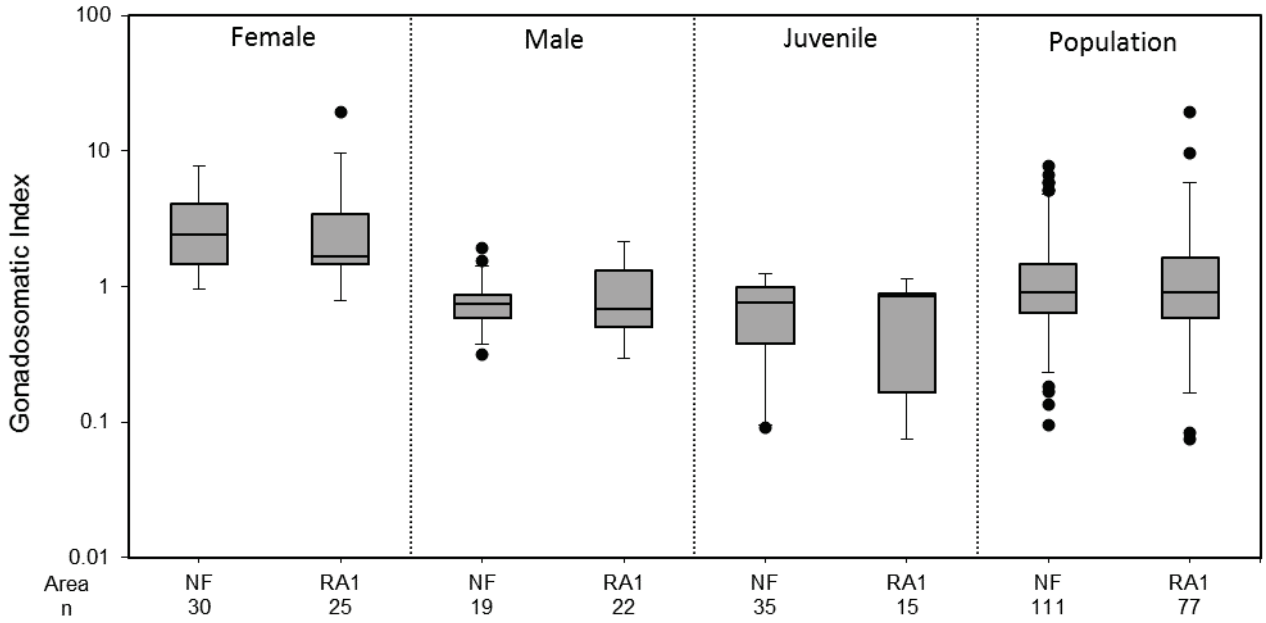
NF = Near-field; RA1 = Reference Area 1; n = sample size.

Figure 10C-4: Condition Factor of Threespine Stickleback Captured During the Lethal and Population Surveys at Meliadine Lake, 2018



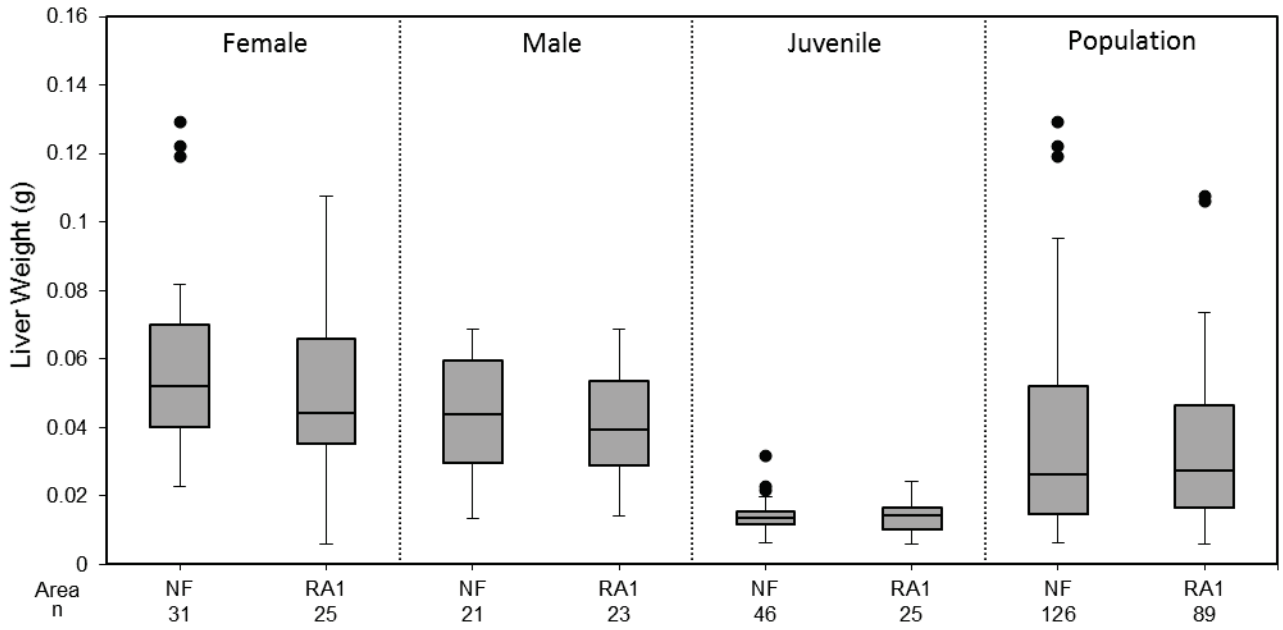
NF = Near-field; RA1 = Reference Area 1; n = sample size.

Figure 10C-5: Liver Somatic Index of Threespine Stickleback Captured During the Lethal and Population Surveys at Meliadine Lake, 2018



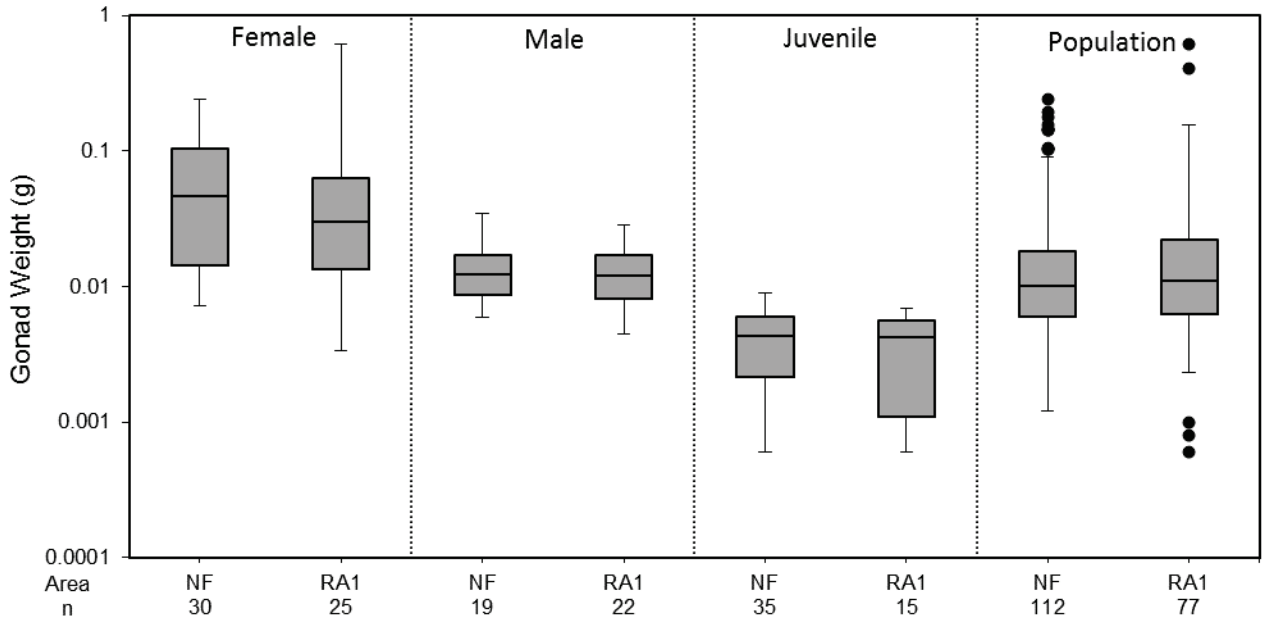
NF = Near-field; RA1 = Reference Area 1; n = sample size.

Figure 10C-6: Gonadosomatic Index (log10) of Threespine Stickleback Captured During the Lethal and Population Surveys at Meliadine Lake, 2018



NF = Near-field; RA1 = Reference Area 1; g = gram; n = sample size.

Figure 10C-7: Liver Weight of Threespine Stickleback Captured During the Lethal and Population Surveys at Meliadine Lake, 2018



NF = Near-field; RA1 = Reference Area 1; g = gram; n = sample size.

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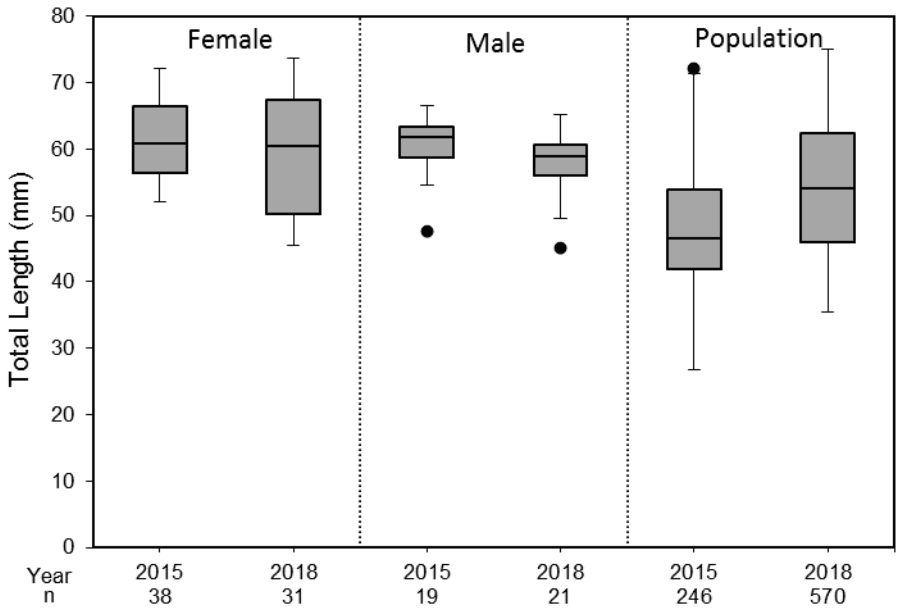
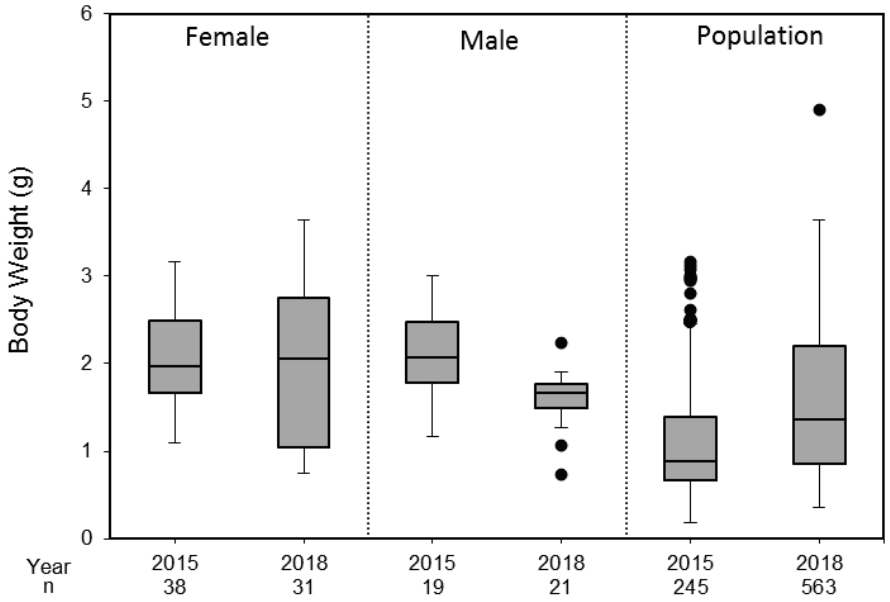


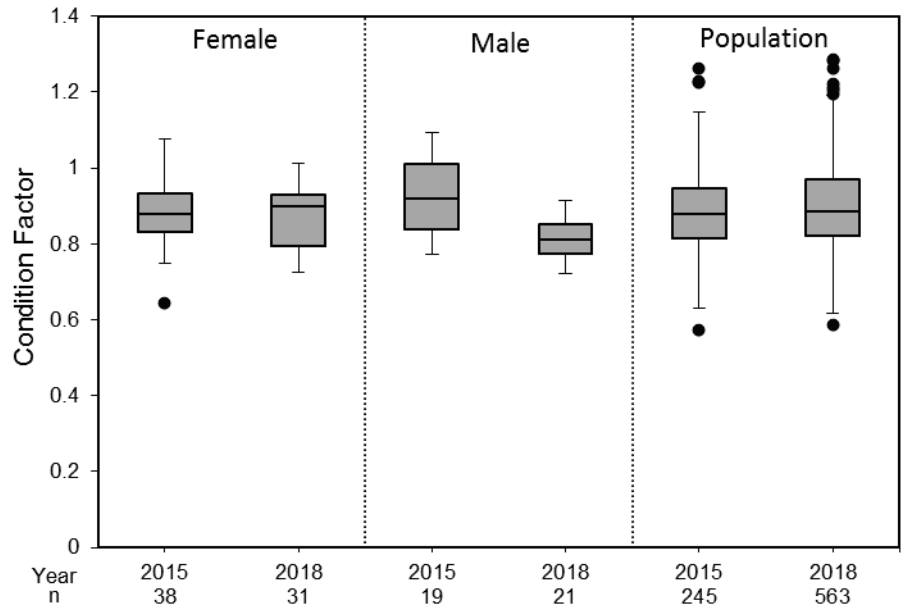
mm= millimetre; n = sample size.

Figure 10D-1: Total Length of Threespine Stickleback Captured During the Lethal and Population Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



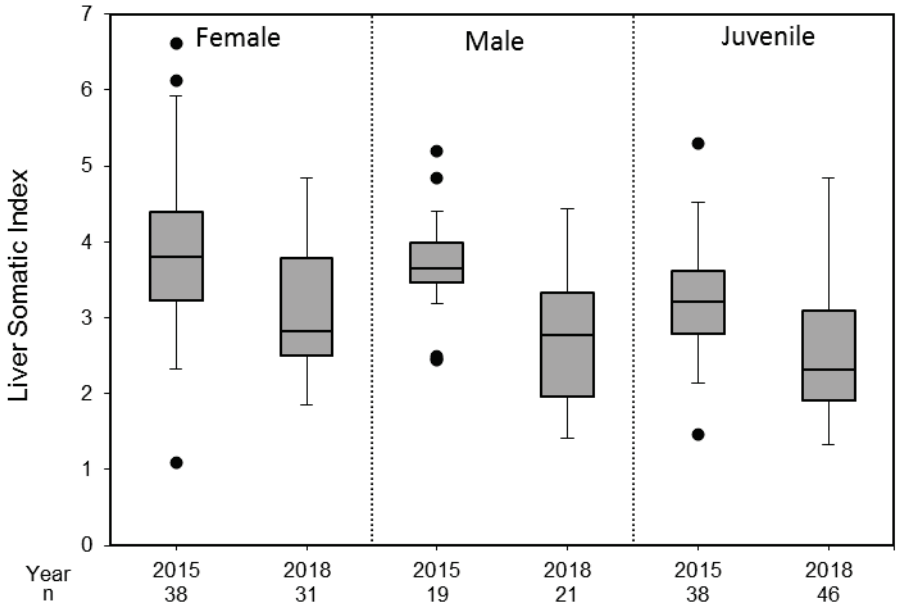
g = gram; n = sample size.

Figure 10D-2: Body Weight of Threespine Stickleback Captured During the Lethal and Population Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



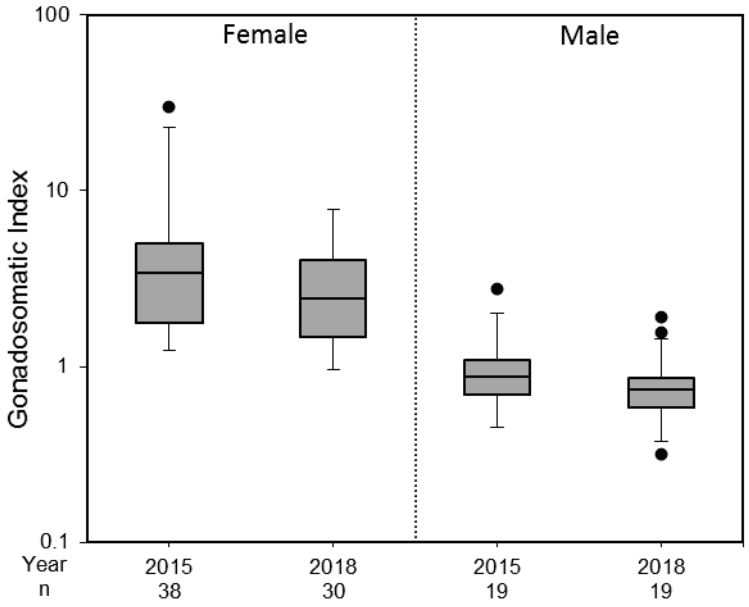
n = sample size.

Figure 10D-3: Condition Factor of Threespine Stickleback Captured During the Lethal and Population Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



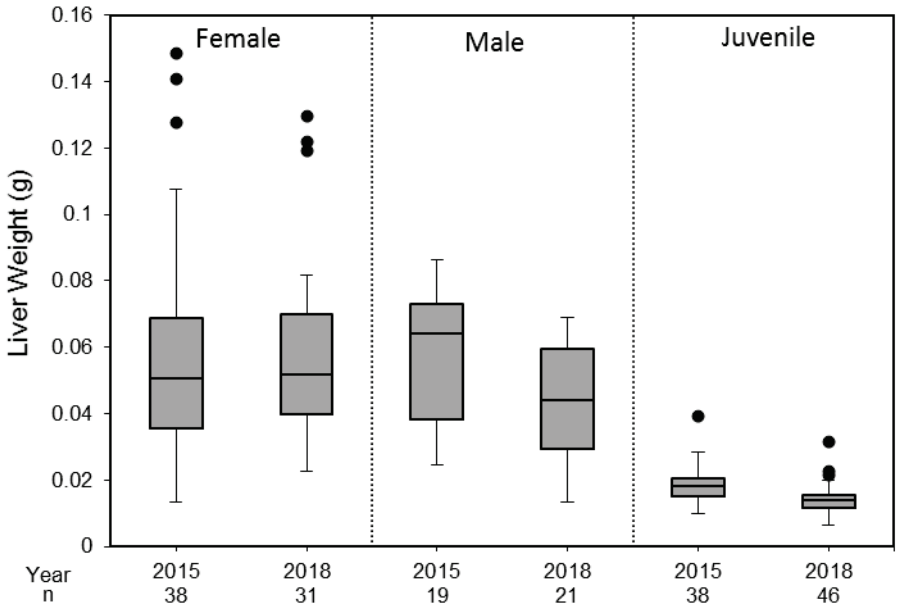
n = sample size.

Figure 10D-4: Liver Somatic Index of Threespine Stickleback Captured During the Lethal Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



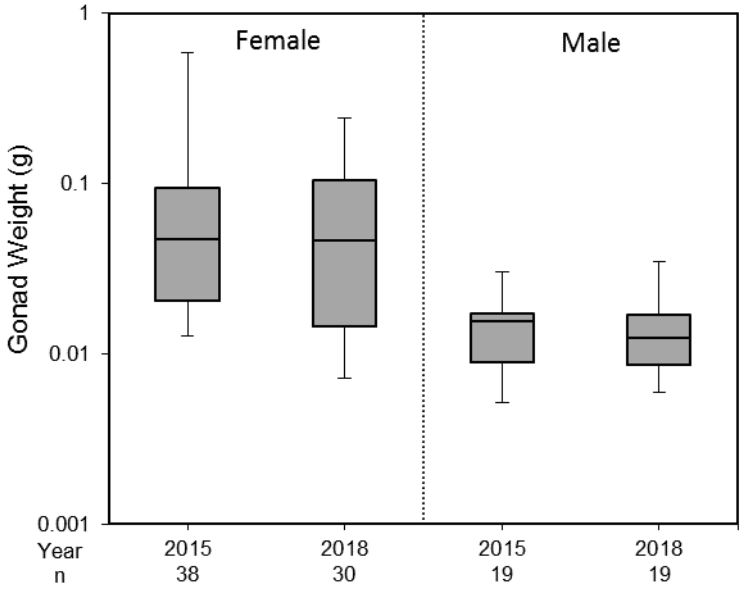
n = sample size.

Figure 10D-5: Gonadosomatic Index (log10) of Threespine Stickleback Captured During the Lethal Population Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



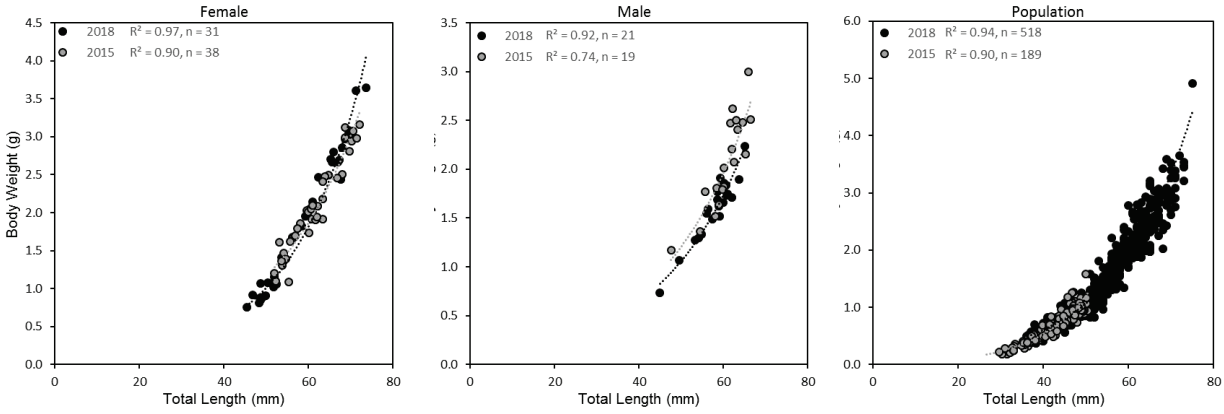
g = gram; n = sample size.

Figure 10D-6: Liver Weight of Threespine Stickleback Captured During the Lethal Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



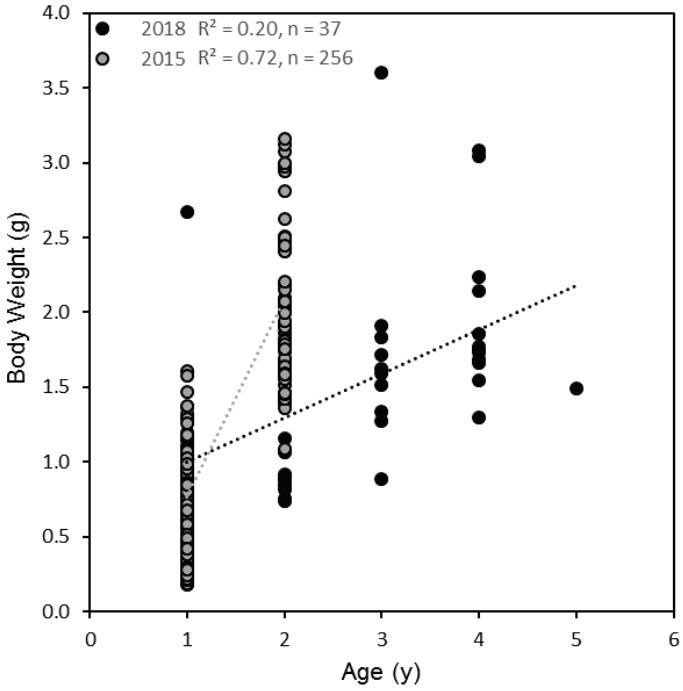
g = gram; n = sample size.

Figure 10D-7: Gonad Weight (log10) of Threespine Stickleback Captured During the Lethal Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



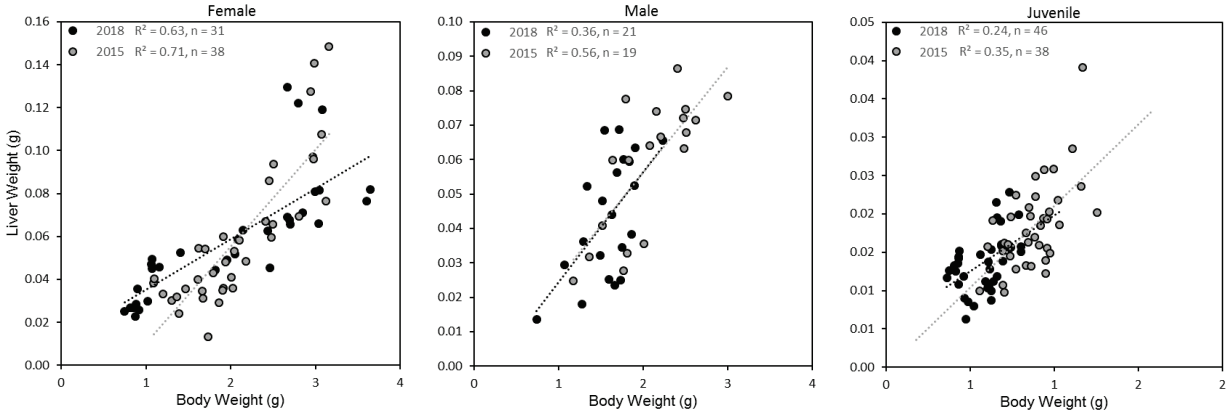
NF = Near-field Area; RA1 = Reference Area 1; g = gram; mm = millimetre; R^2 = coefficient of determination; n = sample size; rank = rank transformed data.

Figure 10D-8: Body Weight in Relation to Total Length for Threespine Stickleback Captured During the Lethal and Population Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



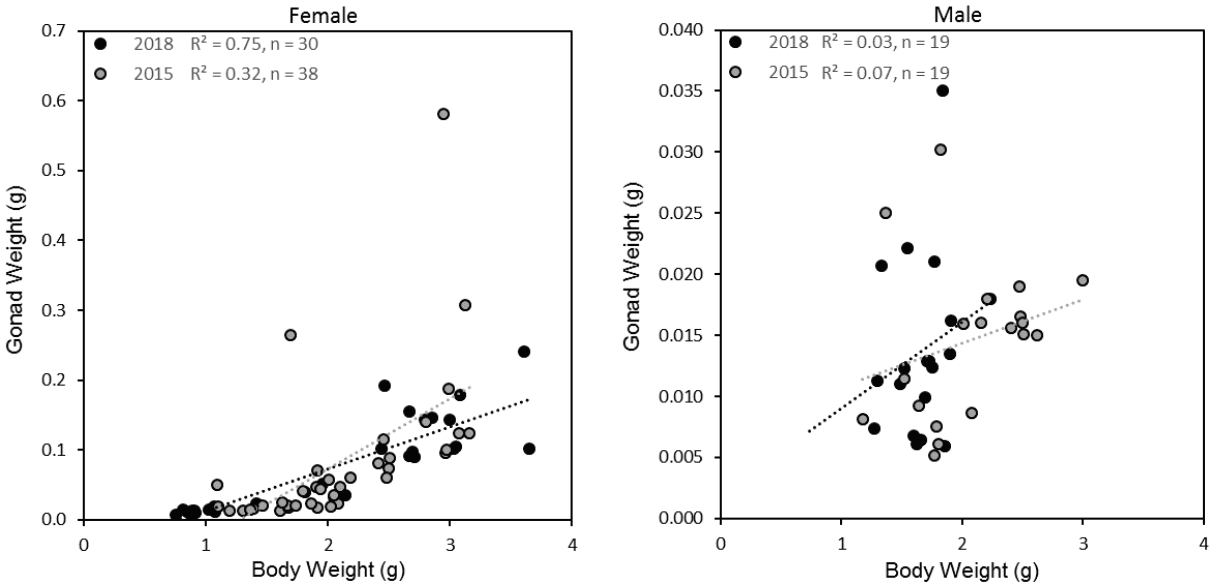
Note: Age calculations were based on otolith analysis in 2018, whereas in 2015 age was calculated using length-frequency distributions.
g = gram; y = year; R^2 = coefficient of determination; n = sample size.

Figure 10D-9: Body Weight in Relation to Age for Lethally Sampled Threespine Stickleback Captured During the Lethal and Population Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



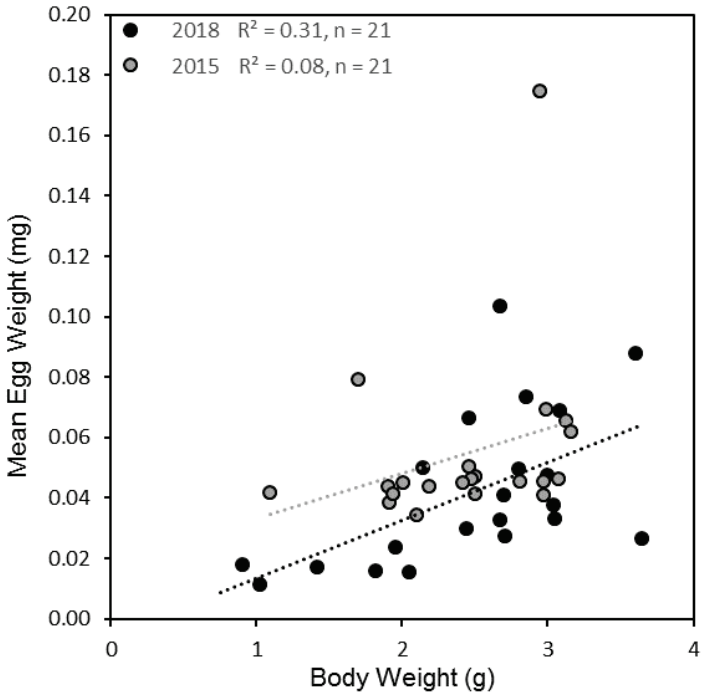
g = gram; R^2 = coefficient of determination; n = sample size.

Figure 10D-10: Liver Weight in Relation to Body Weight for Threespine Stickleback Captured During the Lethal Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



g = gram; R^2 = coefficient of determination; n = sample size.

Figure 10D-11: Relative Gonad Weight of Threespine Stickleback Captured During the Lethal Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018



g = gram; mg = milligram; R^2 = coefficient of determination; n = sample size.

Figure 10D-12: Egg Weight in Relation to Body Weight for Threespine Stickleback Captured During the Lethal Surveys at the Near-field Area of Meliadine Lake, 2015 and 2018

APPENDIX 11A

Plankton QA/QC

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11A1.0 INTRODUCTION

Quality assurance and quality control (QA/QC) procedures are applied during all aspects of a monitoring program, and are used to determine data integrity. Quality assurance (QA) procedures include training of personnel, data management, and other technical practices designed to confirm that high quality data are consistently generated. Quality control (QC) procedures include steps to measure and evaluate data quality, as well as the corrective actions that are applied when data quality objectives are not achieved.

The QA/QC procedures implemented during the 2018 plankton monitoring programs under the Aquatic Effects Monitoring Program (AEMP) for the Meliadine Gold Mine Project (Project) are described in the following sections. QA/QC procedures and results for the 2015, 2016, and 2017 plankton monitoring programs are reported by Golder (Golder 2018). An evaluation of the QC data and implications for the interpretation of the AEMP study results is also included.

11A2.0 QUALITY ASSURANCE

Similar to water quality (Appendix 6A) and sediment quality (Appendix 7A), the QA procedures implemented for the 2018 plankton monitoring program can be classified into three categories of data management. These include field operations, laboratory analyses, and office operations.

11A2.1 Field Operations

Quality assurance procedures for field operations involve field crew training, pre-field meetings, and the use of standardized methods and explicit instructions for collecting and handling field data. Field staff for the Project were trained to be proficient in standardized field sampling procedures, data recording, and equipment operation. Golder Associates Ltd. (Golder) developed specific work instructions (SWI) for the field component of Project, based on standardized technical procedures that are consistent with widely accepted field protocols described in relevant scientific literature (e.g., Environment Canada 1993). Field work was completed according to the SWI, which included the exact locations of sampling sites and detailed step by step instructions for field tasks, including:

- equipment maintenance
- sample collection, handling, preservation, labelling, storage, and shipping
- record keeping and sample tracking

The SWI also included contact information for members of the project team and the analytical laboratory, as well as references to applicable technical procedures. Field data were recorded on standardized field data sheets or in a bound field notebook. Chain of custody forms were used to track samples sent to the analytical laboratory, and receipt of the samples at the laboratory was confirmed. The crew lead was responsible for tracking samples to confirm that all required samples were collected, chain of custody and analytical request forms were complete and correct, and that labelling and documentation procedures were followed. Field crews checked in with component managers, as needed, and submitted daily reports to provide updates on completed tasks.

Pre-field meetings were held with the field crew and project/component manager prior to the start of each field program to discuss the purpose of the field program, the role of each crew member, specific details of the SWI, equipment needs, field logistics, and contingency plans.

11A2.2 Laboratory Analyses

Water samples collected in 2018 for depth integrated nutrient (DIN) and chlorophyll *a* analyses were submitted to a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory; therefore, confidence in the reliability of the analytical results received from the laboratory is considered high. To receive accreditation, a laboratory must pass an evaluation of its internal procedures, analytical methods, and QC processes.

A designated member of the project team was responsible for liaising with the analytical laboratories.

11A2.3 Office Operations

Quality assurance procedures implemented for office-based tasks included the following:

- having trained personnel complete data management, analysis, and reporting tasks
- using standardized data storage, manipulation, and summary tools, as required
- establishing a data management system to support consistency, QC, and data retrieval
- senior review of data deliverables at appropriate milestones

11A3.0 QUALITY CONTROL

QC steps implemented during the 2018 plankton monitoring program activities can be classified into the same three categories used describe QA procedures: field operations, laboratory analyses, and office operations.

11A3.1 Field Operations

Quality control procedures implemented during field operations included the collection of QC samples that were used to check the precision of field sampling methods and laboratory analyses. QC samples collected in support of the plankton monitoring programs included:

- **Duplicate DIN samples:** Duplicate samples consisted of paired, depth integrated water samples collected at the same time and location, using the same methods. Duplicate samples were collected at randomly selected stations in Meliadine Lake, and represented approximately 10% of the total number of DIN samples submitted for analysis. All QC samples were submitted “blind” to the analytical laboratory and analyzed for the same set of parameters as the other DIN samples.
- **Triplicate chlorophyll *a* samples:** Triplicate samples were collected at all stations in Meliadine Lake and were kept cool and dark until filtered and frozen prior to sample shipment.
- **Duplicate phytoplankton samples:** These samples were collected at randomly selected stations in Meliadine Lake.

11A3.2 Laboratory Analyses

To support analysis of the DIN samples, the analytical laboratory prepared in-house QC samples and analyzed them along with the field collected samples. The objective was to confirm the quality and reliability of the analytical results. QC analyses and sample types included duplicate analyses, spiked samples, and method blanks.

Plankton R Us performed an internal QC of the phytoplankton taxonomy by performing replicate counts on 10% of the samples. Replicate phytoplankton samples were chosen at random and processed at different times from the original analysis to reduce bias. The laboratory QC results were reviewed to confirm the quality of the data and to evaluate whether the laboratory identified any questionable results for specific parameters.

11A3.3 Office Operations

QC operations implemented in the office focussed on confirming and maintaining the quality of in situ measurement data and analytical results, as well as verifying the accuracy of data summaries (i.e., summary statistics and plots). Field data entered into the Project database were compared against the field data sheets and field notebook to confirm their accuracy. Unaltered data files from the laboratory were saved to the Project directory and were used as a reference to confirm the accuracy of the data entered into the Project database. Laboratory data were also screened for quality. Backup files were created before each major data analysis operation and calculations were reviewed to confirm the accuracy of the results.

11A3.4 Laboratory Data Screening

A series of standard data screening steps were completed upon receipt of water chemistry results from the analytical laboratory to identify potential issues with the DIN dataset, including:

- verification that all requested parameters and samples were analyzed
- verification that the appropriate detection limits (DLs) were used and data were reported in the appropriate units
- data logic checks (e.g., comparisons of dissolved and total nitrogen and phosphorus concentrations)
- identification of outliers
- review of duplicate sample results for unacceptable variation
- review of laboratory QC results (i.e., sample temperature and integrity of containers upon receipt, holding times, laboratory blanks and recoveries from spiked samples, internal duplicates, review of laboratory qualifiers and notes)
- review of the final dataset for completeness, and confirmation that sources of unexpected values and trends have been identified

Prompt completion of the screening steps allowed for potential re analysis of samples by the laboratory to verify questionable data or to generate data for missing parameters. If samples were re analyzed by the laboratory and the data were still considered questionable, qualifiers for consideration during data summary and analysis steps were added to the dataset, or the data were excluded from further analyses.

11A3.5 Quality Control Data Evaluation

11A3.5.1 Depth-integrated Nutrients

Differences between concentrations measured in duplicate DIN samples were evaluated based on the relative percent difference (RPD), where:

$$RPD = \frac{|C1 - C2|}{\frac{(C1 + C2)}{2}} * 100$$

where C1 is the concentrations in the sample and C2 is the concentration in the second or duplicate sample.

The RPD was only calculated if both of the paired concentrations in the duplicate samples were greater than five times the DL. The RPD for a given parameter was flagged if it was greater than 20%.

11A3.5.2 Chlorophyll *a*

Chlorophyll *a* data were checked thoroughly for errors or omissions. RPDs were not calculated for chlorophyll *a,* as samples were collected in triplicate at all sampling stations as part of the study design. Anomalous results were clarified with the analytical laboratory and data believed to be recorded in error was flagged and omitted from statistical analyses.

11A3.5.3 Phytoplankton

The inherent variability associated with phytoplankton samples prevents the establishment of a QC threshold value. For the purposes of the plankton QC, the proportion of each major group was calculated and the occurrence of dominant species used to assess consistency between the field samples and duplicate samples analyzed. In addition, the RPD was used to assess the overall similarity between the field and duplicate samples. Due to high variability in species occurrence, the comparisons were made at the major group level for both abundance and biomass, rather than the species level. Differences in total abundance and biomass were also evaluated. RPDs greater than 50% were flagged and follow-up assessments of the data were performed. Plots of the relative abundance results for the field and duplicate samples were made so that duplicate results could be evaluated on a case by case basis.

11A3.6 Quality Control Results

A summary of the quality control samples collected during the plankton monitoring program is provided in Table 11A-1. Detailed QC results for DIN and phytoplankton are presented in Section 11A4.0 (Table 11A-2 to Table 11A-6). The results from each type of sample are provided in the sections below.

Table 11A-1: Summary of Quality Control Samples Collected in 2018

Type of Sample	Summer 2018
Duplicates – Depth Integrated Nutrients	MEL-01-09 MEL-03-01
Duplicates – Phytoplankton	MEL-02-02 MEL-04-05 MEL-05-01

11A3.6.1 Depth Integrated Nutrients

To maintain sample integrity, DIN samples for laboratory analyses were submitted as soon as possible after collection. However, holding time exceedances are a common issue for water samples collected from remote areas because transport of samples to the laboratory is subject to the availability of scheduled charter flights. Holding times may also be exceeded if the laboratory is unable to initiate testing promptly following sample receipt. Analytical holding times were met for most parameters, with the exception of nitrate, nitrite, and orthophosphate.

Two duplicate DIN samples were collected in support of the 2018 plankton program (Table 11A-1). RPDs could not be calculated for the majority of DIN parameters due to concentrations being less than five times the detection limit (Table 11A-2). RPDs exceeded 20% for total Kjeldahl nitrogen, total nitrogen and total phosphorus in the duplicate samples collected at MEL-01-09. RPDs were all below 20% in the duplicate samples collected at MEL-03-01.

A single equipment blank sample was also collected and submitted for analysis of all DIN parameters. Concentrations of all DIN parameters were below detection limits in the equipment blank sample.

Dissolved concentrations measured in the DIN samples, including duplicates, were compared to their corresponding total concentrations. The majority of dissolved parameter concentrations in the dataset met quality criteria (i.e., for paired total and dissolved concentrations that were more than five times the DL, the dissolved concentration was no more than 20% higher than the total concentration). Concentrations of dissolved Kjeldahl nitrogen were more than 20% higher than concentrations of total Kjeldahl nitrogen in 8 of the 26 DIN samples collected; however, statistical analysis of total Kjeldahl nitrogen was not undertaken in the plankton targeted study. Therefore, these results would not have impacted the analysis of nutrient variability in Meliadine Lake.

11A3.6.2 Chlorophyll *a*

No errors or omissions were found in chlorophyll *a* data reported in 2018.

11A3.6.3 Phytoplankton

A total of three duplicate phytoplankton samples were collected from Meliadine Lake in 2018 (Table 11A-3 and Table 11A-4). For phytoplankton, RPD values were below 50% when calculated on total biomass (Table 11A-3). However, at the major group level, all three duplicate samples for phytoplankton biomass had RPDs greater than 50% for one or more taxonomic group. Affected groups included cyanobacteria, cryptophytes and dinoflagellates. Similarly, for phytoplankton abundance, based on total abundance, RPDs were less than 50%, but at the major group level, 2 out of 3 duplicates had RPDs greater than 50% for one or more taxonomic group (Table 11A-4). Affected groups included chlorophytes, cryptophytes, and dinoflagellates. In general, where high RPDs were observed, the biomass or abundance of the taxa tended to be low in both samples in comparison with the total biomass or abundance of the sample. A visual examination of relative abundance and relative biomass plots for paired duplicate samples indicates that the general composition of the samples appears to be similar between duplicates (Figure 11A-1 and Figure 11A-2). In addition, the dominant taxon (i.e., the taxon contributing the most biomass or abundance to the sample) was consistent between duplicates.

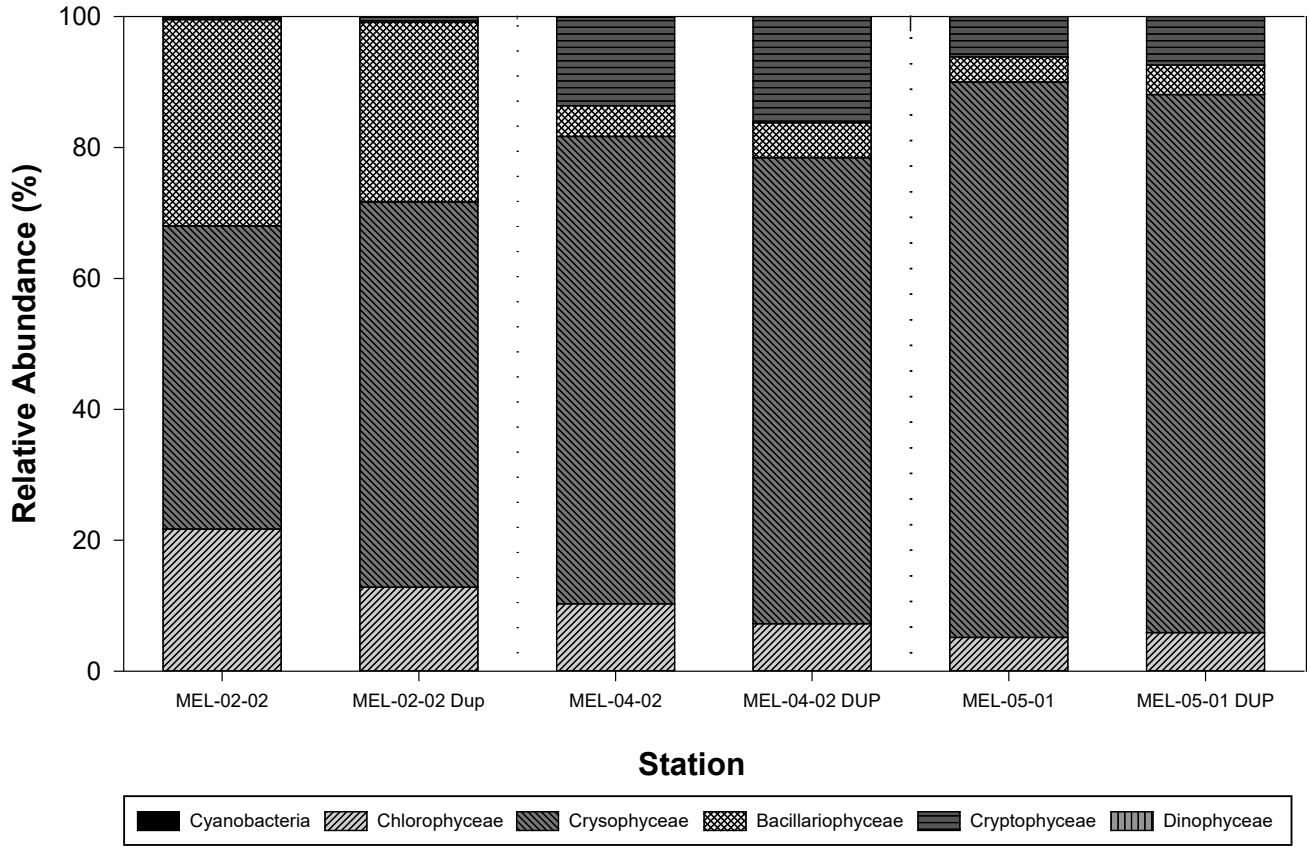

Figure 11A-1: Relative Abundance of Major Phytoplankton Taxonomic Groups in Duplicate Samples, Meliadine Lake, 2018

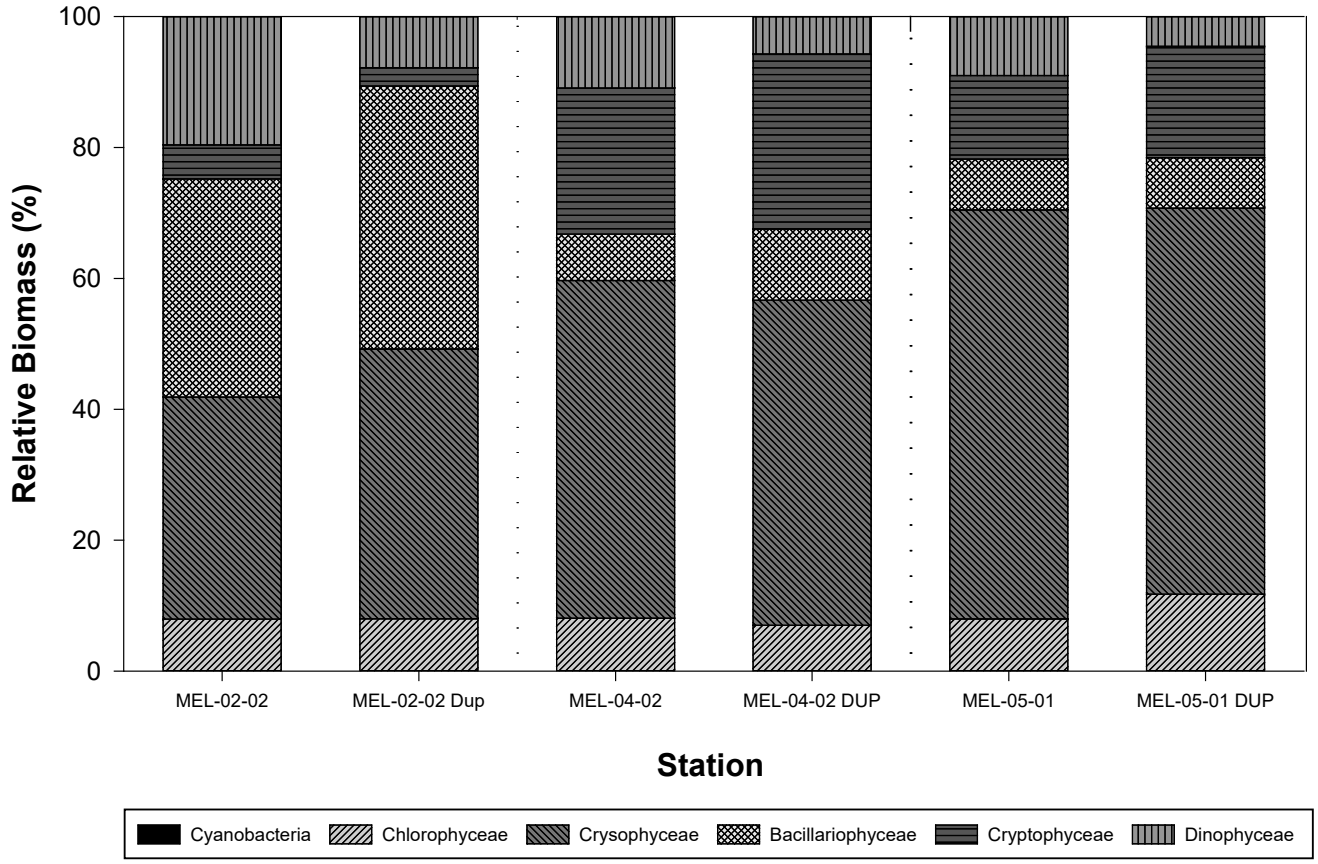

Figure 11A-2: Relative Biomass of Major Phytoplankton Taxonomic Groups in Duplicate Samples, Meliadine Lake, 2018

11A3.7 Data Quality Summary

Key QC findings for the 2018 plankton monitoring programs are as follows:

- A total of 12% of paired concentrations in duplicate DIN samples had a RPD greater than 20%. Each of the three RPD exceedances came from duplicate samples collected at MEL-01-09 in August 2018, where RPDs for concentrations of total Kjeldahl nitrogen, total nitrogen and total phosphorus exceeded 20%. All RPDs for the other set of DIN duplicate samples collected at MEL-02-01 in 2018 were below 20%.
- Concentrations of dissolved parameters were generally lower than corresponding total concentrations for the DIN samples. Dissolved concentrations were higher than total concentrations for 4.4% of comparisons.
- RPDs for total phosphorus concentrations in 2018 were below 20% in all samples.
- The dominant taxon was consistent between duplicate samples for phytoplankton biomass and abundance.
- RPDs for total phytoplankton biomass and abundance were below 50% for all duplicates.
- RPDs above 50% were observed in the majority of duplicates for major phytoplankton taxonomic groups; however, graphical presentation of the relative abundance of major phytoplankton groups showed that variation between duplicates was actually low, and that the proportions of major groups were similar between duplicates.

Differences between original and QC samples were deemed minor, and within the range of variability expected in plankton data. Based on this assessment, the plankton monitoring data are considered adequate to meet the needs of the AEMP for the Mine.

11A4.0 DETAILED RESULTS TABLES

Table 11A-2: Depth integrated Nutrient Water Quality Duplicate Results, 2018

Station	Units	DL	RPD Alert Limit	MEL-03-01		RPD (%)[a]	MEL-01-09		RPD (%)[a]
Sample Name				Sample	Duplicate		Sample	Duplicate	
Sample Collection Date				20-Aug-18			22-Aug-18		
Parameter									
Reactive silica, as SiO_2	mg/L	0.010	>20%	0.356	0.356	0	0.231	0.229	1
Dissolved Kjeldahl nitrogen	mg/L	0.050	>20%	0.206	0.158	nc	0.181	0.185	nc
Dissolved nitrogen	mg/L	0.050	>20%	0.206	0.158	nc	0.181	0.185	nc
Dissolved phosphorus	mg/L	0.0010	>20%	0.0024	0.0019	nc	0.0021	0.0018	nc
Nitrate	mg/L	0.0050	>20%	<0.0050	<0.0050	nc	<0.0050	<0.0050	nc
Nitrite	mg/L	0.0010	>20%	<0.0010	<0.0010	nc	<0.0010	<0.0010	nc
Orthophosphate	mg/L	0.0010	>20%	0.0012	<0.0010	nc	<0.0010	<0.0010	nc
Total ammonia	mg/L	0.0050	>20%	<0.0050	<0.0050	nc	<0.0050	<0.0050	nc
Total Kjeldahl nitrogen	mg/L	0.050	>20%	0.234	0.336	**36**	0.103	0.203	nc
Total nitrogen	mg/L	0.050	>20%	0.234	0.336	**36**	0.103	0.203	nc
Total phosphorus	mg/L	0.0010	>20%	0.0052	0.003	**54**	0.0038	0.0022	nc

Note: RPDs greater than 20% are shown in **bold**; duplicate concentrations failed the QC check.
a) The RPD was only calculated if both of the paired concentrations were above five times the DL.
DL = detection limit; RPD = relative percent difference; % = percent; SiO_2 = silicon dioxide;
mg/L = milligrams per litre; >= greater than; nc = not calculated; <= less than.

Table 11A-3: Quality Control Comparison of Phytoplankton Biomass Results in Duplicate Samples from Meliadine Lake, 2018

Station	Units	RPD Alert Limit	MEL-02-02		RPD (%)	MEL-04-05		RPD (%)	MEL-05-01		RPD (%)
Sample Name			Sample	Sample		Sample	Sample		Sample	Sample	
Sampling Season			Summer			Summer			Summer		
Sample Collection Date			31-Aug-18			2-Sep-18			1-Sep-18		
Biomass by Taxonomic Group											
Cyanophytes	mg/m^3	>50%	0.00	0.00	nc	0.00	0.00	nc	0.00	0.00	nc
Chlorophytes	mg/m^3	>50%	8.35	7.69	8	20.70	15.14	31	16.69	23.97	36
Chrysophytes	mg/m^3	>50%	35.77	39.69	10	132.29	107.64	21	130.86	120.49	8
Diatoms	mg/m^3	>50%	35.09	38.65	10	18.20	23.51	25	16.26	15.76	3
Cryptophytes	mg/m^3	>50%	5.47	2.70	**68**	57.23	57.94	1	26.68	34.72	26
Dinoflagellates	mg/m^3	>50%	20.64	7.50	**93**	27.95	12.37	**77**	18.85	9.27	**68**
Total	mg/m^3	>50%	105.32	96.23	9	256.37	216.59	17	209.34	204.21	2

Note: RPDs greater than 50% are shown in **bold**; duplicate concentrations failed the QC check.
The dominant taxon (i.e., the taxon contributing the most biomass to the sample) is highlighted in grey for each sample and duplicate.
RPD = relative percent difference; % = percent; mg/m^3 = milligrams per cubic metre; >= greater than; nc = not calculated if one sample had a biomass of zero; QC = quality control.

Table 11A-4: Quality Control Comparison of Phytoplankton Abundance Results in Duplicate Samples from Meliadine Lake, 2018

Station	Units	RPD Alert Limit	MEL-02-02		RPD (%)	MEL-04-05		RPD (%)	MEL-05-01		RPD (%)
Sample Name			Sample	Sample		Sample	Sample		Sample	Sample	
Sampling Season			Summer			Summer			Summer		
Sample Collection Date			31-Aug-18			2-Sep-18			1-Sep-18		
Biomass by Taxonomic Group											
Cyanophytes	cells/L	>50%	-	-	nc	-	-	nc	-	-	nc
Chlorophytes	cells/L	>50%	252,240	137,696	59	296,144	174,816	52	145,280	167,632	14
Chrysophytes	cells/L	>50%	538,800	632,392	16	2,054,824	1,717,176	18	2,400,056	2,349,168	2
Diatoms	cells/L	>50%	366,032	295,008	21	135,312	128,528	5	108,376	129,128	17
Cryptophytes	cells/L	>50%	3,200	8,184	88	390,336	390,536	0	174,016	211,736	20
Dinoflagellates	cells/L	>50%	2,600	1,400	60	2,600	1,400	60	1,200	800	40
Total	**cells/L**	**>50%**	**1,162,872**	**1,074,680**	**8**	**2,879,216**	**2,412,456**	**18**	**2,828,928**	**2,858,464**	**1**

Note: RPDs greater than 50% are shown in **bold**; duplicate concentrations failed the QC check.
The dominant or most abundant taxon is highlighted in grey for each sample and duplicate.
RPD = relative percent difference; % = percent; cells/L = cells per litre; >= greater than; nc = not calculated if one sample had an abundance of zero; QC = quality control.

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APPENDIX 11B

Depth Integrated Nutrients and Chlorophyll *a*

Table 11B-1: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2015

Parameter	Unit	MEL-01						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.23	0.29	0.31	0.38	0.067	0.030
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.024	0.088	0.037	0.016
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.024	0.088	0.037	0.016
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0039	0.0093	0.0030	0.001
Total Kjeldahl nitrogen	mg-N/L	5	<0.05	0.078	0.078	0.13	0.053	0.024
Dissolved Kjeldahl nitrogen	mg-N/L	5	<0.05	<0.05	0.057	0.11	0.044	0.019
Total nitrogen (calculated)	mg-N/L	5	0.048	0.13	0.10	0.17	0.060	0.027
Total nitrogen	mg-N/L	5	<0.05	0.13	0.096	0.17	0.066	0.030
Dissolved nitrogen	mg-N/L	5	<0.05	0.088	0.074	0.13	0.047	0.021
Total phosphorus	mg-P/L	5	0.0039	0.0041	0.0051	0.0091	0.0023	0.001
Dissolved phosphorus	mg-P/L	5	<0.001	0.0014	0.0014	0.0021	0.00058	0.000
Orthophosphate	mg-P/L	5	<0.001	0.0012	0.0010	0.0014	0.00046	0.000
Parameter	**Unit**	**MEL-02**						
		Count	**Minimum**	**Median**	**Mean**	**Maximum**	**Standard Deviation**	**Standard Error**
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.22	0.27	0.27	0.30	0.030	0.013
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0058	0.019	0.0074	0.003
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0058	0.019	0.0074	0.003
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	<0.05	<0.05	0.073	0.19	0.073	0.033
Dissolved Kjeldahl nitrogen	mg-N/L	5	<0.05	<0.05	0.051	0.11	0.039	0.017
Total nitrogen (calculated)	mg-N/L	5	<0.05	<0.05	0.076	0.19	0.075	0.034
Total nitrogen	mg-N/L	5	<0.05	<0.05	0.076	0.19	0.075	0.034
Dissolved nitrogen	mg-N/L	5	<0.05	<0.05	0.051	0.11	0.039	0.017
Total phosphorus	mg-P/L	5	0.0014	0.0045	0.0039	0.0056	0.0017	0.001
Dissolved phosphorus	mg-P/L	5	<0.001	0.0011	0.0019	0.0050	0.0019	0.001
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00064	0.0012	0.00031	0.000

Notes: < = parameter below detection limit; mg/L=milligrams per litre;

Values below detection limits were converted to half-detects for the calculation of summary statistics.

Table 11B-2: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2016

Parameter	Unit	MEL-01						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.38	0.39	0.39	0.40	0.0045	0.002
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0034	0.0072	0.0021	0.001
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0035	0.0072	0.0021	0.001
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.050	0.058	0.079	0.14	0.037	0.016
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.11	0.14	0.13	0.15	0.016	0.007
Total nitrogen (calculated)	mg-N/L	5	0.050	0.064	0.081	0.14	0.036	0.016
Total nitrogen	mg-N/L	5	0.050	0.064	0.081	0.14	0.036	0.016
Dissolved nitrogen	mg-N/L	5	0.11	0.14	0.13	0.16	0.019	0.008
Total phosphorus	mg-P/L	5	0.0050	0.0055	0.0059	0.0071	0.00092	0.000
Dissolved phosphorus	mg-P/L	5	0.0019	0.0021	0.0021	0.0023	0.00016	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00072	0.0011	0.00030	0.000
Parameter	**Unit**	**MEL-02**						
		Count	**Minimum**	**Median**	**Mean**	**Maximum**	**Standard Deviation**	**Standard Error**
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.25	0.26	0.26	0.27	0.0075	0.003
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0055	0.018	0.0068	0.003
Total Kjeldahl nitrogen	mg-N/L	5	0.092	0.11	0.11	0.13	0.018	0.008
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.14	0.17	0.17	0.20	0.023	0.010
Total nitrogen (calculated)	mg-N/L	5	0.092	0.11	0.11	0.13	0.018	0.008
Total nitrogen	mg-N/L	5	0.092	0.11	0.11	0.13	0.018	0.008
Dissolved nitrogen	mg-N/L	5	0.14	0.17	0.17	0.20	0.023	0.010
Total phosphorus	mg-P/L	5	0.0040	0.0067	0.0072	0.013	0.0033	0.001
Dissolved phosphorus	mg-P/L	5	0.0015	0.0016	0.0018	0.0024	0.00037	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00090	0.0015	0.00055	0.000

Table 11B-2: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2016

Parameter	Unit	MEL-03						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.18	0.19	0.19	0.19	0.0049	0.002
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0040	0.010	0.0034	0.002
Total Kjeldahl nitrogen	mg-N/L	5	0.055	0.098	0.12	0.22	0.065	0.029
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.14	0.14	0.16	0.19	0.022	0.010
Total nitrogen (calculated)	mg-N/L	5	0.055	0.098	0.12	0.22	0.065	0.029
Total nitrogen	mg-N/L	5	0.055	0.098	0.12	0.22	0.065	0.029
Dissolved nitrogen	mg-N/L	5	0.14	0.14	0.16	0.19	0.022	0.010
Total phosphorus	mg-P/L	5	0.0034	0.0046	0.0044	0.0051	0.00063	0.000
Dissolved phosphorus	mg-P/L	5	0.0013	0.0016	0.0017	0.0024	0.00042	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000

Parameter	Unit	MEL-04						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.19	0.19	0.20	0.23	0.020	0.009
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.068	0.11	0.10	0.15	0.030	0.014
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.078	0.11	0.11	0.19	0.045	0.020
Total nitrogen (calculated)	mg-N/L	5	0.068	0.11	0.10	0.15	0.030	0.014
Total nitrogen	mg-N/L	5	0.068	0.11	0.10	0.15	0.030	0.014
Dissolved nitrogen	mg-N/L	5	0.078	0.11	0.11	0.19	0.045	0.020
Total phosphorus	mg-P/L	5	0.0041	0.0043	0.0046	0.0058	0.00068	0.000
Dissolved phosphorus	mg-P/L	5	0.0019	0.0024	0.0025	0.0032	0.00051	0.000
Orthophosphate	mg-P/L	5	<0.001	0.0014	0.0015	0.0028	0.0011	0.000

Table 11B-2: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2016

Parameter	Unit	MEL-05						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.20	0.20	0.20	0.21	0.0050	0.002
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.061	0.086	0.10	0.16	0.042	0.019
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.076	0.10	0.099	0.11	0.013	0.006
Total nitrogen (calculated)	mg-N/L	5	0.061	0.086	0.10	0.16	0.042	0.019
Total nitrogen	mg-N/L	5	0.061	0.086	0.10	0.16	0.042	0.019
Dissolved nitrogen	mg-N/L	5	0.076	0.10	0.099	0.11	0.013	0.006
Total phosphorus	mg-P/L	5	0.0035	0.0044	0.0045	0.0058	0.00087	0.000
Dissolved phosphorus	mg-P/L	5	0.0023	0.0029	0.0031	0.0048	0.00099	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00080	0.0014	0.00042	0.000

Notes: < = parameter below detection limit; mg/L=milligrams per litre;

Values below detection limits were converted to half-detects for the calculation of summary statistics.

Table 11B-3: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2017

Parameter	Unit	MEL-01						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.54	0.55	0.55	0.57	0.012	0.005
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00064	0.0012	0.00031	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.18	0.21	0.22	0.26	0.028	0.013
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.16	0.19	0.19	0.20	0.016	0.007
Total nitrogen (calculated)	mg-N/L	5	0.18	0.21	0.22	0.26	0.028	0.013
Total nitrogen	mg-N/L	5	0.18	0.21	0.22	0.26	0.028	0.013
Dissolved nitrogen	mg-N/L	5	0.16	0.19	0.19	0.20	0.016	0.007
Total phosphorus	mg-P/L	5	0.0052	0.0058	0.0060	0.0068	0.00072	0.000
Dissolved phosphorus	mg-P/L	5	0.0020	0.0028	0.0027	0.0035	0.00058	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00072	0.0016	0.00049	0.000
Parameter	**Unit**	**MEL-02**						
		Count	**Minimum**	**Median**	**Mean**	**Maximum**	**Standard Deviation**	**Standard Error**
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.34	0.35	0.35	0.35	0.0041	0.002
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.13	0.15	0.16	0.19	0.022	0.010
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.14	0.16	0.16	0.17	0.011	0.005
Total nitrogen (calculated)	mg-N/L	5	0.13	0.15	0.16	0.19	0.022	0.010
Total nitrogen	mg-N/L	5	0.13	0.15	0.16	0.19	0.022	0.010
Dissolved nitrogen	mg-N/L	5	0.14	0.16	0.16	0.17	0.011	0.005
Total phosphorus	mg-P/L	5	0.0035	0.0040	0.0044	0.0055	0.00088	0.000
Dissolved phosphorus	mg-P/L	5	0.0017	0.0023	0.0024	0.0035	0.00070	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000

Table 11B-3: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2017

Parameter	Unit	MEL-03						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.24	0.25	0.25	0.25	0.0025	0.001
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.11	0.13	0.12	0.13	0.0093	0.004
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.10	0.14	0.13	0.14	0.018	0.008
Total nitrogen (calculated)	mg-N/L	5	0.11	0.13	0.12	0.13	0.0093	0.004
Total nitrogen	mg-N/L	5	0.11	0.13	0.12	0.13	0.0093	0.004
Dissolved nitrogen	mg-N/L	5	0.10	0.14	0.13	0.14	0.018	0.008
Total phosphorus	mg-P/L	5	0.0030	0.0037	0.0038	0.0053	0.00090	0.000
Dissolved phosphorus	mg-P/L	5	0.0012	0.0017	0.0020	0.0028	0.00067	0.000
Orthophosphate	mg-P/L	5	<0.001	0.0010	0.00086	0.0012	0.00034	0.000
Parameter	**Unit**	**MEL-04**						
		Count	**Minimum**	**Median**	**Mean**	**Maximum**	**Standard Deviation**	**Standard Error**
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.25	0.26	0.26	0.26	0.0042	0.002
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.12	0.15	0.14	0.17	0.023	0.010
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.13	0.14	0.14	0.17	0.015	0.007
Total nitrogen (calculated)	mg-N/L	5	0.12	0.15	0.14	0.17	0.023	0.010
Total nitrogen	mg-N/L	5	0.12	0.15	0.14	0.17	0.023	0.010
Dissolved nitrogen	mg-N/L	5	0.13	0.14	0.14	0.17	0.015	0.007
Total phosphorus	mg-P/L	5	0.0037	0.0057	0.0071	0.015	0.0042	0.002
Dissolved phosphorus	mg-P/L	5	0.0016	0.0017	0.0018	0.0024	0.00034	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000

Table 11B-3: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2017

Parameter	Unit	MEL-05						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.26	0.27	0.27	0.27	0.0058	0.003
Nutrients								
Nitrate	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Nitrite	mg-N/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000
Nitrate + nitrite	mg-N/L	5	<0.0051	<0.0051	0.0026	<0.0051	0	0.000
Total ammonia	mg-N/L	5	<0.005	<0.005	0.0025	<0.005	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.15	0.16	0.16	0.18	0.013	0.006
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.15	0.16	0.16	0.19	0.017	0.008
Total nitrogen (calculated)	mg-N/L	5	0.15	0.16	0.16	0.18	0.013	0.006
Total nitrogen	mg-N/L	5	0.15	0.16	0.16	0.18	0.013	0.006
Dissolved nitrogen	mg-N/L	5	0.15	0.16	0.16	0.19	0.017	0.008
Total phosphorus	mg-P/L	5	0.0032	0.0037	0.0036	0.0040	0.00032	0.000
Dissolved phosphorus	mg-P/L	5	0.0014	0.0022	0.0024	0.0040	0.00097	0.000
Orthophosphate	mg-P/L	5	<0.001	<0.001	0.00050	<0.001	0	0.000

Notes: < = parameter below detection limit; mg/L=milligrams per litre;

Values below detection limits were converted to half-detects for the calculation of summary statistics.

Table 11B-4: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2018

Parameter	Unit	MEL-01						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.35	0.36	0.36	0.37	0.006	0.003
Nutrients								
Nitrate	mg-N/L	5	0.012	0.012	0.012	0.012	0	0.000
Nitrite	mg-N/L	5	0.0011	0.0011	0.0011	0.0011	0	0.000
Nitrate + nitrite	mg-N/L	5	0.0131	0.0131	0.0131	0.0131	0	0.000
Total ammonia	mg-N/L	5	< 0.0050	< 0.0050	0.0025	< 0.0050	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.20	0.25	0.24	0.27	0.029	0.013
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.18	0.22	0.23	0.28	0.037	0.016
Total nitrogen	mg-N/L	5	0.20	0.25	0.25	0.28	0.032	0.014
Dissolved nitrogen	mg-N/L	5	0.19	0.22	0.23	0.28	0.033	0.015
Total phosphorus	mg-P/L	5	0.0042	0.0050	0.0049	0.0052	0.00041	0.000
Dissolved phosphorus	mg-P/L	5	0.0020	0.0024	0.0029	0.0049	0.00115	0.001
Orthophosphate	mg-P/L	5	0.001	0.001	0.00115	0.0012	0.00007	0.000
Parameter	**Unit**	**MEL-02**						
		Count	**Minimum**	**Median**	**Mean**	**Maximum**	**Standard Deviation**	**Standard Error**
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.28	0.32	0.31	0.33	0.0225	0.010
Nutrients								
Nitrate	mg-N/L	5	< 0.0050	< 0.0050	0.0025	< 0.0050	0	0.000
Nitrite	mg-N/L	5	< 0.0010	< 0.0010	0.00050	< 0.0010	0	0.000
Nitrate + nitrite	mg-N/L	5	< 0.0051	< 0.0051	0.0025	< 0.0051	0	0.000
Total ammonia	mg-N/L	5	0.0065	0.0077	0.0077	0.0089	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.12	0.15	0.17	0.23	0.047	0.021
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.15	0.22	0.21	0.28	0.052	0.023
Total nitrogen	mg-N/L	5	0.12	0.15	0.17	0.23	0.047	0.021
Dissolved nitrogen	mg-N/L	5	0.15	0.22	0.21	0.28	0.052	0.023
Total phosphorus	mg-P/L	5	0.0047	0.0052	0.0073	0.0113	0.00332	0.001
Dissolved phosphorus	mg-P/L	5	0.0016	0.0023	0.0039	0.0108	0.00388	0.002
Orthophosphate	mg-P/L	5	0.001	0.002	0.00150	0.002	0	0.000

Table 11B-4: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2018

Parameter	Unit	MEL-03						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.23	0.23	0.23	0.23	0.0019	0.001
Nutrients								
Nitrate	mg-N/L	5	0.014	0.014	0.014	0.014	0	0.000
Nitrite	mg-N/L	5	< 0.0010	< 0.0010	0.00050	< 0.0010	0	0.000
Nitrate + nitrite	mg-N/L	5	0.014	0.014	0.014	0.014	0	0.000
Total ammonia	mg-N/L	5	< 0.0050	< 0.0050	0.0025	< 0.0050	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.10	0.16	0.15	0.18	0.0306	0.014
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.10	0.15	0.15	0.19	0.039	0.018
Total nitrogen	mg-N/L	5	0.10	0.17	0.15	0.18	0.0316	0.014
Dissolved nitrogen	mg-N/L	5	0.10	0.15	0.15	0.19	0.038	0.017
Total phosphorus	mg-P/L	5	0.0026	0.0037	0.0039	0.0064	0.00148	0.001
Dissolved phosphorus	mg-P/L	5	0.0015	0.0016	0.0018	0.0023	0.00037	0.000
Orthophosphate	mg-P/L	5	< 0.0010	< 0.0010	0.00050	< 0.0010	0	0.000
Parameter	**Unit**	**MEL-04**						
		Count	**Minimum**	**Median**	**Mean**	**Maximum**	**Standard Deviation**	**Standard Error**
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.24	0.24	0.24	0.25	0.0080	0.004
Nutrients								
Nitrate	mg-N/L	5	< 0.0050	< 0.0050	0.0025	< 0.0050	0	0.000
Nitrite	mg-N/L	5	< 0.0010	< 0.0010	0.00050	< 0.0010	0	0.000
Nitrate + nitrite	mg-N/L	5	< 0.0051	< 0.0051	0.0025	< 0.0051	0	0.000
Total ammonia	mg-N/L	5	0.027	0.027	0.027	0.027	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.13	0.15	0.16	0.20	0.028	0.014
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.11	0.13	0.13	0.17	0.024	0.012
Total nitrogen	mg-N/L	5	0.13	0.16	0.16	0.20	0.029	0.014
Dissolved nitrogen	mg-N/L	5	0.11	0.14	0.14	0.17	0.024	0.012
Total phosphorus	mg-P/L	5	0.0039	0.0041	0.0040	0.004	0.0002	0.000
Dissolved phosphorus	mg-P/L	5	0.0024	0.0024	0.0023	0.0028	0.00050	0.000
Orthophosphate	mg-P/L	5	< 0.0010	< 0.0010	0.00050	< 0.0010	0	0.000

Table 11B-4: Summary Statistics for Depth-integrated Nutrients from Meliadine Lake, August 2018

Parameter	Unit	MEL-05						
		Count	Minimum	Median	Mean	Maximum	Standard Deviation	Standard Error
Major Ions								
Reactive silica, as SiO2	mg/L	5	0.25	0.26	0.26	0.26	0.0036	0.002
Nutrients								
Nitrate	mg-N/L	5	< 0.0050	< 0.0050	0.0025	< 0.0050	0	0.000
Nitrite	mg-N/L	5	< 0.0010	< 0.0010	0.00050	< 0.0010	0	0.000
Nitrate + nitrite	mg-N/L	5	< 0.0051	< 0.0051	0.0025	< 0.0051	0	0.000
Total ammonia	mg-N/L	5	0.0073	0.008	0.0085	0.010	0	0.000
Total Kjeldahl nitrogen	mg-N/L	5	0.09	0.12	0.12	0.15	0.027	0.012
Dissolved Kjeldahl nitrogen	mg-N/L	5	0.10	0.14	0.14	0.17	0.028	0.013
Total nitrogen	mg-N/L	5	0.09	0.12	0.12	0.15	0.027	0.012
Dissolved nitrogen	mg-N/L	5	0.10	0.14	0.14	0.17	0.028	0.013
Total phosphorus	mg-P/L	5	0.0037	0.0049	0.0056	0.0094	0.00222	0.001
Dissolved phosphorus	mg-P/L	5	0.0021	0.0026	0.0025	0.0029	0.00033	0.000
Orthophosphate	mg-P/L	5	< 0.0010	< 0.0010	0.00050	< 0.0010	0	0.000

Notes: < = parameter below detection limit; mg/L=milligrams per litre;

Values below detection limits were converted to half-detects for the calculation of summary statistics.

Table 11B-5: Summary Statistics for Chlorophyll *a* from Meliadine Lake, 2015-2018

Year	Station	Season	Descriptive Statistic	Chlorophyll *a* (µg/L)
2015	MEL-01	August	Minimum	0.70
			Maximum	0.97
			Median	0.87
			Mean	0.86
			Standard Deviation	0.08
			Standard Error	0.02
	MEL-02	August	Minimum	0.32
			Maximum	0.57
			Median	0.41
			Mean	0.45
			Standard Deviation	0.10
			Standard Error	0.02
2016	MEL-01	August	Minimum	1.33
			Maximum	2.27
			Median	1.90
			Mean	1.88
			Standard Deviation	0.26
			Standard Error	0.07
	MEL-02	August	Minimum	0.34
			Maximum	1.37
			Median	1.21
			Mean	1.15
			Standard Deviation	0.26
			Standard Error	0.07
	MEL-03	August	Minimum	0.46
			Maximum	0.97
			Median	0.74
			Mean	0.73
			Standard Deviation	0.12
			Standard Error	0.03
	MEL-04	August	Minimum	0.78
			Maximum	1.09
			Median	0.92
			Mean	0.93
			Standard Deviation	0.09
			Standard Error	0.02
	MEL-05	August	Minimum	0.87
			Maximum	1.40
			Median	1.08
			Mean	1.10
			Standard Deviation	0.15
			Standard Error	0.04

Table 11B-5: Summary Statistics for Chlorophyll *a* from Meliadine Lake, 2015-2018

Year	Station	Season	Descriptive Statistic	Chlorophyll *a* (µg/L)
2017	MEL-01	August	Minimum	1.27
			Maximum	1.70
			Median	1.47
			Mean	1.48
			Standard Deviation	0.12
			Standard Error	0.03
	MEL-02	August	Minimum	0.46
			Maximum	0.72
			Median	0.62
			Mean	0.61
			Standard Deviation	0.07
			Standard Error	0.02
	MEL-03	August	Minimum	0.43
			Maximum	0.69
			Median	0.58
			Mean	0.57
			Standard Deviation	0.07
			Standard Error	0.02
	MEL-04	August	Minimum	0.51
			Maximum	0.71
			Median	0.63
			Mean	0.61
			Standard Deviation	0.07
			Standard Error	0.02
	MEL-05	August	Minimum	0.49
			Maximum	0.68
			Median	0.58
			Mean	0.58
			Standard Deviation	0.04
			Standard Error	0.01
2018	MEL-01	August	Minimum	1.83
			Maximum	2.04
			Median	1.90
			Mean	1.91
			Standard Deviation	0.08
			Standard Error	0.03
	MEL-02	August	Minimum	0.75
			Maximum	1.02
			Median	0.87
			Mean	0.88
			Standard Deviation	0.11
			Standard Error	0.05

Table 11B-5: Summary Statistics for Chlorophyll *a* from Meliadine Lake, 2015-2018

Year	Station	Season	Descriptive Statistic	Chlorophyll *a* (µg/L)
2018	MEL-03	August	Minimum	0.52
			Maximum	0.70
			Median	0.59
			Mean	0.61
			Standard Deviation	0.07
			Standard Error	0.03
	MEL-04	August	Minimum	0.56
			Maximum	0.63
			Median	0.57
			Mean	0.58
			Standard Deviation	0.04
			Standard Error	0.02
	MEL-05	August	Minimum	0.48
			Maximum	0.62
			Median	0.61
			Mean	0.58
			Standard Deviation	0.06
			Standard Error	0.03

Notes: mg/L=micrograms per litre.

Table 11B-6: Raw Depth Integrated Nutrients Data, 2015-2018

Location	MEL-01-01	MEL-01-01	MEL-01-01	MEL-01-01	MEL-01-02	MEL-01-02	MEL-01-02
Sample Name	MEL-01-01-N	MEL-01-01-N	MEL-01-01-N	MEL-01-01N	MEL-01-02-N	MEL-01-02-N	MEL-01-02-N
Sample Date	2015-08-14	2016-08-11	2017-08-09	2018-08-22	2015-08-14	2016-08-11	2017-08-09
Sample Depth	4 m	4 m	4 m	4 m	4 m	4 m	4 m
SAMPLE_TYPE_CODE	N	N	N	N	N	N	N
TASK_CODE	DIN	DIN	DIN	DIN	DIN	DIN	DIN
Parameter / **Unit**							
Major Ions							
Reactive silica, as SiO_2 / mg/L	0.231	0.395	0.568	0.353	0.294	0.392	0.55
Nutrients							
Nitrate / mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Nitrite / mg-N/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + Nitrite / mg-N/L	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051
Total Ammonia / mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Total Kjeldahl Nitrogen / mg-N/L	0.129	0.058	0.212	0.268	0.133	0.094	0.258
Dissolved Kjeldahl Nitrogen / mg-N/L	< 0.050	0.135	0.192	0.223	0.103	0.135	0.202
Total Nitrogen / mg-N/L	0.129	0.058	0.212	0.268	0.133	0.094	0.258
Dissolved Nitrogen / mg-N/L	< 0.050	0.135	0.192	0.223	0.103	0.135	0.202
Total Phosphorus / mg-P/L	0.0043	0.0071	0.0058	0.005	0.0041	0.0055	0.0067
Dissolved Phosphorus / mg-P/L	0.0016	0.0022	0.0028	0.0024	0.0013	0.002	0.0023
Orthophosphate / mg-P/L	0.0014	0.0011	< 0.0010	< 0.0010	< 0.0010	0.001	< 0.0010

Table 11B-6: Raw Depth Integrated Nutrients Data, 2015-2018

Location		MEL-01-03	MEL-01-03	MEL-01-03	MEL-01-04	MEL-01-04	MEL-01-04	MEL-01-05	MEL-01-05	MEL-01-05	MEL-01-06	MEL-01-07	MEL-01-08	MEL-01-09
Sample Name		MEL-01-03-N	MEL-01-03-N	MEL-01-03-N	MEL-01-04-N	MEL-01-04-N	MEL-01-04-N	MEL-01-05-N	MEL-01-05-N	MEL-01-05-N	MEL-01-06N	MEL-01-07N	MEL-01-08N	MEL-01-09N
Sample Date		2015-08-14	2016-08-11	2017-08-09	2015-08-14	2016-08-11	2017-08-09	2015-08-15	2016-08-11	2017-08-09	2018-08-22	2018-08-21	2018-08-22	2018-08-22
Sample Depth		4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m
SAMPLE_TYPE_CODE		N	N	N	N	N	N	N	N	N	N	N	N	N
TASK_CODE		DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN
Parameter	**Unit**													
Major Ions														
Reactive silica, as SiO_2	mg/L	0.259	0.389	0.56	0.37	0.388	0.537	0.382	0.383	0.552	0.353	0.367	0.356	0.356
Nutrients														
Nitrate	mg-N/L	0.0876	< 0.0050	< 0.0050	0.0226	< 0.0050	< 0.0050	< 0.0050	0.0072	< 0.0050	< 0.0050	0.0121	< 0.0050	< 0.0050
Nitrite	mg-N/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0012	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0011	< 0.0010	< 0.0010
Nitrate + Nitrite	mg-N/L	0.0876	< 0.0051	< 0.0051	0.0226	< 0.0051	< 0.0051	< 0.0051	0.0072	< 0.0051	< 0.0051	0.0131	< 0.0051	< 0.0051
Total Ammonia	mg-N/L	< 0.0050	< 0.0050	< 0.0050	0.0093	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Total Kjeldahl Nitrogen	mg-N/L	0.078	0.05	0.23	< 0.050	0.137	0.205	< 0.050	0.057	0.182	0.199	0.269	0.248	0.234
Dissolved Kjeldahl Nitrogen	mg-N/L	< 0.050	0.108	0.176	0.106	0.122	0.198	< 0.050	0.151	0.164	0.241	0.179	0.276	0.206
Total Nitrogen	mg-N/L	0.166	0.05	0.23	< 0.050	0.137	0.207	< 0.050	0.064	0.182	0.199	0.282	0.248	0.234
Dissolved Nitrogen	mg-N/L	0.088	0.108	0.176	0.129	0.122	0.199	< 0.050	0.158	0.164	0.241	0.192	0.276	0.206
Total Phosphorus	mg-P/L	0.004	0.0067	0.0052	0.0039	0.0053	0.0068	0.0091	0.005	0.0055	0.0052	0.005	0.0042	0.0052
Dissolved Phosphorus	mg-P/L	0.0014	0.0019	0.002	< 0.0010	0.0021	0.0035	0.0021	0.0023	0.0029	0.002	0.0028	0.0049	0.0024
Orthophosphate	mg-P/L	0.0014	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0016	0.0012	< 0.0010	< 0.0010	< 0.0010	0.0011	< 0.0010	0.0012

Table 11B-6: Raw Depth Integrated Nutrients Data, 2015-2018

Location		MEL-02-01	MEL-02-01	MEL-02-01	MEL-02-02	MEL-02-02	MEL-02-02	MEL-02-02	MEL-02-03	MEL-02-03	MEL-02-03	MEL-02-03	MEL-02-04	MEL-02-04	MEL-02-04
Sample Name		MEL-02-01-N	MEL-02-01-N	MEL-02-01-N	MEL-02-02-N	MEL-02-02-N	MEL-02-02N	MEL-02-02N	MEL-02-03-N	MEL-02-03-N	MEL-02-03N	MEL-02-03N	MEL-02-04N	MEL-02-04-N	MEL-02-04N
Sample Date		2015-08-16	2016-08-11	2017-08-11	2015-08-16	2016-08-11	2017-08-11	2018-08-31	2015-08-16	2016-08-11	2017-08-11	2018-08-18	2015-08-17	2016-08-11	2017-08-11
Sample Depth		4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m
SAMPLE_TYPE_CODE		N	N	N	N	N	N	N	N	N	N	N	N	N	N
TASK_CODE		DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN
Parameter	**Unit**														
Major Ions															
Reactive silica, as SiO_2	mg/L	0.288	0.257	0.343	0.264	0.249	0.35	0.28	0.301	0.254	0.348	0.318	0.268	0.269	0.346
Nutrients															
Nitrate	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.019	< 0.0050	< 0.0050
Nitrite	mg-N/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + Nitrite	mg-N/L	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	0.019	< 0.0051	< 0.0051
Total Ammonia	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0065	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0176	< 0.0050
Total Kjeldahl Nitrogen	mg-N/L	< 0.050	0.105	0.185	< 0.050	0.092	0.172	0.118	< 0.050	0.127	0.153	0.198	0.096	0.131	0.138
Dissolved Kjeldahl Nitrogen	mg-N/L	0.069	0.197	0.142	0.111	0.158	0.163	0.173	< 0.050	0.167	0.151	0.227	< 0.050	0.136	0.158
Total Nitrogen	mg-N/L	< 0.050	0.105	0.185	< 0.050	0.092	0.172	0.118	< 0.050	0.127	0.153	0.198	0.115	0.131	0.138
Dissolved Nitrogen	mg-N/L	0.069	0.197	0.142	0.111	0.158	0.163	0.173	< 0.050	0.167	0.151	0.227	< 0.050	0.136	0.158
Total Phosphorus	mg-P/L	0.005	0.0125	0.0052	0.0031	0.0052	0.004	0.0113	0.0045	0.0078	0.0035	0.0105	0.0014	0.004	0.0055
Dissolved Phosphorus	mg-P/L	< 0.0010	0.0019	0.0023	< 0.0010	0.0024	0.0017	0.0108	0.0011	0.0016	0.002	0.0022	0.005	0.0016	0.0035
Orthophosphate	mg-P/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0018	0.0012	0.0015	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Table 11B-6: Raw Depth Integrated Nutrients Data, 2015-2018

Location	MEL-02-05	MEL-02-05	MEL-02-05	MEL-02-05	MEL-02-06	MEL-02-08	MEL-03-01	MEL-03-01	MEL-03-01	MEL-03-02	MEL-03-02	MEL-03-02	MEL-03-03	MEL-03-03	MEL-03-03
Sample Name	MEL-02-05N	MEL-02-05-N	MEL-02-05N	MEL-02-05N	MEL-02-06N	MEL-02-08N	MEL-03-01-N	MEL-03-01-N	MEL-03-01N	MEL-03-02-N	MEL-03-02-N	MEL-03-02 N	MEL-03-03-N	MEL-03-03-N	MEL-03-03
Sample Date	2015-08-17	2016-08-11	2017-08-11	2018-08-18	2018-08-31	2018-08-15	2016-08-12	2017-08-13	2018-08-20	2016-08-12	2017-08-13	2018-08-26	2016-08-12	2017-08-13	2018-08-20
Sample Depth	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4m	4m	4 m	4m	4m	4 m	4m	4m
SAMPLE_TYPE_CODE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
TASK_CODE	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN
Parameter	**Unit**														
Major Ions															
Reactive silica, as SiO_2	mg/L	0.223	0.261	0.354	0.316	0.283	0.33	0.181	0.244	0.231	0.188	0.244	0.23	0.179	0.245	0.233
Nutrients																
Nitrate	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Nitrite	mg-N/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + Nitrite	mg-N/L	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051
Total Ammonia	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0089	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0102	< 0.0050	< 0.0050
Total Kjeldahl Nitrogen	mg-N/L	0.192	0.097	0.134	0.149	0.137	0.232	0.075	0.128	0.103	0.219	0.127	0.174	0.137	0.108	0.143
Dissolved Kjeldahl Nitrogen	mg-N/L	< 0.050	0.179	0.171	0.149	0.215	0.284	0.142	0.136	0.181	0.194	0.143	0.15	0.16	0.113	0.095
Total Nitrogen	mg-N/L	0.192	0.097	0.134	0.149	0.137	0.232	0.075	0.128	0.103	0.219	0.127	0.174	0.137	0.108	0.143
Dissolved Nitrogen	mg-N/L	< 0.050	0.179	0.171	0.149	0.215	0.284	0.142	0.136	0.181	0.194	0.143	0.15	0.16	0.113	0.095
Total Phosphorus	mg-P/L	0.0056	0.0067	0.0039	0.0047	0.0047	0.0052	0.0051	0.003	0.0038	0.0046	0.0032	0.0026	0.0046	0.0038	0.0064
Dissolved Phosphorus	mg-P/L	0.0025	0.0015	0.0027	0.0023	0.0025	0.0016	0.0017	0.0028	0.0021	0.0015	0.0012	0.0016	0.0024	0.0016	0.0023
Orthophosphate	mg-P/L	< 0.0010	0.0015	< 0.0010	0.0012	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0011	< 0.0010

Table 11B-6: Raw Depth Integrated Nutrients Data, 2015-2018

Location		MEL-03-04	MEL-03-04	MEL-03-04	MEL-03-05	MEL-03-05	MEL-03-05	MEL-04-01	MEL-04-01	MEL-04-01	MEL-04-02	MEL-04-02	MEL-04-02	MEL-04-03	MEL-04-03	MEL-04-03
Sample Name		MEL-03-04-N	MEL-03-04-N	MEL-03-04 N	MEL-03-05-N	MEL-03-05-N	MEL-03-05 N	MEL-04-01-N	MEL-04-01-N	MEL-04-01N	MEL-04-02-N	MEL-04-02-N	MEL-04-02N	MEL-04-03-N	MEL-04-03-N	MEL-04-03N
Sample Date		2016-08-12	2017-08-13	2018-08-26	2016-08-12	2017-08-13	2018-08-26	2016-08-14	2017-08-15	2018-09-02	2016-08-14	2017-08-15	2018-09-02	2016-08-14	2017-08-15	2018-09-02
Sample Depth		4 m	4m	4m	4 m	4m	4m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m	4 m
SAMPLE_TYPE_CODE		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
TASK_CODE		DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN
Parameter	**Unit**															
Major Ions																
Reactive silica, as SiO_2	mg/L	0.186	0.25	0.229	0.191	0.246	0.228	0.232	0.261	0.249	0.186	0.256	0.245	0.19	0.264	0.243
Nutrients																
Nitrate	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0135	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Nitrite	mg-N/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + Nitrite	mg-N/L	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	0.0135	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051
Total Ammonia	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0272
Total Kjeldahl Nitrogen	mg-N/L	0.055	0.131	0.18	0.098	0.119	0.155	0.146	0.12	< 0.050	0.112	0.153	0.13	0.107	0.118	0.196
Dissolved Kjeldahl Nitrogen	mg-N/L	0.142	0.138	0.194	0.143	0.102	0.133	0.191	0.126	< 0.050	0.078	0.138	0.166	0.106	0.147	0.11
Total Nitrogen	mg-N/L	0.055	0.131	0.18	0.098	0.119	0.168	0.146	0.12	< 0.050	0.112	0.153	0.13	0.107	0.118	0.196
Dissolved Nitrogen	mg-N/L	0.142	0.138	0.194	0.143	0.102	0.147	0.191	0.126	< 0.050	0.078	0.138	0.166	0.106	0.147	0.11
Total Phosphorus	mg-P/L	0.0034	0.0053	0.003	0.0043	0.0037	0.0037	0.0058	0.0055	0.0039	0.0043	0.0037	0.0041	0.0043	0.0145	0.0041
Dissolved Phosphorus	mg-P/L	0.0013	0.0017	0.0015	0.0016	0.0025	0.0015	0.0019	0.0024	0.0028	0.0029	0.0019	0.0024	0.0023	0.0016	0.0024
Orthophosphate	mg-P/L	< 0.0010	0.0012	< 0.0010	< 0.0010	0.001	< 0.0010	0.0014	< 0.0010	< 0.0010	0.0028	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Table 11B-6: Raw Depth Integrated Nutrients Data, 2015-2018

Location		MEL-04-04	MEL-04-04	MEL-04-05	MEL-04-05	MEL-04-05	MEL-05-01	MEL-05-01	MEL-05-01	MEL-05-02	MEL-05-02	MEL-05-02	MEL-05-03	MEL-05-03	MEL-05-03
Sample Name		MEL-04-04-N	MEL-04-04-N	MEL-04-05-N	MEL-04-05-N	MEL-04-05N	MEL-05-01-N	MEL-05-01N	MEL-05-01N	MEL-05-02-N	MEL-05-02N	MEL-05-02N	MEL-05-03-N	MEL-05-03N	MEL-05-03N
Sample Date		2016-08-14	2017-08-15	2016-08-14	2017-08-15	2018-09-02	2016-08-16	2017-08-12	2018-09-01	2016-08-16	2017-08-12	2018-08-30	2016-08-16	2017-08-12	2018-08-29
Sample Depth		4 m	4 m	4 m	4 m	4 m	4 m	4m	4 m	4 m	4m	4m	4 m	4m	4m
SAMPLE_TYPE_CODE		N	N	N	N	N	N	N	N	N	N	N	N	N	N
TASK_CODE		DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN	DIN
Parameter	**Unit**														
Major Ions															
Reactive silica, as SiO_2	mg/L	0.189	0.262	0.186	0.254	0.244	0.207	0.27	0.253	0.2	0.272	0.259	0.199	0.26	0.262
Nutrients															
Nitrate	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Nitrite	mg-N/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + Nitrite	mg-N/L	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051
Total Ammonia	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.008	< 0.0050	< 0.0050	0.0102
Total Kjeldahl Nitrogen	mg-N/L	0.08	0.155	0.068	0.169	0.146	0.135	0.168	0.085	0.086	0.152	0.152	0.061	0.157	0.106
Dissolved Kjeldahl Nitrogen	mg-N/L	0.105	0.168	0.084	0.141	0.126	0.111	0.149	0.174	0.102	0.19	0.142	0.076	0.17	0.097
Total Nitrogen	mg-N/L	0.08	0.155	0.068	0.169	0.146	0.135	0.168	0.085	0.086	0.152	0.152	0.061	0.157	0.106
Dissolved Nitrogen	mg-N/L	0.105	0.168	0.084	0.141	0.126	0.111	0.149	0.174	0.102	0.19	0.142	0.076	0.17	0.097
Total Phosphorus	mg-P/L	0.0046	0.0057	0.0041	0.006	0.0042	0.0049	0.0034	0.0045	0.0035	0.0037	0.0094	0.0044	0.004	0.0049
Dissolved Phosphorus	mg-P/L	0.0024	0.0016	0.0032	0.0017	0.0026	0.0048	0.004	0.0021	0.0025	0.0022	0.0022	0.0029	0.002	0.0026
Orthophosphate	mg-P/L	0.0025	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0014	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0011	< 0.0010	< 0.0010

Table 11B-6: Raw Depth Integrated Nutrients Data, 2015-2018

Location		MEL-05-04	MEL-05-04	MEL-05-04	MEL-05-05	MEL-05-05	MEL-05-05
Sample Name		MEL-05-04-N	MEL-05-04N	MEL-05-04N	MEL-05-05-N	MEL-05-05N	MEL-05-05N
Sample Date		2016-08-16	2017-08-12	2018-08-30	2016-08-16	2017-08-12	2018-08-29
Sample Depth		4 m	4m	4m	4 m	4m	4m
SAMPLE_TYPE_CODE		N	N	N	N	N	N
TASK_CODE		DIN	DIN	DIN	DIN	DIN	DIN
Parameter	**Unit**						
Major Ions							
Reactive silica, as SiO_2	mg/L	0.196	0.259	0.257	0.207	0.265	0.261
Nutrients							
Nitrate	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Nitrite	mg-N/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + Nitrite	mg-N/L	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051	< 0.0051
Total Ammonia	mg-N/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0073
Total Kjeldahl Nitrogen	mg-N/L	0.158	0.178	0.122	0.073	0.147	0.144
Dissolved Kjeldahl Nitrogen	mg-N/L	0.102	0.163	0.152	0.103	0.15	0.134
Total Nitrogen	mg-N/L	0.158	0.178	0.122	0.073	0.147	0.144
Dissolved Nitrogen	mg-N/L	0.102	0.163	0.152	0.103	0.15	0.134
Total Phosphorus	mg-P/L	0.0058	0.0032	0.0037	0.0041	0.0038	0.0055
Dissolved Phosphorus	mg-P/L	0.0023	0.0014	0.0026	0.0032	0.0025	0.0029
Orthophosphate	mg-P/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2015	A8-01	August	Rep 1	2.019
			Rep 2	1.874
			Rep 3	1.98
	A8-02	August	Rep 1	1.722
			Rep 2	1.502
			Rep 3	1.937
	A8-03	August	Rep 1	2.267
			Rep 2	2.287
			Rep 3	2.437
	B7-01	August	Rep 1	1.436
			Rep 2	1.238
			Rep 3	1.59
	MEL-01-01	August	Rep 1	0.737
			Rep 2	0.866
			Rep 3	0.702
	MEL-01-02	August	Rep 1	0.954
			Rep 2	0.862
			Rep 3	0.84
	MEL-01-03	August	Rep 1	0.889
			Rep 2	0.751
			Rep 3	<MDL
	MEL-01-04	August	Rep 1	0.877
			Rep 2	0.899
			Rep 3	0.973
	MEL-01-05	August	Rep 1	0.927
			Rep 2	0.861
			Rep 3	0.883
	MEL-02-01	August	Rep 1	0.392
			Rep 2	0.412
			Rep 3	0.32
	MEL-02-02	August	Rep 1	0.349
			Rep 2	0.349
			Rep 3	0.381
	MEL-02-03	August	Rep 1	0.533
			Rep 2	0.327
			Rep 3	0.547
	MEL-02-04	August	Rep 1	0.42
			Rep 2	0.573
			Rep 3	0.409
	MEL-02-05	August	Rep 1	0.544
			Rep 2	0.569
			Rep 3	0.551

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2016	A8-01	August	Rep 1	1.857
			Rep 2	1.923
			Rep 3	2.101
	A8-02	August	Rep 1	2.112
			Rep 2	2.185
			Rep 3	2.302
	A8-04	August	Rep 1	2.2
			Rep 2	1.961
			Rep 3	2.072
	B7-01	August	Rep 1	2.984
			Rep 2	2.762
			Rep 3	2.731
	B7-02	August	Rep 1	3.236
			Rep 2	2.987
			Rep 3	3.408
	B7-03	August	Rep 1	3.039
			Rep 2	3.388
			Rep 3	3.373
	D7-01	August	Rep 1	3.804
			Rep 2	3.474
			Rep 3	3.542
	D7-02	August	Rep 1	3.866
			Rep 2	3.906
			Rep 3	3.433
	D7-03	August	Rep 1	4.197
			Rep 2	4.209
			Rep 3	3.723
	MEL-01-01	August	Rep 1	2.269
			Rep 2	1.653
			Rep 3	1.912
	MEL-01-02	August	Rep 1	2.044
			Rep 2	2.063
			Rep 3	2.134
	MEL-01-03	August	Rep 1	1.65
			Rep 2	1.895
			Rep 3	2.259
	MEL-01-04	August	Rep 1	1.851
			Rep 2	1.781
			Rep 3	1.809
	MEL-01-05	August	Rep 1	1.334
			Rep 2	1.932
			Rep 3	1.597
	MEL-02-01	August	Rep 1	1.263
			Rep 2	0.337
			Rep 3	1.086

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2016	MEL-02-02	August	Rep 1	0.91
			Rep 2	1.208
			Rep 3	1
	MEL-02-03	August	Rep 1	1.197
			Rep 2	1.372
			Rep 3	1.206
	MEL-02-04	August	Rep 1	1.271
			Rep 2	1.325
			Rep 3	1.184
	MEL-02-05	August	Rep 1	1.322
			Rep 2	1.249
			Rep 3	1.289
	MEL-03-01	August	Rep 1	0.763
			Rep 2	0.693
			Rep 3	0.748
	MEL-03-02	August	Rep 1	0.46
			Rep 2	0.659
			Rep 3	0.744
	MEL-03-03	August	Rep 1	0.65
			Rep 2	0.757
			Rep 3	0.708
	MEL-03-04	August	Rep 1	0.701
			Rep 2	0.822
			Rep 3	0.574
	MEL-03-05	August	Rep 1	0.824
			Rep 2	0.879
			Rep 3	0.965
	Mel-04-01	August	Rep 1	0.78
			Rep 2	0.826
			Rep 3	0.818
	Mel-04-02	August	Rep 1	0.866
			Rep 2	0.901
			Rep 3	0.863
	Mel-04-03	August	Rep 1	0.891
			Rep 2	0.965
			Rep 3	0.946
	Mel-04-04	August	Rep 1	1.083
			Rep 2	1
			Rep 3	0.943
	Mel-04-05	August	Rep 1	1.092
			Rep 2	1.008
			Rep 3	0.915
	Mel-05-01	August	Rep 1	1.401
			Rep 2	1.206
			Rep 3	1.178

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2016	Mel-05-02	August	Rep 1	1.235
			Rep 2	1.296
			Rep 3	1.112
	Mel-05-03	August	Rep 1	1.02
			Rep 2	1.079
			Rep 3	1.048
	Mel-05-04	August	Rep 1	1.044
			Rep 2	0.9
			Rep 3	0.974
	Mel-05-05	August	Rep 1	1.134
			Rep 2	0.984
			Rep 3	0.868
2017	A8-01	August	Rep 1	0.92
			Rep 2	0.92
			Rep 3	0.95
	A8-02	August	Rep 1	3.11
			Rep 2	0.96
			Rep 3	0.89
	A8-03	August	Rep 1	1.46
			Rep 2	1.44
			Rep 3	0.32
	B7-01	August	Rep 1	1.03
			Rep 2	1.18
			Rep 3	1.16
	B7-02	August	Rep 1	1.15
			Rep 2	1.27
			Rep 3	1.38
	B7-03	August	Rep 1	1.4
			Rep 2	1.56
			Rep 3	1.47
	D7-01	August	Rep 1	2.47
			Rep 2	2.32
			Rep 3	1.94
	D7-02	August	Rep 1	2.16
			Rep 2	2.29
			Rep 3	2.18
	D7-03	August	Rep 1	2.26
			Rep 2	2.25
			Rep 3	2.39
	MEL-01-01	August	Rep 1	1.44
			Rep 2	1.7
			Rep 3	1.56
	MEL-01-02	August	Rep 1	1.47
			Rep 2	1.42
			Rep 3	1.52

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2017	MEL-01-03	August	Rep 1	1.34
			Rep 2	1.27
			Rep 3	1.39
	MEL-01-04	August	Rep 1	1.55
			Rep 2	1.67
			Rep 3	1.59
	MEL-01-05	August	Rep 1	1.45
			Rep 2	1.4
			Rep 3	1.48
	MEL-02-01	August	Rep 1	0.66
			Rep 2	0.66
			Rep 3	0.65
	MEL-02-02	August	Rep 1	0.59
			Rep 2	0.65
			Rep 3	0.58
	MEL-02-03	August	Rep 1	0.6
			Rep 2	0.52
			Rep 3	0.51
	MEL-02-04	August	Rep 1	0.59
			Rep 2	0.63
			Rep 3	0.62
	MEL-02-05	August	Rep 1	0.72
			Rep 2	0.64
			Rep 3	0.46
	MEL-03-01	August	Rep 1	0.6
			Rep 2	0.64
			Rep 3	0.64
	MEL-03-02	August	Rep 1	0.62
			Rep 2	0.69
			Rep 3	0.61
	MEL-03-03	August	Rep 1	0.43
			Rep 2	0.51
			Rep 3	0.53
	MEL-03-04	August	Rep 1	0.51
			Rep 2	0.57
			Rep 3	0.57
	MEL-03-05	August	Rep 1	0.58
			Rep 2	0.51
			Rep 3	0.58
	Mel-04-01	August	Rep 1	0.52
			Rep 2	0.66
			Rep 3	0.49
	Mel-04-02	August	Rep 1	0.52
			Rep 2	0.54
			Rep 3	0.54

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2017	Mel-04-03	August	Rep 1	0.71
			Rep 2	0.63
			Rep 3	0.71
	Mel-04-04	August	Rep 1	0.66
			Rep 2	0.61
			Rep 3	0.62
	Mel-04-05	August	Rep 1	0.67
			Rep 2	0.64
			Rep 3	0.68
	Mel-05-01	August	Rep 1	0.62
			Rep 2	0.63
			Rep 3	0.6
	Mel-05-02	August	Rep 1	0.58
			Rep 2	0.49
			Rep 3	0.6
	Mel-05-03	August	Rep 1	0.68
			Rep 2	0.6
			Rep 3	0.59
	Mel-05-04	August	Rep 1	0.56
			Rep 2	0.54
			Rep 3	0.55
	Mel-05-05	August	Rep 1	0.56
			Rep 2	0.55
			Rep 3	0.56
2018	A8-01	August	Rep 1	1.22
			Rep 2	1.14
			Rep 3	1.25
	A8-02	August	Rep 1	1.06
			Rep 2	1.01
			Rep 3	1
	A8-03	August	Rep 1	1.09
			Rep 2	1.35
			Rep 3	1.26
	B7-01	August	Rep 1	1.32
			Rep 2	1.59
			Rep 3	1
	B7-02	August	Rep 1	1.87
			Rep 2	1.94
			Rep 3	1.84
	B7-03	August	Rep 1	1.62
			Rep 2	1.58
			Rep 3	2.26
	MEL-01-01	August	Rep 1	2.05
			Rep 2	1.86
			Rep 3	1.73

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2018	MEL-01-06	August	Rep 1	1.82
			Rep 2	1.81
			Rep 3	1.87
	MEL-01-07	August	Rep 1	1.97
			Rep 2	1.95
			Rep 3	1.85
	MEL-01-08	August	Rep 1	2.09
			Rep 2	1.99
			Rep 3	2.03
	MEL-01-09	August	Rep 1	1.94
			Rep 2	1.95
			Rep 3	1.81
	MEL-02-02	August	Rep 1	0.7
			Rep 2	0.76
			Rep 3	0.78
	MEL-02-03	August	Rep 1	0.92
			Rep 2	1.05
			Rep 3	1.1
	MEL-02-05	August	Rep 1	0.8
			Rep 2	0.84
			Rep 3	0.82
	MEL-02-06	August	Rep 1	0.72
			Rep 2	0.71
			Rep 3	1.17
	MEL-02-08	August	Rep 1	0.9
			Rep 2	0.96
			Rep 3	0.99
	MEL-03-01	August	Rep 1	0.74
			Rep 2	0.69
			Rep 3	0.65
	MEL-03-02	August	Rep 1	0.55
			Rep 2	0.58
			Rep 3	0.59
	MEL-03-03	August	Rep 1	0.69
			Rep 2	0.69
			Rep 3	0.67
	MEL-03-04	August	Rep 1	0.61
			Rep 2	0.56
			Rep 3	0.6
	MEL-03-05	August	Rep 1	0.53
			Rep 2	0.48
			Rep 3	0.57
	Mel-04-01	August	Rep 1	0.64
			Rep 2	0.62
			Rep 3	0.64

Table 11B-7: Raw Chlorophyll *a* Data, 2015-2018

Year	Station	Sampling Period	Replicate	Chlorophyll *a* (µg/L)
2018	Mel-04-02	August	Rep 1	0.56
			Rep 2	0.55
			Rep 3	0.55
	Mel-04-03	August	Rep 1	0.55
			Rep 2	0.62
	Mel-04-05	August	Rep 1	0.56
			Rep 2	0.58
			Rep 3	0.56
	Mel-05-01	August	Rep 1	0.63
			Rep 2	0.62
			Rep 3	0.62
	Mel-05-02	August	Rep 1	0.57
			Rep 2	0.55
			Rep 3	0.61
	Mel-05-03	August	Rep 1	0.5
			Rep 2	0.47
			Rep 3	0.48
	Mel-05-04	August	Rep 1	0.63
			Rep 2	0.61
			Rep 3	0.6
	Mel-05-05	August	Rep 1	0.62
			Rep 2	0.6
			Rep 3	0.64

Notes: mg/L=micrograms per litre

APPENDIX 11C

Trophic Status

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Table 11C-1: Summary of Total Phosphorus, Secchi Depth, and Chlorophyll *a* Sampling Results in Meliadine Lake, 2015 to 2018

Year	Station	Total Phosphorus (mg/L)			Secchi Depth (m)			Chlorophyll *a* (µg/L)		
		Mean	SE	Count	Mean	SE	Count	Mean	SE	Count
2015	MEL-01	0.0051	0.001	5	6	0.2	5	0.8	0.06	15
	MEL-02	0.0039	0.0008	5	6.4	0.4	5	0.45	0.02	15
2016	MEL-01	0.0059	0.0004	5	7	0	5	1.88	0.07	15
	MEL-02	0.0072	0.0015	5	7	0	5	1.15	0.07	15
	MEL-03	0.0044	0.0003	5	7.2	0.2	5	0.73	0.03	15
	MEL-04	0.0046	0.0003	5	7.2	0.2	5	0.93	0.02	15
	MEL-05	0.0045	0.0004	5	7.4	0.2	5	1.1	0.04	15
2017	MEL-01	0.006	0.0003	5	7.6	0.5	5	1.48	0.03	15
	MEL-02	0.0044	0.0004	5	8.5	0.3	5	0.61	0.02	15
	MEL-03	0.0038	0.0004	5	7.9	0.4	5	0.57	0.02	15
	MEL-04	0.0071	0.0019	5	8.6	0.4	5	0.61	0.02	15
	MEL-05	0.0036	0.0001	5	8.9	0.5	5	0.58	0.01	15
2018	MEL-01	0.0049	0.0002	5	6.4	0.2	5	1.91	0.03	15
	MEL-02	0.0073	0.0015	5	6.5	0.2	5	0.88	0.05	15
	MEL-03	0.0039	0.0007	5	6.6	0.3	5	0.61	0.03	15
	MEL-04	0.0041	0.0001	5	6.9	0.2	5	0.58	0.02	15
	MEL-05	0.0056	0.001	5	7	0.1	5	0.58	0.03	15

Table 11C-2: Summary of Trophic Status Index in Meliadine Lake, 2015 to 2018

Parameter	2015	2016	2017	2018
Near-field Exposure Area (MEL-01)				
TSI (TP)	26.7 ± 2.3	29.7 ± 1.0	29.9 ± 0.8	27.1 ± 0.6
TSI (TChl)	26.2 ± 2.9	36.7 ± 0.4	34.4 ± 0.2	37 ± 0.2
TSI (Secchi)	33.9 ± 0.4	31.9 ± 0.0	30.9 ± 0.9	33.3 ± 0.4
Trophic Status Classification	Oligotrophic[(a)]	Oligotrophic[(a)]	Oligotrophic[(a)]	Oligotrophic[(a)]
Mid-field Exposure Area (MEL-02)				
TSI (TP)	22.3 ± 3.6	31.6 ± 2.8	25.4 ± 1.3	31.6 ± 2.9
TSI (TChl)	22.4 ± 0.5	31.5 ± 0.9	25.6 ± 0.3	29.3 ± 0.5
TSI (Secchi)	32.8 ± 0.5	30.8 ± 0.5	29.2 ± 0.5	32.1 ± 0.5
Trophic Status Classification	Oligotrophic[(a)]	Oligotrophic[(a)]	Oligotrophic[(a)]	Oligotrophic[(a)]
Meliadine Lake Reference Area 1 (MEL-03)				
TSI (TP)	-	25.4 ± 1.0	23.1 ± 1.4	23.1 ± 2.2
TSI (TChl)	-	27.4 ± 0.5	25.1 ± 0.3	25.7 ± 0.5
TSI (Secchi)	-	30.2 ± 0.6	30.2 ± 0.8	33.3 ± 0.3
Trophic Status Classification		Oligotrophic[(a)]	Oligotrophic[(a)]	Oligotrophic[(a)]
Meliadine Lake Reference Area 2 (MEL-04)				
TSI (TP)	-	26.1 ± 0.9	30.8 ± 3.2	24.7 ± 0.3
TSI (TChl)	-	29.8 ± 0.3	25.7 ± 0.3	25.4 ± 0.3
TSI (Secchi)	-	38.6 ± 1.0	29.0 ± 0.7	30.6 ± 0.4
Trophic Status Classification		Oligotrophic[(a)]	Oligotrophic[(a)]	Oligotrophic[(a)]
Meliadine Lake Reference Area 3 (MEL-05)				
TSI (TP)	-	25.8 ± 1.2	22.7 ± 0.6	28.2 ± 2.3
TSI (TChl)	-	31.4 ± 0.3	25.2 ± 0.2	25.3 ± 0.5
TSI (Secchi)	-	28.9 ± 0.2	28.5 ± 0.8	30.6 ± 0.4
Trophic Status Classification		Oligotrophic[(a)]	Oligotrophic[(a)]	Oligotrophic[(a)]

a) Trophic status classification based on Carlson (1977).

TSI mean values plus/minus standard error presented. TSI=Trophic status index; TP = total phosphorus; TChl = total chlorophyll a; Secchi = Secchi Depth; "− " indicates sample not collected.

APPENDIX 11D

Phytoplankton Community Results

Table 11D-1: Descriptive Statistics for Phytoplankton Variables, Meliadine Lake, 2015-2018

Year	Site	Abundance (cells/L)						Biomass (mg/m^3)						Richness					
		min	max	med	mean	se	sd	min	max	med	mean	se	sd	min	max	med	mean	se	sd
2015	MEL-01	2,144,496	3,223,312	2,784,272	2,689,406	188,936	422,473	290	364	350	336	13	29	39	46	41	42	1	2.97
	MEL-02	1,603,880	2,275,392	1,936,376	1,962,499	135,748	303,541	178	262	208	220	16	35	41	43	41	41	0	0.89
2016	MEL-01	2,572,236	3,422,032	2,885,648	2,909,414	154,628	345,759	315	446	328	351	24	54	37	41	39	39	1	1.48
	MEL-02	1,989,032	2,415,088	2,200,368	2,184,686	79,091	176,853	192	304	243	252	20	44	38	43	39	40	1	2.00
	MEL-03	1,859,688	2,284,960	2,084,392	2,087,709	80,645	180,328	208	249	236	231	8	17	33	40	37	37	1	2.49
	MEL-04	944,070	2,048,272	1,847,120	1,630,267	203,485	455,007	42	204	181	156	29	65	23	40	37	35	3	6.76
	MEL-05	1,604,464	2,917,584	1,815,000	2,026,913	231,151	516,869	186	352	192	227	32	71	30	39	37	36	2	3.56
2017	MEL-01	2,430,520	3,013,992	2,560,384	2,637,110	104,786	234,310	259	349	337	316	17	39	38	43	39	40	1	2.00
	MEL-02	1,834,152	2,275,176	2,132,480	2,106,584	73,702	164,802	181	292	209	222	19	42	39	42	40	40	1	1.30
	MEL-03	1,682,288	2,350,416	1,863,072	1,942,189	112,311	251,136	181	248	202	206	11	25	37	41	39	39	1	1.58
	MEL-04	1,864,872	2,301,896	2,086,976	2,093,600	77,358	172,977	173	233	202	201	10	22	34	39	36	36	1	1.87
	MEL-05	1,829,352	2,704,016	2,104,544	2,176,504	169,119	378,161	197	255	204	216	11	25	33	45	42	41	2	4.76
2018	MEL-01	2,994,000	3,758,240	3,649,128	3,503,229	137,000	306,341	297	367	339	339	12	27	39	47	42	42	1	3.11
	MEL-02	1,162,872	3,048,496	1,997,048	2,101,478	366,873	820,352	105	329	209	207	39	88	25	44	35	34	3	6.88
	MEL-03	2,568,736	3,767,864	2,878,032	3,054,288	212,971	476,218	252	306	268	276	11	26	35	41	40	39	1	2.51
	MEL-04	2,383,936	2,879,216	2,531,992	2,581,784	107,187	214,374	227	256	239	241	7	15	34	38	36	36	1	1.63
	MEL-05	1,480,752	2,828,928	1,545,792	1,803,459	257,821	576,505	132	209	155	160	14	30	25	34	28	29	2	3.36

Table 11D-2: Relative Abundance of Major Phytoplankton Groups, Meliadine Lake, 2015-2018

Year	Site	Relative Abundance (%)						Relative Biomass (%)					
		Cyanophyte	Chlorophyte	Chrysophyte	Diatoms	Cryptophytes	Dinoflagellates	Cyanophyte	Chlorophyte	Chrysophyte	Diatoms	Cryptophytes	Dinoflagellates
2015	MEL-01	0.24	0.87	85.26	11.46	2.04	0.14	0.08	0.82	74.02	7.51	3.52	13.95
	MEL-01	0.43	8.59	77.85	9.68	3.21	0.24	0.16	6.96	62.61	10.00	5.23	14.95
	MEL-02	0.02	10.00	72.02	7.79	9.87	0.30	0.24	8.12	57.38	9.31	14.97	9.99
2016	MEL-01	0.81	8.86	80.70	4.10	5.17	0.36	0.80	6.07	69.32	4.19	7.45	12.17
	MEL-02	0.20	9.09	76.61	3.83	9.74	0.53	0.10	5.38	54.97	12.65	14.41	12.47
	MEL-03	0.14	9.48	78.15	3.41	8.52	0.30	0.06	5.08	71.31	4.47	11.20	7.88
	MEL-04	0.62	14.18	70.37	4.34	10.26	0.23	0.27	5.96	66.19	7.52	15.46	4.60
	MEL-05	0.64	8.29	73.15	3.05	14.63	0.24	0.28	4.91	58.93	6.48	21.00	8.39
2017	MEL-01	0.02	8.19	78.21	3.74	9.24	0.60	0.11	6.10	59.62	5.24	12.03	16.89
	MEL-02	0.28	14.20	70.29	4.14	10.58	0.51	1.01	11.52	55.15	6.90	16.14	9.27
	MEL-03	0.00	6.66	80.54	2.77	9.58	0.45	0.10	3.98	66.07	3.56	13.72	12.37
	MEL-04	1.65	7.70	74.78	2.73	13.01	0.13	5.80	3.97	60.19	4.39	20.79	4.86
	MEL-05	0.00	8.15	75.57	3.75	12.28	0.25	0.02	4.33	64.35	5.12	19.48	6.71
2018	MEL-01	0.18	17.13	66.15	10.87	5.55	0.12	0.63	8.12	46.66	18.48	14.77	11.35
	MEL-02	0.39	16.36	61.72	16.03	5.26	0.23	0.19	9.47	44.40	20.19	11.41	14.34
	MEL-03	0.21	6.16	81.31	4.08	8.12	0.11	0.11	6.58	61.82	6.53	15.05	9.90
	MEL-04	0.01	8.45	73.60	4.94	12.94	0.06	0.54	9.45	52.79	8.35	20.83	8.05
	MEL-05	0.21	9.88	71.69	11.58	6.59	0.05	0.44	10.24	52.59	16.28	12.61	7.84

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101	1	19-Jul-15	Chlamydomonas spp.	28736	0.81
MEL - 0101	1	19-Jul-15	Chlamydomonas spp.	200	0.61
MEL - 0101	1	19-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0101	1	19-Jul-15	Small chrysophyceae	208336	3.92
MEL - 0101	1	19-Jul-15	Large chrysophyceae	14368	2.58
MEL - 0101	1	19-Jul-15	Chrysochromulina parva Lackey	919552	60.14
MEL - 0101	1	19-Jul-15	Chrysococcus sp.	675296	41.60
MEL - 0101	1	19-Jul-15	Chrysostephanospaera globulifera Scherffel	21552	8.50
MEL - 0101	1	19-Jul-15	Kephyrion sp.	21552	0.22
MEL - 0101	1	19-Jul-15	Spiniferomonas sirrata**********	21552	1.98
MEL - 0101	1	19-Jul-15	Dinobryon borgei Lemmermann	14368	0.75
MEL - 0101	1	19-Jul-15	Dinobryon bavaricum Imhof	100576	22.75
MEL - 0101	1	19-Jul-15	Dinobryon bavaricum Imhof	5200	11.05
MEL - 0101	1	19-Jul-15	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0101	1	19-Jul-15	Dinobryon sertularia Ehrenberg	2000	6.78
MEL - 0101	1	19-Jul-15	Dinobryon sociale Ehrenberg	129312	29.25
MEL - 0101	1	19-Jul-15	Dinobryon sociale Ehrenberg	3000	3.68
MEL - 0101	1	19-Jul-15	Chrysolkos skuja (Nauwerck) Willen	43104	1.27
MEL - 0101	1	19-Jul-15	Uroglena volvox Ehrenberg	1810368	204.75
MEL - 0101	1	19-Jul-15	Uroglena volvox Ehrenberg	1200	13.56
MEL - 0101	1	19-Jul-15	Bitrichia chodatii (Reverdin) Chodat	50288	2.57
MEL - 0101	1	19-Jul-15	Chrysochromulina laurentiana Kling	136496	52.10
MEL - 0101	1	19-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	122128	4.18
MEL - 0101	1	19-Jul-15	Pteridomonas sp.	7184	1.71
MEL - 0101	1	19-Jul-15	Cyclotella stelligera Cleve and Grunow	1000	1.69
MEL - 0101	1	19-Jul-15	Rhizosolenia eriense H.L. Smith	330464	25.71
MEL - 0101	1	19-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	1600	1.24
MEL - 0101	1	19-Jul-15	Tabellaria flocculsa (Roth) Kutzing	1600	1.96
MEL - 0101	1	19-Jul-15	Synedra acus Kutzing	30000	2.80
MEL - 0101	1	19-Jul-15	Asterionella formosa Hassall	4400	0.44
MEL - 0101	1	19-Jul-15	Cyclotella michiganiana Skvortzow	86208	2.11
MEL - 0101	1	19-Jul-15	Rhodomonas minuta Skuja	57472	8.67

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101	1	19-Jul-15	Cryptomonas erosa Ehrenberg	5800	7.08
MEL - 0101	1	19-Jul-15	Cryptomonas reflexa (Marsson) Skuja	1400	1.03
MEL - 0101	1	19-Jul-15	Cryptomonas rostratiformis Skuja	1200	2.71
MEL - 0101	1	19-Jul-15	Katablepharis ovalis Skuja	35920	1.45
MEL - 0101	1	19-Jul-15	Gymnodinium helveticum Penard	1600	41.47
MEL - 0101	1	19-Jul-15	Gymnodinium sp.	2200	34.32
MEL - 0101	1	19-Jul-15	Peridinium willei Huitfeldt-Kaas	200	5.13
MEL - 0101	1	19-Jul-15	Peridinium pusillum (Penard) Lemmermann	1800	3.86
MEL - 0101	1	19-Jul-15	Peridinium aciculiferum Lemmermann	1200	10.86
MEL - 0101	1	14-Aug-15	Pyramidomonas tetrarhynchus Schmarda	400	0.20
MEL - 0101	1	14-Aug-15	Chlamydomonas spp.	7184	0.17
MEL - 0101	1	14-Aug-15	Oocystis lacustris Chodat	21552	0.57
MEL - 0101	1	14-Aug-15	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.99
MEL - 0101	1	14-Aug-15	Crucigenia quadrata Morr.	28736	0.04
MEL - 0101	1	14-Aug-15	Elakatothrix gelatinosa Willen	50288	0.87
MEL - 0101	1	14-Aug-15	Micrasterias sp.	200	0.37
MEL - 0101	1	14-Aug-15	Staurodesmus extensus (Andersson) Teiling	200	0.12
MEL - 0101	1	14-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0101	1	14-Aug-15	Mougeotia sp.	21552	4.88
MEL - 0101	1	14-Aug-15	Botryococcus braunii Kutzing	800	0.42
MEL - 0101	1	14-Aug-15	Monomastix minuta Skuja	7184	0.14
MEL - 0101	1	14-Aug-15	Small chrysophyceae	380752	5.37
MEL - 0101	1	14-Aug-15	Large chrysophyceae	7184	6.50
MEL - 0101	1	14-Aug-15	Chrysochromulina parva Lackey	100576	6.58
MEL - 0101	1	14-Aug-15	Chrysococcus sp.	423856	21.62
MEL - 0101	1	14-Aug-15	Kephyrion sp.	93392	1.20
MEL - 0101	1	14-Aug-15	Dinobryon bavaricum Imhof	136496	30.88
MEL - 0101	1	14-Aug-15	Dinobryon bavaricum Imhof	600	1.19
MEL - 0101	1	14-Aug-15	Dinobryon sertularia Ehrenberg	28736	7.17
MEL - 0101	1	14-Aug-15	Dinobryon sertularia Ehrenberg	200	0.68
MEL - 0101	1	14-Aug-15	Dinobryon sociale Ehrenberg	136496	30.88
MEL - 0101	1	14-Aug-15	Dinobryon sociale Ehrenberg	600	0.74

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101	1	14-Aug-15	Chrysolkos skuja (Nauwerck) Willen	50288	1.72
MEL - 0101	1	14-Aug-15	Uroglena volvox Ehrenberg	280176	31.69
MEL - 0101	1	14-Aug-15	Chrysochromulina laurentiana Kling	71840	28.35
MEL - 0101	1	14-Aug-15	Stichogloea spp.	43104	2.17
MEL - 0101	1	14-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	129312	3.88
MEL - 0101	1	14-Aug-15	Pteridomonas sp.	7184	1.71
MEL - 0101	1	14-Aug-15	Cyclotella stelligera Cleve and Grunow	4200	7.97
MEL - 0101	1	14-Aug-15	Cyclotella ocellata Pant.	7184	0.51
MEL - 0101	1	14-Aug-15	Rhizosolenia eriense H.L. Smith	100576	6.40
MEL - 0101	1	14-Aug-15	Synedra acus Kutzing	6200	0.59
MEL - 0101	1	14-Aug-15	Asterionella formosa Hassall	2600	0.26
MEL - 0101	1	14-Aug-15	Cyclotella michiganiana Skvortzow	150864	2.88
MEL - 0101	1	14-Aug-15	Rhodomonas minuta Skuja	57472	8.67
MEL - 0101	1	14-Aug-15	Cryptomonas erosa Ehrenberg	2000	2.37
MEL - 0101	1	14-Aug-15	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0101	1	14-Aug-15	Cryptomonas reflexa (Marsson) Skuja	600	0.40
MEL - 0101	1	14-Aug-15	Cryptomonas rostratiformis Skuja	600	1.23
MEL - 0101	1	14-Aug-15	Katablepharis ovalis Skuja	7184	0.35
MEL - 0101	1	14-Aug-15	Gymnodinium helveticum Penard	400	9.42
MEL - 0101	1	14-Aug-15	Gymnodinium sp.	2400	45.16
MEL - 0101	1	14-Aug-15	Peridinium pusillum (Penard) Lemmermann	2200	3.61
MEL - 0101	1	14-Aug-15	Peridinium aciculiferum Lemmermann	800	7.24
MEL - 0101	1	19-Sep-15	Chlamydomonas spp.	14368	0.38
MEL - 0101	1	19-Sep-15	Oocystis lacustris Chodat	158048	3.62
MEL - 0101	1	19-Sep-15	Dictyosphaerium simplex Sukja	14368	0.07
MEL - 0101	1	19-Sep-15	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL - 0101	1	19-Sep-15	Elakatothrix gelatinosa Willen	71840	1.91
MEL - 0101	1	19-Sep-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0101	1	19-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0101	1	19-Sep-15	Botryococcus braunii Kutzing	400	0.36
MEL - 0101	1	19-Sep-15	Monomastix minuta Skuja	7184	0.11
MEL - 0101	1	19-Sep-15	Small chrysophyceae	502880	4.63

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101	1	19-Sep-15	Large chrysophyceae	28736	4.94
MEL - 0101	1	19-Sep-15	Chrysochromulina parva Lackey	122128	7.52
MEL - 0101	1	19-Sep-15	Chrysococcus sp.	574720	33.28
MEL - 0101	1	19-Sep-15	Chrysostephanospaera globulifera Scherffel	7184	1.65
MEL - 0101	1	19-Sep-15	Kephyrion boreale Skuja	14368	1.32
MEL - 0101	1	19-Sep-15	Kephyrion sp.	136496	2.57
MEL - 0101	1	19-Sep-15	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0101	1	19-Sep-15	Dinobryon bavaricum Imhof	14368	3.25
MEL - 0101	1	19-Sep-15	Dinobryon bavaricum Imhof	2200	4.38
MEL - 0101	1	19-Sep-15	Dinobryon sertularia Ehrenberg	200	1.02
MEL - 0101	1	19-Sep-15	Dinobryon sociale Ehrenberg	21552	4.71
MEL - 0101	1	19-Sep-15	Dinobryon sociale Ehrenberg	800	0.98
MEL - 0101	1	19-Sep-15	Uroglena volvox Ehrenberg	107760	12.19
MEL - 0101	1	19-Sep-15	Chrysochromulina laurentiana Kling	100576	38.39
MEL - 0101	1	19-Sep-15	Stichogloea spp.	14368	0.76
MEL - 0101	1	19-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	237072	10.53
MEL - 0101	1	19-Sep-15	Cyclotella stelligera Cleve and Grunow	3200	5.82
MEL - 0101	1	19-Sep-15	Cyclotella pseudostelligera	7184	3.55
MEL - 0101	1	19-Sep-15	Cyclotella ocellata Pant.	7184	0.48
MEL - 0101	1	19-Sep-15	Rhizosolenia eriense H.L. Smith	7184	0.61
MEL - 0101	1	19-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	4800	4.03
MEL - 0101	1	19-Sep-15	Tabellaria flocculsa (Roth) Kutzing	200	0.23
MEL - 0101	1	19-Sep-15	Synedra acus Kutzing	6200	0.59
MEL - 0101	1	19-Sep-15	Asterionella formosa Hassall	175800	17.67
MEL - 0101	1	19-Sep-15	Cyclotella michiganiana Skvortzow	86208	1.65
MEL - 0101	1	19-Sep-15	Rhopalodia gibba (Ehrenberg) O. Muller	200	6.67
MEL - 0101	1	19-Sep-15	Rhodomonas minuta Skuja	251440	36.96
MEL - 0101	1	19-Sep-15	Cryptomonas erosa Ehrenberg	2400	2.80
MEL - 0101	1	19-Sep-15	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0101	1	19-Sep-15	Cryptomonas reflexa (Marsson) Skuja	1200	0.88
MEL - 0101	1	19-Sep-15	Cryptomonas rostratiformis Skuja	200	0.40
MEL - 0101	1	19-Sep-15	Katablepharis ovalis Skuja	50288	2.30

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101	1	19-Sep-15	Gymnodinium helveticum Penard	400	8.67
MEL - 0101	1	19-Sep-15	Peridinium pusillum (Penard) Lemmermann	2000	3.28
MEL - 0101	1	19-Sep-15	Peridinium aciculiferum Lemmermann	1200	10.86
MEL - 0101	2	19-Sep-15	Snowella sp	400	0.21
MEL - 0101	2	19-Sep-15	Carteria spp.	7184	1.08
MEL - 0101	2	19-Sep-15	Chlamydomonas spp.	7184	0.19
MEL - 0101	2	19-Sep-15	Sphaerocystis schroeteri Chodat	35920	1.20
MEL - 0101	2	19-Sep-15	Pediastrum tetras (Ehrenberg) Ralfs	28736	0.32
MEL - 0101	2	19-Sep-15	Oocystis lacustris Chodat	35920	0.93
MEL - 0101	2	19-Sep-15	Elakatothrix gelatinosa Willen	50288	1.34
MEL - 0101	2	19-Sep-15	Staurodesmus extensus (Andersson) Teiling	400	0.21
MEL - 0101	2	19-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	64656	2.44
MEL - 0101	2	19-Sep-15	Mougeotia sp.	7184	1.63
MEL - 0101	2	19-Sep-15	Mougeotia sp.	1200	1.40
MEL - 0101	2	19-Sep-15	Scenedesmus ecornis	28736	0.45
MEL - 0101	2	19-Sep-15	Small chrysophyceae	395120	3.64
MEL - 0101	2	19-Sep-15	Large chrysophyceae	93392	16.06
MEL - 0101	2	19-Sep-15	Chrysochromulina parva Lackey	323280	19.91
MEL - 0101	2	19-Sep-15	Chrysococcus sp.	272992	15.81
MEL - 0101	2	19-Sep-15	Kephyrion boreale Skuja	14368	1.79
MEL - 0101	2	19-Sep-15	Kephyrion sp.	57472	1.08
MEL - 0101	2	19-Sep-15	Spiniferomonas sirrata**********	7184	0.63
MEL - 0101	2	19-Sep-15	Mallomonas crassisquama (Asmund) Fott	1000	1.05
MEL - 0101	2	19-Sep-15	Dinobryon borgei Lemmermann	7184	0.44
MEL - 0101	2	19-Sep-15	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0101	2	19-Sep-15	Dinobryon bavaricum Imhof	1800	3.58
MEL - 0101	2	19-Sep-15	Dinobryon sociale Ehrenberg	43104	9.67
MEL - 0101	2	19-Sep-15	Dinobryon sociale Ehrenberg	400	0.49
MEL - 0101	2	19-Sep-15	Uroglena volvox Ehrenberg	201152	22.75
MEL - 0101	2	19-Sep-15	Chrysosphaerella longispina Lauterborn	200	3.52
MEL - 0101	2	19-Sep-15	Chrysochromulina laurentiana Kling	28736	10.97
MEL - 0101	2	19-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	466960	20.73

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101	2	19-Sep-15	Cyclotella stelligera Cleve and Grunow	3400	6.18
MEL - 0101	2	19-Sep-15	Cyclotella ocellata Pant.	28736	1.93
MEL - 0101	2	19-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	600	0.50
MEL - 0101	2	19-Sep-15	Tabellaria flocculsa (Roth) Kutzing	200	0.25
MEL - 0101	2	19-Sep-15	Fragilaria crotonensis Kitton	400	0.14
MEL - 0101	2	19-Sep-15	Synedra acus Kutzing	7200	0.69
MEL - 0101	2	19-Sep-15	Asterionella formosa Hassall	14400	1.45
MEL - 0101	2	19-Sep-15	Cyclotella michiganiana Skvortzow	50288	0.96
MEL - 0101	2	19-Sep-15	Rhodomonas minuta Skuja	186784	27.46
MEL - 0101	2	19-Sep-15	Cryptomonas erosa Ehrenberg	3800	4.39
MEL - 0101	2	19-Sep-15	Cryptomonas reflexa (Marsson) Skuja	400	0.29
MEL - 0101	2	19-Sep-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0101	2	19-Sep-15	Katablepharis ovalis Skuja	7184	0.33
MEL - 0101	2	19-Sep-15	Gymnodinium helveticum Penard	200	4.81
MEL - 0101	2	19-Sep-15	Gymnodinium sp.	400	3.72
MEL - 0101	2	19-Sep-15	Peridinium willei Huitfeldt-Kaas	200	5.30
MEL - 0101	2	19-Sep-15	Peridinium pusillum (Penard) Lemmermann	2000	3.28
MEL - 0101	2	19-Sep-15	Peridinium aciculiferum Lemmermann	2000	18.10
MEL - 0102	1	19-Jul-15	Chroococcus limneticus Lemmermann	28736	1.11
MEL - 0102	1	19-Jul-15	Chlamydomonas spp.	7184	0.20
MEL - 0102	1	19-Jul-15	Elakatothrix gelatinosa Willen	14368	0.35
MEL - 0102	1	19-Jul-15	Euastrum spp.	200	0.37
MEL - 0102	1	19-Jul-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0102	1	19-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0102	1	19-Jul-15	Mougeotia sp.	7184	1.63
MEL - 0102	1	19-Jul-15	Small chrysophyceae	330464	6.21
MEL - 0102	1	19-Jul-15	Large chrysophyceae	21552	3.87
MEL - 0102	1	19-Jul-15	Chrysochromulina parva Lackey	826160	54.03
MEL - 0102	1	19-Jul-15	Chrysococcus sp.	581904	38.06
MEL - 0102	1	19-Jul-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0102	1	19-Jul-15	Kephyrion sp.	114944	1.62
MEL - 0102	1	19-Jul-15	Spiniferomonas sirrata**********	14368	2.16

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	1	19-Jul-15	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0102	1	19-Jul-15	Dinobryon borgei Lemmermann	35920	1.86
MEL - 0102	1	19-Jul-15	Dinobryon bavaricum Imhof	143680	32.50
MEL - 0102	1	19-Jul-15	Dinobryon bavaricum Imhof	5400	13.69
MEL - 0102	1	19-Jul-15	Dinobryon sertularia Ehrenberg	50288	11.38
MEL - 0102	1	19-Jul-15	Dinobryon sertularia Ehrenberg	3200	10.85
MEL - 0102	1	19-Jul-15	Dinobryon sociale Ehrenberg	158048	35.75
MEL - 0102	1	19-Jul-15	Dinobryon sociale Ehrenberg	2200	2.70
MEL - 0102	1	19-Jul-15	Epiphyxis sp.	21552	1.73
MEL - 0102	1	19-Jul-15	Chrysolkos skuja (Nauwerck) Willen	93392	3.01
MEL - 0102	1	19-Jul-15	Uroglena volvox Ehrenberg	2090544	236.44
MEL - 0102	1	19-Jul-15	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL - 0102	1	19-Jul-15	Chrysochromulina laurentiana Kling	71840	27.42
MEL - 0102	1	19-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.98
MEL - 0102	1	19-Jul-15	Cyclotella pseudostelligera	600	1.09
MEL - 0102	1	19-Jul-15	Cyclotella ocellata Pant.	14368	1.05
MEL - 0102	1	19-Jul-15	Rhizosolenia eriense H.L. Smith	481328	37.45
MEL - 0102	1	19-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	1400	1.04
MEL - 0102	1	19-Jul-15	Fragilaria crotonensis Kitton	4000	1.44
MEL - 0102	1	19-Jul-15	Synedra acus Kutzing	40200	3.92
MEL - 0102	1	19-Jul-15	Asterionella formosa Hassall	1400	0.12
MEL - 0102	1	19-Jul-15	Cyclotella michiganiana Skvortzow	100576	2.46
MEL - 0102	1	19-Jul-15	Rhodomonas minuta Skuja	50288	7.58
MEL - 0102	1	19-Jul-15	Cryptomonas erosa Ehrenberg	8000	9.73
MEL - 0102	1	19-Jul-15	Cryptomonas reflexa (Marsson) Skuja	3000	2.20
MEL - 0102	1	19-Jul-15	Cryptomonas rostratiformis Skuja	600	1.27
MEL - 0102	1	19-Jul-15	Katablepharis ovalis Skuja	35920	1.45
MEL - 0102	1	19-Jul-15	Gymnodinium helveticum Penard	1400	21.84
MEL - 0102	1	19-Jul-15	Gymnodinium helveticum Penard	1600	37.70
MEL - 0102	1	19-Jul-15	Peridinium willei Huitfeldt-Kaas	600	13.47
MEL - 0102	1	19-Jul-15	Peridinium pusillum (Penard) Lemmermann	600	1.00
MEL - 0102	1	19-Jul-15	Peridinium aciculiferum Lemmermann	2400	21.71

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	2	19-Jul-15	Chlamydomonas spp.	14368	0.41
MEL - 0102	2	19-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0102	2	19-Jul-15	Mougeotia sp.	14368	3.25
MEL - 0102	2	19-Jul-15	Small chrysophyceae	294544	5.54
MEL - 0102	2	19-Jul-15	Large chrysophyceae	86208	15.48
MEL - 0102	2	19-Jul-15	Chrysochromulina parva Lackey	603456	39.47
MEL - 0102	2	19-Jul-15	Chrysococcus sp.	301728	19.73
MEL - 0102	2	19-Jul-15	Chrysostephanospaera globulifera Scherffel	35920	12.82
MEL - 0102	2	19-Jul-15	Kephyrion sp.	100576	1.73
MEL - 0102	2	19-Jul-15	Spiniferomonas sirrata**********	7184	0.81
MEL - 0102	2	19-Jul-15	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0102	2	19-Jul-15	Dinobryon borgei Lemmermann	7184	0.44
MEL - 0102	2	19-Jul-15	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0102	2	19-Jul-15	Dinobryon bavaricum Imhof	93392	21.13
MEL - 0102	2	19-Jul-15	Dinobryon bavaricum Imhof	5600	11.15
MEL - 0102	2	19-Jul-15	Dinobryon sertularia Ehrenberg	86208	19.50
MEL - 0102	2	19-Jul-15	Dinobryon sertularia Ehrenberg	2800	9.49
MEL - 0102	2	19-Jul-15	Dinobryon sociale Ehrenberg	107760	24.38
MEL - 0102	2	19-Jul-15	Dinobryon sociale Ehrenberg	2200	2.70
MEL - 0102	2	19-Jul-15	Chrysolkos skuja (Nauwerck) Willen	71840	2.26
MEL - 0102	2	19-Jul-15	Uroglena volvox Ehrenberg	2011520	227.50
MEL - 0102	2	19-Jul-15	Uroglena volvox Ehrenberg	200	4.72
MEL - 0102	2	19-Jul-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.37
MEL - 0102	2	19-Jul-15	Chrysochromulina laurentiana Kling	100576	39.69
MEL - 0102	2	19-Jul-15	Stichogloea spp.	43104	2.17
MEL - 0102	2	19-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	107760	3.30
MEL - 0102	2	19-Jul-15	Cyclotella stelligera Cleve and Grunow	1000	1.82
MEL - 0102	2	19-Jul-15	Cyclotella ocellata Pant.	28736	3.00
MEL - 0102	2	19-Jul-15	Rhizosolenia eriense H.L. Smith	431040	33.53
MEL - 0102	2	19-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	1400	1.06
MEL - 0102	2	19-Jul-15	Fragilaria crotonensis Kitton	16400	5.63
MEL - 0102	2	19-Jul-15	Synedra acus Kutzing	10800	1.09

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	2	19-Jul-15	Asterionella formosa Hassall	4200	0.44
MEL - 0102	2	19-Jul-15	Cyclotella michiganiana Skvortzow	100576	2.32
MEL - 0102	2	19-Jul-15	Rhodomonas minuta Skuja	43104	6.18
MEL - 0102	2	19-Jul-15	Cryptomonas erosa Ehrenberg	4800	5.79
MEL - 0102	2	19-Jul-15	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL - 0102	2	19-Jul-15	Cryptomonas rostratiformis Skuja	600	1.27
MEL - 0102	2	19-Jul-15	Katablepharis ovalis Skuja	14368	0.66
MEL - 0102	2	19-Jul-15	Gymnodinium helveticum Penard	600	14.14
MEL - 0102	2	19-Jul-15	Gymnodinium sp.	1800	25.45
MEL - 0102	2	19-Jul-15	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL - 0102	2	19-Jul-15	Peridinium pusillum (Penard) Lemmermann	1800	3.79
MEL - 0102	2	19-Jul-15	Peridinium aciculiferum Lemmermann	1600	14.48
MEL - 0102	1	14-Aug-15	Aphanothece sp.	28736	1.61
MEL - 0102	1	14-Aug-15	Oocystis lacustris Chodat	28736	0.81
MEL - 0102	1	14-Aug-15	Dictyosphaerium simplex Sukja	14368	0.07
MEL - 0102	1	14-Aug-15	Crucigenia quadrata Morr.	28736	0.04
MEL - 0102	1	14-Aug-15	Quadrigula closterioides (Bohl.) Printz	86208	2.46
MEL - 0102	1	14-Aug-15	Elakatothrix gelatinosa Willen	14368	0.20
MEL - 0102	1	14-Aug-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0102	1	14-Aug-15	Staurodesmus paradoxum Meyen	200	1.01
MEL - 0102	1	14-Aug-15	Staurodesmus bullardii G.M. Smith	200	0.46
MEL - 0102	1	14-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0102	1	14-Aug-15	Mougeotia sp.	107760	24.38
MEL - 0102	1	14-Aug-15	Mougeotia sp.	200	0.31
MEL - 0102	1	14-Aug-15	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL - 0102	1	14-Aug-15	Ankistrodesmus spiralis Lemmermann	28736	1.54
MEL - 0102	1	14-Aug-15	Monomastix minuta Skuja	7184	0.13
MEL - 0102	1	14-Aug-15	Euglena acus Ehrenberg	200	1.69
MEL - 0102	1	14-Aug-15	Small chrysophyceae	510064	9.59
MEL - 0102	1	14-Aug-15	Large chrysophyceae	28736	5.16
MEL - 0102	1	14-Aug-15	Chrysochromulina parva Lackey	366384	23.96
MEL - 0102	1	14-Aug-15	Chrysococcus sp.	402304	26.31

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	1	14-Aug-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0102	1	14-Aug-15	Kephyrion sp.	86208	1.22
MEL - 0102	1	14-Aug-15	Spiniferomonas sirrata**********	14368	2.16
MEL - 0102	1	14-Aug-15	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0102	1	14-Aug-15	Dinobryon borgei Lemmermann	7184	0.37
MEL - 0102	1	14-Aug-15	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0102	1	14-Aug-15	Dinobryon bavaricum Imhof	43104	9.75
MEL - 0102	1	14-Aug-15	Dinobryon bavaricum Imhof	3400	6.77
MEL - 0102	1	14-Aug-15	Dinobryon sociale Ehrenberg	193968	43.88
MEL - 0102	1	14-Aug-15	Dinobryon sociale Ehrenberg	800	0.98
MEL - 0102	1	14-Aug-15	Chrysolkos skuja (Nauwerck) Willen	28736	0.93
MEL - 0102	1	14-Aug-15	Uroglena volvox Ehrenberg	589088	66.63
MEL - 0102	1	14-Aug-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0102	1	14-Aug-15	Chrysochromulina laurentiana Kling	93392	35.65
MEL - 0102	1	14-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.74
MEL - 0102	1	14-Aug-15	Pteridomonas sp.	7184	1.59
MEL - 0102	1	14-Aug-15	Cyclotella stelligera Cleve and Grunow	2800	4.60
MEL - 0102	1	14-Aug-15	Cyclotella ocellata Pant.	14368	0.97
MEL - 0102	1	14-Aug-15	Rhizosolenia eriense H.L. Smith	136496	10.62
MEL - 0102	1	14-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	1400	1.07
MEL - 0102	1	14-Aug-15	Fragilaria crotonensis Kitton	3000	1.11
MEL - 0102	1	14-Aug-15	Synedra acus Kutzing	10800	1.03
MEL - 0102	1	14-Aug-15	Asterionella formosa Hassall	4000	0.39
MEL - 0102	1	14-Aug-15	Cyclotella michiganiana Skvortzow	172416	4.22
MEL - 0102	1	14-Aug-15	Rhopalodia gibba (Ehrenberg) O. Muller	200	6.97
MEL - 0102	1	14-Aug-15	Rhodomonas minuta Skuja	64656	9.75
MEL - 0102	1	14-Aug-15	Cryptomonas erosa Ehrenberg	4600	5.41
MEL - 0102	1	14-Aug-15	Cryptomonas reflexa (Marsson) Skuja	1600	1.17
MEL - 0102	1	14-Aug-15	Cryptomonas rostratiformis Skuja	1200	2.63
MEL - 0102	1	14-Aug-15	Katablepharis ovalis Skuja	14368	0.66
MEL - 0102	1	14-Aug-15	Gymnodinium sp.	2400	22.09
MEL - 0102	1	14-Aug-15	Peridinium pusillum (Penard) Lemmermann	3200	5.32

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	1	19-Sep-15	Nostoc sp.	200	0.47
MEL - 0102	1	19-Sep-15	Chlamydomonas spp.	14368	0.37
MEL - 0102	1	19-Sep-15	Sphaerocystis schroeteri Chodat	114944	3.57
MEL - 0102	1	19-Sep-15	Oocystis lacustris Chodat	7184	0.20
MEL - 0102	1	19-Sep-15	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.32
MEL - 0102	1	19-Sep-15	Elakatothrix gelatinosa Willen	14368	0.23
MEL - 0102	1	19-Sep-15	Staurodesmus extensus (Andersson) Teiling	800	0.33
MEL - 0102	1	19-Sep-15	Staurodesmus bullardii G.M. Smith	400	1.10
MEL - 0102	1	19-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0102	1	19-Sep-15	Botryococcus braunii Kutzing	1000	1.44
MEL - 0102	1	19-Sep-15	Euglena acus Ehrenberg	200	1.87
MEL - 0102	1	19-Sep-15	Small chrysophyceae	481328	8.28
MEL - 0102	1	19-Sep-15	Large chrysophyceae	14368	2.58
MEL - 0102	1	19-Sep-15	Chrysochromulina parva Lackey	431040	28.19
MEL - 0102	1	19-Sep-15	Chrysococcus sp.	531616	34.77
MEL - 0102	1	19-Sep-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0102	1	19-Sep-15	Kephyrion sp.	143680	2.47
MEL - 0102	1	19-Sep-15	Spiniferomonas sirrata**********	14368	1.71
MEL - 0102	1	19-Sep-15	Dinobryon borgei Lemmermann	7184	0.37
MEL - 0102	1	19-Sep-15	Dinobryon mucronutom Nygaard	21552	2.82
MEL - 0102	1	19-Sep-15	Dinobryon bavaricum Imhof	86208	19.50
MEL - 0102	1	19-Sep-15	Dinobryon bavaricum Imhof	3200	6.37
MEL - 0102	1	19-Sep-15	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0102	1	19-Sep-15	Dinobryon sociale Ehrenberg	14368	3.25
MEL - 0102	1	19-Sep-15	Dinobryon sociale Ehrenberg	400	0.49
MEL - 0102	1	19-Sep-15	Chrysolkos skuja (Nauwerck) Willen	14368	0.49
MEL - 0102	1	19-Sep-15	Uroglena volvox Ehrenberg	43104	4.88
MEL - 0102	1	19-Sep-15	Chrysochromulina laurentiana Kling	79024	31.18
MEL - 0102	1	19-Sep-15	Stichogloea spp.	28736	1.45
MEL - 0102	1	19-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	136496	4.67
MEL - 0102	1	19-Sep-15	Cyclotella stelligera Cleve and Grunow	3800	5.97
MEL - 0102	1	19-Sep-15	Cyclotella ocellata Pant.	14368	1.24

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	1	19-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	9000	6.53
MEL - 0102	1	19-Sep-15	Fragilaria crotonensis Kitton	2600	0.96
MEL - 0102	1	19-Sep-15	Synedra acus Kutzing	2200	0.21
MEL - 0102	1	19-Sep-15	Asterionella formosa Hassall	148600	14.47
MEL - 0102	1	19-Sep-15	Cyclotella michiganiana Skvortzow	100576	2.46
MEL - 0102	1	19-Sep-15	Rhopalodia gibba (Ehrenberg) O. Muller	200	11.15
MEL - 0102	1	19-Sep-15	Rhodomonas minuta Skuja	172416	26.00
MEL - 0102	1	19-Sep-15	Cryptomonas erosa Ehrenberg	5800	7.06
MEL - 0102	1	19-Sep-15	Cryptomonas reflexa (Marsson) Skuja	800	0.56
MEL - 0102	1	19-Sep-15	Cryptomonas rostratiformis Skuja	800	1.62
MEL - 0102	1	19-Sep-15	Katablepharis ovalis Skuja	14368	0.66
MEL - 0102	1	19-Sep-15	Gymnodinium sp.	800	12.48
MEL - 0102	1	19-Sep-15	Peridinium willei Huitfeldt-Kaas	600	13.47
MEL - 0102	1	19-Sep-15	Peridinium pusillum (Penard) Lemmermann	400	0.67
MEL - 0102	1	19-Sep-15	Peridinium aciculiferum Lemmermann	1400	12.67
MEL - 0103	1	19-Jul-15	Chroococcus limneticus Lemmermann	28736	1.11
MEL - 0103	1	19-Jul-15	Snowella sp	200	0.20
MEL - 0103	1	19-Jul-15	Pyramidomonas tetrarhynchus Schmarda	200	0.15
MEL - 0103	1	19-Jul-15	Oocystis lacustris Chodat	35920	1.02
MEL - 0103	1	19-Jul-15	Staurodesmus paradoxum Meyen	200	1.21
MEL - 0103	1	19-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0103	1	19-Jul-15	Mougeotia sp.	7184	1.68
MEL - 0103	1	19-Jul-15	Mougeotia sp.	3200	12.82
MEL - 0103	1	19-Jul-15	Monomastix minuta Skuja	7184	0.28
MEL - 0103	1	19-Jul-15	Small chrysophyceae	201152	3.14
MEL - 0103	1	19-Jul-15	Large chrysophyceae	21552	3.87
MEL - 0103	1	19-Jul-15	Chrysochromulina parva Lackey	898000	58.73
MEL - 0103	1	19-Jul-15	Chrysococcus sp.	704032	46.04
MEL - 0103	1	19-Jul-15	Kephyrion boreale Skuja	21552	2.56
MEL - 0103	1	19-Jul-15	Kephyrion sp.	93392	1.46
MEL - 0103	1	19-Jul-15	Spiniferomonas sirrata**********	28736	4.32
MEL - 0103	1	19-Jul-15	Mallomonas crassisquama (Asmund) Fott	200	0.21

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103	1	19-Jul-15	Dinobryon borgei Lemmermann	57472	3.55
MEL - 0103	1	19-Jul-15	Dinobryon bavaricum Imhof	150864	34.13
MEL - 0103	1	19-Jul-15	Dinobryon bavaricum Imhof	3000	5.97
MEL - 0103	1	19-Jul-15	Dinobryon sertularia Ehrenberg	57472	13.00
MEL - 0103	1	19-Jul-15	Dinobryon sertularia Ehrenberg	3400	11.53
MEL - 0103	1	19-Jul-15	Dinobryon sociale Ehrenberg	93392	21.13
MEL - 0103	1	19-Jul-15	Dinobryon sociale Ehrenberg	2600	3.19
MEL - 0103	1	19-Jul-15	Chrysolkos skuja (Nauwerck) Willen	50288	1.72
MEL - 0103	1	19-Jul-15	Uroglena volvox Ehrenberg	2033072	229.94
MEL - 0103	1	19-Jul-15	Chrysosphaerella longispina Lauterborn	35920	18.81
MEL - 0103	1	19-Jul-15	Bitrichia chodatii (Reverdin) Chodat	21552	1.08
MEL - 0103	1	19-Jul-15	Chrysochromulina laurentiana Kling	93392	38.08
MEL - 0103	1	19-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.85
MEL - 0103	1	19-Jul-15	Cyclotella stelligera Cleve and Grunow	600	0.94
MEL - 0103	1	19-Jul-15	Rhizosolenia eriense H.L. Smith	589088	45.83
MEL - 0103	1	19-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	4600	3.55
MEL - 0103	1	19-Jul-15	Tabellaria flocculsa (Roth) Kutzing	800	1.19
MEL - 0103	1	19-Jul-15	Fragilaria crotonensis Kitton	11200	4.03
MEL - 0103	1	19-Jul-15	Synedra acus Kutzing	15000	1.46
MEL - 0103	1	19-Jul-15	Asterionella formosa Hassall	2000	0.20
MEL - 0103	1	19-Jul-15	Cyclotella michiganiana Skvortzow	79024	1.94
MEL - 0103	1	19-Jul-15	Cyclotella bodanica Eulenst.	200	1.17
MEL - 0103	1	19-Jul-15	Rhodomonas minuta Skuja	64656	9.18
MEL - 0103	1	19-Jul-15	Cryptomonas erosa Ehrenberg	4600	5.60
MEL - 0103	1	19-Jul-15	Cryptomonas reflexa (Marsson) Skuja	1400	0.98
MEL - 0103	1	19-Jul-15	Cryptomonas rostratiformis Skuja	400	0.85
MEL - 0103	1	19-Jul-15	Katablepharis ovalis Skuja	21552	0.99
MEL - 0103	1	19-Jul-15	Gymnodinium helveticum Penard	800	18.85
MEL - 0103	1	19-Jul-15	Gymnodinium sp.	1400	21.84
MEL - 0103	1	19-Jul-15	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL - 0103	1	19-Jul-15	Peridinium pusillum (Penard) Lemmermann	1400	3.00
MEL - 0103	1	19-Jul-15	Peridinium aciculiferum Lemmermann	1600	14.96

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103	1R	19-Jul-15	Chroococcus limneticus Lemmermann	28736	1.11
MEL - 0103	1R	19-Jul-15	Pyramidomonas tetrarhynchus Schmarda	200	0.13
MEL - 0103	1R	19-Jul-15	Oocystis lacustris Chodat	28736	0.81
MEL - 0103	1R	19-Jul-15	Elakatothrix gelatinosa Willen	14368	0.20
MEL - 0103	1R	19-Jul-15	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0103	1R	19-Jul-15	Staurodesmus paradoxum Meyen	600	3.63
MEL - 0103	1R	19-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0103	1R	19-Jul-15	Mougeotia sp.	14368	3.25
MEL - 0103	1R	19-Jul-15	Mougeotia sp.	2000	8.01
MEL - 0103	1R	19-Jul-15	Monomastix minuta Skuja	21552	0.84
MEL - 0103	1R	19-Jul-15	Small chrysophyceae	258624	4.03
MEL - 0103	1R	19-Jul-15	Large chrysophyceae	50288	9.03
MEL - 0103	1R	19-Jul-15	Chrysochromulina parva Lackey	854896	55.91
MEL - 0103	1R	19-Jul-15	Chrysococcus sp.	747136	48.86
MEL - 0103	1R	19-Jul-15	Chrysostephanospaera globulifera Scherffel	7184	2.15
MEL - 0103	1R	19-Jul-15	Kephyrion boreale Skuja	14368	1.71
MEL - 0103	1R	19-Jul-15	Kephyrion sp.	100576	1.57
MEL - 0103	1R	19-Jul-15	Spiniferomonas sirrata**********	50288	7.57
MEL - 0103	1R	19-Jul-15	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0103	1R	19-Jul-15	Dinobryon borgei Lemmermann	28736	1.78
MEL - 0103	1R	19-Jul-15	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0103	1R	19-Jul-15	Dinobryon bavaricum Imhof	186784	42.25
MEL - 0103	1R	19-Jul-15	Dinobryon bavaricum Imhof	2400	4.78
MEL - 0103	1R	19-Jul-15	Dinobryon sertularia Ehrenberg	71840	16.25
MEL - 0103	1R	19-Jul-15	Dinobryon sertularia Ehrenberg	4200	14.24
MEL - 0103	1R	19-Jul-15	Dinobryon sociale Ehrenberg	114944	26.00
MEL - 0103	1R	19-Jul-15	Dinobryon sociale Ehrenberg	3800	4.66
MEL - 0103	1R	19-Jul-15	Chrysolkos skuja (Nauwerck) Willen	35920	1.23
MEL - 0103	1R	19-Jul-15	Uroglena volvox Ehrenberg	1982784	224.25
MEL - 0103	1R	19-Jul-15	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL - 0103	1R	19-Jul-15	Chrysochromulina laurentiana Kling	86208	35.15
MEL - 0103	1R	19-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.21

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103	1R	19-Jul-15	Cyclotella stelligera Cleve and Grunow	400	0.63
MEL - 0103	1R	19-Jul-15	Cyclotella ocellata Pant.	7184	0.78
MEL - 0103	1R	19-Jul-15	Rhizosolenia eriense H.L. Smith	653744	50.86
MEL - 0103	1R	19-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	3000	2.32
MEL - 0103	1R	19-Jul-15	Fragilaria crotonensis Kitton	8600	3.10
MEL - 0103	1R	19-Jul-15	Synedra acus Kutzing	14000	1.36
MEL - 0103	1R	19-Jul-15	Asterionella formosa Hassall	3200	0.32
MEL - 0103	1R	19-Jul-15	Cyclotella michiganiana Skvortzow	100576	2.46
MEL - 0103	1R	19-Jul-15	Cyclotella bodanica Eulenst.	200	1.17
MEL - 0103	1R	19-Jul-15	Rhodomonas minuta Skuja	71840	10.20
MEL - 0103	1R	19-Jul-15	Cryptomonas erosa Ehrenberg	5200	6.33
MEL - 0103	1R	19-Jul-15	Cryptomonas reflexa (Marsson) Skuja	1000	0.70
MEL - 0103	1R	19-Jul-15	Cryptomonas rostratiformis Skuja	800	1.70
MEL - 0103	1R	19-Jul-15	Katablepharis ovalis Skuja	14368	0.66
MEL - 0103	1R	19-Jul-15	Gymnodinium helveticum Penard	1200	28.27
MEL - 0103	1R	19-Jul-15	Gymnodinium sp.	1400	21.84
MEL - 0103	1R	19-Jul-15	Peridinium willei Huitfeldt-Kaas	400	8.98
MEL - 0103	1R	19-Jul-15	Peridinium pusillum (Penard) Lemmermann	1000	2.14
MEL - 0103	1R	19-Jul-15	Peridinium aciculiferum Lemmermann	1800	16.83
MEL - 0103	1	14-Aug-15	Chroococcus limneticus Lemmermann	28736	1.11
MEL - 0103	1	14-Aug-15	Pyramidomonas tetrarhynchus Schmarda	400	0.21
MEL - 0103	1	14-Aug-15	Sphaerocystis schroeteri Chodat	28736	0.54
MEL - 0103	1	14-Aug-15	Oocystis lacustris Chodat	50288	2.53
MEL - 0103	1	14-Aug-15	Dictyosphaerium simplex Sukja	28736	0.14
MEL - 0103	1	14-Aug-15	Elakatothrix gelatinosa Willen	35920	0.56
MEL - 0103	1	14-Aug-15	Cosmarium sp.	200	0.20
MEL - 0103	1	14-Aug-15	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0103	1	14-Aug-15	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.41
MEL - 0103	1	14-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0103	1	14-Aug-15	Mougeotia sp.	57472	11.56
MEL - 0103	1	14-Aug-15	Small chrysophyceae	474144	6.69
MEL - 0103	1	14-Aug-15	Large chrysophyceae	21552	3.87

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103	1	14-Aug-15	Chrysochromulina parva Lackey	265808	17.38
MEL - 0103	1	14-Aug-15	Chrysococcus sp.	366384	23.96
MEL - 0103	1	14-Aug-15	Kephyrion boreale Skuja	28736	3.09
MEL - 0103	1	14-Aug-15	Kephyrion sp.	35920	0.51
MEL - 0103	1	14-Aug-15	Spiniferomonas sirrata**********	14368	2.16
MEL - 0103	1	14-Aug-15	Mallomonas crassisquama (Asmund) Fott	1600	1.73
MEL - 0103	1	14-Aug-15	Dinobryon borgei Lemmermann	28736	1.54
MEL - 0103	1	14-Aug-15	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0103	1	14-Aug-15	Dinobryon bavaricum Imhof	136496	30.88
MEL - 0103	1	14-Aug-15	Dinobryon bavaricum Imhof	2400	4.78
MEL - 0103	1	14-Aug-15	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0103	1	14-Aug-15	Dinobryon sertularia Ehrenberg	600	2.03
MEL - 0103	1	14-Aug-15	Dinobryon sociale Ehrenberg	86208	19.50
MEL - 0103	1	14-Aug-15	Dinobryon sociale Ehrenberg	400	0.49
MEL - 0103	1	14-Aug-15	Chrysolkos skuja (Nauwerck) Willen	28736	0.85
MEL - 0103	1	14-Aug-15	Uroglena volvox Ehrenberg	459776	52.00
MEL - 0103	1	14-Aug-15	Chrysosphaerella longispina Lauterborn	200	4.61
MEL - 0103	1	14-Aug-15	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL - 0103	1	14-Aug-15	Chrysochromulina laurentiana Kling	50288	19.19
MEL - 0103	1	14-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.69
MEL - 0103	1	14-Aug-15	Pteridomonas sp.	7184	1.33
MEL - 0103	1	14-Aug-15	Cyclotella stelligera Cleve and Grunow	3400	5.34
MEL - 0103	1	14-Aug-15	Cyclotella ocellata Pant.	14368	1.24
MEL - 0103	1	14-Aug-15	Rhizosolenia eriense H.L. Smith	150864	10.67
MEL - 0103	1	14-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	3800	2.97
MEL - 0103	1	14-Aug-15	Fragilaria crotonensis Kitton	3400	1.22
MEL - 0103	1	14-Aug-15	Synedra acus Kutzing	3600	0.35
MEL - 0103	1	14-Aug-15	Asterionella formosa Hassall	1600	0.16
MEL - 0103	1	14-Aug-15	Cyclotella michiganiana Skvortzow	129312	3.17
MEL - 0103	1	14-Aug-15	Cyclotella bodanica Eulenst.	7184	53.51
MEL - 0103	1	14-Aug-15	Rhodomonas minuta Skuja	100576	14.28
MEL - 0103	1	14-Aug-15	Cryptomonas erosa Ehrenberg	2000	2.43

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103	1	14-Aug-15	Cryptomonas reflexa (Marsson) Skuja	1600	1.09
MEL - 0103	1	14-Aug-15	Cryptomonas rostratiformis Skuja	400	0.82
MEL - 0103	1	14-Aug-15	Katablepharis ovalis Skuja	21552	0.99
MEL - 0103	1	14-Aug-15	Gymnodinium sp.	1800	28.08
MEL - 0103	1	14-Aug-15	Peridinium pusillum (Penard) Lemmermann	4400	9.44
MEL - 0103	1	14-Aug-15	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0104	1	19-Jul-15	Snowella sp	200	0.22
MEL - 0104	1	19-Jul-15	Sphaerocystis schroeteri Chodat	7184	0.10
MEL - 0104	1	19-Jul-15	Oocystis lacustris Chodat	7184	0.20
MEL - 0104	1	19-Jul-15	Elakatothrix gelatinosa Willen	35920	0.74
MEL - 0104	1	19-Jul-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0104	1	19-Jul-15	Mougeotia sp.	7184	1.53
MEL - 0104	1	19-Jul-15	Botryococcus braunii Kutzing	200	0.43
MEL - 0104	1	19-Jul-15	Small chrysophyceae	186784	2.63
MEL - 0104	1	19-Jul-15	Large chrysophyceae	43104	7.74
MEL - 0104	1	19-Jul-15	Chrysochromulina parva Lackey	625008	40.88
MEL - 0104	1	19-Jul-15	Chrysococcus sp.	136496	6.96
MEL - 0104	1	19-Jul-15	Kephyrion sp.	114944	1.98
MEL - 0104	1	19-Jul-15	Spiniferomonas sirrata**********	35920	3.30
MEL - 0104	1	19-Jul-15	Mallomonas crassisquama (Asmund) Fott	800	0.85
MEL - 0104	1	19-Jul-15	Dinobryon borgei Lemmermann	7184	0.37
MEL - 0104	1	19-Jul-15	Dinobryon bavaricum Imhof	193968	43.88
MEL - 0104	1	19-Jul-15	Dinobryon bavaricum Imhof	4600	15.59
MEL - 0104	1	19-Jul-15	Dinobryon sertularia Ehrenberg	43104	9.75
MEL - 0104	1	19-Jul-15	Dinobryon sertularia Ehrenberg	1200	4.07
MEL - 0104	1	19-Jul-15	Dinobryon sociale Ehrenberg	43104	9.75
MEL - 0104	1	19-Jul-15	Dinobryon sociale Ehrenberg	3000	5.97
MEL - 0104	1	19-Jul-15	Chrysolkos skuja (Nauwerck) Willen	79024	2.37
MEL - 0104	1	19-Jul-15	Ochromonas sp.	14368	1.88
MEL - 0104	1	19-Jul-15	Uroglena volvox Ehrenberg	2119280	239.69
MEL - 0104	1	19-Jul-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.39
MEL - 0104	1	19-Jul-15	Chrysochromulina laurentiana Kling	107760	41.13

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104	1	19-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	28736	1.49
MEL - 0104	1	19-Jul-15	Cyclotella stelligera Cleve and Grunow	1200	1.97
MEL - 0104	1	19-Jul-15	Cyclotella pseudostelligera	7184	3.87
MEL - 0104	1	19-Jul-15	Cyclotella ocellata Pant.	21552	1.86
MEL - 0104	1	19-Jul-15	Rhizosolenia eriense H.L. Smith	416672	32.42
MEL - 0104	1	19-Jul-15	Fragilaria crotonensis Kitton	22800	8.21
MEL - 0104	1	19-Jul-15	Synedra acus Kutzing	6200	0.59
MEL - 0104	1	19-Jul-15	Asterionella formosa Hassall	3800	0.38
MEL - 0104	1	19-Jul-15	Cyclotella michiganiana Skvortzow	100576	2.46
MEL - 0104	1	19-Jul-15	Rhodomonas minuta Skuja	93392	13.38
MEL - 0104	1	19-Jul-15	Cryptomonas erosa Ehrenberg	10200	12.61
MEL - 0104	1	19-Jul-15	Cryptomonas reflexa (Marsson) Skuja	1200	1.06
MEL - 0104	1	19-Jul-15	Cryptomonas rostratiformis Skuja	1200	2.63
MEL - 0104	1	19-Jul-15	Katablepharis ovalis Skuja	21552	0.87
MEL - 0104	1	19-Jul-15	Gymnodinium helveticum Penard	1200	28.27
MEL - 0104	1	19-Jul-15	Gymnodinium sp.	2000	37.63
MEL - 0104	1	19-Jul-15	Peridinium pusillum (Penard) Lemmermann	1400	3.17
MEL - 0104	1	19-Jul-15	Peridinium aciculiferum Lemmermann	4000	36.19
MEL - 0104	1	14-Aug-15	Chlamydomonas spp.	14368	0.34
MEL - 0104	1	14-Aug-15	Oocystis lacustris Chodat	57472	2.89
MEL - 0104	1	14-Aug-15	Crucigenia quadrata Morr.	28736	0.14
MEL - 0104	1	14-Aug-15	Elakatothrix gelatinosa Willen	28736	0.54
MEL - 0104	1	14-Aug-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0104	1	14-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0104	1	14-Aug-15	Mougeotia sp.	129312	28.28
MEL - 0104	1	14-Aug-15	Botryococcus braunii Kutzing	400	0.86
MEL - 0104	1	14-Aug-15	Small chrysophyceae	495696	6.99
MEL - 0104	1	14-Aug-15	Large chrysophyceae	28736	5.16
MEL - 0104	1	14-Aug-15	Chrysochromulina parva Lackey	172416	11.28
MEL - 0104	1	14-Aug-15	Chrysococcus sp.	251440	16.44
MEL - 0104	1	14-Aug-15	Chrysostephanospaera globulifera Scherffel	7184	2.00
MEL - 0104	1	14-Aug-15	Kephyrion boreale Skuja	14368	1.54

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104	1	14-Aug-15	Kephyrion sp.	43104	0.61
MEL - 0104	1	14-Aug-15	Spiniferomonas sirrata**********	7184	0.85
MEL - 0104	1	14-Aug-15	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0104	1	14-Aug-15	Synura sphagnicola Korschikow	200	3.93
MEL - 0104	1	14-Aug-15	Dinobryon borgei Lemmermann	7184	0.40
MEL - 0104	1	14-Aug-15	Dinobryon bavaricum Imhof	129312	29.25
MEL - 0104	1	14-Aug-15	Dinobryon bavaricum Imhof	1000	3.39
MEL - 0104	1	14-Aug-15	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0104	1	14-Aug-15	Dinobryon sociale Ehrenberg	107760	24.38
MEL - 0104	1	14-Aug-15	Dinobryon sociale Ehrenberg	600	1.19
MEL - 0104	1	14-Aug-15	Chrysolkos skuja (Nauwerck) Willen	21552	0.69
MEL - 0104	1	14-Aug-15	Ochromonas sp.	7184	0.55
MEL - 0104	1	14-Aug-15	Uroglena volvox Ehrenberg	898000	101.56
MEL - 0104	1	14-Aug-15	Uroglena volvox Ehrenberg	200	11.26
MEL - 0104	1	14-Aug-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.37
MEL - 0104	1	14-Aug-15	Chrysochromulina laurentiana Kling	21552	8.50
MEL - 0104	1	14-Aug-15	Stichogloea spp.	35920	1.81
MEL - 0104	1	14-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.72
MEL - 0104	1	14-Aug-15	Cyclotella stelligera Cleve and Grunow	2800	5.31
MEL - 0104	1	14-Aug-15	Cyclotella ocellata Pant.	7184	0.48
MEL - 0104	1	14-Aug-15	Rhizosolenia eriense H.L. Smith	79024	6.15
MEL - 0104	1	14-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	8400	6.25
MEL - 0104	1	14-Aug-15	Fragilaria crotonensis Kitton	6400	2.20
MEL - 0104	1	14-Aug-15	Synedra acus Kutzing	2800	0.28
MEL - 0104	1	14-Aug-15	Asterionella formosa Hassall	4600	0.46
MEL - 0104	1	14-Aug-15	Cyclotella michiganiana Skvortzow	64656	1.49
MEL - 0104	1	14-Aug-15	Rhodomonas minuta Skuja	57472	8.67
MEL - 0104	1	14-Aug-15	Cryptomonas erosa Ehrenberg	5400	6.54
MEL - 0104	1	14-Aug-15	Cryptomonas reflexa (Marsson) Skuja	600	0.41
MEL - 0104	1	14-Aug-15	Cryptomonas rostratiformis Skuja	800	1.81
MEL - 0104	1	14-Aug-15	Katablepharis ovalis Skuja	21552	1.01
MEL - 0104	1	14-Aug-15	Gymnodinium helveticum Penard	200	4.71

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104	1	14-Aug-15	Gymnodinium sp.	1400	21.84
MEL - 0104	1	14-Aug-15	Peridinium pusillum (Penard) Lemmermann	3400	7.42
MEL - 0104	1	19-Sep-15	Sphaerocystis schroeteri Chodat	14368	0.18
MEL - 0104	1	19-Sep-15	Oocystis lacustris Chodat	21552	1.08
MEL - 0104	1	19-Sep-15	Monoraphidium contortum (Thur.) Komarkova-Legnerova	7184	0.13
MEL - 0104	1	19-Sep-15	Crucigenia quadrata Morr.	28736	0.14
MEL - 0104	1	19-Sep-15	Elakatothrix gelatinosa Willen	35920	0.62
MEL - 0104	1	19-Sep-15	Staurodesmus extensus (Andersson) Teiling	400	0.17
MEL - 0104	1	19-Sep-15	Staurodesmus paradoxum Meyen	200	1.67
MEL - 0104	1	19-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0104	1	19-Sep-15	Mougeotia sp.	14368	3.25
MEL - 0104	1	19-Sep-15	Mougeotia sp.	600	1.63
MEL - 0104	1	19-Sep-15	Botryococcus braunii Kutzing	2200	3.16
MEL - 0104	1	19-Sep-15	Small chrysophyceae	359200	5.60
MEL - 0104	1	19-Sep-15	Large chrysophyceae	28736	5.16
MEL - 0104	1	19-Sep-15	Chrysochromulina parva Lackey	272992	17.85
MEL - 0104	1	19-Sep-15	Chrysococcus sp.	287360	17.70
MEL - 0104	1	19-Sep-15	Kephyrion boreale Skuja	7184	0.77
MEL - 0104	1	19-Sep-15	Kephyrion sp.	114944	1.62
MEL - 0104	1	19-Sep-15	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0104	1	19-Sep-15	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0104	1	19-Sep-15	Dinobryon bavaricum Imhof	2400	8.14
MEL - 0104	1	19-Sep-15	Dinobryon sociale Ehrenberg	43104	9.75
MEL - 0104	1	19-Sep-15	Chrysolkos skuja (Nauwerck) Willen	14368	0.46
MEL - 0104	1	19-Sep-15	Uroglena volvox Ehrenberg	581904	65.81
MEL - 0104	1	19-Sep-15	Chrysochromulina laurentiana Kling	14368	5.86
MEL - 0104	1	19-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	761504	39.52
MEL - 0104	1	19-Sep-15	Pteridomonas sp.	7184	1.43
MEL - 0104	1	19-Sep-15	Cyclotella stelligera Cleve and Grunow	3000	4.71
MEL - 0104	1	19-Sep-15	Cyclotella ocellata Pant.	21552	1.58
MEL - 0104	1	19-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	9400	6.64
MEL - 0104	1	19-Sep-15	Tabellaria flocculsa (Roth) Kutzing	600	0.74

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104	1	19-Sep-15	Fragilaria crotonensis Kitton	3200	1.15
MEL - 0104	1	19-Sep-15	Synedra acus Kutzing	400	0.04
MEL - 0104	1	19-Sep-15	Asterionella formosa Hassall	162000	15.78
MEL - 0104	1	19-Sep-15	Cyclotella michiganiana Skvortzow	107760	2.64
MEL - 0104	1	19-Sep-15	Rhodomonas minuta Skuja	150864	22.75
MEL - 0104	1	19-Sep-15	Cryptomonas erosa Ehrenberg	2800	3.27
MEL - 0104	1	19-Sep-15	Cryptomonas reflexa (Marsson) Skuja	2200	1.54
MEL - 0104	1	19-Sep-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0104	1	19-Sep-15	Katablepharis ovalis Skuja	28736	1.35
MEL - 0104	1	19-Sep-15	Gymnodinium helveticum Penard	400	9.42
MEL - 0104	1	19-Sep-15	Gymnodinium sp.	1200	18.72
MEL - 0104	1	19-Sep-15	Peridinium pusillum (Penard) Lemmermann	1400	3.00
MEL - 0104	1	19-Sep-15	Peridinium aciculiferum Lemmermann	1400	12.67
MEL - 0105	1	18-Jul-15	Chlamydomonas spp.	14368	0.41
MEL - 0105	1	18-Jul-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0105	1	18-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0105	1	18-Jul-15	Euglena acus Ehrenberg	400	2.74
MEL - 0105	1	18-Jul-15	Small chrysophyceae	380752	3.92
MEL - 0105	1	18-Jul-15	Large chrysophyceae	71840	12.90
MEL - 0105	1	18-Jul-15	Chrysochromulina parva Lackey	337648	22.08
MEL - 0105	1	18-Jul-15	Chrysococcus sp.	308912	20.20
MEL - 0105	1	18-Jul-15	Kephyrion boreale Skuja	14368	1.88
MEL - 0105	1	18-Jul-15	Kephyrion sp.	57472	0.59
MEL - 0105	1	18-Jul-15	Spiniferomonas sirrata**********	7184	0.85
MEL - 0105	1	18-Jul-15	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0105	1	18-Jul-15	Dinobryon borgei Lemmermann	35920	2.07
MEL - 0105	1	18-Jul-15	Dinobryon bavaricum Imhof	79024	17.88
MEL - 0105	1	18-Jul-15	Dinobryon bavaricum Imhof	3600	12.20
MEL - 0105	1	18-Jul-15	Dinobryon sertularia Ehrenberg	57472	13.00
MEL - 0105	1	18-Jul-15	Dinobryon sertularia Ehrenberg	1200	4.07
MEL - 0105	1	18-Jul-15	Dinobryon sociale Ehrenberg	86208	19.50
MEL - 0105	1	18-Jul-15	Dinobryon sociale Ehrenberg	3800	4.66

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	1	18-Jul-15	Epiphyxis sp.	14368	1.11
MEL - 0105	1	18-Jul-15	Chrysolkos skuja (Nauwerck) Willen	43104	1.29
MEL - 0105	1	18-Jul-15	Uroglena volvox Ehrenberg	1853472	209.63
MEL - 0105	1	18-Jul-15	Bitrichia chodatii (Reverdin) Chodat	14368	0.71
MEL - 0105	1	18-Jul-15	Chrysochromulina laurentiana Kling	150864	59.53
MEL - 0105	1	18-Jul-15	Stichogloea spp.	28736	1.45
MEL - 0105	1	18-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.34
MEL - 0105	1	18-Jul-15	Cyclotella stelligera Cleve and Grunow	600	0.99
MEL - 0105	1	18-Jul-15	Cyclotella ocellata Pant.	14368	1.05
MEL - 0105	1	18-Jul-15	Rhizosolenia eriense H.L. Smith	287360	22.36
MEL - 0105	1	18-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	1600	1.15
MEL - 0105	1	18-Jul-15	Tabellaria flocculsa (Roth) Kutzing	800	0.94
MEL - 0105	1	18-Jul-15	Fragilaria crotonensis Kitton	23800	8.77
MEL - 0105	1	18-Jul-15	Synedra acus Kutzing	14000	1.36
MEL - 0105	1	18-Jul-15	Asterionella formosa Hassall	2800	0.28
MEL - 0105	1	18-Jul-15	Cyclotella michiganiana Skvortzow	86208	2.11
MEL - 0105	1	18-Jul-15	Rhodomonas minuta Skuja	35920	5.15
MEL - 0105	1	18-Jul-15	Cryptomonas erosa Ehrenberg	5400	6.68
MEL - 0105	1	18-Jul-15	Cryptomonas reflexa (Marsson) Skuja	2800	2.05
MEL - 0105	1	18-Jul-15	Cryptomonas rostratiformis Skuja	1600	3.39
MEL - 0105	1	18-Jul-15	Katablepharis ovalis Skuja	35920	1.65
MEL - 0105	1	18-Jul-15	Gymnodinium helveticum Penard	1200	28.27
MEL - 0105	1	18-Jul-15	Gymnodinium sp.	1800	28.08
MEL - 0105	1	18-Jul-15	Peridinium willei Huitfeldt-Kaas	200	5.43
MEL - 0105	1	18-Jul-15	Peridinium pusillum (Penard) Lemmermann	2400	5.15
MEL - 0105	1	18-Jul-15	Peridinium aciculiferum Lemmermann	1200	10.86
MEL - 0105	1	15-Aug-15	Pyramidomonas tetrarhynchus Schmarda	200	0.11
MEL - 0105	1	15-Aug-15	Chlamydomonas spp.	7184	0.17
MEL - 0105	1	15-Aug-15	Oocystis lacustris Chodat	21552	0.61
MEL - 0105	1	15-Aug-15	Elakatothrix gelatinosa Willen	28736	0.45
MEL - 0105	1	15-Aug-15	Cosmarium sp.	200	2.12
MEL - 0105	1	15-Aug-15	Euastrum spp.	200	0.37

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	1	15-Aug-15	Staurodesmus extensus (Andersson) Teiling	800	0.31
MEL - 0105	1	15-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0105	1	15-Aug-15	Mougeotia sp.	86208	19.50
MEL - 0105	1	15-Aug-15	Botryococcus braunii Kutzing	600	1.06
MEL - 0105	1	15-Aug-15	Small chrysophyceae	452592	5.79
MEL - 0105	1	15-Aug-15	Large chrysophyceae	28736	5.16
MEL - 0105	1	15-Aug-15	Chrysochromulina parva Lackey	93392	6.11
MEL - 0105	1	15-Aug-15	Chrysococcus sp.	143680	9.40
MEL - 0105	1	15-Aug-15	Chrysostephanospaera globulifera Scherffel	7184	2.07
MEL - 0105	1	15-Aug-15	Kephyrion boreale Skuja	14368	1.63
MEL - 0105	1	15-Aug-15	Kephyrion sp.	64656	1.11
MEL - 0105	1	15-Aug-15	Spiniferomonas sirrata**********	7184	0.53
MEL - 0105	1	15-Aug-15	Mallomonas crassisquama (Asmund) Fott	200	0.22
MEL - 0105	1	15-Aug-15	Dinobryon borgei Lemmermann	7184	0.56
MEL - 0105	1	15-Aug-15	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0105	1	15-Aug-15	Dinobryon bavaricum Imhof	150864	34.13
MEL - 0105	1	15-Aug-15	Dinobryon bavaricum Imhof	1400	2.79
MEL - 0105	1	15-Aug-15	Dinobryon sociale Ehrenberg	79024	17.88
MEL - 0105	1	15-Aug-15	Dinobryon sociale Ehrenberg	400	2.03
MEL - 0105	1	15-Aug-15	Chrysolkos skuja (Nauwerck) Willen	28736	0.90
MEL - 0105	1	15-Aug-15	Uroglena volvox Ehrenberg	488512	55.25
MEL - 0105	1	15-Aug-15	Bitrichia chodatii (Reverdin) Chodat	14368	0.67
MEL - 0105	1	15-Aug-15	Chrysochromulina laurentiana Kling	86208	35.15
MEL - 0105	1	15-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.38
MEL - 0105	1	15-Aug-15	Cyclotella stelligera Cleve and Grunow	3400	5.58
MEL - 0105	1	15-Aug-15	Cyclotella ocellata Pant.	21552	1.52
MEL - 0105	1	15-Aug-15	Rhizosolenia eriense H.L. Smith	64656	4.11
MEL - 0105	1	15-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	2400	2.06
MEL - 0105	1	15-Aug-15	Fragilaria crotonensis Kitton	4400	1.59
MEL - 0105	1	15-Aug-15	Synedra acus Kutzing	600	0.06
MEL - 0105	1	15-Aug-15	Asterionella formosa Hassall	1200	0.12
MEL - 0105	1	15-Aug-15	Cyclotella michiganiana Skvortzow	93392	2.29

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	1	15-Aug-15	Rhodomonas minuta Skuja	43104	6.28
MEL - 0105	1	15-Aug-15	Cryptomonas erosa Ehrenberg	5200	6.43
MEL - 0105	1	15-Aug-15	Cryptomonas reflexa (Marsson) Skuja	1000	0.71
MEL - 0105	1	15-Aug-15	Cryptomonas rostratiformis Skuja	1000	2.26
MEL - 0105	1	15-Aug-15	Katablepharis ovalis Skuja	14368	0.66
MEL - 0105	1	15-Aug-15	Gymnodinium helveticum Penard	400	9.42
MEL - 0105	1	15-Aug-15	Gymnodinium sp.	3800	53.72
MEL - 0105	1	15-Aug-15	Peridinium pusillum (Penard) Lemmermann	3600	7.72
MEL - 0105	1	15-Aug-15	Peridinium aciculiferum Lemmermann	1400	12.67
MEL - 0105	2	15-Aug-15	Snowella sp	200	0.15
MEL - 0105	2	15-Aug-15	Nostoc sp.	200	0.70
MEL - 0105	2	15-Aug-15	Pyramidomonas tetrarhynchus Schmarda	200	0.10
MEL - 0105	2	15-Aug-15	Chlamydomonas spp.	14368	0.37
MEL - 0105	2	15-Aug-15	Sphaerocystis schroeteri Chodat	86208	1.10
MEL - 0105	2	15-Aug-15	Oocystis lacustris Chodat	43104	2.17
MEL - 0105	2	15-Aug-15	Quadrigula closterioides (Bohl.) Printz	114944	2.46
MEL - 0105	2	15-Aug-15	Elakatothrix gelatinosa Willen	86208	1.35
MEL - 0105	2	15-Aug-15	Cosmarium sp.	800	1.12
MEL - 0105	2	15-Aug-15	Staurodesmus extensus (Andersson) Teiling	800	0.46
MEL - 0105	2	15-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0105	2	15-Aug-15	Mougeotia sp.	79024	17.88
MEL - 0105	2	15-Aug-15	Euglena acus Ehrenberg	200	0.92
MEL - 0105	2	15-Aug-15	Small chrysophyceae	596272	8.41
MEL - 0105	2	15-Aug-15	Large chrysophyceae	28736	10.97
MEL - 0105	2	15-Aug-15	Chrysochromulina parva Lackey	193968	12.69
MEL - 0105	2	15-Aug-15	Chrysococcus sp.	179600	11.75
MEL - 0105	2	15-Aug-15	Kephyrion boreale Skuja	7184	0.66
MEL - 0105	2	15-Aug-15	Kephyrion sp.	100576	1.89
MEL - 0105	2	15-Aug-15	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL - 0105	2	15-Aug-15	Dinobryon borgei Lemmermann	21552	1.64
MEL - 0105	2	15-Aug-15	Dinobryon mucronutom Nygaard	35920	4.70
MEL - 0105	2	15-Aug-15	Dinobryon bavaricum Imhof	114944	26.00

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	2	15-Aug-15	Dinobryon bavaricum Imhof	1400	2.79
MEL - 0105	2	15-Aug-15	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0105	2	15-Aug-15	Dinobryon sociale Ehrenberg	122128	27.63
MEL - 0105	2	15-Aug-15	Dinobryon sociale Ehrenberg	600	2.03
MEL - 0105	2	15-Aug-15	Epiphyxis sp.	7184	0.58
MEL - 0105	2	15-Aug-15	Chrysolkos skuja (Nauwerck) Willen	14368	0.46
MEL - 0105	2	15-Aug-15	Uroglena volvox Ehrenberg	754320	85.31
MEL - 0105	2	15-Aug-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.35
MEL - 0105	2	15-Aug-15	Chrysochromulina laurentiana Kling	50288	19.84
MEL - 0105	2	15-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.49
MEL - 0105	2	15-Aug-15	Pteridomonas sp.	21552	4.78
MEL - 0105	2	15-Aug-15	Cyclotella stelligera Cleve and Grunow	3200	5.03
MEL - 0105	2	15-Aug-15	Cyclotella ocellata Pant.	7184	0.51
MEL - 0105	2	15-Aug-15	Rhizosolenia eriense H.L. Smith	93392	6.60
MEL - 0105	2	15-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	5600	4.06
MEL - 0105	2	15-Aug-15	Fragilaria crotonensis Kitton	4600	1.66
MEL - 0105	2	15-Aug-15	Synedra acus Kutzing	1600	0.15
MEL - 0105	2	15-Aug-15	Asterionella formosa Hassall	2200	0.23
MEL - 0105	2	15-Aug-15	Cyclotella michiganiana Skvortzow	150864	3.70
MEL - 0105	2	15-Aug-15	Rhodomonas minuta Skuja	64656	9.75
MEL - 0105	2	15-Aug-15	Cryptomonas erosa Ehrenberg	3200	3.72
MEL - 0105	2	15-Aug-15	Cryptomonas reflexa (Marsson) Skuja	600	0.40
MEL - 0105	2	15-Aug-15	Cryptomonas rostratiformis Skuja	400	0.85
MEL - 0105	2	15-Aug-15	Katablepharis ovalis Skuja	28736	1.19
MEL - 0105	2	15-Aug-15	Gymnodinium sp.	2200	26.39
MEL - 0105	2	15-Aug-15	Peridinium pusillum (Penard) Lemmermann	3200	6.86
MEL - 0105	1R	15-Aug-15	Chlamydomonas spp.	7184	0.17
MEL - 0105	1R	15-Aug-15	Oocystis lacustris Chodat	28736	0.81
MEL - 0105	1R	15-Aug-15	Elakatothrix gelatinosa Willen	14368	0.23
MEL - 0105	1R	15-Aug-15	Cosmarium sp.	200	2.12
MEL - 0105	1R	15-Aug-15	Euastrum spp.	200	0.37
MEL - 0105	1R	15-Aug-15	Staurodesmus extensus (Andersson) Teiling	200	0.08

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	1R	15-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0105	1R	15-Aug-15	Mougeotia sp.	100576	22.75
MEL - 0105	1R	15-Aug-15	Botryococcus braunii Kutzing	400	0.71
MEL - 0105	1R	15-Aug-15	Euglena acus Ehrenberg	400	2.44
MEL - 0105	1R	15-Aug-15	Small chrysophyceae	330464	4.23
MEL - 0105	1R	15-Aug-15	Large chrysophyceae	28736	5.16
MEL - 0105	1R	15-Aug-15	Chrysochromulina parva Lackey	114944	7.52
MEL - 0105	1R	15-Aug-15	Chrysococcus sp.	165232	10.81
MEL - 0105	1R	15-Aug-15	Kephyrion boreale Skuja	7184	0.81
MEL - 0105	1R	15-Aug-15	Kephyrion sp.	57472	0.99
MEL - 0105	1R	15-Aug-15	Spiniferomonas sirrata**********	7184	0.53
MEL - 0105	1R	15-Aug-15	Dinobryon borgei Lemmermann	28736	2.24
MEL - 0105	1R	15-Aug-15	Dinobryon mucronutom Nygaard	21552	2.82
MEL - 0105	1R	15-Aug-15	Dinobryon bavaricum Imhof	107760	24.38
MEL - 0105	1R	15-Aug-15	Dinobryon bavaricum Imhof	800	1.59
MEL - 0105	1R	15-Aug-15	Dinobryon sertularia Ehrenberg	200	0.68
MEL - 0105	1R	15-Aug-15	Dinobryon sociale Ehrenberg	50288	11.38
MEL - 0105	1R	15-Aug-15	Dinobryon sociale Ehrenberg	800	4.07
MEL - 0105	1R	15-Aug-15	Chrysolkos skuja (Nauwerck) Willen	14368	0.42
MEL - 0105	1R	15-Aug-15	Uroglena volvox Ehrenberg	438224	49.56
MEL - 0105	1R	15-Aug-15	Bitrichia chodatii (Reverdin) Chodat	28736	1.35
MEL - 0105	1R	15-Aug-15	Chrysochromulina laurentiana Kling	107760	43.93
MEL - 0105	1R	15-Aug-15	Bicoeca lacustris Clark	7184	0.50
MEL - 0105	1R	15-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	64656	2.06
MEL - 0105	1R	15-Aug-15	Cyclotella stelligera Cleve and Grunow	4200	6.90
MEL - 0105	1R	15-Aug-15	Cyclotella ocellata Pant.	14368	1.01
MEL - 0105	1R	15-Aug-15	Rhizosolenia eriense H.L. Smith	43104	2.74
MEL - 0105	1R	15-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	3800	3.26
MEL - 0105	1R	15-Aug-15	Fragilaria crotonensis Kitton	2000	0.72
MEL - 0105	1R	15-Aug-15	Synedra acus Kutzing	1000	0.10
MEL - 0105	1R	15-Aug-15	Asterionella formosa Hassall	800	0.08
MEL - 0105	1R	15-Aug-15	Cyclotella michiganiana Skvortzow	143680	3.52

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	1R	15-Aug-15	Rhodomonas minuta Skuja	43104	6.28
MEL - 0105	1R	15-Aug-15	Cryptomonas erosa Ehrenberg	7800	9.64
MEL - 0105	1R	15-Aug-15	Cryptomonas reflexa (Marsson) Skuja	600	0.42
MEL - 0105	1R	15-Aug-15	Cryptomonas rostratiformis Skuja	800	1.81
MEL - 0105	1R	15-Aug-15	Katablepharis ovalis Skuja	7184	0.33
MEL - 0105	1R	15-Aug-15	Gymnodinium helveticum Penard	800	18.85
MEL - 0105	1R	15-Aug-15	Gymnodinium sp.	3000	42.41
MEL - 0105	1R	15-Aug-15	Peridinium pusillum (Penard) Lemmermann	3000	6.43
MEL - 0105	1R	15-Aug-15	Peridinium aciculiferum Lemmermann	2000	18.10
MEL - 0105	1	19-Sep-15	Snowella sp	400	0.21
MEL - 0105	1	19-Sep-15	Chlamydomonas spp.	7184	0.17
MEL - 0105	1	19-Sep-15	Pediastrum duplex Meyen	3200	0.33
MEL - 0105	1	19-Sep-15	Oocystis lacustris Chodat	50288	2.53
MEL - 0105	1	19-Sep-15	Elakatothrix gelatinosa Willen	14368	0.25
MEL - 0105	1	19-Sep-15	Closterium kuetzingii Brebisson	200	2.92
MEL - 0105	1	19-Sep-15	Cosmarium sp.	200	0.28
MEL - 0105	1	19-Sep-15	Staurodesmus extensus (Andersson) Teiling	400	0.17
MEL - 0105	1	19-Sep-15	Staurodesmus paradoxum Meyen	200	0.57
MEL - 0105	1	19-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL - 0105	1	19-Sep-15	Small chrysophyceae	352016	4.96
MEL - 0105	1	19-Sep-15	Large chrysophyceae	71840	27.42
MEL - 0105	1	19-Sep-15	Chrysochromulina parva Lackey	366384	23.96
MEL - 0105	1	19-Sep-15	Chrysococcus sp.	258624	13.19
MEL - 0105	1	19-Sep-15	Kephyrion boreale Skuja	43104	4.63
MEL - 0105	1	19-Sep-15	Kephyrion sp.	150864	2.35
MEL - 0105	1	19-Sep-15	Spiniferomonas sirrata**********	14368	1.63
MEL - 0105	1	19-Sep-15	Dinobryon bavaricum Imhof	35920	8.13
MEL - 0105	1	19-Sep-15	Dinobryon bavaricum Imhof	2000	6.78
MEL - 0105	1	19-Sep-15	Dinobryon sociale Ehrenberg	600	0.74
MEL - 0105	1	19-Sep-15	Uroglena volvox Ehrenberg	344832	39.00
MEL - 0105	1	19-Sep-15	Chrysochromulina laurentiana Kling	86208	35.15
MEL - 0105	1	19-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	510064	26.47

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	1	19-Sep-15	Cyclotella stelligera Cleve and Grunow	1200	1.97
MEL - 0105	1	19-Sep-15	Rhizosolenia eriense H.L. Smith	43104	3.35
MEL - 0105	1	19-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	4400	3.40
MEL - 0105	1	19-Sep-15	Fragilaria crotonensis Kitton	3800	1.43
MEL - 0105	1	19-Sep-15	Asterionella formosa Hassall	119200	12.36
MEL - 0105	1	19-Sep-15	Cyclotella michiganiana Skvortzow	129312	2.99
MEL - 0105	1	19-Sep-15	Rhopalodia gibba (Ehrenberg) O. Muller	200	10.19
MEL - 0105	1	19-Sep-15	Rhodomonas minuta Skuja	244256	36.83
MEL - 0105	1	19-Sep-15	Cryptomonas erosa Ehrenberg	5000	5.93
MEL - 0105	1	19-Sep-15	Cryptomonas reflexa (Marsson) Skuja	1200	0.84
MEL - 0105	1	19-Sep-15	Cryptomonas rostratiformis Skuja	200	0.47
MEL - 0105	1	19-Sep-15	Katablepharis ovalis Skuja	21552	1.04
MEL - 0105	1	19-Sep-15	Gymnodinium sp.	7184	2.31
MEL - 0105	1	19-Sep-15	Gymnodinium sp.	1800	30.88
MEL - 0105	1	19-Sep-15	Peridinium willei Huitfeldt-Kaas	400	9.77
MEL - 0105	1	19-Sep-15	Peridinium pusillum (Penard) Lemmermann	1600	3.63
MEL - 0105	1	19-Sep-15	Peridinium aciculiferum Lemmermann	1400	12.67
MEL - 0201	1	21-Jul-15	Snowella sp	400	0.28
MEL - 0201	1	21-Jul-15	Chlamydomonas spp.	7184	0.15
MEL - 0201	1	21-Jul-15	Elakatothrix gelatinosa Willen	21552	0.37
MEL - 0201	1	21-Jul-15	Cosmarium sp.	200	0.55
MEL - 0201	1	21-Jul-15	Staurodesmus bullardii G.M. Smith	200	0.57
MEL - 0201	1	21-Jul-15	Mougeotia sp.	28736	6.50
MEL - 0201	1	21-Jul-15	Botryococcus braunii Kutzing	400	0.36
MEL - 0201	1	21-Jul-15	Small chrysophyceae	208336	2.94
MEL - 0201	1	21-Jul-15	Large chrysophyceae	107760	19.35
MEL - 0201	1	21-Jul-15	Chrysochromulina parva Lackey	387936	25.37
MEL - 0201	1	21-Jul-15	Chrysococcus sp.	409488	22.28
MEL - 0201	1	21-Jul-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0201	1	21-Jul-15	Kephyrion sp.	64656	1.01
MEL - 0201	1	21-Jul-15	Spiniferomonas sirrata**********	14368	1.54
MEL - 0201	1	21-Jul-15	Mallomonas crassisquama (Asmund) Fott	1400	1.47

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201	1	21-Jul-15	Synura sphagnicola Korschikow	400	6.20
MEL - 0201	1	21-Jul-15	Dinobryon borgei Lemmermann	50288	3.83
MEL - 0201	1	21-Jul-15	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0201	1	21-Jul-15	Dinobryon bavaricum Imhof	150864	34.13
MEL - 0201	1	21-Jul-15	Dinobryon bavaricum Imhof	5400	18.31
MEL - 0201	1	21-Jul-15	Dinobryon sertularia Ehrenberg	71840	16.25
MEL - 0201	1	21-Jul-15	Dinobryon sertularia Ehrenberg	2400	6.06
MEL - 0201	1	21-Jul-15	Dinobryon sociale Ehrenberg	114944	26.00
MEL - 0201	1	21-Jul-15	Dinobryon sociale Ehrenberg	3600	7.17
MEL - 0201	1	21-Jul-15	Chrysolkos skuja (Nauwerck) Willen	71840	2.16
MEL - 0201	1	21-Jul-15	Uroglena volvox Ehrenberg	1767264	199.88
MEL - 0201	1	21-Jul-15	Chrysosphaerella longispina Lauterborn	14368	7.52
MEL - 0201	1	21-Jul-15	Chrysochromulina laurentiana Kling	50288	21.18
MEL - 0201	1	21-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.74
MEL - 0201	1	21-Jul-15	Cyclotella stelligera Cleve and Grunow	800	1.52
MEL - 0201	1	21-Jul-15	Cyclotella ocellata Pant.	14368	0.97
MEL - 0201	1	21-Jul-15	Rhizosolenia eriense H.L. Smith	466960	36.33
MEL - 0201	1	21-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.31
MEL - 0201	1	21-Jul-15	Fragilaria crotonensis Kitton	15800	5.69
MEL - 0201	1	21-Jul-15	Synedra acus Kutzing	11400	1.09
MEL - 0201	1	21-Jul-15	Asterionella formosa Hassall	4200	0.42
MEL - 0201	1	21-Jul-15	Cyclotella michiganiana Skvortzow	43104	1.06
MEL - 0201	1	21-Jul-15	Rhopalodia gibba (Ehrenberg) O. Muller	200	8.44
MEL - 0201	1	21-Jul-15	Rhodomonas minuta Skuja	35920	5.37
MEL - 0201	1	21-Jul-15	Cryptomonas erosa Ehrenberg	6400	7.82
MEL - 0201	1	21-Jul-15	Cryptomonas ovata Ehrenberg	400	1.81
MEL - 0201	1	21-Jul-15	Cryptomonas reflexa (Marsson) Skuja	2200	1.61
MEL - 0201	1	21-Jul-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0201	1	21-Jul-15	Katablepharis ovalis Skuja	14368	0.69
MEL - 0201	1	21-Jul-15	Gymnodinium helveticum Penard	800	19.23
MEL - 0201	1	21-Jul-15	Gymnodinium sp.	7184	2.65
MEL - 0201	1	21-Jul-15	Gymnodinium sp.	1800	33.87

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201	1	21-Jul-15	Peridinium willei Huitfeldt-Kaas	200	4.89
MEL - 0201	1	21-Jul-15	Peridinium pusillum (Penard) Lemmermann	600	1.29
MEL - 0201	1	21-Jul-15	Peridinium aciculiferum Lemmermann	1600	14.48
MEL - 0201	1	16-Aug-15	Sphaerocystis schroeteri Chodat	7184	0.09
MEL - 0201	1	16-Aug-15	Pediastrum tetras (Ehrenberg) Ralfs	2800	0.25
MEL - 0201	1	16-Aug-15	Oocystis lacustris Chodat	21552	1.08
MEL - 0201	1	16-Aug-15	Elakatothrix gelatinosa Willen	21552	0.34
MEL - 0201	1	16-Aug-15	Cosmarium sp.	200	0.28
MEL - 0201	1	16-Aug-15	Euastrum spp.	800	1.49
MEL - 0201	1	16-Aug-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0201	1	16-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0201	1	16-Aug-15	Mougeotia sp.	64656	13.89
MEL - 0201	1	16-Aug-15	Botryococcus braunii Kutzing	400	0.71
MEL - 0201	1	16-Aug-15	Monomastix minuta Skuja	14368	0.29
MEL - 0201	1	16-Aug-15	Small chrysophyceae	316096	4.46
MEL - 0201	1	16-Aug-15	Large chrysophyceae	28736	8.30
MEL - 0201	1	16-Aug-15	Chrysochromulina parva Lackey	35920	1.95
MEL - 0201	1	16-Aug-15	Chrysococcus sp.	172416	11.28
MEL - 0201	1	16-Aug-15	Kephyrion sp.	107760	1.68
MEL - 0201	1	16-Aug-15	Spiniferomonas sirrata**********	14368	1.54
MEL - 0201	1	16-Aug-15	Dinobryon borgei Lemmermann	7184	0.45
MEL - 0201	1	16-Aug-15	Dinobryon bavaricum Imhof	43104	9.75
MEL - 0201	1	16-Aug-15	Dinobryon bavaricum Imhof	200	0.40
MEL - 0201	1	16-Aug-15	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0201	1	16-Aug-15	Dinobryon sociale Ehrenberg	35920	8.13
MEL - 0201	1	16-Aug-15	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0201	1	16-Aug-15	Chrysolkos skuja (Nauwerck) Willen	14368	0.42
MEL - 0201	1	16-Aug-15	Uroglena volvox Ehrenberg	323280	36.56
MEL - 0201	1	16-Aug-15	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL - 0201	1	16-Aug-15	Chrysochromulina laurentiana Kling	57472	22.68
MEL - 0201	1	16-Aug-15	Stichogloea spp.	28736	1.45
MEL - 0201	1	16-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.36

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201	1	16-Aug-15	Cyclotella stelligera Cleve and Grunow	3600	6.55
MEL - 0201	1	16-Aug-15	Cyclotella ocellata Pant.	21552	1.45
MEL - 0201	1	16-Aug-15	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL - 0201	1	16-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	3200	2.47
MEL - 0201	1	16-Aug-15	Tabellaria flocculsa (Roth) Kutzing	800	1.34
MEL - 0201	1	16-Aug-15	Fragilaria crotonensis Kitton	1600	0.51
MEL - 0201	1	16-Aug-15	Synedra acus Kutzing	200	0.02
MEL - 0201	1	16-Aug-15	Asterionella formosa Hassall	1600	0.16
MEL - 0201	1	16-Aug-15	Cyclotella michiganiana Skvortzow	79024	1.51
MEL - 0201	1	16-Aug-15	Rhodomonas minuta Skuja	71840	10.83
MEL - 0201	1	16-Aug-15	Cryptomonas erosa Ehrenberg	4000	4.75
MEL - 0201	1	16-Aug-15	Cryptomonas reflexa (Marsson) Skuja	800	0.53
MEL - 0201	1	16-Aug-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0201	1	16-Aug-15	Gymnodinium sp.	7184	2.31
MEL - 0201	1	16-Aug-15	Gymnodinium sp.	1600	24.96
MEL - 0201	1	16-Aug-15	Peridinium willei Huitfeldt-Kaas	200	4.53
MEL - 0201	1	16-Aug-15	Peridinium pusillum (Penard) Lemmermann	800	1.28
MEL - 0201	1	10-Sep-15	Planktothrix	200	3.18
MEL - 0201	1	10-Sep-15	Sphaerocystis schroeteri Chodat	28736	0.96
MEL - 0201	1	10-Sep-15	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL - 0201	1	10-Sep-15	Cosmarium sp.	600	0.84
MEL - 0201	1	10-Sep-15	Euastrum spp.	400	0.74
MEL - 0201	1	10-Sep-15	Staurodesmus extensus (Andersson) Teiling	200	0.10
MEL - 0201	1	10-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0201	1	10-Sep-15	Mougeotia sp.	107760	23.02
MEL - 0201	1	10-Sep-15	Botryococcus braunii Kutzing	400	0.36
MEL - 0201	1	10-Sep-15	Euglena acus Ehrenberg	200	1.29
MEL - 0201	1	10-Sep-15	Small chrysophyceae	438224	6.84
MEL - 0201	1	10-Sep-15	Large chrysophyceae	50288	9.03
MEL - 0201	1	10-Sep-15	Chrysochromulina parva Lackey	215520	14.10
MEL - 0201	1	10-Sep-15	Chrysococcus sp.	265808	17.38
MEL - 0201	1	10-Sep-15	Kephyrion sp.	107760	1.85

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201	1	10-Sep-15	Kephyrion sp.	7184	0.85
MEL - 0201	1	10-Sep-15	Spiniferomonas sirrata**********	14368	1.54
MEL - 0201	1	10-Sep-15	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0201	1	10-Sep-15	Dinobryon borgei Lemmermann	7184	0.37
MEL - 0201	1	10-Sep-15	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0201	1	10-Sep-15	Dinobryon bavaricum Imhof	14368	3.25
MEL - 0201	1	10-Sep-15	Dinobryon bavaricum Imhof	1400	4.75
MEL - 0201	1	10-Sep-15	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0201	1	10-Sep-15	Dinobryon sertularia Ehrenberg	200	0.68
MEL - 0201	1	10-Sep-15	Dinobryon sociale Ehrenberg	7184	1.63
MEL - 0201	1	10-Sep-15	Dinobryon sociale Ehrenberg	400	0.49
MEL - 0201	1	10-Sep-15	Chrysolkos skuja (Nauwerck) Willen	7184	0.22
MEL - 0201	1	10-Sep-15	Uroglena volvox Ehrenberg	538800	60.94
MEL - 0201	1	10-Sep-15	Chrysochromulina laurentiana Kling	50288	20.50
MEL - 0201	1	10-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.81
MEL - 0201	1	10-Sep-15	Pteridomonas sp.	7184	1.71
MEL - 0201	1	10-Sep-15	Cyclotella stelligera Cleve and Grunow	5200	10.29
MEL - 0201	1	10-Sep-15	Cyclotella ocellata Pant.	43104	2.90
MEL - 0201	1	10-Sep-15	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL - 0201	1	10-Sep-15	Fragilaria crotonensis Kitton	800	0.28
MEL - 0201	1	10-Sep-15	Synedra acus Kutzing	400	0.04
MEL - 0201	1	10-Sep-15	Asterionella formosa Hassall	11000	1.11
MEL - 0201	1	10-Sep-15	Cyclotella michiganiana Skvortzow	64656	1.40
MEL - 0201	1	10-Sep-15	Rhodomonas minuta Skuja	179600	27.53
MEL - 0201	1	10-Sep-15	Cryptomonas erosa Ehrenberg	2800	3.32
MEL - 0201	1	10-Sep-15	Cryptomonas reflexa (Marsson) Skuja	800	0.56
MEL - 0201	1	10-Sep-15	Cryptomonas rostratiformis Skuja	200	0.38
MEL - 0201	1	10-Sep-15	Katablepharis ovalis Skuja	7184	0.34
MEL - 0201	1	10-Sep-15	Gymnodinium helveticum Penard	600	14.14
MEL - 0201	1	10-Sep-15	Gymnodinium sp.	7184	2.41
MEL - 0201	1	10-Sep-15	Gymnodinium sp.	1200	15.32
MEL - 0201	1	10-Sep-15	Peridinium pusillum (Penard) Lemmermann	800	1.29

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201	1	10-Sep-15	Peridinium aciculiferum Lemmermann	800	7.24
MEL - 0202	1	21-Jul-15	Elakatothrix gelatinosa Willen	14368	0.25
MEL - 0202	1	21-Jul-15	Cosmarium sp.	200	0.61
MEL - 0202	1	21-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0202	1	21-Jul-15	Mougeotia sp.	14368	3.18
MEL - 0202	1	21-Jul-15	Mougeotia sp.	800	0.88
MEL - 0202	1	21-Jul-15	Botryococcus braunii Kutzing	400	0.61
MEL - 0202	1	21-Jul-15	Euglena acus Ehrenberg	200	1.52
MEL - 0202	1	21-Jul-15	Small chrysophyceae	409488	4.22
MEL - 0202	1	21-Jul-15	Large chrysophyceae	107760	19.35
MEL - 0202	1	21-Jul-15	Chrysochromulina parva Lackey	574720	37.59
MEL - 0202	1	21-Jul-15	Chrysococcus sp.	466960	28.76
MEL - 0202	1	21-Jul-15	Chrysostephanospaera globulifera Scherffel	14368	4.78
MEL - 0202	1	21-Jul-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0202	1	21-Jul-15	Kephyrion sp.	93392	1.20
MEL - 0202	1	21-Jul-15	Spiniferomonas sirrata**********	35920	4.27
MEL - 0202	1	21-Jul-15	Mallomonas crassisquama (Asmund) Fott	600	0.62
MEL - 0202	1	21-Jul-15	Synura sphagnicola Korschikow	400	6.81
MEL - 0202	1	21-Jul-15	Dinobryon borgei Lemmermann	71840	3.96
MEL - 0202	1	21-Jul-15	Dinobryon bavaricum Imhof	222704	50.38
MEL - 0202	1	21-Jul-15	Dinobryon bavaricum Imhof	5800	19.66
MEL - 0202	1	21-Jul-15	Dinobryon sertularia Ehrenberg	64656	14.63
MEL - 0202	1	21-Jul-15	Dinobryon sertularia Ehrenberg	3400	11.53
MEL - 0202	1	21-Jul-15	Dinobryon sociale Ehrenberg	201152	45.50
MEL - 0202	1	21-Jul-15	Dinobryon sociale Ehrenberg	3800	4.66
MEL - 0202	1	21-Jul-15	Chrysolkos skuja (Nauwerck) Willen	50288	1.62
MEL - 0202	1	21-Jul-15	Uroglena volvox Ehrenberg	1645136	186.06
MEL - 0202	1	21-Jul-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.38
MEL - 0202	1	21-Jul-15	Chrysochromulina laurentiana Kling	50288	19.84
MEL - 0202	1	21-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.62
MEL - 0202	1	21-Jul-15	Dinobryon attenatum Hill	7184	1.00
MEL - 0202	1	21-Jul-15	Pteridomonas sp.	7184	1.71

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202	1	21-Jul-15	Cyclotella stelligera Cleve and Grunow	1800	2.87
MEL - 0202	1	21-Jul-15	Cyclotella pseudostelligera	7184	3.87
MEL - 0202	1	21-Jul-15	Cyclotella ocellata Pant.	7184	0.48
MEL - 0202	1	21-Jul-15	Rhizosolenia eriense H.L. Smith	459776	35.77
MEL - 0202	1	21-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	2600	2.01
MEL - 0202	1	21-Jul-15	Fragilaria crotonensis Kitton	14600	4.95
MEL - 0202	1	21-Jul-15	Synedra acus Kutzing	5400	0.54
MEL - 0202	1	21-Jul-15	Asterionella formosa Hassall	3000	0.31
MEL - 0202	1	21-Jul-15	Cyclotella michiganiana Skvortzow	193968	5.04
MEL - 0202	1	21-Jul-15	Rhodomonas minuta Skuja	43104	6.50
MEL - 0202	1	21-Jul-15	Cryptomonas erosa Ehrenberg	3800	4.64
MEL - 0202	1	21-Jul-15	Cryptomonas reflexa (Marsson) Skuja	1000	0.73
MEL - 0202	1	21-Jul-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0202	1	21-Jul-15	Katablepharis ovalis Skuja	28736	1.32
MEL - 0202	1	21-Jul-15	Gymnodinium helveticum Penard	600	14.14
MEL - 0202	1	21-Jul-15	Gymnodinium sp.	14368	5.10
MEL - 0202	1	21-Jul-15	Gymnodinium sp.	1400	21.84
MEL - 0202	1	21-Jul-15	Peridinium willei Huitfeldt-Kaas	200	5.30
MEL - 0202	1	21-Jul-15	Peridinium pusillum (Penard) Lemmermann	800	1.72
MEL - 0202	1	21-Jul-15	Peridinium aciculiferum Lemmermann	1800	16.83
MEL - 0202	1R	21-Jul-15	Elakatothrix gelatinosa Willen	14368	0.25
MEL - 0202	1R	21-Jul-15	Cosmarium sp.	200	0.61
MEL - 0202	1R	21-Jul-15	Staurodesmus extensus (Andersson) Teiling	200	0.11
MEL - 0202	1R	21-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0202	1R	21-Jul-15	Mougeotia sp.	21552	4.77
MEL - 0202	1R	21-Jul-15	Mougeotia sp.	1800	1.98
MEL - 0202	1R	21-Jul-15	Botryococcus braunii Kutzing	200	0.31
MEL - 0202	1R	21-Jul-15	Euglena acus Ehrenberg	600	1.73
MEL - 0202	1R	21-Jul-15	Small chrysophyceae	474144	4.88
MEL - 0202	1R	21-Jul-15	Large chrysophyceae	79024	14.19
MEL - 0202	1R	21-Jul-15	Chrysochromulina parva Lackey	438224	28.66
MEL - 0202	1R	21-Jul-15	Chrysococcus sp.	466960	28.76

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202	1R	21-Jul-15	Chrysostephanospaera globulifera Scherffel	14368	4.78
MEL - 0202	1R	21-Jul-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0202	1R	21-Jul-15	Kephyrion sp.	143680	1.84
MEL - 0202	1R	21-Jul-15	Spiniferomonas sirrata**********	21552	2.56
MEL - 0202	1R	21-Jul-15	Mallomonas crassisquama (Asmund) Fott	400	0.41
MEL - 0202	1R	21-Jul-15	Dinobryon borgei Lemmermann	43104	2.38
MEL - 0202	1R	21-Jul-15	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0202	1R	21-Jul-15	Dinobryon bavaricum Imhof	208336	47.13
MEL - 0202	1R	21-Jul-15	Dinobryon bavaricum Imhof	5000	16.95
MEL - 0202	1R	21-Jul-15	Dinobryon sertularia Ehrenberg	35920	8.13
MEL - 0202	1R	21-Jul-15	Dinobryon sertularia Ehrenberg	3000	10.17
MEL - 0202	1R	21-Jul-15	Dinobryon sociale Ehrenberg	150864	34.13
MEL - 0202	1R	21-Jul-15	Dinobryon sociale Ehrenberg	4200	5.15
MEL - 0202	1R	21-Jul-15	Epiphyxis sp.	14368	1.25
MEL - 0202	1R	21-Jul-15	Chrysolkos skuja (Nauwerck) Willen	28736	0.93
MEL - 0202	1R	21-Jul-15	Uroglena volvox Ehrenberg	1731344	195.82
MEL - 0202	1R	21-Jul-15	Bitrichia chodatii (Reverdin) Chodat	21552	1.14
MEL - 0202	1R	21-Jul-15	Chrysochromulina laurentiana Kling	50288	19.84
MEL - 0202	1R	21-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.16
MEL - 0202	1R	21-Jul-15	Dinobryon attenatum Hill	14368	1.99
MEL - 0202	1R	21-Jul-15	Cyclotella stelligera Cleve and Grunow	1200	1.91
MEL - 0202	1R	21-Jul-15	Cyclotella ocellata Pant.	21552	1.45
MEL - 0202	1R	21-Jul-15	Rhizosolenia eriense H.L. Smith	510064	39.68
MEL - 0202	1R	21-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	1800	1.39
MEL - 0202	1R	21-Jul-15	Fragilaria crotonensis Kitton	13400	4.55
MEL - 0202	1R	21-Jul-15	Synedra acus Kutzing	3800	0.36
MEL - 0202	1R	21-Jul-15	Asterionella formosa Hassall	3000	0.31
MEL - 0202	1R	21-Jul-15	Cyclotella michiganiana Skvortzow	222704	5.79
MEL - 0202	1R	21-Jul-15	Rhodomonas minuta Skuja	43104	6.50
MEL - 0202	1R	21-Jul-15	Cryptomonas erosa Ehrenberg	5200	6.35
MEL - 0202	1R	21-Jul-15	Cryptomonas reflexa (Marsson) Skuja	400	0.29
MEL - 0202	1R	21-Jul-15	Cryptomonas rostratiformis Skuja	400	0.85

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202	1R	21-Jul-15	Katablepharis ovalis Skuja	21552	0.99
MEL - 0202	1R	21-Jul-15	Gymnodinium helveticum Penard	600	14.14
MEL - 0202	1R	21-Jul-15	Gymnodinium sp.	7184	2.55
MEL - 0202	1R	21-Jul-15	Gymnodinium sp.	1000	15.60
MEL - 0202	1R	21-Jul-15	Peridinium willei Huitfeldt-Kaas	200	5.30
MEL - 0202	1R	21-Jul-15	Peridinium pusillum (Penard) Lemmermann	1000	2.14
MEL - 0202	1R	21-Jul-15	Peridinium aciculiferum Lemmermann	1000	9.35
MEL - 0202	1	16-Aug-15	Snowella sp	200	0.15
MEL - 0202	1	16-Aug-15	Pediastrum tetras (Ehrenberg) Ralfs	86208	0.41
MEL - 0202	1	16-Aug-15	Oocystis lacustris Chodat	14368	0.72
MEL - 0202	1	16-Aug-15	Elakatothrix gelatinosa Willen	50288	0.79
MEL - 0202	1	16-Aug-15	Cosmarium sp.	400	0.41
MEL - 0202	1	16-Aug-15	Staurodesmus extensus (Andersson) Teiling	2200	1.31
MEL - 0202	1	16-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0202	1	16-Aug-15	Mougeotia sp.	43104	9.75
MEL - 0202	1	16-Aug-15	Botryococcus braunii Kutzing	400	0.71
MEL - 0202	1	16-Aug-15	Monomastix minuta Skuja	21552	0.41
MEL - 0202	1	16-Aug-15	Small chrysophyceae	474144	6.69
MEL - 0202	1	16-Aug-15	Large chrysophyceae	21552	3.87
MEL - 0202	1	16-Aug-15	Chrysochromulina parva Lackey	107760	7.05
MEL - 0202	1	16-Aug-15	Chrysococcus sp.	244256	15.97
MEL - 0202	1	16-Aug-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0202	1	16-Aug-15	Kephyrion sp.	64656	0.91
MEL - 0202	1	16-Aug-15	Spiniferomonas sirrata**********	7184	0.77
MEL - 0202	1	16-Aug-15	Mallomonas crassisquama (Asmund) Fott	600	0.57
MEL - 0202	1	16-Aug-15	Dinobryon borgei Lemmermann	21552	1.64
MEL - 0202	1	16-Aug-15	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0202	1	16-Aug-15	Dinobryon bavaricum Imhof	43104	9.75
MEL - 0202	1	16-Aug-15	Dinobryon bavaricum Imhof	600	3.05
MEL - 0202	1	16-Aug-15	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0202	1	16-Aug-15	Dinobryon sociale Ehrenberg	100576	22.75
MEL - 0202	1	16-Aug-15	Chrysolkos skuja (Nauwerck) Willen	14368	0.43

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202	1	16-Aug-15	Ochromonas sp.	7184	0.52
MEL - 0202	1	16-Aug-15	Uroglena volvox Ehrenberg	438224	49.56
MEL - 0202	1	16-Aug-15	Chrysochromulina laurentiana Kling	64656	24.68
MEL - 0202	1	16-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.22
MEL - 0202	1	16-Aug-15	Cyclotella stelligera Cleve and Grunow	6000	11.87
MEL - 0202	1	16-Aug-15	Cyclotella pseudostelligera	14368	7.74
MEL - 0202	1	16-Aug-15	Cyclotella ocellata Pant.	21552	1.86
MEL - 0202	1	16-Aug-15	Rhizosolenia eriense H.L. Smith	21552	1.68
MEL - 0202	1	16-Aug-15	Fragilaria crotonensis Kitton	400	0.15
MEL - 0202	1	16-Aug-15	Synedra acus Kutzing	600	0.06
MEL - 0202	1	16-Aug-15	Asterionella formosa Hassall	6200	0.62
MEL - 0202	1	16-Aug-15	Cyclotella michiganiana Skvortzow	86208	2.24
MEL - 0202	1	16-Aug-15	Rhodomonas minuta Skuja	222704	31.33
MEL - 0202	1	16-Aug-15	Cryptomonas erosa Ehrenberg	3600	4.20
MEL - 0202	1	16-Aug-15	Cryptomonas reflexa (Marsson) Skuja	1600	1.08
MEL - 0202	1	16-Aug-15	Cryptomonas rostratiformis Skuja	1600	3.19
MEL - 0202	1	16-Aug-15	Katablepharis ovalis Skuja	7184	0.30
MEL - 0202	1	16-Aug-15	Gymnodinium helveticum Penard	400	10.37
MEL - 0202	1	16-Aug-15	Gymnodinium sp.	7184	2.65
MEL - 0202	1	16-Aug-15	Gymnodinium sp.	800	10.32
MEL - 0202	1	16-Aug-15	Peridinium pusillum (Penard) Lemmermann	800	1.54
MEL - 0202	1	16-Aug-15	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0202	1	10-Sep-15	Aphanothece sp.	7184	0.36
MEL - 0202	1	10-Sep-15	Snowella sp	200	0.27
MEL - 0202	1	10-Sep-15	Chlamydomonas spp.	7184	0.17
MEL - 0202	1	10-Sep-15	Sphaerocystis schroeteri Chodat	14368	0.27
MEL - 0202	1	10-Sep-15	Oocystis lacustris Chodat	28736	2.63
MEL - 0202	1	10-Sep-15	Elakatothrix gelatinosa Willen	14368	0.25
MEL - 0202	1	10-Sep-15	Cosmarium sp.	400	0.56
MEL - 0202	1	10-Sep-15	Euastrum spp.	200	0.37
MEL - 0202	1	10-Sep-15	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0202	1	10-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202	1	10-Sep-15	Mougeotia sp.	57472	13.00
MEL - 0202	1	10-Sep-15	Small chrysophyceae	416672	3.83
MEL - 0202	1	10-Sep-15	Large chrysophyceae	28736	5.16
MEL - 0202	1	10-Sep-15	Chrysochromulina parva Lackey	229888	15.03
MEL - 0202	1	10-Sep-15	Chrysococcus sp.	251440	16.44
MEL - 0202	1	10-Sep-15	Kephyrion sp.	179600	2.53
MEL - 0202	1	10-Sep-15	Spiniferomonas sirrata**********	14368	1.25
MEL - 0202	1	10-Sep-15	Mallomonas crassisquama (Asmund) Fott	400	0.43
MEL - 0202	1	10-Sep-15	Dinobryon borgei Lemmermann	14368	0.74
MEL - 0202	1	10-Sep-15	Dinobryon bavaricum Imhof	43104	9.75
MEL - 0202	1	10-Sep-15	Dinobryon bavaricum Imhof	2200	4.38
MEL - 0202	1	10-Sep-15	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0202	1	10-Sep-15	Dinobryon sertularia Ehrenberg	800	2.71
MEL - 0202	1	10-Sep-15	Dinobryon sociale Ehrenberg	14368	3.25
MEL - 0202	1	10-Sep-15	Dinobryon sociale Ehrenberg	600	0.74
MEL - 0202	1	10-Sep-15	Chrysolkos skuja (Nauwerck) Willen	21552	0.65
MEL - 0202	1	10-Sep-15	Uroglena volvox Ehrenberg	380752	43.06
MEL - 0202	1	10-Sep-15	Uroglena volvox Ehrenberg	200	11.26
MEL - 0202	1	10-Sep-15	Chrysochromulina laurentiana Kling	86208	32.91
MEL - 0202	1	10-Sep-15	Stichogloea spp.	14368	0.72
MEL - 0202	1	10-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.25
MEL - 0202	1	10-Sep-15	Pteridomonas sp.	7184	1.33
MEL - 0202	1	10-Sep-15	Cyclotella stelligera Cleve and Grunow	6400	10.05
MEL - 0202	1	10-Sep-15	Cyclotella ocellata Pant.	57472	5.99
MEL - 0202	1	10-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	1600	1.37
MEL - 0202	1	10-Sep-15	Fragilaria crotonensis Kitton	2200	0.73
MEL - 0202	1	10-Sep-15	Synedra acus Kutzing	600	0.06
MEL - 0202	1	10-Sep-15	Asterionella formosa Hassall	8200	0.82
MEL - 0202	1	10-Sep-15	Cyclotella michiganiana Skvortzow	21552	0.53
MEL - 0202	1	10-Sep-15	Rhodomonas minuta Skuja	114944	14.45
MEL - 0202	1	10-Sep-15	Cryptomonas erosa Ehrenberg	3000	3.56
MEL - 0202	1	10-Sep-15	Cryptomonas reflexa (Marsson) Skuja	400	0.28

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202	1	10-Sep-15	Cryptomonas rostratiformis Skuja	200	0.40
MEL - 0202	1	10-Sep-15	Gymnodinium sp.	7184	2.43
MEL - 0202	1	10-Sep-15	Gymnodinium sp.	400	6.24
MEL - 0202	1	10-Sep-15	Peridinium pusillum (Penard) Lemmermann	1000	1.60
MEL - 0202	1	10-Sep-15	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0203	1	21-Jul-15	Snowella sp	200	0.15
MEL - 0203	1	21-Jul-15	Chlamydomonas spp.	7184	0.19
MEL - 0203	1	21-Jul-15	Staurodesmus extensus (Andersson) Teiling	400	0.24
MEL - 0203	1	21-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0203	1	21-Jul-15	Mougeotia sp.	14368	3.27
MEL - 0203	1	21-Jul-15	Botryococcus braunii Kutzing	200	0.14
MEL - 0203	1	21-Jul-15	Bambusina brebissonii Kutzing	1200	6.72
MEL - 0203	1	21-Jul-15	Small chrysophyceae	316096	2.59
MEL - 0203	1	21-Jul-15	Large chrysophyceae	86208	15.48
MEL - 0203	1	21-Jul-15	Chrysochromulina parva Lackey	625008	40.88
MEL - 0203	1	21-Jul-15	Chrysococcus sp.	179600	11.06
MEL - 0203	1	21-Jul-15	Chrysostephanospaera globulifera Scherffel	7184	2.07
MEL - 0203	1	21-Jul-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0203	1	21-Jul-15	Kephyrion sp.	143680	1.84
MEL - 0203	1	21-Jul-15	Spiniferomonas sirrata**********	28736	3.09
MEL - 0203	1	21-Jul-15	Mallomonas crassisquama (Asmund) Fott	1200	1.33
MEL - 0203	1	21-Jul-15	Synura sphagnicola Korschikow	1200	18.75
MEL - 0203	1	21-Jul-15	Dinobryon borgei Lemmermann	35920	2.19
MEL - 0203	1	21-Jul-15	Dinobryon bavaricum Imhof	222704	50.38
MEL - 0203	1	21-Jul-15	Dinobryon sertularia Ehrenberg	93392	21.13
MEL - 0203	1	21-Jul-15	Dinobryon sertularia Ehrenberg	5600	18.98
MEL - 0203	1	21-Jul-15	Dinobryon sertularia Ehrenberg	3800	12.88
MEL - 0203	1	21-Jul-15	Dinobryon sociale Ehrenberg	208336	47.13
MEL - 0203	1	21-Jul-15	Dinobryon sociale Ehrenberg	3800	4.66
MEL - 0203	1	21-Jul-15	Epiphyxis sp.	7184	0.60
MEL - 0203	1	21-Jul-15	Chrysolkos skuja (Nauwerck) Willen	64656	2.08
MEL - 0203	1	21-Jul-15	Uroglena volvox Ehrenberg	1781632	201.50

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203	1	21-Jul-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0203	1	21-Jul-15	Chrysochromulina laurentiana Kling	186784	73.70
MEL - 0203	1	21-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL - 0203	1	21-Jul-15	Cyclotella stelligera Cleve and Grunow	1000	1.57
MEL - 0203	1	21-Jul-15	Cyclotella ocellata Pant.	64656	4.94
MEL - 0203	1	21-Jul-15	Rhizosolenia eriense H.L. Smith	466960	36.33
MEL - 0203	1	21-Jul-15	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.31
MEL - 0203	1	21-Jul-15	Tabellaria flocculsa (Roth) Kutzing	2600	3.34
MEL - 0203	1	21-Jul-15	Fragilaria crotonensis Kitton	4200	1.46
MEL - 0203	1	21-Jul-15	Synedra acus Kutzing	30600	2.92
MEL - 0203	1	21-Jul-15	Asterionella formosa Hassall	1800	0.18
MEL - 0203	1	21-Jul-15	Cyclotella michiganiana Skvortzow	136496	3.55
MEL - 0203	1	21-Jul-15	Rhodomonas minuta Skuja	64656	9.75
MEL - 0203	1	21-Jul-15	Cryptomonas erosa Ehrenberg	6000	7.33
MEL - 0203	1	21-Jul-15	Cryptomonas reflexa (Marsson) Skuja	600	0.44
MEL - 0203	1	21-Jul-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0203	1	21-Jul-15	Katablepharis ovalis Skuja	7184	0.34
MEL - 0203	1	21-Jul-15	Gymnodinium sp.	1800	25.45
MEL - 0203	1	21-Jul-15	Peridinium willei Huitfeldt-Kaas	400	9.77
MEL - 0203	1	21-Jul-15	Peridinium pusillum (Penard) Lemmermann	2200	4.37
MEL - 0203	1	21-Jul-15	Peridinium aciculiferum Lemmermann	1800	16.83
MEL - 0203	1	16-Aug-15	Chlamydomonas spp.	7184	0.19
MEL - 0203	1	16-Aug-15	Sphaerocystis schroeteri Chodat	50288	0.52
MEL - 0203	1	16-Aug-15	Oocystis lacustris Chodat	14368	0.37
MEL - 0203	1	16-Aug-15	Elakatothrix gelatinosa Willen	64656	1.26
MEL - 0203	1	16-Aug-15	Cosmarium sp.	200	0.20
MEL - 0203	1	16-Aug-15	Staurodesmus extensus (Andersson) Teiling	800	0.45
MEL - 0203	1	16-Aug-15	Mougeotia sp.	64656	14.30
MEL - 0203	1	16-Aug-15	Botryococcus braunii Kutzing	200	0.18
MEL - 0203	1	16-Aug-15	Oocystis gigas Archer	200	0.68
MEL - 0203	1	16-Aug-15	Small chrysophyceae	510064	5.25
MEL - 0203	1	16-Aug-15	Large chrysophyceae	43104	7.74

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203	1	16-Aug-15	Chrysochromulina parva Lackey	50288	3.29
MEL - 0203	1	16-Aug-15	Chrysococcus sp.	287360	17.70
MEL - 0203	1	16-Aug-15	Kephyrion boreale Skuja	7184	0.77
MEL - 0203	1	16-Aug-15	Kephyrion sp.	71840	1.01
MEL - 0203	1	16-Aug-15	Spiniferomonas sirrata**********	14368	1.32
MEL - 0203	1	16-Aug-15	Mallomonas crassisquama (Asmund) Fott	1000	1.06
MEL - 0203	1	16-Aug-15	Dinobryon borgei Lemmermann	7184	0.50
MEL - 0203	1	16-Aug-15	Dinobryon bavaricum Imhof	93392	21.13
MEL - 0203	1	16-Aug-15	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0203	1	16-Aug-15	Dinobryon sociale Ehrenberg	93392	21.13
MEL - 0203	1	16-Aug-15	Epiphyxis sp.	14368	1.09
MEL - 0203	1	16-Aug-15	Chrysolkos skuja (Nauwerck) Willen	28736	0.93
MEL - 0203	1	16-Aug-15	Uroglena volvox Ehrenberg	7184	0.36
MEL - 0203	1	16-Aug-15	Uroglena volvox Ehrenberg	294544	33.31
MEL - 0203	1	16-Aug-15	Chrysosphaerella longispina Lauterborn	7184	3.33
MEL - 0203	1	16-Aug-15	Chrysochromulina laurentiana Kling	57472	21.94
MEL - 0203	1	16-Aug-15	Stichogloea spp.	21552	1.08
MEL - 0203	1	16-Aug-15	Pteridomonas sp.	14368	3.42
MEL - 0203	1	16-Aug-15	Cyclotella stelligera Cleve and Grunow	3600	6.55
MEL - 0203	1	16-Aug-15	Cyclotella ocellata Pant.	35920	2.53
MEL - 0203	1	16-Aug-15	Rhizosolenia eriense H.L. Smith	28736	2.24
MEL - 0203	1	16-Aug-15	Tabellaria flocculsa (Roth) Kutzing	1400	1.87
MEL - 0203	1	16-Aug-15	Fragilaria crotonensis Kitton	600	0.22
MEL - 0203	1	16-Aug-15	Synedra acus Kutzing	1400	0.13
MEL - 0203	1	16-Aug-15	Asterionella formosa Hassall	7800	0.76
MEL - 0203	1	16-Aug-15	Cyclotella michiganiana Skvortzow	114944	2.66
MEL - 0203	1	16-Aug-15	Cyclotella bodanica Eulenst.	200	1.44
MEL - 0203	1	16-Aug-15	Rhodomonas minuta Skuja	208336	29.58
MEL - 0203	1	16-Aug-15	Cryptomonas erosa Ehrenberg	9200	10.73
MEL - 0203	1	16-Aug-15	Cryptomonas reflexa (Marsson) Skuja	2600	1.78
MEL - 0203	1	16-Aug-15	Cryptomonas rostratiformis Skuja	200	0.40
MEL - 0203	1	16-Aug-15	Gymnodinium sp.	1200	12.37

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203	1	16-Aug-15	Peridinium pusillum (Penard) Lemmermann	4000	8.42
MEL - 0203	1	16-Aug-15	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0203	1	10-Sep-15	Sphaerocystis schroeteri Chodat	28736	0.41
MEL - 0203	1	10-Sep-15	Oocystis lacustris Chodat	7184	0.36
MEL - 0203	1	10-Sep-15	Quadrigula closterioides (Bohl.) Printz	57472	1.68
MEL - 0203	1	10-Sep-15	Cosmarium sp.	400	0.56
MEL - 0203	1	10-Sep-15	Staurodesmus extensus (Andersson) Teiling	1000	0.59
MEL - 0203	1	10-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0203	1	10-Sep-15	Mougeotia sp.	79024	16.98
MEL - 0203	1	10-Sep-15	Botryococcus braunii Kutzing	400	0.21
MEL - 0203	1	10-Sep-15	Small chrysophyceae	459776	6.48
MEL - 0203	1	10-Sep-15	Large chrysophyceae	21552	3.87
MEL - 0203	1	10-Sep-15	Chrysochromulina parva Lackey	143680	9.40
MEL - 0203	1	10-Sep-15	Chrysococcus sp.	258624	13.19
MEL - 0203	1	10-Sep-15	Kephyrion boreale Skuja	7184	0.77
MEL - 0203	1	10-Sep-15	Kephyrion sp.	107760	1.85
MEL - 0203	1	10-Sep-15	Spiniferomonas sirrata**********	7184	0.66
MEL - 0203	1	10-Sep-15	Dinobryon mucronutom Nygaard	7184	0.88
MEL - 0203	1	10-Sep-15	Dinobryon bavaricum Imhof	50288	11.38
MEL - 0203	1	10-Sep-15	Dinobryon bavaricum Imhof	600	1.19
MEL - 0203	1	10-Sep-15	Dinobryon sociale Ehrenberg	35920	7.72
MEL - 0203	1	10-Sep-15	Dinobryon sociale Ehrenberg	800	1.59
MEL - 0203	1	10-Sep-15	Chrysolkos skuja (Nauwerck) Willen	7184	0.22
MEL - 0203	1	10-Sep-15	Uroglena volvox Ehrenberg	258624	29.25
MEL - 0203	1	10-Sep-15	Chrysochromulina laurentiana Kling	50288	19.19
MEL - 0203	1	10-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23
MEL - 0203	1	10-Sep-15	Pteridomonas sp.	21552	4.30
MEL - 0203	1	10-Sep-15	Cyclotella stelligera Cleve and Grunow	3600	5.65
MEL - 0203	1	10-Sep-15	Cyclotella ocellata Pant.	35920	2.42
MEL - 0203	1	10-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	1200	0.94
MEL - 0203	1	10-Sep-15	Fragilaria crotonensis Kitton	200	0.07
MEL - 0203	1	10-Sep-15	Synedra acus Kutzing	800	0.08

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203	1	10-Sep-15	Asterionella formosa Hassall	13600	1.42
MEL - 0203	1	10-Sep-15	Cyclotella michiganiana Skvortzow	93392	2.16
MEL - 0203	1	10-Sep-15	Rhodomonas minuta Skuja	107760	16.25
MEL - 0203	1	10-Sep-15	Cryptomonas erosa Ehrenberg	1200	1.35
MEL - 0203	1	10-Sep-15	Cryptomonas reflexa (Marsson) Skuja	600	0.41
MEL - 0203	1	10-Sep-15	Gymnodinium helveticum Penard	200	4.90
MEL - 0203	1	10-Sep-15	Gymnodinium sp.	21552	7.15
MEL - 0203	1	10-Sep-15	Gymnodinium sp.	400	4.90
MEL - 0203	1	10-Sep-15	Peridinium pusillum (Penard) Lemmermann	600	1.22
MEL - 0204	1	21-Jul-15	Oocystis lacustris Chodat	7184	0.36
MEL - 0204	1	21-Jul-15	Staurodesmus extensus (Andersson) Teiling	600	0.36
MEL - 0204	1	21-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0204	1	21-Jul-15	Mougeotia sp.	14368	3.16
MEL - 0204	1	21-Jul-15	Small chrysophyceae	301728	4.25
MEL - 0204	1	21-Jul-15	Large chrysophyceae	114944	26.41
MEL - 0204	1	21-Jul-15	Chrysochromulina parva Lackey	423856	27.72
MEL - 0204	1	21-Jul-15	Chrysococcus sp.	258624	13.19
MEL - 0204	1	21-Jul-15	Kephyrion sp.	57472	0.99
MEL - 0204	1	21-Jul-15	Spiniferomonas sirrata**********	14368	1.79
MEL - 0204	1	21-Jul-15	Mallomonas crassisquama (Asmund) Fott	1000	0.97
MEL - 0204	1	21-Jul-15	Synura sphagnicola Korschikow	14368	8.73
MEL - 0204	1	21-Jul-15	Dinobryon borgei Lemmermann	35920	1.86
MEL - 0204	1	21-Jul-15	Dinobryon bavaricum Imhof	215520	48.75
MEL - 0204	1	21-Jul-15	Dinobryon bavaricum Imhof	4600	9.16
MEL - 0204	1	21-Jul-15	Dinobryon sertularia Ehrenberg	64656	14.63
MEL - 0204	1	21-Jul-15	Dinobryon sertularia Ehrenberg	2000	6.78
MEL - 0204	1	21-Jul-15	Dinobryon sociale Ehrenberg	179600	40.63
MEL - 0204	1	21-Jul-15	Dinobryon sociale Ehrenberg	4400	5.39
MEL - 0204	1	21-Jul-15	Epiphyxis sp.	7184	0.58
MEL - 0204	1	21-Jul-15	Chrysolkos skuja (Nauwerck) Willen	71840	2.03
MEL - 0204	1	21-Jul-15	Uroglena volvox Ehrenberg	1616400	182.81
MEL - 0204	1	21-Jul-15	Chrysosphaerella longispina Lauterborn	400	5.86

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204	1	21-Jul-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0204	1	21-Jul-15	Chrysochromulina laurentiana Kling	93392	35.65
MEL - 0204	1	21-Jul-15	Bicoeca lacustris Clark	7184	0.47
MEL - 0204	1	21-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.60
MEL - 0204	1	21-Jul-15	Cyclotella stelligera Cleve and Grunow	800	1.26
MEL - 0204	1	21-Jul-15	Cyclotella ocellata Pant.	28736	2.48
MEL - 0204	1	21-Jul-15	Rhizosolenia eriense H.L. Smith	265808	20.68
MEL - 0204	1	21-Jul-15	Fragilaria crotonensis Kitton	600	0.20
MEL - 0204	1	21-Jul-15	Synedra acus Kutzing	17200	1.73
MEL - 0204	1	21-Jul-15	Asterionella formosa Hassall	1600	0.16
MEL - 0204	1	21-Jul-15	Cyclotella michiganiana Skvortzow	179600	4.15
MEL - 0204	1	21-Jul-15	Rhodomonas minuta Skuja	107760	15.98
MEL - 0204	1	21-Jul-15	Cryptomonas erosa Ehrenberg	7000	8.41
MEL - 0204	1	21-Jul-15	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0204	1	21-Jul-15	Cryptomonas reflexa (Marsson) Skuja	1200	0.84
MEL - 0204	1	21-Jul-15	Cryptomonas rostratiformis Skuja	1000	2.05
MEL - 0204	1	21-Jul-15	Katablepharis ovalis Skuja	28736	1.35
MEL - 0204	1	21-Jul-15	Gymnodinium sp.	1600	16.49
MEL - 0204	1	21-Jul-15	Peridinium willei Huitfeldt-Kaas	600	14.42
MEL - 0204	1	21-Jul-15	Peridinium pusillum (Penard) Lemmermann	600	0.98
MEL - 0204	1	21-Jul-15	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0204	1	21-Jul-15	Peridinium wisconsiense Eddy	200	6.70
MEL - 0204	1	16-Aug-15	Snowella sp	400	0.40
MEL - 0204	1	16-Aug-15	Chlamydomonas spp.	7184	0.16
MEL - 0204	1	16-Aug-15	Sphaerocystis schroeteri Chodat	35920	0.46
MEL - 0204	1	16-Aug-15	Pediastrum tetras (Ehrenberg) Ralfs	28736	0.32
MEL - 0204	1	16-Aug-15	Oocystis lacustris Chodat	14368	0.38
MEL - 0204	1	16-Aug-15	Elakatothrix gelatinosa Willen	14368	0.27
MEL - 0204	1	16-Aug-15	Euastrum spp.	400	0.74
MEL - 0204	1	16-Aug-15	Staurodesmus extensus (Andersson) Teiling	1200	0.71
MEL - 0204	1	16-Aug-15	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	600	2.45
MEL - 0204	1	16-Aug-15	Staurodesmus paradoxum Meyen	200	1.05

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204	1	16-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	43104	1.63
MEL - 0204	1	16-Aug-15	Mougeotia sp.	21552	4.88
MEL - 0204	1	16-Aug-15	Botryococcus braunii Kutzing	400	0.36
MEL - 0204	1	16-Aug-15	Oocystis gigas Archer	400	1.36
MEL - 0204	1	16-Aug-15	Small chrysophyceae	466960	6.58
MEL - 0204	1	16-Aug-15	Large chrysophyceae	21552	8.23
MEL - 0204	1	16-Aug-15	Chrysochromulina parva Lackey	57472	3.76
MEL - 0204	1	16-Aug-15	Chrysococcus sp.	272992	13.92
MEL - 0204	1	16-Aug-15	Kephyrion boreale Skuja	14368	1.88
MEL - 0204	1	16-Aug-15	Kephyrion sp.	71840	1.01
MEL - 0204	1	16-Aug-15	Mallomonas crassisquama (Asmund) Fott	1600	1.68
MEL - 0204	1	16-Aug-15	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0204	1	16-Aug-15	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0204	1	16-Aug-15	Dinobryon sociale Ehrenberg	43104	9.75
MEL - 0204	1	16-Aug-15	Epiphyxis sp.	7184	0.56
MEL - 0204	1	16-Aug-15	Chrysolkos skuja (Nauwerck) Willen	7184	0.21
MEL - 0204	1	16-Aug-15	Uroglena volvox Ehrenberg	165232	18.69
MEL - 0204	1	16-Aug-15	Chrysochromulina laurentiana Kling	64656	25.51
MEL - 0204	1	16-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.20
MEL - 0204	1	16-Aug-15	Pteridomonas sp.	7184	1.71
MEL - 0204	1	16-Aug-15	Cyclotella stelligera Cleve and Grunow	4800	9.11
MEL - 0204	1	16-Aug-15	Cyclotella ocellata Pant.	28736	2.38
MEL - 0204	1	16-Aug-15	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL - 0204	1	16-Aug-15	Fragilaria crotonensis Kitton	4600	1.66
MEL - 0204	1	16-Aug-15	Synedra acus Kutzing	2000	0.19
MEL - 0204	1	16-Aug-15	Asterionella formosa Hassall	7800	0.82
MEL - 0204	1	16-Aug-15	Cyclotella michiganiana Skvortzow	14368	0.27
MEL - 0204	1	16-Aug-15	Rhodomonas minuta Skuja	244256	28.38
MEL - 0204	1	16-Aug-15	Cryptomonas erosa Ehrenberg	3000	3.56
MEL - 0204	1	16-Aug-15	Cryptomonas reflexa (Marsson) Skuja	2400	1.63
MEL - 0204	1	16-Aug-15	Cryptomonas rostratiformis Skuja	800	1.60
MEL - 0204	1	16-Aug-15	Gymnodinium sp.	800	5.79

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204	1	16-Aug-15	Peridinium pusillum (Penard) Lemmermann	600	1.19
MEL - 0204	1	16-Aug-15	Peridinium aciculiferum Lemmermann	400	3.74
MEL - 0204	1	10-Sep-15	Chlamydomonas spp.	7184	0.16
MEL - 0204	1	10-Sep-15	Sphaerocystis schroeteri Chodat	21552	0.16
MEL - 0204	1	10-Sep-15	Oocystis lacustris Chodat	21552	0.61
MEL - 0204	1	10-Sep-15	Staurodesmus extensus (Andersson) Teiling	600	0.31
MEL - 0204	1	10-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0204	1	10-Sep-15	Mougeotia sp.	79024	16.98
MEL - 0204	1	10-Sep-15	Botryococcus braunii Kutzing	1400	1.27
MEL - 0204	1	10-Sep-15	Small chrysophyceae	395120	3.24
MEL - 0204	1	10-Sep-15	Large chrysophyceae	28736	5.16
MEL - 0204	1	10-Sep-15	Chrysochromulina parva Lackey	179600	11.75
MEL - 0204	1	10-Sep-15	Chrysococcus sp.	208336	13.63
MEL - 0204	1	10-Sep-15	Chrysostephanospaera globulifera Scherffel	7184	3.12
MEL - 0204	1	10-Sep-15	Kephyrion boreale Skuja	21552	2.82
MEL - 0204	1	10-Sep-15	Kephyrion sp.	93392	1.61
MEL - 0204	1	10-Sep-15	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0204	1	10-Sep-15	Dinobryon borgei Lemmermann	7184	0.44
MEL - 0204	1	10-Sep-15	Dinobryon bavaricum Imhof	28736	6.50
MEL - 0204	1	10-Sep-15	Dinobryon bavaricum Imhof	600	0.74
MEL - 0204	1	10-Sep-15	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0204	1	10-Sep-15	Dinobryon sertularia Ehrenberg	200	0.40
MEL - 0204	1	10-Sep-15	Dinobryon sociale Ehrenberg	7184	1.63
MEL - 0204	1	10-Sep-15	Dinobryon sociale Ehrenberg	1400	1.72
MEL - 0204	1	10-Sep-15	Epiphyxis sp.	7184	0.44
MEL - 0204	1	10-Sep-15	Chrysolkos skuja (Nauwerck) Willen	7184	0.20
MEL - 0204	1	10-Sep-15	Uroglena volvox Ehrenberg	380752	43.06
MEL - 0204	1	10-Sep-15	Chrysochromulina laurentiana Kling	86208	32.91
MEL - 0204	1	10-Sep-15	Stichogloea spp.	7184	0.36
MEL - 0204	1	10-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.39
MEL - 0204	1	10-Sep-15	Cyclotella stelligera Cleve and Grunow	6000	12.37
MEL - 0204	1	10-Sep-15	Cyclotella ocellata Pant.	43104	3.16

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204	1	10-Sep-15	Synedra acus Kutzing	2000	0.19
MEL - 0204	1	10-Sep-15	Asterionella formosa Hassall	15200	1.50
MEL - 0204	1	10-Sep-15	Cyclotella michiganiana Skvortzow	93392	2.16
MEL - 0204	1	10-Sep-15	Rhodomonas minuta Skuja	107760	15.30
MEL - 0204	1	10-Sep-15	Cryptomonas erosa Ehrenberg	2200	2.67
MEL - 0204	1	10-Sep-15	Cryptomonas reflexa (Marsson) Skuja	1200	0.82
MEL - 0204	1	10-Sep-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0204	1	10-Sep-15	Gymnodinium sp.	14368	5.56
MEL - 0204	1	10-Sep-15	Gymnodinium sp.	600	5.91
MEL - 0204	1	10-Sep-15	Peridinium pusillum (Penard) Lemmermann	1000	1.99
MEL - 0204	1	10-Sep-15	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0205	1	21-Jul-15	Chlamydomonas spp.	14368	0.15
MEL - 0205	1	21-Jul-15	Oocystis lacustris Chodat	7184	0.20
MEL - 0205	1	21-Jul-15	Elakatothrix gelatinosa Willen	7184	0.16
MEL - 0205	1	21-Jul-15	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0205	1	21-Jul-15	Mougeotia sp.	7184	1.63
MEL - 0205	1	21-Jul-15	Botryococcus braunii Kutzing	200	0.29
MEL - 0205	1	21-Jul-15	Small chrysophyceae	229888	1.66
MEL - 0205	1	21-Jul-15	Large chrysophyceae	79024	14.19
MEL - 0205	1	21-Jul-15	Chrysochromulina parva Lackey	725584	47.45
MEL - 0205	1	21-Jul-15	Chrysococcus sp.	445408	22.72
MEL - 0205	1	21-Jul-15	Kephyrion boreale Skuja	7184	0.85
MEL - 0205	1	21-Jul-15	Kephyrion sp.	114944	1.62
MEL - 0205	1	21-Jul-15	Spiniferomonas sirrata**********	21552	1.88
MEL - 0205	1	21-Jul-15	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL - 0205	1	21-Jul-15	Mallomonas spp.	1000	1.89
MEL - 0205	1	21-Jul-15	Synura sphagnicola Korschikow	600	9.89
MEL - 0205	1	21-Jul-15	Dinobryon borgei Lemmermann	35920	1.84
MEL - 0205	1	21-Jul-15	Dinobryon bavaricum Imhof	251440	56.88
MEL - 0205	1	21-Jul-15	Dinobryon bavaricum Imhof	5000	16.95
MEL - 0205	1	21-Jul-15	Dinobryon sertularia Ehrenberg	71840	16.25
MEL - 0205	1	21-Jul-15	Dinobryon sertularia Ehrenberg	2000	10.17

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205	1	21-Jul-15	Dinobryon sociale Ehrenberg	280176	63.38
MEL - 0205	1	21-Jul-15	Dinobryon sociale Ehrenberg	6400	13.60
MEL - 0205	1	21-Jul-15	Epiphyxis sp.	28736	2.19
MEL - 0205	1	21-Jul-15	Chrysolkos skuja (Nauwerck) Willen	93392	2.59
MEL - 0205	1	21-Jul-15	Uroglena volvox Ehrenberg	1623584	183.63
MEL - 0205	1	21-Jul-15	Bitrichia chodatii (Reverdin) Chodat	21552	1.14
MEL - 0205	1	21-Jul-15	Chrysochromulina laurentiana Kling	100576	38.39
MEL - 0205	1	21-Jul-15	Salpingoeca frequentissima (Zach.) Lemmermann	79024	2.52
MEL - 0205	1	21-Jul-15	Cyclotella stelligera Cleve and Grunow	1200	1.97
MEL - 0205	1	21-Jul-15	Cyclotella ocellata Pant.	7184	0.59
MEL - 0205	1	21-Jul-15	Rhizosolenia eriense H.L. Smith	373568	29.06
MEL - 0205	1	21-Jul-15	Tabellaria flocculsa (Roth) Kutzing	1800	2.40
MEL - 0205	1	21-Jul-15	Fragilaria crotonensis Kitton	800	0.29
MEL - 0205	1	21-Jul-15	Synedra acus Kutzing	28400	2.83
MEL - 0205	1	21-Jul-15	Asterionella formosa Hassall	4400	0.44
MEL - 0205	1	21-Jul-15	Cyclotella michiganiana Skvortzow	100576	1.92
MEL - 0205	1	21-Jul-15	Rhodomonas minuta Skuja	50288	7.58
MEL - 0205	1	21-Jul-15	Cryptomonas erosa Ehrenberg	6800	8.07
MEL - 0205	1	21-Jul-15	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0205	1	21-Jul-15	Cryptomonas reflexa (Marsson) Skuja	1600	1.11
MEL - 0205	1	21-Jul-15	Cryptomonas rostratiformis Skuja	1200	2.87
MEL - 0205	1	21-Jul-15	Katablepharis ovalis Skuja	21552	0.87
MEL - 0205	1	21-Jul-15	Gymnodinium helveticum Penard	200	4.81
MEL - 0205	1	21-Jul-15	Gymnodinium sp.	800	11.31
MEL - 0205	1	21-Jul-15	Peridinium willei Huitfeldt-Kaas	200	5.05
MEL - 0205	1	21-Jul-15	Peridinium pusillum (Penard) Lemmermann	600	1.15
MEL - 0205	1	21-Jul-15	Peridinium aciculiferum Lemmermann	1400	12.67
MEL - 0205	1	17-Aug-15	Snowella sp	1400	1.40
MEL - 0205	1	17-Aug-15	Anabaena solitaria Klebs	200	0.66
MEL - 0205	1	17-Aug-15	Chlamydomonas spp.	7184	0.08
MEL - 0205	1	17-Aug-15	Sphaerocystis schroeteri Chodat	50288	0.78
MEL - 0205	1	17-Aug-15	Oocystis lacustris Chodat	14368	0.41

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205	1	17-Aug-15	Dictyosphaerium simplex Sukja	28736	0.12
MEL - 0205	1	17-Aug-15	Elakatothrix gelatinosa Willen	57472	0.99
MEL - 0205	1	17-Aug-15	Cosmarium sp.	200	0.61
MEL - 0205	1	17-Aug-15	Euastrum spp.	400	0.74
MEL - 0205	1	17-Aug-15	Staurodesmus extensus (Andersson) Teiling	1000	0.56
MEL - 0205	1	17-Aug-15	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.87
MEL - 0205	1	17-Aug-15	Mougeotia sp.	57472	14.16
MEL - 0205	1	17-Aug-15	Botryococcus braunii Kutzing	800	0.42
MEL - 0205	1	17-Aug-15	Spirogyra sp.	3200	1.29
MEL - 0205	1	17-Aug-15	Oocystis gigas Archer	400	0.97
MEL - 0205	1	17-Aug-15	Small chrysophyceae	359200	3.70
MEL - 0205	1	17-Aug-15	Large chrysophyceae	7184	1.29
MEL - 0205	1	17-Aug-15	Chrysochromulina parva Lackey	79024	5.17
MEL - 0205	1	17-Aug-15	Chrysococcus sp.	179600	11.75
MEL - 0205	1	17-Aug-15	Kephyrion boreale Skuja	14368	1.54
MEL - 0205	1	17-Aug-15	Kephyrion sp.	100576	1.89
MEL - 0205	1	17-Aug-15	Spiniferomonas sirrata**********	7184	0.56
MEL - 0205	1	17-Aug-15	Mallomonas crassisquama (Asmund) Fott	1000	1.06
MEL - 0205	1	17-Aug-15	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0205	1	17-Aug-15	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0205	1	17-Aug-15	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0205	1	17-Aug-15	Dinobryon sociale Ehrenberg	122128	27.63
MEL - 0205	1	17-Aug-15	Uroglena volvox Ehrenberg	294544	33.31
MEL - 0205	1	17-Aug-15	Chrysochromulina laurentiana Kling	35920	13.71
MEL - 0205	1	17-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	71840	2.29
MEL - 0205	1	17-Aug-15	Cyclotella stelligera Cleve and Grunow	3200	5.82
MEL - 0205	1	17-Aug-15	Cyclotella pseudostelligera	14368	4.40
MEL - 0205	1	17-Aug-15	Cyclotella ocellata Pant.	57472	5.99
MEL - 0205	1	17-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	7400	7.28
MEL - 0205	1	17-Aug-15	Fragilaria crotonensis Kitton	1200	0.43
MEL - 0205	1	17-Aug-15	Synedra acus Kutzing	1000	0.10
MEL - 0205	1	17-Aug-15	Asterionella formosa Hassall	10800	1.13

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205	1	17-Aug-15	Cyclotella michiganiana Skvortzow	122128	2.65
MEL - 0205	1	17-Aug-15	Rhodomonas minuta Skuja	172416	24.48
MEL - 0205	1	17-Aug-15	Cryptomonas erosa Ehrenberg	2400	2.80
MEL - 0205	1	17-Aug-15	Cryptomonas reflexa (Marsson) Skuja	1600	1.06
MEL - 0205	1	17-Aug-15	Cryptomonas rostratiformis Skuja	800	1.59
MEL - 0205	1	17-Aug-15	Katablepharis ovalis Skuja	7184	0.34
MEL - 0205	1	17-Aug-15	Gymnodinium helveticum Penard	200	4.42
MEL - 0205	1	17-Aug-15	Gymnodinium sp.	400	3.68
MEL - 0205	1	17-Aug-15	Peridinium pusillum (Penard) Lemmermann	1600	3.09
MEL - 0205	1	17-Aug-15	Peridinium aciculiferum Lemmermann	400	3.74
MEL - 0205	1R	17-Aug-15	Snowella sp	800	0.80
MEL - 0205	1R	17-Aug-15	Anabaena solitaria Klebs	400	1.69
MEL - 0205	1R	17-Aug-15	Chlamydomonas spp.	7184	0.08
MEL - 0205	1R	17-Aug-15	Sphaerocystis schroeteri Chodat	28736	0.45
MEL - 0205	1R	17-Aug-15	Dictyosphaerium simplex Sukja	28736	0.12
MEL - 0205	1R	17-Aug-15	Elakatothrix gelatinosa Willen	71840	1.24
MEL - 0205	1R	17-Aug-15	Euastrum spp.	600	1.12
MEL - 0205	1R	17-Aug-15	Staurodesmus extensus (Andersson) Teiling	1200	0.68
MEL - 0205	1R	17-Aug-15	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0205	1R	17-Aug-15	Mougeotia sp.	71840	17.69
MEL - 0205	1R	17-Aug-15	Botryococcus braunii Kutzing	400	0.21
MEL - 0205	1R	17-Aug-15	Spirogyra sp.	5200	2.09
MEL - 0205	1R	17-Aug-15	Oocystis gigas Archer	200	0.48
MEL - 0205	1R	17-Aug-15	Small chrysophyceae	316096	3.26
MEL - 0205	1R	17-Aug-15	Large chrysophyceae	14368	2.58
MEL - 0205	1R	17-Aug-15	Chrysochromulina parva Lackey	136496	8.93
MEL - 0205	1R	17-Aug-15	Chrysococcus sp.	208336	13.63
MEL - 0205	1R	17-Aug-15	Chrysostephanospaera globulifera Scherffel	7184	2.00
MEL - 0205	1R	17-Aug-15	Kephyrion boreale Skuja	14368	1.54
MEL - 0205	1R	17-Aug-15	Kephyrion sp.	129312	2.43
MEL - 0205	1R	17-Aug-15	Mallomonas crassisquama (Asmund) Fott	1200	1.28
MEL - 0205	1R	17-Aug-15	Dinobryon borgei Lemmermann	21552	1.55

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205	1R	17-Aug-15	Dinobryon mucronutom Nygaard	28736	5.42
MEL - 0205	1R	17-Aug-15	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0205	1R	17-Aug-15	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0205	1R	17-Aug-15	Dinobryon sociale Ehrenberg	107760	24.38
MEL - 0205	1R	17-Aug-15	Dinobryon sociale Ehrenberg	400	0.80
MEL - 0205	1R	17-Aug-15	Uroglena volvox Ehrenberg	330464	37.38
MEL - 0205	1R	17-Aug-15	Chrysochromulina laurentiana Kling	21552	8.23
MEL - 0205	1R	17-Aug-15	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.38
MEL - 0205	1R	17-Aug-15	Cyclotella stelligera Cleve and Grunow	2400	4.36
MEL - 0205	1R	17-Aug-15	Cyclotella pseudostelligera	7184	2.20
MEL - 0205	1R	17-Aug-15	Cyclotella ocellata Pant.	43104	4.50
MEL - 0205	1R	17-Aug-15	Tabellaria fenestrata (Lyngbye) Kutzing	8800	8.66
MEL - 0205	1R	17-Aug-15	Tabellaria flocculsa (Roth) Kutzing	800	1.07
MEL - 0205	1R	17-Aug-15	Fragilaria crotonensis Kitton	800	0.29
MEL - 0205	1R	17-Aug-15	Synedra acus Kutzing	800	0.08
MEL - 0205	1R	17-Aug-15	Asterionella formosa Hassall	12200	1.28
MEL - 0205	1R	17-Aug-15	Cyclotella michiganiana Skvortzow	158048	3.43
MEL - 0205	1R	17-Aug-15	Rhodomonas minuta Skuja	129312	18.36
MEL - 0205	1R	17-Aug-15	Cryptomonas erosa Ehrenberg	3400	3.97
MEL - 0205	1R	17-Aug-15	Cryptomonas reflexa (Marsson) Skuja	1200	0.80
MEL - 0205	1R	17-Aug-15	Cryptomonas rostratiformis Skuja	800	1.59
MEL - 0205	1R	17-Aug-15	Katablepharis ovalis Skuja	7184	0.34
MEL - 0205	1R	17-Aug-15	Gymnodinium helveticum Penard	200	4.42
MEL - 0205	1R	17-Aug-15	Gymnodinium sp.	800	7.36
MEL - 0205	1R	17-Aug-15	Peridinium pusillum (Penard) Lemmermann	1400	2.70
MEL - 0205	1R	17-Aug-15	Peridinium aciculiferum Lemmermann	400	3.74
MEL - 0205	1	10-Sep-15	Snowella sp	600	0.66
MEL - 0205	1	10-Sep-15	Chlamydomonas spp.	7184	0.07
MEL - 0205	1	10-Sep-15	Oocystis lacustris Chodat	35920	0.85
MEL - 0205	1	10-Sep-15	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.99
MEL - 0205	1	10-Sep-15	Quadrigula closterioides (Bohl.) Printz	28736	0.80
MEL - 0205	1	10-Sep-15	Elakatothrix gelatinosa Willen	7184	0.11

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205	1	10-Sep-15	Euastrum spp.	200	0.37
MEL - 0205	1	10-Sep-15	Staurodesmus extensus (Andersson) Teiling	1200	0.57
MEL - 0205	1	10-Sep-15	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0205	1	10-Sep-15	Mougeotia sp.	122128	28.09
MEL - 0205	1	10-Sep-15	Botryococcus braunii Kutzing	1000	1.44
MEL - 0205	1	10-Sep-15	Small chrysophyceae	387936	2.17
MEL - 0205	1	10-Sep-15	Large chrysophyceae	35920	13.71
MEL - 0205	1	10-Sep-15	Chrysochromulina parva Lackey	215520	14.10
MEL - 0205	1	10-Sep-15	Chrysococcus sp.	373568	24.43
MEL - 0205	1	10-Sep-15	Kephyrion sp.	57472	0.74
MEL - 0205	1	10-Sep-15	Spiniferomonas sirrata**********	21552	1.98
MEL - 0205	1	10-Sep-15	Mallomonas crassisquama (Asmund) Fott	400	0.40
MEL - 0205	1	10-Sep-15	Dinobryon mucronutom Nygaard	7184	0.90
MEL - 0205	1	10-Sep-15	Dinobryon bavaricum Imhof	35920	8.13
MEL - 0205	1	10-Sep-15	Dinobryon bavaricum Imhof	1600	3.19
MEL - 0205	1	10-Sep-15	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0205	1	10-Sep-15	Dinobryon sertularia Ehrenberg	600	3.05
MEL - 0205	1	10-Sep-15	Dinobryon sociale Ehrenberg	28736	6.50
MEL - 0205	1	10-Sep-15	Dinobryon sociale Ehrenberg	1400	2.79
MEL - 0205	1	10-Sep-15	Chrysolkos skuja (Nauwerck) Willen	7184	0.17
MEL - 0205	1	10-Sep-15	Uroglena volvox Ehrenberg	316096	35.75
MEL - 0205	1	10-Sep-15	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0205	1	10-Sep-15	Chrysochromulina laurentiana Kling	64656	24.68
MEL - 0205	1	10-Sep-15	Bicoeca lacustris Clark	7184	0.53
MEL - 0205	1	10-Sep-15	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43
MEL - 0205	1	10-Sep-15	Cyclotella stelligera Cleve and Grunow	9600	18.22
MEL - 0205	1	10-Sep-15	Cyclotella pseudostelligera	7184	3.87
MEL - 0205	1	10-Sep-15	Cyclotella ocellata Pant.	28736	3.00
MEL - 0205	1	10-Sep-15	Tabellaria fenestrata (Lyngbye) Kutzing	4000	3.43
MEL - 0205	1	10-Sep-15	Fragilaria crotonensis Kitton	1000	0.35
MEL - 0205	1	10-Sep-15	Synedra acus Kutzing	1200	0.12
MEL - 0205	1	10-Sep-15	Asterionella formosa Hassall	14400	1.51

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205	1	10-Sep-15	Cyclotella michiganiana Skvortzow	64656	1.58
MEL - 0205	1	10-Sep-15	Rhodomonas minuta Skuja	172416	26.00
MEL - 0205	1	10-Sep-15	Cryptomonas erosa Ehrenberg	3200	3.80
MEL - 0205	1	10-Sep-15	Cryptomonas reflexa (Marsson) Skuja	1000	0.70
MEL - 0205	1	10-Sep-15	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0205	1	10-Sep-15	Gymnodinium helveticum Penard	200	5.28
MEL - 0205	1	10-Sep-15	Gymnodinium sp.	1000	10.31
MEL - 0205	1	10-Sep-15	Peridinium pusillum (Penard) Lemmermann	600	1.26
MEL- 0302		01-Sep-17	Large chrysophyceae	57472	10.32
MEL- 0302		01-Sep-17	Chrysochromulina parva Lackey	28736	1.88
MEL- 0302		01-Sep-17	Chrysococcus sp.	366384	21.21
MEL- 0302		01-Sep-17	Kephyrion sp.	21552	0.20
MEL- 0302		01-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0302		01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0302		01-Sep-17	Dinobryon bavaricum Imhof	7184	1.63
MEL- 0302		01-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0302		01-Sep-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0302		01-Sep-17	Dinobryon sertularia Ehrenberg	200	1.02
MEL- 0302		01-Sep-17	Ochromonas sp.	14368	0.88
MEL- 0302		01-Sep-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0302		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	251440	8.10
MEL- 0302		01-Sep-17	Cyclotella stelligera Cleve and Grunow	3200	5.03
MEL- 0302		01-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0302		01-Sep-17	Tabellaria flocculsa (Roth) Kutzing	200	0.27
MEL- 0302		01-Sep-17	Synedra acus Kutzing	200	0.02
MEL- 0302		01-Sep-17	Synedra ulna (Nitzsch) Ehrenberg	200	1.47
MEL- 0302		01-Sep-17	Asterionella formosa Hassall	1800	0.19
MEL- 0302		01-Sep-17	Cyclotella michiganiana Skvortzow	57472	1.41
MEL- 0302		01-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0302		01-Sep-17	Rhodomonas minuta Skuja	14368	1.99
MEL- 0302		01-Sep-17	Cryptomonas erosa Ehrenberg	1000	1.31
MEL- 0302		01-Sep-17	Katablepharis ovalis Skuja	64656	2.34

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0302		01-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0302		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	800	1.99
MEL- 0303		01-Sep-17	Snowella sp	200	0.15
MEL- 0303		01-Sep-17	Oocystis lacustris Chodat	50288	1.52
MEL- 0303		01-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0303		01-Sep-17	Cosmarium sp.	200	0.28
MEL- 0303		01-Sep-17	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL- 0303		01-Sep-17	Staurodesmus paradoxum Meyen	200	1.05
MEL- 0303		01-Sep-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0303		01-Sep-17	Small chrysophyceae	193968	2.73
MEL- 0303		01-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0303		01-Sep-17	Chrysochromulina parva Lackey	64656	4.23
MEL- 0303		01-Sep-17	Chrysococcus sp.	524432	30.36
MEL- 0303		01-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	4.78
MEL- 0303		01-Sep-17	Kephyrion sp.	35920	0.88
MEL- 0303		01-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0303		01-Sep-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0303		01-Sep-17	Dinobryon bavaricum Imhof	57472	13.00
MEL- 0303		01-Sep-17	Dinobryon bavaricum Imhof	400	0.80
MEL- 0303		01-Sep-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0303		01-Sep-17	Dinobryon sertularia Ehrenberg	800	1.00
MEL- 0303		01-Sep-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0303		01-Sep-17	Stichogloea spp.	7184	0.36
MEL- 0303		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	86208	2.78
MEL- 0303		01-Sep-17	Cyclotella stelligera Cleve and Grunow	4200	6.60
MEL- 0303		01-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0303		01-Sep-17	Fragilaria crotonensis Kitton	200	0.06
MEL- 0303		01-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0303		01-Sep-17	Asterionella formosa Hassall	1800	0.19
MEL- 0303		01-Sep-17	Cyclotella michiganiana Skvortzow	35920	0.88
MEL- 0303		01-Sep-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0303		01-Sep-17	Rhodomonas minuta Skuja	43104	5.96

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0303		01-Sep-17	Cryptomonas erosa Ehrenberg	600	0.78
MEL- 0303		01-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0303		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	4400	10.92
MEL- 0304		01-Sep-17	Sphaerocystis schroeteri Chodat	35920	0.56
MEL- 0304		01-Sep-17	Oocystis lacustris Chodat	28736	0.87
MEL- 0304		01-Sep-17	Planctonema lauterbornii Schmidle	28736	6.50
MEL- 0304		01-Sep-17	Cosmarium sp.	200	0.28
MEL- 0304		01-Sep-17	Staurodesmus extensus (Andersson) Teiling	1400	0.54
MEL- 0304		01-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0304		01-Sep-17	Small chrysophyceae	100576	1.42
MEL- 0304		01-Sep-17	Large chrysophyceae	43104	7.74
MEL- 0304		01-Sep-17	Chrysochromulina parva Lackey	28736	1.88
MEL- 0304		01-Sep-17	Chrysococcus sp.	395120	22.88
MEL- 0304		01-Sep-17	Kephyrion sp.	35920	0.88
MEL- 0304		01-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0304		01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0304		01-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0304		01-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0304		01-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0304		01-Sep-17	Dinobryon sertularia Ehrenberg	1600	11.62
MEL- 0304		01-Sep-17	Chrysochromulina laurentiana Kling	100576	39.69
MEL- 0304		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.93
MEL- 0304		01-Sep-17	Pteridomonas sp.	7184	1.38
MEL- 0304		01-Sep-17	Cyclotella stelligera Cleve and Grunow	1600	2.51
MEL- 0304		01-Sep-17	Cyclotella ocellata Pant.	35920	4.49
MEL- 0304		01-Sep-17	Fragilaria crotonensis Kitton	200	0.06
MEL- 0304		01-Sep-17	Synedra acus Kutzing	1400	0.15
MEL- 0304		01-Sep-17	Asterionella formosa Hassall	2200	0.23
MEL- 0304		01-Sep-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0304		01-Sep-17	Cyclotella bodanica Eulenst.	400	3.09
MEL- 0304		01-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0304		01-Sep-17	Cryptomonas erosa Ehrenberg	1000	1.31

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0304		01-Sep-17	Gymnodinium sp.	1600	16.49
MEL- 0304		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	1600	3.97
MEL- 0305		01-Sep-17	Elakatothrix gelatinosa Willen	35920	0.68
MEL- 0305		01-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0305		01-Sep-17	Cosmarium sp.	600	0.84
MEL- 0305		01-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.14
MEL- 0305		01-Sep-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0305		01-Sep-17	Small chrysophyceae	208336	2.94
MEL- 0305		01-Sep-17	Large chrysophyceae	64656	11.61
MEL- 0305		01-Sep-17	Chrysochromulina parva Lackey	35920	2.35
MEL- 0305		01-Sep-17	Chrysococcus sp.	466960	27.04
MEL- 0305		01-Sep-17	Kephyrion boreale Skuja	7184	0.77
MEL- 0305		01-Sep-17	Kephyrion sp.	107760	0.99
MEL- 0305		01-Sep-17	Spiniferomonas sirrata**********	21552	1.98
MEL- 0305		01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0305		01-Sep-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0305		01-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0305		01-Sep-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0305		01-Sep-17	Dinobryon sertularia Ehrenberg	1200	6.10
MEL- 0305		01-Sep-17	Chrysochromulina laurentiana Kling	86208	34.02
MEL- 0305		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL- 0305		01-Sep-17	Cyclotella stelligera Cleve and Grunow	2400	3.77
MEL- 0305		01-Sep-17	Cyclotella ocellata Pant.	50288	6.28
MEL- 0305		01-Sep-17	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL- 0305		01-Sep-17	Tabellaria flocculsa (Roth) Kutzing	600	0.80
MEL- 0305		01-Sep-17	Fragilaria crotonensis Kitton	1400	0.45
MEL- 0305		01-Sep-17	Synedra acus Kutzing	600	0.06
MEL- 0305		01-Sep-17	Asterionella formosa Hassall	2000	0.21
MEL- 0305		01-Sep-17	Cyclotella michiganiana Skvortzow	50288	1.23
MEL- 0305		01-Sep-17	Rhodomonas minuta Skuja	64656	8.94
MEL- 0305		01-Sep-17	Cryptomonas erosa Ehrenberg	800	1.05
MEL- 0305		01-Sep-17	Cryptomonas reflexa (Marsson) Skuja	600	0.41

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305		01-Sep-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0305		01-Sep-17	Gymnodinium sp.	1000	10.31
MEL- 0305		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	2000	4.62
MEL- 0305R	Recount	01-Sep-17	Elakatothrix gelatinosa Willen	28736	0.54
MEL- 0305R	Recount	01-Sep-17	Planctonema lauterbornii Schmidle	28736	6.50
MEL- 0305R	Recount	01-Sep-17	Cosmarium sp.	600	0.84
MEL- 0305R	Recount	01-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0305R	Recount	01-Sep-17	Spondylosium planum (Wolle) W. and G.S. West	43104	1.63
MEL- 0305R	Recount	01-Sep-17	Small chrysophyceae	107760	1.52
MEL- 0305R	Recount	01-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0305R	Recount	01-Sep-17	Chrysochromulina parva Lackey	14368	0.94
MEL- 0305R	Recount	01-Sep-17	Chrysococcus sp.	431040	24.96
MEL- 0305R	Recount	01-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	4.78
MEL- 0305R	Recount	01-Sep-17	Kephyrion boreale Skuja	7184	0.77
MEL- 0305R	Recount	01-Sep-17	Kephyrion sp.	64656	0.59
MEL- 0305R	Recount	01-Sep-17	Spiniferomonas sirrata**********	14368	1.32
MEL- 0305R	Recount	01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0305R	Recount	01-Sep-17	Dinobryon mucronutom Nygaard	7184	0.86
MEL- 0305R	Recount	01-Sep-17	Dinobryon bavaricum Imhof	28736	6.50
MEL- 0305R	Recount	01-Sep-17	Dinobryon bavaricum Imhof	1200	2.39
MEL- 0305R	Recount	01-Sep-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0305R	Recount	01-Sep-17	Dinobryon sertularia Ehrenberg	2000	10.17
MEL- 0305R	Recount	01-Sep-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0305R	Recount	01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	114944	3.70
MEL- 0305R	Recount	01-Sep-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0305R	Recount	01-Sep-17	Cyclotella ocellata Pant.	43104	5.38
MEL- 0305R	Recount	01-Sep-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0305R	Recount	01-Sep-17	Fragilaria crotonensis Kitton	3400	1.08
MEL- 0305R	Recount	01-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0305R	Recount	01-Sep-17	Asterionella formosa Hassall	3400	0.36
MEL- 0305R	Recount	01-Sep-17	Cyclotella michiganiana Skvortzow	79024	1.94
MEL- 0305R	Recount	01-Sep-17	Cyclotella bodanica Eulenst.	400	3.09

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305R	Recount	01-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0305R	Recount	01-Sep-17	Cryptomonas erosa Ehrenberg	400	0.52
MEL- 0305R	Recount	01-Sep-17	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL- 0305R	Recount	01-Sep-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0305R	Recount	01-Sep-17	Gymnodinium sp.	1600	16.49
MEL- 0305R	Recount	01-Sep-17	Peridinium pusillum (Penard) Lemmermann	1600	3.70
MEL- 0101		04-Sep-17	Sphaerocystis schroeteri Chodat	57472	0.53
MEL- 0101		04-Sep-17	Oocystis lacustris Chodat	21552	0.57
MEL- 0101		04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0101		04-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0101		04-Sep-17	Cosmarium sp.	200	0.94
MEL- 0101		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL- 0101		04-Sep-17	Botryococcus braunii Kutzing	800	0.42
MEL- 0101		04-Sep-17	Euglena acus Ehrenberg	200	1.19
MEL- 0101		04-Sep-17	Small chrysophyceae	122128	1.72
MEL- 0101		04-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0101		04-Sep-17	Chrysochromulina parva Lackey	86208	5.64
MEL- 0101		04-Sep-17	Chrysococcus sp.	445408	22.72
MEL- 0101		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0101		04-Sep-17	Kephyrion sp.	7184	0.11
MEL- 0101		04-Sep-17	Dinobryon borgei Lemmermann	28736	1.39
MEL- 0101		04-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0101		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0101		04-Sep-17	Dinobryon sertularia Ehrenberg	50288	11.38
MEL- 0101		04-Sep-17	Dinobryon sertularia Ehrenberg	800	1.59
MEL- 0101		04-Sep-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0101		04-Sep-17	Stichogloea spp.	7184	0.36
MEL- 0101		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	431040	13.88
MEL- 0101		04-Sep-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0101		04-Sep-17	Rhizosolenia eriense H.L. Smith	50288	3.91
MEL- 0101		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	4600	3.73
MEL- 0101		04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	11000	18.06

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101		04-Sep-17	Fragilaria crotonensis Kitton	4200	1.27
MEL- 0101		04-Sep-17	Synedra acus Kutzing	3800	0.38
MEL- 0101		04-Sep-17	Asterionella formosa Hassall	133200	13.81
MEL- 0101		04-Sep-17	Cyclotella michiganiana Skvortzow	28736	0.70
MEL- 0101		04-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0101		04-Sep-17	Rhodomonas minuta Skuja	158048	21.84
MEL- 0101		04-Sep-17	Cryptomonas erosa Ehrenberg	600	0.78
MEL- 0101		04-Sep-17	Katablepharis ovalis Skuja	14368	0.52
MEL- 0101		04-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0101		04-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0101		04-Sep-17	Gymnodinium sp.	200	2.83
MEL- 0101		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	800	2.83
MEL- 0101		04-Sep-17	Peridinium aciculiferum Lemmermann	400	3.62
MEL- 0101	Rep1	04-Sep-17	Carteria spp.	7184	2.65
MEL- 0101	Rep1	04-Sep-17	Chlamydomonas spp.	7184	0.24
MEL- 0101	Rep1	04-Sep-17	Sphaerocystis schroeteri Chodat	50288	0.46
MEL- 0101	Rep1	04-Sep-17	Oocystis lacustris Chodat	50288	1.33
MEL- 0101	Rep1	04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0101	Rep1	04-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0101	Rep1	04-Sep-17	Cosmarium sp.	200	0.28
MEL- 0101	Rep1	04-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL- 0101	Rep1	04-Sep-17	Staurodesmus paradoxum Meyen	400	0.42
MEL- 0101	Rep1	04-Sep-17	Botryococcus braunii Kutzing	1400	0.73
MEL- 0101	Rep1	04-Sep-17	Small chrysophyceae	57472	0.81
MEL- 0101	Rep1	04-Sep-17	Large chrysophyceae	14368	2.58
MEL- 0101	Rep1	04-Sep-17	Chrysochromulina parva Lackey	50288	3.29
MEL- 0101	Rep1	04-Sep-17	Chrysococcus sp.	502880	25.65
MEL- 0101	Rep1	04-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	5.13
MEL- 0101	Rep1	04-Sep-17	Dinobryon borgei Lemmermann	7184	0.35
MEL- 0101	Rep1	04-Sep-17	Dinobryon bavaricum Imhof	43104	9.75
MEL- 0101	Rep1	04-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0101	Rep1	04-Sep-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.88

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101	Rep1	04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0101	Rep1	04-Sep-17	Dinobryon sertularia Ehrenberg	1000	1.99
MEL- 0101	Rep1	04-Sep-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0101	Rep1	04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	229888	7.40
MEL- 0101	Rep1	04-Sep-17	Cyclotella stelligera Cleve and Grunow	2200	3.46
MEL- 0101	Rep1	04-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0101	Rep1	04-Sep-17	Rhizosolenia eriense H.L. Smith	28736	2.24
MEL- 0101	Rep1	04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	9400	7.62
MEL- 0101	Rep1	04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	7200	11.82
MEL- 0101	Rep1	04-Sep-17	Fragilaria crotonensis Kitton	2200	0.66
MEL- 0101	Rep1	04-Sep-17	Synedra acus Kutzing	3400	0.34
MEL- 0101	Rep1	04-Sep-17	Asterionella formosa Hassall	139800	14.50
MEL- 0101	Rep1	04-Sep-17	Cyclotella michiganiana Skvortzow	28736	0.70
MEL- 0101	Rep1	04-Sep-17	Rhodomonas minuta Skuja	43104	5.96
MEL- 0101	Rep1	04-Sep-17	Cryptomonas erosa Ehrenberg	200	0.26
MEL- 0101	Rep1	04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0101	Rep1	04-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0101	Rep1	04-Sep-17	Gymnodinium sp.	200	2.83
MEL- 0101	Rep1	04-Sep-17	Peridinium pusillum (Penard) Lemmermann	1800	6.36
MEL- 0101	Rep1	04-Sep-17	Peridinium aciculiferum Lemmermann	600	5.43
MEL- 0101R	Rep1 Recount	04-Sep-17	Snowella sp	200	0.15
MEL- 0101R	Rep1 Recount	04-Sep-17	Chlamydomonas spp.	35920	1.19
MEL- 0101R	Rep1 Recount	04-Sep-17	Sphaerocystis schroeteri Chodat	28736	0.36
MEL- 0101R	Rep1 Recount	04-Sep-17	Oocystis lacustris Chodat	43104	1.14
MEL- 0101R	Rep1 Recount	04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0101R	Rep1 Recount	04-Sep-17	Planctonema lauterbornii Schmidle	64656	14.63
MEL- 0101R	Rep1 Recount	04-Sep-17	Staurodesmus paradoxum Meyen	200	0.21
MEL- 0101R	Rep1 Recount	04-Sep-17	Botryococcus braunii Kutzing	1800	0.94
MEL- 0101R	Rep1 Recount	04-Sep-17	Small chrysophyceae	28736	0.41
MEL- 0101R	Rep1 Recount	04-Sep-17	Large chrysophyceae	14368	2.58
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysochromulina parva Lackey	28736	1.88
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysococcus sp.	617824	31.51

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysostephanospaera globulifera Scherffel	21552	7.69
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon bavaricum Imhof	35920	8.13
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon bavaricum Imhof	1400	2.79
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon sertularia Ehrenberg	800	1.59
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.22
MEL- 0101R	Rep1 Recount	04-Sep-17	Uroglena volvox Ehrenberg	28736	3.25
MEL- 0101R	Rep1 Recount	04-Sep-17	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysochromulina laurentiana Kling	28736	11.34
MEL- 0101R	Rep1 Recount	04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	186784	6.01
MEL- 0101R	Rep1 Recount	04-Sep-17	Cyclotella stelligera Cleve and Grunow	3000	4.71
MEL- 0101R	Rep1 Recount	04-Sep-17	Cyclotella ocellata Pant.	14368	1.56
MEL- 0101R	Rep1 Recount	04-Sep-17	Rhizosolenia eriense H.L. Smith	43104	3.35
MEL- 0101R	Rep1 Recount	04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	5200	4.21
MEL- 0101R	Rep1 Recount	04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	12200	20.03
MEL- 0101R	Rep1 Recount	04-Sep-17	Fragilaria crotonensis Kitton	1400	0.42
MEL- 0101R	Rep1 Recount	04-Sep-17	Synedra acus Kutzing	2200	0.22
MEL- 0101R	Rep1 Recount	04-Sep-17	Asterionella formosa Hassall	129600	13.02
MEL- 0101R	Rep1 Recount	04-Sep-17	Cyclotella michiganiana Skvortzow	21552	0.53
MEL- 0101R	Rep1 Recount	04-Sep-17	Rhodomonas minuta Skuja	71840	9.93
MEL- 0101R	Rep1 Recount	04-Sep-17	Cryptomonas erosa Ehrenberg	1200	1.57
MEL- 0101R	Rep1 Recount	04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.44
MEL- 0101R	Rep1 Recount	04-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0101R	Rep1 Recount	04-Sep-17	Gymnodinium sp.	400	5.65
MEL- 0101R	Rep1 Recount	04-Sep-17	Peridinium pusillum (Penard) Lemmermann	2000	7.07
MEL- 0101R	Rep1 Recount	04-Sep-17	Peridinium aciculiferum Lemmermann	400	3.62
MEL- 0102		04-Sep-17	Sphaerocystis schroeteri Chodat	100576	0.93
MEL- 0102		04-Sep-17	Oocystis lacustris Chodat	43104	1.14
MEL- 0102		04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0102		04-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0102		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL- 0102		04-Sep-17	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling		

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0102		04-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0102		04-Sep-17	Small chrysophyceae	43104	0.61
MEL- 0102		04-Sep-17	Large chrysophyceae	21552	3.87
MEL- 0102		04-Sep-17	Chrysochromulina parva Lackey	43104	2.82
MEL- 0102		04-Sep-17	Chrysococcus sp.	495696	25.28
MEL- 0102		04-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	4.15
MEL- 0102		04-Sep-17	Kephyrion boreale Skuja	7184	0.77
MEL- 0102		04-Sep-17	Kephyrion sp.	7184	0.11
MEL- 0102		04-Sep-17	Spiniferomonas sirrata**********	21552	1.98
MEL- 0102		04-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0102		04-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0102		04-Sep-17	Dinobryon bavaricum Imhof	400	0.80
MEL- 0102		04-Sep-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	5.75
MEL- 0102		04-Sep-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0102		04-Sep-17	Dinobryon sertularia Ehrenberg	1000	1.99
MEL- 0102		04-Sep-17	Chrysochromulina laurentiana Kling	57472	22.68
MEL- 0102		04-Sep-17	Stichogloea spp.	35920	1.81
MEL- 0102		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	646560	20.82
MEL- 0102		04-Sep-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0102		04-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0102		04-Sep-17	Rhizosolenia eriense H.L. Smith	35920	2.79
MEL- 0102		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	3600	2.92
MEL- 0102		04-Sep-17	Fragilaria crotonensis Kitton	6400	1.98
MEL- 0102		04-Sep-17	Synedra acus Kutzing	7200	0.72
MEL- 0102		04-Sep-17	Asterionella formosa Hassall	130400	13.52
MEL- 0102		04-Sep-17	Cyclotella michiganiana Skvortzow	35920	0.88
MEL- 0102		04-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0102		04-Sep-17	Rhodomonas minuta Skuja	71840	9.93
MEL- 0102		04-Sep-17	Cryptomonas erosa Ehrenberg	1200	1.57
MEL- 0102		04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.41
MEL- 0102		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0102		04-Sep-17	Gymnodinium helveticum Penard	200	4.81

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0102		04-Sep-17	Gymnodinium sp.	200	2.83
MEL- 0102		04-Sep-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0102		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	4200	14.85
MEL- 0102		04-Sep-17	Peridinium aciculiferum Lemmermann	400	3.62
MEL- 0103		04-Sep-17	Snowella sp	200	0.15
MEL- 0103		04-Sep-17	Sphaerocystis schroeteri Chodat	35920	0.33
MEL- 0103		04-Sep-17	Oocystis lacustris Chodat	79024	2.09
MEL- 0103		04-Sep-17	Elakatothrix gelatinosa Willen	14368	0.25
MEL- 0103		04-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0103		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	800	0.29
MEL- 0103		04-Sep-17	Small chrysophyceae	64656	0.91
MEL- 0103		04-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0103		04-Sep-17	Chrysochromulina parva Lackey	14368	0.94
MEL- 0103		04-Sep-17	Chrysococcus sp.	510064	26.01
MEL- 0103		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0103		04-Sep-17	Kephyrion sp.	7184	0.11
MEL- 0103		04-Sep-17	Kephyrion sp.	7184	0.81
MEL- 0103		04-Sep-17	Spiniferomonas sirrata**********	14368	1.32
MEL- 0103		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0103		04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0103		04-Sep-17	Dinobryon sertularia Ehrenberg	600	1.19
MEL- 0103		04-Sep-17	Epiphyxis sp.	43104	3.25
MEL- 0103		04-Sep-17	Chrysochromulina laurentiana Kling	28736	11.34
MEL- 0103		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	538800	17.35
MEL- 0103		04-Sep-17	Cyclotella stelligera Cleve and Grunow	2200	3.46
MEL- 0103		04-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0103		04-Sep-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0103		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	14600	11.83
MEL- 0103		04-Sep-17	Fragilaria crotonensis Kitton	3600	1.12
MEL- 0103		04-Sep-17	Synedra acus Kutzing	7400	0.74
MEL- 0103		04-Sep-17	Asterionella formosa Hassall	133600	13.85
MEL- 0103		04-Sep-17	Cyclotella michiganiana Skvortzow	14368	0.35

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0103		04-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0103		04-Sep-17	Rhodomonas minuta Skuja	79024	10.92
MEL- 0103		04-Sep-17	Cryptomonas erosa Ehrenberg	200	0.26
MEL- 0103		04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.41
MEL- 0103		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0103		04-Sep-17	Gymnodinium helveticum Penard	400	9.42
MEL- 0103		04-Sep-17	Gymnodinium sp.	1000	14.14
MEL- 0103		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	3800	13.43
MEL- 0103		04-Sep-17	Peridinium aciculiferum Lemmermann	200	1.81
MEL- 0104		04-Sep-17	Sphaerocystis schroeteri Chodat	193968	3.03
MEL- 0104		04-Sep-17	Oocystis lacustris Chodat	21552	0.61
MEL- 0104		04-Sep-17	Elakatothrix gelatinosa Willen	7184	0.12
MEL- 0104		04-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0104		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.09
MEL- 0104		04-Sep-17	Staurodesmus paradoxum Meyen	200	0.55
MEL- 0104		04-Sep-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0104		04-Sep-17	Small chrysophyceae	43104	0.61
MEL- 0104		04-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0104		04-Sep-17	Chrysochromulina parva Lackey	93392	6.11
MEL- 0104		04-Sep-17	Chrysococcus sp.	359200	18.32
MEL- 0104		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0104		04-Sep-17	Kephyrion boreale Skuja	14368	1.71
MEL- 0104		04-Sep-17	Kephyrion sp.	28736	0.45
MEL- 0104		04-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0104		04-Sep-17	Dinobryon bavaricum Imhof	35920	8.13
MEL- 0104		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0104		04-Sep-17	Dinobryon sertularia Ehrenberg	57472	13.00
MEL- 0104		04-Sep-17	Dinobryon sertularia Ehrenberg	400	0.80
MEL- 0104		04-Sep-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0104		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	768688	24.75
MEL- 0104		04-Sep-17	Pteridomonas sp.	7184	1.59
MEL- 0104		04-Sep-17	Cyclotella stelligera Cleve and Grunow	800	1.45

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0104		04-Sep-17	Rhizosolenia eriense H.L. Smith	21552	1.68
MEL- 0104		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	5200	4.21
MEL- 0104		04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	3200	4.93
MEL- 0104		04-Sep-17	Fragilaria crotonensis Kitton	3000	0.95
MEL- 0104		04-Sep-17	Synedra acus Kutzing	5400	0.54
MEL- 0104		04-Sep-17	Asterionella formosa Hassall	166400	17.26
MEL- 0104		04-Sep-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0104		04-Sep-17	Rhodomonas minuta Skuja	107760	14.89
MEL- 0104		04-Sep-17	Cryptomonas erosa Ehrenberg	600	0.78
MEL- 0104		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0104		04-Sep-17	Gymnodinium helveticum Penard	600	14.14
MEL- 0104		04-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0104		04-Sep-17	Gymnodinium sp.	400	5.65
MEL- 0104		04-Sep-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0104		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	1600	5.66
MEL- 0104		04-Sep-17	Peridinium aciculiferum Lemmermann	200	1.81
MEL- 0105		04-Sep-17	Chlamydomonas spp.	43104	1.42
MEL- 0105		04-Sep-17	Sphaerocystis schroeteri Chodat	86208	0.79
MEL- 0105		04-Sep-17	Oocystis lacustris Chodat	107760	2.84
MEL- 0105		04-Sep-17	Crucigenia quadrata Morr.	28736	0.14
MEL- 0105		04-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0105		04-Sep-17	Cosmarium sp.	200	0.94
MEL- 0105		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL- 0105		04-Sep-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0105		04-Sep-17	Mougeotia sp.	1200	3.00
MEL- 0105		04-Sep-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0105		04-Sep-17	Small chrysophyceae	57472	0.81
MEL- 0105		04-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0105		04-Sep-17	Chrysochromulina parva Lackey	7184	0.47
MEL- 0105		04-Sep-17	Chrysococcus sp.	258624	13.19
MEL- 0105		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0105		04-Sep-17	Kephyrion sp.	7184	0.11

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0105		04-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0105		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0105		04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0105		04-Sep-17	Dinobryon sertularia Ehrenberg	400	0.80
MEL- 0105		04-Sep-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0105		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	330464	10.64
MEL- 0105		04-Sep-17	Cyclotella ocellata Pant.	7184	0.78
MEL- 0105		04-Sep-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0105		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	8400	6.81
MEL- 0105		04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	2400	3.94
MEL- 0105		04-Sep-17	Fragilaria crotonensis Kitton	4400	1.33
MEL- 0105		04-Sep-17	Synedra acus Kutzing	4000	0.40
MEL- 0105		04-Sep-17	Asterionella formosa Hassall	136000	14.10
MEL- 0105		04-Sep-17	Cyclotella michiganiana Skvortzow	7184	0.18
MEL- 0105		04-Sep-17	Rhodomonas minuta Skuja	35920	4.96
MEL- 0105		04-Sep-17	Cryptomonas erosa Ehrenberg	1400	1.83
MEL- 0105		04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.41
MEL- 0105		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0105		04-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0105		04-Sep-17	Gymnodinium sp.	1600	22.62
MEL- 0105		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	3000	10.61
MEL- 0201		05-Sep-17	Planktolyngbya limnetica	200	0.05
MEL- 0201		05-Sep-17	Chlamydomonas spp.	7184	0.36
MEL- 0201		05-Sep-17	Oocystis lacustris Chodat	50288	1.44
MEL- 0201		05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0201		05-Sep-17	Cosmarium sp.	600	0.84
MEL- 0201		05-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL- 0201		05-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0201		05-Sep-17	Oocystis gigas Archer	400	0.97
MEL- 0201		05-Sep-17	Small chrysophyceae	79024	1.11
MEL- 0201		05-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0201		05-Sep-17	Chrysochromulina parva Lackey	14368	0.94

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0201		05-Sep-17	Chrysococcus sp.	431040	21.98
MEL- 0201		05-Sep-17	Kephyrion sp.	14368	0.25
MEL- 0201		05-Sep-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0201		05-Sep-17	Dinobryon borgei Lemmermann	28736	1.23
MEL- 0201		05-Sep-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0201		05-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0201		05-Sep-17	Dinobryon sertularia Ehrenberg	50288	11.38
MEL- 0201		05-Sep-17	Dinobryon sertularia Ehrenberg	400	0.80
MEL- 0201		05-Sep-17	Epiphyxis sp.	7184	0.54
MEL- 0201		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.60
MEL- 0201		05-Sep-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0201		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.39
MEL- 0201		05-Sep-17	Cyclotella stelligera Cleve and Grunow	6000	9.42
MEL- 0201		05-Sep-17	Cyclotella ocellata Pant.	21552	2.25
MEL- 0201		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.32
MEL- 0201		05-Sep-17	Fragilaria crotonensis Kitton	600	0.19
MEL- 0201		05-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0201		05-Sep-17	Asterionella formosa Hassall	19800	2.09
MEL- 0201		05-Sep-17	Cyclotella michiganiana Skvortzow	79024	1.94
MEL- 0201		05-Sep-17	Cyclotella bodanica Eulenst.	1400	10.80
MEL- 0201		05-Sep-17	Rhodomonas minuta Skuja	50288	6.95
MEL- 0201		05-Sep-17	Cryptomonas erosa Ehrenberg	1400	1.83
MEL- 0201		05-Sep-17	Gymnodinium sp.	600	6.18
MEL- 0201		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	2800	6.71
MEL- 0201		05-Sep-17	Peridinium wisconsiense Eddy	200	4.49
MEL- 0202		05-Sep-17	Oocystis lacustris Chodat	14368	0.38
MEL- 0202		05-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0202		05-Sep-17	Closterium sp.	200	0.30
MEL- 0202		05-Sep-17	Small chrysophyceae	136496	1.92
MEL- 0202		05-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0202		05-Sep-17	Chrysochromulina parva Lackey	35920	2.35
MEL- 0202		05-Sep-17	Chrysococcus sp.	359200	18.32

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0202		05-Sep-17	Kephyrion sp.	28736	0.49
MEL- 0202		05-Sep-17	Mallomonas crassisquama (Asmund) Fott	200	0.20
MEL- 0202		05-Sep-17	Dinobryon bavaricum Imhof	43104	9.75
MEL- 0202		05-Sep-17	Dinobryon bavaricum Imhof	600	2.03
MEL- 0202		05-Sep-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0202		05-Sep-17	Dinobryon sertularia Ehrenberg	1000	5.09
MEL- 0202		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	35920	0.94
MEL- 0202		05-Sep-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0202		05-Sep-17	Chrysochromulina laurentiana Kling	57472	22.68
MEL- 0202		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.69
MEL- 0202		05-Sep-17	Cyclotella stelligera Cleve and Grunow	3800	5.97
MEL- 0202		05-Sep-17	Cyclotella ocellata Pant.	43104	4.50
MEL- 0202		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.32
MEL- 0202		05-Sep-17	Synedra acus Kutzing	400	0.04
MEL- 0202		05-Sep-17	Asterionella formosa Hassall	14200	1.50
MEL- 0202		05-Sep-17	Cyclotella michiganiana Skvortzow	143680	3.12
MEL- 0202		05-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0202		05-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0202		05-Sep-17	Cryptomonas erosa Ehrenberg	800	1.05
MEL- 0202		05-Sep-17	Gymnodinium sp.	400	4.12
MEL- 0202		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	2200	5.27
MEL- 0203		05-Sep-17	Snowella sp	200	0.14
MEL- 0203		05-Sep-17	Sphaerocystis schroeteri Chodat	35920	0.56
MEL- 0203		05-Sep-17	Oocystis lacustris Chodat	21552	0.57
MEL- 0203		05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0203		05-Sep-17	Cosmarium sp.	800	1.12
MEL- 0203		05-Sep-17	Staurodesmus paradoxum Meyen	600	2.45
MEL- 0203		05-Sep-17	Botryococcus braunii Kutzing	800	0.42
MEL- 0203		05-Sep-17	Zygnema sp.	600	1.97
MEL- 0203		05-Sep-17	Small chrysophyceae	64656	0.91
MEL- 0203		05-Sep-17	Large chrysophyceae	21552	3.87
MEL- 0203		05-Sep-17	Chrysochromulina parva Lackey	57472	3.76

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0203		05-Sep-17	Chrysococcus sp.	510064	26.01
MEL- 0203		05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0203		05-Sep-17	Kephyrion sp.	28736	0.49
MEL- 0203		05-Sep-17	Mallomonas caudata Ivanov	400	2.14
MEL- 0203		05-Sep-17	Mallomonas crassisquama (Asmund) Fott	200	0.20
MEL- 0203		05-Sep-17	Dinobryon borgei Lemmermann	21552	0.95
MEL- 0203		05-Sep-17	Dinobryon mucronutom Nygaard	7184	0.86
MEL- 0203		05-Sep-17	Dinobryon bavaricum Imhof	71840	16.25
MEL- 0203		05-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0203		05-Sep-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0203		05-Sep-17	Dinobryon sertularia Ehrenberg	2000	6.78
MEL- 0203		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.39
MEL- 0203		05-Sep-17	Uroglena volvox Ehrenberg	28736	3.25
MEL- 0203		05-Sep-17	Chrysochromulina laurentiana Kling	35920	14.17
MEL- 0203		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.39
MEL- 0203		05-Sep-17	Cyclotella stelligera Cleve and Grunow	6600	10.37
MEL- 0203		05-Sep-17	Cyclotella ocellata Pant.	28736	3.00
MEL- 0203		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.65
MEL- 0203		05-Sep-17	Fragilaria crotonensis Kitton	1400	0.45
MEL- 0203		05-Sep-17	Synedra acus Kutzing	1200	0.12
MEL- 0203		05-Sep-17	Asterionella formosa Hassall	16000	1.69
MEL- 0203		05-Sep-17	Cyclotella michiganiana Skvortzow	79024	1.51
MEL- 0203		05-Sep-17	Cyclotella bodanica Eulenst.	1000	7.72
MEL- 0203		05-Sep-17	Rhodomonas minuta Skuja	50288	6.95
MEL- 0203		05-Sep-17	Cryptomonas erosa Ehrenberg	2000	2.61
MEL- 0203		05-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0203		05-Sep-17	Gymnodinium sp.	14368	5.30
MEL- 0203		05-Sep-17	Gymnodinium sp.	400	4.12
MEL- 0203		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	3400	8.14
MEL- 0204		05-Sep-17	Planktolyngbya limnetica	200	0.02
MEL- 0204		05-Sep-17	Chlamydomonas spp.	7184	0.85
MEL- 0204		05-Sep-17	Sphaerocystis schroeteri Chodat	21552	0.34

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204		05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0204		05-Sep-17	Cosmarium sp.	600	0.84
MEL- 0204		05-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0204		05-Sep-17	Staurodesmus paradoxum Meyen	200	0.37
MEL- 0204		05-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0204		05-Sep-17	Small chrysophyceae	28736	0.41
MEL- 0204		05-Sep-17	Large chrysophyceae	14368	2.58
MEL- 0204		05-Sep-17	Chrysochromulina parva Lackey	7184	0.47
MEL- 0204		05-Sep-17	Chrysococcus sp.	524432	26.75
MEL- 0204		05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0204		05-Sep-17	Kephyrion sp.	21552	0.37
MEL- 0204		05-Sep-17	Dinobryon borgei Lemmermann	7184	0.32
MEL- 0204		05-Sep-17	Dinobryon mucronutom Nygaard	7184	0.86
MEL- 0204		05-Sep-17	Dinobryon bavaricum Imhof	35920	8.13
MEL- 0204		05-Sep-17	Dinobryon bavaricum Imhof	600	1.19
MEL- 0204		05-Sep-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0204		05-Sep-17	Dinobryon sertularia Ehrenberg	1600	3.19
MEL- 0204		05-Sep-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0204		05-Sep-17	Chrysochromulina laurentiana Kling	35920	14.17
MEL- 0204		05-Sep-17	Stichogloea spp.	21552	1.08
MEL- 0204		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.93
MEL- 0204		05-Sep-17	Cyclotella stelligera Cleve and Grunow	4400	6.91
MEL- 0204		05-Sep-17	Cyclotella ocellata Pant.	28736	2.89
MEL- 0204		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	2000	1.62
MEL- 0204		05-Sep-17	Fragilaria crotonensis Kitton	1400	0.45
MEL- 0204		05-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0204		05-Sep-17	Asterionella formosa Hassall	28400	3.00
MEL- 0204		05-Sep-17	Cyclotella michiganiana Skvortzow	107760	2.06
MEL- 0204		05-Sep-17	Cyclotella bodanica Eulenst.	1000	7.72
MEL- 0204		05-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0204		05-Sep-17	Cryptomonas erosa Ehrenberg	1200	1.57
MEL- 0204		05-Sep-17	Katablepharis ovalis Skuja	7184	0.25

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204		05-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0204		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	4400	10.54
MEL- 0204	Rep 2	05-Sep-17	Planktolyngbya limnetica	400	0.06
MEL- 0204	Rep 2	05-Sep-17	Chlamydomonas spp.	7184	0.85
MEL- 0204	Rep 2	05-Sep-17	Sphaerocystis schroeteri Chodat	64656	1.01
MEL- 0204	Rep 2	05-Sep-17	Oocystis lacustris Chodat	7184	0.19
MEL- 0204	Rep 2	05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0204	Rep 2	05-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL- 0204	Rep 2	05-Sep-17	Oocystis gigas Archer	200	0.48
MEL- 0204	Rep 2	05-Sep-17	Small chrysophyceae	86208	1.22
MEL- 0204	Rep 2	05-Sep-17	Large chrysophyceae	43104	7.74
MEL- 0204	Rep 2	05-Sep-17	Chrysochromulina parva Lackey	14368	0.94
MEL- 0204	Rep 2	05-Sep-17	Chrysococcus sp.	416672	21.25
MEL- 0204	Rep 2	05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0204	Rep 2	05-Sep-17	Kephyrion sp.	43104	0.74
MEL- 0204	Rep 2	05-Sep-17	Mallomonas crassisquama (Asmund) Fott	400	0.40
MEL- 0204	Rep 2	05-Sep-17	Dinobryon borgei Lemmermann	21552	0.95
MEL- 0204	Rep 2	05-Sep-17	Dinobryon bavaricum Imhof	50288	11.38
MEL- 0204	Rep 2	05-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0204	Rep 2	05-Sep-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0204	Rep 2	05-Sep-17	Dinobryon sertularia Ehrenberg	600	1.19
MEL- 0204	Rep 2	05-Sep-17	Chrysochromulina laurentiana Kling	21552	8.50
MEL- 0204	Rep 2	05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.16
MEL- 0204	Rep 2	05-Sep-17	Cyclotella stelligera Cleve and Grunow	4200	6.60
MEL- 0204	Rep 2	05-Sep-17	Cyclotella ocellata Pant.	64656	6.50
MEL- 0204	Rep 2	05-Sep-17	Fragilaria crotonensis Kitton	2600	0.83
MEL- 0204	Rep 2	05-Sep-17	Synedra acus Kutzing	1600	0.16
MEL- 0204	Rep 2	05-Sep-17	Asterionella formosa Hassall	16200	1.71
MEL- 0204	Rep 2	05-Sep-17	Cyclotella michiganiana Skvortzow	57472	1.10
MEL- 0204	Rep 2	05-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0204	Rep 2	05-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0204	Rep 2	05-Sep-17	Cryptomonas erosa Ehrenberg	1000	1.31

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204	Rep 2	05-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0204	Rep 2	05-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0204	Rep 2	05-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0204	Rep 2	05-Sep-17	Peridinium pusillum (Penard) Lemmermann	3400	8.14
MEL- 0205		05-Sep-17	Chlamydomonas spp.	14368	2.17
MEL- 0205		05-Sep-17	Sphaerocystis schroeteri Chodat	64656	1.01
MEL- 0205		05-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0205		05-Sep-17	Planctonema lauterbornii Schmidle	43104	9.75
MEL- 0205		05-Sep-17	Closterium kuetzingii Brebisson	200	0.34
MEL- 0205		05-Sep-17	Cosmarium sp.	600	0.84
MEL- 0205		05-Sep-17	Botryococcus braunii Kutzing	800	0.42
MEL- 0205		05-Sep-17	Small chrysophyceae	122128	1.72
MEL- 0205		05-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0205		05-Sep-17	Chrysochromulina parva Lackey	129312	8.46
MEL- 0205		05-Sep-17	Chrysococcus sp.	431040	21.98
MEL- 0205		05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0205		05-Sep-17	Kephyrion sp.	28736	0.49
MEL- 0205		05-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0205		05-Sep-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0205		05-Sep-17	Mallomonas crassisquama (Asmund) Fott	200	0.20
MEL- 0205		05-Sep-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0205		05-Sep-17	Dinobryon bavaricum Imhof	1000	1.99
MEL- 0205		05-Sep-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0205		05-Sep-17	Dinobryon sertularia Ehrenberg	1200	2.39
MEL- 0205		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.19
MEL- 0205		05-Sep-17	Uroglena volvox Ehrenberg	28736	3.25
MEL- 0205		05-Sep-17	Chrysochromulina laurentiana Kling	86208	34.02
MEL- 0205		05-Sep-17	Stichogloea spp.	7184	0.36
MEL- 0205		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	79024	2.54
MEL- 0205		05-Sep-17	Cyclotella stelligera Cleve and Grunow	3800	5.97
MEL- 0205		05-Sep-17	Cyclotella ocellata Pant.	14368	1.50
MEL- 0205		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	6000	4.86

Table 11D-3: Raw Phytoplankton Data, Meliadine Lake 2015

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0205		05-Sep-17	Fragilaria crotonensis Kitton	1000	0.32
MEL- 0205		05-Sep-17	Synedra acus Kutzing	2000	0.20
MEL- 0205		05-Sep-17	Asterionella formosa Hassall	32800	3.47
MEL- 0205		05-Sep-17	Cyclotella michiganiana Skvortzow	64656	1.58
MEL- 0205		05-Sep-17	Cyclotella bodanica Eulenst.	800	6.17
MEL- 0205		05-Sep-17	Rhodomonas minuta Skuja	64656	8.94
MEL- 0205		05-Sep-17	Cryptomonas erosa Ehrenberg	1400	1.83
MEL- 0205		05-Sep-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0205		05-Sep-17	Gymnodinium sp.	400	4.12
MEL- 0205		05-Sep-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0205		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	2800	6.71

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101		21-Jul-16	Sphaerocystis schroeteri Chodat	28736	0.54
MEL - 0101		21-Jul-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.40
MEL - 0101		21-Jul-16	Planctonema lauterbornii Schmidle	21552	2.71
MEL - 0101		21-Jul-16	Cosmarium sp.	200	0.28
MEL - 0101		21-Jul-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0101		21-Jul-16	Mougeotia sp.	600	0.34
MEL - 0101		21-Jul-16	Botryococcus braunii Kutzing	200	0.29
MEL - 0101		21-Jul-16	Small chrysophyceae	459776	5.89
MEL - 0101		21-Jul-16	Large chrysophyceae	107760	22.87
MEL - 0101		21-Jul-16	Chrysochromulina parva Lackey	208336	13.63
MEL - 0101		21-Jul-16	Chrysococcus sp.	581904	38.06
MEL - 0101		21-Jul-16	Chrysostephanospaera globulifera Scherffel	14368	4.00
MEL - 0101		21-Jul-16	Kephyrion sp.	114944	2.16
MEL - 0101		21-Jul-16	Spiniferomonas sirrata**********	14368	1.25
MEL - 0101		21-Jul-16	Dinobryon borgei Lemmermann	107760	5.53
MEL - 0101		21-Jul-16	Dinobryon bavaricum Imhof	200	0.25
MEL - 0101		21-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	6.01
MEL - 0101		21-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.51
MEL - 0101		21-Jul-16	Dinobryon sertularia Ehrenberg	71840	16.25
MEL - 0101		21-Jul-16	Dinobryon sertularia Ehrenberg	1800	3.58
MEL - 0101		21-Jul-16	Dinobryon sociale Ehrenberg	143680	32.50
MEL - 0101		21-Jul-16	Chrysolkos skuja (Nauwerck) Willen	57472	1.02
MEL - 0101		21-Jul-16	Uroglena volvox Ehrenberg	402304	45.50
MEL - 0101		21-Jul-16	Chrysochromulina laurentiana Kling	100576	43.74
MEL - 0101		21-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.25
MEL - 0101		21-Jul-16	Cyclotella stelligera Cleve and Grunow	2800	3.26
MEL - 0101		21-Jul-16	Cyclotella pseudostelligera	28736	9.75
MEL - 0101		21-Jul-16	Rhizosolenia eriense H.L. Smith	617824	48.07
MEL - 0101		21-Jul-16	Tabellaria flocculsa (Roth) Kutzing	2400	2.99
MEL - 0101		21-Jul-16	Synedra acus Kutzing	23800	3.02
MEL - 0101		21-Jul-16	Synedra ulna (Nitzsch) Ehrenberg	200	0.45
MEL - 0101		21-Jul-16	Asterionella formosa Hassall	6200	0.67
MEL - 0101		21-Jul-16	Cyclotella michiganiana Skvortzow	71840	1.76

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101		21-Jul-16	Rhodomonas minuta Skuja	14368	1.20
MEL - 0101		21-Jul-16	Cryptomonas erosa Ehrenberg	3600	5.69
MEL - 0101		21-Jul-16	Cryptomonas ovata Ehrenberg	800	3.62
MEL - 0101		21-Jul-16	Cryptomonas reflexa (Marsson) Skuja	4400	3.38
MEL - 0101		21-Jul-16	Katablepharis ovalis Skuja	14368	0.81
MEL - 0101		21-Jul-16	Gymnodinium sp.	400	3.68
MEL - 0101		21-Jul-16	Peridinium willei Huitfeldt-Kaas	200	7.22
MEL - 0101		21-Jul-16	Peridinium pusillum (Penard) Lemmermann	4600	14.76
MEL - 0101		21-Jul-16	Peridinium aciculiferum Lemmermann	600	5.43
MEL - 0101		11-Aug-16	Snowella sp	200	0.15
MEL - 0101		11-Aug-16	Sphaerocystis schroeteri Chodat	86208	2.89
MEL - 0101		11-Aug-16	Oocystis lacustris Chodat	57472	2.89
MEL - 0101		11-Aug-16	Elakatothrix gelatinosa Willen	7184	0.11
MEL - 0101		11-Aug-16	Planctonema lauterbornii Schmidle	86208	10.84
MEL - 0101		11-Aug-16	Cosmarium sp.	600	3.20
MEL - 0101		11-Aug-16	Euastrum spp.	800	1.49
MEL - 0101		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	800	0.33
MEL - 0101		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0101		11-Aug-16	Botryococcus braunii Kutzing	400	0.57
MEL - 0101		11-Aug-16	Small chrysophyceae	646560	10.09
MEL - 0101		11-Aug-16	Large chrysophyceae	21552	3.87
MEL - 0101		11-Aug-16	Chrysochromulina parva Lackey	129312	8.46
MEL - 0101		11-Aug-16	Chrysococcus sp.	567536	37.12
MEL - 0101		11-Aug-16	Kephyrion boreale Skuja	14368	1.71
MEL - 0101		11-Aug-16	Kephyrion sp.	64656	0.59
MEL - 0101		11-Aug-16	Spiniferomonas sirrata**********	35920	3.30
MEL - 0101		11-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.20
MEL - 0101		11-Aug-16	Synura sphagnicola Korschikow	200	4.73
MEL - 0101		11-Aug-16	Dinobryon borgei Lemmermann	14368	0.58
MEL - 0101		11-Aug-16	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0101		11-Aug-16	Dinobryon bavaricum Imhof	136496	30.88
MEL - 0101		11-Aug-16	Dinobryon bavaricum Imhof	28736	6.50
MEL - 0101		11-Aug-16	Dinobryon bavaricum Imhof	1400	2.79

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101		11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.95
MEL - 0101		11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	800	5.20
MEL - 0101		11-Aug-16	Dinobryon sertularia Ehrenberg	71840	16.25
MEL - 0101		11-Aug-16	Dinobryon sertularia Ehrenberg	400	0.80
MEL - 0101		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	79024	2.37
MEL - 0101		11-Aug-16	Uroglena volvox Ehrenberg	79024	8.94
MEL - 0101		11-Aug-16	Chrysochromulina laurentiana Kling	165232	69.60
MEL - 0101		11-Aug-16	Stichogloea spp.	7184	0.36
MEL - 0101		11-Aug-16	Pteridomonas sp.	43104	10.61
MEL - 0101		11-Aug-16	Cyclotella stelligera Cleve and Grunow	3200	5.82
MEL - 0101		11-Aug-16	Rhizosolenia eriense H.L. Smith	21552	1.83
MEL - 0101		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	5600	4.80
MEL - 0101		11-Aug-16	Synedra acus Kutzing	4000	0.42
MEL - 0101		11-Aug-16	Asterionella formosa Hassall	4000	0.42
MEL - 0101		11-Aug-16	Cyclotella michiganiana Skvortzow	57472	1.25
MEL - 0101		11-Aug-16	Rhodomonas minuta Skuja	107760	14.21
MEL - 0101		11-Aug-16	Cryptomonas erosa Ehrenberg	6400	7.75
MEL - 0101		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	600	0.40
MEL - 0101		11-Aug-16	Cryptomonas rostratiformis Skuja	200	0.38
MEL - 0101		11-Aug-16	Katablepharis ovalis Skuja	35920	1.45
MEL - 0101		11-Aug-16	Gymnodinium sp.	2000	15.03
MEL - 0101		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	3800	9.60
MEL - 0101		10-Sep-16	Sphaerocystis schroeteri Chodat	7184	0.15
MEL - 0101		10-Sep-16	Oocystis lacustris Chodat	43104	2.17
MEL - 0101		10-Sep-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL - 0101		10-Sep-16	Elakatothrix gelatinosa Willen	14368	0.27
MEL - 0101		10-Sep-16	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0101		10-Sep-16	Mougeotia sp.	200	0.63
MEL - 0101		10-Sep-16	Botryococcus braunii Kutzing	800	0.72
MEL - 0101		10-Sep-16	Ankistrodesmus spiralis Lemmermann	7184	0.46
MEL - 0101		10-Sep-16	Trachelomonas volvocina Ehrenberg	200	0.41
MEL - 0101		10-Sep-16	Small chrysophyceae	301728	4.25
MEL - 0101		10-Sep-16	Large chrysophyceae	14368	2.58

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0101		10-Sep-16	Chrysochromulina parva Lackey	373568	24.43
MEL - 0101		10-Sep-16	Chrysococcus sp.	617824	40.41
MEL - 0101		10-Sep-16	Chrysostephanospaera globulifera Scherffel	14368	7.52
MEL - 0101		10-Sep-16	Kephyrion boreale Skuja	14368	1.71
MEL - 0101		10-Sep-16	Kephyrion sp.	28736	0.30
MEL - 0101		10-Sep-16	Spiniferomonas sirrata**********	14368	1.06
MEL - 0101		10-Sep-16	Mallomonas crassisquama (Asmund) Fott	400	0.40
MEL - 0101		10-Sep-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0101		10-Sep-16	Dinobryon bavaricum Imhof	600	1.19
MEL - 0101		10-Sep-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0101		10-Sep-16	Dinobryon sertularia Ehrenberg	400	2.03
MEL - 0101		10-Sep-16	Dinobryon sociale Ehrenberg	71840	16.25
MEL - 0101		10-Sep-16	Epiphyxis sp.	7184	0.55
MEL - 0101		10-Sep-16	Chrysolkos skuja (Nauwerck) Willen	35920	1.08
MEL - 0101		10-Sep-16	Uroglena volvox Ehrenberg	244256	27.63
MEL - 0101		10-Sep-16	Chrysochromulina laurentiana Kling	481328	252.02
MEL - 0101		10-Sep-16	Stichogloea spp.	14368	0.72
MEL - 0101		10-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	107760	2.79
MEL - 0101		10-Sep-16	Cyclotella stelligera Cleve and Grunow	2200	4.06
MEL - 0101		10-Sep-16	Rhizosolenia eriense H.L. Smith	43104	3.66
MEL - 0101		10-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	5400	4.12
MEL - 0101		10-Sep-16	Fragilaria crotonensis Kitton	2800	0.90
MEL - 0101		10-Sep-16	Synedra acus Kutzing	19800	1.78
MEL - 0101		10-Sep-16	Asterionella formosa Hassall	9600	1.01
MEL - 0101		10-Sep-16	Cyclotella michiganiana Skvortzow	28736	0.70
MEL - 0101		10-Sep-16	Rhodomonas minuta Skuja	93392	11.74
MEL - 0101		10-Sep-16	Cryptomonas erosa Ehrenberg	8600	10.38
MEL - 0101		10-Sep-16	Cryptomonas rostratiformis Skuja	400	0.88
MEL - 0101		10-Sep-16	Katablepharis ovalis Skuja	35920	1.85
MEL - 0101		10-Sep-16	Gymnodinium helveticum Penard	1200	28.27
MEL - 0101		10-Sep-16	Gymnodinium sp.	2200	22.67
MEL - 0101		10-Sep-16	Peridinium pusillum (Penard) Lemmermann	3400	7.02
MEL - 0101		10-Sep-16	Peridinium aciculiferum Lemmermann	1600	14.48

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102		21-Jul-16	Chlamydomonas spp.	7184	0.08
MEL - 0102		21-Jul-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.81
MEL - 0102		21-Jul-16	Elakatothrix gelatinosa Willen	21552	0.34
MEL - 0102		21-Jul-16	Planctonema lauterbornii Schmidle	129312	16.25
MEL - 0102		21-Jul-16	Cosmarium sp.	200	0.28
MEL - 0102		21-Jul-16	Staurodesmus extensus (Andersson) Teiling	600	0.22
MEL - 0102		21-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0102		21-Jul-16	Small chrysophyceae	445408	5.70
MEL - 0102		21-Jul-16	Large chrysophyceae	79024	14.81
MEL - 0102		21-Jul-16	Chrysochromulina parva Lackey	237072	15.50
MEL - 0102		21-Jul-16	Chrysococcus sp.	1185360	77.52
MEL - 0102		21-Jul-16	Chrysostephanospaera globulifera Scherffel	43104	15.38
MEL - 0102		21-Jul-16	Kephyrion sp.	93392	1.76
MEL - 0102		21-Jul-16	Spiniferomonas sirrata**********	28736	3.09
MEL - 0102		21-Jul-16	Mallomonas crassisquama (Asmund) Fott	200	0.19
MEL - 0102		21-Jul-16	Dinobryon borgei Lemmermann	114944	5.63
MEL - 0102		21-Jul-16	Dinobryon bavaricum Imhof	158048	35.75
MEL - 0102		21-Jul-16	Dinobryon bavaricum Imhof	7200	14.34
MEL - 0102		21-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.01
MEL - 0102		21-Jul-16	Dinobryon sertularia Ehrenberg	143680	32.50
MEL - 0102		21-Jul-16	Dinobryon sertularia Ehrenberg	4200	8.36
MEL - 0102		21-Jul-16	Epiphyxis sp.	21552	1.55
MEL - 0102		21-Jul-16	Chrysolkos skuja (Nauwerck) Willen	71840	1.58
MEL - 0102		21-Jul-16	Uroglena volvox Ehrenberg	941104	106.44
MEL - 0102		21-Jul-16	Chrysochromulina laurentiana Kling	100576	43.74
MEL - 0102		21-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.85
MEL - 0102		21-Jul-16	Dinobryon attenatum Hill	14368	2.44
MEL - 0102		21-Jul-16	Cyclotella stelligera Cleve and Grunow	2600	3.29
MEL - 0102		21-Jul-16	Cyclotella pseudostelligera	14368	4.88
MEL - 0102		21-Jul-16	Rhizosolenia eriense H.L. Smith	696848	54.21
MEL - 0102		21-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	5400	4.53
MEL - 0102		21-Jul-16	Synedra acus Kutzing	21800	2.76
MEL - 0102		21-Jul-16	Asterionella formosa Hassall	7000	0.76

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102		21-Jul-16	Cyclotella michiganiana Skvortzow	100576	2.46
MEL - 0102		21-Jul-16	Rhodomonas minuta Skuja	35920	3.01
MEL - 0102		21-Jul-16	Cryptomonas erosa Ehrenberg	4000	6.35
MEL - 0102		21-Jul-16	Cryptomonas ovata Ehrenberg	400	1.81
MEL - 0102		21-Jul-16	Cryptomonas reflexa (Marsson) Skuja	800	0.59
MEL - 0102		21-Jul-16	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0102		21-Jul-16	Katablepharis ovalis Skuja	57472	3.25
MEL - 0102		21-Jul-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0102		21-Jul-16	Gymnodinium sp.	2400	30.65
MEL - 0102		21-Jul-16	Peridinium pusillum (Penard) Lemmermann	5400	16.77
MEL - 0102		21-Jul-16	Peridinium aciculiferum Lemmermann	400	3.74
MEL - 0102	RECOUNT	21-Jul-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.81
MEL - 0102	RECOUNT	21-Jul-16	Elakatothrix gelatinosa Willen	14368	0.23
MEL - 0102	RECOUNT	21-Jul-16	Planctonema lauterbornii Schmidle	107760	13.55
MEL - 0102	RECOUNT	21-Jul-16	Staurodesmus extensus (Andersson) Teiling	800	0.30
MEL - 0102	RECOUNT	21-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0102	RECOUNT	21-Jul-16	Small chrysophyceae	323280	4.14
MEL - 0102	RECOUNT	21-Jul-16	Large chrysophyceae	50288	9.42
MEL - 0102	RECOUNT	21-Jul-16	Chrysochromulina parva Lackey	208336	13.63
MEL - 0102	RECOUNT	21-Jul-16	Chrysococcus sp.	1170992	76.58
MEL - 0102	RECOUNT	21-Jul-16	Chrysostephanospaera globulifera Scherffel	28736	10.25
MEL - 0102	RECOUNT	21-Jul-16	Kephyrion sp.	129312	2.43
MEL - 0102	RECOUNT	21-Jul-16	Spiniferomonas sirrata**********	7184	0.77
MEL - 0102	RECOUNT	21-Jul-16	Mallomonas crassisquama (Asmund) Fott	400	0.39
MEL - 0102	RECOUNT	21-Jul-16	Dinobryon borgei Lemmermann	86208	4.22
MEL - 0102	RECOUNT	21-Jul-16	Dinobryon bavaricum Imhof	129312	29.25
MEL - 0102	RECOUNT	21-Jul-16	Dinobryon bavaricum Imhof	6200	12.34
MEL - 0102	RECOUNT	21-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	800	2.02
MEL - 0102	RECOUNT	21-Jul-16	Dinobryon sertularia Ehrenberg	122128	27.63
MEL - 0102	RECOUNT	21-Jul-16	Dinobryon sertularia Ehrenberg	5200	10.35
MEL - 0102	RECOUNT	21-Jul-16	Epiphyxis sp.	14368	1.03
MEL - 0102	RECOUNT	21-Jul-16	Chrysolkos skuja (Nauwerck) Willen	114944	2.53
MEL - 0102	RECOUNT	21-Jul-16	Uroglena volvox Ehrenberg	1070416	121.06

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	RECOUNT	21-Jul-16	Chrysochromulina laurentiana Kling	100576	43.74
MEL - 0102	RECOUNT	21-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.27
MEL - 0102	RECOUNT	21-Jul-16	Cyclotella stelligera Cleve and Grunow	28736	9.75
MEL - 0102	RECOUNT	21-Jul-16	Cyclotella stelligera Cleve and Grunow	2000	2.53
MEL - 0102	RECOUNT	21-Jul-16	Rhizosolenia eriense H.L. Smith	739952	57.57
MEL - 0102	RECOUNT	21-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	6200	5.20
MEL - 0102	RECOUNT	21-Jul-16	Synedra acus Kutzing	17800	2.26
MEL - 0102	RECOUNT	21-Jul-16	Synedra ulna (Nitzsch) Ehrenberg	800	1.67
MEL - 0102	RECOUNT	21-Jul-16	Asterionella formosa Hassall	6000	0.65
MEL - 0102	RECOUNT	21-Jul-16	Cyclotella michiganiana Skvortzow	71840	1.76
MEL - 0102	RECOUNT	21-Jul-16	Rhodomonas minuta Skuja	64656	0.87
MEL - 0102	RECOUNT	21-Jul-16	Cryptomonas erosa Ehrenberg	5200	8.25
MEL - 0102	RECOUNT	21-Jul-16	Cryptomonas ovata Ehrenberg	400	1.81
MEL - 0102	RECOUNT	21-Jul-16	Cryptomonas reflexa (Marsson) Skuja	600	0.44
MEL - 0102	RECOUNT	21-Jul-16	Katablepharis ovalis Skuja	43104	2.44
MEL - 0102	RECOUNT	21-Jul-16	Gymnodinium sp.	3200	40.86
MEL - 0102	RECOUNT	21-Jul-16	Peridinium pusillum (Penard) Lemmermann	4200	13.04
MEL - 0102	RECOUNT	21-Jul-16	Peridinium aciculiferum Lemmermann	800	7.48
MEL - 0102		11-Aug-16	Anabaena cf heterospora Nygarrd	114944	13.00
MEL - 0102		11-Aug-16	Sphaerocystis schroeteri Chodat	71840	2.41
MEL - 0102		11-Aug-16	Oocystis lacustris Chodat	21552	0.61
MEL - 0102		11-Aug-16	Paulschulzia pseudovolvox (Schulz and Teiling) Skuja	200	1.13
MEL - 0102		11-Aug-16	Crucigenia quadrata Morr.	28736	0.32
MEL - 0102		11-Aug-16	Elakatothrix gelatinosa Willen	14368	0.23
MEL - 0102		11-Aug-16	Planctonema lauterbornii Schmidle	79024	9.93
MEL - 0102		11-Aug-16	Cosmarium sp.	200	0.28
MEL - 0102		11-Aug-16	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.48
MEL - 0102		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0102		11-Aug-16	Botryococcus braunii Kutzing	1000	1.44
MEL - 0102		11-Aug-16	Small chrysophyceae	1070416	11.03
MEL - 0102		11-Aug-16	Large chrysophyceae	43104	8.78
MEL - 0102		11-Aug-16	Chrysochromulina parva Lackey	272992	17.85
MEL - 0102		11-Aug-16	Chrysococcus sp.	373568	19.05

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102		11-Aug-16	Kephyrion boreale Skuja	28736	2.64
MEL - 0102		11-Aug-16	Kephyrion sp.	208336	1.92
MEL - 0102		11-Aug-16	Spiniferomonas sirrata**********	43104	1.29
MEL - 0102		11-Aug-16	Dinobryon borgei Lemmermann	7184	0.32
MEL - 0102		11-Aug-16	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0102		11-Aug-16	Dinobryon bavaricum Imhof	800	1.59
MEL - 0102		11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	1.30
MEL - 0102		11-Aug-16	Dinobryon sertularia Ehrenberg	79024	17.88
MEL - 0102		11-Aug-16	Dinobryon sertularia Ehrenberg	1400	4.75
MEL - 0102		11-Aug-16	Dinobryon sociale Ehrenberg	143680	32.50
MEL - 0102		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	35920	0.99
MEL - 0102		11-Aug-16	Uroglena volvox Ehrenberg	129312	14.63
MEL - 0102		11-Aug-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0102		11-Aug-16	Chrysochromulina laurentiana Kling	208336	87.75
MEL - 0102		11-Aug-16	Stichogloea spp.	35920	1.81
MEL - 0102		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.27
MEL - 0102		11-Aug-16	Pteridomonas sp.	7184	1.71
MEL - 0102		11-Aug-16	Cyclotella stelligera Cleve and Grunow	2400	4.36
MEL - 0102		11-Aug-16	Rhizosolenia eriense H.L. Smith	21552	1.68
MEL - 0102		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	4000	3.43
MEL - 0102		11-Aug-16	Synedra acus Kutzing	3600	0.41
MEL - 0102		11-Aug-16	Asterionella formosa Hassall	800	0.08
MEL - 0102		11-Aug-16	Cyclotella michiganiana Skvortzow	107760	2.64
MEL - 0102		11-Aug-16	Rhodomonas minuta Skuja	150864	18.96
MEL - 0102		11-Aug-16	Cryptomonas erosa Ehrenberg	3800	4.51
MEL - 0102		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1000	0.70
MEL - 0102		11-Aug-16	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0102		11-Aug-16	Katablepharis ovalis Skuja	7184	0.37
MEL - 0102		11-Aug-16	Gymnodinium helveticum Penard	200	4.71
MEL - 0102		11-Aug-16	Gymnodinium sp.	7184	2.72
MEL - 0102		11-Aug-16	Gymnodinium sp.	1600	14.72
MEL - 0102		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	2400	6.39
MEL - 0102		10-Sep-16	Pyramidomonas tetrarhynchus Schmarda	200	0.10

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102		10-Sep-16	Chlamydomonas spp.	14368	0.41
MEL - 0102		10-Sep-16	Sphaerocystis schroeteri Chodat	7184	0.09
MEL - 0102		10-Sep-16	Pediastrum duplex Meyen	3200	0.32
MEL - 0102		10-Sep-16	Oocystis lacustris Chodat	14368	0.41
MEL - 0102		10-Sep-16	Elakatothrix gelatinosa Willen	7184	0.14
MEL - 0102		10-Sep-16	Planctonema lauterbornii Schmidle	21552	2.71
MEL - 0102		10-Sep-16	Cosmarium sp.	200	0.20
MEL - 0102		10-Sep-16	Staurodesmus paradoxum Meyen	200	1.01
MEL - 0102		10-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0102		10-Sep-16	Mougeotia sp.	400	0.52
MEL - 0102		10-Sep-16	Botryococcus braunii Kutzing	200	0.35
MEL - 0102		10-Sep-16	Ankistrodesmus spiralis Lemmermann	7184	0.55
MEL - 0102		10-Sep-16	Small chrysophyceae	323280	4.56
MEL - 0102		10-Sep-16	Large chrysophyceae	43104	7.74
MEL - 0102		10-Sep-16	Chrysochromulina parva Lackey	625008	40.88
MEL - 0102		10-Sep-16	Chrysococcus sp.	423856	27.72
MEL - 0102		10-Sep-16	Chrysostephanospaera globulifera Scherffel	21552	11.28
MEL - 0102		10-Sep-16	Kephyrion boreale Skuja	7184	0.81
MEL - 0102		10-Sep-16	Kephyrion sp.	71840	0.74
MEL - 0102		10-Sep-16	Spiniferomonas sirrata**********	7184	0.81
MEL - 0102		10-Sep-16	Dinobryon borgei Lemmermann	7184	0.33
MEL - 0102		10-Sep-16	Dinobryon bavaricum Imhof	43104	9.75
MEL - 0102		10-Sep-16	Dinobryon bavaricum Imhof	800	1.59
MEL - 0102		10-Sep-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	5.71
MEL - 0102		10-Sep-16	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0102		10-Sep-16	Dinobryon sertularia Ehrenberg	200	1.02
MEL - 0102		10-Sep-16	Dinobryon sociale Ehrenberg	86208	19.50
MEL - 0102		10-Sep-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0102		10-Sep-16	Chrysolkos skuja (Nauwerck) Willen	57472	1.02
MEL - 0102		10-Sep-16	Uroglena volvox Ehrenberg	201152	22.75
MEL - 0102		10-Sep-16	Chrysochromulina laurentiana Kling	416672	238.42
MEL - 0102		10-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	71840	1.72
MEL - 0102		10-Sep-16	Pteridomonas sp.	7184	1.71

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102		10-Sep-16	Cyclotella stelligera Cleve and Grunow	2800	5.09
MEL - 0102		10-Sep-16	Rhizosolenia eriense H.L. Smith	100576	6.40
MEL - 0102		10-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	1000	0.83
MEL - 0102		10-Sep-16	Synedra acus Kutzing	20400	2.14
MEL - 0102		10-Sep-16	Asterionella formosa Hassall	8200	0.86
MEL - 0102		10-Sep-16	Cyclotella michiganiana Skvortzow	28736	0.55
MEL - 0102		10-Sep-16	Rhodomonas minuta Skuja	122128	18.42
MEL - 0102		10-Sep-16	Cryptomonas erosa Ehrenberg	8200	13.30
MEL - 0102		10-Sep-16	Katablepharis ovalis Skuja	43104	1.97
MEL - 0102		10-Sep-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0102		10-Sep-16	Gymnodinium sp.	1000	11.01
MEL - 0102		10-Sep-16	Peridinium willei Huitfeldt-Kaas	400	13.40
MEL - 0102		10-Sep-16	Peridinium pusillum (Penard) Lemmermann	3400	7.43
MEL - 0102		10-Sep-16	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0102	REP6	10-Sep-16	Aphanocapsa delicatissima W. and G.S. West	200	0.42
MEL - 0102	REP6	10-Sep-16	Anabaena solitaria Klebs	200	0.05
MEL - 0102	REP6	10-Sep-16	Chlamydomonas spp.	7184	0.14
MEL - 0102	REP6	10-Sep-16	Sphaerocystis schroeteri Chodat	7184	0.07
MEL - 0102	REP6	10-Sep-16	Oocystis lacustris Chodat	7184	0.17
MEL - 0102	REP6	10-Sep-16	Crucigenia quadrata Morr.	28736	0.32
MEL - 0102	REP6	10-Sep-16	Elakatothrix gelatinosa Willen	28736	0.54
MEL - 0102	REP6	10-Sep-16	Planctonema lauterbornii Schmidle	50288	6.95
MEL - 0102	REP6	10-Sep-16	Cosmarium sp.	200	0.28
MEL - 0102	REP6	10-Sep-16	Staurodesmus extensus (Andersson) Teiling	600	0.23
MEL - 0102	REP6	10-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0102	REP6	10-Sep-16	Botryococcus braunii Kutzing	200	0.10
MEL - 0102	REP6	10-Sep-16	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL - 0102	REP6	10-Sep-16	Small chrysophyceae	323280	4.56
MEL - 0102	REP6	10-Sep-16	Large chrysophyceae	28736	5.16
MEL - 0102	REP6	10-Sep-16	Chrysochromulina parva Lackey	438224	28.66
MEL - 0102	REP6	10-Sep-16	Chrysococcus sp.	510064	33.36
MEL - 0102	REP6	10-Sep-16	Chrysostephanospaera globulifera Scherffel	14368	5.30
MEL - 0102	REP6	10-Sep-16	Kephyrion boreale Skuja	7184	0.85

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0102	REP6	10-Sep-16	Kephyrion sp.	43104	0.61
MEL - 0102	REP6	10-Sep-16	Spiniferomonas sirrata**********	43104	4.88
MEL - 0102	REP6	10-Sep-16	Mallomonas crassisquama (Asmund) Fott	400	0.41
MEL - 0102	REP6	10-Sep-16	Dinobryon borgei Lemmermann	14368	0.66
MEL - 0102	REP6	10-Sep-16	Dinobryon bavaricum Imhof	35920	8.13
MEL - 0102	REP6	10-Sep-16	Dinobryon bavaricum Imhof	1200	2.39
MEL - 0102	REP6	10-Sep-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.86
MEL - 0102	REP6	10-Sep-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0102	REP6	10-Sep-16	Dinobryon sertularia Ehrenberg	200	0.25
MEL - 0102	REP6	10-Sep-16	Dinobryon sertularia Ehrenberg	200	1.02
MEL - 0102	REP6	10-Sep-16	Dinobryon sociale Ehrenberg	57472	13.00
MEL - 0102	REP6	10-Sep-16	Chrysolkos skuja (Nauwerck) Willen	50288	0.89
MEL - 0102	REP6	10-Sep-16	Uroglena volvox Ehrenberg	502880	56.88
MEL - 0102	REP6	10-Sep-16	Chrysochromulina laurentiana Kling	387936	221.98
MEL - 0102	REP6	10-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	93392	2.24
MEL - 0102	REP6	10-Sep-16	Cyclotella stelligera Cleve and Grunow	3200	5.03
MEL - 0102	REP6	10-Sep-16	Rhizosolenia eriense H.L. Smith	79024	6.70
MEL - 0102	REP6	10-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	6000	4.92
MEL - 0102	REP6	10-Sep-16	Fragilaria crotonensis Kitton	2000	0.58
MEL - 0102	REP6	10-Sep-16	Synedra acus Kutzing	22000	2.10
MEL - 0102	REP6	10-Sep-16	Asterionella formosa Hassall	6200	0.65
MEL - 0102	REP6	10-Sep-16	Cyclotella michiganiana Skvortzow	64656	1.23
MEL - 0102	REP6	10-Sep-16	Rhodomonas minuta Skuja	93392	11.74
MEL - 0102	REP6	10-Sep-16	Cryptomonas erosa Ehrenberg	8800	14.45
MEL - 0102	REP6	10-Sep-16	Cryptomonas rostratiformis Skuja	1000	2.33
MEL - 0102	REP6	10-Sep-16	Katablepharis ovalis Skuja	50288	2.59
MEL - 0102	REP6	10-Sep-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0102	REP6	10-Sep-16	Gymnodinium sp.	7184	2.65
MEL - 0102	REP6	10-Sep-16	Gymnodinium sp.	1400	19.59
MEL - 0102	REP6	10-Sep-16	Peridinium pusillum (Penard) Lemmermann	1200	2.57
MEL - 0102	REP6	10-Sep-16	Peridinium aciculiferum Lemmermann	1400	12.67
MEL - 0103		21-Jul-16	Sphaerocystis schroeteri Chodat	35920	0.46
MEL - 0103		21-Jul-16	Scenedesmus denticulatus Lagerhiem	28736	0.98

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103		21-Jul-16	Elakatothrix gelatinosa Willen	28736	0.50
MEL - 0103		21-Jul-16	Planctonema lauterbornii Schmidle	50288	6.32
MEL - 0103		21-Jul-16	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL - 0103		21-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0103		21-Jul-16	Botryococcus braunii Kutzing	200	0.18
MEL - 0103		21-Jul-16	Euglena acus Ehrenberg	200	1.85
MEL - 0103		21-Jul-16	Small chrysophyceae	632192	8.91
MEL - 0103		21-Jul-16	Large chrysophyceae	43104	7.74
MEL - 0103		21-Jul-16	Chrysochromulina parva Lackey	352016	23.02
MEL - 0103		21-Jul-16	Chrysococcus sp.	718400	46.98
MEL - 0103		21-Jul-16	Chrysostephanospaera globulifera Scherffel	35920	18.81
MEL - 0103		21-Jul-16	Kephyrion sp.	79024	1.11
MEL - 0103		21-Jul-16	Spiniferomonas sirrata**********	28736	2.64
MEL - 0103		21-Jul-16	Mallomonas crassisquama (Asmund) Fott	400	0.41
MEL - 0103		21-Jul-16	Dinobryon borgei Lemmermann	71840	3.69
MEL - 0103		21-Jul-16	Dinobryon bavaricum Imhof	186784	42.25
MEL - 0103		21-Jul-16	Dinobryon bavaricum Imhof	5600	6.86
MEL - 0103		21-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	28736	10.76
MEL - 0103		21-Jul-16	Dinobryon sertularia Ehrenberg	107760	24.38
MEL - 0103		21-Jul-16	Dinobryon sertularia Ehrenberg	2200	4.38
MEL - 0103		21-Jul-16	Epiphyxis sp.	64656	4.77
MEL - 0103		21-Jul-16	Chrysolkos skuja (Nauwerck) Willen	93392	1.82
MEL - 0103		21-Jul-16	Uroglena volvox Ehrenberg	510064	57.69
MEL - 0103		21-Jul-16	Chrysochromulina laurentiana Kling	86208	37.49
MEL - 0103		21-Jul-16	Stichogloea spp.	57472	2.89
MEL - 0103		21-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.00
MEL - 0103		21-Jul-16	Pteridomonas sp.	14368	3.19
MEL - 0103		21-Jul-16	Cyclotella stelligera Cleve and Grunow	2000	3.14
MEL - 0103		21-Jul-16	Cyclotella pseudostelligera	14368	5.12
MEL - 0103		21-Jul-16	Rhizosolenia eriense H.L. Smith	876448	68.19
MEL - 0103		21-Jul-16	Synedra acus Kutzing	24000	3.04
MEL - 0103		21-Jul-16	Synedra ulna (Nitzsch) Ehrenberg	1000	2.07
MEL - 0103		21-Jul-16	Asterionella formosa Hassall	4000	0.42

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103		21-Jul-16	Cyclotella michiganiana Skvortzow	71840	1.76
MEL - 0103		21-Jul-16	Rhodomonas minuta Skuja	71840	6.02
MEL - 0103		21-Jul-16	Cryptomonas erosa Ehrenberg	2000	3.16
MEL - 0103		21-Jul-16	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0103		21-Jul-16	Cryptomonas reflexa (Marsson) Skuja	1000	0.68
MEL - 0103		21-Jul-16	Cryptomonas rostratiformis Skuja	200	0.41
MEL - 0103		21-Jul-16	Katablepharis ovalis Skuja	21552	1.11
MEL - 0103		21-Jul-16	Gymnodinium helveticum Penard	600	14.42
MEL - 0103		21-Jul-16	Gymnodinium sp.	1600	16.31
MEL - 0103		21-Jul-16	Peridinium willei Huitfeldt-Kaas	600	21.65
MEL - 0103		21-Jul-16	Peridinium pusillum (Penard) Lemmermann	7600	23.21
MEL - 0103		11-Aug-16	Snowella sp	200	0.10
MEL - 0103		11-Aug-16	Anabaena solitaria Klebs	2800	0.55
MEL - 0103		11-Aug-16	Carteria spp.	800	1.81
MEL - 0103		11-Aug-16	Sphaerocystis schroeteri Chodat	57472	1.08
MEL - 0103		11-Aug-16	Oocystis lacustris Chodat	57472	2.89
MEL - 0103		11-Aug-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	21552	1.22
MEL - 0103		11-Aug-16	Elakatothrix gelatinosa Willen	28736	0.45
MEL - 0103		11-Aug-16	Planctonema lauterbornii Schmidle	122128	15.35
MEL - 0103		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0103		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL - 0103		11-Aug-16	Botryococcus braunii Kutzing	400	0.57
MEL - 0103		11-Aug-16	Oocystis gigas Archer	400	0.97
MEL - 0103		11-Aug-16	Small chrysophyceae	524432	5.40
MEL - 0103		11-Aug-16	Large chrysophyceae	7184	1.29
MEL - 0103		11-Aug-16	Chrysochromulina parva Lackey	222704	14.56
MEL - 0103		11-Aug-16	Chrysococcus sp.	567536	37.12
MEL - 0103		11-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	3.65
MEL - 0103		11-Aug-16	Kephyrion boreale Skuja	28736	3.59
MEL - 0103		11-Aug-16	Kephyrion sp.	57472	0.74
MEL - 0103		11-Aug-16	Spiniferomonas sirrata**********	57472	6.50
MEL - 0103		11-Aug-16	Mallomonas crassisquama (Asmund) Fott	2100	2.20
MEL - 0103		11-Aug-16	Dinobryon bavaricum Imhof	14368	3.25

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103		11-Aug-16	Dinobryon bavaricum Imhof	1800	3.58
MEL - 0103		11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	1.30
MEL - 0103		11-Aug-16	Dinobryon sertularia Ehrenberg	57472	13.00
MEL - 0103		11-Aug-16	Dinobryon sertularia Ehrenberg	400	0.80
MEL - 0103		11-Aug-16	Dinobryon sociale Ehrenberg	93392	21.13
MEL - 0103		11-Aug-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0103		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	50288	1.51
MEL - 0103		11-Aug-16	Uroglena volvox Ehrenberg	43104	4.88
MEL - 0103		11-Aug-16	Chrysochromulina laurentiana Kling	229888	99.98
MEL - 0103		11-Aug-16	Stichogloea spp.	14368	0.72
MEL - 0103		11-Aug-16	Pteridomonas sp.	7184	1.71
MEL - 0103		11-Aug-16	Cyclotella stelligera Cleve and Grunow	1600	2.51
MEL - 0103		11-Aug-16	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL - 0103		11-Aug-16	Synedra acus Kutzing	5400	0.62
MEL - 0103		11-Aug-16	Cyclotella michiganiana Skvortzow	71840	1.76
MEL - 0103		11-Aug-16	Rhodomonas minuta Skuja	143680	18.06
MEL - 0103		11-Aug-16	Cryptomonas erosa Ehrenberg	4200	5.00
MEL - 0103		11-Aug-16	Cryptomonas ovata Ehrenberg	200	0.65
MEL - 0103		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	800	0.53
MEL - 0103		11-Aug-16	Cryptomonas rostratiformis Skuja	1600	3.28
MEL - 0103		11-Aug-16	Gymnodinium helveticum Penard	600	14.70
MEL - 0103		11-Aug-16	Gymnodinium sp.	7184	2.41
MEL - 0103		11-Aug-16	Gymnodinium sp.	1800	25.45
MEL - 0103		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	3400	9.38
MEL - 0103		10-Sep-16	Snowella sp	400	0.40
MEL - 0103		10-Sep-16	Pyramidomonas tetrarhynchus Schmarda	200	0.10
MEL - 0103		10-Sep-16	Chlamydomonas spp.	7184	0.17
MEL - 0103		10-Sep-16	Sphaerocystis schroeteri Chodat	14368	0.20
MEL - 0103		10-Sep-16	Elakatothrix gelatinosa Willen	7184	0.15
MEL - 0103		10-Sep-16	Planctonema lauterbornii Schmidle	28736	3.97
MEL - 0103		10-Sep-16	Staurodesmus extensus (Andersson) Teiling	400	0.14
MEL - 0103		10-Sep-16	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	400	0.37
MEL - 0103		10-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103		10-Sep-16	Botryococcus braunii Kutzing	1000	0.90
MEL - 0103		10-Sep-16	Ankistrodesmus spiralis Lemmermann	7184	0.46
MEL - 0103		10-Sep-16	Trachelomonas volvocina Ehrenberg	200	0.41
MEL - 0103		10-Sep-16	Small chrysophyceae	373568	5.27
MEL - 0103		10-Sep-16	Large chrysophyceae	35920	6.45
MEL - 0103		10-Sep-16	Chrysochromulina parva Lackey	387936	25.37
MEL - 0103		10-Sep-16	Kephyrion boreale Skuja	14368	1.32
MEL - 0103		10-Sep-16	Kephyrion sp.	50288	0.46
MEL - 0103		10-Sep-16	Spiniferomonas sirrata**********	28736	0.69
MEL - 0103		10-Sep-16	Mallomonas crassisquama (Asmund) Fott	800	0.84
MEL - 0103		10-Sep-16	Synura sphagnicola Korschikow	200	3.10
MEL - 0103		10-Sep-16	Dinobryon bavaricum Imhof	100576	22.75
MEL - 0103		10-Sep-16	Dinobryon bavaricum Imhof	2600	5.18
MEL - 0103		10-Sep-16	Dinobryon sertularia Ehrenberg	200	0.25
MEL - 0103		10-Sep-16	Dinobryon sociale Ehrenberg	28736	6.50
MEL - 0103		10-Sep-16	Epiphyxis sp.	7184	0.52
MEL - 0103		10-Sep-16	Chrysolkos skuja (Nauwerck) Willen	43104	1.14
MEL - 0103		10-Sep-16	Uroglena volvox Ehrenberg	208336	23.56
MEL - 0103		10-Sep-16	Chrysochromulina laurentiana Kling	502880	263.31
MEL - 0103		10-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.74
MEL - 0103		10-Sep-16	Cyclotella stelligera Cleve and Grunow	1800	3.56
MEL - 0103		10-Sep-16	Cyclotella ocellata Pant.	14368	1.61
MEL - 0103		10-Sep-16	Rhizosolenia eriense H.L. Smith	79024	6.70
MEL - 0103		10-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.62
MEL - 0103		10-Sep-16	Synedra acus Kutzing	23400	2.23
MEL - 0103		10-Sep-16	Asterionella formosa Hassall	24600	2.58
MEL - 0103		10-Sep-16	Cyclotella michiganiana Skvortzow	79024	1.94
MEL - 0103		10-Sep-16	Rhodomonas minuta Skuja	100576	12.64
MEL - 0103		10-Sep-16	Cryptomonas erosa Ehrenberg	3800	6.01
MEL - 0103		10-Sep-16	Cryptomonas rostratiformis Skuja	600	1.35
MEL - 0103		10-Sep-16	Katablepharis ovalis Skuja	50288	2.36
MEL - 0103		10-Sep-16	Gymnodinium helveticum Penard	600	14.70
MEL - 0103		10-Sep-16	Gymnodinium sp.	1200	12.37

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0103		10-Sep-16	Peridinium pusillum (Penard) Lemmermann	2200	4.72
MEL - 0103		10-Sep-16	Peridinium aciculiferum Lemmermann	800	7.24
MEL - 0104		22-Jul-16	Chlamydomonas spp.	7184	0.07
MEL - 0104		22-Jul-16	Sphaerocystis schroeteri Chodat	7184	0.22
MEL - 0104		22-Jul-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0104		22-Jul-16	Botryococcus braunii Kutzing	600	0.54
MEL - 0104		22-Jul-16	Ankistrodesmus spiralis Lemmermann	7184	0.49
MEL - 0104		22-Jul-16	Small chrysophyceae	431040	6.08
MEL - 0104		22-Jul-16	Large chrysophyceae	28736	5.16
MEL - 0104		22-Jul-16	Chrysochromulina parva Lackey	445408	29.13
MEL - 0104		22-Jul-16	Chrysococcus sp.	984208	53.54
MEL - 0104		22-Jul-16	Chrysostephanospaera globulifera Scherffel	14368	7.52
MEL - 0104		22-Jul-16	Kephyrion sp.	79024	1.36
MEL - 0104		22-Jul-16	Spiniferomonas sirrata**********	50288	4.63
MEL - 0104		22-Jul-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0104		22-Jul-16	Synura sphagnicola Korschikow	7184	2.89
MEL - 0104		22-Jul-16	Dinobryon borgei Lemmermann	79024	4.05
MEL - 0104		22-Jul-16	Dinobryon bavaricum Imhof	150864	34.13
MEL - 0104		22-Jul-16	Dinobryon bavaricum Imhof	4400	5.39
MEL - 0104		22-Jul-16	Dinobryon sertularia Ehrenberg	114944	26.00
MEL - 0104		22-Jul-16	Dinobryon sertularia Ehrenberg	2200	5.56
MEL - 0104		22-Jul-16	Epiphyxis sp.	7184	0.55
MEL - 0104		22-Jul-16	Chrysolkos skuja (Nauwerck) Willen	28736	0.52
MEL - 0104		22-Jul-16	Uroglena volvox Ehrenberg	747136	84.50
MEL - 0104		22-Jul-16	Chrysochromulina laurentiana Kling	143680	62.49
MEL - 0104		22-Jul-16	Stichogloea spp.	7184	0.36
MEL - 0104		22-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.36
MEL - 0104		22-Jul-16	Dinobryon attenatum Hill	14368	2.44
MEL - 0104		22-Jul-16	Cyclotella stelligera Cleve and Grunow	2000	3.64
MEL - 0104		22-Jul-16	Cyclotella pseudostelligera	14368	5.64
MEL - 0104		22-Jul-16	Rhizosolenia eriense H.L. Smith	847712	65.95
MEL - 0104		22-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	3600	3.09
MEL - 0104		22-Jul-16	Tabellaria flocculsa (Roth) Kutzing	2000	2.60

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104		22-Jul-16	Synedra acus Kutzing	19800	2.45
MEL - 0104		22-Jul-16	Synedra ulna (Nitzsch) Ehrenberg	4600	10.40
MEL - 0104		22-Jul-16	Asterionella formosa Hassall	13800	1.44
MEL - 0104		22-Jul-16	Cyclotella michiganiana Skvortzow	57472	1.41
MEL - 0104		22-Jul-16	Cyclotella bodanica Eulenst.	600	4.23
MEL - 0104		22-Jul-16	Rhodomonas minuta Skuja	14368	1.20
MEL - 0104		22-Jul-16	Cryptomonas erosa Ehrenberg	5800	9.36
MEL - 0104		22-Jul-16	Cryptomonas reflexa (Marsson) Skuja	1600	1.23
MEL - 0104		22-Jul-16	Cryptomonas rostratiformis Skuja	2000	4.24
MEL - 0104		22-Jul-16	Katablepharis ovalis Skuja	35920	2.08
MEL - 0104		22-Jul-16	Gymnodinium helveticum Penard	200	5.00
MEL - 0104		22-Jul-16	Gymnodinium sp.	1400	21.84
MEL - 0104		22-Jul-16	Peridinium willei Huitfeldt-Kaas	200	7.76
MEL - 0104		22-Jul-16	Peridinium pusillum (Penard) Lemmermann	3600	8.16
MEL - 0104		22-Jul-16	Peridinium aciculiferum Lemmermann	400	3.74
MEL - 0104		11-Aug-16	Snowella sp	400	0.20
MEL - 0104		11-Aug-16	Pyramidomonas tetrarhynchus Schmarda	200	0.11
MEL - 0104		11-Aug-16	Chlamydomonas spp.	7184	0.09
MEL - 0104		11-Aug-16	Sphaerocystis schroeteri Chodat	14368	0.45
MEL - 0104		11-Aug-16	Oocystis lacustris Chodat	28736	1.45
MEL - 0104		11-Aug-16	Paulschulzia pseudovolvox (Schulz and Teiling) Skuja	200	0.54
MEL - 0104		11-Aug-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL - 0104		11-Aug-16	Elakatothrix gelatinosa Willen	57472	0.90
MEL - 0104		11-Aug-16	Planctonema lauterbornii Schmidle	122128	15.35
MEL - 0104		11-Aug-16	Cosmarium sp.	800	3.77
MEL - 0104		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	1000	0.36
MEL - 0104		11-Aug-16	Botryococcus braunii Kutzing	200	0.29
MEL - 0104		11-Aug-16	Small chrysophyceae	301728	3.86
MEL - 0104		11-Aug-16	Large chrysophyceae	43104	7.74
MEL - 0104		11-Aug-16	Chrysochromulina parva Lackey	323280	21.14
MEL - 0104		11-Aug-16	Chrysococcus sp.	581904	38.06
MEL - 0104		11-Aug-16	Kephyrion boreale Skuja	43104	5.12
MEL - 0104		11-Aug-16	Kephyrion sp.	129312	2.43

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104		11-Aug-16	Spiniferomonas sirrata**********	79024	8.94
MEL - 0104		11-Aug-16	Dinobryon borgei Lemmermann	50288	2.62
MEL - 0104		11-Aug-16	Dinobryon bavaricum Imhof	57472	13.00
MEL - 0104		11-Aug-16	Dinobryon bavaricum Imhof	1400	2.79
MEL - 0104		11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	3.11
MEL - 0104		11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	2.03
MEL - 0104		11-Aug-16	Dinobryon sertularia Ehrenberg	64656	14.63
MEL - 0104		11-Aug-16	Dinobryon sertularia Ehrenberg	200	0.25
MEL - 0104		11-Aug-16	Dinobryon sertularia Ehrenberg	600	2.03
MEL - 0104		11-Aug-16	Dinobryon sociale Ehrenberg	179600	40.63
MEL - 0104		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	86208	1.65
MEL - 0104		11-Aug-16	Uroglena volvox Ehrenberg	186784	21.13
MEL - 0104		11-Aug-16	Chrysochromulina laurentiana Kling	215520	99.83
MEL - 0104		11-Aug-16	Stichogloea spp.	28736	1.45
MEL - 0104		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.47
MEL - 0104		11-Aug-16	Pteridomonas sp.	28736	7.07
MEL - 0104		11-Aug-16	Cyclotella stelligera Cleve and Grunow	4000	8.59
MEL - 0104		11-Aug-16	Cyclotella ocellata Pant.	50288	3.69
MEL - 0104		11-Aug-16	Rhizosolenia eriense H.L. Smith	14368	1.22
MEL - 0104		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	12000	10.08
MEL - 0104		11-Aug-16	Synedra acus Kutzing	5000	0.51
MEL - 0104		11-Aug-16	Cyclotella michiganiana Skvortzow	50288	1.09
MEL - 0104		11-Aug-16	Cyclotella bodanica Eulenst.	400	2.50
MEL - 0104		11-Aug-16	Rhodomonas minuta Skuja	193968	26.81
MEL - 0104		11-Aug-16	Cryptomonas erosa Ehrenberg	5800	6.59
MEL - 0104		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1000	0.70
MEL - 0104		11-Aug-16	Cryptomonas rostratiformis Skuja	800	1.70
MEL - 0104		11-Aug-16	Gymnodinium helveticum Penard	200	4.83
MEL - 0104		11-Aug-16	Gymnodinium sp.	7184	2.38
MEL - 0104		11-Aug-16	Gymnodinium sp.	2200	37.75
MEL - 0104		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	5600	12.93
MEL - 0104	RECOUNT	11-Aug-16	Snowella sp	400	0.20
MEL - 0104	RECOUNT	11-Aug-16	Chlamydomonas spp.	14368	0.24

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104	RECOUNT	11-Aug-16	Sphaerocystis schroeteri Chodat	43104	1.34
MEL - 0104	RECOUNT	11-Aug-16	Oocystis lacustris Chodat	21552	1.08
MEL - 0104	RECOUNT	11-Aug-16	Paulschulzia pseudovolvox (Schulz and Teiling) Skuja	400	1.07
MEL - 0104	RECOUNT	11-Aug-16	Elakatothrix gelatinosa Willen	86208	1.35
MEL - 0104	RECOUNT	11-Aug-16	Planctonema lauterbornii Schmidle	136496	17.16
MEL - 0104	RECOUNT	11-Aug-16	Cosmarium sp.	600	2.83
MEL - 0104	RECOUNT	11-Aug-16	Staurodesmus extensus (Andersson) Teiling	600	0.22
MEL - 0104	RECOUNT	11-Aug-16	Small chrysophyceae	783056	10.02
MEL - 0104	RECOUNT	11-Aug-16	Large chrysophyceae	28736	5.16
MEL - 0104	RECOUNT	11-Aug-16	Chrysochromulina parva Lackey	366384	23.96
MEL - 0104	RECOUNT	11-Aug-16	Chrysococcus sp.	574720	37.59
MEL - 0104	RECOUNT	11-Aug-16	Kephyrion boreale Skuja	43104	5.12
MEL - 0104	RECOUNT	11-Aug-16	Kephyrion sp.	136496	2.57
MEL - 0104	RECOUNT	11-Aug-16	Spiniferomonas sirrata**********	86208	9.75
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon borgei Lemmermann	43104	2.25
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon bavaricum Imhof	71840	16.25
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon bavaricum Imhof	1800	3.58
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	6.23
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	600	3.05
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon sertularia Ehrenberg	50288	11.38
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon sertularia Ehrenberg	400	1.36
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon sociale Ehrenberg	172416	39.00
MEL - 0104	RECOUNT	11-Aug-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0104	RECOUNT	11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	71840	1.37
MEL - 0104	RECOUNT	11-Aug-16	Uroglena volvox Ehrenberg	222704	25.19
MEL - 0104	RECOUNT	11-Aug-16	Chrysochromulina laurentiana Kling	244256	113.14
MEL - 0104	RECOUNT	11-Aug-16	Stichogloea spp.	28736	1.45
MEL - 0104	RECOUNT	11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.74
MEL - 0104	RECOUNT	11-Aug-16	Pteridomonas sp.	14368	3.54
MEL - 0104	RECOUNT	11-Aug-16	Cyclotella stelligera Cleve and Grunow	3200	6.87
MEL - 0104	RECOUNT	11-Aug-16	Cyclotella ocellata Pant.	64656	4.74
MEL - 0104	RECOUNT	11-Aug-16	Rhizosolenia eriense H.L. Smith	28736	2.44

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104	RECOUNT	11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	11600	9.77
MEL - 0104	RECOUNT	11-Aug-16	Synedra acus Kutzing	5200	0.53
MEL - 0104	RECOUNT	11-Aug-16	Asterionella formosa Hassall	2000	0.21
MEL - 0104	RECOUNT	11-Aug-16	Cyclotella michiganiana Skvortzow	28736	0.62
MEL - 0104	RECOUNT	11-Aug-16	Cyclotella bodanica Eulenst.	1200	7.51
MEL - 0104	RECOUNT	11-Aug-16	Rhodomonas minuta Skuja	172416	23.83
MEL - 0104	RECOUNT	11-Aug-16	Cryptomonas erosa Ehrenberg	5000	5.68
MEL - 0104	RECOUNT	11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	800	0.56
MEL - 0104	RECOUNT	11-Aug-16	Cryptomonas rostratiformis Skuja	800	1.70
MEL - 0104	RECOUNT	11-Aug-16	Katablepharis ovalis Skuja	14368	0.74
MEL - 0104	RECOUNT	11-Aug-16	Gymnodinium helveticum Penard	200	4.52
MEL - 0104	RECOUNT	11-Aug-16	Gymnodinium sp.	1800	30.88
MEL - 0104	RECOUNT	11-Aug-16	Peridinium pusillum (Penard) Lemmermann	6200	14.32
MEL - 0104		10-Sep-16	Anabaena flos-aquae (Lyngb.) Breb. & Bornet	200	0.51
MEL - 0104		10-Sep-16	Carteria spp.	200	0.40
MEL - 0104		10-Sep-16	Sphaerocystis schroeteri Chodat	14368	0.20
MEL - 0104		10-Sep-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL - 0104		10-Sep-16	Crucigenia quadrata Morr.	79024	0.89
MEL - 0104		10-Sep-16	Elakatothrix gelatinosa Willen	43104	0.81
MEL - 0104		10-Sep-16	Planctonema lauterbornii Schmidle	43104	5.96
MEL - 0104		10-Sep-16	Cosmarium sp.	600	0.84
MEL - 0104		10-Sep-16	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL - 0104		10-Sep-16	Staurodesmus paradoxum Meyen	200	0.87
MEL - 0104		10-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0104		10-Sep-16	Botryococcus braunii Kutzing	600	0.54
MEL - 0104		10-Sep-16	Small chrysophyceae	237072	3.03
MEL - 0104		10-Sep-16	Large chrysophyceae	28736	10.97
MEL - 0104		10-Sep-16	Chrysochromulina parva Lackey	352016	23.02
MEL - 0104		10-Sep-16	Chrysococcus sp.	538800	35.24
MEL - 0104		10-Sep-16	Chrysostephanospaera globulifera Scherffel	7184	3.76
MEL - 0104		10-Sep-16	Kephyrion boreale Skuja	7184	0.66
MEL - 0104		10-Sep-16	Kephyrion sp.	50288	0.95
MEL - 0104		10-Sep-16	Mallomonas crassisquama (Asmund) Fott	200	0.21

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0104		10-Sep-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0104		10-Sep-16	Dinobryon bavaricum Imhof	1400	2.79
MEL - 0104		10-Sep-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	21552	8.63
MEL - 0104		10-Sep-16	Dinobryon sertularia Ehrenberg	200	1.02
MEL - 0104		10-Sep-16	Dinobryon sociale Ehrenberg	107760	24.38
MEL - 0104		10-Sep-16	Uroglena volvox Ehrenberg	244256	27.63
MEL - 0104		10-Sep-16	Chrysochromulina laurentiana Kling	452592	236.98
MEL - 0104		10-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	143680	3.65
MEL - 0104		10-Sep-16	Dinobryon attenatum Hill	7184	0.94
MEL - 0104		10-Sep-16	Cyclotella stelligera Cleve and Grunow	2400	5.09
MEL - 0104		10-Sep-16	Rhizosolenia eriense H.L. Smith	71840	6.09
MEL - 0104		10-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	1200	0.93
MEL - 0104		10-Sep-16	Tabellaria flocculsa (Roth) Kutzing	400	0.57
MEL - 0104		10-Sep-16	Synedra acus Kutzing	26000	2.34
MEL - 0104		10-Sep-16	Asterionella formosa Hassall	8000	0.84
MEL - 0104		10-Sep-16	Cyclotella michiganiana Skvortzow	114944	2.82
MEL - 0104		10-Sep-16	Rhodomonas minuta Skuja	122128	15.35
MEL - 0104		10-Sep-16	Cryptomonas erosa Ehrenberg	8000	12.70
MEL - 0104		10-Sep-16	Cryptomonas rostratiformis Skuja	600	1.27
MEL - 0104		10-Sep-16	Katablepharis ovalis Skuja	28736	1.48
MEL - 0104		10-Sep-16	Gymnodinium helveticum Penard	600	14.14
MEL - 0104		10-Sep-16	Gymnodinium sp.	14368	6.09
MEL - 0104		10-Sep-16	Gymnodinium sp.	2600	28.62
MEL - 0104		10-Sep-16	Peridinium willei Huitfeldt-Kaas	200	6.70
MEL - 0104		10-Sep-16	Peridinium pusillum (Penard) Lemmermann	5200	9.75
MEL - 0104		10-Sep-16	Peridinium aciculiferum Lemmermann	600	5.43
MEL - 0105		22-Jul-16	Snowella sp	200	0.30
MEL - 0105		22-Jul-16	Chlamydomonas spp.	7184	0.11
MEL - 0105		22-Jul-16	Sphaerocystis schroeteri Chodat	7184	0.24
MEL - 0105		22-Jul-16	Elakatothrix gelatinosa Willen	7184	0.12
MEL - 0105		22-Jul-16	Planctonema lauterbornii Schmidle	50288	6.32
MEL - 0105		22-Jul-16	Euastrum spp.	800	1.49
MEL - 0105		22-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105		22-Jul-16	Small chrysophyceae	416672	5.88
MEL - 0105		22-Jul-16	Large chrysophyceae	100576	18.06
MEL - 0105		22-Jul-16	Chrysochromulina parva Lackey	481328	31.48
MEL - 0105		22-Jul-16	Chrysococcus sp.	833344	45.33
MEL - 0105		22-Jul-16	Chrysostephanospaera globulifera Scherffel	43104	22.57
MEL - 0105		22-Jul-16	Kephyrion boreale Skuja	7184	0.66
MEL - 0105		22-Jul-16	Kephyrion sp.	122128	1.56
MEL - 0105		22-Jul-16	Spiniferomonas sirrata**********	21552	2.56
MEL - 0105		22-Jul-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0105		22-Jul-16	Synura sphagnicola Korschikow	200	3.70
MEL - 0105		22-Jul-16	Dinobryon borgei Lemmermann	143680	7.04
MEL - 0105		22-Jul-16	Dinobryon bavaricum Imhof	122128	27.63
MEL - 0105		22-Jul-16	Dinobryon bavaricum Imhof	8200	16.33
MEL - 0105		22-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.40
MEL - 0105		22-Jul-16	Dinobryon sertularia Ehrenberg	100576	22.75
MEL - 0105		22-Jul-16	Dinobryon sertularia Ehrenberg	2400	5.04
MEL - 0105		22-Jul-16	Epiphyxis sp.	21552	1.55
MEL - 0105		22-Jul-16	Chrysolkos skuja (Nauwerck) Willen	86208	2.34
MEL - 0105		22-Jul-16	Uroglena volvox Ehrenberg	660928	74.75
MEL - 0105		22-Jul-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.17
MEL - 0105		22-Jul-16	Chrysochromulina laurentiana Kling	79024	34.37
MEL - 0105		22-Jul-16	Stichogloea spp.	71840	3.61
MEL - 0105		22-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	57472	1.42
MEL - 0105		22-Jul-16	Cyclotella stelligera Cleve and Grunow	1600	2.91
MEL - 0105		22-Jul-16	Cyclotella pseudostelligera	21552	7.31
MEL - 0105		22-Jul-16	Rhizosolenia eriense H.L. Smith	1149440	73.10
MEL - 0105		22-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.17
MEL - 0105		22-Jul-16	Tabellaria flocculsa (Roth) Kutzing	4000	5.38
MEL - 0105		22-Jul-16	Synedra acus Kutzing	29800	3.59
MEL - 0105		22-Jul-16	Synedra ulna (Nitzsch) Ehrenberg	5400	11.20
MEL - 0105		22-Jul-16	Asterionella formosa Hassall	11400	1.21
MEL - 0105		22-Jul-16	Eunotia zazumenensis **********	5200	0.16
MEL - 0105		22-Jul-16	Cyclotella michiganiana Skvortzow	71840	1.87

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105		22-Jul-16	Cyclotella bodanica Eulenst.	400	2.34
MEL - 0105		22-Jul-16	Rhodomonas minuta Skuja	86208	7.22
MEL - 0105		22-Jul-16	Cryptomonas erosa Ehrenberg	9400	14.86
MEL - 0105		22-Jul-16	Cryptomonas ovata Ehrenberg	400	1.81
MEL - 0105		22-Jul-16	Cryptomonas reflexa (Marsson) Skuja	2600	1.91
MEL - 0105		22-Jul-16	Cryptomonas rostratiformis Skuja	2400	5.09
MEL - 0105		22-Jul-16	Katablepharis ovalis Skuja	28736	1.48
MEL - 0105		22-Jul-16	Gymnodinium helveticum Penard	200	4.90
MEL - 0105		22-Jul-16	Gymnodinium sp.	1600	24.96
MEL - 0105		22-Jul-16	Peridinium willei Huitfeldt-Kaas	200	4.69
MEL - 0105		22-Jul-16	Peridinium pusillum (Penard) Lemmermann	2400	7.33
MEL - 0105		22-Jul-16	Peridinium aciculiferum Lemmermann	600	5.61
MEL - 0105	REP1	22-Jul-16	Aphanothece sp.	14368	0.76
MEL - 0105	REP1	22-Jul-16	Snowella sp	400	0.60
MEL - 0105	REP1	22-Jul-16	Oocystis lacustris Chodat	43104	0.76
MEL - 0105	REP1	22-Jul-16	Elakatothrix gelatinosa Willen	14368	0.25
MEL - 0105	REP1	22-Jul-16	Planctonema lauterbornii Schmidle	28736	3.61
MEL - 0105	REP1	22-Jul-16	Euastrum spp.	200	0.37
MEL - 0105	REP1	22-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0105	REP1	22-Jul-16	Ankistrodesmus spiralis Lemmermann	14368	0.97
MEL - 0105	REP1	22-Jul-16	Small chrysophyceae	244256	3.44
MEL - 0105	REP1	22-Jul-16	Large chrysophyceae	64656	11.61
MEL - 0105	REP1	22-Jul-16	Chrysochromulina parva Lackey	438224	28.66
MEL - 0105	REP1	22-Jul-16	Chrysococcus sp.	926736	50.41
MEL - 0105	REP1	22-Jul-16	Chrysostephanospaera globulifera Scherffel	50288	26.33
MEL - 0105	REP1	22-Jul-16	Kephyrion boreale Skuja	14368	1.32
MEL - 0105	REP1	22-Jul-16	Kephyrion sp.	79024	1.01
MEL - 0105	REP1	22-Jul-16	Spiniferomonas sirrata**********	28736	3.41
MEL - 0105	REP1	22-Jul-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0105	REP1	22-Jul-16	Mallomonas crassisquama (Asmund) Fott	200	0.22
MEL - 0105	REP1	22-Jul-16	Dinobryon borgei Lemmermann	172416	8.45
MEL - 0105	REP1	22-Jul-16	Dinobryon bavaricum Imhof	79024	17.88
MEL - 0105	REP1	22-Jul-16	Dinobryon bavaricum Imhof	8000	15.93

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105	REP1	22-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	800	2.80
MEL - 0105	REP1	22-Jul-16	Dinobryon sertularia Ehrenberg	100576	22.75
MEL - 0105	REP1	22-Jul-16	Dinobryon sertularia Ehrenberg	1800	3.78
MEL - 0105	REP1	22-Jul-16	Epiphyxis sp.	28736	2.07
MEL - 0105	REP1	22-Jul-16	Chrysolkos skuja (Nauwerck) Willen	107760	2.93
MEL - 0105	REP1	22-Jul-16	Uroglena volvox Ehrenberg	617824	69.88
MEL - 0105	REP1	22-Jul-16	Chrysochromulina laurentiana Kling	71840	31.24
MEL - 0105	REP1	22-Jul-16	Stichogloea spp.	28736	1.45
MEL - 0105	REP1	22-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.71
MEL - 0105	REP1	22-Jul-16	Cyclotella stelligera Cleve and Grunow	2000	3.64
MEL - 0105	REP1	22-Jul-16	Rhizosolenia eriense H.L. Smith	1048864	66.71
MEL - 0105	REP1	22-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	1200	1.03
MEL - 0105	REP1	22-Jul-16	Tabellaria flocculsa (Roth) Kutzing	3200	4.32
MEL - 0105	REP1	22-Jul-16	Synedra acus Kutzing	34200	4.12
MEL - 0105	REP1	22-Jul-16	Synedra ulna (Nitzsch) Ehrenberg	5000	10.37
MEL - 0105	REP1	22-Jul-16	Asterionella formosa Hassall	12800	1.35
MEL - 0105	REP1	22-Jul-16	Eunotia zazumenensis **********	2800	0.09
MEL - 0105	REP1	22-Jul-16	Cyclotella michiganiana Skvortzow	57472	1.49
MEL - 0105	REP1	22-Jul-16	Cyclotella bodanica Eulenst.	200	1.17
MEL - 0105	REP1	22-Jul-16	Rhodomonas minuta Skuja	86208	7.22
MEL - 0105	REP1	22-Jul-16	Cryptomonas erosa Ehrenberg	10200	16.12
MEL - 0105	REP1	22-Jul-16	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0105	REP1	22-Jul-16	Cryptomonas reflexa (Marsson) Skuja	1800	1.32
MEL - 0105	REP1	22-Jul-16	Cryptomonas rostratiformis Skuja	1800	3.82
MEL - 0105	REP1	22-Jul-16	Katablepharis ovalis Skuja	28736	1.48
MEL - 0105	REP1	22-Jul-16	Gymnodinium sp.	1600	24.96
MEL - 0105	REP1	22-Jul-16	Gymnodinium sp.	400	9.80
MEL - 0105	REP1	22-Jul-16	Peridinium willei Huitfeldt-Kaas	600	14.06
MEL - 0105	REP1	22-Jul-16	Peridinium pusillum (Penard) Lemmermann	1600	4.89
MEL - 0105	REP1	22-Jul-16	Peridinium aciculiferum Lemmermann	600	5.61
MEL - 0105		11-Aug-16	Sphaerocystis schroeteri Chodat	21552	0.53
MEL - 0105		11-Aug-16	Oocystis lacustris Chodat	28736	0.70
MEL - 0105		11-Aug-16	Dictyosphaerium simplex Sukja	21552	0.10

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105		11-Aug-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.45
MEL - 0105		11-Aug-16	Elakatothrix gelatinosa Willen	43104	0.75
MEL - 0105		11-Aug-16	Planctonema lauterbornii Schmidle	93392	11.74
MEL - 0105		11-Aug-16	Cosmarium sp.	200	0.32
MEL - 0105		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	400	0.12
MEL - 0105		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0105		11-Aug-16	Botryococcus braunii Kutzing	200	0.10
MEL - 0105		11-Aug-16	Oocystis gigas Archer	400	0.97
MEL - 0105		11-Aug-16	Small chrysophyceae	725584	10.23
MEL - 0105		11-Aug-16	Large chrysophyceae	35920	6.45
MEL - 0105		11-Aug-16	Chrysochromulina parva Lackey	251440	16.44
MEL - 0105		11-Aug-16	Chrysococcus sp.	581904	38.06
MEL - 0105		11-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	3.12
MEL - 0105		11-Aug-16	Kephyrion sp.	71840	1.12
MEL - 0105		11-Aug-16	Spiniferomonas sirrata**********	64656	7.31
MEL - 0105		11-Aug-16	Dinobryon borgei Lemmermann	7184	0.43
MEL - 0105		11-Aug-16	Dinobryon mucronutom Nygaard	7184	0.88
MEL - 0105		11-Aug-16	Dinobryon bavaricum Imhof	28736	6.50
MEL - 0105		11-Aug-16	Dinobryon bavaricum Imhof	1600	3.19
MEL - 0105		11-Aug-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	1.02
MEL - 0105		11-Aug-16	Dinobryon sertularia Ehrenberg	35920	8.13
MEL - 0105		11-Aug-16	Dinobryon sertularia Ehrenberg	400	1.36
MEL - 0105		11-Aug-16	Dinobryon sociale Ehrenberg	143680	32.50
MEL - 0105		11-Aug-16	Dinobryon sociale Ehrenberg	200	0.40
MEL - 0105		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	79024	2.54
MEL - 0105		11-Aug-16	Uroglena volvox Ehrenberg	129312	14.63
MEL - 0105		11-Aug-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0105		11-Aug-16	Chrysochromulina laurentiana Kling	143680	62.49
MEL - 0105		11-Aug-16	Stichogloea spp.	50288	2.53
MEL - 0105		11-Aug-16	Bicoeca lacustris Clark	7184	0.63
MEL - 0105		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.63
MEL - 0105		11-Aug-16	Pteridomonas sp.	28736	5.95
MEL - 0105		11-Aug-16	Cyclotella stelligera Cleve and Grunow	3000	4.93

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105		11-Aug-16	Rhizosolenia eriense H.L. Smith	21552	1.37
MEL - 0105		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	4200	3.25
MEL - 0105		11-Aug-16	Synedra acus Kutzing	4800	0.50
MEL - 0105		11-Aug-16	Asterionella formosa Hassall	4000	0.42
MEL - 0105		11-Aug-16	Cyclotella michiganiana Skvortzow	93392	2.29
MEL - 0105		11-Aug-16	Rhodomonas minuta Skuja	79024	9.93
MEL - 0105		11-Aug-16	Cryptomonas erosa Ehrenberg	5200	6.27
MEL - 0105		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	600	0.38
MEL - 0105		11-Aug-16	Cryptomonas rostratiformis Skuja	800	1.53
MEL - 0105		11-Aug-16	Gymnodinium helveticum Penard	200	4.90
MEL - 0105		11-Aug-16	Gymnodinium sp.	2400	33.93
MEL - 0105		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	4800	11.50
MEL - 0105		10-Sep-16	Pyramidomonas tetrarhynchus Schmarda	200	0.11
MEL - 0105		10-Sep-16	Carteria spp.	400	1.24
MEL - 0105		10-Sep-16	Chlamydomonas spp.	21552	0.27
MEL - 0105		10-Sep-16	Sphaerocystis schroeteri Chodat	57472	0.90
MEL - 0105		10-Sep-16	Pediastrum duplex Meyen	2400	0.24
MEL - 0105		10-Sep-16	Oocystis lacustris Chodat	35920	0.93
MEL - 0105		10-Sep-16	Crucigenia quadrata Morr.	28736	0.32
MEL - 0105		10-Sep-16	Kichnerella lunaris (Kirchn.) Moeb.	57472	0.81
MEL - 0105		10-Sep-16	Planctonema lauterbornii Schmidle	35920	4.52
MEL - 0105		10-Sep-16	Cosmarium sp.	200	0.94
MEL - 0105		10-Sep-16	Staurodesmus extensus (Andersson) Teiling	600	0.25
MEL - 0105		10-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0105		10-Sep-16	Botryococcus braunii Kutzing	600	0.54
MEL - 0105		10-Sep-16	Monomastix minuta Skuja	7184	0.14
MEL - 0105		10-Sep-16	Small chrysophyceae	495696	6.34
MEL - 0105		10-Sep-16	Large chrysophyceae	21552	4.39
MEL - 0105		10-Sep-16	Chrysochromulina parva Lackey	330464	21.61
MEL - 0105		10-Sep-16	Chrysococcus sp.	617824	40.41
MEL - 0105		10-Sep-16	Chrysostephanospaera globulifera Scherffel	14368	5.67
MEL - 0105		10-Sep-16	Kephyrion boreale Skuja	14368	1.32
MEL - 0105		10-Sep-16	Kephyrion sp.	21552	0.28

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0105		10-Sep-16	Dinobryon bavaricum Imhof	57472	13.00
MEL - 0105		10-Sep-16	Dinobryon bavaricum Imhof	1200	2.39
MEL - 0105		10-Sep-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.86
MEL - 0105		10-Sep-16	Dinobryon sertularia Ehrenberg	600	3.05
MEL - 0105		10-Sep-16	Dinobryon sociale Ehrenberg	71840	16.25
MEL - 0105		10-Sep-16	Chrysolkos skuja (Nauwerck) Willen	28736	0.77
MEL - 0105		10-Sep-16	Uroglena volvox Ehrenberg	136496	15.44
MEL - 0105		10-Sep-16	Chrysochromulina laurentiana Kling	380752	211.55
MEL - 0105		10-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	129312	3.17
MEL - 0105		10-Sep-16	Dinobryon attenatum Hill	14368	1.69
MEL - 0105		10-Sep-16	Cyclotella stelligera Cleve and Grunow	8800	16.00
MEL - 0105		10-Sep-16	Cyclotella ocellata Pant.	14368	1.19
MEL - 0105		10-Sep-16	Rhizosolenia eriense H.L. Smith	50288	3.20
MEL - 0105		10-Sep-16	Fragilaria crotonensis Kitton	1600	0.54
MEL - 0105		10-Sep-16	Synedra acus Kutzing	24800	2.36
MEL - 0105		10-Sep-16	Asterionella formosa Hassall	200	0.02
MEL - 0105		10-Sep-16	Cyclotella michiganiana Skvortzow	122128	2.99
MEL - 0105		10-Sep-16	Rhodomonas minuta Skuja	86208	10.84
MEL - 0105		10-Sep-16	Cryptomonas erosa Ehrenberg	8400	13.56
MEL - 0105		10-Sep-16	Cryptomonas ovata Ehrenberg	200	1.12
MEL - 0105		10-Sep-16	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0105		10-Sep-16	Katablepharis ovalis Skuja	14368	0.74
MEL - 0105		10-Sep-16	Gymnodinium helveticum Penard	400	9.61
MEL - 0105		10-Sep-16	Gymnodinium sp.	21552	7.37
MEL - 0105		10-Sep-16	Gymnodinium sp.	2200	22.67
MEL - 0105		10-Sep-16	Peridinium willei Huitfeldt-Kaas	400	10.27
MEL - 0105		10-Sep-16	Peridinium pusillum (Penard) Lemmermann	4800	9.36
MEL - 0105		10-Sep-16	Peridinium aciculiferum Lemmermann	5200	47.05
MEL - 0201		23-Jul-16	Anabaena solitaria Klebs	12600	2.46
MEL - 0201		23-Jul-16	Sphaerocystis schroeteri Chodat	14368	0.22
MEL - 0201		23-Jul-16	Oocystis lacustris Chodat	14368	0.84
MEL - 0201		23-Jul-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.45
MEL - 0201		23-Jul-16	Elakatothrix gelatinosa Willen	14368	0.27

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201		23-Jul-16	Planctonema lauterbornii Schmidle	43104	5.42
MEL - 0201		23-Jul-16	Cosmarium sp.	400	0.74
MEL - 0201		23-Jul-16	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0201		23-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0201		23-Jul-16	Botryococcus braunii Kutzing	600	0.86
MEL - 0201		23-Jul-16	Small chrysophyceae	596272	9.30
MEL - 0201		23-Jul-16	Large chrysophyceae	50288	9.03
MEL - 0201		23-Jul-16	Chrysochromulina parva Lackey	581904	38.06
MEL - 0201		23-Jul-16	Chrysococcus sp.	495696	32.42
MEL - 0201		23-Jul-16	Kephyrion boreale Skuja	14368	1.71
MEL - 0201		23-Jul-16	Kephyrion sp.	165232	2.84
MEL - 0201		23-Jul-16	Spiniferomonas sirrata**********	43104	3.17
MEL - 0201		23-Jul-16	Mallomonas caudata Ivanov	400	2.14
MEL - 0201		23-Jul-16	Mallomonas crassisquama (Asmund) Fott	1600	1.68
MEL - 0201		23-Jul-16	Dinobryon borgei Lemmermann	43104	2.21
MEL - 0201		23-Jul-16	Dinobryon mucronutom Nygaard	64656	8.38
MEL - 0201		23-Jul-16	Dinobryon bavaricum Imhof	287360	65.00
MEL - 0201		23-Jul-16	Dinobryon bavaricum Imhof	3000	3.68
MEL - 0201		23-Jul-16	Dinobryon sertularia Ehrenberg	114944	26.00
MEL - 0201		23-Jul-16	Dinobryon sertularia Ehrenberg	4800	12.12
MEL - 0201		23-Jul-16	Epiphyxis sp.	21552	1.68
MEL - 0201		23-Jul-16	Chrysolkos skuja (Nauwerck) Willen	43104	1.22
MEL - 0201		23-Jul-16	Uroglena volvox Ehrenberg	890816	100.75
MEL - 0201		23-Jul-16	Chrysochromulina laurentiana Kling	79024	34.37
MEL - 0201		23-Jul-16	Stichogloea spp.	28736	1.66
MEL - 0201		23-Jul-16	Cyclotella stelligera Cleve and Grunow	3800	6.91
MEL - 0201		23-Jul-16	Rhizosolenia eriense H.L. Smith	423856	32.98
MEL - 0201		23-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	7400	6.21
MEL - 0201		23-Jul-16	Synedra acus Kutzing	8800	1.06
MEL - 0201		23-Jul-16	Asterionella formosa Hassall	5600	0.53
MEL - 0201		23-Jul-16	Cyclotella michiganiana Skvortzow	35920	0.93
MEL - 0201		23-Jul-16	Rhodomonas minuta Skuja	79024	11.02
MEL - 0201		23-Jul-16	Cryptomonas erosa Ehrenberg	7400	11.95

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201		23-Jul-16	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0201		23-Jul-16	Cryptomonas reflexa (Marsson) Skuja	200	0.13
MEL - 0201		23-Jul-16	Cryptomonas rostratiformis Skuja	800	1.70
MEL - 0201		23-Jul-16	Katablepharis ovalis Skuja	28736	1.62
MEL - 0201		23-Jul-16	Gymnodinium sp.	400	6.24
MEL - 0201		23-Jul-16	Peridinium pusillum (Penard) Lemmermann	4600	11.63
MEL - 0201		23-Jul-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0201		11-Aug-16	Chlamydomonas spp.	14368	0.22
MEL - 0201		11-Aug-16	Sphaerocystis schroeteri Chodat	14368	0.22
MEL - 0201		11-Aug-16	Elakatothrix gelatinosa Willen	129312	3.69
MEL - 0201		11-Aug-16	Planctonema lauterbornii Schmidle	71840	9.03
MEL - 0201		11-Aug-16	Euastrum spp.	800	1.93
MEL - 0201		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0201		11-Aug-16	Botryococcus braunii Kutzing	400	0.21
MEL - 0201		11-Aug-16	Oocystis gigas Archer	200	0.48
MEL - 0201		11-Aug-16	Small chrysophyceae	653744	3.66
MEL - 0201		11-Aug-16	Large chrysophyceae	21552	3.87
MEL - 0201		11-Aug-16	Chrysochromulina parva Lackey	143680	9.40
MEL - 0201		11-Aug-16	Chrysococcus sp.	359200	18.32
MEL - 0201		11-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	2.83
MEL - 0201		11-Aug-16	Kephyrion boreale Skuja	14368	1.71
MEL - 0201		11-Aug-16	Kephyrion sp.	64656	0.83
MEL - 0201		11-Aug-16	Dinobryon borgei Lemmermann	7184	0.31
MEL - 0201		11-Aug-16	Dinobryon bavaricum Imhof	200	0.40
MEL - 0201		11-Aug-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0201		11-Aug-16	Dinobryon sertularia Ehrenberg	400	0.80
MEL - 0201		11-Aug-16	Dinobryon sociale Ehrenberg	64656	14.63
MEL - 0201		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.20
MEL - 0201		11-Aug-16	Uroglena volvox Ehrenberg	43104	4.88
MEL - 0201		11-Aug-16	Chrysochromulina laurentiana Kling	71840	30.26
MEL - 0201		11-Aug-16	Stichogloea spp.	28736	1.45
MEL - 0201		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.20
MEL - 0201		11-Aug-16	Pteridomonas sp.	21552	5.30

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201		11-Aug-16	Cyclotella stelligera Cleve and Grunow	4400	8.00
MEL - 0201		11-Aug-16	Cyclotella pseudostelligera	7184	3.87
MEL - 0201		11-Aug-16	Cyclotella ocellata Pant.	14368	1.24
MEL - 0201		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	6400	5.31
MEL - 0201		11-Aug-16	Fragilaria crotonensis Kitton	2000	0.59
MEL - 0201		11-Aug-16	Synedra acus Kutzing	1600	0.18
MEL - 0201		11-Aug-16	Cyclotella michiganiana Skvortzow	43104	1.00
MEL - 0201		11-Aug-16	Cyclotella bodanica Eulenst.	1800	10.53
MEL - 0201		11-Aug-16	Diatoma elongatum Agardh	600	0.03
MEL - 0201		11-Aug-16	Rhodomonas minuta Skuja	150864	20.85
MEL - 0201		11-Aug-16	Cryptomonas erosa Ehrenberg	4200	4.90
MEL - 0201		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	2400	1.64
MEL - 0201		11-Aug-16	Cryptomonas rostratiformis Skuja	400	0.77
MEL - 0201		11-Aug-16	Katablepharis ovalis Skuja	14368	0.74
MEL - 0201		11-Aug-16	Gymnodinium sp.	7184	3.35
MEL - 0201		11-Aug-16	Gymnodinium sp.	600	4.68
MEL - 0201		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	1600	4.19
MEL - 0201		11-Aug-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0201		11-Sep-16	Snowella sp	200	0.15
MEL - 0201		11-Sep-16	Planktothrix	200	2.62
MEL - 0201		11-Sep-16	Pyramidomonas tetrarhynchus Schmarda	200	0.10
MEL - 0201		11-Sep-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.82
MEL - 0201		11-Sep-16	Planctonema lauterbornii Schmidle	28736	3.61
MEL - 0201		11-Sep-16	Cosmarium sp.	200	0.55
MEL - 0201		11-Sep-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0201		11-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0201		11-Sep-16	Botryococcus braunii Kutzing	400	0.36
MEL - 0201		11-Sep-16	Small chrysophyceae	488512	6.89
MEL - 0201		11-Sep-16	Large chrysophyceae	14368	2.58
MEL - 0201		11-Sep-16	Chrysochromulina parva Lackey	330464	21.61
MEL - 0201		11-Sep-16	Chrysococcus sp.	466960	30.54
MEL - 0201		11-Sep-16	Kephyrion sp.	28736	0.70
MEL - 0201		11-Sep-16	Spiniferomonas sirrata**********	35920	3.30

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0201		11-Sep-16	Mallomonas crassisquama (Asmund) Fott	600	0.60
MEL - 0201		11-Sep-16	Dinobryon borgei Lemmermann	7184	0.35
MEL - 0201		11-Sep-16	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0201		11-Sep-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0201		11-Sep-16	Dinobryon bavaricum Imhof	3200	6.37
MEL - 0201		11-Sep-16	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0201		11-Sep-16	Dinobryon sertularia Ehrenberg	2600	13.22
MEL - 0201		11-Sep-16	Dinobryon sociale Ehrenberg	64656	14.63
MEL - 0201		11-Sep-16	Dinobryon sociale Ehrenberg	1000	1.25
MEL - 0201		11-Sep-16	Chrysolkos skuja (Nauwerck) Willen	35920	0.82
MEL - 0201		11-Sep-16	Uroglena volvox Ehrenberg	57472	6.50
MEL - 0201		11-Sep-16	Uroglena volvox Ehrenberg	200	14.52
MEL - 0201		11-Sep-16	Bitrichia chodatii (Reverdin) Chodat	21552	1.08
MEL - 0201		11-Sep-16	Chrysochromulina laurentiana Kling	79024	41.38
MEL - 0201		11-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.62
MEL - 0201		11-Sep-16	Pteridomonas sp.	7184	1.71
MEL - 0201		11-Sep-16	Cyclotella stelligera Cleve and Grunow	12200	24.14
MEL - 0201		11-Sep-16	Cyclotella ocellata Pant.	35920	3.75
MEL - 0201		11-Sep-16	Synedra acus Kutzing	3200	0.37
MEL - 0201		11-Sep-16	Asterionella formosa Hassall	19000	2.01
MEL - 0201		11-Sep-16	Cyclotella michiganiana Skvortzow	21552	0.39
MEL - 0201		11-Sep-16	Cyclotella bodanica Eulenst.	600	5.50
MEL - 0201		11-Sep-16	Rhodomonas minuta Skuja	122128	18.42
MEL - 0201		11-Sep-16	Cryptomonas erosa Ehrenberg	4800	7.75
MEL - 0201		11-Sep-16	Cryptomonas rostratiformis Skuja	400	0.85
MEL - 0201		11-Sep-16	Katablepharis ovalis Skuja	7184	0.37
MEL - 0201		11-Sep-16	Gymnodinium helveticum Penard	400	9.61
MEL - 0201		11-Sep-16	Gymnodinium sp.	1000	10.65
MEL - 0201		11-Sep-16	Peridinium willei Huitfeldt-Kaas	200	5.13
MEL - 0201		11-Sep-16	Peridinium pusillum (Penard) Lemmermann	3800	8.46
MEL - 0201		11-Sep-16	Peridinium aciculiferum Lemmermann	800	7.24
MEL - 0202		23-Jul-16	Pediastrum duplex Meyen	3600	0.37
MEL - 0202		23-Jul-16	Dictyosphaerium simplex Sukja	28736	0.14

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202		23-Jul-16	Cosmarium sp.	200	0.61
MEL - 0202		23-Jul-16	Botryococcus braunii Kutzing	200	0.29
MEL - 0202		23-Jul-16	Small chrysophyceae	308912	5.81
MEL - 0202		23-Jul-16	Large chrysophyceae	35920	6.18
MEL - 0202		23-Jul-16	Chrysochromulina parva Lackey	43104	2.82
MEL - 0202		23-Jul-16	Chrysococcus sp.	114944	7.52
MEL - 0202		23-Jul-16	Chrysostephanospaera globulifera Scherffel	21552	11.28
MEL - 0202		23-Jul-16	Kephyrion sp.	21552	0.20
MEL - 0202		23-Jul-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0202		23-Jul-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0202		23-Jul-16	Uroglena volvox Ehrenberg	14368	1.63
MEL - 0202		23-Jul-16	Chrysochromulina laurentiana Kling	7184	3.33
MEL - 0202		23-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	64656	2.08
MEL - 0202		23-Jul-16	Cyclotella stelligera Cleve and Grunow	800	1.45
MEL - 0202		23-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	5000	4.05
MEL - 0202		23-Jul-16	Tabellaria flocculsa (Roth) Kutzing	1600	2.55
MEL - 0202		23-Jul-16	Synedra acus Kutzing	800	0.10
MEL - 0202		23-Jul-16	Cyclotella michiganiana Skvortzow	50288	1.09
MEL - 0202		23-Jul-16	Cyclotella bodanica Eulenst.	200	1.54
MEL - 0202		23-Jul-16	Cryptomonas erosa Ehrenberg	200	0.34
MEL - 0202		23-Jul-16	Katablepharis ovalis Skuja	71840	3.69
MEL - 0202		23-Jul-16	Peridinium pusillum (Penard) Lemmermann	400	1.26
MEL - 0202		11-Aug-16	Aphanothece sp.	7184	0.18
MEL - 0202		11-Aug-16	Snowella sp	200	0.11
MEL - 0202		11-Aug-16	Sphaerocystis schroeteri Chodat	43104	1.44
MEL - 0202		11-Aug-16	Oocystis lacustris Chodat	14368	0.38
MEL - 0202		11-Aug-16	Elakatothrix gelatinosa Willen	43104	0.75
MEL - 0202		11-Aug-16	Planctonema lauterbornii Schmidle	50288	6.32
MEL - 0202		11-Aug-16	Cosmarium sp.	200	0.28
MEL - 0202		11-Aug-16	Euastrum spp.	600	1.12
MEL - 0202		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	600	0.26
MEL - 0202		11-Aug-16	Oocystis gigas Archer	200	0.68
MEL - 0202		11-Aug-16	Small chrysophyceae	517248	7.29

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202		11-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0202		11-Aug-16	Chrysochromulina parva Lackey	122128	7.99
MEL - 0202		11-Aug-16	Chrysococcus sp.	366384	23.96
MEL - 0202		11-Aug-16	Kephyrion sp.	114944	1.79
MEL - 0202		11-Aug-16	Spiniferomonas sirrata**********	35920	4.27
MEL - 0202		11-Aug-16	Dinobryon borgei Lemmermann	14368	0.61
MEL - 0202		11-Aug-16	Dinobryon bavaricum Imhof	600	1.19
MEL - 0202		11-Aug-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0202		11-Aug-16	Dinobryon sociale Ehrenberg	143680	32.50
MEL - 0202		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	21552	0.65
MEL - 0202		11-Aug-16	Uroglena volvox Ehrenberg	71840	8.13
MEL - 0202		11-Aug-16	Chrysochromulina laurentiana Kling	64656	29.95
MEL - 0202		11-Aug-16	Stichogloea spp.	21552	1.08
MEL - 0202		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.18
MEL - 0202		11-Aug-16	Pteridomonas sp.	14368	3.19
MEL - 0202		11-Aug-16	Cyclotella stelligera Cleve and Grunow	8000	15.83
MEL - 0202		11-Aug-16	Cyclotella pseudostelligera	28736	15.48
MEL - 0202		11-Aug-16	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL - 0202		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.65
MEL - 0202		11-Aug-16	Synedra acus Kutzing	1000	0.12
MEL - 0202		11-Aug-16	Asterionella formosa Hassall	2600	0.26
MEL - 0202		11-Aug-16	Cyclotella michiganiana Skvortzow	50288	1.23
MEL - 0202		11-Aug-16	Cyclotella bodanica Eulenst.	2600	20.06
MEL - 0202		11-Aug-16	Rhodomonas minuta Skuja	172416	23.83
MEL - 0202		11-Aug-16	Cryptomonas erosa Ehrenberg	3600	4.36
MEL - 0202		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1600	1.17
MEL - 0202		11-Aug-16	Cryptomonas rostratiformis Skuja	600	1.35
MEL - 0202		11-Aug-16	Katablepharis ovalis Skuja	7184	0.52
MEL - 0202		11-Aug-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0202		11-Aug-16	Gymnodinium sp.	400	4.60
MEL - 0202		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	4000	9.93
MEL - 0202		11-Sep-16	Snowella sp	200	0.15
MEL - 0202		11-Sep-16	Anabaena flos-aquae (Lyngb.) Breb. & Bornet	200	0.47

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202		11-Sep-16	Sphaerocystis schroeteri Chodat	7184	0.24
MEL - 0202		11-Sep-16	Elakatothrix gelatinosa Willen	14368	0.32
MEL - 0202		11-Sep-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0202		11-Sep-16	Cosmarium sp.	400	0.56
MEL - 0202		11-Sep-16	Staurodesmus extensus (Andersson) Teiling	400	0.17
MEL - 0202		11-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0202		11-Sep-16	Botryococcus braunii Kutzing	1800	1.63
MEL - 0202		11-Sep-16	Small chrysophyceae	510064	7.19
MEL - 0202		11-Sep-16	Large chrysophyceae	14368	2.58
MEL - 0202		11-Sep-16	Chrysochromulina parva Lackey	251440	16.44
MEL - 0202		11-Sep-16	Chrysococcus sp.	323280	21.14
MEL - 0202		11-Sep-16	Chrysostephanospaera globulifera Scherffel	7184	2.65
MEL - 0202		11-Sep-16	Kephyrion boreale Skuja	7184	0.77
MEL - 0202		11-Sep-16	Kephyrion sp.	86208	2.10
MEL - 0202		11-Sep-16	Spiniferomonas sirrata**********	14368	1.32
MEL - 0202		11-Sep-16	Mallomonas crassisquama (Asmund) Fott	400	0.44
MEL - 0202		11-Sep-16	Dinobryon borgei Lemmermann	14368	0.75
MEL - 0202		11-Sep-16	Dinobryon bavaricum Imhof	28736	6.50
MEL - 0202		11-Sep-16	Dinobryon bavaricum Imhof	1200	2.39
MEL - 0202		11-Sep-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0202		11-Sep-16	Dinobryon sertularia Ehrenberg	1400	7.12
MEL - 0202		11-Sep-16	Dinobryon sociale Ehrenberg	114944	26.00
MEL - 0202		11-Sep-16	Dinobryon sociale Ehrenberg	1000	1.25
MEL - 0202		11-Sep-16	Chrysolkos skuja (Nauwerck) Willen	14368	0.33
MEL - 0202		11-Sep-16	Uroglena volvox Ehrenberg	150864	17.06
MEL - 0202		11-Sep-16	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL - 0202		11-Sep-16	Chrysochromulina laurentiana Kling	129312	67.71
MEL - 0202		11-Sep-16	Stichogloea spp.	7184	0.36
MEL - 0202		11-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.39
MEL - 0202		11-Sep-16	Pteridomonas sp.	14368	3.42
MEL - 0202		11-Sep-16	Cyclotella stelligera Cleve and Grunow	8600	17.02
MEL - 0202		11-Sep-16	Cyclotella ocellata Pant.	35920	3.75
MEL - 0202		11-Sep-16	Rhizosolenia eriense H.L. Smith	7184	0.46

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202		11-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	2400	1.99
MEL - 0202		11-Sep-16	Synedra acus Kutzing	800	0.10
MEL - 0202		11-Sep-16	Asterionella formosa Hassall	8800	0.92
MEL - 0202		11-Sep-16	Cyclotella michiganiana Skvortzow	86208	1.87
MEL - 0202		11-Sep-16	Rhodomonas minuta Skuja	129312	16.25
MEL - 0202		11-Sep-16	Cryptomonas erosa Ehrenberg	6200	10.01
MEL - 0202		11-Sep-16	Cryptomonas reflexa (Marsson) Skuja	800	0.53
MEL - 0202		11-Sep-16	Cryptomonas rostratiformis Skuja	400	0.85
MEL - 0202		11-Sep-16	Gymnodinium sp.	1800	19.18
MEL - 0202		11-Sep-16	Peridinium pusillum (Penard) Lemmermann	1200	2.67
MEL - 0202		11-Sep-16	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0202	RECOUNT	11-Sep-16	Oocystis lacustris Chodat	43104	2.17
MEL - 0202	RECOUNT	11-Sep-16	Elakatothrix gelatinosa Willen	14368	0.32
MEL - 0202	RECOUNT	11-Sep-16	Planctonema lauterbornii Schmidle	43104	5.42
MEL - 0202	RECOUNT	11-Sep-16	Cosmarium sp.	200	0.28
MEL - 0202	RECOUNT	11-Sep-16	Staurodesmus extensus (Andersson) Teiling	800	0.34
MEL - 0202	RECOUNT	11-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0202	RECOUNT	11-Sep-16	Botryococcus braunii Kutzing	1400	1.27
MEL - 0202	RECOUNT	11-Sep-16	Ankistrodesmus spiralis Lemmermann	14368	0.98
MEL - 0202	RECOUNT	11-Sep-16	Small chrysophyceae	466960	6.58
MEL - 0202	RECOUNT	11-Sep-16	Large chrysophyceae	14368	2.58
MEL - 0202	RECOUNT	11-Sep-16	Chrysochromulina parva Lackey	301728	19.73
MEL - 0202	RECOUNT	11-Sep-16	Chrysococcus sp.	316096	20.67
MEL - 0202	RECOUNT	11-Sep-16	Chrysostephanospaera globulifera Scherffel	14368	5.30
MEL - 0202	RECOUNT	11-Sep-16	Kephyrion sp.	71840	1.75
MEL - 0202	RECOUNT	11-Sep-16	Spiniferomonas sirrata**********	7184	0.66
MEL - 0202	RECOUNT	11-Sep-16	Mallomonas crassisquama (Asmund) Fott	200	0.22
MEL - 0202	RECOUNT	11-Sep-16	Dinobryon borgei Lemmermann	21552	1.12
MEL - 0202	RECOUNT	11-Sep-16	Dinobryon mucronutom Nygaard	35920	8.13
MEL - 0202	RECOUNT	11-Sep-16	Dinobryon bavaricum Imhof	1600	3.19
MEL - 0202	RECOUNT	11-Sep-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0202	RECOUNT	11-Sep-16	Dinobryon sertularia Ehrenberg	1000	1.25
MEL - 0202	RECOUNT	11-Sep-16	Dinobryon sertularia Ehrenberg	2000	10.17

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0202	RECOUNT	11-Sep-16	Dinobryon sociale Ehrenberg	86208	19.50
MEL - 0202	RECOUNT	11-Sep-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.16
MEL - 0202	RECOUNT	11-Sep-16	Uroglena volvox Ehrenberg	186784	21.13
MEL - 0202	RECOUNT	11-Sep-16	Bitrichia chodatii (Reverdin) Chodat	28736	1.45
MEL - 0202	RECOUNT	11-Sep-16	Chrysochromulina laurentiana Kling	150864	78.99
MEL - 0202	RECOUNT	11-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	64656	2.08
MEL - 0202	RECOUNT	11-Sep-16	Pteridomonas sp.	21552	5.13
MEL - 0202	RECOUNT	11-Sep-16	Cyclotella stelligera Cleve and Grunow	9200	18.20
MEL - 0202	RECOUNT	11-Sep-16	Cyclotella ocellata Pant.	28736	3.00
MEL - 0202	RECOUNT	11-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	4200	3.48
MEL - 0202	RECOUNT	11-Sep-16	Synedra acus Kutzing	1800	0.22
MEL - 0202	RECOUNT	11-Sep-16	Asterionella formosa Hassall	7800	0.82
MEL - 0202	RECOUNT	11-Sep-16	Cyclotella michiganiana Skvortzow	136496	2.96
MEL - 0202	RECOUNT	11-Sep-16	Cyclotella bodanica Eulenst.	400	3.34
MEL - 0202	RECOUNT	11-Sep-16	Rhodomonas minuta Skuja	129312	16.25
MEL - 0202	RECOUNT	11-Sep-16	Cryptomonas erosa Ehrenberg	5200	8.40
MEL - 0202	RECOUNT	11-Sep-16	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL - 0202	RECOUNT	11-Sep-16	Cryptomonas rostratiformis Skuja	800	1.70
MEL - 0202	RECOUNT	11-Sep-16	Katablepharis ovalis Skuja	14368	0.67
MEL - 0202	RECOUNT	11-Sep-16	Gymnodinium sp.	1400	14.91
MEL - 0202	RECOUNT	11-Sep-16	Peridinium pusillum (Penard) Lemmermann	800	1.78
MEL - 0202	RECOUNT	11-Sep-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0203		23-Jul-16	Chroococcus limneticus Lemmermann	114944	12.36
MEL - 0203		23-Jul-16	Oocystis lacustris Chodat	14368	0.37
MEL - 0203		23-Jul-16	Dictyosphaerium simplex Sukja	14368	0.07
MEL - 0203		23-Jul-16	Elakatothrix gelatinosa Willen	35920	0.62
MEL - 0203		23-Jul-16	Planctonema lauterbornii Schmidle	64656	8.13
MEL - 0203		23-Jul-16	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0203		23-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0203		23-Jul-16	Mougeotia sp.	400	2.31
MEL - 0203		23-Jul-16	Botryococcus braunii Kutzing	200	0.29
MEL - 0203		23-Jul-16	Ankistrodesmus spiralis Lemmermann	7184	0.56
MEL - 0203		23-Jul-16	Small chrysophyceae	610640	12.58

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203		23-Jul-16	Large chrysophyceae	86208	32.91
MEL - 0203		23-Jul-16	Chrysochromulina parva Lackey	452592	29.60
MEL - 0203		23-Jul-16	Chrysococcus sp.	409488	5.77
MEL - 0203		23-Jul-16	Chrysostephanospaera globulifera Scherffel	21552	11.28
MEL - 0203		23-Jul-16	Kephyrion sp.	86208	0.79
MEL - 0203		23-Jul-16	Spiniferomonas sirrata**********	21552	2.56
MEL - 0203		23-Jul-16	Mallomonas crassisquama (Asmund) Fott	400	0.43
MEL - 0203		23-Jul-16	Dinobryon borgei Lemmermann	64656	3.33
MEL - 0203		23-Jul-16	Dinobryon mucronutom Nygaard	14368	1.45
MEL - 0203		23-Jul-16	Dinobryon bavaricum Imhof	237072	53.63
MEL - 0203		23-Jul-16	Dinobryon bavaricum Imhof	7200	8.82
MEL - 0203		23-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	2.03
MEL - 0203		23-Jul-16	Dinobryon sertularia Ehrenberg	79024	17.88
MEL - 0203		23-Jul-16	Dinobryon sertularia Ehrenberg	2600	5.18
MEL - 0203		23-Jul-16	Chrysolkos skuja (Nauwerck) Willen	43104	1.03
MEL - 0203		23-Jul-16	Uroglena volvox Ehrenberg	739952	83.69
MEL - 0203		23-Jul-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0203		23-Jul-16	Chrysochromulina laurentiana Kling	28736	11.72
MEL - 0203		23-Jul-16	Bicoeca lacustris Clark	7184	0.50
MEL - 0203		23-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.53
MEL - 0203		23-Jul-16	Pteridomonas sp.	14368	3.19
MEL - 0203		23-Jul-16	Cyclotella stelligera Cleve and Grunow	400	0.73
MEL - 0203		23-Jul-16	Rhizosolenia eriense H.L. Smith	344832	26.83
MEL - 0203		23-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	1600	1.48
MEL - 0203		23-Jul-16	Synedra acus Kutzing	1800	0.21
MEL - 0203		23-Jul-16	Asterionella formosa Hassall	5000	0.53
MEL - 0203		23-Jul-16	Cyclotella michiganiana Skvortzow	107760	2.64
MEL - 0203		23-Jul-16	Rhodomonas minuta Skuja	93392	12.32
MEL - 0203		23-Jul-16	Cryptomonas erosa Ehrenberg	3400	5.49
MEL - 0203		23-Jul-16	Cryptomonas reflexa (Marsson) Skuja	400	0.29
MEL - 0203		23-Jul-16	Cryptomonas rostratiformis Skuja	800	1.67
MEL - 0203		23-Jul-16	Katablepharis ovalis Skuja	14368	0.59
MEL - 0203		23-Jul-16	Gymnodinium sp.	800	7.36

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203		23-Jul-16	Peridinium willei Huitfeldt-Kaas	400	14.43
MEL - 0203		23-Jul-16	Peridinium pusillum (Penard) Lemmermann	1200	3.03
MEL - 0203		23-Jul-16	Peridinium aciculiferum Lemmermann	200	1.87
MEL - 0203		11-Aug-16	Aphanothece sp.	14368	0.73
MEL - 0203		11-Aug-16	Snowella sp	600	0.30
MEL - 0203		11-Aug-16	Chlamydomonas spp.	14368	0.18
MEL - 0203		11-Aug-16	Sphaerocystis schroeteri Chodat	14368	0.48
MEL - 0203		11-Aug-16	Oocystis lacustris Chodat	57472	1.36
MEL - 0203		11-Aug-16	Elakatothrix gelatinosa Willen	28736	0.41
MEL - 0203		11-Aug-16	Planctonema lauterbornii Schmidle	50288	6.32
MEL - 0203		11-Aug-16	Euastrum spp.	200	0.37
MEL - 0203		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	600	0.29
MEL - 0203		11-Aug-16	Staurodesmus paradoxum Meyen	200	0.82
MEL - 0203		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0203		11-Aug-16	Botryococcus braunii Kutzing	400	0.28
MEL - 0203		11-Aug-16	Oocystis gigas Archer	200	0.48
MEL - 0203		11-Aug-16	Small chrysophyceae	603456	8.51
MEL - 0203		11-Aug-16	Large chrysophyceae	28736	5.16
MEL - 0203		11-Aug-16	Chrysochromulina parva Lackey	71840	4.70
MEL - 0203		11-Aug-16	Chrysococcus sp.	495696	32.42
MEL - 0203		11-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	3.33
MEL - 0203		11-Aug-16	Kephyrion boreale Skuja	7184	0.85
MEL - 0203		11-Aug-16	Kephyrion sp.	114944	1.06
MEL - 0203		11-Aug-16	Spiniferomonas sirrata**********	14368	1.63
MEL - 0203		11-Aug-16	Mallomonas crassisquama (Asmund) Fott	400	0.40
MEL - 0203		11-Aug-16	Synura sphagnicola Korschikow	7184	4.51
MEL - 0203		11-Aug-16	Dinobryon borgei Lemmermann	7184	0.31
MEL - 0203		11-Aug-16	Dinobryon bavaricum Imhof	600	1.19
MEL - 0203		11-Aug-16	Dinobryon sertularia Ehrenberg	50288	11.38
MEL - 0203		11-Aug-16	Dinobryon sertularia Ehrenberg	1200	6.10
MEL - 0203		11-Aug-16	Dinobryon sociale Ehrenberg	158048	35.75
MEL - 0203		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	28736	0.51
MEL - 0203		11-Aug-16	Uroglena volvox Ehrenberg	107760	12.19

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203		11-Aug-16	Chrysochromulina laurentiana Kling	79024	34.37
MEL - 0203		11-Aug-16	Stichogloea spp.	28736	1.45
MEL - 0203		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43
MEL - 0203		11-Aug-16	Pteridomonas sp.	28736	6.38
MEL - 0203		11-Aug-16	Cyclotella stelligera Cleve and Grunow	5200	11.79
MEL - 0203		11-Aug-16	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL - 0203		11-Aug-16	Synedra acus Kutzing	3000	0.33
MEL - 0203		11-Aug-16	Asterionella formosa Hassall	3200	0.34
MEL - 0203		11-Aug-16	Cyclotella michiganiana Skvortzow	21552	0.53
MEL - 0203		11-Aug-16	Cyclotella bodanica Eulenst.	1000	8.42
MEL - 0203		11-Aug-16	Rhodomonas minuta Skuja	165232	20.77
MEL - 0203		11-Aug-16	Cryptomonas erosa Ehrenberg	7200	8.54
MEL - 0203		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	2000	1.33
MEL - 0203		11-Aug-16	Cryptomonas rostratiformis Skuja	200	0.40
MEL - 0203		11-Aug-16	Katablepharis ovalis Skuja	7184	0.51
MEL - 0203		11-Aug-16	Gymnodinium helveticum Penard	400	9.80
MEL - 0203		11-Aug-16	Gymnodinium sp.	800	7.62
MEL - 0203		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	17600	48.55
MEL - 0203		11-Sep-16	Chroococcus limneticus Lemmermann	129312	5.02
MEL - 0203		11-Sep-16	Oocystis lacustris Chodat	28736	0.80
MEL - 0203		11-Sep-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0203		11-Sep-16	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.36
MEL - 0203		11-Sep-16	Botryococcus braunii Kutzing	400	0.36
MEL - 0203		11-Sep-16	Small chrysophyceae	395120	5.57
MEL - 0203		11-Sep-16	Large chrysophyceae	28736	5.16
MEL - 0203		11-Sep-16	Chrysochromulina parva Lackey	265808	17.38
MEL - 0203		11-Sep-16	Chrysococcus sp.	380752	24.90
MEL - 0203		11-Sep-16	Kephyrion sp.	100576	2.45
MEL - 0203		11-Sep-16	Spiniferomonas sirrata**********	14368	1.32
MEL - 0203		11-Sep-16	Mallomonas crassisquama (Asmund) Fott	800	0.85
MEL - 0203		11-Sep-16	Dinobryon borgei Lemmermann	35920	1.81
MEL - 0203		11-Sep-16	Dinobryon mucronutom Nygaard	7184	0.93
MEL - 0203		11-Sep-16	Dinobryon bavaricum Imhof	35920	8.13

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0203		11-Sep-16	Dinobryon bavaricum Imhof	1800	3.58
MEL - 0203		11-Sep-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0203		11-Sep-16	Dinobryon sertularia Ehrenberg	1800	9.15
MEL - 0203		11-Sep-16	Dinobryon sociale Ehrenberg	64656	14.63
MEL - 0203		11-Sep-16	Dinobryon sociale Ehrenberg	400	0.50
MEL - 0203		11-Sep-16	Uroglena volvox Ehrenberg	251440	28.44
MEL - 0203		11-Sep-16	Uroglena volvox Ehrenberg	400	21.04
MEL - 0203		11-Sep-16	Chrysochromulina laurentiana Kling	86208	45.14
MEL - 0203		11-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.58
MEL - 0203		11-Sep-16	Pteridomonas sp.	14368	3.42
MEL - 0203		11-Sep-16	Cyclotella stelligera Cleve and Grunow	12400	22.87
MEL - 0203		11-Sep-16	Cyclotella ocellata Pant.	21552	1.65
MEL - 0203		11-Sep-16	Synedra acus Kutzing	3000	0.36
MEL - 0203		11-Sep-16	Asterionella formosa Hassall	18200	1.91
MEL - 0203		11-Sep-16	Cyclotella michiganiana Skvortzow	86208	1.99
MEL - 0203		11-Sep-16	Rhodomonas minuta Skuja	107760	13.55
MEL - 0203		11-Sep-16	Cryptomonas erosa Ehrenberg	4000	6.46
MEL - 0203		11-Sep-16	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL - 0203		11-Sep-16	Cryptomonas rostratiformis Skuja	600	1.23
MEL - 0203		11-Sep-16	Gymnodinium helveticum Penard	200	4.71
MEL - 0203		11-Sep-16	Gymnodinium sp.	2200	12.77
MEL - 0203		11-Sep-16	Peridinium willei Huitfeldt-Kaas	200	6.70
MEL - 0203		11-Sep-16	Peridinium pusillum (Penard) Lemmermann	3200	6.86
MEL - 0203		11-Sep-16	Peridinium aciculiferum Lemmermann	1600	14.48
MEL - 0204		23-Jul-16	Radiocystis geminata Skuja	7184	1.26
MEL - 0204		23-Jul-16	Chlamydomonas spp.	21552	0.23
MEL - 0204		23-Jul-16	Elakatothrix gelatinosa Willen	14368	0.27
MEL - 0204		23-Jul-16	Planctonema lauterbornii Schmidle	28736	3.61
MEL - 0204		23-Jul-16	Cosmarium sp.	400	2.74
MEL - 0204		23-Jul-16	Euastrum spp.	200	0.37
MEL - 0204		23-Jul-16	Staurodesmus extensus (Andersson) Teiling	800	0.30
MEL - 0204		23-Jul-16	Staurodesmus paradoxum Meyen	200	0.41
MEL - 0204		23-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204		23-Jul-16	Botryococcus braunii Kutzing	400	0.46
MEL - 0204		23-Jul-16	Small chrysophyceae	481328	7.51
MEL - 0204		23-Jul-16	Large chrysophyceae	50288	9.03
MEL - 0204		23-Jul-16	Chrysochromulina parva Lackey	445408	29.13
MEL - 0204		23-Jul-16	Chrysococcus sp.	416672	24.13
MEL - 0204		23-Jul-16	Chrysostephanospaera globulifera Scherffel	7184	3.76
MEL - 0204		23-Jul-16	Kephyrion sp.	86208	0.99
MEL - 0204		23-Jul-16	Spiniferomonas sirrata**********	14368	1.25
MEL - 0204		23-Jul-16	Mallomonas crassisquama (Asmund) Fott	1600	1.64
MEL - 0204		23-Jul-16	Dinobryon borgei Lemmermann	79024	4.07
MEL - 0204		23-Jul-16	Dinobryon mucronutom Nygaard	57472	6.37
MEL - 0204		23-Jul-16	Dinobryon bavaricum Imhof	294544	66.63
MEL - 0204		23-Jul-16	Dinobryon bavaricum Imhof	4800	5.88
MEL - 0204		23-Jul-16	Dinobryon sertularia Ehrenberg	71840	16.25
MEL - 0204		23-Jul-16	Dinobryon sertularia Ehrenberg	4400	8.76
MEL - 0204		23-Jul-16	Epiphyxis sp.	21552	1.37
MEL - 0204		23-Jul-16	Chrysolkos skuja (Nauwerck) Willen	100576	2.60
MEL - 0204		23-Jul-16	Uroglena volvox Ehrenberg	761504	86.13
MEL - 0204		23-Jul-16	Chrysochromulina laurentiana Kling	150864	69.88
MEL - 0204		23-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.20
MEL - 0204		23-Jul-16	Pteridomonas sp.	7184	1.59
MEL - 0204		23-Jul-16	Cyclotella stelligera Cleve and Grunow	2200	4.00
MEL - 0204		23-Jul-16	Cyclotella pseudostelligera	35920	19.35
MEL - 0204		23-Jul-16	Rhizosolenia eriense H.L. Smith	287360	22.36
MEL - 0204		23-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.17
MEL - 0204		23-Jul-16	Tabellaria flocculsa (Roth) Kutzing	200	0.23
MEL - 0204		23-Jul-16	Synedra acus Kutzing	5600	0.67
MEL - 0204		23-Jul-16	Asterionella formosa Hassall	4200	0.44
MEL - 0204		23-Jul-16	Cyclotella michiganiana Skvortzow	28736	0.70
MEL - 0204		23-Jul-16	Rhodomonas minuta Skuja	71840	11.57
MEL - 0204		23-Jul-16	Cryptomonas erosa Ehrenberg	4400	7.29
MEL - 0204		23-Jul-16	Cryptomonas reflexa (Marsson) Skuja	800	0.59
MEL - 0204		23-Jul-16	Cryptomonas rostratiformis Skuja	1400	2.87

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204		23-Jul-16	Katablepharis ovalis Skuja	14368	0.81
MEL - 0204		23-Jul-16	Gymnodinium helveticum Penard	200	5.18
MEL - 0204		23-Jul-16	Gymnodinium sp.	800	7.36
MEL - 0204		23-Jul-16	Peridinium pusillum (Penard) Lemmermann	3200	10.27
MEL - 0204		23-Jul-16	Peridinium aciculiferum Lemmermann	200	1.87
MEL - 0204		11-Aug-16	Sphaerocystis schroeteri Chodat	35920	1.20
MEL - 0204		11-Aug-16	Oocystis lacustris Chodat	21552	1.08
MEL - 0204		11-Aug-16	Elakatothrix gelatinosa Willen	93392	1.47
MEL - 0204		11-Aug-16	Planctonema lauterbornii Schmidle	71840	9.03
MEL - 0204		11-Aug-16	Cosmarium sp.	600	0.43
MEL - 0204		11-Aug-16	Euastrum spp.	200	0.37
MEL - 0204		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	800	0.28
MEL - 0204		11-Aug-16	Staurodesmus sp.	400	1.27
MEL - 0204		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0204		11-Aug-16	Botryococcus braunii Kutzing	800	1.15
MEL - 0204		11-Aug-16	Small chrysophyceae	639376	6.59
MEL - 0204		11-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0204		11-Aug-16	Chrysochromulina parva Lackey	57472	3.76
MEL - 0204		11-Aug-16	Chrysococcus sp.	344832	22.55
MEL - 0204		11-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	2.74
MEL - 0204		11-Aug-16	Kephyrion boreale Skuja	14368	1.47
MEL - 0204		11-Aug-16	Kephyrion sp.	122128	2.30
MEL - 0204		11-Aug-16	Spiniferomonas sirrata**********	43104	1.18
MEL - 0204		11-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0204		11-Aug-16	Dinobryon borgei Lemmermann	21552	0.94
MEL - 0204		11-Aug-16	Dinobryon bavaricum Imhof	14368	3.25
MEL - 0204		11-Aug-16	Dinobryon bavaricum Imhof	400	0.80
MEL - 0204		11-Aug-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0204		11-Aug-16	Dinobryon sertularia Ehrenberg	600	2.03
MEL - 0204		11-Aug-16	Dinobryon sociale Ehrenberg	107760	24.38
MEL - 0204		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	21552	0.57
MEL - 0204		11-Aug-16	Uroglena volvox Ehrenberg	50288	5.69
MEL - 0204		11-Aug-16	Chrysochromulina laurentiana Kling	64656	28.12

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204		11-Aug-16	Stichogloea spp.	21552	1.08
MEL - 0204		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.21
MEL - 0204		11-Aug-16	Pteridomonas sp.	28736	7.07
MEL - 0204		11-Aug-16	Cyclotella stelligera Cleve and Grunow	3600	6.55
MEL - 0204		11-Aug-16	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL - 0204		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	2800	2.08
MEL - 0204		11-Aug-16	Synedra acus Kutzing	1000	0.10
MEL - 0204		11-Aug-16	Asterionella formosa Hassall	2800	0.29
MEL - 0204		11-Aug-16	Cyclotella michiganiana Skvortzow	43104	1.12
MEL - 0204		11-Aug-16	Cyclotella bodanica Eulenst.	1800	12.70
MEL - 0204		11-Aug-16	Rhodomonas minuta Skuja	265808	36.73
MEL - 0204		11-Aug-16	Cryptomonas erosa Ehrenberg	6200	6.98
MEL - 0204		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1600	1.06
MEL - 0204		11-Aug-16	Cryptomonas rostratiformis Skuja	1000	2.19
MEL - 0204		11-Aug-16	Katablepharis ovalis Skuja	14368	0.93
MEL - 0204		11-Aug-16	Gymnodinium sp.	2000	18.41
MEL - 0204		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	4000	9.58
MEL - 0204		11-Sep-16	Pyramidomonas tetrarhynchus Schmarda	400	0.21
MEL - 0204		11-Sep-16	Sphaerocystis schroeteri Chodat	35920	1.20
MEL - 0204		11-Sep-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.32
MEL - 0204		11-Sep-16	Elakatothrix gelatinosa Willen	21552	0.57
MEL - 0204		11-Sep-16	Planctonema lauterbornii Schmidle	43104	5.42
MEL - 0204		11-Sep-16	Closterium sp.	200	0.28
MEL - 0204		11-Sep-16	Euastrum spp.	200	0.37
MEL - 0204		11-Sep-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0204		11-Sep-16	Small chrysophyceae	416672	5.88
MEL - 0204		11-Sep-16	Large chrysophyceae	28736	5.16
MEL - 0204		11-Sep-16	Chrysochromulina parva Lackey	352016	23.02
MEL - 0204		11-Sep-16	Chrysococcus sp.	431040	28.19
MEL - 0204		11-Sep-16	Kephyrion sp.	57472	1.79
MEL - 0204		11-Sep-16	Spiniferomonas sirrata**********	7184	1.08
MEL - 0204		11-Sep-16	Mallomonas crassisquama (Asmund) Fott	600	0.65
MEL - 0204		11-Sep-16	Dinobryon bavaricum Imhof	7184	1.63

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0204		11-Sep-16	Dinobryon bavaricum Imhof	2400	4.78
MEL - 0204		11-Sep-16	Dinobryon sertularia Ehrenberg	2200	11.19
MEL - 0204		11-Sep-16	Dinobryon sociale Ehrenberg	100576	22.75
MEL - 0204		11-Sep-16	Dinobryon sociale Ehrenberg	1200	1.50
MEL - 0204		11-Sep-16	Epiphyxis sp.	14368	1.09
MEL - 0204		11-Sep-16	Chrysolkos skuja (Nauwerck) Willen	14368	0.38
MEL - 0204		11-Sep-16	Uroglena volvox Ehrenberg	114944	13.00
MEL - 0204		11-Sep-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0204		11-Sep-16	Chrysochromulina laurentiana Kling	229888	120.37
MEL - 0204		11-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	86208	2.50
MEL - 0204		11-Sep-16	Cyclotella stelligera Cleve and Grunow	1000	2.12
MEL - 0204		11-Sep-16	Cyclotella ocellata Pant.	28736	2.11
MEL - 0204		11-Sep-16	Synedra acus Kutzing	3000	0.35
MEL - 0204		11-Sep-16	Asterionella formosa Hassall	14000	1.47
MEL - 0204		11-Sep-16	Cyclotella michiganiana Skvortzow	64656	1.58
MEL - 0204		11-Sep-16	Cyclotella bodanica Eulenst.	1200	10.99
MEL - 0204		11-Sep-16	Rhodomonas minuta Skuja	150864	18.96
MEL - 0204		11-Sep-16	Cryptomonas erosa Ehrenberg	4200	6.87
MEL - 0204		11-Sep-16	Cryptomonas reflexa (Marsson) Skuja	1000	0.70
MEL - 0204		11-Sep-16	Cryptomonas rostratiformis Skuja	800	1.64
MEL - 0204		11-Sep-16	Katablepharis ovalis Skuja	7184	0.42
MEL - 0204		11-Sep-16	Gymnodinium helveticum Penard	200	4.71
MEL - 0204		11-Sep-16	Gymnodinium sp.	800	6.78
MEL - 0204		11-Sep-16	Peridinium willei Huitfeldt-Kaas	400	13.40
MEL - 0204		11-Sep-16	Peridinium pusillum (Penard) Lemmermann	1800	4.01
MEL - 0204		11-Sep-16	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0205		23-Jul-16	Chroococcus limneticus Lemmermann	43104	5.12
MEL - 0205		23-Jul-16	Snowella sp	600	0.33
MEL - 0205		23-Jul-16	Chlamydomonas spp.	7184	0.07
MEL - 0205		23-Jul-16	Sphaerocystis schroeteri Chodat	7184	0.22
MEL - 0205		23-Jul-16	Oocystis lacustris Chodat	14368	0.72
MEL - 0205		23-Jul-16	Elakatothrix gelatinosa Willen	35920	0.68
MEL - 0205		23-Jul-16	Planctonema lauterbornii Schmidle	28736	3.61

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205		23-Jul-16	Cosmarium sp.	200	0.28
MEL - 0205		23-Jul-16	Micrasterias sp.	200	0.20
MEL - 0205		23-Jul-16	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0205		23-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0205		23-Jul-16	Small chrysophyceae	445408	8.37
MEL - 0205		23-Jul-16	Large chrysophyceae	35920	6.45
MEL - 0205		23-Jul-16	Chrysochromulina parva Lackey	359200	20.80
MEL - 0205		23-Jul-16	Chrysochromulina parva Lackey	589088	38.53
MEL - 0205		23-Jul-16	Chrysostephanospaera globulifera Scherffel	7184	3.76
MEL - 0205		23-Jul-16	Kephyrion boreale Skuja	7184	0.66
MEL - 0205		23-Jul-16	Kephyrion sp.	79024	1.11
MEL - 0205		23-Jul-16	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0205		23-Jul-16	Synura sphagnicola Korschikow	200	3.10
MEL - 0205		23-Jul-16	Dinobryon borgei Lemmermann	86208	3.98
MEL - 0205		23-Jul-16	Dinobryon mucronutom Nygaard	35920	4.70
MEL - 0205		23-Jul-16	Dinobryon bavaricum Imhof	387936	87.75
MEL - 0205		23-Jul-16	Dinobryon bavaricum Imhof	5400	6.62
MEL - 0205		23-Jul-16	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.88
MEL - 0205		23-Jul-16	Dinobryon sertularia Ehrenberg	114944	26.00
MEL - 0205		23-Jul-16	Dinobryon sertularia Ehrenberg	4200	8.36
MEL - 0205		23-Jul-16	Epiphyxis sp.	14368	1.06
MEL - 0205		23-Jul-16	Chrysolkos skuja (Nauwerck) Willen	50288	1.33
MEL - 0205		23-Jul-16	Uroglena volvox Ehrenberg	790240	89.38
MEL - 0205		23-Jul-16	Chrysochromulina laurentiana Kling	165232	76.54
MEL - 0205		23-Jul-16	Stichogloea spp.	7184	0.36
MEL - 0205		23-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.16
MEL - 0205		23-Jul-16	Dinobryon attenatum Hill	7184	1.22
MEL - 0205		23-Jul-16	Pteridomonas sp.	14368	3.42
MEL - 0205		23-Jul-16	Cyclotella stelligera Cleve and Grunow	3000	6.27
MEL - 0205		23-Jul-16	Cyclotella pseudostelligera	7184	3.87
MEL - 0205		23-Jul-16	Rhizosolenia eriense H.L. Smith	316096	24.59
MEL - 0205		23-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	1400	1.08
MEL - 0205		23-Jul-16	Synedra acus Kutzing	4800	0.59

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205		23-Jul-16	Asterionella formosa Hassall	800	0.08
MEL - 0205		23-Jul-16	Cyclotella michiganiana Skvortzow	7184	0.18
MEL - 0205		23-Jul-16	Cyclotella bodanica Eulenst.	200	2.51
MEL - 0205		23-Jul-16	Rhodomonas minuta Skuja	79024	12.72
MEL - 0205		23-Jul-16	Cryptomonas erosa Ehrenberg	5200	9.11
MEL - 0205		23-Jul-16	Cryptomonas ovata Ehrenberg	200	0.90
MEL - 0205		23-Jul-16	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL - 0205		23-Jul-16	Cryptomonas rostratiformis Skuja	1600	3.28
MEL - 0205		23-Jul-16	Katablepharis ovalis Skuja	21552	1.22
MEL - 0205		23-Jul-16	Gymnodinium sp.	1000	14.14
MEL - 0205		23-Jul-16	Peridinium pusillum (Penard) Lemmermann	1800	4.55
MEL - 0205		11-Aug-16	Chlamydomonas spp.	7184	0.13
MEL - 0205		11-Aug-16	Sphaerocystis schroeteri Chodat	50288	1.68
MEL - 0205		11-Aug-16	Tetraedron minimum (Brunow) Hansgrig	7184	1.25
MEL - 0205		11-Aug-16	Elakatothrix gelatinosa Willen	43104	1.10
MEL - 0205		11-Aug-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0205		11-Aug-16	Staurodesmus extensus (Andersson) Teiling	600	0.25
MEL - 0205		11-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0205		11-Aug-16	Botryococcus braunii Kutzing	400	0.28
MEL - 0205		11-Aug-16	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL - 0205		11-Aug-16	Monomastix minuta Skuja	7184	0.33
MEL - 0205		11-Aug-16	Small chrysophyceae	696848	10.87
MEL - 0205		11-Aug-16	Large chrysophyceae	28736	6.60
MEL - 0205		11-Aug-16	Chrysochromulina parva Lackey	43104	2.82
MEL - 0205		11-Aug-16	Chrysococcus sp.	488512	31.95
MEL - 0205		11-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	4.35
MEL - 0205		11-Aug-16	Kephyrion sp.	64656	1.01
MEL - 0205		11-Aug-16	Spiniferomonas sirrata**********	43104	3.97
MEL - 0205		11-Aug-16	Dinobryon borgei Lemmermann	21552	1.41
MEL - 0205		11-Aug-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0205		11-Aug-16	Dinobryon bavaricum Imhof	200	0.40
MEL - 0205		11-Aug-16	Dinobryon sertularia Ehrenberg	35920	8.13
MEL - 0205		11-Aug-16	Dinobryon sertularia Ehrenberg	1200	4.07

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205		11-Aug-16	Dinobryon sociale Ehrenberg	107760	24.38
MEL - 0205		11-Aug-16	Chrysolkos skuja (Nauwerck) Willen	14368	0.39
MEL - 0205		11-Aug-16	Uroglena volvox Ehrenberg	93392	10.56
MEL - 0205		11-Aug-16	Chrysochromulina laurentiana Kling	107760	46.86
MEL - 0205		11-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.29
MEL - 0205		11-Aug-16	Pteridomonas sp.	28736	6.84
MEL - 0205		11-Aug-16	Cyclotella stelligera Cleve and Grunow	6000	11.87
MEL - 0205		11-Aug-16	Cyclotella ocellata Pant.	14368	1.44
MEL - 0205		11-Aug-16	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL - 0205		11-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	1200	1.00
MEL - 0205		11-Aug-16	Synedra acus Kutzing	1600	0.17
MEL - 0205		11-Aug-16	Cyclotella michiganiana Skvortzow	93392	1.78
MEL - 0205		11-Aug-16	Cyclotella bodanica Eulenst.	1600	12.35
MEL - 0205		11-Aug-16	Rhodomonas minuta Skuja	208336	26.19
MEL - 0205		11-Aug-16	Cryptomonas erosa Ehrenberg	9800	11.43
MEL - 0205		11-Aug-16	Cryptomonas reflexa (Marsson) Skuja	2400	1.68
MEL - 0205		11-Aug-16	Cryptomonas rostratiformis Skuja	1000	2.12
MEL - 0205		11-Aug-16	Katablepharis ovalis Skuja	14368	0.84
MEL - 0205		11-Aug-16	Gymnodinium helveticum Penard	200	4.71
MEL - 0205		11-Aug-16	Gymnodinium sp.	14368	5.30
MEL - 0205		11-Aug-16	Gymnodinium sp.	1000	12.25
MEL - 0205		11-Aug-16	Peridinium pusillum (Penard) Lemmermann	2800	7.72
MEL - 0205		11-Sep-16	Pyramidomonas tetrarhynchus Schmarda	200	0.10
MEL - 0205		11-Sep-16	Elakatothrix gelatinosa Willen	7184	0.12
MEL - 0205		11-Sep-16	Planctonema lauterbornii Schmidle	28736	3.97
MEL - 0205		11-Sep-16	Staurodesmus extensus (Andersson) Teiling	600	0.24
MEL - 0205		11-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0205		11-Sep-16	Botryococcus braunii Kutzing	200	0.1
MEL - 0205		11-Sep-16	Monomastix minuta Skuja	7184	0.13
MEL - 0205		11-Sep-16	Small chrysophyceae	466960	6.58
MEL - 0205		11-Sep-16	Large chrysophyceae	35920	6.45
MEL - 0205		11-Sep-16	Chrysochromulina parva Lackey	287360	18.79
MEL - 0205		11-Sep-16	Chrysococcus sp.	308912	20.20

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0205		11-Sep-16	Kephyrion sp.	86208	2.10
MEL - 0205		11-Sep-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0205		11-Sep-16	Dinobryon borgei Lemmermann	7184	0.35
MEL - 0205		11-Sep-16	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0205		11-Sep-16	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0205		11-Sep-16	Dinobryon bavaricum Imhof	1600	3.19
MEL - 0205		11-Sep-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0205		11-Sep-16	Dinobryon sertularia Ehrenberg	1000	5.09
MEL - 0205		11-Sep-16	Dinobryon sociale Ehrenberg	64656	14.63
MEL - 0205		11-Sep-16	Dinobryon sociale Ehrenberg	1200	1.50
MEL - 0205		11-Sep-16	Epiphyxis sp.	14368	1.03
MEL - 0205		11-Sep-16	Uroglena volvox Ehrenberg	158048	17.88
MEL - 0205		11-Sep-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0205		11-Sep-16	Chrysochromulina laurentiana Kling	129312	67.71
MEL - 0205		11-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	71840	2.08
MEL - 0205		11-Sep-16	Pteridomonas sp.	7184	1.59
MEL - 0205		11-Sep-16	Cyclotella stelligera Cleve and Grunow	7600	16.11
MEL - 0205		11-Sep-16	Cyclotella ocellata Pant.	7184	0.55
MEL - 0205		11-Sep-16	Synedra acus Kutzing	1400	0.16
MEL - 0205		11-Sep-16	Asterionella formosa Hassall	9600	1.00
MEL - 0205		11-Sep-16	Cyclotella michiganiana Skvortzow	28736	0.70
MEL - 0205		11-Sep-16	Cyclotella bodanica Eulenst.	400	3.66
MEL - 0205		11-Sep-16	Rhodomonas minuta Skuja	165232	20.77
MEL - 0205		11-Sep-16	Cryptomonas erosa Ehrenberg	3600	5.91
MEL - 0205		11-Sep-16	Cryptomonas reflexa (Marsson) Skuja	1000	0.67
MEL - 0205		11-Sep-16	Cryptomonas rostratiformis Skuja	600	1.27
MEL - 0205		11-Sep-16	Gymnodinium sp.	1200	10.06
MEL - 0205		11-Sep-16	Peridinium willei Huitfeldt-Kaas	200	6.21
MEL - 0205		11-Sep-16	Peridinium pusillum (Penard) Lemmermann	1600	3.43
MEL - 0205		11-Sep-16	Peridinium aciculiferum Lemmermann	1600	14.48
MEL - 0301		26-Jul-16	Planktothrix	200	5.54
MEL - 0301		26-Jul-16	Chlamydomonas spp.	7184	0.07
MEL - 0301		26-Jul-16	Sphaerocystis schroeteri Chodat	21552	0.44

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0301		26-Jul-16	Dictyosphaerium simplex Sukja	28736	0.45
MEL - 0301		26-Jul-16	Elakatothrix gelatinosa Willen	43104	0.91
MEL - 0301		26-Jul-16	Euastrum spp.	200	0.37
MEL - 0301		26-Jul-16	Staurodesmus extensus (Andersson) Teiling	1000	0.35
MEL - 0301		26-Jul-16	Botryococcus braunii Kutzing	200	0.29
MEL - 0301		26-Jul-16	Small chrysophyceae	280176	5.27
MEL - 0301		26-Jul-16	Large chrysophyceae	14368	2.58
MEL - 0301		26-Jul-16	Chrysochromulina parva Lackey	158048	10.34
MEL - 0301		26-Jul-16	Chrysococcus sp.	366384	23.96
MEL - 0301		26-Jul-16	Chrysostephanospaera globulifera Scherffel	14368	7.52
MEL - 0301		26-Jul-16	Kephyrion sp.	86208	1.34
MEL - 0301		26-Jul-16	Spiniferomonas sirrata**********	14368	1.25
MEL - 0301		26-Jul-16	Mallomonas crassisquama (Asmund) Fott	1000	1.05
MEL - 0301		26-Jul-16	Dinobryon borgei Lemmermann	7184	0.32
MEL - 0301		26-Jul-16	Dinobryon bavaricum Imhof	114944	26.00
MEL - 0301		26-Jul-16	Dinobryon bavaricum Imhof	6000	7.35
MEL - 0301		26-Jul-16	Dinobryon sertularia Ehrenberg	71840	16.25
MEL - 0301		26-Jul-16	Dinobryon sertularia Ehrenberg	1800	6.10
MEL - 0301		26-Jul-16	Chrysolkos skuja (Nauwerck) Willen	28736	0.53
MEL - 0301		26-Jul-16	Uroglena volvox Ehrenberg	251440	28.44
MEL - 0301		26-Jul-16	Chrysosphaerella longispina Lauterborn	200	3.00
MEL - 0301		26-Jul-16	Chrysochromulina laurentiana Kling	129312	56.24
MEL - 0301		26-Jul-16	Stichogloea spp.	43104	2.17
MEL - 0301		26-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.42
MEL - 0301		26-Jul-16	Pteridomonas sp.	28736	6.84
MEL - 0301		26-Jul-16	Cyclotella stelligera Cleve and Grunow	400	0.63
MEL - 0301		26-Jul-16	Rhizosolenia eriense H.L. Smith	50288	3.20
MEL - 0301		26-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	1600	1.33
MEL - 0301		26-Jul-16	Tabellaria flocculsa (Roth) Kutzing	200	0.25
MEL - 0301		26-Jul-16	Synedra acus Kutzing	4600	0.58
MEL - 0301		26-Jul-16	Synedra ulna (Nitzsch) Ehrenberg	200	0.41
MEL - 0301		26-Jul-16	Asterionella formosa Hassall	1400	0.15
MEL - 0301		26-Jul-16	Cyclotella michiganiana Skvortzow	28736	0.48

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0301		26-Jul-16	Cyclotella bodanica Eulenst.	400	3.09
MEL - 0301		26-Jul-16	Rhodomonas minuta Skuja	79024	8.94
MEL - 0301		26-Jul-16	Cryptomonas erosa Ehrenberg	4400	7.83
MEL - 0301		26-Jul-16	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL - 0301		26-Jul-16	Cryptomonas rostratiformis Skuja	200	0.41
MEL - 0301		26-Jul-16	Katablepharis ovalis Skuja	21552	1.22
MEL - 0301		26-Jul-16	Gymnodinium helveticum Penard	600	14.42
MEL - 0301		26-Jul-16	Gymnodinium sp.	7184	3.05
MEL - 0301		26-Jul-16	Gymnodinium sp.	1400	11.32
MEL - 0301		26-Jul-16	Peridinium pusillum (Penard) Lemmermann	1600	3.83
MEL - 0301		12-Aug-16	Chlamydomonas spp.	7184	0.08
MEL - 0301		12-Aug-16	Sphaerocystis schroeteri Chodat	28736	0.41
MEL - 0301		12-Aug-16	Elakatothrix gelatinosa Willen	7184	0.13
MEL - 0301		12-Aug-16	Planctonema lauterbornii Schmidle	43104	5.42
MEL - 0301		12-Aug-16	Euastrum spp.	200	0.37
MEL - 0301		12-Aug-16	Staurodesmus paradoxum Meyen	200	0.73
MEL - 0301		12-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0301		12-Aug-16	Small chrysophyceae	495696	4.06
MEL - 0301		12-Aug-16	Large chrysophyceae	28736	5.16
MEL - 0301		12-Aug-16	Chrysochromulina parva Lackey	215520	14.10
MEL - 0301		12-Aug-16	Chrysococcus sp.	380752	24.90
MEL - 0301		12-Aug-16	Kephyrion boreale Skuja	14368	1.71
MEL - 0301		12-Aug-16	Kephyrion sp.	43104	0.40
MEL - 0301		12-Aug-16	Spiniferomonas sirrata**********	14368	1.25
MEL - 0301		12-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0301		12-Aug-16	Dinobryon borgei Lemmermann	7184	0.36
MEL - 0301		12-Aug-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0301		12-Aug-16	Dinobryon bavaricum Imhof	400	1.36
MEL - 0301		12-Aug-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0301		12-Aug-16	Dinobryon sertularia Ehrenberg	200	0.25
MEL - 0301		12-Aug-16	Dinobryon sertularia Ehrenberg	600	2.03
MEL - 0301		12-Aug-16	Dinobryon sociale Ehrenberg	215520	48.75
MEL - 0301		12-Aug-16	Chrysolkos skuja (Nauwerck) Willen	21552	0.54

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0301		12-Aug-16	Uroglena volvox Ehrenberg	43104	4.88
MEL - 0301		12-Aug-16	Chrysochromulina laurentiana Kling	79024	36.60
MEL - 0301		12-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.38
MEL - 0301		12-Aug-16	Pteridomonas sp.	14368	3.42
MEL - 0301		12-Aug-16	Cyclotella stelligera Cleve and Grunow	3000	5.94
MEL - 0301		12-Aug-16	Fragilaria crotonensis Kitton	3000	0.97
MEL - 0301		12-Aug-16	Synedra acus Kutzing	1400	0.15
MEL - 0301		12-Aug-16	Cyclotella michiganiana Skvortzow	7184	0.19
MEL - 0301		12-Aug-16	Cyclotella bodanica Eulenst.	800	6.17
MEL - 0301		12-Aug-16	Rhodomonas minuta Skuja	107760	13.55
MEL - 0301		12-Aug-16	Cryptomonas erosa Ehrenberg	1800	2.08
MEL - 0301		12-Aug-16	Cryptomonas reflexa (Marsson) Skuja	200	0.14
MEL - 0301		12-Aug-16	Cryptomonas rostratiformis Skuja	400	0.85
MEL - 0301		12-Aug-16	Gymnodinium helveticum Penard	200	4.71
MEL - 0301		12-Aug-16	Gymnodinium sp.	400	4.08
MEL - 0301		12-Aug-16	Peridinium pusillum (Penard) Lemmermann	400	0.99
MEL - 0301	RECOUNT	12-Aug-16	Chlamydomonas spp.	14368	0.17
MEL - 0301	RECOUNT	12-Aug-16	Sphaerocystis schroeteri Chodat	28736	0.41
MEL - 0301	RECOUNT	12-Aug-16	Elakatothrix gelatinosa Willen	7184	0.13
MEL - 0301	RECOUNT	12-Aug-16	Planctonema lauterbornii Schmidle	93392	12.91
MEL - 0301	RECOUNT	12-Aug-16	Euastrum spp.	200	0.37
MEL - 0301	RECOUNT	12-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.11
MEL - 0301	RECOUNT	12-Aug-16	Staurodesmus paradoxum Meyen	200	0.73
MEL - 0301	RECOUNT	12-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0301	RECOUNT	12-Aug-16	Oocystis gigas Archer	200	0.48
MEL - 0301	RECOUNT	12-Aug-16	Small chrysophyceae	531616	4.36
MEL - 0301	RECOUNT	12-Aug-16	Large chrysophyceae	35920	6.45
MEL - 0301	RECOUNT	12-Aug-16	Chrysochromulina parva Lackey	165232	10.81
MEL - 0301	RECOUNT	12-Aug-16	Chrysococcus sp.	344832	22.55
MEL - 0301	RECOUNT	12-Aug-16	Kephyrion sp.	64656	0.59
MEL - 0301	RECOUNT	12-Aug-16	Spiniferomonas sirrata**********	14368	1.25
MEL - 0301	RECOUNT	12-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0301	RECOUNT	12-Aug-16	Dinobryon borgei Lemmermann	14368	0.73

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0301	RECOUNT	12-Aug-16	Dinobryon bavaricum Imhof	35920	8.13
MEL - 0301	RECOUNT	12-Aug-16	Dinobryon bavaricum Imhof	200	0.68
MEL - 0301	RECOUNT	12-Aug-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0301	RECOUNT	12-Aug-16	Dinobryon sertularia Ehrenberg	1000	3.39
MEL - 0301	RECOUNT	12-Aug-16	Dinobryon sociale Ehrenberg	229888	52.00
MEL - 0301	RECOUNT	12-Aug-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0301	RECOUNT	12-Aug-16	Chrysolkos skuja (Nauwerck) Willen	28736	0.72
MEL - 0301	RECOUNT	12-Aug-16	Uroglena volvox Ehrenberg	28736	3.25
MEL - 0301	RECOUNT	12-Aug-16	Chrysochromulina laurentiana Kling	100576	46.59
MEL - 0301	RECOUNT	12-Aug-16	Pteridomonas sp.	7184	1.71
MEL - 0301	RECOUNT	12-Aug-16	Cyclotella stelligera Cleve and Grunow	1400	2.77
MEL - 0301	RECOUNT	12-Aug-16	Cyclotella ocellata Pant.	14368	1.24
MEL - 0301	RECOUNT	12-Aug-16	Fragilaria crotonensis Kitton	1800	0.58
MEL - 0301	RECOUNT	12-Aug-16	Synedra acus Kutzing	2200	0.23
MEL - 0301	RECOUNT	12-Aug-16	Cyclotella michiganiana Skvortzow	14368	0.37
MEL - 0301	RECOUNT	12-Aug-16	Cyclotella bodanica Eulenst.	800	6.17
MEL - 0301	RECOUNT	12-Aug-16	Rhodomonas minuta Skuja	122128	1.54
MEL - 0301	RECOUNT	12-Aug-16	Cryptomonas erosa Ehrenberg	1000	1.16
MEL - 0301	RECOUNT	12-Aug-16	Cryptomonas reflexa (Marsson) Skuja	200	0.14
MEL - 0301	RECOUNT	12-Aug-16	Katablepharis ovalis Skuja	7184	0.43
MEL - 0301	RECOUNT	12-Aug-16	Gymnodinium sp.	400	4.08
MEL - 0301	RECOUNT	12-Aug-16	Peridinium pusillum (Penard) Lemmermann	600	1.49
MEL - 0301		12-Sep-16	Pyramidomonas tetrarhynchus Schmarda	200	0.08
MEL - 0301		12-Sep-16	Sphaerocystis schroeteri Chodat	28736	0.54
MEL - 0301		12-Sep-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL - 0301		12-Sep-16	Elakatothrix gelatinosa Willen	7184	0.16
MEL - 0301		12-Sep-16	Planctonema lauterbornii Schmidle	64656	8.13
MEL - 0301		12-Sep-16	Cosmarium sp.	200	0.28
MEL - 0301		12-Sep-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0301		12-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0301		12-Sep-16	Botryococcus braunii Kutzing	400	0.36
MEL - 0301		12-Sep-16	Oocystis gigas Archer	200	0.48
MEL - 0301		12-Sep-16	Monomastix minuta Skuja	7184	0.10

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0301		12-Sep-16	Small chrysophyceae	373568	4.78
MEL - 0301		12-Sep-16	Large chrysophyceae	14368	2.58
MEL - 0301		12-Sep-16	Chrysochromulina parva Lackey	395120	25.84
MEL - 0301		12-Sep-16	Chrysococcus sp.	409488	26.78
MEL - 0301		12-Sep-16	Chrysostephanospaera globulifera Scherffel	21552	7.95
MEL - 0301		12-Sep-16	Kephyrion sp.	79024	1.01
MEL - 0301		12-Sep-16	Spiniferomonas sirrata**********	7184	0.66
MEL - 0301		12-Sep-16	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0301		12-Sep-16	Mallomonas akrokomos Asmund and Kristiansen	7184	1.63
MEL - 0301		12-Sep-16	Dinobryon borgei Lemmermann	28736	1.36
MEL - 0301		12-Sep-16	Dinobryon bavaricum Imhof	800	1.59
MEL - 0301		12-Sep-16	Dinobryon sertularia Ehrenberg	2600	13.22
MEL - 0301		12-Sep-16	Dinobryon sociale Ehrenberg	114944	26.00
MEL - 0301		12-Sep-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0301		12-Sep-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.20
MEL - 0301		12-Sep-16	Uroglena volvox Ehrenberg	107760	12.19
MEL - 0301		12-Sep-16	Chrysochromulina laurentiana Kling	107760	56.42
MEL - 0301		12-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.56
MEL - 0301		12-Sep-16	Cyclotella stelligera Cleve and Grunow	4400	7.55
MEL - 0301		12-Sep-16	Cyclotella ocellata Pant.	258624	26.97
MEL - 0301		12-Sep-16	Synedra acus Kutzing	4600	0.41
MEL - 0301		12-Sep-16	Asterionella formosa Hassall	3400	0.36
MEL - 0301		12-Sep-16	Cyclotella michiganiana Skvortzow	57472	1.41
MEL - 0301		12-Sep-16	Rhodomonas minuta Skuja	201152	25.79
MEL - 0301		12-Sep-16	Cryptomonas erosa Ehrenberg	1800	2.86
MEL - 0301		12-Sep-16	Cryptomonas rostratiformis Skuja	600	1.23
MEL - 0301		12-Sep-16	Katablepharis ovalis Skuja	14368	0.67
MEL - 0301		12-Sep-16	Gymnodinium helveticum Penard	400	9.42
MEL - 0301		12-Sep-16	Gymnodinium sp.	14368	4.62
MEL - 0301		12-Sep-16	Gymnodinium sp.	800	6.95
MEL - 0301		12-Sep-16	Peridinium pusillum (Penard) Lemmermann	800	1.75
MEL - 0301		12-Sep-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0301	REP7	12-Sep-16	Chlamydomonas spp.	7184	0.24

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0301	REP7	12-Sep-16	Elakatothrix gelatinosa Willen	14368	0.30
MEL - 0301	REP7	12-Sep-16	Planctonema lauterbornii Schmidle	28736	3.61
MEL - 0301	REP7	12-Sep-16	Cosmarium sp.	400	0.56
MEL - 0301	REP7	12-Sep-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0301	REP7	12-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0301	REP7	12-Sep-16	Ankistrodesmus spiralis Lemmermann	7184	0.42
MEL - 0301	REP7	12-Sep-16	Monomastix minuta Skuja	7184	0.14
MEL - 0301	REP7	12-Sep-16	Small chrysophyceae	445408	5.70
MEL - 0301	REP7	12-Sep-16	Large chrysophyceae	57472	10.32
MEL - 0301	REP7	12-Sep-16	Chrysochromulina parva Lackey	409488	26.78
MEL - 0301	REP7	12-Sep-16	Chrysococcus sp.	409488	26.78
MEL - 0301	REP7	12-Sep-16	Chrysostephanospaera globulifera Scherffel	7184	3.33
MEL - 0301	REP7	12-Sep-16	Kephyrion sp.	100576	1.29
MEL - 0301	REP7	12-Sep-16	Spiniferomonas sirrata**********	21552	2.32
MEL - 0301	REP7	12-Sep-16	Mallomonas crassisquama (Asmund) Fott	400	0.41
MEL - 0301	REP7	12-Sep-16	Dinobryon borgei Lemmermann	35920	1.61
MEL - 0301	REP7	12-Sep-16	Dinobryon bavaricum Imhof	14368	3.25
MEL - 0301	REP7	12-Sep-16	Dinobryon bavaricum Imhof	1800	3.58
MEL - 0301	REP7	12-Sep-16	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0301	REP7	12-Sep-16	Dinobryon sertularia Ehrenberg	1200	6.10
MEL - 0301	REP7	12-Sep-16	Dinobryon sociale Ehrenberg	158048	35.75
MEL - 0301	REP7	12-Sep-16	Dinobryon sociale Ehrenberg	1000	1.25
MEL - 0301	REP7	12-Sep-16	Chrysolkos skuja (Nauwerck) Willen	14368	0.26
MEL - 0301	REP7	12-Sep-16	Uroglena volvox Ehrenberg	129312	14.63
MEL - 0301	REP7	12-Sep-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0301	REP7	12-Sep-16	Chrysochromulina laurentiana Kling	64656	33.85
MEL - 0301	REP7	12-Sep-16	Stichogloea spp.	35920	1.81
MEL - 0301	REP7	12-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	64656	1.63
MEL - 0301	REP7	12-Sep-16	Pteridomonas sp.	7184	1.71
MEL - 0301	REP7	12-Sep-16	Cyclotella stelligera Cleve and Grunow	4800	8.85
MEL - 0301	REP7	12-Sep-16	Synedra acus Kutzing	3800	0.38
MEL - 0301	REP7	12-Sep-16	Asterionella formosa Hassall	3000	0.30
MEL - 0301	REP7	12-Sep-16	Cyclotella michiganiana Skvortzow	14368	0.27

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0301	REP7	12-Sep-16	Cyclotella bodanica Eulenst.	600	4.63
MEL - 0301	REP7	12-Sep-16	Rhodomonas minuta Skuja	122128	15.35
MEL - 0301	REP7	12-Sep-16	Cryptomonas erosa Ehrenberg	4200	6.61
MEL - 0301	REP7	12-Sep-16	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0301	REP7	12-Sep-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0301	REP7	12-Sep-16	Gymnodinium sp.	14368	5.30
MEL - 0301	REP7	12-Sep-16	Gymnodinium sp.	600	5.72
MEL - 0301	REP7	12-Sep-16	Peridinium pusillum (Penard) Lemmermann	1800	3.79
MEL - 0301	REP7	12-Sep-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0302		26-Jul-16	Aphanothece sp.	14368	0.73
MEL - 0302		26-Jul-16	Sphaerocystis schroeteri Chodat	165232	5.96
MEL - 0302		26-Jul-16	Oocystis lacustris Chodat	43104	1.22
MEL - 0302		26-Jul-16	Dictyosphaerium simplex Sukja	28736	0.12
MEL - 0302		26-Jul-16	Elakatothrix gelatinosa Willen	28736	0.50
MEL - 0302		26-Jul-16	Planctonema lauterbornii Schmidle	21552	2.71
MEL - 0302		26-Jul-16	Staurodesmus extensus (Andersson) Teiling	1400	0.49
MEL - 0302		26-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0302		26-Jul-16	Botryococcus braunii Kutzing	200	0.18
MEL - 0302		26-Jul-16	Small chrysophyceae	150864	2.84
MEL - 0302		26-Jul-16	Large chrysophyceae	21552	3.87
MEL - 0302		26-Jul-16	Chrysochromulina parva Lackey	222704	14.56
MEL - 0302		26-Jul-16	Chrysococcus sp.	287360	18.79
MEL - 0302		26-Jul-16	Kephyrion sp.	50288	0.71
MEL - 0302		26-Jul-16	Mallomonas crassisquama (Asmund) Fott	400	0.43
MEL - 0302		26-Jul-16	Dinobryon borgei Lemmermann	57472	2.63
MEL - 0302		26-Jul-16	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0302		26-Jul-16	Dinobryon bavaricum Imhof	136496	30.88
MEL - 0302		26-Jul-16	Dinobryon bavaricum Imhof	5200	6.37
MEL - 0302		26-Jul-16	Dinobryon sertularia Ehrenberg	50288	11.38
MEL - 0302		26-Jul-16	Dinobryon sertularia Ehrenberg	3400	6.77
MEL - 0302		26-Jul-16	Uroglena volvox Ehrenberg	603456	68.25
MEL - 0302		26-Jul-16	Uroglena volvox Ehrenberg	200	2.26
MEL - 0302		26-Jul-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0302		26-Jul-16	Chrysochromulina laurentiana Kling	79024	36.60
MEL - 0302		26-Jul-16	Stichogloea spp.	43104	2.17
MEL - 0302		26-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.21
MEL - 0302		26-Jul-16	Cyclotella stelligera Cleve and Grunow	1400	2.55
MEL - 0302		26-Jul-16	Cyclotella pseudostelligera	43104	23.22
MEL - 0302		26-Jul-16	Rhizosolenia eriense H.L. Smith	21552	1.68
MEL - 0302		26-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	6000	4.98
MEL - 0302		26-Jul-16	Synedra acus Kutzing	6000	0.75
MEL - 0302		26-Jul-16	Asterionella formosa Hassall	2000	0.21
MEL - 0302		26-Jul-16	Eunotia zazumenensis **********	800	0.03
MEL - 0302		26-Jul-16	Cyclotella michiganiana Skvortzow	21552	0.53
MEL - 0302		26-Jul-16	Rhodomonas minuta Skuja	100576	11.01
MEL - 0302		26-Jul-16	Cryptomonas erosa Ehrenberg	3400	5.82
MEL - 0302		26-Jul-16	Cryptomonas reflexa (Marsson) Skuja	200	0.14
MEL - 0302		26-Jul-16	Katablepharis ovalis Skuja	14368	0.83
MEL - 0302		26-Jul-16	Gymnodinium helveticum Penard	600	15.55
MEL - 0302		26-Jul-16	Gymnodinium sp.	600	5.52
MEL - 0302		26-Jul-16	Peridinium pusillum (Penard) Lemmermann	2000	6.11
MEL - 0302		12-Aug-16	Aphanothece sp.	7184	0.37
MEL - 0302		12-Aug-16	Chlamydomonas spp.	7184	0.07
MEL - 0302		12-Aug-16	Pediastrum duplex Meyen	4200	0.39
MEL - 0302		12-Aug-16	Oocystis lacustris Chodat	14368	0.34
MEL - 0302		12-Aug-16	Crucigenia quadrata Morr.	28736	0.14
MEL - 0302		12-Aug-16	Elakatothrix gelatinosa Willen	35920	0.62
MEL - 0302		12-Aug-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0302		12-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.14
MEL - 0302		12-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	43104	1.63
MEL - 0302		12-Aug-16	Small chrysophyceae	416672	5.33
MEL - 0302		12-Aug-16	Large chrysophyceae	7184	1.29
MEL - 0302		12-Aug-16	Chrysochromulina parva Lackey	215520	14.10
MEL - 0302		12-Aug-16	Chrysococcus sp.	359200	22.13
MEL - 0302		12-Aug-16	Kephyrion boreale Skuja	7184	0.90
MEL - 0302		12-Aug-16	Kephyrion sp.	57472	0.81

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0302		12-Aug-16	Spiniferomonas sirrata**********	14368	1.00
MEL - 0302		12-Aug-16	Mallomonas crassisquama (Asmund) Fott	600	0.62
MEL - 0302		12-Aug-16	Dinobryon borgei Lemmermann	21552	0.80
MEL - 0302		12-Aug-16	Dinobryon bavaricum Imhof	28736	6.50
MEL - 0302		12-Aug-16	Dinobryon bavaricum Imhof	400	0.39
MEL - 0302		12-Aug-16	Dinobryon sertularia Ehrenberg	43104	9.75
MEL - 0302		12-Aug-16	Dinobryon sertularia Ehrenberg	1200	2.39
MEL - 0302		12-Aug-16	Dinobryon sociale Ehrenberg	143680	32.50
MEL - 0302		12-Aug-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0302		12-Aug-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.23
MEL - 0302		12-Aug-16	Uroglena volvox Ehrenberg	79024	8.94
MEL - 0302		12-Aug-16	Chrysochromulina laurentiana Kling	114944	49.99
MEL - 0302		12-Aug-16	Stichogloea spp.	21552	1.08
MEL - 0302		12-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19
MEL - 0302		12-Aug-16	Pteridomonas sp.	28736	6.61
MEL - 0302		12-Aug-16	Cyclotella stelligera Cleve and Grunow	3000	5.46
MEL - 0302		12-Aug-16	Cyclotella ocellata Pant.	14368	1.44
MEL - 0302		12-Aug-16	Synedra acus Kutzing	1800	0.19
MEL - 0302		12-Aug-16	Asterionella formosa Hassall	1200	0.12
MEL - 0302		12-Aug-16	Cyclotella michiganiana Skvortzow	64656	1.58
MEL - 0302		12-Aug-16	Cyclotella bodanica Eulenst.	1000	7.06
MEL - 0302		12-Aug-16	Rhodomonas minuta Skuja	100576	12.64
MEL - 0302		12-Aug-16	Cryptomonas erosa Ehrenberg	2200	2.55
MEL - 0302		12-Aug-16	Cryptomonas reflexa (Marsson) Skuja	600	0.41
MEL - 0302		12-Aug-16	Cryptomonas rostratiformis Skuja	400	0.77
MEL - 0302		12-Aug-16	Gymnodinium sp.	600	5.52
MEL - 0302		12-Aug-16	Peridinium pusillum (Penard) Lemmermann	1400	3.73
MEL - 0302		13-Sep-16	Elakatothrix gelatinosa Willen	21552	0.41
MEL - 0302		13-Sep-16	Planctonema lauterbornii Schmidle	35920	4.52
MEL - 0302		13-Sep-16	Cosmarium sp.	200	0.28
MEL - 0302		13-Sep-16	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0302		13-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0302		13-Sep-16	Botryococcus braunii Kutzing	800	0.92

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0302		13-Sep-16	Small chrysophyceae	359200	4.60
MEL - 0302		13-Sep-16	Large chrysophyceae	35920	6.45
MEL - 0302		13-Sep-16	Chrysochromulina parva Lackey	452592	29.60
MEL - 0302		13-Sep-16	Chrysococcus sp.	323280	21.14
MEL - 0302		13-Sep-16	Chrysostephanospaera globulifera Scherffel	14368	5.67
MEL - 0302		13-Sep-16	Kephyrion boreale Skuja	7184	0.81
MEL - 0302		13-Sep-16	Kephyrion sp.	79024	1.36
MEL - 0302		13-Sep-16	Spiniferomonas sirrata**********	7184	0.85
MEL - 0302		13-Sep-16	Dinobryon borgei Lemmermann	35920	1.78
MEL - 0302		13-Sep-16	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0302		13-Sep-16	Dinobryon bavaricum Imhof	1600	3.19
MEL - 0302		13-Sep-16	Dinobryon sertularia Ehrenberg	28736	6.50
MEL - 0302		13-Sep-16	Dinobryon sertularia Ehrenberg	2400	12.20
MEL - 0302		13-Sep-16	Dinobryon sociale Ehrenberg	143680	32.50
MEL - 0302		13-Sep-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0302		13-Sep-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.19
MEL - 0302		13-Sep-16	Uroglena volvox Ehrenberg	179600	20.31
MEL - 0302		13-Sep-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0302		13-Sep-16	Chrysochromulina laurentiana Kling	57472	30.09
MEL - 0302		13-Sep-16	Stichogloea spp.	14368	0.72
MEL - 0302		13-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	79024	2.16
MEL - 0302		13-Sep-16	Pteridomonas sp.	7184	1.77
MEL - 0302		13-Sep-16	Cyclotella stelligera Cleve and Grunow	4200	9.02
MEL - 0302		13-Sep-16	Cyclotella ocellata Pant.	7184	0.78
MEL - 0302		13-Sep-16	Rhizosolenia eriense H.L. Smith	7184	0.61
MEL - 0302		13-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	4000	3.36
MEL - 0302		13-Sep-16	Fragilaria crotonensis Kitton	2400	0.77
MEL - 0302		13-Sep-16	Synedra acus Kutzing	2600	0.26
MEL - 0302		13-Sep-16	Asterionella formosa Hassall	9600	1.01
MEL - 0302		13-Sep-16	Cyclotella michiganiana Skvortzow	43104	1.06
MEL - 0302		13-Sep-16	Cyclotella bodanica Eulenst.	1000	9.16
MEL - 0302		13-Sep-16	Rhodomonas minuta Skuja	86208	10.84
MEL - 0302		13-Sep-16	Cryptomonas erosa Ehrenberg	2400	3.81

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0302		13-Sep-16	Gymnodinium sp.	600	5.09
MEL - 0302		13-Sep-16	Peridinium pusillum (Penard) Lemmermann	1600	3.5
MEL - 0302		13-Sep-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0303		26-Jul-16	Aphanothece sp.	14368	0.72
MEL - 0303		26-Jul-16	Snowella sp	400	0.68
MEL - 0303		26-Jul-16	Chlamydomonas spp.	28736	0.29
MEL - 0303		26-Jul-16	Sphaerocystis schroeteri Chodat	21552	0.72
MEL - 0303		26-Jul-16	Oocystis lacustris Chodat	7184	0.17
MEL - 0303		26-Jul-16	Elakatothrix gelatinosa Willen	14368	0.29
MEL - 0303		26-Jul-16	Planctonema lauterbornii Schmidle	14368	1.81
MEL - 0303		26-Jul-16	Cosmarium sp.	400	0.56
MEL - 0303		26-Jul-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0303		26-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0303		26-Jul-16	Small chrysophyceae	581904	11.99
MEL - 0303		26-Jul-16	Large chrysophyceae	64656	11.61
MEL - 0303		26-Jul-16	Chrysochromulina parva Lackey	395120	25.84
MEL - 0303		26-Jul-16	Chrysococcus sp.	359200	23.49
MEL - 0303		26-Jul-16	Kephyrion sp.	93392	1.2
MEL - 0303		26-Jul-16	Mallomonas crassisquama (Asmund) Fott	1400	1.51
MEL - 0303		26-Jul-16	Dinobryon borgei Lemmermann	21552	0.92
MEL - 0303		26-Jul-16	Dinobryon mucronutom Nygaard	7184	0.9
MEL - 0303		26-Jul-16	Dinobryon bavaricum Imhof	280176	63.38
MEL - 0303		26-Jul-16	Dinobryon bavaricum Imhof	6800	8.33
MEL - 0303		26-Jul-16	Dinobryon sertularia Ehrenberg	35920	8.13
MEL - 0303		26-Jul-16	Dinobryon sertularia Ehrenberg	2800	5.57
MEL - 0303		26-Jul-16	Chrysolkos skuja (Nauwerck) Willen	64656	1.82
MEL - 0303		26-Jul-16	Uroglena volvox Ehrenberg	481328	54.44
MEL - 0303		26-Jul-16	Chrysosphaerella longispina Lauterborn	200	3.02
MEL - 0303		26-Jul-16	Chrysochromulina laurentiana Kling	129312	56.24
MEL - 0303		26-Jul-16	Bicoeca lacustris Clark	7184	0.7
MEL - 0303		26-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43
MEL - 0303		26-Jul-16	Cyclotella stelligera Cleve and Grunow	1400	2.55
MEL - 0303		26-Jul-16	Cyclotella pseudostelligera	14368	7.74

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0303		26-Jul-16	Rhizosolenia eriense H.L. Smith	43104	3.35
MEL - 0303		26-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.33
MEL - 0303		26-Jul-16	Tabellaria flocculsa (Roth) Kutzing	4000	5.34
MEL - 0303		26-Jul-16	Synedra acus Kutzing	3400	0.42
MEL - 0303		26-Jul-16	Asterionella formosa Hassall	2400	0.25
MEL - 0303		26-Jul-16	Cyclotella michiganiana Skvortzow	43104	1.06
MEL - 0303		26-Jul-16	Rhodomonas minuta Skuja	172416	21.45
MEL - 0303		26-Jul-16	Cryptomonas erosa Ehrenberg	2800	4.64
MEL - 0303		26-Jul-16	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL - 0303		26-Jul-16	Katablepharis ovalis Skuja	21552	1.22
MEL - 0303		26-Jul-16	Gymnodinium sp.	7184	3.35
MEL - 0303		26-Jul-16	Gymnodinium sp.	200	3.12
MEL - 0303		26-Jul-16	Peridinium willei Huitfeldt-Kaas	400	13.4
MEL - 0303		26-Jul-16	Peridinium pusillum (Penard) Lemmermann	2400	6.07
MEL - 0303		12-Aug-16	Chlamydomonas spp.	21552	0.3
MEL - 0303		12-Aug-16	Pediastrum duplex Meyen	4800	0.4
MEL - 0303		12-Aug-16	Oocystis lacustris Chodat	14368	0.72
MEL - 0303		12-Aug-16	Elakatothrix gelatinosa Willen	93392	1.47
MEL - 0303		12-Aug-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0303		12-Aug-16	Cosmarium sp.	400	1.88
MEL - 0303		12-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.11
MEL - 0303		12-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0303		12-Aug-16	Small chrysophyceae	431040	5.52
MEL - 0303		12-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0303		12-Aug-16	Chrysochromulina parva Lackey	301728	22.21
MEL - 0303		12-Aug-16	Chrysococcus sp.	301728	19.73
MEL - 0303		12-Aug-16	Chrysostephanospaera globulifera Scherffel	14368	7.52
MEL - 0303		12-Aug-16	Kephyrion sp.	71840	1.01
MEL - 0303		12-Aug-16	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL - 0303		12-Aug-16	Mallomonas akrokomos Asmund and Kristiansen	7184	1.9
MEL - 0303		12-Aug-16	Dinobryon borgei Lemmermann	28736	1.17
MEL - 0303		12-Aug-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0303		12-Aug-16	Dinobryon bavaricum Imhof	800	1.59

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0303		12-Aug-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0303		12-Aug-16	Dinobryon sertularia Ehrenberg	400	2.03
MEL - 0303		12-Aug-16	Dinobryon sociale Ehrenberg	143680	32.5
MEL - 0303		12-Aug-16	Dinobryon sociale Ehrenberg	200	0.2
MEL - 0303		12-Aug-16	Chrysolkos skuja (Nauwerck) Willen	21552	0.74
MEL - 0303		12-Aug-16	Uroglena volvox Ehrenberg	79024	8.94
MEL - 0303		12-Aug-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0303		12-Aug-16	Chrysochromulina laurentiana Kling	114944	53.24
MEL - 0303		12-Aug-16	Stichogloea spp.	28736	1.45
MEL - 0303		12-Aug-16	Pteridomonas sp.	28736	5.74
MEL - 0303		12-Aug-16	Cyclotella stelligera Cleve and Grunow	800	1.18
MEL - 0303		12-Aug-16	Cyclotella ocellata Pant.	7184	1.03
MEL - 0303		12-Aug-16	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL - 0303		12-Aug-16	Synedra acus Kutzing	2800	0.34
MEL - 0303		12-Aug-16	Cyclotella michiganiana Skvortzow	79024	1.51
MEL - 0303		12-Aug-16	Cyclotella bodanica Eulenst.	600	3.51
MEL - 0303		12-Aug-16	Diatoma elongatum Agardh	400	0.08
MEL - 0303		12-Aug-16	Rhodomonas minuta Skuja	294544	37.02
MEL - 0303		12-Aug-16	Cryptomonas erosa Ehrenberg	1200	1.39
MEL - 0303		12-Aug-16	Cryptomonas reflexa (Marsson) Skuja	600	0.41
MEL - 0303		12-Aug-16	Cryptomonas rostratiformis Skuja	200	0.39
MEL - 0303		12-Aug-16	Gymnodinium sp.	1200	9.02
MEL - 0303		12-Aug-16	Peridinium pusillum (Penard) Lemmermann	1400	3.48
MEL - 0303		13-Sep-16	Chlamydomonas spp.	14368	0.84
MEL - 0303		13-Sep-16	Sphaerocystis schroeteri Chodat	35920	0.74
MEL - 0303		13-Sep-16	Oocystis lacustris Chodat	35920	1.02
MEL - 0303		13-Sep-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.5
MEL - 0303		13-Sep-16	Planctonema lauterbornii Schmidle	7184	0.9
MEL - 0303		13-Sep-16	Cosmarium sp.	600	0.84
MEL - 0303		13-Sep-16	Cosmarium sp.	200	0.32
MEL - 0303		13-Sep-16	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL - 0303		13-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0303		13-Sep-16	Botryococcus braunii Kutzing	200	0.18

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0303		13-Sep-16	Small chrysophyceae	395120	5.57
MEL - 0303		13-Sep-16	Large chrysophyceae	35920	6.45
MEL - 0303		13-Sep-16	Chrysochromulina parva Lackey	359200	23.49
MEL - 0303		13-Sep-16	Chrysococcus sp.	308912	20.2
MEL - 0303		13-Sep-16	Chrysostephanospaera globulifera Scherffel	28736	14.6
MEL - 0303		13-Sep-16	Kephyrion sp.	64656	0.91
MEL - 0303		13-Sep-16	Spiniferomonas sirrata**********	14368	1.54
MEL - 0303		13-Sep-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0303		13-Sep-16	Dinobryon borgei Lemmermann	14368	0.79
MEL - 0303		13-Sep-16	Dinobryon mucronutom Nygaard	7184	0.94
MEL - 0303		13-Sep-16	Dinobryon bavaricum Imhof	800	1.59
MEL - 0303		13-Sep-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0303		13-Sep-16	Dinobryon sertularia Ehrenberg	1600	8.14
MEL - 0303		13-Sep-16	Dinobryon sociale Ehrenberg	43104	9.75
MEL - 0303		13-Sep-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0303		13-Sep-16	Epiphyxis sp.	7184	0.55
MEL - 0303		13-Sep-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.17
MEL - 0303		13-Sep-16	Uroglena volvox Ehrenberg	28736	3.25
MEL - 0303		13-Sep-16	Chrysochromulina laurentiana Kling	57472	30.09
MEL - 0303		13-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.58
MEL - 0303		13-Sep-16	Cyclotella stelligera Cleve and Grunow	4000	7.27
MEL - 0303		13-Sep-16	Cyclotella ocellata Pant.	21552	2.17
MEL - 0303		13-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.34
MEL - 0303		13-Sep-16	Synedra acus Kutzing	1200	0.12
MEL - 0303		13-Sep-16	Asterionella formosa Hassall	5200	0.54
MEL - 0303		13-Sep-16	Cyclotella michiganiana Skvortzow	35920	0.88
MEL - 0303		13-Sep-16	Cyclotella bodanica Eulenst.	400	3.66
MEL - 0303		13-Sep-16	Rhodomonas minuta Skuja	107760	13.55
MEL - 0303		13-Sep-16	Cryptomonas erosa Ehrenberg	2000	2.31
MEL - 0303		13-Sep-16	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0303		13-Sep-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0303		13-Sep-16	Gymnodinium sp.	200	1.5
MEL - 0303		13-Sep-16	Peridinium pusillum (Penard) Lemmermann	1000	2.14

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0303		13-Sep-16	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0303	RECOUNT	13-Sep-16	Chlamydomonas spp.	7184	0.42
MEL - 0303	RECOUNT	13-Sep-16	Sphaerocystis schroeteri Chodat	28736	0.59
MEL - 0303	RECOUNT	13-Sep-16	Oocystis lacustris Chodat	43104	1.22
MEL - 0303	RECOUNT	13-Sep-16	Elakatothrix gelatinosa Willen	28736	0.54
MEL - 0303	RECOUNT	13-Sep-16	Planctonema lauterbornii Schmidle	14368	1.81
MEL - 0303	RECOUNT	13-Sep-16	Cosmarium sp.	600	0.84
MEL - 0303	RECOUNT	13-Sep-16	Euastrum spp.	200	0.37
MEL - 0303	RECOUNT	13-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0303	RECOUNT	13-Sep-16	Botryococcus braunii Kutzing	400	0.36
MEL - 0303	RECOUNT	13-Sep-16	Ankistrodesmus spiralis Lemmermann	14368	1.06
MEL - 0303	RECOUNT	13-Sep-16	Small chrysophyceae	438224	6.18
MEL - 0303	RECOUNT	13-Sep-16	Large chrysophyceae	64656	11.61
MEL - 0303	RECOUNT	13-Sep-16	Chrysochromulina parva Lackey	294544	19.26
MEL - 0303	RECOUNT	13-Sep-16	Chrysococcus sp.	287360	18.79
MEL - 0303	RECOUNT	13-Sep-16	Chrysostephanospaera globulifera Scherffel	43104	21.9
MEL - 0303	RECOUNT	13-Sep-16	Kephyrion sp.	43104	0.61
MEL - 0303	RECOUNT	13-Sep-16	Spiniferomonas sirrata**********	28736	3.09
MEL - 0303	RECOUNT	13-Sep-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0303	RECOUNT	13-Sep-16	Dinobryon borgei Lemmermann	7184	0.4
MEL - 0303	RECOUNT	13-Sep-16	Dinobryon mucronutom Nygaard	14368	1.88
MEL - 0303	RECOUNT	13-Sep-16	Dinobryon bavaricum Imhof	400	0.8
MEL - 0303	RECOUNT	13-Sep-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0303	RECOUNT	13-Sep-16	Dinobryon sertularia Ehrenberg	800	4.07
MEL - 0303	RECOUNT	13-Sep-16	Dinobryon sociale Ehrenberg	28736	6.5
MEL - 0303	RECOUNT	13-Sep-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0303	RECOUNT	13-Sep-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.17
MEL - 0303	RECOUNT	13-Sep-16	Uroglena volvox Ehrenberg	21552	2.44
MEL - 0303	RECOUNT	13-Sep-16	Chrysochromulina laurentiana Kling	28736	15.05
MEL - 0303	RECOUNT	13-Sep-16	Stichogloea spp.	14368	0.72
MEL - 0303	RECOUNT	13-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19
MEL - 0303	RECOUNT	13-Sep-16	Cyclotella stelligera Cleve and Grunow	5000	9.09
MEL - 0303	RECOUNT	13-Sep-16	Cyclotella ocellata Pant.	28736	2.89

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0303	RECOUNT	13-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.67
MEL - 0303	RECOUNT	13-Sep-16	Synedra acus Kutzing	1000	0.1
MEL - 0303	RECOUNT	13-Sep-16	Asterionella formosa Hassall	4000	0.42
MEL - 0303	RECOUNT	13-Sep-16	Cyclotella michiganiana Skvortzow	28736	0.7
MEL - 0303	RECOUNT	13-Sep-16	Rhodomonas minuta Skuja	143680	18.06
MEL - 0303	RECOUNT	13-Sep-16	Cryptomonas erosa Ehrenberg	3200	3.7
MEL - 0303	RECOUNT	13-Sep-16	Cryptomonas rostratiformis Skuja	200	0.42
MEL - 0303	RECOUNT	13-Sep-16	Gymnodinium sp.	400	3.01
MEL - 0303	RECOUNT	13-Sep-16	Peridinium willei Huitfeldt-Kaas	200	4.89
MEL - 0303	RECOUNT	13-Sep-16	Peridinium pusillum (Penard) Lemmermann	400	0.86
MEL - 0303	RECOUNT	13-Sep-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0304		26-Jul-16	Chlamydomonas spp.	7184	0.07
MEL - 0304		26-Jul-16	Sphaerocystis schroeteri Chodat	43104	1.56
MEL - 0304		26-Jul-16	Oocystis lacustris Chodat	7184	0.36
MEL - 0304		26-Jul-16	Elakatothrix gelatinosa Willen	71840	1.48
MEL - 0304		26-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0304		26-Jul-16	Botryococcus braunii Kutzing	200	0.1
MEL - 0304		26-Jul-16	Small chrysophyceae	201152	2.84
MEL - 0304		26-Jul-16	Large chrysophyceae	35920	6.45
MEL - 0304		26-Jul-16	Chrysochromulina parva Lackey	395120	25.84
MEL - 0304		26-Jul-16	Chrysococcus sp.	373568	24.43
MEL - 0304		26-Jul-16	Kephyrion sp.	129312	1.66
MEL - 0304		26-Jul-16	Spiniferomonas sirrata**********	7184	1.08
MEL - 0304		26-Jul-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0304		26-Jul-16	Dinobryon borgei Lemmermann	35920	1.57
MEL - 0304		26-Jul-16	Dinobryon bavaricum Imhof	330464	74.75
MEL - 0304		26-Jul-16	Dinobryon bavaricum Imhof	4800	5.88
MEL - 0304		26-Jul-16	Dinobryon sertularia Ehrenberg	64656	14.63
MEL - 0304		26-Jul-16	Dinobryon sertularia Ehrenberg	2600	5.18
MEL - 0304		26-Jul-16	Chrysolkos skuja (Nauwerck) Willen	57472	1.85
MEL - 0304		26-Jul-16	Uroglena volvox Ehrenberg	459776	52
MEL - 0304		26-Jul-16	Chrysosphaerella longispina Lauterborn	200	3.62
MEL - 0304		26-Jul-16	Chrysochromulina laurentiana Kling	122128	56.57

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0304		26-Jul-16	Stichogloea spp.	14368	0.72
MEL - 0304		26-Jul-16	Bicoeca lacustris Clark	7184	0.63
MEL - 0304		26-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.48
MEL - 0304		26-Jul-16	Pteridomonas sp.	7184	1.71
MEL - 0304		26-Jul-16	Cyclotella stelligera Cleve and Grunow	1200	2.18
MEL - 0304		26-Jul-16	Rhizosolenia eriense H.L. Smith	57472	4.47
MEL - 0304		26-Jul-16	Tabellaria fenestrata (Lyngbye) Kutzing	3200	2.74
MEL - 0304		26-Jul-16	Synedra acus Kutzing	1800	0.21
MEL - 0304		26-Jul-16	Asterionella formosa Hassall	400	0.04
MEL - 0304		26-Jul-16	Cyclotella michiganiana Skvortzow	35920	0.88
MEL - 0304		26-Jul-16	Rhodomonas minuta Skuja	79024	9.93
MEL - 0304		26-Jul-16	Cryptomonas erosa Ehrenberg	3200	5.25
MEL - 0304		26-Jul-16	Cryptomonas reflexa (Marsson) Skuja	200	0.14
MEL - 0304		26-Jul-16	Katablepharis ovalis Skuja	14368	0.84
MEL - 0304		26-Jul-16	Gymnodinium sp.	800	7.36
MEL - 0304		26-Jul-16	Peridinium willei Huitfeldt-Kaas	200	7.22
MEL - 0304		26-Jul-16	Peridinium pusillum (Penard) Lemmermann	2600	6.23
MEL - 0304		26-Jul-16	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0304		12-Aug-16	Aphanothece sp.	7184	0.28
MEL - 0304		12-Aug-16	Chlamydomonas spp.	14368	0.18
MEL - 0304		12-Aug-16	Sphaerocystis schroeteri Chodat	57472	0.66
MEL - 0304		12-Aug-16	Oocystis lacustris Chodat	7184	0.36
MEL - 0304		12-Aug-16	Oocystis lacustris Chodat	7184	0.42
MEL - 0304		12-Aug-16	Elakatothrix gelatinosa Willen	86208	1.23
MEL - 0304		12-Aug-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0304		12-Aug-16	Cosmarium sp.	200	0.28
MEL - 0304		12-Aug-16	Euastrum spp.	200	0.37
MEL - 0304		12-Aug-16	Staurodesmus extensus (Andersson) Teiling	600	0.28
MEL - 0304		12-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	64656	2.44
MEL - 0304		12-Aug-16	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL - 0304		12-Aug-16	Oocystis gigas Archer	400	0.93
MEL - 0304		12-Aug-16	Small chrysophyceae	459776	5.89
MEL - 0304		12-Aug-16	Large chrysophyceae	14368	1.88

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0304		12-Aug-16	Chrysochromulina parva Lackey	179600	11.75
MEL - 0304		12-Aug-16	Chrysococcus sp.	344832	21.24
MEL - 0304		12-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	3.33
MEL - 0304		12-Aug-16	Kephyrion boreale Skuja	7184	0.85
MEL - 0304		12-Aug-16	Kephyrion sp.	57472	0.53
MEL - 0304		12-Aug-16	Spiniferomonas sirrata**********	28736	3.25
MEL - 0304		12-Aug-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0304		12-Aug-16	Mallomonas crassisquama (Asmund) Fott	400	0.4
MEL - 0304		12-Aug-16	Dinobryon borgei Lemmermann	28736	1.32
MEL - 0304		12-Aug-16	Dinobryon bavaricum Imhof	43104	9.75
MEL - 0304		12-Aug-16	Dinobryon bavaricum Imhof	400	0.39
MEL - 0304		12-Aug-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0304		12-Aug-16	Dinobryon sertularia Ehrenberg	800	1.59
MEL - 0304		12-Aug-16	Dinobryon sociale Ehrenberg	150864	34.13
MEL - 0304		12-Aug-16	Uroglena volvox Ehrenberg	28736	3.25
MEL - 0304		12-Aug-16	Uroglena volvox Ehrenberg	200	11.26
MEL - 0304		12-Aug-16	Chrysochromulina laurentiana Kling	86208	37.49
MEL - 0304		12-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.65
MEL - 0304		12-Aug-16	Pteridomonas sp.	50288	10.04
MEL - 0304		12-Aug-16	Cyclotella stelligera Cleve and Grunow	1400	3.01
MEL - 0304		12-Aug-16	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL - 0304		12-Aug-16	Synedra acus Kutzing	1200	0.14
MEL - 0304		12-Aug-16	Asterionella formosa Hassall	200	0.02
MEL - 0304		12-Aug-16	Cyclotella michiganiana Skvortzow	43104	1
MEL - 0304		12-Aug-16	Cyclotella bodanica Eulenst.	200	1.17
MEL - 0304		12-Aug-16	Rhodomonas minuta Skuja	186784	19.22
MEL - 0304		12-Aug-16	Cryptomonas erosa Ehrenberg	3600	4.34
MEL - 0304		12-Aug-16	Cryptomonas ovata Ehrenberg	200	0.9
MEL - 0304		12-Aug-16	Cryptomonas reflexa (Marsson) Skuja	600	0.4
MEL - 0304		12-Aug-16	Gymnodinium sp.	1400	15.41
MEL - 0304		12-Aug-16	Peridinium willei Huitfeldt-Kaas	200	4.89
MEL - 0304		12-Aug-16	Peridinium pusillum (Penard) Lemmermann	3000	7.45
MEL - 0304		22-Sep-16	Chlamydomonas spp.	7184	0.42

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0304		22-Sep-16	Sphaerocystis schroeteri Chodat	7184	0.18
MEL - 0304		22-Sep-16	Cosmarium sp.	200	0.37
MEL - 0304		22-Sep-16	Staurodesmus extensus (Andersson) Teiling	400	0.17
MEL - 0304		22-Sep-16	Staurodesmus paradoxum Meyen	200	0.82
MEL - 0304		22-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0304		22-Sep-16	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL - 0304		22-Sep-16	Ankistrodesmus spiralis Lemmermann	7184	0.54
MEL - 0304		22-Sep-16	Small chrysophyceae	574720	8.1
MEL - 0304		22-Sep-16	Large chrysophyceae	50288	9.03
MEL - 0304		22-Sep-16	Chrysochromulina parva Lackey	366384	23.96
MEL - 0304		22-Sep-16	Chrysococcus sp.	545984	35.71
MEL - 0304		22-Sep-16	Chrysostephanospaera globulifera Scherffel	21552	10.95
MEL - 0304		22-Sep-16	Kephyrion sp.	150864	2.84
MEL - 0304		22-Sep-16	Spiniferomonas sirrata**********	7184	0.81
MEL - 0304		22-Sep-16	Mallomonas crassisquama (Asmund) Fott	200	0.22
MEL - 0304		22-Sep-16	Dinobryon borgei Lemmermann	57472	2.78
MEL - 0304		22-Sep-16	Dinobryon bavaricum Imhof	200	0.4
MEL - 0304		22-Sep-16	Dinobryon sertularia Ehrenberg	35920	8.13
MEL - 0304		22-Sep-16	Dinobryon sertularia Ehrenberg	1800	9.15
MEL - 0304		22-Sep-16	Dinobryon sociale Ehrenberg	237072	53.63
MEL - 0304		22-Sep-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0304		22-Sep-16	Uroglena volvox Ehrenberg	193968	21.94
MEL - 0304		22-Sep-16	Bitrichia chodatii (Reverdin) Chodat	21552	1.5
MEL - 0304		22-Sep-16	Chrysochromulina laurentiana Kling	122128	63.95
MEL - 0304		22-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	71840	1.86
MEL - 0304		22-Sep-16	Pteridomonas sp.	7184	1.59
MEL - 0304		22-Sep-16	Cyclotella stelligera Cleve and Grunow	4400	9.2
MEL - 0304		22-Sep-16	Cyclotella ocellata Pant.	35920	3.61
MEL - 0304		22-Sep-16	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL - 0304		22-Sep-16	Fragilaria crotonensis Kitton	2000	0.63
MEL - 0304		22-Sep-16	Synedra acus Kutzing	4400	0.44
MEL - 0304		22-Sep-16	Asterionella formosa Hassall	13600	1.41
MEL - 0304		22-Sep-16	Cyclotella michiganiana Skvortzow	122128	2.65

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0304		22-Sep-16	Rhodomonas minuta Skuja	79024	9.93
MEL - 0304		22-Sep-16	Cryptomonas erosa Ehrenberg	1400	1.59
MEL - 0304		22-Sep-16	Katablepharis ovalis Skuja	7184	0.29
MEL - 0304		22-Sep-16	Gymnodinium sp.	200	1.86
MEL - 0304		22-Sep-16	Peridinium willei Huitfeldt-Kaas	400	9.37
MEL - 0304		22-Sep-16	Peridinium pusillum (Penard) Lemmermann	1200	2.39
MEL - 0304		22-Sep-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0305		26-Jul-16	Aphanothece sp.	35920	2.12
MEL - 0305		26-Jul-16	Chlamydomonas spp.	14368	0.15
MEL - 0305		26-Jul-16	Sphaerocystis schroeteri Chodat	64656	2.17
MEL - 0305		26-Jul-16	Pediastrum duplex Meyen	3200	0.37
MEL - 0305		26-Jul-16	Elakatothrix gelatinosa Willen	35920	0.73
MEL - 0305		26-Jul-16	Cosmarium sp.	200	0.28
MEL - 0305		26-Jul-16	Euastrum spp.	200	0.32
MEL - 0305		26-Jul-16	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL - 0305		26-Jul-16	Staurodesmus bullardii G.M. Smith	200	0.44
MEL - 0305		26-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0305		26-Jul-16	Mougeotia sp.	400	1.92
MEL - 0305		26-Jul-16	Small chrysophyceae	294544	3.77
MEL - 0305		26-Jul-16	Large chrysophyceae	28736	5.16
MEL - 0305		26-Jul-16	Chrysochromulina parva Lackey	294544	19.26
MEL - 0305		26-Jul-16	Chrysococcus sp.	265808	17.38
MEL - 0305		26-Jul-16	Kephyrion sp.	100576	1.04
MEL - 0305		26-Jul-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0305		26-Jul-16	Mallomonas crassisquama (Asmund) Fott	800	0.81
MEL - 0305		26-Jul-16	Synura sphagnicola Korschikow	7184	2.41
MEL - 0305		26-Jul-16	Dinobryon borgei Lemmermann	14368	0.62
MEL - 0305		26-Jul-16	Dinobryon bavaricum Imhof	258624	58.5
MEL - 0305		26-Jul-16	Dinobryon bavaricum Imhof	4800	5.88
MEL - 0305		26-Jul-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0305		26-Jul-16	Dinobryon sertularia Ehrenberg	2800	9.49
MEL - 0305		26-Jul-16	Chrysolkos skuja (Nauwerck) Willen	21552	0.65
MEL - 0305		26-Jul-16	Uroglena volvox Ehrenberg	366384	41.44

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0305		26-Jul-16	Chrysochromulina laurentiana Kling	71840	33.28
MEL - 0305		26-Jul-16	Stichogloea spp.	7184	0.36
MEL - 0305		26-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL - 0305		26-Jul-16	Dinobryon attenatum Hill	14368	1.5
MEL - 0305		26-Jul-16	Pteridomonas sp.	35920	6.91
MEL - 0305		26-Jul-16	Cyclotella stelligera Cleve and Grunow	1000	1.82
MEL - 0305		26-Jul-16	Cyclotella pseudostelligera	28736	15.48
MEL - 0305		26-Jul-16	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL - 0305		26-Jul-16	Synedra acus Kutzing	4600	0.57
MEL - 0305		26-Jul-16	Asterionella formosa Hassall	3600	0.38
MEL - 0305		26-Jul-16	Cyclotella michiganiana Skvortzow	28736	0.7
MEL - 0305		26-Jul-16	Cyclotella bodanica Eulenst.	400	3.66
MEL - 0305		26-Jul-16	Rhodomonas minuta Skuja	129312	14.63
MEL - 0305		26-Jul-16	Cryptomonas erosa Ehrenberg	3600	5.71
MEL - 0305		26-Jul-16	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL - 0305		26-Jul-16	Cryptomonas rostratiformis Skuja	800	1.7
MEL - 0305		26-Jul-16	Katablepharis ovalis Skuja	28736	1.62
MEL - 0305		26-Jul-16	Gymnodinium helveticum Penard	400	9.61
MEL - 0305		26-Jul-16	Gymnodinium sp.	800	6.54
MEL - 0305		26-Jul-16	Peridinium willei Huitfeldt-Kaas	600	21.65
MEL - 0305		26-Jul-16	Peridinium pusillum (Penard) Lemmermann	2800	8.69
MEL - 0305	RECOUNT	26-Jul-16	Aphanothece sp.	7184	0.42
MEL - 0305	RECOUNT	26-Jul-16	Chlamydomonas spp.	14368	0.15
MEL - 0305	RECOUNT	26-Jul-16	Sphaerocystis schroeteri Chodat	14368	0.48
MEL - 0305	RECOUNT	26-Jul-16	Oocystis lacustris Chodat	28736	0.76
MEL - 0305	RECOUNT	26-Jul-16	Elakatothrix gelatinosa Willen	14368	0.29
MEL - 0305	RECOUNT	26-Jul-16	Cosmarium sp.	400	0.56
MEL - 0305	RECOUNT	26-Jul-16	Euastrum spp.	400	0.65
MEL - 0305	RECOUNT	26-Jul-16	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL - 0305	RECOUNT	26-Jul-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0305	RECOUNT	26-Jul-16	Mougeotia sp.	1600	7.67
MEL - 0305	RECOUNT	26-Jul-16	Small chrysophyceae	251440	3.22
MEL - 0305	RECOUNT	26-Jul-16	Large chrysophyceae	64656	11.61

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0305	RECOUNT	26-Jul-16	Chrysochromulina parva Lackey	352016	23.02
MEL - 0305	RECOUNT	26-Jul-16	Chrysococcus sp.	294544	19.26
MEL - 0305	RECOUNT	26-Jul-16	Kephyrion boreale Skuja	14368	1.79
MEL - 0305	RECOUNT	26-Jul-16	Kephyrion sp.	114944	1.18
MEL - 0305	RECOUNT	26-Jul-16	Mallomonas crassisquama (Asmund) Fott	1400	1.42
MEL - 0305	RECOUNT	26-Jul-16	Dinobryon borgei Lemmermann	7184	0.31
MEL - 0305	RECOUNT	26-Jul-16	Dinobryon bavaricum Imhof	222704	50.38
MEL - 0305	RECOUNT	26-Jul-16	Dinobryon bavaricum Imhof	5400	6.62
MEL - 0305	RECOUNT	26-Jul-16	Dinobryon sertularia Ehrenberg	64656	14.63
MEL - 0305	RECOUNT	26-Jul-16	Dinobryon sertularia Ehrenberg	2800	9.49
MEL - 0305	RECOUNT	26-Jul-16	Chrysolkos skuja (Nauwerck) Willen	43104	1.29
MEL - 0305	RECOUNT	26-Jul-16	Uroglena volvox Ehrenberg	445408	50.38
MEL - 0305	RECOUNT	26-Jul-16	Chrysochromulina laurentiana Kling	57472	26.62
MEL - 0305	RECOUNT	26-Jul-16	Stichogloea spp.	7184	0.36
MEL - 0305	RECOUNT	26-Jul-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL - 0305	RECOUNT	26-Jul-16	Pteridomonas sp.	43104	8.3
MEL - 0305	RECOUNT	26-Jul-16	Cyclotella stelligera Cleve and Grunow	1000	1.82
MEL - 0305	RECOUNT	26-Jul-16	Cyclotella pseudostelligera	14368	7.74
MEL - 0305	RECOUNT	26-Jul-16	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL - 0305	RECOUNT	26-Jul-16	Synedra acus Kutzing	6200	0.77
MEL - 0305	RECOUNT	26-Jul-16	Asterionella formosa Hassall	2400	0.25
MEL - 0305	RECOUNT	26-Jul-16	Cyclotella michiganiana Skvortzow	28736	0.7
MEL - 0305	RECOUNT	26-Jul-16	Cyclotella bodanica Eulenst.	200	1.83
MEL - 0305	RECOUNT	26-Jul-16	Rhodomonas minuta Skuja	158048	17.88
MEL - 0305	RECOUNT	26-Jul-16	Cryptomonas erosa Ehrenberg	2200	3.49
MEL - 0305	RECOUNT	26-Jul-16	Cryptomonas reflexa (Marsson) Skuja	800	0.59
MEL - 0305	RECOUNT	26-Jul-16	Cryptomonas rostratiformis Skuja	800	1.7
MEL - 0305	RECOUNT	26-Jul-16	Gymnodinium helveticum Penard	400	9.61
MEL - 0305	RECOUNT	26-Jul-16	Gymnodinium sp.	400	3.27
MEL - 0305	RECOUNT	26-Jul-16	Peridinium willei Huitfeldt-Kaas	200	7.22
MEL - 0305	RECOUNT	26-Jul-16	Peridinium pusillum (Penard) Lemmermann	2200	6.83
MEL - 0305	RECOUNT	26-Jul-16	Peridinium aciculiferum Lemmermann	400	3.62
MEL - 0305		12-Aug-16	Chlamydomonas spp.	35920	0.46

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0305		12-Aug-16	Oocystis lacustris Chodat	7184	0.36
MEL - 0305		12-Aug-16	Chodatella sp.	7184	0.36
MEL - 0305		12-Aug-16	Elakatothrix gelatinosa Willen	43104	0.81
MEL - 0305		12-Aug-16	Planctonema lauterbornii Schmidle	64656	8.13
MEL - 0305		12-Aug-16	Cosmarium sp.	200	0.28
MEL - 0305		12-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0305		12-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0305		12-Aug-16	Botryococcus braunii Kutzing	800	1.15
MEL - 0305		12-Aug-16	Oocystis gigas Archer	200	0.51
MEL - 0305		12-Aug-16	Small chrysophyceae	531616	3.4
MEL - 0305		12-Aug-16	Large chrysophyceae	21552	3.87
MEL - 0305		12-Aug-16	Chrysochromulina parva Lackey	193968	12.69
MEL - 0305		12-Aug-16	Chrysococcus sp.	395120	20.15
MEL - 0305		12-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	3.76
MEL - 0305		12-Aug-16	Kephyrion boreale Skuja	7184	0.77
MEL - 0305		12-Aug-16	Kephyrion sp.	143680	2.24
MEL - 0305		12-Aug-16	Spiniferomonas sirrata**********	28736	2
MEL - 0305		12-Aug-16	Mallomonas caudata Ivanov	200	1.02
MEL - 0305		12-Aug-16	Dinobryon borgei Lemmermann	35920	1.46
MEL - 0305		12-Aug-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0305		12-Aug-16	Dinobryon bavaricum Imhof	800	1.59
MEL - 0305		12-Aug-16	Dinobryon sertularia Ehrenberg	35920	8.13
MEL - 0305		12-Aug-16	Dinobryon sertularia Ehrenberg	1000	1.25
MEL - 0305		12-Aug-16	Dinobryon sertularia Ehrenberg	800	1.59
MEL - 0305		12-Aug-16	Dinobryon sociale Ehrenberg	222704	50.38
MEL - 0305		12-Aug-16	Chrysolkos skuja (Nauwerck) Willen	14368	0.25
MEL - 0305		12-Aug-16	Uroglena volvox Ehrenberg	35920	4.06
MEL - 0305		12-Aug-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0305		12-Aug-16	Chrysochromulina laurentiana Kling	64656	28.12
MEL - 0305		12-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.18
MEL - 0305		12-Aug-16	Pteridomonas sp.	21552	5.13
MEL - 0305		12-Aug-16	Cyclotella stelligera Cleve and Grunow	2200	4.35
MEL - 0305		12-Aug-16	Rhizosolenia eriense H.L. Smith	14368	1.22

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0305		12-Aug-16	Synedra acus Kutzing	1000	0.11
MEL - 0305		12-Aug-16	Cyclotella michiganiana Skvortzow	79024	1.94
MEL - 0305		12-Aug-16	Rhodomonas minuta Skuja	179600	22.58
MEL - 0305		12-Aug-16	Cryptomonas erosa Ehrenberg	6800	8.2
MEL - 0305		12-Aug-16	Cryptomonas reflexa (Marsson) Skuja	800	0.51
MEL - 0305		12-Aug-16	Cryptomonas rostratiformis Skuja	400	0.77
MEL - 0305		12-Aug-16	Gymnodinium sp.	14368	4.77
MEL - 0305		12-Aug-16	Gymnodinium sp.	1200	9.02
MEL - 0305		12-Aug-16	Peridinium willei Huitfeldt-Kaas	200	4.89
MEL - 0305		12-Aug-16	Peridinium pusillum (Penard) Lemmermann	5200	12.91
MEL - 0306		22-Sep-16	Sphaerocystis schroeteri Chodat	7184	0.1
MEL - 0306		22-Sep-16	Elakatothrix gelatinosa Willen	7184	0.14
MEL - 0306		22-Sep-16	Cosmarium sp.	200	0.28
MEL - 0306		22-Sep-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0306		22-Sep-16	Mougeotia sp.	600	1.03
MEL - 0306		22-Sep-16	Small chrysophyceae	337648	3.48
MEL - 0306		22-Sep-16	Large chrysophyceae	14368	2.58
MEL - 0306		22-Sep-16	Chrysochromulina parva Lackey	387936	25.37
MEL - 0306		22-Sep-16	Chrysococcus sp.	265808	17.38
MEL - 0306		22-Sep-16	Chrysostephanospaera globulifera Scherffel	7184	3.33
MEL - 0306		22-Sep-16	Kephyrion sp.	129312	2.22
MEL - 0306		22-Sep-16	Spiniferomonas sirrata**********	14368	1.25
MEL - 0306		22-Sep-16	Dinobryon borgei Lemmermann	35920	1.61
MEL - 0306		22-Sep-16	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0306		22-Sep-16	Dinobryon bavaricum Imhof	800	1.59
MEL - 0306		22-Sep-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0306		22-Sep-16	Dinobryon sertularia Ehrenberg	200	0.25
MEL - 0306		22-Sep-16	Dinobryon sertularia Ehrenberg	1000	5.09
MEL - 0306		22-Sep-16	Dinobryon sociale Ehrenberg	150864	34.13
MEL - 0306		22-Sep-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.17
MEL - 0306		22-Sep-16	Uroglena volvox Ehrenberg	71840	8.13
MEL - 0306		22-Sep-16	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL - 0306		22-Sep-16	Chrysochromulina laurentiana Kling	71840	37.62

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0306		22-Sep-16	Stichogloea spp.	7184	0.36
MEL - 0306		22-Sep-16	Bicoeca lacustris Clark	7184	0.5
MEL - 0306		22-Sep-16	Salpingoeca frequentissima (Zach.) Lemmermann	57472	1.49
MEL - 0306		22-Sep-16	Dinobryon attenatum Hill	7184	0.66
MEL - 0306		22-Sep-16	Pteridomonas sp.	7184	1.77
MEL - 0306		22-Sep-16	Cyclotella stelligera Cleve and Grunow	4200	8.31
MEL - 0306		22-Sep-16	Cyclotella ocellata Pant.	21552	2.69
MEL - 0306		22-Sep-16	Rhizosolenia eriense H.L. Smith	7184	0.61
MEL - 0306		22-Sep-16	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.17
MEL - 0306		22-Sep-16	Synedra acus Kutzing	4000	0.42
MEL - 0306		22-Sep-16	Asterionella formosa Hassall	13600	1.42
MEL - 0306		22-Sep-16	Cyclotella michiganiana Skvortzow	93392	2.29
MEL - 0306		22-Sep-16	Cyclotella bodanica Eulenst.	800	5.64
MEL - 0306		22-Sep-16	Rhodomonas minuta Skuja	136496	17.16
MEL - 0306		22-Sep-16	Cryptomonas erosa Ehrenberg	2800	4.6
MEL - 0306		22-Sep-16	Gymnodinium sp.	1000	8.68
MEL - 0306		22-Sep-16	Peridinium pusillum (Penard) Lemmermann	1600	3.5
MEL - 0306		22-Sep-16	Peridinium aciculiferum Lemmermann	600	5.43
MEL - 0401		14-Aug-16	Aphanothece sp.	14368	0.73
MEL - 0401		14-Aug-16	Snowella sp	200	0.15
MEL - 0401		14-Aug-16	Sphaerocystis schroeteri Chodat	57472	1.93
MEL - 0401		14-Aug-16	Oocystis lacustris Chodat	35920	0.41
MEL - 0401		14-Aug-16	Dictyosphaerium simplex Sukja	50288	0.24
MEL - 0401		14-Aug-16	Elakatothrix gelatinosa Willen	35920	0.68
MEL - 0401		14-Aug-16	Planctonema lauterbornii Schmidle	21552	2.71
MEL - 0401		14-Aug-16	Cosmarium sp.	400	0.56
MEL - 0401		14-Aug-16	Staurodesmus bullardii G.M. Smith	200	0.64
MEL - 0401		14-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0401		14-Aug-16	Botryococcus braunii Kutzing	600	0.54
MEL - 0401		14-Aug-16	Oocystis gigas Archer	200	0.49
MEL - 0401		14-Aug-16	Small chrysophyceae	294544	2.71
MEL - 0401		14-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0401		14-Aug-16	Chrysochromulina parva Lackey	50288	3.29

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0401		14-Aug-16	Chrysococcus sp.	208336	13.63
MEL - 0401		14-Aug-16	Kephyrion boreale Skuja	7184	0.77
MEL - 0401		14-Aug-16	Kephyrion sp.	64656	0.59
MEL - 0401		14-Aug-16	Spiniferomonas sirrata**********	21552	1.98
MEL - 0401		14-Aug-16	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL - 0401		14-Aug-16	Dinobryon borgei Lemmermann	7184	0.31
MEL - 0401		14-Aug-16	Dinobryon bavaricum Imhof	14368	3.25
MEL - 0401		14-Aug-16	Dinobryon bavaricum Imhof	200	0.68
MEL - 0401		14-Aug-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0401		14-Aug-16	Dinobryon sertularia Ehrenberg	600	2.03
MEL - 0401		14-Aug-16	Dinobryon sociale Ehrenberg	71840	16.25
MEL - 0401		14-Aug-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.13
MEL - 0401		14-Aug-16	Uroglena volvox Ehrenberg	35920	4.06
MEL - 0401		14-Aug-16	Chrysochromulina laurentiana Kling	100576	43.74
MEL - 0401		14-Aug-16	Stichogloea spp.	21552	1.08
MEL - 0401		14-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.38
MEL - 0401		14-Aug-16	Cyclotella stelligera Cleve and Grunow	3200	4.73
MEL - 0401		14-Aug-16	Cyclotella ocellata Pant.	14368	1.44
MEL - 0401		14-Aug-16	Synedra acus Kutzing	400	0.04
MEL - 0401		14-Aug-16	Cyclotella michiganiana Skvortzow	14368	0.24
MEL - 0401		14-Aug-16	Rhodomonas minuta Skuja	179600	27.08
MEL - 0401		14-Aug-16	Cryptomonas erosa Ehrenberg	600	0.7
MEL - 0401		14-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1000	0.66
MEL - 0401		14-Aug-16	Gymnodinium sp.	1000	8.78
MEL - 0401		14-Aug-16	Peridinium pusillum (Penard) Lemmermann	1200	2.98
MEL - 0401		14-Aug-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0402		14-Aug-16	Aphanothece sp.	7184	0.25
MEL - 0402		14-Aug-16	Chlamydomonas spp.	7184	0.07
MEL - 0402		14-Aug-16	Sphaerocystis schroeteri Chodat	7184	0.18
MEL - 0402		14-Aug-16	Oocystis lacustris Chodat	21552	0.58
MEL - 0402		14-Aug-16	Dictyosphaerium simplex Sukja	50288	0.24
MEL - 0402		14-Aug-16	Elakatothrix gelatinosa Willen	86208	1.22
MEL - 0402		14-Aug-16	Planctonema lauterbornii Schmidle	64656	8.13

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0402		14-Aug-16	Cosmarium sp.	200	0.28
MEL - 0402		14-Aug-16	Staurodesmus extensus (Andersson) Teiling	800	0.38
MEL - 0402		14-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL - 0402		14-Aug-16	Botryococcus braunii Kutzing	200	0.18
MEL - 0402		14-Aug-16	Ankistrodesmus spiralis Lemmermann	7184	0.45
MEL - 0402		14-Aug-16	Oocystis gigas Archer	200	0.42
MEL - 0402		14-Aug-16	Monomastix minuta Skuja	7184	0.2
MEL - 0402		14-Aug-16	Small chrysophyceae	517248	4.76
MEL - 0402		14-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0402		14-Aug-16	Chrysochromulina parva Lackey	229888	15.03
MEL - 0402		14-Aug-16	Chrysococcus sp.	193968	12.69
MEL - 0402		14-Aug-16	Chrysostephanospaera globulifera Scherffel	7184	3.33
MEL - 0402		14-Aug-16	Kephyrion sp.	122128	1.72
MEL - 0402		14-Aug-16	Spiniferomonas sirrata**********	7184	0.73
MEL - 0402		14-Aug-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0402		14-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0402		14-Aug-16	Dinobryon borgei Lemmermann	14368	0.7
MEL - 0402		14-Aug-16	Dinobryon bavaricum Imhof	14368	3.25
MEL - 0402		14-Aug-16	Dinobryon bavaricum Imhof	600	2.03
MEL - 0402		14-Aug-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0402		14-Aug-16	Dinobryon sertularia Ehrenberg	200	0.4
MEL - 0402		14-Aug-16	Dinobryon sertularia Ehrenberg	800	2.71
MEL - 0402		14-Aug-16	Dinobryon sociale Ehrenberg	107760	24.38
MEL - 0402		14-Aug-16	Uroglena volvox Ehrenberg	79024	8.94
MEL - 0402		14-Aug-16	Chrysochromulina laurentiana Kling	71840	30.26
MEL - 0402		14-Aug-16	Stichogloea spp.	21552	1.08
MEL - 0402		14-Aug-16	Pteridomonas sp.	21552	5.13
MEL - 0402		14-Aug-16	Cyclotella stelligera Cleve and Grunow	2400	3.39
MEL - 0402		14-Aug-16	Cyclotella ocellata Pant.	28736	2.89
MEL - 0402		14-Aug-16	Synedra acus Kutzing	2400	0.25
MEL - 0402		14-Aug-16	Cyclotella michiganiana Skvortzow	57472	1.1
MEL - 0402		14-Aug-16	Cyclotella bodanica Eulenst.	600	4.23
MEL - 0402		14-Aug-16	Rhodomonas minuta Skuja	208336	26.19

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0402		14-Aug-16	Cryptomonas erosa Ehrenberg	3400	3.93
MEL - 0402		14-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1600	1.06
MEL - 0402		14-Aug-16	Cryptomonas rostratiformis Skuja	400	0.81
MEL - 0402		14-Aug-16	Gymnodinium sp.	7184	3.35
MEL - 0402		14-Aug-16	Gymnodinium sp.	400	5.65
MEL - 0402		14-Aug-16	Peridinium pusillum (Penard) Lemmermann	600	1.31
MEL - 0402	REP2	14-Aug-16	Aphanothece sp.	14368	0.5
MEL - 0402	REP2	14-Aug-16	Planktolyngbya limnetica	200	0.04
MEL - 0402	REP2	14-Aug-16	Snowella sp	400	0.3
MEL - 0402	REP2	14-Aug-16	Sphaerocystis schroeteri Chodat	21552	0.53
MEL - 0402	REP2	14-Aug-16	Oocystis lacustris Chodat	21552	0.38
MEL - 0402	REP2	14-Aug-16	Dictyosphaerium simplex Sukja	71840	0.34
MEL - 0402	REP2	14-Aug-16	Elakatothrix gelatinosa Willen	107760	1.52
MEL - 0402	REP2	14-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.1
MEL - 0402	REP2	14-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0402	REP2	14-Aug-16	Mougeotia sp.	200	0.83
MEL - 0402	REP2	14-Aug-16	Botryococcus braunii Kutzing	200	0.18
MEL - 0402	REP2	14-Aug-16	Oocystis gigas Archer	200	0.42
MEL - 0402	REP2	14-Aug-16	Monomastix minuta Skuja	21552	0.61
MEL - 0402	REP2	14-Aug-16	Small chrysophyceae	531616	4.89
MEL - 0402	REP2	14-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0402	REP2	14-Aug-16	Chrysochromulina parva Lackey	272992	17.85
MEL - 0402	REP2	14-Aug-16	Chrysococcus sp.	445408	29.13
MEL - 0402	REP2	14-Aug-16	Kephyrion sp.	193968	2.73
MEL - 0402	REP2	14-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0402	REP2	14-Aug-16	Dinobryon bavaricum Imhof	400	1.36
MEL - 0402	REP2	14-Aug-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0402	REP2	14-Aug-16	Dinobryon sertularia Ehrenberg	800	2.71
MEL - 0402	REP2	14-Aug-16	Dinobryon sociale Ehrenberg	186784	42.25
MEL - 0402	REP2	14-Aug-16	Chrysolkos skuja (Nauwerck) Willen	35920	0.89
MEL - 0402	REP2	14-Aug-16	Uroglena volvox Ehrenberg	57472	6.5
MEL - 0402	REP2	14-Aug-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.33
MEL - 0402	REP2	14-Aug-16	Chrysochromulina laurentiana Kling	79024	33.28

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0402	REP2	14-Aug-16	Stichogloea spp.	57472	2.89
MEL - 0402	REP2	14-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.33
MEL - 0402	REP2	14-Aug-16	Pteridomonas sp.	7184	1.71
MEL - 0402	REP2	14-Aug-16	Cyclotella stelligera Cleve and Grunow	1400	1.98
MEL - 0402	REP2	14-Aug-16	Cyclotella ocellata Pant.	7184	0.72
MEL - 0402	REP2	14-Aug-16	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL - 0402	REP2	14-Aug-16	Synedra acus Kutzing	2800	0.29
MEL - 0402	REP2	14-Aug-16	Cyclotella michiganiana Skvortzow	14368	0.27
MEL - 0402	REP2	14-Aug-16	Cyclotella bodanica Eulenst.	400	2.82
MEL - 0402	REP2	14-Aug-16	Diatoma elongatum Agardh	400	0.02
MEL - 0402	REP2	14-Aug-16	Rhodomonas minuta Skuja	215520	27.09
MEL - 0402	REP2	14-Aug-16	Cryptomonas erosa Ehrenberg	1200	1.39
MEL - 0402	REP2	14-Aug-16	Cryptomonas reflexa (Marsson) Skuja	600	0.4
MEL - 0402	REP2	14-Aug-16	Gymnodinium sp.	7184	3.81
MEL - 0402	REP2	14-Aug-16	Gymnodinium sp.		
MEL - 0402	REP2	14-Aug-16	Peridinium pusillum (Penard) Lemmermann	1000	2.19
MEL - 0403		14-Aug-16	Chlamydomonas spp.	3546	0.08
MEL - 0403		14-Aug-16	Oocystis lacustris Chodat	60284	1.07
MEL - 0403		14-Aug-16	Dictyosphaerium simplex Sukja	113475	0.48
MEL - 0403		14-Aug-16	Elakatothrix gelatinosa Willen	3546	0.06
MEL - 0403		14-Aug-16	Cosmarium sp.	200	0.32
MEL - 0403		14-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	3546	0.13
MEL - 0403		14-Aug-16	Collodictyon sp	3546	2.47
MEL - 0403		14-Aug-16	Small chrysophyceae	170213	1.4
MEL - 0403		14-Aug-16	Large chrysophyceae	10638	1.91
MEL - 0403		14-Aug-16	Chrysochromulina parva Lackey	92199	6.03
MEL - 0403		14-Aug-16	Chrysococcus sp.	187943	9.59
MEL - 0403		14-Aug-16	Kephyrion sp.	39007	0.36
MEL - 0403		14-Aug-16	Dinobryon sertularia Ehrenberg	200	0.4
MEL - 0403		14-Aug-16	Dinobryon sociale Ehrenberg	14184	3.21
MEL - 0403		14-Aug-16	Chrysolkos skuja (Nauwerck) Willen	3546	0.09
MEL - 0403		14-Aug-16	Uroglena volvox Ehrenberg	3546	0.4
MEL - 0403		14-Aug-16	Stichogloea spp.	28369	1.43

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0403		14-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	85106	2.4
MEL - 0403		14-Aug-16	Cyclotella stelligera Cleve and Grunow	2100	3.3
MEL - 0403		14-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	4800	4.12
MEL - 0403		14-Aug-16	Synedra acus Kutzing	400	0.04
MEL - 0403		14-Aug-16	Cyclotella michiganiana Skvortzow	88653	1.92
MEL - 0403		14-Aug-16	Diatoma elongatum Agardh	100	0.02
MEL - 0403		14-Aug-16	Cryptomonas erosa Ehrenberg	100	0.12
MEL - 0403		14-Aug-16	Katablepharis ovalis Skuja	24823	1.14
MEL - 0404		14-Aug-16	Aphanothece sp.	7184	0.25
MEL - 0404		14-Aug-16	Chlamydomonas spp.	7184	0.16
MEL - 0404		14-Aug-16	Sphaerocystis schroeteri Chodat	28736	1.28
MEL - 0404		14-Aug-16	Dictyosphaerium simplex Sukja	50288	0.21
MEL - 0404		14-Aug-16	Elakatothrix gelatinosa Willen	28736	0.41
MEL - 0404		14-Aug-16	Planctonema lauterbornii Schmidle	64656	8.13
MEL - 0404		14-Aug-16	Cosmarium sp.	200	0.48
MEL - 0404		14-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.09
MEL - 0404		14-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0404		14-Aug-16	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL - 0404		14-Aug-16	Small chrysophyceae	272992	2.81
MEL - 0404		14-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0404		14-Aug-16	Chrysochromulina parva Lackey	193968	12.69
MEL - 0404		14-Aug-16	Chrysococcus sp.	344832	22.55
MEL - 0404		14-Aug-16	Kephyrion boreale Skuja	21552	2.2
MEL - 0404		14-Aug-16	Kephyrion sp.	64656	0.59
MEL - 0404		14-Aug-16	Spiniferomonas sirrata**********	7184	0.66
MEL - 0404		14-Aug-16	Spiniferomonas sirrata**********	14368	1.32
MEL - 0404		14-Aug-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0404		14-Aug-16	Mallomonas crassisquama (Asmund) Fott	800	0.84
MEL - 0404		14-Aug-16	Dinobryon borgei Lemmermann	7184	0.39
MEL - 0404		14-Aug-16	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0404		14-Aug-16	Dinobryon bavaricum Imhof	400	1.36
MEL - 0404		14-Aug-16	Dinobryon sertularia Ehrenberg	35920	8.13
MEL - 0404		14-Aug-16	Dinobryon sertularia Ehrenberg	1400	7.12

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0404		14-Aug-16	Dinobryon sociale Ehrenberg	158048	35.75
MEL - 0404		14-Aug-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.18
MEL - 0404		14-Aug-16	Uroglena volvox Ehrenberg	50288	5.69
MEL - 0404		14-Aug-16	Chrysochromulina laurentiana Kling	79024	32.22
MEL - 0404		14-Aug-16	Stichogloea spp.	43104	2.17
MEL - 0404		14-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.13
MEL - 0404		14-Aug-16	Pteridomonas sp.	14368	3.42
MEL - 0404		14-Aug-16	Cyclotella stelligera Cleve and Grunow	3200	5.03
MEL - 0404		14-Aug-16	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL - 0404		14-Aug-16	Synedra acus Kutzing	3200	0.35
MEL - 0404		14-Aug-16	Synedra ulna (Nitzsch) Ehrenberg	200	0.48
MEL - 0404		14-Aug-16	Cyclotella michiganiana Skvortzow	50288	1.23
MEL - 0404		14-Aug-16	Cyclotella bodanica Eulenst.	600	3.72
MEL - 0404		14-Aug-16	Rhodomonas minuta Skuja	208336	26.19
MEL - 0404		14-Aug-16	Cryptomonas erosa Ehrenberg	3600	4.22
MEL - 0404		14-Aug-16	Cryptomonas reflexa (Marsson) Skuja	800	0.55
MEL - 0404		14-Aug-16	Gymnodinium sp.	200	3.12
MEL - 0404		14-Aug-16	Peridinium pusillum (Penard) Lemmermann	200	0.48
MEL - 0405		14-Aug-16	Aphanothece sp.	21552	0.75
MEL - 0405		14-Aug-16	Chlamydomonas spp.	7184	0.16
MEL - 0405		14-Aug-16	Sphaerocystis schroeteri Chodat	79024	1.23
MEL - 0405		14-Aug-16	Dictyosphaerium simplex Sukja	28736	0.12
MEL - 0405		14-Aug-16	Elakatothrix gelatinosa Willen	79024	1.24
MEL - 0405		14-Aug-16	Elakatothrix gelatinosa Willen	21552	0.34
MEL - 0405		14-Aug-16	Cosmarium sp.	600	1.12
MEL - 0405		14-Aug-16	Staurodesmus extensus (Andersson) Teiling	400	0.19
MEL - 0405		14-Aug-16	Staurodesmus bullardii G.M. Smith	400	1.12
MEL - 0405		14-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL - 0405		14-Aug-16	Botryococcus braunii Kutzing	800	0.72
MEL - 0405		14-Aug-16	Ankistrodesmus spiralis Lemmermann	7184	0.4
MEL - 0405		14-Aug-16	Small chrysophyceae	402304	5.15
MEL - 0405		14-Aug-16	Large chrysophyceae	21552	3.87
MEL - 0405		14-Aug-16	Chrysochromulina parva Lackey	150864	9.87

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0405		14-Aug-16	Chrysococcus sp.	265808	17.38
MEL - 0405		14-Aug-16	Kephyrion sp.	86208	0.79
MEL - 0405		14-Aug-16	Spiniferomonas sirrata**********	21552	1.88
MEL - 0405		14-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.2
MEL - 0405		14-Aug-16	Dinobryon borgei Lemmermann	28736	1.43
MEL - 0405		14-Aug-16	Dinobryon bavaricum Imhof	50288	11.38
MEL - 0405		14-Aug-16	Dinobryon bavaricum Imhof	200	0.4
MEL - 0405		14-Aug-16	Dinobryon sertularia Ehrenberg	7184	1.63
MEL - 0405		14-Aug-16	Dinobryon sertularia Ehrenberg	800	2.71
MEL - 0405		14-Aug-16	Dinobryon sociale Ehrenberg	150864	34.13
MEL - 0405		14-Aug-16	Dinobryon sociale Ehrenberg	200	0.25
MEL - 0405		14-Aug-16	Epiphyxis sp.	7184	0.48
MEL - 0405		14-Aug-16	Chrysolkos skuja (Nauwerck) Willen	14368	0.35
MEL - 0405		14-Aug-16	Uroglena volvox Ehrenberg	93392	10.56
MEL - 0405		14-Aug-16	Chrysochromulina laurentiana Kling	28736	12.1
MEL - 0405		14-Aug-16	Stichogloea spp.	21552	1.08
MEL - 0405		14-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.22
MEL - 0405		14-Aug-16	Pteridomonas sp.	7184	1.28
MEL - 0405		14-Aug-16	Cyclotella stelligera Cleve and Grunow	3400	6.18
MEL - 0405		14-Aug-16	Cyclotella ocellata Pant.	7184	0.55
MEL - 0405		14-Aug-16	Synedra acus Kutzing	200	0.02
MEL - 0405		14-Aug-16	Cyclotella michiganiana Skvortzow	50288	1.09
MEL - 0405		14-Aug-16	Cyclotella bodanica Eulenst.	800	4.33
MEL - 0405		14-Aug-16	Rhopalodia gibba (Ehrenberg) O. Muller	200	6.94
MEL - 0405		14-Aug-16	Rhodomonas minuta Skuja	201152	25.28
MEL - 0405		14-Aug-16	Cryptomonas erosa Ehrenberg	2000	2.27
MEL - 0405		14-Aug-16	Cryptomonas reflexa (Marsson) Skuja	200	0.13
MEL - 0405		14-Aug-16	Gymnodinium sp.	7184	2.5
MEL - 0405		14-Aug-16	Gymnodinium sp.	200	4.49
MEL - 0405		14-Aug-16	Peridinium pusillum (Penard) Lemmermann	600	1.31
MEL - 0501		16-Aug-16	Chlamydomonas spp.	21552	0.27
MEL - 0501		16-Aug-16	Sphaerocystis schroeteri Chodat	50288	0.95
MEL - 0501		16-Aug-16	Oocystis lacustris Chodat	21552	0.51

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0501		16-Aug-16	Elakatothrix gelatinosa Willen	14368	0.25
MEL - 0501		16-Aug-16	Planctonema lauterbornii Schmidle	28736	3.61
MEL - 0501		16-Aug-16	Cosmarium sp.	200	0.28
MEL - 0501		16-Aug-16	Staurodesmus extensus (Andersson) Teiling	800	0.38
MEL - 0501		16-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0501		16-Aug-16	Mougeotia sp.	600	2.64
MEL - 0501		16-Aug-16	Botryococcus braunii Kutzing	1200	1.72
MEL - 0501		16-Aug-16	Oocystis gigas Archer	200	0.48
MEL - 0501		16-Aug-16	Small chrysophyceae	581904	7.45
MEL - 0501		16-Aug-16	Large chrysophyceae	35920	13.71
MEL - 0501		16-Aug-16	Chrysochromulina parva Lackey	344832	22.55
MEL - 0501		16-Aug-16	Chrysococcus sp.	474144	31.01
MEL - 0501		16-Aug-16	Kephyrion sp.	143680	1.32
MEL - 0501		16-Aug-16	Spiniferomonas sirrata**********	21552	2.44
MEL - 0501		16-Aug-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0501		16-Aug-16	Mallomonas crassisquama (Asmund) Fott	1000	0.99
MEL - 0501		16-Aug-16	Dinobryon borgei Lemmermann	21552	1.06
MEL - 0501		16-Aug-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0501		16-Aug-16	Dinobryon bavaricum Imhof	400	0.8
MEL - 0501		16-Aug-16	Dinobryon sertularia Ehrenberg	50288	11.38
MEL - 0501		16-Aug-16	Dinobryon sertularia Ehrenberg	200	0.25
MEL - 0501		16-Aug-16	Dinobryon sertularia Ehrenberg	1000	1.99
MEL - 0501		16-Aug-16	Dinobryon sociale Ehrenberg	172416	39
MEL - 0501		16-Aug-16	Epiphyxis sp.	7184	0.54
MEL - 0501		16-Aug-16	Chrysolkos skuja (Nauwerck) Willen	21552	1.12
MEL - 0501		16-Aug-16	Uroglena volvox Ehrenberg	122128	13.81
MEL - 0501		16-Aug-16	Chrysochromulina laurentiana Kling	79024	34.37
MEL - 0501		16-Aug-16	Stichogloea spp.	43104	2.17
MEL - 0501		16-Aug-16	Pteridomonas sp.	14368	3.42
MEL - 0501		16-Aug-16	Cyclotella stelligera Cleve and Grunow	4000	7.92
MEL - 0501		16-Aug-16	Cyclotella ocellata Pant.	21552	1.45
MEL - 0501		16-Aug-16	Synedra acus Kutzing	1800	0.19
MEL - 0501		16-Aug-16	Cyclotella michiganiana Skvortzow	71840	1.56

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0501		16-Aug-16	Cyclotella bodanica Eulenst.	1800	13.89
MEL - 0501		16-Aug-16	Rhodomonas minuta Skuja	481328	60.5
MEL - 0501		16-Aug-16	Cryptomonas erosa Ehrenberg	12200	14.23
MEL - 0501		16-Aug-16	Cryptomonas reflexa (Marsson) Skuja	2800	1.92
MEL - 0501		16-Aug-16	Cryptomonas rostratiformis Skuja	2600	5.51
MEL - 0501		16-Aug-16	Gymnodinium helveticum Penard	200	4.71
MEL - 0501		16-Aug-16	Gymnodinium sp.	2200	22.67
MEL - 0501		16-Aug-16	Peridinium pusillum (Penard) Lemmermann	3200	8.68
MEL - 0501		16-Aug-16	Peridinium aciculiferum Lemmermann	200	1.81
MEL - 0502		16-Aug-16	Aphanothece sp.	7184	0.25
MEL - 0502		16-Aug-16	Chlamydomonas spp.	14368	0.27
MEL - 0502		16-Aug-16	Dictyosphaerium simplex Sukja	35920	0.15
MEL - 0502		16-Aug-16	Elakatothrix gelatinosa Willen	35920	0.51
MEL - 0502		16-Aug-16	Planctonema lauterbornii Schmidle	35920	4.52
MEL - 0502		16-Aug-16	Cosmarium sp.	200	0.37
MEL - 0502		16-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL - 0502		16-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0502		16-Aug-16	Botryococcus braunii Kutzing	200	0.18
MEL - 0502		16-Aug-16	Small chrysophyceae	488512	6.89
MEL - 0502		16-Aug-16	Large chrysophyceae	21552	3.87
MEL - 0502		16-Aug-16	Chrysochromulina parva Lackey	107760	7.05
MEL - 0502		16-Aug-16	Chrysococcus sp.	380752	22.05
MEL - 0502		16-Aug-16	Kephyrion sp.	64656	0.67
MEL - 0502		16-Aug-16	Spiniferomonas sirrata**********	21552	1.98
MEL - 0502		16-Aug-16	Dinobryon borgei Lemmermann	14368	0.65
MEL - 0502		16-Aug-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0502		16-Aug-16	Dinobryon sertularia Ehrenberg	200	0.68
MEL - 0502		16-Aug-16	Dinobryon sociale Ehrenberg	114944	26
MEL - 0502		16-Aug-16	Uroglena volvox Ehrenberg	14368	1.63
MEL - 0502		16-Aug-16	Chrysochromulina laurentiana Kling	57472	24.99
MEL - 0502		16-Aug-16	Stichogloea spp.	21552	1.08
MEL - 0502		16-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.53
MEL - 0502		16-Aug-16	Cyclotella stelligera Cleve and Grunow	2000	3.5

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0502		16-Aug-16	Fragilaria crotonensis Kitton	1200	0.38
MEL - 0502		16-Aug-16	Synedra acus Kutzing	1800	0.19
MEL - 0502		16-Aug-16	Cyclotella michiganiana Skvortzow	50288	1.23
MEL - 0502		16-Aug-16	Cyclotella bodanica Eulenst.	800	4.24
MEL - 0502		16-Aug-16	Rhodomonas minuta Skuja	251440	31.61
MEL - 0502		16-Aug-16	Cryptomonas erosa Ehrenberg	7600	8.75
MEL - 0502		16-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1400	0.93
MEL - 0502		16-Aug-16	Gymnodinium helveticum Penard	400	9.61
MEL - 0502		16-Aug-16	Gymnodinium sp.	7184	2.65
MEL - 0502		16-Aug-16	Gymnodinium sp.	1400	13.18
MEL - 0502		16-Aug-16	Peridinium pusillum (Penard) Lemmermann	1600	4.04
MEL - 0502	REP3	16-Aug-16	Chlamydomonas spp.	7184	0.14
MEL - 0502	REP3	16-Aug-16	Oocystis lacustris Chodat	43104	1.06
MEL - 0502	REP3	16-Aug-16	Elakatothrix gelatinosa Willen	114944	1.62
MEL - 0502	REP3	16-Aug-16	Cosmarium sp.	200	0.28
MEL - 0502	REP3	16-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL - 0502	REP3	16-Aug-16	Staurodesmus sp.	200	2.54
MEL - 0502	REP3	16-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0502	REP3	16-Aug-16	Botryococcus braunii Kutzing	200	0.18
MEL - 0502	REP3	16-Aug-16	Small chrysophyceae	344832	4.86
MEL - 0502	REP3	16-Aug-16	Large chrysophyceae	21552	3.87
MEL - 0502	REP3	16-Aug-16	Chrysochromulina parva Lackey	179600	11.75
MEL - 0502	REP3	16-Aug-16	Chrysococcus sp.	229888	13.31
MEL - 0502	REP3	16-Aug-16	Kephyrion sp.	43104	0.4
MEL - 0502	REP3	16-Aug-16	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL - 0502	REP3	16-Aug-16	Dinobryon borgei Lemmermann	21552	1.06
MEL - 0502	REP3	16-Aug-16	Dinobryon sertularia Ehrenberg	28736	6.5
MEL - 0502	REP3	16-Aug-16	Dinobryon sertularia Ehrenberg	1200	4.07
MEL - 0502	REP3	16-Aug-16	Dinobryon sociale Ehrenberg	237072	53.63
MEL - 0502	REP3	16-Aug-16	Uroglena volvox Ehrenberg	43104	4.88
MEL - 0502	REP3	16-Aug-16	Chrysochromulina laurentiana Kling	79024	34.37
MEL - 0502	REP3	16-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.6
MEL - 0502	REP3	16-Aug-16	Pteridomonas sp.	21552	5.3

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0502	REP3	16-Aug-16	Cyclotella stelligera Cleve and Grunow	3400	6.27
MEL - 0502	REP3	16-Aug-16	Synedra acus Kutzing	600	0.06
MEL - 0502	REP3	16-Aug-16	Synedra ulna (Nitzsch) Ehrenberg	200	0.81
MEL - 0502	REP3	16-Aug-16	Cyclotella michiganiana Skvortzow	64656	1.58
MEL - 0502	REP3	16-Aug-16	Cyclotella bodanica Eulenst.	800	4.24
MEL - 0502	REP3	16-Aug-16	Rhodomonas minuta Skuja	222704	27.99
MEL - 0502	REP3	16-Aug-16	Cryptomonas erosa Ehrenberg	5200	5.99
MEL - 0502	REP3	16-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1400	0.93
MEL - 0502	REP3	16-Aug-16	Katablepharis ovalis Skuja	7184	0.51
MEL - 0502	REP3	16-Aug-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0502	REP3	16-Aug-16	Gymnodinium sp.	600	5.72
MEL - 0502	REP3	16-Aug-16	Peridinium pusillum (Penard) Lemmermann	400	1.01
MEL - 0503		16-Aug-16	Aphanothece sp.	35920	1.83
MEL - 0503		16-Aug-16	Chlamydomonas spp.	14368	0.15
MEL - 0503		16-Aug-16	Sphaerocystis schroeteri Chodat	71840	1.01
MEL - 0503		16-Aug-16	Elakatothrix gelatinosa Willen	21552	0.37
MEL - 0503		16-Aug-16	Elakatothrix gelatinosa Willen	50288	3.16
MEL - 0503		16-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL - 0503		16-Aug-16	Staurodesmus paradoxum Meyen	500	2.04
MEL - 0503		16-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0503		16-Aug-16	Small chrysophyceae	517248	4.24
MEL - 0503		16-Aug-16	Large chrysophyceae	35920	6.45
MEL - 0503		16-Aug-16	Chrysochromulina parva Lackey	143680	9.4
MEL - 0503		16-Aug-16	Chrysococcus sp.	208336	9.29
MEL - 0503		16-Aug-16	Kephyrion sp.	79024	0.81
MEL - 0503		16-Aug-16	Spiniferomonas sirrata**********	28736	3.25
MEL - 0503		16-Aug-16	Mallomonas crassisquama (Asmund) Fott	800	0.84
MEL - 0503		16-Aug-16	Dinobryon borgei Lemmermann	28736	1.32
MEL - 0503		16-Aug-16	Dinobryon mucronutom Nygaard	14368	1.81
MEL - 0503		16-Aug-16	Dinobryon bavaricum Imhof	200	0.25
MEL - 0503		16-Aug-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0503		16-Aug-16	Dinobryon sertularia Ehrenberg	400	0.8
MEL - 0503		16-Aug-16	Dinobryon sociale Ehrenberg	208336	47.13

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0503		16-Aug-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.23
MEL - 0503		16-Aug-16	Uroglena volvox Ehrenberg	71840	8.13
MEL - 0503		16-Aug-16	Chrysochromulina laurentiana Kling	57472	24.99
MEL - 0503		16-Aug-16	Bicoeca lacustris Clark	7184	0.56
MEL - 0503		16-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43
MEL - 0503		16-Aug-16	Pteridomonas sp.	50288	12.38
MEL - 0503		16-Aug-16	Cyclotella stelligera Cleve and Grunow	1400	2.55
MEL - 0503		16-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	600	0.5
MEL - 0503		16-Aug-16	Synedra acus Kutzing	1400	0.16
MEL - 0503		16-Aug-16	Asterionella formosa Hassall	1400	0.15
MEL - 0503		16-Aug-16	Cyclotella michiganiana Skvortzow	43104	1.12
MEL - 0503		16-Aug-16	Cyclotella bodanica Eulenst.	400	2.34
MEL - 0503		16-Aug-16	Rhodomonas minuta Skuja	229888	30.05
MEL - 0503		16-Aug-16	Cryptomonas erosa Ehrenberg	4000	4.46
MEL - 0503		16-Aug-16	Cryptomonas reflexa (Marsson) Skuja	600	0.4
MEL - 0503		16-Aug-16	Katablepharis ovalis Skuja	14368	0.93
MEL - 0503		16-Aug-16	Gymnodinium sp.	800	0.82
MEL - 0503		16-Aug-16	Peridinium pusillum (Penard) Lemmermann	1000	2.53
MEL - 0504		16-Aug-16	Oocystis lacustris Chodat	7184	0.2
MEL - 0504		16-Aug-16	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL - 0504		16-Aug-16	Elakatothrix gelatinosa Willen	28736	0.45
MEL - 0504		16-Aug-16	Planctonema lauterbornii Schmidle	57472	7.22
MEL - 0504		16-Aug-16	Cosmarium sp.	400	0.56
MEL - 0504		16-Aug-16	Staurodesmus extensus (Andersson) Teiling	800	0.3
MEL - 0504		16-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL - 0504		16-Aug-16	Scourfieldia cordiformis Takeda	7184	0.17
MEL - 0504		16-Aug-16	Botryococcus braunii Kutzing	600	0.42
MEL - 0504		16-Aug-16	Small chrysophyceae	330464	6.81
MEL - 0504		16-Aug-16	Large chrysophyceae	14368	2.58
MEL - 0504		16-Aug-16	Chrysochromulina parva Lackey	172416	12.69
MEL - 0504		16-Aug-16	Chrysococcus sp.	244256	17.98
MEL - 0504		16-Aug-16	Kephyrion sp.	57472	0.9
MEL - 0504		16-Aug-16	Spiniferomonas sirrata**********	7184	1.08

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0504		16-Aug-16	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL - 0504		16-Aug-16	Dinobryon borgei Lemmermann	14368	0.78
MEL - 0504		16-Aug-16	Dinobryon mucronutom Nygaard	14368	1.77
MEL - 0504		16-Aug-16	Dinobryon bavaricum Imhof	21552	4.88
MEL - 0504		16-Aug-16	Dinobryon bavaricum Imhof	200	0.68
MEL - 0504		16-Aug-16	Dinobryon sertularia Ehrenberg	21552	4.88
MEL - 0504		16-Aug-16	Dinobryon sertularia Ehrenberg	200	1.02
MEL - 0504		16-Aug-16	Dinobryon sociale Ehrenberg	114944	26
MEL - 0504		16-Aug-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.23
MEL - 0504		16-Aug-16	Uroglena volvox Ehrenberg	107760	12.19
MEL - 0504		16-Aug-16	Chrysochromulina laurentiana Kling	28736	11.72
MEL - 0504		16-Aug-16	Stichogloea spp.	57472	2.89
MEL - 0504		16-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.17
MEL - 0504		16-Aug-16	Pteridomonas sp.	21552	5.13
MEL - 0504		16-Aug-16	Cyclotella stelligera Cleve and Grunow	3600	6.55
MEL - 0504		16-Aug-16	Cyclotella ocellata Pant.	35920	5.14
MEL - 0504		16-Aug-16	Synedra acus Kutzing	1000	0.08
MEL - 0504		16-Aug-16	Asterionella formosa Hassall	400	0.03
MEL - 0504		16-Aug-16	Cyclotella bodanica Eulenst.	800	5.85
MEL - 0504		16-Aug-16	Rhodomonas minuta Skuja	179600	25.5
MEL - 0504		16-Aug-16	Cryptomonas erosa Ehrenberg	3800	4.32
MEL - 0504		16-Aug-16	Cryptomonas reflexa (Marsson) Skuja	1200	3.02
MEL - 0504		16-Aug-16	Cryptomonas rostratiformis Skuja	600	1.19
MEL - 0504		16-Aug-16	Katablepharis ovalis Skuja	7184	0.51
MEL - 0504		16-Aug-16	Gymnodinium sp.	400	4.12
MEL - 0504		16-Aug-16	Peridinium pusillum (Penard) Lemmermann	2600	4.99
MEL - 0504	REP4	16-Aug-16	Aphanocapsa sp.	200	0.3
MEL - 0504	REP4	16-Aug-16	Oocystis lacustris Chodat	43104	1.22
MEL - 0504	REP4	16-Aug-16	Dictyosphaerium simplex Sukja	86208	0.36
MEL - 0504	REP4	16-Aug-16	Elakatothrix gelatinosa Willen	7184	0.11
MEL - 0504	REP4	16-Aug-16	Planctonema lauterbornii Schmidle	43104	5.42
MEL - 0504	REP4	16-Aug-16	Euastrum spp.	200	0.37
MEL - 0504	REP4	16-Aug-16	Staurodesmus extensus (Andersson) Teiling	200	0.08

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0504	REP4	16-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL - 0504	REP4	16-Aug-16	Small chrysophyceae	466960	9.62
MEL - 0504	REP4	16-Aug-16	Large chrysophyceae	28736	5.16
MEL - 0504	REP4	16-Aug-16	Chrysochromulina parva Lackey	57472	4.23
MEL - 0504	REP4	16-Aug-16	Chrysococcus sp.	316096	23.26
MEL - 0504	REP4	16-Aug-16	Kephyrion boreale Skuja	7184	0.66
MEL - 0504	REP4	16-Aug-16	Kephyrion sp.	64656	0.91
MEL - 0504	REP4	16-Aug-16	Spiniferomonas sirrata**********	28736	4.32
MEL - 0504	REP4	16-Aug-16	Mallomonas crassisquama (Asmund) Fott	600	0.62
MEL - 0504	REP4	16-Aug-16	Dinobryon borgei Lemmermann	14368	0.78
MEL - 0504	REP4	16-Aug-16	Dinobryon mucronutom Nygaard	21552	2.65
MEL - 0504	REP4	16-Aug-16	Dinobryon bavaricum Imhof	7184	1.63
MEL - 0504	REP4	16-Aug-16	Dinobryon bavaricum Imhof	200	0.68
MEL - 0504	REP4	16-Aug-16	Dinobryon sertularia Ehrenberg	14368	3.25
MEL - 0504	REP4	16-Aug-16	Dinobryon sertularia Ehrenberg	800	4.07
MEL - 0504	REP4	16-Aug-16	Dinobryon sociale Ehrenberg	122128	27.63
MEL - 0504	REP4	16-Aug-16	Epiphyxis sp.	7184	0.56
MEL - 0504	REP4	16-Aug-16	Chrysolkos skuja (Nauwerck) Willen	7184	0.2
MEL - 0504	REP4	16-Aug-16	Uroglena volvox Ehrenberg	193968	21.94
MEL - 0504	REP4	16-Aug-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0504	REP4	16-Aug-16	Chrysochromulina laurentiana Kling	57472	23.43
MEL - 0504	REP4	16-Aug-16	Stichogloea spp.	114944	5.78
MEL - 0504	REP4	16-Aug-16	Bicoeca lacustris Clark	7184	0.56
MEL - 0504	REP4	16-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.17
MEL - 0504	REP4	16-Aug-16	Pteridomonas sp.	14368	3.42
MEL - 0504	REP4	16-Aug-16	Cyclotella stelligera Cleve and Grunow	5000	9.09
MEL - 0504	REP4	16-Aug-16	Cyclotella ocellata Pant.	64656	9.25
MEL - 0504	REP4	16-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.62
MEL - 0504	REP4	16-Aug-16	Synedra acus Kutzing	200	0.02
MEL - 0504	REP4	16-Aug-16	Asterionella formosa Hassall	800	0.09
MEL - 0504	REP4	16-Aug-16	Cyclotella bodanica Eulenst.	1200	8.78
MEL - 0504	REP4	16-Aug-16	Rhodomonas minuta Skuja	165232	23.46
MEL - 0504	REP4	16-Aug-16	Cryptomonas erosa Ehrenberg	6200	7.04

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0504	REP4	16-Aug-16	Cryptomonas reflexa (Marsson) Skuja	2200	1.46
MEL - 0504	REP4	16-Aug-16	Cryptomonas rostratiformis Skuja	1000	1.98
MEL - 0504	REP4	16-Aug-16	Katablepharis ovalis Skuja	7184	0.51
MEL - 0504	REP4	16-Aug-16	Gymnodinium helveticum Penard	200	4.81
MEL - 0504	REP4	16-Aug-16	Gymnodinium sp.	800	8.24
MEL - 0504	REP4	16-Aug-16	Peridinium pusillum (Penard) Lemmermann	1000	1.92
MEL - 0505		16-Aug-16	Aphanothece sp.	21552	1.08
MEL - 0505		16-Aug-16	Chlamydomonas spp.	14368	0.18
MEL - 0505		16-Aug-16	Sphaerocystis schroeteri Chodat	57472	1.08
MEL - 0505		16-Aug-16	Oocystis lacustris Chodat	43104	1.03
MEL - 0505		16-Aug-16	Planctonema lauterbornii Schmidle	64656	8.13
MEL - 0505		16-Aug-16	Planctonema lauterbornii Schmidle	57472	7.94
MEL - 0505		16-Aug-16	Cosmarium sp.	200	0.07
MEL - 0505		16-Aug-16	Cosmarium sp.	200	0.28
MEL - 0505		16-Aug-16	Euastrum spp.	200	0.37
MEL - 0505		16-Aug-16	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL - 0505		16-Aug-16	Botryococcus braunii Kutzing	200	0.29
MEL - 0505		16-Aug-16	Monomastix minuta Skuja	7184	0.23
MEL - 0505		16-Aug-16	Small chrysophyceae	373568	5.27
MEL - 0505		16-Aug-16	Large chrysophyceae	50288	9.03
MEL - 0505		16-Aug-16	Chrysochromulina parva Lackey	79024	5.17
MEL - 0505		16-Aug-16	Chrysococcus sp.	158048	10.34
MEL - 0505		16-Aug-16	Kephyrion sp.	57472	0.53
MEL - 0505		16-Aug-16	Spiniferomonas sirrata**********	7184	0.81
MEL - 0505		16-Aug-16	Mallomonas caudata Ivanov	200	1.07
MEL - 0505		16-Aug-16	Mallomonas crassisquama (Asmund) Fott	800	0.78
MEL - 0505		16-Aug-16	Dinobryon borgei Lemmermann	14368	0.66
MEL - 0505		16-Aug-16	Dinobryon mucronutom Nygaard	7184	0.86
MEL - 0505		16-Aug-16	Dinobryon bavaricum Imhof	143680	32.5
MEL - 0505		16-Aug-16	Dinobryon bavaricum Imhof	14368	3.25
MEL - 0505		16-Aug-16	Dinobryon bavaricum Imhof	400	0.8
MEL - 0505		16-Aug-16	Dinobryon sertularia Ehrenberg	43104	9.75
MEL - 0505		16-Aug-16	Dinobryon sertularia Ehrenberg	400	0.8

Table 11D-4: Raw Phytoplankton Data, Meliadine Lake 2016

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL - 0505		16-Aug-16	Uroglena volvox Ehrenberg	129312	14.63
MEL - 0505		16-Aug-16	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL - 0505		16-Aug-16	Chrysochromulina laurentiana Kling	35920	15.62
MEL - 0505		16-Aug-16	Stichogloea spp.	14368	0.72
MEL - 0505		16-Aug-16	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.18
MEL - 0505		16-Aug-16	Pteridomonas sp.	21552	5.3
MEL - 0505		16-Aug-16	Cyclotella stelligera Cleve and Grunow	3200	7.55
MEL - 0505		16-Aug-16	Cyclotella ocellata Pant.	21552	1.45
MEL - 0505		16-Aug-16	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.15
MEL - 0505		16-Aug-16	Synedra acus Kutzing	600	0.06
MEL - 0505		16-Aug-16	Cyclotella michiganiana Skvortzow	35920	0.69
MEL - 0505		16-Aug-16	Cyclotella bodanica Eulenst.	600	4.63
MEL - 0505		16-Aug-16	Rhodomonas minuta Skuja	272992	34.32
MEL - 0505		16-Aug-16	Cryptomonas erosa Ehrenberg	5400	6.05
MEL - 0505		16-Aug-16	Cryptomonas reflexa (Marsson) Skuja	2400	1.59
MEL - 0505		16-Aug-16	Cryptomonas rostratiformis Skuja	1200	2.46
MEL - 0505		16-Aug-16	Gymnodinium sp.	1400	10.78
MEL - 0505		16-Aug-16	Peridinium pusillum (Penard) Lemmermann	1800	4.55

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101		16-Jul-17	Chroococcus limneticus Lemmermann	28736	0.70
MEL- 0101		16-Jul-17	Snowella sp	200	0.10
MEL- 0101		16-Jul-17	Pyramidomonas tetrarhynchus Schmarda	200	0.15
MEL- 0101		16-Jul-17	Chlamydomonas spp.	7184	0.12
MEL- 0101		16-Jul-17	Sphaerocystis schroeteri Chodat	21552	0.48
MEL- 0101		16-Jul-17	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	7184	0.50
MEL- 0101		16-Jul-17	Planctonema lauterbornii Schmidle	35920	9.03
MEL- 0101		16-Jul-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0101		16-Jul-17	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.72
MEL- 0101		16-Jul-17	Staurodesmus paradoxum Meyen	200	0.37
MEL- 0101		16-Jul-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0101		16-Jul-17	Small chrysophyceae	517248	6.62
MEL- 0101		16-Jul-17	Large chrysophyceae	158048	28.39
MEL- 0101		16-Jul-17	Chrysochromulina parva Lackey	797424	52.15
MEL- 0101		16-Jul-17	Chrysococcus sp.	287360	18.79
MEL- 0101		16-Jul-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0101		16-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0101		16-Jul-17	Kephyrion sp.	64656	1.22
MEL- 0101		16-Jul-17	Spiniferomonas sirrata**********	43104	3.55
MEL- 0101		16-Jul-17	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL- 0101		16-Jul-17	Dinobryon borgei Lemmermann	57472	2.95
MEL- 0101		16-Jul-17	Dinobryon bavaricum Imhof	136496	30.88
MEL- 0101		16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.55
MEL- 0101		16-Jul-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0101		16-Jul-17	Dinobryon sertularia Ehrenberg	4800	9.56
MEL- 0101		16-Jul-17	Dinobryon sertularia Ehrenberg	1200	4.07
MEL- 0101		16-Jul-17	Dinobryon sociale Ehrenberg	107760	24.38
MEL- 0101		16-Jul-17	Dinobryon sociale Ehrenberg	200	0.25
MEL- 0101		16-Jul-17	Epiphyxis sp.	57472	4.48
MEL- 0101		16-Jul-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.65
MEL- 0101		16-Jul-17	Uroglena volvox Ehrenberg	1796000	203.13
MEL- 0101		16-Jul-17	Chrysochromulina laurentiana Kling	93392	36.85

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101		16-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19
MEL- 0101		16-Jul-17	Cyclotella stelligera Cleve and Grunow	1000	1.82
MEL- 0101		16-Jul-17	Rhizosolenia eriense H.L. Smith	193968	15.09
MEL- 0101		16-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	7200	5.97
MEL- 0101		16-Jul-17	Synedra acus Kutzing	9000	1.04
MEL- 0101		16-Jul-17	Asterionella formosa Hassall	8000	0.80
MEL- 0101		16-Jul-17	Cyclotella michiganiana Skvortzow	64656	1.58
MEL- 0101		16-Jul-17	Rhodomonas minuta Skuja	122128	11.49
MEL- 0101		16-Jul-17	Cryptomonas erosa Ehrenberg	6200	7.48
MEL- 0101		16-Jul-17	Cryptomonas reflexa (Marsson) Skuja	600	0.44
MEL- 0101		16-Jul-17	Cryptomonas rostratiformis Skuja	800	1.81
MEL- 0101		16-Jul-17	Katablepharis ovalis Skuja	35920	2.03
MEL- 0101		16-Jul-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0101		16-Jul-17	Gymnodinium sp.	28736	10.59
MEL- 0101		16-Jul-17	Gymnodinium sp.	5200	44.09
MEL- 0101		16-Jul-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0101		16-Jul-17	Peridinium pusillum (Penard) Lemmermann	4600	9.87
MEL- 0101		16-Jul-17	Peridinium aciculiferum Lemmermann	24000	16.69
MEL- 0101		16-Jul-17	Peridinium aciculiferum Lemmermann	1000	9.05
MEL- 0101R	Recount	16-Jul-17	Chroococcus limneticus Lemmermann	57472	1.40
MEL- 0101R	Recount	16-Jul-17	Pyramidomonas tetrarhynchus Schmarda	600	0.46
MEL- 0101R	Recount	16-Jul-17	Chlamydomonas spp.	7184	0.12
MEL- 0101R	Recount	16-Jul-17	Sphaerocystis schroeteri Chodat	28736	0.64
MEL- 0101R	Recount	16-Jul-17	Oocystis lacustris Chodat	35920	1.02
MEL- 0101R	Recount	16-Jul-17	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	7184	0.50
MEL- 0101R	Recount	16-Jul-17	Elakatothrix gelatinosa Willen	14368	0.20
MEL- 0101R	Recount	16-Jul-17	Planctonema lauterbornii Schmidle	28736	7.22
MEL- 0101R	Recount	16-Jul-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0101R	Recount	16-Jul-17	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	400	0.70
MEL- 0101R	Recount	16-Jul-17	Ankistrodesmus spiralis Lemmermann	14368	0.68
MEL- 0101R	Recount	16-Jul-17	Small chrysophyceae	387936	4.97
MEL- 0101R	Recount	16-Jul-17	Large chrysophyceae	122128	21.93

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101R	Recount	16-Jul-17	Chrysochromulina parva Lackey	689664	45.10
MEL- 0101R	Recount	16-Jul-17	Chrysococcus sp.	366384	23.96
MEL- 0101R	Recount	16-Jul-17	Kephyrion sp.	86208	1.62
MEL- 0101R	Recount	16-Jul-17	Spiniferomonas sirrata**********	57472	4.74
MEL- 0101R	Recount	16-Jul-17	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL- 0101R	Recount	16-Jul-17	Dinobryon borgei Lemmermann	43104	2.21
MEL- 0101R	Recount	16-Jul-17	Dinobryon bavaricum Imhof	122128	27.63
MEL- 0101R	Recount	16-Jul-17	Dinobryon bavaricum Imhof	4200	8.36
MEL- 0101R	Recount	16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	1200	3.27
MEL- 0101R	Recount	16-Jul-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0101R	Recount	16-Jul-17	Dinobryon sertularia Ehrenberg	1600	5.42
MEL- 0101R	Recount	16-Jul-17	Dinobryon sociale Ehrenberg	122128	27.63
MEL- 0101R	Recount	16-Jul-17	Dinobryon sociale Ehrenberg	400	0.50
MEL- 0101R	Recount	16-Jul-17	Epiphyxis sp.	79024	6.16
MEL- 0101R	Recount	16-Jul-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.23
MEL- 0101R	Recount	16-Jul-17	Ochromonas sp.	14368	1.09
MEL- 0101R	Recount	16-Jul-17	Uroglena volvox Ehrenberg	1889392	213.69
MEL- 0101R	Recount	16-Jul-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0101R	Recount	16-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.38
MEL- 0101R	Recount	16-Jul-17	Cyclotella stelligera Cleve and Grunow	1800	3.27
MEL- 0101R	Recount	16-Jul-17	Rhizosolenia eriense H.L. Smith	136496	10.62
MEL- 0101R	Recount	16-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	8800	7.30
MEL- 0101R	Recount	16-Jul-17	Fragilaria crotonensis Kitton	29200	10.15
MEL- 0101R	Recount	16-Jul-17	Synedra acus Kutzing	7200	0.83
MEL- 0101R	Recount	16-Jul-17	Asterionella formosa Hassall	6200	0.62
MEL- 0101R	Recount	16-Jul-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0101R	Recount	16-Jul-17	Cyclotella bodanica Eulenst.	200	1.58
MEL- 0101R	Recount	16-Jul-17	Rhodomonas minuta Skuja	100576	9.46
MEL- 0101R	Recount	16-Jul-17	Cryptomonas erosa Ehrenberg	9200	11.10
MEL- 0101R	Recount	16-Jul-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0101R	Recount	16-Jul-17	Cryptomonas rostratiformis Skuja	800	1.81
MEL- 0101R	Recount	16-Jul-17	Katablepharis ovalis Skuja	28736	1.62

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101R	Recount	16-Jul-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0101R	Recount	16-Jul-17	Gymnodinium sp.	21552	7.94
MEL- 0101R	Recount	16-Jul-17	Gymnodinium sp.	5000	42.40
MEL- 0101R	Recount	16-Jul-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0101R	Recount	16-Jul-17	Peridinium pusillum (Penard) Lemmermann	3800	8.15
MEL- 0101R	Recount	16-Jul-17	Peridinium aciculiferum Lemmermann	2000	18.10
MEL- 0102		16-Jul-17	Chlamydomonas spp.	7184	0.11
MEL- 0102		16-Jul-17	Oocystis lacustris Chodat	43104	1.22
MEL- 0102		16-Jul-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0102		16-Jul-17	Planctonema lauterbornii Schmidle	71840	18.05
MEL- 0102		16-Jul-17	Staurodesmus paradoxum Meyen	200	0.56
MEL- 0102		16-Jul-17	Botryococcus braunii Kutzing	600	0.31
MEL- 0102		16-Jul-17	Ankistrodesmus spiralis Lemmermann	7184	0.25
MEL- 0102		16-Jul-17	Small chrysophyceae	531616	6.80
MEL- 0102		16-Jul-17	Large chrysophyceae	71840	12.90
MEL- 0102		16-Jul-17	Chrysochromulina parva Lackey	790240	51.68
MEL- 0102		16-Jul-17	Chrysococcus sp.	452592	29.60
MEL- 0102		16-Jul-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0102		16-Jul-17	Kephyrion sp.	57472	1.08
MEL- 0102		16-Jul-17	Spiniferomonas sirrata**********	50288	4.14
MEL- 0102		16-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0102		16-Jul-17	Dinobryon borgei Lemmermann	21552	1.11
MEL- 0102		16-Jul-17	Dinobryon mucronutom Nygaard	7184	0.85
MEL- 0102		16-Jul-17	Dinobryon bavaricum Imhof	136496	30.88
MEL- 0102		16-Jul-17	Dinobryon bavaricum Imhof	7200	14.34
MEL- 0102		16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.09
MEL- 0102		16-Jul-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0102		16-Jul-17	Dinobryon sociale Ehrenberg	107760	24.38
MEL- 0102		16-Jul-17	Dinobryon sociale Ehrenberg	1400	1.75
MEL- 0102		16-Jul-17	Epiphyxis sp.	21552	1.68
MEL- 0102		16-Jul-17	Chrysolkos skuja (Nauwerck) Willen	35920	1.15
MEL- 0102		16-Jul-17	Uroglena volvox Ehrenberg	1084784	122.69

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0102		16-Jul-17	Chrysochromulina laurentiana Kling	21552	8.50
MEL- 0102		16-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.16
MEL- 0102		16-Jul-17	Cyclotella stelligera Cleve and Grunow	600	1.09
MEL- 0102		16-Jul-17	Rhizosolenia eriense H.L. Smith	301728	23.47
MEL- 0102		16-Jul-17	Fragilaria crotonensis Kitton	32000	11.13
MEL- 0102		16-Jul-17	Synedra acus Kutzing	9000	1.04
MEL- 0102		16-Jul-17	Asterionella formosa Hassall	7400	0.73
MEL- 0102		16-Jul-17	Cyclotella michiganiana Skvortzow	50288	1.23
MEL- 0102		16-Jul-17	Rhodomonas minuta Skuja	129312	12.17
MEL- 0102		16-Jul-17	Cryptomonas erosa Ehrenberg	4200	4.98
MEL- 0102		16-Jul-17	Cryptomonas reflexa (Marsson) Skuja	1400	1.03
MEL- 0102		16-Jul-17	Cryptomonas rostratiformis Skuja	200	0.45
MEL- 0102		16-Jul-17	Katablepharis ovalis Skuja	71840	4.06
MEL- 0102		16-Jul-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0102		16-Jul-17	Gymnodinium sp.	1800	28.08
MEL- 0102		16-Jul-17	Peridinium willei Huitfeldt-Kaas	200	4.89
MEL- 0102		16-Jul-17	Peridinium pusillum (Penard) Lemmermann	3800	8.15
MEL- 0102		16-Jul-17	Peridinium aciculiferum Lemmermann	1400	12.67
MEL- 0103		16-Jul-17	Oocystis lacustris Chodat	21552	1.08
MEL- 0103		16-Jul-17	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.07
MEL- 0103		16-Jul-17	Planctonema lauterbornii Schmidle	28736	7.22
MEL- 0103		16-Jul-17	Euastrum spp.	200	0.37
MEL- 0103		16-Jul-17	Staurodesmus extensus (Andersson) Teiling	1200	0.49
MEL- 0103		16-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0103		16-Jul-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0103		16-Jul-17	Ankistrodesmus spiralis Lemmermann	7184	0.34
MEL- 0103		16-Jul-17	Small chrysophyceae	438224	5.61
MEL- 0103		16-Jul-17	Large chrysophyceae	43104	7.74
MEL- 0103		16-Jul-17	Chrysochromulina parva Lackey	567536	37.12
MEL- 0103		16-Jul-17	Chrysococcus sp.	136496	8.93
MEL- 0103		16-Jul-17	Kephyrion sp.	150864	2.59
MEL- 0103		16-Jul-17	Spiniferomonas sirrata**********	28736	2.37

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0103		16-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0103		16-Jul-17	Dinobryon borgei Lemmermann	28736	1.47
MEL- 0103		16-Jul-17	Dinobryon bavaricum Imhof	79024	17.88
MEL- 0103		16-Jul-17	Dinobryon bavaricum Imhof	8200	16.33
MEL- 0103		16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	35920	14.38
MEL- 0103		16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.09
MEL- 0103		16-Jul-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0103		16-Jul-17	Dinobryon sertularia Ehrenberg	1000	3.39
MEL- 0103		16-Jul-17	Dinobryon sociale Ehrenberg	79024	17.88
MEL- 0103		16-Jul-17	Dinobryon sociale Ehrenberg	2200	2.75
MEL- 0103		16-Jul-17	Epiphyxis sp.	14368	1.25
MEL- 0103		16-Jul-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.35
MEL- 0103		16-Jul-17	Ochromonas sp.	7184	0.54
MEL- 0103		16-Jul-17	Uroglena volvox Ehrenberg	1831920	207.19
MEL- 0103		16-Jul-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0103		16-Jul-17	Chrysochromulina laurentiana Kling	28736	11.34
MEL- 0103		16-Jul-17	Stichogloea spp.	28736	1.45
MEL- 0103		16-Jul-17	Cyclotella stelligera Cleve and Grunow	400	0.73
MEL- 0103		16-Jul-17	Rhizosolenia eriense H.L. Smith	172416	13.41
MEL- 0103		16-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	8800	7.30
MEL- 0103		16-Jul-17	Tabellaria flocculsa (Roth) Kutzing	800	1.03
MEL- 0103		16-Jul-17	Fragilaria crotonensis Kitton	20200	7.02
MEL- 0103		16-Jul-17	Synedra acus Kutzing	600	0.06
MEL- 0103		16-Jul-17	Synedra ulna (Nitzsch) Ehrenberg	400	0.98
MEL- 0103		16-Jul-17	Asterionella formosa Hassall	3400	0.34
MEL- 0103		16-Jul-17	Cyclotella michiganiana Skvortzow	86208	1.44
MEL- 0103		16-Jul-17	Rhodomonas minuta Skuja	150864	14.80
MEL- 0103		16-Jul-17	Cryptomonas erosa Ehrenberg	3200	3.86
MEL- 0103		16-Jul-17	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL- 0103		16-Jul-17	Cryptomonas rostratiformis Skuja	1600	0.36
MEL- 0103		16-Jul-17	Katablepharis ovalis Skuja	64656	3.65
MEL- 0103		16-Jul-17	Gymnodinium sp.	14368	4.81

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0103		16-Jul-17	Gymnodinium sp.	2800	23.74
MEL- 0103		16-Jul-17	Peridinium pusillum (Penard) Lemmermann	4800	10.29
MEL- 0103		16-Jul-17	Peridinium aciculiferum Lemmermann	1400	12.67
MEL- 0103	Rep 2	16-Jul-17	Pyramidomonas tetrarhynchus Schmarda	200	0.15
MEL- 0103	Rep 2	16-Jul-17	Chlamydomonas spp.	7184	0.17
MEL- 0103	Rep 2	16-Jul-17	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.07
MEL- 0103	Rep 2	16-Jul-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0103	Rep 2	16-Jul-17	Euastrum spp.	200	0.37
MEL- 0103	Rep 2	16-Jul-17	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL- 0103	Rep 2	16-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0103	Rep 2	16-Jul-17	Small chrysophyceae	625008	8.00
MEL- 0103	Rep 2	16-Jul-17	Large chrysophyceae	28736	5.16
MEL- 0103	Rep 2	16-Jul-17	Chrysochromulina parva Lackey	459776	30.07
MEL- 0103	Rep 2	16-Jul-17	Chrysococcus sp.	158048	10.34
MEL- 0103	Rep 2	16-Jul-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0103	Rep 2	16-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0103	Rep 2	16-Jul-17	Kephyrion sp.	122128	2.10
MEL- 0103	Rep 2	16-Jul-17	Spiniferomonas sirrata**********	14368	1.18
MEL- 0103	Rep 2	16-Jul-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0103	Rep 2	16-Jul-17	Dinobryon borgei Lemmermann	43104	2.21
MEL- 0103	Rep 2	16-Jul-17	Dinobryon bavaricum Imhof	100576	22.75
MEL- 0103	Rep 2	16-Jul-17	Dinobryon bavaricum Imhof	7000	13.94
MEL- 0103	Rep 2	16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	21552	8.63
MEL- 0103	Rep 2	16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	800	2.18
MEL- 0103	Rep 2	16-Jul-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0103	Rep 2	16-Jul-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0103	Rep 2	16-Jul-17	Dinobryon sociale Ehrenberg	136496	30.88
MEL- 0103	Rep 2	16-Jul-17	Dinobryon sociale Ehrenberg	2000	2.50
MEL- 0103	Rep 2	16-Jul-17	Epiphyxis sp.	21552	1.88
MEL- 0103	Rep 2	16-Jul-17	Chrysolkos skuja (Nauwerck) Willen	35920	0.88
MEL- 0103	Rep 2	16-Jul-17	Uroglena volvox Ehrenberg	1731344	195.82
MEL- 0103	Rep 2	16-Jul-17	Chrysochromulina laurentiana Kling	50288	19.84

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0103	Rep 2	16-Jul-17	Stichogloea spp.	14368	0.72
MEL- 0103	Rep 2	16-Jul-17	Cyclotella stelligera Cleve and Grunow	400	0.73
MEL- 0103	Rep 2	16-Jul-17	Cyclotella ocellata Pant.	14368	0.97
MEL- 0103	Rep 2	16-Jul-17	Rhizosolenia eriense H.L. Smith	150864	11.74
MEL- 0103	Rep 2	16-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	5400	4.48
MEL- 0103	Rep 2	16-Jul-17	Tabellaria flocculsa (Roth) Kutzing	600	0.77
MEL- 0103	Rep 2	16-Jul-17	Fragilaria crotonensis Kitton	22200	7.72
MEL- 0103	Rep 2	16-Jul-17	Synedra acus Kutzing	8200	0.86
MEL- 0103	Rep 2	16-Jul-17	Asterionella formosa Hassall	6000	0.60
MEL- 0103	Rep 2	16-Jul-17	Cyclotella michiganiana Skvortzow	129312	2.16
MEL- 0103	Rep 2	16-Jul-17	Rhodomonas minuta Skuja	107760	10.57
MEL- 0103	Rep 2	16-Jul-17	Cryptomonas erosa Ehrenberg	4400	5.31
MEL- 0103	Rep 2	16-Jul-17	Cryptomonas reflexa (Marsson) Skuja	400	0.29
MEL- 0103	Rep 2	16-Jul-17	Cryptomonas rostratiformis Skuja	600	1.35
MEL- 0103	Rep 2	16-Jul-17	Katablepharis ovalis Skuja	50288	2.84
MEL- 0103	Rep 2	16-Jul-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0103	Rep 2	16-Jul-17	Gymnodinium sp.	7184	2.65
MEL- 0103	Rep 2	16-Jul-17	Gymnodinium sp.	2600	22.05
MEL- 0103	Rep 2	16-Jul-17	Peridinium pusillum (Penard) Lemmermann	6400	13.73
MEL- 0103	Rep 2	16-Jul-17	Peridinium aciculiferum Lemmermann	400	3.62
MEL- 0104		16-Jul-17	Snowella sp	200	0.10
MEL- 0104		16-Jul-17	Chlamydomonas spp.	7184	0.17
MEL- 0104		16-Jul-17	Dictyosphaerium simplex Sukja	86208	0.41
MEL- 0104		16-Jul-17	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	7184	0.54
MEL- 0104		16-Jul-17	Planctonema lauterbornii Schmidle	79024	19.86
MEL- 0104		16-Jul-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0104		16-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0104		16-Jul-17	Small chrysophyceae	387936	4.97
MEL- 0104		16-Jul-17	Large chrysophyceae	100576	18.06
MEL- 0104		16-Jul-17	Chrysochromulina parva Lackey	811792	53.09
MEL- 0104		16-Jul-17	Chrysococcus sp.	193968	12.69
MEL- 0104		16-Jul-17	Kephyrion boreale Skuja	7184	0.85

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0104		16-Jul-17	Kephyrion sp.	114944	1.98
MEL- 0104		16-Jul-17	Spiniferomonas sirrata**********	28736	2.64
MEL- 0104		16-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0104		16-Jul-17	Dinobryon borgei Lemmermann	64656	3.32
MEL- 0104		16-Jul-17	Dinobryon bavaricum Imhof	57472	13.00
MEL- 0104		16-Jul-17	Dinobryon bavaricum Imhof	7200	14.34
MEL- 0104		16-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.88
MEL- 0104		16-Jul-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0104		16-Jul-17	Dinobryon sociale Ehrenberg	165232	37.38
MEL- 0104		16-Jul-17	Dinobryon sociale Ehrenberg	1400	1.75
MEL- 0104		16-Jul-17	Epiphyxis sp.	64656	4.93
MEL- 0104		16-Jul-17	Chrysolkos skuja (Nauwerck) Willen	35920	1.04
MEL- 0104		16-Jul-17	Uroglena volvox Ehrenberg	1558928	176.31
MEL- 0104		16-Jul-17	Chrysochromulina laurentiana Kling	122128	48.19
MEL- 0104		16-Jul-17	Cyclotella stelligera Cleve and Grunow	1600	2.91
MEL- 0104		16-Jul-17	Rhizosolenia eriense H.L. Smith	215520	16.77
MEL- 0104		16-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	5400	4.48
MEL- 0104		16-Jul-17	Tabellaria flocculsa (Roth) Kutzing	400	0.53
MEL- 0104		16-Jul-17	Fragilaria crotonensis Kitton	23200	8.07
MEL- 0104		16-Jul-17	Synedra acus Kutzing	3600	0.38
MEL- 0104		16-Jul-17	Synedra ulna (Nitzsch) Ehrenberg	200	0.48
MEL- 0104		16-Jul-17	Asterionella formosa Hassall	8400	0.84
MEL- 0104		16-Jul-17	Cyclotella michiganiana Skvortzow	57472	1.10
MEL- 0104		16-Jul-17	Rhodomonas minuta Skuja	64656	6.34
MEL- 0104		16-Jul-17	Cryptomonas erosa Ehrenberg	5800	7.00
MEL- 0104		16-Jul-17	Cryptomonas ovata Ehrenberg	200	0.90
MEL- 0104		16-Jul-17	Cryptomonas reflexa (Marsson) Skuja	1000	0.66
MEL- 0104		16-Jul-17	Cryptomonas rostratiformis Skuja	1400	2.87
MEL- 0104		16-Jul-17	Katablepharis ovalis Skuja	71840	4.06
MEL- 0104		16-Jul-17	Gymnodinium helveticum Penard	400	9.42
MEL- 0104		16-Jul-17	Gymnodinium sp.	3000	25.44
MEL- 0104		16-Jul-17	Peridinium willei Huitfeldt-Kaas	200	4.89

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0104		16-Jul-17	Peridinium pusillum (Penard) Lemmermann	4600	9.87
MEL- 0104		16-Jul-17	Peridinium aciculiferum Lemmermann	600	5.43
MEL- 0105		16-Jul-17	Aphanocapsa sp.	200	0.24
MEL- 0105		16-Jul-17	Snowella sp	400	0.30
MEL- 0105		16-Jul-17	Dictyosphaerium simplex Sukja	71840	0.34
MEL- 0105		16-Jul-17	Monoraphidium komarkovae (Nyg.) Komarkova-Legnerova	14368	1.00
MEL- 0105		16-Jul-17	Planctonema lauterbornii Schmidle	57472	14.44
MEL- 0105		16-Jul-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0105		16-Jul-17	Small chrysophyceae	610640	7.82
MEL- 0105		16-Jul-17	Large chrysophyceae	50288	9.03
MEL- 0105		16-Jul-17	Chrysochromulina parva Lackey	639376	41.82
MEL- 0105		16-Jul-17	Chrysococcus sp.	193968	12.69
MEL- 0105		16-Jul-17	Chrysostephanospaera globulifera Scherffel	14368	4.78
MEL- 0105		16-Jul-17	Kephyrion sp.	50288	0.86
MEL- 0105		16-Jul-17	Spiniferomonas sirrata**********	50288	4.38
MEL- 0105		16-Jul-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0105		16-Jul-17	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL- 0105		16-Jul-17	Dinobryon borgei Lemmermann	50288	2.58
MEL- 0105		16-Jul-17	Dinobryon bavaricum Imhof	79024	17.88
MEL- 0105		16-Jul-17	Dinobryon bavaricum Imhof	3600	7.17
MEL- 0105		16-Jul-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0105		16-Jul-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0105		16-Jul-17	Dinobryon sociale Ehrenberg	136496	30.88
MEL- 0105		16-Jul-17	Dinobryon sociale Ehrenberg	1200	1.50
MEL- 0105		16-Jul-17	Epiphyxis sp.	7184	0.54
MEL- 0105		16-Jul-17	Chrysolkos skuja (Nauwerck) Willen	100576	3.02
MEL- 0105		16-Jul-17	Uroglena volvox Ehrenberg	1587664	179.56
MEL- 0105		16-Jul-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0105		16-Jul-17	Pteridomonas sp.	7184	1.71
MEL- 0105		16-Jul-17	Cyclotella stelligera Cleve and Grunow	600	1.09
MEL- 0105		16-Jul-17	Cyclotella ocellata Pant.	21552	2.17
MEL- 0105		16-Jul-17	Rhizosolenia eriense H.L. Smith	258624	20.12

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0105		16-Jul-17	Tabellaria flocculsa (Roth) Kutzing	400	0.51
MEL- 0105		16-Jul-17	Fragilaria crotonensis Kitton	20000	6.87
MEL- 0105		16-Jul-17	Synedra acus Kutzing	4600	0.48
MEL- 0105		16-Jul-17	Asterionella formosa Hassall	3200	0.31
MEL- 0105		16-Jul-17	Cyclotella michiganiana Skvortzow	43104	0.82
MEL- 0105		16-Jul-17	Rhodomonas minuta Skuja	71840	7.05
MEL- 0105		16-Jul-17	Cryptomonas erosa Ehrenberg	2400	2.90
MEL- 0105		16-Jul-17	Cryptomonas reflexa (Marsson) Skuja	1600	1.06
MEL- 0105		16-Jul-17	Cryptomonas rostratiformis Skuja	400	0.82
MEL- 0105		16-Jul-17	Katablepharis ovalis Skuja	43104	2.44
MEL- 0105		16-Jul-17	Gymnodinium helveticum Penard	600	14.14
MEL- 0105		16-Jul-17	Gymnodinium sp.	3000	26.35
MEL- 0105		16-Jul-17	Peridinium willei Huitfeldt-Kaas	200	5.30
MEL- 0105		16-Jul-17	Peridinium pusillum (Penard) Lemmermann	2800	6.01
MEL- 0105		16-Jul-17	Peridinium aciculiferum Lemmermann	600	5.43
MEL- 0301		21-Jul-17	Oocystis lacustris Chodat	7184	0.20
MEL- 0301		21-Jul-17	Paulschulzia pseudovolvox (Schulz and Teiling) Skuja	200	0.70
MEL- 0301		21-Jul-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0301		21-Jul-17	Staurodesmus paradoxum Meyen	200	0.82
MEL- 0301		21-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0301		21-Jul-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0301		21-Jul-17	Small chrysophyceae	244256	1.56
MEL- 0301		21-Jul-17	Large chrysophyceae	21552	3.87
MEL- 0301		21-Jul-17	Chrysochromulina parva Lackey	359200	23.49
MEL- 0301		21-Jul-17	Chrysococcus sp.	229888	15.03
MEL- 0301		21-Jul-17	Chrysostephanospaera globulifera Scherffel	14368	5.13
MEL- 0301		21-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0301		21-Jul-17	Kephyrion sp.	136496	2.35
MEL- 0301		21-Jul-17	Spiniferomonas sirrata**********	14368	1.25
MEL- 0301		21-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0301		21-Jul-17	Dinobryon borgei Lemmermann	86208	4.42
MEL- 0301		21-Jul-17	Dinobryon mucronutom Nygaard	21552	2.77

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0301		21-Jul-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0301		21-Jul-17	Dinobryon sertularia Ehrenberg	57472	13.00
MEL- 0301		21-Jul-17	Dinobryon sertularia Ehrenberg	1400	2.79
MEL- 0301		21-Jul-17	Dinobryon sociale Ehrenberg	107760	24.38
MEL- 0301		21-Jul-17	Epiphyxis sp.	7184	0.55
MEL- 0301		21-Jul-17	Chrysolkos skuja (Nauwerck) Willen	57472	1.49
MEL- 0301		21-Jul-17	Uroglena volvox Ehrenberg	488512	55.25
MEL- 0301		21-Jul-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0301		21-Jul-17	Stichogloea spp.	14368	0.72
MEL- 0301		21-Jul-17	Cyclotella stelligera Cleve and Grunow	1200	2.18
MEL- 0301		21-Jul-17	Cyclotella ocellata Pant.	14368	1.44
MEL- 0301		21-Jul-17	Rhizosolenia eriense H.L. Smith	21552	1.68
MEL- 0301		21-Jul-17	Fragilaria crotonensis Kitton	400	0.13
MEL- 0301		21-Jul-17	Synedra acus Kutzing	1000	0.10
MEL- 0301		21-Jul-17	Cyclotella michiganiana Skvortzow	57472	1.10
MEL- 0301		21-Jul-17	Cyclotella bodanica Eulenst.	200	1.17
MEL- 0301		21-Jul-17	Rhodomonas minuta Skuja	79024	7.18
MEL- 0301		21-Jul-17	Cryptomonas erosa Ehrenberg	1800	2.20
MEL- 0301		21-Jul-17	Cryptomonas reflexa (Marsson) Skuja	200	0.14
MEL- 0301		21-Jul-17	Cryptomonas rostratiformis Skuja	400	0.85
MEL- 0301		21-Jul-17	Katablepharis ovalis Skuja	7184	0.41
MEL- 0301		21-Jul-17	Gymnodinium sp.	1000	5.73
MEL- 0301		21-Jul-17	Peridinium pusillum (Penard) Lemmermann	400	0.96
MEL- 0301	Rep 2	21-Jul-17	Oocystis lacustris Chodat	14368	0.41
MEL- 0301	Rep 2	21-Jul-17	Elakatothrix gelatinosa Willen	28736	0.50
MEL- 0301	Rep 2	21-Jul-17	Planctonema lauterbornii Schmidle	7184	1.81
MEL- 0301	Rep 2	21-Jul-17	Cosmarium sp.	200	0.28
MEL- 0301	Rep 2	21-Jul-17	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL- 0301	Rep 2	21-Jul-17	Staurodesmus paradoxum Meyen	200	0.58
MEL- 0301	Rep 2	21-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0301	Rep 2	21-Jul-17	Oocystis gigas Archer	200	0.48
MEL- 0301	Rep 2	21-Jul-17	Small chrysophyceae	280176	1.79

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0301	Rep 2	21-Jul-17	Large chrysophyceae	7184	1.29
MEL- 0301	Rep 2	21-Jul-17	Chrysochromulina parva Lackey	258624	16.91
MEL- 0301	Rep 2	21-Jul-17	Chrysococcus sp.	222704	14.56
MEL- 0301	Rep 2	21-Jul-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0301	Rep 2	21-Jul-17	Kephyrion sp.	150864	2.59
MEL- 0301	Rep 2	21-Jul-17	Spiniferomonas sirrata**********	7184	0.63
MEL- 0301	Rep 2	21-Jul-17	Dinobryon borgei Lemmermann	71840	3.69
MEL- 0301	Rep 2	21-Jul-17	Dinobryon mucronutom Nygaard	7184	0.93
MEL- 0301	Rep 2	21-Jul-17	Dinobryon bavaricum Imhof	400	0.50
MEL- 0301	Rep 2	21-Jul-17	Dinobryon sertularia Ehrenberg	50288	11.38
MEL- 0301	Rep 2	21-Jul-17	Dinobryon sertularia Ehrenberg	1200	4.07
MEL- 0301	Rep 2	21-Jul-17	Dinobryon sociale Ehrenberg	100576	22.75
MEL- 0301	Rep 2	21-Jul-17	Epiphyxis sp.	7184	0.55
MEL- 0301	Rep 2	21-Jul-17	Chrysolkos skuja (Nauwerck) Willen	71840	1.86
MEL- 0301	Rep 2	21-Jul-17	Uroglena volvox Ehrenberg	373568	42.25
MEL- 0301	Rep 2	21-Jul-17	Chrysochromulina laurentiana Kling	50288	19.84
MEL- 0301	Rep 2	21-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19
MEL- 0301	Rep 2	21-Jul-17	Cyclotella stelligera Cleve and Grunow	800	1.45
MEL- 0301	Rep 2	21-Jul-17	Cyclotella ocellata Pant.	28736	2.89
MEL- 0301	Rep 2	21-Jul-17	Rhizosolenia eriense H.L. Smith	43104	3.35
MEL- 0301	Rep 2	21-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	1600	1.24
MEL- 0301	Rep 2	21-Jul-17	Synedra acus Kutzing	400	0.04
MEL- 0301	Rep 2	21-Jul-17	Cyclotella michiganiana Skvortzow	43104	0.82
MEL- 0301	Rep 2	21-Jul-17	Rhodomonas minuta Skuja	64656	5.87
MEL- 0301	Rep 2	21-Jul-17	Cryptomonas erosa Ehrenberg	2600	3.18
MEL- 0301	Rep 2	21-Jul-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0301	Rep 2	21-Jul-17	Katablepharis ovalis Skuja	21552	1.22
MEL- 0301	Rep 2	21-Jul-17	Gymnodinium sp.	2800	16.04
MEL- 0301	Rep 2	21-Jul-17	Peridinium pusillum (Penard) Lemmermann	600	1.44
MEL- 0302		21-Jul-17	Oocystis lacustris Chodat	21552	1.08
MEL- 0302		21-Jul-17	Paulschulzia pseudovolvox (Schulz and Teiling) Skuja	200	0.70
MEL- 0302		21-Jul-17	Elakatothrix gelatinosa Willen	14368	0.25

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0302		21-Jul-17	Planctonema lauterbornii Schmidle	7184	1.63
MEL- 0302		21-Jul-17	Cosmarium sp.	200	1.14
MEL- 0302		21-Jul-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0302		21-Jul-17	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL- 0302		21-Jul-17	Small chrysophyceae	301728	2.17
MEL- 0302		21-Jul-17	Large chrysophyceae	7184	1.29
MEL- 0302		21-Jul-17	Chrysochromulina parva Lackey	208336	13.63
MEL- 0302		21-Jul-17	Chrysococcus sp.	265808	17.38
MEL- 0302		21-Jul-17	Kephyrion boreale Skuja	14368	1.71
MEL- 0302		21-Jul-17	Kephyrion sp.	107760	1.68
MEL- 0302		21-Jul-17	Dinobryon borgei Lemmermann	93392	4.79
MEL- 0302		21-Jul-17	Dinobryon mucronutom Nygaard	7184	0.93
MEL- 0302		21-Jul-17	Dinobryon bavaricum Imhof	400	0.50
MEL- 0302		21-Jul-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0302		21-Jul-17	Dinobryon sertularia Ehrenberg	1600	5.42
MEL- 0302		21-Jul-17	Dinobryon sociale Ehrenberg	100576	22.75
MEL- 0302		21-Jul-17	Chrysolkos skuja (Nauwerck) Willen	71840	1.76
MEL- 0302		21-Jul-17	Uroglena volvox Ehrenberg	524432	59.31
MEL- 0302		21-Jul-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0302		21-Jul-17	Cyclotella stelligera Cleve and Grunow	200	0.36
MEL- 0302		21-Jul-17	Cyclotella ocellata Pant.	21552	2.17
MEL- 0302		21-Jul-17	Rhizosolenia eriense H.L. Smith	28736	2.24
MEL- 0302		21-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	4800	3.80
MEL- 0302		21-Jul-17	Fragilaria crotonensis Kitton	600	0.20
MEL- 0302		21-Jul-17	Synedra acus Kutzing	800	0.08
MEL- 0302		21-Jul-17	Asterionella formosa Hassall	2400	0.24
MEL- 0302		21-Jul-17	Cyclotella michiganiana Skvortzow	35920	0.83
MEL- 0302		21-Jul-17	Rhodomonas minuta Skuja	143680	13.05
MEL- 0302		21-Jul-17	Cryptomonas erosa Ehrenberg	1400	1.70
MEL- 0302		21-Jul-17	Cryptomonas rostratiformis Skuja	200	0.45
MEL- 0302		21-Jul-17	Katablepharis ovalis Skuja	7184	0.42
MEL- 0302		21-Jul-17	Gymnodinium sp.	1000	6.37

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0302		21-Jul-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0302		21-Jul-17	Peridinium pusillum (Penard) Lemmermann	2000	4.37
MEL- 0302		21-Jul-17	Peridinium aciculiferum Lemmermann	600	5.43
MEL- 0303		21-Jul-17	Planktolyngbya limnetica	200	0.03
MEL- 0303		21-Jul-17	Snowella sp	400	0.31
MEL- 0303		21-Jul-17	Oocystis lacustris Chodat	14368	0.37
MEL- 0303		21-Jul-17	Elakatothrix gelatinosa Willen	7184	0.12
MEL- 0303		21-Jul-17	Planctonema lauterbornii Schmidle	7184	1.63
MEL- 0303		21-Jul-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0303		21-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0303		21-Jul-17	Mougeotia sp.	400	1.32
MEL- 0303		21-Jul-17	Small chrysophyceae	280176	1.79
MEL- 0303		21-Jul-17	Large chrysophyceae	7184	1.29
MEL- 0303		21-Jul-17	Chrysochromulina parva Lackey	402304	26.31
MEL- 0303		21-Jul-17	Chrysococcus sp.	244256	15.97
MEL- 0303		21-Jul-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0303		21-Jul-17	Kephyrion boreale Skuja	21552	2.69
MEL- 0303		21-Jul-17	Kephyrion sp.	158048	2.72
MEL- 0303		21-Jul-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0303		21-Jul-17	Dinobryon borgei Lemmermann	71840	5.15
MEL- 0303		21-Jul-17	Dinobryon bavaricum Imhof	600	2.03
MEL- 0303		21-Jul-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0303		21-Jul-17	Dinobryon sertularia Ehrenberg	1200	4.07
MEL- 0303		21-Jul-17	Dinobryon sociale Ehrenberg	150864	34.13
MEL- 0303		21-Jul-17	Chrysolkos skuja (Nauwerck) Willen	93392	2.47
MEL- 0303		21-Jul-17	Uroglena volvox Ehrenberg	675296	76.38
MEL- 0303		21-Jul-17	Chrysochromulina laurentiana Kling	35920	14.17
MEL- 0303		21-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.37
MEL- 0303		21-Jul-17	Cyclotella stelligera Cleve and Grunow	1000	1.57
MEL- 0303		21-Jul-17	Cyclotella ocellata Pant.	28736	3.23
MEL- 0303		21-Jul-17	Rhizosolenia eriense H.L. Smith	21552	1.37
MEL- 0303		21-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.15

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0303		21-Jul-17	Fragilaria crotonensis Kitton	800	0.27
MEL- 0303		21-Jul-17	Synedra acus Kutzing	800	0.08
MEL- 0303		21-Jul-17	Cyclotella michiganiana Skvortzow	79024	1.51
MEL- 0303		21-Jul-17	Rhodomonas minuta Skuja	129312	11.74
MEL- 0303		21-Jul-17	Cryptomonas erosa Ehrenberg	1400	1.71
MEL- 0303		21-Jul-17	Cryptomonas reflexa (Marsson) Skuja	400	0.28
MEL- 0303		21-Jul-17	Cryptomonas rostratiformis Skuja	1000	2.12
MEL- 0303		21-Jul-17	Katablepharis ovalis Skuja	7184	0.41
MEL- 0303		21-Jul-17	Gymnodinium sp.	1200	7.25
MEL- 0303		21-Jul-17	Peridinium willei Huitfeldt-Kaas	200	4.89
MEL- 0303		21-Jul-17	Peridinium pusillum (Penard) Lemmermann	1200	2.87
MEL- 0304		21-Jul-17	Oocystis lacustris Chodat	7184	0.19
MEL- 0304		21-Jul-17	Planctonema lauterbornii Schmidle	7184	1.63
MEL- 0304		21-Jul-17	Cosmarium sp.	400	0.56
MEL- 0304		21-Jul-17	Staurodesmus extensus (Andersson) Teiling	600	0.22
MEL- 0304		21-Jul-17	Staurodesmus paradoxum Meyen	200	0.82
MEL- 0304		21-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL- 0304		21-Jul-17	Botryococcus braunii Kutzing	600	0.42
MEL- 0304		21-Jul-17	Small chrysophyceae	466960	2.99
MEL- 0304		21-Jul-17	Large chrysophyceae	7184	1.29
MEL- 0304		21-Jul-17	Chrysochromulina parva Lackey	452592	29.60
MEL- 0304		21-Jul-17	Chrysococcus sp.	272992	17.85
MEL- 0304		21-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0304		21-Jul-17	Kephyrion sp.	122128	2.52
MEL- 0304		21-Jul-17	Spiniferomonas sirrata**********	14368	1.63
MEL- 0304		21-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0304		21-Jul-17	Dinobryon borgei Lemmermann	100576	4.86
MEL- 0304		21-Jul-17	Dinobryon mucronutom Nygaard	14368	1.81
MEL- 0304		21-Jul-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0304		21-Jul-17	Dinobryon sertularia Ehrenberg	1200	4.07
MEL- 0304		21-Jul-17	Dinobryon sociale Ehrenberg	57472	13.00
MEL- 0304		21-Jul-17	Chrysolkos skuja (Nauwerck) Willen	93392	2.47

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0304		21-Jul-17	Uroglena volvox Ehrenberg	560352	63.38
MEL- 0304		21-Jul-17	Uroglena volvox Ehrenberg	200	2.32
MEL- 0304		21-Jul-17	Chrysochromulina laurentiana Kling	71840	28.35
MEL- 0304		21-Jul-17	Stichogloea spp.	14368	0.72
MEL- 0304		21-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.74
MEL- 0304		21-Jul-17	Cyclotella stelligera Cleve and Grunow	800	1.45
MEL- 0304		21-Jul-17	Rhizosolenia eriense H.L. Smith	35920	2.28
MEL- 0304		21-Jul-17	Fragilaria crotonensis Kitton	600	0.20
MEL- 0304		21-Jul-17	Synedra acus Kutzing	800	0.09
MEL- 0304		21-Jul-17	Asterionella formosa Hassall	800	0.08
MEL- 0304		21-Jul-17	Cyclotella michiganiana Skvortzow	28736	0.55
MEL- 0304		21-Jul-17	Rhodomonas minuta Skuja	50288	4.57
MEL- 0304		21-Jul-17	Cryptomonas erosa Ehrenberg	1800	2.19
MEL- 0304		21-Jul-17	Cryptomonas reflexa (Marsson) Skuja	600	0.42
MEL- 0304		21-Jul-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0304		21-Jul-17	Katablepharis ovalis Skuja	7184	0.41
MEL- 0304		21-Jul-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0304		21-Jul-17	Gymnodinium sp.	7184	2.65
MEL- 0304		21-Jul-17	Gymnodinium sp.	1600	8.10
MEL- 0304		21-Jul-17	Peridinium pusillum (Penard) Lemmermann	2000	4.97
MEL- 0304		21-Jul-17	Peridinium aciculiferum Lemmermann	200	1.81
MEL- 0304R	Recount	21-Jul-17	Oocystis lacustris Chodat	21552	0.57
MEL- 0304R	Recount	21-Jul-17	Dictyosphaerium simplex Sukja	28736	0.12
MEL- 0304R	Recount	21-Jul-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0304R	Recount	21-Jul-17	Euastrum spp.	400	0.74
MEL- 0304R	Recount	21-Jul-17	Staurodesmus extensus (Andersson) Teiling	800	0.30
MEL- 0304R	Recount	21-Jul-17	Staurodesmus paradoxum Meyen	200	0.82
MEL- 0304R	Recount	21-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0304R	Recount	21-Jul-17	Botryococcus braunii Kutzing	200	0.14
MEL- 0304R	Recount	21-Jul-17	Small chrysophyceae	294544	1.89
MEL- 0304R	Recount	21-Jul-17	Chrysochromulina parva Lackey	510064	33.36
MEL- 0304R	Recount	21-Jul-17	Chrysococcus sp.	208336	13.63

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0304R	Recount	21-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0304R	Recount	21-Jul-17	Kephyrion sp.	86208	1.78
MEL- 0304R	Recount	21-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0304R	Recount	21-Jul-17	Synura sphagnicola Korschikow	200	3.11
MEL- 0304R	Recount	21-Jul-17	Dinobryon borgei Lemmermann	122128	5.90
MEL- 0304R	Recount	21-Jul-17	Dinobryon mucronutom Nygaard	21552	2.71
MEL- 0304R	Recount	21-Jul-17	Dinobryon bavaricum Imhof	28736	6.50
MEL- 0304R	Recount	21-Jul-17	Dinobryon bavaricum Imhof	7184	1.63
MEL- 0304R	Recount	21-Jul-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0304R	Recount	21-Jul-17	Dinobryon sertularia Ehrenberg	800	2.71
MEL- 0304R	Recount	21-Jul-17	Dinobryon sociale Ehrenberg	50288	11.38
MEL- 0304R	Recount	21-Jul-17	Chrysolkos skuja (Nauwerck) Willen	114944	3.03
MEL- 0304R	Recount	21-Jul-17	Uroglena volvox Ehrenberg	617824	69.88
MEL- 0304R	Recount	21-Jul-17	Uroglena volvox Ehrenberg	600	6.96
MEL- 0304R	Recount	21-Jul-17	Chrysochromulina laurentiana Kling	57472	22.68
MEL- 0304R	Recount	21-Jul-17	Stichogloea spp.	28736	1.45
MEL- 0304R	Recount	21-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.37
MEL- 0304R	Recount	21-Jul-17	Cyclotella stelligera Cleve and Grunow	1200	2.18
MEL- 0304R	Recount	21-Jul-17	Rhizosolenia eriense H.L. Smith	28736	1.83
MEL- 0304R	Recount	21-Jul-17	Tabellaria flocculsa (Roth) Kutzing	600	0.80
MEL- 0304R	Recount	21-Jul-17	Fragilaria crotonensis Kitton	400	0.13
MEL- 0304R	Recount	21-Jul-17	Synedra acus Kutzing	1400	0.16
MEL- 0304R	Recount	21-Jul-17	Asterionella formosa Hassall	1600	0.16
MEL- 0304R	Recount	21-Jul-17	Cyclotella michiganiana Skvortzow	7184	0.14
MEL- 0304R	Recount	21-Jul-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0304R	Recount	21-Jul-17	Rhodomonas minuta Skuja	86208	7.83
MEL- 0304R	Recount	21-Jul-17	Cryptomonas erosa Ehrenberg	2400	2.92
MEL- 0304R	Recount	21-Jul-17	Cryptomonas reflexa (Marsson) Skuja	400	0.28
MEL- 0304R	Recount	21-Jul-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0304R	Recount	21-Jul-17	Katablepharis ovalis Skuja	21552	1.22
MEL- 0304R	Recount	21-Jul-17	Gymnodinium sp.	1200	6.07
MEL- 0304R	Recount	21-Jul-17	Peridinium pusillum (Penard) Lemmermann	1200	2.98

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305		21-Jul-17	Planktolyngbya limnetica	200	0.04
MEL- 0305		21-Jul-17	Elakatothrix gelatinosa Willen	14368	0.25
MEL- 0305		21-Jul-17	Cosmarium sp.	600	0.84
MEL- 0305		21-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0305		21-Jul-17	Oocystis gigas Archer	200	0.48
MEL- 0305		21-Jul-17	Small chrysophyceae	474144	3.03
MEL- 0305		21-Jul-17	Large chrysophyceae	35920	6.45
MEL- 0305		21-Jul-17	Chrysochromulina parva Lackey	272992	17.85
MEL- 0305		21-Jul-17	Chrysococcus sp.	165232	10.81
MEL- 0305		21-Jul-17	Kephyrion sp.	28736	0.45
MEL- 0305		21-Jul-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0305		21-Jul-17	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL- 0305		21-Jul-17	Dinobryon borgei Lemmermann	93392	4.79
MEL- 0305		21-Jul-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0305		21-Jul-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0305		21-Jul-17	Dinobryon sertularia Ehrenberg	2200	11.19
MEL- 0305		21-Jul-17	Dinobryon sociale Ehrenberg	107760	24.38
MEL- 0305		21-Jul-17	Chrysolkos skuja (Nauwerck) Willen	71840	1.90
MEL- 0305		21-Jul-17	Uroglena volvox Ehrenberg	754320	85.31
MEL- 0305		21-Jul-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0305		21-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.56
MEL- 0305		21-Jul-17	Cyclotella stelligera Cleve and Grunow	200	0.31
MEL- 0305		21-Jul-17	Cyclotella ocellata Pant.	14368	1.92
MEL- 0305		21-Jul-17	Rhizosolenia eriense H.L. Smith	71840	4.57
MEL- 0305		21-Jul-17	Fragilaria crotonensis Kitton	200	0.07
MEL- 0305		21-Jul-17	Synedra acus Kutzing	1400	0.15
MEL- 0305		21-Jul-17	Cyclotella michiganiana Skvortzow	57472	1.10
MEL- 0305		21-Jul-17	Rhodomonas minuta Skuja	71840	6.52
MEL- 0305		21-Jul-17	Cryptomonas erosa Ehrenberg	800	0.97
MEL- 0305		21-Jul-17	Cryptomonas reflexa (Marsson) Skuja	400	0.28
MEL- 0305		21-Jul-17	Cryptomonas rostratiformis Skuja	400	0.85
MEL- 0305		21-Jul-17	Katablepharis ovalis Skuja	35920	2.03

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305		21-Jul-17	Gymnodinium sp.	600	3.35
MEL- 0305		21-Jul-17	Peridinium pusillum (Penard) Lemmermann	2400	5.54
MEL- 0201		23-Jul-17	Pyramidomonas tetrarhynchus Schmarda	200	0.11
MEL- 0201		23-Jul-17	Elakatothrix gelatinosa Willen	21552	0.37
MEL- 0201		23-Jul-17	Planctonema lauterbornii Schmidle	21552	5.42
MEL- 0201		23-Jul-17	Cosmarium sp.	200	2.23
MEL- 0201		23-Jul-17	Euastrum spp.	600	1.12
MEL- 0201		23-Jul-17	Staurodesmus extensus (Andersson) Teiling	600	0.25
MEL- 0201		23-Jul-17	Staurodesmus paradoxum Meyen	200	0.55
MEL- 0201		23-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL- 0201		23-Jul-17	Oocystis gigas Archer	200	0.48
MEL- 0201		23-Jul-17	Small chrysophyceae	352016	4.51
MEL- 0201		23-Jul-17	Large chrysophyceae	14368	2.58
MEL- 0201		23-Jul-17	Chrysochromulina parva Lackey	193968	12.69
MEL- 0201		23-Jul-17	Chrysococcus sp.	215520	14.10
MEL- 0201		23-Jul-17	Kephyrion sp.	100576	1.73
MEL- 0201		23-Jul-17	Spiniferomonas sirrata**********	14368	1.79
MEL- 0201		23-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0201		23-Jul-17	Dinobryon borgei Lemmermann	28736	1.47
MEL- 0201		23-Jul-17	Dinobryon mucronutom Nygaard	43104	5.64
MEL- 0201		23-Jul-17	Dinobryon bavaricum Imhof	7184	1.63
MEL- 0201		23-Jul-17	Dinobryon bavaricum Imhof	2400	8.14
MEL- 0201		23-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	5.90
MEL- 0201		23-Jul-17	Dinobryon sertularia Ehrenberg	43104	9.75
MEL- 0201		23-Jul-17	Dinobryon sertularia Ehrenberg	1000	5.09
MEL- 0201		23-Jul-17	Dinobryon sociale Ehrenberg	114944	26.00
MEL- 0201		23-Jul-17	Dinobryon sociale Ehrenberg	200	0.40
MEL- 0201		23-Jul-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.65
MEL- 0201		23-Jul-17	Uroglena volvox Ehrenberg	531616	60.13
MEL- 0201		23-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	35920	0.93
MEL- 0201		23-Jul-17	Chrysolykos anulatus	79024	31.18
MEL- 0201		23-Jul-17	Pteridomonas sp.	7184	1.71

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0201		23-Jul-17	Cyclotella stelligera Cleve and Grunow	1400	2.20
MEL- 0201		23-Jul-17	Cyclotella ocellata Pant.	7184	0.53
MEL- 0201		23-Jul-17	Rhizosolenia eriense H.L. Smith	35920	2.79
MEL- 0201		23-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.17
MEL- 0201		23-Jul-17	Fragilaria crotonensis Kitton	800	0.26
MEL- 0201		23-Jul-17	Synedra acus Kutzing	3400	0.36
MEL- 0201		23-Jul-17	Asterionella formosa Hassall	1200	0.12
MEL- 0201		23-Jul-17	Cyclotella michiganiana Skvortzow	100576	1.92
MEL- 0201		23-Jul-17	Rhodomonas minuta Skuja	179600	14.10
MEL- 0201		23-Jul-17	Cryptomonas erosa Ehrenberg	2000	2.46
MEL- 0201		23-Jul-17	Cryptomonas rostratiformis Skuja	400	0.88
MEL- 0201		23-Jul-17	Katablepharis ovalis Skuja	14368	0.81
MEL- 0201		23-Jul-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0201		23-Jul-17	Gymnodinium sp.	2600	17.00
MEL- 0201		23-Jul-17	Peridinium pusillum (Penard) Lemmermann	2600	5.58
MEL- 0202		23-Jul-17	Elakatothrix gelatinosa Willen	21552	0.37
MEL- 0202		23-Jul-17	Planctonema lauterbornii Schmidle	50288	12.64
MEL- 0202		23-Jul-17	Cosmarium sp.	200	0.28
MEL- 0202		23-Jul-17	Euastrum spp.	200	0.37
MEL- 0202		23-Jul-17	Staurodesmus extensus (Andersson) Teiling	800	0.29
MEL- 0202		23-Jul-17	Mougeotia sp.	200	0.41
MEL- 0202		23-Jul-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0202		23-Jul-17	Small chrysophyceae	545984	6.99
MEL- 0202		23-Jul-17	Large chrysophyceae	28736	5.16
MEL- 0202		23-Jul-17	Chrysochromulina parva Lackey	387936	25.37
MEL- 0202		23-Jul-17	Chrysococcus sp.	193968	12.69
MEL- 0202		23-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0202		23-Jul-17	Kephyrion sp.	129312	2.22
MEL- 0202		23-Jul-17	Spiniferomonas sirrata**********	7184	0.85
MEL- 0202		23-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0202		23-Jul-17	Dinobryon borgei Lemmermann	43104	2.21
MEL- 0202		23-Jul-17	Dinobryon mucronutom Nygaard	14368	1.88

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0202		23-Jul-17	Dinobryon bavaricum Imhof	50288	11.38
MEL- 0202		23-Jul-17	Dinobryon bavaricum Imhof	1800	6.10
MEL- 0202		23-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.55
MEL- 0202		23-Jul-17	Dinobryon sertularia Ehrenberg	43104	9.75
MEL- 0202		23-Jul-17	Dinobryon sertularia Ehrenberg	3000	15.26
MEL- 0202		23-Jul-17	Dinobryon sociale Ehrenberg	100576	22.75
MEL- 0202		23-Jul-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.22
MEL- 0202		23-Jul-17	Uroglena volvox Ehrenberg	790240	89.38
MEL- 0202		23-Jul-17	Chrysochromulina laurentiana Kling	93392	36.85
MEL- 0202		23-Jul-17	Stichogloea spp.	28736	1.45
MEL- 0202		23-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.56
MEL- 0202		23-Jul-17	Pteridomonas sp.	7184	1.71
MEL- 0202		23-Jul-17	Cyclotella stelligera Cleve and Grunow	1200	1.88
MEL- 0202		23-Jul-17	Cyclotella ocellata Pant.	7184	0.53
MEL- 0202		23-Jul-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0202		23-Jul-17	Tabellaria flocculsa (Roth) Kutzing	400	0.53
MEL- 0202		23-Jul-17	Fragilaria crotonensis Kitton	1600	0.53
MEL- 0202		23-Jul-17	Synedra acus Kutzing	1600	0.17
MEL- 0202		23-Jul-17	Asterionella formosa Hassall	1600	0.16
MEL- 0202		23-Jul-17	Cyclotella michiganiana Skvortzow	28736	0.55
MEL- 0202		23-Jul-17	Rhodomonas minuta Skuja	93392	7.33
MEL- 0202		23-Jul-17	Cryptomonas erosa Ehrenberg	1800	2.22
MEL- 0202		23-Jul-17	Cryptomonas reflexa (Marsson) Skuja	1000	0.66
MEL- 0202		23-Jul-17	Cryptomonas rostratiformis Skuja	400	0.85
MEL- 0202		23-Jul-17	Katablepharis ovalis Skuja	14368	0.81
MEL- 0202		23-Jul-17	Gymnodinium sp.	7184	2.31
MEL- 0202		23-Jul-17	Gymnodinium sp.	600	4.18
MEL- 0202		23-Jul-17	Peridinium pusillum (Penard) Lemmermann	1600	3.43
MEL- 0203		23-Jul-17	Planktolyngbya limnetica	21552	5.42
MEL- 0203		23-Jul-17	Oocystis lacustris Chodat	21552	0.61
MEL- 0203		23-Jul-17	Dictyosphaerium simplex Sukja	14368	0.06
MEL- 0203		23-Jul-17	Crucigenia quadrata Morr.	28736	0.32

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0203		23-Jul-17	Elakatothrix gelatinosa Willen	57472	0.99
MEL- 0203		23-Jul-17	Staurodesmus extensus (Andersson) Teiling	800	0.29
MEL- 0203		23-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0203		23-Jul-17	Oocystis gigas Archer	200	0.48
MEL- 0203		23-Jul-17	Small chrysophyceae	452592	5.79
MEL- 0203		23-Jul-17	Large chrysophyceae	258624	46.45
MEL- 0203		23-Jul-17	Chrysochromulina parva Lackey	459776	30.07
MEL- 0203		23-Jul-17	Chrysococcus sp.	344832	22.55
MEL- 0203		23-Jul-17	Kephyrion sp.	71840	1.24
MEL- 0203		23-Jul-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0203		23-Jul-17	Dinobryon borgei Lemmermann	50288	2.58
MEL- 0203		23-Jul-17	Dinobryon mucronutom Nygaard	71840	9.03
MEL- 0203		23-Jul-17	Dinobryon bavaricum Imhof	28736	6.50
MEL- 0203		23-Jul-17	Dinobryon bavaricum Imhof	2200	4.38
MEL- 0203		23-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.09
MEL- 0203		23-Jul-17	Dinobryon sertularia Ehrenberg	57472	13.00
MEL- 0203		23-Jul-17	Dinobryon sertularia Ehrenberg	2800	9.49
MEL- 0203		23-Jul-17	Dinobryon sociale Ehrenberg	100576	22.75
MEL- 0203		23-Jul-17	Chrysolkos skuja (Nauwerck) Willen	43104	1.29
MEL- 0203		23-Jul-17	Uroglena volvox Ehrenberg	847712	95.88
MEL- 0203		23-Jul-17	Chrysochromulina laurentiana Kling	129312	51.03
MEL- 0203		23-Jul-17	Stichogloea spp.	71840	3.61
MEL- 0203		23-Jul-17	Pteridomonas sp.	21552	5.13
MEL- 0203		23-Jul-17	Cyclotella stelligera Cleve and Grunow	1200	1.88
MEL- 0203		23-Jul-17	Cyclotella ocellata Pant.	14368	1.56
MEL- 0203		23-Jul-17	Rhizosolenia eriense H.L. Smith	35920	2.79
MEL- 0203		23-Jul-17	Fragilaria crotonensis Kitton	2000	0.66
MEL- 0203		23-Jul-17	Synedra acus Kutzing	1400	0.15
MEL- 0203		23-Jul-17	Asterionella formosa Hassall	2400	0.24
MEL- 0203		23-Jul-17	Cyclotella michiganiana Skvortzow	14368	0.27
MEL- 0203		23-Jul-17	Rhodomonas minuta Skuja	136496	10.71
MEL- 0203		23-Jul-17	Cryptomonas erosa Ehrenberg	1600	1.97

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0203		23-Jul-17	Cryptomonas reflexa (Marsson) Skuja	600	0.40
MEL- 0203		23-Jul-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0203		23-Jul-17	Katablepharis ovalis Skuja	21552	1.22
MEL- 0203		23-Jul-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0203		23-Jul-17	Gymnodinium sp.	3800	26.49
MEL- 0203		23-Jul-17	Peridinium pusillum (Penard) Lemmermann	3800	8.15
MEL- 0203		23-Jul-17	Peridinium aciculiferum Lemmermann	200	1.81
MEL- 0204		23-Jul-17	Oocystis lacustris Chodat	7184	0.17
MEL- 0204		23-Jul-17	Elakatothrix gelatinosa Willen	28736	0.50
MEL- 0204		23-Jul-17	Planctonema lauterbornii Schmidle	28736	7.22
MEL- 0204		23-Jul-17	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL- 0204		23-Jul-17	Staurodesmus paradoxum Meyen	200	0.22
MEL- 0204		23-Jul-17	Botryococcus braunii Kutzing	200	0.14
MEL- 0204		23-Jul-17	Oocystis gigas Archer	200	0.48
MEL- 0204		23-Jul-17	Small chrysophyceae	445408	5.70
MEL- 0204		23-Jul-17	Large chrysophyceae	21552	3.87
MEL- 0204		23-Jul-17	Chrysochromulina parva Lackey	538800	35.24
MEL- 0204		23-Jul-17	Chrysococcus sp.	222704	14.56
MEL- 0204		23-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0204		23-Jul-17	Kephyrion sp.	122128	2.10
MEL- 0204		23-Jul-17	Spiniferomonas sirrata**********	28736	3.41
MEL- 0204		23-Jul-17	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL- 0204		23-Jul-17	Dinobryon borgei Lemmermann	35920	1.52
MEL- 0204		23-Jul-17	Dinobryon mucronutom Nygaard	7184	0.85
MEL- 0204		23-Jul-17	Dinobryon bavaricum Imhof	35920	8.13
MEL- 0204		23-Jul-17	Dinobryon bavaricum Imhof	1200	2.39
MEL- 0204		23-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.55
MEL- 0204		23-Jul-17	Dinobryon sertularia Ehrenberg	57472	13.00
MEL- 0204		23-Jul-17	Dinobryon sertularia Ehrenberg	1200	4.07
MEL- 0204		23-Jul-17	Dinobryon sociale Ehrenberg	107760	24.38
MEL- 0204		23-Jul-17	Epiphyxis sp.	7184	0.55
MEL- 0204		23-Jul-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.39

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204		23-Jul-17	Uroglena volvox Ehrenberg	725584	82.06
MEL- 0204		23-Jul-17	Chrysochromulina laurentiana Kling	86208	34.02
MEL- 0204		23-Jul-17	Stichogloea spp.	7184	0.36
MEL- 0204		23-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.22
MEL- 0204		23-Jul-17	Pteridomonas sp.	21552	5.13
MEL- 0204		23-Jul-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0204		23-Jul-17	Cyclotella ocellata Pant.	35920	3.89
MEL- 0204		23-Jul-17	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL- 0204		23-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	600	0.50
MEL- 0204		23-Jul-17	Fragilaria crotonensis Kitton	1400	0.47
MEL- 0204		23-Jul-17	Synedra acus Kutzing	1600	0.17
MEL- 0204		23-Jul-17	Asterionella formosa Hassall	2800	0.28
MEL- 0204		23-Jul-17	Cyclotella michiganiana Skvortzow	14368	0.27
MEL- 0204		23-Jul-17	Rhodomonas minuta Skuja	86208	6.77
MEL- 0204		23-Jul-17	Cryptomonas erosa Ehrenberg	1800	2.22
MEL- 0204		23-Jul-17	Cryptomonas reflexa (Marsson) Skuja	200	0.13
MEL- 0204		23-Jul-17	Cryptomonas rostratiformis Skuja	200	0.45
MEL- 0204		23-Jul-17	Katablepharis ovalis Skuja	21552	1.22
MEL- 0204		23-Jul-17	Gymnodinium sp.	1200	11.04
MEL- 0204		23-Jul-17	Peridinium pusillum (Penard) Lemmermann	2200	4.72
MEL- 0205		23-Jul-17	Sphaerocystis schroeteri Chodat	14368	0.48
MEL- 0205		23-Jul-17	Elakatothrix gelatinosa Willen	28736	0.50
MEL- 0205		23-Jul-17	Planctonema lauterbornii Schmidle	28736	7.22
MEL- 0205		23-Jul-17	Cosmarium sp.	200	0.28
MEL- 0205		23-Jul-17	Staurodesmus extensus (Andersson) Teiling	1000	0.38
MEL- 0205		23-Jul-17	Staurodesmus paradoxum Meyen	400	1.63
MEL- 0205		23-Jul-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0205		23-Jul-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0205		23-Jul-17	Oocystis gigas Archer	800	1.93
MEL- 0205		23-Jul-17	Small chrysophyceae	459776	5.89
MEL- 0205		23-Jul-17	Large chrysophyceae	21552	3.87
MEL- 0205		23-Jul-17	Chrysochromulina parva Lackey	387936	25.37

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0205		23-Jul-17	Chrysococcus sp.	215520	14.10
MEL- 0205		23-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0205		23-Jul-17	Kephyrion sp.	86208	1.48
MEL- 0205		23-Jul-17	Spiniferomonas sirrata**********	14368	1.32
MEL- 0205		23-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0205		23-Jul-17	Dinobryon borgei Lemmermann	21552	1.11
MEL- 0205		23-Jul-17	Dinobryon mucronutom Nygaard	43104	5.64
MEL- 0205		23-Jul-17	Dinobryon bavaricum Imhof	35920	8.13
MEL- 0205		23-Jul-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0205		23-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.09
MEL- 0205		23-Jul-17	Dinobryon sertularia Ehrenberg	43104	9.75
MEL- 0205		23-Jul-17	Dinobryon sertularia Ehrenberg	1600	5.42
MEL- 0205		23-Jul-17	Dinobryon sociale Ehrenberg	93392	21.13
MEL- 0205		23-Jul-17	Chrysolkos skuja (Nauwerck) Willen	35920	0.88
MEL- 0205		23-Jul-17	Uroglena volvox Ehrenberg	653744	73.94
MEL- 0205		23-Jul-17	Chrysochromulina laurentiana Kling	100576	39.69
MEL- 0205		23-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43
MEL- 0205		23-Jul-17	Cyclotella stelligera Cleve and Grunow	2000	3.14
MEL- 0205		23-Jul-17	Cyclotella ocellata Pant.	7184	0.75
MEL- 0205		23-Jul-17	Rhizosolenia eriense H.L. Smith	35920	2.79
MEL- 0205		23-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	3200	2.62
MEL- 0205		23-Jul-17	Fragilaria crotonensis Kitton	1600	0.53
MEL- 0205		23-Jul-17	Synedra acus Kutzing	1600	0.17
MEL- 0205		23-Jul-17	Asterionella formosa Hassall	2000	0.20
MEL- 0205		23-Jul-17	Cyclotella michiganiana Skvortzow	71840	1.66
MEL- 0205		23-Jul-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0205		23-Jul-17	Rhodomonas minuta Skuja	71840	6.27
MEL- 0205		23-Jul-17	Cryptomonas erosa Ehrenberg	1800	2.22
MEL- 0205		23-Jul-17	Cryptomonas rostratiformis Skuja	200	0.45
MEL- 0205		23-Jul-17	Katablepharis ovalis Skuja	7184	0.41
MEL- 0205		23-Jul-17	Gymnodinium sp.	1400	12.88
MEL- 0205		23-Jul-17	Peridinium pusillum (Penard) Lemmermann	1000	2.14

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0205	Rep 2	23-Jul-17	Chlamydomonas spp.	7184	0.24
MEL- 0205	Rep 2	23-Jul-17	Sphaerocystis schroeteri Chodat	28736	0.96
MEL- 0205	Rep 2	23-Jul-17	Crucigenia quadrata Morr.	28736	0.14
MEL- 0205	Rep 2	23-Jul-17	Elakatothrix gelatinosa Willen	28736	0.50
MEL- 0205	Rep 2	23-Jul-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0205	Rep 2	23-Jul-17	Cosmarium sp.	200	0.28
MEL- 0205	Rep 2	23-Jul-17	Staurodesmus extensus (Andersson) Teiling	600	0.23
MEL- 0205	Rep 2	23-Jul-17	Oocystis gigas Archer	600	1.45
MEL- 0205	Rep 2	23-Jul-17	Small chrysophyceae	567536	7.26
MEL- 0205	Rep 2	23-Jul-17	Large chrysophyceae	7184	1.29
MEL- 0205	Rep 2	23-Jul-17	Chrysochromulina parva Lackey	452592	29.60
MEL- 0205	Rep 2	23-Jul-17	Chrysococcus sp.	251440	16.44
MEL- 0205	Rep 2	23-Jul-17	Chrysostephanospaera globulifera Scherffel	14368	3.85
MEL- 0205	Rep 2	23-Jul-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0205	Rep 2	23-Jul-17	Kephyrion sp.	64656	1.11
MEL- 0205	Rep 2	23-Jul-17	Spiniferomonas sirrata**********	35920	3.30
MEL- 0205	Rep 2	23-Jul-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0205	Rep 2	23-Jul-17	Dinobryon borgei Lemmermann	43104	2.21
MEL- 0205	Rep 2	23-Jul-17	Dinobryon mucronutom Nygaard	43104	5.64
MEL- 0205	Rep 2	23-Jul-17	Dinobryon bavaricum Imhof	28736	6.50
MEL- 0205	Rep 2	23-Jul-17	Dinobryon bavaricum Imhof	64656	14.63
MEL- 0205	Rep 2	23-Jul-17	Dinobryon bavaricum Imhof	600	1.19
MEL- 0205	Rep 2	23-Jul-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	800	2.18
MEL- 0205	Rep 2	23-Jul-17	Dinobryon sertularia Ehrenberg	2400	8.14
MEL- 0205	Rep 2	23-Jul-17	Dinobryon sociale Ehrenberg	71840	16.25
MEL- 0205	Rep 2	23-Jul-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.35
MEL- 0205	Rep 2	23-Jul-17	Uroglena volvox Ehrenberg	725584	82.06
MEL- 0205	Rep 2	23-Jul-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0205	Rep 2	23-Jul-17	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.08
MEL- 0205	Rep 2	23-Jul-17	Cyclotella stelligera Cleve and Grunow	1200	1.88
MEL- 0205	Rep 2	23-Jul-17	Rhizosolenia eriense H.L. Smith	28736	2.24
MEL- 0205	Rep 2	23-Jul-17	Tabellaria fenestrata (Lyngbye) Kutzing	6200	5.08

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0205	Rep 2	23-Jul-17	Fragilaria crotonensis Kitton	400	0.13
MEL- 0205	Rep 2	23-Jul-17	Synedra acus Kutzing	2000	0.21
MEL- 0205	Rep 2	23-Jul-17	Asterionella formosa Hassall	2800	0.28
MEL- 0205	Rep 2	23-Jul-17	Cyclotella michiganiana Skvortzow	43104	1.00
MEL- 0205	Rep 2	23-Jul-17	Rhodomonas minuta Skuja	43104	3.76
MEL- 0205	Rep 2	23-Jul-17	Cryptomonas erosa Ehrenberg	1200	1.48
MEL- 0205	Rep 2	23-Jul-17	Cryptomonas rostratiformis Skuja	400	0.90
MEL- 0205	Rep 2	23-Jul-17	Katablepharis ovalis Skuja	7184	0.41
MEL- 0205	Rep 2	23-Jul-17	Gymnodinium sp.	2200	20.25
MEL- 0205	Rep 2	23-Jul-17	Peridinium pusillum (Penard) Lemmermann	1000	2.14
MEL- 0101		09-Aug-17	Snowella sp	200	0.11
MEL- 0101		09-Aug-17	Chlamydomonas spp.	14368	0.72
MEL- 0101		09-Aug-17	Pediastrum duplex Meyen	200	0.85
MEL- 0101		09-Aug-17	Oocystis lacustris Chodat	21552	0.56
MEL- 0101		09-Aug-17	Elakatothrix gelatinosa Willen	129312	2.24
MEL- 0101		09-Aug-17	Planctonema lauterbornii Schmidle	79024	17.88
MEL- 0101		09-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0101		09-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0101		09-Aug-17	Botryococcus braunii Kutzing	200	0.18
MEL- 0101		09-Aug-17	Ankistrodesmus spiralis Lemmermann	7184	0.39
MEL- 0101		09-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0101		09-Aug-17	Small chrysophyceae	423856	1.78
MEL- 0101		09-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0101		09-Aug-17	Chrysochromulina parva Lackey	251440	16.44
MEL- 0101		09-Aug-17	Chrysococcus sp.	632192	41.35
MEL- 0101		09-Aug-17	Kephyrion boreale Skuja	28736	3.41
MEL- 0101		09-Aug-17	Kephyrion sp.	86208	1.10
MEL- 0101		09-Aug-17	Spiniferomonas sirrata**********	7184	1.08
MEL- 0101		09-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0101		09-Aug-17	Dinobryon borgei Lemmermann	7184	0.37
MEL- 0101		09-Aug-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0101		09-Aug-17	Dinobryon bavaricum Imhof	114944	26.00

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101		09-Aug-17	Dinobryon bavaricum Imhof	1000	1.25
MEL- 0101		09-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.80
MEL- 0101		09-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.84
MEL- 0101		09-Aug-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0101		09-Aug-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0101		09-Aug-17	Dinobryon sociale Ehrenberg	50288	11.38
MEL- 0101		09-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.23
MEL- 0101		09-Aug-17	Uroglena volvox Ehrenberg	114944	13.00
MEL- 0101		09-Aug-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0101		09-Aug-17	Stichogloea spp.	28736	1.45
MEL- 0101		09-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.69
MEL- 0101		09-Aug-17	Cyclotella stelligera Cleve and Grunow	1200	1.88
MEL- 0101		09-Aug-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0101		09-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	8000	11.13
MEL- 0101		09-Aug-17	Fragilaria crotonensis Kitton	10800	3.76
MEL- 0101		09-Aug-17	Synedra acus Kutzing	4200	0.48
MEL- 0101		09-Aug-17	Asterionella formosa Hassall	5600	0.56
MEL- 0101		09-Aug-17	Cyclotella michiganiana Skvortzow	64656	1.58
MEL- 0101		09-Aug-17	Rhodomonas minuta Skuja	165232	24.92
MEL- 0101		09-Aug-17	Cryptomonas erosa Ehrenberg	2400	2.85
MEL- 0101		09-Aug-17	Cryptomonas reflexa (Marsson) Skuja	400	0.31
MEL- 0101		09-Aug-17	Katablepharis ovalis Skuja	28736	1.48
MEL- 0101		09-Aug-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0101		09-Aug-17	Gymnodinium sp.	3400	39.92
MEL- 0101		09-Aug-17	Peridinium pusillum (Penard) Lemmermann	4600	10.43
MEL- 0101R	Recount	09-Aug-17	Snowella sp	600	0.33
MEL- 0101R	Recount	09-Aug-17	Pediastrum duplex Meyen	200	0.85
MEL- 0101R	Recount	09-Aug-17	Oocystis lacustris Chodat	21552	0.56
MEL- 0101R	Recount	09-Aug-17	Elakatothrix gelatinosa Willen	100576	1.74
MEL- 0101R	Recount	09-Aug-17	Planctonema lauterbornii Schmidle	64656	14.63
MEL- 0101R	Recount	09-Aug-17	Staurodesmus extensus (Andersson) Teiling	200	0.09
MEL- 0101R	Recount	09-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101R	Recount	09-Aug-17	Botryococcus braunii Kutzing	200	0.18
MEL- 0101R	Recount	09-Aug-17	Ankistrodesmus spiralis Lemmermann	21552	1.16
MEL- 0101R	Recount	09-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0101R	Recount	09-Aug-17	Small chrysophyceae	502880	6.44
MEL- 0101R	Recount	09-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0101R	Recount	09-Aug-17	Chrysochromulina parva Lackey	337648	22.08
MEL- 0101R	Recount	09-Aug-17	Chrysococcus sp.	574720	37.59
MEL- 0101R	Recount	09-Aug-17	Kephyrion boreale Skuja	14368	1.71
MEL- 0101R	Recount	09-Aug-17	Kephyrion sp.	71840	0.92
MEL- 0101R	Recount	09-Aug-17	Spiniferomonas sirrata**********	14368	2.16
MEL- 0101R	Recount	09-Aug-17	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL- 0101R	Recount	09-Aug-17	Dinobryon borgei Lemmermann	14368	0.74
MEL- 0101R	Recount	09-Aug-17	Dinobryon bavaricum Imhof	86208	19.50
MEL- 0101R	Recount	09-Aug-17	Dinobryon bavaricum Imhof	400	0.50
MEL- 0101R	Recount	09-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	5.60
MEL- 0101R	Recount	09-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.68
MEL- 0101R	Recount	09-Aug-17	Dinobryon sertularia Ehrenberg	43104	9.75
MEL- 0101R	Recount	09-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0101R	Recount	09-Aug-17	Dinobryon sociale Ehrenberg	71840	16.25
MEL- 0101R	Recount	09-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.23
MEL- 0101R	Recount	09-Aug-17	Uroglena volvox Ehrenberg	86208	9.75
MEL- 0101R	Recount	09-Aug-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0101R	Recount	09-Aug-17	Chrysochromulina laurentiana Kling	71840	28.35
MEL- 0101R	Recount	09-Aug-17	Stichogloea spp.	71840	3.61
MEL- 0101R	Recount	09-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23
MEL- 0101R	Recount	09-Aug-17	Cyclotella stelligera Cleve and Grunow	2000	3.14
MEL- 0101R	Recount	09-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	9600	13.35
MEL- 0101R	Recount	09-Aug-17	Fragilaria crotonensis Kitton	7200	2.50
MEL- 0101R	Recount	09-Aug-17	Synedra acus Kutzing	3800	0.44
MEL- 0101R	Recount	09-Aug-17	Asterionella formosa Hassall	4000	0.40
MEL- 0101R	Recount	09-Aug-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0101R	Recount	09-Aug-17	Rhodomonas minuta Skuja	136496	20.58

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101R	Recount	09-Aug-17	Cryptomonas erosa Ehrenberg	1200	1.42
MEL- 0101R	Recount	09-Aug-17	Cryptomonas reflexa (Marsson) Skuja	800	0.61
MEL- 0101R	Recount	09-Aug-17	Katablepharis ovalis Skuja	7184	0.37
MEL- 0101R	Recount	09-Aug-17	Gymnodinium sp.	3200	37.57
MEL- 0101R	Recount	09-Aug-17	Peridinium pusillum (Penard) Lemmermann	5000	11.34
MEL- 0102		09-Aug-17	Snowella sp	1400	0.77
MEL- 0102		09-Aug-17	Pediastrum duplex Meyen	200	0.85
MEL- 0102		09-Aug-17	Elakatothrix gelatinosa Willen	93392	1.62
MEL- 0102		09-Aug-17	Planctonema lauterbornii Schmidle	71840	16.25
MEL- 0102		09-Aug-17	Cosmarium sp.	200	0.28
MEL- 0102		09-Aug-17	Staurodesmus extensus (Andersson) Teiling	1200	0.55
MEL- 0102		09-Aug-17	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.33
MEL- 0102		09-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL- 0102		09-Aug-17	Botryococcus braunii Kutzing	600	0.54
MEL- 0102		09-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0102		09-Aug-17	Monomastix minuta Skuja	7184	0.14
MEL- 0102		09-Aug-17	Small chrysophyceae	481328	6.16
MEL- 0102		09-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0102		09-Aug-17	Chrysochromulina parva Lackey	201152	13.16
MEL- 0102		09-Aug-17	Chrysococcus sp.	840528	54.97
MEL- 0102		09-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0102		09-Aug-17	Kephyrion sp.	71840	0.92
MEL- 0102		09-Aug-17	Spiniferomonas sirrata**********	7184	1.08
MEL- 0102		09-Aug-17	Dinobryon borgei Lemmermann	7184	0.37
MEL- 0102		09-Aug-17	Dinobryon bavaricum Imhof	79024	17.88
MEL- 0102		09-Aug-17	Dinobryon bavaricum Imhof	800	1.00
MEL- 0102		09-Aug-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0102		09-Aug-17	Dinobryon sertularia Ehrenberg	1000	3.39
MEL- 0102		09-Aug-17	Dinobryon sociale Ehrenberg	35920	8.13
MEL- 0102		09-Aug-17	Chrysolkos skuja (Nauwerck) Willen	28736	0.93
MEL- 0102		09-Aug-17	Uroglena volvox Ehrenberg	43104	4.88
MEL- 0102		09-Aug-17	Chrysochromulina laurentiana Kling	107760	43.93

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0102		09-Aug-17	Stichogloea spp.	14368	0.72
MEL- 0102		09-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.60
MEL- 0102		09-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0102		09-Aug-17	Cyclotella stelligera Cleve and Grunow	1400	2.20
MEL- 0102		09-Aug-17	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL- 0102		09-Aug-17	Fragilaria crotonensis Kitton	11200	3.89
MEL- 0102		09-Aug-17	Synedra acus Kutzing	4000	0.46
MEL- 0102		09-Aug-17	Asterionella formosa Hassall	10200	1.03
MEL- 0102		09-Aug-17	Cyclotella michiganiana Skvortzow	21552	0.53
MEL- 0102		09-Aug-17	Rhodomonas minuta Skuja	215520	32.50
MEL- 0102		09-Aug-17	Cryptomonas erosa Ehrenberg	1200	1.42
MEL- 0102		09-Aug-17	Cryptomonas ovata Ehrenberg	200	0.90
MEL- 0102		09-Aug-17	Cryptomonas reflexa (Marsson) Skuja	800	0.61
MEL- 0102		09-Aug-17	Katablepharis ovalis Skuja	21552	1.11
MEL- 0102		09-Aug-17	Gymnodinium sp.	21552	7.94
MEL- 0102		09-Aug-17	Gymnodinium sp.	400	3.12
MEL- 0102		09-Aug-17	Peridinium pusillum (Penard) Lemmermann	3600	8.16
MEL- 0103		09-Aug-17	Snowella sp	200	0.11
MEL- 0103		09-Aug-17	Oocystis lacustris Chodat	14368	0.37
MEL- 0103		09-Aug-17	Dictyosphaerium simplex Sukja	14368	0.06
MEL- 0103		09-Aug-17	Elakatothrix gelatinosa Willen	64656	1.12
MEL- 0103		09-Aug-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0103		09-Aug-17	Euastrum spp.	200	0.37
MEL- 0103		09-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0103		09-Aug-17	Staurodesmus paradoxum Meyen	600	2.45
MEL- 0103		09-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL- 0103		09-Aug-17	Botryococcus braunii Kutzing	800	0.42
MEL- 0103		09-Aug-17	Small chrysophyceae	402304	5.15
MEL- 0103		09-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0103		09-Aug-17	Chrysochromulina parva Lackey	323280	21.14
MEL- 0103		09-Aug-17	Chrysococcus sp.	538800	35.24
MEL- 0103		09-Aug-17	Kephyrion boreale Skuja	14368	1.71

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0103		09-Aug-17	Kephyrion sp.	14368	0.18
MEL- 0103		09-Aug-17	Spiniferomonas sirrata**********	14368	1.06
MEL- 0103		09-Aug-17	Mallomonas crassisquama (Asmund) Fott	800	0.84
MEL- 0103		09-Aug-17	Dinobryon bavaricum Imhof	150864	34.13
MEL- 0103		09-Aug-17	Dinobryon bavaricum Imhof	1000	1.25
MEL- 0103		09-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.68
MEL- 0103		09-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0103		09-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0103		09-Aug-17	Dinobryon sociale Ehrenberg	43104	9.75
MEL- 0103		09-Aug-17	Uroglena volvox Ehrenberg	186784	21.13
MEL- 0103		09-Aug-17	Chrysochromulina laurentiana Kling	150864	59.53
MEL- 0103		09-Aug-17	Stichogloea spp.	21552	1.08
MEL- 0103		09-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.85
MEL- 0103		09-Aug-17	Cyclotella stelligera Cleve and Grunow	2600	4.08
MEL- 0103		09-Aug-17	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL- 0103		09-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	12600	17.52
MEL- 0103		09-Aug-17	Tabellaria flocculsa (Roth) Kutzing	200	0.23
MEL- 0103		09-Aug-17	Fragilaria crotonensis Kitton	10200	3.46
MEL- 0103		09-Aug-17	Synedra acus Kutzing	2400	0.28
MEL- 0103		09-Aug-17	Asterionella formosa Hassall	13000	1.31
MEL- 0103		09-Aug-17	Cyclotella michiganiana Skvortzow	57472	1.41
MEL- 0103		09-Aug-17	Rhodomonas minuta Skuja	251440	37.92
MEL- 0103		09-Aug-17	Cryptomonas erosa Ehrenberg	4400	5.22
MEL- 0103		09-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0103		09-Aug-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0103		09-Aug-17	Katablepharis ovalis Skuja	14368	0.66
MEL- 0103		09-Aug-17	Gymnodinium helveticum Penard	400	9.42
MEL- 0103		09-Aug-17	Gymnodinium sp.	3200	36.78
MEL- 0103		09-Aug-17	Peridinium pusillum (Penard) Lemmermann	5400	12.02
MEL- 0103		09-Aug-17	Peridinium aciculiferum Lemmermann	200	1.81
MEL- 0104		09-Aug-17	Snowella sp	200	0.11
MEL- 0104		09-Aug-17	Oocystis lacustris Chodat	7184	0.19

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0104		09-Aug-17	Tetraedron minimum (Brunow) Hansgrig	7184	1.25
MEL- 0104		09-Aug-17	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.50
MEL- 0104		09-Aug-17	Crucigenia quadrata Morr.	28736	0.14
MEL- 0104		09-Aug-17	Elakatothrix gelatinosa Willen	7184	0.12
MEL- 0104		09-Aug-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0104		09-Aug-17	Cosmarium sp.	200	0.94
MEL- 0104		09-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0104		09-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL- 0104		09-Aug-17	Botryococcus braunii Kutzing	600	0.54
MEL- 0104		09-Aug-17	Tetraedron caudatum (Corda) Hansgrig	28736	0.32
MEL- 0104		09-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0104		09-Aug-17	Small chrysophyceae	452592	5.79
MEL- 0104		09-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0104		09-Aug-17	Chrysochromulina parva Lackey	466960	30.54
MEL- 0104		09-Aug-17	Chrysococcus sp.	402304	26.31
MEL- 0104		09-Aug-17	Chrysostephanospaera globulifera Scherffel	7184	2.00
MEL- 0104		09-Aug-17	Kephyrion boreale Skuja	21552	2.56
MEL- 0104		09-Aug-17	Kephyrion sp.	93392	1.20
MEL- 0104		09-Aug-17	Spiniferomonas sirrata**********	14368	2.16
MEL- 0104		09-Aug-17	Mallomonas crassisquama (Asmund) Fott	800	0.84
MEL- 0104		09-Aug-17	Dinobryon borgei Lemmermann	7184	0.37
MEL- 0104		09-Aug-17	Dinobryon bavaricum Imhof	79024	17.88
MEL- 0104		09-Aug-17	Dinobryon bavaricum Imhof	2200	2.75
MEL- 0104		09-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.68
MEL- 0104		09-Aug-17	Dinobryon sertularia Ehrenberg	57472	13.00
MEL- 0104		09-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0104		09-Aug-17	Dinobryon sociale Ehrenberg	50288	11.38
MEL- 0104		09-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.46
MEL- 0104		09-Aug-17	Uroglena volvox Ehrenberg	208336	23.56
MEL- 0104		09-Aug-17	Chrysochromulina laurentiana Kling	114944	45.36
MEL- 0104		09-Aug-17	Stichogloea spp.	50288	2.53
MEL- 0104		09-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	57472	1.70

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0104		09-Aug-17	Cyclotella stelligera Cleve and Grunow	2400	3.77
MEL- 0104		09-Aug-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0104		09-Aug-17	Fragilaria crotonensis Kitton	5000	1.74
MEL- 0104		09-Aug-17	Synedra acus Kutzing	2000	0.23
MEL- 0104		09-Aug-17	Asterionella formosa Hassall	11200	1.13
MEL- 0104		09-Aug-17	Cyclotella michiganiana Skvortzow	50288	1.23
MEL- 0104		09-Aug-17	Rhodomonas minuta Skuja	308912	46.58
MEL- 0104		09-Aug-17	Cryptomonas erosa Ehrenberg	2200	2.65
MEL- 0104		09-Aug-17	Cryptomonas reflexa (Marsson) Skuja	1600	1.23
MEL- 0104		09-Aug-17	Cryptomonas rostratiformis Skuja	200	0.45
MEL- 0104		09-Aug-17	Katablepharis ovalis Skuja	35920	1.65
MEL- 0104		09-Aug-17	Gymnodinium helveticum Penard	400	9.42
MEL- 0104		09-Aug-17	Gymnodinium sp.	7184	2.65
MEL- 0104		09-Aug-17	Gymnodinium sp.	4000	46.97
MEL- 0104		09-Aug-17	Peridinium pusillum (Penard) Lemmermann	7800	17.69
MEL- 0104		09-Aug-17	Peridinium wisconsiense Eddy	600	5.61
MEL- 0105		09-Aug-17	Snowella sp	1200	0.66
MEL- 0105		09-Aug-17	Sphaerocystis schroeteri Chodat	57472	2.23
MEL- 0105		09-Aug-17	Pediastrum tetras (Ehrenberg) Ralfs	28736	0.32
MEL- 0105		09-Aug-17	Oocystis lacustris Chodat	7184	0.19
MEL- 0105		09-Aug-17	Crucigenia quadrata Morr.	28736	0.14
MEL- 0105		09-Aug-17	Elakatothrix gelatinosa Willen	100576	1.74
MEL- 0105		09-Aug-17	Planctonema lauterbornii Schmidle	107760	24.38
MEL- 0105		09-Aug-17	Staurodesmus extensus (Andersson) Teiling	1200	0.55
MEL- 0105		09-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0105		09-Aug-17	Botryococcus braunii Kutzing	800	0.72
MEL- 0105		09-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0105		09-Aug-17	Small chrysophyceae	589088	7.54
MEL- 0105		09-Aug-17	Large chrysophyceae	28736	5.16
MEL- 0105		09-Aug-17	Chrysochromulina parva Lackey	294544	19.26
MEL- 0105		09-Aug-17	Chrysococcus sp.	560352	36.65
MEL- 0105		09-Aug-17	Kephyrion boreale Skuja	21552	2.56

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0105		09-Aug-17	Kephyrion sp.	71840	0.92
MEL- 0105		09-Aug-17	Dinobryon borgei Lemmermann	7184	0.37
MEL- 0105		09-Aug-17	Dinobryon bavaricum Imhof	136496	30.88
MEL- 0105		09-Aug-17	Dinobryon bavaricum Imhof	800	1.00
MEL- 0105		09-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.84
MEL- 0105		09-Aug-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0105		09-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0105		09-Aug-17	Dinobryon sociale Ehrenberg	21552	4.88
MEL- 0105		09-Aug-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.65
MEL- 0105		09-Aug-17	Uroglena volvox Ehrenberg	395120	44.69
MEL- 0105		09-Aug-17	Chrysochromulina laurentiana Kling	114944	45.36
MEL- 0105		09-Aug-17	Stichogloea spp.	35920	1.81
MEL- 0105		09-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.65
MEL- 0105		09-Aug-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0105		09-Aug-17	Rhizosolenia eriense H.L. Smith	35920	2.79
MEL- 0105		09-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	2000	2.78
MEL- 0105		09-Aug-17	Fragilaria crotonensis Kitton	13000	4.52
MEL- 0105		09-Aug-17	Synedra acus Kutzing	2400	0.28
MEL- 0105		09-Aug-17	Asterionella formosa Hassall	10600	1.07
MEL- 0105		09-Aug-17	Cyclotella michiganiana Skvortzow	71840	1.37
MEL- 0105		09-Aug-17	Rhodomonas minuta Skuja	143680	21.67
MEL- 0105		09-Aug-17	Cryptomonas erosa Ehrenberg	3000	3.62
MEL- 0105		09-Aug-17	Cryptomonas reflexa (Marsson) Skuja	1000	0.77
MEL- 0105		09-Aug-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0105		09-Aug-17	Katablepharis ovalis Skuja	14368	0.66
MEL- 0105		09-Aug-17	Gymnodinium helveticum Penard	400	9.61
MEL- 0105		09-Aug-17	Gymnodinium sp.	7184	2.67
MEL- 0105		09-Aug-17	Gymnodinium sp.	1800	21.14
MEL- 0105		09-Aug-17	Peridinium pusillum (Penard) Lemmermann	5800	13.15
MEL- 0105		09-Aug-17	Peridinium aciculiferum Lemmermann	400	3.74
MEL- 0201		11-Aug-17	Snowella sp	200	0.20
MEL- 0201		11-Aug-17	Chlamydomonas spp.	28736	0.59

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0201		11-Aug-17	Sphaerocystis schroeteri Chodat	79024	1.93
MEL- 0201		11-Aug-17	Oocystis lacustris Chodat	7184	0.18
MEL- 0201		11-Aug-17	Crucigenia quadrata Morr.	57472	0.64
MEL- 0201		11-Aug-17	Elakatothrix gelatinosa Willen	57472	0.99
MEL- 0201		11-Aug-17	Planctonema lauterbornii Schmidle	28736	6.50
MEL- 0201		11-Aug-17	Cosmarium sp.	200	0.28
MEL- 0201		11-Aug-17	Euastrum spp.	200	0.37
MEL- 0201		11-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0201		11-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0201		11-Aug-17	Oocystis gigas Archer	600	1.45
MEL- 0201		11-Aug-17	Nephrocytiun lunatum W. West	400	1.07
MEL- 0201		11-Aug-17	Small chrysophyceae	344832	4.41
MEL- 0201		11-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0201		11-Aug-17	Chrysochromulina parva Lackey	158048	10.34
MEL- 0201		11-Aug-17	Chrysococcus sp.	531616	34.77
MEL- 0201		11-Aug-17	Chrysostephanospaera globulifera Scherffel	7184	2.15
MEL- 0201		11-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0201		11-Aug-17	Kephyrion sp.	93392	0.96
MEL- 0201		11-Aug-17	Spiniferomonas sirrata**********	7184	0.85
MEL- 0201		11-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0201		11-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0201		11-Aug-17	Dinobryon sociale Ehrenberg	35920	8.13
MEL- 0201		11-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.39
MEL- 0201		11-Aug-17	Uroglena volvox Ehrenberg	86208	9.75
MEL- 0201		11-Aug-17	Chrysochromulina laurentiana Kling	100576	41.00
MEL- 0201		11-Aug-17	Stichogloea spp.	28736	1.45
MEL- 0201		11-Aug-17	Bicoeca lacustris Clark	7184	0.37
MEL- 0201		11-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.56
MEL- 0201		11-Aug-17	Pteridomonas sp.	7184	1.59
MEL- 0201		11-Aug-17	Cyclotella stelligera Cleve and Grunow	3200	5.82
MEL- 0201		11-Aug-17	Cyclotella ocellata Pant.	57472	6.69
MEL- 0201		11-Aug-17	Rhizosolenia eriense H.L. Smith	7184	0.46

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0201		11-Aug-17	Fragilaria crotonensis Kitton	1400	0.49
MEL- 0201		11-Aug-17	Synedra acus Kutzing	600	0.07
MEL- 0201		11-Aug-17	Cyclotella michiganiana Skvortzow	86208	1.65
MEL- 0201		11-Aug-17	Cyclotella bodanica Eulenst.	600	4.23
MEL- 0201		11-Aug-17	Rhodomonas minuta Skuja	186784	28.17
MEL- 0201		11-Aug-17	Cryptomonas erosa Ehrenberg	2200	2.65
MEL- 0201		11-Aug-17	Cryptomonas reflexa (Marsson) Skuja	1000	0.74
MEL- 0201		11-Aug-17	Cryptomonas rostratiformis Skuja	400	0.60
MEL- 0201		11-Aug-17	Katablepharis ovalis Skuja	7184	0.36
MEL- 0201		11-Aug-17	Gymnodinium sp.	14368	5.10
MEL- 0201		11-Aug-17	Gymnodinium sp.	1200	14.24
MEL- 0201		11-Aug-17	Peridinium pusillum (Penard) Lemmermann	1000	1.99
MEL- 0202		11-Aug-17	Snowella sp	600	0.30
MEL- 0202		11-Aug-17	Chlamydomonas spp.	35920	0.86
MEL- 0202		11-Aug-17	Sphaerocystis schroeteri Chodat	14368	0.48
MEL- 0202		11-Aug-17	Oocystis lacustris Chodat	50288	1.23
MEL- 0202		11-Aug-17	Dictyosphaerium simplex Sukja	14368	0.06
MEL- 0202		11-Aug-17	Quadrigula closterioides (Bohl.) Printz	57472	2.03
MEL- 0202		11-Aug-17	Elakatothrix gelatinosa Willen	93392	1.62
MEL- 0202		11-Aug-17	Planctonema lauterbornii Schmidle	28736	7.22
MEL- 0202		11-Aug-17	Staurodesmus extensus (Andersson) Teiling	200	0.09
MEL- 0202		11-Aug-17	Staurodesmus paradoxum Meyen	200	0.58
MEL- 0202		11-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0202		11-Aug-17	Mougeotia sp.	200	0.28
MEL- 0202		11-Aug-17	Botryococcus braunii Kutzing	200	0.18
MEL- 0202		11-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0202		11-Aug-17	Small chrysophyceae	237072	3.03
MEL- 0202		11-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0202		11-Aug-17	Chrysochromulina parva Lackey	143680	9.40
MEL- 0202		11-Aug-17	Chrysococcus sp.	632192	41.35
MEL- 0202		11-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0202		11-Aug-17	Kephyrion sp.	129312	1.33

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0202		11-Aug-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0202		11-Aug-17	Dinobryon bavaricum Imhof	7184	1.63
MEL- 0202		11-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0202		11-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0202		11-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0202		11-Aug-17	Dinobryon sociale Ehrenberg	28736	6.50
MEL- 0202		11-Aug-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.59
MEL- 0202		11-Aug-17	Uroglena volvox Ehrenberg	186784	21.13
MEL- 0202		11-Aug-17	Chrysochromulina laurentiana Kling	57472	23.43
MEL- 0202		11-Aug-17	Stichogloea spp.	21552	1.08
MEL- 0202		11-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.74
MEL- 0202		11-Aug-17	Cyclotella stelligera Cleve and Grunow	5000	9.09
MEL- 0202		11-Aug-17	Cyclotella ocellata Pant.	50288	5.65
MEL- 0202		11-Aug-17	Tabellaria flocculsa (Roth) Kutzing	1600	2.05
MEL- 0202		11-Aug-17	Fragilaria crotonensis Kitton	600	0.21
MEL- 0202		11-Aug-17	Synedra acus Kutzing	200	0.02
MEL- 0202		11-Aug-17	Asterionella formosa Hassall	1600	0.16
MEL- 0202		11-Aug-17	Cyclotella michiganiana Skvortzow	28736	0.55
MEL- 0202		11-Aug-17	Cyclotella bodanica Eulenst.	600	4.23
MEL- 0202		11-Aug-17	Rhodomonas minuta Skuja	215520	32.50
MEL- 0202		11-Aug-17	Cryptomonas erosa Ehrenberg	2000	2.41
MEL- 0202		11-Aug-17	Cryptomonas rostratiformis Skuja	200	0.30
MEL- 0202		11-Aug-17	Katablepharis ovalis Skuja	7184	0.36
MEL- 0202		11-Aug-17	Gymnodinium sp.	14368	5.30
MEL- 0202		11-Aug-17	Gymnodinium sp.	600	7.58
MEL- 0202		11-Aug-17	Peridinium pusillum (Penard) Lemmermann	2600	5.18
MEL- 0202	Rep 2	11-Aug-17	Chlamydomonas spp.	14368	0.34
MEL- 0202	Rep 2	11-Aug-17	Sphaerocystis schroeteri Chodat	7184	0.24
MEL- 0202	Rep 2	11-Aug-17	Oocystis lacustris Chodat	21552	0.53
MEL- 0202	Rep 2	11-Aug-17	Dictyosphaerium simplex Sukja	14368	0.06
MEL- 0202	Rep 2	11-Aug-17	Elakatothrix gelatinosa Willen	71840	1.24
MEL- 0202	Rep 2	11-Aug-17	Planctonema lauterbornii Schmidle	28736	6.50

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0202	Rep 2	11-Aug-17	Cosmarium sp.	600	0.84
MEL- 0202	Rep 2	11-Aug-17	Euastrum spp.	400	0.74
MEL- 0202	Rep 2	11-Aug-17	Staurodesmus extensus (Andersson) Teiling	800	0.37
MEL- 0202	Rep 2	11-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0202	Rep 2	11-Aug-17	Botryococcus braunii Kutzing	800	0.72
MEL- 0202	Rep 2	11-Aug-17	Oocystis gigas Archer	400	0.97
MEL- 0202	Rep 2	11-Aug-17	Small chrysophyceae	330464	4.23
MEL- 0202	Rep 2	11-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0202	Rep 2	11-Aug-17	Chrysochromulina parva Lackey	222704	14.56
MEL- 0202	Rep 2	11-Aug-17	Chrysococcus sp.	581904	38.06
MEL- 0202	Rep 2	11-Aug-17	Kephyrion boreale Skuja	14368	1.71
MEL- 0202	Rep 2	11-Aug-17	Kephyrion sp.	107760	1.11
MEL- 0202	Rep 2	11-Aug-17	Spiniferomonas sirrata**********	7184	0.85
MEL- 0202	Rep 2	11-Aug-17	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL- 0202	Rep 2	11-Aug-17	Dinobryon borgei Lemmermann	28736	1.47
MEL- 0202	Rep 2	11-Aug-17	Dinobryon mucronutom Nygaard	21552	2.71
MEL- 0202	Rep 2	11-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0202	Rep 2	11-Aug-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0202	Rep 2	11-Aug-17	Dinobryon sociale Ehrenberg	43104	9.75
MEL- 0202	Rep 2	11-Aug-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.59
MEL- 0202	Rep 2	11-Aug-17	Uroglena volvox Ehrenberg	229888	26.00
MEL- 0202	Rep 2	11-Aug-17	Chrysochromulina laurentiana Kling	50288	20.50
MEL- 0202	Rep 2	11-Aug-17	Stichogloea spp.	14368	0.72
MEL- 0202	Rep 2	11-Aug-17	Bicoeca lacustris Clark	14368	0.73
MEL- 0202	Rep 2	11-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.12
MEL- 0202	Rep 2	11-Aug-17	Cyclotella stelligera Cleve and Grunow	3000	5.46
MEL- 0202	Rep 2	11-Aug-17	Cyclotella ocellata Pant.	35920	4.03
MEL- 0202	Rep 2	11-Aug-17	Fragilaria crotonensis Kitton	1000	0.35
MEL- 0202	Rep 2	11-Aug-17	Synedra acus Kutzing	400	0.05
MEL- 0202	Rep 2	11-Aug-17	Asterionella formosa Hassall	800	0.08
MEL- 0202	Rep 2	11-Aug-17	Cyclotella michiganiana Skvortzow	28736	0.55
MEL- 0202	Rep 2	11-Aug-17	Cyclotella bodanica Eulenst.	600	4.23

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0202	Rep 2	11-Aug-17	Rhodomonas minuta Skuja	222704	33.58
MEL- 0202	Rep 2	11-Aug-17	Cryptomonas erosa Ehrenberg	2600	3.14
MEL- 0202	Rep 2	11-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0202	Rep 2	11-Aug-17	Cryptomonas rostratiformis Skuja	600	0.89
MEL- 0202	Rep 2	11-Aug-17	Katablepharis ovalis Skuja	21552	1.09
MEL- 0202	Rep 2	11-Aug-17	Gymnodinium sp.	200	2.53
MEL- 0202	Rep 2	11-Aug-17	Peridinium pusillum (Penard) Lemmermann	3800	7.57
MEL- 0203		11-Aug-17	Chroococcus turgidus (Kutzing) Nageli	28736	10.59
MEL- 0203		11-Aug-17	Chlamydomonas spp.	14368	0.34
MEL- 0203		11-Aug-17	Pediastrum duplex Meyen	200	0.88
MEL- 0203		11-Aug-17	Oocystis lacustris Chodat	7184	0.18
MEL- 0203		11-Aug-17	Dictyosphaerium simplex Sukja	14368	0.08
MEL- 0203		11-Aug-17	Elakatothrix gelatinosa Willen	265808	5.85
MEL- 0203		11-Aug-17	Planctonema lauterbornii Schmidle	57472	14.44
MEL- 0203		11-Aug-17	Cosmarium sp.	400	0.56
MEL- 0203		11-Aug-17	Euastrum spp.	200	0.37
MEL- 0203		11-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0203		11-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL- 0203		11-Aug-17	Monomastix minuta Skuja	7184	0.16
MEL- 0203		11-Aug-17	Nephrocytiun lunatum W. West	200	0.54
MEL- 0203		11-Aug-17	Small chrysophyceae	272992	3.49
MEL- 0203		11-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0203		11-Aug-17	Chrysochromulina parva Lackey	93392	6.11
MEL- 0203		11-Aug-17	Chrysococcus sp.	553168	36.18
MEL- 0203		11-Aug-17	Kephyrion boreale Skuja	21552	2.56
MEL- 0203		11-Aug-17	Kephyrion sp.	100576	1.04
MEL- 0203		11-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0203		11-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0203		11-Aug-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0203		11-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0203		11-Aug-17	Dinobryon sociale Ehrenberg	28736	6.50
MEL- 0203		11-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.39

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0203		11-Aug-17	Uroglena volvox Ehrenberg	186784	21.13
MEL- 0203		11-Aug-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.58
MEL- 0203		11-Aug-17	Chrysochromulina laurentiana Kling	86208	35.15
MEL- 0203		11-Aug-17	Stichogloea spp.	35920	1.81
MEL- 0203		11-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.56
MEL- 0203		11-Aug-17	Pteridomonas sp.	14368	3.19
MEL- 0203		11-Aug-17	Cyclotella stelligera Cleve and Grunow	5000	9.09
MEL- 0203		11-Aug-17	Fragilaria crotonensis Kitton	400	0.14
MEL- 0203		11-Aug-17	Synedra acus Kutzing	400	0.05
MEL- 0203		11-Aug-17	Cyclotella michiganiana Skvortzow	21552	0.41
MEL- 0203		11-Aug-17	Rhodomonas minuta Skuja	201152	30.33
MEL- 0203		11-Aug-17	Cryptomonas erosa Ehrenberg	2000	2.41
MEL- 0203		11-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0203		11-Aug-17	Cryptomonas rostratiformis Skuja	200	0.30
MEL- 0203		11-Aug-17	Katablepharis ovalis Skuja	14368	0.72
MEL- 0203		11-Aug-17	Gymnodinium sp.	800	10.11
MEL- 0203		11-Aug-17	Peridinium pusillum (Penard) Lemmermann	1600	3.19
MEL- 0203R	Recount	11-Aug-17	Snowella sp	200	0.10
MEL- 0203R	Recount	11-Aug-17	Chlamydomonas spp.	7184	0.17
MEL- 0203R	Recount	11-Aug-17	Pediastrum duplex Meyen	200	0.88
MEL- 0203R	Recount	11-Aug-17	Oocystis lacustris Chodat	7184	0.18
MEL- 0203R	Recount	11-Aug-17	Dictyosphaerium simplex Sukja	86208	0.48
MEL- 0203R	Recount	11-Aug-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0203R	Recount	11-Aug-17	Elakatothrix gelatinosa Willen	193968	4.27
MEL- 0203R	Recount	11-Aug-17	Planctonema lauterbornii Schmidle	64656	24.38
MEL- 0203R	Recount	11-Aug-17	Cosmarium sp.	400	0.56
MEL- 0203R	Recount	11-Aug-17	Euastrum spp.	200	0.37
MEL- 0203R	Recount	11-Aug-17	Staurodesmus extensus (Andersson) Teiling	200	0.09
MEL- 0203R	Recount	11-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0203R	Recount	11-Aug-17	Small chrysophyceae	186784	2.39
MEL- 0203R	Recount	11-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0203R	Recount	11-Aug-17	Chrysochromulina parva Lackey	136496	8.93

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0203R	Recount	11-Aug-17	Chrysococcus sp.	495696	32.42
MEL- 0203R	Recount	11-Aug-17	Kephyrion boreale Skuja	14368	1.71
MEL- 0203R	Recount	11-Aug-17	Kephyrion sp.	114944	1.18
MEL- 0203R	Recount	11-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0203R	Recount	11-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0203R	Recount	11-Aug-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0203R	Recount	11-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0203R	Recount	11-Aug-17	Dinobryon sociale Ehrenberg	21552	4.88
MEL- 0203R	Recount	11-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.20
MEL- 0203R	Recount	11-Aug-17	Ochromonas sp.	7184	0.55
MEL- 0203R	Recount	11-Aug-17	Uroglena volvox Ehrenberg	251440	28.44
MEL- 0203R	Recount	11-Aug-17	Chrysochromulina laurentiana Kling	64656	26.36
MEL- 0203R	Recount	11-Aug-17	Stichogloea spp.	28736	1.45
MEL- 0203R	Recount	11-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19
MEL- 0203R	Recount	11-Aug-17	Pteridomonas sp.	28736	6.38
MEL- 0203R	Recount	11-Aug-17	Cyclotella stelligera Cleve and Grunow	4600	8.36
MEL- 0203R	Recount	11-Aug-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0203R	Recount	11-Aug-17	Fragilaria crotonensis Kitton	3200	1.11
MEL- 0203R	Recount	11-Aug-17	Synedra acus Kutzing	400	0.05
MEL- 0203R	Recount	11-Aug-17	Cyclotella michiganiana Skvortzow	14368	0.27
MEL- 0203R	Recount	11-Aug-17	Cyclotella bodanica Eulenst.	400	2.82
MEL- 0203R	Recount	11-Aug-17	Rhodomonas minuta Skuja	179600	27.08
MEL- 0203R	Recount	11-Aug-17	Cryptomonas erosa Ehrenberg	2800	3.38
MEL- 0203R	Recount	11-Aug-17	Cryptomonas rostratiformis Skuja	400	0.60
MEL- 0203R	Recount	11-Aug-17	Katablepharis ovalis Skuja	7184	0.36
MEL- 0203R	Recount	11-Aug-17	Gymnodinium sp.	1200	15.17
MEL- 0203R	Recount	11-Aug-17	Peridinium pusillum (Penard) Lemmermann	1200	2.39
MEL- 0204		11-Aug-17	Snowella sp	200	0.10
MEL- 0204		11-Aug-17	Sphaerocystis schroeteri Chodat	14368	0.52
MEL- 0204		11-Aug-17	Oocystis lacustris Chodat	7184	0.18
MEL- 0204		11-Aug-17	Elakatothrix gelatinosa Willen	229888	5.06
MEL- 0204		11-Aug-17	Planctonema lauterbornii Schmidle	14368	3.61

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204		11-Aug-17	Cosmarium sp.	400	0.56
MEL- 0204		11-Aug-17	Staurodesmus extensus (Andersson) Teiling	1000	0.48
MEL- 0204		11-Aug-17	Staurodesmus paradoxum Meyen	200	0.63
MEL- 0204		11-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0204		11-Aug-17	Botryococcus braunii Kutzing	50288	45.50
MEL- 0204		11-Aug-17	Ankistrodesmus spiralis Lemmermann	7184	0.41
MEL- 0204		11-Aug-17	Nephrocytiun lunatum W. West	200	0.54
MEL- 0204		11-Aug-17	Small chrysophyceae	265808	3.40
MEL- 0204		11-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0204		11-Aug-17	Chrysochromulina parva Lackey	86208	5.64
MEL- 0204		11-Aug-17	Chrysococcus sp.	603456	39.47
MEL- 0204		11-Aug-17	Kephyrion sp.	71840	0.74
MEL- 0204		11-Aug-17	Spiniferomonas sirrata**********	14368	1.71
MEL- 0204		11-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0204		11-Aug-17	Dinobryon borgei Lemmermann	7184	0.37
MEL- 0204		11-Aug-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0204		11-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0204		11-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0204		11-Aug-17	Dinobryon sertularia Ehrenberg	1400	4.75
MEL- 0204		11-Aug-17	Dinobryon sociale Ehrenberg	50288	11.38
MEL- 0204		11-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.39
MEL- 0204		11-Aug-17	Uroglena volvox Ehrenberg	258624	29.25
MEL- 0204		11-Aug-17	Chrysochromulina laurentiana Kling	100576	39.69
MEL- 0204		11-Aug-17	Stichogloea spp.	14368	0.72
MEL- 0204		11-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.56
MEL- 0204		11-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0204		11-Aug-17	Cyclotella stelligera Cleve and Grunow	4000	7.27
MEL- 0204		11-Aug-17	Cyclotella ocellata Pant.	57472	7.18
MEL- 0204		11-Aug-17	Fragilaria crotonensis Kitton	1600	0.54
MEL- 0204		11-Aug-17	Synedra acus Kutzing	800	0.09
MEL- 0204		11-Aug-17	Asterionella formosa Hassall	1200	0.12
MEL- 0204		11-Aug-17	Cyclotella michiganiana Skvortzow	35920	0.88

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204		11-Aug-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0204		11-Aug-17	Rhodomonas minuta Skuja	237072	35.75
MEL- 0204		11-Aug-17	Cryptomonas erosa Ehrenberg	3000	3.62
MEL- 0204		11-Aug-17	Cryptomonas rostratiformis Skuja	200	0.29
MEL- 0204		11-Aug-17	Katablepharis ovalis Skuja	14368	0.72
MEL- 0204		11-Aug-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0204		11-Aug-17	Gymnodinium sp.	7184	2.65
MEL- 0204		11-Aug-17	Gymnodinium sp.	1200	14.39
MEL- 0204		11-Aug-17	Peridinium pusillum (Penard) Lemmermann	3200	6.37
MEL- 0205		11-Aug-17	Chlamydomonas spp.	14368	0.34
MEL- 0205		11-Aug-17	Sphaerocystis schroeteri Chodat	7184	0.24
MEL- 0205		11-Aug-17	Oocystis lacustris Chodat	28736	0.70
MEL- 0205		11-Aug-17	Elakatothrix gelatinosa Willen	50288	1.11
MEL- 0205		11-Aug-17	Planctonema lauterbornii Schmidle	28736	7.22
MEL- 0205		11-Aug-17	Cosmarium sp.	400	0.56
MEL- 0205		11-Aug-17	Euastrum spp.	200	0.37
MEL- 0205		11-Aug-17	Staurodesmus extensus (Andersson) Teiling	400	0.19
MEL- 0205		11-Aug-17	Staurodesmus paradoxum Meyen	200	0.59
MEL- 0205		11-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL- 0205		11-Aug-17	Botryococcus braunii Kutzing	600	0.54
MEL- 0205		11-Aug-17	Oocystis gigas Archer	400	0.97
MEL- 0205		11-Aug-17	Small chrysophyceae	272992	3.49
MEL- 0205		11-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0205		11-Aug-17	Chrysochromulina parva Lackey	136496	8.93
MEL- 0205		11-Aug-17	Chrysococcus sp.	538800	35.24
MEL- 0205		11-Aug-17	Kephyrion boreale Skuja	14368	1.71
MEL- 0205		11-Aug-17	Kephyrion sp.	107760	1.11
MEL- 0205		11-Aug-17	Spiniferomonas sirrata**********	7184	0.85
MEL- 0205		11-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0205		11-Aug-17	Dinobryon borgei Lemmermann	14368	0.74
MEL- 0205		11-Aug-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0205		11-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0205		11-Aug-17	Dinobryon sociale Ehrenberg	7184	1.63
MEL- 0205		11-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.20
MEL- 0205		11-Aug-17	Uroglena volvox Ehrenberg	201152	22.75
MEL- 0205		11-Aug-17	Chrysochromulina laurentiana Kling	43104	17.57
MEL- 0205		11-Aug-17	Stichogloea spp.	7184	0.36
MEL- 0205		11-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.37
MEL- 0205		11-Aug-17	Cyclotella stelligera Cleve and Grunow	1600	2.91
MEL- 0205		11-Aug-17	Cyclotella ocellata Pant.	21552	2.42
MEL- 0205		11-Aug-17	Fragilaria crotonensis Kitton	400	0.14
MEL- 0205		11-Aug-17	Synedra acus Kutzing	800	0.09
MEL- 0205		11-Aug-17	Asterionella formosa Hassall	1400	0.15
MEL- 0205		11-Aug-17	Cyclotella michiganiana Skvortzow	35920	0.88
MEL- 0205		11-Aug-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0205		11-Aug-17	Rhodomonas minuta Skuja	208336	31.42
MEL- 0205		11-Aug-17	Cryptomonas erosa Ehrenberg	3800	4.58
MEL- 0205		11-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0205		11-Aug-17	Katablepharis ovalis Skuja	7184	0.36
MEL- 0205		11-Aug-17	Gymnodinium sp.	1200	13.94
MEL- 0205		11-Aug-17	Peridinium pusillum (Penard) Lemmermann	4000	7.96
MEL- 0501		12-Aug-17	Snowella sp	400	0.20
MEL- 0501		12-Aug-17	Chlamydomonas spp.	21552	0.47
MEL- 0501		12-Aug-17	Sphaerocystis schroeteri Chodat	28736	0.96
MEL- 0501		12-Aug-17	Oocystis lacustris Chodat	14368	0.37
MEL- 0501		12-Aug-17	Elakatothrix gelatinosa Willen	107760	1.86
MEL- 0501		12-Aug-17	Planctonema lauterbornii Schmidle	7184	1.81
MEL- 0501		12-Aug-17	Cosmarium sp.	200	0.28
MEL- 0501		12-Aug-17	Staurodesmus extensus (Andersson) Teiling	800	0.37
MEL- 0501		12-Aug-17	Staurodesmus bullardii G.M. Smith	200	0.50
MEL- 0501		12-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0501		12-Aug-17	Mougeotia sp.	400	0.95
MEL- 0501		12-Aug-17	Botryococcus braunii Kutzing	400	0.36
MEL- 0501		12-Aug-17	Oocystis gigas Archer	200	0.48

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0501		12-Aug-17	Nephrocytiun lunatum W. West	200	0.54
MEL- 0501		12-Aug-17	Small chrysophyceae	589088	7.54
MEL- 0501		12-Aug-17	Large chrysophyceae	21552	3.87
MEL- 0501		12-Aug-17	Chrysochromulina parva Lackey	100576	6.58
MEL- 0501		12-Aug-17	Chrysococcus sp.	610640	39.94
MEL- 0501		12-Aug-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0501		12-Aug-17	Kephyrion sp.	64656	0.91
MEL- 0501		12-Aug-17	Spiniferomonas sirrata**********	28736	2.50
MEL- 0501		12-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0501		12-Aug-17	Dinobryon borgei Lemmermann	28736	1.47
MEL- 0501		12-Aug-17	Dinobryon mucronutom Nygaard	28736	3.72
MEL- 0501		12-Aug-17	Dinobryon bavaricum Imhof	50288	11.38
MEL- 0501		12-Aug-17	Dinobryon bavaricum Imhof	600	0.75
MEL- 0501		12-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0501		12-Aug-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0501		12-Aug-17	Dinobryon sociale Ehrenberg	7184	1.63
MEL- 0501		12-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.17
MEL- 0501		12-Aug-17	Uroglena volvox Ehrenberg	337648	38.19
MEL- 0501		12-Aug-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0501		12-Aug-17	Chrysochromulina laurentiana Kling	71840	28.35
MEL- 0501		12-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.06
MEL- 0501		12-Aug-17	Cyclotella stelligera Cleve and Grunow	2200	3.46
MEL- 0501		12-Aug-17	Cyclotella ocellata Pant.	57472	6.45
MEL- 0501		12-Aug-17	Synedra acus Kutzing	1400	0.16
MEL- 0501		12-Aug-17	Asterionella formosa Hassall	1200	0.12
MEL- 0501		12-Aug-17	Cyclotella michiganiana Skvortzow	57472	1.41
MEL- 0501		12-Aug-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0501		12-Aug-17	Rhodomonas minuta Skuja	352016	50.87
MEL- 0501		12-Aug-17	Cryptomonas erosa Ehrenberg	3200	3.96
MEL- 0501		12-Aug-17	Cryptomonas reflexa (Marsson) Skuja	1000	0.77
MEL- 0501		12-Aug-17	Cryptomonas rostratiformis Skuja	800	1.17
MEL- 0501		12-Aug-17	Katablepharis ovalis Skuja	7184	0.33

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0501		12-Aug-17	Gymnodinium sp.	7184	3.14
MEL- 0501		12-Aug-17	Gymnodinium sp.	1200	12.23
MEL- 0501		12-Aug-17	Peridinium pusillum (Penard) Lemmermann	2000	3.98
MEL- 0502		12-Aug-17	Chlamydomonas spp.	7184	0.14
MEL- 0502		12-Aug-17	Sphaerocystis schroeteri Chodat	28736	0.96
MEL- 0502		12-Aug-17	Oocystis lacustris Chodat	14368	0.34
MEL- 0502		12-Aug-17	Elakatothrix gelatinosa Willen	244256	4.23
MEL- 0502		12-Aug-17	Planctonema lauterbornii Schmidle	14368	3.25
MEL- 0502		12-Aug-17	Cosmarium sp.	400	0.56
MEL- 0502		12-Aug-17	Euastrum spp.	200	0.37
MEL- 0502		12-Aug-17	Staurodesmus extensus (Andersson) Teiling	1400	0.67
MEL- 0502		12-Aug-17	Staurodesmus paradoxum Meyen	400	2.21
MEL- 0502		12-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0502		12-Aug-17	Botryococcus braunii Kutzing	400	0.36
MEL- 0502		12-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0502		12-Aug-17	Small chrysophyceae	380752	4.87
MEL- 0502		12-Aug-17	Large chrysophyceae	57472	10.32
MEL- 0502		12-Aug-17	Chrysochromulina parva Lackey	86208	5.64
MEL- 0502		12-Aug-17	Chrysococcus sp.	668112	43.69
MEL- 0502		12-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0502		12-Aug-17	Kephyrion sp.	79024	1.11
MEL- 0502		12-Aug-17	Spiniferomonas sirrata**********	28736	3.41
MEL- 0502		12-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0502		12-Aug-17	Mallomonas akrokomos Asmund and Kristiansen	7184	0.93
MEL- 0502		12-Aug-17	Dinobryon borgei Lemmermann	7184	0.37
MEL- 0502		12-Aug-17	Dinobryon mucronutom Nygaard	7184	0.93
MEL- 0502		12-Aug-17	Dinobryon bavaricum Imhof	7184	1.63
MEL- 0502		12-Aug-17	Dinobryon bavaricum Imhof	800	1.00
MEL- 0502		12-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0502		12-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0502		12-Aug-17	Dinobryon sociale Ehrenberg	50288	11.38
MEL- 0502		12-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.17

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0502		12-Aug-17	Uroglena volvox Ehrenberg	222704	25.19
MEL- 0502		12-Aug-17	Chrysochromulina laurentiana Kling	93392	36.85
MEL- 0502		12-Aug-17	Stichogloea spp.	28736	1.45
MEL- 0502		12-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.64
MEL- 0502		12-Aug-17	Pteridomonas sp.	7184	1.59
MEL- 0502		12-Aug-17	Cyclotella stelligera Cleve and Grunow	2600	4.08
MEL- 0502		12-Aug-17	Cyclotella ocellata Pant.	93392	9.74
MEL- 0502		12-Aug-17	Fragilaria crotonensis Kitton	400	0.13
MEL- 0502		12-Aug-17	Synedra acus Kutzing	1000	0.12
MEL- 0502		12-Aug-17	Cyclotella michiganiana Skvortzow	28736	0.70
MEL- 0502		12-Aug-17	Rhodomonas minuta Skuja	158048	22.84
MEL- 0502		12-Aug-17	Cryptomonas erosa Ehrenberg	1800	2.23
MEL- 0502		12-Aug-17	Cryptomonas reflexa (Marsson) Skuja	1600	1.23
MEL- 0502		12-Aug-17	Cryptomonas rostratiformis Skuja	600	0.88
MEL- 0502		12-Aug-17	Katablepharis ovalis Skuja	21552	0.99
MEL- 0502		12-Aug-17	Gymnodinium sp.	800	10.32
MEL- 0502		12-Aug-17	Peridinium pusillum (Penard) Lemmermann	1400	2.79
MEL- 0502	Rep 2	12-Aug-17	Chlamydomonas spp.	7184	0.14
MEL- 0502	Rep 2	12-Aug-17	Pediastrum duplex Meyen	200	0.74
MEL- 0502	Rep 2	12-Aug-17	Oocystis lacustris Chodat	28736	0.69
MEL- 0502	Rep 2	12-Aug-17	Elakatothrix gelatinosa Willen	57472	0.99
MEL- 0502	Rep 2	12-Aug-17	Cosmarium sp.	600	0.84
MEL- 0502	Rep 2	12-Aug-17	Euastrum spp.	200	1.50
MEL- 0502	Rep 2	12-Aug-17	Staurodesmus extensus (Andersson) Teiling	1000	0.48
MEL- 0502	Rep 2	12-Aug-17	Staurodesmus paradoxum Meyen	400	2.32
MEL- 0502	Rep 2	12-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0502	Rep 2	12-Aug-17	Botryococcus braunii Kutzing	400	0.36
MEL- 0502	Rep 2	12-Aug-17	Oocystis gigas Archer	400	0.97
MEL- 0502	Rep 2	12-Aug-17	Small chrysophyceae	287360	3.68
MEL- 0502	Rep 2	12-Aug-17	Large chrysophyceae	43104	7.74
MEL- 0502	Rep 2	12-Aug-17	Chrysochromulina parva Lackey	107760	7.05
MEL- 0502	Rep 2	12-Aug-17	Chrysococcus sp.	574720	37.59

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0502	Rep 2	12-Aug-17	Chrysostephanospaera globulifera Scherffel	14368	5.13
MEL- 0502	Rep 2	12-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0502	Rep 2	12-Aug-17	Kephyrion sp.	79024	1.11
MEL- 0502	Rep 2	12-Aug-17	Spiniferomonas sirrata**********	50288	5.97
MEL- 0502	Rep 2	12-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0502	Rep 2	12-Aug-17	Mallomonas akrokomos Asmund and Kristiansen	7184	0.97
MEL- 0502	Rep 2	12-Aug-17	Dinobryon borgei Lemmermann	21552	1.11
MEL- 0502	Rep 2	12-Aug-17	Dinobryon mucronutom Nygaard	7184	0.93
MEL- 0502	Rep 2	12-Aug-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0502	Rep 2	12-Aug-17	Dinobryon bavaricum Imhof	600	0.75
MEL- 0502	Rep 2	12-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0502	Rep 2	12-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0502	Rep 2	12-Aug-17	Dinobryon sociale Ehrenberg	57472	13.00
MEL- 0502	Rep 2	12-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.17
MEL- 0502	Rep 2	12-Aug-17	Uroglena volvox Ehrenberg	179600	20.31
MEL- 0502	Rep 2	12-Aug-17	Chrysochromulina laurentiana Kling	35920	14.17
MEL- 0502	Rep 2	12-Aug-17	Stichogloea spp.	21552	1.08
MEL- 0502	Rep 2	12-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.64
MEL- 0502	Rep 2	12-Aug-17	Pteridomonas sp.	7184	1.59
MEL- 0502	Rep 2	12-Aug-17	Cyclotella stelligera Cleve and Grunow	2200	3.46
MEL- 0502	Rep 2	12-Aug-17	Cyclotella ocellata Pant.	14368	1.44
MEL- 0502	Rep 2	12-Aug-17	Fragilaria crotonensis Kitton	400	0.13
MEL- 0502	Rep 2	12-Aug-17	Synedra acus Kutzing	2200	0.25
MEL- 0502	Rep 2	12-Aug-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0502	Rep 2	12-Aug-17	Rhodomonas minuta Skuja	222704	32.18
MEL- 0502	Rep 2	12-Aug-17	Cryptomonas erosa Ehrenberg	3400	4.20
MEL- 0502	Rep 2	12-Aug-17	Cryptomonas reflexa (Marsson) Skuja	400	0.31
MEL- 0502	Rep 2	12-Aug-17	Cryptomonas rostratiformis Skuja	200	0.29
MEL- 0502	Rep 2	12-Aug-17	Katablepharis ovalis Skuja	7184	0.33
MEL- 0502	Rep 2	12-Aug-17	Gymnodinium sp.	800	10.32
MEL- 0502	Rep 2	12-Aug-17	Peridinium pusillum (Penard) Lemmermann	2600	5.18
MEL- 0503		12-Aug-17	Pediastrum duplex Meyen	200	0.84

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0503		12-Aug-17	Oocystis lacustris Chodat	14368	0.37
MEL- 0503		12-Aug-17	Elakatothrix gelatinosa Willen	57472	0.99
MEL- 0503		12-Aug-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0503		12-Aug-17	Cosmarium sp.	200	0.28
MEL- 0503		12-Aug-17	Euastrum spp.	400	0.74
MEL- 0503		12-Aug-17	Staurodesmus extensus (Andersson) Teiling	400	0.19
MEL- 0503		12-Aug-17	Staurodesmus paradoxum Meyen	400	2.21
MEL- 0503		12-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0503		12-Aug-17	Botryococcus braunii Kutzing	200	0.18
MEL- 0503		12-Aug-17	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL- 0503		12-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0503		12-Aug-17	Nephrocytiun lunatum W. West	200	0.54
MEL- 0503		12-Aug-17	Small chrysophyceae	229888	2.94
MEL- 0503		12-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0503		12-Aug-17	Chrysochromulina parva Lackey	129312	8.46
MEL- 0503		12-Aug-17	Chrysococcus sp.	567536	37.12
MEL- 0503		12-Aug-17	Kephyrion sp.	57472	0.81
MEL- 0503		12-Aug-17	Spiniferomonas sirrata**********	7184	1.08
MEL- 0503		12-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0503		12-Aug-17	Dinobryon borgei Lemmermann	21552	1.11
MEL- 0503		12-Aug-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0503		12-Aug-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0503		12-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0503		12-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0503		12-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0503		12-Aug-17	Dinobryon sociale Ehrenberg	43104	9.75
MEL- 0503		12-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.17
MEL- 0503		12-Aug-17	Uroglena volvox Ehrenberg	208336	23.56
MEL- 0503		12-Aug-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0503		12-Aug-17	Chrysochromulina laurentiana Kling	71840	28.35
MEL- 0503		12-Aug-17	Stichogloea spp.	7184	0.36
MEL- 0503		12-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.74

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0503		12-Aug-17	Pteridomonas sp.	21552	4.78
MEL- 0503		12-Aug-17	Cyclotella stelligera Cleve and Grunow	1600	2.51
MEL- 0503		12-Aug-17	Cyclotella ocellata Pant.	28736	2.78
MEL- 0503		12-Aug-17	Rhizosolenia eriense H.L. Smith	7184	0.61
MEL- 0503		12-Aug-17	Tabellaria flocculsa (Roth) Kutzing	600	0.77
MEL- 0503		12-Aug-17	Synedra acus Kutzing	400	0.05
MEL- 0503		12-Aug-17	Cyclotella michiganiana Skvortzow	7184	0.18
MEL- 0503		12-Aug-17	Cyclotella bodanica Eulenst.	400	2.82
MEL- 0503		12-Aug-17	Rhodomonas minuta Skuja	229888	33.22
MEL- 0503		12-Aug-17	Cryptomonas erosa Ehrenberg	2800	3.32
MEL- 0503		12-Aug-17	Cryptomonas reflexa (Marsson) Skuja	800	0.61
MEL- 0503		12-Aug-17	Cryptomonas rostratiformis Skuja	200	0.30
MEL- 0503		12-Aug-17	Katablepharis ovalis Skuja	7184	0.33
MEL- 0503		12-Aug-17	Gymnodinium sp.	400	5.16
MEL- 0503		12-Aug-17	Peridinium pusillum (Penard) Lemmermann	2800	5.54
MEL- 0504		12-Aug-17	Chlamydomonas spp.	14368	0.39
MEL- 0504		12-Aug-17	Sphaerocystis schroeteri Chodat	21552	0.41
MEL- 0504		12-Aug-17	Oocystis lacustris Chodat	28736	0.74
MEL- 0504		12-Aug-17	Elakatothrix gelatinosa Willen	64656	1.12
MEL- 0504		12-Aug-17	Planctonema lauterbornii Schmidle	7184	1.63
MEL- 0504		12-Aug-17	Cosmarium sp.	400	1.88
MEL- 0504		12-Aug-17	Euastrum spp.	400	0.74
MEL- 0504		12-Aug-17	Staurodesmus extensus (Andersson) Teiling	400	0.19
MEL- 0504		12-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0504		12-Aug-17	Botryococcus braunii Kutzing	200	0.18
MEL- 0504		12-Aug-17	Ankistrodesmus spiralis Lemmermann	7184	0.41
MEL- 0504		12-Aug-17	Small chrysophyceae	510064	6.53
MEL- 0504		12-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0504		12-Aug-17	Chrysochromulina parva Lackey	129312	8.46
MEL- 0504		12-Aug-17	Chrysococcus sp.	524432	34.30
MEL- 0504		12-Aug-17	Chrysostephanospaera globulifera Scherffel	7184	2.65
MEL- 0504		12-Aug-17	Kephyrion sp.	79024	1.11

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0504		12-Aug-17	Spiniferomonas sirrata**********	21552	1.98
MEL- 0504		12-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0504		12-Aug-17	Dinobryon mucronutom Nygaard	7184	0.93
MEL- 0504		12-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0504		12-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0504		12-Aug-17	Dinobryon sociale Ehrenberg	50288	11.38
MEL- 0504		12-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.43
MEL- 0504		12-Aug-17	Uroglena volvox Ehrenberg	158048	17.88
MEL- 0504		12-Aug-17	Chrysochromulina laurentiana Kling	71840	28.35
MEL- 0504		12-Aug-17	Stichogloea spp.	14368	0.72
MEL- 0504		12-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.12
MEL- 0504		12-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0504		12-Aug-17	Cyclotella stelligera Cleve and Grunow	2600	4.08
MEL- 0504		12-Aug-17	Cyclotella ocellata Pant.	28736	3.59
MEL- 0504		12-Aug-17	Fragilaria crotonensis Kitton	2400	0.80
MEL- 0504		12-Aug-17	Synedra acus Kutzing	400	0.05
MEL- 0504		12-Aug-17	Asterionella formosa Hassall	200	0.02
MEL- 0504		12-Aug-17	Cyclotella michiganiana Skvortzow	14368	0.35
MEL- 0504		12-Aug-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0504		12-Aug-17	Rhodomonas minuta Skuja	215520	31.14
MEL- 0504		12-Aug-17	Cryptomonas erosa Ehrenberg	2200	2.65
MEL- 0504		12-Aug-17	Cryptomonas reflexa (Marsson) Skuja	800	0.61
MEL- 0504		12-Aug-17	Cryptomonas rostratiformis Skuja	200	0.30
MEL- 0504		12-Aug-17	Katablepharis ovalis Skuja	7184	0.33
MEL- 0504		12-Aug-17	Gymnodinium sp.	7184	2.46
MEL- 0504		12-Aug-17	Gymnodinium sp.	1000	13.04
MEL- 0504		12-Aug-17	Peridinium pusillum (Penard) Lemmermann	1800	3.52
MEL- 0504R	Recount	12-Aug-17	Chlamydomonas spp.	7184	0.19
MEL- 0504R	Recount	12-Aug-17	Sphaerocystis schroeteri Chodat	14368	0.27
MEL- 0504R	Recount	12-Aug-17	Oocystis lacustris Chodat	14368	0.37
MEL- 0504R	Recount	12-Aug-17	Elakatothrix gelatinosa Willen	21552	0.37
MEL- 0504R	Recount	12-Aug-17	Planctonema lauterbornii Schmidle	7184	0.73

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0504R	Recount	12-Aug-17	Cosmarium sp.	400	1.88
MEL- 0504R	Recount	12-Aug-17	Euastrum spp.	200	0.37
MEL- 0504R	Recount	12-Aug-17	Staurodesmus extensus (Andersson) Teiling	200	0.10
MEL- 0504R	Recount	12-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0504R	Recount	12-Aug-17	Botryococcus braunii Kutzing	200	0.18
MEL- 0504R	Recount	12-Aug-17	Small chrysophyceae	617824	7.91
MEL- 0504R	Recount	12-Aug-17	Small chrysophyceae	114944	1.62
MEL- 0504R	Recount	12-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0504R	Recount	12-Aug-17	Chrysochromulina parva Lackey	179600	11.75
MEL- 0504R	Recount	12-Aug-17	Chrysococcus sp.	502880	32.89
MEL- 0504R	Recount	12-Aug-17	Spiniferomonas sirrata**********	14368	1.32
MEL- 0504R	Recount	12-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0504R	Recount	12-Aug-17	Dinobryon borgei Lemmermann	7184	0.35
MEL- 0504R	Recount	12-Aug-17	Dinobryon mucronutom Nygaard	7184	0.93
MEL- 0504R	Recount	12-Aug-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0504R	Recount	12-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0504R	Recount	12-Aug-17	Dinobryon sociale Ehrenberg	28736	6.50
MEL- 0504R	Recount	12-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.43
MEL- 0504R	Recount	12-Aug-17	Uroglena volvox Ehrenberg	136496	15.44
MEL- 0504R	Recount	12-Aug-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0504R	Recount	12-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.37
MEL- 0504R	Recount	12-Aug-17	Pteridomonas sp.	21552	5.13
MEL- 0504R	Recount	12-Aug-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0504R	Recount	12-Aug-17	Cyclotella ocellata Pant.	14368	1.79
MEL- 0504R	Recount	12-Aug-17	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL- 0504R	Recount	12-Aug-17	Fragilaria crotonensis Kitton	800	0.27
MEL- 0504R	Recount	12-Aug-17	Synedra acus Kutzing	1000	0.12
MEL- 0504R	Recount	12-Aug-17	Cyclotella michiganiana Skvortzow	7184	0.18
MEL- 0504R	Recount	12-Aug-17	Cyclotella bodanica Eulenst.	400	2.82
MEL- 0504R	Recount	12-Aug-17	Rhodomonas minuta Skuja	186784	26.99
MEL- 0504R	Recount	12-Aug-17	Cryptomonas erosa Ehrenberg	3200	3.86
MEL- 0504R	Recount	12-Aug-17	Cryptomonas reflexa (Marsson) Skuja	600	0.46

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0504R	Recount	12-Aug-17	Cryptomonas rostratiformis Skuja	400	0.60
MEL- 0504R	Recount	12-Aug-17	Katablepharis ovalis Skuja	7184	0.33
MEL- 0504R	Recount	12-Aug-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0504R	Recount	12-Aug-17	Gymnodinium sp.	14368	4.91
MEL- 0504R	Recount	12-Aug-17	Gymnodinium sp.	1400	18.25
MEL- 0504R	Recount	12-Aug-17	Peridinium pusillum (Penard) Lemmermann	1000	1.96
MEL- 0505		12-Aug-17	Sphaerocystis schroeteri Chodat	35920	1.20
MEL- 0505		12-Aug-17	Oocystis lacustris Chodat	21552	0.56
MEL- 0505		12-Aug-17	Elakatothrix gelatinosa Willen	14368	0.25
MEL- 0505		12-Aug-17	Cosmarium sp.	200	0.20
MEL- 0505		12-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.29
MEL- 0505		12-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL- 0505		12-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0505		12-Aug-17	Small chrysophyceae	294544	3.77
MEL- 0505		12-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0505		12-Aug-17	Chrysochromulina parva Lackey	57472	3.76
MEL- 0505		12-Aug-17	Chrysococcus sp.	330464	21.61
MEL- 0505		12-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0505		12-Aug-17	Kephyrion sp.	57472	0.81
MEL- 0505		12-Aug-17	Spiniferomonas sirrata**********	14368	1.32
MEL- 0505		12-Aug-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0505		12-Aug-17	Dinobryon borgei Lemmermann	35920	1.84
MEL- 0505		12-Aug-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0505		12-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0505		12-Aug-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.95
MEL- 0505		12-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0505		12-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0505		12-Aug-17	Dinobryon sociale Ehrenberg	100576	22.75
MEL- 0505		12-Aug-17	Uroglena volvox Ehrenberg	237072	26.81
MEL- 0505		12-Aug-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0505		12-Aug-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0505		12-Aug-17	Stichogloea spp.	43104	2.17

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0505		12-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.63
MEL- 0505		12-Aug-17	Cyclotella stelligera Cleve and Grunow	2400	3.77
MEL- 0505		12-Aug-17	Cyclotella ocellata Pant.	21552	2.42
MEL- 0505		12-Aug-17	Fragilaria crotonensis Kitton	200	0.07
MEL- 0505		12-Aug-17	Synedra acus Kutzing	200	0.02
MEL- 0505		12-Aug-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0505		12-Aug-17	Rhodomonas minuta Skuja	316096	45.68
MEL- 0505		12-Aug-17	Cryptomonas erosa Ehrenberg	4200	4.92
MEL- 0505		12-Aug-17	Cryptomonas reflexa (Marsson) Skuja	600	0.46
MEL- 0505		12-Aug-17	Cryptomonas rostratiformis Skuja	600	0.88
MEL- 0505		12-Aug-17	Gymnodinium sp.	600	7.74
MEL- 0505		12-Aug-17	Peridinium pusillum (Penard) Lemmermann	1200	2.39
MEL- 0301		13-Aug-17	Sphaerocystis schroeteri Chodat	7184	0.18
MEL- 0301		13-Aug-17	Oocystis lacustris Chodat	57472	1.49
MEL- 0301		13-Aug-17	Elakatothrix gelatinosa Willen	28736	0.50
MEL- 0301		13-Aug-17	Cosmarium sp.	200	0.28
MEL- 0301		13-Aug-17	Staurodesmus extensus (Andersson) Teiling	400	0.18
MEL- 0301		13-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0301		13-Aug-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0301		13-Aug-17	Ankistrodesmus spiralis Lemmermann	14368	0.90
MEL- 0301		13-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0301		13-Aug-17	Small chrysophyceae	229888	3.24
MEL- 0301		13-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0301		13-Aug-17	Chrysochromulina parva Lackey	79024	5.17
MEL- 0301		13-Aug-17	Chrysococcus sp.	409488	26.78
MEL- 0301		13-Aug-17	Chrysostephanospaera globulifera Scherffel	21552	7.18
MEL- 0301		13-Aug-17	Kephyrion sp.	28736	0.41
MEL- 0301		13-Aug-17	Spiniferomonas sirrata**********	14368	1.63
MEL- 0301		13-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0301		13-Aug-17	Dinobryon borgei Lemmermann	7184	0.30
MEL- 0301		13-Aug-17	Dinobryon bavaricum Imhof	2000	2.50
MEL- 0301		13-Aug-17	Dinobryon sertularia Ehrenberg	57472	13.00

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0301		13-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0301		13-Aug-17	Dinobryon sociale Ehrenberg	28736	6.50
MEL- 0301		13-Aug-17	Uroglena volvox Ehrenberg	136496	15.44
MEL- 0301		13-Aug-17	Chrysochromulina laurentiana Kling	107760	42.52
MEL- 0301		13-Aug-17	Stichogloea spp.	35920	1.81
MEL- 0301		13-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	122128	3.38
MEL- 0301		13-Aug-17	Pteridomonas sp.	7184	0.80
MEL- 0301		13-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0301		13-Aug-17	Cyclotella stelligera Cleve and Grunow	1800	3.27
MEL- 0301		13-Aug-17	Fragilaria crotonensis Kitton	200	0.07
MEL- 0301		13-Aug-17	Synedra acus Kutzing	1400	0.16
MEL- 0301		13-Aug-17	Asterionella formosa Hassall	1400	0.15
MEL- 0301		13-Aug-17	Cyclotella michiganiana Skvortzow	21552	0.53
MEL- 0301		13-Aug-17	Rhodomonas minuta Skuja	172416	24.91
MEL- 0301		13-Aug-17	Cryptomonas erosa Ehrenberg	1800	2.17
MEL- 0301		13-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0301		13-Aug-17	Cryptomonas rostratiformis Skuja	400	0.60
MEL- 0301		13-Aug-17	Katablepharis ovalis Skuja	14368	0.66
MEL- 0301		13-Aug-17	Gymnodinium sp.	14368	5.30
MEL- 0301		13-Aug-17	Gymnodinium sp.	1400	16.26
MEL- 0301		13-Aug-17	Peridinium pusillum (Penard) Lemmermann	3000	5.94
MEL- 0302		13-Aug-17	Chlamydomonas spp.	7184	0.30
MEL- 0302		13-Aug-17	Sphaerocystis schroeteri Chodat	28736	0.70
MEL- 0302		13-Aug-17	Oocystis lacustris Chodat	21552	0.56
MEL- 0302		13-Aug-17	Quadrigula closterioides (Bohl.) Printz	7184	0.17
MEL- 0302		13-Aug-17	Elakatothrix gelatinosa Willen	7184	0.12
MEL- 0302		13-Aug-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0302		13-Aug-17	Cosmarium sp.	400	0.56
MEL- 0302		13-Aug-17	Staurodesmus extensus (Andersson) Teiling	1000	0.46
MEL- 0302		13-Aug-17	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.14
MEL- 0302		13-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0302		13-Aug-17	Botryococcus braunii Kutzing	200	0.10

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0302		13-Aug-17	Ankistrodesmus spiralis Lemmermann	14368	0.90
MEL- 0302		13-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0302		13-Aug-17	Small chrysophyceae	287360	4.05
MEL- 0302		13-Aug-17	Large chrysophyceae	21552	3.87
MEL- 0302		13-Aug-17	Chrysochromulina parva Lackey	86208	5.64
MEL- 0302		13-Aug-17	Chrysococcus sp.	488512	31.95
MEL- 0302		13-Aug-17	Kephyrion sp.	79024	1.11
MEL- 0302		13-Aug-17	Spiniferomonas sirrata**********	14368	1.63
MEL- 0302		13-Aug-17	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL- 0302		13-Aug-17	Dinobryon borgei Lemmermann	7184	0.30
MEL- 0302		13-Aug-17	Dinobryon mucronutom Nygaard	21552	2.71
MEL- 0302		13-Aug-17	Dinobryon bavaricum Imhof	7184	1.63
MEL- 0302		13-Aug-17	Dinobryon bavaricum Imhof	1600	2.00
MEL- 0302		13-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0302		13-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0302		13-Aug-17	Dinobryon sociale Ehrenberg	7184	1.63
MEL- 0302		13-Aug-17	Uroglena volvox Ehrenberg	136496	15.44
MEL- 0302		13-Aug-17	Chrysochromulina laurentiana Kling	93392	36.85
MEL- 0302		13-Aug-17	Stichogloea spp.	28736	1.45
MEL- 0302		13-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	93392	2.59
MEL- 0302		13-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0302		13-Aug-17	Cyclotella stelligera Cleve and Grunow	1800	3.27
MEL- 0302		13-Aug-17	Cyclotella ocellata Pant.	14368	1.61
MEL- 0302		13-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	600	0.50
MEL- 0302		13-Aug-17	Fragilaria crotonensis Kitton	200	0.07
MEL- 0302		13-Aug-17	Synedra acus Kutzing	1200	0.14
MEL- 0302		13-Aug-17	Cyclotella michiganiana Skvortzow	35920	0.88
MEL- 0302		13-Aug-17	Rhodomonas minuta Skuja	237072	34.26
MEL- 0302		13-Aug-17	Cryptomonas erosa Ehrenberg	1000	1.18
MEL- 0302		13-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0302		13-Aug-17	Katablepharis ovalis Skuja	14368	0.66
MEL- 0302		13-Aug-17	Gymnodinium sp.	2200	25.56

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0302		13-Aug-17	Peridinium pusillum (Penard) Lemmermann	2400	4.75
MEL- 0302	Rep 2	13-Aug-17	Chlamydomonas spp.	7184	0.30
MEL- 0302	Rep 2	13-Aug-17	Sphaerocystis schroeteri Chodat	7184	0.18
MEL- 0302	Rep 2	13-Aug-17	Oocystis lacustris Chodat	21552	0.56
MEL- 0302	Rep 2	13-Aug-17	Elakatothrix gelatinosa Willen	100576	1.74
MEL- 0302	Rep 2	13-Aug-17	Planctonema lauterbornii Schmidle	21552	5.42
MEL- 0302	Rep 2	13-Aug-17	Cosmarium sp.	400	0.56
MEL- 0302	Rep 2	13-Aug-17	Staurodesmus extensus (Andersson) Teiling	1000	0.46
MEL- 0302	Rep 2	13-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL- 0302	Rep 2	13-Aug-17	Ankistrodesmus spiralis Lemmermann	7184	0.45
MEL- 0302	Rep 2	13-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0302	Rep 2	13-Aug-17	Nephrocytiun lunatum W. West	200	0.54
MEL- 0302	Rep 2	13-Aug-17	Small chrysophyceae	114944	1.62
MEL- 0302	Rep 2	13-Aug-17	Large chrysophyceae	64656	11.61
MEL- 0302	Rep 2	13-Aug-17	Chrysochromulina parva Lackey	122128	7.99
MEL- 0302	Rep 2	13-Aug-17	Chrysococcus sp.	416672	27.25
MEL- 0302	Rep 2	13-Aug-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0302	Rep 2	13-Aug-17	Kephyrion sp.	57472	0.81
MEL- 0302	Rep 2	13-Aug-17	Spiniferomonas sirrata**********	35920	4.06
MEL- 0302	Rep 2	13-Aug-17	Dinobryon mucronutom Nygaard	21552	2.71
MEL- 0302	Rep 2	13-Aug-17	Dinobryon bavaricum Imhof	800	1.00
MEL- 0302	Rep 2	13-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0302	Rep 2	13-Aug-17	Dinobryon sertularia Ehrenberg	1200	4.07
MEL- 0302	Rep 2	13-Aug-17	Dinobryon sociale Ehrenberg	71840	16.25
MEL- 0302	Rep 2	13-Aug-17	Uroglena volvox Ehrenberg	186784	21.13
MEL- 0302	Rep 2	13-Aug-17	Chrysochromulina laurentiana Kling	71840	28.35
MEL- 0302	Rep 2	13-Aug-17	Stichogloea spp.	7184	0.36
MEL- 0302	Rep 2	13-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	107760	2.98
MEL- 0302	Rep 2	13-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0302	Rep 2	13-Aug-17	Cyclotella stelligera Cleve and Grunow	1600	2.91
MEL- 0302	Rep 2	13-Aug-17	Cyclotella ocellata Pant.	57472	6.45
MEL- 0302	Rep 2	13-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.17

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0302	Rep 2	13-Aug-17	Fragilaria crotonensis Kitton	800	0.27
MEL- 0302	Rep 2	13-Aug-17	Synedra acus Kutzing	400	0.05
MEL- 0302	Rep 2	13-Aug-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0302	Rep 2	13-Aug-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0302	Rep 2	13-Aug-17	Rhodomonas minuta Skuja	143680	20.76
MEL- 0302	Rep 2	13-Aug-17	Cryptomonas erosa Ehrenberg	1800	2.12
MEL- 0302	Rep 2	13-Aug-17	Katablepharis ovalis Skuja	7184	0.33
MEL- 0302	Rep 2	13-Aug-17	Gymnodinium sp.	14368	4.91
MEL- 0302	Rep 2	13-Aug-17	Gymnodinium sp.	1600	18.59
MEL- 0302	Rep 2	13-Aug-17	Peridinium pusillum (Penard) Lemmermann	2400	4.75
MEL- 0303		13-Aug-17	Chlamydomonas spp.	14368	0.63
MEL- 0303		13-Aug-17	Sphaerocystis schroeteri Chodat	7184	0.18
MEL- 0303		13-Aug-17	Oocystis lacustris Chodat	14368	0.37
MEL- 0303		13-Aug-17	Elakatothrix gelatinosa Willen	86208	1.49
MEL- 0303		13-Aug-17	Planctonema lauterbornii Schmidle	14368	3.61
MEL- 0303		13-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0303		13-Aug-17	Staurodesmus paradoxum Meyen	200	0.52
MEL- 0303		13-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0303		13-Aug-17	Trachelomonas hispida (Perty) Stein	200	2.08
MEL- 0303		13-Aug-17	Small chrysophyceae	352016	4.96
MEL- 0303		13-Aug-17	Large chrysophyceae	21552	3.87
MEL- 0303		13-Aug-17	Chrysochromulina parva Lackey	86208	5.64
MEL- 0303		13-Aug-17	Chrysococcus sp.	481328	31.48
MEL- 0303		13-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0303		13-Aug-17	Kephyrion sp.	28736	0.41
MEL- 0303		13-Aug-17	Spiniferomonas sirrata**********	28736	3.41
MEL- 0303		13-Aug-17	Dinobryon borgei Lemmermann	14368	0.61
MEL- 0303		13-Aug-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0303		13-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0303		13-Aug-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0303		13-Aug-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0303		13-Aug-17	Dinobryon sociale Ehrenberg	28736	6.50

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0303		13-Aug-17	Chrysolkos skuja (Nauwerck) Willen	35920	0.98
MEL- 0303		13-Aug-17	Uroglena volvox Ehrenberg	193968	21.94
MEL- 0303		13-Aug-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0303		13-Aug-17	Stichogloea spp.	21552	1.08
MEL- 0303		13-Aug-17	Bicoeca lacustris Clark	7184	0.37
MEL- 0303		13-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	64656	1.79
MEL- 0303		13-Aug-17	Cyclotella stelligera Cleve and Grunow	1000	1.82
MEL- 0303		13-Aug-17	Cyclotella ocellata Pant.	21552	2.25
MEL- 0303		13-Aug-17	Fragilaria crotonensis Kitton	200	0.07
MEL- 0303		13-Aug-17	Synedra acus Kutzing	400	0.05
MEL- 0303		13-Aug-17	Asterionella formosa Hassall	400	0.04
MEL- 0303		13-Aug-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0303		13-Aug-17	Rhodomonas minuta Skuja	136496	19.72
MEL- 0303		13-Aug-17	Cryptomonas erosa Ehrenberg	2200	2.65
MEL- 0303		13-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0303		13-Aug-17	Katablepharis ovalis Skuja	7184	0.33
MEL- 0303		13-Aug-17	Gymnodinium sp.	1400	16.26
MEL- 0303		13-Aug-17	Peridinium pusillum (Penard) Lemmermann	2200	4.35
MEL- 0304		13-Aug-17	Snowella sp	200	0.10
MEL- 0304		13-Aug-17	Chlamydomonas spp.	14368	0.96
MEL- 0304		13-Aug-17	Oocystis lacustris Chodat	7184	0.19
MEL- 0304		13-Aug-17	Dictyosphaerium simplex Sukja	14368	0.06
MEL- 0304		13-Aug-17	Elakatothrix gelatinosa Willen	35920	0.62
MEL- 0304		13-Aug-17	Cosmarium sp.	400	0.56
MEL- 0304		13-Aug-17	Staurodesmus extensus (Andersson) Teiling	200	0.09
MEL- 0304		13-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL- 0304		13-Aug-17	Botryococcus braunii Kutzing	600	0.54
MEL- 0304		13-Aug-17	Ankistrodesmus spiralis Lemmermann	7184	0.45
MEL- 0304		13-Aug-17	Oocystis gigas Archer	400	0.97
MEL- 0304		13-Aug-17	Small chrysophyceae	308912	4.36
MEL- 0304		13-Aug-17	Large chrysophyceae	43104	7.74
MEL- 0304		13-Aug-17	Chrysochromulina parva Lackey	136496	8.93

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0304		13-Aug-17	Chrysococcus sp.	445408	29.13
MEL- 0304		13-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0304		13-Aug-17	Kephyrion sp.	107760	1.52
MEL- 0304		13-Aug-17	Spiniferomonas sirrata**********	14368	1.71
MEL- 0304		13-Aug-17	Mallomonas crassisquama (Asmund) Fott	600	0.62
MEL- 0304		13-Aug-17	Dinobryon borgei Lemmermann	28736	1.22
MEL- 0304		13-Aug-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0304		13-Aug-17	Dinobryon bavaricum Imhof	1800	2.25
MEL- 0304		13-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0304		13-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0304		13-Aug-17	Dinobryon sociale Ehrenberg	50288	11.38
MEL- 0304		13-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.39
MEL- 0304		13-Aug-17	Uroglena volvox Ehrenberg	265808	30.06
MEL- 0304		13-Aug-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0304		13-Aug-17	Chrysochromulina laurentiana Kling	100576	39.69
MEL- 0304		13-Aug-17	Stichogloea spp.	35920	1.81
MEL- 0304		13-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	93392	2.42
MEL- 0304		13-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0304		13-Aug-17	Cyclotella stelligera Cleve and Grunow	1000	1.82
MEL- 0304		13-Aug-17	Cyclotella ocellata Pant.	21552	2.25
MEL- 0304		13-Aug-17	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL- 0304		13-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	2400	1.99
MEL- 0304		13-Aug-17	Synedra acus Kutzing	1000	0.12
MEL- 0304		13-Aug-17	Cyclotella michiganiana Skvortzow	21552	0.53
MEL- 0304		13-Aug-17	Rhodomonas minuta Skuja	122128	17.65
MEL- 0304		13-Aug-17	Cryptomonas erosa Ehrenberg	800	0.97
MEL- 0304		13-Aug-17	Cryptomonas reflexa (Marsson) Skuja	1000	0.73
MEL- 0304		13-Aug-17	Cryptomonas rostratiformis Skuja	200	0.31
MEL- 0304		13-Aug-17	Gymnodinium sp.	7184	2.55
MEL- 0304		13-Aug-17	Gymnodinium sp.	200	2.35
MEL- 0304		13-Aug-17	Peridinium pusillum (Penard) Lemmermann	3600	7.13
MEL- 0305		13-Aug-17	Anabaena solitaria Klebs	200	0.93

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305		13-Aug-17	Elakatothrix gelatinosa Willen	57472	0.99
MEL- 0305		13-Aug-17	Planctonema lauterbornii Schmidle	35920	9.03
MEL- 0305		13-Aug-17	Cosmarium sp.	200	0.94
MEL- 0305		13-Aug-17	Staurodesmus extensus (Andersson) Teiling	1000	0.46
MEL- 0305		13-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0305		13-Aug-17	Ankistrodesmus spiralis Lemmermann	7184	0.45
MEL- 0305		13-Aug-17	Oocystis gigas Archer	400	0.97
MEL- 0305		13-Aug-17	Small chrysophyceae	287360	4.05
MEL- 0305		13-Aug-17	Large chrysophyceae	14368	2.58
MEL- 0305		13-Aug-17	Chrysochromulina parva Lackey	100576	6.58
MEL- 0305		13-Aug-17	Chrysococcus sp.	718400	46.98
MEL- 0305		13-Aug-17	Kephyrion boreale Skuja	7184	0.81
MEL- 0305		13-Aug-17	Kephyrion sp.	57472	0.81
MEL- 0305		13-Aug-17	Spiniferomonas sirrata**********	21552	2.56
MEL- 0305		13-Aug-17	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL- 0305		13-Aug-17	Dinobryon borgei Lemmermann	337648	14.32
MEL- 0305		13-Aug-17	Dinobryon bavaricum Imhof	2800	3.50
MEL- 0305		13-Aug-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0305		13-Aug-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0305		13-Aug-17	Dinobryon sociale Ehrenberg	43104	9.75
MEL- 0305		13-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.20
MEL- 0305		13-Aug-17	Uroglena volvox Ehrenberg	86208	9.75
MEL- 0305		13-Aug-17	Chrysochromulina laurentiana Kling	86208	35.15
MEL- 0305		13-Aug-17	Stichogloea spp.	21552	1.08
MEL- 0305		13-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	129312	3.35
MEL- 0305		13-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0305		13-Aug-17	Cyclotella stelligera Cleve and Grunow	1200	1.88
MEL- 0305		13-Aug-17	Cyclotella ocellata Pant.	21552	2.25
MEL- 0305		13-Aug-17	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL- 0305		13-Aug-17	Tabellaria fenestrata (Lyngbye) Kutzing	7600	6.30
MEL- 0305		13-Aug-17	Fragilaria crotonensis Kitton	400	0.14
MEL- 0305		13-Aug-17	Synedra acus Kutzing	200	0.02

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305		13-Aug-17	Cyclotella michiganiana Skvortzow	21552	0.53
MEL- 0305		13-Aug-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0305		13-Aug-17	Rhodomonas minuta Skuja	215520	31.14
MEL- 0305		13-Aug-17	Cryptomonas erosa Ehrenberg	1800	2.17
MEL- 0305		13-Aug-17	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL- 0305		13-Aug-17	Cryptomonas rostratiformis Skuja	400	0.59
MEL- 0305		13-Aug-17	Gymnodinium helveticum Penard	400	9.42
MEL- 0305		13-Aug-17	Gymnodinium sp.	1800	21.14
MEL- 0305		13-Aug-17	Peridinium pusillum (Penard) Lemmermann	3200	6.33
MEL- 0401		15-Aug-17	Sphaerocystis schroeteri Chodat	28736	0.96
MEL- 0401		15-Aug-17	Pediastrum duplex Meyen	200	0.92
MEL- 0401		15-Aug-17	Oocystis lacustris Chodat	7184	0.19
MEL- 0401		15-Aug-17	Elakatothrix gelatinosa Willen	86208	1.49
MEL- 0401		15-Aug-17	Cosmarium sp.	600	0.84
MEL- 0401		15-Aug-17	Staurodesmus extensus (Andersson) Teiling	800	0.37
MEL- 0401		15-Aug-17	Staurodesmus paradoxum Meyen	200	0.64
MEL- 0401		15-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0401		15-Aug-17	Mougeotia sp.	200	0.38
MEL- 0401		15-Aug-17	Botryococcus braunii Kutzing	400	0.36
MEL- 0401		15-Aug-17	Oocystis gigas Archer	200	0.48
MEL- 0401		15-Aug-17	Monomastix minuta Skuja	7184	0.14
MEL- 0401		15-Aug-17	Small chrysophyceae	265808	2.74
MEL- 0401		15-Aug-17	Large chrysophyceae	21552	3.87
MEL- 0401		15-Aug-17	Chrysochromulina parva Lackey	79024	5.17
MEL- 0401		15-Aug-17	Chrysococcus sp.	625008	40.88
MEL- 0401		15-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0401		15-Aug-17	Kephyrion sp.	71840	0.92
MEL- 0401		15-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0401		15-Aug-17	Dinobryon borgei Lemmermann	14368	0.62
MEL- 0401		15-Aug-17	Dinobryon bavaricum Imhof	400	0.50
MEL- 0401		15-Aug-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0401		15-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0401		15-Aug-17	Dinobryon sociale Ehrenberg	14368	3.25
MEL- 0401		15-Aug-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.38
MEL- 0401		15-Aug-17	Ochromonas sp.	7184	0.55
MEL- 0401		15-Aug-17	Uroglena volvox Ehrenberg	86208	9.75
MEL- 0401		15-Aug-17	Chrysochromulina laurentiana Kling	57472	22.68
MEL- 0401		15-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.21
MEL- 0401		15-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0401		15-Aug-17	Cyclotella stelligera Cleve and Grunow	1800	3.27
MEL- 0401		15-Aug-17	Cyclotella ocellata Pant.	28736	2.20
MEL- 0401		15-Aug-17	Rhizosolenia eriense H.L. Smith	7184	0.61
MEL- 0401		15-Aug-17	Tabellaria flocculsa (Roth) Kutzing	200	0.24
MEL- 0401		15-Aug-17	Synedra acus Kutzing	600	0.07
MEL- 0401		15-Aug-17	Asterionella formosa Hassall	1600	0.17
MEL- 0401		15-Aug-17	Cyclotella michiganiana Skvortzow	7184	0.17
MEL- 0401		15-Aug-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0401		15-Aug-17	Rhodomonas minuta Skuja	316096	45.68
MEL- 0401		15-Aug-17	Cryptomonas erosa Ehrenberg	2400	2.90
MEL- 0401		15-Aug-17	Cryptomonas rostratiformis Skuja	200	0.30
MEL- 0401		15-Aug-17	Gymnodinium sp.	400	4.70
MEL- 0401		15-Aug-17	Peridinium pusillum (Penard) Lemmermann	600	1.19
MEL- 0402		15-Aug-17	Chroococcus turgidus (Kutzing) Nageli	57472	19.26
MEL- 0402		15-Aug-17	Chlamydomonas spp.	7184	0.36
MEL- 0402		15-Aug-17	Oocystis lacustris Chodat	7184	0.19
MEL- 0402		15-Aug-17	Elakatothrix gelatinosa Willen	93392	1.62
MEL- 0402		15-Aug-17	Planctonema lauterbornii Schmidle	14368	3.25
MEL- 0402		15-Aug-17	Cosmarium sp.	800	1.12
MEL- 0402		15-Aug-17	Staurodesmus extensus (Andersson) Teiling	400	0.19
MEL- 0402		15-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0402		15-Aug-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0402		15-Aug-17	Nephrocytiun lunatum W. West	400	1.07
MEL- 0402		15-Aug-17	Small chrysophyceae	452592	5.79
MEL- 0402		15-Aug-17	Large chrysophyceae	35920	6.45

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0402		15-Aug-17	Chrysochromulina parva Lackey	114944	7.52
MEL- 0402		15-Aug-17	Chrysococcus sp.	510064	33.36
MEL- 0402		15-Aug-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0402		15-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0402		15-Aug-17	Kephyrion sp.	86208	1.10
MEL- 0402		15-Aug-17	Spiniferomonas sirrata**********	35920	4.06
MEL- 0402		15-Aug-17	Dinobryon mucronutom Nygaard	14368	1.81
MEL- 0402		15-Aug-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0402		15-Aug-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0402		15-Aug-17	Dinobryon sociale Ehrenberg	64656	14.63
MEL- 0402		15-Aug-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.20
MEL- 0402		15-Aug-17	Uroglena volvox Ehrenberg	57472	6.50
MEL- 0402		15-Aug-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0402		15-Aug-17	Stichogloea spp.	14368	0.72
MEL- 0402		15-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.52
MEL- 0402		15-Aug-17	Pteridomonas sp.	7184	1.71
MEL- 0402		15-Aug-17	Cyclotella stelligera Cleve and Grunow	3000	5.46
MEL- 0402		15-Aug-17	Cyclotella ocellata Pant.	35920	4.03
MEL- 0402		15-Aug-17	Fragilaria crotonensis Kitton	200	0.07
MEL- 0402		15-Aug-17	Large diatoms	200	0.02
MEL- 0402		15-Aug-17	Cyclotella michiganiana Skvortzow	14368	0.33
MEL- 0402		15-Aug-17	Cyclotella bodanica Eulenst.	200	1.45
MEL- 0402		15-Aug-17	Rhodomonas minuta Skuja	222704	32.18
MEL- 0402		15-Aug-17	Cryptomonas erosa Ehrenberg	1400	1.69
MEL- 0402		15-Aug-17	Cryptomonas erosa Ehrenberg	400	3.13
MEL- 0402		15-Aug-17	Katablepharis ovalis Skuja	7184	0.34
MEL- 0402		15-Aug-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0402		15-Aug-17	Peridinium pusillum (Penard) Lemmermann	800	1.58
MEL- 0403		15-Aug-17	Sphaerocystis schroeteri Chodat	14368	0.48
MEL- 0403		15-Aug-17	Dictyosphaerium simplex Sukja	28736	0.12
MEL- 0403		15-Aug-17	Elakatothrix gelatinosa Willen	57472	0.99
MEL- 0403		15-Aug-17	Planctonema lauterbornii Schmidle	7184	1.63

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0403		15-Aug-17	Cosmarium sp.	200	0.28
MEL- 0403		15-Aug-17	Staurodesmus extensus (Andersson) Teiling	600	0.27
MEL- 0403		15-Aug-17	Staurodesmus paradoxum Meyen	200	0.82
MEL- 0403		15-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL- 0403		15-Aug-17	Botryococcus braunii Kutzing	400	0.36
MEL- 0403		15-Aug-17	Small chrysophyceae	452592	4.66
MEL- 0403		15-Aug-17	Large chrysophyceae	35920	6.45
MEL- 0403		15-Aug-17	Chrysochromulina parva Lackey	86208	5.64
MEL- 0403		15-Aug-17	Chrysococcus sp.	553168	36.18
MEL- 0403		15-Aug-17	Kephyrion sp.	93392	1.20
MEL- 0403		15-Aug-17	Spiniferomonas sirrata**********	14368	1.63
MEL- 0403		15-Aug-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0403		15-Aug-17	Dinobryon borgei Lemmermann	43104	1.83
MEL- 0403		15-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0403		15-Aug-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0403		15-Aug-17	Dinobryon sertularia Ehrenberg	200	0.68
MEL- 0403		15-Aug-17	Dinobryon sociale Ehrenberg	28736	6.50
MEL- 0403		15-Aug-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.60
MEL- 0403		15-Aug-17	Uroglena volvox Ehrenberg	50288	5.69
MEL- 0403		15-Aug-17	Chrysochromulina laurentiana Kling	86208	34.02
MEL- 0403		15-Aug-17	Bicoeca lacustris Clark	7184	0.37
MEL- 0403		15-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	35920	0.86
MEL- 0403		15-Aug-17	Cyclotella stelligera Cleve and Grunow	2400	4.36
MEL- 0403		15-Aug-17	Cyclotella ocellata Pant.	14368	1.10
MEL- 0403		15-Aug-17	Synedra acus Kutzing	600	0.07
MEL- 0403		15-Aug-17	Asterionella formosa Hassall	600	0.06
MEL- 0403		15-Aug-17	Cyclotella michiganiana Skvortzow	57472	1.33
MEL- 0403		15-Aug-17	Cyclotella bodanica Eulenst.	600	3.51
MEL- 0403		15-Aug-17	Rhodomonas minuta Skuja	359200	51.90
MEL- 0403		15-Aug-17	Cryptomonas erosa Ehrenberg	1600	1.93
MEL- 0403		15-Aug-17	Cryptomonas reflexa (Marsson) Skuja	800	0.61
MEL- 0403		15-Aug-17	Cryptomonas rostratiformis Skuja	200	0.30

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0403		15-Aug-17	Katablepharis ovalis Skuja	7184	0.33
MEL- 0403		15-Aug-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0403		15-Aug-17	Gymnodinium sp.	200	2.35
MEL- 0403		15-Aug-17	Peridinium pusillum (Penard) Lemmermann	1600	3.19
MEL- 0404		15-Aug-17	Chroococcus turgidus (Kutzing) Nageli	114944	38.52
MEL- 0404		15-Aug-17	Chlamydomonas spp.	7184	0.17
MEL- 0404		15-Aug-17	Sphaerocystis schroeteri Chodat	28736	0.96
MEL- 0404		15-Aug-17	Oocystis lacustris Chodat	50288	1.30
MEL- 0404		15-Aug-17	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL- 0404		15-Aug-17	Elakatothrix gelatinosa Willen	86208	1.49
MEL- 0404		15-Aug-17	Planctonema lauterbornii Schmidle	14368	3.25
MEL- 0404		15-Aug-17	Cosmarium sp.	200	0.28
MEL- 0404		15-Aug-17	Staurodesmus extensus (Andersson) Teiling	1200	0.55
MEL- 0404		15-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL- 0404		15-Aug-17	Botryococcus braunii Kutzing	200	0.18
MEL- 0404		15-Aug-17	Nephrocytiun lunatum W. West	200	0.54
MEL- 0404		15-Aug-17	Small chrysophyceae	402304	4.14
MEL- 0404		15-Aug-17	Large chrysophyceae	7184	1.29
MEL- 0404		15-Aug-17	Chrysochromulina parva Lackey	122128	7.99
MEL- 0404		15-Aug-17	Chrysococcus sp.	660928	43.22
MEL- 0404		15-Aug-17	Kephyrion sp.	114944	1.47
MEL- 0404		15-Aug-17	Spiniferomonas sirrata**********	21552	2.44
MEL- 0404		15-Aug-17	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL- 0404		15-Aug-17	Dinobryon borgei Lemmermann	21552	0.92
MEL- 0404		15-Aug-17	Dinobryon bavaricum Imhof	400	0.50
MEL- 0404		15-Aug-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0404		15-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0404		15-Aug-17	Dinobryon sociale Ehrenberg	35920	8.13
MEL- 0404		15-Aug-17	Uroglena volvox Ehrenberg	93392	10.56
MEL- 0404		15-Aug-17	Chrysochromulina laurentiana Kling	93392	36.85
MEL- 0404		15-Aug-17	Stichogloea spp.	14368	0.72
MEL- 0404		15-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.03

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0404		15-Aug-17	Pteridomonas sp.	28736	6.84
MEL- 0404		15-Aug-17	Cyclotella stelligera Cleve and Grunow	3000	5.46
MEL- 0404		15-Aug-17	Cyclotella ocellata Pant.	28736	2.20
MEL- 0404		15-Aug-17	Fragilaria crotonensis Kitton	1400	0.48
MEL- 0404		15-Aug-17	Synedra acus Kutzing	200	0.02
MEL- 0404		15-Aug-17	Cyclotella michiganiana Skvortzow	35920	0.83
MEL- 0404		15-Aug-17	Cyclotella bodanica Eulenst.	200	1.24
MEL- 0404		15-Aug-17	Rhodomonas minuta Skuja	208336	30.10
MEL- 0404		15-Aug-17	Cryptomonas erosa Ehrenberg	1400	1.66
MEL- 0404		15-Aug-17	Cryptomonas reflexa (Marsson) Skuja	400	0.29
MEL- 0404		15-Aug-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0404		15-Aug-17	Gymnodinium sp.	7184	2.55
MEL- 0404		15-Aug-17	Gymnodinium sp.	400	4.70
MEL- 0405		15-Aug-17	Aphanocapsa delicatissima W. and G.S. West	200	0.43
MEL- 0405		15-Aug-17	Chlamydomonas spp.	7184	0.17
MEL- 0405		15-Aug-17	Sphaerocystis schroeteri Chodat	28736	0.96
MEL- 0405		15-Aug-17	Oocystis lacustris Chodat	64656	1.67
MEL- 0405		15-Aug-17	Elakatothrix gelatinosa Willen	43104	0.75
MEL- 0405		15-Aug-17	Planctonema lauterbornii Schmidle	14368	3.25
MEL- 0405		15-Aug-17	Cosmarium sp.	400	0.56
MEL- 0405		15-Aug-17	Staurodesmus extensus (Andersson) Teiling	1000	0.46
MEL- 0405		15-Aug-17	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL- 0405		15-Aug-17	Small chrysophyceae	366384	3.77
MEL- 0405		15-Aug-17	Large chrysophyceae	21552	3.87
MEL- 0405		15-Aug-17	Chrysochromulina parva Lackey	100576	6.58
MEL- 0405		15-Aug-17	Chrysococcus sp.	553168	36.18
MEL- 0405		15-Aug-17	Kephyrion boreale Skuja	7184	0.85
MEL- 0405		15-Aug-17	Kephyrion sp.	136496	1.75
MEL- 0405		15-Aug-17	Spiniferomonas sirrata**********	14368	1.63
MEL- 0405		15-Aug-17	Mallomonas crassisquama (Asmund) Fott	800	0.84
MEL- 0405		15-Aug-17	Dinobryon borgei Lemmermann	14368	0.62
MEL- 0405		15-Aug-17	Dinobryon mucronutom Nygaard	14368	1.81

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0405		15-Aug-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0405		15-Aug-17	Dinobryon bavaricum Imhof	200	0.25
MEL- 0405		15-Aug-17	Dinobryon sertularia Ehrenberg	600	2.03
MEL- 0405		15-Aug-17	Dinobryon sociale Ehrenberg	71840	16.25
MEL- 0405		15-Aug-17	Uroglena volvox Ehrenberg	150864	17.06
MEL- 0405		15-Aug-17	Chrysochromulina laurentiana Kling	86208	34.02
MEL- 0405		15-Aug-17	Stichogloea spp.	50288	2.53
MEL- 0405		15-Aug-17	Salpingoeca frequentissima (Zach.) Lemmermann	136496	3.28
MEL- 0405		15-Aug-17	Pteridomonas sp.	21552	5.13
MEL- 0405		15-Aug-17	Cyclotella stelligera Cleve and Grunow	1200	2.18
MEL- 0405		15-Aug-17	Cyclotella ocellata Pant.	14368	1.10
MEL- 0405		15-Aug-17	Synedra acus Kutzing	200	0.02
MEL- 0405		15-Aug-17	Asterionella formosa Hassall	1400	0.15
MEL- 0405		15-Aug-17	Cyclotella michiganiana Skvortzow	21552	0.50
MEL- 0405		15-Aug-17	Rhodomonas minuta Skuja	229888	33.22
MEL- 0405		15-Aug-17	Cryptomonas erosa Ehrenberg	1200	1.45
MEL- 0405		15-Aug-17	Cryptomonas reflexa (Marsson) Skuja	600	0.46
MEL- 0405		15-Aug-17	Cryptomonas rostratiformis Skuja	200	0.30
MEL- 0405		15-Aug-17	Gymnodinium sp.	1000	11.74
MEL- 0405		15-Aug-17	Peridinium pusillum (Penard) Lemmermann	1200	2.39
MEL- 0301		01-Sep-17	Oocystis lacustris Chodat	35920	1.08
MEL- 0301		01-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0301		01-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0301		01-Sep-17	Cosmarium sp.	200	0.28
MEL- 0301		01-Sep-17	Euastrum spp.	200	0.37
MEL- 0301		01-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL- 0301		01-Sep-17	Small chrysophyceae	122128	1.72
MEL- 0301		01-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0301		01-Sep-17	Chrysochromulina parva Lackey	21552	1.41
MEL- 0301		01-Sep-17	Chrysococcus sp.	711216	41.18
MEL- 0301		01-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	4.78
MEL- 0301		01-Sep-17	Kephyrion boreale Skuja	7184	0.77

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0301		01-Sep-17	Kephyrion sp.	21552	0.20
MEL- 0301		01-Sep-17	Spiniferomonas sirrata**********	21552	1.98
MEL- 0301		01-Sep-17	Dinobryon borgei Lemmermann	14368	0.62
MEL- 0301		01-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0301		01-Sep-17	Dinobryon bavaricum Imhof	400	0.80
MEL- 0301		01-Sep-17	Dinobryon sertularia Ehrenberg	71840	16.25
MEL- 0301		01-Sep-17	Dinobryon sertularia Ehrenberg	400	1.36
MEL- 0301		01-Sep-17	Epiphyxis sp.	28736	2.19
MEL- 0301		01-Sep-17	Chrysochromulina laurentiana Kling	57472	22.68
MEL- 0301		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	100576	3.24
MEL- 0301		01-Sep-17	Cyclotella stelligera Cleve and Grunow	4200	6.60
MEL- 0301		01-Sep-17	Cyclotella ocellata Pant.	43104	5.38
MEL- 0301		01-Sep-17	Tabellaria flocculsa (Roth) Kutzing	800	1.07
MEL- 0301		01-Sep-17	Fragilaria crotonensis Kitton	800	0.25
MEL- 0301		01-Sep-17	Synedra acus Kutzing	1400	0.15
MEL- 0301		01-Sep-17	Asterionella formosa Hassall	5600	0.59
MEL- 0301		01-Sep-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0301		01-Sep-17	Cyclotella bodanica Eulenst.	600	4.63
MEL- 0301		01-Sep-17	Rhodomonas minuta Skuja	136496	18.86
MEL- 0301		01-Sep-17	Cryptomonas erosa Ehrenberg	600	0.78
MEL- 0301		01-Sep-17	Gymnodinium sp.	800	8.24
MEL- 0301		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	1400	3.48
MEL- 0302		01-Sep-17	Oocystis lacustris Chodat	28736	0.87
MEL- 0302		01-Sep-17	Planctonema lauterbornii Schmidle	7184	1.63
MEL- 0302		01-Sep-17	Cosmarium sp.	200	0.28
MEL- 0302		01-Sep-17	Small chrysophyceae	136496	1.92
MEL- 0302		01-Sep-17	Large chrysophyceae	57472	10.32
MEL- 0302		01-Sep-17	Chrysochromulina parva Lackey	28736	1.88
MEL- 0302		01-Sep-17	Chrysococcus sp.	366384	21.21
MEL- 0302		01-Sep-17	Kephyrion sp.	21552	0.20
MEL- 0302		01-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0302		01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0302		01-Sep-17	Dinobryon bavaricum Imhof	7184	1.63
MEL- 0302		01-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0302		01-Sep-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0302		01-Sep-17	Dinobryon sertularia Ehrenberg	200	1.02
MEL- 0302		01-Sep-17	Ochromonas sp.	14368	0.88
MEL- 0302		01-Sep-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0302		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	251440	8.10
MEL- 0302		01-Sep-17	Cyclotella stelligera Cleve and Grunow	3200	5.03
MEL- 0302		01-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0302		01-Sep-17	Tabellaria flocculsa (Roth) Kutzing	200	0.27
MEL- 0302		01-Sep-17	Synedra acus Kutzing	200	0.02
MEL- 0302		01-Sep-17	Synedra ulna (Nitzsch) Ehrenberg	200	1.47
MEL- 0302		01-Sep-17	Asterionella formosa Hassall	1800	0.19
MEL- 0302		01-Sep-17	Cyclotella michiganiana Skvortzow	57472	1.41
MEL- 0302		01-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0302		01-Sep-17	Rhodomonas minuta Skuja	14368	1.99
MEL- 0302		01-Sep-17	Cryptomonas erosa Ehrenberg	1000	1.31
MEL- 0302		01-Sep-17	Katablepharis ovalis Skuja	64656	2.34
MEL- 0302		01-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0302		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	800	1.99
MEL- 0303		01-Sep-17	Snowella sp	200	0.15
MEL- 0303		01-Sep-17	Oocystis lacustris Chodat	50288	1.52
MEL- 0303		01-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0303		01-Sep-17	Cosmarium sp.	200	0.28
MEL- 0303		01-Sep-17	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL- 0303		01-Sep-17	Staurodesmus paradoxum Meyen	200	1.05
MEL- 0303		01-Sep-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0303		01-Sep-17	Small chrysophyceae	193968	2.73
MEL- 0303		01-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0303		01-Sep-17	Chrysochromulina parva Lackey	64656	4.23
MEL- 0303		01-Sep-17	Chrysococcus sp.	524432	30.36
MEL- 0303		01-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	4.78

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0303		01-Sep-17	Kephyrion sp.	35920	0.88
MEL- 0303		01-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0303		01-Sep-17	Dinobryon mucronutom Nygaard	7184	0.90
MEL- 0303		01-Sep-17	Dinobryon bavaricum Imhof	57472	13.00
MEL- 0303		01-Sep-17	Dinobryon bavaricum Imhof	400	0.80
MEL- 0303		01-Sep-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0303		01-Sep-17	Dinobryon sertularia Ehrenberg	800	1.00
MEL- 0303		01-Sep-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0303		01-Sep-17	Stichogloea spp.	7184	0.36
MEL- 0303		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	86208	2.78
MEL- 0303		01-Sep-17	Cyclotella stelligera Cleve and Grunow	4200	6.60
MEL- 0303		01-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0303		01-Sep-17	Fragilaria crotonensis Kitton	200	0.06
MEL- 0303		01-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0303		01-Sep-17	Asterionella formosa Hassall	1800	0.19
MEL- 0303		01-Sep-17	Cyclotella michiganiana Skvortzow	35920	0.88
MEL- 0303		01-Sep-17	Cyclotella bodanica Eulenst.	200	1.41
MEL- 0303		01-Sep-17	Rhodomonas minuta Skuja	43104	5.96
MEL- 0303		01-Sep-17	Cryptomonas erosa Ehrenberg	600	0.78
MEL- 0303		01-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0303		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	4400	10.92
MEL- 0304		01-Sep-17	Sphaerocystis schroeteri Chodat	35920	0.56
MEL- 0304		01-Sep-17	Oocystis lacustris Chodat	28736	0.87
MEL- 0304		01-Sep-17	Planctonema lauterbornii Schmidle	28736	6.50
MEL- 0304		01-Sep-17	Cosmarium sp.	200	0.28
MEL- 0304		01-Sep-17	Staurodesmus extensus (Andersson) Teiling	1400	0.54
MEL- 0304		01-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0304		01-Sep-17	Small chrysophyceae	100576	1.42
MEL- 0304		01-Sep-17	Large chrysophyceae	43104	7.74
MEL- 0304		01-Sep-17	Chrysochromulina parva Lackey	28736	1.88
MEL- 0304		01-Sep-17	Chrysococcus sp.	395120	22.88
MEL- 0304		01-Sep-17	Kephyrion sp.	35920	0.88

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0304		01-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0304		01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0304		01-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0304		01-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0304		01-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0304		01-Sep-17	Dinobryon sertularia Ehrenberg	1600	11.62
MEL- 0304		01-Sep-17	Chrysochromulina laurentiana Kling	100576	39.69
MEL- 0304		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.93
MEL- 0304		01-Sep-17	Pteridomonas sp.	7184	1.38
MEL- 0304		01-Sep-17	Cyclotella stelligera Cleve and Grunow	1600	2.51
MEL- 0304		01-Sep-17	Cyclotella ocellata Pant.	35920	4.49
MEL- 0304		01-Sep-17	Fragilaria crotonensis Kitton	200	0.06
MEL- 0304		01-Sep-17	Synedra acus Kutzing	1400	0.15
MEL- 0304		01-Sep-17	Asterionella formosa Hassall	2200	0.23
MEL- 0304		01-Sep-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0304		01-Sep-17	Cyclotella bodanica Eulenst.	400	3.09
MEL- 0304		01-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0304		01-Sep-17	Cryptomonas erosa Ehrenberg	1000	1.31
MEL- 0304		01-Sep-17	Gymnodinium sp.	1600	16.49
MEL- 0304		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	1600	3.97
MEL- 0305		01-Sep-17	Elakatothrix gelatinosa Willen	35920	0.68
MEL- 0305		01-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0305		01-Sep-17	Cosmarium sp.	600	0.84
MEL- 0305		01-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.14
MEL- 0305		01-Sep-17	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL- 0305		01-Sep-17	Small chrysophyceae	208336	2.94
MEL- 0305		01-Sep-17	Large chrysophyceae	64656	11.61
MEL- 0305		01-Sep-17	Chrysochromulina parva Lackey	35920	2.35
MEL- 0305		01-Sep-17	Chrysococcus sp.	466960	27.04
MEL- 0305		01-Sep-17	Kephyrion boreale Skuja	7184	0.77
MEL- 0305		01-Sep-17	Kephyrion sp.	107760	0.99
MEL- 0305		01-Sep-17	Spiniferomonas sirrata**********	21552	1.98

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305		01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0305		01-Sep-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0305		01-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0305		01-Sep-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0305		01-Sep-17	Dinobryon sertularia Ehrenberg	1200	6.10
MEL- 0305		01-Sep-17	Chrysochromulina laurentiana Kling	86208	34.02
MEL- 0305		01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL- 0305		01-Sep-17	Cyclotella stelligera Cleve and Grunow	2400	3.77
MEL- 0305		01-Sep-17	Cyclotella ocellata Pant.	50288	6.28
MEL- 0305		01-Sep-17	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL- 0305		01-Sep-17	Tabellaria flocculsa (Roth) Kutzing	600	0.80
MEL- 0305		01-Sep-17	Fragilaria crotonensis Kitton	1400	0.45
MEL- 0305		01-Sep-17	Synedra acus Kutzing	600	0.06
MEL- 0305		01-Sep-17	Asterionella formosa Hassall	2000	0.21
MEL- 0305		01-Sep-17	Cyclotella michiganiana Skvortzow	50288	1.23
MEL- 0305		01-Sep-17	Rhodomonas minuta Skuja	64656	8.94
MEL- 0305		01-Sep-17	Cryptomonas erosa Ehrenberg	800	1.05
MEL- 0305		01-Sep-17	Cryptomonas reflexa (Marsson) Skuja	600	0.41
MEL- 0305		01-Sep-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0305		01-Sep-17	Gymnodinium sp.	1000	10.31
MEL- 0305		01-Sep-17	Peridinium pusillum (Penard) Lemmermann	2000	4.62
MEL- 0305R	Recount	01-Sep-17	Elakatothrix gelatinosa Willen	28736	0.54
MEL- 0305R	Recount	01-Sep-17	Planctonema lauterbornii Schmidle	28736	6.50
MEL- 0305R	Recount	01-Sep-17	Cosmarium sp.	600	0.84
MEL- 0305R	Recount	01-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0305R	Recount	01-Sep-17	Spondylosium planum (Wolle) W. and G.S. West	43104	1.63
MEL- 0305R	Recount	01-Sep-17	Small chrysophyceae	107760	1.52
MEL- 0305R	Recount	01-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0305R	Recount	01-Sep-17	Chrysochromulina parva Lackey	14368	0.94
MEL- 0305R	Recount	01-Sep-17	Chrysococcus sp.	431040	24.96
MEL- 0305R	Recount	01-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	4.78
MEL- 0305R	Recount	01-Sep-17	Kephyrion boreale Skuja	7184	0.77

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0305R	Recount	01-Sep-17	Kephyrion sp.	64656	0.59
MEL- 0305R	Recount	01-Sep-17	Spiniferomonas sirrata**********	14368	1.32
MEL- 0305R	Recount	01-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0305R	Recount	01-Sep-17	Dinobryon mucronutom Nygaard	7184	0.86
MEL- 0305R	Recount	01-Sep-17	Dinobryon bavaricum Imhof	28736	6.50
MEL- 0305R	Recount	01-Sep-17	Dinobryon bavaricum Imhof	1200	2.39
MEL- 0305R	Recount	01-Sep-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0305R	Recount	01-Sep-17	Dinobryon sertularia Ehrenberg	2000	10.17
MEL- 0305R	Recount	01-Sep-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0305R	Recount	01-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	114944	3.70
MEL- 0305R	Recount	01-Sep-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0305R	Recount	01-Sep-17	Cyclotella ocellata Pant.	43104	5.38
MEL- 0305R	Recount	01-Sep-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0305R	Recount	01-Sep-17	Fragilaria crotonensis Kitton	3400	1.08
MEL- 0305R	Recount	01-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0305R	Recount	01-Sep-17	Asterionella formosa Hassall	3400	0.36
MEL- 0305R	Recount	01-Sep-17	Cyclotella michiganiana Skvortzow	79024	1.94
MEL- 0305R	Recount	01-Sep-17	Cyclotella bodanica Eulenst.	400	3.09
MEL- 0305R	Recount	01-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0305R	Recount	01-Sep-17	Cryptomonas erosa Ehrenberg	400	0.52
MEL- 0305R	Recount	01-Sep-17	Cryptomonas reflexa (Marsson) Skuja	400	0.27
MEL- 0305R	Recount	01-Sep-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0305R	Recount	01-Sep-17	Gymnodinium sp.	1600	16.49
MEL- 0305R	Recount	01-Sep-17	Peridinium pusillum (Penard) Lemmermann	1600	3.70
MEL- 0101		04-Sep-17	Sphaerocystis schroeteri Chodat	57472	0.53
MEL- 0101		04-Sep-17	Oocystis lacustris Chodat	21552	0.57
MEL- 0101		04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0101		04-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0101		04-Sep-17	Cosmarium sp.	200	0.94
MEL- 0101		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL- 0101		04-Sep-17	Botryococcus braunii Kutzing	800	0.42
MEL- 0101		04-Sep-17	Euglena acus Ehrenberg	200	1.19

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101		04-Sep-17	Small chrysophyceae	122128	1.72
MEL- 0101		04-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0101		04-Sep-17	Chrysochromulina parva Lackey	86208	5.64
MEL- 0101		04-Sep-17	Chrysococcus sp.	445408	22.72
MEL- 0101		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0101		04-Sep-17	Kephyrion sp.	7184	0.11
MEL- 0101		04-Sep-17	Dinobryon borgei Lemmermann	28736	1.39
MEL- 0101		04-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0101		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0101		04-Sep-17	Dinobryon sertularia Ehrenberg	50288	11.38
MEL- 0101		04-Sep-17	Dinobryon sertularia Ehrenberg	800	1.59
MEL- 0101		04-Sep-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0101		04-Sep-17	Stichogloea spp.	7184	0.36
MEL- 0101		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	431040	13.88
MEL- 0101		04-Sep-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0101		04-Sep-17	Rhizosolenia eriense H.L. Smith	50288	3.91
MEL- 0101		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	4600	3.73
MEL- 0101		04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	11000	18.06
MEL- 0101		04-Sep-17	Fragilaria crotonensis Kitton	4200	1.27
MEL- 0101		04-Sep-17	Synedra acus Kutzing	3800	0.38
MEL- 0101		04-Sep-17	Asterionella formosa Hassall	133200	13.81
MEL- 0101		04-Sep-17	Cyclotella michiganiana Skvortzow	28736	0.70
MEL- 0101		04-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0101		04-Sep-17	Rhodomonas minuta Skuja	158048	21.84
MEL- 0101		04-Sep-17	Cryptomonas erosa Ehrenberg	600	0.78
MEL- 0101		04-Sep-17	Katablepharis ovalis Skuja	14368	0.52
MEL- 0101		04-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0101		04-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0101		04-Sep-17	Gymnodinium sp.	200	2.83
MEL- 0101		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	800	2.83
MEL- 0101		04-Sep-17	Peridinium aciculiferum Lemmermann	400	3.62
MEL- 0101	Rep1	04-Sep-17	Carteria spp.	7184	2.65

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101	Rep1	04-Sep-17	Chlamydomonas spp.	7184	0.24
MEL- 0101	Rep1	04-Sep-17	Sphaerocystis schroeteri Chodat	50288	0.46
MEL- 0101	Rep1	04-Sep-17	Oocystis lacustris Chodat	50288	1.33
MEL- 0101	Rep1	04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0101	Rep1	04-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0101	Rep1	04-Sep-17	Cosmarium sp.	200	0.28
MEL- 0101	Rep1	04-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL- 0101	Rep1	04-Sep-17	Staurodesmus paradoxum Meyen	400	0.42
MEL- 0101	Rep1	04-Sep-17	Botryococcus braunii Kutzing	1400	0.73
MEL- 0101	Rep1	04-Sep-17	Small chrysophyceae	57472	0.81
MEL- 0101	Rep1	04-Sep-17	Large chrysophyceae	14368	2.58
MEL- 0101	Rep1	04-Sep-17	Chrysochromulina parva Lackey	50288	3.29
MEL- 0101	Rep1	04-Sep-17	Chrysococcus sp.	502880	25.65
MEL- 0101	Rep1	04-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	5.13
MEL- 0101	Rep1	04-Sep-17	Dinobryon borgei Lemmermann	7184	0.35
MEL- 0101	Rep1	04-Sep-17	Dinobryon bavaricum Imhof	43104	9.75
MEL- 0101	Rep1	04-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0101	Rep1	04-Sep-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.88
MEL- 0101	Rep1	04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0101	Rep1	04-Sep-17	Dinobryon sertularia Ehrenberg	1000	1.99
MEL- 0101	Rep1	04-Sep-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0101	Rep1	04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	229888	7.40
MEL- 0101	Rep1	04-Sep-17	Cyclotella stelligera Cleve and Grunow	2200	3.46
MEL- 0101	Rep1	04-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0101	Rep1	04-Sep-17	Rhizosolenia eriense H.L. Smith	28736	2.24
MEL- 0101	Rep1	04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	9400	7.62
MEL- 0101	Rep1	04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	7200	11.82
MEL- 0101	Rep1	04-Sep-17	Fragilaria crotonensis Kitton	2200	0.66
MEL- 0101	Rep1	04-Sep-17	Synedra acus Kutzing	3400	0.34
MEL- 0101	Rep1	04-Sep-17	Asterionella formosa Hassall	139800	14.50
MEL- 0101	Rep1	04-Sep-17	Cyclotella michiganiana Skvortzow	28736	0.70
MEL- 0101	Rep1	04-Sep-17	Rhodomonas minuta Skuja	43104	5.96

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101	Rep1	04-Sep-17	Cryptomonas erosa Ehrenberg	200	0.26
MEL- 0101	Rep1	04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0101	Rep1	04-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0101	Rep1	04-Sep-17	Gymnodinium sp.	200	2.83
MEL- 0101	Rep1	04-Sep-17	Peridinium pusillum (Penard) Lemmermann	1800	6.36
MEL- 0101	Rep1	04-Sep-17	Peridinium aciculiferum Lemmermann	600	5.43
MEL- 0101R	Rep1 Recount	04-Sep-17	Snowella sp	200	0.15
MEL- 0101R	Rep1 Recount	04-Sep-17	Chlamydomonas spp.	35920	1.19
MEL- 0101R	Rep1 Recount	04-Sep-17	Sphaerocystis schroeteri Chodat	28736	0.36
MEL- 0101R	Rep1 Recount	04-Sep-17	Oocystis lacustris Chodat	43104	1.14
MEL- 0101R	Rep1 Recount	04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0101R	Rep1 Recount	04-Sep-17	Planctonema lauterbornii Schmidle	64656	14.63
MEL- 0101R	Rep1 Recount	04-Sep-17	Staurodesmus paradoxum Meyen	200	0.21
MEL- 0101R	Rep1 Recount	04-Sep-17	Botryococcus braunii Kutzing	1800	0.94
MEL- 0101R	Rep1 Recount	04-Sep-17	Small chrysophyceae	28736	0.41
MEL- 0101R	Rep1 Recount	04-Sep-17	Large chrysophyceae	14368	2.58
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysochromulina parva Lackey	28736	1.88
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysococcus sp.	617824	31.51
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysostephanospaera globulifera Scherffel	21552	7.69
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon bavaricum Imhof	35920	8.13
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon bavaricum Imhof	1400	2.79
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0101R	Rep1 Recount	04-Sep-17	Dinobryon sertularia Ehrenberg	800	1.59
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.22
MEL- 0101R	Rep1 Recount	04-Sep-17	Uroglena volvox Ehrenberg	28736	3.25
MEL- 0101R	Rep1 Recount	04-Sep-17	Bitrichia chodatii (Reverdin) Chodat	14368	0.72
MEL- 0101R	Rep1 Recount	04-Sep-17	Chrysochromulina laurentiana Kling	28736	11.34
MEL- 0101R	Rep1 Recount	04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	186784	6.01
MEL- 0101R	Rep1 Recount	04-Sep-17	Cyclotella stelligera Cleve and Grunow	3000	4.71
MEL- 0101R	Rep1 Recount	04-Sep-17	Cyclotella ocellata Pant.	14368	1.56
MEL- 0101R	Rep1 Recount	04-Sep-17	Rhizosolenia eriense H.L. Smith	43104	3.35
MEL- 0101R	Rep1 Recount	04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	5200	4.21

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0101R	Rep1 Recount	04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	12200	20.03
MEL- 0101R	Rep1 Recount	04-Sep-17	Fragilaria crotonensis Kitton	1400	0.42
MEL- 0101R	Rep1 Recount	04-Sep-17	Synedra acus Kutzing	2200	0.22
MEL- 0101R	Rep1 Recount	04-Sep-17	Asterionella formosa Hassall	129600	13.02
MEL- 0101R	Rep1 Recount	04-Sep-17	Cyclotella michiganiana Skvortzow	21552	0.53
MEL- 0101R	Rep1 Recount	04-Sep-17	Rhodomonas minuta Skuja	71840	9.93
MEL- 0101R	Rep1 Recount	04-Sep-17	Cryptomonas erosa Ehrenberg	1200	1.57
MEL- 0101R	Rep1 Recount	04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.44
MEL- 0101R	Rep1 Recount	04-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0101R	Rep1 Recount	04-Sep-17	Gymnodinium sp.	400	5.65
MEL- 0101R	Rep1 Recount	04-Sep-17	Peridinium pusillum (Penard) Lemmermann	2000	7.07
MEL- 0101R	Rep1 Recount	04-Sep-17	Peridinium aciculiferum Lemmermann	400	3.62
MEL- 0102		04-Sep-17	Sphaerocystis schroeteri Chodat	100576	0.93
MEL- 0102		04-Sep-17	Oocystis lacustris Chodat	43104	1.14
MEL- 0102		04-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0102		04-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0102		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL- 0102		04-Sep-17	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling		
MEL- 0102		04-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0102		04-Sep-17	Small chrysophyceae	43104	0.61
MEL- 0102		04-Sep-17	Large chrysophyceae	21552	3.87
MEL- 0102		04-Sep-17	Chrysochromulina parva Lackey	43104	2.82
MEL- 0102		04-Sep-17	Chrysococcus sp.	495696	25.28
MEL- 0102		04-Sep-17	Chrysostephanospaera globulifera Scherffel	14368	4.15
MEL- 0102		04-Sep-17	Kephyrion boreale Skuja	7184	0.77
MEL- 0102		04-Sep-17	Kephyrion sp.	7184	0.11
MEL- 0102		04-Sep-17	Spiniferomonas sirrata**********	21552	1.98
MEL- 0102		04-Sep-17	Dinobryon borgei Lemmermann	7184	0.31
MEL- 0102		04-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0102		04-Sep-17	Dinobryon bavaricum Imhof	400	0.80
MEL- 0102		04-Sep-17	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	14368	5.75
MEL- 0102		04-Sep-17	Dinobryon sertularia Ehrenberg	28736	6.50

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0102		04-Sep-17	Dinobryon sertularia Ehrenberg	1000	1.99
MEL- 0102		04-Sep-17	Chrysochromulina laurentiana Kling	57472	22.68
MEL- 0102		04-Sep-17	Stichogloea spp.	35920	1.81
MEL- 0102		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	646560	20.82
MEL- 0102		04-Sep-17	Cyclotella stelligera Cleve and Grunow	1800	2.83
MEL- 0102		04-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0102		04-Sep-17	Rhizosolenia eriense H.L. Smith	35920	2.79
MEL- 0102		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	3600	2.92
MEL- 0102		04-Sep-17	Fragilaria crotonensis Kitton	6400	1.98
MEL- 0102		04-Sep-17	Synedra acus Kutzing	7200	0.72
MEL- 0102		04-Sep-17	Asterionella formosa Hassall	130400	13.52
MEL- 0102		04-Sep-17	Cyclotella michiganiana Skvortzow	35920	0.88
MEL- 0102		04-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0102		04-Sep-17	Rhodomonas minuta Skuja	71840	9.93
MEL- 0102		04-Sep-17	Cryptomonas erosa Ehrenberg	1200	1.57
MEL- 0102		04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.41
MEL- 0102		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0102		04-Sep-17	Gymnodinium helveticum Penard	200	4.81
MEL- 0102		04-Sep-17	Gymnodinium sp.	200	2.83
MEL- 0102		04-Sep-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0102		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	4200	14.85
MEL- 0102		04-Sep-17	Peridinium aciculiferum Lemmermann	400	3.62
MEL- 0103		04-Sep-17	Snowella sp	200	0.15
MEL- 0103		04-Sep-17	Sphaerocystis schroeteri Chodat	35920	0.33
MEL- 0103		04-Sep-17	Oocystis lacustris Chodat	79024	2.09
MEL- 0103		04-Sep-17	Elakatothrix gelatinosa Willen	14368	0.25
MEL- 0103		04-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0103		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	800	0.29
MEL- 0103		04-Sep-17	Small chrysophyceae	64656	0.91
MEL- 0103		04-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0103		04-Sep-17	Chrysochromulina parva Lackey	14368	0.94
MEL- 0103		04-Sep-17	Chrysococcus sp.	510064	26.01

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0103		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0103		04-Sep-17	Kephyrion sp.	7184	0.11
MEL- 0103		04-Sep-17	Kephyrion sp.	7184	0.81
MEL- 0103		04-Sep-17	Spiniferomonas sirrata**********	14368	1.32
MEL- 0103		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0103		04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0103		04-Sep-17	Dinobryon sertularia Ehrenberg	600	1.19
MEL- 0103		04-Sep-17	Epiphyxis sp.	43104	3.25
MEL- 0103		04-Sep-17	Chrysochromulina laurentiana Kling	28736	11.34
MEL- 0103		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	538800	17.35
MEL- 0103		04-Sep-17	Cyclotella stelligera Cleve and Grunow	2200	3.46
MEL- 0103		04-Sep-17	Cyclotella ocellata Pant.	7184	0.90
MEL- 0103		04-Sep-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0103		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	14600	11.83
MEL- 0103		04-Sep-17	Fragilaria crotonensis Kitton	3600	1.12
MEL- 0103		04-Sep-17	Synedra acus Kutzing	7400	0.74
MEL- 0103		04-Sep-17	Asterionella formosa Hassall	133600	13.85
MEL- 0103		04-Sep-17	Cyclotella michiganiana Skvortzow	14368	0.35
MEL- 0103		04-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0103		04-Sep-17	Rhodomonas minuta Skuja	79024	10.92
MEL- 0103		04-Sep-17	Cryptomonas erosa Ehrenberg	200	0.26
MEL- 0103		04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.41
MEL- 0103		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0103		04-Sep-17	Gymnodinium helveticum Penard	400	9.42
MEL- 0103		04-Sep-17	Gymnodinium sp.	1000	14.14
MEL- 0103		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	3800	13.43
MEL- 0103		04-Sep-17	Peridinium aciculiferum Lemmermann	200	1.81
MEL- 0104		04-Sep-17	Sphaerocystis schroeteri Chodat	193968	3.03
MEL- 0104		04-Sep-17	Oocystis lacustris Chodat	21552	0.61
MEL- 0104		04-Sep-17	Elakatothrix gelatinosa Willen	7184	0.12
MEL- 0104		04-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0104		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.09

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0104		04-Sep-17	Staurodesmus paradoxum Meyen	200	0.55
MEL- 0104		04-Sep-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0104		04-Sep-17	Small chrysophyceae	43104	0.61
MEL- 0104		04-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0104		04-Sep-17	Chrysochromulina parva Lackey	93392	6.11
MEL- 0104		04-Sep-17	Chrysococcus sp.	359200	18.32
MEL- 0104		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0104		04-Sep-17	Kephyrion boreale Skuja	14368	1.71
MEL- 0104		04-Sep-17	Kephyrion sp.	28736	0.45
MEL- 0104		04-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0104		04-Sep-17	Dinobryon bavaricum Imhof	35920	8.13
MEL- 0104		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0104		04-Sep-17	Dinobryon sertularia Ehrenberg	57472	13.00
MEL- 0104		04-Sep-17	Dinobryon sertularia Ehrenberg	400	0.80
MEL- 0104		04-Sep-17	Chrysochromulina laurentiana Kling	79024	31.18
MEL- 0104		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	768688	24.75
MEL- 0104		04-Sep-17	Pteridomonas sp.	7184	1.59
MEL- 0104		04-Sep-17	Cyclotella stelligera Cleve and Grunow	800	1.45
MEL- 0104		04-Sep-17	Rhizosolenia eriense H.L. Smith	21552	1.68
MEL- 0104		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	5200	4.21
MEL- 0104		04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	3200	4.93
MEL- 0104		04-Sep-17	Fragilaria crotonensis Kitton	3000	0.95
MEL- 0104		04-Sep-17	Synedra acus Kutzing	5400	0.54
MEL- 0104		04-Sep-17	Asterionella formosa Hassall	166400	17.26
MEL- 0104		04-Sep-17	Cyclotella michiganiana Skvortzow	43104	1.06
MEL- 0104		04-Sep-17	Rhodomonas minuta Skuja	107760	14.89
MEL- 0104		04-Sep-17	Cryptomonas erosa Ehrenberg	600	0.78
MEL- 0104		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0104		04-Sep-17	Gymnodinium helveticum Penard	600	14.14
MEL- 0104		04-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0104		04-Sep-17	Gymnodinium sp.	400	5.65
MEL- 0104		04-Sep-17	Peridinium willei Huitfeldt-Kaas	200	4.49

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0104		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	1600	5.66
MEL- 0104		04-Sep-17	Peridinium aciculiferum Lemmermann	200	1.81
MEL- 0105		04-Sep-17	Chlamydomonas spp.	43104	1.42
MEL- 0105		04-Sep-17	Sphaerocystis schroeteri Chodat	86208	0.79
MEL- 0105		04-Sep-17	Oocystis lacustris Chodat	107760	2.84
MEL- 0105		04-Sep-17	Crucigenia quadrata Morr.	28736	0.14
MEL- 0105		04-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0105		04-Sep-17	Cosmarium sp.	200	0.94
MEL- 0105		04-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL- 0105		04-Sep-17	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL- 0105		04-Sep-17	Mougeotia sp.	1200	3.00
MEL- 0105		04-Sep-17	Botryococcus braunii Kutzing	400	0.21
MEL- 0105		04-Sep-17	Small chrysophyceae	57472	0.81
MEL- 0105		04-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0105		04-Sep-17	Chrysochromulina parva Lackey	7184	0.47
MEL- 0105		04-Sep-17	Chrysococcus sp.	258624	13.19
MEL- 0105		04-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0105		04-Sep-17	Kephyrion sp.	7184	0.11
MEL- 0105		04-Sep-17	Dinobryon bavaricum Imhof	21552	4.88
MEL- 0105		04-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0105		04-Sep-17	Dinobryon sertularia Ehrenberg	35920	8.13
MEL- 0105		04-Sep-17	Dinobryon sertularia Ehrenberg	400	0.80
MEL- 0105		04-Sep-17	Chrysochromulina laurentiana Kling	43104	17.01
MEL- 0105		04-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	330464	10.64
MEL- 0105		04-Sep-17	Cyclotella ocellata Pant.	7184	0.78
MEL- 0105		04-Sep-17	Rhizosolenia eriense H.L. Smith	14368	1.12
MEL- 0105		04-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	8400	6.81
MEL- 0105		04-Sep-17	Tabellaria flocculsa (Roth) Kutzing	2400	3.94
MEL- 0105		04-Sep-17	Fragilaria crotonensis Kitton	4400	1.33
MEL- 0105		04-Sep-17	Synedra acus Kutzing	4000	0.40
MEL- 0105		04-Sep-17	Asterionella formosa Hassall	136000	14.10
MEL- 0105		04-Sep-17	Cyclotella michiganiana Skvortzow	7184	0.18

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0105		04-Sep-17	Rhodomonas minuta Skuja	35920	4.96
MEL- 0105		04-Sep-17	Cryptomonas erosa Ehrenberg	1400	1.83
MEL- 0105		04-Sep-17	Cryptomonas rostratiformis Skuja	200	0.41
MEL- 0105		04-Sep-17	Katablepharis ovalis Skuja	7184	0.26
MEL- 0105		04-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0105		04-Sep-17	Gymnodinium sp.	1600	22.62
MEL- 0105		04-Sep-17	Peridinium pusillum (Penard) Lemmermann	3000	10.61
MEL- 0201		05-Sep-17	Planktolyngbya limnetica	200	0.05
MEL- 0201		05-Sep-17	Chlamydomonas spp.	7184	0.36
MEL- 0201		05-Sep-17	Oocystis lacustris Chodat	50288	1.44
MEL- 0201		05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0201		05-Sep-17	Cosmarium sp.	600	0.84
MEL- 0201		05-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL- 0201		05-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0201		05-Sep-17	Oocystis gigas Archer	400	0.97
MEL- 0201		05-Sep-17	Small chrysophyceae	79024	1.11
MEL- 0201		05-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0201		05-Sep-17	Chrysochromulina parva Lackey	14368	0.94
MEL- 0201		05-Sep-17	Chrysococcus sp.	431040	21.98
MEL- 0201		05-Sep-17	Kephyrion sp.	14368	0.25
MEL- 0201		05-Sep-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0201		05-Sep-17	Dinobryon borgei Lemmermann	28736	1.23
MEL- 0201		05-Sep-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0201		05-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0201		05-Sep-17	Dinobryon sertularia Ehrenberg	50288	11.38
MEL- 0201		05-Sep-17	Dinobryon sertularia Ehrenberg	400	0.80
MEL- 0201		05-Sep-17	Epiphyxis sp.	7184	0.54
MEL- 0201		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	21552	0.60
MEL- 0201		05-Sep-17	Chrysochromulina laurentiana Kling	64656	25.51
MEL- 0201		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.39
MEL- 0201		05-Sep-17	Cyclotella stelligera Cleve and Grunow	6000	9.42
MEL- 0201		05-Sep-17	Cyclotella ocellata Pant.	21552	2.25

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0201		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.32
MEL- 0201		05-Sep-17	Fragilaria crotonensis Kitton	600	0.19
MEL- 0201		05-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0201		05-Sep-17	Asterionella formosa Hassall	19800	2.09
MEL- 0201		05-Sep-17	Cyclotella michiganiana Skvortzow	79024	1.94
MEL- 0201		05-Sep-17	Cyclotella bodanica Eulenst.	1400	10.80
MEL- 0201		05-Sep-17	Rhodomonas minuta Skuja	50288	6.95
MEL- 0201		05-Sep-17	Cryptomonas erosa Ehrenberg	1400	1.83
MEL- 0201		05-Sep-17	Gymnodinium sp.	600	6.18
MEL- 0201		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	2800	6.71
MEL- 0201		05-Sep-17	Peridinium wisconsiense Eddy	200	4.49
MEL- 0202		05-Sep-17	Oocystis lacustris Chodat	14368	0.38
MEL- 0202		05-Sep-17	Planctonema lauterbornii Schmidle	50288	11.38
MEL- 0202		05-Sep-17	Closterium sp.	200	0.30
MEL- 0202		05-Sep-17	Small chrysophyceae	136496	1.92
MEL- 0202		05-Sep-17	Large chrysophyceae	28736	5.16
MEL- 0202		05-Sep-17	Chrysochromulina parva Lackey	35920	2.35
MEL- 0202		05-Sep-17	Chrysococcus sp.	359200	18.32
MEL- 0202		05-Sep-17	Kephyrion sp.	28736	0.49
MEL- 0202		05-Sep-17	Mallomonas crassisquama (Asmund) Fott	200	0.20
MEL- 0202		05-Sep-17	Dinobryon bavaricum Imhof	43104	9.75
MEL- 0202		05-Sep-17	Dinobryon bavaricum Imhof	600	2.03
MEL- 0202		05-Sep-17	Dinobryon sertularia Ehrenberg	28736	6.50
MEL- 0202		05-Sep-17	Dinobryon sertularia Ehrenberg	1000	5.09
MEL- 0202		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	35920	0.94
MEL- 0202		05-Sep-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0202		05-Sep-17	Chrysochromulina laurentiana Kling	57472	22.68
MEL- 0202		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.69
MEL- 0202		05-Sep-17	Cyclotella stelligera Cleve and Grunow	3800	5.97
MEL- 0202		05-Sep-17	Cyclotella ocellata Pant.	43104	4.50
MEL- 0202		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.32
MEL- 0202		05-Sep-17	Synedra acus Kutzing	400	0.04

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0202		05-Sep-17	Asterionella formosa Hassall	14200	1.50
MEL- 0202		05-Sep-17	Cyclotella michiganiana Skvortzow	143680	3.12
MEL- 0202		05-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0202		05-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0202		05-Sep-17	Cryptomonas erosa Ehrenberg	800	1.05
MEL- 0202		05-Sep-17	Gymnodinium sp.	400	4.12
MEL- 0202		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	2200	5.27
MEL- 0203		05-Sep-17	Snowella sp	200	0.14
MEL- 0203		05-Sep-17	Sphaerocystis schroeteri Chodat	35920	0.56
MEL- 0203		05-Sep-17	Oocystis lacustris Chodat	21552	0.57
MEL- 0203		05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0203		05-Sep-17	Cosmarium sp.	800	1.12
MEL- 0203		05-Sep-17	Staurodesmus paradoxum Meyen	600	2.45
MEL- 0203		05-Sep-17	Botryococcus braunii Kutzing	800	0.42
MEL- 0203		05-Sep-17	Zygnema sp.	600	1.97
MEL- 0203		05-Sep-17	Small chrysophyceae	64656	0.91
MEL- 0203		05-Sep-17	Large chrysophyceae	21552	3.87
MEL- 0203		05-Sep-17	Chrysochromulina parva Lackey	57472	3.76
MEL- 0203		05-Sep-17	Chrysococcus sp.	510064	26.01
MEL- 0203		05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0203		05-Sep-17	Kephyrion sp.	28736	0.49
MEL- 0203		05-Sep-17	Mallomonas caudata Ivanov	400	2.14
MEL- 0203		05-Sep-17	Mallomonas crassisquama (Asmund) Fott	200	0.20
MEL- 0203		05-Sep-17	Dinobryon borgei Lemmermann	21552	0.95
MEL- 0203		05-Sep-17	Dinobryon mucronutom Nygaard	7184	0.86
MEL- 0203		05-Sep-17	Dinobryon bavaricum Imhof	71840	16.25
MEL- 0203		05-Sep-17	Dinobryon bavaricum Imhof	800	1.59
MEL- 0203		05-Sep-17	Dinobryon sertularia Ehrenberg	7184	1.63
MEL- 0203		05-Sep-17	Dinobryon sertularia Ehrenberg	2000	6.78
MEL- 0203		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	14368	0.39
MEL- 0203		05-Sep-17	Uroglena volvox Ehrenberg	28736	3.25
MEL- 0203		05-Sep-17	Chrysochromulina laurentiana Kling	35920	14.17

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0203		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.39
MEL- 0203		05-Sep-17	Cyclotella stelligera Cleve and Grunow	6600	10.37
MEL- 0203		05-Sep-17	Cyclotella ocellata Pant.	28736	3.00
MEL- 0203		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.65
MEL- 0203		05-Sep-17	Fragilaria crotonensis Kitton	1400	0.45
MEL- 0203		05-Sep-17	Synedra acus Kutzing	1200	0.12
MEL- 0203		05-Sep-17	Asterionella formosa Hassall	16000	1.69
MEL- 0203		05-Sep-17	Cyclotella michiganiana Skvortzow	79024	1.51
MEL- 0203		05-Sep-17	Cyclotella bodanica Eulenst.	1000	7.72
MEL- 0203		05-Sep-17	Rhodomonas minuta Skuja	50288	6.95
MEL- 0203		05-Sep-17	Cryptomonas erosa Ehrenberg	2000	2.61
MEL- 0203		05-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0203		05-Sep-17	Gymnodinium sp.	14368	5.30
MEL- 0203		05-Sep-17	Gymnodinium sp.	400	4.12
MEL- 0203		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	3400	8.14
MEL- 0204		05-Sep-17	Planktolyngbya limnetica	200	0.02
MEL- 0204		05-Sep-17	Chlamydomonas spp.	7184	0.85
MEL- 0204		05-Sep-17	Sphaerocystis schroeteri Chodat	21552	0.34
MEL- 0204		05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0204		05-Sep-17	Cosmarium sp.	600	0.84
MEL- 0204		05-Sep-17	Staurodesmus extensus (Andersson) Teiling	200	0.07
MEL- 0204		05-Sep-17	Staurodesmus paradoxum Meyen	200	0.37
MEL- 0204		05-Sep-17	Botryococcus braunii Kutzing	200	0.10
MEL- 0204		05-Sep-17	Small chrysophyceae	28736	0.41
MEL- 0204		05-Sep-17	Large chrysophyceae	14368	2.58
MEL- 0204		05-Sep-17	Chrysochromulina parva Lackey	7184	0.47
MEL- 0204		05-Sep-17	Chrysococcus sp.	524432	26.75
MEL- 0204		05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56
MEL- 0204		05-Sep-17	Kephyrion sp.	21552	0.37
MEL- 0204		05-Sep-17	Dinobryon borgei Lemmermann	7184	0.32
MEL- 0204		05-Sep-17	Dinobryon mucronutom Nygaard	7184	0.86
MEL- 0204		05-Sep-17	Dinobryon bavaricum Imhof	35920	8.13

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204		05-Sep-17	Dinobryon bavaricum Imhof	600	1.19
MEL- 0204		05-Sep-17	Dinobryon sertularia Ehrenberg	14368	3.25
MEL- 0204		05-Sep-17	Dinobryon sertularia Ehrenberg	1600	3.19
MEL- 0204		05-Sep-17	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL- 0204		05-Sep-17	Chrysochromulina laurentiana Kling	35920	14.17
MEL- 0204		05-Sep-17	Stichogloea spp.	21552	1.08
MEL- 0204		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.93
MEL- 0204		05-Sep-17	Cyclotella stelligera Cleve and Grunow	4400	6.91
MEL- 0204		05-Sep-17	Cyclotella ocellata Pant.	28736	2.89
MEL- 0204		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	2000	1.62
MEL- 0204		05-Sep-17	Fragilaria crotonensis Kitton	1400	0.45
MEL- 0204		05-Sep-17	Synedra acus Kutzing	1000	0.10
MEL- 0204		05-Sep-17	Asterionella formosa Hassall	28400	3.00
MEL- 0204		05-Sep-17	Cyclotella michiganiana Skvortzow	107760	2.06
MEL- 0204		05-Sep-17	Cyclotella bodanica Eulenst.	1000	7.72
MEL- 0204		05-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0204		05-Sep-17	Cryptomonas erosa Ehrenberg	1200	1.57
MEL- 0204		05-Sep-17	Katablepharis ovalis Skuja	7184	0.25
MEL- 0204		05-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0204		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	4400	10.54
MEL- 0204	Rep 2	05-Sep-17	Planktolyngbya limnetica	400	0.06
MEL- 0204	Rep 2	05-Sep-17	Chlamydomonas spp.	7184	0.85
MEL- 0204	Rep 2	05-Sep-17	Sphaerocystis schroeteri Chodat	64656	1.01
MEL- 0204	Rep 2	05-Sep-17	Oocystis lacustris Chodat	7184	0.19
MEL- 0204	Rep 2	05-Sep-17	Planctonema lauterbornii Schmidle	21552	4.88
MEL- 0204	Rep 2	05-Sep-17	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL- 0204	Rep 2	05-Sep-17	Oocystis gigas Archer	200	0.48
MEL- 0204	Rep 2	05-Sep-17	Small chrysophyceae	86208	1.22
MEL- 0204	Rep 2	05-Sep-17	Large chrysophyceae	43104	7.74
MEL- 0204	Rep 2	05-Sep-17	Chrysochromulina parva Lackey	14368	0.94
MEL- 0204	Rep 2	05-Sep-17	Chrysococcus sp.	416672	21.25
MEL- 0204	Rep 2	05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.56

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0204	Rep 2	05-Sep-17	Kephyrion sp.	43104	0.74
MEL- 0204	Rep 2	05-Sep-17	Mallomonas crassisquama (Asmund) Fott	400	0.40
MEL- 0204	Rep 2	05-Sep-17	Dinobryon borgei Lemmermann	21552	0.95
MEL- 0204	Rep 2	05-Sep-17	Dinobryon bavaricum Imhof	50288	11.38
MEL- 0204	Rep 2	05-Sep-17	Dinobryon bavaricum Imhof	200	0.40
MEL- 0204	Rep 2	05-Sep-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0204	Rep 2	05-Sep-17	Dinobryon sertularia Ehrenberg	600	1.19
MEL- 0204	Rep 2	05-Sep-17	Chrysochromulina laurentiana Kling	21552	8.50
MEL- 0204	Rep 2	05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.16
MEL- 0204	Rep 2	05-Sep-17	Cyclotella stelligera Cleve and Grunow	4200	6.60
MEL- 0204	Rep 2	05-Sep-17	Cyclotella ocellata Pant.	64656	6.50
MEL- 0204	Rep 2	05-Sep-17	Fragilaria crotonensis Kitton	2600	0.83
MEL- 0204	Rep 2	05-Sep-17	Synedra acus Kutzing	1600	0.16
MEL- 0204	Rep 2	05-Sep-17	Asterionella formosa Hassall	16200	1.71
MEL- 0204	Rep 2	05-Sep-17	Cyclotella michiganiana Skvortzow	57472	1.10
MEL- 0204	Rep 2	05-Sep-17	Cyclotella bodanica Eulenst.	200	1.54
MEL- 0204	Rep 2	05-Sep-17	Rhodomonas minuta Skuja	28736	3.97
MEL- 0204	Rep 2	05-Sep-17	Cryptomonas erosa Ehrenberg	1000	1.31
MEL- 0204	Rep 2	05-Sep-17	Gymnodinium helveticum Penard	200	4.71
MEL- 0204	Rep 2	05-Sep-17	Gymnodinium sp.	7184	2.65
MEL- 0204	Rep 2	05-Sep-17	Gymnodinium sp.	200	2.06
MEL- 0204	Rep 2	05-Sep-17	Peridinium pusillum (Penard) Lemmermann	3400	8.14
MEL- 0205		05-Sep-17	Chlamydomonas spp.	14368	2.17
MEL- 0205		05-Sep-17	Sphaerocystis schroeteri Chodat	64656	1.01
MEL- 0205		05-Sep-17	Crucigenia quadrata Morr.	28736	0.32
MEL- 0205		05-Sep-17	Planctonema lauterbornii Schmidle	43104	9.75
MEL- 0205		05-Sep-17	Closterium kuetzingii Brebisson	200	0.34
MEL- 0205		05-Sep-17	Cosmarium sp.	600	0.84
MEL- 0205		05-Sep-17	Botryococcus braunii Kutzing	800	0.42
MEL- 0205		05-Sep-17	Small chrysophyceae	122128	1.72
MEL- 0205		05-Sep-17	Large chrysophyceae	7184	1.29
MEL- 0205		05-Sep-17	Chrysochromulina parva Lackey	129312	8.46

Table 11D-5: Raw Phytoplankton Data, Meliadine Lake 2017

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL- 0205		05-Sep-17	Chrysococcus sp.	431040	21.98
MEL- 0205		05-Sep-17	Chrysostephanospaera globulifera Scherffel	7184	2.39
MEL- 0205		05-Sep-17	Kephyrion sp.	28736	0.49
MEL- 0205		05-Sep-17	Spiniferomonas sirrata**********	7184	0.66
MEL- 0205		05-Sep-17	Mallomonas caudata Ivanov	200	1.07
MEL- 0205		05-Sep-17	Mallomonas crassisquama (Asmund) Fott	200	0.20
MEL- 0205		05-Sep-17	Dinobryon bavaricum Imhof	14368	3.25
MEL- 0205		05-Sep-17	Dinobryon bavaricum Imhof	1000	1.99
MEL- 0205		05-Sep-17	Dinobryon sertularia Ehrenberg	21552	4.88
MEL- 0205		05-Sep-17	Dinobryon sertularia Ehrenberg	1200	2.39
MEL- 0205		05-Sep-17	Chrysolkos skuja (Nauwerck) Willen	7184	0.19
MEL- 0205		05-Sep-17	Uroglena volvox Ehrenberg	28736	3.25
MEL- 0205		05-Sep-17	Chrysochromulina laurentiana Kling	86208	34.02
MEL- 0205		05-Sep-17	Stichogloea spp.	7184	0.36
MEL- 0205		05-Sep-17	Salpingoeca frequentissima (Zach.) Lemmermann	79024	2.54
MEL- 0205		05-Sep-17	Cyclotella stelligera Cleve and Grunow	3800	5.97
MEL- 0205		05-Sep-17	Cyclotella ocellata Pant.	14368	1.50
MEL- 0205		05-Sep-17	Tabellaria fenestrata (Lyngbye) Kutzing	6000	4.86
MEL- 0205		05-Sep-17	Fragilaria crotonensis Kitton	1000	0.32
MEL- 0205		05-Sep-17	Synedra acus Kutzing	2000	0.20
MEL- 0205		05-Sep-17	Asterionella formosa Hassall	32800	3.47
MEL- 0205		05-Sep-17	Cyclotella michiganiana Skvortzow	64656	1.58
MEL- 0205		05-Sep-17	Cyclotella bodanica Eulenst.	800	6.17
MEL- 0205		05-Sep-17	Rhodomonas minuta Skuja	64656	8.94
MEL- 0205		05-Sep-17	Cryptomonas erosa Ehrenberg	1400	1.83
MEL- 0205		05-Sep-17	Cryptomonas rostratiformis Skuja	200	0.42
MEL- 0205		05-Sep-17	Gymnodinium sp.	400	4.12
MEL- 0205		05-Sep-17	Peridinium willei Huitfeldt-Kaas	200	4.49
MEL- 0205		05-Sep-17	Peridinium pusillum (Penard) Lemmermann	2800	6.71

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0101		22-Aug-18	Chroococcus limneticus Lemmermann	28736	1.04
MEL -0101		22-Aug-18	Snowella sp	600	0.45
MEL -0101		22-Aug-18	Sphaerocystis schroeteri Chodat	122128	2.52
MEL -0101		22-Aug-18	Oocystis lacustris Chodat	100576	2.85
MEL -0101		22-Aug-18	Crucigenia quadrata Morr.	28736	0.14
MEL -0101		22-Aug-18	Crucigeniella rectangularis (Nag.) Komarek	186784	4.69
MEL -0101		22-Aug-18	Elakatothrix gelatinosa Willen	165232	2.86
MEL -0101		22-Aug-18	Planctonema lauterbornii Schmidle	35920	12.69
MEL -0101		22-Aug-18	Cosmarium sp.	200	0.37
MEL -0101		22-Aug-18	Euastrum spp.	200	0.37
MEL -0101		22-Aug-18	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL -0101		22-Aug-18	Staurodesmus paradoxum Meyen	200	0.44
MEL -0101		22-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL -0101		22-Aug-18	Botryococcus braunii Kutzing	200	0.10
MEL -0101		22-Aug-18	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL -0101		22-Aug-18	Monomastix minuta Skuja	7184	0.14
MEL -0101		22-Aug-18	Small chrysophyceae	948288	12.14
MEL -0101		22-Aug-18	Large chrysophyceae	43104	7.74
MEL -0101		22-Aug-18	Chrysochromulina parva Lackey	35920	2.35
MEL -0101		22-Aug-18	Chrysococcus sp.	538800	35.24
MEL -0101		22-Aug-18	Kephyrion boreale Skuja	14368	1.71
MEL -0101		22-Aug-18	Kephyrion sp.	179600	3.38
MEL -0101		22-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0101		22-Aug-18	Dinobryon bavaricum Imhof	86208	19.50
MEL -0101		22-Aug-18	Dinobryon bavaricum Imhof	200	0.40
MEL -0101		22-Aug-18	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.93
MEL -0101		22-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0101		22-Aug-18	Chrysolykos skuja (Nauwerck) Willen	28736	0.87
MEL -0101		22-Aug-18	Uroglena volvox Ehrenberg	330464	37.38
MEL -0101		22-Aug-18	Uroglena volvox Ehrenberg	400	9.04
MEL -0101		22-Aug-18	Chrysochromulina laurentiana Kling	64656	29.95
MEL -0101		22-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.85

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0101		22-Aug-18	Cyclotella stelligera Cleve and Grunow	14000	33.01
MEL -0101		22-Aug-18	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL -0101		22-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	7400	5.97
MEL -0101		22-Aug-18	Tabellaria flocculosa (Roth) Kutzing	400	0.51
MEL -0101		22-Aug-18	Synedra acus Kutzing	5200	0.60
MEL -0101		22-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	400	2.41
MEL -0101		22-Aug-18	Asterionella formosa Hassall	54600	5.83
MEL -0101		22-Aug-18	Cyclotella michiganiana Skvortzow	352016	8.62
MEL -0101		22-Aug-18	Cyclotella bodanica Eulenst.	400	2.82
MEL -0101		22-Aug-18	Rhodomonas minuta Skuja	150864	20.85
MEL -0101		22-Aug-18	Cryptomonas erosa Ehrenberg	9600	16.35
MEL -0101		22-Aug-18	Cryptomonas reflexa (Marsson) Skuja	3400	2.53
MEL -0101		22-Aug-18	Cryptomonas rostratiformis Skuja	800	1.81
MEL -0101		22-Aug-18	Katablepharis ovalis Skuja	14368	0.85
MEL -0101		22-Aug-18	Gymnodinium sp.	1800	28.08
MEL -0101		22-Aug-18	Peridinium pusillum (Penard) Lemmermann	3000	12.57
MEL -0106		22-Aug-18	Snowella sp	800	0.60
MEL -0106		22-Aug-18	Chlamydomonas spp.	14368	0.34
MEL -0106		22-Aug-18	Sphaerocystis schroeteri Chodat	229888	4.74
MEL -0106		22-Aug-18	Pediastrum tetras (Ehrenberg) Ralfs	28736	0.32
MEL -0106		22-Aug-18	Oocystis lacustris Chodat	114944	3.25
MEL -0106		22-Aug-18	Crucigenia quadrata Morr.	57472	0.27
MEL -0106		22-Aug-18	Elakatothrix gelatinosa Willen	208336	3.60
MEL -0106		22-Aug-18	Planctonema lauterbornii Schmidle	28736	10.16
MEL -0106		22-Aug-18	Staurodesmus extensus (Andersson) Teiling	600	0.23
MEL -0106		22-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL -0106		22-Aug-18	Botryococcus braunii Kutzing	600	0.31
MEL -0106		22-Aug-18	Small chrysophyceae	977024	12.51
MEL -0106		22-Aug-18	Large chrysophyceae	71840	12.90
MEL -0106		22-Aug-18	Chrysochromulina parva Lackey	7184	0.47
MEL -0106		22-Aug-18	Chrysococcus sp.	589088	38.53
MEL -0106		22-Aug-18	Kephyrion sp.	237072	4.46

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0106		22-Aug-18	Spiniferomonas serrata	14368	1.71
MEL -0106		22-Aug-18	Dinobryon bavaricum Imhof	57472	13.00
MEL -0106		22-Aug-18	Dinobryon bavaricum Imhof	200	0.40
MEL -0106		22-Aug-18	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	400	1.71
MEL -0106		22-Aug-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0106		22-Aug-18	Dinobryon sertularia Ehrenberg	200	0.40
MEL -0106		22-Aug-18	Epiphyxis sp.	7184	0.55
MEL -0106		22-Aug-18	Chrysolykos skuja (Nauwerck) Willen	21552	0.65
MEL -0106		22-Aug-18	Uroglena volvox Ehrenberg	265808	30.06
MEL -0106		22-Aug-18	Uroglena volvox Ehrenberg	200	4.52
MEL -0106		22-Aug-18	Chrysochromulina laurentiana Kling	107760	49.91
MEL -0106		22-Aug-18	Stichogloea spp.	35920	1.81
MEL -0106		22-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.06
MEL -0106		22-Aug-18	Pteridomonas sp.	7184	1.71
MEL -0106		22-Aug-18	Cyclotella stelligera Cleve and Grunow	14800	34.90
MEL -0106		22-Aug-18	Cyclotella ocellata Pant.	7184	0.96
MEL -0106		22-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	1800	1.49
MEL -0106		22-Aug-18	Synedra acus Kutzing	400	0.04
MEL -0106		22-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	200	1.36
MEL -0106		22-Aug-18	Asterionella formosa Hassall	52800	5.64
MEL -0106		22-Aug-18	Cyclotella michiganiana Skvortzow	265808	6.51
MEL -0106		22-Aug-18	Cyclotella bodanica Eulenst.	800	4.68
MEL -0106		22-Aug-18	Rhodomonas minuta Skuja	237072	32.76
MEL -0106		22-Aug-18	Cryptomonas erosa Ehrenberg	10800	18.40
MEL -0106		22-Aug-18	Cryptomonas reflexa (Marsson) Skuja	3600	2.71
MEL -0106		22-Aug-18	Cryptomonas rostratiformis Skuja	1800	4.06
MEL -0106		22-Aug-18	Katablepharis ovalis Skuja	14368	0.87
MEL -0106		22-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0106		22-Aug-18	Gymnodinium sp.	1400	21.84
MEL -0106		22-Aug-18	Peridinium pusillum (Penard) Lemmermann	2800	11.73
MEL -0107		21-Aug-18	Snowella sp	800	0.60
MEL -0107		21-Aug-18	Planktothrix	200	6.69

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0107		21-Aug-18	Chlamydomonas spp.	14368	0.38
MEL -0107		21-Aug-18	Sphaerocystis schroeteri Chodat	114944	1.98
MEL -0107		21-Aug-18	Pediastrum duplex Meyen	200	0.44
MEL -0107		21-Aug-18	Pediastrum tetras (Ehrenberg) Ralfs	86208	0.97
MEL -0107		21-Aug-18	Oocystis lacustris Chodat	7184	0.20
MEL -0107		21-Aug-18	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.45
MEL -0107		21-Aug-18	Crucigenia quadrata Morr.	258624	1.22
MEL -0107		21-Aug-18	Elakatothrix gelatinosa Willen	143680	2.49
MEL -0107		21-Aug-18	Planctonema lauterbornii Schmidle	43104	15.23
MEL -0107		21-Aug-18	Cosmarium sp.	200	0.28
MEL -0107		21-Aug-18	Euastrum spp.	200	0.37
MEL -0107		21-Aug-18	Staurodesmus extensus (Andersson) Teiling	1000	0.39
MEL -0107		21-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL -0107		21-Aug-18	Botryococcus braunii Kutzing	400	0.28
MEL -0107		21-Aug-18	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL -0107		21-Aug-18	Monomastix minuta Skuja	7184	0.16
MEL -0107		21-Aug-18	Small chrysophyceae	804608	8.29
MEL -0107		21-Aug-18	Large chrysophyceae	79024	14.19
MEL -0107		21-Aug-18	Chrysochromulina parva Lackey	43104	2.82
MEL -0107		21-Aug-18	Chrysococcus sp.	617824	38.06
MEL -0107		21-Aug-18	Kephyrion boreale Skuja	7184	0.85
MEL -0107		21-Aug-18	Kephyrion sp.	186784	3.51
MEL -0107		21-Aug-18	Spiniferomonas serrata	21552	2.56
MEL -0107		21-Aug-18	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL -0107		21-Aug-18	Dinobryon bavaricum Imhof	57472	13.00
MEL -0107		21-Aug-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0107		21-Aug-18	Chrysolykos skuja (Nauwerck) Willen	14368	0.42
MEL -0107		21-Aug-18	Uroglena volvox Ehrenberg	308912	34.94
MEL -0107		21-Aug-18	Chrysochromulina laurentiana Kling	28736	13.31
MEL -0107		21-Aug-18	Stichogloea spp.	14368	0.72
MEL -0107		21-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.65
MEL -0107		21-Aug-18	Pteridomonas sp.	7184	1.71

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0107		21-Aug-18	Cyclotella stelligera Cleve and Grunow	16000	36.26
MEL -0107		21-Aug-18	Cyclotella ocellata Pant.	7184	0.78
MEL -0107		21-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	3200	2.65
MEL -0107		21-Aug-18	Synedra acus Kutzing	4600	0.51
MEL -0107		21-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	400	2.72
MEL -0107		21-Aug-18	Asterionella formosa Hassall	33400	3.57
MEL -0107		21-Aug-18	Cyclotella michiganiana Skvortzow	301728	7.39
MEL -0107		21-Aug-18	Cyclotella bodanica Eulenst.	1200	7.02
MEL -0107		21-Aug-18	Rhodomonas minuta Skuja	122128	16.88
MEL -0107		21-Aug-18	Cryptomonas erosa Ehrenberg	13200	23.39
MEL -0107		21-Aug-18	Cryptomonas reflexa (Marsson) Skuja	3200	2.41
MEL -0107		21-Aug-18	Cryptomonas rostratiformis Skuja	1600	3.28
MEL -0107		21-Aug-18	Katablepharis ovalis Skuja	7184	0.39
MEL -0107		21-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0107		21-Aug-18	Gymnodinium sp.	3000	42.41
MEL -0107		21-Aug-18	Peridinium pusillum (Penard) Lemmermann	2400	9.03
MEL -0107		21-Aug-18	Peridinium aciculiferum Lemmermann	200	1.81
MEL -0107R	Recount	21-Aug-18	Snowella sp	1400	1.05
MEL -0107R	Recount	21-Aug-18	Planktothrix	400	15.43
MEL -0107R	Recount	21-Aug-18	Chlamydomonas spp.	14368	0.34
MEL -0107R	Recount	21-Aug-18	Sphaerocystis schroeteri Chodat	114944	1.98
MEL -0107R	Recount	21-Aug-18	Pediastrum duplex Meyen	200	0.44
MEL -0107R	Recount	21-Aug-18	Pediastrum tetras (Ehrenberg) Ralfs	114944	1.29
MEL -0107R	Recount	21-Aug-18	Oocystis lacustris Chodat	28736	0.81
MEL -0107R	Recount	21-Aug-18	Monoraphidium minutum (Nag.) Komarkova-Legnerova	14368	0.90
MEL -0107R	Recount	21-Aug-18	Crucigenia quadrata Morr.	172416	0.81
MEL -0107R	Recount	21-Aug-18	Elakatothrix gelatinosa Willen	122128	2.11
MEL -0107R	Recount	21-Aug-18	Planctonema lauterbornii Schmidle	28736	10.16
MEL -0107R	Recount	21-Aug-18	Euastrum spp.	400	0.56
MEL -0107R	Recount	21-Aug-18	Staurodesmus extensus (Andersson) Teiling	800	0.31
MEL -0107R	Recount	21-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL -0107R	Recount	21-Aug-18	Botryococcus braunii Kutzing	200	0.14

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0107R	Recount	21-Aug-18	Small chrysophyceae	941104	9.69
MEL -0107R	Recount	21-Aug-18	Large chrysophyceae	50288	9.03
MEL -0107R	Recount	21-Aug-18	Chrysochromulina parva Lackey	71840	4.70
MEL -0107R	Recount	21-Aug-18	Chrysococcus sp.	603456	37.17
MEL -0107R	Recount	21-Aug-18	Kephyrion boreale Skuja	14368	1.71
MEL -0107R	Recount	21-Aug-18	Kephyrion sp.	172416	3.24
MEL -0107R	Recount	21-Aug-18	Spiniferomonas serrata	14368	1.71
MEL -0107R	Recount	21-Aug-18	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL -0107R	Recount	21-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0107R	Recount	21-Aug-18	Dinobryon bavaricum Imhof	86208	19.50
MEL -0107R	Recount	21-Aug-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0107R	Recount	21-Aug-18	Chrysolykos skuja (Nauwerck) Willen	21552	0.64
MEL -0107R	Recount	21-Aug-18	Uroglena volvox Ehrenberg	258624	29.25
MEL -0107R	Recount	21-Aug-18	Chrysochromulina laurentiana Kling	21552	9.98
MEL -0107R	Recount	21-Aug-18	Stichogloea spp.	28736	1.45
MEL -0107R	Recount	21-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43
MEL -0107R	Recount	21-Aug-18	Pteridomonas sp.	21552	5.13
MEL -0107R	Recount	21-Aug-18	Cyclotella stelligera Cleve and Grunow	16200	36.72
MEL -0107R	Recount	21-Aug-18	Cyclotella ocellata Pant.	21552	2.33
MEL -0107R	Recount	21-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	4800	3.98
MEL -0107R	Recount	21-Aug-18	Synedra acus Kutzing	3800	0.42
MEL -0107R	Recount	21-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	200	1.36
MEL -0107R	Recount	21-Aug-18	Asterionella formosa Hassall	34200	3.65
MEL -0107R	Recount	21-Aug-18	Cyclotella michiganiana Skvortzow	330464	8.10
MEL -0107R	Recount	21-Aug-18	Cyclotella bodanica Eulenst.	800	4.68
MEL -0107R	Recount	21-Aug-18	Rhodomonas minuta Skuja	150864	20.85
MEL -0107R	Recount	21-Aug-18	Cryptomonas erosa Ehrenberg	15400	27.29
MEL -0107R	Recount	21-Aug-18	Cryptomonas reflexa (Marsson) Skuja	2400	1.81
MEL -0107R	Recount	21-Aug-18	Cryptomonas rostratiformis Skuja	1800	3.69
MEL -0107R	Recount	21-Aug-18	Katablepharis ovalis Skuja	7184	0.39
MEL -0107R	Recount	21-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0107R	Recount	21-Aug-18	Gymnodinium sp.	2200	31.10

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0107R	Recount	21-Aug-18	Peridinium pusillum (Penard) Lemmermann	3000	11.29
MEL -0108		22-Aug-18	Snowella sp	600	0.45
MEL -0108		22-Aug-18	Pediastrum duplex Meyen	200	0.63
MEL -0108		22-Aug-18	Oocystis lacustris Chodat	14368	0.41
MEL -0108		22-Aug-18	Crucigenia quadrata Morr.	143680	0.68
MEL -0108		22-Aug-18	Elakatothrix gelatinosa Willen	122128	2.11
MEL -0108		22-Aug-18	Planctonema lauterbornii Schmidle	43104	15.23
MEL -0108		22-Aug-18	Cosmarium sp.	200	0.28
MEL -0108		22-Aug-18	Staurodesmus extensus (Andersson) Teiling	800	0.30
MEL -0108		22-Aug-18	Staurodesmus paradoxum Meyen	200	0.55
MEL -0108		22-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL -0108		22-Aug-18	Botryococcus braunii Kutzing	400	0.28
MEL -0108		22-Aug-18	Ankistrodesmus spiralis Lemmermann	7184	0.48
MEL -0108		22-Aug-18	Small chrysophyceae	797424	10.21
MEL -0108		22-Aug-18	Large chrysophyceae	21552	3.87
MEL -0108		22-Aug-18	Chrysochromulina parva Lackey	35920	2.35
MEL -0108		22-Aug-18	Chrysococcus sp.	481328	31.48
MEL -0108		22-Aug-18	Kephyrion boreale Skuja	35920	4.27
MEL -0108		22-Aug-18	Kephyrion sp.	122128	2.30
MEL -0108		22-Aug-18	Spiniferomonas serrata	7184	0.85
MEL -0108		22-Aug-18	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL -0108		22-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0108		22-Aug-18	Dinobryon bavaricum Imhof	86208	19.50
MEL -0108		22-Aug-18	Dinobryon bavaricum Imhof	200	0.40
MEL -0108		22-Aug-18	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.86
MEL -0108		22-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0108		22-Aug-18	Chrysolykos skuja (Nauwerck) Willen	14368	0.40
MEL -0108		22-Aug-18	Uroglena volvox Ehrenberg	186784	21.13
MEL -0108		22-Aug-18	Chrysochromulina laurentiana Kling	57472	26.62
MEL -0108		22-Aug-18	Stichogloea spp.	258624	13.01
MEL -0108		22-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.39
MEL -0108		22-Aug-18	Cyclotella stelligera Cleve and Grunow	14400	32.64

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0108		22-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	25600	21.23
MEL -0108		22-Aug-18	Synedra acus Kutzing	5200	0.54
MEL -0108		22-Aug-18	Asterionella formosa Hassall	51200	5.47
MEL -0108		22-Aug-18	Cyclotella michiganiana Skvortzow	222704	5.46
MEL -0108		22-Aug-18	Cyclotella bodanica Eulenst.	800	4.68
MEL -0108		22-Aug-18	Rhodomonas minuta Skuja	143680	19.86
MEL -0108		22-Aug-18	Cryptomonas erosa Ehrenberg	11000	19.49
MEL -0108		22-Aug-18	Cryptomonas reflexa (Marsson) Skuja	5600	4.22
MEL -0108		22-Aug-18	Cryptomonas rostratiformis Skuja	600	1.23
MEL -0108		22-Aug-18	Katablepharis ovalis Skuja	7184	0.39
MEL -0108		22-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0108		22-Aug-18	Gymnodinium sp.	400	6.24
MEL -0108		22-Aug-18	Peridinium pusillum (Penard) Lemmermann	2000	7.89
MEL -0109		21-Aug-18	Snowella sp	1000	0.75
MEL -0109		21-Aug-18	Chlamydomonas spp.	14368	0.60
MEL -0109		21-Aug-18	Sphaerocystis schroeteri Chodat	150864	2.84
MEL -0109		21-Aug-18	Oocystis lacustris Chodat	43104	1.22
MEL -0109		21-Aug-18	Dictyosphaerium simplex Sukja	28736	0.12
MEL -0109		21-Aug-18	Elakatothrix gelatinosa Willen	265808	4.60
MEL -0109		21-Aug-18	Planctonema lauterbornii Schmidle	79024	27.93
MEL -0109		21-Aug-18	Cosmarium sp.	600	0.84
MEL -0109		21-Aug-18	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL -0109		21-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL -0109		21-Aug-18	Botryococcus braunii Kutzing	800	0.56
MEL -0109		21-Aug-18	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL -0109		21-Aug-18	Small chrysophyceae	725584	10.23
MEL -0109		21-Aug-18	Large chrysophyceae	28736	5.16
MEL -0109		21-Aug-18	Chrysochromulina parva Lackey	14368	0.94
MEL -0109		21-Aug-18	Chrysococcus sp.	610640	37.62
MEL -0109		21-Aug-18	Kephyrion boreale Skuja	21552	2.56
MEL -0109		21-Aug-18	Kephyrion sp.	201152	3.14
MEL -0109		21-Aug-18	Spiniferomonas serrata	7184	0.90

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0109		21-Aug-18	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL -0109		21-Aug-18	Dinobryon borgei Lemmermann	14368	0.65
MEL -0109		21-Aug-18	Dinobryon bavaricum Imhof	64656	14.63
MEL -0109		21-Aug-18	Dinobryon sertularia Ehrenberg	21552	4.88
MEL -0109		21-Aug-18	Chrysolykos skuja (Nauwerck) Willen	28736	0.98
MEL -0109		21-Aug-18	Uroglena volvox Ehrenberg	344832	39.00
MEL -0109		21-Aug-18	Uroglena volvox Ehrenberg	200	2.32
MEL -0109		21-Aug-18	Chrysochromulina laurentiana Kling	71840	33.28
MEL -0109		21-Aug-18	Stichogloea spp.	79024	3.97
MEL -0109		21-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	143680	3.98
MEL -0109		21-Aug-18	Pteridomonas sp.	7184	1.71
MEL -0109		21-Aug-18	Cyclotella stelligera Cleve and Grunow	13200	27.98
MEL -0109		21-Aug-18	Cyclotella ocellata Pant.	28736	3.84
MEL -0109		21-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	7800	6.47
MEL -0109		21-Aug-18	Tabellaria flocculosa (Roth) Kutzing	400	0.51
MEL -0109		21-Aug-18	Synedra acus Kutzing	5200	0.54
MEL -0109		21-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	1000	6.41
MEL -0109		21-Aug-18	Asterionella formosa Hassall	58600	6.26
MEL -0109		21-Aug-18	Cyclotella michiganiana Skvortzow	308912	7.57
MEL -0109		21-Aug-18	Cyclotella bodanica Eulenst.	600	3.51
MEL -0109		21-Aug-18	Rhodomonas minuta Skuja	179600	24.82
MEL -0109		21-Aug-18	Cryptomonas erosa Ehrenberg	14800	25.92
MEL -0109		21-Aug-18	Cryptomonas reflexa (Marsson) Skuja	2600	1.95
MEL -0109		21-Aug-18	Cryptomonas rostratiformis Skuja	2200	4.67
MEL -0109		21-Aug-18	Katablepharis ovalis Skuja	14368	0.78
MEL -0109		21-Aug-18	Gymnodinium helveticum Penard	600	14.14
MEL -0109		21-Aug-18	Gymnodinium sp.	800	12.48
MEL -0109		21-Aug-18	Peridinium pusillum (Penard) Lemmermann	2800	11.73
MEL -0202	Rep1	31-Aug-18	Sphaerocystis schroeteri Chodat	28736	0.37
MEL -0202	Rep1	31-Aug-18	Pediastrum tetras (Ehrenberg) Ralfs	28736	0.32
MEL -0202	Rep1	31-Aug-18	Oocystis lacustris Chodat	21552	0.56
MEL -0202	Rep1	31-Aug-18	Crucigenia quadrata Morr.	114944	0.54

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0202	Rep1	31-Aug-18	Elakatothrix gelatinosa Willen	14368	0.25
MEL -0202	Rep1	31-Aug-18	Planctonema lauterbornii Schmidle	14368	4.51
MEL -0202	Rep1	31-Aug-18	Cosmarium sp.	400	0.56
MEL -0202	Rep1	31-Aug-18	Staurodesmus extensus (Andersson) Teiling	400	0.15
MEL -0202	Rep1	31-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL -0202	Rep1	31-Aug-18	Small chrysophyceae	136496	1.75
MEL -0202	Rep1	31-Aug-18	Large chrysophyceae	14368	2.58
MEL -0202	Rep1	31-Aug-18	Chrysococcus sp.	258624	14.97
MEL -0202	Rep1	31-Aug-18	Kephyrion sp.	43104	0.89
MEL -0202	Rep1	31-Aug-18	Dinobryon mucronatom Nygaard	21552	4.88
MEL -0202	Rep1	31-Aug-18	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	7184	2.76
MEL -0202	Rep1	31-Aug-18	Uroglena volvox Ehrenberg	43104	4.88
MEL -0202	Rep1	31-Aug-18	Chrysochromulina laurentiana Kling	7184	2.83
MEL -0202	Rep1	31-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23
MEL -0202	Rep1	31-Aug-18	Cyclotella stelligera Cleve and Grunow	11800	23.35
MEL -0202	Rep1	31-Aug-18	Cyclotella ocellata Pant.	14368	1.24
MEL -0202	Rep1	31-Aug-18	Synedra acus Kutzing	800	0.08
MEL -0202	Rep1	31-Aug-18	Asterionella formosa Hassall	8200	0.86
MEL -0202	Rep1	31-Aug-18	Cyclotella michiganiana Skvortzow	330464	6.74
MEL -0202	Rep1	31-Aug-18	Cyclotella bodanica Eulenst.	400	2.82
MEL -0202	Rep1	31-Aug-18	Cryptomonas erosa Ehrenberg	3200	5.47
MEL -0202	Rep1	31-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0202	Rep1	31-Aug-18	Gymnodinium sp.	600	9.36
MEL -0202	Rep1	31-Aug-18	Peridinium pusillum (Penard) Lemmermann	1800	6.57
MEL -0202	Rep2	31-Aug-18	Sphaerocystis schroeteri Chodat	35920	0.46
MEL -0202	Rep2	31-Aug-18	Pediastrum tetras (Ehrenberg) Ralfs	57472	0.64
MEL -0202	Rep2	31-Aug-18	Oocystis lacustris Chodat	7184	0.19
MEL -0202	Rep2	31-Aug-18	Planctonema lauterbornii Schmidle	14368	4.51
MEL -0202	Rep2	31-Aug-18	Cosmarium sp.	600	0.84
MEL -0202	Rep2	31-Aug-18	Staurodesmus extensus (Andersson) Teiling	600	0.23
MEL -0202	Rep2	31-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL -0202	Rep2	31-Aug-18	Small chrysophyceae	201152	2.57

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0202	Rep2	31-Aug-18	Large chrysophyceae	50288	9.03
MEL -0202	Rep2	31-Aug-18	Chrysococcus sp.	222704	12.89
MEL -0202	Rep2	31-Aug-18	Kephyrion sp.	71840	1.48
MEL -0202	Rep2	31-Aug-18	Dinobryon bavaricum Imhof	35920	8.13
MEL -0202	Rep2	31-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0202	Rep2	31-Aug-18	Dinobryon sertularia Ehrenberg	200	0.25
MEL -0202	Rep2	31-Aug-18	Uroglena volvox Ehrenberg	28736	3.25
MEL -0202	Rep2	31-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL -0202	Rep2	31-Aug-18	Cyclotella stelligera Cleve and Grunow	14600	28.89
MEL -0202	Rep2	31-Aug-18	Cyclotella ocellata Pant.	21552	1.86
MEL -0202	Rep2	31-Aug-18	Synedra acus Kutzing	1400	0.15
MEL -0202	Rep2	31-Aug-18	Asterionella formosa Hassall	13000	1.36
MEL -0202	Rep2	31-Aug-18	Cyclotella michiganiana Skvortzow	244256	4.98
MEL -0202	Rep2	31-Aug-18	Cyclotella bodanica Eulenst.	200	1.41
MEL -0202	Rep2	31-Aug-18	Rhodomonas minuta Skuja	7184	0.99
MEL -0202	Rep2	31-Aug-18	Cryptomonas erosa Ehrenberg	1000	1.71
MEL -0202	Rep2	31-Aug-18	Gymnodinium sp.	200	3.12
MEL -0202	Rep2	31-Aug-18	Peridinium pusillum (Penard) Lemmermann	1200	4.38
MEL -0203		18-Aug-18	Sphaerocystis schroeteri Chodat	64656	1.33
MEL -0203		18-Aug-18	Oocystis lacustris Chodat	28736	0.81
MEL -0203		18-Aug-18	Dictyosphaerium simplex Sukja	28736	0.12
MEL -0203		18-Aug-18	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.45
MEL -0203		18-Aug-18	Quadrigula closterioides (Bohl.) Printz	179600	5.46
MEL -0203		18-Aug-18	Elakatothrix gelatinosa Willen	215520	3.73
MEL -0203		18-Aug-18	Planctonema lauterbornii Schmidle	50288	17.77
MEL -0203		18-Aug-18	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL -0203		18-Aug-18	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	400	2.50
MEL -0203		18-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL -0203		18-Aug-18	Botryococcus braunii Kutzing	400	0.21
MEL -0203		18-Aug-18	Small chrysophyceae	589088	6.07
MEL -0203		18-Aug-18	Large chrysophyceae	35920	6.45
MEL -0203		18-Aug-18	Chrysochromulina parva Lackey	28736	1.88

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0203		18-Aug-18	Chrysococcus sp.	603456	39.47
MEL -0203		18-Aug-18	Kephyrion sp.	158048	2.02
MEL -0203		18-Aug-18	Spiniferomonas serrata	7184	0.85
MEL -0203		18-Aug-18	Mallomonas caudata Ivanov	200	1.07
MEL -0203		18-Aug-18	Mallomonas crassisquama (Asmund) Fott	600	0.60
MEL -0203		18-Aug-18	Dinobryon borgei Lemmermann	21552	1.11
MEL -0203		18-Aug-18	Dinobryon bavaricum Imhof	143680	32.50
MEL -0203		18-Aug-18	Dinobryon bavaricum v vanhoeffenii (Bachmann) Krieger	200	0.86
MEL -0203		18-Aug-18	Dinobryon sertularia Ehrenberg	35920	8.13
MEL -0203		18-Aug-18	Dinobryon sertularia Ehrenberg	200	0.40
MEL -0203		18-Aug-18	Chrysolykos skuja (Nauwerck) Willen	21552	0.64
MEL -0203		18-Aug-18	Uroglena volvox Ehrenberg	215520	24.38
MEL -0203		18-Aug-18	Chrysochromulina laurentiana Kling	57472	22.68
MEL -0203		18-Aug-18	Stichogloea spp.	7184	0.36
MEL -0203		18-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	50288	1.62
MEL -0203		18-Aug-18	Pteridomonas sp.	21552	4.78
MEL -0203		18-Aug-18	Cyclotella stelligera Cleve and Grunow	6400	15.09
MEL -0203		18-Aug-18	Cyclotella ocellata Pant.	28736	2.11
MEL -0203		18-Aug-18	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL -0203		18-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.17
MEL -0203		18-Aug-18	Tabellaria flocculosa (Roth) Kutzing	400	0.53
MEL -0203		18-Aug-18	Synedra acus Kutzing	3200	0.34
MEL -0203		18-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	400	2.57
MEL -0203		18-Aug-18	Asterionella formosa Hassall	3000	0.31
MEL -0203		18-Aug-18	Cyclotella michiganiana Skvortzow	165232	4.05
MEL -0203		18-Aug-18	Cyclotella bodanica Eulenst.	600	3.51
MEL -0203		18-Aug-18	Rhodomonas minuta Skuja	215520	29.78
MEL -0203		18-Aug-18	Cryptomonas erosa Ehrenberg	8600	14.83
MEL -0203		18-Aug-18	Cryptomonas reflexa (Marsson) Skuja	3600	2.64
MEL -0203		18-Aug-18	Cryptomonas rostratiformis Skuja	1600	3.39
MEL -0203		18-Aug-18	Gymnodinium helveticum Penard	400	9.61
MEL -0203		18-Aug-18	Gymnodinium sp.	1800	28.08

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0203		18-Aug-18	Peridinium pusillum (Penard) Lemmermann	4800	20.11
MEL -0203		18-Aug-18	Peridinium aciculiferum Lemmermann	200	1.81
MEL -0205		18-Aug-18	Snowella sp	200	0.15
MEL -0205		18-Aug-18	Oocystis lacustris Chodat	43104	1.22
MEL -0205		18-Aug-18	Crucigenia quadrata Morr.	143680	1.61
MEL -0205		18-Aug-18	Elakatothrix gelatinosa Willen	100576	1.74
MEL -0205		18-Aug-18	Planctonema lauterbornii Schmidle	57472	20.31
MEL -0205		18-Aug-18	Cosmarium sp.	200	0.28
MEL -0205		18-Aug-18	Euastrum spp.	200	0.37
MEL -0205		18-Aug-18	Staurodesmus extensus (Andersson) Teiling	800	0.29
MEL -0205		18-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL -0205		18-Aug-18	Small chrysophyceae	833344	7.67
MEL -0205		18-Aug-18	Large chrysophyceae	43104	7.74
MEL -0205		18-Aug-18	Chrysochromulina parva Lackey	43104	2.82
MEL -0205		18-Aug-18	Chrysococcus sp.	589088	28.10
MEL -0205		18-Aug-18	Kephyrion boreale Skuja	7184	0.90
MEL -0205		18-Aug-18	Kephyrion sp.	107760	1.52
MEL -0205		18-Aug-18	Spiniferomonas serrata	28736	3.41
MEL -0205		18-Aug-18	Dinobryon borgei Lemmermann	21552	1.06
MEL -0205		18-Aug-18	Dinobryon mucronatom Nygaard	28736	3.61
MEL -0205		18-Aug-18	Dinobryon bavaricum Imhof	114944	26.00
MEL -0205		18-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0205		18-Aug-18	Chrysolykos skuja (Nauwerck) Willen	28736	0.85
MEL -0205		18-Aug-18	Uroglena volvox Ehrenberg	50288	5.69
MEL -0205		18-Aug-18	Chrysochromulina laurentiana Kling	57472	26.62
MEL -0205		18-Aug-18	Stichogloea spp.	28736	1.45
MEL -0205		18-Aug-18	Pteridomonas sp.	14368	0.98
MEL -0205		18-Aug-18	Cyclotella stelligera Cleve and Grunow	7400	16.77
MEL -0205		18-Aug-18	Cyclotella ocellata Pant.	43104	6.17
MEL -0205		18-Aug-18	Rhizosolenia eriense H.L. Smith	7184	0.61
MEL -0205		18-Aug-18	Synedra acus Kutzing	600	0.06
MEL -0205		18-Aug-18	Asterionella formosa Hassall	4800	0.52

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0205		18-Aug-18	Cyclotella michiganiana Skvortzow	208336	3.48
MEL -0205		18-Aug-18	Cyclotella bodanica Eulenst.	600	3.51
MEL -0205		18-Aug-18	Rhodomonas minuta Skuja	158048	21.84
MEL -0205		18-Aug-18	Cryptomonas erosa Ehrenberg	4600	7.96
MEL -0205		18-Aug-18	Cryptomonas reflexa (Marsson) Skuja	1200	0.88
MEL -0205		18-Aug-18	Cryptomonas rostratiformis Skuja	400	0.85
MEL -0205		18-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0205		18-Aug-18	Gymnodinium sp.	7184	2.43
MEL -0205		18-Aug-18	Gymnodinium sp.	1200	18.72
MEL -0205		18-Aug-18	Peridinium pusillum (Penard) Lemmermann	2800	11.73
MEL -0206		31-Aug-18	Chroococcus limneticus Lemmermann	28736	1.28
MEL -0206		31-Aug-18	Chlamydomonas spp.	7184	0.16
MEL -0206		31-Aug-18	Oocystis lacustris Chodat	43104	2.17
MEL -0206		31-Aug-18	Crucigenia quadrata Morr.	143680	0.68
MEL -0206		31-Aug-18	Elakatothrix gelatinosa Willen	28736	0.50
MEL -0206		31-Aug-18	Planctonema lauterbornii Schmidle	35920	12.69
MEL -0206		31-Aug-18	Cosmarium sp.	400	0.56
MEL -0206		31-Aug-18	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL -0206		31-Aug-18	Botryococcus braunii Kutzing	400	0.28
MEL -0206		31-Aug-18	Small chrysophyceae	129312	1.66
MEL -0206		31-Aug-18	Large chrysophyceae	35920	6.45
MEL -0206		31-Aug-18	Chrysochromulina parva Lackey	7184	0.47
MEL -0206		31-Aug-18	Chrysococcus sp.	366384	23.96
MEL -0206		31-Aug-18	Kephyrion sp.	100576	1.57
MEL -0206		31-Aug-18	Mallomonas crassisquama (Asmund) Fott	1000	1.04
MEL -0206		31-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0206		31-Aug-18	Dinobryon bavaricum Imhof	50288	11.38
MEL -0206		31-Aug-18	Dinobryon bavaricum Imhof	200	0.40
MEL -0206		31-Aug-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0206		31-Aug-18	Dinobryon sertularia Ehrenberg	400	0.80
MEL -0206		31-Aug-18	Chrysolykos skuja (Nauwerck) Willen	7184	0.22
MEL -0206		31-Aug-18	Uroglena volvox Ehrenberg	28736	3.25

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0206		31-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	71840	2.16
MEL -0206		31-Aug-18	Cyclotella stelligera Cleve and Grunow	6400	14.51
MEL -0206		31-Aug-18	Cyclotella ocellata Pant.	43104	5.38
MEL -0206		31-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	5600	4.64
MEL -0206		31-Aug-18	Synedra acus Kutzing	1400	0.15
MEL -0206		31-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	400	2.41
MEL -0206		31-Aug-18	Asterionella formosa Hassall	20400	2.18
MEL -0206		31-Aug-18	Cyclotella michiganiana Skvortzow	201152	4.93
MEL -0206		31-Aug-18	Cyclotella bodanica Eulenst.	1000	5.85
MEL -0206		31-Aug-18	Rhodomonas minuta Skuja	86208	11.91
MEL -0206		31-Aug-18	Cryptomonas erosa Ehrenberg	1600	2.80
MEL -0206		31-Aug-18	Cryptomonas rostratiformis Skuja	200	0.42
MEL -0206		31-Aug-18	Gymnodinium sp.	400	6.24
MEL -0206		31-Aug-18	Peridinium pusillum (Penard) Lemmermann	1400	5.52
MEL -0208		15-Aug-18	Pediastrum duplex Meyen	400	1.10
MEL -0208		15-Aug-18	Oocystis lacustris Chodat	64656	3.25
MEL -0208		15-Aug-18	Dictyosphaerium simplex Sukja	28736	0.12
MEL -0208		15-Aug-18	Crucigenia quadrata Morr.	28736	0.32
MEL -0208		15-Aug-18	Elakatothrix gelatinosa Willen	50288	0.87
MEL -0208		15-Aug-18	Planctonema lauterbornii Schmidle	14368	5.08
MEL -0208		15-Aug-18	Cosmarium sp.	400	0.56
MEL -0208		15-Aug-18	Euastrum spp.	200	0.37
MEL -0208		15-Aug-18	Staurodesmus extensus (Andersson) Teiling	1000	0.39
MEL -0208		15-Aug-18	Staurodesmus paradoxum Meyen	200	0.54
MEL -0208		15-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL -0208		15-Aug-18	Small chrysophyceae	316096	2.59
MEL -0208		15-Aug-18	Large chrysophyceae	50288	9.03
MEL -0208		15-Aug-18	Chrysococcus sp.	589088	36.29
MEL -0208		15-Aug-18	Kephyrion sp.	107760	2.03
MEL -0208		15-Aug-18	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL -0208		15-Aug-18	Dinobryon borgei Lemmermann	50288	2.55
MEL -0208		15-Aug-18	Dinobryon mucronatom Nygaard	21552	2.79

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0208		15-Aug-18	Dinobryon bavaricum Imhof	143680	32.50
MEL -0208		15-Aug-18	Dinobryon bavaricum Imhof	400	0.50
MEL -0208		15-Aug-18	Dinobryon sertularia Ehrenberg	43104	9.75
MEL -0208		15-Aug-18	Uroglena volvox Ehrenberg	21552	2.44
MEL -0208		15-Aug-18	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL -0208		15-Aug-18	Chrysochromulina laurentiana Kling	14368	6.66
MEL -0208		15-Aug-18	Bicosoeca lacustris Clark	7184	0.37
MEL -0208		15-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.76
MEL -0208		15-Aug-18	Cyclotella stelligera Cleve and Grunow	5800	11.48
MEL -0208		15-Aug-18	Cyclotella ocellata Pant.	14368	1.39
MEL -0208		15-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	13200	10.43
MEL -0208		15-Aug-18	Synedra acus Kutzing	1000	0.10
MEL -0208		15-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	400	2.57
MEL -0208		15-Aug-18	Asterionella formosa Hassall	9800	1.03
MEL -0208		15-Aug-18	Cyclotella michiganiana Skvortzow	215520	4.98
MEL -0208		15-Aug-18	Cyclotella bodanica Eulenst.	1000	5.85
MEL -0208		15-Aug-18	Rhodomonas minuta Skuja	129312	17.87
MEL -0208		15-Aug-18	Cryptomonas erosa Ehrenberg	5200	8.97
MEL -0208		15-Aug-18	Cryptomonas rostratiformis Skuja	200	0.41
MEL -0208		15-Aug-18	Glenodinium spp.	600	9.36
MEL -0208		15-Aug-18	Peridinium pusillum (Penard) Lemmermann	3000	12.57
MEL -0301		20-Aug-18	Chlamydomonas spp.	7184	0.31
MEL -0301		20-Aug-18	Elakatothrix gelatinosa Willen	107760	1.86
MEL -0301		20-Aug-18	Planctonema lauterbornii Schmidle	71840	25.39
MEL -0301		20-Aug-18	Cosmarium sp.	200	0.28
MEL -0301		20-Aug-18	Staurodesmus extensus (Andersson) Teiling	200	0.08
MEL -0301		20-Aug-18	Botryococcus braunii Kutzing	1000	0.52
MEL -0301		20-Aug-18	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL -0301		20-Aug-18	Small chrysophyceae	1206912	5.79
MEL -0301		20-Aug-18	Large chrysophyceae	57472	10.32
MEL -0301		20-Aug-18	Chrysochromulina parva Lackey	43104	2.82
MEL -0301		20-Aug-18	Chrysococcus sp.	510064	31.42

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0301		20-Aug-18	Kephyrion sp.	280176	5.77
MEL -0301		20-Aug-18	Mallomonas crassisquama (Asmund) Fott	2200	1.15
MEL -0301		20-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0301		20-Aug-18	Dinobryon mucronatom Nygaard	21552	2.65
MEL -0301		20-Aug-18	Dinobryon bavaricum Imhof	359200	81.25
MEL -0301		20-Aug-18	Dinobryon sertularia Ehrenberg	21552	4.88
MEL -0301		20-Aug-18	Epiphyxis sp.	7184	0.58
MEL -0301		20-Aug-18	Chrysolykos skuja (Nauwerck) Willen	43104	1.29
MEL -0301		20-Aug-18	Uroglena volvox Ehrenberg	57472	6.50
MEL -0301		20-Aug-18	Chrysochromulina laurentiana Kling	64656	29.95
MEL -0301		20-Aug-18	Bicosoeca lacustris Clark	7184	0.44
MEL -0301		20-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.93
MEL -0301		20-Aug-18	Pteridomonas sp.	28736	6.84
MEL -0301		20-Aug-18	Cyclotella stelligera Cleve and Grunow	1800	3.56
MEL -0301		20-Aug-18	Cyclotella ocellata Pant.	50288	4.33
MEL -0301		20-Aug-18	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL -0301		20-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	1800	1.49
MEL -0301		20-Aug-18	Synedra acus Kutzing	4000	0.42
MEL -0301		20-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	400	2.41
MEL -0301		20-Aug-18	Asterionella formosa Hassall	1000	0.11
MEL -0301		20-Aug-18	Cyclotella michiganiana Skvortzow	79024	1.94
MEL -0301		20-Aug-18	Cyclotella bodanica Eulenst.	400	2.82
MEL -0301		20-Aug-18	Rhodomonas minuta Skuja	179600	24.82
MEL -0301		20-Aug-18	Cryptomonas erosa Ehrenberg	4400	7.50
MEL -0301		20-Aug-18	Cryptomonas reflexa (Marsson) Skuja	800	0.59
MEL -0301		20-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0301		20-Aug-18	Gymnodinium sp.	1000	18.82
MEL -0301		20-Aug-18	Peridinium pusillum (Penard) Lemmermann	2000	7.89
MEL -0301		20-Aug-18	Peridinium aciculiferum Lemmermann	200	1.81
MEL -0302		26-Aug-18	Snowella sp	200	0.15
MEL -0302		26-Aug-18	Oocystis lacustris Chodat	14368	0.72
MEL -0302		26-Aug-18	Dictyosphaerium simplex Sukja	57472	0.24

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0302		26-Aug-18	Elakatothrix gelatinosa Willen	79024	1.37
MEL -0302		26-Aug-18	Planctonema lauterbornii Schmidle	28736	10.16
MEL -0302		26-Aug-18	Cosmarium sp.	800	1.12
MEL -0302		26-Aug-18	Staurodesmus extensus (Andersson) Teiling	1000	0.36
MEL -0302		26-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	50288	1.90
MEL -0302		26-Aug-18	Botryococcus braunii Kutzing	400	0.21
MEL -0302		26-Aug-18	Ankistrodesmus spiralis Lemmermann	7184	0.39
MEL -0302		26-Aug-18	Small chrysophyceae	560352	2.69
MEL -0302		26-Aug-18	Large chrysophyceae	79024	14.19
MEL -0302		26-Aug-18	Chrysochromulina parva Lackey	28736	1.88
MEL -0302		26-Aug-18	Chrysococcus sp.	653744	33.34
MEL -0302		26-Aug-18	Kephyrion boreale Skuja	28736	3.41
MEL -0302		26-Aug-18	Kephyrion sp.	143680	2.70
MEL -0302		26-Aug-18	Spiniferomonas serrata	21552	1.98
MEL -0302		26-Aug-18	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL -0302		26-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0302		26-Aug-18	Dinobryon bavaricum Imhof	93392	21.13
MEL -0302		26-Aug-18	Dinobryon bavaricum Imhof	200	0.25
MEL -0302		26-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0302		26-Aug-18	Dinobryon sertularia Ehrenberg	600	1.19
MEL -0302		26-Aug-18	Chrysolykos skuja (Nauwerck) Willen	50288	1.42
MEL -0302		26-Aug-18	Uroglena volvox Ehrenberg	143680	16.25
MEL -0302		26-Aug-18	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL -0302		26-Aug-18	Chrysochromulina laurentiana Kling	86208	37.49
MEL -0302		26-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.21
MEL -0302		26-Aug-18	Pteridomonas sp.	14368	3.42
MEL -0302		26-Aug-18	Cyclotella stelligera Cleve and Grunow	2800	5.54
MEL -0302		26-Aug-18	Cyclotella ocellata Pant.	7184	0.53
MEL -0302		26-Aug-18	Rhizosolenia eriense H.L. Smith	7184	0.56
MEL -0302		26-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	2200	1.82
MEL -0302		26-Aug-18	Synedra acus Kutzing	1800	0.19
MEL -0302		26-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	200	1.15

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0302		26-Aug-18	Asterionella formosa Hassall	3000	0.31
MEL -0302		26-Aug-18	Cyclotella michiganiana Skvortzow	114944	2.82
MEL -0302		26-Aug-18	Cyclotella bodanica Eulenst.	600	4.23
MEL -0302		26-Aug-18	Rhodomonas minuta Skuja	229888	31.77
MEL -0302		26-Aug-18	Cryptomonas erosa Ehrenberg	6000	10.51
MEL -0302		26-Aug-18	Cryptomonas reflexa (Marsson) Skuja	1200	0.88
MEL -0302		26-Aug-18	Cryptomonas rostratiformis Skuja	200	0.41
MEL -0302		26-Aug-18	Katablepharis ovalis Skuja	14368	0.80
MEL -0302		26-Aug-18	Gymnodinium sp.	1200	20.59
MEL -0302		26-Aug-18	Peridinium pusillum (Penard) Lemmermann	2800	11.04
MEL -0302R	Recount	26-Aug-18	Chlamydomonas spp.	7184	0.30
MEL -0302R	Recount	26-Aug-18	Oocystis lacustris Chodat	28736	1.45
MEL -0302R	Recount	26-Aug-18	Dictyosphaerium simplex Sukja	28736	0.12
MEL -0302R	Recount	26-Aug-18	Elakatothrix gelatinosa Willen	107760	1.86
MEL -0302R	Recount	26-Aug-18	Planctonema lauterbornii Schmidle	21552	7.62
MEL -0302R	Recount	26-Aug-18	Cosmarium sp.	400	0.56
MEL -0302R	Recount	26-Aug-18	Staurodesmus extensus (Andersson) Teiling	800	0.29
MEL -0302R	Recount	26-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	43104	1.63
MEL -0302R	Recount	26-Aug-18	Botryococcus braunii Kutzing	400	0.21
MEL -0302R	Recount	26-Aug-18	Ankistrodesmus spiralis Lemmermann	28736	1.54
MEL -0302R	Recount	26-Aug-18	Small chrysophyceae	402304	1.93
MEL -0302R	Recount	26-Aug-18	Large chrysophyceae	64656	11.61
MEL -0302R	Recount	26-Aug-18	Chrysochromulina parva Lackey	14368	0.94
MEL -0302R	Recount	26-Aug-18	Chrysococcus sp.	725584	37.00
MEL -0302R	Recount	26-Aug-18	Kephyrion boreale Skuja	14368	1.71
MEL -0302R	Recount	26-Aug-18	Kephyrion sp.	222704	4.19
MEL -0302R	Recount	26-Aug-18	Spiniferomonas serrata	7184	0.66
MEL -0302R	Recount	26-Aug-18	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL -0302R	Recount	26-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0302R	Recount	26-Aug-18	Dinobryon bavaricum Imhof	79024	17.88
MEL -0302R	Recount	26-Aug-18	Dinobryon bavaricum Imhof	600	0.75
MEL -0302R	Recount	26-Aug-18	Dinobryon sertularia Ehrenberg	200	0.40

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0302R	Recount	26-Aug-18	Chrysolykos skuja (Nauwerck) Willen	57472	1.62
MEL -0302R	Recount	26-Aug-18	Uroglena volvox Ehrenberg	193968	21.94
MEL -0302R	Recount	26-Aug-18	Chrysochromulina laurentiana Kling	100576	43.74
MEL -0302R	Recount	26-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	21552	0.65
MEL -0302R	Recount	26-Aug-18	Pteridomonas sp.	7184	1.71
MEL -0302R	Recount	26-Aug-18	Cyclotella stelligera Cleve and Grunow	3800	7.52
MEL -0302R	Recount	26-Aug-18	Cyclotella ocellata Pant.	14368	1.05
MEL -0302R	Recount	26-Aug-18	Rhizosolenia eriense H.L. Smith	14368	0.91
MEL -0302R	Recount	26-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	2400	1.99
MEL -0302R	Recount	26-Aug-18	Synedra acus Kutzing	800	0.08
MEL -0302R	Recount	26-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	200	1.15
MEL -0302R	Recount	26-Aug-18	Asterionella formosa Hassall	5200	0.54
MEL -0302R	Recount	26-Aug-18	Cyclotella michiganiana Skvortzow	107760	2.64
MEL -0302R	Recount	26-Aug-18	Cyclotella bodanica Eulenst.	400	2.82
MEL -0302R	Recount	26-Aug-18	Rhodomonas minuta Skuja	280176	38.72
MEL -0302R	Recount	26-Aug-18	Cryptomonas erosa Ehrenberg	4800	8.41
MEL -0302R	Recount	26-Aug-18	Cryptomonas reflexa (Marsson) Skuja	800	0.59
MEL -0302R	Recount	26-Aug-18	Cryptomonas rostratiformis Skuja	800	1.64
MEL -0302R	Recount	26-Aug-18	Katablepharis ovalis Skuja	7184	0.40
MEL -0302R	Recount	26-Aug-18	Gymnodinium helveticum Penard	200	4.71
MEL -0302R	Recount	26-Aug-18	Gymnodinium sp.	1200	20.59
MEL -0302R	Recount	26-Aug-18	Peridinium pusillum (Penard) Lemmermann	3800	14.98
MEL -0303		20-Aug-18	Pediastrum duplex Meyen	400	0.68
MEL -0303		20-Aug-18	Oocystis lacustris Chodat	14368	0.72
MEL -0303		20-Aug-18	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.41
MEL -0303		20-Aug-18	Crucigenia quadrata Morr.	57472	0.27
MEL -0303		20-Aug-18	Elakatothrix gelatinosa Willen	28736	0.50
MEL -0303		20-Aug-18	Planctonema lauterbornii Schmidle	14368	5.08
MEL -0303		20-Aug-18	Cosmarium sp.	600	0.84
MEL -0303		20-Aug-18	Staurodesmus extensus (Andersson) Teiling	1000	0.40
MEL -0303		20-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL -0303		20-Aug-18	Botryococcus braunii Kutzing	200	0.14

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0303		20-Aug-18	Small chrysophyceae	510064	7.19
MEL -0303		20-Aug-18	Large chrysophyceae	64656	11.61
MEL -0303		20-Aug-18	Chrysochromulina parva Lackey	21552	1.41
MEL -0303		20-Aug-18	Chrysococcus sp.	603456	30.78
MEL -0303		20-Aug-18	Chrysostephanosphaera globulifera Scherffel	7184	2.65
MEL -0303		20-Aug-18	Kephyrion boreale Skuja	14368	1.71
MEL -0303		20-Aug-18	Kephyrion sp.	1587664	29.85
MEL -0303		20-Aug-18	Spiniferomonas serrata	14368	1.71
MEL -0303		20-Aug-18	Mallomonas crassisquama (Asmund) Fott	1600	1.68
MEL -0303		20-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0303		20-Aug-18	Dinobryon bavaricum Imhof	122128	27.63
MEL -0303		20-Aug-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0303		20-Aug-18	Chrysolykos skuja (Nauwerck) Willen	7184	0.21
MEL -0303		20-Aug-18	Uroglena volvox Ehrenberg	179600	20.31
MEL -0303		20-Aug-18	Chrysochromulina laurentiana Kling	93392	36.85
MEL -0303		20-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.98
MEL -0303		20-Aug-18	Pteridomonas sp.	35920	8.55
MEL -0303		20-Aug-18	Cyclotella stelligera Cleve and Grunow	3400	8.02
MEL -0303		20-Aug-18	Cyclotella ocellata Pant.	7184	0.75
MEL -0303		20-Aug-18	Rhizosolenia eriense H.L. Smith	14368	1.22
MEL -0303		20-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	2200	1.82
MEL -0303		20-Aug-18	Synedra acus Kutzing	3200	0.30
MEL -0303		20-Aug-18	Asterionella formosa Hassall	1600	0.17
MEL -0303		20-Aug-18	Cyclotella michiganiana Skvortzow	86208	2.11
MEL -0303		20-Aug-18	Cyclotella bodanica Eulenst.	600	3.51
MEL -0303		20-Aug-18	Rhodomonas minuta Skuja	172416	23.83
MEL -0303		20-Aug-18	Cryptomonas erosa Ehrenberg	3000	5.13
MEL -0303		20-Aug-18	Cryptomonas reflexa (Marsson) Skuja	1000	0.68
MEL -0303		20-Aug-18	Cryptomonas rostratiformis Skuja	600	1.27
MEL -0303		20-Aug-18	Katablepharis ovalis Skuja	14368	0.83
MEL -0303		20-Aug-18	Gymnodinium helveticum Penard	400	5.65
MEL -0303		20-Aug-18	Gymnodinium sp.	1800	33.87

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0303		20-Aug-18	Peridinium pusillum (Penard) Lemmermann	3200	13.40
MEL -0303		20-Aug-18	Peridinium aciculiferum Lemmermann	200	1.81
MEL -0304		26-Aug-18	Chroococcus limneticus Lemmermann	28736	0.89
MEL -0304		26-Aug-18	Chlamydomonas spp.	14368	0.61
MEL -0304		26-Aug-18	Oocystis lacustris Chodat	14368	0.41
MEL -0304		26-Aug-18	Elakatothrix gelatinosa Willen	93392	1.62
MEL -0304		26-Aug-18	Planctonema lauterbornii Schmidle	21552	7.62
MEL -0304		26-Aug-18	Closterium kuetzingii Brebisson	200	0.23
MEL -0304		26-Aug-18	Cosmarium sp.	200	0.28
MEL -0304		26-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL -0304		26-Aug-18	Mougeotia sp.	1200	2.29
MEL -0304		26-Aug-18	Small chrysophyceae	689664	4.41
MEL -0304		26-Aug-18	Large chrysophyceae	28736	5.16
MEL -0304		26-Aug-18	Chrysochromulina parva Lackey	43104	2.82
MEL -0304		26-Aug-18	Chrysococcus sp.	545984	35.71
MEL -0304		26-Aug-18	Kephyrion sp.	122128	1.72
MEL -0304		26-Aug-18	Spiniferomonas serrata	21552	2.32
MEL -0304		26-Aug-18	Mallomonas crassisquama (Asmund) Fott	1200	1.23
MEL -0304		26-Aug-18	Dinobryon borgei Lemmermann	14368	0.65
MEL -0304		26-Aug-18	Dinobryon bavaricum Imhof	114944	26.00
MEL -0304		26-Aug-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0304		26-Aug-18	Dinobryon sertularia Ehrenberg	200	0.40
MEL -0304		26-Aug-18	Chrysolykos skuja (Nauwerck) Willen	28736	0.86
MEL -0304		26-Aug-18	Uroglena volvox Ehrenberg	416672	47.13
MEL -0304		26-Aug-18	Chrysochromulina laurentiana Kling	93392	40.62
MEL -0304		26-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL -0304		26-Aug-18	Pteridomonas sp.	1000	0.22
MEL -0304		26-Aug-18	Cyclotella stelligera Cleve and Grunow	3600	8.60
MEL -0304		26-Aug-18	Cyclotella ocellata Pant.	14368	1.50
MEL -0304		26-Aug-18	Rhizosolenia eriense H.L. Smith	7184	0.61
MEL -0304		26-Aug-18	Tabellaria flocculosa (Roth) Kutzing	400	0.51
MEL -0304		26-Aug-18	Synedra acus Kutzing	4800	0.55

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0304		26-Aug-18	Cyclotella michiganiana Skvortzow	43104	1.06
MEL -0304		26-Aug-18	Cyclotella bodanica Eulenst.	400	2.34
MEL -0304		26-Aug-18	Rhodomonas minuta Skuja	344832	47.66
MEL -0304		26-Aug-18	Cryptomonas erosa Ehrenberg	5400	8.98
MEL -0304		26-Aug-18	Cryptomonas reflexa (Marsson) Skuja	1000	0.70
MEL -0304		26-Aug-18	Cryptomonas rostratiformis Skuja	1000	2.33
MEL -0304		26-Aug-18	Katablepharis ovalis Skuja	7184	0.34
MEL -0304		26-Aug-18	Peridinium pusillum (Penard) Lemmermann	1600	5.84
MEL -0305		26-Aug-18	Anabaena solitaria Klebs	200	0.44
MEL -0305		26-Aug-18	Chlamydomonas spp.	14368	0.34
MEL -0305		26-Aug-18	Oocystis lacustris Chodat	14368	0.72
MEL -0305		26-Aug-18	Dictyosphaerium simplex Sukja	28736	0.12
MEL -0305		26-Aug-18	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.45
MEL -0305		26-Aug-18	Elakatothrix gelatinosa Willen	50288	0.87
MEL -0305		26-Aug-18	Planctonema lauterbornii Schmidle	50288	17.77
MEL -0305		26-Aug-18	Cosmarium sp.	400	0.56
MEL -0305		26-Aug-18	Staurodesmus extensus (Andersson) Teiling	2000	0.81
MEL -0305		26-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL -0305		26-Aug-18	Botryococcus braunii Kutzing	800	0.42
MEL -0305		26-Aug-18	Small chrysophyceae	840528	10.76
MEL -0305		26-Aug-18	Large chrysophyceae	57472	10.32
MEL -0305		26-Aug-18	Chrysochromulina parva Lackey	21552	1.41
MEL -0305		26-Aug-18	Chrysococcus sp.	653744	42.75
MEL -0305		26-Aug-18	Chrysostephanosphaera globulifera Scherffel	7184	2.83
MEL -0305		26-Aug-18	Kephyrion boreale Skuja	7184	0.85
MEL -0305		26-Aug-18	Kephyrion sp.	308912	5.81
MEL -0305		26-Aug-18	Spiniferomonas serrata	14368	1.71
MEL -0305		26-Aug-18	Mallomonas caudata Ivanov	200	1.07
MEL -0305		26-Aug-18	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL -0305		26-Aug-18	Dinobryon borgei Lemmermann	21552	1.04
MEL -0305		26-Aug-18	Dinobryon bavaricum Imhof	114944	26.00
MEL -0305		26-Aug-18	Dinobryon bavaricum Imhof	200	0.25

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0305		26-Aug-18	Dinobryon sertularia Ehrenberg	21552	4.88
MEL -0305		26-Aug-18	Dinobryon sertularia Ehrenberg	200	0.40
MEL -0305		26-Aug-18	Chrysolykos skuja (Nauwerck) Willen	79024	2.37
MEL -0305		26-Aug-18	Uroglena volvox Ehrenberg	93392	10.56
MEL -0305		26-Aug-18	Chrysochromulina laurentiana Kling	71840	31.24
MEL -0305		26-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	43104	1.29
MEL -0305		26-Aug-18	Pteridomonas sp.	7184	1.59
MEL -0305		26-Aug-18	Cyclotella stelligera Cleve and Grunow	3000	6.19
MEL -0305		26-Aug-18	Cyclotella ocellata Pant.	14368	1.92
MEL -0305		26-Aug-18	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL -0305		26-Aug-18	Synedra acus Kutzing	1800	0.19
MEL -0305		26-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	1200	8.17
MEL -0305		26-Aug-18	Asterionella formosa Hassall	600	0.06
MEL -0305		26-Aug-18	Cyclotella michiganiana Skvortzow	100576	2.46
MEL -0305		26-Aug-18	Cyclotella bodanica Eulenst.	200	1.29
MEL -0305		26-Aug-18	Nitzschia linearis W. Smith	200	0.45
MEL -0305		26-Aug-18	Rhodomonas minuta Skuja	201152	27.80
MEL -0305		26-Aug-18	Cryptomonas erosa Ehrenberg	3000	5.13
MEL -0305		26-Aug-18	Cryptomonas reflexa (Marsson) Skuja	1000	0.73
MEL -0305		26-Aug-18	Cryptomonas rostratiformis Skuja	800	1.78
MEL -0305		26-Aug-18	Gymnodinium sp.	400	6.24
MEL -0305		26-Aug-18	Peridinium pusillum (Penard) Lemmermann	2200	8.41
MEL -0401		02-Sep-18	Oocystis lacustris Chodat	7184	0.20
MEL -0401		02-Sep-18	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.50
MEL -0401		02-Sep-18	Elakatothrix gelatinosa Willen	93392	1.47
MEL -0401		02-Sep-18	Planctonema lauterbornii Schmidle	21552	7.62
MEL -0401		02-Sep-18	Cosmarium sp.	200	0.28
MEL -0401		02-Sep-18	Euastrum spp.	200	0.37
MEL -0401		02-Sep-18	Staurodesmus extensus (Andersson) Teiling	1800	0.73
MEL -0401		02-Sep-18	Staurodesmus bullardii G.M. Smith	200	1.14
MEL -0401		02-Sep-18	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL -0401		02-Sep-18	Bambusina brebissonii Kutzing	4200	19.24

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0401		02-Sep-18	Small chrysophyceae	718400	5.89
MEL -0401		02-Sep-18	Large chrysophyceae	28736	5.16
MEL -0401		02-Sep-18	Chrysochromulina parva Lackey	28736	1.88
MEL -0401		02-Sep-18	Chrysococcus sp.	560352	28.58
MEL -0401		02-Sep-18	Chrysostephanosphaera globulifera Scherffel	14368	4.78
MEL -0401		02-Sep-18	Kephyrion boreale Skuja	7184	0.77
MEL -0401		02-Sep-18	Kephyrion sp.	158048	2.02
MEL -0401		02-Sep-18	Spiniferomonas serrata	14368	1.71
MEL -0401		02-Sep-18	Mallomonas crassisquama (Asmund) Fott	600	0.61
MEL -0401		02-Sep-18	Dinobryon borgei Lemmermann	14368	0.64
MEL -0401		02-Sep-18	Dinobryon borgei Lemmermann	21552	1.12
MEL -0401		02-Sep-18	Dinobryon bavaricum Imhof	93392	21.13
MEL -0401		02-Sep-18	Dinobryon bavaricum Imhof	400	0.50
MEL -0401		02-Sep-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0401		02-Sep-18	Dinobryon sertularia Ehrenberg	200	0.25
MEL -0401		02-Sep-18	Chrysolykos skuja (Nauwerck) Willen	35920	1.08
MEL -0401		02-Sep-18	Uroglena volvox Ehrenberg	71840	8.13
MEL -0401		02-Sep-18	Bitrichia chodatii (Reverdin) Chodat	21552	1.08
MEL -0401		02-Sep-18	Chrysochromulina laurentiana Kling	50288	23.29
MEL -0401		02-Sep-18	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.42
MEL -0401		02-Sep-18	Pteridomonas sp.	43104	8.92
MEL -0401		02-Sep-18	Cyclotella stelligera Cleve and Grunow	3200	6.60
MEL -0401		02-Sep-18	Cyclotella ocellata Pant.	35920	3.75
MEL -0401		02-Sep-18	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.62
MEL -0401		02-Sep-18	Synedra acus Kutzing	1600	0.17
MEL -0401		02-Sep-18	Synedra ulna (Nitzsch) Ehrenberg	200	1.28
MEL -0401		02-Sep-18	Asterionella formosa Hassall	1600	0.17
MEL -0401		02-Sep-18	Cyclotella michiganiana Skvortzow	86208	2.11
MEL -0401		02-Sep-18	Cyclotella bodanica Eulenst.	800	6.17
MEL -0401		02-Sep-18	Rhodomonas minuta Skuja	201152	27.80
MEL -0401		02-Sep-18	Cryptomonas erosa Ehrenberg	2000	3.50
MEL -0401		02-Sep-18	Cryptomonas reflexa (Marsson) Skuja	400	0.29

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0401		02-Sep-18	Gymnodinium helveticum Penard	200	4.71
MEL -0401		02-Sep-18	Gymnodinium sp.	1000	16.52
MEL -0401		02-Sep-18	Peridinium pusillum (Penard) Lemmermann	800	3.35
MEL -0402		02-Sep-18	Pediastrum duplex Meyen	200	0.55
MEL -0402		02-Sep-18	Oocystis lacustris Chodat	71840	1.90
MEL -0402		02-Sep-18	Elakatothrix gelatinosa Willen	93392	1.62
MEL -0402		02-Sep-18	Planctonema lauterbornii Schmidle	71840	25.39
MEL -0402		02-Sep-18	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL -0402		02-Sep-18	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL -0402		02-Sep-18	Botryococcus braunii Kutzing	400	0.21
MEL -0402		02-Sep-18	Small chrysophyceae	653744	6.73
MEL -0402		02-Sep-18	Large chrysophyceae	21552	3.87
MEL -0402		02-Sep-18	Chrysochromulina parva Lackey	50288	3.29
MEL -0402		02-Sep-18	Chrysococcus sp.	524432	34.30
MEL -0402		02-Sep-18	Kephyrion sp.	179600	2.80
MEL -0402		02-Sep-18	Spiniferomonas serrata	35920	3.30
MEL -0402		02-Sep-18	Mallomonas crassisquama (Asmund) Fott	600	0.62
MEL -0402		02-Sep-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0402		02-Sep-18	Dinobryon mucronatom Nygaard	28736	3.76
MEL -0402		02-Sep-18	Dinobryon bavaricum Imhof	100576	22.75
MEL -0402		02-Sep-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0402		02-Sep-18	Dinobryon sertularia Ehrenberg	200	0.25
MEL -0402		02-Sep-18	Chrysolykos skuja (Nauwerck) Willen	14368	0.43
MEL -0402		02-Sep-18	Uroglena volvox Ehrenberg	50288	5.69
MEL -0402		02-Sep-18	Chrysochromulina laurentiana Kling	71840	33.28
MEL -0402		02-Sep-18	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.13
MEL -0402		02-Sep-18	Pteridomonas sp.	28736	6.38
MEL -0402		02-Sep-18	Cyclotella stelligera Cleve and Grunow	3800	8.96
MEL -0402		02-Sep-18	Cyclotella ocellata Pant.	7184	0.62
MEL -0402		02-Sep-18	Tabellaria fenestrata (Lyngbye) Kutzing	2400	1.99
MEL -0402		02-Sep-18	Synedra acus Kutzing	1200	0.12
MEL -0402		02-Sep-18	Synedra ulna (Nitzsch) Ehrenberg	1200	8.17

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0402		02-Sep-18	Asterionella formosa Hassall	400	0.04
MEL -0402		02-Sep-18	Cyclotella michiganiana Skvortzow	64656	1.08
MEL -0402		02-Sep-18	Cyclotella bodanica Eulenst.	800	5.64
MEL -0402		02-Sep-18	Rhodomonas minuta Skuja	316096	43.68
MEL -0402		02-Sep-18	Cryptomonas erosa Ehrenberg	1800	3.19
MEL -0402		02-Sep-18	Cryptomonas reflexa (Marsson) Skuja	600	0.44
MEL -0402		02-Sep-18	Cryptomonas rostratiformis Skuja	400	0.92
MEL -0402		02-Sep-18	Katablepharis ovalis Skuja	7184	0.35
MEL -0402		02-Sep-18	Gymnodinium helveticum Penard	200	4.71
MEL -0402		02-Sep-18	Gymnodinium sp.	400	6.24
MEL -0402		02-Sep-18	Peridinium pusillum (Penard) Lemmermann	600	2.51
MEL -0403		02-Sep-18	Anabaena solitaria Klebs	1400	4.92
MEL -0403		02-Sep-18	Elakatothrix gelatinosa Willen	143680	2.49
MEL -0403		02-Sep-18	Planctonema lauterbornii Schmidle	7184	2.54
MEL -0403		02-Sep-18	Cosmarium sp.	200	0.28
MEL -0403		02-Sep-18	Euastrum spp.	200	0.37
MEL -0403		02-Sep-18	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL -0403		02-Sep-18	Staurodesmus cuspidatus (Brebisson and Ralfs) Teiling	200	0.55
MEL -0403		02-Sep-18	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL -0403		02-Sep-18	Small chrysophyceae	725584	4.06
MEL -0403		02-Sep-18	Large chrysophyceae	35920	6.45
MEL -0403		02-Sep-18	Chrysochromulina parva Lackey	21552	1.41
MEL -0403		02-Sep-18	Chrysococcus sp.	316096	20.67
MEL -0403		02-Sep-18	Kephyrion sp.	229888	3.59
MEL -0403		02-Sep-18	Spiniferomonas serrata	14368	1.54
MEL -0403		02-Sep-18	Mallomonas crassisquama (Asmund) Fott	400	0.42
MEL -0403		02-Sep-18	Dinobryon borgei Lemmermann	7184	0.31
MEL -0403		02-Sep-18	Dinobryon mucronatom Nygaard	21552	2.71
MEL -0403		02-Sep-18	Dinobryon bavaricum Imhof	86208	19.50
MEL -0403		02-Sep-18	Dinobryon sertularia Ehrenberg	28736	6.50
MEL -0403		02-Sep-18	Chrysolykos skuja (Nauwerck) Willen	14368	0.46
MEL -0403		02-Sep-18	Uroglena volvox Ehrenberg	107760	12.19

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0403		02-Sep-18	Chrysochromulina laurentiana Kling	79024	34.37
MEL -0403		02-Sep-18	Stichogloea spp.	57472	2.89
MEL -0403		02-Sep-18	Salpingoeca frequentissima (Zach.) Lemmermann	35920	1.15
MEL -0403		02-Sep-18	Pteridomonas sp.	28736	6.84
MEL -0403		02-Sep-18	Cyclotella stelligera Cleve and Grunow	2800	6.35
MEL -0403		02-Sep-18	Cyclotella ocellata Pant.	35920	2.53
MEL -0403		02-Sep-18	Synedra acus Kutzing	1400	0.14
MEL -0403		02-Sep-18	Cyclotella michiganiana Skvortzow	122128	2.99
MEL -0403		02-Sep-18	Cyclotella bodanica Eulenst.	400	2.82
MEL -0403		02-Sep-18	Rhodomonas minuta Skuja	423856	58.58
MEL -0403		02-Sep-18	Cryptomonas erosa Ehrenberg	2200	3.91
MEL -0403		02-Sep-18	Cryptomonas reflexa (Marsson) Skuja	200	0.14
MEL -0403		02-Sep-18	Cryptomonas rostratiformis Skuja	200	0.41
MEL -0403		02-Sep-18	Gymnodinium helveticum Penard	200	4.71
MEL -0403		02-Sep-18	Gymnodinium sp.	400	6.24
MEL -0403		02-Sep-18	Peridinium pusillum (Penard) Lemmermann	200	0.75
MEL -0405	Rep1	02-Sep-18	Sphaerocystis schroeteri Chodat	57472	0.81
MEL -0405	Rep1	02-Sep-18	Oocystis lacustris Chodat	14368	0.41
MEL -0405	Rep1	02-Sep-18	Dictyosphaerium simplex Sukja	28736	0.12
MEL -0405	Rep1	02-Sep-18	Elakatothrix gelatinosa Willen	122128	1.92
MEL -0405	Rep1	02-Sep-18	Planctonema lauterbornii Schmidle	43104	15.23
MEL -0405	Rep1	02-Sep-18	Cosmarium sp.	200	0.28
MEL -0405	Rep1	02-Sep-18	Staurodesmus extensus (Andersson) Teiling	800	0.31
MEL -0405	Rep1	02-Sep-18	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL -0405	Rep1	02-Sep-18	Botryococcus braunii Kutzing	600	0.54
MEL -0405	Rep1	02-Sep-18	Small chrysophyceae	754320	6.94
MEL -0405	Rep1	02-Sep-18	Large chrysophyceae	43104	7.74
MEL -0405	Rep1	02-Sep-18	Chrysochromulina parva Lackey	64656	4.23
MEL -0405	Rep1	02-Sep-18	Chrysococcus sp.	502880	32.89
MEL -0405	Rep1	02-Sep-18	Kephyrion boreale Skuja	7184	0.85
MEL -0405	Rep1	02-Sep-18	Kephyrion sp.	208336	2.67
MEL -0405	Rep1	02-Sep-18	Mallomonas crassisquama (Asmund) Fott	200	0.21

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0405	Rep1	02-Sep-18	Dinobryon borgei Lemmermann	14368	0.74
MEL -0405	Rep1	02-Sep-18	Dinobryon mucronatom Nygaard	35920	4.52
MEL -0405	Rep1	02-Sep-18	Dinobryon bavaricum Imhof	86208	19.50
MEL -0405	Rep1	02-Sep-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0405	Rep1	02-Sep-18	Chrysolykos skuja (Nauwerck) Willen	50288	1.42
MEL -0405	Rep1	02-Sep-18	Uroglena volvox Ehrenberg	114944	13.00
MEL -0405	Rep1	02-Sep-18	Chrysochromulina laurentiana Kling	57472	24.99
MEL -0405	Rep1	02-Sep-18	Stichogloea spp.	71840	3.61
MEL -0405	Rep1	02-Sep-18	Pteridomonas sp.	28736	5.74
MEL -0405	Rep1	02-Sep-18	Cyclotella stelligera Cleve and Grunow	3800	8.61
MEL -0405	Rep1	02-Sep-18	Cyclotella ocellata Pant.	14368	2.13
MEL -0405	Rep1	02-Sep-18	Tabellaria fenestrata (Lyngbye) Kutzing	800	0.61
MEL -0405	Rep1	02-Sep-18	Synedra acus Kutzing	800	0.08
MEL -0405	Rep1	02-Sep-18	Synedra ulna (Nitzsch) Ehrenberg	200	1.13
MEL -0405	Rep1	02-Sep-18	Cyclotella michiganiana Skvortzow	114944	2.82
MEL -0405	Rep1	02-Sep-18	Cyclotella bodanica Eulenst.	400	2.82
MEL -0405	Rep1	02-Sep-18	Rhodomonas minuta Skuja	380752	52.62
MEL -0405	Rep1	02-Sep-18	Cryptomonas erosa Ehrenberg	1600	2.79
MEL -0405	Rep1	02-Sep-18	Cryptomonas reflexa (Marsson) Skuja	200	0.15
MEL -0405	Rep1	02-Sep-18	Cryptomonas rostratiformis Skuja	600	1.34
MEL -0405	Rep1	02-Sep-18	Katablepharis ovalis Skuja	7184	0.34
MEL -0405	Rep1	02-Sep-18	Gymnodinium helveticum Penard	200	4.71
MEL -0405	Rep1	02-Sep-18	Gymnodinium sp.	1200	18.72
MEL -0405	Rep1	02-Sep-18	Peridinium pusillum (Penard) Lemmermann	1200	4.52
MEL -0405	Rep2	02-Sep-18	Oocystis lacustris Chodat	7184	0.20
MEL -0405	Rep2	02-Sep-18	Elakatothrix gelatinosa Willen	100576	1.58
MEL -0405	Rep2	02-Sep-18	Planctonema lauterbornii Schmidle	28736	10.16
MEL -0405	Rep2	02-Sep-18	Cosmarium sp.	600	0.84
MEL -0405	Rep2	02-Sep-18	Staurodesmus extensus (Andersson) Teiling	1200	0.46
MEL -0405	Rep2	02-Sep-18	Spondylosium planum (Wolle) W. and G.S. West	35920	1.35
MEL -0405	Rep2	02-Sep-18	Botryococcus braunii Kutzing	600	0.54
MEL -0405	Rep2	02-Sep-18	Small chrysophyceae	589088	5.42

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0405	Rep2	02-Sep-18	Large chrysophyceae	43104	7.74
MEL -0405	Rep2	02-Sep-18	Chrysochromulina parva Lackey	50288	3.29
MEL -0405	Rep2	02-Sep-18	Chrysococcus sp.	452592	29.60
MEL -0405	Rep2	02-Sep-18	Kephyrion sp.	222704	2.85
MEL -0405	Rep2	02-Sep-18	Dinobryon borgei Lemmermann	14368	0.74
MEL -0405	Rep2	02-Sep-18	Dinobryon mucronatom Nygaard	14368	1.81
MEL -0405	Rep2	02-Sep-18	Dinobryon bavaricum Imhof	57472	13.00
MEL -0405	Rep2	02-Sep-18	Dinobryon bavaricum Imhof	200	0.25
MEL -0405	Rep2	02-Sep-18	Dinobryon sertularia Ehrenberg	28736	6.50
MEL -0405	Rep2	02-Sep-18	Chrysolykos skuja (Nauwerck) Willen	35920	1.01
MEL -0405	Rep2	02-Sep-18	Uroglena volvox Ehrenberg	86208	9.75
MEL -0405	Rep2	02-Sep-18	Bitrichia chodatii (Reverdin) Chodat	7184	0.36
MEL -0405	Rep2	02-Sep-18	Chrysochromulina laurentiana Kling	43104	18.75
MEL -0405	Rep2	02-Sep-18	Stichogloea spp.	35920	1.81
MEL -0405	Rep2	02-Sep-18	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.46
MEL -0405	Rep2	02-Sep-18	Pteridomonas sp.	21552	4.30
MEL -0405	Rep2	02-Sep-18	Cyclotella stelligera Cleve and Grunow	2800	6.35
MEL -0405	Rep2	02-Sep-18	Cyclotella ocellata Pant.	28736	4.25
MEL -0405	Rep2	02-Sep-18	Synedra acus Kutzing	1600	0.17
MEL -0405	Rep2	02-Sep-18	Synedra ulna (Nitzsch) Ehrenberg	600	3.38
MEL -0405	Rep2	02-Sep-18	Asterionella formosa Hassall	800	0.09
MEL -0405	Rep2	02-Sep-18	Cyclotella michiganiana Skvortzow	93392	2.29
MEL -0405	Rep2	02-Sep-18	Cyclotella bodanica Eulenst.	600	6.99
MEL -0405	Rep2	02-Sep-18	Rhodomonas minuta Skuja	387936	53.61
MEL -0405	Rep2	02-Sep-18	Cryptomonas erosa Ehrenberg	1800	3.14
MEL -0405	Rep2	02-Sep-18	Cryptomonas reflexa (Marsson) Skuja	400	0.29
MEL -0405	Rep2	02-Sep-18	Cryptomonas rostratiformis Skuja	400	0.89
MEL -0405	Rep2	02-Sep-18	Gymnodinium sp.	600	9.36
MEL -0405	Rep2	02-Sep-18	Peridinium pusillum (Penard) Lemmermann	800	3.01
MEL -0501	Rep1	01-Sep-18	Chlamydomonas spp.	7184	0.19
MEL -0501	Rep1	01-Sep-18	Oocystis lacustris Chodat	28736	0.81
MEL -0501	Rep1	01-Sep-18	Elakatothrix gelatinosa Willen	28736	0.50

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0501	Rep1	01-Sep-18	Planctonema lauterbornii Schmidle	35920	12.69
MEL -0501	Rep1	01-Sep-18	Cosmarium sp.	200	0.28
MEL -0501	Rep1	01-Sep-18	Staurodesmus extensus (Andersson) Teiling	1200	0.49
MEL -0501	Rep1	01-Sep-18	Spondylosium planum (Wolle) W. and G.S. West	43104	1.63
MEL -0501	Rep1	01-Sep-18	Botryococcus braunii Kutzing	200	0.10
MEL -0501	Rep1	01-Sep-18	Small chrysophyceae	926736	9.55
MEL -0501	Rep1	01-Sep-18	Large chrysophyceae	43104	7.74
MEL -0501	Rep1	01-Sep-18	Chrysochromulina parva Lackey	43104	2.82
MEL -0501	Rep1	01-Sep-18	Chrysococcus sp.	840528	42.87
MEL -0501	Rep1	01-Sep-18	Chrysostephanosphaera globulifera Scherffel	7184	2.00
MEL -0501	Rep1	01-Sep-18	Kephyrion boreale Skuja	14368	1.71
MEL -0501	Rep1	01-Sep-18	Kephyrion sp.	107760	1.68
MEL -0501	Rep1	01-Sep-18	Spiniferomonas serrata	21552	2.69
MEL -0501	Rep1	01-Sep-18	Mallomonas crassisquama (Asmund) Fott	600	0.63
MEL -0501	Rep1	01-Sep-18	Dinobryon borgei Lemmermann	14368	0.74
MEL -0501	Rep1	01-Sep-18	Dinobryon bavaricum Imhof	64656	14.63
MEL -0501	Rep1	01-Sep-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0501	Rep1	01-Sep-18	Chrysolykos skuja (Nauwerck) Willen	28736	0.85
MEL -0501	Rep1	01-Sep-18	Uroglena volvox Ehrenberg	143680	16.25
MEL -0501	Rep1	01-Sep-18	Chrysochromulina laurentiana Kling	28736	13.31
MEL -0501	Rep1	01-Sep-18	Stichogloea spp.	57472	2.89
MEL -0501	Rep1	01-Sep-18	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.43
MEL -0501	Rep1	01-Sep-18	Pteridomonas sp.	28736	6.84
MEL -0501	Rep1	01-Sep-18	Cyclotella stelligera Cleve and Grunow	3600	8.16
MEL -0501	Rep1	01-Sep-18	Cyclotella ocellata Pant.	28736	4.11
MEL -0501	Rep1	01-Sep-18	Tabellaria flocculosa (Roth) Kutzing	400	0.51
MEL -0501	Rep1	01-Sep-18	Synedra acus Kutzing	1000	0.10
MEL -0501	Rep1	01-Sep-18	Asterionella formosa Hassall	2600	0.28
MEL -0501	Rep1	01-Sep-18	Cyclotella michiganiana Skvortzow	71840	1.56
MEL -0501	Rep1	01-Sep-18	Cyclotella bodanica Eulenst.	200	1.54
MEL -0501	Rep1	01-Sep-18	Rhodomonas minuta Skuja	172416	23.83
MEL -0501	Rep1	01-Sep-18	Cryptomonas erosa Ehrenberg	1400	2.44

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0501	Rep1	01-Sep-18	Cryptomonas rostratiformis Skuja	200	0.41
MEL -0501	Rep1	01-Sep-18	Gymnodinium helveticum Penard	200	4.71
MEL -0501	Rep1	01-Sep-18	Gymnodinium sp.	1000	14.14
MEL -0501	Rep2	01-Sep-18	Carteria spp.	7184	0.34
MEL -0501	Rep2	01-Sep-18	Oocystis lacustris Chodat	28736	0.81
MEL -0501	Rep2	01-Sep-18	Monoraphidium minutum (Nag.) Komarkova-Legnerova	7184	0.45
MEL -0501	Rep2	01-Sep-18	Elakatothrix gelatinosa Willen	57472	0.99
MEL -0501	Rep2	01-Sep-18	Planctonema lauterbornii Schmidle	35920	12.69
MEL -0501	Rep2	01-Sep-18	Cosmarium sp.	200	0.28
MEL -0501	Rep2	01-Sep-18	Cosmarium sp.	200	1.50
MEL -0501	Rep2	01-Sep-18	Euastrum spp.	200	0.37
MEL -0501	Rep2	01-Sep-18	Staurodesmus extensus (Andersson) Teiling	400	0.16
MEL -0501	Rep2	01-Sep-18	Spondylosium planum (Wolle) W. and G.S. West	28736	1.08
MEL -0501	Rep2	01-Sep-18	Mougeotia sp.	1200	5.18
MEL -0501	Rep2	01-Sep-18	Botryococcus braunii Kutzing	200	0.10
MEL -0501	Rep2	01-Sep-18	Small chrysophyceae	1048864	10.80
MEL -0501	Rep2	01-Sep-18	Large chrysophyceae	28736	5.16
MEL -0501	Rep2	01-Sep-18	Chrysochromulina parva Lackey	14368	0.94
MEL -0501	Rep2	01-Sep-18	Chrysococcus sp.	739952	37.74
MEL -0501	Rep2	01-Sep-18	Chrysostephanosphaera globulifera Scherffel	7184	2.00
MEL -0501	Rep2	01-Sep-18	Kephyrion sp.	122128	1.91
MEL -0501	Rep2	01-Sep-18	Spiniferomonas serrata	14368	1.79
MEL -0501	Rep2	01-Sep-18	Mallomonas akrokomos Asmund and Kristiansen	7184	1.72
MEL -0501	Rep2	01-Sep-18	Dinobryon borgei Lemmermann	21552	1.11
MEL -0501	Rep2	01-Sep-18	Dinobryon bavaricum Imhof	79024	17.88
MEL -0501	Rep2	01-Sep-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0501	Rep2	01-Sep-18	Chrysolykos skuja (Nauwerck) Willen	21552	0.64
MEL -0501	Rep2	01-Sep-18	Uroglena volvox Ehrenberg	172416	19.50
MEL -0501	Rep2	01-Sep-18	Chrysochromulina laurentiana Kling	28736	13.31
MEL -0501	Rep2	01-Sep-18	Stichogloea spp.	14368	0.72
MEL -0501	Rep2	01-Sep-18	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23
MEL -0501	Rep2	01-Sep-18	Pteridomonas sp.	14368	3.42

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0501	Rep2	01-Sep-18	Cyclotella stelligera Cleve and Grunow	2400	5.44
MEL -0501	Rep2	01-Sep-18	Cyclotella ocellata Pant.	21552	3.08
MEL -0501	Rep2	01-Sep-18	Synedra acus Kutzing	400	0.04
MEL -0501	Rep2	01-Sep-18	Asterionella formosa Hassall	3600	0.38
MEL -0501	Rep2	01-Sep-18	Cyclotella michiganiana Skvortzow	100576	2.18
MEL -0501	Rep2	01-Sep-18	Cyclotella bodanica Eulenst.	600	4.63
MEL -0501	Rep2	01-Sep-18	Rhodomonas minuta Skuja	208336	28.79
MEL -0501	Rep2	01-Sep-18	Cryptomonas erosa Ehrenberg	3400	5.93
MEL -0501	Rep2	01-Sep-18	Gymnodinium sp.	400	5.65
MEL -0501	Rep2	01-Sep-18	Peridinium aciculiferum Lemmermann	400	3.62
MEL -0502		30-Aug-18	Elakatothrix gelatinosa Willen	71840	1.24
MEL -0502		30-Aug-18	Planctonema lauterbornii Schmidle	21552	7.62
MEL -0502		30-Aug-18	Cosmarium sp.	200	0.28
MEL -0502		30-Aug-18	Staurodesmus extensus (Andersson) Teiling	3600	1.39
MEL -0502		30-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL -0502		30-Aug-18	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL -0502		30-Aug-18	Small chrysophyceae	395120	5.06
MEL -0502		30-Aug-18	Large chrysophyceae	100576	18.06
MEL -0502		30-Aug-18	Chrysochromulina parva Lackey	7184	0.47
MEL -0502		30-Aug-18	Chrysococcus sp.	280176	18.32
MEL -0502		30-Aug-18	Kephyrion sp.	122128	2.30
MEL -0502		30-Aug-18	Mallomonas crassisquama (Asmund) Fott	1000	1.05
MEL -0502		30-Aug-18	Dinobryon bavaricum Imhof	57472	13.00
MEL -0502		30-Aug-18	Dinobryon bavaricum Imhof	200	0.25
MEL -0502		30-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0502		30-Aug-18	Chrysolykos skuja (Nauwerck) Willen	21552	0.65
MEL -0502		30-Aug-18	Uroglena volvox Ehrenberg	79024	8.94
MEL -0502		30-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.19
MEL -0502		30-Aug-18	Cyclotella stelligera Cleve and Grunow	5600	12.69
MEL -0502		30-Aug-18	Cyclotella ocellata Pant.	50288	5.05
MEL -0502		30-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	200	0.15
MEL -0502		30-Aug-18	Synedra acus Kutzing	2000	0.22

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0502		30-Aug-18	Asterionella formosa Hassall	3200	0.34
MEL -0502		30-Aug-18	Cyclotella michiganiana Skvortzow	143680	3.52
MEL -0502		30-Aug-18	Cyclotella bodanica Eulenst.	1800	13.89
MEL -0502		30-Aug-18	Rhodomonas minuta Skuja	71840	9.93
MEL -0502		30-Aug-18	Cryptomonas erosa Ehrenberg	3400	5.84
MEL -0502		30-Aug-18	Gymnodinium sp.	1200	22.58
MEL -0503		29-Aug-18	Oocystis lacustris Chodat	57472	1.68
MEL -0503		29-Aug-18	Elakatothrix gelatinosa Willen	64656	1.12
MEL -0503		29-Aug-18	Planctonema lauterbornii Schmidle	35920	12.69
MEL -0503		29-Aug-18	Cosmarium sp.	1000	1.40
MEL -0503		29-Aug-18	Staurodesmus extensus (Andersson) Teiling	2400	0.97
MEL -0503		29-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	7184	0.27
MEL -0503		29-Aug-18	Botryococcus braunii Kutzing	400	0.36
MEL -0503		29-Aug-18	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL -0503		29-Aug-18	Small chrysophyceae	222704	2.85
MEL -0503		29-Aug-18	Large chrysophyceae	57472	10.32
MEL -0503		29-Aug-18	Chrysococcus sp.	344832	22.55
MEL -0503		29-Aug-18	Kephyrion boreale Skuja	14368	1.71
MEL -0503		29-Aug-18	Kephyrion sp.	86208	1.22
MEL -0503		29-Aug-18	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL -0503		29-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0503		29-Aug-18	Dinobryon bavaricum Imhof	71840	16.25
MEL -0503		29-Aug-18	Dinobryon sertularia Ehrenberg	21552	4.88
MEL -0503		29-Aug-18	Chrysolykos skuja (Nauwerck) Willen	28736	0.86
MEL -0503		29-Aug-18	Uroglena volvox Ehrenberg	172416	19.50
MEL -0503		29-Aug-18	Chrysochromulina laurentiana Kling	7184	2.83
MEL -0503		29-Aug-18	Stichogloea spp.	14368	0.72
MEL -0503		29-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	7184	0.23
MEL -0503		29-Aug-18	Cyclotella stelligera Cleve and Grunow	5200	11.17
MEL -0503		29-Aug-18	Cyclotella ocellata Pant.	43104	3.03
MEL -0503		29-Aug-18	Synedra acus Kutzing	1200	0.14
MEL -0503		29-Aug-18	Cyclotella michiganiana Skvortzow	179600	3.00

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0503		29-Aug-18	Cyclotella bodanica Eulenst.	600	4.63
MEL -0503		29-Aug-18	Rhodomonas minuta Skuja	179600	24.82
MEL -0503		29-Aug-18	Cryptomonas erosa Ehrenberg	2600	4.61
MEL -0503		29-Aug-18	Gymnodinium sp.	400	6.24
MEL -0503		29-Aug-18	Peridinium pusillum (Penard) Lemmermann	400	1.68
MEL -0503R	Recount	29-Aug-18	Oocystis lacustris Chodat	86208	2.52
MEL -0503R	Recount	29-Aug-18	Elakatothrix gelatinosa Willen	50288	0.87
MEL -0503R	Recount	29-Aug-18	Planctonema lauterbornii Schmidle	35920	12.69
MEL -0503R	Recount	29-Aug-18	Cosmarium sp.	600	0.84
MEL -0503R	Recount	29-Aug-18	Euastrum spp.	200	0.37
MEL -0503R	Recount	29-Aug-18	Staurodesmus extensus (Andersson) Teiling	1600	0.65
MEL -0503R	Recount	29-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL -0503R	Recount	29-Aug-18	Botryococcus braunii Kutzing	800	0.72
MEL -0503R	Recount	29-Aug-18	Small chrysophyceae	186784	2.39
MEL -0503R	Recount	29-Aug-18	Large chrysophyceae	35920	6.45
MEL -0503R	Recount	29-Aug-18	Chrysochromulina parva Lackey	14368	0.94
MEL -0503R	Recount	29-Aug-18	Chrysococcus sp.	287360	18.79
MEL -0503R	Recount	29-Aug-18	Kephyrion boreale Skuja	28736	3.41
MEL -0503R	Recount	29-Aug-18	Kephyrion sp.	71840	1.01
MEL -0503R	Recount	29-Aug-18	Spiniferomonas serrata	7184	0.73
MEL -0503R	Recount	29-Aug-18	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL -0503R	Recount	29-Aug-18	Dinobryon borgei Lemmermann	7184	0.37
MEL -0503R	Recount	29-Aug-18	Dinobryon bavaricum Imhof	79024	17.88
MEL -0503R	Recount	29-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0503R	Recount	29-Aug-18	Dinobryon sertularia Ehrenberg	200	0.25
MEL -0503R	Recount	29-Aug-18	Chrysolykos skuja (Nauwerck) Willen	14368	0.43
MEL -0503R	Recount	29-Aug-18	Uroglena volvox Ehrenberg	143680	16.25
MEL -0503R	Recount	29-Aug-18	Chrysochromulina laurentiana Kling	7184	2.83
MEL -0503R	Recount	29-Aug-18	Stichogloea spp.	28736	1.45
MEL -0503R	Recount	29-Aug-18	Cyclotella stelligera Cleve and Grunow	4000	8.59
MEL -0503R	Recount	29-Aug-18	Cyclotella ocellata Pant.	28736	2.02
MEL -0503R	Recount	29-Aug-18	Synedra acus Kutzing	1200	0.13

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0503R	Recount	29-Aug-18	Synedra acus Kutzing	800	0.09
MEL -0503R	Recount	29-Aug-18	Cyclotella michiganiana Skvortzow	179600	3.00
MEL -0503R	Recount	29-Aug-18	Cyclotella bodanica Eulenst.	800	6.17
MEL -0503R	Recount	29-Aug-18	Rhodomonas minuta Skuja	222704	30.78
MEL -0503R	Recount	29-Aug-18	Cryptomonas erosa Ehrenberg	3200	5.67
MEL -0503R	Recount	29-Aug-18	Gymnodinium sp.	400	6.24
MEL -0503R	Recount	29-Aug-18	Peridinium pusillum (Penard) Lemmermann	200	0.84
MEL -0504		30-Aug-18	Snowella sp	800	0.60
MEL -0504		30-Aug-18	Elakatothrix gelatinosa Willen	143680	2.49
MEL -0504		30-Aug-18	Planctonema lauterbornii Schmidle	57472	20.31
MEL -0504		30-Aug-18	Cosmarium sp.	400	0.56
MEL -0504		30-Aug-18	Staurodesmus extensus (Andersson) Teiling	1800	0.65
MEL -0504		30-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	21552	0.81
MEL -0504		30-Aug-18	Tetraedron caudatum (Corda) Hansgrig	7184	0.03
MEL -0504		30-Aug-18	Small chrysophyceae	423856	2.37
MEL -0504		30-Aug-18	Large chrysophyceae	50288	9.03
MEL -0504		30-Aug-18	Chrysococcus sp.	222704	9.26
MEL -0504		30-Aug-18	Kephyrion boreale Skuja	7184	0.85
MEL -0504		30-Aug-18	Kephyrion sp.	100576	1.89
MEL -0504		30-Aug-18	Mallomonas crassisquama (Asmund) Fott	200	0.21
MEL -0504		30-Aug-18	Dinobryon borgei Lemmermann	14368	0.65
MEL -0504		30-Aug-18	Dinobryon bavaricum Imhof	129312	29.25
MEL -0504		30-Aug-18	Dinobryon sertularia Ehrenberg	14368	3.25
MEL -0504		30-Aug-18	Dinobryon sertularia Ehrenberg	200	0.40
MEL -0504		30-Aug-18	Chrysolykos skuja (Nauwerck) Willen	35920	1.15
MEL -0504		30-Aug-18	Uroglena volvox Ehrenberg	50288	5.69
MEL -0504		30-Aug-18	Chrysochromulina laurentiana Kling	7184	3.33
MEL -0504		30-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	14368	0.45
MEL -0504		30-Aug-18	Cyclotella stelligera Cleve and Grunow	3400	8.02
MEL -0504		30-Aug-18	Cyclotella ocellata Pant.	28736	2.89
MEL -0504		30-Aug-18	Rhizosolenia eriense H.L. Smith	7184	0.46
MEL -0504		30-Aug-18	Tabellaria fenestrata (Lyngbye) Kutzing	400	0.31

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0504		30-Aug-18	Synedra acus Kutzing	2000	0.23
MEL -0504		30-Aug-18	Synedra ulna (Nitzsch) Ehrenberg	400	2.72
MEL -0504		30-Aug-18	Asterionella formosa Hassall	2000	0.21
MEL -0504		30-Aug-18	Cyclotella michiganiana Skvortzow	122128	2.99
MEL -0504		30-Aug-18	Cyclotella bodanica Eulenst.	1200	7.02
MEL -0504		30-Aug-18	Rhodomonas minuta Skuja	71840	9.93
MEL -0504		30-Aug-18	Cryptomonas erosa Ehrenberg	2200	3.70
MEL -0504		30-Aug-18	Gymnodinium sp.	600	8.48
MEL -0505		29-Aug-18	Chroococcus limneticus Lemmermann	14368	1.71
MEL -0505		29-Aug-18	Snowella sp	800	0.60
MEL -0505		29-Aug-18	Oocystis lacustris Chodat	14368	0.41
MEL -0505		29-Aug-18	Elakatothrix gelatinosa Willen	114944	1.99
MEL -0505		29-Aug-18	Planctonema lauterbornii Schmidle	14368	5.08
MEL -0505		29-Aug-18	Cosmarium sp.	400	0.56
MEL -0505		29-Aug-18	Staurodesmus extensus (Andersson) Teiling	1400	0.57
MEL -0505		29-Aug-18	Spondylosium planum (Wolle) W. and G.S. West	14368	0.54
MEL -0505		29-Aug-18	Small chrysophyceae	265808	2.45
MEL -0505		29-Aug-18	Large chrysophyceae	57472	10.32
MEL -0505		29-Aug-18	Chrysococcus sp.	373568	24.43
MEL -0505		29-Aug-18	Kephyrion boreale Skuja	7184	0.90
MEL -0505		29-Aug-18	Kephyrion sp.	100576	2.07
MEL -0505		29-Aug-18	Spiniferomonas serrata	7184	0.63
MEL -0505		29-Aug-18	Dinobryon borgei Lemmermann	7184	0.35
MEL -0505		29-Aug-18	Dinobryon mucronatom Nygaard	7184	0.88
MEL -0505		29-Aug-18	Dinobryon bavaricum Imhof	93392	21.13
MEL -0505		29-Aug-18	Dinobryon sertularia Ehrenberg	7184	1.63
MEL -0505		29-Aug-18	Chrysolykos skuja (Nauwerck) Willen	7184	0.23
MEL -0505		29-Aug-18	Uroglena volvox Ehrenberg	57472	6.50
MEL -0505		29-Aug-18	Salpingoeca frequentissima (Zach.) Lemmermann	28736	0.93
MEL -0505		29-Aug-18	Cyclotella stelligera Cleve and Grunow	4200	10.17
MEL -0505		29-Aug-18	Cyclotella ocellata Pant.	35920	2.53
MEL -0505		29-Aug-18	Tabellaria flocculosa (Roth) Kutzing	200	0.27

Table 11D-6: Raw Phytoplankton Data, Meliadine Lake 2018

Station	Replicate	Date	Species Name	Abundance	Biomass
				cells/L	mg/m^3
MEL -0505		29-Aug-18	Synedra acus Kutzing	1600	0.16
MEL -0505		29-Aug-18	Synedra acus Kutzing	2600	0.27
MEL -0505		29-Aug-18	Cyclotella michiganiana Skvortzow	186784	4.58
MEL -0505		29-Aug-18	Cyclotella bodanica Eulenst.	1200	7.43
MEL -0505		29-Aug-18	Rhodomonas minuta Skuja	86208	11.91
MEL -0505		29-Aug-18	Cryptomonas erosa Ehrenberg	2400	4.27
MEL -0505		29-Aug-18	Gymnodinium sp.	400	6.24

Appendix H-1

Analysis certificates for EEM samples

Maxxam
A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532361
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8J0420
Received: 2018/07/26, 11:35

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity (1)	2	N/A	2018/07/31	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide (1)	2	N/A	2018/08/01	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry (1)	2	N/A	2018/07/30	CAM SOP-00463	EPA 325.2 m
Conductivity (1)	2	N/A	2018/07/31	CAM SOP-00414	SM 23 2510 m
Free (WAD) Cyanide (1)	2	N/A	2018/07/31	CAM SOP-00457	OMOE E3015 m
Total Cyanide (1)	2	2018/07/30	2018/07/31	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1, 4)	2	N/A	2018/07/30	CAM SOP-00446	SM 23 5310 B m
Petroleum Hydro. CCME F1 & BTEX in Water (1)	2	N/A	2018/07/30	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	2	2018/07/31	2018/08/01	CAM SOP-00316	CCME PHC-CWS m
Dissolved Mercury (low level) (1)	2	2018/08/01	2018/08/01	CAM SOP-00453	EPA 7470 m
Mercury (low level) (1)	2	2018/08/01	2018/08/01	CAM SOP-00453	EPA 7470 m
Total Ammonia-N (1)	2	N/A	2018/07/31	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	2	N/A	2018/07/30	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Total Oil and Grease (1)	2	2018/07/31	2018/07/31	CAM SOP-00326	EPA1664B m,SM5520A m
Orthophosphate (1)	2	N/A	2018/07/30	CAM SOP-00461	EPA 365.1 m
Radium-226 Low Level (2, 7)	2	N/A	2018/08/04	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry
Sulphate by Automated Colourimetry (1)	2	N/A	2018/07/30	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	2	2018/07/28	2018/07/28	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	1	2018/07/31	2018/08/02	CAM SOP-00938	OMOE E3516 m
Total Kjeldahl Nitrogen in Water (1)	1	2018/07/31	2018/08/03	CAM SOP-00938	OMOE E3516 m
Total Organic Carbon (TOC) (1, 8)	2	N/A	2018/07/31	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric) (1)	2	2018/07/31	2018/08/01	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids (1)	2	2018/07/28	2018/07/28	CAM SOP-00428	SM 23 2540D m
Turbidity (1)	2	N/A	2018/07/30	CAM SOP-00417	SM 23 2130 B m
Hardness (calculated as CaCO3) (3)	2	N/A	2018/10/01	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using

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Maxxam
A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532361
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8J0420
Received: 2018/07/26, 11:35

accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Analytics Mississauga
(2) This test was performed by Maxxam Analytics Kitimat
(3) This test was performed by Campo to Burnaby Subcontract
(4) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(5) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(6) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(7) Radium-226 results have not been corrected for blanks.
(8) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key



Alisha Williamson
Project Manager
19 Dec 2018 15:38:21

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Jonathan Urben, Senior Project Manager
Email: jurben@maxxam.ca
Phone# (613) 274-0573

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

CCME PETROLEUM HYDROCARBONS IN WATER (WATER)

Maxxam ID		HII609	HII610		
Sampling Date		2018/07/23 15:00	2018/07/23 12:35		
COC Number		na	na		
	UNITS	MEL-14	MEL-13	RDL	QC Batch
BTEX & F1 Hydrocarbons					
Benzene	ug/L	<0.20	<0.20	0.20	5654645
Toluene	ug/L	<0.20	<0.20	0.20	5654645
Ethylbenzene	ug/L	<0.20	<0.20	0.20	5654645
o-Xylene	ug/L	<0.20	<0.20	0.20	5654645
p+m-Xylene	ug/L	<0.40	<0.40	0.40	5654645
Total Xylenes	ug/L	<0.40	<0.40	0.40	5654645
F1 (C6-C10)	ug/L	<25	<25	25	5654645
F1 (C6-C10) - BTEX	ug/L	<25	<25	25	5654645
F2-F4 Hydrocarbons					
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	100	5657080
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	200	5657080
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	200	5657080
Reached Baseline at C50	ug/L	Yes	Yes		5657080
Surrogate Recovery (%)					
1,4-Difluorobenzene	%	102	104		5654645
4-Bromofluorobenzene	%	98	99		5654645
D10-Ethylbenzene	%	121	121		5654645
D4-1,2-Dichloroethane	%	107	109		5654645
o-Terphenyl	%	95	91		5657080

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

RESULTS OF ANALYSES OF WATER

Maxxam ID		HII609			HII609			HII610		
Sampling Date		2018/07/23 15:00			2018/07/23 15:00			2018/07/23 12:35		
COC Number		na			na			na		
	UNITS	MEL-14	RDL	QC Batch	MEL-14 Lab-Dup	RDL	QC Batch	MEL-13	RDL	QC Batch
Calculated Parameters										
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	38	1.0	5651226				16	1.0	5651226
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	5651226				<1.0	1.0	5651226
Inorganics										
Total Ammonia-N	mg/L	0.47	0.050	5655193				<0.050	0.050	5655193
Conductivity	umho/cm	1800	1.0	5653511				88	1.0	5653511
Total Dissolved Solids	mg/L	1070	10	5653751				15	10	5653751
Total Kjeldahl Nitrogen (TKN)	mg/L	1.2 (1)	0.20	5656652				0.12	0.10	5656652
Dissolved Organic Carbon	mg/L	7.4	0.50	5653605				3.0	0.50	5653605
Total Organic Carbon (TOC)	mg/L	13	0.50	5655289				3.1	0.50	5655289
Orthophosphate (P)	mg/L	<0.010	0.010	5653770				<0.010	0.010	5653770
Total Phosphorus	mg/L	0.099	0.020	5656535				<0.020	0.020	5656535
Total Suspended Solids	mg/L	21	3	5653669				1	1	5653669
Dissolved Sulphate (SO4)	mg/L	43	1.0	5653768				4.8	1.0	5653768
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5655455				<0.0050	0.0050	5655455
Turbidity	NTU	1.6	0.1	5652935	1.6	0.1	5652935	0.3	0.1	5652935
WAD Cyanide (Free)	mg/L	0.0010	0.0010	5655460				<0.0010	0.0010	5655460
Alkalinity (Total as CaCO3)	mg/L	39	1.0	5653507				16	1.0	5653507
Dissolved Chloride (Cl-)	mg/L	400	5.0	5653764				13	1.0	5653764
Nitrite (N)	mg/L	0.304	0.010	5653774				<0.010	0.010	5653774
Nitrate (N)	mg/L	4.48	0.10	5653774				<0.10	0.10	5653774
Nitrate + Nitrite (N)	mg/L	4.78	0.10	5653774				<0.10	0.10	5653774
RADIONUCLIDE										
Radium-226	Bq/L	0.0070	0.0050	5656489				<0.0050	0.0050	5656489
Petroleum Hydrocarbons										
Total Oil & Grease	mg/L	1.8	0.50	5657267				<0.50	0.50	5657267

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Due to a high concentration of NOx, the sample required dilution. The detection limit was adjusted accordingly.

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

RESULTS OF ANALYSES OF WATER

Maxxam ID		HII610		
Sampling Date		2018/07/23 12:35		
COC Number		na		
	UNITS	**MEL-13 Lab-Dup**	**RDL**	**QC Batch**
Inorganics				
Total Dissolved Solids	mg/L	15	10	5653751

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HII609	HII610		
Sampling Date		2018/07/23 15:00	2018/07/23 12:35		
COC Number		na	na		
	UNITS	MEL-14	MEL-13	RDL	QC Batch
Metals					
Mercury (Hg)	mg/L	<0.00001	<0.00001	0.00001	5658501
Dissolved Mercury (Hg)	mg/L	<0.00001	<0.00001	0.00001	5658493

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: HII609
Sample ID: MEL-14
Matrix: Water

Collected: 2018/07/23
Shipped:
Received: 2018/07/26

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5653507	N/A	2018/07/31	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5651226	N/A	2018/08/01	Automated Statchk
Chloride by Automated Colourimetry	KONE	5653764	N/A	2018/07/30	Deonarine Ramnarine
Conductivity	AT	5653511	N/A	2018/07/31	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5655460	N/A	2018/07/31	Xuanhong Qiu
Total Cyanide	SKAL/CN	5655455	2018/07/30	2018/07/31	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5653605	N/A	2018/07/30	Nimarta Singh
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5654645	N/A	2018/07/30	Georgeta Rusu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5657080	2018/07/31	2018/08/01	Barbara Wowk
Dissolved Mercury (low level)	CV/AA	5658493	2018/08/01	2018/08/01	Ron Morrison
Mercury (low level)	CV/AA	5658501	2018/08/01	2018/08/01	Ron Morrison
Total Ammonia-N	LACH/NH4	5655193	N/A	2018/07/31	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5653774	N/A	2018/07/30	Chandra Nandlal
Total Oil and Grease	BAL	5657267	2018/07/31	2018/07/31	Mansoor Ahmed
Orthophosphate	KONE	5653770	N/A	2018/07/30	Alina Dobreanu
Radium-226 Low Level	AS	5656489	N/A	2018/08/04	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5653768	N/A	2018/07/30	Deonarine Ramnarine
Total Dissolved Solids	BAL	5653751	2018/07/28	2018/07/28	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5656652	2018/07/31	2018/08/03	Bramdeo Motiram
Total Organic Carbon (TOC)	TOCV/NDIR	5655289	N/A	2018/07/31	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5656535	2018/07/31	2018/08/01	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5653669	2018/07/28	2018/07/28	Mandeep Kaur
Turbidity	AT	5652935	N/A	2018/07/30	Neil Dassanayake
Hardness (calculated as CaCO3)	CALC	5676192	N/A	2018/10/01	Tamsin Denison

Maxxam ID: HII609 Dup
Sample ID: MEL-14
Matrix: Water

Collected: 2018/07/23
Shipped:
Received: 2018/07/26

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Turbidity	AT	5652935	N/A	2018/07/30	Neil Dassanayake

Maxxam ID: HII610
Sample ID: MEL-13
Matrix: Water

Collected: 2018/07/23
Shipped:
Received: 2018/07/26

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5653507	N/A	2018/07/31	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5651226	N/A	2018/08/01	Automated Statchk
Chloride by Automated Colourimetry	KONE	5653764	N/A	2018/07/30	Deonarine Ramnarine
Conductivity	AT	5653511	N/A	2018/07/31	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5655460	N/A	2018/07/31	Xuanhong Qiu
Total Cyanide	SKAL/CN	5655455	2018/07/30	2018/07/31	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5653605	N/A	2018/07/30	Nimarta Singh
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5654645	N/A	2018/07/30	Georgeta Rusu

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: HII610
Sample ID: MEL-13
Matrix: Water

Collected: 2018/07/23
Shipped:
Received: 2018/07/26

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5657080	2018/07/31	2018/08/01	Barbara Wowk
Dissolved Mercury (low level)	CV/AA	5658493	2018/08/01	2018/08/01	Ron Morrison
Mercury (low level)	CV/AA	5658501	2018/08/01	2018/08/01	Ron Morrison
Total Ammonia-N	LACH/NH4	5655193	N/A	2018/07/31	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5653774	N/A	2018/07/30	Chandra Nandlal
Total Oil and Grease	BAL	5657267	2018/07/31	2018/07/31	Mansoor Ahmed
Orthophosphate	KONE	5653770	N/A	2018/07/30	Alina Dobreanu
Radium-226 Low Level	AS	5656489	N/A	2018/08/04	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5653768	N/A	2018/07/30	Deonarine Ramnarine
Total Dissolved Solids	BAL	5653751	2018/07/28	2018/07/28	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5656652	2018/07/31	2018/08/02	Bramdeo Motiram
Total Organic Carbon (TOC)	TOCV/NDIR	5655289	N/A	2018/07/31	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5656535	2018/07/31	2018/08/01	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5653669	2018/07/28	2018/07/28	Mandeep Kaur
Turbidity	AT	5652935	N/A	2018/07/30	Neil Dassanayake
Hardness (calculated as CaCO3)	CALC	5676192	N/A	2018/10/01	Tamsin Denison

Maxxam ID: HII610 Dup
Sample ID: MEL-13
Matrix: Water

Collected: 2018/07/23
Shipped:
Received: 2018/07/26

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids	BAL	5653751	2018/07/28	2018/07/28	Mandeep Kaur

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	12.7°C

Revised Report (2018/10/02): Client sample ID changed as per client request.

Revised Report (2018/12/18): Client sample ID changed to MEL-13 and MEL-14 as per client request.

MEL-14 - GPS coordinates: 63°02'15.5'' 92°13'06.3''
MEL-13 - GPS coordinates: 63°01'44.6'' 92°09'14.6''

Sample HII609 [MEL-14] : Total Cyanide < Free Cyanide: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5654645	1,4-Difluorobenzene	2018/07/30	104	70 - 130	101	70 - 130	101	%				
5654645	4-Bromofluorobenzene	2018/07/30	102	70 - 130	103	70 - 130	97	%				
5654645	D10-Ethylbenzene	2018/07/30	118	70 - 130	104	70 - 130	117	%				
5654645	D4-1,2-Dichloroethane	2018/07/30	112	70 - 130	113	70 - 130	112	%				
5657080	o-Terphenyl	2018/07/31	96	60 - 130	93	60 - 130	90	%				
5652935	Turbidity	2018/07/30			99	85 - 115	<0.1	NTU	1.9	20		
5653507	Alkalinity (Total as CaCO3)	2018/07/31			95	85 - 115	<1.0	mg/L	2.9	20		
5653511	Conductivity	2018/07/31			100	85 - 115	<1.0	umho/cm	0	25		
5653605	Dissolved Organic Carbon	2018/07/30	95	80 - 120	97	80 - 120	<0.50	mg/L	0.15	20		
5653669	Total Suspended Solids	2018/07/28					<1	mg/L	9.7	25	96	85 - 115
5653751	Total Dissolved Solids	2018/07/28					<10	mg/L	0	25	100	90 - 110
5653764	Dissolved Chloride (Cl-)	2018/07/30	115	80 - 120	104	80 - 120	<1.0	mg/L	2.1	20		
5653768	Dissolved Sulphate (SO4)	2018/07/30	111	75 - 125	104	80 - 120	<1.0	mg/L	5.6	20		
5653770	Orthophosphate (P)	2018/07/30	98	75 - 125	100	80 - 120	<0.010	mg/L	11	25		
5653774	Nitrate (N)	2018/07/30	102	80 - 120	97	80 - 120	<0.10	mg/L	NC	20		
5653774	Nitrite (N)	2018/07/30	100	80 - 120	94	80 - 120	<0.010	mg/L	NC	20		
5654645	Benzene	2018/07/31	122	70 - 130	108	70 - 130	<0.20	ug/L	NC	30		
5654645	Ethylbenzene	2018/07/31	115	70 - 130	102	70 - 130	<0.20	ug/L	NC	30		
5654645	F1 (C6-C10) - BTEX	2018/07/31					<25	ug/L	NC	30		
5654645	F1 (C6-C10)	2018/07/31	97	70 - 130	100	70 - 130	<25	ug/L	NC	30		
5654645	o-Xylene	2018/07/31	117	70 - 130	108	70 - 130	<0.20	ug/L	NC	30		
5654645	p+m-Xylene	2018/07/31	106	70 - 130	97	70 - 130	<0.40	ug/L	NC	30		
5654645	Toluene	2018/07/31	114	70 - 130	103	70 - 130	<0.20	ug/L	NC	30		
5654645	Total Xylenes	2018/07/31					<0.40	ug/L	NC	30		
5655193	Total Ammonia-N	2018/07/31	96	75 - 125	100	80 - 120	<0.050	mg/L	NC	20		
5655289	Total Organic Carbon (TOC)	2018/07/30	96	80 - 120	96	80 - 120	<0.50	mg/L	0.28	20		
5655455	Total Cyanide (CN)	2018/07/31	104	80 - 120	101	80 - 120	<0.0050	mg/L	NC	20		
5655460	WAD Cyanide (Free)	2018/07/31	103	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
5656489	Radium-226	2018/08/04			87	85 - 115	<0.0050	Bq/L	20	N/A		
5656535	Total Phosphorus	2018/08/01	99	80 - 120	98	80 - 120	<0.020	mg/L	0.57	20	98	80 - 120
5656652	Total Kjeldahl Nitrogen (TKN)	2018/08/02	104	80 - 120	105	80 - 120	<0.10	mg/L	NC	20	114	80 - 120

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT(CONT'D)

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5657080	F2 (C10-C16 Hydrocarbons)	2018/08/01	86	50 - 130	82	60 - 130	<100	ug/L	NC	30		
5657080	F3 (C16-C34 Hydrocarbons)	2018/08/01	86	50 - 130	82	60 - 130	<200	ug/L	NC	30		
5657080	F4 (C34-C50 Hydrocarbons)	2018/08/01	83	50 - 130	79	60 - 130	<200	ug/L	NC	30		
5657267	Total Oil & Grease	2018/07/31			97	85 - 115	<0.50	mg/L	2.9	25		
5658493	Dissolved Mercury (Hg)	2018/08/01	85	75 - 125	97	80 - 120	<0.00001	mg/L	NC	20		
5658501	Mercury (Hg)	2018/08/01	97	75 - 125	95	80 - 120	<0.00001	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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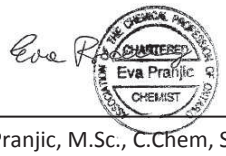
Maxxam Job #: B8J0420
Report Date: 2018/12/19

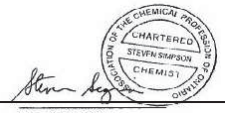
Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist



Steven Simpson, Lab Director

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Maxxam Job #: B8J0420
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

Exceedence Summary Table – Metal Mining Effluent Reg

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Success Through Science®

Your P.O. #: B8J0420
Site#: 63*01'44.6'' 92*09'14.6''
Site Location: MELIADINE
Your C.O.C. #: B8J0420-M060-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/04
Report #: R2612843
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B863518
Received: 2018/07/31, 08:48

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	2	N/A	2018/08/04	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Omran Desouki
Junior Project Manager
04 Sep 2018 09:30:14

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

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Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		TZ0467		TZ0468		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M060-01-01		B8J0420-M060-01-01		
	UNITS	EWTP (MEL-14) (HII609)	QC Batch	MEL-13 (WL AND EEM)	RDL	QC Batch
Misc. Inorganics						
Reactive Silica	mg/L	0.21	9091570	0.39	0.050	9091565
RDL = Reportable Detection Limit						

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: TZ0467
Sample ID: EWTP (MEL-14) (HII609)
Matrix: Water

Collected: 2018/07/23
Shipped: 2018/07/30
Received: 2018/07/31

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9091570	N/A	2018/08/04	YuLun (steven) Qiu

Maxxam ID: TZ0468
Sample ID: MEL-13 (WL AND EEM)
Matrix: Water

Collected: 2018/07/23
Shipped: 2018/07/30
Received: 2018/07/31

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9091565	N/A	2018/08/04	YuLun (steven) Qiu

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Report Re-issued with updated sample ID and GPS Coordinates

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/09/04

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9091565	Reactive Silica	2018/08/04	98	80 - 120	103	80 - 120	<0.050	mg/L	0.90	20
9091570	Reactive Silica	2018/08/04	99	80 - 120	102	80 - 120	<0.050	mg/L	0.96	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

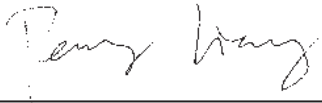
Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your P.O. #: B8J0420
Site Location: MELIADINE
Your C.O.C. #: B8J0420-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/10/03
Report #: R2629419
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B863796
Received: 2018/07/31, 08:30

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/08/02	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/08/08	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/08/03	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/08/08	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2018/08/02	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (dissolved)	1	N/A	2018/08/07	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/08/01	2018/08/02	BBY7SOP-00003,	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/08/04	2018/08/07	BBY7SOP-00003,	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	2	N/A	2018/08/01	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Your P.O. #: B8J0420
Site Location: MELIADINE
Your C.O.C. #: B8J0420-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/10/03
Report #: R2629419
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B863796
Received: 2018/07/31, 08:30

Encryption Key



Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		TZ1946		TZ1947		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M058-01-01		B8J0420-M058-01-01		
	UNITS	MEL-14ac (MDMER and EEM)	QC Batch	MEL-13 (WL and EEM)	RDL	QC Batch
Calculated Parameters						
Filter and HNO3 Preservation	N/A	FIELD	ONSITE	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	462	9090189	23.7	0.50	9086891
Total Hardness (CaCO3)	mg/L	344	9090188	485	0.50	9086968

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		TZ1946		TZ1947		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M058-01-01		B8J0420-M058-01-01		
	UNITS	MEL-14ac (MDMER and EEM)	QC Batch	MEL-13 (WL and EEM)	RDL	QC Batch
Dissolved Metals by ICPMS						
Dissolved Aluminum (Al)	mg/L	0.0994	9091293	0.0123	0.0030	9087349
Dissolved Antimony (Sb)	mg/L	<0.00050	9091293	<0.00050	0.00050	9087349
Dissolved Arsenic (As)	mg/L	0.00156	9091293	0.00031	0.00010	9087349
Dissolved Barium (Ba)	mg/L	0.114 (1)	9091293	0.0076	0.0010	9087349
Dissolved Beryllium (Be)	mg/L	<0.00010	9091293	<0.00010	0.00010	9087349
Dissolved Boron (B)	mg/L	0.138	9091293	<0.050	0.050	9087349
Dissolved Cadmium (Cd)	mg/L	0.000010	9091293	<0.000010	0.000010	9087349
Dissolved Chromium (Cr)	mg/L	<0.0010	9091293	<0.0010	0.0010	9087349
Dissolved Copper (Cu)	mg/L	0.00117	9091293	0.00062	0.00020	9087349
Dissolved Iron (Fe)	mg/L	<0.0050	9091293	0.0092	0.0050	9087349
Dissolved Lead (Pb)	mg/L	<0.00020	9091293	<0.00020	0.00020	9087349
Dissolved Lithium (Li)	mg/L	0.135 (1)	9091293	<0.0020	0.0020	9087349
Dissolved Manganese (Mn)	mg/L	0.0605	9091293	0.0012	0.0010	9087349
Dissolved Molybdenum (Mo)	mg/L	0.0011	9091293	<0.0010	0.0010	9087349
Dissolved Nickel (Ni)	mg/L	0.0022	9091293	<0.0010	0.0010	9087349
Dissolved Selenium (Se)	mg/L	<0.00010	9091293	<0.00010	0.00010	9087349
Dissolved Silver (Ag)	mg/L	<0.000020	9091293	<0.000020	0.000020	9087349
Dissolved Strontium (Sr)	mg/L	2.38	9091293	0.0490	0.0010	9087349
Dissolved Thallium (Tl)	mg/L	0.000033	9091293	<0.000010	0.000010	9087349
Dissolved Tin (Sn)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Titanium (Ti)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Uranium (U)	mg/L	0.00012	9091293	<0.00010	0.00010	9087349
Dissolved Vanadium (V)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Zinc (Zn)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Calcium (Ca)	mg/L	145 (1)	9091293	7.39	0.050	9087349
Dissolved Magnesium (Mg)	mg/L	24.3 (1)	9091293	1.28	0.050	9087349
Dissolved Potassium (K)	mg/L	13.8 (1)	9091293	0.914	0.050	9087349
Dissolved Sodium (Na)	mg/L	124 (1)	9091293	5.22	0.050	9087349

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.

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Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		TZ1946		TZ1947		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M058-01-01		B8J0420-M058-01-01		
	UNITS	MEL-14ac (MDMER and EEM)	QC Batch	MEL-13 (WL and EEM)	RDL	QC Batch
Total Metals by ICPMS						
Total Aluminum (Al)	mg/L	4.39	9091571	6.64	0.0030	9086950
Total Antimony (Sb)	mg/L	<0.00050	9091571	<0.00050	0.00050	9086950
Total Arsenic (As)	mg/L	0.00178	9091571	0.00283	0.00010	9086950
Total Barium (Ba)	mg/L	0.0830	9091571	0.126	0.0010	9086950
Total Beryllium (Be)	mg/L	<0.00010	9091571	<0.00010	0.00010	9086950
Total Boron (B)	mg/L	0.094	9091571	0.156	0.050	9086950
Total Cadmium (Cd)	mg/L	0.000020	9091571	0.000028	0.000010	9086950
Total Chromium (Cr)	mg/L	<0.0010	9091571	<0.0010	0.0010	9086950
Total Copper (Cu)	mg/L	0.00207	9091571	0.00281	0.00050	9086950
Total Iron (Fe)	mg/L	0.293	9091571	0.405	0.010	9086950
Total Lead (Pb)	mg/L	<0.00020	9091571	0.00021	0.00020	9086950
Total Lithium (Li)	mg/L	0.0917	9091571	0.145	0.0020	9086950
Total Manganese (Mn)	mg/L	0.190	9091571	0.271	0.0010	9086950
Total Molybdenum (Mo)	mg/L	<0.0010	9091571	0.0013	0.0010	9086950
Total Nickel (Ni)	mg/L	0.0025	9091571	0.0033	0.0010	9086950
Total Selenium (Se)	mg/L	<0.00010	9091571	0.00011	0.00010	9086950
Total Silver (Ag)	mg/L	<0.000020	9091571	<0.000020	0.000020	9086950
Total Strontium (Sr)	mg/L	2.18	9091571	3.80	0.0010	9086950
Total Thallium (Tl)	mg/L	0.000022	9091571	0.000036	0.000010	9086950
Total Tin (Sn)	mg/L	<0.0050	9091571	<0.0050	0.0050	9086950
Total Titanium (Ti)	mg/L	<0.0050	9091571	<0.0050	0.0050	9086950
Total Uranium (U)	mg/L	0.00064	9091571	0.00098	0.00010	9086950
Total Vanadium (V)	mg/L	<0.0050	9091571	<0.0050	0.0050	9086950
Total Zinc (Zn)	mg/L	0.0086	9091571	0.0107	0.0050	9086950
Total Calcium (Ca)	mg/L	109	9091571	152	0.050	9086950
Total Magnesium (Mg)	mg/L	17.6	9091571	25.9	0.050	9086950
Total Potassium (K)	mg/L	9.56	9091571	13.9	0.050	9086950
Total Sodium (Na)	mg/L	85.3	9091571	127	0.050	9086950
RDL = Reportable Detection Limit						

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Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.0°C

Revised Report (2018/10/03): Client sample ID changed as per client request, and GPS coordinates included.

Sample TZ1946 [MEL-14ac (MDMER and EEM)] : GPS coordinates: 63°02'15.5'' 92°13'06.3''

Sample TZ1947 [MEL-13 (WL and EEM)] : GPS coordinates: 63°01'44.6'' 92°09'14.6''

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9086950	GS9	Matrix Spike	Total Aluminum (Al)	2018/08/02		105	%	80 - 120
			Total Antimony (Sb)	2018/08/02		106	%	80 - 120
			Total Arsenic (As)	2018/08/02		120	%	80 - 120
			Total Barium (Ba)	2018/08/02		NC	%	80 - 120
			Total Beryllium (Be)	2018/08/02		103	%	80 - 120
			Total Boron (B)	2018/08/02		94	%	80 - 120
			Total Cadmium (Cd)	2018/08/02		98	%	80 - 120
			Total Chromium (Cr)	2018/08/02		97	%	80 - 120
			Total Copper (Cu)	2018/08/02		86	%	80 - 120
			Total Iron (Fe)	2018/08/02		98	%	80 - 120
			Total Lead (Pb)	2018/08/02		101	%	80 - 120
			Total Lithium (Li)	2018/08/02		NC	%	80 - 120
			Total Manganese (Mn)	2018/08/02		97	%	80 - 120
			Total Molybdenum (Mo)	2018/08/02		118	%	80 - 120
			Total Nickel (Ni)	2018/08/02		88	%	80 - 120
			Total Selenium (Se)	2018/08/02		112	%	80 - 120
			Total Silver (Ag)	2018/08/02		97	%	80 - 120
			Total Strontium (Sr)	2018/08/02		NC	%	80 - 120
			Total Thallium (Tl)	2018/08/02		95	%	80 - 120
			Total Tin (Sn)	2018/08/02		105	%	80 - 120
			Total Titanium (Ti)	2018/08/02		106	%	80 - 120
			Total Uranium (U)	2018/08/02		108	%	80 - 120
			Total Vanadium (V)	2018/08/02		105	%	80 - 120
			Total Zinc (Zn)	2018/08/02		86	%	80 - 120
			Total Calcium (Ca)	2018/08/02		NC	%	80 - 120
			Total Magnesium (Mg)	2018/08/02		NC	%	80 - 120
			Total Potassium (K)	2018/08/02		104	%	80 - 120
			Total Sodium (Na)	2018/08/02		NC	%	80 - 120
9086950	GS9	Spiked Blank	Total Aluminum (Al)	2018/08/02		106	%	80 - 120
			Total Antimony (Sb)	2018/08/02		109	%	80 - 120
			Total Arsenic (As)	2018/08/02		112	%	80 - 120
			Total Barium (Ba)	2018/08/02		108	%	80 - 120
			Total Beryllium (Be)	2018/08/02		108	%	80 - 120
			Total Boron (B)	2018/08/02		100	%	80 - 120
			Total Cadmium (Cd)	2018/08/02		106	%	80 - 120
			Total Chromium (Cr)	2018/08/02		106	%	80 - 120
			Total Copper (Cu)	2018/08/02		103	%	80 - 120
			Total Iron (Fe)	2018/08/02		110	%	80 - 120
			Total Lead (Pb)	2018/08/02		106	%	80 - 120
			Total Lithium (Li)	2018/08/02		108	%	80 - 120
			Total Manganese (Mn)	2018/08/02		107	%	80 - 120
			Total Molybdenum (Mo)	2018/08/02		111	%	80 - 120
			Total Nickel (Ni)	2018/08/02		105	%	80 - 120
			Total Selenium (Se)	2018/08/02		109	%	80 - 120
			Total Silver (Ag)	2018/08/02		105	%	80 - 120
			Total Strontium (Sr)	2018/08/02		112	%	80 - 120
			Total Thallium (Tl)	2018/08/02		102	%	80 - 120
			Total Tin (Sn)	2018/08/02		107	%	80 - 120
			Total Titanium (Ti)	2018/08/02		109	%	80 - 120
			Total Uranium (U)	2018/08/02		107	%	80 - 120
			Total Vanadium (V)	2018/08/02		108	%	80 - 120
			Total Zinc (Zn)	2018/08/02		108	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Calcium (Ca)	2018/08/02		107	%	80 - 120
			Total Magnesium (Mg)	2018/08/02		108	%	80 - 120
			Total Potassium (K)	2018/08/02		109	%	80 - 120
			Total Sodium (Na)	2018/08/02		105	%	80 - 120
9086950	GS9	Method Blank	Total Aluminum (Al)	2018/08/02	<0.0030		mg/L	
			Total Antimony (Sb)	2018/08/02	<0.00050		mg/L	
			Total Arsenic (As)	2018/08/02	<0.00010		mg/L	
			Total Barium (Ba)	2018/08/02	<0.0010		mg/L	
			Total Beryllium (Be)	2018/08/02	<0.00010		mg/L	
			Total Boron (B)	2018/08/02	<0.050		mg/L	
			Total Cadmium (Cd)	2018/08/02	<0.000010		mg/L	
			Total Chromium (Cr)	2018/08/02	<0.0010		mg/L	
			Total Copper (Cu)	2018/08/02	<0.00050		mg/L	
			Total Iron (Fe)	2018/08/02	<0.010		mg/L	
			Total Lead (Pb)	2018/08/02	<0.00020		mg/L	
			Total Lithium (Li)	2018/08/02	<0.0020		mg/L	
			Total Manganese (Mn)	2018/08/02	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/08/02	<0.0010		mg/L	
			Total Nickel (Ni)	2018/08/02	<0.0010		mg/L	
			Total Selenium (Se)	2018/08/02	<0.00010		mg/L	
			Total Silver (Ag)	2018/08/02	<0.000020		mg/L	
			Total Strontium (Sr)	2018/08/02	<0.0010		mg/L	
			Total Thallium (Tl)	2018/08/02	<0.000010		mg/L	
			Total Tin (Sn)	2018/08/02	<0.0050		mg/L	
			Total Titanium (Ti)	2018/08/02	<0.0050		mg/L	
			Total Uranium (U)	2018/08/02	<0.00010		mg/L	
			Total Vanadium (V)	2018/08/02	<0.0050		mg/L	
			Total Zinc (Zn)	2018/08/02	<0.0050		mg/L	
			Total Calcium (Ca)	2018/08/02	<0.050		mg/L	
			Total Magnesium (Mg)	2018/08/02	<0.050		mg/L	
			Total Potassium (K)	2018/08/02	<0.050		mg/L	
			Total Sodium (Na)	2018/08/02	<0.050		mg/L	
9086950	GS9	RPD	Total Aluminum (Al)	2018/08/02	1.6		%	20
			Total Antimony (Sb)	2018/08/02	NC		%	20
			Total Arsenic (As)	2018/08/02	4.4		%	20
			Total Barium (Ba)	2018/08/02	1.1		%	20
			Total Beryllium (Be)	2018/08/02	NC		%	20
			Total Boron (B)	2018/08/02	3.0		%	20
			Total Cadmium (Cd)	2018/08/02	0.89		%	20
			Total Chromium (Cr)	2018/08/02	NC		%	20
			Total Copper (Cu)	2018/08/02	3.1		%	20
			Total Iron (Fe)	2018/08/02	5.9		%	20
			Total Lead (Pb)	2018/08/02	NC		%	20
			Total Lithium (Li)	2018/08/02	1.4		%	20
			Total Manganese (Mn)	2018/08/02	4.1		%	20
			Total Molybdenum (Mo)	2018/08/02	4.3		%	20
			Total Nickel (Ni)	2018/08/02	5.3		%	20
			Total Selenium (Se)	2018/08/02	2.3		%	20
			Total Silver (Ag)	2018/08/02	NC		%	20
			Total Strontium (Sr)	2018/08/02	3.4		%	20
			Total Thallium (Tl)	2018/08/02	0.52		%	20
			Total Tin (Sn)	2018/08/02	NC		%	20

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Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Titanium (Ti)	2018/08/02	NC		%	20
			Total Uranium (U)	2018/08/02	2.0		%	20
			Total Vanadium (V)	2018/08/02	NC		%	20
			Total Zinc (Zn)	2018/08/02	NC		%	20
9087349	AA1	Matrix Spike	Dissolved Aluminum (Al)	2018/08/02		101	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/02		98	%	80 - 120
			Dissolved Arsenic (As)	2018/08/02		103	%	80 - 120
			Dissolved Barium (Ba)	2018/08/02		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/02		97	%	80 - 120
			Dissolved Boron (B)	2018/08/02		98	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/02		98	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/02		95	%	80 - 120
			Dissolved Copper (Cu)	2018/08/02		89	%	80 - 120
			Dissolved Iron (Fe)	2018/08/02		96	%	80 - 120
			Dissolved Lead (Pb)	2018/08/02		95	%	80 - 120
			Dissolved Lithium (Li)	2018/08/02		96	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/02		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/02		NC	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/02		92	%	80 - 120
			Dissolved Selenium (Se)	2018/08/02		97	%	80 - 120
			Dissolved Silver (Ag)	2018/08/02		95	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/02		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/02		94	%	80 - 120
			Dissolved Tin (Sn)	2018/08/02		99	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/02		99	%	80 - 120
			Dissolved Uranium (U)	2018/08/02		102	%	80 - 120
			Dissolved Vanadium (V)	2018/08/02		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/02		92	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/02		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/02		NC	%	80 - 120
			Dissolved Potassium (K)	2018/08/02		NC	%	80 - 120
			Dissolved Sodium (Na)	2018/08/02		NC	%	80 - 120
9087349	AA1	Spiked Blank	Dissolved Aluminum (Al)	2018/08/02		103	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/02		100	%	80 - 120
			Dissolved Arsenic (As)	2018/08/02		103	%	80 - 120
			Dissolved Barium (Ba)	2018/08/02		99	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/02		100	%	80 - 120
			Dissolved Boron (B)	2018/08/02		102	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/02		102	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/02		98	%	80 - 120
			Dissolved Copper (Cu)	2018/08/02		96	%	80 - 120
			Dissolved Iron (Fe)	2018/08/02		101	%	80 - 120
			Dissolved Lead (Pb)	2018/08/02		101	%	80 - 120
			Dissolved Lithium (Li)	2018/08/02		103	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/02		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/02		101	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/02		98	%	80 - 120
			Dissolved Selenium (Se)	2018/08/02		100	%	80 - 120
			Dissolved Silver (Ag)	2018/08/02		100	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/02		103	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/02		100	%	80 - 120
			Dissolved Tin (Sn)	2018/08/02		101	%	80 - 120

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Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Titanium (Ti)	2018/08/02		102	%	80 - 120
			Dissolved Uranium (U)	2018/08/02		101	%	80 - 120
			Dissolved Vanadium (V)	2018/08/02		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/02		99	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/02		101	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/02		102	%	80 - 120
			Dissolved Potassium (K)	2018/08/02		103	%	80 - 120
			Dissolved Sodium (Na)	2018/08/02		101	%	80 - 120
9087349	AA1	Method Blank	Dissolved Aluminum (Al)	2018/08/02	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/08/02	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/08/02	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/08/02	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/08/02	<0.00010		mg/L	
			Dissolved Boron (B)	2018/08/02	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/08/02	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/08/02	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/08/02	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/08/02	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/08/02	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/08/02	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/08/02	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/08/02	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/08/02	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/08/02	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/08/02	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/08/02	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/08/02	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/08/02	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/08/02	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/08/02	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/08/02	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/08/02	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/08/02	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/08/02	<0.050		mg/L	
			Dissolved Potassium (K)	2018/08/02	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/08/02	<0.050		mg/L	
9087349	AA1	RPD	Dissolved Aluminum (Al)	2018/08/02	2.8		%	20
			Dissolved Antimony (Sb)	2018/08/02	2.6		%	20
			Dissolved Arsenic (As)	2018/08/02	1.0		%	20
			Dissolved Barium (Ba)	2018/08/02	3.2		%	20
			Dissolved Beryllium (Be)	2018/08/02	NC		%	20
			Dissolved Boron (B)	2018/08/02	5.4		%	20
			Dissolved Cadmium (Cd)	2018/08/02	15		%	20
			Dissolved Chromium (Cr)	2018/08/02	1.8		%	20
			Dissolved Copper (Cu)	2018/08/02	4.6		%	20
			Dissolved Iron (Fe)	2018/08/02	NC		%	20
			Dissolved Lead (Pb)	2018/08/02	NC		%	20
			Dissolved Lithium (Li)	2018/08/02	2.7		%	20
			Dissolved Manganese (Mn)	2018/08/02	4.8		%	20
			Dissolved Molybdenum (Mo)	2018/08/02	3.4		%	20
			Dissolved Nickel (Ni)	2018/08/02	4.0		%	20
			Dissolved Selenium (Se)	2018/08/02	3.6		%	20

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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Silver (Ag)	2018/08/02	NC		%	20
			Dissolved Strontium (Sr)	2018/08/02	2.6		%	20
			Dissolved Thallium (Tl)	2018/08/02	4.6		%	20
			Dissolved Tin (Sn)	2018/08/02	NC		%	20
			Dissolved Titanium (Ti)	2018/08/02	NC		%	20
			Dissolved Uranium (U)	2018/08/02	2.7		%	20
			Dissolved Vanadium (V)	2018/08/02	NC		%	20
			Dissolved Zinc (Zn)	2018/08/02	NC		%	20
9091293	JC8	Matrix Spike	Dissolved Aluminum (Al)	2018/08/07		101	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/07		102	%	80 - 120
			Dissolved Arsenic (As)	2018/08/07		110	%	80 - 120
			Dissolved Barium (Ba)	2018/08/07		105	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/07		103	%	80 - 120
			Dissolved Boron (B)	2018/08/07		109	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/07		102	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/07		97	%	80 - 120
			Dissolved Copper (Cu)	2018/08/07		92	%	80 - 120
			Dissolved Iron (Fe)	2018/08/07		104	%	80 - 120
			Dissolved Lead (Pb)	2018/08/07		103	%	80 - 120
			Dissolved Lithium (Li)	2018/08/07		105	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/07		102	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/07		104	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/07		95	%	80 - 120
			Dissolved Selenium (Se)	2018/08/07		104	%	80 - 120
			Dissolved Silver (Ag)	2018/08/07		102	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/07		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/07		100	%	80 - 120
			Dissolved Tin (Sn)	2018/08/07		101	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/07		107	%	80 - 120
			Dissolved Uranium (U)	2018/08/07		106	%	80 - 120
			Dissolved Vanadium (V)	2018/08/07		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/07		97	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/07		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/07		103	%	80 - 120
			Dissolved Potassium (K)	2018/08/07		106	%	80 - 120
			Dissolved Sodium (Na)	2018/08/07		NC	%	80 - 120
9091293	JC8	Spiked Blank	Dissolved Aluminum (Al)	2018/08/07		104	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/07		95	%	80 - 120
			Dissolved Arsenic (As)	2018/08/07		102	%	80 - 120
			Dissolved Barium (Ba)	2018/08/07		96	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/07		101	%	80 - 120
			Dissolved Boron (B)	2018/08/07		108	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/07		97	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/07		94	%	80 - 120
			Dissolved Copper (Cu)	2018/08/07		90	%	80 - 120
			Dissolved Iron (Fe)	2018/08/07		103	%	80 - 120
			Dissolved Lead (Pb)	2018/08/07		99	%	80 - 120
			Dissolved Lithium (Li)	2018/08/07		102	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/07		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/07		102	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/07		92	%	80 - 120
			Dissolved Selenium (Se)	2018/08/07		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Silver (Ag)	2018/08/07		100	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/07		103	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/07		97	%	80 - 120
			Dissolved Tin (Sn)	2018/08/07		96	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/07		100	%	80 - 120
			Dissolved Uranium (U)	2018/08/07		101	%	80 - 120
			Dissolved Vanadium (V)	2018/08/07		97	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/07		95	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/07		105	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/07		97	%	80 - 120
			Dissolved Potassium (K)	2018/08/07		103	%	80 - 120
			Dissolved Sodium (Na)	2018/08/07		97	%	80 - 120
9091293	JC8	Method Blank	Dissolved Aluminum (Al)	2018/08/07	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/08/07	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/08/07	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/08/07	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/08/07	<0.00010		mg/L	
			Dissolved Boron (B)	2018/08/07	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/08/07	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/08/07	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/08/07	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/08/07	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/08/07	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/08/07	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/08/07	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/08/07	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/08/07	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/08/07	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/08/07	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/08/07	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/08/07	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/08/07	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/08/07	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/08/07	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/08/07	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/08/07	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/08/07	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/08/07	<0.050		mg/L	
			Dissolved Potassium (K)	2018/08/07	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/08/07	<0.050		mg/L	
9091293	JC8	RPD	Dissolved Aluminum (Al)	2018/08/07	5.9		%	20
			Dissolved Antimony (Sb)	2018/08/07	NC		%	20
			Dissolved Arsenic (As)	2018/08/07	14		%	20
			Dissolved Barium (Ba)	2018/08/07	2.0		%	20
			Dissolved Beryllium (Be)	2018/08/07	NC		%	20
			Dissolved Boron (B)	2018/08/07	2.2		%	20
			Dissolved Cadmium (Cd)	2018/08/07	NC		%	20
			Dissolved Chromium (Cr)	2018/08/07	NC		%	20
			Dissolved Copper (Cu)	2018/08/07	9.6		%	20
			Dissolved Iron (Fe)	2018/08/07	5.3		%	20
			Dissolved Lead (Pb)	2018/08/07	NC		%	20
			Dissolved Lithium (Li)	2018/08/07	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Manganese (Mn)	2018/08/07	3.0		%	20
			Dissolved Molybdenum (Mo)	2018/08/07	NC		%	20
			Dissolved Nickel (Ni)	2018/08/07	NC		%	20
			Dissolved Selenium (Se)	2018/08/07	NC		%	20
			Dissolved Silver (Ag)	2018/08/07	NC		%	20
			Dissolved Strontium (Sr)	2018/08/07	1.8		%	20
			Dissolved Thallium (Tl)	2018/08/07	NC		%	20
			Dissolved Tin (Sn)	2018/08/07	NC		%	20
			Dissolved Titanium (Ti)	2018/08/07	NC		%	20
			Dissolved Uranium (U)	2018/08/07	NC		%	20
			Dissolved Vanadium (V)	2018/08/07	NC		%	20
			Dissolved Zinc (Zn)	2018/08/07	NC		%	20
9091571	JC8	Matrix Spike	Total Aluminum (Al)	2018/08/07		123 (1)	%	80 - 120
			Total Antimony (Sb)	2018/08/07		101	%	80 - 120
			Total Arsenic (As)	2018/08/07		107	%	80 - 120
			Total Barium (Ba)	2018/08/07		106	%	80 - 120
			Total Beryllium (Be)	2018/08/07		105	%	80 - 120
			Total Boron (B)	2018/08/07		114	%	80 - 120
			Total Cadmium (Cd)	2018/08/07		103	%	80 - 120
			Total Chromium (Cr)	2018/08/07		98	%	80 - 120
			Total Copper (Cu)	2018/08/07		93	%	80 - 120
			Total Iron (Fe)	2018/08/07		100	%	80 - 120
			Total Lead (Pb)	2018/08/07		107	%	80 - 120
			Total Lithium (Li)	2018/08/07		108	%	80 - 120
			Total Manganese (Mn)	2018/08/07		105	%	80 - 120
			Total Molybdenum (Mo)	2018/08/07		105	%	80 - 120
			Total Nickel (Ni)	2018/08/07		97	%	80 - 120
			Total Selenium (Se)	2018/08/07		103	%	80 - 120
			Total Silver (Ag)	2018/08/07		105	%	80 - 120
			Total Strontium (Sr)	2018/08/07		110	%	80 - 120
			Total Thallium (Tl)	2018/08/07		105	%	80 - 120
			Total Tin (Sn)	2018/08/07		97	%	80 - 120
			Total Titanium (Ti)	2018/08/07		104	%	80 - 120
			Total Uranium (U)	2018/08/07		109	%	80 - 120
			Total Vanadium (V)	2018/08/07		103	%	80 - 120
			Total Zinc (Zn)	2018/08/07		98	%	80 - 120
			Total Calcium (Ca)	2018/08/07		NC	%	80 - 120
			Total Magnesium (Mg)	2018/08/07		100	%	80 - 120
			Total Potassium (K)	2018/08/07		108	%	80 - 120
			Total Sodium (Na)	2018/08/07		102	%	80 - 120
9091571	JC8	Spiked Blank	Total Aluminum (Al)	2018/08/07		107	%	80 - 120
			Total Antimony (Sb)	2018/08/07		101	%	80 - 120
			Total Arsenic (As)	2018/08/07		106	%	80 - 120
			Total Barium (Ba)	2018/08/07		105	%	80 - 120
			Total Beryllium (Be)	2018/08/07		105	%	80 - 120
			Total Boron (B)	2018/08/07		115	%	80 - 120
			Total Cadmium (Cd)	2018/08/07		104	%	80 - 120
			Total Chromium (Cr)	2018/08/07		102	%	80 - 120
			Total Copper (Cu)	2018/08/07		96	%	80 - 120
			Total Iron (Fe)	2018/08/07		104	%	80 - 120
			Total Lead (Pb)	2018/08/07		107	%	80 - 120
			Total Lithium (Li)	2018/08/07		108	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Manganese (Mn)	2018/08/07		107	%	80 - 120
			Total Molybdenum (Mo)	2018/08/07		106	%	80 - 120
			Total Nickel (Ni)	2018/08/07		99	%	80 - 120
			Total Selenium (Se)	2018/08/07		108	%	80 - 120
			Total Silver (Ag)	2018/08/07		106	%	80 - 120
			Total Strontium (Sr)	2018/08/07		108	%	80 - 120
			Total Thallium (Tl)	2018/08/07		106	%	80 - 120
			Total Tin (Sn)	2018/08/07		102	%	80 - 120
			Total Titanium (Ti)	2018/08/07		109	%	80 - 120
			Total Uranium (U)	2018/08/07		108	%	80 - 120
			Total Vanadium (V)	2018/08/07		105	%	80 - 120
			Total Zinc (Zn)	2018/08/07		101	%	80 - 120
			Total Calcium (Ca)	2018/08/07		111	%	80 - 120
			Total Magnesium (Mg)	2018/08/07		109	%	80 - 120
			Total Potassium (K)	2018/08/07		113	%	80 - 120
			Total Sodium (Na)	2018/08/07		104	%	80 - 120
9091571	JC8	Method Blank	Total Aluminum (Al)	2018/08/07	<0.0030		mg/L	
			Total Antimony (Sb)	2018/08/07	<0.00050		mg/L	
			Total Arsenic (As)	2018/08/07	<0.00010		mg/L	
			Total Barium (Ba)	2018/08/07	<0.0010		mg/L	
			Total Beryllium (Be)	2018/08/07	<0.00010		mg/L	
			Total Boron (B)	2018/08/07	<0.050		mg/L	
			Total Cadmium (Cd)	2018/08/07	<0.000010		mg/L	
			Total Chromium (Cr)	2018/08/07	<0.0010		mg/L	
			Total Copper (Cu)	2018/08/07	<0.00050		mg/L	
			Total Iron (Fe)	2018/08/07	<0.010		mg/L	
			Total Lead (Pb)	2018/08/07	<0.00020		mg/L	
			Total Lithium (Li)	2018/08/07	<0.0020		mg/L	
			Total Manganese (Mn)	2018/08/07	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/08/07	<0.0010		mg/L	
			Total Nickel (Ni)	2018/08/07	<0.0010		mg/L	
			Total Selenium (Se)	2018/08/07	<0.00010		mg/L	
			Total Silver (Ag)	2018/08/07	<0.000020		mg/L	
			Total Strontium (Sr)	2018/08/07	<0.0010		mg/L	
			Total Thallium (Tl)	2018/08/07	<0.000010		mg/L	
			Total Tin (Sn)	2018/08/07	<0.0050		mg/L	
			Total Titanium (Ti)	2018/08/07	<0.0050		mg/L	
			Total Uranium (U)	2018/08/07	<0.00010		mg/L	
			Total Vanadium (V)	2018/08/07	<0.0050		mg/L	
			Total Zinc (Zn)	2018/08/07	<0.0050		mg/L	
			Total Calcium (Ca)	2018/08/07	<0.050		mg/L	
			Total Magnesium (Mg)	2018/08/07	<0.050		mg/L	
			Total Potassium (K)	2018/08/07	<0.050		mg/L	
			Total Sodium (Na)	2018/08/07	<0.050		mg/L	
9091571	JC8	RPD	Total Aluminum (Al)	2018/08/07	12		%	20
			Total Antimony (Sb)	2018/08/07	NC		%	20
			Total Arsenic (As)	2018/08/07	3.7		%	20
			Total Barium (Ba)	2018/08/07	0.27		%	20
			Total Beryllium (Be)	2018/08/07	NC		%	20
			Total Boron (B)	2018/08/07	NC		%	20
			Total Cadmium (Cd)	2018/08/07	0		%	20
			Total Chromium (Cr)	2018/08/07	NC		%	20

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Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Copper (Cu)	2018/08/07	4.0		%	20
			Total Iron (Fe)	2018/08/07	3.7		%	20
			Total Lead (Pb)	2018/08/07	2.6		%	20
			Total Lithium (Li)	2018/08/07	1.1		%	20
			Total Manganese (Mn)	2018/08/07	5.7		%	20
			Total Molybdenum (Mo)	2018/08/07	NC		%	20
			Total Nickel (Ni)	2018/08/07	NC		%	20
			Total Selenium (Se)	2018/08/07	0.97		%	20
			Total Silver (Ag)	2018/08/07	NC		%	20
			Total Strontium (Sr)	2018/08/07	0.031		%	20
			Total Thallium (Tl)	2018/08/07	NC		%	20
			Total Tin (Sn)	2018/08/07	NC		%	20
			Total Titanium (Ti)	2018/08/07	10		%	20
			Total Uranium (U)	2018/08/07	0.95		%	20
			Total Vanadium (V)	2018/08/07	NC		%	20
			Total Zinc (Zn)	2018/08/07	NC		%	20
			Total Potassium (K)	2018/08/07	3.7		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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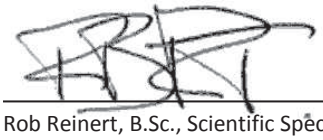
Maxxam Job #: B863796
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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Your P.O. #: B8J0420
Site Location: MELIADINE
Your C.O.C. #: B8J0420-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/11
Report #: R2662614
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B863796
Received: 2018/07/31, 08:30

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/08/02	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/08/08	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/08/03	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/08/08	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2018/08/02	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (dissolved)	1	N/A	2018/08/07	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/08/01	2018/08/02	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/08/04	2018/08/07	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	2	N/A	2018/08/01	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be

Your P.O. #: B8J0420
Site Location: MELIADINE
Your C.O.C. #: B8J0420-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/11
Report #: R2662614
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B863796
Received: 2018/07/31, 08:30
used for compliance if available).

Encryption Key



Jennifer Villocero
Project Manager
11 Dec 2018 13:40:06

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276
==========

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Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		TZ1946		TZ1947		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M058-01-01		B8J0420-M058-01-01		
	UNITS	MEL-14	QC Batch	MEL-13	RDL	QC Batch
Calculated Parameters						
Filter and HNO3 Preservation	N/A	FIELD	ONSITE	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	462	9090189	23.7	0.50	9086891
Total Hardness (CaCO3)	mg/L	344	9090188	485	0.50	9086968

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		TZ1946		TZ1947		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M058-01-01		B8J0420-M058-01-01		
	UNITS	MEL-14	QC Batch	MEL-13	RDL	QC Batch
Dissolved Metals by ICPMS						
Dissolved Aluminum (Al)	mg/L	0.0994	9091293	0.0123	0.0030	9087349
Dissolved Antimony (Sb)	mg/L	<0.00050	9091293	<0.00050	0.00050	9087349
Dissolved Arsenic (As)	mg/L	0.00156	9091293	0.00031	0.00010	9087349
Dissolved Barium (Ba)	mg/L	0.114 (1)	9091293	0.0076	0.0010	9087349
Dissolved Beryllium (Be)	mg/L	<0.00010	9091293	<0.00010	0.00010	9087349
Dissolved Boron (B)	mg/L	0.138	9091293	<0.050	0.050	9087349
Dissolved Cadmium (Cd)	mg/L	0.000010	9091293	<0.000010	0.000010	9087349
Dissolved Chromium (Cr)	mg/L	<0.0010	9091293	<0.0010	0.0010	9087349
Dissolved Copper (Cu)	mg/L	0.00117	9091293	0.00062	0.00020	9087349
Dissolved Iron (Fe)	mg/L	<0.0050	9091293	0.0092	0.0050	9087349
Dissolved Lead (Pb)	mg/L	<0.00020	9091293	<0.00020	0.00020	9087349
Dissolved Lithium (Li)	mg/L	0.135 (1)	9091293	<0.0020	0.0020	9087349
Dissolved Manganese (Mn)	mg/L	0.0605	9091293	0.0012	0.0010	9087349
Dissolved Molybdenum (Mo)	mg/L	0.0011	9091293	<0.0010	0.0010	9087349
Dissolved Nickel (Ni)	mg/L	0.0022	9091293	<0.0010	0.0010	9087349
Dissolved Selenium (Se)	mg/L	<0.00010	9091293	<0.00010	0.00010	9087349
Dissolved Silver (Ag)	mg/L	<0.000020	9091293	<0.000020	0.000020	9087349
Dissolved Strontium (Sr)	mg/L	2.38	9091293	0.0490	0.0010	9087349
Dissolved Thallium (Tl)	mg/L	0.000033	9091293	<0.000010	0.000010	9087349
Dissolved Tin (Sn)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Titanium (Ti)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Uranium (U)	mg/L	0.00012	9091293	<0.00010	0.00010	9087349
Dissolved Vanadium (V)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Zinc (Zn)	mg/L	<0.0050	9091293	<0.0050	0.0050	9087349
Dissolved Calcium (Ca)	mg/L	145 (1)	9091293	7.39	0.050	9087349
Dissolved Magnesium (Mg)	mg/L	24.3 (1)	9091293	1.28	0.050	9087349
Dissolved Potassium (K)	mg/L	13.8 (1)	9091293	0.914	0.050	9087349
Dissolved Sodium (Na)	mg/L	124 (1)	9091293	5.22	0.050	9087349
Total Metals by ICPMS						
Total Aluminum (Al)	mg/L	4.39	9091571	6.64	0.0030	9086950
Total Antimony (Sb)	mg/L	<0.00050	9091571	<0.00050	0.00050	9086950

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.

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Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		TZ1946		TZ1947		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M058-01-01		B8J0420-M058-01-01		
	UNITS	MEL-14	QC Batch	MEL-13	RDL	QC Batch
Total Arsenic (As)	mg/L	0.00178	9091571	0.00283	0.00010	9086950
Total Barium (Ba)	mg/L	0.0830	9091571	0.126	0.0010	9086950
Total Beryllium (Be)	mg/L	<0.00010	9091571	<0.00010	0.00010	9086950
Total Boron (B)	mg/L	0.094	9091571	0.156	0.050	9086950
Total Cadmium (Cd)	mg/L	0.000020	9091571	0.000028	0.000010	9086950
Total Chromium (Cr)	mg/L	<0.0010	9091571	<0.0010	0.0010	9086950
Total Copper (Cu)	mg/L	0.00207	9091571	0.00281	0.00050	9086950
Total Iron (Fe)	mg/L	0.293	9091571	0.405	0.010	9086950
Total Lead (Pb)	mg/L	<0.00020	9091571	0.00021	0.00020	9086950
Total Lithium (Li)	mg/L	0.0917	9091571	0.145	0.0020	9086950
Total Manganese (Mn)	mg/L	0.190	9091571	0.271	0.0010	9086950
Total Molybdenum (Mo)	mg/L	<0.0010	9091571	0.0013	0.0010	9086950
Total Nickel (Ni)	mg/L	0.0025	9091571	0.0033	0.0010	9086950
Total Selenium (Se)	mg/L	<0.00010	9091571	0.00011	0.00010	9086950
Total Silver (Ag)	mg/L	<0.000020	9091571	<0.000020	0.000020	9086950
Total Strontium (Sr)	mg/L	2.18	9091571	3.80	0.0010	9086950
Total Thallium (Tl)	mg/L	0.000022	9091571	0.000036	0.000010	9086950
Total Tin (Sn)	mg/L	<0.0050	9091571	<0.0050	0.0050	9086950
Total Titanium (Ti)	mg/L	<0.0050	9091571	<0.0050	0.0050	9086950
Total Uranium (U)	mg/L	0.00064	9091571	0.00098	0.00010	9086950
Total Vanadium (V)	mg/L	<0.0050	9091571	<0.0050	0.0050	9086950
Total Zinc (Zn)	mg/L	0.0086	9091571	0.0107	0.0050	9086950
Total Calcium (Ca)	mg/L	109	9091571	152	0.050	9086950
Total Magnesium (Mg)	mg/L	17.6	9091571	25.9	0.050	9086950
Total Potassium (K)	mg/L	9.56	9091571	13.9	0.050	9086950
Total Sodium (Na)	mg/L	85.3	9091571	127	0.050	9086950

RDL = Reportable Detection Limit

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Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.0°C

Revised Report (2018/10/03): Client sample ID changed as per client request, and GPS coordinates included.

Revised Report (2018/12/11): Client sample ID and GPS coordinates for lab ID TZ1946 updated per client request.

Revised Report (2018/12/11): Client sample ID and GPS coordinates for lab ID TZ1947 updated per client request.

Sample TZ1946 [MEL-14] : GPS coordinates: 63°02'15.5'' 92°13'06.3''

Sample TZ1947 [MEL-13] : GPS coordinates: 63°01'44.6'' 92°09'14.6''

Results relate only to the items tested.

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Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9086950	GS9	Matrix Spike	Total Aluminum (Al)	2018/08/02		105	%	80 - 120
			Total Antimony (Sb)	2018/08/02		106	%	80 - 120
			Total Arsenic (As)	2018/08/02		120	%	80 - 120
			Total Barium (Ba)	2018/08/02		NC	%	80 - 120
			Total Beryllium (Be)	2018/08/02		103	%	80 - 120
			Total Boron (B)	2018/08/02		94	%	80 - 120
			Total Cadmium (Cd)	2018/08/02		98	%	80 - 120
			Total Chromium (Cr)	2018/08/02		97	%	80 - 120
			Total Copper (Cu)	2018/08/02		86	%	80 - 120
			Total Iron (Fe)	2018/08/02		98	%	80 - 120
			Total Lead (Pb)	2018/08/02		101	%	80 - 120
			Total Lithium (Li)	2018/08/02		NC	%	80 - 120
			Total Manganese (Mn)	2018/08/02		97	%	80 - 120
			Total Molybdenum (Mo)	2018/08/02		118	%	80 - 120
			Total Nickel (Ni)	2018/08/02		88	%	80 - 120
			Total Selenium (Se)	2018/08/02		112	%	80 - 120
			Total Silver (Ag)	2018/08/02		97	%	80 - 120
			Total Strontium (Sr)	2018/08/02		NC	%	80 - 120
			Total Thallium (Tl)	2018/08/02		95	%	80 - 120
			Total Tin (Sn)	2018/08/02		105	%	80 - 120
			Total Titanium (Ti)	2018/08/02		106	%	80 - 120
			Total Uranium (U)	2018/08/02		108	%	80 - 120
			Total Vanadium (V)	2018/08/02		105	%	80 - 120
			Total Zinc (Zn)	2018/08/02		86	%	80 - 120
			Total Calcium (Ca)	2018/08/02		NC	%	80 - 120
			Total Magnesium (Mg)	2018/08/02		NC	%	80 - 120
			Total Potassium (K)	2018/08/02		104	%	80 - 120
			Total Sodium (Na)	2018/08/02		NC	%	80 - 120
9086950	GS9	Spiked Blank	Total Aluminum (Al)	2018/08/02		106	%	80 - 120
			Total Antimony (Sb)	2018/08/02		109	%	80 - 120
			Total Arsenic (As)	2018/08/02		112	%	80 - 120
			Total Barium (Ba)	2018/08/02		108	%	80 - 120
			Total Beryllium (Be)	2018/08/02		108	%	80 - 120
			Total Boron (B)	2018/08/02		100	%	80 - 120
			Total Cadmium (Cd)	2018/08/02		106	%	80 - 120
			Total Chromium (Cr)	2018/08/02		106	%	80 - 120
			Total Copper (Cu)	2018/08/02		103	%	80 - 120
			Total Iron (Fe)	2018/08/02		110	%	80 - 120
			Total Lead (Pb)	2018/08/02		106	%	80 - 120
			Total Lithium (Li)	2018/08/02		108	%	80 - 120
			Total Manganese (Mn)	2018/08/02		107	%	80 - 120
			Total Molybdenum (Mo)	2018/08/02		111	%	80 - 120
			Total Nickel (Ni)	2018/08/02		105	%	80 - 120
			Total Selenium (Se)	2018/08/02		109	%	80 - 120
			Total Silver (Ag)	2018/08/02		105	%	80 - 120
			Total Strontium (Sr)	2018/08/02		112	%	80 - 120
			Total Thallium (Tl)	2018/08/02		102	%	80 - 120
			Total Tin (Sn)	2018/08/02		107	%	80 - 120
			Total Titanium (Ti)	2018/08/02		109	%	80 - 120
			Total Uranium (U)	2018/08/02		107	%	80 - 120
			Total Vanadium (V)	2018/08/02		108	%	80 - 120
			Total Zinc (Zn)	2018/08/02		108	%	80 - 120
			Total Calcium (Ca)	2018/08/02		107	%	80 - 120

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Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Magnesium (Mg)	2018/08/02		108	%	80 - 120
			Total Potassium (K)	2018/08/02		109	%	80 - 120
			Total Sodium (Na)	2018/08/02		105	%	80 - 120
9086950	GS9	Method Blank	Total Aluminum (Al)	2018/08/02	<0.0030		mg/L	
			Total Antimony (Sb)	2018/08/02	<0.00050		mg/L	
			Total Arsenic (As)	2018/08/02	<0.00010		mg/L	
			Total Barium (Ba)	2018/08/02	<0.0010		mg/L	
			Total Beryllium (Be)	2018/08/02	<0.00010		mg/L	
			Total Boron (B)	2018/08/02	<0.050		mg/L	
			Total Cadmium (Cd)	2018/08/02	<0.000010		mg/L	
			Total Chromium (Cr)	2018/08/02	<0.0010		mg/L	
			Total Copper (Cu)	2018/08/02	<0.00050		mg/L	
			Total Iron (Fe)	2018/08/02	<0.010		mg/L	
			Total Lead (Pb)	2018/08/02	<0.00020		mg/L	
			Total Lithium (Li)	2018/08/02	<0.0020		mg/L	
			Total Manganese (Mn)	2018/08/02	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/08/02	<0.0010		mg/L	
			Total Nickel (Ni)	2018/08/02	<0.0010		mg/L	
			Total Selenium (Se)	2018/08/02	<0.00010		mg/L	
			Total Silver (Ag)	2018/08/02	<0.000020		mg/L	
			Total Strontium (Sr)	2018/08/02	<0.0010		mg/L	
			Total Thallium (Tl)	2018/08/02	<0.000010		mg/L	
			Total Tin (Sn)	2018/08/02	<0.0050		mg/L	
			Total Titanium (Ti)	2018/08/02	<0.0050		mg/L	
			Total Uranium (U)	2018/08/02	<0.00010		mg/L	
			Total Vanadium (V)	2018/08/02	<0.0050		mg/L	
			Total Zinc (Zn)	2018/08/02	<0.0050		mg/L	
			Total Calcium (Ca)	2018/08/02	<0.050		mg/L	
			Total Magnesium (Mg)	2018/08/02	<0.050		mg/L	
			Total Potassium (K)	2018/08/02	<0.050		mg/L	
			Total Sodium (Na)	2018/08/02	<0.050		mg/L	
9086950	GS9	RPD	Total Aluminum (Al)	2018/08/02	1.6		%	20
			Total Antimony (Sb)	2018/08/02	NC		%	20
			Total Arsenic (As)	2018/08/02	4.4		%	20
			Total Barium (Ba)	2018/08/02	1.1		%	20
			Total Beryllium (Be)	2018/08/02	NC		%	20
			Total Boron (B)	2018/08/02	3.0		%	20
			Total Cadmium (Cd)	2018/08/02	0.89		%	20
			Total Chromium (Cr)	2018/08/02	NC		%	20
			Total Copper (Cu)	2018/08/02	3.1		%	20
			Total Iron (Fe)	2018/08/02	5.9		%	20
			Total Lead (Pb)	2018/08/02	NC		%	20
			Total Lithium (Li)	2018/08/02	1.4		%	20
			Total Manganese (Mn)	2018/08/02	4.1		%	20
			Total Molybdenum (Mo)	2018/08/02	4.3		%	20
			Total Nickel (Ni)	2018/08/02	5.3		%	20
			Total Selenium (Se)	2018/08/02	2.3		%	20
			Total Silver (Ag)	2018/08/02	NC		%	20
			Total Strontium (Sr)	2018/08/02	3.4		%	20
			Total Thallium (Tl)	2018/08/02	0.52		%	20
			Total Tin (Sn)	2018/08/02	NC		%	20
			Total Titanium (Ti)	2018/08/02	NC		%	20
			Total Uranium (U)	2018/08/02	2.0		%	20

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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Vanadium (V)	2018/08/02	NC		%	20
			Total Zinc (Zn)	2018/08/02	NC		%	20
9087349	AA1	Matrix Spike	Dissolved Aluminum (Al)	2018/08/02		101	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/02		98	%	80 - 120
			Dissolved Arsenic (As)	2018/08/02		103	%	80 - 120
			Dissolved Barium (Ba)	2018/08/02		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/02		97	%	80 - 120
			Dissolved Boron (B)	2018/08/02		98	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/02		98	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/02		95	%	80 - 120
			Dissolved Copper (Cu)	2018/08/02		89	%	80 - 120
			Dissolved Iron (Fe)	2018/08/02		96	%	80 - 120
			Dissolved Lead (Pb)	2018/08/02		95	%	80 - 120
			Dissolved Lithium (Li)	2018/08/02		96	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/02		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/02		NC	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/02		92	%	80 - 120
			Dissolved Selenium (Se)	2018/08/02		97	%	80 - 120
			Dissolved Silver (Ag)	2018/08/02		95	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/02		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/02		94	%	80 - 120
			Dissolved Tin (Sn)	2018/08/02		99	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/02		99	%	80 - 120
			Dissolved Uranium (U)	2018/08/02		102	%	80 - 120
			Dissolved Vanadium (V)	2018/08/02		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/02		92	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/02		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/02		NC	%	80 - 120
			Dissolved Potassium (K)	2018/08/02		NC	%	80 - 120
			Dissolved Sodium (Na)	2018/08/02		NC	%	80 - 120
9087349	AA1	Spiked Blank	Dissolved Aluminum (Al)	2018/08/02		103	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/02		100	%	80 - 120
			Dissolved Arsenic (As)	2018/08/02		103	%	80 - 120
			Dissolved Barium (Ba)	2018/08/02		99	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/02		100	%	80 - 120
			Dissolved Boron (B)	2018/08/02		102	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/02		102	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/02		98	%	80 - 120
			Dissolved Copper (Cu)	2018/08/02		96	%	80 - 120
			Dissolved Iron (Fe)	2018/08/02		101	%	80 - 120
			Dissolved Lead (Pb)	2018/08/02		101	%	80 - 120
			Dissolved Lithium (Li)	2018/08/02		103	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/02		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/02		101	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/02		98	%	80 - 120
			Dissolved Selenium (Se)	2018/08/02		100	%	80 - 120
			Dissolved Silver (Ag)	2018/08/02		100	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/02		103	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/02		100	%	80 - 120
			Dissolved Tin (Sn)	2018/08/02		101	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/02		102	%	80 - 120
			Dissolved Uranium (U)	2018/08/02		101	%	80 - 120
			Dissolved Vanadium (V)	2018/08/02		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Zinc (Zn)	2018/08/02		99	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/02		101	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/02		102	%	80 - 120
			Dissolved Potassium (K)	2018/08/02		103	%	80 - 120
			Dissolved Sodium (Na)	2018/08/02		101	%	80 - 120
9087349	AA1	Method Blank	Dissolved Aluminum (Al)	2018/08/02	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/08/02	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/08/02	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/08/02	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/08/02	<0.00010		mg/L	
			Dissolved Boron (B)	2018/08/02	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/08/02	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/08/02	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/08/02	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/08/02	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/08/02	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/08/02	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/08/02	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/08/02	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/08/02	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/08/02	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/08/02	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/08/02	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/08/02	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/08/02	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/08/02	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/08/02	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/08/02	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/08/02	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/08/02	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/08/02	<0.050		mg/L	
			Dissolved Potassium (K)	2018/08/02	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/08/02	<0.050		mg/L	
9087349	AA1	RPD	Dissolved Aluminum (Al)	2018/08/02	2.8		%	20
			Dissolved Antimony (Sb)	2018/08/02	2.6		%	20
			Dissolved Arsenic (As)	2018/08/02	1.0		%	20
			Dissolved Barium (Ba)	2018/08/02	3.2		%	20
			Dissolved Beryllium (Be)	2018/08/02	NC		%	20
			Dissolved Boron (B)	2018/08/02	5.4		%	20
			Dissolved Cadmium (Cd)	2018/08/02	15		%	20
			Dissolved Chromium (Cr)	2018/08/02	1.8		%	20
			Dissolved Copper (Cu)	2018/08/02	4.6		%	20
			Dissolved Iron (Fe)	2018/08/02	NC		%	20
			Dissolved Lead (Pb)	2018/08/02	NC		%	20
			Dissolved Lithium (Li)	2018/08/02	2.7		%	20
			Dissolved Manganese (Mn)	2018/08/02	4.8		%	20
			Dissolved Molybdenum (Mo)	2018/08/02	3.4		%	20
			Dissolved Nickel (Ni)	2018/08/02	4.0		%	20
			Dissolved Selenium (Se)	2018/08/02	3.6		%	20
			Dissolved Silver (Ag)	2018/08/02	NC		%	20
			Dissolved Strontium (Sr)	2018/08/02	2.6		%	20
			Dissolved Thallium (Tl)	2018/08/02	4.6		%	20
			Dissolved Tin (Sn)	2018/08/02	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Titanium (Ti)	2018/08/02	NC		%	20
			Dissolved Uranium (U)	2018/08/02	2.7		%	20
			Dissolved Vanadium (V)	2018/08/02	NC		%	20
			Dissolved Zinc (Zn)	2018/08/02	NC		%	20
9091293	JC8	Matrix Spike	Dissolved Aluminum (Al)	2018/08/07		101	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/07		102	%	80 - 120
			Dissolved Arsenic (As)	2018/08/07		110	%	80 - 120
			Dissolved Barium (Ba)	2018/08/07		105	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/07		103	%	80 - 120
			Dissolved Boron (B)	2018/08/07		109	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/07		102	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/07		97	%	80 - 120
			Dissolved Copper (Cu)	2018/08/07		92	%	80 - 120
			Dissolved Iron (Fe)	2018/08/07		104	%	80 - 120
			Dissolved Lead (Pb)	2018/08/07		103	%	80 - 120
			Dissolved Lithium (Li)	2018/08/07		105	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/07		102	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/07		104	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/07		95	%	80 - 120
			Dissolved Selenium (Se)	2018/08/07		104	%	80 - 120
			Dissolved Silver (Ag)	2018/08/07		102	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/07		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/07		100	%	80 - 120
			Dissolved Tin (Sn)	2018/08/07		101	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/07		107	%	80 - 120
			Dissolved Uranium (U)	2018/08/07		106	%	80 - 120
			Dissolved Vanadium (V)	2018/08/07		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/07		97	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/07		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/07		103	%	80 - 120
			Dissolved Potassium (K)	2018/08/07		106	%	80 - 120
			Dissolved Sodium (Na)	2018/08/07		NC	%	80 - 120
9091293	JC8	Spiked Blank	Dissolved Aluminum (Al)	2018/08/07		104	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/07		95	%	80 - 120
			Dissolved Arsenic (As)	2018/08/07		102	%	80 - 120
			Dissolved Barium (Ba)	2018/08/07		96	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/07		101	%	80 - 120
			Dissolved Boron (B)	2018/08/07		108	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/07		97	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/07		94	%	80 - 120
			Dissolved Copper (Cu)	2018/08/07		90	%	80 - 120
			Dissolved Iron (Fe)	2018/08/07		103	%	80 - 120
			Dissolved Lead (Pb)	2018/08/07		99	%	80 - 120
			Dissolved Lithium (Li)	2018/08/07		102	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/07		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/07		102	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/07		92	%	80 - 120
			Dissolved Selenium (Se)	2018/08/07		101	%	80 - 120
			Dissolved Silver (Ag)	2018/08/07		100	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/07		103	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/07		97	%	80 - 120
			Dissolved Tin (Sn)	2018/08/07		96	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/07		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Uranium (U)	2018/08/07		101	%	80 - 120
			Dissolved Vanadium (V)	2018/08/07		97	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/07		95	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/07		105	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/07		97	%	80 - 120
			Dissolved Potassium (K)	2018/08/07		103	%	80 - 120
			Dissolved Sodium (Na)	2018/08/07		97	%	80 - 120
9091293	JC8	Method Blank	Dissolved Aluminum (Al)	2018/08/07	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/08/07	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/08/07	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/08/07	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/08/07	<0.00010		mg/L	
			Dissolved Boron (B)	2018/08/07	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/08/07	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/08/07	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/08/07	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/08/07	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/08/07	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/08/07	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/08/07	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/08/07	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/08/07	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/08/07	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/08/07	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/08/07	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/08/07	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/08/07	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/08/07	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/08/07	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/08/07	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/08/07	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/08/07	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/08/07	<0.050		mg/L	
			Dissolved Potassium (K)	2018/08/07	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/08/07	<0.050		mg/L	
9091293	JC8	RPD	Dissolved Aluminum (Al)	2018/08/07	5.9		%	20
			Dissolved Antimony (Sb)	2018/08/07	NC		%	20
			Dissolved Arsenic (As)	2018/08/07	14		%	20
			Dissolved Barium (Ba)	2018/08/07	2.0		%	20
			Dissolved Beryllium (Be)	2018/08/07	NC		%	20
			Dissolved Boron (B)	2018/08/07	2.2		%	20
			Dissolved Cadmium (Cd)	2018/08/07	NC		%	20
			Dissolved Chromium (Cr)	2018/08/07	NC		%	20
			Dissolved Copper (Cu)	2018/08/07	9.6		%	20
			Dissolved Iron (Fe)	2018/08/07	5.3		%	20
			Dissolved Lead (Pb)	2018/08/07	NC		%	20
			Dissolved Lithium (Li)	2018/08/07	NC		%	20
			Dissolved Manganese (Mn)	2018/08/07	3.0		%	20
			Dissolved Molybdenum (Mo)	2018/08/07	NC		%	20
			Dissolved Nickel (Ni)	2018/08/07	NC		%	20
			Dissolved Selenium (Se)	2018/08/07	NC		%	20
			Dissolved Silver (Ag)	2018/08/07	NC		%	20
			Dissolved Strontium (Sr)	2018/08/07	1.8		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Thallium (Tl)	2018/08/07	NC		%	20
			Dissolved Tin (Sn)	2018/08/07	NC		%	20
			Dissolved Titanium (Ti)	2018/08/07	NC		%	20
			Dissolved Uranium (U)	2018/08/07	NC		%	20
			Dissolved Vanadium (V)	2018/08/07	NC		%	20
			Dissolved Zinc (Zn)	2018/08/07	NC		%	20
9091571	JC8	Matrix Spike	Total Aluminum (Al)	2018/08/07		123 (1)	%	80 - 120
			Total Antimony (Sb)	2018/08/07		101	%	80 - 120
			Total Arsenic (As)	2018/08/07		107	%	80 - 120
			Total Barium (Ba)	2018/08/07		106	%	80 - 120
			Total Beryllium (Be)	2018/08/07		105	%	80 - 120
			Total Boron (B)	2018/08/07		114	%	80 - 120
			Total Cadmium (Cd)	2018/08/07		103	%	80 - 120
			Total Chromium (Cr)	2018/08/07		98	%	80 - 120
			Total Copper (Cu)	2018/08/07		93	%	80 - 120
			Total Iron (Fe)	2018/08/07		100	%	80 - 120
			Total Lead (Pb)	2018/08/07		107	%	80 - 120
			Total Lithium (Li)	2018/08/07		108	%	80 - 120
			Total Manganese (Mn)	2018/08/07		105	%	80 - 120
			Total Molybdenum (Mo)	2018/08/07		105	%	80 - 120
			Total Nickel (Ni)	2018/08/07		97	%	80 - 120
			Total Selenium (Se)	2018/08/07		103	%	80 - 120
			Total Silver (Ag)	2018/08/07		105	%	80 - 120
			Total Strontium (Sr)	2018/08/07		110	%	80 - 120
			Total Thallium (Tl)	2018/08/07		105	%	80 - 120
			Total Tin (Sn)	2018/08/07		97	%	80 - 120
			Total Titanium (Ti)	2018/08/07		104	%	80 - 120
			Total Uranium (U)	2018/08/07		109	%	80 - 120
			Total Vanadium (V)	2018/08/07		103	%	80 - 120
			Total Zinc (Zn)	2018/08/07		98	%	80 - 120
			Total Calcium (Ca)	2018/08/07		NC	%	80 - 120
			Total Magnesium (Mg)	2018/08/07		100	%	80 - 120
			Total Potassium (K)	2018/08/07		108	%	80 - 120
			Total Sodium (Na)	2018/08/07		102	%	80 - 120
9091571	JC8	Spiked Blank	Total Aluminum (Al)	2018/08/07		107	%	80 - 120
			Total Antimony (Sb)	2018/08/07		101	%	80 - 120
			Total Arsenic (As)	2018/08/07		106	%	80 - 120
			Total Barium (Ba)	2018/08/07		105	%	80 - 120
			Total Beryllium (Be)	2018/08/07		105	%	80 - 120
			Total Boron (B)	2018/08/07		115	%	80 - 120
			Total Cadmium (Cd)	2018/08/07		104	%	80 - 120
			Total Chromium (Cr)	2018/08/07		102	%	80 - 120
			Total Copper (Cu)	2018/08/07		96	%	80 - 120
			Total Iron (Fe)	2018/08/07		104	%	80 - 120
			Total Lead (Pb)	2018/08/07		107	%	80 - 120
			Total Lithium (Li)	2018/08/07		108	%	80 - 120
			Total Manganese (Mn)	2018/08/07		107	%	80 - 120
			Total Molybdenum (Mo)	2018/08/07		106	%	80 - 120
			Total Nickel (Ni)	2018/08/07		99	%	80 - 120
			Total Selenium (Se)	2018/08/07		108	%	80 - 120
			Total Silver (Ag)	2018/08/07		106	%	80 - 120
			Total Strontium (Sr)	2018/08/07		108	%	80 - 120
			Total Thallium (Tl)	2018/08/07		106	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2018/08/07		102	%	80 - 120
			Total Titanium (Ti)	2018/08/07		109	%	80 - 120
			Total Uranium (U)	2018/08/07		108	%	80 - 120
			Total Vanadium (V)	2018/08/07		105	%	80 - 120
			Total Zinc (Zn)	2018/08/07		101	%	80 - 120
			Total Calcium (Ca)	2018/08/07		111	%	80 - 120
			Total Magnesium (Mg)	2018/08/07		109	%	80 - 120
			Total Potassium (K)	2018/08/07		113	%	80 - 120
			Total Sodium (Na)	2018/08/07		104	%	80 - 120
9091571	JC8	Method Blank	Total Aluminum (Al)	2018/08/07	<0.0030		mg/L	
			Total Antimony (Sb)	2018/08/07	<0.00050		mg/L	
			Total Arsenic (As)	2018/08/07	<0.00010		mg/L	
			Total Barium (Ba)	2018/08/07	<0.0010		mg/L	
			Total Beryllium (Be)	2018/08/07	<0.00010		mg/L	
			Total Boron (B)	2018/08/07	<0.050		mg/L	
			Total Cadmium (Cd)	2018/08/07	<0.000010		mg/L	
			Total Chromium (Cr)	2018/08/07	<0.0010		mg/L	
			Total Copper (Cu)	2018/08/07	<0.00050		mg/L	
			Total Iron (Fe)	2018/08/07	<0.010		mg/L	
			Total Lead (Pb)	2018/08/07	<0.00020		mg/L	
			Total Lithium (Li)	2018/08/07	<0.0020		mg/L	
			Total Manganese (Mn)	2018/08/07	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/08/07	<0.0010		mg/L	
			Total Nickel (Ni)	2018/08/07	<0.0010		mg/L	
			Total Selenium (Se)	2018/08/07	<0.00010		mg/L	
			Total Silver (Ag)	2018/08/07	<0.000020		mg/L	
			Total Strontium (Sr)	2018/08/07	<0.0010		mg/L	
			Total Thallium (Tl)	2018/08/07	<0.000010		mg/L	
			Total Tin (Sn)	2018/08/07	<0.0050		mg/L	
			Total Titanium (Ti)	2018/08/07	<0.0050		mg/L	
			Total Uranium (U)	2018/08/07	<0.00010		mg/L	
			Total Vanadium (V)	2018/08/07	<0.0050		mg/L	
			Total Zinc (Zn)	2018/08/07	<0.0050		mg/L	
			Total Calcium (Ca)	2018/08/07	<0.050		mg/L	
			Total Magnesium (Mg)	2018/08/07	<0.050		mg/L	
			Total Potassium (K)	2018/08/07	<0.050		mg/L	
			Total Sodium (Na)	2018/08/07	<0.050		mg/L	
9091571	JC8	RPD	Total Aluminum (Al)	2018/08/07	12		%	20
			Total Antimony (Sb)	2018/08/07	NC		%	20
			Total Arsenic (As)	2018/08/07	3.7		%	20
			Total Barium (Ba)	2018/08/07	0.27		%	20
			Total Beryllium (Be)	2018/08/07	NC		%	20
			Total Boron (B)	2018/08/07	NC		%	20
			Total Cadmium (Cd)	2018/08/07	0		%	20
			Total Chromium (Cr)	2018/08/07	NC		%	20
			Total Copper (Cu)	2018/08/07	4.0		%	20
			Total Iron (Fe)	2018/08/07	3.7		%	20
			Total Lead (Pb)	2018/08/07	2.6		%	20
			Total Lithium (Li)	2018/08/07	1.1		%	20
			Total Manganese (Mn)	2018/08/07	5.7		%	20
			Total Molybdenum (Mo)	2018/08/07	NC		%	20
			Total Nickel (Ni)	2018/08/07	NC		%	20
			Total Selenium (Se)	2018/08/07	0.97		%	20

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Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Silver (Ag)	2018/08/07	NC		%	20
			Total Strontium (Sr)	2018/08/07	0.031		%	20
			Total Thallium (Tl)	2018/08/07	NC		%	20
			Total Tin (Sn)	2018/08/07	NC		%	20
			Total Titanium (Ti)	2018/08/07	10		%	20
			Total Uranium (U)	2018/08/07	0.95		%	20
			Total Vanadium (V)	2018/08/07	NC		%	20
			Total Zinc (Zn)	2018/08/07	NC		%	20
			Total Potassium (K)	2018/08/07	3.7		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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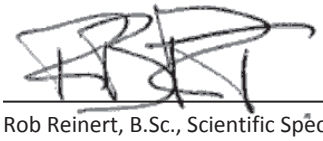
Maxxam Job #: B863796
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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Success Through Science®

Your P.O. #: B8J0420
Site Location: MELIADINE
Your C.O.C. #: B8J0420-M060-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663041
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B863518
Received: 2018/07/31, 08:48

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	2	N/A	2018/08/04	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Omran Desouki
Junior Project Manager
12 Dec 2018 12:12:50

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

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Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		TZ0467		TZ0468		
Sampling Date		2018/07/23 15:00		2018/07/23 12:35		
COC Number		B8J0420-M060-01-01		B8J0420-M060-01-01		
	UNITS	MEL-14	QC Batch	MEL-13	RDL	QC Batch
Misc. Inorganics						
Reactive Silica	mg/L	0.21	9091570	0.39	0.050	9091565
RDL = Reportable Detection Limit						

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Maxxam Job #: B863518
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: TZ0467
Sample ID: MEL-14
Matrix: Water

Collected: 2018/07/23
Shipped: 2018/07/30
Received: 2018/07/31

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9091570	N/A	2018/08/04	YuLun (steven) Qiu

Maxxam ID: TZ0468
Sample ID: MEL-13
Matrix: Water

Collected: 2018/07/23
Shipped: 2018/07/30
Received: 2018/07/31

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9091565	N/A	2018/08/04	YuLun (steven) Qiu

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated per client request.

GPS coordinates: 63°02'15.5'' 92°13'06.3'' (MEL-14)

GPS coordinates: 63°01'44.6'' 92°09'14.6'' (MEL-13)

Report Re-issued with updated sample ID and GPS Coordinates 2018/09/04

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/12/12

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9091565	Reactive Silica	2018/08/04	98	80 - 120	103	80 - 120	<0.050	mg/L	0.90	20
9091570	Reactive Silica	2018/08/04	99	80 - 120	102	80 - 120	<0.050	mg/L	0.96	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B863518
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8J0420
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Your P.O. #: OL-664695
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: n/a

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532386
Version: 5 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8L7292
Received: 2018/08/22, 14:00

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity (1)	2	N/A	2018/08/27	CAM SOP-00448	SM 23 2320 B m
Alkalinity (1)	5	N/A	2018/08/28	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide (1)	7	N/A	2018/08/28	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry (1)	7	N/A	2018/08/24	CAM SOP-00463	EPA 325.2 m
Conductivity (1)	2	N/A	2018/08/27	CAM SOP-00414	SM 23 2510 m
Conductivity (1)	5	N/A	2018/08/28	CAM SOP-00414	SM 23 2510 m
Free (WAD) Cyanide (1)	7	N/A	2018/08/27	CAM SOP-00457	OMOE E3015 m
Total Cyanide (1)	7	2018/08/24	2018/08/27	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1, 4)	7	N/A	2018/08/24	CAM SOP-00446	SM 23 5310 B m
Petroleum Hydro. CCME F1 & BTEX in Water (1)	5	N/A	2018/08/25	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	2	2018/08/24	2018/08/24	CAM SOP-00316	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	3	2018/08/24	2018/08/25	CAM SOP-00316	CCME PHC-CWS m
Dissolved Mercury (low level) (1)	5	2018/08/27	2018/08/27	CAM SOP-00453	EPA 7470 m
Mercury (low level) (1)	7	2018/08/27	2018/08/27	CAM SOP-00453	EPA 7470 m
Total Ammonia-N (1)	7	N/A	2018/08/27	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	7	N/A	2018/08/24	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Total Oil and Grease (1)	5	2018/08/25	2018/08/25	CAM SOP-00326	EPA1664B m,SM5520A m
pH (1)	2	N/A	2018/08/27	CAM SOP-00413	SM 4500H+ B m
pH (1)	5	N/A	2018/08/28	CAM SOP-00413	SM 4500H+ B m
Orthophosphate (1)	7	N/A	2018/08/24	CAM SOP-00461	EPA 365.1 m
Radium-226 Low Level (2, 7)	4	N/A	2018/09/01	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry
Sulphate by Automated Colourimetry (1)	7	N/A	2018/08/24	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	5	2018/08/25	2018/08/25	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids (1)	2	2018/09/20	2018/09/20	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	7	2018/08/27	2018/08/28	CAM SOP-00938	OMOE E3516 m
Total Organic Carbon (TOC) (1, 8)	7	N/A	2018/08/25	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric) (1)	7	2018/08/27	2018/08/27	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids (1)	7	2018/08/25	2018/08/25	CAM SOP-00428	SM 23 2540D m
Turbidity (1)	7	N/A	2018/08/24	CAM SOP-00417	SM 23 2130 B m
Hardness (calculated as CaCO3) (3)	7	N/A	2018/09/18	BBY WI-00033	Auto Calc

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

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A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: n/a

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532386
Version: 5 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8L7292
Received: 2018/08/22, 14:00

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Analytics Mississauga
(2) This test was performed by Maxxam Analytics Kitimat
(3) This test was performed by Campo to Burnaby Subcontract
(4) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(5) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following "Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003". Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(6) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(7) Radium-226 results have not been corrected for blanks.
(8) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key



Alisha Williamson
Project Manager
19 Dec 2018 15:44:08

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alisha Williamson, Project Manager
Email: AWilliamson@maxxam.ca

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

Your P.O. #: OL-664695
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: n/a

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532386
Version: 5 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8L7292
Received: 2018/08/22, 14:00
Phone# (613) 274-0573

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

CCME PETROLEUM HYDROCARBONS IN WATER (WATER)

Maxxam ID		HOA135	HOA136	HOA137	HOA138	HOA139		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00	2018/08/19 10:15	2018/08/20 07:30		
COC Number		n/a	n/a	n/a	n/a	n/a		
	UNITS	MEL-14	2018-0085	2018-0086	MEL-22 CP5	RO EFFLUENT	RDL	QC Batch
BTEX & F1 Hydrocarbons								
Benzene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	5697148
Toluene	ug/L	<0.20	<0.20	1.9	0.36	<0.20	0.20	5697148
Ethylbenzene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	5697148
o-Xylene	ug/L	<0.20	<0.20	0.42	<0.20	<0.20	0.20	5697148
p+m-Xylene	ug/L	<0.40	<0.40	0.78	<0.40	<0.40	0.40	5697148
Total Xylenes	ug/L	<0.40	<0.40	1.2	<0.40	<0.40	0.40	5697148
F1 (C6-C10)	ug/L	<25	<25	<25	<25	<25	25	5697148
F1 (C6-C10) - BTEX	ug/L	<25	<25	<25	<25	<25	25	5697148
F2-F4 Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	<100	<100	100	5697183
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	<200	<200	200	5697183
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	<200	<200	200	5697183
Reached Baseline at C50	ug/L	Yes	Yes	Yes	Yes	Yes		5697183
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	102	100	103	100	99		5697148
4-Bromofluorobenzene	%	97	98	98	99	96		5697148
D10-Ethylbenzene	%	101	96	98	97	93		5697148
D4-1,2-Dichloroethane	%	89	90	91	92	89		5697148
o-Terphenyl	%	97	97	95	97	97		5697183

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

RESULTS OF ANALYSES OF WATER

Maxxam ID		HOA135			HOA135			HOA136		
Sampling Date		2018/08/19 10:30			2018/08/19 10:30			2018/08/19 10:45		
COC Number		n/a			n/a			n/a		
	UNITS	MEL-14	RDL	QC Batch	MEL-14 REPEAT	RDL	QC Batch	2018-0085	RDL	QC Batch
Calculated Parameters										
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	37	1.0	5695167				37	1.0	5695167
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	5695167				<1.0	1.0	5695167
Inorganics										
Total Ammonia-N	mg/L	0.80	0.050	5700483				0.84	0.050	5700483
Conductivity	umho/cm	2300	1.0	5696395				2300	1.0	5696395
Total Dissolved Solids	mg/L	1430	10	5699369	1370	10	5742915	1400	10	5699369
Total Kjeldahl Nitrogen (TKN)	mg/L	1.4	0.20	5700413				1.3	0.20	5700413
Dissolved Organic Carbon	mg/L	11	0.50	5696357				9.9	0.50	5696357
Total Organic Carbon (TOC)	mg/L	12	0.50	5697780				12	0.50	5697780
Orthophosphate (P)	mg/L	<0.010	0.010	5696525				<0.010	0.010	5696525
pH	pH	7.18		5696399				7.32		5696399
Total Phosphorus	mg/L	0.037	0.020	5700373				0.034	0.020	5700373
Total Suspended Solids	mg/L	11	1	5699365				16	1	5699365
Dissolved Sulphate (SO4)	mg/L	60	1.0	5696506				60	1.0	5696506
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5697306				<0.0050	0.0050	5697306
Turbidity	NTU	1.0	0.1	5698284				1.0	0.1	5696239
WAD Cyanide (Free)	mg/L	<0.0010	0.0010	5697312				<0.0010	0.0010	5697312
Alkalinity (Total as CaCO3)	mg/L	37	1.0	5696368				37	1.0	5696368
Dissolved Chloride (Cl-)	mg/L	660	10	5696496				630	10	5696496
Nitrite (N)	mg/L	0.362	0.010	5696309				0.361	0.010	5696309
Nitrate (N)	mg/L	3.69	0.10	5696309				3.74	0.10	5696309
Nitrate + Nitrite (N)	mg/L	4.06	0.10	5696309				4.11	0.10	5696309
RADIONUCLIDE										
Radium-226	Bq/L	0.0080	0.0050	5702797				0.010	0.0050	5702797
Petroleum Hydrocarbons										
Total Oil & Grease	mg/L	<0.50	0.50	5699331				<0.50	0.50	5699331

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

RESULTS OF ANALYSES OF WATER

Maxxam ID		HOA136			HOA137		HOA138		
Sampling Date		2018/08/19 10:45			2018/08/19 11:00		2018/08/19 10:15		
COC Number		n/a			n/a		n/a		
	UNITS	2018-0085 REPEAT	RDL	QC Batch	2018-0086	RDL	MEL-22 CP5	RDL	QC Batch
Calculated Parameters									
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	79	1.0	5695167
Carb. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	<1.0	1.0	5695167
Inorganics									
Total Ammonia-N	mg/L				<0.050	0.050	29 (1)	0.050	5700483
Conductivity	umho/cm				1.4	1.0	18000	1.0	5696395
Total Dissolved Solids	mg/L	1450	10	5742915	75	10	11200	20	5699369
Total Kjeldahl Nitrogen (TKN)	mg/L				<0.10	0.10	25 (1)	5.0	5700413
Dissolved Organic Carbon	mg/L				<0.50	0.50	22	0.50	5696357
Total Organic Carbon (TOC)	mg/L				<0.50	0.50	24	0.50	5697780
Orthophosphate (P)	mg/L				<0.010	0.010	<0.010	0.010	5696525
pH	pH				5.96		7.47		5696399
Total Phosphorus	mg/L				<0.020	0.020	0.044	0.020	5700373
Total Suspended Solids	mg/L				<1	1	14	1	5699365
Dissolved Sulphate (SO4)	mg/L				<1.0	1.0	570	5.0	5696506
Total Cyanide (CN)	mg/L				<0.0050	0.0050	0.0082	0.0050	5697306
Turbidity	NTU				<0.1	0.1	3.7	0.1	5696239
WAD Cyanide (Free)	mg/L				<0.0010	0.0010	0.0020	0.0010	5697312
Alkalinity (Total as CaCO3)	mg/L				<1.0	1.0	79	1.0	5696368
Dissolved Chloride (Cl-)	mg/L				<1.0	1.0	6400	70	5696496
Nitrite (N)	mg/L				<0.010	0.010	0.794	0.010	5696309
Nitrate (N)	mg/L				<0.10	0.10	45.7	0.50	5696309
Nitrate + Nitrite (N)	mg/L				<0.10	0.10	46.5	0.50	5696309
RADIONUCLIDE									
Radium-226	Bq/L				<0.0050	0.0050	0.039	0.0050	5702797
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L				<0.50	0.50	<0.50	0.50	5699331

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) TKN < NH4: Both values fall within acceptable RPD limits for duplicates and are likely equivalent.

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

RESULTS OF ANALYSES OF WATER

Maxxam ID		HOA138			HOA139			HOA139		
Sampling Date		2018/08/19 10:15			2018/08/20 07:30			2018/08/20 07:30		
COC Number		n/a			n/a			n/a		
	UNITS	MEL-22 CP5 Lab-Dup	RDL	QC Batch	RO EFFLUENT	RDL	QC Batch	RO EFFLUENT Lab-Dup	RDL	QC Batch
Calculated Parameters										
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				4.7	1.0	5695167			
Carb. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	5695167			
Inorganics										
Total Ammonia-N	mg/L				1.9 (1)	0.050	5700483			
Conductivity	umho/cm				640	1.0	5696395			
Total Dissolved Solids	mg/L				315	10	5699369			
Total Kjeldahl Nitrogen (TKN)	mg/L				1.7 (1)	0.50	5700413			
Dissolved Organic Carbon	mg/L				<0.50	0.50	5696357			
Total Organic Carbon (TOC)	mg/L				<0.50	0.50	5697780	<0.50	0.50	5697780
Orthophosphate (P)	mg/L				<0.010	0.010	5696525			
pH	pH				6.82		5696399			
Total Phosphorus	mg/L				<0.020	0.020	5700373	<0.020	0.020	5700373
Total Suspended Solids	mg/L				<1	1	5699365			
Dissolved Sulphate (SO4)	mg/L				1.9	1.0	5696506			
Total Cyanide (CN)	mg/L	0.0075	0.0050	5697306	<0.0050	0.0050	5697306			
Turbidity	NTU				<0.1	0.1	5696239			
WAD Cyanide (Free)	mg/L	0.0014	0.0010	5697312	<0.0010	0.0010	5697312			
Alkalinity (Total as CaCO3)	mg/L				4.7	1.0	5696368			
Dissolved Chloride (Cl-)	mg/L				150	2.0	5696496			
Nitrite (N)	mg/L				0.099	0.010	5696309	0.098	0.010	5696309
Nitrate (N)	mg/L				6.70	0.10	5696309	6.75	0.10	5696309
Nitrate + Nitrite (N)	mg/L				6.80	0.10	5696309	6.84	0.10	5696309
Petroleum Hydrocarbons										
Total Oil & Grease	mg/L				0.50	0.50	5699331			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) TKN < NH4: Both values fall within acceptable RPD limits for duplicates and are likely equivalent.

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

RESULTS OF ANALYSES OF WATER

Maxxam ID		HOA140	HOA141		
Sampling Date		2018/08/19 12:30	2018/08/19 12:45		
COC Number		n/a	n/a		
	UNITS	DCP1- DOWNSTREAM	2018-0083	RDL	QC Batch
Calculated Parameters					
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	170	170	1.0	5695167
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.5	1.5	1.0	5695167
Inorganics					
Total Ammonia-N	mg/L	15	15	0.050	5700483
Conductivity	umho/cm	6500	6500	1.0	5696395
Total Dissolved Solids	mg/L	4130	4180	10	5699369
Total Kjeldahl Nitrogen (TKN)	mg/L	15	15	2.0	5700413
Dissolved Organic Carbon	mg/L	27	27	0.50	5696357
Total Organic Carbon (TOC)	mg/L	27	28	0.50	5697780
Orthophosphate (P)	mg/L	<0.010	<0.010	0.010	5696525
pH	pH	7.96	7.97		5696399
Total Phosphorus	mg/L	<0.040 (1)	<0.040 (1)	0.040	5700373
Total Suspended Solids	mg/L	16	25	1	5699365
Dissolved Sulphate (SO4)	mg/L	490	480	2.0	5696506
Total Cyanide (CN)	mg/L	<0.0050	<0.0050	0.0050	5697306
Turbidity	NTU	0.8	1.3	0.1	5696239
WAD Cyanide (Free)	mg/L	0.0017	0.0018	0.0010	5697312
Alkalinity (Total as CaCO3)	mg/L	170	180	1.0	5696368
Dissolved Chloride (Cl-)	mg/L	1900	1900	30	5696496
Nitrite (N)	mg/L	0.188	0.187	0.010	5696309
Nitrate (N)	mg/L	25.6	25.5	0.50	5696309
Nitrate + Nitrite (N)	mg/L	25.8	25.7	0.50	5696309

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HOA135	HOA136	HOA137			HOA137		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00			2018/08/19 11:00		
COC Number		n/a	n/a	n/a			n/a		
	UNITS	MEL-14	2018-0085	2018-0086	RDL	QC Batch	2018-0086 Lab-Dup	RDL	QC Batch
Metals									
Mercury (Hg)	mg/L	<0.00001	<0.00001	<0.00001	0.00001	5700416	<0.00001	0.00001	5700416
Dissolved Mercury (Hg)	mg/L	<0.00001	<0.00001	<0.00001	0.00001	5700492			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		HOA138	HOA139			HOA140	HOA141		
Sampling Date		2018/08/19 10:15	2018/08/20 07:30			2018/08/19 12:30	2018/08/19 12:45		
COC Number		n/a	n/a			n/a	n/a		
	UNITS	MEL-22 CP5	RO EFFLUENT	RDL	QC Batch	DCP1- DOWNSTREAM	2018-0083	RDL	QC Batch
Metals									
Mercury (Hg)	mg/L	<0.00001	<0.00001	0.00001	5700416	<0.00001	<0.00001	0.00001	5700416
Dissolved Mercury (Hg)	mg/L	<0.00001	<0.00001	0.00001	5700492				

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOA135
Sample ID: MEL-14
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5696368	N/A	2018/08/27	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5695167	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5696496	N/A	2018/08/24	Deonarine Ramnarine
Conductivity	AT	5696395	N/A	2018/08/27	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5696357	N/A	2018/08/24	Nimarta Singh
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5697148	N/A	2018/08/25	Domnica Andronescu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5697183	2018/08/24	2018/08/24	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5700492	2018/08/27	2018/08/27	Ron Morrison
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison
Total Ammonia-N	LACH/NH4	5700483	N/A	2018/08/27	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
Total Oil and Grease	BAL	5699331	2018/08/25	2018/08/25	Amjad Mir
pH	AT	5696399	N/A	2018/08/27	Surinder Rai
Orthophosphate	KONE	5696525	N/A	2018/08/24	Alina Dobreanu
Radium-226 Low Level	AS	5702797	N/A	2018/09/01	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5696506	N/A	2018/08/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5742915	2018/09/20	2018/09/20	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5700413	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5699365	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Turbidity	AT	5698284	N/A	2018/08/24	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5730126	N/A	2018/09/18	Tamsin Denison

Maxxam ID: HOA136
Sample ID: 2018-0085
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5696368	N/A	2018/08/27	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5695167	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5696496	N/A	2018/08/24	Deonarine Ramnarine
Conductivity	AT	5696395	N/A	2018/08/27	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5696357	N/A	2018/08/24	Nimarta Singh
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5697148	N/A	2018/08/25	Domnica Andronescu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5697183	2018/08/24	2018/08/24	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5700492	2018/08/27	2018/08/27	Ron Morrison
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison
Total Ammonia-N	LACH/NH4	5700483	N/A	2018/08/27	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
Total Oil and Grease	BAL	5699331	2018/08/25	2018/08/25	Amjad Mir

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOA136
Sample ID: 2018-0085
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH	AT	5696399	N/A	2018/08/27	Surinder Rai
Orthophosphate	KONE	5696525	N/A	2018/08/24	Alina Dobreanu
Radium-226 Low Level	AS	5702797	N/A	2018/09/01	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5696506	N/A	2018/08/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5742915	2018/09/20	2018/09/20	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5700413	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5699365	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Turbidity	AT	5696239	N/A	2018/08/24	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5730126	N/A	2018/09/18	Tamsin Denison

Maxxam ID: HOA137
Sample ID: 2018-0086
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5696368	N/A	2018/08/28	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5695167	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5696496	N/A	2018/08/24	Deonarine Ramnarine
Conductivity	AT	5696395	N/A	2018/08/28	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5696357	N/A	2018/08/24	Nimarta Singh
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5697148	N/A	2018/08/25	Domnica Andronescu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5697183	2018/08/24	2018/08/25	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5700492	2018/08/27	2018/08/27	Ron Morrison
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison
Total Ammonia-N	LACH/NH4	5700483	N/A	2018/08/27	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
Total Oil and Grease	BAL	5699331	2018/08/25	2018/08/25	Amjad Mir
pH	AT	5696399	N/A	2018/08/28	Surinder Rai
Orthophosphate	KONE	5696525	N/A	2018/08/24	Alina Dobreanu
Radium-226 Low Level	AS	5702797	N/A	2018/09/01	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5696506	N/A	2018/08/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5699369	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5700413	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5699365	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Turbidity	AT	5696239	N/A	2018/08/24	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5730126	N/A	2018/09/18	Tamsin Denison

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOA137 Dup
Sample ID: 2018-0086
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison

Maxxam ID: HOA138
Sample ID: MEL-22 CP5
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5696368	N/A	2018/08/28	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5695167	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5696496	N/A	2018/08/24	Deonarine Ramnarine
Conductivity	AT	5696395	N/A	2018/08/28	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5696357	N/A	2018/08/24	Nimarta Singh
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5697148	N/A	2018/08/25	Domnica Andronescu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5697183	2018/08/24	2018/08/25	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5700492	2018/08/27	2018/08/27	Ron Morrison
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison
Total Ammonia-N	LACH/NH4	5700483	N/A	2018/08/27	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
Total Oil and Grease	BAL	5699331	2018/08/25	2018/08/25	Amjad Mir
pH	AT	5696399	N/A	2018/08/28	Surinder Rai
Orthophosphate	KONE	5696525	N/A	2018/08/24	Alina Dobreanu
Radium-226 Low Level	AS	5702797	N/A	2018/09/01	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5696506	N/A	2018/08/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5699369	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5700413	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5699365	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Turbidity	AT	5696239	N/A	2018/08/24	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5730126	N/A	2018/09/18	Tamsin Denison

Maxxam ID: HOA138 Dup
Sample ID: MEL-22 CP5
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOA139
Sample ID: RO EFFLUENT
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5696368	N/A	2018/08/28	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5695167	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5696496	N/A	2018/08/24	Deonarine Ramnarine
Conductivity	AT	5696395	N/A	2018/08/28	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5696357	N/A	2018/08/24	Nimarta Singh
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5697148	N/A	2018/08/25	Domnica Andronescu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5697183	2018/08/24	2018/08/25	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5700492	2018/08/27	2018/08/27	Ron Morrison
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison
Total Ammonia-N	LACH/NH4	5700483	N/A	2018/08/27	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
Total Oil and Grease	BAL	5699331	2018/08/25	2018/08/25	Amjad Mir
pH	AT	5696399	N/A	2018/08/28	Surinder Rai
Orthophosphate	KONE	5696525	N/A	2018/08/24	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	5696506	N/A	2018/08/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5699369	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5700413	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5699365	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Turbidity	AT	5696239	N/A	2018/08/24	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5730126	N/A	2018/09/18	Tamsin Denison

Maxxam ID: HOA139 Dup
Sample ID: RO EFFLUENT
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal

Maxxam ID: HOA140
Sample ID: DCP1- DOWNSTREAM
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5696368	N/A	2018/08/28	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5695167	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5696496	N/A	2018/08/24	Deonarine Ramnarine
Conductivity	AT	5696395	N/A	2018/08/28	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOA140
Sample ID: DCP1- DOWNSTREAM
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5696357	N/A	2018/08/24	Nimarta Singh
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison
Total Ammonia-N	LACH/NH4	5700483	N/A	2018/08/27	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
pH	AT	5696399	N/A	2018/08/28	Surinder Rai
Orthophosphate	KONE	5696525	N/A	2018/08/24	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	5696506	N/A	2018/08/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5699369	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5700413	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5699365	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Turbidity	AT	5696239	N/A	2018/08/24	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5730126	N/A	2018/09/18	Tamsin Denison

Maxxam ID: HOA141
Sample ID: 2018-0083
Matrix: Water

Collected: 2018/08/19
Shipped:
Received: 2018/08/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5696368	N/A	2018/08/28	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5695167	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5696496	N/A	2018/08/24	Deonarine Ramnarine
Conductivity	AT	5696395	N/A	2018/08/28	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5697312	N/A	2018/08/27	Xuanhong Qiu
Total Cyanide	SKAL/CN	5697306	2018/08/24	2018/08/27	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5696357	N/A	2018/08/24	Nimarta Singh
Mercury (low level)	CV/AA	5700416	2018/08/27	2018/08/27	Ron Morrison
Total Ammonia-N	LACH/NH4	5700483	N/A	2018/08/27	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5696309	N/A	2018/08/24	Charles Opoku-Ware
pH	AT	5696399	N/A	2018/08/28	Surinder Rai
Orthophosphate	KONE	5696525	N/A	2018/08/24	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	5696506	N/A	2018/08/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5699369	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5700413	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5697780	N/A	2018/08/25	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5700373	2018/08/27	2018/08/27	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5699365	2018/08/25	2018/08/25	Jingwei (Alvin) Shi
Turbidity	AT	5696239	N/A	2018/08/24	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5730126	N/A	2018/09/18	Tamsin Denison

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.3°C
Package 2	10.0°C
Package 3	10.3°C

Revised report (2018/09/21): Includes Repeat values for TDS.

Revised Report (2018/12/12): Client sample ID changed to MEL-14 per client request.

Sample HOA138 [MEL-22 CP5] : TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample HOA139 [RO EFFLUENT] : TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample HOA140 [DCP1- DOWNSTREAM] : Total Cyanide < Free Cyanide: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample HOA141 [2018-0083] : Total Cyanide < Free Cyanide: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5697148	1,4-Difluorobenzene	2018/08/24	99	70 - 130	99	70 - 130	100	%				
5697148	4-Bromofluorobenzene	2018/08/24	100	70 - 130	98	70 - 130	97	%				
5697148	D10-Ethylbenzene	2018/08/24	102	70 - 130	101	70 - 130	97	%				
5697148	D4-1,2-Dichloroethane	2018/08/24	91	70 - 130	91	70 - 130	89	%				
5697183	o-Terphenyl	2018/08/24	99	60 - 130	97	60 - 130	96	%				
5696239	Turbidity	2018/08/24			101	85 - 115	<0.1	NTU	1.3	20		
5696309	Nitrate (N)	2018/08/24	99	80 - 120	95	80 - 120	<0.10	mg/L	0.74	20		
5696309	Nitrite (N)	2018/08/24	106	80 - 120	98	80 - 120	<0.010	mg/L	0.71	20		
5696357	Dissolved Organic Carbon	2018/08/24	93	80 - 120	100	80 - 120	<0.50	mg/L	0.14	20		
5696368	Alkalinity (Total as CaCO3)	2018/08/27			100	85 - 115	<1.0	mg/L	0.66	20		
5696395	Conductivity	2018/08/27			101	85 - 115	<1.0	umho/cm	0.31	25		
5696399	pH	2018/08/27			101	98 - 103			0.36	N/A		
5696496	Dissolved Chloride (Cl-)	2018/08/24	NC	80 - 120	102	80 - 120	<1.0	mg/L	0.17	20		
5696506	Dissolved Sulphate (SO4)	2018/08/24	NC	75 - 125	106	80 - 120	<1.0	mg/L	0.031	20		
5696525	Orthophosphate (P)	2018/08/24	NC	75 - 125	100	80 - 120	<0.010	mg/L	0.63	25		
5697148	Benzene	2018/08/24	108	70 - 130	103	70 - 130	<0.20	ug/L				
5697148	Ethylbenzene	2018/08/24	102	70 - 130	99	70 - 130	<0.20	ug/L				
5697148	F1 (C6-C10) - BTEX	2018/08/24					<25	ug/L	NC	30		
5697148	F1 (C6-C10)	2018/08/24	99	70 - 130	87	70 - 130	<25	ug/L	NC	30		
5697148	o-Xylene	2018/08/24	105	70 - 130	104	70 - 130	<0.20	ug/L				
5697148	p+m-Xylene	2018/08/24	104	70 - 130	101	70 - 130	<0.40	ug/L				
5697148	Toluene	2018/08/24	109	70 - 130	106	70 - 130	<0.20	ug/L				
5697148	Total Xylenes	2018/08/24					<0.40	ug/L				
5697183	F2 (C10-C16 Hydrocarbons)	2018/08/24	108	50 - 130	106	60 - 130	<100	ug/L	NC	30		
5697183	F3 (C16-C34 Hydrocarbons)	2018/08/24	108	50 - 130	107	60 - 130	<200	ug/L	NC	30		
5697183	F4 (C34-C50 Hydrocarbons)	2018/08/24	99	50 - 130	98	60 - 130	<200	ug/L	NC	30		
5697306	Total Cyanide (CN)	2018/08/27	94	80 - 120	96	80 - 120	<0.0050	mg/L	8.9	20		
5697312	WAD Cyanide (Free)	2018/08/27	98	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20		
5697780	Total Organic Carbon (TOC)	2018/08/25	96	80 - 120	96	80 - 120	<0.50	mg/L	NC	20		
5698284	Turbidity	2018/08/24			100	85 - 115	<0.1	NTU	1.5	20		
5699331	Total Oil & Grease	2018/08/25	94	75 - 125	97	85 - 115	<0.50	mg/L	1.3	25		

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT(CONT'D)

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5699365	Total Suspended Solids	2018/08/25					<1	mg/L	6.9	25	96	85 - 115
5699369	Total Dissolved Solids	2018/08/25					<10	mg/L	1.9	25	97	90 - 110
5700373	Total Phosphorus	2018/08/27	102	80 - 120	96	80 - 120	<0.020	mg/L	NC	20	102	80 - 120
5700413	Total Kjeldahl Nitrogen (TKN)	2018/08/27	99	80 - 120	103	80 - 120	<0.10	mg/L	NC	20	95	80 - 120
5700416	Mercury (Hg)	2018/08/27	100	75 - 125	99	80 - 120	<0.00001	mg/L	NC	20		
5700483	Total Ammonia-N	2018/08/27	96	75 - 125	103	80 - 120	<0.050	mg/L	NC	20		
5700492	Dissolved Mercury (Hg)	2018/08/27	99	75 - 125	99	80 - 120	<0.00001	mg/L	NC	20		
5702797	Radium-226	2018/08/31			93	85 - 115	<0.0050	Bq/L	NC	N/A		
5742915	Total Dissolved Solids	2018/09/20					<10	mg/L	11	25	97	90 - 110

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Service Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Steven Simpson, Lab Director

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Maxxam Job #: B8L7292
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

Exceedence Summary Table – Metal Mining Effluent Reg

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Your P.O. #: B8L7292
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: B8L7292-M060-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/04
Report #: R2612893
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B872191
Received: 2018/08/25, 11:30

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	4	N/A	2018/08/27	AB SOP-00011	EPA 370.1 R1978 m
Silica (Reactive)	1	N/A	2018/08/28	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: B8L7292
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: B8L7292-M060-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/04
Report #: R2612893
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B872191
Received: 2018/08/25, 11:30

Encryption Key



Omran Desouki
Junior Project Manager
04 Sep 2018 11:28:45

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077
==========

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Maxxam Job #: B872191
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UD8561		UD8562	UD8563		
Sampling Date		2018/08/19 10:30		2018/08/19 10:45	2018/08/19 11:00		
COC Number		B8L7292-M060-01-01		B8L7292-M060-01-01	B8L7292-M060-01-01		
	UNITS	MEL-14AC (MDMER AND EEM)	QC Batch	2018-0085	2018-0086	RDL	QC Batch
Misc. Inorganics							
Reactive Silica	mg/L	1.3	9119329	2.2	<0.050	0.050	9119332
RDL = Reportable Detection Limit							

Maxxam ID		UD8564		UD8565		
Sampling Date		2018/08/19 10:15		2018/08/20 07:30		
COC Number		B8L7292-M060-01-01		B8L7292-M060-01-01		
	UNITS	MEL-22 CPS	RDL	RO EFFLUENT	RDL	QC Batch
Misc. Inorganics						
Reactive Silica	mg/L	1.8 (1)	0.50	<0.050	0.050	9119329
RDL = Reportable Detection Limit						
(1) Detection limits raised due to matrix interference.						

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Maxxam Job #: B872191
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: UD8561
Sample ID: MEL-14AC (MDMER AND EEM)
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119329	N/A	2018/08/27	Jason Hollingsworth

Maxxam ID: UD8562
Sample ID: 2018-0085
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119332	N/A	2018/08/27	Jason Hollingsworth

Maxxam ID: UD8563
Sample ID: 2018-0086
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119332	N/A	2018/08/27	Jason Hollingsworth

Maxxam ID: UD8564
Sample ID: MEL-22 CPS
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119329	N/A	2018/08/28	Jason Hollingsworth

Maxxam ID: UD8565
Sample ID: RO EFFLUENT
Matrix: Water

Collected: 2018/08/20
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119329	N/A	2018/08/27	Jason Hollingsworth

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Maxxam Job #: B872191
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.0°C

Report Re-issued with updated Sample ID and GPS Coordinates 2018/09/04

Results relate only to the items tested.

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Maxxam Job #: B872191
Report Date: 2018/09/04

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9119329	Reactive Silica	2018/08/27	NC	80 - 120	98	80 - 120	<0.050	mg/L	1.5	20
9119332	Reactive Silica	2018/08/27	115	80 - 120	100	80 - 120	<0.050	mg/L	13	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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Maxxam Job #: B872191
Report Date: 2018/09/04

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

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Your P.O. #: B8L7292
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: B8L7292-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/10/12
Report #: R2633738
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B872232
Received: 2018/08/25, 12:00

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	7	N/A	2018/08/30	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	5	N/A	2018/08/28	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	5	N/A	2018/08/28	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	7	2018/08/28	2018/08/29	BBY7SOP-00003,	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	5	N/A	2018/08/27	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8L7292
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: B8L7292-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/10/12
Report #: R2633738
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B872232
Received: 2018/08/25, 12:00

Encryption Key



Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

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Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UD8907	UD8908	UD8909	UD8910		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00	2018/08/19 10:15		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	**MEL-14ac (MDMER and EEM)**	**2018-0085**	**2018-0086**	**MEL-22 CP5**	**RDL**	**QC Batch**
Calculated Parameters							
Filter and HNO3 Preservation	N/A	FIELD	FIELD	FIELD	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	565	559	<0.50	4290	0.50	9118517
Total Hardness (CaCO3)	mg/L	557	541	<0.50	4030	0.50	9118516

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam ID		UD8911	UD8912	UD8913		
Sampling Date		2018/08/19 07:30	2018/08/19 12:30	2018/08/19 12:45		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	**RO EFFLUENT**	**DCP1- DOWNSTREAM**	**2018-0083**	**RDL**	**QC Batch**
Calculated Parameters						
Filter and HNO3 Preservation	N/A	FIELD	N/A	N/A	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	16.9	N/A	N/A	0.50	9118517
Total Hardness (CaCO3)	mg/L	16.3	2140	2060	0.50	9118516

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8907	UD8908	UD8909		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	MEL-14ac (MDMER and EEM)	2018-0085	2018-0086	RDL	QC Batch
Dissolved Metals by ICPMS						
Dissolved Aluminum (Al)	mg/L	0.0568	0.0569	0.0034	0.0030	9119838
Dissolved Antimony (Sb)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	9119838
Dissolved Arsenic (As)	mg/L	0.00274	0.00259	<0.00010	0.00010	9119838
Dissolved Barium (Ba)	mg/L	0.150	0.147	<0.0010	0.0010	9119838
Dissolved Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9119838
Dissolved Boron (B)	mg/L	0.206	0.225	<0.050	0.050	9119838
Dissolved Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9119838
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9119838
Dissolved Copper (Cu)	mg/L	0.00065	0.00066	<0.00020	0.00020	9119838
Dissolved Iron (Fe)	mg/L	0.0324	0.0297	<0.0050	0.0050	9119838
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	9119838
Dissolved Lithium (Li)	mg/L	0.163	0.165	<0.0020	0.0020	9119838
Dissolved Manganese (Mn)	mg/L	0.382	0.399	<0.0010	0.0010	9119838
Dissolved Molybdenum (Mo)	mg/L	0.0020	0.0020	<0.0010	0.0010	9119838
Dissolved Nickel (Ni)	mg/L	0.0030	0.0029	<0.0010	0.0010	9119838
Dissolved Selenium (Se)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9119838
Dissolved Silver (Ag)	mg/L	<0.000020	<0.000020	<0.000020	0.000020	9119838
Dissolved Strontium (Sr)	mg/L	4.10	4.11	<0.0010	0.0010	9119838
Dissolved Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9119838
Dissolved Tin (Sn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Uranium (U)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9119838
Dissolved Vanadium (V)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Zinc (Zn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Calcium (Ca)	mg/L	173	171	<0.050	0.050	9119838
Dissolved Magnesium (Mg)	mg/L	32.2	32.0	<0.050	0.050	9119838
Dissolved Potassium (K)	mg/L	16.6	16.6	<0.050	0.050	9119838
Dissolved Sodium (Na)	mg/L	165	164	<0.050	0.050	9119838
Total Metals by ICPMS						
Total Aluminum (Al)	mg/L	1.03	1.06	0.0055	0.0030	9120507
RDL = Reportable Detection Limit						

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8907	UD8908	UD8909		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	MEL-14ac (MDMER and EEM)	2018-0085	2018-0086	RDL	QC Batch
Total Antimony (Sb)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	9120507
Total Arsenic (As)	mg/L	0.00295	0.00295	<0.00010	0.00010	9120507
Total Barium (Ba)	mg/L	0.160	0.157	<0.0010	0.0010	9120507
Total Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9120507
Total Boron (B)	mg/L	0.190	0.192	<0.050	0.050	9120507
Total Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9120507
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9120507
Total Copper (Cu)	mg/L	0.00099	0.00098	<0.00050	0.00050	9120507
Total Iron (Fe)	mg/L	0.260	0.188	<0.010	0.010	9120507
Total Lead (Pb)	mg/L	<0.00020	0.00023	<0.00020	0.00020	9120507
Total Lithium (Li)	mg/L	0.159	0.161	<0.0020	0.0020	9120507
Total Manganese (Mn)	mg/L	0.406	0.423	<0.0010	0.0010	9120507
Total Molybdenum (Mo)	mg/L	0.0022	0.0023	<0.0010	0.0010	9120507
Total Nickel (Ni)	mg/L	0.0034	0.0034	<0.0010	0.0010	9120507
Total Selenium (Se)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9120507
Total Silver (Ag)	mg/L	<0.000020	<0.000020	<0.000020	0.000020	9120507
Total Strontium (Sr)	mg/L	3.97	3.93	<0.0010	0.0010	9120507
Total Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9120507
Total Tin (Sn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9120507
Total Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9120507
Total Uranium (U)	mg/L	0.00018	0.00019	<0.00010	0.00010	9120507
Total Vanadium (V)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9120507
Total Zinc (Zn)	mg/L	0.0067	<0.0050	<0.0050	0.0050	9120507
Total Calcium (Ca)	mg/L	171	167	<0.050	0.050	9120507
Total Magnesium (Mg)	mg/L	31.4	30.5	<0.050	0.050	9120507
Total Potassium (K)	mg/L	16.7	16.5	<0.050	0.050	9120507
Total Sodium (Na)	mg/L	161	160	<0.050	0.050	9120507
RDL = Reportable Detection Limit						

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8910		UD8911		UD8912		
Sampling Date		2018/08/19 10:15		2018/08/19 07:30		2018/08/19 12:30		
COC Number		B8L7292-M058-01-01		B8L7292-M058-01-01		B8L7292-M058-01-01		
	UNITS	MEL-22 CP5	RDL	RO EFFLUENT	RDL	DCP1- DOWNSTREAM	RDL	QC Batch
Dissolved Metals by ICPMS								
Dissolved Aluminum (Al)	mg/L	<0.030	0.030	0.0038	0.0030	N/A	0.0030	9119838
Dissolved Antimony (Sb)	mg/L	<0.0050	0.0050	<0.00050	0.00050	N/A	0.00050	9119838
Dissolved Arsenic (As)	mg/L	0.0043	0.0010	0.00016	0.00010	N/A	0.00010	9119838
Dissolved Barium (Ba)	mg/L	0.317	0.010	0.0013	0.0010	N/A	0.0010	9119838
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.00010	0.00010	N/A	0.00010	9119838
Dissolved Boron (B)	mg/L	0.95	0.50	0.608	0.050	N/A	0.050	9119838
Dissolved Cadmium (Cd)	mg/L	0.00061	0.00010	<0.000010	0.000010	N/A	0.000010	9119838
Dissolved Chromium (Cr)	mg/L	<0.010	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Copper (Cu)	mg/L	0.0084	0.0020	<0.00020	0.00020	N/A	0.00020	9119838
Dissolved Iron (Fe)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Lead (Pb)	mg/L	<0.0020	0.0020	<0.00020	0.00020	N/A	0.00020	9119838
Dissolved Lithium (Li)	mg/L	1.19	0.020	0.0613	0.0020	N/A	0.0020	9119838
Dissolved Manganese (Mn)	mg/L	0.238	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Molybdenum (Mo)	mg/L	<0.010	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Nickel (Ni)	mg/L	0.036	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Selenium (Se)	mg/L	<0.0010	0.0010	<0.00010	0.00010	N/A	0.00010	9119838
Dissolved Silver (Ag)	mg/L	<0.00020	0.00020	<0.000020	0.000020	N/A	0.000020	9119838
Dissolved Strontium (Sr)	mg/L	32.8	0.010	0.114	0.0010	N/A	0.0010	9119838
Dissolved Thallium (Tl)	mg/L	0.00029	0.00010	<0.000010	0.000010	N/A	0.000010	9119838
Dissolved Tin (Sn)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Titanium (Ti)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Uranium (U)	mg/L	0.0084	0.0010	<0.00010	0.00010	N/A	0.00010	9119838
Dissolved Vanadium (V)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Zinc (Zn)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Calcium (Ca)	mg/L	1220	0.50	4.92	0.050	N/A	0.050	9119838
Dissolved Magnesium (Mg)	mg/L	303	0.50	1.12	0.050	N/A	0.050	9119838
Dissolved Potassium (K)	mg/L	116	0.50	5.38	0.050	N/A	0.050	9119838
Dissolved Sodium (Na)	mg/L	1930	0.50	97.2	0.050	N/A	0.050	9119838

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8910		UD8911		UD8912		
Sampling Date		2018/08/19 10:15		2018/08/19 07:30		2018/08/19 12:30		
COC Number		B8L7292-M058-01-01		B8L7292-M058-01-01		B8L7292-M058-01-01		
	UNITS	MEL-22 CP5	RDL	RO EFFLUENT	RDL	DCP1- DOWNSTREAM	RDL	QC Batch
Total Metals by ICPMS								
Total Aluminum (Al)	mg/L	0.042	0.030	0.0043	0.0030	0.173	0.030	9120507
Total Antimony (Sb)	mg/L	<0.0050	0.0050	<0.00050	0.00050	<0.0050	0.0050	9120507
Total Arsenic (As)	mg/L	0.0054	0.0010	0.00013	0.00010	0.0064	0.0010	9120507
Total Barium (Ba)	mg/L	0.311	0.010	0.0013	0.0010	0.154	0.010	9120507
Total Beryllium (Be)	mg/L	<0.0010	0.0010	<0.00010	0.00010	<0.0010	0.0010	9120507
Total Boron (B)	mg/L	0.79	0.50	0.568	0.050	<0.50	0.50	9120507
Total Cadmium (Cd)	mg/L	0.00086	0.00010	<0.000010	0.000010	0.00030	0.00010	9120507
Total Chromium (Cr)	mg/L	<0.010	0.010	<0.0010	0.0010	<0.010	0.010	9120507
Total Copper (Cu)	mg/L	0.0111	0.0050	<0.00050	0.00050	0.0077	0.0050	9120507
Total Iron (Fe)	mg/L	0.36	0.10	<0.010	0.010	0.37	0.10	9120507
Total Lead (Pb)	mg/L	<0.0020	0.0020	<0.00020	0.00020	<0.0020	0.0020	9120507
Total Lithium (Li)	mg/L	1.13	0.020	0.0575	0.0020	0.326	0.020	9120507
Total Manganese (Mn)	mg/L	0.286	0.010	<0.0010	0.0010	1.12	0.010	9120507
Total Molybdenum (Mo)	mg/L	<0.010	0.010	<0.0010	0.0010	<0.010	0.010	9120507
Total Nickel (Ni)	mg/L	0.039	0.010	<0.0010	0.0010	0.063	0.010	9120507
Total Selenium (Se)	mg/L	<0.0010	0.0010	<0.00010	0.00010	<0.0010	0.0010	9120507
Total Silver (Ag)	mg/L	<0.00020	0.00020	<0.000020	0.000020	<0.00020	0.00020	9120507
Total Strontium (Sr)	mg/L	29.6	0.010	0.111	0.0010	10.0	0.010	9120507
Total Thallium (Tl)	mg/L	0.00033	0.00010	<0.000010	0.000010	0.00013	0.00010	9120507
Total Tin (Sn)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Titanium (Ti)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Uranium (U)	mg/L	0.0090	0.0010	<0.00010	0.00010	0.0225	0.0010	9120507
Total Vanadium (V)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Zinc (Zn)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Calcium (Ca)	mg/L	1150	0.50	4.71	0.050	666	0.50	9120507
Total Magnesium (Mg)	mg/L	278	0.50	1.09	0.050	115	0.50	9120507
Total Potassium (K)	mg/L	113	0.50	5.41	0.050	35.4	0.50	9120507
Total Sodium (Na)	mg/L	1860	0.50	94.7	0.050	391	0.50	9120507

RDL = Reportable Detection Limit

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Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8913		
Sampling Date		2018/08/19 12:45		
COC Number		B8L7292-M058-01-01		
	UNITS	2018-0083	RDL	QC Batch
Total Metals by ICPMS				
Total Aluminum (Al)	mg/L	0.143	0.015	9120507
Total Antimony (Sb)	mg/L	<0.0025	0.0025	9120507
Total Arsenic (As)	mg/L	0.00664	0.00050	9120507
Total Barium (Ba)	mg/L	0.151	0.0050	9120507
Total Beryllium (Be)	mg/L	<0.00050	0.00050	9120507
Total Boron (B)	mg/L	0.25	0.25	9120507
Total Cadmium (Cd)	mg/L	0.000274	0.000050	9120507
Total Chromium (Cr)	mg/L	<0.0050	0.0050	9120507
Total Copper (Cu)	mg/L	0.0075	0.0025	9120507
Total Iron (Fe)	mg/L	0.301	0.050	9120507
Total Lead (Pb)	mg/L	<0.0010	0.0010	9120507
Total Lithium (Li)	mg/L	0.323	0.010	9120507
Total Manganese (Mn)	mg/L	1.09	0.0050	9120507
Total Molybdenum (Mo)	mg/L	0.0080	0.0050	9120507
Total Nickel (Ni)	mg/L	0.0637	0.0050	9120507
Total Selenium (Se)	mg/L	0.00061	0.00050	9120507
Total Silver (Ag)	mg/L	<0.00010	0.00010	9120507
Total Strontium (Sr)	mg/L	9.93	0.0050	9120507
Total Thallium (Tl)	mg/L	0.000128	0.000050	9120507
Total Tin (Sn)	mg/L	<0.025	0.025	9120507
Total Titanium (Ti)	mg/L	<0.025	0.025	9120507
Total Uranium (U)	mg/L	0.0223	0.00050	9120507
Total Vanadium (V)	mg/L	<0.025	0.025	9120507
Total Zinc (Zn)	mg/L	<0.025	0.025	9120507
Total Calcium (Ca)	mg/L	644	0.25	9120507
Total Magnesium (Mg)	mg/L	109	0.25	9120507
Total Potassium (K)	mg/L	34.5	0.25	9120507
Total Sodium (Na)	mg/L	378	0.25	9120507
RDL = Reportable Detection Limit				

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Maxxam Job #: B872232
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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C

Revised Report (2018/10/12): Client sample ID changed as per client request, and GPS coordinates included.

Sample UD8907 [MEL-14ac (MDMER and EEM)] : GPS coordinates: 63°02'15.5'' 92°13'06.3''

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER) Comments

Matrix Spike Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8910 [MEL-22 CP5] Elements by CRC ICPMS (dissolved): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8910 [MEL-22 CP5] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8912 [DCP1- DOWNSTREAM] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8913 [2018-0083] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.

Results relate only to the items tested.

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Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9119838	JLP	Matrix Spike	Dissolved Aluminum (Al)	2018/08/28		100	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/28		104	%	80 - 120
			Dissolved Arsenic (As)	2018/08/28		105	%	80 - 120
			Dissolved Barium (Ba)	2018/08/28		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/28		105	%	80 - 120
			Dissolved Boron (B)	2018/08/28		103	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/28		100	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/28		97	%	80 - 120
			Dissolved Copper (Cu)	2018/08/28		89	%	80 - 120
			Dissolved Iron (Fe)	2018/08/28		NC	%	80 - 120
			Dissolved Lead (Pb)	2018/08/28		97	%	80 - 120
			Dissolved Lithium (Li)	2018/08/28		103	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/28		NC	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/28		107	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/28		94	%	80 - 120
			Dissolved Selenium (Se)	2018/08/28		102	%	80 - 120
			Dissolved Silver (Ag)	2018/08/28		99	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/28		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/28		97	%	80 - 120
			Dissolved Tin (Sn)	2018/08/28		104	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/28		102	%	80 - 120
			Dissolved Uranium (U)	2018/08/28		105	%	80 - 120
			Dissolved Vanadium (V)	2018/08/28		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/28		97	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/28		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/28		NC	%	80 - 120
			Dissolved Potassium (K)	2018/08/28		98	%	80 - 120
			Dissolved Sodium (Na)	2018/08/28		NC	%	80 - 120
9119838	JLP	Spiked Blank	Dissolved Aluminum (Al)	2018/08/28		94	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/28		96	%	80 - 120
			Dissolved Arsenic (As)	2018/08/28		98	%	80 - 120
			Dissolved Barium (Ba)	2018/08/28		94	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/28		96	%	80 - 120
			Dissolved Boron (B)	2018/08/28		95	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/28		94	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/28		95	%	80 - 120
			Dissolved Copper (Cu)	2018/08/28		90	%	80 - 120
			Dissolved Iron (Fe)	2018/08/28		96	%	80 - 120
			Dissolved Lead (Pb)	2018/08/28		94	%	80 - 120
			Dissolved Lithium (Li)	2018/08/28		94	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/28		95	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/28		96	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/28		94	%	80 - 120
			Dissolved Selenium (Se)	2018/08/28		93	%	80 - 120
			Dissolved Silver (Ag)	2018/08/28		94	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/28		95	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/28		95	%	80 - 120
			Dissolved Tin (Sn)	2018/08/28		95	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/28		96	%	80 - 120
			Dissolved Uranium (U)	2018/08/28		97	%	80 - 120
			Dissolved Vanadium (V)	2018/08/28		95	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/28		96	%	80 - 120

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Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Calcium (Ca)	2018/08/28		94	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/28		95	%	80 - 120
			Dissolved Potassium (K)	2018/08/28		94	%	80 - 120
			Dissolved Sodium (Na)	2018/08/28		94	%	80 - 120
9119838	JLP	Method Blank	Dissolved Aluminum (Al)	2018/08/28	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/08/28	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/08/28	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/08/28	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/08/28	<0.00010		mg/L	
			Dissolved Boron (B)	2018/08/28	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/08/28	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/08/28	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/08/28	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/08/28	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/08/28	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/08/28	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/08/28	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/08/28	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/08/28	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/08/28	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/08/28	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/08/28	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/08/28	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/08/28	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/08/28	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/08/28	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/08/28	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/08/28	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/08/28	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/08/28	<0.050		mg/L	
			Dissolved Potassium (K)	2018/08/28	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/08/28	<0.050		mg/L	
9119838	JLP	RPD	Dissolved Lithium (Li)	2018/08/28	2.7		%	20
			Dissolved Aluminum (Al)	2018/08/28	1.9		%	20
			Dissolved Antimony (Sb)	2018/08/28	NC		%	20
			Dissolved Arsenic (As)	2018/08/28	NC		%	20
			Dissolved Barium (Ba)	2018/08/28	NC		%	20
			Dissolved Beryllium (Be)	2018/08/28	NC		%	20
			Dissolved Boron (B)	2018/08/28	NC		%	20
			Dissolved Cadmium (Cd)	2018/08/28	NC		%	20
			Dissolved Chromium (Cr)	2018/08/28	NC		%	20
			Dissolved Copper (Cu)	2018/08/28	NC		%	20
			Dissolved Iron (Fe)	2018/08/28	NC		%	20
			Dissolved Lead (Pb)	2018/08/28	NC		%	20
			Dissolved Lithium (Li)	2018/08/28	NC		%	20
			Dissolved Manganese (Mn)	2018/08/28	NC		%	20
			Dissolved Molybdenum (Mo)	2018/08/28	NC		%	20
			Dissolved Nickel (Ni)	2018/08/28	NC		%	20
			Dissolved Selenium (Se)	2018/08/28	NC		%	20
			Dissolved Silver (Ag)	2018/08/28	NC		%	20
			Dissolved Strontium (Sr)	2018/08/28	NC		%	20
			Dissolved Thallium (Tl)	2018/08/28	NC		%	20

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Maxxam Job #: B872232
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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Tin (Sn)	2018/08/28	NC		%	20
			Dissolved Titanium (Ti)	2018/08/28	NC		%	20
			Dissolved Uranium (U)	2018/08/28	NC		%	20
			Dissolved Vanadium (V)	2018/08/28	NC		%	20
			Dissolved Zinc (Zn)	2018/08/28	NC		%	20
			Dissolved Aluminum (Al)	2018/08/28	NC		%	20
			Dissolved Antimony (Sb)	2018/08/28	NC		%	20
			Dissolved Arsenic (As)	2018/08/28	NC		%	20
			Dissolved Barium (Ba)	2018/08/28	NC		%	20
			Dissolved Beryllium (Be)	2018/08/28	NC		%	20
			Dissolved Boron (B)	2018/08/28	NC		%	20
			Dissolved Cadmium (Cd)	2018/08/28	NC		%	20
			Dissolved Chromium (Cr)	2018/08/28	NC		%	20
			Dissolved Copper (Cu)	2018/08/28	NC		%	20
			Dissolved Iron (Fe)	2018/08/28	NC		%	20
			Dissolved Lead (Pb)	2018/08/28	NC		%	20
			Dissolved Lithium (Li)	2018/08/28	NC		%	20
			Dissolved Manganese (Mn)	2018/08/28	NC		%	20
			Dissolved Molybdenum (Mo)	2018/08/28	NC		%	20
			Dissolved Nickel (Ni)	2018/08/28	NC		%	20
			Dissolved Selenium (Se)	2018/08/28	NC		%	20
			Dissolved Silver (Ag)	2018/08/28	NC		%	20
			Dissolved Strontium (Sr)	2018/08/28	NC		%	20
			Dissolved Thallium (Tl)	2018/08/28	NC		%	20
			Dissolved Tin (Sn)	2018/08/28	NC		%	20
			Dissolved Titanium (Ti)	2018/08/28	NC		%	20
			Dissolved Uranium (U)	2018/08/28	NC		%	20
			Dissolved Vanadium (V)	2018/08/28	NC		%	20
			Dissolved Zinc (Zn)	2018/08/28	NC		%	20
9120507	MHM	Matrix Spike	Total Aluminum (Al)	2018/08/29		97	%	80 - 120
			Total Antimony (Sb)	2018/08/29		NC	%	80 - 120
			Total Arsenic (As)	2018/08/29		106	%	80 - 120
			Total Barium (Ba)	2018/08/29		100	%	80 - 120
			Total Beryllium (Be)	2018/08/29		100	%	80 - 120
			Total Boron (B)	2018/08/29		100	%	80 - 120
			Total Cadmium (Cd)	2018/08/29		101	%	80 - 120
			Total Chromium (Cr)	2018/08/29		95	%	80 - 120
			Total Copper (Cu)	2018/08/29		89	%	80 - 120
			Total Iron (Fe)	2018/08/29		95	%	80 - 120
			Total Lead (Pb)	2018/08/29		98	%	80 - 120
			Total Lithium (Li)	2018/08/29		100	%	80 - 120
			Total Manganese (Mn)	2018/08/29		NC	%	80 - 120
			Total Molybdenum (Mo)	2018/08/29		NC	%	80 - 120
			Total Nickel (Ni)	2018/08/29		94	%	80 - 120
			Total Selenium (Se)	2018/08/29		104	%	80 - 120
			Total Silver (Ag)	2018/08/29		97	%	80 - 120
			Total Strontium (Sr)	2018/08/29		NC	%	80 - 120
			Total Thallium (Tl)	2018/08/29		98	%	80 - 120
			Total Tin (Sn)	2018/08/29		99	%	80 - 120
			Total Titanium (Ti)	2018/08/29		101	%	80 - 120
			Total Uranium (U)	2018/08/29		108	%	80 - 120
			Total Vanadium (V)	2018/08/29		101	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Zinc (Zn)	2018/08/29		NC	%	80 - 120
			Total Calcium (Ca)	2018/08/29		NC	%	80 - 120
			Total Magnesium (Mg)	2018/08/29		NC	%	80 - 120
			Total Potassium (K)	2018/08/29		NC	%	80 - 120
			Total Sodium (Na)	2018/08/29		NC	%	80 - 120
9120507	MHM	Spiked Blank	Total Aluminum (Al)	2018/08/29		101	%	80 - 120
			Total Antimony (Sb)	2018/08/29		102	%	80 - 120
			Total Arsenic (As)	2018/08/29		106	%	80 - 120
			Total Barium (Ba)	2018/08/29		102	%	80 - 120
			Total Beryllium (Be)	2018/08/29		104	%	80 - 120
			Total Boron (B)	2018/08/29		108	%	80 - 120
			Total Cadmium (Cd)	2018/08/29		105	%	80 - 120
			Total Chromium (Cr)	2018/08/29		100	%	80 - 120
			Total Copper (Cu)	2018/08/29		96	%	80 - 120
			Total Iron (Fe)	2018/08/29		103	%	80 - 120
			Total Lead (Pb)	2018/08/29		104	%	80 - 120
			Total Lithium (Li)	2018/08/29		105	%	80 - 120
			Total Manganese (Mn)	2018/08/29		101	%	80 - 120
			Total Molybdenum (Mo)	2018/08/29		106	%	80 - 120
			Total Nickel (Ni)	2018/08/29		98	%	80 - 120
			Total Selenium (Se)	2018/08/29		103	%	80 - 120
			Total Silver (Ag)	2018/08/29		102	%	80 - 120
			Total Strontium (Sr)	2018/08/29		107	%	80 - 120
			Total Thallium (Tl)	2018/08/29		102	%	80 - 120
			Total Tin (Sn)	2018/08/29		102	%	80 - 120
			Total Titanium (Ti)	2018/08/29		102	%	80 - 120
			Total Uranium (U)	2018/08/29		110	%	80 - 120
			Total Vanadium (V)	2018/08/29		102	%	80 - 120
			Total Zinc (Zn)	2018/08/29		107	%	80 - 120
			Total Calcium (Ca)	2018/08/29		105	%	80 - 120
			Total Magnesium (Mg)	2018/08/29		101	%	80 - 120
			Total Potassium (K)	2018/08/29		101	%	80 - 120
			Total Sodium (Na)	2018/08/29		100	%	80 - 120
9120507	MHM	Method Blank	Total Aluminum (Al)	2018/08/29	<0.0030		mg/L	
			Total Antimony (Sb)	2018/08/29	<0.00050		mg/L	
			Total Arsenic (As)	2018/08/29	<0.00010		mg/L	
			Total Barium (Ba)	2018/08/29	<0.0010		mg/L	
			Total Beryllium (Be)	2018/08/29	<0.00010		mg/L	
			Total Boron (B)	2018/08/29	<0.050		mg/L	
			Total Cadmium (Cd)	2018/08/29	<0.000010		mg/L	
			Total Chromium (Cr)	2018/08/29	<0.0010		mg/L	
			Total Copper (Cu)	2018/08/29	<0.00050		mg/L	
			Total Iron (Fe)	2018/08/29	<0.010		mg/L	
			Total Lead (Pb)	2018/08/29	<0.00020		mg/L	
			Total Lithium (Li)	2018/08/29	<0.0020		mg/L	
			Total Manganese (Mn)	2018/08/29	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/08/29	<0.0010		mg/L	
			Total Nickel (Ni)	2018/08/29	<0.0010		mg/L	
			Total Selenium (Se)	2018/08/29	<0.00010		mg/L	
			Total Silver (Ag)	2018/08/29	<0.000020		mg/L	
			Total Strontium (Sr)	2018/08/29	<0.0010		mg/L	
			Total Thallium (Tl)	2018/08/29	<0.000010		mg/L	

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Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2018/08/29	<0.0050		mg/L	
			Total Titanium (Ti)	2018/08/29	<0.0050		mg/L	
			Total Uranium (U)	2018/08/29	<0.00010		mg/L	
			Total Vanadium (V)	2018/08/29	<0.0050		mg/L	
			Total Zinc (Zn)	2018/08/29	<0.0050		mg/L	
			Total Calcium (Ca)	2018/08/29	<0.050		mg/L	
			Total Magnesium (Mg)	2018/08/29	<0.050		mg/L	
			Total Potassium (K)	2018/08/29	<0.050		mg/L	
			Total Sodium (Na)	2018/08/29	<0.050		mg/L	
9120507	MHM	RPD	Total Aluminum (Al)	2018/08/29	NC		%	20
			Total Antimony (Sb)	2018/08/29	0.91		%	20
			Total Arsenic (As)	2018/08/29	3.7		%	20
			Total Barium (Ba)	2018/08/29	0.32		%	20
			Total Beryllium (Be)	2018/08/29	NC		%	20
			Total Boron (B)	2018/08/29	NC		%	20
			Total Cadmium (Cd)	2018/08/29	16		%	20
			Total Chromium (Cr)	2018/08/29	NC		%	20
			Total Copper (Cu)	2018/08/29	NC		%	20
			Total Iron (Fe)	2018/08/29	NC		%	20
			Total Lead (Pb)	2018/08/29	0.61		%	20
			Total Lithium (Li)	2018/08/29	1.6		%	20
			Total Manganese (Mn)	2018/08/29	1.5		%	20
			Total Molybdenum (Mo)	2018/08/29	3.3		%	20
			Total Nickel (Ni)	2018/08/29	0.64		%	20
			Total Selenium (Se)	2018/08/29	5.0		%	20
			Total Silver (Ag)	2018/08/29	NC		%	20
			Total Strontium (Sr)	2018/08/29	0.70		%	20
			Total Thallium (Tl)	2018/08/29	0		%	20
			Total Tin (Sn)	2018/08/29	NC		%	20
			Total Titanium (Ti)	2018/08/29	NC		%	20
			Total Uranium (U)	2018/08/29	1.0		%	20
			Total Vanadium (V)	2018/08/29	NC		%	20
			Total Zinc (Zn)	2018/08/29	4.7		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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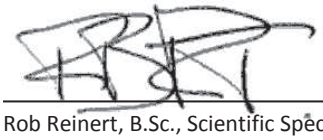
Maxxam Job #: B872232
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: B8L7292
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: B8L7292-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/11
Report #: R2662591
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B872232
Received: 2018/08/25, 12:00

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	7	N/A	2018/08/30	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	5	N/A	2018/08/28	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	5	N/A	2018/08/28	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	7	2018/08/28	2018/08/29	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	5	N/A	2018/08/27	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Encryption Key



Jennifer Villocero
Project Manager
11 Dec 2018 13:25:55

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8L7292
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: B8L7292-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/11
Report #: R2662591
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B872232
Received: 2018/08/25, 12:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UD8907	UD8908	UD8909	UD8910		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00	2018/08/19 10:15		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	**MEL-14**	**2018-0085**	**2018-0086**	**MEL-22 CP5**	**RDL**	**QC Batch**
Calculated Parameters							
Filter and HNO3 Preservation	N/A	FIELD	FIELD	FIELD	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	565	559	<0.50	4290	0.50	9118517
Total Hardness (CaCO3)	mg/L	557	541	<0.50	4030	0.50	9118516

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam ID		UD8911	UD8912	UD8913		
Sampling Date		2018/08/19 07:30	2018/08/19 12:30	2018/08/19 12:45		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	**RO EFFLUENT**	**DCP1- DOWNSTREAM**	**2018-0083**	**RDL**	**QC Batch**
Calculated Parameters						
Filter and HNO3 Preservation	N/A	FIELD	N/A	N/A	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	16.9	N/A	N/A	0.50	9118517
Total Hardness (CaCO3)	mg/L	16.3	2140	2060	0.50	9118516

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8907	UD8908	UD8909		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	MEL-14	2018-0085	2018-0086	RDL	QC Batch
Dissolved Metals by ICPMS						
Dissolved Aluminum (Al)	mg/L	0.0568	0.0569	0.0034	0.0030	9119838
Dissolved Antimony (Sb)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	9119838
Dissolved Arsenic (As)	mg/L	0.00274	0.00259	<0.00010	0.00010	9119838
Dissolved Barium (Ba)	mg/L	0.150	0.147	<0.0010	0.0010	9119838
Dissolved Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9119838
Dissolved Boron (B)	mg/L	0.206	0.225	<0.050	0.050	9119838
Dissolved Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9119838
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9119838
Dissolved Copper (Cu)	mg/L	0.00065	0.00066	<0.00020	0.00020	9119838
Dissolved Iron (Fe)	mg/L	0.0324	0.0297	<0.0050	0.0050	9119838
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	9119838
Dissolved Lithium (Li)	mg/L	0.163	0.165	<0.0020	0.0020	9119838
Dissolved Manganese (Mn)	mg/L	0.382	0.399	<0.0010	0.0010	9119838
Dissolved Molybdenum (Mo)	mg/L	0.0020	0.0020	<0.0010	0.0010	9119838
Dissolved Nickel (Ni)	mg/L	0.0030	0.0029	<0.0010	0.0010	9119838
Dissolved Selenium (Se)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9119838
Dissolved Silver (Ag)	mg/L	<0.000020	<0.000020	<0.000020	0.000020	9119838
Dissolved Strontium (Sr)	mg/L	4.10	4.11	<0.0010	0.0010	9119838
Dissolved Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9119838
Dissolved Tin (Sn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Uranium (U)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9119838
Dissolved Vanadium (V)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Zinc (Zn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9119838
Dissolved Calcium (Ca)	mg/L	173	171	<0.050	0.050	9119838
Dissolved Magnesium (Mg)	mg/L	32.2	32.0	<0.050	0.050	9119838
Dissolved Potassium (K)	mg/L	16.6	16.6	<0.050	0.050	9119838
Dissolved Sodium (Na)	mg/L	165	164	<0.050	0.050	9119838
Total Metals by ICPMS						
Total Aluminum (Al)	mg/L	1.03	1.06	0.0055	0.0030	9120507
Total Antimony (Sb)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	9120507

RDL = Reportable Detection Limit

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Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8907	UD8908	UD8909		
Sampling Date		2018/08/19 10:30	2018/08/19 10:45	2018/08/19 11:00		
COC Number		B8L7292-M058-01-01	B8L7292-M058-01-01	B8L7292-M058-01-01		
	UNITS	MEL-14	2018-0085	2018-0086	RDL	QC Batch
Total Arsenic (As)	mg/L	0.00295	0.00295	<0.00010	0.00010	9120507
Total Barium (Ba)	mg/L	0.160	0.157	<0.0010	0.0010	9120507
Total Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9120507
Total Boron (B)	mg/L	0.190	0.192	<0.050	0.050	9120507
Total Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9120507
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9120507
Total Copper (Cu)	mg/L	0.00099	0.00098	<0.00050	0.00050	9120507
Total Iron (Fe)	mg/L	0.260	0.188	<0.010	0.010	9120507
Total Lead (Pb)	mg/L	<0.00020	0.00023	<0.00020	0.00020	9120507
Total Lithium (Li)	mg/L	0.159	0.161	<0.0020	0.0020	9120507
Total Manganese (Mn)	mg/L	0.406	0.423	<0.0010	0.0010	9120507
Total Molybdenum (Mo)	mg/L	0.0022	0.0023	<0.0010	0.0010	9120507
Total Nickel (Ni)	mg/L	0.0034	0.0034	<0.0010	0.0010	9120507
Total Selenium (Se)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9120507
Total Silver (Ag)	mg/L	<0.000020	<0.000020	<0.000020	0.000020	9120507
Total Strontium (Sr)	mg/L	3.97	3.93	<0.0010	0.0010	9120507
Total Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9120507
Total Tin (Sn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9120507
Total Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9120507
Total Uranium (U)	mg/L	0.00018	0.00019	<0.00010	0.00010	9120507
Total Vanadium (V)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9120507
Total Zinc (Zn)	mg/L	0.0067	<0.0050	<0.0050	0.0050	9120507
Total Calcium (Ca)	mg/L	171	167	<0.050	0.050	9120507
Total Magnesium (Mg)	mg/L	31.4	30.5	<0.050	0.050	9120507
Total Potassium (K)	mg/L	16.7	16.5	<0.050	0.050	9120507
Total Sodium (Na)	mg/L	161	160	<0.050	0.050	9120507

RDL = Reportable Detection Limit

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8910		UD8911		UD8912		
Sampling Date		2018/08/19 10:15		2018/08/19 07:30		2018/08/19 12:30		
COC Number		B8L7292-M058-01-01		B8L7292-M058-01-01		B8L7292-M058-01-01		
	UNITS	MEL-22 CP5	RDL	RO EFFLUENT	RDL	DCP1- DOWNSTREAM	RDL	QC Batch
Dissolved Metals by ICPMS								
Dissolved Aluminum (Al)	mg/L	<0.030	0.030	0.0038	0.0030	N/A	0.0030	9119838
Dissolved Antimony (Sb)	mg/L	<0.0050	0.0050	<0.00050	0.00050	N/A	0.00050	9119838
Dissolved Arsenic (As)	mg/L	0.0043	0.0010	0.00016	0.00010	N/A	0.00010	9119838
Dissolved Barium (Ba)	mg/L	0.317	0.010	0.0013	0.0010	N/A	0.0010	9119838
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.00010	0.00010	N/A	0.00010	9119838
Dissolved Boron (B)	mg/L	0.95	0.50	0.608	0.050	N/A	0.050	9119838
Dissolved Cadmium (Cd)	mg/L	0.00061	0.00010	<0.000010	0.000010	N/A	0.000010	9119838
Dissolved Chromium (Cr)	mg/L	<0.010	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Copper (Cu)	mg/L	0.0084	0.0020	<0.00020	0.00020	N/A	0.00020	9119838
Dissolved Iron (Fe)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Lead (Pb)	mg/L	<0.0020	0.0020	<0.00020	0.00020	N/A	0.00020	9119838
Dissolved Lithium (Li)	mg/L	1.19	0.020	0.0613	0.0020	N/A	0.0020	9119838
Dissolved Manganese (Mn)	mg/L	0.238	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Molybdenum (Mo)	mg/L	<0.010	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Nickel (Ni)	mg/L	0.036	0.010	<0.0010	0.0010	N/A	0.0010	9119838
Dissolved Selenium (Se)	mg/L	<0.0010	0.0010	<0.00010	0.00010	N/A	0.00010	9119838
Dissolved Silver (Ag)	mg/L	<0.00020	0.00020	<0.000020	0.000020	N/A	0.000020	9119838
Dissolved Strontium (Sr)	mg/L	32.8	0.010	0.114	0.0010	N/A	0.0010	9119838
Dissolved Thallium (Tl)	mg/L	0.00029	0.00010	<0.000010	0.000010	N/A	0.000010	9119838
Dissolved Tin (Sn)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Titanium (Ti)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Uranium (U)	mg/L	0.0084	0.0010	<0.00010	0.00010	N/A	0.00010	9119838
Dissolved Vanadium (V)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Zinc (Zn)	mg/L	<0.050	0.050	<0.0050	0.0050	N/A	0.0050	9119838
Dissolved Calcium (Ca)	mg/L	1220	0.50	4.92	0.050	N/A	0.050	9119838
Dissolved Magnesium (Mg)	mg/L	303	0.50	1.12	0.050	N/A	0.050	9119838
Dissolved Potassium (K)	mg/L	116	0.50	5.38	0.050	N/A	0.050	9119838
Dissolved Sodium (Na)	mg/L	1930	0.50	97.2	0.050	N/A	0.050	9119838
Total Metals by ICPMS								
Total Aluminum (Al)	mg/L	0.042	0.030	0.0043	0.0030	0.173	0.030	9120507
Total Antimony (Sb)	mg/L	<0.0050	0.0050	<0.00050	0.00050	<0.0050	0.0050	9120507

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8910		UD8911		UD8912		
Sampling Date		2018/08/19 10:15		2018/08/19 07:30		2018/08/19 12:30		
COC Number		B8L7292-M058-01-01		B8L7292-M058-01-01		B8L7292-M058-01-01		
	UNITS	MEL-22 CP5	RDL	RO EFFLUENT	RDL	DCP1- DOWNSTREAM	RDL	QC Batch
Total Arsenic (As)	mg/L	0.0054	0.0010	0.00013	0.00010	0.0064	0.0010	9120507
Total Barium (Ba)	mg/L	0.311	0.010	0.0013	0.0010	0.154	0.010	9120507
Total Beryllium (Be)	mg/L	<0.0010	0.0010	<0.00010	0.00010	<0.0010	0.0010	9120507
Total Boron (B)	mg/L	0.79	0.50	0.568	0.050	<0.50	0.50	9120507
Total Cadmium (Cd)	mg/L	0.00086	0.00010	<0.000010	0.000010	0.00030	0.00010	9120507
Total Chromium (Cr)	mg/L	<0.010	0.010	<0.0010	0.0010	<0.010	0.010	9120507
Total Copper (Cu)	mg/L	0.0111	0.0050	<0.00050	0.00050	0.0077	0.0050	9120507
Total Iron (Fe)	mg/L	0.36	0.10	<0.010	0.010	0.37	0.10	9120507
Total Lead (Pb)	mg/L	<0.0020	0.0020	<0.00020	0.00020	<0.0020	0.0020	9120507
Total Lithium (Li)	mg/L	1.13	0.020	0.0575	0.0020	0.326	0.020	9120507
Total Manganese (Mn)	mg/L	0.286	0.010	<0.0010	0.0010	1.12	0.010	9120507
Total Molybdenum (Mo)	mg/L	<0.010	0.010	<0.0010	0.0010	<0.010	0.010	9120507
Total Nickel (Ni)	mg/L	0.039	0.010	<0.0010	0.0010	0.063	0.010	9120507
Total Selenium (Se)	mg/L	<0.0010	0.0010	<0.00010	0.00010	<0.0010	0.0010	9120507
Total Silver (Ag)	mg/L	<0.00020	0.00020	<0.000020	0.000020	<0.00020	0.00020	9120507
Total Strontium (Sr)	mg/L	29.6	0.010	0.111	0.0010	10.0	0.010	9120507
Total Thallium (Tl)	mg/L	0.00033	0.00010	<0.000010	0.000010	0.00013	0.00010	9120507
Total Tin (Sn)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Titanium (Ti)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Uranium (U)	mg/L	0.0090	0.0010	<0.00010	0.00010	0.0225	0.0010	9120507
Total Vanadium (V)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Zinc (Zn)	mg/L	<0.050	0.050	<0.0050	0.0050	<0.050	0.050	9120507
Total Calcium (Ca)	mg/L	1150	0.50	4.71	0.050	666	0.50	9120507
Total Magnesium (Mg)	mg/L	278	0.50	1.09	0.050	115	0.50	9120507
Total Potassium (K)	mg/L	113	0.50	5.41	0.050	35.4	0.50	9120507
Total Sodium (Na)	mg/L	1860	0.50	94.7	0.050	391	0.50	9120507

RDL = Reportable Detection Limit

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Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UD8913		
Sampling Date		2018/08/19 12:45		
COC Number		B8L7292-M058-01-01		
	UNITS	2018-0083	RDL	QC Batch
Total Metals by ICPMS				
Total Aluminum (Al)	mg/L	0.143	0.015	9120507
Total Antimony (Sb)	mg/L	<0.0025	0.0025	9120507
Total Arsenic (As)	mg/L	0.00664	0.00050	9120507
Total Barium (Ba)	mg/L	0.151	0.0050	9120507
Total Beryllium (Be)	mg/L	<0.00050	0.00050	9120507
Total Boron (B)	mg/L	0.25	0.25	9120507
Total Cadmium (Cd)	mg/L	0.000274	0.000050	9120507
Total Chromium (Cr)	mg/L	<0.0050	0.0050	9120507
Total Copper (Cu)	mg/L	0.0075	0.0025	9120507
Total Iron (Fe)	mg/L	0.301	0.050	9120507
Total Lead (Pb)	mg/L	<0.0010	0.0010	9120507
Total Lithium (Li)	mg/L	0.323	0.010	9120507
Total Manganese (Mn)	mg/L	1.09	0.0050	9120507
Total Molybdenum (Mo)	mg/L	0.0080	0.0050	9120507
Total Nickel (Ni)	mg/L	0.0637	0.0050	9120507
Total Selenium (Se)	mg/L	0.00061	0.00050	9120507
Total Silver (Ag)	mg/L	<0.00010	0.00010	9120507
Total Strontium (Sr)	mg/L	9.93	0.0050	9120507
Total Thallium (Tl)	mg/L	0.000128	0.000050	9120507
Total Tin (Sn)	mg/L	<0.025	0.025	9120507
Total Titanium (Ti)	mg/L	<0.025	0.025	9120507
Total Uranium (U)	mg/L	0.0223	0.00050	9120507
Total Vanadium (V)	mg/L	<0.025	0.025	9120507
Total Zinc (Zn)	mg/L	<0.025	0.025	9120507
Total Calcium (Ca)	mg/L	644	0.25	9120507
Total Magnesium (Mg)	mg/L	109	0.25	9120507
Total Potassium (K)	mg/L	34.5	0.25	9120507
Total Sodium (Na)	mg/L	378	0.25	9120507
RDL = Reportable Detection Limit				

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Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C

Revised Report (2018/10/12): Client sample ID changed as per client request, and GPS coordinates included.

Revised Report (2018/12/11): Client sample ID and GPS coordinates for lab ID UD8907 updated as per client request.

Sample UD8907 [MEL-14] : GPS coordinates: 63°02'15.5'' 92°13'06.3''

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER) Comments

Matrix Spike Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8910 [MEL-22 CP5] Elements by CRC ICPMS (dissolved): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8910 [MEL-22 CP5] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8912 [DCP1- DOWNSTREAM] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.
Sample UD8913 [2018-0083] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9119838	JLP	Matrix Spike	Dissolved Aluminum (Al)	2018/08/28		100	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/28		104	%	80 - 120
			Dissolved Arsenic (As)	2018/08/28		105	%	80 - 120
			Dissolved Barium (Ba)	2018/08/28		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/28		105	%	80 - 120
			Dissolved Boron (B)	2018/08/28		103	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/28		100	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/28		97	%	80 - 120
			Dissolved Copper (Cu)	2018/08/28		89	%	80 - 120
			Dissolved Iron (Fe)	2018/08/28		NC	%	80 - 120
			Dissolved Lead (Pb)	2018/08/28		97	%	80 - 120
			Dissolved Lithium (Li)	2018/08/28		103	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/28		NC	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/28		107	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/28		94	%	80 - 120
			Dissolved Selenium (Se)	2018/08/28		102	%	80 - 120
			Dissolved Silver (Ag)	2018/08/28		99	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/28		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/28		97	%	80 - 120
			Dissolved Tin (Sn)	2018/08/28		104	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/28		102	%	80 - 120
			Dissolved Uranium (U)	2018/08/28		105	%	80 - 120
			Dissolved Vanadium (V)	2018/08/28		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/28		97	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/28		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/28		NC	%	80 - 120
			Dissolved Potassium (K)	2018/08/28		98	%	80 - 120
			Dissolved Sodium (Na)	2018/08/28		NC	%	80 - 120
9119838	JLP	Spiked Blank	Dissolved Aluminum (Al)	2018/08/28		94	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/28		96	%	80 - 120
			Dissolved Arsenic (As)	2018/08/28		98	%	80 - 120
			Dissolved Barium (Ba)	2018/08/28		94	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/28		96	%	80 - 120
			Dissolved Boron (B)	2018/08/28		95	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/28		94	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/28		95	%	80 - 120
			Dissolved Copper (Cu)	2018/08/28		90	%	80 - 120
			Dissolved Iron (Fe)	2018/08/28		96	%	80 - 120
			Dissolved Lead (Pb)	2018/08/28		94	%	80 - 120
			Dissolved Lithium (Li)	2018/08/28		94	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/28		95	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/28		96	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/28		94	%	80 - 120
			Dissolved Selenium (Se)	2018/08/28		93	%	80 - 120
			Dissolved Silver (Ag)	2018/08/28		94	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/28		95	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/28		95	%	80 - 120
			Dissolved Tin (Sn)	2018/08/28		95	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/28		96	%	80 - 120
			Dissolved Uranium (U)	2018/08/28		97	%	80 - 120
			Dissolved Vanadium (V)	2018/08/28		95	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/28		96	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/28		94	%	80 - 120

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Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Magnesium (Mg)	2018/08/28		95	%	80 - 120
			Dissolved Potassium (K)	2018/08/28		94	%	80 - 120
			Dissolved Sodium (Na)	2018/08/28		94	%	80 - 120
9119838	JLP	Method Blank	Dissolved Aluminum (Al)	2018/08/28	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/08/28	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/08/28	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/08/28	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/08/28	<0.00010		mg/L	
			Dissolved Boron (B)	2018/08/28	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/08/28	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/08/28	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/08/28	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/08/28	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/08/28	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/08/28	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/08/28	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/08/28	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/08/28	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/08/28	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/08/28	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/08/28	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/08/28	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/08/28	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/08/28	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/08/28	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/08/28	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/08/28	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/08/28	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/08/28	<0.050		mg/L	
			Dissolved Potassium (K)	2018/08/28	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/08/28	<0.050		mg/L	
9119838	JLP	RPD	Dissolved Lithium (Li)	2018/08/28	2.7		%	20
			Dissolved Aluminum (Al)	2018/08/28	1.9		%	20
			Dissolved Antimony (Sb)	2018/08/28	NC		%	20
			Dissolved Arsenic (As)	2018/08/28	NC		%	20
			Dissolved Barium (Ba)	2018/08/28	NC		%	20
			Dissolved Beryllium (Be)	2018/08/28	NC		%	20
			Dissolved Boron (B)	2018/08/28	NC		%	20
			Dissolved Cadmium (Cd)	2018/08/28	NC		%	20
			Dissolved Chromium (Cr)	2018/08/28	NC		%	20
			Dissolved Copper (Cu)	2018/08/28	NC		%	20
			Dissolved Iron (Fe)	2018/08/28	NC		%	20
			Dissolved Lead (Pb)	2018/08/28	NC		%	20
			Dissolved Lithium (Li)	2018/08/28	NC		%	20
			Dissolved Manganese (Mn)	2018/08/28	NC		%	20
			Dissolved Molybdenum (Mo)	2018/08/28	NC		%	20
			Dissolved Nickel (Ni)	2018/08/28	NC		%	20
			Dissolved Selenium (Se)	2018/08/28	NC		%	20
			Dissolved Silver (Ag)	2018/08/28	NC		%	20
			Dissolved Strontium (Sr)	2018/08/28	NC		%	20
			Dissolved Thallium (Tl)	2018/08/28	NC		%	20
			Dissolved Tin (Sn)	2018/08/28	NC		%	20
			Dissolved Titanium (Ti)	2018/08/28	NC		%	20

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Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Uranium (U)	2018/08/28	NC		%	20
			Dissolved Vanadium (V)	2018/08/28	NC		%	20
			Dissolved Zinc (Zn)	2018/08/28	NC		%	20
			Dissolved Aluminum (Al)	2018/08/28	NC		%	20
			Dissolved Antimony (Sb)	2018/08/28	NC		%	20
			Dissolved Arsenic (As)	2018/08/28	NC		%	20
			Dissolved Barium (Ba)	2018/08/28	NC		%	20
			Dissolved Beryllium (Be)	2018/08/28	NC		%	20
			Dissolved Boron (B)	2018/08/28	NC		%	20
			Dissolved Cadmium (Cd)	2018/08/28	NC		%	20
			Dissolved Chromium (Cr)	2018/08/28	NC		%	20
			Dissolved Copper (Cu)	2018/08/28	NC		%	20
			Dissolved Iron (Fe)	2018/08/28	NC		%	20
			Dissolved Lead (Pb)	2018/08/28	NC		%	20
			Dissolved Lithium (Li)	2018/08/28	NC		%	20
			Dissolved Manganese (Mn)	2018/08/28	NC		%	20
			Dissolved Molybdenum (Mo)	2018/08/28	NC		%	20
			Dissolved Nickel (Ni)	2018/08/28	NC		%	20
			Dissolved Selenium (Se)	2018/08/28	NC		%	20
			Dissolved Silver (Ag)	2018/08/28	NC		%	20
			Dissolved Strontium (Sr)	2018/08/28	NC		%	20
			Dissolved Thallium (Tl)	2018/08/28	NC		%	20
			Dissolved Tin (Sn)	2018/08/28	NC		%	20
			Dissolved Titanium (Ti)	2018/08/28	NC		%	20
			Dissolved Uranium (U)	2018/08/28	NC		%	20
			Dissolved Vanadium (V)	2018/08/28	NC		%	20
			Dissolved Zinc (Zn)	2018/08/28	NC		%	20
9120507	MHM	Matrix Spike	Total Aluminum (Al)	2018/08/29		97	%	80 - 120
			Total Antimony (Sb)	2018/08/29		NC	%	80 - 120
			Total Arsenic (As)	2018/08/29		106	%	80 - 120
			Total Barium (Ba)	2018/08/29		100	%	80 - 120
			Total Beryllium (Be)	2018/08/29		100	%	80 - 120
			Total Boron (B)	2018/08/29		100	%	80 - 120
			Total Cadmium (Cd)	2018/08/29		101	%	80 - 120
			Total Chromium (Cr)	2018/08/29		95	%	80 - 120
			Total Copper (Cu)	2018/08/29		89	%	80 - 120
			Total Iron (Fe)	2018/08/29		95	%	80 - 120
			Total Lead (Pb)	2018/08/29		98	%	80 - 120
			Total Lithium (Li)	2018/08/29		100	%	80 - 120
			Total Manganese (Mn)	2018/08/29		NC	%	80 - 120
			Total Molybdenum (Mo)	2018/08/29		NC	%	80 - 120
			Total Nickel (Ni)	2018/08/29		94	%	80 - 120
			Total Selenium (Se)	2018/08/29		104	%	80 - 120
			Total Silver (Ag)	2018/08/29		97	%	80 - 120
			Total Strontium (Sr)	2018/08/29		NC	%	80 - 120
			Total Thallium (Tl)	2018/08/29		98	%	80 - 120
			Total Tin (Sn)	2018/08/29		99	%	80 - 120
			Total Titanium (Ti)	2018/08/29		101	%	80 - 120
			Total Uranium (U)	2018/08/29		108	%	80 - 120
			Total Vanadium (V)	2018/08/29		101	%	80 - 120
			Total Zinc (Zn)	2018/08/29		NC	%	80 - 120
			Total Calcium (Ca)	2018/08/29		NC	%	80 - 120
			Total Magnesium (Mg)	2018/08/29		NC	%	80 - 120

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Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Potassium (K)	2018/08/29		NC	%	80 - 120
			Total Sodium (Na)	2018/08/29		NC	%	80 - 120
9120507	MHM	Spiked Blank	Total Aluminum (Al)	2018/08/29		101	%	80 - 120
			Total Antimony (Sb)	2018/08/29		102	%	80 - 120
			Total Arsenic (As)	2018/08/29		106	%	80 - 120
			Total Barium (Ba)	2018/08/29		102	%	80 - 120
			Total Beryllium (Be)	2018/08/29		104	%	80 - 120
			Total Boron (B)	2018/08/29		108	%	80 - 120
			Total Cadmium (Cd)	2018/08/29		105	%	80 - 120
			Total Chromium (Cr)	2018/08/29		100	%	80 - 120
			Total Copper (Cu)	2018/08/29		96	%	80 - 120
			Total Iron (Fe)	2018/08/29		103	%	80 - 120
			Total Lead (Pb)	2018/08/29		104	%	80 - 120
			Total Lithium (Li)	2018/08/29		105	%	80 - 120
			Total Manganese (Mn)	2018/08/29		101	%	80 - 120
			Total Molybdenum (Mo)	2018/08/29		106	%	80 - 120
			Total Nickel (Ni)	2018/08/29		98	%	80 - 120
			Total Selenium (Se)	2018/08/29		103	%	80 - 120
			Total Silver (Ag)	2018/08/29		102	%	80 - 120
			Total Strontium (Sr)	2018/08/29		107	%	80 - 120
			Total Thallium (Tl)	2018/08/29		102	%	80 - 120
			Total Tin (Sn)	2018/08/29		102	%	80 - 120
			Total Titanium (Ti)	2018/08/29		102	%	80 - 120
			Total Uranium (U)	2018/08/29		110	%	80 - 120
			Total Vanadium (V)	2018/08/29		102	%	80 - 120
			Total Zinc (Zn)	2018/08/29		107	%	80 - 120
			Total Calcium (Ca)	2018/08/29		105	%	80 - 120
			Total Magnesium (Mg)	2018/08/29		101	%	80 - 120
			Total Potassium (K)	2018/08/29		101	%	80 - 120
			Total Sodium (Na)	2018/08/29		100	%	80 - 120
9120507	MHM	Method Blank	Total Aluminum (Al)	2018/08/29	<0.0030		mg/L	
			Total Antimony (Sb)	2018/08/29	<0.00050		mg/L	
			Total Arsenic (As)	2018/08/29	<0.00010		mg/L	
			Total Barium (Ba)	2018/08/29	<0.0010		mg/L	
			Total Beryllium (Be)	2018/08/29	<0.00010		mg/L	
			Total Boron (B)	2018/08/29	<0.050		mg/L	
			Total Cadmium (Cd)	2018/08/29	<0.000010		mg/L	
			Total Chromium (Cr)	2018/08/29	<0.0010		mg/L	
			Total Copper (Cu)	2018/08/29	<0.00050		mg/L	
			Total Iron (Fe)	2018/08/29	<0.010		mg/L	
			Total Lead (Pb)	2018/08/29	<0.00020		mg/L	
			Total Lithium (Li)	2018/08/29	<0.0020		mg/L	
			Total Manganese (Mn)	2018/08/29	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/08/29	<0.0010		mg/L	
			Total Nickel (Ni)	2018/08/29	<0.0010		mg/L	
			Total Selenium (Se)	2018/08/29	<0.00010		mg/L	
			Total Silver (Ag)	2018/08/29	<0.000020		mg/L	
			Total Strontium (Sr)	2018/08/29	<0.0010		mg/L	
			Total Thallium (Tl)	2018/08/29	<0.000010		mg/L	
			Total Tin (Sn)	2018/08/29	<0.0050		mg/L	
			Total Titanium (Ti)	2018/08/29	<0.0050		mg/L	
			Total Uranium (U)	2018/08/29	<0.00010		mg/L	
			Total Vanadium (V)	2018/08/29	<0.0050		mg/L	

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Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Zinc (Zn)	2018/08/29	<0.0050		mg/L	
			Total Calcium (Ca)	2018/08/29	<0.050		mg/L	
			Total Magnesium (Mg)	2018/08/29	<0.050		mg/L	
			Total Potassium (K)	2018/08/29	<0.050		mg/L	
			Total Sodium (Na)	2018/08/29	<0.050		mg/L	
9120507	MHM	RPD	Total Aluminum (Al)	2018/08/29	NC		%	20
			Total Antimony (Sb)	2018/08/29	0.91		%	20
			Total Arsenic (As)	2018/08/29	3.7		%	20
			Total Barium (Ba)	2018/08/29	0.32		%	20
			Total Beryllium (Be)	2018/08/29	NC		%	20
			Total Boron (B)	2018/08/29	NC		%	20
			Total Cadmium (Cd)	2018/08/29	16		%	20
			Total Chromium (Cr)	2018/08/29	NC		%	20
			Total Copper (Cu)	2018/08/29	NC		%	20
			Total Iron (Fe)	2018/08/29	NC		%	20
			Total Lead (Pb)	2018/08/29	0.61		%	20
			Total Lithium (Li)	2018/08/29	1.6		%	20
			Total Manganese (Mn)	2018/08/29	1.5		%	20
			Total Molybdenum (Mo)	2018/08/29	3.3		%	20
			Total Nickel (Ni)	2018/08/29	0.64		%	20
			Total Selenium (Se)	2018/08/29	5.0		%	20
			Total Silver (Ag)	2018/08/29	NC		%	20
			Total Strontium (Sr)	2018/08/29	0.70		%	20
			Total Thallium (Tl)	2018/08/29	0		%	20
			Total Tin (Sn)	2018/08/29	NC		%	20
			Total Titanium (Ti)	2018/08/29	NC		%	20
			Total Uranium (U)	2018/08/29	1.0		%	20
			Total Vanadium (V)	2018/08/29	NC		%	20
			Total Zinc (Zn)	2018/08/29	4.7		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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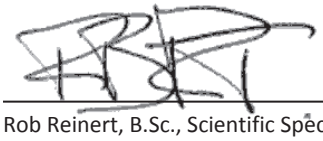
Maxxam Job #: B872232
Report Date: 2018/12/11

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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Your P.O. #: B8L7292
Site Location: MELIADINE
Your C.O.C. #: B8L7292-M060-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663045
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B872191
Received: 2018/08/25, 11:30

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	4	N/A	2018/08/27	AB SOP-00011	EPA 370.1 R1978 m
Silica (Reactive)	1	N/A	2018/08/28	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Omran Desouki
Junior Project Manager
12 Dec 2018 12:13:45

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

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Maxxam Job #: B872191
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UD8561		UD8562	UD8563		
Sampling Date		2018/08/19 10:30		2018/08/19 10:45	2018/08/19 11:00		
COC Number		B8L7292-M060-01-01		B8L7292-M060-01-01	B8L7292-M060-01-01		
	UNITS	MEL-14	QC Batch	2018-0085	2018-0086	RDL	QC Batch
Misc. Inorganics							
Reactive Silica	mg/L	1.3	9119329	2.2	<0.050	0.050	9119332

RDL = Reportable Detection Limit

Maxxam ID		UD8564		UD8565		
Sampling Date		2018/08/19 10:15		2018/08/20 07:30		
COC Number		B8L7292-M060-01-01		B8L7292-M060-01-01		
	UNITS	MEL-22 CPS	RDL	RO EFFLUENT	RDL	QC Batch
Misc. Inorganics						
Reactive Silica	mg/L	1.8 (1)	0.50	<0.050	0.050	9119329

RDL = Reportable Detection Limit
(1) Detection limits raised due to matrix interference.

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Maxxam Job #: B872191
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: UD8561
Sample ID: MEL-14
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119329	N/A	2018/08/27	Jason Hollingsworth

Maxxam ID: UD8562
Sample ID: 2018-0085
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119332	N/A	2018/08/27	Jason Hollingsworth

Maxxam ID: UD8563
Sample ID: 2018-0086
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119332	N/A	2018/08/27	Jason Hollingsworth

Maxxam ID: UD8564
Sample ID: MEL-22 CPS
Matrix: Water

Collected: 2018/08/19
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119329	N/A	2018/08/28	Jason Hollingsworth

Maxxam ID: UD8565
Sample ID: RO EFFLUENT
Matrix: Water

Collected: 2018/08/20
Shipped: 2018/08/24
Received: 2018/08/25

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9119329	N/A	2018/08/27	Jason Hollingsworth

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B872191
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.0°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated per client request.

GPS coordinates: 63°02'15.5'' 92°13'06.3''

Report Re-issued with updated Sample ID and GPS Coordinates 2018/09/04

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B872191
Report Date: 2018/12/12

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9119329	Reactive Silica	2018/08/27	NC	80 - 120	98	80 - 120	<0.050	mg/L	1.5	20
9119332	Reactive Silica	2018/08/27	115	80 - 120	100	80 - 120	<0.050	mg/L	13	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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Maxxam Job #: B872191
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L7292
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

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Maxxam
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Your P.O. #: OL-664695
Site#: 63°01'44.6'' 92°09'14.6''
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/10/12
Report #: R5438000
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8L8915
Received: 2018/08/23, 10:55

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity (1)	3	N/A	2018/08/27	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide (1)	3	N/A	2018/08/28	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry (1)	3	N/A	2018/08/28	CAM SOP-00463	EPA 325.2 m
Conductivity (1)	3	N/A	2018/08/27	CAM SOP-00414	SM 23 2510 m
Free (WAD) Cyanide (1)	3	N/A	2018/08/28	CAM SOP-00457	OMOE E3015 m
Total Cyanide (1)	3	2018/08/28	2018/08/28	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1, 4)	3	N/A	2018/08/27	CAM SOP-00446	SM 23 5310 B m
Petroleum Hydro. CCME F1 & BTEX in Water (1)	3	N/A	2018/08/27	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	3	2018/08/28	2018/08/29	CAM SOP-00316	CCME PHC-CWS m
Dissolved Mercury (low level) (1)	3	2018/08/29	2018/08/29	CAM SOP-00453	EPA 7470 m
Mercury (low level) (1)	3	2018/08/29	2018/08/29	CAM SOP-00453	EPA 7470 m
Total Ammonia-N (1)	3	N/A	2018/08/28	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	3	N/A	2018/08/28	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Total Oil and Grease (1)	3	2018/08/26	2018/08/27	CAM SOP-00326	EPA1664B m,SM5520A m
pH (1)	3	N/A	2018/08/27	CAM SOP-00413	SM 4500H+ B m
Orthophosphate (1)	3	N/A	2018/08/28	CAM SOP-00461	EPA 365.1 m
Radium-226 Low Level (2, 7)	3	N/A	2018/09/05	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry
Sulphate by Automated Colourimetry (1)	3	N/A	2018/08/28	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	1	2018/08/28	2018/08/28	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids (1)	2	2018/08/28	2018/08/29	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	3	2018/08/27	2018/08/28	CAM SOP-00938	OMOE E3516 m
Total Organic Carbon (TOC) (1, 8)	3	N/A	2018/08/28	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric) (1)	3	2018/08/28	2018/08/28	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids (1)	3	2018/08/28	2018/08/28	CAM SOP-00428	SM 23 2540D m
Turbidity (1)	3	N/A	2018/08/27	CAM SOP-00417	SM 23 2130 B m
Hardness (calculated as CaCO3) (3)	3	N/A	N/A	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

Maxxam Analytics International Corporation o/a Maxxam Analytics 32 Colonnade Rd, Unit #1000, Nepean, ON K2E 7J6 Phone: 613 274-0573 Fax: 613 274-0574 Website: www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site#: 63°01'44.6'' 92°09'14.6''
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/10/12
Report #: R5438000
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8L8915
Received: 2018/08/23, 10:55

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Analytics Mississauga
(2) This test was performed by Maxxam Analytics Kitimat
(3) This test was performed by Campo to Burnaby Subcontract
(4) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(5) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following "Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003". Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(6) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(7) Radium-226 results have not been corrected for blanks.
(8) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key



Sara Singh
Senior Project Manager
12 Oct 2018 13:50:09

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Jonathan Urben, Senior Project Manager
Email: jurben@maxxam.ca
Phone# (613) 274-0573

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E),

Your P.O. #: OL-664695
Site#: 63°01'44.6'' 92°09'14.6''
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/10/12
Report #: R5438000
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8L8915
Received: 2018/08/23, 10:55

signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

CCME PETROLEUM HYDROCARBONS IN WATER (WATER)

Maxxam ID		HOI315	HOI316	HOI317			HOI317		
Sampling Date		2018/08/20 12:35	2018/08/20 12:50	2018/08/20 13:10			2018/08/20 13:10		
COC Number		na	na	na			na		
	UNITS	MEL-13 (WL and EEM)	2018-0087	2018-0088	RDL	QC Batch	2018-0088 Lab-Dup	RDL	QC Batch
BTEX & F1 Hydrocarbons									
Benzene	ug/L	<0.20	<0.20	<0.20	0.20	5700207			
Toluene	ug/L	<0.20	1.8	<0.20	0.20	5700207			
Ethylbenzene	ug/L	<0.20	<0.20	<0.20	0.20	5700207			
o-Xylene	ug/L	<0.20	0.29	<0.20	0.20	5700207			
p+m-Xylene	ug/L	<0.40	0.52	<0.40	0.40	5700207			
Total Xylenes	ug/L	<0.40	0.81	<0.40	0.40	5700207			
F1 (C6-C10)	ug/L	<25	<25	<25	25	5700207			
F1 (C6-C10) - BTEX	ug/L	<25	<25	<25	25	5700207			
F2-F4 Hydrocarbons									
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	100	5703943	<100	100	5703943
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	200	5703943	<200	200	5703943
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	200	5703943	<200	200	5703943
Reached Baseline at C50	ug/L	Yes	Yes	Yes		5703943	Yes		5703943
Surrogate Recovery (%)									
1,4-Difluorobenzene	%	99	99	98		5700207			
4-Bromofluorobenzene	%	99	99	98		5700207			
D10-Ethylbenzene	%	93	94	94		5700207			
D4-1,2-Dichloroethane	%	96	96	95		5700207			
o-Terphenyl	%	93	93	92		5703943	93		5703943

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

RESULTS OF ANALYSES OF WATER

Maxxam ID		HOI315		HOI316			HOI316		
Sampling Date		2018/08/20 12:35		2018/08/20 12:50			2018/08/20 12:50		
COC Number		na		na			na		
	UNITS	MEL-13 (WL and EEM)	QC Batch	2018-0087	RDL	QC Batch	2018-0087 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	17	5699465	<1.0	1.0	5699465			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	5699465	<1.0	1.0	5699465			
Inorganics									
Total Ammonia-N	mg/L	<0.050	5701332	<0.050	0.050	5701332			
Conductivity	umho/cm	91	5699765	1.2	1.0	5699765			
Total Dissolved Solids	mg/L	400	5703176	50	10	5703963			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.14	5701345	<0.10	0.10	5701345			
Dissolved Organic Carbon	mg/L	2.9	5699436	<0.50	0.50	5699778	<0.50	0.50	5699778
Total Organic Carbon (TOC)	mg/L	2.9	5702710	<0.50	0.50	5701256	<0.50	0.50	5701256
Orthophosphate (P)	mg/L	<0.010	5700819	<0.010	0.010	5700819			
pH	pH	7.27	5699766	5.93		5699766			
Total Phosphorus	mg/L	<0.020	5702198	<0.020	0.020	5702198			
Total Suspended Solids	mg/L	1	5702706	<1	1	5702691			
Dissolved Sulphate (SO4)	mg/L	4.3	5700816	<1.0	1.0	5700816			
Total Cyanide (CN)	mg/L	<0.0050	5702429	<0.0050	0.0050	5702429			
Turbidity	NTU	0.3	5699705	<0.1	0.1	5699705			
WAD Cyanide (Free)	mg/L	<0.0010	5702435	<0.0010	0.0010	5702435			
Alkalinity (Total as CaCO3)	mg/L	17	5699763	<1.0	1.0	5699763			
Dissolved Chloride (Cl-)	mg/L	13	5700795	<1.0	1.0	5700795			
Nitrite (N)	mg/L	<0.010	5700892	<0.010	0.010	5700892			
Nitrate (N)	mg/L	<0.10	5700892	<0.10	0.10	5700892			
Nitrate + Nitrite (N)	mg/L	<0.10	5700892	<0.10	0.10	5700892			
RADIONUCLIDE									
Radium-226	Bq/L	<0.0050	5702810	<0.0050	0.0050	5702810			
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L	0.60	5699974	1.1	0.50	5699974			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

RESULTS OF ANALYSES OF WATER

Maxxam ID		HOI317			HOI317		
Sampling Date		2018/08/20 13:10			2018/08/20 13:10		
COC Number		na			na		
	UNITS	2018-0088	RDL	QC Batch	2018-0088 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	15	1.0	5699465			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	5699465			
Inorganics							
Total Ammonia-N	mg/L	<0.050	0.050	5701332			
Conductivity	umho/cm	90	1.0	5699765			
Total Dissolved Solids	mg/L	20	10	5703176			
Total Kjeldahl Nitrogen (TKN)	mg/L	<0.10	0.10	5701345			
Dissolved Organic Carbon	mg/L	3.3	0.50	5699778			
Total Organic Carbon (TOC)	mg/L	3.0	0.50	5702710			
Orthophosphate (P)	mg/L	<0.010	0.010	5700819			
pH	pH	7.23		5699766			
Total Phosphorus	mg/L	<0.020	0.020	5702198			
Total Suspended Solids	mg/L	<1	1	5702706			
Dissolved Sulphate (SO4)	mg/L	4.0	1.0	5700816			
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5702429	<0.0050	0.0050	5702429
Turbidity	NTU	0.2	0.1	5699705			
WAD Cyanide (Free)	mg/L	<0.0010	0.0010	5702435	<0.0010	0.0010	5702435
Alkalinity (Total as CaCO3)	mg/L	15	1.0	5699763			
Dissolved Chloride (Cl-)	mg/L	13	1.0	5700795			
Nitrite (N)	mg/L	<0.010	0.010	5700892			
Nitrate (N)	mg/L	<0.10	0.10	5700892			
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	5700892			
RADIONUCLIDE							
Radium-226	Bq/L	<0.0050	0.0050	5702810			
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	1.8	0.50	5699974			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HOI315	HOI316	HOI317			HOI317		
Sampling Date		2018/08/20 12:35	2018/08/20 12:50	2018/08/20 13:10			2018/08/20 13:10		
COC Number		na	na	na			na		
	UNITS	MEL-13 (WL and EEM)	2018-0087	2018-0088	RDL	QC Batch	2018-0088 Lab-Dup	RDL	QC Batch
Metals									
Mercury (Hg)	mg/L	<0.00001	<0.00001	<0.00001	0.00001	5704588			
Dissolved Mercury (Hg)	mg/L	<0.00001	<0.00001	<0.00001	0.00001	5704586	<0.00001	0.00001	5704586

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOI315
Sample ID: MEL-13 (WL and EEM)
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5699763	N/A	2018/08/27	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5699465	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5700795	N/A	2018/08/28	Deonarine Ramnarine
Conductivity	AT	5699765	N/A	2018/08/27	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5702435	N/A	2018/08/28	Xuanhong Qiu
Total Cyanide	SKAL/CN	5702429	2018/08/28	2018/08/28	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5699436	N/A	2018/08/27	Shivani Shivani
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5700207	N/A	2018/08/27	Abdi Mohamud
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5703943	2018/08/28	2018/08/29	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5704586	2018/08/29	2018/08/29	Ron Morrison
Mercury (low level)	CV/AA	5704588	2018/08/29	2018/08/29	Ron Morrison
Total Ammonia-N	LACH/NH4	5701332	N/A	2018/08/28	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5700892	N/A	2018/08/28	Charles Opoku-Ware
Total Oil and Grease	BAL	5699974	2018/08/26	2018/08/27	Francis Afonso
pH	AT	5699766	N/A	2018/08/27	Surinder Rai
Orthophosphate	KONE	5700819	N/A	2018/08/28	Alina Dobreanu
Radium-226 Low Level	AS	5702810	N/A	2018/09/05	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5700816	N/A	2018/08/28	Alina Dobreanu
Total Dissolved Solids	BAL	5703176	2018/08/28	2018/08/29	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5701345	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5702710	N/A	2018/08/28	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5702198	2018/08/28	2018/08/28	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5702706	2018/08/28	2018/08/28	Niket Kumar Patel
Turbidity	AT	5699705	N/A	2018/08/27	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5720078	N/A		Tamsin Denison

Maxxam ID: HOI316
Sample ID: 2018-0087
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5699763	N/A	2018/08/27	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5699465	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5700795	N/A	2018/08/28	Deonarine Ramnarine
Conductivity	AT	5699765	N/A	2018/08/27	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5702435	N/A	2018/08/28	Xuanhong Qiu
Total Cyanide	SKAL/CN	5702429	2018/08/28	2018/08/28	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5699778	N/A	2018/08/27	Anastassia Hamanov
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5700207	N/A	2018/08/27	Abdi Mohamud
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5703943	2018/08/28	2018/08/29	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5704586	2018/08/29	2018/08/29	Ron Morrison
Mercury (low level)	CV/AA	5704588	2018/08/29	2018/08/29	Ron Morrison
Total Ammonia-N	LACH/NH4	5701332	N/A	2018/08/28	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5700892	N/A	2018/08/28	Charles Opoku-Ware

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOI316
Sample ID: 2018-0087
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Oil and Grease	BAL	5699974	2018/08/26	2018/08/27	Francis Afonso
pH	AT	5699766	N/A	2018/08/27	Surinder Rai
Orthophosphate	KONE	5700819	N/A	2018/08/28	Alina Dobreanu
Radium-226 Low Level	AS	5702810	N/A	2018/09/05	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5700816	N/A	2018/08/28	Alina Dobreanu
Total Dissolved Solids	BAL	5703963	2018/08/28	2018/08/28	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5701345	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5701256	N/A	2018/08/28	Anastassia Hamanov
Total Phosphorus (Colourimetric)	LACH/P	5702198	2018/08/28	2018/08/28	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5702691	2018/08/28	2018/08/28	Jingwei (Alvin) Shi
Turbidity	AT	5699705	N/A	2018/08/27	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5720078	N/A		Tamsin Denison

Maxxam ID: HOI316 Dup
Sample ID: 2018-0087
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5699778	N/A	2018/08/27	Anastassia Hamanov
Total Organic Carbon (TOC)	TOCV/NDIR	5701256	N/A	2018/08/28	Anastassia Hamanov

Maxxam ID: HOI317
Sample ID: 2018-0088
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5699763	N/A	2018/08/27	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5699465	N/A	2018/08/28	Automated Statchk
Chloride by Automated Colourimetry	KONE	5700795	N/A	2018/08/28	Deonarine Ramnarine
Conductivity	AT	5699765	N/A	2018/08/27	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5702435	N/A	2018/08/28	Xuanhong Qiu
Total Cyanide	SKAL/CN	5702429	2018/08/28	2018/08/28	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5699778	N/A	2018/08/27	Anastassia Hamanov
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5700207	N/A	2018/08/27	Abdi Mohamud
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5703943	2018/08/28	2018/08/29	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5704586	2018/08/29	2018/08/29	Ron Morrison
Mercury (low level)	CV/AA	5704588	2018/08/29	2018/08/29	Ron Morrison
Total Ammonia-N	LACH/NH4	5701332	N/A	2018/08/28	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5700892	N/A	2018/08/28	Charles Opoku-Ware
Total Oil and Grease	BAL	5699974	2018/08/26	2018/08/27	Francis Afonso
pH	AT	5699766	N/A	2018/08/27	Surinder Rai
Orthophosphate	KONE	5700819	N/A	2018/08/28	Alina Dobreanu
Radium-226 Low Level	AS	5702810	N/A	2018/09/05	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5700816	N/A	2018/08/28	Alina Dobreanu

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: HOI317
Sample ID: 2018-0088
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids	BAL	5703176	2018/08/28	2018/08/29	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5701345	2018/08/27	2018/08/28	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5702710	N/A	2018/08/28	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5702198	2018/08/28	2018/08/28	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5702706	2018/08/28	2018/08/28	Niket Kumar Patel
Turbidity	AT	5699705	N/A	2018/08/27	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5720078	N/A		Tamsin Denison

Maxxam ID: HOI317 Dup
Sample ID: 2018-0088
Matrix: Water

Collected: 2018/08/20
Shipped:
Received: 2018/08/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Free (WAD) Cyanide	SKAL/CN	5702435	N/A	2018/08/28	Xuanhong Qiu
Total Cyanide	SKAL/CN	5702429	2018/08/28	2018/08/28	Xuanhong Qiu
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5703943	2018/08/28	2018/08/29	Zhiyue (Frank) Zhu
Dissolved Mercury (low level)	CV/AA	5704586	2018/08/29	2018/08/29	Ron Morrison

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	17.3°C
Package 2	11.3°C

Revised Report (2018/10/02): Client sample ID changed as per client request, and GPS coordinates included.

Sample HOI317 [2018-0088] : TOC< DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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A Bureau Veritas Group Company

Maxxam Job #: B8L8915
Report Date: 2018/10/12

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5700207	1,4-Difluorobenzene	2018/08/27	97	70 - 130	99	70 - 130	98	%				
5700207	4-Bromofluorobenzene	2018/08/27	100	70 - 130	100	70 - 130	99	%				
5700207	D10-Ethylbenzene	2018/08/27	94	70 - 130	100	70 - 130	94	%				
5700207	D4-1,2-Dichloroethane	2018/08/27	101	70 - 130	102	70 - 130	97	%				
5703943	o-Terphenyl	2018/08/29	96	60 - 130	97	60 - 130	93	%				
5699436	Dissolved Organic Carbon	2018/08/27	95	80 - 120	99	80 - 120	<0.50	mg/L	0.014	20		
5699705	Turbidity	2018/08/27			101	85 - 115	<0.1	NTU	4.3	20		
5699763	Alkalinity (Total as CaCO3)	2018/08/27			97	85 - 115	<1.0	mg/L	0.49	20		
5699765	Conductivity	2018/08/27			101	85 - 115	<1.0	umho/cm	0.32	25		
5699766	pH	2018/08/27			101	98 - 103			0.47	N/A		
5699778	Dissolved Organic Carbon	2018/08/27	94	80 - 120	97	80 - 120	<0.50	mg/L	NC	20		
5699974	Total Oil & Grease	2018/08/27			94	85 - 115	<0.50	mg/L	3.9	25		
5700207	Benzene	2018/08/27	95	70 - 130	95	70 - 130	<0.20	ug/L	NC	30		
5700207	Ethylbenzene	2018/08/27	90	70 - 130	92	70 - 130	<0.20	ug/L	NC	30		
5700207	F1 (C6-C10) - BTEX	2018/08/27					<25	ug/L	NC	30		
5700207	F1 (C6-C10)	2018/08/27	97	70 - 130	89	70 - 130	<25	ug/L	NC	30		
5700207	o-Xylene	2018/08/27	88	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5700207	p+m-Xylene	2018/08/27	89	70 - 130	91	70 - 130	<0.40	ug/L	NC	30		
5700207	Toluene	2018/08/27	90	70 - 130	91	70 - 130	<0.20	ug/L	0.56	30		
5700207	Total Xylenes	2018/08/27					<0.40	ug/L	NC	30		
5700795	Dissolved Chloride (Cl-)	2018/08/28	108	80 - 120	102	80 - 120	<1.0	mg/L	0.031	20		
5700816	Dissolved Sulphate (SO4)	2018/08/28	107	75 - 125	104	80 - 120	<1.0	mg/L	NC	20		
5700819	Orthophosphate (P)	2018/08/28	104	75 - 125	100	80 - 120	<0.010	mg/L	NC	25		
5700892	Nitrate (N)	2018/08/28	98	80 - 120	96	80 - 120	<0.10	mg/L	4.9	20		
5700892	Nitrite (N)	2018/08/28	102	80 - 120	99	80 - 120	<0.010	mg/L				
5701256	Total Organic Carbon (TOC)	2018/08/28	95	80 - 120	98	80 - 120	<0.50	mg/L	NC	20		
5701332	Total Ammonia-N	2018/08/28	105	75 - 125	101	80 - 120	<0.050	mg/L	12	20		
5701345	Total Kjeldahl Nitrogen (TKN)	2018/08/28	96	80 - 120	94	80 - 120	<0.10	mg/L	18	20	91	80 - 120
5702198	Total Phosphorus	2018/08/28	97	80 - 120	95	80 - 120	<0.020	mg/L	7.8	20	98	N/A
5702429	Total Cyanide (CN)	2018/08/28	103	80 - 120	102	80 - 120	<0.0050	mg/L	NC	20		

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

QUALITY ASSURANCE REPORT(CONT'D)

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5702435	WAD Cyanide (Free)	2018/08/28	107	80 - 120	105	80 - 120	<0.0010	mg/L	NC	20		
5702691	Total Suspended Solids	2018/08/28					<1	mg/L	NC	25	101	85 - 115
5702706	Total Suspended Solids	2018/08/28					<1	mg/L	NC	25	97	85 - 115
5702710	Total Organic Carbon (TOC)	2018/08/28	95	80 - 120	96	80 - 120	<0.50	mg/L	0.88	20		
5702810	Radium-226	2018/09/05			96	85 - 115	<0.0050	Bq/L	0	N/A		
5703176	Total Dissolved Solids	2018/08/29					<10	mg/L	7.8	25	98	90 - 110
5703943	F2 (C10-C16 Hydrocarbons)	2018/08/29	103	50 - 130	103	60 - 130	<100	ug/L	NC	30		
5703943	F3 (C16-C34 Hydrocarbons)	2018/08/29	99	50 - 130	99	60 - 130	<200	ug/L	NC	30		
5703943	F4 (C34-C50 Hydrocarbons)	2018/08/29	92	50 - 130	92	60 - 130	<200	ug/L	NC	30		
5703963	Total Dissolved Solids	2018/08/28					<10	mg/L	4.6	25	100	90 - 110
5704586	Dissolved Mercury (Hg)	2018/08/29	100	75 - 125	99	80 - 120	<0.00001	mg/L	NC	20		
5704588	Mercury (Hg)	2018/08/29	99	75 - 125	98	80 - 120	<0.00001	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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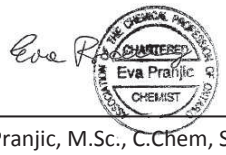
Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist



Robert Allen, Scientific Specialist

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Maxxam Job #: B8L8915
Report Date: 2018/10/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: PS

Exceedence Summary Table – Metal Mining Effluent Reg

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Your P.O. #: B8L8915
Site#: 63*01'44.6'' 92*09'14.6''
Site Location: MELIADINE
Your C.O.C. #: B8L8915-M060-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/05
Report #: R2613944
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B872797
Received: 2018/08/28, 09:52

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	3	N/A	2018/09/05	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your P.O. #: B8L8915
Site#: 63*01'44.6'' 92*09'14.6''
Site Location: MELIADINE
Your C.O.C. #: B8L8915-M060-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/05
Report #: R2613944
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B872797
Received: 2018/08/28, 09:52

Encryption Key



Maxxam
05 Sep 2018 13:00:10

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077
==========
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Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B872797
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UE1964	UE1965	UE1966	UE1966		
Sampling Date		2018/08/20 12:35	2018/08/20 12:50	2018/08/20 01:10	2018/08/20 01:10		
COC Number		B8L8915-M060-01-01	B8L8915-M060-01-01	B8L8915-M060-01-01	B8L8915-M060-01-01		
	UNITS	MEL-13 (WL AND EEM)	2018-0087	2018-0088	2018-0088 Lab-Dup	RDL	QC Batch
Misc. Inorganics							
Reactive Silica	mg/L	0.33	<0.050	0.33	0.34	0.050	9129646

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B872797
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

TEST SUMMARY

Maxxam ID: UE1964
Sample ID: MEL-13 (WL AND EEM)
Matrix: Water

Collected: 2018/08/20
Shipped: 2018/08/27
Received: 2018/08/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129646	N/A	2018/09/05	Zafar Iqbal

Maxxam ID: UE1965
Sample ID: 2018-0087
Matrix: Water

Collected: 2018/08/20
Shipped: 2018/08/27
Received: 2018/08/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129646	N/A	2018/09/05	Zafar Iqbal

Maxxam ID: UE1966
Sample ID: 2018-0088
Matrix: Water

Collected: 2018/08/20
Shipped: 2018/08/27
Received: 2018/08/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129646	N/A	2018/09/05	Zafar Iqbal

Maxxam ID: UE1966 Dup
Sample ID: 2018-0088
Matrix: Water

Collected: 2018/08/20
Shipped: 2018/08/27
Received: 2018/08/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129646	N/A	2018/09/05	Zafar Iqbal

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B872797
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B872797
Report Date: 2018/09/05

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9129646	Reactive Silica	2018/09/05	105	80 - 120	102	80 - 120	<0.050	mg/L	3.5	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

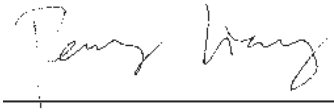
Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B872797
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Your P.O. #: B8L8915
Site#: 63°01'44.6'' 92°09'14.6''
Site Location: MELIADINE
Your C.O.C. #: B8L8915-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/10/03
Report #: R2629276
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B873034
Received: 2018/08/28, 09:05

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	3	N/A	2018/09/04	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	3	N/A	2018/08/30	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	3	N/A	2018/08/30	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	3	2018/08/30	2018/09/04	BBY7SOP-00003,	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	3	N/A	2018/08/29	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8L8915
Site#: 63°01'44.6'' 92°09'14.6''
Site Location: MELIADINE
Your C.O.C. #: B8L8915-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/10/03
Report #: R2629276
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B873034
Received: 2018/08/28, 09:05

Encryption Key



Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B873034
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UE3700	UE3701	UE3702		
Sampling Date		2018/08/20 12:35	2018/08/20 12:50	2018/08/20 01:10		
COC Number		B8L8915-M058-01-01	B8L8915-M058-01-01	B8L8915-M058-01-01		
	UNITS	MEL-13 (WL and EEM)	2018-0087	2018-0088	RDL	QC Batch
Calculated Parameters						
Filter and HNO3 Preservation	N/A	FIELD	FIELD	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	24.8	<0.50	24.4	0.50	9121426
Total Hardness (CaCO3)	mg/L	25.3	<0.50	25.4	0.50	9121424

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B873034
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UE3700	UE3701	UE3702		
Sampling Date		2018/08/20 12:35	2018/08/20 12:50	2018/08/20 01:10		
COC Number		B8L8915-M058-01-01	B8L8915-M058-01-01	B8L8915-M058-01-01		
	UNITS	MEL-13 (WL and EEM)	2018-0087	2018-0088	RDL	QC Batch
Dissolved Metals by ICPMS						
Dissolved Aluminum (Al)	mg/L	0.0077	0.0036	0.0064	0.0030	9122743
Dissolved Antimony (Sb)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	9122743
Dissolved Arsenic (As)	mg/L	0.00040	<0.00010	0.00038	0.00010	9122743
Dissolved Barium (Ba)	mg/L	0.0078	<0.0010	0.0077	0.0010	9122743
Dissolved Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9122743
Dissolved Boron (B)	mg/L	<0.050	<0.050	<0.050	0.050	9122743
Dissolved Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9122743
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9122743
Dissolved Copper (Cu)	mg/L	0.00076	<0.00020	0.00071	0.00020	9122743
Dissolved Iron (Fe)	mg/L	0.0113	<0.0050	0.0062	0.0050	9122743
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	9122743
Dissolved Lithium (Li)	mg/L	<0.0020	<0.0020	<0.0020	0.0020	9122743
Dissolved Manganese (Mn)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9122743
Dissolved Molybdenum (Mo)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9122743
Dissolved Nickel (Ni)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9122743
Dissolved Selenium (Se)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9122743
Dissolved Silver (Ag)	mg/L	<0.000020	<0.000020	<0.000020	0.000020	9122743
Dissolved Strontium (Sr)	mg/L	0.0512	<0.0010	0.0531	0.0010	9122743
Dissolved Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9122743
Dissolved Tin (Sn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9122743
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9122743
Dissolved Uranium (U)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9122743
Dissolved Vanadium (V)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9122743
Dissolved Zinc (Zn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9122743
Dissolved Calcium (Ca)	mg/L	7.67	0.051	7.52	0.050	9122743
Dissolved Magnesium (Mg)	mg/L	1.37	<0.050	1.37	0.050	9122743
Dissolved Potassium (K)	mg/L	0.948	<0.050	0.923	0.050	9122743
Dissolved Sodium (Na)	mg/L	5.67	<0.050	5.73	0.050	9122743
Total Metals by ICPMS						
Total Aluminum (Al)	mg/L	0.0118	0.0038	0.0114	0.0030	9124684
RDL = Reportable Detection Limit						

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Maxxam Job #: B873034
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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UE3700	UE3701	UE3702		
Sampling Date		2018/08/20 12:35	2018/08/20 12:50	2018/08/20 01:10		
COC Number		B8L8915-M058-01-01	B8L8915-M058-01-01	B8L8915-M058-01-01		
	UNITS	MEL-13 (WL and EEM)	2018-0087	2018-0088	RDL	QC Batch
Total Antimony (Sb)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	9124684
Total Arsenic (As)	mg/L	0.00042	<0.00010	0.00044	0.00010	9124684
Total Barium (Ba)	mg/L	0.0082	<0.0010	0.0083	0.0010	9124684
Total Beryllium (Be)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9124684
Total Boron (B)	mg/L	<0.050	<0.050	<0.050	0.050	9124684
Total Cadmium (Cd)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9124684
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9124684
Total Copper (Cu)	mg/L	0.00079	<0.00050	0.00079	0.00050	9124684
Total Iron (Fe)	mg/L	0.029	<0.010	0.024	0.010	9124684
Total Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	9124684
Total Lithium (Li)	mg/L	<0.0020	<0.0020	<0.0020	0.0020	9124684
Total Manganese (Mn)	mg/L	0.0048	<0.0010	0.0048	0.0010	9124684
Total Molybdenum (Mo)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9124684
Total Nickel (Ni)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9124684
Total Selenium (Se)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9124684
Total Silver (Ag)	mg/L	<0.000020	<0.000020	<0.000020	0.000020	9124684
Total Strontium (Sr)	mg/L	0.0494	<0.0010	0.0506	0.0010	9124684
Total Thallium (Tl)	mg/L	<0.000010	<0.000010	<0.000010	0.000010	9124684
Total Tin (Sn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9124684
Total Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9124684
Total Uranium (U)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	9124684
Total Vanadium (V)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9124684
Total Zinc (Zn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	9124684
Total Calcium (Ca)	mg/L	7.80	<0.050	7.73	0.050	9124684
Total Magnesium (Mg)	mg/L	1.43	<0.050	1.47	0.050	9124684
Total Potassium (K)	mg/L	0.949	<0.050	0.973	0.050	9124684
Total Sodium (Na)	mg/L	5.59	<0.050	5.72	0.050	9124684
RDL = Reportable Detection Limit						

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Site Location: MELIADINE
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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	-0.7°C

Revised Report (2018/10/03): Client sample ID changed as per client request, and GPS coordinates included.

Sample UE3700 [MEL-13 (WL and EEM)] : GPS coordinates: 63°01'44.6'' 92°09'14.6''

Results relate only to the items tested.

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Agnico-Eagle
Site Location: MELIADINE
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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9122743	MHM	Matrix Spike	Dissolved Aluminum (Al)	2018/08/30		96	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/30		102	%	80 - 120
			Dissolved Arsenic (As)	2018/08/30		106	%	80 - 120
			Dissolved Barium (Ba)	2018/08/30		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/30		101	%	80 - 120
			Dissolved Boron (B)	2018/08/30		104	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/30		101	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/30		98	%	80 - 120
			Dissolved Copper (Cu)	2018/08/30		91	%	80 - 120
			Dissolved Iron (Fe)	2018/08/30		96	%	80 - 120
			Dissolved Lead (Pb)	2018/08/30		96	%	80 - 120
			Dissolved Lithium (Li)	2018/08/30		95	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/30		NC	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/30		105	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/30		95	%	80 - 120
			Dissolved Selenium (Se)	2018/08/30		103	%	80 - 120
			Dissolved Silver (Ag)	2018/08/30		98	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/30		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/30		94	%	80 - 120
			Dissolved Tin (Sn)	2018/08/30		99	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/30		103	%	80 - 120
			Dissolved Uranium (U)	2018/08/30		103	%	80 - 120
			Dissolved Vanadium (V)	2018/08/30		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/30		103	%	80 - 120
			Dissolved Calcium (Ca)	2018/08/30		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/30		NC	%	80 - 120
			Dissolved Potassium (K)	2018/08/30		96	%	80 - 120
			Dissolved Sodium (Na)	2018/08/30		NC	%	80 - 120
9122743	MHM	Spiked Blank	Dissolved Aluminum (Al)	2018/08/30		106	%	80 - 120
			Dissolved Antimony (Sb)	2018/08/30		104	%	80 - 120
			Dissolved Arsenic (As)	2018/08/30		110	%	80 - 120
			Dissolved Barium (Ba)	2018/08/30		102	%	80 - 120
			Dissolved Beryllium (Be)	2018/08/30		109	%	80 - 120
			Dissolved Boron (B)	2018/08/30		111	%	80 - 120
			Dissolved Cadmium (Cd)	2018/08/30		107	%	80 - 120
			Dissolved Chromium (Cr)	2018/08/30		104	%	80 - 120
			Dissolved Copper (Cu)	2018/08/30		102	%	80 - 120
			Dissolved Iron (Fe)	2018/08/30		109	%	80 - 120
			Dissolved Lead (Pb)	2018/08/30		103	%	80 - 120
			Dissolved Lithium (Li)	2018/08/30		103	%	80 - 120
			Dissolved Manganese (Mn)	2018/08/30		105	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/08/30		107	%	80 - 120
			Dissolved Nickel (Ni)	2018/08/30		102	%	80 - 120
			Dissolved Selenium (Se)	2018/08/30		108	%	80 - 120
			Dissolved Silver (Ag)	2018/08/30		103	%	80 - 120
			Dissolved Strontium (Sr)	2018/08/30		111	%	80 - 120
			Dissolved Thallium (Tl)	2018/08/30		102	%	80 - 120
			Dissolved Tin (Sn)	2018/08/30		101	%	80 - 120
			Dissolved Titanium (Ti)	2018/08/30		107	%	80 - 120
			Dissolved Uranium (U)	2018/08/30		108	%	80 - 120
			Dissolved Vanadium (V)	2018/08/30		105	%	80 - 120
			Dissolved Zinc (Zn)	2018/08/30		108	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Calcium (Ca)	2018/08/30		105	%	80 - 120
			Dissolved Magnesium (Mg)	2018/08/30		102	%	80 - 120
			Dissolved Potassium (K)	2018/08/30		102	%	80 - 120
			Dissolved Sodium (Na)	2018/08/30		105	%	80 - 120
9122743	MHM	Method Blank	Dissolved Aluminum (Al)	2018/08/30	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/08/30	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/08/30	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/08/30	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/08/30	<0.00010		mg/L	
			Dissolved Boron (B)	2018/08/30	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/08/30	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/08/30	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/08/30	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/08/30	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/08/30	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/08/30	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/08/30	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/08/30	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/08/30	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/08/30	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/08/30	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/08/30	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/08/30	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/08/30	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/08/30	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/08/30	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/08/30	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/08/30	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/08/30	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/08/30	<0.050		mg/L	
			Dissolved Potassium (K)	2018/08/30	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/08/30	<0.050		mg/L	
9122743	MHM	RPD	Dissolved Aluminum (Al)	2018/08/30	1.7		%	20
			Dissolved Antimony (Sb)	2018/08/30	NC		%	20
			Dissolved Arsenic (As)	2018/08/30	1.3		%	20
			Dissolved Barium (Ba)	2018/08/30	0.13		%	20
			Dissolved Beryllium (Be)	2018/08/30	NC		%	20
			Dissolved Boron (B)	2018/08/30	2.3		%	20
			Dissolved Cadmium (Cd)	2018/08/30	0		%	20
			Dissolved Chromium (Cr)	2018/08/30	NC		%	20
			Dissolved Copper (Cu)	2018/08/30	1.1		%	20
			Dissolved Iron (Fe)	2018/08/30	NC		%	20
			Dissolved Lead (Pb)	2018/08/30	NC		%	20
			Dissolved Lithium (Li)	2018/08/30	0.58		%	20
			Dissolved Manganese (Mn)	2018/08/30	0.98		%	20
			Dissolved Molybdenum (Mo)	2018/08/30	1.4		%	20
			Dissolved Nickel (Ni)	2018/08/30	2.5		%	20
			Dissolved Selenium (Se)	2018/08/30	9.7		%	20
			Dissolved Silver (Ag)	2018/08/30	NC		%	20
			Dissolved Strontium (Sr)	2018/08/30	0.31		%	20
			Dissolved Thallium (Tl)	2018/08/30	7.7		%	20
			Dissolved Tin (Sn)	2018/08/30	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Titanium (Ti)	2018/08/30	NC		%	20
			Dissolved Uranium (U)	2018/08/30	0.095		%	20
			Dissolved Vanadium (V)	2018/08/30	NC		%	20
			Dissolved Zinc (Zn)	2018/08/30	NC		%	20
9124684	JLP	Matrix Spike	Total Aluminum (Al)	2018/09/04		116	%	80 - 120
			Total Antimony (Sb)	2018/09/04		105	%	80 - 120
			Total Arsenic (As)	2018/09/04		111	%	80 - 120
			Total Barium (Ba)	2018/09/04		105	%	80 - 120
			Total Beryllium (Be)	2018/09/04		101	%	80 - 120
			Total Boron (B)	2018/09/04		91	%	80 - 120
			Total Cadmium (Cd)	2018/09/04		103	%	80 - 120
			Total Chromium (Cr)	2018/09/04		101	%	80 - 120
			Total Copper (Cu)	2018/09/04		96	%	80 - 120
			Total Iron (Fe)	2018/09/04		107	%	80 - 120
			Total Lead (Pb)	2018/09/04		102	%	80 - 120
			Total Lithium (Li)	2018/09/04		95	%	80 - 120
			Total Manganese (Mn)	2018/09/04		104	%	80 - 120
			Total Molybdenum (Mo)	2018/09/04		110	%	80 - 120
			Total Nickel (Ni)	2018/09/04		96	%	80 - 120
			Total Selenium (Se)	2018/09/04		108	%	80 - 120
			Total Silver (Ag)	2018/09/04		101	%	80 - 120
			Total Strontium (Sr)	2018/09/04		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/04		97	%	80 - 120
			Total Tin (Sn)	2018/09/04		101	%	80 - 120
			Total Titanium (Ti)	2018/09/04		103	%	80 - 120
			Total Uranium (U)	2018/09/04		106	%	80 - 120
			Total Vanadium (V)	2018/09/04		105	%	80 - 120
			Total Zinc (Zn)	2018/09/04		103	%	80 - 120
			Total Calcium (Ca)	2018/09/04		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/04		NC	%	80 - 120
			Total Potassium (K)	2018/09/04		101	%	80 - 120
			Total Sodium (Na)	2018/09/04		NC	%	80 - 120
9124684	JLP	Spiked Blank	Total Aluminum (Al)	2018/09/04		101	%	80 - 120
			Total Antimony (Sb)	2018/09/04		100	%	80 - 120
			Total Arsenic (As)	2018/09/04		105	%	80 - 120
			Total Barium (Ba)	2018/09/04		101	%	80 - 120
			Total Beryllium (Be)	2018/09/04		98	%	80 - 120
			Total Boron (B)	2018/09/04		92	%	80 - 120
			Total Cadmium (Cd)	2018/09/04		100	%	80 - 120
			Total Chromium (Cr)	2018/09/04		101	%	80 - 120
			Total Copper (Cu)	2018/09/04		98	%	80 - 120
			Total Iron (Fe)	2018/09/04		105	%	80 - 120
			Total Lead (Pb)	2018/09/04		101	%	80 - 120
			Total Lithium (Li)	2018/09/04		95	%	80 - 120
			Total Manganese (Mn)	2018/09/04		100	%	80 - 120
			Total Molybdenum (Mo)	2018/09/04		102	%	80 - 120
			Total Nickel (Ni)	2018/09/04		99	%	80 - 120
			Total Selenium (Se)	2018/09/04		107	%	80 - 120
			Total Silver (Ag)	2018/09/04		99	%	80 - 120
			Total Strontium (Sr)	2018/09/04		101	%	80 - 120
			Total Thallium (Tl)	2018/09/04		94	%	80 - 120
			Total Tin (Sn)	2018/09/04		100	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B873034
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Titanium (Ti)	2018/09/04		100	%	80 - 120
			Total Uranium (U)	2018/09/04		101	%	80 - 120
			Total Vanadium (V)	2018/09/04		102	%	80 - 120
			Total Zinc (Zn)	2018/09/04		102	%	80 - 120
			Total Calcium (Ca)	2018/09/04		102	%	80 - 120
			Total Magnesium (Mg)	2018/09/04		98	%	80 - 120
			Total Potassium (K)	2018/09/04		99	%	80 - 120
			Total Sodium (Na)	2018/09/04		101	%	80 - 120
9124684	JLP	Method Blank	Total Aluminum (Al)	2018/09/04	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/04	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/04	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/04	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/04	<0.00010		mg/L	
			Total Boron (B)	2018/09/04	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/04	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/04	<0.0010		mg/L	
			Total Copper (Cu)	2018/09/04	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/04	<0.010		mg/L	
			Total Lead (Pb)	2018/09/04	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/04	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/04	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/04	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/04	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/04	<0.00010		mg/L	
			Total Silver (Ag)	2018/09/04	<0.000020		mg/L	
			Total Strontium (Sr)	2018/09/04	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/04	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/04	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/04	<0.0050		mg/L	
			Total Uranium (U)	2018/09/04	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/04	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/04	<0.0050		mg/L	
			Total Calcium (Ca)	2018/09/04	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/04	<0.050		mg/L	
			Total Potassium (K)	2018/09/04	<0.050		mg/L	
			Total Sodium (Na)	2018/09/04	<0.050		mg/L	
9124684	JLP	RPD	Total Aluminum (Al)	2018/09/04	18		%	20
			Total Antimony (Sb)	2018/09/04	9.1		%	20
			Total Arsenic (As)	2018/09/04	5.4		%	20
			Total Barium (Ba)	2018/09/04	7.3		%	20
			Total Beryllium (Be)	2018/09/04	NC		%	20
			Total Boron (B)	2018/09/04	NC		%	20
			Total Cadmium (Cd)	2018/09/04	11		%	20
			Total Chromium (Cr)	2018/09/04	NC		%	20
			Total Copper (Cu)	2018/09/04	4.0		%	20
			Total Iron (Fe)	2018/09/04	5.8		%	20
			Total Lead (Pb)	2018/09/04	11		%	20
			Total Lithium (Li)	2018/09/04	NC		%	20
			Total Manganese (Mn)	2018/09/04	4.7		%	20
			Total Molybdenum (Mo)	2018/09/04	5.6		%	20
			Total Nickel (Ni)	2018/09/04	0.13		%	20
			Total Selenium (Se)	2018/09/04	NC		%	20

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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Silver (Ag)	2018/09/04	NC		%	20
			Total Strontium (Sr)	2018/09/04	5.7		%	20
			Total Thallium (Tl)	2018/09/04	NC		%	20
			Total Tin (Sn)	2018/09/04	NC		%	20
			Total Titanium (Ti)	2018/09/04	NC		%	20
			Total Uranium (U)	2018/09/04	NC		%	20
			Total Vanadium (V)	2018/09/04	NC		%	20
			Total Zinc (Zn)	2018/09/04	7.7		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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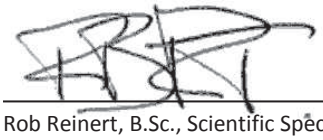
Maxxam Job #: B873034
Report Date: 2018/10/03

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8L8915
Sampler Initials: PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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Maxxam
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Your P.O. #: OL-664695
Site#: 63°02'15.5" 92°13'06.3"
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532382
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8M4749
Received: 2018/08/29, 12:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity (1)	1	N/A	2018/08/31	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2018/09/04	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry (1)	1	N/A	2018/09/04	CAM SOP-00463	EPA 325.2 m
Conductivity (1)	1	N/A	2018/08/31	CAM SOP-00414	SM 23 2510 m
Free (WAD) Cyanide (1)	1	N/A	2018/08/31	CAM SOP-00457	OMOE E3015 m
Total Cyanide (1)	1	2018/08/31	2018/08/31	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1, 4)	1	N/A	2018/08/31	CAM SOP-00446	SM 23 5310 B m
Dissolved Oxygen (1)	1	2018/08/30	2018/08/30	CAM SOP-00427	SM 23 4500 O G m
Petroleum Hydro. CCME F1 & BTEX in Water (1)	1	N/A	2018/09/01	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	1	2018/09/04	2018/09/05	CAM SOP-00316	CCME PHC-CWS m
Dissolved Mercury (low level) (1)	1	2018/08/31	2018/09/03	CAM SOP-00453	EPA 7470 m
Mercury (low level) (1)	1	2018/08/31	2018/09/03	CAM SOP-00453	EPA 7470 m
Total Ammonia-N (1)	1	N/A	2018/09/05	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	1	N/A	2018/08/31	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH (1)	1	N/A	2018/08/31	CAM SOP-00413	SM 4500H+ B m
Orthophosphate (1)	1	N/A	2018/09/04	CAM SOP-00461	EPA 365.1 m
Radium-226 Low Level (2, 7)	1	N/A	2018/09/10	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry
Sulphate by Automated Colourimetry (1)	1	N/A	2018/09/04	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	1	2018/09/04	2018/09/04	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	1	2018/09/01	2018/09/05	CAM SOP-00938	OMOE E3516 m
Total Organic Carbon (TOC) (1, 8)	1	N/A	2018/08/31	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric) (1)	1	2018/08/31	2018/09/04	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids (1)	1	2018/09/01	2018/09/04	CAM SOP-00428	SM 23 2540D m
Turbidity (1)	1	N/A	2018/08/31	CAM SOP-00417	SM 23 2130 B m
Hardness (calculated as CaCO3) (3)	1	N/A	N/A	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using

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Your P.O. #: OL-664695
Site#: 63°02'15.5" 92°13'06.3"
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532382
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8M4749
Received: 2018/08/29, 12:00

accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Analytics Mississauga
(2) This test was performed by Maxxam Analytics Kitimat
(3) This test was performed by Campo to Burnaby Subcontract
(4) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(5) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(6) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(7) Radium-226 results have not been corrected for blanks.
(8) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key



Alisha Williamson
Project Manager
19 Dec 2018 15:42:19

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alisha Williamson, Project Manager
Email: AWilliamson@maxxam.ca
Phone# (613) 274-0573

==========

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Maxxam Job #: B8M4749
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

CCME PETROLEUM HYDROCARBONS IN WATER (WATER)

Maxxam ID		HPR218		
Sampling Date		2018/08/26		
COC Number		na		
	UNITS	MEL-14	RDL	QC Batch
BTEX & F1 Hydrocarbons				
Benzene	ug/L	<0.20	0.20	5710040
Toluene	ug/L	<0.20	0.20	5710040
Ethylbenzene	ug/L	<0.20	0.20	5710040
o-Xylene	ug/L	<0.20	0.20	5710040
p+m-Xylene	ug/L	<0.40	0.40	5710040
Total Xylenes	ug/L	<0.40	0.40	5710040
F1 (C6-C10)	ug/L	<25	25	5710040
F1 (C6-C10) - BTEX	ug/L	<25	25	5710040
F2-F4 Hydrocarbons				
F2 (C10-C16 Hydrocarbons)	ug/L	<100	100	5712356
F3 (C16-C34 Hydrocarbons)	ug/L	<200	200	5712356
F4 (C34-C50 Hydrocarbons)	ug/L	<200	200	5712356
Reached Baseline at C50	ug/L	Yes		5712356
Surrogate Recovery (%)				
1,4-Difluorobenzene	%	98		5710040
4-Bromofluorobenzene	%	109		5710040
D10-Ethylbenzene	%	99		5710040
D4-1,2-Dichloroethane	%	90		5710040
o-Terphenyl	%	97		5712356

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8M4749
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

RESULTS OF ANALYSES OF WATER

Maxxam ID		HPR218			HPR218		
Sampling Date		2018/08/26			2018/08/26		
COC Number		na			na		
	UNITS	MEL-14	RDL	QC Batch	MEL-14 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	6.2	1.0	5707057			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	5707057			
Inorganics							
Total Ammonia-N	mg/L	4.1	0.050	5711486			
Conductivity	umho/cm	1500	1.0	5708280			
Total Dissolved Solids	mg/L	870	10	5712659			
Total Kjeldahl Nitrogen (TKN)	mg/L	3.6	0.50	5711459			
Dissolved Organic Carbon	mg/L	<0.50	0.50	5707562			
Total Organic Carbon (TOC)	mg/L	<0.50	0.50	5710189			
Orthophosphate (P)	mg/L	<0.010	0.010	5710261			
Dissolved Oxygen	mg/L	10.2		5708661	10.2		5708661
pH	pH	6.80		5708282			
Total Phosphorus	mg/L	0.021	0.020	5709959			
Total Suspended Solids	mg/L	<1	1	5711526			
Dissolved Sulphate (SO4)	mg/L	7.2	1.0	5710257			
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5709305			
Turbidity	NTU	<0.1	0.1	5708298	<0.1	0.1	5708298
WAD Cyanide (Free)	mg/L	<0.0010	0.0010	5709300			
Alkalinity (Total as CaCO3)	mg/L	6.3	1.0	5708268			
Dissolved Chloride (Cl-)	mg/L	400	5.0	5710254			
Nitrite (N)	mg/L	0.191	0.010	5708344			
Nitrate (N)	mg/L	15.3	0.10	5708344			
Nitrate + Nitrite (N)	mg/L	15.5	0.10	5708344			
RADIONUCLIDE							
Radium-226	Bq/L	<0.0050	0.0050	5714454			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8M4749
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HPR218		
Sampling Date		2018/08/26		
COC Number		na		
	UNITS	**MEL-14**	**RDL**	**QC Batch**
Metals				
Mercury (Hg)	mg/L	<0.00001	0.00001	5709006
Dissolved Mercury (Hg)	mg/L	<0.00001	0.00001	5709004

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8M4749
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: HPR218
Sample ID: MEL-14
Matrix: Water

Collected: 2018/08/26
Shipped:
Received: 2018/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5708268	N/A	2018/08/31	Neil Dassanayake
Carbonate, Bicarbonate and Hydroxide	CALC	5707057	N/A	2018/09/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	5710254	N/A	2018/09/04	Deonarine Ramnarine
Conductivity	AT	5708280	N/A	2018/08/31	Neil Dassanayake
Free (WAD) Cyanide	SKAL/CN	5709300	N/A	2018/08/31	Xuanhong Qiu
Total Cyanide	SKAL/CN	5709305	2018/08/31	2018/08/31	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5707562	N/A	2018/08/31	Nimarta Singh
Dissolved Oxygen	DO	5708661	2018/08/30	2018/08/30	Frank Zhang
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5710040	N/A	2018/09/01	Lincoln Ramdahin
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5712356	2018/09/04	2018/09/05	(Kent) Maolin Li
Dissolved Mercury (low level)	CV/AA	5709004	2018/08/31	2018/09/03	Ron Morrison
Mercury (low level)	CV/AA	5709006	2018/08/31	2018/09/03	Ron Morrison
Total Ammonia-N	LACH/NH4	5711486	N/A	2018/09/05	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5708344	N/A	2018/08/31	Chandra Nandlal
pH	AT	5708282	N/A	2018/08/31	Neil Dassanayake
Orthophosphate	KONE	5710261	N/A	2018/09/04	Alina Dobreanu
Radium-226 Low Level	AS	5714454	N/A	2018/09/10	Fariba Kashavarz
Sulphate by Automated Colourimetry	KONE	5710257	N/A	2018/09/04	Alina Dobreanu
Total Dissolved Solids	BAL	5712659	2018/09/04	2018/09/04	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5711459	2018/09/01	2018/09/05	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5710189	N/A	2018/08/31	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5709959	2018/08/31	2018/09/04	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5711526	2018/09/01	2018/09/04	Mandeep Kaur
Turbidity	AT	5708298	N/A	2018/08/31	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5739311	N/A		Lims Auto Schedule Runner

Maxxam ID: HPR218 Dup
Sample ID: MEL-14
Matrix: Water

Collected: 2018/08/26
Shipped:
Received: 2018/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Oxygen	DO	5708661	2018/08/30	2018/08/30	Frank Zhang
Turbidity	AT	5708298	N/A	2018/08/31	Tahir Anwar

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Maxxam Job #: B8M4749
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.7°C

Revised Report (2018/12/18): Client sample ID changed to MEL-14 and GPS coordinates included per client request.

Sample HPR218 [MEL-14] : TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B8M4749
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5710040	1,4-Difluorobenzene	2018/08/31	97	70 - 130	99	70 - 130	95	%				
5710040	4-Bromofluorobenzene	2018/08/31	113	70 - 130	112	70 - 130	111	%				
5710040	D10-Ethylbenzene	2018/08/31	103	70 - 130	93	70 - 130	97	%				
5710040	D4-1,2-Dichloroethane	2018/08/31	90	70 - 130	92	70 - 130	92	%				
5712356	o-Terphenyl	2018/09/04	87	60 - 130	63	60 - 130	83	%				
5707562	Dissolved Organic Carbon	2018/08/30	94	80 - 120	97	80 - 120	<0.50	mg/L	0.30	20		
5708268	Alkalinity (Total as CaCO3)	2018/08/31			98	85 - 115	<1.0	mg/L	0.55	20		
5708280	Conductivity	2018/08/31			102	85 - 115	<1.0	umho/cm	1.1	25		
5708282	pH	2018/08/31			101	98 - 103			0.11	N/A		
5708298	Turbidity	2018/08/31			101	85 - 115	<0.1	NTU	NC	20		
5708344	Nitrate (N)	2018/08/31	100	80 - 120	100	80 - 120	<0.10	mg/L	NC	20		
5708344	Nitrite (N)	2018/08/31	101	80 - 120	100	80 - 120	<0.010	mg/L	NC	20		
5709004	Dissolved Mercury (Hg)	2018/09/03	92	75 - 125	94	80 - 120	<0.00001	mg/L	NC	20		
5709006	Mercury (Hg)	2018/09/03	92	75 - 125	99	80 - 120	<0.00001	mg/L	NC	20		
5709300	WAD Cyanide (Free)	2018/08/31	105	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20		
5709305	Total Cyanide (CN)	2018/08/31	101	80 - 120	98	80 - 120	<0.0050	mg/L	NC	20		
5709959	Total Phosphorus	2018/09/04	98	80 - 120	98	80 - 120	<0.020	mg/L	1.9	20	100	80 - 120
5710040	Benzene	2018/08/31	84	70 - 130	85	70 - 130	<0.20	ug/L	4.4	30		
5710040	Ethylbenzene	2018/08/31	91	70 - 130	88	70 - 130	<0.20	ug/L	3.2	30		
5710040	F1 (C6-C10) - BTEX	2018/08/31					<25	ug/L	NC	30		
5710040	F1 (C6-C10)	2018/08/31	88	70 - 130	93	70 - 130	<25	ug/L	5.2	30		
5710040	o-Xylene	2018/08/31	86	70 - 130	85	70 - 130	<0.20	ug/L	9.5	30		
5710040	p+m-Xylene	2018/08/31	89	70 - 130	90	70 - 130	<0.40	ug/L	0.26	30		
5710040	Toluene	2018/08/31	89	70 - 130	90	70 - 130	<0.20	ug/L	14	30		
5710040	Total Xylenes	2018/08/31					<0.40	ug/L	2.1	30		
5710189	Total Organic Carbon (TOC)	2018/08/31	95	80 - 120	94	80 - 120	<0.50	mg/L	0.086	20		
5710254	Dissolved Chloride (Cl-)	2018/09/04	110	80 - 120	103	80 - 120	<1.0	mg/L	2.0	20		
5710257	Dissolved Sulphate (SO4)	2018/09/04	NC	75 - 125	106	80 - 120	<1.0	mg/L	1.0	20		
5710261	Orthophosphate (P)	2018/09/04	109	75 - 125	100	80 - 120	<0.010	mg/L	NC	25		
5711459	Total Kjeldahl Nitrogen (TKN)	2018/09/04	102	80 - 120	101	80 - 120	<0.10	mg/L	18	20	108	80 - 120
5711486	Total Ammonia-N	2018/09/05	97	75 - 125	99	80 - 120	<0.050	mg/L	NC	20		

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A Bureau Veritas Group Company

Maxxam Job #: B8M4749
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT(CONT'D)

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5711526	Total Suspended Solids	2018/09/04					<1	mg/L	4.8	25	95	85 - 115
5712356	F2 (C10-C16 Hydrocarbons)	2018/09/04	85	50 - 130	83	60 - 130	<100	ug/L	NC	30		
5712356	F3 (C16-C34 Hydrocarbons)	2018/09/04	85	50 - 130	74	60 - 130	<200	ug/L	NC	30		
5712356	F4 (C34-C50 Hydrocarbons)	2018/09/04	79	50 - 130	71	60 - 130	<200	ug/L	NC	30		
5712659	Total Dissolved Solids	2018/09/04					<10	mg/L	6.9	25	100	90 - 110
5714454	Radium-226	2018/09/09			99	85 - 115	<0.0050	Bq/L	NC	N/A		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B8M4749
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Service Specialist

Steven Simpson, Lab Director

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Maxxam Job #: B8M4749
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

Exceedence Summary Table – Metal Mining Effluent Reg

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Your P.O. #: B8M4749
Site Location: MELIADINE
Your C.O.C. #: B8M4749-M060-01-01

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/05
Report #: R2613979
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874301
Received: 2018/08/31, 09:11

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	1	N/A	2018/09/05	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: B8M4749
Site Location: MELIADINE
Your C.O.C. #: B8M4749-M060-01-01

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/05
Report #: R2613979
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874301
Received: 2018/08/31, 09:11

Encryption Key



Maxxam
05 Sep 2018 13:13:53

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

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Maxxam Job #: B874301
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF1191		
Sampling Date		2018/08/26		
COC Number		B8M4749-M060-01-01		
	UNITS	MEL-14AC (MDMER AND EEM)	RDL	QC Batch
Misc. Inorganics				
Reactive Silica	mg/L	0.078	0.050	9129561
RDL = Reportable Detection Limit				

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Maxxam Job #: B874301
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: UF1191
Sample ID: MEL-14AC (MDMER AND EEM)
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/30
Received: 2018/08/31

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129561	N/A	2018/09/05	Zafar Iqbal

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Maxxam Job #: B874301
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C

Results relate only to the items tested.

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Maxxam Job #: B874301
Report Date: 2018/09/05

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9129561	Reactive Silica	2018/09/05	NC	80 - 120	102	80 - 120	<0.050	mg/L	0.067	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

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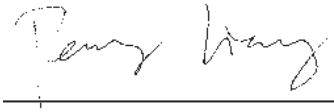
Maxxam Job #: B874301
Report Date: 2018/09/05

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Your P.O. #: B8M4759
Site Location: MELIADINE
Your C.O.C. #: B8M4759-M058-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/07
Report #: R2615554
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874497
Received: 2018/08/31, 10:00

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	3	N/A	2018/09/06	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	3	2018/09/05	2018/09/06	BBY7SOP-00003,	EPA 6020b R2 m

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8M4759
Site Location: MELIADINE
Your C.O.C. #: B8M4759-M058-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/07
Report #: R2615554
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874497
Received: 2018/08/31, 10:00

Encryption Key

Morgan Melnychuk
Burnaby Project Manager
07 Sep 2018 15:33:40

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

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Maxxam Job #: B874497
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4759
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF2177	UF2178	UF2179		
Sampling Date		2018/08/24 15:02	2018/08/24 14:50	2018/08/24 15:10		
COC Number		B8M4759-M058-01-01	B8M4759-M058-01-01	B8M4759-M058-01-01		
	UNITS	MEL-SR-1	MEL-SR-8	ITIVIA MEL-SR-3	RDL	QC Batch
Calculated Parameters						
Total Hardness (CaCO3)	mg/L	524	229	4870	0.50	9125675
RDL = Reportable Detection Limit						

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Maxxam Job #: B874497
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4759
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UF2177		UF2178		UF2179		
Sampling Date		2018/08/24 15:02		2018/08/24 14:50		2018/08/24 15:10		
COC Number		B8M4759-M058-01-01		B8M4759-M058-01-01		B8M4759-M058-01-01		
	UNITS	MEL-SR-1	RDL	MEL-SR-8	RDL	ITIVIA MEL-SR-3	RDL	QC Batch
Total Metals by ICPMS								
Total Aluminum (Al)	mg/L	0.0147	0.0030	0.0941	0.0060	0.470	0.060	9130327
Total Antimony (Sb)	mg/L	<0.00050	0.00050	0.0012	0.0010	<0.010	0.010	9130327
Total Arsenic (As)	mg/L	0.00414	0.00010	0.00101	0.00020	0.0030	0.0020	9130327
Total Barium (Ba)	mg/L	0.0611	0.0010	0.0535	0.0020	<0.020	0.020	9130327
Total Beryllium (Be)	mg/L	<0.00010	0.00010	<0.00020	0.00020	<0.0020	0.0020	9130327
Total Boron (B)	mg/L	0.075	0.050	0.41	0.10	3.5	1.0	9130327
Total Cadmium (Cd)	mg/L	0.000023	0.000010	<0.000020	0.000020	<0.00020	0.00020	9130327
Total Chromium (Cr)	mg/L	<0.0010	0.0010	<0.0020	0.0020	<0.020	0.020	9130327
Total Copper (Cu)	mg/L	0.00434	0.00050	0.0050	0.0010	<0.010	0.010	9130327
Total Iron (Fe)	mg/L	0.092	0.010	0.075	0.020	0.97	0.20	9130327
Total Lead (Pb)	mg/L	<0.00020	0.00020	<0.00040	0.00040	<0.0040	0.0040	9130327
Total Lithium (Li)	mg/L	0.0163	0.0020	0.0056	0.0040	0.148	0.040	9130327
Total Manganese (Mn)	mg/L	0.0259	0.0010	0.0202	0.0020	<0.020	0.020	9130327
Total Molybdenum (Mo)	mg/L	0.0011	0.0010	0.0116	0.0020	<0.020	0.020	9130327
Total Nickel (Ni)	mg/L	0.0308	0.0010	0.0039	0.0020	<0.020	0.020	9130327
Total Selenium (Se)	mg/L	0.00013	0.00010	0.00303	0.00020	<0.0020	0.0020	9130327
Total Silver (Ag)	mg/L	<0.000020	0.000020	<0.000040	0.000040	<0.00040	0.00040	9130327
Total Strontium (Sr)	mg/L	0.752	0.0010	0.268	0.0020	6.76	0.020	9130327
Total Thallium (Tl)	mg/L	0.000012	0.000010	<0.000020	0.000020	<0.00020	0.00020	9130327
Total Tin (Sn)	mg/L	<0.0050	0.0050	<0.010	0.010	<0.10	0.10	9130327
Total Titanium (Ti)	mg/L	<0.0050	0.0050	<0.010	0.010	<0.10	0.10	9130327
Total Uranium (U)	mg/L	0.00325	0.00010	0.00364	0.00020	0.0029	0.0020	9130327
Total Vanadium (V)	mg/L	<0.0050	0.0050	<0.010	0.010	<0.10	0.10	9130327
Total Zinc (Zn)	mg/L	0.0506	0.0050	<0.010	0.010	<0.10	0.10	9130327
Total Calcium (Ca)	mg/L	159	0.050	53.0	0.10	347	1.0	9130327
Total Magnesium (Mg)	mg/L	30.7	0.050	23.4	0.10	972	1.0	9130327
Total Potassium (K)	mg/L	14.0	0.050	24.1	0.10	320	1.0	9130327
Total Sodium (Na)	mg/L	124	0.050	429	0.10	8380	1.0	9130327

RDL = Reportable Detection Limit

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874497
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4759
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.7°C

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER) Comments

Sample UF2178 [MEL-SR-8] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.
Sample UF2179 [ITIVIA MEL-SR-3] Elements by CRC ICPMS (total): RDL raised due to concentration over linear range, sample dilution required.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874497
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4759
Sampler Initials: LH

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9130327	MHM	Matrix Spike	Total Aluminum (Al)	2018/09/06		100	%	80 - 120
			Total Antimony (Sb)	2018/09/06		101	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		100	%	80 - 120
			Total Beryllium (Be)	2018/09/06		104	%	80 - 120
			Total Boron (B)	2018/09/06		108	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		99	%	80 - 120
			Total Copper (Cu)	2018/09/06		94	%	80 - 120
			Total Iron (Fe)	2018/09/06		97	%	80 - 120
			Total Lead (Pb)	2018/09/06		99	%	80 - 120
			Total Lithium (Li)	2018/09/06		99	%	80 - 120
			Total Manganese (Mn)	2018/09/06		99	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		95	%	80 - 120
			Total Selenium (Se)	2018/09/06		104	%	80 - 120
			Total Silver (Ag)	2018/09/06		99	%	80 - 120
			Total Strontium (Sr)	2018/09/06		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/06		99	%	80 - 120
			Total Tin (Sn)	2018/09/06		100	%	80 - 120
			Total Titanium (Ti)	2018/09/06		108	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		99	%	80 - 120
			Total Zinc (Zn)	2018/09/06		110	%	80 - 120
			Total Calcium (Ca)	2018/09/06		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		NC	%	80 - 120
			Total Potassium (K)	2018/09/06		101	%	80 - 120
			Total Sodium (Na)	2018/09/06		NC	%	80 - 120
9130327	MHM	Spiked Blank	Total Aluminum (Al)	2018/09/06		102	%	80 - 120
			Total Antimony (Sb)	2018/09/06		105	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		102	%	80 - 120
			Total Beryllium (Be)	2018/09/06		106	%	80 - 120
			Total Boron (B)	2018/09/06		109	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		101	%	80 - 120
			Total Copper (Cu)	2018/09/06		97	%	80 - 120
			Total Iron (Fe)	2018/09/06		104	%	80 - 120
			Total Lead (Pb)	2018/09/06		101	%	80 - 120
			Total Lithium (Li)	2018/09/06		101	%	80 - 120
			Total Manganese (Mn)	2018/09/06		101	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		97	%	80 - 120
			Total Selenium (Se)	2018/09/06		105	%	80 - 120
			Total Silver (Ag)	2018/09/06		101	%	80 - 120
			Total Strontium (Sr)	2018/09/06		105	%	80 - 120
			Total Thallium (Tl)	2018/09/06		101	%	80 - 120
			Total Tin (Sn)	2018/09/06		101	%	80 - 120
			Total Titanium (Ti)	2018/09/06		104	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		103	%	80 - 120
			Total Zinc (Zn)	2018/09/06		107	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874497
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4759
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Calcium (Ca)	2018/09/06		104	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		101	%	80 - 120
			Total Potassium (K)	2018/09/06		102	%	80 - 120
			Total Sodium (Na)	2018/09/06		104	%	80 - 120
9130327	MHM	Method Blank	Total Aluminum (Al)	2018/09/06	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/06	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/06	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/06	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/06	<0.00010		mg/L	
			Total Boron (B)	2018/09/06	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/06	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/06	<0.0010		mg/L	
			Total Copper (Cu)	2018/09/06	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/06	<0.010		mg/L	
			Total Lead (Pb)	2018/09/06	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/06	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/06	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/06	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/06	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/06	<0.00010		mg/L	
			Total Silver (Ag)	2018/09/06	<0.000020		mg/L	
			Total Strontium (Sr)	2018/09/06	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/06	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/06	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/06	<0.0050		mg/L	
			Total Uranium (U)	2018/09/06	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/06	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/06	<0.0050		mg/L	
			Total Calcium (Ca)	2018/09/06	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/06	<0.050		mg/L	
			Total Potassium (K)	2018/09/06	<0.050		mg/L	
			Total Sodium (Na)	2018/09/06	<0.050		mg/L	
9130327	MHM	RPD	Total Aluminum (Al)	2018/09/06	3.6		%	20
			Total Antimony (Sb)	2018/09/06	NC		%	20
			Total Arsenic (As)	2018/09/06	4.7		%	20
			Total Barium (Ba)	2018/09/06	1.7		%	20
			Total Beryllium (Be)	2018/09/06	NC		%	20
			Total Boron (B)	2018/09/06	NC		%	20
			Total Cadmium (Cd)	2018/09/06	NC		%	20
			Total Chromium (Cr)	2018/09/06	NC		%	20
			Total Copper (Cu)	2018/09/06	6.9		%	20
			Total Iron (Fe)	2018/09/06	3.1		%	20
			Total Lead (Pb)	2018/09/06	6.4		%	20
			Total Lithium (Li)	2018/09/06	NC		%	20
			Total Manganese (Mn)	2018/09/06	1.3		%	20
			Total Molybdenum (Mo)	2018/09/06	NC		%	20
			Total Nickel (Ni)	2018/09/06	NC		%	20
			Total Selenium (Se)	2018/09/06	NC		%	20
			Total Silver (Ag)	2018/09/06	NC		%	20
			Total Strontium (Sr)	2018/09/06	0.99		%	20
			Total Thallium (Tl)	2018/09/06	NC		%	20
			Total Tin (Sn)	2018/09/06	NC		%	20

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Maxxam Job #: B874497
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4759
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Titanium (Ti)	2018/09/06	NC		%	20
			Total Uranium (U)	2018/09/06	NC		%	20
			Total Vanadium (V)	2018/09/06	NC		%	20
			Total Zinc (Zn)	2018/09/06	0.72		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B874497
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4759
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: B8M4749
Site Location: MELIADINE
Your C.O.C. #: B8M4749-M058-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/07
Report #: R2615553
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874487
Received: 2018/08/31, 10:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/09/06	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/09/05	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2018/09/04	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/09/05	2018/09/06	BBY7SOP-00003,	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	1	N/A	2018/08/31	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

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Your P.O. #: B8M4749
Site Location: MELIADINE
Your C.O.C. #: B8M4749-M058-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/07
Report #: R2615553
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874487
Received: 2018/08/31, 10:00

Encryption Key

Morgan Melnychuk
Burnaby Project Manager
07 Sep 2018 15:33:04

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF2141		
Sampling Date		2018/08/26		
COC Number		B8M4749-M058-01-01		
	UNITS	**MEL-14AC (MDMER AND EEM)**	**RDL**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	59.2	0.50	9125290
Total Hardness (CaCO3)	mg/L	57.1	0.50	9125675

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UF2141		
Sampling Date		2018/08/26		
COC Number		B8M4749-M058-01-01		
	UNITS	MEL-14AC (MDMER AND EEM)	RDL	QC Batch
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	mg/L	0.0043	0.0030	9128928
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	9128928
Dissolved Arsenic (As)	mg/L	0.00029	0.00010	9128928
Dissolved Barium (Ba)	mg/L	0.0044	0.0010	9128928
Dissolved Beryllium (Be)	mg/L	<0.00010	0.00010	9128928
Dissolved Boron (B)	mg/L	0.723	0.050	9128928
Dissolved Cadmium (Cd)	mg/L	<0.000010	0.000010	9128928
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	9128928
Dissolved Copper (Cu)	mg/L	0.00022	0.00020	9128928
Dissolved Iron (Fe)	mg/L	<0.0050	0.0050	9128928
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	9128928
Dissolved Lithium (Li)	mg/L	0.134	0.0020	9128928
Dissolved Manganese (Mn)	mg/L	0.0025	0.0010	9128928
Dissolved Molybdenum (Mo)	mg/L	<0.0010	0.0010	9128928
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	9128928
Dissolved Selenium (Se)	mg/L	<0.00010	0.00010	9128928
Dissolved Silver (Ag)	mg/L	<0.000020	0.000020	9128928
Dissolved Strontium (Sr)	mg/L	0.422	0.0010	9128928
Dissolved Thallium (Tl)	mg/L	0.000020	0.000010	9128928
Dissolved Tin (Sn)	mg/L	<0.0050	0.0050	9128928
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	9128928
Dissolved Uranium (U)	mg/L	0.00011	0.00010	9128928
Dissolved Vanadium (V)	mg/L	<0.0050	0.0050	9128928
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	9128928
Dissolved Calcium (Ca)	mg/L	17.2	0.050	9128928
Dissolved Magnesium (Mg)	mg/L	3.96	0.050	9128928
Dissolved Potassium (K)	mg/L	14.0	0.050	9128928
Dissolved Sodium (Na)	mg/L	236	0.050	9128928
Total Metals by ICPMS				
Total Aluminum (Al)	mg/L	0.0050	0.0030	9130327
Total Antimony (Sb)	mg/L	<0.00050	0.00050	9130327
RDL = Reportable Detection Limit				

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Maxxam Job #: B874487
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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UF2141		
Sampling Date		2018/08/26		
COC Number		B8M4749-M058-01-01		
	UNITS	MEL-14AC (MDMER AND EEM)	RDL	QC Batch
Total Arsenic (As)	mg/L	0.00028	0.00010	9130327
Total Barium (Ba)	mg/L	0.0043	0.0010	9130327
Total Beryllium (Be)	mg/L	<0.00010	0.00010	9130327
Total Boron (B)	mg/L	0.770	0.050	9130327
Total Cadmium (Cd)	mg/L	<0.000010	0.000010	9130327
Total Chromium (Cr)	mg/L	<0.0010	0.0010	9130327
Total Copper (Cu)	mg/L	<0.00050	0.00050	9130327
Total Iron (Fe)	mg/L	<0.010	0.010	9130327
Total Lead (Pb)	mg/L	<0.00020	0.00020	9130327
Total Lithium (Li)	mg/L	0.133	0.0020	9130327
Total Manganese (Mn)	mg/L	0.0024	0.0010	9130327
Total Molybdenum (Mo)	mg/L	<0.0010	0.0010	9130327
Total Nickel (Ni)	mg/L	<0.0010	0.0010	9130327
Total Selenium (Se)	mg/L	<0.00010	0.00010	9130327
Total Silver (Ag)	mg/L	<0.000020	0.000020	9130327
Total Strontium (Sr)	mg/L	0.401	0.0010	9130327
Total Thallium (Tl)	mg/L	0.000020	0.000010	9130327
Total Tin (Sn)	mg/L	<0.0050	0.0050	9130327
Total Titanium (Ti)	mg/L	<0.0050	0.0050	9130327
Total Uranium (U)	mg/L	0.00010	0.00010	9130327
Total Vanadium (V)	mg/L	<0.0050	0.0050	9130327
Total Zinc (Zn)	mg/L	<0.0050	0.0050	9130327
Total Calcium (Ca)	mg/L	16.5	0.050	9130327
Total Magnesium (Mg)	mg/L	3.86	0.050	9130327
Total Potassium (K)	mg/L	13.2	0.050	9130327
Total Sodium (Na)	mg/L	229	0.050	9130327
RDL = Reportable Detection Limit				

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Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.7°C

Results relate only to the items tested.

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Maxxam Job #: B874487
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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9128928	MHM	Matrix Spike	Dissolved Aluminum (Al)	2018/09/04		97	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/04		103	%	80 - 120
			Dissolved Arsenic (As)	2018/09/04		105	%	80 - 120
			Dissolved Barium (Ba)	2018/09/04		98	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/04		95	%	80 - 120
			Dissolved Boron (B)	2018/09/04		96	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/04		103	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/04		96	%	80 - 120
			Dissolved Copper (Cu)	2018/09/04		87	%	80 - 120
			Dissolved Iron (Fe)	2018/09/04		100	%	80 - 120
			Dissolved Lead (Pb)	2018/09/04		99	%	80 - 120
			Dissolved Lithium (Li)	2018/09/04		95	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/04		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/04		107	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/04		89	%	80 - 120
			Dissolved Selenium (Se)	2018/09/04		103	%	80 - 120
			Dissolved Silver (Ag)	2018/09/04		99	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/04		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/04		97	%	80 - 120
			Dissolved Tin (Sn)	2018/09/04		101	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/04		104	%	80 - 120
			Dissolved Uranium (U)	2018/09/04		103	%	80 - 120
			Dissolved Vanadium (V)	2018/09/04		99	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/04		104	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/04		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/04		NC	%	80 - 120
			Dissolved Potassium (K)	2018/09/04		101	%	80 - 120
			Dissolved Sodium (Na)	2018/09/04		NC	%	80 - 120
9128928	MHM	Spiked Blank	Dissolved Aluminum (Al)	2018/09/04		97	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/04		99	%	80 - 120
			Dissolved Arsenic (As)	2018/09/04		103	%	80 - 120
			Dissolved Barium (Ba)	2018/09/04		97	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/04		97	%	80 - 120
			Dissolved Boron (B)	2018/09/04		98	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/04		104	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/04		97	%	80 - 120
			Dissolved Copper (Cu)	2018/09/04		92	%	80 - 120
			Dissolved Iron (Fe)	2018/09/04		102	%	80 - 120
			Dissolved Lead (Pb)	2018/09/04		102	%	80 - 120
			Dissolved Lithium (Li)	2018/09/04		94	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/04		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/04		102	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/04		92	%	80 - 120
			Dissolved Selenium (Se)	2018/09/04		102	%	80 - 120
			Dissolved Silver (Ag)	2018/09/04		99	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/04		106	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/04		99	%	80 - 120
			Dissolved Tin (Sn)	2018/09/04		98	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/04		101	%	80 - 120
			Dissolved Uranium (U)	2018/09/04		103	%	80 - 120
			Dissolved Vanadium (V)	2018/09/04		99	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/04		107	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Calcium (Ca)	2018/09/04		100	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/04		96	%	80 - 120
			Dissolved Potassium (K)	2018/09/04		101	%	80 - 120
			Dissolved Sodium (Na)	2018/09/04		97	%	80 - 120
9128928	MHM	Method Blank	Dissolved Aluminum (Al)	2018/09/04	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/09/04	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/09/04	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/09/04	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/09/04	<0.00010		mg/L	
			Dissolved Boron (B)	2018/09/04	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/09/04	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/09/04	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/09/04	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/09/04	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/09/04	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/09/04	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/09/04	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/09/04	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/09/04	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/09/04	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/09/04	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/09/04	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/09/04	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/09/04	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/09/04	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/09/04	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/09/04	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/09/04	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/09/04	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/09/04	<0.050		mg/L	
			Dissolved Potassium (K)	2018/09/04	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/09/04	<0.050		mg/L	
9128928	MHM	RPD	Dissolved Aluminum (Al)	2018/09/04	NC		%	20
			Dissolved Antimony (Sb)	2018/09/04	NC		%	20
			Dissolved Arsenic (As)	2018/09/04	7.1		%	20
			Dissolved Barium (Ba)	2018/09/04	1.7		%	20
			Dissolved Beryllium (Be)	2018/09/04	NC		%	20
			Dissolved Boron (B)	2018/09/04	NC		%	20
			Dissolved Cadmium (Cd)	2018/09/04	0		%	20
			Dissolved Chromium (Cr)	2018/09/04	NC		%	20
			Dissolved Copper (Cu)	2018/09/04	1.1		%	20
			Dissolved Iron (Fe)	2018/09/04	NC		%	20
			Dissolved Lead (Pb)	2018/09/04	NC		%	20
			Dissolved Lithium (Li)	2018/09/04	NC		%	20
			Dissolved Manganese (Mn)	2018/09/04	0.75		%	20
			Dissolved Molybdenum (Mo)	2018/09/04	NC		%	20
			Dissolved Nickel (Ni)	2018/09/04	NC		%	20
			Dissolved Selenium (Se)	2018/09/04	NC		%	20
			Dissolved Silver (Ag)	2018/09/04	NC		%	20
			Dissolved Strontium (Sr)	2018/09/04	0.99		%	20
			Dissolved Thallium (Tl)	2018/09/04	NC		%	20
			Dissolved Tin (Sn)	2018/09/04	NC		%	20

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Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Titanium (Ti)	2018/09/04	NC		%	20
			Dissolved Uranium (U)	2018/09/04	0.98		%	20
			Dissolved Vanadium (V)	2018/09/04	NC		%	20
			Dissolved Zinc (Zn)	2018/09/04	NC		%	20
9130327	MHM	Matrix Spike	Total Aluminum (Al)	2018/09/06		100	%	80 - 120
			Total Antimony (Sb)	2018/09/06		101	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		100	%	80 - 120
			Total Beryllium (Be)	2018/09/06		104	%	80 - 120
			Total Boron (B)	2018/09/06		108	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		99	%	80 - 120
			Total Copper (Cu)	2018/09/06		94	%	80 - 120
			Total Iron (Fe)	2018/09/06		97	%	80 - 120
			Total Lead (Pb)	2018/09/06		99	%	80 - 120
			Total Lithium (Li)	2018/09/06		99	%	80 - 120
			Total Manganese (Mn)	2018/09/06		99	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		95	%	80 - 120
			Total Selenium (Se)	2018/09/06		104	%	80 - 120
			Total Silver (Ag)	2018/09/06		99	%	80 - 120
			Total Strontium (Sr)	2018/09/06		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/06		99	%	80 - 120
			Total Tin (Sn)	2018/09/06		100	%	80 - 120
			Total Titanium (Ti)	2018/09/06		108	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		99	%	80 - 120
			Total Zinc (Zn)	2018/09/06		110	%	80 - 120
			Total Calcium (Ca)	2018/09/06		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		NC	%	80 - 120
			Total Potassium (K)	2018/09/06		101	%	80 - 120
			Total Sodium (Na)	2018/09/06		NC	%	80 - 120
9130327	MHM	Spiked Blank	Total Aluminum (Al)	2018/09/06		102	%	80 - 120
			Total Antimony (Sb)	2018/09/06		105	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		102	%	80 - 120
			Total Beryllium (Be)	2018/09/06		106	%	80 - 120
			Total Boron (B)	2018/09/06		109	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		101	%	80 - 120
			Total Copper (Cu)	2018/09/06		97	%	80 - 120
			Total Iron (Fe)	2018/09/06		104	%	80 - 120
			Total Lead (Pb)	2018/09/06		101	%	80 - 120
			Total Lithium (Li)	2018/09/06		101	%	80 - 120
			Total Manganese (Mn)	2018/09/06		101	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		97	%	80 - 120
			Total Selenium (Se)	2018/09/06		105	%	80 - 120
			Total Silver (Ag)	2018/09/06		101	%	80 - 120
			Total Strontium (Sr)	2018/09/06		105	%	80 - 120
			Total Thallium (Tl)	2018/09/06		101	%	80 - 120
			Total Tin (Sn)	2018/09/06		101	%	80 - 120

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Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Titanium (Ti)	2018/09/06		104	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		103	%	80 - 120
			Total Zinc (Zn)	2018/09/06		107	%	80 - 120
			Total Calcium (Ca)	2018/09/06		104	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		101	%	80 - 120
			Total Potassium (K)	2018/09/06		102	%	80 - 120
			Total Sodium (Na)	2018/09/06		104	%	80 - 120
9130327	MHM	Method Blank	Total Aluminum (Al)	2018/09/06	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/06	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/06	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/06	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/06	<0.00010		mg/L	
			Total Boron (B)	2018/09/06	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/06	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/06	<0.0010		mg/L	
			Total Copper (Cu)	2018/09/06	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/06	<0.010		mg/L	
			Total Lead (Pb)	2018/09/06	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/06	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/06	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/06	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/06	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/06	<0.00010		mg/L	
			Total Silver (Ag)	2018/09/06	<0.000020		mg/L	
			Total Strontium (Sr)	2018/09/06	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/06	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/06	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/06	<0.0050		mg/L	
			Total Uranium (U)	2018/09/06	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/06	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/06	<0.0050		mg/L	
			Total Calcium (Ca)	2018/09/06	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/06	<0.050		mg/L	
			Total Potassium (K)	2018/09/06	<0.050		mg/L	
			Total Sodium (Na)	2018/09/06	<0.050		mg/L	
9130327	MHM	RPD	Total Aluminum (Al)	2018/09/06	3.6		%	20
			Total Antimony (Sb)	2018/09/06	NC		%	20
			Total Arsenic (As)	2018/09/06	4.7		%	20
			Total Barium (Ba)	2018/09/06	1.7		%	20
			Total Beryllium (Be)	2018/09/06	NC		%	20
			Total Boron (B)	2018/09/06	NC		%	20
			Total Cadmium (Cd)	2018/09/06	NC		%	20
			Total Chromium (Cr)	2018/09/06	NC		%	20
			Total Copper (Cu)	2018/09/06	6.9		%	20
			Total Iron (Fe)	2018/09/06	3.1		%	20
			Total Lead (Pb)	2018/09/06	6.4		%	20
			Total Lithium (Li)	2018/09/06	NC		%	20
			Total Manganese (Mn)	2018/09/06	1.3		%	20
			Total Molybdenum (Mo)	2018/09/06	NC		%	20
			Total Nickel (Ni)	2018/09/06	NC		%	20
			Total Selenium (Se)	2018/09/06	NC		%	20

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Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Silver (Ag)	2018/09/06	NC		%	20
			Total Strontium (Sr)	2018/09/06	0.99		%	20
			Total Thallium (Tl)	2018/09/06	NC		%	20
			Total Tin (Sn)	2018/09/06	NC		%	20
			Total Titanium (Ti)	2018/09/06	NC		%	20
			Total Uranium (U)	2018/09/06	NC		%	20
			Total Vanadium (V)	2018/09/06	NC		%	20
			Total Zinc (Zn)	2018/09/06	0.72		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B874487
Report Date: 2018/09/07

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your P.O. #: B8M4749
Site Location: MELIADINE
Your C.O.C. #: B8M4749-M060-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663048
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B874301
Received: 2018/08/31, 09:11

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	1	N/A	2018/09/05	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Omran Desouki
Junior Project Manager
12 Dec 2018 12:14:45

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B874301
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF1191		
Sampling Date		2018/08/26		
COC Number		B8M4749-M060-01-01		
	UNITS	MEL-14	RDL	QC Batch
Misc. Inorganics				
Reactive Silica	mg/L	0.078	0.050	9129561
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874301
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: UF1191
Sample ID: MEL-14
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/30
Received: 2018/08/31

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129561	N/A	2018/09/05	Zafar Iqbal

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Maxxam Job #: B874301
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated per client request.

GPS coordinates: 63°02'15.5'' 92°13'06.3''

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874301
Report Date: 2018/12/12

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9129561	Reactive Silica	2018/09/05	NC	80 - 120	102	80 - 120	<0.050	mg/L	0.067	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

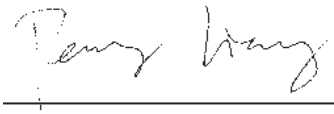
Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874301
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4749
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Maxxam
A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532380
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8M4777
Received: 2018/08/29, 12:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity (1)	1	N/A	2018/08/31	CAM SOP-00448	SM 23 2320 B m
Alkalinity (1)	1	N/A	2018/09/04	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2018/09/04	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2018/09/05	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry (1)	2	N/A	2018/09/04	CAM SOP-00463	EPA 325.2 m
Conductivity (1)	1	N/A	2018/08/31	CAM SOP-00414	SM 23 2510 m
Conductivity (1)	1	N/A	2018/09/04	CAM SOP-00414	SM 23 2510 m
Free (WAD) Cyanide (1)	2	N/A	2018/08/31	CAM SOP-00457	OMOE E3015 m
Total Cyanide (1)	2	2018/08/31	2018/08/31	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1, 4)	1	N/A	2018/08/31	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (1, 4)	1	N/A	2018/09/04	CAM SOP-00446	SM 23 5310 B m
Dissolved Oxygen (1)	1	2018/08/30	2018/08/30	CAM SOP-00427	SM 23 4500 O G m
Dissolved Oxygen (1)	1	2018/08/31	2018/08/31	CAM SOP-00427	SM 23 4500 O G m
Petroleum Hydro. CCME F1 & BTEX in Water (1)	2	N/A	2018/09/02	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	2	2018/09/04	2018/09/05	CAM SOP-00316	CCME PHC-CWS m
Dissolved Mercury (low level) (1)	2	2018/08/31	2018/09/03	CAM SOP-00453	EPA 7470 m
Mercury (low level) (1)	2	2018/08/31	2018/09/03	CAM SOP-00453	EPA 7470 m
Total Ammonia-N (1)	2	N/A	2018/09/05	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	1	N/A	2018/08/31	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	1	N/A	2018/09/04	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH (1)	1	N/A	2018/08/31	CAM SOP-00413	SM 4500H+ B m
pH (1)	1	N/A	2018/09/04	CAM SOP-00413	SM 4500H+ B m
Orthophosphate (1)	2	N/A	2018/09/04	CAM SOP-00461	EPA 365.1 m
Radium-226 Low Level (2, 7)	2	N/A	2018/09/10	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry
Sulphate by Automated Colourimetry (1)	2	N/A	2018/09/04	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	1	2018/09/04	2018/09/04	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids (1)	1	2018/09/05	2018/09/05	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	2	2018/09/01	2018/09/04	CAM SOP-00938	OMOE E3516 m
Total Organic Carbon (TOC) (1, 8)	2	N/A	2018/08/31	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric) (1)	2	2018/08/31	2018/09/04	CAM SOP-00407	SM 23 4500 P B H m

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A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532380
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8M4777
Received: 2018/08/29, 12:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Low Level Total Suspended Solids (1)	1	2018/09/01	2018/09/04	CAM SOP-00428	SM 23 2540D m
Low Level Total Suspended Solids (1)	1	2018/09/05	2018/09/05	CAM SOP-00428	SM 23 2540D m
Turbidity (1)	2	N/A	2018/08/31	CAM SOP-00417	SM 23 2130 B m
Hardness (calculated as CaCO3) (3)	2	N/A	2018/09/11	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Analytics Mississauga
(2) This test was performed by Maxxam Analytics Kitimat
(3) This test was performed by Campo to Burnaby Subcontract
(4) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(5) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following "Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003". Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(6) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

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Your P.O. #: OL-664695
Site Location: MELIADINE
Your C.O.C. #: na

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532380
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8M4777
Received: 2018/08/29, 12:00

(7) Radium-226 results have not been corrected for blanks.
(8) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key



Alisha Williamson
Project Manager
19 Dec 2018 15:43:04

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alisha Williamson, Project Manager
Email: AWilliamson@maxxam.ca
Phone# (613) 274-0573

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

CCME PETROLEUM HYDROCARBONS IN WATER (WATER)

Maxxam ID		HPR415	HPR416		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30		
COC Number		na	na		
	UNITS	MEL-13	MEL-03-01	RDL	QC Batch
BTEX & F1 Hydrocarbons					
Benzene	ug/L	<0.20	<0.20	0.20	5711511
Toluene	ug/L	<0.20	<0.20	0.20	5711511
Ethylbenzene	ug/L	<0.20	<0.20	0.20	5711511
o-Xylene	ug/L	<0.20	<0.20	0.20	5711511
p+m-Xylene	ug/L	<0.40	<0.40	0.40	5711511
Total Xylenes	ug/L	<0.40	<0.40	0.40	5711511
F1 (C6-C10)	ug/L	<25	<25	25	5711511
F1 (C6-C10) - BTEX	ug/L	<25	<25	25	5711511
F2-F4 Hydrocarbons					
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	100	5712356
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	200	5712356
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	200	5712356
Reached Baseline at C50	ug/L	Yes	Yes		5712356
Surrogate Recovery (%)					
1,4-Difluorobenzene	%	96	96		5711511
4-Bromofluorobenzene	%	112	113		5711511
D10-Ethylbenzene	%	101	100		5711511
D4-1,2-Dichloroethane	%	94	94		5711511
o-Terphenyl	%	99	98		5712356

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

RESULTS OF ANALYSES OF WATER

Maxxam ID		HPR415			HPR415			HPR416		
Sampling Date		2018/08/26 15:10			2018/08/26 15:10			2018/08/26 16:30		
COC Number		na			na			na		
	UNITS	MEL-13	RDL	QC Batch	MEL-13 Lab-Dup	RDL	QC Batch	MEL-03-01	RDL	QC Batch
Calculated Parameters										
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	15	1.0	5707057				18	1.0	5709761
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	5707057				<1.0	1.0	5709761
Inorganics										
Total Ammonia-N	mg/L	0.19	0.050	5711486				<0.050	0.050	5711486
Conductivity	umho/cm	87	1.0	5708280				76	1.0	5711266
Total Dissolved Solids	mg/L	75	10	5712659	70	10	5712659	25	10	5715435
Total Kjeldahl Nitrogen (TKN)	mg/L	0.27	0.10	5711458				0.12	0.10	5711458
Dissolved Organic Carbon	mg/L	2.8	0.50	5707562				2.4	0.50	5710288
Total Organic Carbon (TOC)	mg/L	3.0	0.50	5710189				2.3	0.50	5710189
Orthophosphate (P)	mg/L	<0.010	0.010	5710261				<0.010	0.010	5711461
Dissolved Oxygen	mg/L	10.3		5708661				10.4		5710717
pH	pH	7.32		5708282				7.48		5711269
Total Phosphorus	mg/L	<0.020	0.020	5709959				<0.020	0.020	5709959
Total Suspended Solids	mg/L	1	1	5711526				<1	1	5714430
Dissolved Sulphate (SO4)	mg/L	3.7	1.0	5710257				3.2	1.0	5711460
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5709305				<0.0050	0.0050	5709305
Turbidity	NTU	0.3	0.1	5708298				0.2	0.1	5710018
WAD Cyanide (Free)	mg/L	<0.0010	0.0010	5709300				<0.0010	0.0010	5709300
Alkalinity (Total as CaCO3)	mg/L	15	1.0	5708268				18	1.0	5711265
Dissolved Chloride (Cl-)	mg/L	13	1.0	5710254				8.4	1.0	5711457
Nitrite (N)	mg/L	<0.010	0.010	5708344				<0.010	0.010	5711445
Nitrate (N)	mg/L	<0.10	0.10	5708344				<0.10	0.10	5711445
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	5708344				<0.10	0.10	5711445
RADIONUCLIDE										
Radium-226	Bq/L	<0.0050	0.0050	5714454				<0.0050	0.0050	5714454

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

RESULTS OF ANALYSES OF WATER

Maxxam ID		HPR416	
Sampling Date		2018/08/26 16:30	
COC Number		na	
	UNITS	**MEL-03-01 Lab-Dup**	**QC Batch**
Inorganics			
Dissolved Oxygen	mg/L	10.4	5710717

QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HPR415	HPR416			HPR416		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30			2018/08/26 16:30		
COC Number		na	na			na		
	UNITS	MEL-13	MEL-03-01	RDL	QC Batch	MEL-03-01 Lab-Dup	RDL	QC Batch
Metals								
Mercury (Hg)	mg/L	<0.00001	<0.00001	0.00001	5709006	<0.00001	0.00001	5709006
Dissolved Mercury (Hg)	mg/L	<0.00001	<0.00001	0.00001	5709004			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: HPR415
Sample ID: MEL-13
Matrix: Water

Collected: 2018/08/26
Shipped:
Received: 2018/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5708268	N/A	2018/08/31	Neil Dassanayake
Carbonate, Bicarbonate and Hydroxide	CALC	5707057	N/A	2018/09/04	Automated Statchk
Chloride by Automated Colourimetry	KONE	5710254	N/A	2018/09/04	Deonarine Ramnarine
Conductivity	AT	5708280	N/A	2018/08/31	Neil Dassanayake
Free (WAD) Cyanide	SKAL/CN	5709300	N/A	2018/08/31	Xuanhong Qiu
Total Cyanide	SKAL/CN	5709305	2018/08/31	2018/08/31	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5707562	N/A	2018/08/31	Nimarta Singh
Dissolved Oxygen	DO	5708661	2018/08/30	2018/08/30	Frank Zhang
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5711511	N/A	2018/09/02	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5712356	2018/09/04	2018/09/05	(Kent) Maolin Li
Dissolved Mercury (low level)	CV/AA	5709004	2018/08/31	2018/09/03	Ron Morrison
Mercury (low level)	CV/AA	5709006	2018/08/31	2018/09/03	Ron Morrison
Total Ammonia-N	LACH/NH4	5711486	N/A	2018/09/05	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5708344	N/A	2018/08/31	Chandra Nandlal
pH	AT	5708282	N/A	2018/08/31	Neil Dassanayake
Orthophosphate	KONE	5710261	N/A	2018/09/04	Alina Dobreanu
Radium-226 Low Level	AS	5714454	N/A	2018/09/10	Fariba Kashavarz
Sulphate by Automated Colourimetry	KONE	5710257	N/A	2018/09/04	Alina Dobreanu
Total Dissolved Solids	BAL	5712659	2018/09/04	2018/09/04	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5711458	2018/09/01	2018/09/04	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5710189	N/A	2018/08/31	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5709959	2018/08/31	2018/09/04	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5711526	2018/09/01	2018/09/04	Mandeep Kaur
Turbidity	AT	5708298	N/A	2018/08/31	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5722717	N/A	2018/09/11	Tamsin Denison

Maxxam ID: HPR415 Dup
Sample ID: MEL-13
Matrix: Water

Collected: 2018/08/26
Shipped:
Received: 2018/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids	BAL	5712659	2018/09/04	2018/09/04	Jingwei (Alvin) Shi

Maxxam ID: HPR416
Sample ID: MEL-03-01
Matrix: Water

Collected: 2018/08/26
Shipped:
Received: 2018/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5711265	N/A	2018/09/04	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5709761	N/A	2018/09/05	Automated Statchk
Chloride by Automated Colourimetry	KONE	5711457	N/A	2018/09/04	Deonarine Ramnarine
Conductivity	AT	5711266	N/A	2018/09/04	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5709300	N/A	2018/08/31	Xuanhong Qiu
Total Cyanide	SKAL/CN	5709305	2018/08/31	2018/08/31	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5710288	N/A	2018/09/04	Nimarta Singh

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: HPR416
Sample ID: MEL-03-01
Matrix: Water

Collected: 2018/08/26
Shipped:
Received: 2018/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Oxygen	DO	5710717	2018/08/31	2018/08/31	Prakash Piya
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5711511	N/A	2018/09/02	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5712356	2018/09/04	2018/09/05	(Kent) Maolin Li
Dissolved Mercury (low level)	CV/AA	5709004	2018/08/31	2018/09/03	Ron Morrison
Mercury (low level)	CV/AA	5709006	2018/08/31	2018/09/03	Ron Morrison
Total Ammonia-N	LACH/NH4	5711486	N/A	2018/09/05	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5711445	N/A	2018/09/04	Chandra Nandlal
pH	AT	5711269	N/A	2018/09/04	Surinder Rai
Orthophosphate	KONE	5711461	N/A	2018/09/04	Alina Dobreanu
Radium-226 Low Level	AS	5714454	N/A	2018/09/10	Fariba Kashavarz
Sulphate by Automated Colourimetry	KONE	5711460	N/A	2018/09/04	Alina Dobreanu
Total Dissolved Solids	BAL	5715435	2018/09/05	2018/09/05	Mandeep Kaur
Total Kjeldahl Nitrogen in Water	SKAL	5711458	2018/09/01	2018/09/04	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5710189	N/A	2018/08/31	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5709959	2018/08/31	2018/09/04	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5714430	2018/09/05	2018/09/05	Nusrat Naz
Turbidity	AT	5710018	N/A	2018/08/31	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5722717	N/A	2018/09/11	Tamsin Denison

Maxxam ID: HPR416 Dup
Sample ID: MEL-03-01
Matrix: Water

Collected: 2018/08/26
Shipped:
Received: 2018/08/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Oxygen	DO	5710717	2018/08/31	2018/08/31	Prakash Piya
Mercury (low level)	CV/AA	5709006	2018/08/31	2018/09/03	Ron Morrison

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.7°C

Revised Report (2018/12/18): Client sample ID changed to MEL-13 as per client request.

MEL-13 - GPS coordinates: 63°01'44.6'' 92°09'14.6''
MEL-03-01 - GPS coordinates: 63°06'52.2'' 92°20'23.6''

Sample HPR416 [MEL-03-01] : TOC< DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B8M4777
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5711511	1,4-Difluorobenzene	2018/09/02	98	70 - 130	98	70 - 130	98	%				
5711511	4-Bromofluorobenzene	2018/09/02	116	70 - 130	113	70 - 130	112	%				
5711511	D10-Ethylbenzene	2018/09/02	102	70 - 130	95	70 - 130	101	%				
5711511	D4-1,2-Dichloroethane	2018/09/02	95	70 - 130	97	70 - 130	96	%				
5712356	o-Terphenyl	2018/09/04	87	60 - 130	63	60 - 130	83	%				
5707562	Dissolved Organic Carbon	2018/08/30	94	80 - 120	97	80 - 120	<0.50	mg/L	0.30	20		
5708268	Alkalinity (Total as CaCO3)	2018/08/31			98	85 - 115	<1.0	mg/L	0.55	20		
5708280	Conductivity	2018/08/31			102	85 - 115	<1.0	umho/cm	1.1	25		
5708282	pH	2018/08/31			101	98 - 103			0.11	N/A		
5708298	Turbidity	2018/08/31			101	85 - 115	<0.1	NTU	NC	20		
5708344	Nitrate (N)	2018/08/31	100	80 - 120	100	80 - 120	<0.10	mg/L	NC	20		
5708344	Nitrite (N)	2018/08/31	101	80 - 120	100	80 - 120	<0.010	mg/L	NC	20		
5709004	Dissolved Mercury (Hg)	2018/09/03	92	75 - 125	94	80 - 120	<0.00001	mg/L	NC	20		
5709006	Mercury (Hg)	2018/09/03	92	75 - 125	99	80 - 120	<0.00001	mg/L	NC	20		
5709300	WAD Cyanide (Free)	2018/08/31	105	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20		
5709305	Total Cyanide (CN)	2018/08/31	101	80 - 120	98	80 - 120	<0.0050	mg/L	NC	20		
5709959	Total Phosphorus	2018/09/04	98	80 - 120	98	80 - 120	<0.020	mg/L	1.9	20	100	80 - 120
5710018	Turbidity	2018/08/31			101	85 - 115	<0.1	NTU	0	20		
5710189	Total Organic Carbon (TOC)	2018/08/31	95	80 - 120	94	80 - 120	<0.50	mg/L	0.086	20		
5710254	Dissolved Chloride (Cl-)	2018/09/04	110	80 - 120	103	80 - 120	<1.0	mg/L	2.0	20		
5710257	Dissolved Sulphate (SO4)	2018/09/04	NC	75 - 125	106	80 - 120	<1.0	mg/L	1.0	20		
5710261	Orthophosphate (P)	2018/09/04	109	75 - 125	100	80 - 120	<0.010	mg/L	NC	25		
5710288	Dissolved Organic Carbon	2018/09/04	99	80 - 120	99	80 - 120	<0.50	mg/L	0.92	20		
5711265	Alkalinity (Total as CaCO3)	2018/09/04			99	85 - 115	<1.0	mg/L	0.33	20		
5711266	Conductivity	2018/09/04			103	85 - 115	<1.0	umho/cm	0	25		
5711269	pH	2018/09/04			101	98 - 103			0.64	N/A		
5711445	Nitrate (N)	2018/09/04	103	80 - 120	103	80 - 120	<0.10	mg/L	NC	20		
5711445	Nitrite (N)	2018/09/04	103	80 - 120	102	80 - 120	<0.010	mg/L	NC	20		
5711457	Dissolved Chloride (Cl-)	2018/09/04	NC	80 - 120	103	80 - 120	<1.0	mg/L	0.18	20		
5711458	Total Kjeldahl Nitrogen (TKN)	2018/09/04	101	80 - 120	100	80 - 120	<0.10	mg/L	14	20	105	80 - 120

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT(CONT'D)

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5711460	Dissolved Sulphate (SO4)	2018/09/04	NC	75 - 125	99	80 - 120	<1.0	mg/L	1.5	20		
5711461	Orthophosphate (P)	2018/09/04	105	75 - 125	99	80 - 120	<0.010	mg/L	NC	25		
5711486	Total Ammonia-N	2018/09/05	97	75 - 125	99	80 - 120	<0.050	mg/L	NC	20		
5711511	Benzene	2018/09/02	79	70 - 130	85	70 - 130	<0.20	ug/L	NC	30		
5711511	Ethylbenzene	2018/09/02	88	70 - 130	91	70 - 130	<0.20	ug/L	NC	30		
5711511	F1 (C6-C10) - BTEX	2018/09/02					<25	ug/L	NC	30		
5711511	F1 (C6-C10)	2018/09/02	94	70 - 130	94	70 - 130	<25	ug/L	NC	30		
5711511	o-Xylene	2018/09/02	85	70 - 130	88	70 - 130	<0.20	ug/L	NC	30		
5711511	p+m-Xylene	2018/09/02	88	70 - 130	92	70 - 130	<0.40	ug/L	NC	30		
5711511	Toluene	2018/09/02	88	70 - 130	92	70 - 130	<0.20	ug/L	NC	30		
5711511	Total Xylenes	2018/09/02					<0.40	ug/L	NC	30		
5711526	Total Suspended Solids	2018/09/04					<1	mg/L	4.8	25	95	85 - 115
5712356	F2 (C10-C16 Hydrocarbons)	2018/09/04	85	50 - 130	83	60 - 130	<100	ug/L	NC	30		
5712356	F3 (C16-C34 Hydrocarbons)	2018/09/04	85	50 - 130	74	60 - 130	<200	ug/L	NC	30		
5712356	F4 (C34-C50 Hydrocarbons)	2018/09/04	79	50 - 130	71	60 - 130	<200	ug/L	NC	30		
5712659	Total Dissolved Solids	2018/09/04					<10	mg/L	6.9	25	100	90 - 110
5714430	Total Suspended Solids	2018/09/05					<1	mg/L	0	25	97	85 - 115
5714454	Radium-226	2018/09/09			99	85 - 115	<0.0050	Bq/L	NC	N/A		
5715435	Total Dissolved Solids	2018/09/05					<10	mg/L	3.2	25	100	90 - 110

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Service Specialist

Steven Simpson, Lab Director

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Maxxam Job #: B8M4777
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: LH

Exceedence Summary Table – Metal Mining Effluent Reg

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Your P.O. #: B8M4777
Site Location: MELIADINE
Your C.O.C. #: B8M4777-M060-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/06
Report #: R2614648
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874816
Received: 2018/09/01, 11:35

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	2	N/A	2018/09/05	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your P.O. #: B8M4777
Site Location: MELIADINE
Your C.O.C. #: B8M4777-M060-01-01

Attention: Jonathan Urben

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/06
Report #: R2614648
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874816
Received: 2018/09/01, 11:35

Encryption Key

Maxxam
06 Sep 2018 10:01:04

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077
==========
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Maxxam Job #: B874816
Report Date: 2018/09/06

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF4393	UF4393	UF4394		
Sampling Date		2018/08/26 15:10	2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M060-01-01	B8M4777-M060-01-01	B8M4777-M060-01-01		
	UNITS	MEL-13 (WL AND EEM) (HPR415)	MEL-13 (WL AND EEM) (HPR415) Lab-Dup	ML-03-01 (HPR416)	RDL	QC Batch
Misc. Inorganics						
Reactive Silica	mg/L	0.29	0.29	0.23	0.050	9129608

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874816
Report Date: 2018/09/06

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: UF4393
Sample ID: MEL-13 (WL AND EEM) (HPR415)
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/31
Received: 2018/09/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129608	N/A	2018/09/05	Zafar Iqbal

Maxxam ID: UF4393 Dup
Sample ID: MEL-13 (WL AND EEM) (HPR415)
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/31
Received: 2018/09/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129608	N/A	2018/09/05	Zafar Iqbal

Maxxam ID: UF4394
Sample ID: ML-03-01 (HPR416)
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/31
Received: 2018/09/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129608	N/A	2018/09/05	Zafar Iqbal

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874816
Report Date: 2018/09/06

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.7°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874816
Report Date: 2018/09/06

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9129608	Reactive Silica	2018/09/05	107	80 - 120	101	80 - 120	<0.050	mg/L	1.8	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B874816
Report Date: 2018/09/06

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

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Your P.O. #: B8M4777
Site Location: MELIADINE
Your C.O.C. #: B8M4777-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/10
Report #: R2616343
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874841
Received: 2018/09/01, 12:30

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	2	N/A	2018/09/06	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	2	N/A	2018/09/07	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	2	N/A	2018/09/06	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	2	2018/09/05	2018/09/06	BBY7SOP-00003,	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	2	N/A	2018/09/01	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8M4777
Site Location: MELIADINE
Your C.O.C. #: B8M4777-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/10
Report #: R2616343
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B874841
Received: 2018/09/01, 12:30

Encryption Key

Morgan Melnychuk
Burnaby Project Manager
10 Sep 2018 09:52:54

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

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Maxxam Job #: B874841
Report Date: 2018/09/10

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF4499	UF4500		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M058-01-01	B8M4777-M058-01-01		
	UNITS	MEL-13 (WL AND EEM)	MEL-03-01	RDL	QC Batch
Calculated Parameters					
Filter and HNO3 Preservation	N/A	FIELD	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	25.0	21.9	0.50	9126845
Total Hardness (CaCO3)	mg/L	24.5	21.4	0.50	9127031

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874841
Report Date: 2018/09/10

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UF4499	UF4500		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M058-01-01	B8M4777-M058-01-01		
	UNITS	MEL-13 (WL AND EEM)	MEL-03-01	RDL	QC Batch
Dissolved Metals by ICPMS					
Dissolved Aluminum (Al)	mg/L	0.0054	0.0043	0.0030	9130273
Dissolved Antimony (Sb)	mg/L	<0.00050	<0.00050	0.00050	9130273
Dissolved Arsenic (As)	mg/L	0.00040	0.00019	0.00010	9130273
Dissolved Barium (Ba)	mg/L	0.0076	0.0072	0.0010	9130273
Dissolved Beryllium (Be)	mg/L	<0.00010	<0.00010	0.00010	9130273
Dissolved Boron (B)	mg/L	<0.050	<0.050	0.050	9130273
Dissolved Cadmium (Cd)	mg/L	<0.000010	<0.000010	0.000010	9130273
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Copper (Cu)	mg/L	0.00075	0.00060	0.00020	9130273
Dissolved Iron (Fe)	mg/L	0.0074	<0.0050	0.0050	9130273
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	9130273
Dissolved Lithium (Li)	mg/L	<0.0020	<0.0020	0.0020	9130273
Dissolved Manganese (Mn)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Molybdenum (Mo)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Nickel (Ni)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Selenium (Se)	mg/L	<0.00010	<0.00010	0.00010	9130273
Dissolved Silver (Ag)	mg/L	<0.000020	<0.000020	0.000020	9130273
Dissolved Strontium (Sr)	mg/L	0.0491	0.0335	0.0010	9130273
Dissolved Thallium (Tl)	mg/L	<0.000010	<0.000010	0.000010	9130273
Dissolved Tin (Sn)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Uranium (U)	mg/L	<0.00010	<0.00010	0.00010	9130273
Dissolved Vanadium (V)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Zinc (Zn)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Calcium (Ca)	mg/L	7.82	6.95	0.050	9130273
Dissolved Magnesium (Mg)	mg/L	1.33	1.11	0.050	9130273
Dissolved Potassium (K)	mg/L	0.986	0.874	0.050	9130273
Dissolved Sodium (Na)	mg/L	5.41	4.36	0.050	9130273
Total Metals by ICPMS					
Total Aluminum (Al)	mg/L	0.0098	0.0070	0.0030	9130327
RDL = Reportable Detection Limit					

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Maxxam Job #: B874841
Report Date: 2018/09/10

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UF4499	UF4500		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M058-01-01	B8M4777-M058-01-01		
	UNITS	MEL-13 (WL AND EEM)	MEL-03-01	RDL	QC Batch
Total Antimony (Sb)	mg/L	<0.00050	<0.00050	0.00050	9130327
Total Arsenic (As)	mg/L	0.00046	0.00020	0.00010	9130327
Total Barium (Ba)	mg/L	0.0077	0.0072	0.0010	9130327
Total Beryllium (Be)	mg/L	<0.00010	<0.00010	0.00010	9130327
Total Boron (B)	mg/L	<0.050	<0.050	0.050	9130327
Total Cadmium (Cd)	mg/L	<0.000010	<0.000010	0.000010	9130327
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	9130327
Total Copper (Cu)	mg/L	0.00077	0.00067	0.00050	9130327
Total Iron (Fe)	mg/L	0.024	0.014	0.010	9130327
Total Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	9130327
Total Lithium (Li)	mg/L	<0.0020	<0.0020	0.0020	9130327
Total Manganese (Mn)	mg/L	0.0044	0.0022	0.0010	9130327
Total Molybdenum (Mo)	mg/L	<0.0010	<0.0010	0.0010	9130327
Total Nickel (Ni)	mg/L	<0.0010	<0.0010	0.0010	9130327
Total Selenium (Se)	mg/L	<0.00010	<0.00010	0.00010	9130327
Total Silver (Ag)	mg/L	<0.000020	<0.000020	0.000020	9130327
Total Strontium (Sr)	mg/L	0.0482	0.0333	0.0010	9130327
Total Thallium (Tl)	mg/L	<0.000010	<0.000010	0.000010	9130327
Total Tin (Sn)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Titanium (Ti)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Uranium (U)	mg/L	<0.00010	<0.00010	0.00010	9130327
Total Vanadium (V)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Zinc (Zn)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Calcium (Ca)	mg/L	7.61	6.79	0.050	9130327
Total Magnesium (Mg)	mg/L	1.33	1.08	0.050	9130327
Total Potassium (K)	mg/L	1.00	0.885	0.050	9130327
Total Sodium (Na)	mg/L	5.44	4.25	0.050	9130327
RDL = Reportable Detection Limit					

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Agnico-Eagle
Site Location: MELIADINE
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Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Results relate only to the items tested.

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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9130273	MHM	Matrix Spike	Dissolved Aluminum (Al)	2018/09/06		95	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/06		NC	%	80 - 120
			Dissolved Arsenic (As)	2018/09/06		109	%	80 - 120
			Dissolved Barium (Ba)	2018/09/06		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/06		98	%	80 - 120
			Dissolved Boron (B)	2018/09/06		98	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/06		98	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/06		94	%	80 - 120
			Dissolved Copper (Cu)	2018/09/06		91	%	80 - 120
			Dissolved Iron (Fe)	2018/09/06		97	%	80 - 120
			Dissolved Lead (Pb)	2018/09/06		92	%	80 - 120
			Dissolved Lithium (Li)	2018/09/06		99	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/06		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/06		NC	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/06		92	%	80 - 120
			Dissolved Selenium (Se)	2018/09/06		103	%	80 - 120
			Dissolved Silver (Ag)	2018/09/06		92	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/06		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/06		93	%	80 - 120
			Dissolved Tin (Sn)	2018/09/06		98	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/06		102	%	80 - 120
			Dissolved Uranium (U)	2018/09/06		103	%	80 - 120
			Dissolved Vanadium (V)	2018/09/06		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/06		104	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/06		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/06		91	%	80 - 120
			Dissolved Potassium (K)	2018/09/06		NC	%	80 - 120
			Dissolved Sodium (Na)	2018/09/06		NC	%	80 - 120
9130273	MHM	Spiked Blank	Dissolved Aluminum (Al)	2018/09/06		98	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/06		100	%	80 - 120
			Dissolved Arsenic (As)	2018/09/06		102	%	80 - 120
			Dissolved Barium (Ba)	2018/09/06		99	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/06		101	%	80 - 120
			Dissolved Boron (B)	2018/09/06		107	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/06		101	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/06		94	%	80 - 120
			Dissolved Copper (Cu)	2018/09/06		93	%	80 - 120
			Dissolved Iron (Fe)	2018/09/06		98	%	80 - 120
			Dissolved Lead (Pb)	2018/09/06		98	%	80 - 120
			Dissolved Lithium (Li)	2018/09/06		97	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/06		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/06		105	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/06		93	%	80 - 120
			Dissolved Selenium (Se)	2018/09/06		100	%	80 - 120
			Dissolved Silver (Ag)	2018/09/06		98	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/06		102	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/06		96	%	80 - 120
			Dissolved Tin (Sn)	2018/09/06		98	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/06		98	%	80 - 120
			Dissolved Uranium (U)	2018/09/06		99	%	80 - 120
			Dissolved Vanadium (V)	2018/09/06		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/06		104	%	80 - 120

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Maxxam Job #: B874841
Report Date: 2018/09/10

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Calcium (Ca)	2018/09/06		98	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/06		96	%	80 - 120
			Dissolved Potassium (K)	2018/09/06		100	%	80 - 120
			Dissolved Sodium (Na)	2018/09/06		99	%	80 - 120
9130273	MHM	Method Blank	Dissolved Aluminum (Al)	2018/09/06	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/09/06	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/09/06	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/09/06	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/09/06	<0.00010		mg/L	
			Dissolved Boron (B)	2018/09/06	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/09/06	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/09/06	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/09/06	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/09/06	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/09/06	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/09/06	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/09/06	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/09/06	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/09/06	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/09/06	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/09/06	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/09/06	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/09/06	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/09/06	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/09/06	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/09/06	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/09/06	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/09/06	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/09/06	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/09/06	<0.050		mg/L	
			Dissolved Potassium (K)	2018/09/06	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/09/06	<0.050		mg/L	
9130273	MHM	RPD	Dissolved Aluminum (Al)	2018/09/07	0.33		%	20
			Dissolved Antimony (Sb)	2018/09/07	0.68		%	20
			Dissolved Arsenic (As)	2018/09/07	0.98		%	20
			Dissolved Barium (Ba)	2018/09/07	1.7		%	20
			Dissolved Beryllium (Be)	2018/09/07	NC		%	20
			Dissolved Boron (B)	2018/09/07	3.0		%	20
			Dissolved Cadmium (Cd)	2018/09/07	NC		%	20
			Dissolved Chromium (Cr)	2018/09/07	NC		%	20
			Dissolved Copper (Cu)	2018/09/07	1.8		%	20
			Dissolved Iron (Fe)	2018/09/07	3.6		%	20
			Dissolved Lead (Pb)	2018/09/07	NC		%	20
			Dissolved Lithium (Li)	2018/09/07	2.8		%	20
			Dissolved Manganese (Mn)	2018/09/07	NC		%	20
			Dissolved Molybdenum (Mo)	2018/09/07	0.23		%	20
			Dissolved Nickel (Ni)	2018/09/07	3.6		%	20
			Dissolved Selenium (Se)	2018/09/07	2.5		%	20
			Dissolved Silver (Ag)	2018/09/07	NC		%	20
			Dissolved Strontium (Sr)	2018/09/07	1.0		%	20
			Dissolved Thallium (Tl)	2018/09/07	NC		%	20
			Dissolved Tin (Sn)	2018/09/07	NC		%	20

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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Titanium (Ti)	2018/09/07	NC		%	20
			Dissolved Uranium (U)	2018/09/07	0.14		%	20
			Dissolved Vanadium (V)	2018/09/07	NC		%	20
			Dissolved Zinc (Zn)	2018/09/07	NC		%	20
			Dissolved Aluminum (Al)	2018/09/07	NC		%	20
			Dissolved Antimony (Sb)	2018/09/07	NC		%	20
			Dissolved Arsenic (As)	2018/09/07	NC		%	20
			Dissolved Barium (Ba)	2018/09/07	NC		%	20
			Dissolved Beryllium (Be)	2018/09/07	NC		%	20
			Dissolved Boron (B)	2018/09/07	NC		%	20
			Dissolved Cadmium (Cd)	2018/09/07	NC		%	20
			Dissolved Chromium (Cr)	2018/09/07	NC		%	20
			Dissolved Copper (Cu)	2018/09/07	0.15		%	20
			Dissolved Iron (Fe)	2018/09/07	NC		%	20
			Dissolved Lead (Pb)	2018/09/07	NC		%	20
			Dissolved Lithium (Li)	2018/09/07	NC		%	20
			Dissolved Manganese (Mn)	2018/09/07	NC		%	20
			Dissolved Molybdenum (Mo)	2018/09/07	NC		%	20
			Dissolved Nickel (Ni)	2018/09/07	NC		%	20
			Dissolved Selenium (Se)	2018/09/07	NC		%	20
			Dissolved Silver (Ag)	2018/09/07	8.9		%	20
			Dissolved Strontium (Sr)	2018/09/07	NC		%	20
			Dissolved Thallium (Tl)	2018/09/07	NC		%	20
			Dissolved Tin (Sn)	2018/09/07	NC		%	20
			Dissolved Titanium (Ti)	2018/09/07	NC		%	20
			Dissolved Uranium (U)	2018/09/07	NC		%	20
			Dissolved Vanadium (V)	2018/09/07	NC		%	20
			Dissolved Zinc (Zn)	2018/09/07	0.40		%	20
9130327	MHM	Matrix Spike	Total Aluminum (Al)	2018/09/06		100	%	80 - 120
			Total Antimony (Sb)	2018/09/06		101	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		100	%	80 - 120
			Total Beryllium (Be)	2018/09/06		104	%	80 - 120
			Total Boron (B)	2018/09/06		108	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		99	%	80 - 120
			Total Copper (Cu)	2018/09/06		94	%	80 - 120
			Total Iron (Fe)	2018/09/06		97	%	80 - 120
			Total Lead (Pb)	2018/09/06		99	%	80 - 120
			Total Lithium (Li)	2018/09/06		99	%	80 - 120
			Total Manganese (Mn)	2018/09/06		99	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		95	%	80 - 120
			Total Selenium (Se)	2018/09/06		104	%	80 - 120
			Total Silver (Ag)	2018/09/06		99	%	80 - 120
			Total Strontium (Sr)	2018/09/06		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/06		99	%	80 - 120
			Total Tin (Sn)	2018/09/06		100	%	80 - 120
			Total Titanium (Ti)	2018/09/06		108	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		99	%	80 - 120
			Total Zinc (Zn)	2018/09/06		110	%	80 - 120

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Maxxam Job #: B874841
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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Calcium (Ca)	2018/09/06		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		NC	%	80 - 120
			Total Potassium (K)	2018/09/06		101	%	80 - 120
			Total Sodium (Na)	2018/09/06		NC	%	80 - 120
9130327	MHM	Spiked Blank	Total Aluminum (Al)	2018/09/06		102	%	80 - 120
			Total Antimony (Sb)	2018/09/06		105	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		102	%	80 - 120
			Total Beryllium (Be)	2018/09/06		106	%	80 - 120
			Total Boron (B)	2018/09/06		109	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		101	%	80 - 120
			Total Copper (Cu)	2018/09/06		97	%	80 - 120
			Total Iron (Fe)	2018/09/06		104	%	80 - 120
			Total Lead (Pb)	2018/09/06		101	%	80 - 120
			Total Lithium (Li)	2018/09/06		101	%	80 - 120
			Total Manganese (Mn)	2018/09/06		101	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		97	%	80 - 120
			Total Selenium (Se)	2018/09/06		105	%	80 - 120
			Total Silver (Ag)	2018/09/06		101	%	80 - 120
			Total Strontium (Sr)	2018/09/06		105	%	80 - 120
			Total Thallium (Tl)	2018/09/06		101	%	80 - 120
			Total Tin (Sn)	2018/09/06		101	%	80 - 120
			Total Titanium (Ti)	2018/09/06		104	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		103	%	80 - 120
			Total Zinc (Zn)	2018/09/06		107	%	80 - 120
			Total Calcium (Ca)	2018/09/06		104	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		101	%	80 - 120
			Total Potassium (K)	2018/09/06		102	%	80 - 120
			Total Sodium (Na)	2018/09/06		104	%	80 - 120
9130327	MHM	Method Blank	Total Aluminum (Al)	2018/09/06	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/06	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/06	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/06	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/06	<0.00010		mg/L	
			Total Boron (B)	2018/09/06	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/06	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/06	<0.0010		mg/L	
			Total Copper (Cu)	2018/09/06	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/06	<0.010		mg/L	
			Total Lead (Pb)	2018/09/06	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/06	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/06	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/06	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/06	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/06	<0.00010		mg/L	
			Total Silver (Ag)	2018/09/06	<0.000020		mg/L	
			Total Strontium (Sr)	2018/09/06	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/06	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/06	<0.0050		mg/L	

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Maxxam Job #: B874841
Report Date: 2018/09/10

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Titanium (Ti)	2018/09/06	<0.0050		mg/L	
			Total Uranium (U)	2018/09/06	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/06	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/06	<0.0050		mg/L	
			Total Calcium (Ca)	2018/09/06	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/06	<0.050		mg/L	
			Total Potassium (K)	2018/09/06	<0.050		mg/L	
			Total Sodium (Na)	2018/09/06	<0.050		mg/L	
9130327	MHM	RPD	Total Aluminum (Al)	2018/09/06	3.6		%	20
			Total Antimony (Sb)	2018/09/06	NC		%	20
			Total Arsenic (As)	2018/09/06	4.7		%	20
			Total Barium (Ba)	2018/09/06	1.7		%	20
			Total Beryllium (Be)	2018/09/06	NC		%	20
			Total Boron (B)	2018/09/06	NC		%	20
			Total Cadmium (Cd)	2018/09/06	NC		%	20
			Total Chromium (Cr)	2018/09/06	NC		%	20
			Total Copper (Cu)	2018/09/06	6.9		%	20
			Total Iron (Fe)	2018/09/06	3.1		%	20
			Total Lead (Pb)	2018/09/06	6.4		%	20
			Total Lithium (Li)	2018/09/06	NC		%	20
			Total Manganese (Mn)	2018/09/06	1.3		%	20
			Total Molybdenum (Mo)	2018/09/06	NC		%	20
			Total Nickel (Ni)	2018/09/06	NC		%	20
			Total Selenium (Se)	2018/09/06	NC		%	20
			Total Silver (Ag)	2018/09/06	NC		%	20
			Total Strontium (Sr)	2018/09/06	0.99		%	20
			Total Thallium (Tl)	2018/09/06	NC		%	20
			Total Tin (Sn)	2018/09/06	NC		%	20
			Total Titanium (Ti)	2018/09/06	NC		%	20
			Total Uranium (U)	2018/09/06	NC		%	20
			Total Vanadium (V)	2018/09/06	NC		%	20
			Total Zinc (Zn)	2018/09/06	0.72		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B874841
Report Date: 2018/09/10

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist

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Your P.O. #: B8M4777
Site Location: MELIADINE
Your C.O.C. #: B8M4777-M060-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663084
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B874816
Received: 2018/09/01, 11:35

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	2	N/A	2018/09/05	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Omran Desouki
Junior Project Manager
12 Dec 2018 13:27:57

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

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Maxxam Job #: B874816
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF4393	UF4393	UF4394		
Sampling Date		2018/08/26 15:10	2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M060-01-01	B8M4777-M060-01-01	B8M4777-M060-01-01		
	UNITS	MEL-13	MEL-13 Lab-Dup	ML-03-01	RDL	QC Batch
Misc. Inorganics						
Reactive Silica	mg/L	0.29	0.29	0.23	0.050	9129608

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874816
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

TEST SUMMARY

Maxxam ID: UF4393
Sample ID: MEL-13
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/31
Received: 2018/09/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129608	N/A	2018/09/05	Zafar Iqbal

Maxxam ID: UF4393 Dup
Sample ID: MEL-13
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/31
Received: 2018/09/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129608	N/A	2018/09/05	Zafar Iqbal

Maxxam ID: UF4394
Sample ID: ML-03-01
Matrix: Water

Collected: 2018/08/26
Shipped: 2018/08/31
Received: 2018/09/01

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9129608	N/A	2018/09/05	Zafar Iqbal

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Maxxam Job #: B874816
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.7°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated per client request.

GPS coordinates: 63°01'44.6'' 92°09'14.6''

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B874816
Report Date: 2018/12/12

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9129608	Reactive Silica	2018/09/05	107	80 - 120	101	80 - 120	<0.050	mg/L	1.8	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B874816
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

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Your P.O. #: B8M4777
Site Location: MELIADINE
Your C.O.C. #: B8M4777-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663167
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B874841
Received: 2018/09/01, 12:30

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	2	N/A	2018/09/06	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	2	N/A	2018/09/07	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	2	N/A	2018/09/06	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	2	2018/09/05	2018/09/06	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	2	N/A	2018/09/01	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Encryption Key



Jennifer Villocero
Project Manager
12 Dec 2018 13:38:18

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8M4777
Site Location: MELIADINE
Your C.O.C. #: B8M4777-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663167
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B874841
Received: 2018/09/01, 12:30

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

==========

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Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UF4499	UF4500		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M058-01-01	B8M4777-M058-01-01		
	UNITS	MEL-13	MEL-03-01	RDL	QC Batch
Calculated Parameters					
Filter and HNO3 Preservation	N/A	FIELD	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	25.0	21.9	0.50	9126845
Total Hardness (CaCO3)	mg/L	24.5	21.4	0.50	9127031

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UF4499	UF4500		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M058-01-01	B8M4777-M058-01-01		
	UNITS	MEL-13	MEL-03-01	RDL	QC Batch
Dissolved Metals by ICPMS					
Dissolved Aluminum (Al)	mg/L	0.0054	0.0043	0.0030	9130273
Dissolved Antimony (Sb)	mg/L	<0.00050	<0.00050	0.00050	9130273
Dissolved Arsenic (As)	mg/L	0.00040	0.00019	0.00010	9130273
Dissolved Barium (Ba)	mg/L	0.0076	0.0072	0.0010	9130273
Dissolved Beryllium (Be)	mg/L	<0.00010	<0.00010	0.00010	9130273
Dissolved Boron (B)	mg/L	<0.050	<0.050	0.050	9130273
Dissolved Cadmium (Cd)	mg/L	<0.000010	<0.000010	0.000010	9130273
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Copper (Cu)	mg/L	0.00075	0.00060	0.00020	9130273
Dissolved Iron (Fe)	mg/L	0.0074	<0.0050	0.0050	9130273
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	9130273
Dissolved Lithium (Li)	mg/L	<0.0020	<0.0020	0.0020	9130273
Dissolved Manganese (Mn)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Molybdenum (Mo)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Nickel (Ni)	mg/L	<0.0010	<0.0010	0.0010	9130273
Dissolved Selenium (Se)	mg/L	<0.00010	<0.00010	0.00010	9130273
Dissolved Silver (Ag)	mg/L	<0.000020	<0.000020	0.000020	9130273
Dissolved Strontium (Sr)	mg/L	0.0491	0.0335	0.0010	9130273
Dissolved Thallium (Tl)	mg/L	<0.000010	<0.000010	0.000010	9130273
Dissolved Tin (Sn)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Uranium (U)	mg/L	<0.00010	<0.00010	0.00010	9130273
Dissolved Vanadium (V)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Zinc (Zn)	mg/L	<0.0050	<0.0050	0.0050	9130273
Dissolved Calcium (Ca)	mg/L	7.82	6.95	0.050	9130273
Dissolved Magnesium (Mg)	mg/L	1.33	1.11	0.050	9130273
Dissolved Potassium (K)	mg/L	0.986	0.874	0.050	9130273
Dissolved Sodium (Na)	mg/L	5.41	4.36	0.050	9130273
Total Metals by ICPMS					
Total Aluminum (Al)	mg/L	0.0098	0.0070	0.0030	9130327
Total Antimony (Sb)	mg/L	<0.00050	<0.00050	0.00050	9130327
RDL = Reportable Detection Limit					

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Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		UF4499	UF4500		
Sampling Date		2018/08/26 15:10	2018/08/26 16:30		
COC Number		B8M4777-M058-01-01	B8M4777-M058-01-01		
	UNITS	MEL-13	MEL-03-01	RDL	QC Batch
Total Arsenic (As)	mg/L	0.00046	0.00020	0.00010	9130327
Total Barium (Ba)	mg/L	0.0077	0.0072	0.0010	9130327
Total Beryllium (Be)	mg/L	<0.00010	<0.00010	0.00010	9130327
Total Boron (B)	mg/L	<0.050	<0.050	0.050	9130327
Total Cadmium (Cd)	mg/L	<0.000010	<0.000010	0.000010	9130327
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	9130327
Total Copper (Cu)	mg/L	0.00077	0.00067	0.00050	9130327
Total Iron (Fe)	mg/L	0.024	0.014	0.010	9130327
Total Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	9130327
Total Lithium (Li)	mg/L	<0.0020	<0.0020	0.0020	9130327
Total Manganese (Mn)	mg/L	0.0044	0.0022	0.0010	9130327
Total Molybdenum (Mo)	mg/L	<0.0010	<0.0010	0.0010	9130327
Total Nickel (Ni)	mg/L	<0.0010	<0.0010	0.0010	9130327
Total Selenium (Se)	mg/L	<0.00010	<0.00010	0.00010	9130327
Total Silver (Ag)	mg/L	<0.000020	<0.000020	0.000020	9130327
Total Strontium (Sr)	mg/L	0.0482	0.0333	0.0010	9130327
Total Thallium (Tl)	mg/L	<0.000010	<0.000010	0.000010	9130327
Total Tin (Sn)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Titanium (Ti)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Uranium (U)	mg/L	<0.00010	<0.00010	0.00010	9130327
Total Vanadium (V)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Zinc (Zn)	mg/L	<0.0050	<0.0050	0.0050	9130327
Total Calcium (Ca)	mg/L	7.61	6.79	0.050	9130327
Total Magnesium (Mg)	mg/L	1.33	1.08	0.050	9130327
Total Potassium (K)	mg/L	1.00	0.885	0.050	9130327
Total Sodium (Na)	mg/L	5.44	4.25	0.050	9130327
RDL = Reportable Detection Limit					

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated as per client request.

Sample UF4499 [MEL-13] : GPS coordinates: 63°01'44.6'' 92°09'14.6''

Sample UF4500 [MEL-03-01] : GPS coordinates: 63°06'52.2'' 92°20'23.6''

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9130273	MHM	Matrix Spike	Dissolved Aluminum (Al)	2018/09/06		95	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/06		NC	%	80 - 120
			Dissolved Arsenic (As)	2018/09/06		109	%	80 - 120
			Dissolved Barium (Ba)	2018/09/06		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/06		98	%	80 - 120
			Dissolved Boron (B)	2018/09/06		98	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/06		98	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/06		94	%	80 - 120
			Dissolved Copper (Cu)	2018/09/06		91	%	80 - 120
			Dissolved Iron (Fe)	2018/09/06		97	%	80 - 120
			Dissolved Lead (Pb)	2018/09/06		92	%	80 - 120
			Dissolved Lithium (Li)	2018/09/06		99	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/06		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/06		NC	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/06		92	%	80 - 120
			Dissolved Selenium (Se)	2018/09/06		103	%	80 - 120
			Dissolved Silver (Ag)	2018/09/06		92	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/06		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/06		93	%	80 - 120
			Dissolved Tin (Sn)	2018/09/06		98	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/06		102	%	80 - 120
			Dissolved Uranium (U)	2018/09/06		103	%	80 - 120
			Dissolved Vanadium (V)	2018/09/06		100	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/06		104	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/06		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/06		91	%	80 - 120
			Dissolved Potassium (K)	2018/09/06		NC	%	80 - 120
			Dissolved Sodium (Na)	2018/09/06		NC	%	80 - 120
9130273	MHM	Spiked Blank	Dissolved Aluminum (Al)	2018/09/06		98	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/06		100	%	80 - 120
			Dissolved Arsenic (As)	2018/09/06		102	%	80 - 120
			Dissolved Barium (Ba)	2018/09/06		99	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/06		101	%	80 - 120
			Dissolved Boron (B)	2018/09/06		107	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/06		101	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/06		94	%	80 - 120
			Dissolved Copper (Cu)	2018/09/06		93	%	80 - 120
			Dissolved Iron (Fe)	2018/09/06		98	%	80 - 120
			Dissolved Lead (Pb)	2018/09/06		98	%	80 - 120
			Dissolved Lithium (Li)	2018/09/06		97	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/06		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/06		105	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/06		93	%	80 - 120
			Dissolved Selenium (Se)	2018/09/06		100	%	80 - 120
			Dissolved Silver (Ag)	2018/09/06		98	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/06		102	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/06		96	%	80 - 120
			Dissolved Tin (Sn)	2018/09/06		98	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/06		98	%	80 - 120
			Dissolved Uranium (U)	2018/09/06		99	%	80 - 120
			Dissolved Vanadium (V)	2018/09/06		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/06		104	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/06		98	%	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Magnesium (Mg)	2018/09/06		96	%	80 - 120
			Dissolved Potassium (K)	2018/09/06		100	%	80 - 120
			Dissolved Sodium (Na)	2018/09/06		99	%	80 - 120
9130273	MHM	Method Blank	Dissolved Aluminum (Al)	2018/09/06	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/09/06	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/09/06	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/09/06	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/09/06	<0.00010		mg/L	
			Dissolved Boron (B)	2018/09/06	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/09/06	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/09/06	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/09/06	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/09/06	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/09/06	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/09/06	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/09/06	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/09/06	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/09/06	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/09/06	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/09/06	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/09/06	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/09/06	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/09/06	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/09/06	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/09/06	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/09/06	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/09/06	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/09/06	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/09/06	<0.050		mg/L	
			Dissolved Potassium (K)	2018/09/06	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/09/06	<0.050		mg/L	
9130273	MHM	RPD	Dissolved Aluminum (Al)	2018/09/07	0.33		%	20
			Dissolved Antimony (Sb)	2018/09/07	0.68		%	20
			Dissolved Arsenic (As)	2018/09/07	0.98		%	20
			Dissolved Barium (Ba)	2018/09/07	1.7		%	20
			Dissolved Beryllium (Be)	2018/09/07	NC		%	20
			Dissolved Boron (B)	2018/09/07	3.0		%	20
			Dissolved Cadmium (Cd)	2018/09/07	NC		%	20
			Dissolved Chromium (Cr)	2018/09/07	NC		%	20
			Dissolved Copper (Cu)	2018/09/07	1.8		%	20
			Dissolved Iron (Fe)	2018/09/07	3.6		%	20
			Dissolved Lead (Pb)	2018/09/07	NC		%	20
			Dissolved Lithium (Li)	2018/09/07	2.8		%	20
			Dissolved Manganese (Mn)	2018/09/07	NC		%	20
			Dissolved Molybdenum (Mo)	2018/09/07	0.23		%	20
			Dissolved Nickel (Ni)	2018/09/07	3.6		%	20
			Dissolved Selenium (Se)	2018/09/07	2.5		%	20
			Dissolved Silver (Ag)	2018/09/07	NC		%	20
			Dissolved Strontium (Sr)	2018/09/07	1.0		%	20
			Dissolved Thallium (Tl)	2018/09/07	NC		%	20
			Dissolved Tin (Sn)	2018/09/07	NC		%	20
			Dissolved Titanium (Ti)	2018/09/07	NC		%	20
			Dissolved Uranium (U)	2018/09/07	0.14		%	20

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Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Vanadium (V)	2018/09/07	NC		%	20
			Dissolved Zinc (Zn)	2018/09/07	NC		%	20
			Dissolved Aluminum (Al)	2018/09/07	NC		%	20
			Dissolved Antimony (Sb)	2018/09/07	NC		%	20
			Dissolved Arsenic (As)	2018/09/07	NC		%	20
			Dissolved Barium (Ba)	2018/09/07	NC		%	20
			Dissolved Beryllium (Be)	2018/09/07	NC		%	20
			Dissolved Boron (B)	2018/09/07	NC		%	20
			Dissolved Cadmium (Cd)	2018/09/07	NC		%	20
			Dissolved Chromium (Cr)	2018/09/07	NC		%	20
			Dissolved Copper (Cu)	2018/09/07	0.15		%	20
			Dissolved Iron (Fe)	2018/09/07	NC		%	20
			Dissolved Lead (Pb)	2018/09/07	NC		%	20
			Dissolved Lithium (Li)	2018/09/07	NC		%	20
			Dissolved Manganese (Mn)	2018/09/07	NC		%	20
			Dissolved Molybdenum (Mo)	2018/09/07	NC		%	20
			Dissolved Nickel (Ni)	2018/09/07	NC		%	20
			Dissolved Selenium (Se)	2018/09/07	NC		%	20
			Dissolved Silver (Ag)	2018/09/07	8.9		%	20
			Dissolved Strontium (Sr)	2018/09/07	NC		%	20
			Dissolved Thallium (Tl)	2018/09/07	NC		%	20
			Dissolved Tin (Sn)	2018/09/07	NC		%	20
			Dissolved Titanium (Ti)	2018/09/07	NC		%	20
			Dissolved Uranium (U)	2018/09/07	NC		%	20
			Dissolved Vanadium (V)	2018/09/07	NC		%	20
			Dissolved Zinc (Zn)	2018/09/07	0.40		%	20
9130327	MHM	Matrix Spike	Total Aluminum (Al)	2018/09/06		100	%	80 - 120
			Total Antimony (Sb)	2018/09/06		101	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		100	%	80 - 120
			Total Beryllium (Be)	2018/09/06		104	%	80 - 120
			Total Boron (B)	2018/09/06		108	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		99	%	80 - 120
			Total Copper (Cu)	2018/09/06		94	%	80 - 120
			Total Iron (Fe)	2018/09/06		97	%	80 - 120
			Total Lead (Pb)	2018/09/06		99	%	80 - 120
			Total Lithium (Li)	2018/09/06		99	%	80 - 120
			Total Manganese (Mn)	2018/09/06		99	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		95	%	80 - 120
			Total Selenium (Se)	2018/09/06		104	%	80 - 120
			Total Silver (Ag)	2018/09/06		99	%	80 - 120
			Total Strontium (Sr)	2018/09/06		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/06		99	%	80 - 120
			Total Tin (Sn)	2018/09/06		100	%	80 - 120
			Total Titanium (Ti)	2018/09/06		108	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		99	%	80 - 120
			Total Zinc (Zn)	2018/09/06		110	%	80 - 120
			Total Calcium (Ca)	2018/09/06		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		NC	%	80 - 120
			Total Potassium (K)	2018/09/06		101	%	80 - 120

Maxxam Job #: B874841
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Sodium (Na)	2018/09/06		NC	%	80 - 120
9130327	MHM	Spiked Blank	Total Aluminum (Al)	2018/09/06		102	%	80 - 120
			Total Antimony (Sb)	2018/09/06		105	%	80 - 120
			Total Arsenic (As)	2018/09/06		106	%	80 - 120
			Total Barium (Ba)	2018/09/06		102	%	80 - 120
			Total Beryllium (Be)	2018/09/06		106	%	80 - 120
			Total Boron (B)	2018/09/06		109	%	80 - 120
			Total Cadmium (Cd)	2018/09/06		103	%	80 - 120
			Total Chromium (Cr)	2018/09/06		101	%	80 - 120
			Total Copper (Cu)	2018/09/06		97	%	80 - 120
			Total Iron (Fe)	2018/09/06		104	%	80 - 120
			Total Lead (Pb)	2018/09/06		101	%	80 - 120
			Total Lithium (Li)	2018/09/06		101	%	80 - 120
			Total Manganese (Mn)	2018/09/06		101	%	80 - 120
			Total Molybdenum (Mo)	2018/09/06		106	%	80 - 120
			Total Nickel (Ni)	2018/09/06		97	%	80 - 120
			Total Selenium (Se)	2018/09/06		105	%	80 - 120
			Total Silver (Ag)	2018/09/06		101	%	80 - 120
			Total Strontium (Sr)	2018/09/06		105	%	80 - 120
			Total Thallium (Tl)	2018/09/06		101	%	80 - 120
			Total Tin (Sn)	2018/09/06		101	%	80 - 120
			Total Titanium (Ti)	2018/09/06		104	%	80 - 120
			Total Uranium (U)	2018/09/06		105	%	80 - 120
			Total Vanadium (V)	2018/09/06		103	%	80 - 120
			Total Zinc (Zn)	2018/09/06		107	%	80 - 120
			Total Calcium (Ca)	2018/09/06		104	%	80 - 120
			Total Magnesium (Mg)	2018/09/06		101	%	80 - 120
			Total Potassium (K)	2018/09/06		102	%	80 - 120
			Total Sodium (Na)	2018/09/06		104	%	80 - 120
9130327	MHM	Method Blank	Total Aluminum (Al)	2018/09/06	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/06	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/06	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/06	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/06	<0.00010		mg/L	
			Total Boron (B)	2018/09/06	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/06	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/06	<0.0010		mg/L	
			Total Copper (Cu)	2018/09/06	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/06	<0.010		mg/L	
			Total Lead (Pb)	2018/09/06	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/06	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/06	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/06	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/06	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/06	<0.00010		mg/L	
			Total Silver (Ag)	2018/09/06	<0.000020		mg/L	
			Total Strontium (Sr)	2018/09/06	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/06	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/06	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/06	<0.0050		mg/L	
			Total Uranium (U)	2018/09/06	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/06	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/06	<0.0050		mg/L	

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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Calcium (Ca)	2018/09/06	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/06	<0.050		mg/L	
			Total Potassium (K)	2018/09/06	<0.050		mg/L	
			Total Sodium (Na)	2018/09/06	<0.050		mg/L	
9130327	MHM	RPD	Total Aluminum (Al)	2018/09/06	3.6		%	20
			Total Antimony (Sb)	2018/09/06	NC		%	20
			Total Arsenic (As)	2018/09/06	4.7		%	20
			Total Barium (Ba)	2018/09/06	1.7		%	20
			Total Beryllium (Be)	2018/09/06	NC		%	20
			Total Boron (B)	2018/09/06	NC		%	20
			Total Cadmium (Cd)	2018/09/06	NC		%	20
			Total Chromium (Cr)	2018/09/06	NC		%	20
			Total Copper (Cu)	2018/09/06	6.9		%	20
			Total Iron (Fe)	2018/09/06	3.1		%	20
			Total Lead (Pb)	2018/09/06	6.4		%	20
			Total Lithium (Li)	2018/09/06	NC		%	20
			Total Manganese (Mn)	2018/09/06	1.3		%	20
			Total Molybdenum (Mo)	2018/09/06	NC		%	20
			Total Nickel (Ni)	2018/09/06	NC		%	20
			Total Selenium (Se)	2018/09/06	NC		%	20
			Total Silver (Ag)	2018/09/06	NC		%	20
			Total Strontium (Sr)	2018/09/06	0.99		%	20
			Total Thallium (Tl)	2018/09/06	NC		%	20
			Total Tin (Sn)	2018/09/06	NC		%	20
			Total Titanium (Ti)	2018/09/06	NC		%	20
			Total Uranium (U)	2018/09/06	NC		%	20
			Total Vanadium (V)	2018/09/06	NC		%	20
			Total Zinc (Zn)	2018/09/06	0.72		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B874841
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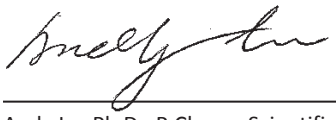
Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8M4777
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam
A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site#: 63°01'44.6'' 92°09'14.6''
Site Location: MELIADINE
Your C.O.C. #: n/a

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532390
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8N2546
Received: 2018/09/06, 11:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity (1)	1	N/A	2018/09/10	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2018/09/11	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry (1)	1	N/A	2018/09/10	CAM SOP-00463	EPA 325.2 m
Conductivity (1)	1	N/A	2018/09/11	CAM SOP-00414	SM 23 2510 m
Free (WAD) Cyanide (1)	1	N/A	2018/09/10	CAM SOP-00457	OMOE E3015 m
Total Cyanide (1)	1	2018/09/10	2018/09/10	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1, 4)	1	N/A	2018/09/10	CAM SOP-00446	SM 23 5310 B m
Dissolved Oxygen (1)	1	2018/09/07	2018/09/07	CAM SOP-00427	SM 23 4500 O G m
Petroleum Hydro. CCME F1 & BTEX in Water (1)	1	N/A	2018/09/09	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	1	2018/09/10	2018/09/10	CAM SOP-00316	CCME PHC-CWS m
Dissolved Mercury (low level) (1)	1	2018/09/11	2018/09/11	CAM SOP-00453	EPA 7470 m
Mercury (low level) (1)	1	2018/09/11	2018/09/11	CAM SOP-00453	EPA 7470 m
Total Ammonia-N (1)	1	N/A	2018/09/11	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	1	N/A	2018/09/10	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH (1)	1	N/A	2018/09/10	CAM SOP-00413	SM 4500H+ B m
Orthophosphate (1)	1	N/A	2018/09/10	CAM SOP-00461	EPA 365.1 m
Radium-226 Low Level (2, 7)	1	N/A	2018/09/18	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry
Sulphate by Automated Colourimetry (1)	1	N/A	2018/09/10	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	1	2018/09/11	2018/09/11	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	1	2018/09/10	2018/09/11	CAM SOP-00938	OMOE E3516 m
Total Organic Carbon (TOC) (1, 8)	1	N/A	2018/09/11	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric) (1)	1	2018/09/11	2018/09/11	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids (1)	1	2018/09/10	2018/09/10	CAM SOP-00428	SM 23 2540D m
Turbidity (1)	1	N/A	2018/09/10	CAM SOP-00417	SM 23 2130 B m
Hardness (calculated as CaCO3) (3)	1	N/A	N/A	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using

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Your P.O. #: OL-664695
Site#: 63°01'44.6'' 92°09'14.6''
Site Location: MELIADINE
Your C.O.C. #: n/a

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532390
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8N2546
Received: 2018/09/06, 11:00

accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Analytics Mississauga
(2) This test was performed by Maxxam Analytics Kitimat
(3) This test was performed by Campo to Burnaby Subcontract
(4) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(5) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(6) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(7) Radium-226 results have not been corrected for blanks.
(8) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key



Alisha Williamson
Project Manager
19 Dec 2018 15:48:27

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alisha Williamson, Project Manager
Email: AWilliamson@maxxam.ca
Phone# (613) 274-0573

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B8N2546
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

CCME PETROLEUM HYDROCARBONS IN WATER (WATER)

Maxxam ID		HRK621		
Sampling Date		2018/09/04 13:30		
COC Number		n/a		
	UNITS	MEL-13	RDL	QC Batch
BTEX & F1 Hydrocarbons				
Benzene	ug/L	<0.20	0.20	5721232
Toluene	ug/L	<0.20	0.20	5721232
Ethylbenzene	ug/L	<0.20	0.20	5721232
o-Xylene	ug/L	<0.20	0.20	5721232
p+m-Xylene	ug/L	<0.40	0.40	5721232
Total Xylenes	ug/L	<0.40	0.40	5721232
F1 (C6-C10)	ug/L	<25	25	5721232
F1 (C6-C10) - BTEX	ug/L	<25	25	5721232
F2-F4 Hydrocarbons				
F2 (C10-C16 Hydrocarbons)	ug/L	<100	100	5722301
F3 (C16-C34 Hydrocarbons)	ug/L	<200	200	5722301
F4 (C34-C50 Hydrocarbons)	ug/L	<200	200	5722301
Reached Baseline at C50	ug/L	Yes		5722301
Surrogate Recovery (%)				
1,4-Difluorobenzene	%	100		5721232
4-Bromofluorobenzene	%	96		5721232
D10-Ethylbenzene	%	100		5721232
D4-1,2-Dichloroethane	%	109		5721232
o-Terphenyl	%	97		5722301

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

RESULTS OF ANALYSES OF WATER

Maxxam ID		HRK621		
Sampling Date		2018/09/04 13:30		
COC Number		n/a		
	UNITS	MEL-13	RDL	QC Batch
Calculated Parameters				
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	16	1.0	5719975
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	5719975
Inorganics				
Total Ammonia-N	mg/L	<0.050	0.050	5724301
Conductivity	umho/cm	84	1.0	5721313
Total Dissolved Solids	mg/L	100	10	5724672
Total Kjeldahl Nitrogen (TKN)	mg/L	<0.10	0.10	5722944
Dissolved Organic Carbon	mg/L	2.9	0.50	5720262
Total Organic Carbon (TOC)	mg/L	3.0	0.50	5724690
Orthophosphate (P)	mg/L	<0.010	0.010	5721404
Dissolved Oxygen	mg/L	10.6		5720610
pH	pH	7.44		5721317
Total Phosphorus	mg/L	<0.020	0.020	5724105
Total Suspended Solids	mg/L	1	1	5722988
Dissolved Sulphate (SO4)	mg/L	4.5	1.0	5721402
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5722432
Turbidity	NTU	0.2	0.1	5720528
WAD Cyanide (Free)	mg/L	<0.0010	0.0010	5722440
Alkalinity (Total as CaCO3)	mg/L	16	1.0	5721315
Dissolved Chloride (Cl-)	mg/L	13	1.0	5721401
Nitrite (N)	mg/L	<0.010	0.010	5721405
Nitrate (N)	mg/L	<0.10	0.10	5721405
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	5721405
RADIONUCLIDE				
Radium-226	Bq/L	<0.0050	0.0050	5717205

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HRK621			HRK621		
Sampling Date		2018/09/04 13:30			2018/09/04 13:30		
COC Number		n/a			n/a		
	UNITS	MEL-13	RDL	QC Batch	MEL-13 Lab-Dup	RDL	QC Batch
Metals							
Mercury (Hg)	mg/L	<0.00001	0.00001	5724123	<0.00001	0.00001	5724123
Dissolved Mercury (Hg)	mg/L	<0.00001	0.00001	5724569			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: HRK621
Sample ID: MEL-13
Matrix: Water

Collected: 2018/09/04
Shipped:
Received: 2018/09/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5721315	N/A	2018/09/10	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5719975	N/A	2018/09/11	Automated Statchk
Chloride by Automated Colourimetry	KONE	5721401	N/A	2018/09/10	Deonarine Ramnarine
Conductivity	AT	5721313	N/A	2018/09/11	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5722440	N/A	2018/09/10	Xuanhong Qiu
Total Cyanide	SKAL/CN	5722432	2018/09/10	2018/09/10	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5720262	N/A	2018/09/10	Nimarta Singh
Dissolved Oxygen	DO	5720610	2018/09/07	2018/09/07	Prakash Piya
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5721232	N/A	2018/09/09	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5722301	2018/09/10	2018/09/10	(Kent) Maolin Li
Dissolved Mercury (low level)	CV/AA	5724569	2018/09/11	2018/09/11	Ron Morrison
Mercury (low level)	CV/AA	5724123	2018/09/11	2018/09/11	Ron Morrison
Total Ammonia-N	LACH/NH4	5724301	N/A	2018/09/11	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5721405	N/A	2018/09/10	Charles Opoku-Ware
pH	AT	5721317	N/A	2018/09/10	Surinder Rai
Orthophosphate	KONE	5721404	N/A	2018/09/10	Alina Dobreanu
Radium-226 Low Level	AS	5717205	N/A	2018/09/18	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5721402	N/A	2018/09/10	Alina Dobreanu
Total Dissolved Solids	BAL	5724672	2018/09/11	2018/09/11	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5722944	2018/09/10	2018/09/11	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5724690	N/A	2018/09/11	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5724105	2018/09/11	2018/09/11	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5722988	2018/09/10	2018/09/10	Mandeep Kaur
Turbidity	AT	5720528	N/A	2018/09/10	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5749409	N/A		Tamsin Denison

Maxxam ID: HRK621 Dup
Sample ID: MEL-13
Matrix: Water

Collected: 2018/09/04
Shipped:
Received: 2018/09/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury (low level)	CV/AA	5724123	2018/09/11	2018/09/11	Ron Morrison

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	15.7°C

Revised Report (2018/09/27): Silica results attached.

Revised Report (2018/12/18): Client sample ID changed to MEL-13 per client request.

Results relate only to the items tested.

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5721232	1,4-Difluorobenzene	2018/09/09	103	70 - 130	104	70 - 130	101	%				
5721232	4-Bromofluorobenzene	2018/09/09	99	70 - 130	100	70 - 130	99	%				
5721232	D10-Ethylbenzene	2018/09/09	107	70 - 130	105	70 - 130	103	%				
5721232	D4-1,2-Dichloroethane	2018/09/09	108	70 - 130	112	70 - 130	106	%				
5722301	o-Terphenyl	2018/09/10	109	60 - 130	102	60 - 130	99	%				
5717205	Radium-226	2018/09/18			90	85 - 115	<0.0050	Bq/L	NC	N/A		
5720262	Dissolved Organic Carbon	2018/09/10	96	80 - 120	98	80 - 120	<0.50	mg/L	1.7	20		
5720528	Turbidity	2018/09/10			100	85 - 115	<0.1	NTU	0.44	20		
5721232	Benzene	2018/09/09	93	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5721232	Ethylbenzene	2018/09/09	93	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5721232	F1 (C6-C10) - BTEX	2018/09/09					<25	ug/L	NC	30		
5721232	F1 (C6-C10)	2018/09/09	92	70 - 130	84	70 - 130	<25	ug/L	NC	30		
5721232	o-Xylene	2018/09/09	95	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5721232	p+m-Xylene	2018/09/09	94	70 - 130	92	70 - 130	<0.40	ug/L	NC	30		
5721232	Toluene	2018/09/09	89	70 - 130	85	70 - 130	<0.20	ug/L	NC	30		
5721232	Total Xylenes	2018/09/09					<0.40	ug/L	NC	30		
5721313	Conductivity	2018/09/11			101	85 - 115	<1.0	umho/cm	3.7	25		
5721315	Alkalinity (Total as CaCO3)	2018/09/10			96	85 - 115	<1.0	mg/L	0.22	20		
5721317	pH	2018/09/10			101	98 - 103			2.3	N/A		
5721401	Dissolved Chloride (Cl-)	2018/09/10	NC	80 - 120	104	80 - 120	<1.0	mg/L	0.82	20		
5721402	Dissolved Sulphate (SO4)	2018/09/10	NC	75 - 125	104	80 - 120	<1.0	mg/L	0.41	20		
5721404	Orthophosphate (P)	2018/09/10	NC	75 - 125	100	80 - 120	<0.010	mg/L	0.81	25		
5721405	Nitrate (N)	2018/09/10	NC	80 - 120	103	80 - 120	<0.10	mg/L	2.6	20		
5721405	Nitrite (N)	2018/09/10	101	80 - 120	103	80 - 120	<0.010	mg/L	0.26	20		
5722301	F2 (C10-C16 Hydrocarbons)	2018/09/10	107	50 - 130	100	60 - 130	<100	ug/L	NC	30		
5722301	F3 (C16-C34 Hydrocarbons)	2018/09/10	109	50 - 130	103	60 - 130	<200	ug/L	NC	30		
5722301	F4 (C34-C50 Hydrocarbons)	2018/09/10	100	50 - 130	93	60 - 130	<200	ug/L	NC	30		
5722432	Total Cyanide (CN)	2018/09/10	NC	80 - 120	104	80 - 120	<0.0050	mg/L	2.2	20		
5722440	WAD Cyanide (Free)	2018/09/10	105	80 - 120	104	80 - 120	<0.0010	mg/L	11	20		
5722944	Total Kjeldahl Nitrogen (TKN)	2018/09/12	102	80 - 120	99	80 - 120	<0.10	mg/L	1.0	20	96	80 - 120
5722988	Total Suspended Solids	2018/09/10					<1	mg/L	0	25	101	85 - 115

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT(CONT'D)

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5724105	Total Phosphorus	2018/09/11	101	80 - 120	100	80 - 120	<0.020	mg/L	3.1	20	101	80 - 120
5724123	Mercury (Hg)	2018/09/11	95	75 - 125	98	80 - 120	<0.00001	mg/L	NC	20		
5724301	Total Ammonia-N	2018/09/11	101	75 - 125	99	80 - 120	<0.050	mg/L	NC	20		
5724569	Dissolved Mercury (Hg)	2018/09/11	93	75 - 125	95	80 - 120	<0.00001	mg/L	NC	20		
5724672	Total Dissolved Solids	2018/09/11					<10	mg/L	0.84	25	98	90 - 110
5724690	Total Organic Carbon (TOC)	2018/09/11	98	80 - 120	99	80 - 120	<0.50	mg/L	0.14	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Service Specialist

Steven Simpson, Lab Director

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B8N2546
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

Exceedence Summary Table – Metal Mining Effluent Reg

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Success Through Science®

Your P.O. #: B8N2546
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2546-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2619958
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B878261
Received: 2018/09/11, 10:15

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/09/17	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/09/13	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2018/09/13	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/09/13	2018/09/14	BBY7SOP-00003,	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	1	N/A	2018/09/12	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8N2546
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2546-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2619958
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B878261
Received: 2018/09/11, 10:15

Encryption Key

Veronica De Guzman
Project Manager
17 Sep 2018 17:13:32

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		UH2948		
Sampling Date		2018/09/04 13:30		
COC Number		B8N2546-M058-01-01		
	UNITS	**ME6-13 (WL AND EEM)**	**RDL**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	22.7	0.50	9138712
Total Hardness (CaCO3)	mg/L	25.2	0.50	9138710

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH2948		
Sampling Date		2018/09/04 13:30		
COC Number		B8N2546-M058-01-01		
	UNITS	ME6-13 (WL AND EEM)	RDL	QC Batch
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	mg/L	0.0060	0.0030	9140761
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	9140761
Dissolved Arsenic (As)	mg/L	0.00034	0.00010	9140761
Dissolved Barium (Ba)	mg/L	0.0075	0.0010	9140761
Dissolved Beryllium (Be)	mg/L	<0.00010	0.00010	9140761
Dissolved Boron (B)	mg/L	<0.050	0.050	9140761
Dissolved Cadmium (Cd)	mg/L	<0.000010	0.000010	9140761
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	9140761
Dissolved Copper (Cu)	mg/L	0.00073	0.00020	9140761
Dissolved Iron (Fe)	mg/L	0.0054	0.0050	9140761
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	9140761
Dissolved Lithium (Li)	mg/L	<0.0020	0.0020	9140761
Dissolved Manganese (Mn)	mg/L	<0.0010	0.0010	9140761
Dissolved Molybdenum (Mo)	mg/L	<0.0010	0.0010	9140761
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	9140761
Dissolved Selenium (Se)	mg/L	<0.00010	0.00010	9140761
Dissolved Silver (Ag)	mg/L	<0.000020	0.000020	9140761
Dissolved Strontium (Sr)	mg/L	0.0471	0.0010	9140761
Dissolved Thallium (Tl)	mg/L	<0.000010	0.000010	9140761
Dissolved Tin (Sn)	mg/L	<0.0050	0.0050	9140761
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	9140761
Dissolved Uranium (U)	mg/L	<0.00010	0.00010	9140761
Dissolved Vanadium (V)	mg/L	<0.0050	0.0050	9140761
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	9140761
Dissolved Calcium (Ca)	mg/L	7.02	0.050	9140761
Dissolved Magnesium (Mg)	mg/L	1.25	0.050	9140761
Dissolved Potassium (K)	mg/L	0.902	0.050	9140761
Dissolved Sodium (Na)	mg/L	5.34	0.050	9140761
Total Metals by ICPMS				
Total Aluminum (Al)	mg/L	0.0083	0.0030	9141492
RDL = Reportable Detection Limit				

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH2948		
Sampling Date		2018/09/04 13:30		
COC Number		B8N2546-M058-01-01		
	UNITS	ME6-13 (WL AND EEM)	RDL	QC Batch
Total Antimony (Sb)	mg/L	<0.00050	0.00050	9141492
Total Arsenic (As)	mg/L	0.00043	0.00010	9141492
Total Barium (Ba)	mg/L	0.0079	0.0010	9141492
Total Beryllium (Be)	mg/L	<0.00010	0.00010	9141492
Total Boron (B)	mg/L	<0.050	0.050	9141492
Total Cadmium (Cd)	mg/L	<0.000010	0.000010	9141492
Total Chromium (Cr)	mg/L	<0.0010	0.0010	9141492
Total Copper (Cu)	mg/L	0.00076	0.00050	9141492
Total Iron (Fe)	mg/L	0.019	0.010	9141492
Total Lead (Pb)	mg/L	<0.00020	0.00020	9141492
Total Lithium (Li)	mg/L	<0.0020	0.0020	9141492
Total Manganese (Mn)	mg/L	0.0045	0.0010	9141492
Total Molybdenum (Mo)	mg/L	<0.0010	0.0010	9141492
Total Nickel (Ni)	mg/L	<0.0010	0.0010	9141492
Total Selenium (Se)	mg/L	<0.00010	0.00010	9141492
Total Silver (Ag)	mg/L	<0.000020	0.000020	9141492
Total Strontium (Sr)	mg/L	0.0488	0.0010	9141492
Total Thallium (Tl)	mg/L	<0.000010	0.000010	9141492
Total Tin (Sn)	mg/L	<0.0050	0.0050	9141492
Total Titanium (Ti)	mg/L	<0.0050	0.0050	9141492
Total Uranium (U)	mg/L	<0.00010	0.00010	9141492
Total Vanadium (V)	mg/L	<0.0050	0.0050	9141492
Total Zinc (Zn)	mg/L	<0.0050	0.0050	9141492
Total Calcium (Ca)	mg/L	7.91	0.050	9141492
Total Magnesium (Mg)	mg/L	1.33	0.050	9141492
Total Potassium (K)	mg/L	0.974	0.050	9141492
Total Sodium (Na)	mg/L	5.52	0.050	9141492
RDL = Reportable Detection Limit				

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Results relate only to the items tested.

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9140761	AA1	Matrix Spike	Dissolved Aluminum (Al)	2018/09/13		95	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		96	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		101	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		90	%	80 - 120
			Dissolved Boron (B)	2018/09/13		89	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		96	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		97	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		93	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		99	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		96	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		83	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		NC	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		NC	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		95	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		97	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		95	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/13		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		105	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		100	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		103	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		101	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/13		94	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/13		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		NC	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		97	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		NC	%	80 - 120
9140761	AA1	Spiked Blank	Dissolved Aluminum (Al)	2018/09/13		100	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		100	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		101	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		102	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		93	%	80 - 120
			Dissolved Boron (B)	2018/09/13		95	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		101	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		101	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		101	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		106	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		101	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		97	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		104	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		103	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		100	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		99	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/13		103	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		110	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		98	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		101	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		102	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		102	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/13		106	%	80 - 120

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Calcium (Ca)	2018/09/13		100	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		98	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		102	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		98	%	80 - 120
9140761	AA1	Method Blank	Dissolved Aluminum (Al)	2018/09/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/09/13	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/09/13	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/09/13	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/09/13	<0.00010		mg/L	
			Dissolved Boron (B)	2018/09/13	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/09/13	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/09/13	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/09/13	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/09/13	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/09/13	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/09/13	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/09/13	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/09/13	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/09/13	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/09/13	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/09/13	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/09/13	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/09/13	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/09/13	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/09/13	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/09/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/09/13	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/09/13	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/09/13	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/09/13	<0.050		mg/L	
			Dissolved Potassium (K)	2018/09/13	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/09/13	<0.050		mg/L	
9140761	AA1	RPD	Dissolved Aluminum (Al)	2018/09/13	0.85		%	20
			Dissolved Antimony (Sb)	2018/09/13	0.51		%	20
			Dissolved Arsenic (As)	2018/09/13	0.046		%	20
			Dissolved Barium (Ba)	2018/09/13	0.57		%	20
			Dissolved Beryllium (Be)	2018/09/13	NC		%	20
			Dissolved Boron (B)	2018/09/13	1.6		%	20
			Dissolved Cadmium (Cd)	2018/09/13	3.4		%	20
			Dissolved Chromium (Cr)	2018/09/13	1.1		%	20
			Dissolved Copper (Cu)	2018/09/13	4.5		%	20
			Dissolved Iron (Fe)	2018/09/13	NC		%	20
			Dissolved Lead (Pb)	2018/09/13	NC		%	20
			Dissolved Lithium (Li)	2018/09/13	0.48		%	20
			Dissolved Manganese (Mn)	2018/09/13	0.41		%	20
			Dissolved Molybdenum (Mo)	2018/09/13	2.1		%	20
			Dissolved Nickel (Ni)	2018/09/13	1.4		%	20
			Dissolved Selenium (Se)	2018/09/13	0.93		%	20
			Dissolved Silver (Ag)	2018/09/13	NC		%	20
			Dissolved Strontium (Sr)	2018/09/13	1.1		%	20
			Dissolved Thallium (Tl)	2018/09/13	NC		%	20
			Dissolved Tin (Sn)	2018/09/13	NC		%	20

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Titanium (Ti)	2018/09/13	NC		%	20
			Dissolved Uranium (U)	2018/09/13	1.4		%	20
			Dissolved Vanadium (V)	2018/09/13	NC		%	20
			Dissolved Zinc (Zn)	2018/09/13	NC		%	20
9141492	AA1	Matrix Spike	Total Aluminum (Al)	2018/09/14		103	%	80 - 120
			Total Antimony (Sb)	2018/09/14		106	%	80 - 120
			Total Arsenic (As)	2018/09/14		112	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		97	%	80 - 120
			Total Boron (B)	2018/09/14		99	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Copper (Cu)	2018/09/14		101	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		104	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		107	%	80 - 120
			Total Nickel (Ni)	2018/09/14		102	%	80 - 120
			Total Selenium (Se)	2018/09/14		108	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120
			Total Strontium (Sr)	2018/09/14		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		104	%	80 - 120
			Total Titanium (Ti)	2018/09/14		105	%	80 - 120
			Total Uranium (U)	2018/09/14		108	%	80 - 120
			Total Vanadium (V)	2018/09/14		105	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Calcium (Ca)	2018/09/14		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		101	%	80 - 120
			Total Potassium (K)	2018/09/14		106	%	80 - 120
			Total Sodium (Na)	2018/09/14		99	%	80 - 120
9141492	AA1	Spiked Blank	Total Aluminum (Al)	2018/09/14		102	%	80 - 120
			Total Antimony (Sb)	2018/09/14		104	%	80 - 120
			Total Arsenic (As)	2018/09/14		110	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		95	%	80 - 120
			Total Boron (B)	2018/09/14		98	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Copper (Cu)	2018/09/14		102	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		103	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		103	%	80 - 120
			Total Nickel (Ni)	2018/09/14		103	%	80 - 120
			Total Selenium (Se)	2018/09/14		106	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120
			Total Strontium (Sr)	2018/09/14		108	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		101	%	80 - 120

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Titanium (Ti)	2018/09/14		107	%	80 - 120
			Total Uranium (U)	2018/09/14		107	%	80 - 120
			Total Vanadium (V)	2018/09/14		103	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Calcium (Ca)	2018/09/14		105	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		100	%	80 - 120
			Total Potassium (K)	2018/09/14		105	%	80 - 120
			Total Sodium (Na)	2018/09/14		101	%	80 - 120
9141492	AA1	Method Blank	Total Aluminum (Al)	2018/09/14	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/14	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/14	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/14	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/14	<0.00010		mg/L	
			Total Boron (B)	2018/09/14	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/14	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/14	<0.0010		mg/L	
			Total Copper (Cu)	2018/09/14	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/14	<0.010		mg/L	
			Total Lead (Pb)	2018/09/14	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/14	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/14	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/14	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/14	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/14	<0.00010		mg/L	
			Total Silver (Ag)	2018/09/14	<0.000020		mg/L	
			Total Strontium (Sr)	2018/09/14	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/14	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/14	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/14	<0.0050		mg/L	
			Total Uranium (U)	2018/09/14	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/14	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/14	<0.0050		mg/L	
			Total Calcium (Ca)	2018/09/14	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/14	<0.050		mg/L	
			Total Potassium (K)	2018/09/14	<0.050		mg/L	
			Total Sodium (Na)	2018/09/14	<0.050		mg/L	
9141492	AA1	RPD	Total Aluminum (Al)	2018/09/14	0.018		%	20
			Total Antimony (Sb)	2018/09/14	NC		%	20
			Total Arsenic (As)	2018/09/14	4.8		%	20
			Total Barium (Ba)	2018/09/14	0.87		%	20
			Total Beryllium (Be)	2018/09/14	NC		%	20
			Total Boron (B)	2018/09/14	NC		%	20
			Total Cadmium (Cd)	2018/09/14	7.7		%	20
			Total Chromium (Cr)	2018/09/14	NC		%	20
			Total Copper (Cu)	2018/09/14	NC		%	20
			Total Iron (Fe)	2018/09/14	NC		%	20
			Total Lead (Pb)	2018/09/14	NC		%	20
			Total Lithium (Li)	2018/09/14	NC		%	20
			Total Manganese (Mn)	2018/09/14	NC		%	20
			Total Molybdenum (Mo)	2018/09/14	NC		%	20
			Total Nickel (Ni)	2018/09/14	NC		%	20
			Total Selenium (Se)	2018/09/14	NC		%	20

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Silver (Ag)	2018/09/14	NC		%	20
			Total Strontium (Sr)	2018/09/14	1.3		%	20
			Total Thallium (Tl)	2018/09/14	NC		%	20
			Total Tin (Sn)	2018/09/14	NC		%	20
			Total Titanium (Ti)	2018/09/14	NC		%	20
			Total Uranium (U)	2018/09/14	NC		%	20
			Total Vanadium (V)	2018/09/14	NC		%	20
			Total Zinc (Zn)	2018/09/14	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B878261
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Melissa McIntosh, Project Manager

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Your P.O. #: B8N2546
Site Location: MELIADINE
Your C.O.C. #: 1 of 1

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2620440
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B877821
Received: 2018/09/11, 09:53

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	1	N/A	2018/09/17	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: B8N2546
Site Location: MELIADINE
Your C.O.C. #: 1 of 1

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2620440
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B877821
Received: 2018/09/11, 09:53

Encryption Key

Maxxam
17 Sep 2018 17:00:36

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077
==========
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Maxxam Job #: B877821
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UH0487	UH0487		
Sampling Date		2018/09/04 13:30	2018/09/04 13:30		
COC Number		1 of 1	1 of 1		
	UNITS	**MEL-13 (WL AND EEM)**	**MEL-13 (WL AND EEM) Lab-Dup**	**RDL**	**QC Batch**
Misc. Inorganics					
Reactive Silica	mg/L	0.27	0.28	0.050	9146428

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B877821
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546

TEST SUMMARY

Maxxam ID: UH0487
Sample ID: MEL-13 (WL AND EEM)
Matrix: Water

Collected: 2018/09/04
Shipped: 2018/09/10
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9146428	N/A	2018/09/17	Zafar Iqbal

Maxxam ID: UH0487 Dup
Sample ID: MEL-13 (WL AND EEM)
Matrix: Water

Collected: 2018/09/04
Shipped: 2018/09/10
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9146428	N/A	2018/09/17	Zafar Iqbal

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Maxxam Job #: B877821
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B877821
Report Date: 2018/09/17

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9146428	Reactive Silica	2018/09/17	104	80 - 120	100	80 - 120	<0.050	mg/L	2.4	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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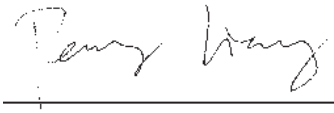
Maxxam Job #: B877821
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Your P.O. #: B8N2546
Site Location: MELIADINE
Your C.O.C. #: 1 of 1

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663056
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B877821
Received: 2018/09/11, 09:53

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	1	N/A	2018/09/17	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Omran Desouki
Junior Project Manager
12 Dec 2018 12:18:01

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

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Maxxam Job #: B877821
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UH0487	UH0487		
Sampling Date		2018/09/04 13:30	2018/09/04 13:30		
COC Number		1 of 1	1 of 1		
	UNITS	MEL-13	MEL-13 Lab-Dup	RDL	QC Batch
Misc. Inorganics					
Reactive Silica	mg/L	0.27	0.28	0.050	9146428

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B877821
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: UH0487
Sample ID: MEL-13
Matrix: Water

Collected: 2018/09/04
Shipped: 2018/09/10
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9146428	N/A	2018/09/17	Zafar Iqbal

Maxxam ID: UH0487 Dup
Sample ID: MEL-13
Matrix: Water

Collected: 2018/09/04
Shipped: 2018/09/10
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9146428	N/A	2018/09/17	Zafar Iqbal

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B877821
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.3°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated per client request.

GPS coordinates: 63°01'44.6'' 92°09'14.6''

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B877821
Report Date: 2018/12/12

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9146428	Reactive Silica	2018/09/17	104	80 - 120	100	80 - 120	<0.050	mg/L	2.4	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

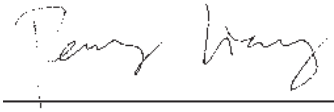
Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B877821
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Your P.O. #: B8N2546
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2546-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663177
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B878261
Received: 2018/09/11, 10:15

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/09/17	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/09/13	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2018/09/13	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/09/13	2018/09/14	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	1	N/A	2018/09/12	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8N2546
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2546-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663177
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B878261
Received: 2018/09/11, 10:15

Encryption Key



Jennifer Villocero
Project Manager
12 Dec 2018 16:47:12

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B878261
Report Date: 2018/12/12

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		UH2948		
Sampling Date		2018/09/04 13:30		
COC Number		B8N2546-M058-01-01		
	UNITS	**MEL-13**	**RDL**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	22.7	0.50	9138712
Total Hardness (CaCO3)	mg/L	25.2	0.50	9138710

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B878261
Report Date: 2018/12/12

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH2948		
Sampling Date		2018/09/04 13:30		
COC Number		B8N2546-M058-01-01		
	UNITS	**MEL-13**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	mg/L	0.0060	0.0030	9140761
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	9140761
Dissolved Arsenic (As)	mg/L	0.00034	0.00010	9140761
Dissolved Barium (Ba)	mg/L	0.0075	0.0010	9140761
Dissolved Beryllium (Be)	mg/L	<0.00010	0.00010	9140761
Dissolved Boron (B)	mg/L	<0.050	0.050	9140761
Dissolved Cadmium (Cd)	mg/L	<0.000010	0.000010	9140761
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	9140761
Dissolved Copper (Cu)	mg/L	0.00073	0.00020	9140761
Dissolved Iron (Fe)	mg/L	0.0054	0.0050	9140761
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	9140761
Dissolved Lithium (Li)	mg/L	<0.0020	0.0020	9140761
Dissolved Manganese (Mn)	mg/L	<0.0010	0.0010	9140761
Dissolved Molybdenum (Mo)	mg/L	<0.0010	0.0010	9140761
Dissolved Nickel (Ni)	mg/L	<0.0010	0.0010	9140761
Dissolved Selenium (Se)	mg/L	<0.00010	0.00010	9140761
Dissolved Silver (Ag)	mg/L	<0.000020	0.000020	9140761
Dissolved Strontium (Sr)	mg/L	0.0471	0.0010	9140761
Dissolved Thallium (Tl)	mg/L	<0.000010	0.000010	9140761
Dissolved Tin (Sn)	mg/L	<0.0050	0.0050	9140761
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	9140761
Dissolved Uranium (U)	mg/L	<0.00010	0.00010	9140761
Dissolved Vanadium (V)	mg/L	<0.0050	0.0050	9140761
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	9140761
Dissolved Calcium (Ca)	mg/L	7.02	0.050	9140761
Dissolved Magnesium (Mg)	mg/L	1.25	0.050	9140761
Dissolved Potassium (K)	mg/L	0.902	0.050	9140761
Dissolved Sodium (Na)	mg/L	5.34	0.050	9140761
Total Metals by ICPMS				
Total Aluminum (Al)	mg/L	0.0083	0.0030	9141492
RDL = Reportable Detection Limit				

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Maxxam Job #: B878261
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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH2948		
Sampling Date		2018/09/04 13:30		
COC Number		B8N2546-M058-01-01		
	UNITS	**MEL-13**	**RDL**	**QC Batch**
Total Antimony (Sb)	mg/L	<0.00050	0.00050	9141492
Total Arsenic (As)	mg/L	0.00043	0.00010	9141492
Total Barium (Ba)	mg/L	0.0079	0.0010	9141492
Total Beryllium (Be)	mg/L	<0.00010	0.00010	9141492
Total Boron (B)	mg/L	<0.050	0.050	9141492
Total Cadmium (Cd)	mg/L	<0.000010	0.000010	9141492
Total Chromium (Cr)	mg/L	<0.0010	0.0010	9141492
Total Copper (Cu)	mg/L	0.00076	0.00050	9141492
Total Iron (Fe)	mg/L	0.019	0.010	9141492
Total Lead (Pb)	mg/L	<0.00020	0.00020	9141492
Total Lithium (Li)	mg/L	<0.0020	0.0020	9141492
Total Manganese (Mn)	mg/L	0.0045	0.0010	9141492
Total Molybdenum (Mo)	mg/L	<0.0010	0.0010	9141492
Total Nickel (Ni)	mg/L	<0.0010	0.0010	9141492
Total Selenium (Se)	mg/L	<0.00010	0.00010	9141492
Total Silver (Ag)	mg/L	<0.000020	0.000020	9141492
Total Strontium (Sr)	mg/L	0.0488	0.0010	9141492
Total Thallium (Tl)	mg/L	<0.000010	0.000010	9141492
Total Tin (Sn)	mg/L	<0.0050	0.0050	9141492
Total Titanium (Ti)	mg/L	<0.0050	0.0050	9141492
Total Uranium (U)	mg/L	<0.00010	0.00010	9141492
Total Vanadium (V)	mg/L	<0.0050	0.0050	9141492
Total Zinc (Zn)	mg/L	<0.0050	0.0050	9141492
Total Calcium (Ca)	mg/L	7.91	0.050	9141492
Total Magnesium (Mg)	mg/L	1.33	0.050	9141492
Total Potassium (K)	mg/L	0.974	0.050	9141492
Total Sodium (Na)	mg/L	5.52	0.050	9141492
RDL = Reportable Detection Limit				

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Maxxam Job #: B878261
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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated as per client request.

Sample UH2948 [MEL-13] : GPS coordinates: 63°01'44.6'' 92°09'14.6''

Results relate only to the items tested.

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Maxxam Job #: B878261
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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9140761	AA1	Matrix Spike	Dissolved Aluminum (Al)	2018/09/13		95	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		96	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		101	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		NC	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		90	%	80 - 120
			Dissolved Boron (B)	2018/09/13		89	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		96	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		97	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		93	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		99	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		96	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		83	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		NC	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		NC	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		95	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		97	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		95	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/13		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		105	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		100	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		103	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		101	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/13		94	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/13		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		NC	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		97	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		NC	%	80 - 120
9140761	AA1	Spiked Blank	Dissolved Aluminum (Al)	2018/09/13		100	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		100	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		101	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		102	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		93	%	80 - 120
			Dissolved Boron (B)	2018/09/13		95	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		101	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		101	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		101	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		106	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		101	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		97	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		104	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		103	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		100	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		99	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/13		103	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		110	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		98	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		101	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		102	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		102	%	80 - 120

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Maxxam Job #: B878261
Report Date: 2018/12/12

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Zinc (Zn)	2018/09/13		106	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/13		100	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		98	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		102	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		98	%	80 - 120
9140761	AA1	Method Blank	Dissolved Aluminum (Al)	2018/09/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/09/13	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/09/13	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/09/13	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/09/13	<0.00010		mg/L	
			Dissolved Boron (B)	2018/09/13	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/09/13	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/09/13	<0.0010		mg/L	
			Dissolved Copper (Cu)	2018/09/13	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/09/13	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/09/13	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/09/13	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/09/13	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/09/13	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/09/13	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/09/13	<0.00010		mg/L	
			Dissolved Silver (Ag)	2018/09/13	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/09/13	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/09/13	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/09/13	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/09/13	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/09/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/09/13	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/09/13	<0.0050		mg/L	
			Dissolved Calcium (Ca)	2018/09/13	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/09/13	<0.050		mg/L	
			Dissolved Potassium (K)	2018/09/13	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/09/13	<0.050		mg/L	
9140761	AA1	RPD	Dissolved Aluminum (Al)	2018/09/13	0.85		%	20
			Dissolved Antimony (Sb)	2018/09/13	0.51		%	20
			Dissolved Arsenic (As)	2018/09/13	0.046		%	20
			Dissolved Barium (Ba)	2018/09/13	0.57		%	20
			Dissolved Beryllium (Be)	2018/09/13	NC		%	20
			Dissolved Boron (B)	2018/09/13	1.6		%	20
			Dissolved Cadmium (Cd)	2018/09/13	3.4		%	20
			Dissolved Chromium (Cr)	2018/09/13	1.1		%	20
			Dissolved Copper (Cu)	2018/09/13	4.5		%	20
			Dissolved Iron (Fe)	2018/09/13	NC		%	20
			Dissolved Lead (Pb)	2018/09/13	NC		%	20
			Dissolved Lithium (Li)	2018/09/13	0.48		%	20
			Dissolved Manganese (Mn)	2018/09/13	0.41		%	20
			Dissolved Molybdenum (Mo)	2018/09/13	2.1		%	20
			Dissolved Nickel (Ni)	2018/09/13	1.4		%	20
			Dissolved Selenium (Se)	2018/09/13	0.93		%	20
			Dissolved Silver (Ag)	2018/09/13	NC		%	20
			Dissolved Strontium (Sr)	2018/09/13	1.1		%	20

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Maxxam Job #: B878261
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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Thallium (Tl)	2018/09/13	NC		%	20
			Dissolved Tin (Sn)	2018/09/13	NC		%	20
			Dissolved Titanium (Ti)	2018/09/13	NC		%	20
			Dissolved Uranium (U)	2018/09/13	1.4		%	20
			Dissolved Vanadium (V)	2018/09/13	NC		%	20
			Dissolved Zinc (Zn)	2018/09/13	NC		%	20
9141492	AA1	Matrix Spike	Total Aluminum (Al)	2018/09/14		103	%	80 - 120
			Total Antimony (Sb)	2018/09/14		106	%	80 - 120
			Total Arsenic (As)	2018/09/14		112	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		97	%	80 - 120
			Total Boron (B)	2018/09/14		99	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Copper (Cu)	2018/09/14		101	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		104	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		107	%	80 - 120
			Total Nickel (Ni)	2018/09/14		102	%	80 - 120
			Total Selenium (Se)	2018/09/14		108	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120
			Total Strontium (Sr)	2018/09/14		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		104	%	80 - 120
			Total Titanium (Ti)	2018/09/14		105	%	80 - 120
			Total Uranium (U)	2018/09/14		108	%	80 - 120
			Total Vanadium (V)	2018/09/14		105	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Calcium (Ca)	2018/09/14		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		101	%	80 - 120
			Total Potassium (K)	2018/09/14		106	%	80 - 120
			Total Sodium (Na)	2018/09/14		99	%	80 - 120
9141492	AA1	Spiked Blank	Total Aluminum (Al)	2018/09/14		102	%	80 - 120
			Total Antimony (Sb)	2018/09/14		104	%	80 - 120
			Total Arsenic (As)	2018/09/14		110	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		95	%	80 - 120
			Total Boron (B)	2018/09/14		98	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Copper (Cu)	2018/09/14		102	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		103	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		103	%	80 - 120
			Total Nickel (Ni)	2018/09/14		103	%	80 - 120
			Total Selenium (Se)	2018/09/14		106	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120

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Maxxam Job #: B878261
Report Date: 2018/12/12

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Strontium (Sr)	2018/09/14		108	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		101	%	80 - 120
			Total Titanium (Ti)	2018/09/14		107	%	80 - 120
			Total Uranium (U)	2018/09/14		107	%	80 - 120
			Total Vanadium (V)	2018/09/14		103	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Calcium (Ca)	2018/09/14		105	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		100	%	80 - 120
			Total Potassium (K)	2018/09/14		105	%	80 - 120
			Total Sodium (Na)	2018/09/14		101	%	80 - 120
9141492	AA1	Method Blank	Total Aluminum (Al)	2018/09/14	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/14	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/14	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/14	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/14	<0.00010		mg/L	
			Total Boron (B)	2018/09/14	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/14	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/14	<0.0010		mg/L	
			Total Copper (Cu)	2018/09/14	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/14	<0.010		mg/L	
			Total Lead (Pb)	2018/09/14	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/14	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/14	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/14	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/14	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/14	<0.00010		mg/L	
			Total Silver (Ag)	2018/09/14	<0.000020		mg/L	
			Total Strontium (Sr)	2018/09/14	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/14	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/14	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/14	<0.0050		mg/L	
			Total Uranium (U)	2018/09/14	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/14	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/14	<0.0050		mg/L	
			Total Calcium (Ca)	2018/09/14	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/14	<0.050		mg/L	
			Total Potassium (K)	2018/09/14	<0.050		mg/L	
			Total Sodium (Na)	2018/09/14	<0.050		mg/L	
9141492	AA1	RPD	Total Aluminum (Al)	2018/09/14	0.018		%	20
			Total Antimony (Sb)	2018/09/14	NC		%	20
			Total Arsenic (As)	2018/09/14	4.8		%	20
			Total Barium (Ba)	2018/09/14	0.87		%	20
			Total Beryllium (Be)	2018/09/14	NC		%	20
			Total Boron (B)	2018/09/14	NC		%	20
			Total Cadmium (Cd)	2018/09/14	7.7		%	20
			Total Chromium (Cr)	2018/09/14	NC		%	20
			Total Copper (Cu)	2018/09/14	NC		%	20
			Total Iron (Fe)	2018/09/14	NC		%	20
			Total Lead (Pb)	2018/09/14	NC		%	20
			Total Lithium (Li)	2018/09/14	NC		%	20

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Maxxam Job #: B878261
Report Date: 2018/12/12

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Manganese (Mn)	2018/09/14	NC		%	20
			Total Molybdenum (Mo)	2018/09/14	NC		%	20
			Total Nickel (Ni)	2018/09/14	NC		%	20
			Total Selenium (Se)	2018/09/14	NC		%	20
			Total Silver (Ag)	2018/09/14	NC		%	20
			Total Strontium (Sr)	2018/09/14	1.3		%	20
			Total Thallium (Tl)	2018/09/14	NC		%	20
			Total Tin (Sn)	2018/09/14	NC		%	20
			Total Titanium (Ti)	2018/09/14	NC		%	20
			Total Uranium (U)	2018/09/14	NC		%	20
			Total Vanadium (V)	2018/09/14	NC		%	20
			Total Zinc (Zn)	2018/09/14	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B878261
Report Date: 2018/12/12

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2546
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Melissa McIntosh, Project Manager

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A Bureau Veritas Group Company

Your P.O. #: OL-664695
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: n/a

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532393
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8N2551
Received: 2018/09/06, 11:00

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity (1)	1	N/A	2018/09/10	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2018/09/10	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry (1)	1	N/A	2018/09/10	CAM SOP-00463	EPA 325.2 m
Conductivity (1)	1	N/A	2018/09/10	CAM SOP-00414	SM 23 2510 m
Free (WAD) Cyanide (1)	1	N/A	2018/09/10	CAM SOP-00457	OMOE E3015 m
Total Cyanide (1)	1	2018/09/10	2018/09/10	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1, 4)	1	N/A	2018/09/10	CAM SOP-00446	SM 23 5310 B m
Dissolved Oxygen (1)	1	2018/09/07	2018/09/07	CAM SOP-00427	SM 23 4500 O G m
Petroleum Hydro. CCME F1 & BTEX in Water (1)	1	N/A	2018/09/09	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1, 5)	1	2018/09/10	2018/09/10	CAM SOP-00316	CCME PHC-CWS m
Dissolved Mercury (low level) (1)	1	2018/09/11	2018/09/11	CAM SOP-00453	EPA 7470 m
Mercury (low level) (1)	1	2018/09/11	2018/09/11	CAM SOP-00453	EPA 7470 m
Total Ammonia-N (1)	1	N/A	2018/09/11	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1, 6)	1	N/A	2018/09/10	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH (1)	1	N/A	2018/09/10	CAM SOP-00413	SM 4500H+ B m
Orthophosphate (1)	1	N/A	2018/09/10	CAM SOP-00461	EPA 365.1 m
Radium-226 Low Level (2, 7)	1	N/A	2018/09/18	BQL SOP-00006 BQL SOP-00017 BQL SOP-00032	Alpha Spectrometry
Sulphate by Automated Colourimetry (1)	1	N/A	2018/09/10	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (1)	1	2018/09/10	2018/09/10	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water (1)	1	2018/09/10	2018/09/12	CAM SOP-00938	OMOE E3516 m
Total Organic Carbon (TOC) (1, 8)	1	N/A	2018/09/11	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric) (1)	1	2018/09/11	2018/09/11	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids (1)	1	2018/09/07	2018/09/08	CAM SOP-00428	SM 23 2540D m
Turbidity (1)	1	N/A	2018/09/10	CAM SOP-00417	SM 23 2130 B m
Hardness (calculated as CaCO3) (3)	1	N/A	2018/09/18	BBY WI-00033	Auto Calc

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using

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Your P.O. #: OL-664695
Site#: 63°02'15.5'' 92°13'06.3''
Site Location: MELIADINE
Your C.O.C. #: n/a

Attention: Reporting

Agnico-Eagle
Meliadine Mine
Rankin Inlet, NU
CANADA X0C 0G0

Report Date: 2018/12/19
Report #: R5532393
Version: 4 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8N2551
Received: 2018/09/06, 11:00

accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Analytics Mississauga
(2) This test was performed by Maxxam Analytics Kitimat
(3) This test was performed by Campo to Burnaby Subcontract
(4) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(5) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(6) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(7) Radium-226 results have not been corrected for blanks.
(8) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key



Alisha Williamson
Project Manager
19 Dec 2018 15:50:08

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alisha Williamson, Project Manager
Email: AWilliamson@maxxam.ca
Phone# (613) 274-0573

==========

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

CCME PETROLEUM HYDROCARBONS IN WATER (WATER)

Maxxam ID		HRK627		
Sampling Date		2018/09/03 07:50		
COC Number		n/a		
	UNITS	MEL-14	RDL	QC Batch
BTEX & F1 Hydrocarbons				
Benzene	ug/L	<0.20	0.20	5721232
Toluene	ug/L	<0.20	0.20	5721232
Ethylbenzene	ug/L	<0.20	0.20	5721232
o-Xylene	ug/L	<0.20	0.20	5721232
p+m-Xylene	ug/L	<0.40	0.40	5721232
Total Xylenes	ug/L	<0.40	0.40	5721232
F1 (C6-C10)	ug/L	<25	25	5721232
F1 (C6-C10) - BTEX	ug/L	<25	25	5721232
F2-F4 Hydrocarbons				
F2 (C10-C16 Hydrocarbons)	ug/L	<100	100	5722256
F3 (C16-C34 Hydrocarbons)	ug/L	<200	200	5722256
F4 (C34-C50 Hydrocarbons)	ug/L	<200	200	5722256
Reached Baseline at C50	ug/L	Yes		5722256
Surrogate Recovery (%)				
1,4-Difluorobenzene	%	100		5721232
4-Bromofluorobenzene	%	96		5721232
D10-Ethylbenzene	%	104		5721232
D4-1,2-Dichloroethane	%	109		5721232
o-Terphenyl	%	96		5722256

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

RESULTS OF ANALYSES OF WATER

Maxxam ID		HRK627		
Sampling Date		2018/09/03 07:50		
COC Number		n/a		
	UNITS	MEL-14	RDL	QC Batch
Calculated Parameters				
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	15	1.0	5719975
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	5719975
Inorganics				
Total Ammonia-N	mg/L	0.91	0.050	5722904
Conductivity	umho/cm	2400	1.0	5720521
Total Dissolved Solids	mg/L	1360	10	5722803
Total Kjeldahl Nitrogen (TKN)	mg/L	1.3	0.20	5722944
Dissolved Organic Carbon	mg/L	7.0	0.50	5720262
Total Organic Carbon (TOC)	mg/L	9.1	0.50	5724690
Orthophosphate (P)	mg/L	<0.010	0.010	5721404
Dissolved Oxygen	mg/L	10.5		5720610
pH	pH	7.08		5720522
Total Phosphorus	mg/L	0.023	0.020	5724105
Total Suspended Solids	mg/L	14	2	5720686
Dissolved Sulphate (SO4)	mg/L	53	1.0	5721402
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5722432
Turbidity	NTU	0.4	0.1	5720528
WAD Cyanide (Free)	mg/L	0.0010	0.0010	5722440
Alkalinity (Total as CaCO3)	mg/L	15	1.0	5720518
Dissolved Chloride (Cl-)	mg/L	660	10	5721401
Nitrite (N)	mg/L	0.331	0.010	5721405
Nitrate (N)	mg/L	5.74	0.10	5721405
Nitrate + Nitrite (N)	mg/L	6.07	0.10	5721405
RADIONUCLIDE				
Radium-226	Bq/L	<0.0050	0.0050	5717205

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HRK627		
Sampling Date		2018/09/03 07:50		
COC Number		n/a		
	UNITS	MEL-14	RDL	QC Batch
Metals				
Mercury (Hg)	mg/L	<0.00001	0.00001	5724123
Dissolved Mercury (Hg)	mg/L	<0.00001	0.00001	5724569

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: HRK627
Sample ID: MEL-14
Matrix: Water

Collected: 2018/09/03
Shipped:
Received: 2018/09/06

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5720518	N/A	2018/09/10	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5719975	N/A	2018/09/10	Automated Statchk
Chloride by Automated Colourimetry	KONE	5721401	N/A	2018/09/10	Deonarine Ramnarine
Conductivity	AT	5720521	N/A	2018/09/10	Surinder Rai
Free (WAD) Cyanide	SKAL/CN	5722440	N/A	2018/09/10	Xuanhong Qiu
Total Cyanide	SKAL/CN	5722432	2018/09/10	2018/09/10	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5720262	N/A	2018/09/10	Nimarta Singh
Dissolved Oxygen	DO	5720610	2018/09/07	2018/09/07	Prakash Piya
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	5721232	N/A	2018/09/09	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	5722256	2018/09/10	2018/09/10	Atoosa Keshavarz
Dissolved Mercury (low level)	CV/AA	5724569	2018/09/11	2018/09/11	Ron Morrison
Mercury (low level)	CV/AA	5724123	2018/09/11	2018/09/11	Ron Morrison
Total Ammonia-N	LACH/NH4	5722904	N/A	2018/09/11	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5721405	N/A	2018/09/10	Charles Opoku-Ware
pH	AT	5720522	N/A	2018/09/10	Surinder Rai
Orthophosphate	KONE	5721404	N/A	2018/09/10	Alina Dobreanu
Radium-226 Low Level	AS	5717205	N/A	2018/09/18	Rajmeet Kaur
Sulphate by Automated Colourimetry	KONE	5721402	N/A	2018/09/10	Alina Dobreanu
Total Dissolved Solids	BAL	5722803	2018/09/10	2018/09/10	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5722944	2018/09/10	2018/09/12	Rajni Tyagi
Total Organic Carbon (TOC)	TOCV/NDIR	5724690	N/A	2018/09/11	Nimarta Singh
Total Phosphorus (Colourimetric)	LACH/P	5724105	2018/09/11	2018/09/11	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5720686	2018/09/07	2018/09/08	Mandeep Kaur
Turbidity	AT	5720528	N/A	2018/09/10	Tahir Anwar
Hardness (calculated as CaCO3)	CALC	5736820	N/A	2018/09/18	Tamsin Denison

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	15.7°C

Revised Report (2018/12/18): Client sample ID changed to MEL-14 and GPS coordinates included per client request.

Sample HRK627 [MEL-14] : Total Cyanide < Free Cyanide: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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Maxxam
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Maxxam Job #: B8N2551
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5721232	1,4-Difluorobenzene	2018/09/09	103	70 - 130	104	70 - 130	101	%				
5721232	4-Bromofluorobenzene	2018/09/09	99	70 - 130	100	70 - 130	99	%				
5721232	D10-Ethylbenzene	2018/09/09	107	70 - 130	105	70 - 130	103	%				
5721232	D4-1,2-Dichloroethane	2018/09/09	108	70 - 130	112	70 - 130	106	%				
5722256	o-Terphenyl	2018/09/10	98	60 - 130	97	60 - 130	94	%				
5717205	Radium-226	2018/09/18			90	85 - 115	<0.0050	Bq/L	NC	N/A		
5720262	Dissolved Organic Carbon	2018/09/10	96	80 - 120	98	80 - 120	<0.50	mg/L	1.7	20		
5720518	Alkalinity (Total as CaCO3)	2018/09/10			94	85 - 115	<1.0	mg/L	2.4	20		
5720521	Conductivity	2018/09/10			101	85 - 115	<1.0	umho/cm	3.5	25		
5720522	pH	2018/09/10			101	98 - 103			0.39	N/A		
5720528	Turbidity	2018/09/10			100	85 - 115	<0.1	NTU	0.44	20		
5720686	Total Suspended Solids	2018/09/08					<1	mg/L	7.7	25	95	85 - 115
5721232	Benzene	2018/09/09	93	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5721232	Ethylbenzene	2018/09/09	93	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5721232	F1 (C6-C10) - BTEX	2018/09/09					<25	ug/L	NC	30		
5721232	F1 (C6-C10)	2018/09/09	92	70 - 130	84	70 - 130	<25	ug/L	NC	30		
5721232	o-Xylene	2018/09/09	95	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5721232	p+m-Xylene	2018/09/09	94	70 - 130	92	70 - 130	<0.40	ug/L	NC	30		
5721232	Toluene	2018/09/09	89	70 - 130	85	70 - 130	<0.20	ug/L	NC	30		
5721232	Total Xylenes	2018/09/09					<0.40	ug/L	NC	30		
5721401	Dissolved Chloride (Cl-)	2018/09/10	NC	80 - 120	104	80 - 120	<1.0	mg/L	0.82	20		
5721402	Dissolved Sulphate (SO4)	2018/09/10	NC	75 - 125	104	80 - 120	<1.0	mg/L	0.41	20		
5721404	Orthophosphate (P)	2018/09/10	NC	75 - 125	100	80 - 120	<0.010	mg/L	0.81	25		
5721405	Nitrate (N)	2018/09/10	NC	80 - 120	103	80 - 120	<0.10	mg/L	2.6	20		
5721405	Nitrite (N)	2018/09/10	101	80 - 120	103	80 - 120	<0.010	mg/L	0.26	20		
5722256	F2 (C10-C16 Hydrocarbons)	2018/09/10	101	50 - 130	95	60 - 130	<100	ug/L	NC	30		
5722256	F3 (C16-C34 Hydrocarbons)	2018/09/10	NC	50 - 130	92	60 - 130	<200	ug/L	NC	30		
5722256	F4 (C34-C50 Hydrocarbons)	2018/09/10	95	50 - 130	91	60 - 130	<200	ug/L	NC	30		
5722432	Total Cyanide (CN)	2018/09/10	NC	80 - 120	104	80 - 120	<0.0050	mg/L	2.2	20		
5722440	WAD Cyanide (Free)	2018/09/10	105	80 - 120	104	80 - 120	<0.0010	mg/L	11	20		
5722803	Total Dissolved Solids	2018/09/10					<10	mg/L	1.2	25	97	90 - 110

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

QUALITY ASSURANCE REPORT(CONT'D)

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5722904	Total Ammonia-N	2018/09/11	98	75 - 125	100	80 - 120	<0.050	mg/L	NC	20		
5722944	Total Kjeldahl Nitrogen (TKN)	2018/09/12	102	80 - 120	99	80 - 120	<0.10	mg/L	1.0	20	96	80 - 120
5724105	Total Phosphorus	2018/09/11	101	80 - 120	100	80 - 120	<0.020	mg/L	3.1	20	101	80 - 120
5724123	Mercury (Hg)	2018/09/11	95	75 - 125	98	80 - 120	<0.00001	mg/L	NC	20		
5724569	Dissolved Mercury (Hg)	2018/09/11	93	75 - 125	95	80 - 120	<0.00001	mg/L	NC	20		
5724690	Total Organic Carbon (TOC)	2018/09/11	98	80 - 120	99	80 - 120	<0.50	mg/L	0.14	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere, Scientific Service Specialist

Kurt Headrick, Ph.D., C. Chem., Laboratory Manager

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Maxxam Job #: B8N2551
Report Date: 2018/12/19

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: OL-664695
Sampler Initials: SA

Exceedence Summary Table – Metal Mining Effluent Reg

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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Your P.O. #: B8N2551
Site Location: MELIADINE
Your C.O.C. #: 1 of 1

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2620441
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B877822
Received: 2018/09/11, 09:53

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	1	N/A	2018/09/17	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your P.O. #: B8N2551
Site Location: MELIADINE
Your C.O.C. #: 1 of 1

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2620441
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B877822
Received: 2018/09/11, 09:53

Encryption Key

Maxxam
17 Sep 2018 17:01:09

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077
==========
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Maxxam Job #: B877822
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UH0488		
Sampling Date		2018/09/03 07:50		
COC Number		1 of 1		
	UNITS	MEL-14 (MDMER AND EEM)	RDL	QC Batch
Misc. Inorganics				
Reactive Silica	mg/L	1.2	0.050	9146428
RDL = Reportable Detection Limit				

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Maxxam Job #: B877822
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: UH0488
Sample ID: MEL-14 (MDMER AND EEM)
Matrix: Water

Collected: 2018/09/03
Shipped: 2018/09/10
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9146428	N/A	2018/09/17	Zafar Iqbal

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Maxxam Job #: B877822
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.3°C

Results relate only to the items tested.

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Maxxam Job #: B877822
Report Date: 2018/09/17

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9146428	Reactive Silica	2018/09/17	104	80 - 120	100	80 - 120	<0.050	mg/L	2.4	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B877822
Report Date: 2018/09/17

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Your P.O. #: B8N2551
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2551-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2619964
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B878278
Received: 2018/09/11, 10:16

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/09/17	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/09/14	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2018/09/13	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/09/13	2018/09/14	BBY7SOP-00003,	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	1	N/A	2018/09/12	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8N2551
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2551-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/09/17
Report #: R2619964
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B878278
Received: 2018/09/11, 10:16

Encryption Key

Veronica De Guzman
Project Manager
17 Sep 2018 17:14:49

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

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Maxxam Job #: B878278
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	**MEL-14 (MDMER AND EEM)**	**RDL**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	510	0.50	9140358
Total Hardness (CaCO3)	mg/L	544	0.50	9140354

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B878278
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	MEL-14 (MDMER AND EEM)	RDL	QC Batch
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	mg/L	0.0233	0.0030	9141253
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	9141253
Dissolved Arsenic (As)	mg/L	0.00202	0.00010	9141253
Dissolved Barium (Ba)	mg/L	0.141	0.0010	9141253
Dissolved Beryllium (Be)	mg/L	<0.00010	0.00010	9141253
Dissolved Bismuth (Bi)	mg/L	<0.0010	0.0010	9141253
Dissolved Boron (B)	mg/L	0.317	0.050	9141253
Dissolved Cadmium (Cd)	mg/L	<0.000010	0.000010	9141253
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	9141253
Dissolved Cobalt (Co)	mg/L	0.00058	0.00020	9141253
Dissolved Copper (Cu)	mg/L	0.00050	0.00020	9141253
Dissolved Iron (Fe)	mg/L	0.0414	0.0050	9141253
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	9141253
Dissolved Lithium (Li)	mg/L	0.158	0.0020	9141253
Dissolved Manganese (Mn)	mg/L	0.209	0.0010	9141253
Dissolved Molybdenum (Mo)	mg/L	0.0013	0.0010	9141253
Dissolved Nickel (Ni)	mg/L	0.0023	0.0010	9141253
Dissolved Selenium (Se)	mg/L	<0.00010	0.00010	9141253
Dissolved Silicon (Si)	mg/L	0.59	0.10	9141253
Dissolved Silver (Ag)	mg/L	<0.000020	0.000020	9141253
Dissolved Strontium (Sr)	mg/L	3.31	0.0010	9141253
Dissolved Thallium (Tl)	mg/L	0.000016	0.000010	9141253
Dissolved Tin (Sn)	mg/L	<0.0050	0.0050	9141253
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	9141253
Dissolved Uranium (U)	mg/L	<0.00010	0.00010	9141253
Dissolved Vanadium (V)	mg/L	<0.0050	0.0050	9141253
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	9141253
Dissolved Zirconium (Zr)	mg/L	<0.00010	0.00010	9141253
Dissolved Calcium (Ca)	mg/L	156	0.050	9141253
Dissolved Magnesium (Mg)	mg/L	29.1	0.050	9141253
RDL = Reportable Detection Limit				

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Maxxam Job #: B878278
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	**MEL-14 (MDMER AND EEM)**	**RDL**	**QC Batch**
Dissolved Potassium (K)	mg/L	17.4	0.050	9141253
Dissolved Sodium (Na)	mg/L	189	0.050	9141253
Total Metals by ICPMS				
Total Aluminum (Al)	mg/L	1.32	0.0030	9141492
Total Antimony (Sb)	mg/L	<0.00050	0.00050	9141492
Total Arsenic (As)	mg/L	0.00237	0.00010	9141492
Total Barium (Ba)	mg/L	0.150	0.0010	9141492
Total Beryllium (Be)	mg/L	<0.00010	0.00010	9141492
Total Bismuth (Bi)	mg/L	<0.0010	0.0010	9141492
Total Boron (B)	mg/L	0.325	0.050	9141492
Total Cadmium (Cd)	mg/L	<0.000010	0.000010	9141492
Total Chromium (Cr)	mg/L	<0.0010	0.0010	9141492
Total Cobalt (Co)	mg/L	0.00066	0.00020	9141492
Total Copper (Cu)	mg/L	0.00062	0.00050	9141492
Total Iron (Fe)	mg/L	0.153	0.010	9141492
Total Lead (Pb)	mg/L	<0.00020	0.00020	9141492
Total Lithium (Li)	mg/L	0.157	0.0020	9141492
Total Manganese (Mn)	mg/L	0.253	0.0010	9141492
Total Molybdenum (Mo)	mg/L	0.0014	0.0010	9141492
Total Nickel (Ni)	mg/L	0.0027	0.0010	9141492
Total Selenium (Se)	mg/L	<0.00010	0.00010	9141492
Total Silicon (Si)	mg/L	0.65	0.10	9141492
Total Silver (Ag)	mg/L	<0.000020	0.000020	9141492
Total Strontium (Sr)	mg/L	4.06	0.0010	9141492
Total Thallium (Tl)	mg/L	0.000015	0.000010	9141492
Total Tin (Sn)	mg/L	<0.0050	0.0050	9141492
Total Titanium (Ti)	mg/L	<0.0050	0.0050	9141492
Total Uranium (U)	mg/L	0.00013	0.00010	9141492
Total Vanadium (V)	mg/L	<0.0050	0.0050	9141492
Total Zinc (Zn)	mg/L	<0.0050	0.0050	9141492
Total Zirconium (Zr)	mg/L	<0.00010	0.00010	9141492
RDL = Reportable Detection Limit				

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Maxxam Job #: B878278
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	**MEL-14 (MDMER AND EEM)**	**RDL**	**QC Batch**
Total Calcium (Ca)	mg/L	168	0.050	9141492
Total Magnesium (Mg)	mg/L	30.2	0.050	9141492
Total Potassium (K)	mg/L	18.5	0.050	9141492
Total Sodium (Na)	mg/L	194	0.050	9141492
RDL = Reportable Detection Limit				

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Maxxam Job #: B878278
Report Date: 2018/09/17

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Results relate only to the items tested.

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9141253	JC8	Matrix Spike	Dissolved Aluminum (Al)	2018/09/13		92	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		98	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		106	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		98	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		94	%	80 - 120
			Dissolved Bismuth (Bi)	2018/09/13		94	%	80 - 120
			Dissolved Boron (B)	2018/09/13		92	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		96	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		97	%	80 - 120
			Dissolved Cobalt (Co)	2018/09/13		96	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		97	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		100	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		95	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		93	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		96	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		97	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		95	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		99	%	80 - 120
			Dissolved Silicon (Si)	2018/09/13		104	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		94	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/13		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		95	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		96	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		102	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		95	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/13		98	%	80 - 120
			Dissolved Zirconium (Zr)	2018/09/13		91	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/13		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		103	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		98	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		104	%	80 - 120
9141253	JC8	Spiked Blank	Dissolved Aluminum (Al)	2018/09/13		95	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		99	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		106	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		96	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		95	%	80 - 120
			Dissolved Bismuth (Bi)	2018/09/13		100	%	80 - 120
			Dissolved Boron (B)	2018/09/13		87	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		96	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		97	%	80 - 120
			Dissolved Cobalt (Co)	2018/09/13		97	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		96	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		98	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		100	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		95	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		94	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		97	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		96	%	80 - 120
			Dissolved Silicon (Si)	2018/09/13		106	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		96	%	80 - 120

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Client Project #: LEACHATE CELL
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Strontium (Sr)	2018/09/13		96	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		100	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		104	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		100	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/13		98	%	80 - 120
			Dissolved Zirconium (Zr)	2018/09/13		94	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/13		101	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		101	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		101	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		99	%	80 - 120
9141253	JC8	Method Blank	Dissolved Aluminum (Al)	2018/09/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/09/13	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/09/13	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/09/13	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/09/13	<0.00010		mg/L	
			Dissolved Bismuth (Bi)	2018/09/13	<0.0010		mg/L	
			Dissolved Boron (B)	2018/09/13	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/09/13	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/09/13	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2018/09/13	<0.00020		mg/L	
			Dissolved Copper (Cu)	2018/09/13	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/09/13	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/09/13	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/09/13	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/09/13	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/09/13	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/09/13	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/09/13	<0.00010		mg/L	
			Dissolved Silicon (Si)	2018/09/13	<0.10		mg/L	
			Dissolved Silver (Ag)	2018/09/13	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/09/13	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/09/13	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/09/13	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/09/13	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/09/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/09/13	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/09/13	<0.0050		mg/L	
			Dissolved Zirconium (Zr)	2018/09/13	<0.00010		mg/L	
			Dissolved Calcium (Ca)	2018/09/13	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/09/13	<0.050		mg/L	
			Dissolved Potassium (K)	2018/09/13	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/09/13	<0.050		mg/L	
9141253	JC8	RPD	Dissolved Aluminum (Al)	2018/09/13	1.2		%	20
			Dissolved Antimony (Sb)	2018/09/13	NC		%	20
			Dissolved Arsenic (As)	2018/09/13	15		%	20
			Dissolved Barium (Ba)	2018/09/13	2.6		%	20
			Dissolved Beryllium (Be)	2018/09/13	NC		%	20
			Dissolved Bismuth (Bi)	2018/09/13	NC		%	20
			Dissolved Boron (B)	2018/09/13	NC		%	20
			Dissolved Cadmium (Cd)	2018/09/13	NC		%	20

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Chromium (Cr)	2018/09/13	NC		%	20
			Dissolved Cobalt (Co)	2018/09/13	NC		%	20
			Dissolved Copper (Cu)	2018/09/13	5.4		%	20
			Dissolved Iron (Fe)	2018/09/13	NC		%	20
			Dissolved Lead (Pb)	2018/09/13	NC		%	20
			Dissolved Lithium (Li)	2018/09/13	NC		%	20
			Dissolved Manganese (Mn)	2018/09/13	NC		%	20
			Dissolved Molybdenum (Mo)	2018/09/13	NC		%	20
			Dissolved Nickel (Ni)	2018/09/13	NC		%	20
			Dissolved Selenium (Se)	2018/09/13	NC		%	20
			Dissolved Silicon (Si)	2018/09/13	1.1		%	20
			Dissolved Silver (Ag)	2018/09/13	NC		%	20
			Dissolved Strontium (Sr)	2018/09/13	2.9		%	20
			Dissolved Thallium (Tl)	2018/09/13	NC		%	20
			Dissolved Tin (Sn)	2018/09/13	NC		%	20
			Dissolved Titanium (Ti)	2018/09/13	NC		%	20
			Dissolved Uranium (U)	2018/09/13	NC		%	20
			Dissolved Vanadium (V)	2018/09/13	NC		%	20
			Dissolved Zinc (Zn)	2018/09/13	NC		%	20
			Dissolved Zirconium (Zr)	2018/09/13	NC		%	20
9141492	AA1	Matrix Spike	Total Aluminum (Al)	2018/09/14		103	%	80 - 120
			Total Antimony (Sb)	2018/09/14		106	%	80 - 120
			Total Arsenic (As)	2018/09/14		112	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		97	%	80 - 120
			Total Bismuth (Bi)	2018/09/14		105	%	80 - 120
			Total Boron (B)	2018/09/14		99	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Cobalt (Co)	2018/09/14		101	%	80 - 120
			Total Copper (Cu)	2018/09/14		101	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		104	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		107	%	80 - 120
			Total Nickel (Ni)	2018/09/14		102	%	80 - 120
			Total Selenium (Se)	2018/09/14		108	%	80 - 120
			Total Silicon (Si)	2018/09/14		101	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120
			Total Strontium (Sr)	2018/09/14		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		104	%	80 - 120
			Total Titanium (Ti)	2018/09/14		105	%	80 - 120
			Total Uranium (U)	2018/09/14		108	%	80 - 120
			Total Vanadium (V)	2018/09/14		105	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Zirconium (Zr)	2018/09/14		108	%	80 - 120
			Total Calcium (Ca)	2018/09/14		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		101	%	80 - 120
			Total Potassium (K)	2018/09/14		106	%	80 - 120
			Total Sodium (Na)	2018/09/14		99	%	80 - 120

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9141492	AA1	Spiked Blank	Total Aluminum (Al)	2018/09/14		102	%	80 - 120
			Total Antimony (Sb)	2018/09/14		104	%	80 - 120
			Total Arsenic (As)	2018/09/14		110	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		95	%	80 - 120
			Total Bismuth (Bi)	2018/09/14		106	%	80 - 120
			Total Boron (B)	2018/09/14		98	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Cobalt (Co)	2018/09/14		101	%	80 - 120
			Total Copper (Cu)	2018/09/14		102	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		103	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		103	%	80 - 120
			Total Nickel (Ni)	2018/09/14		103	%	80 - 120
			Total Selenium (Se)	2018/09/14		106	%	80 - 120
			Total Silicon (Si)	2018/09/14		107	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120
			Total Strontium (Sr)	2018/09/14		108	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		101	%	80 - 120
			Total Titanium (Ti)	2018/09/14		107	%	80 - 120
			Total Uranium (U)	2018/09/14		107	%	80 - 120
			Total Vanadium (V)	2018/09/14		103	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Zirconium (Zr)	2018/09/14		105	%	80 - 120
			Total Calcium (Ca)	2018/09/14		105	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		100	%	80 - 120
			Total Potassium (K)	2018/09/14		105	%	80 - 120
			Total Sodium (Na)	2018/09/14		101	%	80 - 120
9141492	AA1	Method Blank	Total Aluminum (Al)	2018/09/14	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/14	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/14	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/14	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/14	<0.00010		mg/L	
			Total Bismuth (Bi)	2018/09/14	<0.0010		mg/L	
			Total Boron (B)	2018/09/14	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/14	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/14	<0.0010		mg/L	
			Total Cobalt (Co)	2018/09/14	<0.00020		mg/L	
			Total Copper (Cu)	2018/09/14	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/14	<0.010		mg/L	
			Total Lead (Pb)	2018/09/14	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/14	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/14	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/14	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/14	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/14	<0.00010		mg/L	
			Total Silicon (Si)	2018/09/14	<0.10		mg/L	
			Total Silver (Ag)	2018/09/14	<0.000020		mg/L	

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Strontium (Sr)	2018/09/14	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/14	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/14	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/14	<0.0050		mg/L	
			Total Uranium (U)	2018/09/14	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/14	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/14	<0.0050		mg/L	
			Total Zirconium (Zr)	2018/09/14	<0.00010		mg/L	
			Total Calcium (Ca)	2018/09/14	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/14	<0.050		mg/L	
			Total Potassium (K)	2018/09/14	<0.050		mg/L	
			Total Sodium (Na)	2018/09/14	<0.050		mg/L	
9141492	AA1	RPD	Total Aluminum (Al)	2018/09/14	0.018		%	20
			Total Antimony (Sb)	2018/09/14	NC		%	20
			Total Arsenic (As)	2018/09/14	4.8		%	20
			Total Barium (Ba)	2018/09/14	0.87		%	20
			Total Beryllium (Be)	2018/09/14	NC		%	20
			Total Bismuth (Bi)	2018/09/14	NC		%	20
			Total Boron (B)	2018/09/14	NC		%	20
			Total Cadmium (Cd)	2018/09/14	7.7		%	20
			Total Chromium (Cr)	2018/09/14	NC		%	20
			Total Cobalt (Co)	2018/09/14	NC		%	20
			Total Copper (Cu)	2018/09/14	NC		%	20
			Total Iron (Fe)	2018/09/14	NC		%	20
			Total Lead (Pb)	2018/09/14	NC		%	20
			Total Lithium (Li)	2018/09/14	NC		%	20
			Total Manganese (Mn)	2018/09/14	NC		%	20
			Total Molybdenum (Mo)	2018/09/14	NC		%	20
			Total Nickel (Ni)	2018/09/14	NC		%	20
			Total Selenium (Se)	2018/09/14	NC		%	20
			Total Silicon (Si)	2018/09/14	2.3		%	20
			Total Silver (Ag)	2018/09/14	NC		%	20
			Total Strontium (Sr)	2018/09/14	1.3		%	20
			Total Thallium (Tl)	2018/09/14	NC		%	20
			Total Tin (Sn)	2018/09/14	NC		%	20
			Total Titanium (Ti)	2018/09/14	NC		%	20
			Total Uranium (U)	2018/09/14	NC		%	20
			Total Vanadium (V)	2018/09/14	NC		%	20
			Total Zinc (Zn)	2018/09/14	NC		%	20
			Total Zirconium (Zr)	2018/09/14	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Melissa McIntosh, Project Manager

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Your P.O. #: B8N2551
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2551-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/11
Report #: R2662597
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B878278
Received: 2018/09/11, 10:16

Sample Matrix: SURFACE WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hardness Total (calculated as CaCO3) (1)	1	N/A	2018/09/17	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2018/09/14	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved)	1	N/A	2018/09/13	BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2018/09/13	2018/09/14	BBY7SOP-00003 BBY7SOP-00002	EPA 6020b R2 m
Filter and HNO3 Preserve for Metals	1	N/A	2018/09/12	BBY7 WI-00004	BCMOE Reqs 08/14

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).

Encryption Key



Jennifer Villocero
Project Manager
11 Dec 2018 13:36:42

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your P.O. #: B8N2551
Your Project #: LEACHATE CELL
Site Location: MELIADINE
Your C.O.C. #: B8N2551-M058-01-01

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

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CERTIFICATE OF ANALYSIS – REVISED REPORT

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Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Veronica De Guzman, B.Sc., Project Manager
Email: VDeGuzman@maxxam.ca
Phone# (604) 734 7276

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B878278
Report Date: 2018/12/11

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	**MEL-14**	**RDL**	**QC Batch**
Calculated Parameters				
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE
Dissolved Hardness (CaCO3)	mg/L	510	0.50	9140358
Total Hardness (CaCO3)	mg/L	544	0.50	9140354

RDL = Reportable Detection Limit
N/A = Not Applicable

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	MEL-14	RDL	QC Batch
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	mg/L	0.0233	0.0030	9141253
Dissolved Antimony (Sb)	mg/L	<0.00050	0.00050	9141253
Dissolved Arsenic (As)	mg/L	0.00202	0.00010	9141253
Dissolved Barium (Ba)	mg/L	0.141	0.0010	9141253
Dissolved Beryllium (Be)	mg/L	<0.00010	0.00010	9141253
Dissolved Bismuth (Bi)	mg/L	<0.0010	0.0010	9141253
Dissolved Boron (B)	mg/L	0.317	0.050	9141253
Dissolved Cadmium (Cd)	mg/L	<0.000010	0.000010	9141253
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	9141253
Dissolved Cobalt (Co)	mg/L	0.00058	0.00020	9141253
Dissolved Copper (Cu)	mg/L	0.00050	0.00020	9141253
Dissolved Iron (Fe)	mg/L	0.0414	0.0050	9141253
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	9141253
Dissolved Lithium (Li)	mg/L	0.158	0.0020	9141253
Dissolved Manganese (Mn)	mg/L	0.209	0.0010	9141253
Dissolved Molybdenum (Mo)	mg/L	0.0013	0.0010	9141253
Dissolved Nickel (Ni)	mg/L	0.0023	0.0010	9141253
Dissolved Selenium (Se)	mg/L	<0.00010	0.00010	9141253
Dissolved Silicon (Si)	mg/L	0.59	0.10	9141253
Dissolved Silver (Ag)	mg/L	<0.000020	0.000020	9141253
Dissolved Strontium (Sr)	mg/L	3.31	0.0010	9141253
Dissolved Thallium (Tl)	mg/L	0.000016	0.000010	9141253
Dissolved Tin (Sn)	mg/L	<0.0050	0.0050	9141253
Dissolved Titanium (Ti)	mg/L	<0.0050	0.0050	9141253
Dissolved Uranium (U)	mg/L	<0.00010	0.00010	9141253
Dissolved Vanadium (V)	mg/L	<0.0050	0.0050	9141253
Dissolved Zinc (Zn)	mg/L	<0.0050	0.0050	9141253
Dissolved Zirconium (Zr)	mg/L	<0.00010	0.00010	9141253
Dissolved Calcium (Ca)	mg/L	156	0.050	9141253
Dissolved Magnesium (Mg)	mg/L	29.1	0.050	9141253
Dissolved Potassium (K)	mg/L	17.4	0.050	9141253
RDL = Reportable Detection Limit				

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	**MEL-14**	**RDL**	**QC Batch**
Dissolved Sodium (Na)	mg/L	189	0.050	9141253
Total Metals by ICPMS				
Total Aluminum (Al)	mg/L	1.32	0.0030	9141492
Total Antimony (Sb)	mg/L	<0.00050	0.00050	9141492
Total Arsenic (As)	mg/L	0.00237	0.00010	9141492
Total Barium (Ba)	mg/L	0.150	0.0010	9141492
Total Beryllium (Be)	mg/L	<0.00010	0.00010	9141492
Total Bismuth (Bi)	mg/L	<0.0010	0.0010	9141492
Total Boron (B)	mg/L	0.325	0.050	9141492
Total Cadmium (Cd)	mg/L	<0.000010	0.000010	9141492
Total Chromium (Cr)	mg/L	<0.0010	0.0010	9141492
Total Cobalt (Co)	mg/L	0.00066	0.00020	9141492
Total Copper (Cu)	mg/L	0.00062	0.00050	9141492
Total Iron (Fe)	mg/L	0.153	0.010	9141492
Total Lead (Pb)	mg/L	<0.00020	0.00020	9141492
Total Lithium (Li)	mg/L	0.157	0.0020	9141492
Total Manganese (Mn)	mg/L	0.253	0.0010	9141492
Total Molybdenum (Mo)	mg/L	0.0014	0.0010	9141492
Total Nickel (Ni)	mg/L	0.0027	0.0010	9141492
Total Selenium (Se)	mg/L	<0.00010	0.00010	9141492
Total Silicon (Si)	mg/L	0.65	0.10	9141492
Total Silver (Ag)	mg/L	<0.000020	0.000020	9141492
Total Strontium (Sr)	mg/L	4.06	0.0010	9141492
Total Thallium (Tl)	mg/L	0.000015	0.000010	9141492
Total Tin (Sn)	mg/L	<0.0050	0.0050	9141492
Total Titanium (Ti)	mg/L	<0.0050	0.0050	9141492
Total Uranium (U)	mg/L	0.00013	0.00010	9141492
Total Vanadium (V)	mg/L	<0.0050	0.0050	9141492
Total Zinc (Zn)	mg/L	<0.0050	0.0050	9141492
Total Zirconium (Zr)	mg/L	<0.00010	0.00010	9141492
Total Calcium (Ca)	mg/L	168	0.050	9141492
Total Magnesium (Mg)	mg/L	30.2	0.050	9141492
RDL = Reportable Detection Limit				

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Maxxam Job #: B878278
Report Date: 2018/12/11

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		UH3034		
Sampling Date		2018/09/03 07:50		
COC Number		B8N2551-M058-01-01		
	UNITS	**MEL-14**	**RDL**	**QC Batch**
Total Potassium (K)	mg/L	18.5	0.050	9141492
Total Sodium (Na)	mg/L	194	0.050	9141492
RDL = Reportable Detection Limit				

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Revised Report (2018/12/11): Client sample ID and GPS coordinates updated as per client request.

Sample UH3034 [MEL-14] : GPS coordinates: 63°02'15.5'' 92°13'06.3''

Results relate only to the items tested.

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Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9141253	JC8	Matrix Spike	Dissolved Aluminum (Al)	2018/09/13		92	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		98	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		106	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		98	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		94	%	80 - 120
			Dissolved Bismuth (Bi)	2018/09/13		94	%	80 - 120
			Dissolved Boron (B)	2018/09/13		92	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		96	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		97	%	80 - 120
			Dissolved Cobalt (Co)	2018/09/13		96	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		97	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		100	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		95	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		93	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		96	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		97	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		95	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		99	%	80 - 120
			Dissolved Silicon (Si)	2018/09/13		104	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		94	%	80 - 120
			Dissolved Strontium (Sr)	2018/09/13		NC	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		95	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		96	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		102	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		95	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/13		98	%	80 - 120
			Dissolved Zirconium (Zr)	2018/09/13		91	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/13		NC	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		103	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		98	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		104	%	80 - 120
9141253	JC8	Spiked Blank	Dissolved Aluminum (Al)	2018/09/13		95	%	80 - 120
			Dissolved Antimony (Sb)	2018/09/13		99	%	80 - 120
			Dissolved Arsenic (As)	2018/09/13		106	%	80 - 120
			Dissolved Barium (Ba)	2018/09/13		96	%	80 - 120
			Dissolved Beryllium (Be)	2018/09/13		95	%	80 - 120
			Dissolved Bismuth (Bi)	2018/09/13		100	%	80 - 120
			Dissolved Boron (B)	2018/09/13		87	%	80 - 120
			Dissolved Cadmium (Cd)	2018/09/13		96	%	80 - 120
			Dissolved Chromium (Cr)	2018/09/13		97	%	80 - 120
			Dissolved Cobalt (Co)	2018/09/13		97	%	80 - 120
			Dissolved Copper (Cu)	2018/09/13		96	%	80 - 120
			Dissolved Iron (Fe)	2018/09/13		98	%	80 - 120
			Dissolved Lead (Pb)	2018/09/13		100	%	80 - 120
			Dissolved Lithium (Li)	2018/09/13		95	%	80 - 120
			Dissolved Manganese (Mn)	2018/09/13		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2018/09/13		94	%	80 - 120
			Dissolved Nickel (Ni)	2018/09/13		97	%	80 - 120
			Dissolved Selenium (Se)	2018/09/13		96	%	80 - 120
			Dissolved Silicon (Si)	2018/09/13		106	%	80 - 120
			Dissolved Silver (Ag)	2018/09/13		96	%	80 - 120

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Maxxam Job #: B878278
Report Date: 2018/12/11

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Strontium (Sr)	2018/09/13		96	%	80 - 120
			Dissolved Thallium (Tl)	2018/09/13		100	%	80 - 120
			Dissolved Tin (Sn)	2018/09/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2018/09/13		104	%	80 - 120
			Dissolved Uranium (U)	2018/09/13		100	%	80 - 120
			Dissolved Vanadium (V)	2018/09/13		98	%	80 - 120
			Dissolved Zinc (Zn)	2018/09/13		98	%	80 - 120
			Dissolved Zirconium (Zr)	2018/09/13		94	%	80 - 120
			Dissolved Calcium (Ca)	2018/09/13		101	%	80 - 120
			Dissolved Magnesium (Mg)	2018/09/13		101	%	80 - 120
			Dissolved Potassium (K)	2018/09/13		101	%	80 - 120
			Dissolved Sodium (Na)	2018/09/13		99	%	80 - 120
9141253	JC8	Method Blank	Dissolved Aluminum (Al)	2018/09/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2018/09/13	<0.00050		mg/L	
			Dissolved Arsenic (As)	2018/09/13	<0.00010		mg/L	
			Dissolved Barium (Ba)	2018/09/13	<0.0010		mg/L	
			Dissolved Beryllium (Be)	2018/09/13	<0.00010		mg/L	
			Dissolved Bismuth (Bi)	2018/09/13	<0.0010		mg/L	
			Dissolved Boron (B)	2018/09/13	<0.050		mg/L	
			Dissolved Cadmium (Cd)	2018/09/13	<0.000010		mg/L	
			Dissolved Chromium (Cr)	2018/09/13	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2018/09/13	<0.00020		mg/L	
			Dissolved Copper (Cu)	2018/09/13	<0.00020		mg/L	
			Dissolved Iron (Fe)	2018/09/13	<0.0050		mg/L	
			Dissolved Lead (Pb)	2018/09/13	<0.00020		mg/L	
			Dissolved Lithium (Li)	2018/09/13	<0.0020		mg/L	
			Dissolved Manganese (Mn)	2018/09/13	<0.0010		mg/L	
			Dissolved Molybdenum (Mo)	2018/09/13	<0.0010		mg/L	
			Dissolved Nickel (Ni)	2018/09/13	<0.0010		mg/L	
			Dissolved Selenium (Se)	2018/09/13	<0.00010		mg/L	
			Dissolved Silicon (Si)	2018/09/13	<0.10		mg/L	
			Dissolved Silver (Ag)	2018/09/13	<0.000020		mg/L	
			Dissolved Strontium (Sr)	2018/09/13	<0.0010		mg/L	
			Dissolved Thallium (Tl)	2018/09/13	<0.000010		mg/L	
			Dissolved Tin (Sn)	2018/09/13	<0.0050		mg/L	
			Dissolved Titanium (Ti)	2018/09/13	<0.0050		mg/L	
			Dissolved Uranium (U)	2018/09/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2018/09/13	<0.0050		mg/L	
			Dissolved Zinc (Zn)	2018/09/13	<0.0050		mg/L	
			Dissolved Zirconium (Zr)	2018/09/13	<0.00010		mg/L	
			Dissolved Calcium (Ca)	2018/09/13	<0.050		mg/L	
			Dissolved Magnesium (Mg)	2018/09/13	<0.050		mg/L	
			Dissolved Potassium (K)	2018/09/13	<0.050		mg/L	
			Dissolved Sodium (Na)	2018/09/13	<0.050		mg/L	
9141253	JC8	RPD	Dissolved Aluminum (Al)	2018/09/13	1.2		%	20
			Dissolved Antimony (Sb)	2018/09/13	NC		%	20
			Dissolved Arsenic (As)	2018/09/13	15		%	20
			Dissolved Barium (Ba)	2018/09/13	2.6		%	20
			Dissolved Beryllium (Be)	2018/09/13	NC		%	20
			Dissolved Bismuth (Bi)	2018/09/13	NC		%	20
			Dissolved Boron (B)	2018/09/13	NC		%	20
			Dissolved Cadmium (Cd)	2018/09/13	NC		%	20

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Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Chromium (Cr)	2018/09/13	NC		%	20
			Dissolved Cobalt (Co)	2018/09/13	NC		%	20
			Dissolved Copper (Cu)	2018/09/13	5.4		%	20
			Dissolved Iron (Fe)	2018/09/13	NC		%	20
			Dissolved Lead (Pb)	2018/09/13	NC		%	20
			Dissolved Lithium (Li)	2018/09/13	NC		%	20
			Dissolved Manganese (Mn)	2018/09/13	NC		%	20
			Dissolved Molybdenum (Mo)	2018/09/13	NC		%	20
			Dissolved Nickel (Ni)	2018/09/13	NC		%	20
			Dissolved Selenium (Se)	2018/09/13	NC		%	20
			Dissolved Silicon (Si)	2018/09/13	1.1		%	20
			Dissolved Silver (Ag)	2018/09/13	NC		%	20
			Dissolved Strontium (Sr)	2018/09/13	2.9		%	20
			Dissolved Thallium (Tl)	2018/09/13	NC		%	20
			Dissolved Tin (Sn)	2018/09/13	NC		%	20
			Dissolved Titanium (Ti)	2018/09/13	NC		%	20
			Dissolved Uranium (U)	2018/09/13	NC		%	20
			Dissolved Vanadium (V)	2018/09/13	NC		%	20
			Dissolved Zinc (Zn)	2018/09/13	NC		%	20
			Dissolved Zirconium (Zr)	2018/09/13	NC		%	20
9141492	AA1	Matrix Spike	Total Aluminum (Al)	2018/09/14		103	%	80 - 120
			Total Antimony (Sb)	2018/09/14		106	%	80 - 120
			Total Arsenic (As)	2018/09/14		112	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		97	%	80 - 120
			Total Bismuth (Bi)	2018/09/14		105	%	80 - 120
			Total Boron (B)	2018/09/14		99	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Cobalt (Co)	2018/09/14		101	%	80 - 120
			Total Copper (Cu)	2018/09/14		101	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		104	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		107	%	80 - 120
			Total Nickel (Ni)	2018/09/14		102	%	80 - 120
			Total Selenium (Se)	2018/09/14		108	%	80 - 120
			Total Silicon (Si)	2018/09/14		101	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120
			Total Strontium (Sr)	2018/09/14		NC	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		104	%	80 - 120
			Total Titanium (Ti)	2018/09/14		105	%	80 - 120
			Total Uranium (U)	2018/09/14		108	%	80 - 120
			Total Vanadium (V)	2018/09/14		105	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Zirconium (Zr)	2018/09/14		108	%	80 - 120
			Total Calcium (Ca)	2018/09/14		NC	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		101	%	80 - 120
			Total Potassium (K)	2018/09/14		106	%	80 - 120
			Total Sodium (Na)	2018/09/14		99	%	80 - 120

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Maxxam Job #: B878278
Report Date: 2018/12/11

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9141492	AA1	Spiked Blank	Total Aluminum (Al)	2018/09/14		102	%	80 - 120
			Total Antimony (Sb)	2018/09/14		104	%	80 - 120
			Total Arsenic (As)	2018/09/14		110	%	80 - 120
			Total Barium (Ba)	2018/09/14		105	%	80 - 120
			Total Beryllium (Be)	2018/09/14		95	%	80 - 120
			Total Bismuth (Bi)	2018/09/14		106	%	80 - 120
			Total Boron (B)	2018/09/14		98	%	80 - 120
			Total Cadmium (Cd)	2018/09/14		105	%	80 - 120
			Total Chromium (Cr)	2018/09/14		103	%	80 - 120
			Total Cobalt (Co)	2018/09/14		101	%	80 - 120
			Total Copper (Cu)	2018/09/14		102	%	80 - 120
			Total Iron (Fe)	2018/09/14		107	%	80 - 120
			Total Lead (Pb)	2018/09/14		103	%	80 - 120
			Total Lithium (Li)	2018/09/14		99	%	80 - 120
			Total Manganese (Mn)	2018/09/14		105	%	80 - 120
			Total Molybdenum (Mo)	2018/09/14		103	%	80 - 120
			Total Nickel (Ni)	2018/09/14		103	%	80 - 120
			Total Selenium (Se)	2018/09/14		106	%	80 - 120
			Total Silicon (Si)	2018/09/14		107	%	80 - 120
			Total Silver (Ag)	2018/09/14		105	%	80 - 120
			Total Strontium (Sr)	2018/09/14		108	%	80 - 120
			Total Thallium (Tl)	2018/09/14		111	%	80 - 120
			Total Tin (Sn)	2018/09/14		101	%	80 - 120
			Total Titanium (Ti)	2018/09/14		107	%	80 - 120
			Total Uranium (U)	2018/09/14		107	%	80 - 120
			Total Vanadium (V)	2018/09/14		103	%	80 - 120
			Total Zinc (Zn)	2018/09/14		104	%	80 - 120
			Total Zirconium (Zr)	2018/09/14		105	%	80 - 120
			Total Calcium (Ca)	2018/09/14		105	%	80 - 120
			Total Magnesium (Mg)	2018/09/14		100	%	80 - 120
			Total Potassium (K)	2018/09/14		105	%	80 - 120
			Total Sodium (Na)	2018/09/14		101	%	80 - 120
9141492	AA1	Method Blank	Total Aluminum (Al)	2018/09/14	<0.0030		mg/L	
			Total Antimony (Sb)	2018/09/14	<0.00050		mg/L	
			Total Arsenic (As)	2018/09/14	<0.00010		mg/L	
			Total Barium (Ba)	2018/09/14	<0.0010		mg/L	
			Total Beryllium (Be)	2018/09/14	<0.00010		mg/L	
			Total Bismuth (Bi)	2018/09/14	<0.0010		mg/L	
			Total Boron (B)	2018/09/14	<0.050		mg/L	
			Total Cadmium (Cd)	2018/09/14	<0.000010		mg/L	
			Total Chromium (Cr)	2018/09/14	<0.0010		mg/L	
			Total Cobalt (Co)	2018/09/14	<0.00020		mg/L	
			Total Copper (Cu)	2018/09/14	<0.00050		mg/L	
			Total Iron (Fe)	2018/09/14	<0.010		mg/L	
			Total Lead (Pb)	2018/09/14	<0.00020		mg/L	
			Total Lithium (Li)	2018/09/14	<0.0020		mg/L	
			Total Manganese (Mn)	2018/09/14	<0.0010		mg/L	
			Total Molybdenum (Mo)	2018/09/14	<0.0010		mg/L	
			Total Nickel (Ni)	2018/09/14	<0.0010		mg/L	
			Total Selenium (Se)	2018/09/14	<0.00010		mg/L	
			Total Silicon (Si)	2018/09/14	<0.10		mg/L	
			Total Silver (Ag)	2018/09/14	<0.000020		mg/L	

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Maxxam Job #: B878278
Report Date: 2018/12/11

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Strontium (Sr)	2018/09/14	<0.0010		mg/L	
			Total Thallium (Tl)	2018/09/14	<0.000010		mg/L	
			Total Tin (Sn)	2018/09/14	<0.0050		mg/L	
			Total Titanium (Ti)	2018/09/14	<0.0050		mg/L	
			Total Uranium (U)	2018/09/14	<0.00010		mg/L	
			Total Vanadium (V)	2018/09/14	<0.0050		mg/L	
			Total Zinc (Zn)	2018/09/14	<0.0050		mg/L	
			Total Zirconium (Zr)	2018/09/14	<0.00010		mg/L	
			Total Calcium (Ca)	2018/09/14	<0.050		mg/L	
			Total Magnesium (Mg)	2018/09/14	<0.050		mg/L	
			Total Potassium (K)	2018/09/14	<0.050		mg/L	
			Total Sodium (Na)	2018/09/14	<0.050		mg/L	
9141492	AA1	RPD	Total Aluminum (Al)	2018/09/14	0.018		%	20
			Total Antimony (Sb)	2018/09/14	NC		%	20
			Total Arsenic (As)	2018/09/14	4.8		%	20
			Total Barium (Ba)	2018/09/14	0.87		%	20
			Total Beryllium (Be)	2018/09/14	NC		%	20
			Total Bismuth (Bi)	2018/09/14	NC		%	20
			Total Boron (B)	2018/09/14	NC		%	20
			Total Cadmium (Cd)	2018/09/14	7.7		%	20
			Total Chromium (Cr)	2018/09/14	NC		%	20
			Total Cobalt (Co)	2018/09/14	NC		%	20
			Total Copper (Cu)	2018/09/14	NC		%	20
			Total Iron (Fe)	2018/09/14	NC		%	20
			Total Lead (Pb)	2018/09/14	NC		%	20
			Total Lithium (Li)	2018/09/14	NC		%	20
			Total Manganese (Mn)	2018/09/14	NC		%	20
			Total Molybdenum (Mo)	2018/09/14	NC		%	20
			Total Nickel (Ni)	2018/09/14	NC		%	20
			Total Selenium (Se)	2018/09/14	NC		%	20
			Total Silicon (Si)	2018/09/14	2.3		%	20
			Total Silver (Ag)	2018/09/14	NC		%	20
			Total Strontium (Sr)	2018/09/14	1.3		%	20
			Total Thallium (Tl)	2018/09/14	NC		%	20
			Total Tin (Sn)	2018/09/14	NC		%	20
			Total Titanium (Ti)	2018/09/14	NC		%	20
			Total Uranium (U)	2018/09/14	NC		%	20
			Total Vanadium (V)	2018/09/14	NC		%	20
			Total Zinc (Zn)	2018/09/14	NC		%	20
			Total Zirconium (Zr)	2018/09/14	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Maxxam Job #: B878278
Report Date: 2018/12/11

Agnico-Eagle
Client Project #: LEACHATE CELL
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Melissa McIntosh, Project Manager

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Your P.O. #: B8N2551
Site Location: MELIADINE
Your C.O.C. #: 1 of 1

Attention: Alisha Williamson

Agnico-Eagle
Meliadine
Rankin Inlet, NU
Canada X0C 0G0

Report Date: 2018/12/12
Report #: R2663050
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B877822
Received: 2018/09/11, 09:53

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Silica (Reactive)	1	N/A	2018/09/17	AB SOP-00011	EPA 370.1 R1978 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Omran Desouki
Junior Project Manager
12 Dec 2018 12:16:03

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Omran Desouki, Junior Project Manager
Email: ODesouki@maxxam.ca
Phone# (403) 291-3077

==========

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Maxxam Job #: B877822
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		UH0488		
Sampling Date		2018/09/03 07:50		
COC Number		1 of 1		
	UNITS	**MEL-14**	**RDL**	**QC Batch**
Misc. Inorganics				
Reactive Silica	mg/L	1.2	0.050	9146428
RDL = Reportable Detection Limit				

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Maxxam Job #: B877822
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: UH0488
Sample ID: MEL-14
Matrix: Water

Collected: 2018/09/03
Shipped: 2018/09/10
Received: 2018/09/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Silica (Reactive)	KONE/SL	9146428	N/A	2018/09/17	Zafar Iqbal

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Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.3°C

Revised Report (2018/12/12): Client sample ID and GPS coordinates updated per client request.

GPS coordinates: 63°02'15.5'' 92°13'06.3''

Results relate only to the items tested.

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Maxxam Job #: B877822
Report Date: 2018/12/12

QUALITY ASSURANCE REPORT

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9146428	Reactive Silica	2018/09/17	104	80 - 120	100	80 - 120	<0.050	mg/L	2.4	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B877822
Report Date: 2018/12/12

Agnico-Eagle
Site Location: MELIADINE
Your P.O. #: B8N2551
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Harry (Peng) Liang, Senior Analyst

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Agnico-Eagle - Meliadine Gold Project
ATTN: JESSICA HUZA
PO Box 99
Rankin Inlet NU X0C 0G0

Date Received: 01-AUG-18
Report Date: 21-FEB-19 07:14 (MT)
Version: FINAL REV. 3

Client Phone: 819-759-3555

Certificate of Analysis

Lab Work Order #: L2139293

Project P.O. #: NOT SUBMITTED
Job Reference: MEL
C of C Numbers:
Legal Site Desc: 63*06'52.2" 92*20'23.6"

Comments: 15-FEB-2019 AMENDED REPORT - Missing metals reported for L2139293-13
21-FEB-2019 Revised report - GPS added

Hua Wo
Chemistry Laboratory Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-1 MEL-03-01 (EEM)							
Sampled By: CLIENT on 25-JUL-18 @ 10:15							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	19.5		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	16.0		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	8.12		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	68.0		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	40.1			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	1.26		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	1.36		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0968		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	3.55		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	33		13	mg/L		02-AUG-18	R4160187
Turbidity							
Turbidity	0.26		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.41		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.30		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	21.1		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	0.80		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0013		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	<0.0067		0.0067	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.273		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.161		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010	CNI	0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.25		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00357		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000195		0.000020	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-1 MEL-03-01 (EEM)							
Sampled By: CLIENT on 25-JUL-18 @ 10:15							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Barium (Ba)-Total	0.00785		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0039		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	6.78		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000024		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00077		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0236		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	0.00051		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.13		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00334		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000083		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000706		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	0.890		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	0.000050		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	4.29		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0330		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000016		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	0.00103		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.00141		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000179		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00757		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0037		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	6.64		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	0.000065		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000013		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00072		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0127		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00062		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	1.10		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00131		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000075		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000669		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	0.849		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-1 MEL-03-01 (EEM)							
Sampled By: CLIENT on 25-JUL-18 @ 10:15							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Sodium (Na)-Dissolved	4.23		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0315		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000014		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.00		0.50	ng/L		15-AUG-18	R4175604
L2139293-2 MEL-03-02							
Sampled By: CLIENT on 25-JUL-18 @ 12:00							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	19.6		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	16.1		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	7.95		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	66.7		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.023		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	33.4			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	3.26		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	41		13	mg/L		02-AUG-18	R4160187
Turbidity							
Turbidity	0.23		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.41		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.27		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	20.6		0.053	mg/L		04-SEP-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-2 MEL-03-02							
Sampled By: CLIENT on 25-JUL-18 @ 12:00							
Matrix: WATER							
Mercury (Hg)-Total	0.80		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	<0.0065		0.0065	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.263		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.114		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.24		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00466		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000208		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Total	0.00783		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0035		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	6.69		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	0.000086		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000027		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00082		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0252		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	0.000015		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	0.00055		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.12		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00338		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000093		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000783		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	0.894		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	4.39		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0323		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000017		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	0.00091		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.00098		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	0.000143	DTC	0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000189		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00757		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0034		0.0010	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-2 MEL-03-02							
Sampled By: CLIENT on 25-JUL-18 @ 12:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	6.43		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	0.000068		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000011		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00067		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0108		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00053		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	1.10		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00117		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000078		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000614		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	0.844		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Dissolved	4.10		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0313		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000015		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.00		0.50	ng/L		15-AUG-18	R4175604
L2139293-3 MEL-03-03							
Sampled By: CLIENT on 25-JUL-18 @ 14:00							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	20.1		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	16.5		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	8.00		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	67.7		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.023		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	34.4			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-3 MEL-03-03							
Sampled By: CLIENT on 25-JUL-18 @ 14:00							
Matrix: WATER							
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	3.29		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	46		13	mg/L		02-AUG-18	R4160187
Turbidity							
Turbidity	0.22		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.46		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.29		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	21.4		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	0.70		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0021		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	0.0016		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	<0.0066		0.0066	Bq/L	05-SEP-18	11-SEP-18	R4211673
Silica, Reactive (as SiO2)	0.276		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.139		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.33		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00297		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000196		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Total	0.00782		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0036		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	6.70		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000015		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00062		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0152		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	<0.00050		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.14		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00322		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000058		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000457		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	0.890		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	0.000049		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	4.39		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0332		0.000050	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-3 MEL-03-03							
Sampled By: CLIENT on 25-JUL-18 @ 14:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000015		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.00126		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	0.000128		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000190		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00762		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0036		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	6.68		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000011		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00070		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0126		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00064		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	1.14		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00130		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000074		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000696		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	0.872		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		02-SEP-18	R4196403
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Dissolved	4.48		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0322		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000014		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.00		0.50	ng/L		15-AUG-18	R4175604
L2139293-4 MEL-03-04							
Sampled By: CLIENT on 25-JUL-18 @ 16:00							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	20.0		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-4 MEL-03-04							
Sampled By: CLIENT on 25-JUL-18 @ 16:00							
Matrix: WATER							
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	16.4		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	7.88		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	66.6		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.022		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	34.0			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	3.23		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	42		13	mg/L		02-AUG-18	R4160187
Turbidity							
Turbidity	0.25		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.46		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.21		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	21.2		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	0.80		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	0.011		0.0067	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.257		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.193		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.17		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00246		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000201		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Total	0.00768		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0036		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	6.65		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-4 MEL-03-04							
Sampled By: CLIENT on 25-JUL-18 @ 16:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Cobalt (Co)-Total	0.000012		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00064		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0147		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	<0.00050		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.10		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00297		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000057		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000413		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	0.868		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	4.26		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0325		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000015		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.00118		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	0.000166	DTC	0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000195		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00751		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0035		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	6.61		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	0.000076		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00063		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0063		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00055		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	1.13		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00114		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000063		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000392		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	0.871		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Dissolved	4.39		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0318		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000015		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-4 MEL-03-04							
Sampled By: CLIENT on 25-JUL-18 @ 16:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.00		0.50	ng/L		15-AUG-18	R4175604
L2139293-5 MEL-01-08							
Sampled By: CLIENT on 23-JUL-18 @ 15:00							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	20.4		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	16.7		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	12.7		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	90.4		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	43.4			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0217		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	0.0234		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0017		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	3.77		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	58		13	mg/L		16-AUG-18	R4177308
Turbidity							
Turbidity	0.46		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.46		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.95		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	26.4		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	1.00		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0022		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	<0.0081		0.0081	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.418		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.213		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-5 MEL-01-08							
Sampled By: CLIENT on 23-JUL-18 @ 15:00							
Matrix: WATER							
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.90		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0235		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000365		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Total	0.00874		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0050		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	8.00		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000028		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00085		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0260		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	0.00176		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.44		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00726		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000078		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000668		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	1.00		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	5.78		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0580		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000019		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.0185		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000346		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00868		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0050		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	8.15		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000010		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00082		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0089		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00196		0.00050	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-5 MEL-01-08							
Sampled By: CLIENT on 23-JUL-18 @ 15:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Magnesium (Mg)-Dissolved	1.47		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00157		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000064		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000621		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	1.00		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Dissolved	6.18		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0564		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000019		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.20		0.50	ng/L		15-AUG-18	R4175604
L2139293-6 MEL-01-07							
Sampled By: CLIENT on 22-JUL-18 @ 09:00							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	19.3		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	15.8		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	13.7		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	89.1		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.021		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	44.0			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0223		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	0.0239		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0016		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	4.27		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	55		13	mg/L		16-AUG-18	R4177308
Turbidity							
Turbidity	0.40		0.10	NTU		01-AUG-18	R4153812
pH							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-6 MEL-01-07							
Sampled By: CLIENT on 22-JUL-18 @ 09:00							
Matrix: WATER							
pH							
pH	7.36		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.92		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	25.7		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	1.10		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0021		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	<0.0078		0.0078	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.423		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.175		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.96		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0232		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000364		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Total	0.00866		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0051		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	8.06		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000027		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00082		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0271		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	0.00183		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.45		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00711		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000059		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000707		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	0.998		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	5.92		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0582		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000021		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-6 MEL-01-07							
Sampled By: CLIENT on 22-JUL-18 @ 09:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Aluminum (Al)-Dissolved	0.0187		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000341		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00880		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0048		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	7.92		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000022		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00065		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0093		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00186		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	1.45		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00271		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000054		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000647		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	0.984		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	0.000041		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Dissolved	6.10		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0556		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000019		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.30		0.50	ng/L		15-AUG-18	R4175604
L2139293-7 MEL-01-09							
Sampled By: CLIENT on 24-JUL-18 @ 15:30							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	18.4		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	15.1		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	13.1		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	86.0		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.021		0.020	mg/L		01-AUG-18	R4158659

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-7 MEL-01-09							
Sampled By: CLIENT on 24-JUL-18 @ 15:30							
Matrix: WATER							
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	43.0			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0117		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	0.0129		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0012		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	4.19		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	51		13	mg/L		16-AUG-18	R4177308
Turbidity							
Turbidity	0.43		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.41		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.97		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	26.0		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	1.00		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0025		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	0.10		0.0059	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.411		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.236		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.95		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0291		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000342		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Total	0.00888		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0050		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	8.08		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000027		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00086		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0263		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	0.00182		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.46		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00727		0.000050	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-7 MEL-01-09							
Sampled By: CLIENT on 24-JUL-18 @ 15:30							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Molybdenum (Mo)-Total	0.000067		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000694		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	1.01		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	6.00		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0590		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	0.00018		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000018		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.0222		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	0.000104	DTC	0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000329		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00837		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0048		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	7.99		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000012		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00064		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0085		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00201		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	1.46		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00137		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000071		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000640		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	1.01		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Dissolved	6.15		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0564		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000020		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.30		0.50	ng/L		15-AUG-18	R4175604
L2139293-8 R-18-07-01							
Sampled By: CLIENT on 23-JUL-18							
Matrix: WATER							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-8 R-18-07-01							
Sampled By: CLIENT on 23-JUL-18							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	19.2		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	15.7		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	14.2		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	90.9		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.021		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	44.9			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0274		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	0.0294		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0020		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	4.31		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	53		13	mg/L		16-AUG-18	R4177308
Turbidity							
Turbidity	0.39		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.39		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	2.93		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	26.3		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	1.10		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0032		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	<0.0072		0.0072	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.420		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.246		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	2.99		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0280		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.000319		0.000020	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-8 R-18-07-01							
Sampled By: CLIENT on 23-JUL-18							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Barium (Ba)-Total	0.00888		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0052		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	8.08		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	0.000069		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000030		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00073		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0286		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	0.00194		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	1.46		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.00770		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000078		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000738		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	0.999		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	6.06		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.0614		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	0.00013		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000019		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	0.000051		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.0218		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.000330		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.00865		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0050		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	8.10		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000015		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00069		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0088		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00206		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	1.48		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00173		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000064		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000655		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	1.01		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-8 R-18-07-01							
Sampled By: CLIENT on 23-JUL-18							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Sodium (Na)-Dissolved	6.22		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.0604		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000019		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.30		0.50	ng/L		15-AUG-18	R4175604
L2139293-9 A8-01							
Sampled By: CLIENT on 24-JUL-18 @ 08:45							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	48.4		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	39.7		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	40.3		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	220		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.027		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	97.8			%		09-AUG-18	
TDS (Calculated)	109			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	5.48		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	170		20	mg/L		10-AUG-18	R4167826
Turbidity							
Turbidity	0.49		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.82		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0062		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	3.52		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	83.7		0.053	mg/L		04-SEP-18	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-9 A8-01							
Sampled By: CLIENT on 24-JUL-18 @ 08:45							
Matrix: WATER							
Mercury (Hg)-Total	1.00		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0032		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Silica, Reactive (as SiO2)	0.698		0.020	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.396		0.050	mg/L	17-AUG-18	20-AUG-18	R4178658
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	3.39		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	1.2		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00235		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Total	0.000020		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Total	0.00269		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Total	0.0242		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Total	0.0031		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Total	27.8		0.020	mg/L		01-SEP-18	R4196265
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Total	0.000046		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Total	0.00064		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Total	0.0830		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Total	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Total	0.00660		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Total	3.67		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Total	0.0146		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Total	0.000204		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Total	0.000731		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Total	1.67		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Total	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Total	6.44		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Total	0.208		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Total	0.000034		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Total	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		01-SEP-18	R4196265
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					23-AUG-18	R4181194
Aluminum (Al)-Dissolved	0.00156		0.00030	mg/L		01-SEP-18	R4196265
Antimony (Sb)-Dissolved	0.000024		0.000020	mg/L		01-SEP-18	R4196265
Arsenic (As)-Dissolved	0.00221		0.000020	mg/L		01-SEP-18	R4196265
Barium (Ba)-Dissolved	0.0232		0.000050	mg/L		01-SEP-18	R4196265
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Boron (B)-Dissolved	0.0031		0.0010	mg/L		01-SEP-18	R4196265
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Calcium (Ca)-Dissolved	27.5		0.020	mg/L		01-SEP-18	R4196265

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-9 A8-01							
Sampled By: CLIENT on 24-JUL-18 @ 08:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Chromium (Cr)-Dissolved	0.000110		0.000060	mg/L		01-SEP-18	R4196265
Cobalt (Co)-Dissolved	0.000022		0.000010	mg/L		01-SEP-18	R4196265
Copper (Cu)-Dissolved	0.00060		0.00010	mg/L		01-SEP-18	R4196265
Iron (Fe)-Dissolved	0.0342		0.0010	mg/L		01-SEP-18	R4196265
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		01-SEP-18	R4196265
Lithium (Li)-Dissolved	0.00655		0.00050	mg/L		01-SEP-18	R4196265
Magnesium (Mg)-Dissolved	3.66		0.0040	mg/L		01-SEP-18	R4196265
Manganese (Mn)-Dissolved	0.00189		0.000050	mg/L		01-SEP-18	R4196265
Molybdenum (Mo)-Dissolved	0.000209		0.000050	mg/L		01-SEP-18	R4196265
Nickel (Ni)-Dissolved	0.000768		0.000060	mg/L		01-SEP-18	R4196265
Potassium (K)-Dissolved	1.64		0.020	mg/L		01-SEP-18	R4196265
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		01-SEP-18	R4196265
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Sodium (Na)-Dissolved	6.55		0.0050	mg/L		01-SEP-18	R4196265
Strontium (Sr)-Dissolved	0.204		0.000050	mg/L		01-SEP-18	R4196265
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		01-SEP-18	R4196265
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		01-SEP-18	R4196265
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		01-SEP-18	R4196265
Uranium (U)-Dissolved	0.000037		0.000010	mg/L		01-SEP-18	R4196265
Vanadium (V)-Dissolved	0.000051		0.000050	mg/L		01-SEP-18	R4196265
Zinc (Zn)-Dissolved	0.00127		0.00080	mg/L		01-SEP-18	R4196265
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					08-AUG-18	R4175533
Mercury (Hg)-Dissolved	1.00		0.50	ng/L		15-AUG-18	R4175604
L2139293-10 A8-02							
Sampled By: CLIENT on 24-JUL-18 @ 10:00							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	48.6		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	39.8		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	37.5		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	220		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.025		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	102			%		09-AUG-18	
TDS (Calculated)	106			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-10 A8-02							
Sampled By: CLIENT on 24-JUL-18 @ 10:00							
Matrix: WATER							
Sulfate in Water by IC							
Sulfate (SO4)	4.88		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	183		20	mg/L		10-AUG-18	R4167826
Turbidity							
Turbidity	0.49		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.83		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	3.34		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	84.4		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	0.90		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0017		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Silica, Reactive (as SiO2)	0.708		0.020	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.405		0.050	mg/L	17-AUG-18	20-AUG-18	R4178658
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	3.34		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00271		0.00030	mg/L		28-AUG-18	R4189547
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		28-AUG-18	R4189547
Arsenic (As)-Total	0.00254		0.000020	mg/L		28-AUG-18	R4189547
Barium (Ba)-Total	0.0240		0.000050	mg/L		28-AUG-18	R4189547
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Boron (B)-Total	0.0030		0.0010	mg/L		28-AUG-18	R4189547
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Calcium (Ca)-Total	27.0		0.020	mg/L		28-AUG-18	R4189547
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		28-AUG-18	R4189547
Cobalt (Co)-Total	0.000048		0.000010	mg/L		28-AUG-18	R4189547
Copper (Cu)-Total	0.00082		0.00010	mg/L		28-AUG-18	R4189547
Iron (Fe)-Total	0.0757		0.0010	mg/L		28-AUG-18	R4189547
Lead (Pb)-Total	0.000018		0.000010	mg/L		28-AUG-18	R4189547
Lithium (Li)-Total	0.00648		0.00050	mg/L		28-AUG-18	R4189547
Magnesium (Mg)-Total	3.48		0.0040	mg/L		28-AUG-18	R4189547
Manganese (Mn)-Total	0.0146		0.000050	mg/L		28-AUG-18	R4189547
Molybdenum (Mo)-Total	0.000192		0.000050	mg/L		28-AUG-18	R4189547
Nickel (Ni)-Total	0.000693		0.000060	mg/L		28-AUG-18	R4189547
Potassium (K)-Total	1.62		0.020	mg/L		28-AUG-18	R4189547
Selenium (Se)-Total	<0.000040		0.000040	mg/L		28-AUG-18	R4189547
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Sodium (Na)-Total	6.23		0.0050	mg/L		28-AUG-18	R4189547
Strontium (Sr)-Total	0.202		0.000050	mg/L		28-AUG-18	R4189547
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Tin (Sn)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		28-AUG-18	R4189547

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-10 A8-02							
Sampled By: CLIENT on 24-JUL-18 @ 10:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Uranium (U)-Total	0.000033		0.000010	mg/L		28-AUG-18	R4189547
Vanadium (V)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		28-AUG-18	R4189547
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					24-AUG-18	R4182500
Aluminum (Al)-Dissolved	0.00153		0.00030	mg/L		30-AUG-18	R4194848
Antimony (Sb)-Dissolved	0.000134		0.000020	mg/L		30-AUG-18	R4194848
Arsenic (As)-Dissolved	0.00219		0.000020	mg/L		30-AUG-18	R4194848
Barium (Ba)-Dissolved	0.0238		0.000050	mg/L		30-AUG-18	R4194848
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Boron (B)-Dissolved	0.0028		0.0010	mg/L		30-AUG-18	R4194848
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Calcium (Ca)-Dissolved	28.0		0.020	mg/L		30-AUG-18	R4194848
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Cobalt (Co)-Dissolved	0.000024		0.000010	mg/L		30-AUG-18	R4194848
Copper (Cu)-Dissolved	0.00073		0.00010	mg/L		30-AUG-18	R4194848
Iron (Fe)-Dissolved	0.0366		0.0010	mg/L		30-AUG-18	R4194848
Lead (Pb)-Dissolved	0.000017		0.000010	mg/L		30-AUG-18	R4194848
Lithium (Li)-Dissolved	0.00682		0.00050	mg/L		30-AUG-18	R4194848
Magnesium (Mg)-Dissolved	3.51		0.0040	mg/L		30-AUG-18	R4194848
Manganese (Mn)-Dissolved	0.00171		0.000050	mg/L		30-AUG-18	R4194848
Molybdenum (Mo)-Dissolved	0.000202		0.000050	mg/L		30-AUG-18	R4194848
Nickel (Ni)-Dissolved	0.000904		0.000060	mg/L		30-AUG-18	R4194848
Potassium (K)-Dissolved	1.61		0.020	mg/L		30-AUG-18	R4194848
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		30-AUG-18	R4194848
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Sodium (Na)-Dissolved	6.28		0.0050	mg/L		30-AUG-18	R4194848
Strontium (Sr)-Dissolved	0.192		0.000050	mg/L		30-AUG-18	R4194848
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		30-AUG-18	R4194848
Uranium (U)-Dissolved	0.000034		0.000010	mg/L		30-AUG-18	R4194848
Vanadium (V)-Dissolved	0.000061		0.000050	mg/L		30-AUG-18	R4194848
Zinc (Zn)-Dissolved	0.00085		0.00080	mg/L		30-AUG-18	R4194848
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					03-AUG-18	R4161092
Mercury (Hg)-Dissolved	1.20		0.50	ng/L		07-AUG-18	R4161122
L2139293-11 A8-03							
Sampled By: CLIENT on 24-JUL-18 @ 11:15							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	54.7		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	44.8		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-11 A8-03							
Sampled By: CLIENT on 24-JUL-18 @ 11:15							
Matrix: WATER							
Chloride in Water by IC (Low Level)							
Chloride (Cl)	33.3		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	204		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.027		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	97.7			%		09-AUG-18	
TDS (Calculated)	102			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	4.44		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	163		20	mg/L		10-AUG-18	R4167826
Turbidity							
Turbidity	0.63		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.87		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0114		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	4.12		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	79.8		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	1.20		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		21-AUG-18	R4180345
Phosphorus (P)-Total	0.0024		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	0.0011		0.0010	mg/L		20-AUG-18	R4178860
Silica, Reactive (as SiO2)	0.942		0.020	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.362		0.050	mg/L	17-AUG-18	20-AUG-18	R4178658
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	4.09		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00296		0.00030	mg/L		28-AUG-18	R4189547
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		28-AUG-18	R4189547
Arsenic (As)-Total	0.00288		0.000020	mg/L		28-AUG-18	R4189547
Barium (Ba)-Total	0.0228		0.000050	mg/L		28-AUG-18	R4189547
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Boron (B)-Total	0.0025		0.0010	mg/L		28-AUG-18	R4189547
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Calcium (Ca)-Total	25.6		0.020	mg/L		28-AUG-18	R4189547
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		28-AUG-18	R4189547
Cobalt (Co)-Total	0.000066		0.000010	mg/L		28-AUG-18	R4189547
Copper (Cu)-Total	0.00084		0.00010	mg/L		28-AUG-18	R4189547
Iron (Fe)-Total	0.0974		0.0010	mg/L		28-AUG-18	R4189547

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-11 A8-03							
Sampled By: CLIENT on 24-JUL-18 @ 11:15							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Lead (Pb)-Total	0.000017		0.000010	mg/L		28-AUG-18	R4189547
Lithium (Li)-Total	0.00537		0.00050	mg/L		28-AUG-18	R4189547
Magnesium (Mg)-Total	3.30		0.0040	mg/L		28-AUG-18	R4189547
Manganese (Mn)-Total	0.0187		0.000050	mg/L		28-AUG-18	R4189547
Molybdenum (Mo)-Total	0.000181		0.000050	mg/L		28-AUG-18	R4189547
Nickel (Ni)-Total	0.000859		0.000060	mg/L		28-AUG-18	R4189547
Potassium (K)-Total	1.55		0.020	mg/L		28-AUG-18	R4189547
Selenium (Se)-Total	<0.000040		0.000040	mg/L		31-AUG-18	R4195731
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Sodium (Na)-Total	5.64		0.0050	mg/L		28-AUG-18	R4189547
Strontium (Sr)-Total	0.173		0.000050	mg/L		28-AUG-18	R4189547
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Tin (Sn)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		28-AUG-18	R4189547
Uranium (U)-Total	0.000030		0.000010	mg/L		28-AUG-18	R4189547
Vanadium (V)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		28-AUG-18	R4189547
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					24-AUG-18	R4182500
Aluminum (Al)-Dissolved	0.00185		0.00030	mg/L		30-AUG-18	R4194848
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		30-AUG-18	R4194848
Arsenic (As)-Dissolved	0.00248		0.000020	mg/L		30-AUG-18	R4194848
Barium (Ba)-Dissolved	0.0235		0.000050	mg/L		30-AUG-18	R4194848
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Boron (B)-Dissolved	0.0024		0.0010	mg/L		30-AUG-18	R4194848
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Calcium (Ca)-Dissolved	26.3		0.020	mg/L		30-AUG-18	R4194848
Chromium (Cr)-Dissolved	0.000158		0.000060	mg/L		30-AUG-18	R4194848
Cobalt (Co)-Dissolved	0.000033		0.000010	mg/L		30-AUG-18	R4194848
Copper (Cu)-Dissolved	0.00084		0.00010	mg/L		30-AUG-18	R4194848
Iron (Fe)-Dissolved	0.0514		0.0010	mg/L		30-AUG-18	R4194848
Lead (Pb)-Dissolved	0.000011		0.000010	mg/L		30-AUG-18	R4194848
Lithium (Li)-Dissolved	0.00557		0.00050	mg/L		30-AUG-18	R4194848
Magnesium (Mg)-Dissolved	3.40		0.0040	mg/L		30-AUG-18	R4194848
Manganese (Mn)-Dissolved	0.00124		0.000050	mg/L		30-AUG-18	R4194848
Molybdenum (Mo)-Dissolved	0.000210		0.000050	mg/L		30-AUG-18	R4194848
Nickel (Ni)-Dissolved	0.00114		0.000060	mg/L		30-AUG-18	R4194848
Potassium (K)-Dissolved	1.54		0.020	mg/L		30-AUG-18	R4194848
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		30-AUG-18	R4194848
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Sodium (Na)-Dissolved	5.80		0.0050	mg/L		30-AUG-18	R4194848
Strontium (Sr)-Dissolved	0.171		0.000050	mg/L		30-AUG-18	R4194848
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		30-AUG-18	R4194848
Uranium (U)-Dissolved	0.000031		0.000010	mg/L		30-AUG-18	R4194848
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Zinc (Zn)-Dissolved	0.00147		0.00080	mg/L		30-AUG-18	R4194848
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					03-AUG-18	R4161092

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-11 A8-03							
Sampled By: CLIENT on 24-JUL-18 @ 11:15							
Matrix: WATER							
Mercury, Dissolved							
Mercury (Hg)-Dissolved	1.30		0.50	ng/L		07-AUG-18	R4161122
L2139293-12 R-18-07-02							
Sampled By: CLIENT on 24-JUL-18							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	18.9		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	15.5		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	13.1		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	86.4		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	0.021		0.020	mg/L		01-AUG-18	R4158659
Ion Balance Calculation							
Ion Balance	Low EC			%		09-AUG-18	
TDS (Calculated)	42.7			mg/L		09-AUG-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	0.0123		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	0.0135		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	0.0012		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	4.20		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	53		13	mg/L		16-AUG-18	R4177308
Turbidity							
Turbidity	0.39		0.10	NTU		01-AUG-18	R4153812
pH							
pH	7.41		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0055		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	3.00		0.50	mg/L		17-AUG-18	R4178088
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	25.5		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	1.50		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	0.0020		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Ra-226	<0.0041		0.0041	Bq/L	20-AUG-18	28-AUG-18	R4211673
Silica, Reactive (as SiO2)	0.402		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	0.235		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	3.01		0.50	mg/L		17-AUG-18	R4178039

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-12 R-18-07-02							
Sampled By: CLIENT on 24-JUL-18							
Matrix: WATER							
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.0206		0.00030	mg/L		28-AUG-18	R4189547
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		28-AUG-18	R4189547
Arsenic (As)-Total	0.000346		0.000020	mg/L		28-AUG-18	R4189547
Barium (Ba)-Total	0.00853		0.000050	mg/L		28-AUG-18	R4189547
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Boron (B)-Total	0.0046		0.0010	mg/L		28-AUG-18	R4189547
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Calcium (Ca)-Total	7.67		0.020	mg/L		28-AUG-18	R4189547
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		28-AUG-18	R4189547
Cobalt (Co)-Total	0.000027		0.000010	mg/L		28-AUG-18	R4189547
Copper (Cu)-Total	0.00070		0.00010	mg/L		28-AUG-18	R4189547
Iron (Fe)-Total	0.0233		0.0010	mg/L		28-AUG-18	R4189547
Lead (Pb)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Lithium (Li)-Total	0.00176		0.00050	mg/L		28-AUG-18	R4189547
Magnesium (Mg)-Total	1.38		0.0040	mg/L		28-AUG-18	R4189547
Manganese (Mn)-Total	0.00670		0.000050	mg/L		28-AUG-18	R4189547
Molybdenum (Mo)-Total	0.000057		0.000050	mg/L		28-AUG-18	R4189547
Nickel (Ni)-Total	0.000639		0.000060	mg/L		28-AUG-18	R4189547
Potassium (K)-Total	0.992		0.020	mg/L		28-AUG-18	R4189547
Selenium (Se)-Total	<0.000040		0.000040	mg/L		28-AUG-18	R4189547
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Sodium (Na)-Total	5.70		0.0050	mg/L		28-AUG-18	R4189547
Strontium (Sr)-Total	0.0559		0.000050	mg/L		28-AUG-18	R4189547
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Tin (Sn)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		28-AUG-18	R4189547
Uranium (U)-Total	0.000016		0.000010	mg/L		28-AUG-18	R4189547
Vanadium (V)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Zinc (Zn)-Total	0.00140		0.00080	mg/L		28-AUG-18	R4189547
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					24-AUG-18	R4182500
Aluminum (Al)-Dissolved	0.0171		0.00030	mg/L		30-AUG-18	R4194848
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		30-AUG-18	R4194848
Arsenic (As)-Dissolved	0.000323		0.000020	mg/L		30-AUG-18	R4194848
Barium (Ba)-Dissolved	0.00858		0.000050	mg/L		30-AUG-18	R4194848
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Boron (B)-Dissolved	0.0044		0.0010	mg/L		30-AUG-18	R4194848
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Calcium (Ca)-Dissolved	7.90		0.020	mg/L		30-AUG-18	R4194848
Chromium (Cr)-Dissolved	0.000083		0.000060	mg/L		30-AUG-18	R4194848
Cobalt (Co)-Dissolved	0.000011		0.000010	mg/L		30-AUG-18	R4194848
Copper (Cu)-Dissolved	0.00070		0.00010	mg/L		30-AUG-18	R4194848
Iron (Fe)-Dissolved	0.0103		0.0010	mg/L		30-AUG-18	R4194848
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Lithium (Li)-Dissolved	0.00201		0.00050	mg/L		30-AUG-18	R4194848
Magnesium (Mg)-Dissolved	1.40		0.0040	mg/L		30-AUG-18	R4194848
Manganese (Mn)-Dissolved	0.00140		0.000050	mg/L		30-AUG-18	R4194848

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-12 R-18-07-02							
Sampled By: CLIENT on 24-JUL-18							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Molybdenum (Mo)-Dissolved	0.000087		0.000050	mg/L		30-AUG-18	R4194848
Nickel (Ni)-Dissolved	0.000669		0.000060	mg/L		30-AUG-18	R4194848
Potassium (K)-Dissolved	0.987		0.020	mg/L		30-AUG-18	R4194848
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		30-AUG-18	R4194848
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Sodium (Na)-Dissolved	5.78		0.0050	mg/L		30-AUG-18	R4194848
Strontium (Sr)-Dissolved	0.0525		0.000050	mg/L		30-AUG-18	R4194848
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		30-AUG-18	R4194848
Uranium (U)-Dissolved	0.000015		0.000010	mg/L		30-AUG-18	R4194848
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Zinc (Zn)-Dissolved	0.00155		0.00080	mg/L		30-AUG-18	R4194848
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					03-AUG-18	R4161092
Mercury (Hg)-Dissolved	1.30		0.50	ng/L		07-AUG-18	R4161122
L2139293-13 T-18-07-01							
Sampled By: CLIENT on 23-JUL-18 @ 16:30							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	<1.2		1.2	mg/L		02-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		02-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		02-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	<1.0		1.0	mg/L		01-AUG-18	R4153108
Chloride in Water by IC (Low Level)							
Chloride (Cl)	<0.10		0.10	mg/L		01-AUG-18	R4158659
Conductivity							
Conductivity	<1.0		1.0	umhos/cm		01-AUG-18	R4153108
Fluoride in Water by IC							
Fluoride (F)	<0.020		0.020	mg/L		01-AUG-18	R4158659
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		01-AUG-18	R4158659
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		03-AUG-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		01-AUG-18	R4158659
Sulfate in Water by IC							
Sulfate (SO4)	<0.30		0.30	mg/L		01-AUG-18	R4158659
Total Dissolved Solids (TDS)							
Total Dissolved Solids	<4.0		4.0	mg/L		16-AUG-18	R4177308
Turbidity							
Turbidity	<0.10		0.10	NTU		01-AUG-18	R4153812
pH							
pH	5.72		0.10	pH units		01-AUG-18	R4153108
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		08-AUG-18	R4161373
Dissolved Organic Carbon	<0.50		0.50	mg/L		17-AUG-18	R4178088

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-13 T-18-07-01							
Sampled By: CLIENT on 23-JUL-18 @ 16:30							
Matrix: WATER							
Cyanide, Free	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Hardness (as CaCO3)	<0.053		0.053	mg/L		04-SEP-18	
Mercury (Hg)-Total	<0.50		0.50	ng/L	15-AUG-18	15-AUG-18	R4175588
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		02-AUG-18	R4157709
Phosphorus (P)-Total	<0.0010		0.0010	mg/L		15-AUG-18	R4172289
Phosphorus (P)-Total Dissolved	<0.0010		0.0010	mg/L		20-AUG-18	R4178860
Silica, Reactive (as SiO2)	<0.010		0.010	mg/L		04-AUG-18	R4161112
Total Kjeldahl Nitrogen	<0.050		0.050	mg/L	21-AUG-18	22-AUG-18	R4180486
Cyanide, Total	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Total Organic Carbon	<0.50		0.50	mg/L		17-AUG-18	R4178039
Total Suspended Solids	<1.0		1.0	mg/L		02-AUG-18	R4158489
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		01-AUG-18	R4154750
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00083	RRV	0.00030	mg/L		28-AUG-18	R4189547
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		28-AUG-18	R4189547
Arsenic (As)-Total	<0.000020		0.000020	mg/L		28-AUG-18	R4189547
Barium (Ba)-Total	0.000051	RRV	0.000050	mg/L		28-AUG-18	R4189547
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Boron (B)-Total	0.0019	RRV	0.0010	mg/L		28-AUG-18	R4189547
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Calcium (Ca)-Total	0.030	RRV	0.020	mg/L		28-AUG-18	R4189547
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		28-AUG-18	R4189547
Cobalt (Co)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Copper (Cu)-Total	<0.00010		0.00010	mg/L		28-AUG-18	R4189547
Iron (Fe)-Total	<0.0010		0.0010	mg/L		28-AUG-18	R4189547
Lead (Pb)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Lithium (Li)-Total	<0.00050		0.00050	mg/L		28-AUG-18	R4189547
Magnesium (Mg)-Total	0.0120	RRV	0.0040	mg/L		28-AUG-18	R4189547
Manganese (Mn)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Molybdenum (Mo)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Nickel (Ni)-Total	<0.000060		0.000060	mg/L		28-AUG-18	R4189547
Potassium (K)-Total	<0.020		0.020	mg/L		28-AUG-18	R4189547
Selenium (Se)-Total	<0.000040		0.000040	mg/L		28-AUG-18	R4189547
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Sodium (Na)-Total	<0.0050		0.0050	mg/L		28-AUG-18	R4189547
Strontium (Sr)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		28-AUG-18	R4189547
Tin (Sn)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		28-AUG-18	R4189547
Uranium (U)-Total	<0.000010		0.000010	mg/L		28-AUG-18	R4189547
Vanadium (V)-Total	<0.000050		0.000050	mg/L		28-AUG-18	R4189547
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		28-AUG-18	R4189547
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					24-AUG-18	R4182500
Aluminum (Al)-Dissolved	0.00109		0.00030	mg/L		30-AUG-18	R4194848
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		30-AUG-18	R4194848
Arsenic (As)-Dissolved	<0.000020		0.000020	mg/L		30-AUG-18	R4194848
Barium (Ba)-Dissolved	0.000053		0.000050	mg/L		30-AUG-18	R4194848
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2139293-13 T-18-07-01							
Sampled By: CLIENT on 23-JUL-18 @ 16:30							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Boron (B)-Dissolved	0.0023		0.0010	mg/L		30-AUG-18	R4194848
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Calcium (Ca)-Dissolved	<0.020		0.020	mg/L		30-AUG-18	R4194848
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Copper (Cu)-Dissolved	<0.00010		0.00010	mg/L		30-AUG-18	R4194848
Iron (Fe)-Dissolved	0.0012		0.0010	mg/L		30-AUG-18	R4194848
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Lithium (Li)-Dissolved	<0.00050		0.00050	mg/L		30-AUG-18	R4194848
Magnesium (Mg)-Dissolved	<0.0040		0.0040	mg/L		30-AUG-18	R4194848
Manganese (Mn)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Molybdenum (Mo)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Nickel (Ni)-Dissolved	<0.000060		0.000060	mg/L		30-AUG-18	R4194848
Potassium (K)-Dissolved	<0.020		0.020	mg/L		30-AUG-18	R4194848
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		30-AUG-18	R4194848
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Sodium (Na)-Dissolved	<0.0080	DLB	0.0080	mg/L		30-AUG-18	R4194848
Strontium (Sr)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		30-AUG-18	R4194848
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		30-AUG-18	R4194848
Uranium (U)-Dissolved	<0.000010		0.000010	mg/L		30-AUG-18	R4194848
Vanadium (V)-Dissolved	<0.000050		0.000050	mg/L		30-AUG-18	R4194848
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		30-AUG-18	R4194848
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					03-AUG-18	R4161092
Mercury (Hg)-Dissolved	<0.50		0.50	ng/L		07-AUG-18	R4161122

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
CNI	Test result for Total Cyanide may be biased high due to interference from high nitrite in this sample. Nitrite can cause false positives for T-CN at up to ~ 0.8% of the nitrite concentration. Interpret result as a maximum possible value.
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-CO3CO3-CALC-WP	Water	Alkalinity, Carbonate	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by carbonate is calculated and reported as mg CO3 2-/L.			
ALK-HCO3HCO3-CALC-WP	Water	Alkalinity, Bicarbonate	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by bicarbonate is calculated and reported as mg HCO3-/L			
ALK-OHOH-CALC-WP	Water	Alkalinity, Hydroxide	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by hydroxide is calculated and reported as mg OH-/L.			
ALK-TITR-WP	Water	Alkalinity, Total (as CaCO3)	APHA 2320B
The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. Total alkalinity is determined by titration with a strong standard mineral acid to the successive HCO3- and H2CO3 endpoints indicated electrometrically.			
C-DOC-HTC-WP	Water	Dissolved Organic Carbon by Combustion	APHA 5310 B-WP
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP
Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
CL-L-IC-N-WP	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CN-FREE-CFA-WP	Water	Free Cyanide in water by CFA	ASTM D7237
This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.			
CN-T-CFA-WP	Water	Total Cyanide in water by CFA	ISO 14403-2
This analysis is carried out using procedures adapted from ISO Method 14403-2:2012 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourmetric analysis.			
CN-WAD-CFA-WP	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN I
This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak acid dissociable (WAD) cyanide is determined by in-line sample distillation and final determination by colourmetric analysis.			
EC-WP	Water	Conductivity	APHA 2510B
Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
F-IC-N-WP	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-D-L-CVAF-WP	Water	Mercury, Dissolved	EPA 1631 D (modified)
Mercury in filtered aqueous matrices is oxidized with bromine monochloride and analyzed by cold-vapor atomic fluorescence spectrometer.			
HG-T-L-CVAF-WP	Water	Mercury, Total	EPA 1631 T (modified)
Mercury in unfiltered aqueous matrices is oxidized with bromine monochloride and analyzed by cold-vapor atomic fluorescence spectrometer.			
IONBALANCE-CALC-WP	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance (as % difference) cannot be calculated accurately for waters with very low electrical conductivity (EC), and is reported as "Low EC" where EC < 100 uS/cm (umhos/cm). Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2+NO3-CALC-L-WP	Water	Nitrate+Nitrite	CALCULATION
NO2-L-IC-N-WP	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-WP	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-WP	Water	Phosphorus, Total	APHA 4500 P PHOSPHORUS-L
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-WP	Water	Phosphorus, Total Dissolved	APHA 4500 P PHOSPHORUS-L
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH-WP	Water	pH	APHA 4500H
The pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.			
PO4-DO-L-COL-WP	Water	Phosphate Ortho Dissolved in Water	APHA 4500 P PHOSPHORUS-L
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SIO2-L-COL-WP	Water	Reactive Silica by colour	APHA 4500 SIO2
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 "Silica". Molybdate Reactive Silica is determined by analysis of the sample using the heteropoly blue colourimetric method.			
SO4-IC-N-WP	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
TDS-WP	Water	Total Dissolved Solids (TDS)	APHA 2540 SOLIDS C,E
A well-mixed sample is filtered through a glass fiber filter paper. The filtrate is then evaportaed to dryness in a pre-weighed vial and dried at 180 – 2C. The increase in vial weight represents the total dissolved solids.			
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.			
TURBIDITY-WP	Water	Turbidity	APHA 2130B (modified)
Turbidity in aqueous matrices is determined by the nephelometric method.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2139293 Report Date: 21-FEB-19

Client: Agnico-Eagle - Meliadine Gold Project
PO Box 99
Rankin Inlet NU X0C 0G0

Contact: JESSICA HUZA

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-WP	**Water**							
Batch R4153108								
WG2839344-20 DUP		**L2139293-8**						
Alkalinity, Total (as CaCO3)		15.7	16.4		mg/L	4.4	20	01-AUG-18
WG2839344-14 LCS								
Alkalinity, Total (as CaCO3)			100.6		%		85-115	01-AUG-18
WG2839344-19 LCS								
Alkalinity, Total (as CaCO3)			101.4		%		85-115	01-AUG-18
WG2839344-11 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	01-AUG-18
WG2839344-16 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	01-AUG-18
C-DOC-HTC-WP	**Water**							
Batch R4178088								
WG2854043-3 DUP		**L2139293-12**						
Dissolved Organic Carbon		3.00	2.96		mg/L	1.3	20	17-AUG-18
WG2854043-2 LCS								
Dissolved Organic Carbon			97.1		%		80-120	17-AUG-18
WG2854043-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	17-AUG-18
WG2854043-4 MS		**L2139293-13**						
Dissolved Organic Carbon			97.7		%		70-130	17-AUG-18
C-TOC-HTC-WP	**Water**							
Batch R4178039								
WG2854099-3 DUP		**L2139293-1**						
Total Organic Carbon		2.25	2.18		mg/L	3.2	20	17-AUG-18
WG2854099-2 LCS								
Total Organic Carbon			91.9		%		80-120	17-AUG-18
WG2854099-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	17-AUG-18
WG2854099-4 MS		**L2139293-2**						
Total Organic Carbon			95.8		%		70-130	17-AUG-18
CL-L-IC-N-WP	**Water**							
Batch R4158659								
WG2838604-7 DUP		**L2139293-9**						
Chloride (Cl)		40.3	40.7		mg/L	0.9	20	01-AUG-18
WG2838604-2 LCS								
Chloride (Cl)			102.1		%		90-110	01-AUG-18
WG2838604-6 LCS								
Chloride (Cl)			102.2		%		90-110	01-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-L-IC-N-WP	**Water**							
Batch R4158659								
WG2838604-1 MB								
Chloride (Cl)			<0.10		mg/L		0.1	01-AUG-18
WG2838604-5 MB								
Chloride (Cl)			<0.10		mg/L		0.1	01-AUG-18
WG2838604-8 MS		**L2139293-9**						
Chloride (Cl)			101.1		%		75-125	01-AUG-18
CN-FREE-CFA-WP	**Water**							
Batch R4154750								
WG2838743-8 DUP		**L2139293-1**						
Cyanide, Free		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-18
WG2838743-2 LCS								
Cyanide, Free			104.4		%		80-120	01-AUG-18
WG2838743-7 LCS								
Cyanide, Free			104.7		%		80-120	01-AUG-18
WG2838743-1 MB								
Cyanide, Free			<0.0010		mg/L		0.001	01-AUG-18
WG2838743-6 MB								
Cyanide, Free			<0.0010		mg/L		0.001	01-AUG-18
WG2838743-9 MS		**L2139293-1**						
Cyanide, Free			104.4		%		75-125	01-AUG-18
CN-T-CFA-WP	**Water**							
Batch R4154750								
WG2838743-8 DUP		**L2139293-1**						
Cyanide, Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-18
WG2838743-2 LCS								
Cyanide, Total			95.8		%		80-120	01-AUG-18
WG2838743-7 LCS								
Cyanide, Total			94.6		%		80-120	01-AUG-18
WG2838743-1 MB								
Cyanide, Total			<0.0010		mg/L		0.001	01-AUG-18
WG2838743-6 MB								
Cyanide, Total			<0.0010		mg/L		0.001	01-AUG-18
WG2838743-9 MS		**L2139293-1**						
Cyanide, Total			94.7		%		75-125	01-AUG-18
CN-WAD-CFA-WP	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-WAD-CFA-WP	**Water**							
Batch R4154750								
WG2838743-8 DUP		**L2139293-1**						
Cyanide, Weak Acid Diss		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-18
WG2838743-2 LCS								
Cyanide, Weak Acid Diss			102.8		%		80-120	01-AUG-18
WG2838743-7 LCS								
Cyanide, Weak Acid Diss			101.3		%		80-120	01-AUG-18
WG2838743-1 MB								
Cyanide, Weak Acid Diss			<0.0010		mg/L		0.001	01-AUG-18
WG2838743-6 MB								
Cyanide, Weak Acid Diss			<0.0010		mg/L		0.001	01-AUG-18
WG2838743-9 MS		**L2139293-1**						
Cyanide, Weak Acid Diss			99.9		%		75-125	01-AUG-18
EC-WP	**Water**							
Batch R4153108								
WG2839344-20 DUP		**L2139293-8**						
Conductivity		90.9	90.9		umhos/cm	0.0	10	01-AUG-18
WG2839344-13 LCS								
Conductivity			97.4		%		90-110	01-AUG-18
WG2839344-18 LCS								
Conductivity			97.8		%		90-110	01-AUG-18
WG2839344-11 MB								
Conductivity			<1.0		umhos/cm		1	01-AUG-18
WG2839344-16 MB								
Conductivity			<1.0		umhos/cm		1	01-AUG-18
F-IC-N-WP	**Water**							
Batch R4158659								
WG2838604-7 DUP		**L2139293-9**						
Fluoride (F)		0.027	0.025		mg/L	6.7	20	01-AUG-18
WG2838604-2 LCS								
Fluoride (F)			102.9		%		90-110	01-AUG-18
WG2838604-6 LCS								
Fluoride (F)			104.3		%		90-110	01-AUG-18
WG2838604-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	01-AUG-18
WG2838604-5 MB								
Fluoride (F)			<0.020		mg/L		0.02	01-AUG-18
WG2838604-8 MS		**L2139293-9**						
Fluoride (F)			107.9		%		75-125	01-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-L-CVAF-WP	**Water**							
Batch R4161122								
WG2843801-3 DUP		**L2139293-10**						
Mercury (Hg)-Dissolved		1.20	1.10		ng/L	8.7	20	07-AUG-18
WG2843801-2 LCS								
Mercury (Hg)-Dissolved			98.0		%		80-120	07-AUG-18
WG2843801-1 MB								
Mercury (Hg)-Dissolved			<0.50		ng/L		0.5	07-AUG-18
WG2843801-4 MS		**L2139293-11**						
Mercury (Hg)-Dissolved			80.0		%		70-130	07-AUG-18
Batch R4175604								
WG2852944-2 LCS								
Mercury (Hg)-Dissolved			96.2		%		80-120	15-AUG-18
WG2852944-1 MB								
Mercury (Hg)-Dissolved			<0.50		ng/L		0.5	15-AUG-18
HG-T-L-CVAF-WP	**Water**							
Batch R4175588								
WG2852941-3 DUP		**L2139293-12**						
Mercury (Hg)-Total		1.50	1.30		ng/L	14	20	15-AUG-18
WG2852930-2 LCS								
Mercury (Hg)-Total			99.8		%		80-120	15-AUG-18
WG2852941-2 LCS								
Mercury (Hg)-Total			94.4		%		80-120	15-AUG-18
WG2852930-1 MB								
Mercury (Hg)-Total			<0.50		ng/L		0.5	15-AUG-18
WG2852941-1 MB								
Mercury (Hg)-Total			<0.50		ng/L		0.5	15-AUG-18
WG2852941-4 MS		**L2139293-13**						
Mercury (Hg)-Total			93.0		%		70-130	15-AUG-18
MET-D-NP-U-CCMS-ED	**Water**							
Batch R4194848								
WG2859280-2 LCS								
Aluminum (Al)-Dissolved			100.5		%		80-120	30-AUG-18
Antimony (Sb)-Dissolved			101.3		%		80-120	30-AUG-18
Arsenic (As)-Dissolved			98.8		%		80-120	30-AUG-18
Barium (Ba)-Dissolved			102.1		%		80-120	30-AUG-18
Beryllium (Be)-Dissolved			97.9		%		80-120	30-AUG-18
Bismuth (Bi)-Dissolved			96.8		%		80-120	30-AUG-18
Boron (B)-Dissolved			103.2		%		80-120	30-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch	**R4194848**							
WG2859280-2	**LCS**							
Cadmium (Cd)-Dissolved			97.9		%		80-120	30-AUG-18
Calcium (Ca)-Dissolved			101.2		%		80-120	30-AUG-18
Chromium (Cr)-Dissolved			98.1		%		80-120	30-AUG-18
Cobalt (Co)-Dissolved			99.4		%		80-120	30-AUG-18
Copper (Cu)-Dissolved			97.9		%		80-120	30-AUG-18
Iron (Fe)-Dissolved			99.7		%		80-120	30-AUG-18
Lead (Pb)-Dissolved			99.4		%		80-120	30-AUG-18
Lithium (Li)-Dissolved			99.3		%		80-120	30-AUG-18
Magnesium (Mg)-Dissolved			100.2		%		80-120	30-AUG-18
Manganese (Mn)-Dissolved			99.0		%		80-120	30-AUG-18
Molybdenum (Mo)-Dissolved			98.4		%		80-120	30-AUG-18
Nickel (Ni)-Dissolved			99.0		%		80-120	30-AUG-18
Potassium (K)-Dissolved			99.5		%		80-120	30-AUG-18
Selenium (Se)-Dissolved			97.8		%		80-120	30-AUG-18
Silver (Ag)-Dissolved			102.0		%		80-120	30-AUG-18
Sodium (Na)-Dissolved			102.9		%		80-120	30-AUG-18
Strontium (Sr)-Dissolved			98.6		%		80-120	30-AUG-18
Thallium (Tl)-Dissolved			100.3		%		80-120	30-AUG-18
Tin (Sn)-Dissolved			98.7		%		80-120	30-AUG-18
Titanium (Ti)-Dissolved			99.1		%		80-120	30-AUG-18
Uranium (U)-Dissolved			98.3		%		80-120	30-AUG-18
Vanadium (V)-Dissolved			100.2		%		80-120	30-AUG-18
Zinc (Zn)-Dissolved			96.1		%		80-120	30-AUG-18
WG2859280-1	**MB**							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	30-AUG-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	30-AUG-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	30-AUG-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	30-AUG-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	30-AUG-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	30-AUG-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	30-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch	**R4194848**							
WG2859280-1	**MB**							
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	30-AUG-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	30-AUG-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	30-AUG-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	30-AUG-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	30-AUG-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	30-AUG-18
Silver (Ag)-Dissolved			<0.000005C		mg/L		0.000005	30-AUG-18
Sodium (Na)-Dissolved			0.0065	MB-LOR	mg/L		0.005	30-AUG-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Thallium (Tl)-Dissolved			<0.000005C		mg/L		0.000005	30-AUG-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	30-AUG-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	30-AUG-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	30-AUG-18
Batch	**R4196265**							
WG2857831-3	**DUP**	**L2139293-8**						
Aluminum (Al)-Dissolved		0.0218	0.0211		mg/L	3.2	20	01-SEP-18
Antimony (Sb)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	01-SEP-18
Arsenic (As)-Dissolved		0.000330	0.000340		mg/L	3.1	20	01-SEP-18
Barium (Ba)-Dissolved		0.00865	0.00849		mg/L	1.9	20	01-SEP-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-SEP-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-SEP-18
Boron (B)-Dissolved		0.0050	0.0049		mg/L	0.8	20	01-SEP-18
Cadmium (Cd)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	01-SEP-18
Calcium (Ca)-Dissolved		8.10	8.04		mg/L	0.8	20	01-SEP-18
Chromium (Cr)-Dissolved		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	01-SEP-18
Cobalt (Co)-Dissolved		0.000015	0.000015		mg/L	4.4	20	01-SEP-18
Copper (Cu)-Dissolved		0.00069	0.00067		mg/L	3.4	20	01-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch	**R4196265**							
WG2857831-3	**DUP**	**L2139293-8**						
Iron (Fe)-Dissolved		0.0088	0.0084		mg/L	5.4	20	01-SEP-18
Lead (Pb)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-SEP-18
Lithium (Li)-Dissolved		0.00206	0.00196		mg/L	4.6	20	01-SEP-18
Magnesium (Mg)-Dissolved		1.48	1.46		mg/L	1.6	20	01-SEP-18
Manganese (Mn)-Dissolved		0.00173	0.00167		mg/L	3.6	20	01-SEP-18
Molybdenum (Mo)-Dissolved		0.000064	0.000075		mg/L	15	20	01-SEP-18
Nickel (Ni)-Dissolved		0.000655	0.000646		mg/L	1.4	20	01-SEP-18
Potassium (K)-Dissolved		1.01	0.995		mg/L	1.0	20	01-SEP-18
Selenium (Se)-Dissolved		<0.000040	0.000048	RPD-NA	mg/L	N/A	20	01-SEP-18
Silver (Ag)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	01-SEP-18
Sodium (Na)-Dissolved		6.22	6.14		mg/L	1.4	20	01-SEP-18
Strontium (Sr)-Dissolved		0.0604	0.0586		mg/L	3.2	20	01-SEP-18
Thallium (Tl)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	01-SEP-18
Tin (Sn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-SEP-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	01-SEP-18
Uranium (U)-Dissolved		0.000019	0.000018		mg/L	3.0	20	01-SEP-18
Vanadium (V)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-SEP-18
Zinc (Zn)-Dissolved		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	01-SEP-18
WG2857831-2	**LCS**							
Aluminum (Al)-Dissolved			105.1		%		80-120	01-SEP-18
Antimony (Sb)-Dissolved			97.8		%		80-120	01-SEP-18
Arsenic (As)-Dissolved			100.5		%		80-120	01-SEP-18
Barium (Ba)-Dissolved			101.4		%		80-120	01-SEP-18
Beryllium (Be)-Dissolved			103.1		%		80-120	01-SEP-18
Bismuth (Bi)-Dissolved			108.7		%		80-120	01-SEP-18
Boron (B)-Dissolved			96.7		%		80-120	01-SEP-18
Cadmium (Cd)-Dissolved			100.6		%		80-120	01-SEP-18
Calcium (Ca)-Dissolved			97.1		%		80-120	01-SEP-18
Chromium (Cr)-Dissolved			101.0		%		80-120	01-SEP-18
Cobalt (Co)-Dissolved			99.7		%		80-120	01-SEP-18
Copper (Cu)-Dissolved			98.5		%		80-120	01-SEP-18
Iron (Fe)-Dissolved			97.2		%		80-120	01-SEP-18
Lead (Pb)-Dissolved			110.6		%		80-120	01-SEP-18
Lithium (Li)-Dissolved			101.5		%		80-120	01-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch	**R4196265**							
WG2857831-2	**LCS**							
Magnesium (Mg)-Dissolved			102.9		%		80-120	01-SEP-18
Manganese (Mn)-Dissolved			102.9		%		80-120	01-SEP-18
Molybdenum (Mo)-Dissolved			100.8		%		80-120	01-SEP-18
Nickel (Ni)-Dissolved			99.1		%		80-120	01-SEP-18
Potassium (K)-Dissolved			101.1		%		80-120	01-SEP-18
Selenium (Se)-Dissolved			99.8		%		80-120	01-SEP-18
Silver (Ag)-Dissolved			102.0		%		80-120	01-SEP-18
Sodium (Na)-Dissolved			100.5		%		80-120	01-SEP-18
Strontium (Sr)-Dissolved			99.6		%		80-120	01-SEP-18
Thallium (Tl)-Dissolved			106.5		%		80-120	01-SEP-18
Tin (Sn)-Dissolved			103.8		%		80-120	01-SEP-18
Titanium (Ti)-Dissolved			91.2		%		80-120	01-SEP-18
Uranium (U)-Dissolved			112.7		%		80-120	01-SEP-18
Vanadium (V)-Dissolved			100.1		%		80-120	01-SEP-18
Zinc (Zn)-Dissolved			106.1		%		80-120	01-SEP-18
WG2857831-1	**MB**							
Aluminum (Al)-Dissolved			0.00047	B	mg/L		0.0003	01-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	01-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	01-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	01-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	01-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	01-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	01-SEP-18
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	01-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	01-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	01-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	01-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	01-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	01-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	01-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	01-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	01-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	01-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	01-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch R4196265								
WG2857831-1 MB								
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	01-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	01-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	01-SEP-18
Silver (Ag)-Dissolved			<0.000005(		mg/L		0.000005	01-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	01-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	01-SEP-18
Thallium (Tl)-Dissolved			<0.000005(		mg/L		0.000005	01-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	01-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	01-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	01-SEP-18
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	01-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	01-SEP-18
WG2857831-4 MS		**L2139293-9**						
Aluminum (Al)-Dissolved			108.3		%		70-130	01-SEP-18
Antimony (Sb)-Dissolved			122.6		%		70-130	01-SEP-18
Arsenic (As)-Dissolved			108.7		%		70-130	01-SEP-18
Barium (Ba)-Dissolved			N/A	MS-B	%		-	01-SEP-18
Beryllium (Be)-Dissolved			106.8		%		70-130	01-SEP-18
Bismuth (Bi)-Dissolved			98.6		%		70-130	01-SEP-18
Boron (B)-Dissolved			109.9		%		70-130	01-SEP-18
Cadmium (Cd)-Dissolved			111.2		%		70-130	01-SEP-18
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	01-SEP-18
Chromium (Cr)-Dissolved			106.2		%		70-130	01-SEP-18
Cobalt (Co)-Dissolved			104.9		%		70-130	01-SEP-18
Copper (Cu)-Dissolved			106.0		%		70-130	01-SEP-18
Iron (Fe)-Dissolved			105.0		%		70-130	01-SEP-18
Lead (Pb)-Dissolved			108.0		%		70-130	01-SEP-18
Lithium (Li)-Dissolved			100.7		%		70-130	01-SEP-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	01-SEP-18
Manganese (Mn)-Dissolved			108.0		%		70-130	01-SEP-18
Molybdenum (Mo)-Dissolved			118.1		%		70-130	01-SEP-18
Nickel (Ni)-Dissolved			103.8		%		70-130	01-SEP-18
Potassium (K)-Dissolved			106.4		%		70-130	01-SEP-18
Selenium (Se)-Dissolved			111.5		%		70-130	01-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch R4196265								
WG2857831-4 MS		**L2139293-9**						
Silver (Ag)-Dissolved			59.0	K	%		70-130	01-SEP-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	01-SEP-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	01-SEP-18
Thallium (Tl)-Dissolved			107.3		%		70-130	01-SEP-18
Tin (Sn)-Dissolved			121.9		%		70-130	01-SEP-18
Titanium (Ti)-Dissolved			114.6		%		70-130	01-SEP-18
Uranium (U)-Dissolved			109.4		%		70-130	01-SEP-18
Vanadium (V)-Dissolved			105.6		%		70-130	01-SEP-18
Zinc (Zn)-Dissolved			100.4		%		70-130	01-SEP-18
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4189547								
WG2859162-2 LCS								
Aluminum (Al)-Total			101.7		%		80-120	28-AUG-18
Antimony (Sb)-Total			97.3		%		80-120	28-AUG-18
Arsenic (As)-Total			101.1		%		80-120	28-AUG-18
Barium (Ba)-Total			101.2		%		80-120	28-AUG-18
Beryllium (Be)-Total			102.2		%		80-120	28-AUG-18
Bismuth (Bi)-Total			93.6		%		80-120	28-AUG-18
Boron (B)-Total			95.1		%		80-120	28-AUG-18
Cadmium (Cd)-Total			99.0		%		80-120	28-AUG-18
Calcium (Ca)-Total			97.1		%		80-120	28-AUG-18
Chromium (Cr)-Total			103.5		%		80-120	28-AUG-18
Cobalt (Co)-Total			101.9		%		80-120	28-AUG-18
Copper (Cu)-Total			99.5		%		80-120	28-AUG-18
Iron (Fe)-Total			96.9		%		80-120	28-AUG-18
Lead (Pb)-Total			94.7		%		80-120	28-AUG-18
Lithium (Li)-Total			102.6		%		80-120	28-AUG-18
Magnesium (Mg)-Total			102.9		%		80-120	28-AUG-18
Manganese (Mn)-Total			103.6		%		80-120	28-AUG-18
Molybdenum (Mo)-Total			95.6		%		80-120	28-AUG-18
Nickel (Ni)-Total			101.7		%		80-120	28-AUG-18
Potassium (K)-Total			101.2		%		80-120	28-AUG-18
Selenium (Se)-Total			95.8		%		80-120	28-AUG-18
Silver (Ag)-Total			97.9		%		80-120	28-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4189547								
WG2859162-2 LCS								
Sodium (Na)-Total			100.8		%		80-120	28-AUG-18
Strontium (Sr)-Total			97.8		%		80-120	28-AUG-18
Thallium (Tl)-Total			95.1		%		80-120	28-AUG-18
Tin (Sn)-Total			99.6		%		80-120	28-AUG-18
Titanium (Ti)-Total			94.2		%		80-120	28-AUG-18
Uranium (U)-Total			95.1		%		80-120	28-AUG-18
Vanadium (V)-Total			103.6		%		80-120	28-AUG-18
Zinc (Zn)-Total			98.2		%		80-120	28-AUG-18
WG2859162-1 MB								
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	28-AUG-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	28-AUG-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	28-AUG-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	28-AUG-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	28-AUG-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	28-AUG-18
Boron (B)-Total			<0.0010		mg/L		0.001	28-AUG-18
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	28-AUG-18
Calcium (Ca)-Total			<0.020		mg/L		0.02	28-AUG-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	28-AUG-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	28-AUG-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	28-AUG-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	28-AUG-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	28-AUG-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	28-AUG-18
Magnesium (Mg)-Total			<0.0040		mg/L		0.004	28-AUG-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	28-AUG-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	28-AUG-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	28-AUG-18
Potassium (K)-Total			<0.020		mg/L		0.02	28-AUG-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	28-AUG-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	28-AUG-18
Sodium (Na)-Total			<0.0050		mg/L		0.005	28-AUG-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	28-AUG-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	28-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4189547								
WG2859162-1 MB								
Tin (Sn)-Total			<0.000050		mg/L		0.00005	28-AUG-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	28-AUG-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	28-AUG-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	28-AUG-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	28-AUG-18
Batch R4196265								
WG2857799-3 DUP		**L2139293-8**						
Aluminum (Al)-Total		0.0280	0.0282		mg/L	0.6	20	01-SEP-18
Antimony (Sb)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	01-SEP-18
Arsenic (As)-Total		0.000319	0.000326		mg/L	2.2	20	01-SEP-18
Barium (Ba)-Total		0.00888	0.00898		mg/L	1.1	20	01-SEP-18
Beryllium (Be)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-SEP-18
Bismuth (Bi)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-SEP-18
Boron (B)-Total		0.0052	0.0052		mg/L	0.4	20	01-SEP-18
Cadmium (Cd)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	01-SEP-18
Calcium (Ca)-Total		8.08	8.11		mg/L	0.4	20	01-SEP-18
Chromium (Cr)-Total		0.000069	0.000071		mg/L	2.7	20	01-SEP-18
Cobalt (Co)-Total		0.000030	0.000030		mg/L	0.1	20	01-SEP-18
Copper (Cu)-Total		0.00073	0.00078		mg/L	5.7	20	01-SEP-18
Iron (Fe)-Total		0.0286	0.0276		mg/L	3.4	25	01-SEP-18
Lead (Pb)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	01-SEP-18
Lithium (Li)-Total		0.00194	0.00192		mg/L	0.9	20	01-SEP-18
Magnesium (Mg)-Total		1.46	1.46		mg/L	0.0	20	01-SEP-18
Manganese (Mn)-Total		0.00770	0.00763		mg/L	1.0	20	01-SEP-18
Molybdenum (Mo)-Total		0.000078	0.000059	J	mg/L	0.000018	0.0001	01-SEP-18
Nickel (Ni)-Total		0.000738	0.000714		mg/L	3.3	20	01-SEP-18
Potassium (K)-Total		0.999	0.994		mg/L	0.6	20	01-SEP-18
Selenium (Se)-Total		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	01-SEP-18
Silver (Ag)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	01-SEP-18
Sodium (Na)-Total		6.06	5.82		mg/L	4.0	20	01-SEP-18
Strontium (Sr)-Total		0.0614	0.0606		mg/L	1.3	20	01-SEP-18
Thallium (Tl)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	01-SEP-18
Tin (Sn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	01-SEP-18
Titanium (Ti)-Total		0.00013	0.00015		mg/L	9.6	20	01-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4196265								
WG2857799-3 DUP		**L2139293-8**						
Uranium (U)-Total		0.000019	0.000022		mg/L	13	20	01-SEP-18
Vanadium (V)-Total		0.000051	<0.000050	RPD-NA	mg/L	N/A	20	01-SEP-18
Zinc (Zn)-Total		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	01-SEP-18
WG2857799-2 LCS								
Aluminum (Al)-Total			106.5		%		80-120	01-SEP-18
Antimony (Sb)-Total			101.8		%		80-120	01-SEP-18
Arsenic (As)-Total			103.6		%		80-120	01-SEP-18
Barium (Ba)-Total			103.3		%		80-120	01-SEP-18
Beryllium (Be)-Total			104.8		%		80-120	01-SEP-18
Bismuth (Bi)-Total			101.3		%		80-120	01-SEP-18
Boron (B)-Total			104.1		%		80-120	01-SEP-18
Cadmium (Cd)-Total			102.4		%		80-120	01-SEP-18
Calcium (Ca)-Total			101.9		%		80-120	01-SEP-18
Chromium (Cr)-Total			104.0		%		80-120	01-SEP-18
Cobalt (Co)-Total			100.3		%		80-120	01-SEP-18
Copper (Cu)-Total			101.6		%		80-120	01-SEP-18
Iron (Fe)-Total			101.8		%		80-120	01-SEP-18
Lead (Pb)-Total			102.4		%		80-120	01-SEP-18
Lithium (Li)-Total			103.3		%		80-120	01-SEP-18
Magnesium (Mg)-Total			105.3		%		80-120	01-SEP-18
Manganese (Mn)-Total			100.7		%		80-120	01-SEP-18
Molybdenum (Mo)-Total			102.7		%		80-120	01-SEP-18
Nickel (Ni)-Total			100.9		%		80-120	01-SEP-18
Potassium (K)-Total			101.4		%		80-120	01-SEP-18
Selenium (Se)-Total			102.6		%		80-120	01-SEP-18
Silver (Ag)-Total			106.0		%		80-120	01-SEP-18
Sodium (Na)-Total			102.2		%		80-120	01-SEP-18
Strontium (Sr)-Total			104.4		%		80-120	01-SEP-18
Thallium (Tl)-Total			99.9		%		80-120	01-SEP-18
Tin (Sn)-Total			104.2		%		80-120	01-SEP-18
Titanium (Ti)-Total			98.3		%		80-120	01-SEP-18
Uranium (U)-Total			100.7		%		80-120	01-SEP-18
Vanadium (V)-Total			102.5		%		80-120	01-SEP-18
Zinc (Zn)-Total			98.9		%		80-120	01-SEP-18
WG2857799-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4196265								
WG2857799-1 MB								
Aluminum (Al)-Total			0.00086	B	mg/L		0.0003	01-SEP-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	01-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	01-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	01-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	01-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	01-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	01-SEP-18
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	01-SEP-18
Calcium (Ca)-Total			<0.020		mg/L		0.02	01-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	01-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	01-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	01-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	01-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	01-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	01-SEP-18
Magnesium (Mg)-Total			<0.0040		mg/L		0.004	01-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	01-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	01-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	01-SEP-18
Potassium (K)-Total			<0.020		mg/L		0.02	01-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	01-SEP-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	01-SEP-18
Sodium (Na)-Total			<0.0050		mg/L		0.005	01-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	01-SEP-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	01-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	01-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	01-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	01-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	01-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	01-SEP-18
WG2857799-4 MS		**L2139293-9**						
Aluminum (Al)-Total			107.0		%		70-130	01-SEP-18
Antimony (Sb)-Total			126.0		%		70-130	01-SEP-18
Arsenic (As)-Total			107.9		%		70-130	01-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4196265								
WG2857799-4 MS		**L2139293-9**						
Barium (Ba)-Total			N/A	MS-B	%		-	01-SEP-18
Beryllium (Be)-Total			103.7		%		70-130	01-SEP-18
Bismuth (Bi)-Total			94.7		%		70-130	01-SEP-18
Boron (B)-Total			111.9		%		70-130	01-SEP-18
Cadmium (Cd)-Total			107.7		%		70-130	01-SEP-18
Calcium (Ca)-Total			N/A	MS-B	%		-	01-SEP-18
Chromium (Cr)-Total			105.9		%		70-130	01-SEP-18
Cobalt (Co)-Total			102.7		%		70-130	01-SEP-18
Copper (Cu)-Total			104.4		%		70-130	01-SEP-18
Iron (Fe)-Total			102.9		%		70-130	01-SEP-18
Lead (Pb)-Total			105.0		%		70-130	01-SEP-18
Lithium (Li)-Total			98.0		%		70-130	01-SEP-18
Magnesium (Mg)-Total			N/A	MS-B	%		-	01-SEP-18
Manganese (Mn)-Total			103.1		%		70-130	01-SEP-18
Molybdenum (Mo)-Total			118.0		%		70-130	01-SEP-18
Nickel (Ni)-Total			101.9		%		70-130	01-SEP-18
Potassium (K)-Total			103.5		%		70-130	01-SEP-18
Selenium (Se)-Total			111.7		%		70-130	01-SEP-18
Silver (Ag)-Total			52.8	K	%		70-130	01-SEP-18
Sodium (Na)-Total			N/A	MS-B	%		-	01-SEP-18
Strontium (Sr)-Total			N/A	MS-B	%		-	01-SEP-18
Thallium (Tl)-Total			105.7		%		70-130	01-SEP-18
Tin (Sn)-Total			121.4		%		70-130	01-SEP-18
Titanium (Ti)-Total			115.7		%		70-130	01-SEP-18
Uranium (U)-Total			108.6		%		70-130	01-SEP-18
Vanadium (V)-Total			103.1		%		70-130	01-SEP-18
Zinc (Zn)-Total			99.0		%		70-130	01-SEP-18
NH3-L-CFA-ED	**Water**							
Batch R4161373								
WG2844128-10 LCS								
Ammonia, Total (as N)			93.2		%		85-115	08-AUG-18
WG2844128-2 LCS								
Ammonia, Total (as N)			96.9		%		85-115	08-AUG-18
WG2844128-6 LCS								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-CFA-ED	**Water**							
Batch R4161373								
WG2844128-6 LCS								
Ammonia, Total (as N)			94.2		%		85-115	08-AUG-18
WG2844128-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
WG2844128-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
WG2844128-9 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	08-AUG-18
NO2-L-IC-N-WP	**Water**							
Batch R4158659								
WG2838604-7 DUP		**L2139293-9**						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	01-AUG-18
WG2838604-2 LCS								
Nitrite (as N)			105.5		%		90-110	01-AUG-18
WG2838604-6 LCS								
Nitrite (as N)			104.2		%		90-110	01-AUG-18
WG2838604-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	01-AUG-18
WG2838604-5 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	01-AUG-18
WG2838604-8 MS		**L2139293-9**						
Nitrite (as N)			104.6		%		75-125	01-AUG-18
NO3-L-IC-N-WP	**Water**							
Batch R4158659								
WG2838604-7 DUP		**L2139293-9**						
Nitrate (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	01-AUG-18
WG2838604-2 LCS								
Nitrate (as N)			102.6		%		90-110	01-AUG-18
WG2838604-6 LCS								
Nitrate (as N)			101.8		%		90-110	01-AUG-18
WG2838604-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	01-AUG-18
WG2838604-5 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	01-AUG-18
WG2838604-8 MS		**L2139293-9**						
Nitrate (as N)			101.6		%		75-125	01-AUG-18
P-T-L-COL-WP	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-WP	**Water**							
Batch R4172289								
WG2848158-11 DUP		**L2139293-2**						
Phosphorus (P)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	15-AUG-18
WG2848158-10 LCS								
Phosphorus (P)-Total			99.9		%		80-120	15-AUG-18
WG2848158-6 LCS								
Phosphorus (P)-Total			100.4		%		80-120	15-AUG-18
WG2848158-5 MB								
Phosphorus (P)-Total			<0.0010		mg/L		0.001	15-AUG-18
WG2848158-9 MB								
Phosphorus (P)-Total			<0.0010		mg/L		0.001	15-AUG-18
WG2848158-12 MS		**L2139293-3**						
Phosphorus (P)-Total			101.1		%		70-130	15-AUG-18
P-TD-L-COL-WP	**Water**							
Batch R4178860								
WG2854008-3 DUP		**L2139293-1**						
Phosphorus (P)-Total	Dissolved	<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	20-AUG-18
WG2854008-2 LCS								
Phosphorus (P)-Total	Dissolved		99.7		%		80-120	20-AUG-18
WG2854008-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	20-AUG-18
WG2854008-4 MS		**L2139293-2**						
Phosphorus (P)-Total	Dissolved		100.1		%		70-130	20-AUG-18
PH-WP	**Water**							
Batch R4153108								
WG2839344-20 DUP		**L2139293-8**						
pH		7.39	7.41	J	pH units	0.02	0.2	01-AUG-18
WG2839344-12 LCS								
pH			7.48		pH units		7.3-7.5	01-AUG-18
WG2839344-17 LCS								
pH			7.47		pH units		7.3-7.5	01-AUG-18
PO4-DO-L-COL-WP	**Water**							
Batch R4157709								
WG2840606-3 DUP		**L2139293-1**						
Orthophosphate-Dissolved (as P)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	02-AUG-18
WG2840606-2 LCS								
Orthophosphate-Dissolved (as P)			100.1		%		80-120	02-AUG-18
WG2840606-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	02-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-L-COL-WP	**Water**							
Batch R4157709								
WG2840606-4 MS		**L2139293-2**						
Orthophosphate-Dissolved (as P)			106.8		%		70-130	02-AUG-18
Batch R4180345								
WG2856715-2 LCS								
Orthophosphate-Dissolved (as P)			98.5		%		80-120	21-AUG-18
WG2856715-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-AUG-18
SIO2-L-COL-WP	**Water**							
Batch R4161112								
WG2843745-7 DUP		**L2139293-10**						
Silica, Reactive (as SiO2)		0.708	0.689		mg/L	2.7	20	04-AUG-18
WG2843745-2 LCS								
Silica, Reactive (as SiO2)			104.9		%		85-115	04-AUG-18
WG2843745-6 LCS								
Silica, Reactive (as SiO2)			105.3		%		85-115	04-AUG-18
WG2843745-1 MB								
Silica, Reactive (as SiO2)			<0.010		mg/L		0.01	04-AUG-18
WG2843745-5 MB								
Silica, Reactive (as SiO2)			<0.010		mg/L		0.01	04-AUG-18
SO4-IC-N-WP	**Water**							
Batch R4158659								
WG2838604-7 DUP		**L2139293-9**						
Sulfate (SO4)		5.48	5.51		mg/L	0.7	20	01-AUG-18
WG2838604-2 LCS								
Sulfate (SO4)			102.8		%		90-110	01-AUG-18
WG2838604-6 LCS								
Sulfate (SO4)			102.6		%		90-110	01-AUG-18
WG2838604-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-AUG-18
WG2838604-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-AUG-18
WG2838604-8 MS		**L2139293-9**						
Sulfate (SO4)			101.4		%		75-125	01-AUG-18
TDS-WP	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TDS-WP	**Water**							
Batch R4160187								
WG2839372-2 LCS								
Total Dissolved Solids			97.8		%		85-115	02-AUG-18
WG2839372-1 MB								
Total Dissolved Solids			<4.0		mg/L		4	02-AUG-18
Batch R4167826								
WG2845148-2 LCS								
Total Dissolved Solids			100.8		%		85-115	10-AUG-18
WG2845148-1 MB								
Total Dissolved Solids			<4.0		mg/L		4	10-AUG-18
Batch R4177308								
WG2850860-3 DUP		**L2139293-5**						
Total Dissolved Solids		58	56		mg/L	4.7	20	16-AUG-18
WG2850860-2 LCS								
Total Dissolved Solids			99.2		%		85-115	16-AUG-18
WG2850860-1 MB								
Total Dissolved Solids			<4.0		mg/L		4	16-AUG-18
TKN-L-CFA-ED	**Water**							
Batch R4178658								
WG2852974-2 LCS								
Total Kjeldahl Nitrogen			109		%		75-125	20-AUG-18
WG2852974-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	20-AUG-18
Batch R4180486								
WG2855864-3 DUP		**L2139293-1**						
Total Kjeldahl Nitrogen		0.161	0.136		mg/L	17	20	22-AUG-18
WG2855864-2 LCS								
Total Kjeldahl Nitrogen			102		%		75-125	22-AUG-18
WG2855864-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	22-AUG-18
WG2855864-4 MS		**L2139293-1**						
Total Kjeldahl Nitrogen			104		%		70-130	22-AUG-18
TSS-LOW-VA	**Water**							
Batch R4158489								
WG2840029-2 LCS								
Total Suspended Solids			87.6		%		85-115	02-AUG-18
WG2840029-1 MB								
Total Suspended Solids			<1.0		mg/L		1	02-AUG-18
TURBIDITY-WP	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-WP	**Water**							
Batch R4153812								
WG2839544-2 LCS								
Turbidity			107.0		%		85-115	01-AUG-18
WG2839544-1 MB								
Turbidity			<0.10		NTU		0.1	01-AUG-18

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
J	Duplicate results and limits are expressed in terms of absolute difference.
K	Matrix Spike recovery outside ALS DQO due to sample matrix effects.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Total Dissolved Solids (TDS)							
	1	25-JUL-18 10:15	02-AUG-18 07:00	7	8	days	EHTL
	2	25-JUL-18 12:00	02-AUG-18 07:00	7	8	days	EHTL
	3	25-JUL-18 14:00	02-AUG-18 07:00	7	8	days	EHTL
	4	25-JUL-18 16:00	02-AUG-18 07:00	7	8	days	EHTL
	5	23-JUL-18 15:00	16-AUG-18 07:00	7	24	days	EHTR
	6	22-JUL-18 09:00	16-AUG-18 07:00	7	25	days	EHTR
	7	24-JUL-18 15:30	16-AUG-18 07:00	7	23	days	EHTR
	8	23-JUL-18	16-AUG-18 07:00	7	24	days	EHTR
	9	24-JUL-18 08:45	10-AUG-18 07:00	7	17	days	EHTR
	10	24-JUL-18 10:00	10-AUG-18 07:00	7	17	days	EHTR
	11	24-JUL-18 11:15	10-AUG-18 07:00	7	17	days	EHTR
	12	24-JUL-18	16-AUG-18 07:00	7	23	days	EHTR
	13	23-JUL-18 16:30	16-AUG-18 07:00	7	24	days	EHTR
Total Suspended Solids by Grav. (1 mg/L)							
	1	25-JUL-18 10:15	02-AUG-18 14:05	7	8	days	EHTL
	2	25-JUL-18 12:00	02-AUG-18 14:05	7	8	days	EHTL
	3	25-JUL-18 14:00	02-AUG-18 14:05	7	8	days	EHTL
	4	25-JUL-18 16:00	02-AUG-18 14:05	7	8	days	EHTL
	5	23-JUL-18 15:00	02-AUG-18 14:05	7	10	days	EHTR
	6	22-JUL-18 09:00	02-AUG-18 14:05	7	11	days	EHTR
	7	24-JUL-18 15:30	02-AUG-18 14:05	7	9	days	EHTR
	8	23-JUL-18	02-AUG-18 14:05	7	10	days	EHTR
	9	24-JUL-18 08:45	02-AUG-18 14:05	7	9	days	EHTR
	10	24-JUL-18 10:00	02-AUG-18 14:05	7	9	days	EHTR
	11	24-JUL-18 11:15	02-AUG-18 14:05	7	9	days	EHTR
	12	24-JUL-18	02-AUG-18 14:05	7	9	days	EHTR
	13	23-JUL-18 16:30	02-AUG-18 14:05	7	10	days	EHTR
Turbidity							
	1	25-JUL-18 10:15	01-AUG-18 14:00	3	7	days	EHTR
	2	25-JUL-18 12:00	01-AUG-18 14:00	3	7	days	EHTR
	3	25-JUL-18 14:00	01-AUG-18 14:00	3	7	days	EHTR
	4	25-JUL-18 16:00	01-AUG-18 14:00	3	7	days	EHTR
	5	23-JUL-18 15:00	01-AUG-18 14:00	3	9	days	EHTR
	6	22-JUL-18 09:00	01-AUG-18 14:00	3	10	days	EHTR
	7	24-JUL-18 15:30	01-AUG-18 14:00	3	8	days	EHTR
	8	23-JUL-18	01-AUG-18 14:00	3	9	days	EHTR
	9	24-JUL-18 08:45	01-AUG-18 14:00	3	8	days	EHTR
	10	24-JUL-18 10:00	01-AUG-18 14:00	3	8	days	EHTR
	11	24-JUL-18 11:15	01-AUG-18 14:00	3	8	days	EHTR
	12	24-JUL-18	01-AUG-18 14:00	3	8	days	EHTR
	13	23-JUL-18 16:30	01-AUG-18 14:00	3	9	days	EHTR
pH							
	1	25-JUL-18 10:15	01-AUG-18 12:00	0.25	170	hours	EHTR-FM
	2	25-JUL-18 12:00	01-AUG-18 12:00	0.25	168	hours	EHTR-FM
	3	25-JUL-18 14:00	01-AUG-18 12:00	0.25	166	hours	EHTR-FM
	4	25-JUL-18 16:00	01-AUG-18 12:00	0.25	164	hours	EHTR-FM
	5	23-JUL-18 15:00	01-AUG-18 12:00	0.25	213	hours	EHTR-FM
	6	22-JUL-18 09:00	01-AUG-18 12:00	0.25	243	hours	EHTR-FM
	7	24-JUL-18 15:30	01-AUG-18 12:00	0.25	188	hours	EHTR-FM
	8	23-JUL-18	01-AUG-18 12:00	0.25	216	hours	EHTR-FM
	9	24-JUL-18 08:45	01-AUG-18 12:00	0.25	195	hours	EHTR-FM
	10	24-JUL-18 10:00	01-AUG-18 12:00	0.25	194	hours	EHTR-FM
	11	24-JUL-18 11:15	01-AUG-18 12:00	0.25	193	hours	EHTR-FM
	12	24-JUL-18	01-AUG-18 12:00	0.25	192	hours	EHTR-FM
	13	23-JUL-18 16:30	01-AUG-18 12:00	0.25	211	hours	EHTR-FM
Anions and Nutrients							

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	25-JUL-18 10:15	01-AUG-18 11:00	3	7	days	EHTR
	2	25-JUL-18 12:00	01-AUG-18 11:00	3	7	days	EHTR
	3	25-JUL-18 14:00	01-AUG-18 11:00	3	7	days	EHTR
	4	25-JUL-18 16:00	01-AUG-18 11:00	3	7	days	EHTR
	5	23-JUL-18 15:00	01-AUG-18 11:00	3	9	days	EHTR
	6	22-JUL-18 09:00	01-AUG-18 11:00	3	10	days	EHTR
	7	24-JUL-18 15:30	01-AUG-18 11:00	3	8	days	EHTR
	8	23-JUL-18	01-AUG-18 11:00	3	9	days	EHTR
	9	24-JUL-18 08:45	01-AUG-18 11:00	3	8	days	EHTR
	10	24-JUL-18 10:00	01-AUG-18 11:00	3	8	days	EHTR
	11	24-JUL-18 11:15	01-AUG-18 11:00	3	8	days	EHTR
	12	24-JUL-18	01-AUG-18 11:00	3	8	days	EHTR
	13	23-JUL-18 16:30	01-AUG-18 11:00	3	9	days	EHTR
Nitrite in Water by IC (Low Level)							
	1	25-JUL-18 10:15	01-AUG-18 11:00	3	7	days	EHTR
	2	25-JUL-18 12:00	01-AUG-18 11:00	3	7	days	EHTR
	3	25-JUL-18 14:00	01-AUG-18 11:00	3	7	days	EHTR
	4	25-JUL-18 16:00	01-AUG-18 11:00	3	7	days	EHTR
	5	23-JUL-18 15:00	01-AUG-18 11:00	3	9	days	EHTR
	6	22-JUL-18 09:00	01-AUG-18 11:00	3	10	days	EHTR
	7	24-JUL-18 15:30	01-AUG-18 11:00	3	8	days	EHTR
	8	23-JUL-18	01-AUG-18 11:00	3	9	days	EHTR
	9	24-JUL-18 08:45	01-AUG-18 11:00	3	8	days	EHTR
	10	24-JUL-18 10:00	01-AUG-18 11:00	3	8	days	EHTR
	11	24-JUL-18 11:15	01-AUG-18 11:00	3	8	days	EHTR
	12	24-JUL-18	01-AUG-18 11:00	3	8	days	EHTR
	13	23-JUL-18 16:30	01-AUG-18 11:00	3	9	days	EHTR
Phosphate Ortho Dissolved in Water							
	1	25-JUL-18 10:15	02-AUG-18 15:00	3	8	days	EHTR
	2	25-JUL-18 12:00	02-AUG-18 15:00	3	8	days	EHTR
	3	25-JUL-18 14:00	02-AUG-18 15:00	3	8	days	EHTR
	4	25-JUL-18 16:00	02-AUG-18 15:00	3	8	days	EHTR
	5	23-JUL-18 15:00	02-AUG-18 15:00	3	10	days	EHTR
	6	22-JUL-18 09:00	02-AUG-18 15:00	3	11	days	EHTR
	7	24-JUL-18 15:30	02-AUG-18 15:00	3	9	days	EHTR
	8	23-JUL-18	02-AUG-18 15:00	3	10	days	EHTR
	9	24-JUL-18 08:45	02-AUG-18 15:00	3	9	days	EHTR
	10	24-JUL-18 10:00	02-AUG-18 15:00	3	9	days	EHTR
	11	24-JUL-18 11:15	21-AUG-18 14:00	3	28	days	EHTR
	12	24-JUL-18	02-AUG-18 15:00	3	9	days	EHTR
	13	23-JUL-18 16:30	02-AUG-18 15:00	3	10	days	EHTR
Phosphorus, Total Dissolved							
	6	22-JUL-18 09:00	20-AUG-18 12:00	28	29	days	EHT
TKN in Water by Colour							
	6	22-JUL-18 09:00	21-AUG-18 00:00	28	30	days	EHT
	8	23-JUL-18	21-AUG-18 00:00	28	29	days	EHT
	12	24-JUL-18	22-AUG-18 00:00	28	29	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2139293 were received on 01-AUG-18 09:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, September 12, 2018

Judy Dalmaijer
ALS Environmental
1329 Niakwa Road East, Unit 12
Winnipeg, MB R2J 3T4

Re: ALS Workorder: 1808031
Project Name:
Project Number: L2139293

Dear Ms. Dalmaijer:

Ten water samples were received from ALS Environmental, on 8/2/2018. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1808031

Radium-226:
The samples were prepared and analyzed according to the current revision of SOP 783.

Sample 1808031-3 was originally prepped in batch RE180820-2 on 08/20/2018. Due to a laboratory incident, the sample was lost prior to analysis. A replacement was received from the client and the sample was analyzed on 09/11/2018 in batch RE180905-2. Please refer to NCR #14744 at the end of this report for further information.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1808031
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L2139293
Client PO Number: L2139293

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2139293-1	1808031-1		WATER	25-Jul-18	
L2139293-2	1808031-2		WATER	25-Jul-18	
L2139293-3	1808031-3		WATER	25-Jul-18	
L2139293-4	1808031-4		WATER	25-Jul-18	
L2139293-5	1808031-5		WATER	23-Jul-18	
L2139293-6	1808031-6		WATER	22-Jul-18	
L2139293-7	1808031-7		WATER	24-Jul-18	
L2139293-8	1808031-8		WATER	23-Jul-18	
L2139293-12	1808031-9		WATER	24-Jul-18	
L2139293-13	1808031-10		WATER	23-Jul-18	

ALS Environmental

1808031

L2139293

WINNIPEG

Subcontract Request Form

Subcontract To:

WP-SHIPTO-FC-WED

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

WP-SHIPTO-FC-WED

NOTES: Please reference on final report and invoice: PO# *L2139293*
ALS requires QC data to be provided with your final results.

Please see enclosed 10 sample(s) in 10 Container(s)

	SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
(1)	**L2139293-1 MEL-03-01**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/25/2018** 8/22/2018	
(2)	**L2139293-2 MEL-03-02**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/25/2018** 8/22/2018	
(3)	**L2139293-3 MEL-03-03**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/25/2018** 8/22/2018	
(4)	**L2139293-4 MEL-03-04**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/25/2018** 8/22/2018	
(5)	**L2139293-5 MEL-01-08**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/23/2018** 8/22/2018	
(6)	**L2139293-6 MEL-01-07**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/22/2018** 8/22/2018	
(7)	**L2139293-7 MEL-01-09**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/24/2018** 8/22/2018	
(8)	**L2139293-8 R-18-07-01**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/23/2018** 8/22/2018	
(9)	**L2139293-12 R-18-07-02**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/24/2018** 8/22/2018	
(10)	**L2139293-13 T-18-07-01**	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	**7/23/2018** 8/22/2018	

ALS Environmental

1808031

L2139293

WINNIPEG

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

Subcontract Info Contact: Judy Dalmaijer (204) 255-9749

Analysis and reporting info contact: Judy Dalmaijer
12-1329 NIAKWA ROAD E
WINNIPEG,MB R2J3T4
Phone: (204) 255-9749 Email: Judy.Dalmaijer@alsglobal.com

Please email confirmation of receipt to: **Judy.Dalmaijer@alsglobal.com**

Shipped By: BL Date Shipped: 08/01/18

Received By: C Trumble Date Received: 8-2-18 0955

Verified By: _____ Date Verified: _____

Temperature: 10°

Sample Integrity Issues: _____

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS - Winnipeg Workorder No: 1808031

Project Manager: KO Initials: CDS Date: 8-2-18

1.	Are airbills / shipping documents present and/or removable?	DROP OFF	(YES)	NO
2.	Are custody seals on **shipping** containers intact?	(NONE)	YES	NO
3.	Are custody seals on **sample** containers intact?	(NONE)	YES	NO
4.	Is there a COC (chain-of-custody) present?		(YES)	NO
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		(YES)	NO
6.	Are short-hold samples present?		YES	(NO)
7.	Are all samples within holding times for the requested analyses?		(YES)	NO
8.	Were all sample containers received intact? (not broken or leaking)		(YES)	NO
9.	Is there sufficient sample for the requested analyses?		(YES)	NO
10.	Are all samples in the proper containers for the requested analyses?		(YES)	NO
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	(YES)	NO
12.	Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
13.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	(N/A)	YES	NO
14.	Were the samples shipped on ice?		(YES)	NO
15.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	(RAD ONLY)	YES	(NO)

Cooler #:	1							
Temperature (°C):	12.2							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	10							
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: **Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:**

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 8/3/18

Form 201r26.xls
(06/29/2018)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Winnipeg Workorder No: 1808031

Project Manager: [illegible] Initials: [illegible] Date: 8/29/18

1.	Are airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
2.	Are custody seals on **shipping** containers intact?	NONE	YES	NO
3.	Are custody seals on **sample** containers intact?	NONE	YES	NO
4.	Is there a COC (chain-of-custody) present?		YES	NO
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		YES	NO
6.	Are short-hold samples present?		YES	NO
7.	Are all samples within holding times for the requested analyses?		YES	NO
8.	Were all sample containers received intact? (not broken or leaking)		YES	NO
9.	Is there sufficient sample for the requested analyses?		YES	NO
10.	Are all samples in the proper containers for the requested analyses?		YES	NO
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	YES	NO
12.	Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
13.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	N/A	YES	NO
14.	Were the samples shipped on ice?		YES	NO
15.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	RAD ONLY	YES	NO

Cooler #:	1								
Temperature (°C):	Amb								
No. of custody seals on cooler:	0								
DOT Survey/ Acceptance Information — External µR/hr reading:	8								
Background µR/hr reading:	10								

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO / NA** (If no, see Form 008.)

Additional Information: **Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:**

Replacement Sample - 3

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: [signature] 8/29/18

Form 201r26.xls
(06/29/2018)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

1808031

SHIPPING/RECIE VING
ALS LABORATORY GROUP
12042559764
1329 NIAKWA RD E
STE: 12
WINNIPEG MB R2J 3T4
CANADA

33 LBS 1 OF 1
SHP#: 662F 45MP 7RG
SHP WT: 33 LBS
DATE: 01 AUG 2018

12.00

10-0

SHIP TO
LOGIN
ALS ENVIRO
0
225 COMMERCE DRIVE
FORT COLLINS CO 80524
UNITED STATES

CO 805 0-01

UPS EXPRESS

TRACKING #: 1Z 662 F45 66 6680 7092

12.21

BILLING: F/D
DESC: water samples
PUROLATOR PIN: 6919904132

PIECE PIN: 6919904132

EXPORT #

1808031



Shipping/Recie ving
ALS Laboratory Group
12042559764
1329 Niakwa RD E
Ste: 12
WINNIPEG MB R2J 3T4
CANADA

6 LBS 1 OF 1
SHP#: 662F 45MP C7S
SHP WT: 6 LBS
DATE: 28 AUG 2018

8-D

SHIP TO
LOGIN
ALS ENVIRO
00
225 COMMERCE DRIVE
FORT COLLINS CO 80524
UNITED STATES

CO 805 0-01

UPS EXPRESS

TRACKING #: 1Z 662 F45 66 6683 0075

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-1	**Lab ID:**	1808031-1
Legal Location:		**Matrix:**	WATER
Collection Date:	7/25/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	0 (+/- 0.0032)	U	0.0067	BQ/l	NA	8/28/2018 11:49
Carr: BARIUM	*90.9*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-2	**Lab ID:**	1808031-2
Legal Location:		**Matrix:**	WATER
Collection Date:	7/25/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	0.0059 (+/- 0.0049)	U	0.0065	BQ/l	NA	8/28/2018 11:49
Carr: BARIUM	*97.5*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-3	**Lab ID:**	1808031-3
Legal Location:		**Matrix:**	WATER
Collection Date:	7/25/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **9/5/2018**		PrepBy: **ASZ**
Ra-226	0.0035 (+/- 0.0043)	U	0.0066	BQ/l	NA	9/11/2018 11:48
Carr: BARIUM	*87.7*		*40-110*	*%REC*	DL = NA	9/11/2018 11:48

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-4	**Lab ID:**	1808031-4
Legal Location:		**Matrix:**	WATER
Collection Date:	7/25/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**			Prep Date: **8/20/2018**	PrepBy: **CXW**
Ra-226	**0.011 (+/- 0.0062)**		**0.0067**	**BQ/l**	NA	8/28/2018 11:49
Carr: BARIUM	*93.3*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-5	**Lab ID:**	1808031-5
Legal Location:		**Matrix:**	WATER
Collection Date:	7/23/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	0.0020 (+/- 0.0045)	U	0.0081	BQ/l	NA	8/28/2018 11:49
Carr: BARIUM	*94.4*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-6	**Lab ID:**	1808031-6
Legal Location:		**Matrix:**	WATER
Collection Date:	7/22/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	0.0037 (+/- 0.0049)	U	0.0078	BQ/l	NA	8/28/2018 11:49
Carr: BARIUM	*92*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-7	**Lab ID:**	1808031-7
Legal Location:		**Matrix:**	WATER
Collection Date:	7/24/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	**0.10 (+/- 0.029)**		**0.0059**	**BQ/l**	NA	8/28/2018 11:49
Carr: BARIUM	*95.8*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-8	**Lab ID:**	1808031-8
Legal Location:		**Matrix:**	WATER
Collection Date:	7/23/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	0.0036 (+/- 0.0046)	U	0.0072	BQ/l	NA	8/28/2018 11:49
Carr: BARIUM	*91.6*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-12	**Lab ID:**	1808031-9
Legal Location:		**Matrix:**	WATER
Collection Date:	7/24/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	0.0034 (+/- 0.0033)	U	0.0041	BQ/l	NA	8/28/2018 11:49
Carr: BARIUM	*98.6*		*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-13	**Lab ID:**	1808031-10
Legal Location:		**Matrix:**	WATER
Collection Date:	7/23/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **8/20/2018**		PrepBy: **CXW**
Ra-226	0.0022 (+/- 0.0041)	Y1,U	0.0071	BQ/l	NA	8/28/2018 11:49
Carr: BARIUM	*106*	Y1	*40-110*	*%REC*	DL = NA	8/28/2018 11:49

Client:	ALS Environmental	**Date:**	*12-Sep-18*
Project:	L2139293	**Work Order:**	1808031
Sample ID:	L2139293-13	**Lab ID:**	1808031-10
Legal Location:		**Matrix:**	WATER
Collection Date:	7/23/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Batch ID: **RE180820-2-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE180820-2** Units: **BQ/l** Analysis Date: **8/28/2018 13:09**
Client ID: Run ID: **RE180820-2A** Prep Date: **8/20/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.86 (+/- 0.465)	0.0184	1.771		105	67-120					P,M3
Carr: BARIUM	15300		16240		94	40-110					

LCSD Sample ID: **RE180820-2** Units: **BQ/l** Analysis Date: **8/28/2018 13:09**
Client ID: Run ID: **RE180820-2A** Prep Date: **8/20/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.87 (+/- 0.468)	0.0201	1.771		106	67-120		1.86	0.02	2.1	P,Y1,M3
Carr: BARIUM	16900		16240		104	40-110		15300			Y1

MB Sample ID: **RE180820-2** Units: **BQ/l** Analysis Date: **8/28/2018 13:09**
Client ID: Run ID: **RE180820-2A** Prep Date: **8/20/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0010 (+/- 0.0033)	0.0063									U
Carr: BARIUM	14600		16240		90	40-110					

The following samples were analyzed in this batch:

1808031-1	1808031-2	1808031-4
1808031-5	1808031-6	1808031-7
1808031-8	1808031-9	1808031-10

QC BATCH REPORT

Batch ID: **RE180905-2-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE180905-2** Units: **BQ/l** Analysis Date: **9/11/2018 13:21**

Client ID: Run ID: **RE180905-2A** Prep Date: **9/5/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.39 (+/- 0.351)	0.0207	1.771		78.4	67-120					P,M3
Carr: BARIUM	15600		15930		97.9	40-110					

MB Sample ID: **RE180905-2** Units: **BQ/l** Analysis Date: **9/11/2018 13:21**

Client ID: Run ID: **RE180905-2A** Prep Date: **9/5/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	-0.00081 (+/- 0.0031)	0.0065									U
Carr: BARIUM	15200		15930		95.3	40-110					

The following samples were analyzed in this batch: 1808031-3

Ft. Collins, Colorado

NCR #: 14744

CONTROLLED
NON-CONFORMANCE REPORT

Non-Conformance

Initiated By: Channing R. Weber on 9/4/2018

Event Type: Laboratory Incident/Error

Event Explanation: The lid to the vial on sample 1808301-3 fell apart while sample was ingrowing and all of sample leaked out before analysis could be completed.

Action To Prevent Reccurence: (isolated incident).(jfn)

Corrective Action

Corrective Action: Replacement volume received from client

Department Manager Approval:

Approval Date:

Corrective Action Comments:

Workorders Affected

Workorder -- Procedure		Approved By	Approval Date
1808031 -- Ra226_RnE	Judy was contacted on 8/28/2018	Katie M. OBrien	9/6/2018

Associated Batches

The samples were originally associated with the following Batch(es):

RE180820-2 created on 8/20/2018

All rework was completed in the following Batch(es):

Not Applicable

NCR Approval

Comments: Isolated incident.(jfn)

Project Manager Approval: KMO on 9/6/2018

Department Manager Approval:

QA Manager Approval: Joel F. Nolte on 9/10/2018

Date Printed: Wednesday, September 12, 2018

225 Commerce Drive Ft. Collins, Colorado 80524
Phone (970) 490-1511 Fax (970) 490-1522 www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2139293-COFC

C Number: 18 -

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	AGNICO EAGLE
Contact:	Jessica Huza
Phone:	1-819-759-3555 x3928
	Company address below will appear on the final report
Street:	PO Box 99
City/Province:	Rankin Inlet, NU
Postal Code:	X0C 0G0
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: meli.environment@agnicoeagle.com; jessica.huza@
Email 2: Jarett_Nevill@golder.com, colleen_prather@golder.
Email 3: gal_equis@golder.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☑ MAIL ☑ FAX
Email 1 or Fax:
Email 2:

Project Information

ALS Account # / Quote #: Q57496
Job #:
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only)
ALS Contact: Sampler:

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐
EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-TOC-HTC-WP, P-T-L-COL-WP	C-DOC-HTC-WP, P-TD-L-COL-WP	CYANDE - FREE, TOTAL AND WAD	HG-T-L-CVAF-WP, HG-D-L-CVAF-WP	MET-D-NP-U-CCMS-ED	MET-T-NP-U-CCMS-ED	NO2-L-IC-N-WP, NO3-L-IC-N-WP	SIO2-L-COL-WP, PO4-DO-L-COL-WP	TDS-WP, TURBIDITY-WP	NH3-L-CFA-ED, TKN-L-CFA-ED	ROU-LOW-ED	TSS-LOW-VA	Radium 226	Number of Containers
1	MEL-03-01	25/07/18	10:15	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
2	MEL-03-02	25/07/18	12:00		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
3	MEL-03-03	25/07/18	14:00		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
4	MEL-03-04	25/07/18	16:00		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
5	MEL-01-08	23/07/18	15:00		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
6	MEL-01-07	24/07/18	9:00		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
7	MEL-01-09	24/07/18	15:30		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
8	R-18-07-01	23/07/18			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
9	A-8-01	24/07/18	8:45		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
10	AB-02	24/07/18	10:00		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
11	AB-03	~~AB~~ 24/07/18	11:15		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
12	R-18-07-02	24/07/18			✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO
Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

EQuiS facility code: 36923771

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Brian Lingelbach	Date: July 26/18	Time: 600	Received by:	Date: Aug 7/18	Time: 940	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Cooler 1 - 18°C C2-16° C3-18° C4-18° C5-19° C6-18

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2139293-COFC

COC Number: 18 -

Page 2 of 2

Report To	Contact and company name below will appear on the final report
Company:	AGNICO EAGLE
Contact:	Jessica Huza
Phone:	1-819-759-3555 x3928
	Company address below will appear on the final report
Street:	PO Box 99
City/Province:	Rankin Inlet, NU
Postal Code:	X0C 0G0
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: meli.environment@agnicoeagle.com; jessica.huza@

Email 2: Jarett_Nevill@golder.com, colleen_prather@golder.

Email 3: gal_equis@golder.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☑ MAIL ☑ FAX

Email 1 or Fax:

Email 2:

Project Information

ALS Account # / Quote #:	Q57496
Job #:	
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-TOC-HTC-WP, P-T-L-COL-WP	C-DOC-HTC-WP, P-TD-L-COL-WP	CYANDE - FREE, TOTAL AND WAD	HG-T-L-CVAF-WP, HG-D-L-CVAF-WP	MET-D-NP-U-CCMS-ED	MET-T-NP-U-CCMS-ED	NO2-L-IC-N-WP, NO3-L-IC-N-WP	SIO2-L-COL-WP, PO4-DO-L-COL-WP	TDS-WP, TURBIDITY-WP	NH3-L-CFA-ED, TKN-L-CFA-ED	RDU-LOW-ED	TSS-LOW-VA	Radium 226	Number of Containers
13	T-18-07-01	23/07/19	16:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		12

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

EQuiS facility code: 36923771

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Brian Lingelbach	July 26 2018	600						

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Agnico-Eagle - Meliadine Gold Project
ATTN: JENNIFER BROWN
PO Box 99
Rankin Inlet NU X0C 0G0

Date Received: 27-AUG-18
Report Date: 21-FEB-19 07:21 (MT)
Version: FINAL REV. 2

Client Phone: 819-759-3555

Certificate of Analysis

Lab Work Order #: L2153439

Project P.O. #: NOT SUBMITTED
Job Reference: MEL
C of C Numbers:
Legal Site Desc: 63*06'52.2" 92*20'23.6"

Comments:
21-FEB-2019 revised report - GPS added

Hua Wo
Chemistry Laboratory Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2153439-1 R-18-08-01							
Sampled By: CLIENT on 20-AUG-18 @ 10:00							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	20.6		1.2	mg/L		29-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		29-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		29-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	16.9		1.0	mg/L		28-AUG-18	R4190248
Chloride in Water by IC (Low Level)							
Chloride (Cl)	8.29		0.10	mg/L		28-AUG-18	R4203645
Conductivity							
Conductivity	73.0		1.0	umhos/cm		28-AUG-18	R4190248
Fluoride in Water by IC							
Fluoride (F)	0.026		0.020	mg/L		28-AUG-18	R4203645
Hardness Calculated							
Hardness (as CaCO3)	20.9		0.20			27-AUG-18	
Ion Balance Calculation							
Ion Balance	Low EC			%		06-SEP-18	
TDS (Calculated)	35.3			mg/L		06-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		28-AUG-18	R4203645
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		06-SEP-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		28-AUG-18	R4203645
Sulfate in Water by IC							
Sulfate (SO4)	3.83		0.30	mg/L		28-AUG-18	R4203645
Total Dissolved Solids (TDS)							
Total Dissolved Solids	35		13	mg/L		27-AUG-18	R4188028
Turbidity							
Turbidity	0.27		0.10	NTU		27-AUG-18	R4187547
pH							
pH	7.38		0.10	pH units		28-AUG-18	R4190248
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
Dissolved Organic Carbon	2.25		0.50	mg/L		30-AUG-18	R4202908
Cyanide, Free	<0.0010		0.0010	mg/L		04-SEP-18	R4203591
Mercury (Hg)-Total	0.70		0.50	ng/L	13-SEP-18	13-SEP-18	R4216542
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		27-AUG-18	R4188130
Phosphorus (P)-Total	0.0045		0.0010	mg/L		12-SEP-18	R4214816
Phosphorus (P)-Total Dissolved	0.0021		0.0010	mg/L		12-SEP-18	R4214816
Ra-226	<0.0057		0.0057	Bq/L	20-SEP-18	30-SEP-18	R4252755
Silica, Reactive (as SiO2)	0.234		0.010	mg/L		31-AUG-18	R4195637
Total Kjeldahl Nitrogen	0.276		0.050	mg/L	13-SEP-18	14-SEP-18	R4216576
Cyanide, Total	<0.0010		0.0010	mg/L		29-AUG-18	R4194160
Total Organic Carbon	2.24		0.50	mg/L		30-AUG-18	R4202702
Total Suspended Solids	<1.0		1.0	mg/L		28-AUG-18	R4190906
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		29-AUG-18	R4194160
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00328		0.00030	mg/L		28-SEP-18	R4251701
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		28-SEP-18	R4251701

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2153439-1 R-18-08-01							
Sampled By: CLIENT on 20-AUG-18 @ 10:00							
Matrix: WATER							
Metals in Water by CRC ICPMS (No Digest)							
Arsenic (As)-Total	0.000213		0.000020	mg/L		28-SEP-18	R4251701
Barium (Ba)-Total	0.00736		0.000050	mg/L		28-SEP-18	R4251701
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Boron (B)-Total	0.0032		0.0010	mg/L		28-SEP-18	R4251701
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Calcium (Ca)-Total	6.61		0.020	mg/L		28-SEP-18	R4251701
Chromium (Cr)-Total	<0.000060		0.000060	mg/L		28-SEP-18	R4251701
Cobalt (Co)-Total	0.000011		0.000010	mg/L		28-SEP-18	R4251701
Copper (Cu)-Total	0.00063		0.00010	mg/L		28-SEP-18	R4251701
Iron (Fe)-Total	0.0120		0.0010	mg/L		28-SEP-18	R4251701
Lead (Pb)-Total	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Lithium (Li)-Total	0.00070		0.00050	mg/L		28-SEP-18	R4251701
Magnesium (Mg)-Total	1.10		0.0040	mg/L		28-SEP-18	R4251701
Manganese (Mn)-Total	0.00266		0.000050	mg/L		28-SEP-18	R4251701
Molybdenum (Mo)-Total	0.000073		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Total	0.000394		0.000060	mg/L		28-SEP-18	R4251701
Potassium (K)-Total	0.900		0.020	mg/L		28-SEP-18	R4251701
Selenium (Se)-Total	<0.000040		0.000040	mg/L		28-SEP-18	R4251701
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Sodium (Na)-Total	4.47		0.0050	mg/L		28-SEP-18	R4251701
Strontium (Sr)-Total	0.0321		0.000050	mg/L		28-SEP-18	R4251701
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Tin (Sn)-Total	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		28-SEP-18	R4251701
Uranium (U)-Total	0.000013		0.000010	mg/L		28-SEP-18	R4251701
Vanadium (V)-Total	<0.00010	DLB	0.00010	mg/L		28-SEP-18	R4251701
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		28-SEP-18	R4251701
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					28-SEP-18	R4250254
Aluminum (Al)-Dissolved	0.00134		0.00030	mg/L		28-SEP-18	R4251701
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		28-SEP-18	R4251701
Arsenic (As)-Dissolved	0.000201		0.000020	mg/L		28-SEP-18	R4251701
Barium (Ba)-Dissolved	0.00743		0.000050	mg/L		28-SEP-18	R4251701
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Boron (B)-Dissolved	0.0030		0.0010	mg/L		28-SEP-18	R4251701
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Calcium (Ca)-Dissolved	6.56		0.020	mg/L		28-SEP-18	R4251701
Chromium (Cr)-Dissolved	0.000173		0.000060	mg/L		28-SEP-18	R4251701
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Copper (Cu)-Dissolved	0.00062		0.00010	mg/L		28-SEP-18	R4251701
Iron (Fe)-Dissolved	0.0061		0.0010	mg/L		28-SEP-18	R4251701
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Lithium (Li)-Dissolved	0.00078		0.00050	mg/L		28-SEP-18	R4251701
Magnesium (Mg)-Dissolved	1.09		0.0040	mg/L		28-SEP-18	R4251701
Manganese (Mn)-Dissolved	0.000453		0.000050	mg/L		28-SEP-18	R4251701
Molybdenum (Mo)-Dissolved	0.000081		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Dissolved	0.000406		0.000060	mg/L		28-SEP-18	R4251701
Potassium (K)-Dissolved	0.914		0.020	mg/L		28-SEP-18	R4251701
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		28-SEP-18	R4251701

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2153439-1 R-18-08-01							
Sampled By: CLIENT on 20-AUG-18 @ 10:00							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Sodium (Na)-Dissolved	4.47		0.0050	mg/L		28-SEP-18	R4251701
Strontium (Sr)-Dissolved	0.0326		0.000050	mg/L		28-SEP-18	R4251701
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		28-SEP-18	R4251701
Uranium (U)-Dissolved	0.000014		0.000010	mg/L		28-SEP-18	R4251701
Vanadium (V)-Dissolved	<0.00010	DLB	0.00010	mg/L		28-SEP-18	R4251701
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		28-SEP-18	R4251701
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					30-AUG-18	R4216464
Mercury (Hg)-Dissolved	<0.50		0.50	ng/L		13-SEP-18	R4216539
L2153439-2 MEL-03-01							
Sampled By: CLIENT on 20-AUG-18 @ 08:45							
Matrix: WATER							
Agnico-Golder Routine parameters							
Alkalinity, Bicarbonate							
Bicarbonate (HCO3)	21.4		1.2	mg/L		29-AUG-18	
Alkalinity, Carbonate							
Carbonate (CO3)	<0.60		0.60	mg/L		29-AUG-18	
Alkalinity, Hydroxide							
Hydroxide (OH)	<0.34		0.34	mg/L		29-AUG-18	
Alkalinity, Total (as CaCO3)							
Alkalinity, Total (as CaCO3)	17.5		1.0	mg/L		28-AUG-18	R4190248
Chloride in Water by IC (Low Level)							
Chloride (Cl)	8.28		0.10	mg/L		28-AUG-18	R4203645
Conductivity							
Conductivity	71.7		1.0	umhos/cm		28-AUG-18	R4190248
Fluoride in Water by IC							
Fluoride (F)	0.024		0.020	mg/L		28-AUG-18	R4203645
Hardness Calculated							
Hardness (as CaCO3)	20.4		0.20			27-AUG-18	
Ion Balance Calculation							
Ion Balance	Low EC			%		06-SEP-18	
TDS (Calculated)	35.6			mg/L		06-SEP-18	
Nitrate in Water by IC (Low Level)							
Nitrate (as N)	<0.0050		0.0050	mg/L		28-AUG-18	R4203645
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.0051		0.0051	mg/L		06-SEP-18	
Nitrite in Water by IC (Low Level)							
Nitrite (as N)	<0.0010		0.0010	mg/L		28-AUG-18	R4203645
Sulfate in Water by IC							
Sulfate (SO4)	3.75		0.30	mg/L		28-AUG-18	R4203645
Total Dissolved Solids (TDS)							
Total Dissolved Solids	48		13	mg/L		10-SEP-18	R4214384
Turbidity							
Turbidity	0.23		0.10	NTU		27-AUG-18	R4187547
pH							
pH	7.42		0.10	pH units		28-AUG-18	R4190248
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.0050		0.0050	mg/L		30-AUG-18	R4194571
Dissolved Organic Carbon	2.32		0.50	mg/L		30-AUG-18	R4202908

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2153439-2 MEL-03-01							
Sampled By: CLIENT on 20-AUG-18 @ 08:45							
Matrix: WATER							
Cyanide, Free	<0.0010		0.0010	mg/L		04-SEP-18	R4203591
Mercury (Hg)-Total	0.60		0.50	ng/L	13-SEP-18	13-SEP-18	R4216542
Orthophosphate-Dissolved (as P)	<0.0010		0.0010	mg/L		27-AUG-18	R4188130
Phosphorus (P)-Total	0.0042		0.0010	mg/L		12-SEP-18	R4214816
Phosphorus (P)-Total Dissolved	0.0021		0.0010	mg/L		12-SEP-18	R4214816
Ra-226	<0.0074		0.0074	Bq/L	20-SEP-18	30-SEP-18	R4252755
Silica, Reactive (as SiO2)	0.233		0.010	mg/L		31-AUG-18	R4195637
Total Kjeldahl Nitrogen	0.226		0.050	mg/L	13-SEP-18	14-SEP-18	R4216576
Cyanide, Total	<0.0010		0.0010	mg/L		29-AUG-18	R4194160
Total Organic Carbon	2.20		0.50	mg/L		30-AUG-18	R4202702
Total Suspended Solids	<1.0		1.0	mg/L		28-AUG-18	R4190906
Cyanide, Weak Acid Diss	<0.0010		0.0010	mg/L		29-AUG-18	R4194160
Metals in Water by CRC ICPMS (No Digest)							
Aluminum (Al)-Total	0.00283		0.00030	mg/L		28-SEP-18	R4251701
Antimony (Sb)-Total	<0.000020		0.000020	mg/L		28-SEP-18	R4251701
Arsenic (As)-Total	0.000209		0.000020	mg/L		28-SEP-18	R4251701
Barium (Ba)-Total	0.00821		0.000050	mg/L		28-SEP-18	R4251701
Beryllium (Be)-Total	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Bismuth (Bi)-Total	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Boron (B)-Total	0.0030		0.0010	mg/L		28-SEP-18	R4251701
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Calcium (Ca)-Total	6.40		0.020	mg/L		28-SEP-18	R4251701
Chromium (Cr)-Total	0.000555		0.000060	mg/L		28-SEP-18	R4251701
Cobalt (Co)-Total	0.000015		0.000010	mg/L		28-SEP-18	R4251701
Copper (Cu)-Total	0.00064		0.00010	mg/L		28-SEP-18	R4251701
Iron (Fe)-Total	0.0178		0.0010	mg/L		28-SEP-18	R4251701
Lead (Pb)-Total	0.000010		0.000010	mg/L		28-SEP-18	R4251701
Lithium (Li)-Total	0.00064		0.00050	mg/L		28-SEP-18	R4251701
Magnesium (Mg)-Total	1.09		0.0040	mg/L		28-SEP-18	R4251701
Manganese (Mn)-Total	0.00258		0.000050	mg/L		28-SEP-18	R4251701
Molybdenum (Mo)-Total	0.000064		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Total	0.000412		0.000060	mg/L		28-SEP-18	R4251701
Potassium (K)-Total	0.902		0.020	mg/L		28-SEP-18	R4251701
Selenium (Se)-Total	<0.000040		0.000040	mg/L		28-SEP-18	R4251701
Silver (Ag)-Total	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Sodium (Na)-Total	4.50		0.0050	mg/L		28-SEP-18	R4251701
Strontium (Sr)-Total	0.0305		0.000050	mg/L		28-SEP-18	R4251701
Thallium (Tl)-Total	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Tin (Sn)-Total	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Titanium (Ti)-Total	<0.00010		0.00010	mg/L		28-SEP-18	R4251701
Uranium (U)-Total	0.000014		0.000010	mg/L		28-SEP-18	R4251701
Vanadium (V)-Total	<0.00010	DLB	0.00010	mg/L		28-SEP-18	R4251701
Zinc (Zn)-Total	<0.00080		0.00080	mg/L		28-SEP-18	R4251701
Diss. Metals in Water by CRC ICPMS (Ult)							
Dissolved Metals Filtration Location	FIELD					28-SEP-18	R4250254
Aluminum (Al)-Dissolved	0.00143		0.00030	mg/L		28-SEP-18	R4251701
Antimony (Sb)-Dissolved	<0.000020		0.000020	mg/L		28-SEP-18	R4251701
Arsenic (As)-Dissolved	0.000204		0.000020	mg/L		28-SEP-18	R4251701
Barium (Ba)-Dissolved	0.00770		0.000050	mg/L		28-SEP-18	R4251701
Beryllium (Be)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Bismuth (Bi)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2153439-2 MEL-03-01							
Sampled By: CLIENT on 20-AUG-18 @ 08:45							
Matrix: WATER							
Diss. Metals in Water by CRC ICPMS (Ult)							
Boron (B)-Dissolved	0.0030		0.0010	mg/L		28-SEP-18	R4251701
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Calcium (Ca)-Dissolved	6.40		0.020	mg/L		28-SEP-18	R4251701
Chromium (Cr)-Dissolved	<0.000060		0.000060	mg/L		28-SEP-18	R4251701
Cobalt (Co)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Copper (Cu)-Dissolved	0.00057		0.00010	mg/L		28-SEP-18	R4251701
Iron (Fe)-Dissolved	0.0042		0.0010	mg/L		28-SEP-18	R4251701
Lead (Pb)-Dissolved	<0.000010		0.000010	mg/L		28-SEP-18	R4251701
Lithium (Li)-Dissolved	0.00064		0.00050	mg/L		28-SEP-18	R4251701
Magnesium (Mg)-Dissolved	1.08		0.0040	mg/L		28-SEP-18	R4251701
Manganese (Mn)-Dissolved	0.000442		0.000050	mg/L		28-SEP-18	R4251701
Molybdenum (Mo)-Dissolved	0.000064		0.000050	mg/L		28-SEP-18	R4251701
Nickel (Ni)-Dissolved	0.000499		0.000060	mg/L		28-SEP-18	R4251701
Potassium (K)-Dissolved	0.900		0.020	mg/L		28-SEP-18	R4251701
Selenium (Se)-Dissolved	<0.000040		0.000040	mg/L		28-SEP-18	R4251701
Silver (Ag)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Sodium (Na)-Dissolved	4.63		0.0050	mg/L		28-SEP-18	R4251701
Strontium (Sr)-Dissolved	0.0325		0.000050	mg/L		28-SEP-18	R4251701
Thallium (Tl)-Dissolved	<0.0000050		0.0000050	mg/L		28-SEP-18	R4251701
Tin (Sn)-Dissolved	<0.000050		0.000050	mg/L		28-SEP-18	R4251701
Titanium (Ti)-Dissolved	<0.00010		0.00010	mg/L		28-SEP-18	R4251701
Uranium (U)-Dissolved	0.000011		0.000010	mg/L		28-SEP-18	R4251701
Vanadium (V)-Dissolved	<0.00010	DLB	0.00010	mg/L		28-SEP-18	R4251701
Zinc (Zn)-Dissolved	<0.00080		0.00080	mg/L		28-SEP-18	R4251701
Mercury, Dissolved							
Dissolved Mercury Filtration Location	FIELD					30-AUG-18	R4216464
Mercury (Hg)-Dissolved	0.50		0.50	ng/L		13-SEP-18	R4216539

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-CO3CO3-CALC-WP	Water	Alkalinity, Carbonate	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by carbonate is calculated and reported as mg CO3 2-/L.			
ALK-HCO3HCO3-CALC-WP	Water	Alkalinity, Bicarbonate	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by bicarbonate is calculated and reported as mg HCO3-/L			
ALK-OHOH-CALC-WP	Water	Alkalinity, Hydroxide	CALCULATION
The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by hydroxide is calculated and reported as mg OH-/L.			
ALK-TITR-WP	Water	Alkalinity, Total (as CaCO3)	APHA 2320B
The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. Total alkalinity is determined by titration with a strong standard mineral acid to the successive HCO3- and H2CO3 endpoints indicated electrometrically.			
C-DOC-HTC-WP	Water	Dissolved Organic Carbon by Combustion	APHA 5310 B-WP
Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP
Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.			
CL-L-IC-N-WP	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CN-FREE-CFA-WP	Water	Free Cyanide in water by CFA	ASTM D7237
This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.			
CN-T-CFA-WP	Water	Total Cyanide in water by CFA	ISO 14403-2
This analysis is carried out using procedures adapted from ISO Method 14403-2:2012 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourmetric analysis.			
CN-WAD-CFA-WP	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN I
This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak acid dissociable (WAD) cyanide is determined by in-line sample distillation and final determination by colourmetric analysis.			
EC-WP	Water	Conductivity	APHA 2510B
Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.			
F-IC-N-WP	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-WP	Water	Hardness Calculated	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-L-CVAF-WP	Water	Mercury, Dissolved	EPA 1631 D (modified)

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Mercury in filtered aqueous matrices is oxidized with bromine monochloride and analyzed by cold-vapor atomic fluorescence spectrometer.			
HG-T-L-CVAF-WP	Water	Mercury, Total	EPA 1631 T (modified)
Mercury in unfiltered aqueous matrices is oxidized with bromine monochloride and analyzed by cold-vapor atomic fluorescence spectrometer.			
IONBALANCE-CALC-WP	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero. Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance (as % difference) cannot be calculated accurately for waters with very low electrical conductivity (EC), and is reported as "Low EC" where EC < 100 uS/cm (umhos/cm). Ion Balance is calculated as: Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-D-NP-U-CCMS-ED	Water	Diss. Metals in Water by CRC ICPMS (Ult)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.			
MET-T-NP-U-CCMS-ED	Water	Metals in Water by CRC ICPMS (No Digest)	APHA 3125-ICP-MS
Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.			
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2+NO3-CALC-L-WP	Water	Nitrate+Nitrite	CALCULATION
NO2-L-IC-N-WP	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
NO3-L-IC-N-WP	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
P-T-L-COL-WP	Water	Phosphorus, Total	APHA 4500 P PHOSPHORUS-L
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-WP	Water	Phosphorus, Total Dissolved	APHA 4500 P PHOSPHORUS-L
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH-WP	Water	pH	APHA 4500H
The pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.			
PO4-DO-L-COL-WP	Water	Phosphate Ortho Dissolved in Water	APHA 4500 P PHOSPHORUS-L
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
RA226-MMER-FC	Water	Ra226 by Alpha Scint, MDC=0.01 Bq/L	EPA 903.1
SIO2-L-COL-WP	Water	Reactive Silica by colour	APHA 4500 SIO2
This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 "Silica". Molybdate Reactive Silica is determined by analysis of the sample using the heteropoly blue colourimetric method.			
SO4-IC-N-WP	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
TDS-WP	Water	Total Dissolved Solids (TDS)	APHA 2540 SOLIDS C,E
A well-mixed sample is filtered through a glass fiber filter paper. The filtrate is then evaportaed to dryness in a pre-weighed vial and dried at 180 – 2C. The increase in vial weight represents the total dissolved solids.			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.

TSS-LOW-VA	Water	Total Suspended Solids by Grav. (1 mg/L)	APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-WP	Water	Turbidity	APHA 2130B (modified)

Turbidity in aqueous matrices is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Agnico-Eagle - Meliadine Gold Project
PO Box 99
Rankin Inlet NU X0C 0G0
Contact: JENNIFER BROWN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-WP	**Water**							
Batch R4190248								
WG2862592-4 LCS								
Alkalinity, Total (as CaCO3)			101.5		%		85-115	28-AUG-18
WG2862592-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	28-AUG-18
C-DOC-HTC-WP	**Water**							
Batch R4202908								
WG2867914-2 LCS								
Dissolved Organic Carbon			99.9		%		80-120	30-AUG-18
WG2867914-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	30-AUG-18
C-TOC-HTC-WP	**Water**							
Batch R4202702								
WG2867990-2 LCS								
Total Organic Carbon			98.9		%		80-120	30-AUG-18
WG2867990-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	30-AUG-18
CL-L-IC-N-WP	**Water**							
Batch R4203645								
WG2861445-2 LCS								
Chloride (Cl)			99.4		%		90-110	28-AUG-18
WG2861445-1 MB								
Chloride (Cl)			<0.10		mg/L		0.1	28-AUG-18
CN-FREE-CFA-WP	**Water**							
Batch R4203591								
WG2869163-2 LCS								
Cyanide, Free			99.0		%		80-120	04-SEP-18
WG2869163-1 MB								
Cyanide, Free			<0.0010		mg/L		0.001	04-SEP-18
CN-T-CFA-WP	**Water**							
Batch R4194160								
WG2863860-8 DUP		**L2153439-2**						
Cyanide, Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-AUG-18
WG2863860-7 LCS								
Cyanide, Total			87.8		%		80-120	29-AUG-18
WG2863860-6 MB								
Cyanide, Total			<0.0010		mg/L		0.001	29-AUG-18
WG2863860-9 MS		**L2153439-2**						

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-CFA-WP	**Water**							
Batch R4194160								
WG2863860-9 MS		**L2153439-2**						
Cyanide, Total			96.5		%		75-125	29-AUG-18
CN-WAD-CFA-WP	**Water**							
Batch R4194160								
WG2863860-8 DUP		**L2153439-2**						
Cyanide, Weak Acid Diss		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-AUG-18
WG2863860-7 LCS								
Cyanide, Weak Acid Diss			103.7		%		80-120	29-AUG-18
WG2863860-6 MB								
Cyanide, Weak Acid Diss			<0.0010		mg/L		0.001	29-AUG-18
WG2863860-9 MS		**L2153439-2**						
Cyanide, Weak Acid Diss			105.8		%		75-125	29-AUG-18
EC-WP	**Water**							
Batch R4190248								
WG2862592-3 LCS								
Conductivity			98.2		%		90-110	28-AUG-18
WG2862592-1 MB								
Conductivity			<1.0		umhos/cm		1	28-AUG-18
F-IC-N-WP	**Water**							
Batch R4203645								
WG2861445-2 LCS								
Fluoride (F)			103.2		%		90-110	28-AUG-18
WG2861445-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	28-AUG-18
HG-D-L-CVAF-WP	**Water**							
Batch R4216539								
WG2877100-2 LCS								
Mercury (Hg)-Dissolved			100.6		%		80-120	13-SEP-18
WG2877100-1 MB								
Mercury (Hg)-Dissolved			<0.50		ng/L		0.5	13-SEP-18
HG-T-L-CVAF-WP	**Water**							
Batch R4216542								
WG2877115-2 LCS								
Mercury (Hg)-Total			104.8		%		80-120	13-SEP-18
WG2877115-1 MB								
Mercury (Hg)-Total			<0.50		ng/L		0.5	13-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch R4251701								
WG2889727-3 DUP		**L2153439-1**						
Aluminum (Al)-Dissolved		0.00134	0.00137		mg/L	2.3	20	28-SEP-18
Antimony (Sb)-Dissolved		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	28-SEP-18
Arsenic (As)-Dissolved		0.000201	0.000188		mg/L	6.6	20	28-SEP-18
Barium (Ba)-Dissolved		0.00743	0.00746		mg/L	0.3	20	28-SEP-18
Beryllium (Be)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-SEP-18
Bismuth (Bi)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-SEP-18
Boron (B)-Dissolved		0.0030	0.0030		mg/L	0.7	20	28-SEP-18
Cadmium (Cd)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	28-SEP-18
Calcium (Ca)-Dissolved		6.56	6.64		mg/L	1.3	20	28-SEP-18
Chromium (Cr)-Dissolved		0.000173	0.000174		mg/L	0.6	20	28-SEP-18
Cobalt (Co)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-SEP-18
Copper (Cu)-Dissolved		0.00062	0.00061		mg/L	1.4	20	28-SEP-18
Iron (Fe)-Dissolved		0.0061	0.0060		mg/L	2.2	20	28-SEP-18
Lead (Pb)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-SEP-18
Lithium (Li)-Dissolved		0.00078	0.00073		mg/L	6.9	20	28-SEP-18
Magnesium (Mg)-Dissolved		1.09	1.09		mg/L	0.7	20	28-SEP-18
Manganese (Mn)-Dissolved		0.000453	0.000393		mg/L	14	20	28-SEP-18
Molybdenum (Mo)-Dissolved		0.000081	0.000081		mg/L	0.3	20	28-SEP-18
Nickel (Ni)-Dissolved		0.000406	0.000372		mg/L	8.9	20	28-SEP-18
Potassium (K)-Dissolved		0.914	0.917		mg/L	0.3	20	28-SEP-18
Selenium (Se)-Dissolved		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	28-SEP-18
Silver (Ag)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	28-SEP-18
Sodium (Na)-Dissolved		4.47	4.42		mg/L	1.1	20	28-SEP-18
Strontium (Sr)-Dissolved		0.0326	0.0326		mg/L	0.1	20	28-SEP-18
Thallium (Tl)-Dissolved		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	28-SEP-18
Tin (Sn)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	28-SEP-18
Titanium (Ti)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-SEP-18
Uranium (U)-Dissolved		0.000014	0.000013		mg/L	5.8	20	28-SEP-18
Vanadium (V)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-SEP-18
Zinc (Zn)-Dissolved		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	28-SEP-18
WG2889727-2 LCS								
Aluminum (Al)-Dissolved			104.6		%		80-120	28-SEP-18
Antimony (Sb)-Dissolved			99.3		%		80-120	28-SEP-18
Arsenic (As)-Dissolved			98.4		%		80-120	28-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch	**R4251701**							
WG2889727-2	**LCS**							
Barium (Ba)-Dissolved			107.7		%		80-120	28-SEP-18
Beryllium (Be)-Dissolved			95.5		%		80-120	28-SEP-18
Bismuth (Bi)-Dissolved			99.9		%		80-120	28-SEP-18
Boron (B)-Dissolved			96.6		%		80-120	28-SEP-18
Cadmium (Cd)-Dissolved			98.3		%		80-120	28-SEP-18
Calcium (Ca)-Dissolved			97.5		%		80-120	28-SEP-18
Chromium (Cr)-Dissolved			102.1		%		80-120	28-SEP-18
Cobalt (Co)-Dissolved			99.1		%		80-120	28-SEP-18
Copper (Cu)-Dissolved			99.0		%		80-120	28-SEP-18
Iron (Fe)-Dissolved			96.9		%		80-120	28-SEP-18
Lead (Pb)-Dissolved			97.1		%		80-120	28-SEP-18
Lithium (Li)-Dissolved			94.1		%		80-120	28-SEP-18
Magnesium (Mg)-Dissolved			103.6		%		80-120	28-SEP-18
Manganese (Mn)-Dissolved			97.0		%		80-120	28-SEP-18
Molybdenum (Mo)-Dissolved			96.3		%		80-120	28-SEP-18
Nickel (Ni)-Dissolved			96.3		%		80-120	28-SEP-18
Potassium (K)-Dissolved			104.6		%		80-120	28-SEP-18
Selenium (Se)-Dissolved			98.7		%		80-120	28-SEP-18
Silver (Ag)-Dissolved			100.9		%		80-120	28-SEP-18
Sodium (Na)-Dissolved			104.7		%		80-120	28-SEP-18
Strontium (Sr)-Dissolved			97.4		%		80-120	28-SEP-18
Thallium (Tl)-Dissolved			95.8		%		80-120	28-SEP-18
Tin (Sn)-Dissolved			96.6		%		80-120	28-SEP-18
Titanium (Ti)-Dissolved			95.4		%		80-120	28-SEP-18
Uranium (U)-Dissolved			99.0		%		80-120	28-SEP-18
Vanadium (V)-Dissolved			100.0		%		80-120	28-SEP-18
Zinc (Zn)-Dissolved			97.4		%		80-120	28-SEP-18
WG2889727-1	**MB**							
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	28-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	28-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	28-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	28-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	28-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	28-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch	**R4251701**							
WG2889727-1	**MB**							
Boron (B)-Dissolved			<0.0010		mg/L		0.001	28-SEP-18
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	28-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	28-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	28-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	28-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	28-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	28-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	28-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	28-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	28-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	28-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	28-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	28-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	28-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	28-SEP-18
Silver (Ag)-Dissolved			<0.000005C		mg/L		0.000005	28-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	28-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	28-SEP-18
Thallium (Tl)-Dissolved			<0.000005C		mg/L		0.000005	28-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	28-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	28-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	28-SEP-18
Vanadium (V)-Dissolved			0.000062	MB-LOR	mg/L		0.00005	28-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	28-SEP-18
MET-T-NP-U-CCMS-ED	**Water**							
Batch	**R4251701**							
WG2889736-3	**DUP**	**L2153439-2**						
Aluminum (Al)-Total		0.00283	0.00259		mg/L	8.9	20	28-SEP-18
Antimony (Sb)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	28-SEP-18
Arsenic (As)-Total		0.000209	0.000191		mg/L	8.9	20	28-SEP-18
Barium (Ba)-Total		0.00821	0.00727		mg/L	12	20	28-SEP-18
Beryllium (Be)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-SEP-18
Bismuth (Bi)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-SEP-18
Boron (B)-Total		0.0030	0.0031		mg/L	4.3	20	28-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4251701								
WG2889736-3 DUP		**L2153439-2**						
Cadmium (Cd)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	28-SEP-18
Calcium (Ca)-Total		6.40	6.54		mg/L	2.2	20	28-SEP-18
Chromium (Cr)-Total		0.000555	0.000559		mg/L	0.6	20	28-SEP-18
Cobalt (Co)-Total		0.000015	0.000013		mg/L	16	20	28-SEP-18
Copper (Cu)-Total		0.00064	0.00060		mg/L	6.6	20	28-SEP-18
Iron (Fe)-Total		0.0178	0.0183		mg/L	2.7	25	28-SEP-18
Lead (Pb)-Total		0.000010	0.000010		mg/L	3.5	20	28-SEP-18
Lithium (Li)-Total		0.00064	0.00065		mg/L	1.0	20	28-SEP-18
Magnesium (Mg)-Total		1.09	1.08		mg/L	1.1	20	28-SEP-18
Manganese (Mn)-Total		0.00258	0.00247		mg/L	4.4	20	28-SEP-18
Molybdenum (Mo)-Total		0.000064	0.000082	J	mg/L	0.000018	0.0001	28-SEP-18
Nickel (Ni)-Total		0.000412	0.000380		mg/L	8.2	20	28-SEP-18
Potassium (K)-Total		0.902	0.881		mg/L	2.4	20	28-SEP-18
Selenium (Se)-Total		<0.000040	<0.000040	RPD-NA	mg/L	N/A	20	28-SEP-18
Silver (Ag)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	28-SEP-18
Sodium (Na)-Total		4.50	4.39		mg/L	2.4	20	28-SEP-18
Strontium (Sr)-Total		0.0305	0.0321		mg/L	5.2	20	28-SEP-18
Thallium (Tl)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	28-SEP-18
Tin (Sn)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	28-SEP-18
Titanium (Ti)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-SEP-18
Uranium (U)-Total		0.000014	0.000015		mg/L	3.1	20	28-SEP-18
Vanadium (V)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-SEP-18
Zinc (Zn)-Total		<0.00080	<0.00080	RPD-NA	mg/L	N/A	20	28-SEP-18
WG2889736-2 LCS								
Aluminum (Al)-Total			103.9		%		80-120	28-SEP-18
Antimony (Sb)-Total			100.3		%		80-120	28-SEP-18
Arsenic (As)-Total			100.2		%		80-120	28-SEP-18
Barium (Ba)-Total			105.0		%		80-120	28-SEP-18
Beryllium (Be)-Total			95.3		%		80-120	28-SEP-18
Bismuth (Bi)-Total			101.6		%		80-120	28-SEP-18
Boron (B)-Total			95.0		%		80-120	28-SEP-18
Cadmium (Cd)-Total			100.4		%		80-120	28-SEP-18
Calcium (Ca)-Total			94.4		%		80-120	28-SEP-18
Chromium (Cr)-Total			101.0		%		80-120	28-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4251701								
WG2889736-2 LCS								
Cobalt (Co)-Total			98.3		%		80-120	28-SEP-18
Copper (Cu)-Total			99.0		%		80-120	28-SEP-18
Iron (Fe)-Total			95.5		%		80-120	28-SEP-18
Lead (Pb)-Total			94.9		%		80-120	28-SEP-18
Lithium (Li)-Total			92.4		%		80-120	28-SEP-18
Magnesium (Mg)-Total			97.6		%		80-120	28-SEP-18
Manganese (Mn)-Total			99.8		%		80-120	28-SEP-18
Molybdenum (Mo)-Total			95.3		%		80-120	28-SEP-18
Nickel (Ni)-Total			97.4		%		80-120	28-SEP-18
Potassium (K)-Total			104.6		%		80-120	28-SEP-18
Selenium (Se)-Total			95.0		%		80-120	28-SEP-18
Silver (Ag)-Total			105.2		%		80-120	28-SEP-18
Sodium (Na)-Total			101.7		%		80-120	28-SEP-18
Strontium (Sr)-Total			95.7		%		80-120	28-SEP-18
Thallium (Tl)-Total			95.4		%		80-120	28-SEP-18
Tin (Sn)-Total			98.0		%		80-120	28-SEP-18
Titanium (Ti)-Total			95.0		%		80-120	28-SEP-18
Uranium (U)-Total			95.4		%		80-120	28-SEP-18
Vanadium (V)-Total			100.2		%		80-120	28-SEP-18
Zinc (Zn)-Total			99.3		%		80-120	28-SEP-18
WG2889736-1 MB								
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	28-SEP-18
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	28-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	28-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	28-SEP-18
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	28-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	28-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	28-SEP-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	28-SEP-18
Calcium (Ca)-Total			<0.020		mg/L		0.02	28-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	28-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	28-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	28-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	28-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4251701								
WG2889736-1 MB								
Lead (Pb)-Total			<0.000010		mg/L		0.00001	28-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	28-SEP-18
Magnesium (Mg)-Total			<0.0040		mg/L		0.004	28-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	28-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	28-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	28-SEP-18
Potassium (K)-Total			<0.020		mg/L		0.02	28-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	28-SEP-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	28-SEP-18
Sodium (Na)-Total			<0.0050		mg/L		0.005	28-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	28-SEP-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	28-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	28-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	28-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	28-SEP-18
Vanadium (V)-Total			0.000083	MB-LOR	mg/L		0.00005	28-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	28-SEP-18
NH3-L-CFA-ED	**Water**							
Batch R4194571								
WG2864356-5 LCS								
Ammonia, Total (as N)			99.8		%		85-115	30-AUG-18
WG2864356-6 LCS								
Ammonia, Total (as N)			101.2		%		85-115	30-AUG-18
WG2864356-7 LCS								
Ammonia, Total (as N)			103.0		%		85-115	30-AUG-18
WG2864356-8 LCS								
Ammonia, Total (as N)			107.8		%		85-115	30-AUG-18
WG2864356-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-2 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
WG2864356-4 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-18
NO2-L-IC-N-WP	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-WP	**Water**							
Batch R4203645								
WG2861445-2 LCS								
Nitrite (as N)			100.8		%		90-110	28-AUG-18
WG2861445-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	28-AUG-18
NO3-L-IC-N-WP	**Water**							
Batch R4203645								
WG2861445-2 LCS								
Nitrate (as N)			98.7		%		90-110	28-AUG-18
WG2861445-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	28-AUG-18
P-T-L-COL-WP	**Water**							
Batch R4214816								
WG2874214-7 DUP		**L2153439-1**						
Phosphorus (P)-Total		0.0045	0.0052		mg/L	14	20	12-SEP-18
WG2874214-6 LCS								
Phosphorus (P)-Total			101.3		%		80-120	12-SEP-18
WG2874214-5 MB								
Phosphorus (P)-Total			<0.0010		mg/L		0.001	12-SEP-18
WG2874214-8 MS		**L2153439-2**						
Phosphorus (P)-Total			109.4		%		70-130	12-SEP-18
P-TD-L-COL-WP	**Water**							
Batch R4214816								
WG2874203-6 LCS								
Phosphorus (P)-Total	Dissolved		101.3		%		80-120	12-SEP-18
WG2874203-5 MB								
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	12-SEP-18
PH-WP	**Water**							
Batch R4190248								
WG2862592-2 LCS								
pH			7.40		pH units		7.3-7.5	28-AUG-18
PO4-DO-L-COL-WP	**Water**							
Batch R4188130								
WG2861898-6 LCS								
Orthophosphate-Dissolved (as P)			99.6		%		80-120	27-AUG-18
WG2861898-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	27-AUG-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SIO2-L-COL-WP	**Water**							
Batch R4195637								
WG2865613-3 DUP		**L2153439-1**						
Silica, Reactive (as SiO2)		0.234	0.234		mg/L	0.2	20	31-AUG-18
WG2865613-2 LCS								
Silica, Reactive (as SiO2)			102.1		%		85-115	31-AUG-18
WG2865613-1 MB								
Silica, Reactive (as SiO2)			<0.010		mg/L		0.01	31-AUG-18
WG2865613-4 MS		**L2153439-1**						
Silica, Reactive (as SiO2)			N/A	MS-B	%		-	31-AUG-18
SO4-IC-N-WP	**Water**							
Batch R4203645								
WG2861445-2 LCS								
Sulfate (SO4)			99.4		%		90-110	28-AUG-18
WG2861445-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	28-AUG-18
TDS-WP	**Water**							
Batch R4188028								
WG2860866-2 LCS								
Total Dissolved Solids			99.3		%		85-115	27-AUG-18
WG2860866-1 MB								
Total Dissolved Solids			<4.0		mg/L		4	27-AUG-18
Batch R4214384								
WG2872151-3 DUP		**L2153439-2**						
Total Dissolved Solids		48	45		mg/L	5.0	20	10-SEP-18
WG2872151-2 LCS								
Total Dissolved Solids			100.4		%		85-115	10-SEP-18
WG2872151-1 MB								
Total Dissolved Solids			<4.0		mg/L		4	10-SEP-18
TKN-L-CFA-ED	**Water**							
Batch R4216576								
WG2876119-3 DUP		**L2153439-1**						
Total Kjeldahl Nitrogen		0.276	0.302		mg/L	9.1	20	14-SEP-18
WG2876119-2 LCS								
Total Kjeldahl Nitrogen			105		%		75-125	14-SEP-18
WG2876119-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	14-SEP-18
TSS-LOW-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-LOW-VA	**Water**							
Batch R4190906								
WG2862134-2 LCS								
Total Suspended Solids			101.6		%		85-115	28-AUG-18
WG2862134-1 MB								
Total Suspended Solids			<1.0		mg/L		1	28-AUG-18
TURBIDITY-WP	**Water**							
Batch R4187547								
WG2861799-2 LCS								
Turbidity			100.0		%		85-115	27-AUG-18
WG2861799-1 MB								
Turbidity			<0.10		NTU		0.1	27-AUG-18

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Total Dissolved Solids (TDS)							
	2	20-AUG-18 08:45	10-SEP-18 10:00	7	21	days	EHTR
Total Suspended Solids by Grav. (1 mg/L)							
	1	20-AUG-18 10:00	28-AUG-18 14:33	7	8	days	EHTL
	2	20-AUG-18 08:45	28-AUG-18 14:33	7	8	days	EHTR
Turbidity							
	1	20-AUG-18 10:00	27-AUG-18 15:30	3	7	days	EHTR
	2	20-AUG-18 08:45	27-AUG-18 15:30	3	7	days	EHTR
pH							
	1	20-AUG-18 10:00	28-AUG-18 12:00	0.25	194	hours	EHTR-FM
	2	20-AUG-18 08:45	28-AUG-18 12:00	0.25	195	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	20-AUG-18 10:00	28-AUG-18 10:45	3	8	days	EHTR
	2	20-AUG-18 08:45	28-AUG-18 10:45	3	8	days	EHTR
Nitrite in Water by IC (Low Level)							
	1	20-AUG-18 10:00	28-AUG-18 10:45	3	8	days	EHTR
	2	20-AUG-18 08:45	28-AUG-18 10:45	3	8	days	EHTR
Phosphate Ortho Dissolved in Water							
	1	20-AUG-18 10:00	27-AUG-18 15:30	3	7	days	EHTR
	2	20-AUG-18 08:45	27-AUG-18 15:30	3	7	days	EHTR
Cyanides							
Free Cyanide in water by CFA							
	1	20-AUG-18 10:00	04-SEP-18 12:00	14	15	days	EHT
	2	20-AUG-18 08:45	04-SEP-18 12:00	14	15	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2153439 were received on 27-AUG-18 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Sunday, September 30, 2018

Judy Dalmaijer
ALS Environmental
1329 Niakwa Road East, Unit 12
Winnipeg, MB R2J 3T4

Re: ALS Workorder: 1808541
Project Name:
Project Number: L2153439

Dear Ms. Dalmaijer:

Two water samples were received from ALS Environmental, on 8/28/2018. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1808541

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1808541
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L2153439
Client PO Number: L2153439

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2153439-1	1808541-1		WATER	20-Aug-18	
L2153439-2	1808541-2		WATER	20-Aug-18	

180841

ALS Environmental

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L2153439*
ALS requires QC data to be provided with your final results.

Please see enclosed 2 sample(s) in 2 Container(s)

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L2153439-1 R-18-08-01		8/ 20/ 2018	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/17/2018	
L2153439-2 MEL-03-01		8/ 20/ 2018	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	9/17/2018	

1
2

Subcontract Info Contact: Judy Dalmaijer (204) 255-9749
Analysis and reporting info contact: Judy Dalmaijer
12-1329 NIAKWA ROAD E
WINNIPEG,MB R2J3T4
Phone: (204) 255-9749 Email: Judy.Dalmaijer@alsglobal.com

Please email confirmation of receipt to: **Judy.Dalmaijer@alsglobal.com**

Shipped By: DJL Date Shipped: 08/24/18
Received By: KELI-JEAN SMITH Date Received: 8.28.18 0940
Verified By: Date Verified:
Temperature: 16°

Sample Integrity Issues:

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS WINNIPEG Workorder No: 1808541

Project Manager: KMO Initials: KA Date: 8.28.18

1.	Are airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
2.	Are custody seals on **shipping** containers intact?	NONE	YES	NO
3.	Are custody seals on **sample** containers intact?	NONE	YES	NO
4.	Is there a COC (chain-of-custody) present?		YES	NO
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		YES	NO
6.	Are short-hold samples present?		YES	NO
7.	Are all samples within holding times for the requested analyses?		YES	NO
8.	Were all sample containers received intact? (not broken or leaking)		YES	NO
9.	Is there sufficient sample for the requested analyses?		YES	NO
10.	Are all samples in the proper containers for the requested analyses?		YES	NO
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	YES	NO
12.	Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
13.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	N/A	YES	NO
14.	Were the samples shipped on ice?		YES	NO
15.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	RAD ONLY	YES	NO

Cooler #:	1							
Temperature (°C):	9.1							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	10							
Background µR/hr reading:	10							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO / NA** (If no, see Form 008.)

Additional Information: Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:

14; 15) ice blocks included but warm upon arrival.

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 8/29/18

Form 201r26.xls
(06/29/2018)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

160541

Purolator **Purolator Express U.S.**

FROM / DE
ALS Laboratory Group
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1329 Niakwa RD E
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Canada
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LOGIN
ALS ENVIRO
225 COMMERCE DRIVE
FORT COLLINS, CO, 80524
United States

PUROLATOR PIN: 6920119124

NON DOCS
DESC: water samples
VALUE: $ 4.00 CAD
IMP/EXP TYPE: PERMANENT
COUNTRY OF MFG: Canada

DATE: 27 AUG 2018
PIECES: 1 of/de 1 **WEIGHT/POIDS: 5 LB**

DUTIES/TAX
DDU: [ ]
DDP: [X]

DESTINATION
FNL

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EXPRESS 1Z 662 F45 66 6682 9078

Fold the Bill of Lading on the dotted line and insert into the adhesive pocket. Veuillez plier ce connaissement sur la ligne pointillée et l'insérer dans la pochette adhésive. Veuillez joindre ... packages. ...sement à chaque colis.

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CANADA

20 LBS 1 OF 1
SHP#: 662F 45MP BYX
SHP WT: 20 LBS
DATE: 27 AUG 2018

SHIP LOGIN
TO ALS ENVIRO
0
225 COMMERCE DRIVE
FORT COLLINS CO 80524
UNITED STATES

10-0

CO 805 0-01

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1

...g the shipment ...
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...s subject to the ... Purolator Inc.'s ...risdiction where ...gives an ultimate ...n) may apply and ...s the Convention ...land, 12 October, ...gned at Montreal, ...le to the carriage

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...incorporated herein by ...his bill of lading, and no ...or otherwise modify any ...nsignor agrees to these ...aiming an interest in this

Client:	ALS Environmental	**Date:**	*30-Sep-18*
Project:	L2153439	**Work Order:**	1808541
Sample ID:	L2153439-1	**Lab ID:**	1808541-1
Legal Location:		**Matrix:**	WATER
Collection Date:	8/20/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **9/20/2018**		PrepBy: **CXW**
Ra-226	0.0013 (+/- 0.0032)	U	0.0057	BQ/l	NA	9/30/2018 12:37
Carr: BARIUM	*85.1*		*40-110*	*%REC*	DL = NA	9/30/2018 12:37

Client:	ALS Environmental	**Date:**	*30-Sep-18*
Project:	L2153439	**Work Order:**	1808541
Sample ID:	L2153439-2	**Lab ID:**	1808541-2
Legal Location:		**Matrix:**	WATER
Collection Date:	8/20/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **9/20/2018**		PrepBy: **CXW**
Ra-226	0.0069 (+/- 0.0055)	U	0.0074	BQ/l	NA	9/30/2018 12:37
Carr: BARIUM	*88.1*		*40-110*	*%REC*	DL = NA	9/30/2018 12:37

Client:	ALS Environmental	**Date:**	*30-Sep-18*
Project:	L2153439	**Work Order:**	1808541
Sample ID:	L2153439-2	**Lab ID:**	1808541-2
Legal Location:		**Matrix:**	WATER
Collection Date:	8/20/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

QC BATCH REPORT

Batch ID: **RE180920-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE180920-1** Units: **BQ/l** Analysis Date: **9/30/2018 13:56**

Client ID: Run ID: **RE180920-1A** Prep Date: **9/20/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.94 (+/- 0.484)	0.0224	1.771		110	67-120					P,M3
Carr: BARIUM	16100		17490		92.3	40-110					

MB Sample ID: **RE180920-1** Units: **BQ/l** Analysis Date: **9/30/2018 13:56**

Client ID: Run ID: **RE180920-1A** Prep Date: **9/20/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.00094 (+/- 0.0042)	0.0078									U
Carr: BARIUM	17100		17490		97.7	40-110					

The following samples were analyzed in this batch: 1808541-1 1808541-2

L2153439

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2153439-COFC

COC Number: Meliadine-WQ-07

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	AGNICO EAGLE
Contact:	JENNIFER BROWN
Phone:	1-819-759-3555 x3996
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	
Contact:	

Report Format / Dis

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax jeffrey.pratt@agnicoeagle.com

Email 2 zcraciunescu@golder.com,kelly_hille@golder.com

Email 3 colleen_prather@golder.com, erichard@golder.cor

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☑ FAX

Email 1 or Fax

Email 2

E&P TATs with your AM - surcharges will apply

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ 3 day [P3] ☐ 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ Same Day, Weekend or Statutory holiday [E0]. ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #: Q57496

Job #: MEL

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only)

ALS Contact: Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-TOC-HTC-WP, P-T-L-COL-WP	C-DOC-HTC-WP, P-TD-L-COL-WP	CYANDE - FREE, TOTAL AND WAD	HG-T-L-CVAF-WP, HG-D-L-CVAF-WP	MET-D-NP-U-CCMS-ED	MET-T-NP-U-CCMS-ED	AEG-ROU-LOW-WP	SIO2-L-COL-WP	PO4-DO-L-COL-WP	TKN-L-CFA-ED	NH3-L-CFA-ED	TSS-LOW-VA	RA226-MMER-FC	Number of Containers
	R-18-08-01	20-Aug-18	10:00	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11
	Mel-03-01	20-Aug-18	08:45	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	11

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human drinking water use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
17.6					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Mike Hildebrand	Date: 21 Aug 18	Time: 06:00	Received by: [signature]	Date: 08/07/18	Time: 9:00	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Agnico-Eagle - Meliadine Gold Project
ATTN: JENNIFER BROWN
PO Box 99
Rankin Inlet NU X0C 0G0

Date Received: 21-SEP-18
Report Date: 18-OCT-18 14:47 (MT)
Version: FINAL

Client Phone: 819-759-3555

Certificate of Analysis

Lab Work Order #: L2168402

Project P.O. #: NOT SUBMITTED
Job Reference: MEL
C of C Numbers:
Legal Site Desc:

Hua Wo
Chemistry Laboratory Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2168402-1				
	Description	WATER				
	Sampled Date	15-SEP-18				
	Sampled Time	11:30				
	Client ID	MEL-03-01				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (umhos/cm)	74.5				
	Hardness (as CaCO3)	38.7				
	pH (pH units)	7.40				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	54				
	Turbidity (NTU)	0.23				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	17.9				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bicarbonate (HCO3) (mg/L)	21.8				
	Carbonate (CO3) (mg/L)	<0.60				
	Chloride (Cl) (mg/L)	8.66				
	Fluoride (F) (mg/L)	0.026				
	Hydroxide (OH) (mg/L)	<0.34				
	Ion Balance (%)	Low EC				
	Nitrate and Nitrite as N (mg/L)	0.0073				
	Nitrate (as N) (mg/L)	0.0073				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.155				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total Dissolved (mg/L)	0.0028				
	Phosphorus (P)-Total (mg/L)	0.0044				
	Silica, Reactive (as SiO2) (mg/L)	0.215				
	TDS (Calculated) (mg/L)	37.1				
	Sulfate (SO4) (mg/L)	3.84				
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0010				
	Cyanide, Total (mg/L)	<0.0010				
	Cyanide, Free (mg/L)	<0.0010				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.66				
	Total Organic Carbon (mg/L)	2.33				
Total Metals	Mercury (Hg)-Total (ng/L)	<0.50				
Total Metals (Undigested)	Aluminum (Al)-Total (mg/L)	0.00291				
	Antimony (Sb)-Total (mg/L)	<0.000020				
	Arsenic (As)-Total (mg/L)	0.000186				
	Barium (Ba)-Total (mg/L)	0.00748				
	Beryllium (Be)-Total (mg/L)	<0.000010				
	Bismuth (Bi)-Total (mg/L)	<0.000010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2168402-1				
	Description	WATER				
	Sampled Date	15-SEP-18				
	Sampled Time	11:30				
	Client ID	MEL-03-01				
Grouping	**Analyte**					
WATER						
Total Metals (Undigested)	Boron (B)-Total (mg/L)	0.0028				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	6.86				
	Chromium (Cr)-Total (mg/L)	<0.000060				
	Cobalt (Co)-Total (mg/L)	0.000024				
	Copper (Cu)-Total (mg/L)	0.00088				
	Iron (Fe)-Total (mg/L)	0.0071				
	Lead (Pb)-Total (mg/L)	<0.000010				
	Lithium (Li)-Total (mg/L)	<0.00050				
	Magnesium (Mg)-Total (mg/L)	1.40				
	Manganese (Mn)-Total (mg/L)	0.00335				
	Molybdenum (Mo)-Total (mg/L)	0.000067				
	Nickel (Ni)-Total (mg/L)	0.000535				
	Potassium (K)-Total (mg/L)	0.942				
	Selenium (Se)-Total (mg/L)	<0.000040				
	Silver (Ag)-Total (mg/L)	<0.0000050				
	Sodium (Na)-Total (mg/L)	4.58				
	Strontium (Sr)-Total (mg/L)	0.0334				
	Thallium (Tl)-Total (mg/L)	<0.0000050				
	Tin (Sn)-Total (mg/L)	<0.000050				
	Titanium (Ti)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	0.000048				
	Vanadium (V)-Total (mg/L)	<0.000050				
	Zinc (Zn)-Total (mg/L)	<0.00080				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.00165				
	Antimony (Sb)-Dissolved (mg/L)	<0.000020				
	Arsenic (As)-Dissolved (mg/L)	0.000238				
	Barium (Ba)-Dissolved (mg/L)	0.0105				
	Beryllium (Be)-Dissolved (mg/L)	<0.000010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000010				
	Boron (B)-Dissolved (mg/L)	0.0095				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	11.9				
	Chromium (Cr)-Dissolved (mg/L)	<0.000060				
	Cobalt (Co)-Dissolved (mg/L)	0.000076				
	Copper (Cu)-Dissolved (mg/L)	0.00082				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2168402-1				
	Description	WATER				
	Sampled Date	15-SEP-18				
	Sampled Time	11:30				
	Client ID	MEL-03-01				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Iron (Fe)-Dissolved (mg/L)	0.0074				
	Lead (Pb)-Dissolved (mg/L)	0.000012				
	Lithium (Li)-Dissolved (mg/L)	0.00440				
	Magnesium (Mg)-Dissolved (mg/L)	2.15				
	Manganese (Mn)-Dissolved (mg/L)	0.0155				
	Mercury (Hg)-Dissolved (ng/L)	0.80				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000181				
	Nickel (Ni)-Dissolved (mg/L)	0.000669				
	Potassium (K)-Dissolved (mg/L)	1.32				
	Selenium (Se)-Dissolved (mg/L)	0.000042				
	Silver (Ag)-Dissolved (mg/L)	<0.0000050				
	Sodium (Na)-Dissolved (mg/L)	8.54				
	Strontium (Sr)-Dissolved (mg/L)	0.122				
	Thallium (Tl)-Dissolved (mg/L)	<0.0000050				
	Tin (Sn)-Dissolved (mg/L)	0.000334				
	Titanium (Ti)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000113				
	Vanadium (V)-Dissolved (mg/L)	0.000087				
	Zinc (Zn)-Dissolved (mg/L)	0.00291				
Radiological Parameters	Ra-226 (Bq/L)	<0.0097				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2168402-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L2168402-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2168402-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L2168402-1
Matrix Spike	Silica, Reactive (as SiO2)	MS-B	L2168402-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-CO3CO3-CALC-WP	Water	Alkalinity, Carbonate	CALCULATION

The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by carbonate is calculated and reported as mg CO3 2-/L.

ALK-HCO3HCO3-CALC-WP	Water	Alkalinity, Bicarbonate	CALCULATION

The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by bicarbonate is calculated and reported as mg HCO3-/L

ALK-OHOH-CALC-WP	Water	Alkalinity, Hydroxide	CALCULATION

The Alkalinity of water is a measure of its acid neutralizing capacity.Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. The fraction of alkalinity contributed by hydroxide is calculated and reported as mg OH-/L.

ALK-TITR-WP	Water	Alkalinity, Total (as CaCO3)	APHA 2320B

The Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. Total alkalinity is determined by titration with a strong standard mineral acid to the successive HCO3- and H2CO3 endpoints indicated electrometrically.

C-DOC-HTC-WP	Water	Dissolved Organic Carbon by Combustion	APHA 5310 B-WP

Filtered (0.45 um) sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

C-TOC-HTC-WP	Water	Total Organic Carbon by Combustion	APHA 5310 B-WP

Sample is acidified and purged to remove inorganic carbon, then injected into a heated reaction chamber where organic carbon is oxidized to CO2 which is then transported in the carrier gas stream and measured via a non-dispersive infrared analyzer.

CL-L-IC-N-WP	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-FREE-CFA-WP	Water	Free Cyanide in water by CFA	ASTM D7237

This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.

CN-T-CFA-WP	Water	Total Cyanide in water by CFA	ISO 14403-2

This analysis is carried out using procedures adapted from ISO Method 14403-2:2012 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourmetric analysis.

CN-WAD-CFA-WP	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN I

This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak acid dissociable (WAD) cyanide is determined by in-line sample distillation and final determination by colourmetric analysis.

EC-WP	Water	Conductivity	APHA 2510B

Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.

F-IC-N-WP	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-WP	Water	Hardness Calculated	APHA 2340B

Reference Information

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-L-CVAF-WP Water Mercury, Dissolved EPA 1631 D (modified)

Mercury in filtered aqueous matrices is oxidized with bromine monochloride and analyzed by cold-vapor atomic fluorescence spectrometer.

HG-T-L-CVAF-WP Water Mercury, Total EPA 1631 T (modified)

Mercury in unfiltered aqueous matrices is oxidized with bromine monochloride and analyzed by cold-vapor atomic fluorescence spectrometer.

IONBALANCE-CALC-WP Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance (as % difference) cannot be calculated accurately for waters with very low electrical conductivity (EC), and is reported as "Low EC" where EC < 100 uS/cm (umhos/cm). Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-NP-U-CCMS-ED Water Diss. Metals in Water by CRC ICPMS (Ult) APHA 3125-ICP-MS

Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). This procedure is intended for pristine field-filtered acid-preserved water samples. ALS recommends that filtration blanks be submitted for this test to aid with interpretation of results.

MET-T-NP-U-CCMS-ED Water Metals in Water by CRC ICPMS (No Digest) APHA 3125-ICP-MS

Ultra trace metals in water are analyzed by ICPMS, based on US EPA Method 6020A (Jan 1998). The detection limits provided can only be met for undigested samples. This procedure is intended for pristine, non-turbid, acid-preserved water samples, where sample turbidity is < 1 NTU. Where turbidity exceeds 1 NTU, results may be biased low compared to true Total Metals concentrations. ALS recommends that turbidity analysis be requested on samples submitted for this test to aid with interpretation of results.

NH3-L-CFA-ED Water Ammonia in Water by Colour APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.

NO2+NO3-CALC-L-WP Water Nitrate+Nitrite CALCULATION

NO2-L-IC-N-WP Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-WP Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-L-COL-WP Water Phosphorus, Total APHA 4500 P PHOSPHORUS-L

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.

P-TD-L-COL-WP Water Phosphorus, Total Dissolved APHA 4500 P PHOSPHORUS-L

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

PH-WP Water pH APHA 4500H

The pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.

PO4-DO-L-COL-WP Water Phosphate Ortho Dissolved in Water APHA 4500 P PHOSPHORUS-L

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SIO2-L-COL-WP Water Reactive Silica by colour APHA 4500 SIO2

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 "Silica". Molybdate Reactive Silica is determined by analysis of the sample using the heteropoly blue colourimetric method.

SO4-IC-N-WP Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-WP Water Total Dissolved Solids (TDS) APHA 2540 SOLIDS C,E

Reference Information

A well-mixed sample is filtered through a glass fiber filter paper. The filtrate is then evaportaed to dryness in a pre-weighed vial and dried at 180 – 2C. The increase in vial weight represents the total dissolved solids.

TKN-L-CFA-ED Water TKN in Water by Colour APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-WP Water Turbidity APHA 2130B (modified)

Turbidity in aqueous matrices is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Agnico-Eagle - Meliadine Gold Project
PO Box 99
Rankin Inlet NU X0C 0G0
Contact: JENNIFER BROWN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-TITR-WP	**Water**							
Batch R4234949								
WG2884637-14 LCS								
Alkalinity, Total (as CaCO3)			102.0		%		85-115	21-SEP-18
WG2884637-11 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	21-SEP-18
C-DOC-HTC-WP	**Water**							
Batch R4257706								
WG2893051-2 LCS								
Dissolved Organic Carbon			92.5		%		80-120	01-OCT-18
WG2893051-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	01-OCT-18
C-TOC-HTC-WP	**Water**							
Batch R4257715								
WG2893131-2 LCS								
Total Organic Carbon			94.4		%		80-120	01-OCT-18
WG2893131-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	01-OCT-18
CL-L-IC-N-WP	**Water**							
Batch R4242273								
WG2883596-6 LCS								
Chloride (Cl)			102.5		%		90-110	21-SEP-18
WG2883596-5 MB								
Chloride (Cl)			<0.10		mg/L		0.1	21-SEP-18
CN-FREE-CFA-WP	**Water**							
Batch R4241968								
WG2887010-13 DUP		**L2168402-1**						
Cyanide, Free		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-SEP-18
WG2887010-12 LCS								
Cyanide, Free			102.5		%		80-120	25-SEP-18
WG2887010-11 MB								
Cyanide, Free			<0.0010		mg/L		0.001	25-SEP-18
WG2887010-14 MS		**L2168402-1**						
Cyanide, Free			99.97		%		75-125	25-SEP-18
CN-T-CFA-WP	**Water**							
Batch R4241968								
WG2887010-13 DUP		**L2168402-1**						
Cyanide, Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-SEP-18
WG2887010-12 LCS								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-T-CFA-WP	**Water**							
Batch R4241968								
WG2887010-12 LCS								
Cyanide, Total			87.9		%		80-120	25-SEP-18
WG2887010-11 MB								
Cyanide, Total			<0.0010		mg/L		0.001	25-SEP-18
WG2887010-14 MS		**L2168402-1**						
Cyanide, Total			90.6		%		75-125	25-SEP-18
CN-WAD-CFA-WP	**Water**							
Batch R4241968								
WG2887010-13 DUP		**L2168402-1**						
Cyanide, Weak Acid Diss		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-SEP-18
WG2887010-12 LCS								
Cyanide, Weak Acid Diss			106.0		%		80-120	25-SEP-18
WG2887010-11 MB								
Cyanide, Weak Acid Diss			<0.0010		mg/L		0.001	25-SEP-18
WG2887010-14 MS		**L2168402-1**						
Cyanide, Weak Acid Diss			103.6		%		75-125	25-SEP-18
EC-WP	**Water**							
Batch R4234949								
WG2884637-13 LCS								
Conductivity			100.9		%		90-110	21-SEP-18
WG2884637-11 MB								
Conductivity			<1.0		umhos/cm		1	21-SEP-18
F-IC-N-WP	**Water**							
Batch R4242273								
WG2883596-6 LCS								
Fluoride (F)			107.2		%		90-110	21-SEP-18
WG2883596-5 MB								
Fluoride (F)			<0.020		mg/L		0.02	21-SEP-18
HG-D-L-CVAF-WP	**Water**							
Batch R4250268								
WG2889627-2 LCS								
Mercury (Hg)-Dissolved			95.6		%		80-120	27-SEP-18
WG2889627-1 MB								
Mercury (Hg)-Dissolved			<0.50		ng/L		0.5	27-SEP-18
HG-T-L-CVAF-WP	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-L-CVAF-WP	**Water**							
Batch R4258332								
WG2893941-2 LCS								
Mercury (Hg)-Total			103.6		%		80-120	02-OCT-18
WG2893941-1 MB								
Mercury (Hg)-Total			<0.50		ng/L		0.5	02-OCT-18
MET-D-NP-U-CCMS-ED	**Water**							
Batch R4244190								
WG2884857-9 MB								
Aluminum (Al)-Dissolved			<0.00030		mg/L		0.0003	25-SEP-18
Antimony (Sb)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Arsenic (As)-Dissolved			<0.000020		mg/L		0.00002	25-SEP-18
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Beryllium (Be)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Bismuth (Bi)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Boron (B)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	25-SEP-18
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Chromium (Cr)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Cobalt (Co)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Iron (Fe)-Dissolved			<0.0010		mg/L		0.001	25-SEP-18
Lead (Pb)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18
Lithium (Li)-Dissolved			<0.00050		mg/L		0.0005	25-SEP-18
Magnesium (Mg)-Dissolved			<0.0040		mg/L		0.004	25-SEP-18
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Dissolved			<0.000060		mg/L		0.00006	25-SEP-18
Potassium (K)-Dissolved			<0.020		mg/L		0.02	25-SEP-18
Selenium (Se)-Dissolved			<0.000040		mg/L		0.00004	25-SEP-18
Silver (Ag)-Dissolved			<0.000005C		mg/L		0.000005	25-SEP-18
Sodium (Na)-Dissolved			<0.0050		mg/L		0.005	25-SEP-18
Strontium (Sr)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Thallium (Tl)-Dissolved			<0.000005C		mg/L		0.000005	25-SEP-18
Tin (Sn)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Titanium (Ti)-Dissolved			<0.00010		mg/L		0.0001	25-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	25-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-NP-U-CCMS-ED	**Water**							
Batch	**R4244190**							
WG2884857-9	**MB**							
Vanadium (V)-Dissolved			<0.000050		mg/L		0.00005	25-SEP-18
Zinc (Zn)-Dissolved			<0.00080		mg/L		0.0008	25-SEP-18
Batch	**R4251701**							
WG2884857-10	**LCS**							
Aluminum (Al)-Dissolved			103.4		%		80-120	28-SEP-18
Antimony (Sb)-Dissolved			95.7		%		80-120	28-SEP-18
Arsenic (As)-Dissolved			97.0		%		80-120	28-SEP-18
Barium (Ba)-Dissolved			98.9		%		80-120	28-SEP-18
Beryllium (Be)-Dissolved			96.8		%		80-120	28-SEP-18
Bismuth (Bi)-Dissolved			102.2		%		80-120	28-SEP-18
Boron (B)-Dissolved			98.6		%		80-120	28-SEP-18
Cadmium (Cd)-Dissolved			97.5		%		80-120	28-SEP-18
Calcium (Ca)-Dissolved			99.7		%		80-120	28-SEP-18
Chromium (Cr)-Dissolved			98.1		%		80-120	28-SEP-18
Cobalt (Co)-Dissolved			97.0		%		80-120	28-SEP-18
Copper (Cu)-Dissolved			95.3		%		80-120	28-SEP-18
Iron (Fe)-Dissolved			97.6		%		80-120	28-SEP-18
Lead (Pb)-Dissolved			99.0		%		80-120	28-SEP-18
Lithium (Li)-Dissolved			93.1		%		80-120	28-SEP-18
Magnesium (Mg)-Dissolved			95.1		%		80-120	28-SEP-18
Manganese (Mn)-Dissolved			95.7		%		80-120	28-SEP-18
Molybdenum (Mo)-Dissolved			94.3		%		80-120	28-SEP-18
Nickel (Ni)-Dissolved			95.2		%		80-120	28-SEP-18
Potassium (K)-Dissolved			99.2		%		80-120	28-SEP-18
Selenium (Se)-Dissolved			96.3		%		80-120	28-SEP-18
Silver (Ag)-Dissolved			99.3		%		80-120	28-SEP-18
Sodium (Na)-Dissolved			103.4		%		80-120	28-SEP-18
Strontium (Sr)-Dissolved			95.5		%		80-120	28-SEP-18
Thallium (Tl)-Dissolved			98.3		%		80-120	28-SEP-18
Tin (Sn)-Dissolved			97.3		%		80-120	28-SEP-18
Titanium (Ti)-Dissolved			94.8		%		80-120	28-SEP-18
Uranium (U)-Dissolved			98.6		%		80-120	28-SEP-18
Vanadium (V)-Dissolved			96.6		%		80-120	28-SEP-18
Zinc (Zn)-Dissolved			94.7		%		80-120	28-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4239307								
WG2884841-18 LCS								
Aluminum (Al)-Total			98.1		%		80-120	24-SEP-18
Antimony (Sb)-Total			95.3		%		80-120	24-SEP-18
Arsenic (As)-Total			96.7		%		80-120	24-SEP-18
Barium (Ba)-Total			98.1		%		80-120	24-SEP-18
Beryllium (Be)-Total			91.6		%		80-120	24-SEP-18
Bismuth (Bi)-Total			89.9		%		80-120	24-SEP-18
Boron (B)-Total			92.8		%		80-120	24-SEP-18
Cadmium (Cd)-Total			95.5		%		80-120	24-SEP-18
Calcium (Ca)-Total			92.6		%		80-120	24-SEP-18
Chromium (Cr)-Total			98.0		%		80-120	24-SEP-18
Cobalt (Co)-Total			96.9		%		80-120	24-SEP-18
Copper (Cu)-Total			95.1		%		80-120	24-SEP-18
Iron (Fe)-Total			92.5		%		80-120	24-SEP-18
Lead (Pb)-Total			92.6		%		80-120	24-SEP-18
Lithium (Li)-Total			91.6		%		80-120	24-SEP-18
Magnesium (Mg)-Total			98.7		%		80-120	24-SEP-18
Manganese (Mn)-Total			99.8		%		80-120	24-SEP-18
Molybdenum (Mo)-Total			94.1		%		80-120	24-SEP-18
Nickel (Ni)-Total			95.4		%		80-120	24-SEP-18
Potassium (K)-Total			97.7		%		80-120	24-SEP-18
Selenium (Se)-Total			96.8		%		80-120	24-SEP-18
Silver (Ag)-Total			97.0		%		80-120	24-SEP-18
Sodium (Na)-Total			93.4		%		80-120	24-SEP-18
Strontium (Sr)-Total			95.8		%		80-120	24-SEP-18
Thallium (Tl)-Total			94.3		%		80-120	24-SEP-18
Tin (Sn)-Total			94.5		%		80-120	24-SEP-18
Titanium (Ti)-Total			95.8		%		80-120	24-SEP-18
Uranium (U)-Total			91.5		%		80-120	24-SEP-18
Vanadium (V)-Total			97.7		%		80-120	24-SEP-18
Zinc (Zn)-Total			92.4		%		80-120	24-SEP-18
WG2884841-17 MB								
Antimony (Sb)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Arsenic (As)-Total			<0.000020		mg/L		0.00002	24-SEP-18
Barium (Ba)-Total			<0.000050		mg/L		0.00005	24-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-NP-U-CCMS-ED	**Water**							
Batch R4239307								
WG2884841-17 MB								
Beryllium (Be)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Bismuth (Bi)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Boron (B)-Total			<0.0010		mg/L		0.001	24-SEP-18
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Calcium (Ca)-Total			<0.020		mg/L		0.02	24-SEP-18
Cobalt (Co)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Copper (Cu)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Lead (Pb)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Lithium (Li)-Total			<0.00050		mg/L		0.0005	24-SEP-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Potassium (K)-Total			<0.020		mg/L		0.02	24-SEP-18
Selenium (Se)-Total			<0.000040		mg/L		0.00004	24-SEP-18
Silver (Ag)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Sodium (Na)-Total			<0.0050		mg/L		0.005	24-SEP-18
Strontium (Sr)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Thallium (Tl)-Total			<0.000005C		mg/L		0.000005	24-SEP-18
Tin (Sn)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Titanium (Ti)-Total			<0.00010		mg/L		0.0001	24-SEP-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	24-SEP-18
Vanadium (V)-Total			<0.000050		mg/L		0.00005	24-SEP-18
Zinc (Zn)-Total			<0.00080		mg/L		0.0008	24-SEP-18
Batch R4243667								
WG2884841-17 MB								
Aluminum (Al)-Total			<0.00030		mg/L		0.0003	25-SEP-18
Chromium (Cr)-Total			<0.000060		mg/L		0.00006	25-SEP-18
Iron (Fe)-Total			<0.0010		mg/L		0.001	25-SEP-18
Magnesium (Mg)-Total			<0.0040		mg/L		0.004	25-SEP-18
Manganese (Mn)-Total			<0.000050		mg/L		0.00005	25-SEP-18
Nickel (Ni)-Total			<0.000060		mg/L		0.00006	25-SEP-18
NH3-L-CFA-ED	**Water**							
Batch R4247048								
WG2888753-2 LCS								
Ammonia, Total (as N)			98.1		%		85-115	27-SEP-18
WG2888753-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	27-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-WP	**Water**							
Batch R4242273								
WG2883596-6 LCS								
Nitrite (as N)			102.5		%		90-110	21-SEP-18
WG2883596-5 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	21-SEP-18
NO3-L-IC-N-WP	**Water**							
Batch R4242273								
WG2883596-6 LCS								
Nitrate (as N)			102.4		%		90-110	21-SEP-18
WG2883596-5 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	21-SEP-18
P-T-L-COL-WP	**Water**							
Batch R4271118								
WG2898927-3 DUP		**L2168402-1**						
Phosphorus (P)-Total		0.0044	0.0039		mg/L	11	20	10-OCT-18
WG2898927-2 LCS								
Phosphorus (P)-Total			101.9		%		80-120	10-OCT-18
WG2898927-1 MB								
Phosphorus (P)-Total			<0.0010		mg/L		0.001	10-OCT-18
P-TD-L-COL-WP	**Water**							
Batch R4277387								
WG2901662-3 DUP		**L2168402-1**						
Phosphorus (P)-Total	Dissolved	0.0028	0.0024		mg/L	13	20	12-OCT-18
WG2901662-2 LCS								
Phosphorus (P)-Total	Dissolved		95.3		%		80-120	12-OCT-18
WG2901662-1 MB								
Phosphorus (P)-Total	Dissolved		<0.0010		mg/L		0.001	12-OCT-18
PH-WP	**Water**							
Batch R4234949								
WG2884637-12 LCS								
pH			7.43		pH units		7.3-7.5	21-SEP-18
PO4-DO-L-COL-WP	**Water**							
Batch R4236292								
WG2884908-6 LCS								
Orthophosphate-Dissolved (as P)			100.7		%		80-120	21-SEP-18
WG2884908-5 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	21-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SIO2-L-COL-WP	**Water**							
Batch R4251251								
WG2890134-2 LCS								
Silica, Reactive (as SiO2)			103.1		%		85-115	28-SEP-18
WG2890134-1 MB								
Silica, Reactive (as SiO2)			<0.010		mg/L		0.01	28-SEP-18
SO4-IC-N-WP	**Water**							
Batch R4242273								
WG2883596-6 LCS								
Sulfate (SO4)			100.1		%		90-110	21-SEP-18
WG2883596-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	21-SEP-18
TDS-WP	**Water**							
Batch R4239552								
WG2883912-10 LCS								
Total Dissolved Solids			105.1		%		85-115	22-SEP-18
WG2883912-9 MB								
Total Dissolved Solids			<4.0		mg/L		4	22-SEP-18
TKN-L-CFA-ED	**Water**							
Batch R4281869								
WG2904296-18 LCS								
Total Kjeldahl Nitrogen			104		%		75-125	17-OCT-18
WG2904296-17 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	17-OCT-18
TSS-LOW-VA	**Water**							
Batch R4235274								
WG2884147-6 LCS								
Total Suspended Solids			99.1		%		85-115	22-SEP-18
WG2884147-5 MB								
Total Suspended Solids			<1.0		mg/L		1	22-SEP-18
TURBIDITY-WP	**Water**							
Batch R4235929								
WG2884948-2 LCS								
Turbidity			98.0		%		85-115	21-SEP-18
WG2884948-1 MB								
Turbidity			<0.10		NTU		0.1	21-SEP-18

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Turbidity							
	1	15-SEP-18 11:30	21-SEP-18 12:00	3	6	days	EHTR
pH							
	1	15-SEP-18 11:30	21-SEP-18 12:00	0.25	144	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	15-SEP-18 11:30	21-SEP-18 16:00	3	6	days	EHTR
Nitrite in Water by IC (Low Level)							
	1	15-SEP-18 11:30	21-SEP-18 16:00	3	6	days	EHTR
Phosphate Ortho Dissolved in Water							
	1	15-SEP-18 11:30	21-SEP-18 15:00	3	6	days	EHTR
TKN in Water by Colour							
	1	15-SEP-18 11:30	17-OCT-18 00:00	28	32	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2168402 were received on 21-SEP-18 09:20.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Wednesday, October 17, 2018

Judy Dalmaijer
ALS Environmental
1329 Niakwa Road East, Unit 12
Winnipeg, MB R2J 3T4

Re: ALS Workorder: 1809488
Project Name:
Project Number: L2168402

Dear Ms. Dalmaijer:

One water sample was received from ALS Environmental, on 9/24/2018. The sample was scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1809488

Radium-226:
The sample was prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1809488
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L2168402
Client PO Number: L2168402

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2168402-1	1809488-1		WATER	15-Sep-18	

ALS Environmental

L2168402

WINNIPEG

1809488

Subcontract Request Form

Subcontract To:

WP-SHIPTO-FC-FRI

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO,
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# L2168402
ALS requires QC data to be provided with your final results.

6

Please see enclosed 1 **sample(s) in** 1 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L2168402-1 MEL-03-01		9/ 15/ 2018	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	10/12/2018	

Subcontract Info Contact: Judy Dalmaijer (204) 255-9749

Analysis and reporting info contact: Judy Dalmaijer
12-1329 NIAKWA ROAD E
WINNIPEG,MB R2J3T4
Phone: (204) 255-9749 Email: Judy.Dalmaijer@alsglobal.com

Please email confirmation of receipt to: **Judy.Dalmaijer@alsglobal.com**

Shipped By: _____ Date Shipped: 21/9

Received By: _____ Date Received: 9/24/18 9:15

Verified By: _____ Date Verified: _____

Temperature: _____

Sample Integrity Issues: _____

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Winipeg Workorder No: 1809488

Project Manager: KMO Initials: SE Date: 9/24/18

1.	Are airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
2.	Are custody seals on **shipping** containers intact?	NONE	YES	NO
3.	Are custody seals on **sample** containers intact?	NONE	YES	NO
4.	Is there a COC (chain-of-custody) present?		YES	NO
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		YES	NO
6.	Are short-hold samples present?		YES	NO
7.	Are all samples within holding times for the requested analyses?		YES	NO
8.	Were all sample containers received intact? (not broken or leaking)		YES	NO
9.	Is there sufficient sample for the requested analyses?		YES	NO
10.	Are all samples in the proper containers for the requested analyses?		YES	NO
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	YES	NO
12.	Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
13.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	N/A	YES	NO
14.	Were the samples shipped on ice?		YES	NO
15.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	RAD ONLY	YES	NO

Cooler #:	1							
Temperature (°C):	15.6							
No. of custody seals on cooler:	0							
DOT Survey/ Acceptance Information — External µR/hr reading:	12							
Background µR/hr reading:	11							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO / NA** (If no, see Form 008.)

Additional Information: **Please provide details here for any NO responses to gray-shaded boxes above, or any other issues noted:**

Sample pH was ~7. 1ml conc HNO_3 added
Final pH <2

If applicable, was the client contacted? **YES / NO / NA** Contact: _____ Date/Time: _____

Project Manager Signature / Date: 9/25/18

Form 201r26.xls
(06/29/2018)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

1809488
1809489
1809490
1809491

12-0

15.6

Purolator **Purolator Express U.S.**

FROM / DE
ALS Laboratory Group
Shipping/Recieving
1329 Niakwa RD E
SUITE 12
WINNIPEG, MB
R2J 3T4
Canada
204-255-9764

TO / A
LOGIN
ALS ENVIRO
225 COMMERCE DRIVE
FORT COLLINS, CO, 80524
United States

PUROLATOR PIN: 6920353285

NON DOCS
DESC: water samples
VALUE: $ 10.00 CAD
IMP/EXP TYPE: PERMANENT
COUNTRY OF MFG: Canada

DATE: 21 SEP 2018
PIECES: 1 of/de 1 **WEIGHT/POIDS: 50 LB**

DUTIES/TAX
DDU: [ ]
DDP: [X]

DESTINATION
FNL

EXP

ESO - PDF

Purolator's published terms and conditions apply. Warsaw Convention, 1929, as amended or supplemented (including liability limits therein), may also apply if shipment crosses international border(s). Les modalités et conditions publiées par Purolator s'appliquent. La Convention de Varsovie de 1929, dans sa version modifiée ou étoffée (y compris les limites de responsabilité qui y sont prévues), peut également s'appliquer si l'envoi franchit une ou plusieurs frontières.

Fold the Bill of Lading on the dotted line and insert into the adhesive pouch. Attach a Bill of Lading to each package.
Veuillez plier ce connaissement sur la ligne pointillée et l'insérer dans la pochette adhésive. Veuillez joindre un connaissement à chaque colis.

No Declared Value Entered By Sender / Aucune valeur déclarée entrée par

CONDITIONS OF CARRIAGE

IMPORTANT - PLEASE READ: The consignor agrees that the act of tendering the shipment to the carrier for transportation shall be sufficient to constitute signature of this bill of lading by the consignor and shall bind the consignor to the conditions of carriage stated below.

RECEIPT Carrier acknowledges receiving from the shipper, at the point of origin and on the date specified, the shipment described in this bill of lading in apparent good order, except as noted (contents and conditions of contents of shipment unknown), and agrees to carry and deliver the shipment to the receiver at the destination set out in this bill of lading, subject to payment of all lawful charges. "Carrier" refers to Purolator Inc. and any connecting and/or successive carriers involved in the transportation of the shipment herein described, including any of their respective subsidiaries, controlled entities, and their respective employees, agents and independent contractors.

LIMITATION ON LIABILITY Carrier's liability in respect of the shipment described in this bill of lading (including for any loss, damage, delay, misdelivery, non-delivery or failure to deliver) is limited to $2.00 per pound ($4.41 per kilogram) computed on the total weight of the shipment, unless a higher value is declared in the specially marked Purolator Online Shipping user entry field, "Declared Value for Insurance ($)". Notwithstanding any disclosure of the nature or value of the goods carried or any special agreement to the contrary, carrier is not liable under any circumstances for the consequences of delay, or for any indirect or consequential damages (including lost profits) howsoever caused.

NOTICE OF CLAIM Carrier is not liable for any loss, damage or delay to any goods carried under this bill of lading unless notice of the claim setting out particulars of the origin, destination and date of shipment of the goods and the estimated amount claimed in respect of such loss, damage or delay is given in writing to the carrier within sixty (60) days after the delivery of the goods, or, in the case of failure to make delivery, within nine (9) months from the date of shipment. Subject to any overriding statutory provisions, the final statement of the claim must be filed within nine (9) months from the date of shipment, together with a copy of the paid freight bill. If the Convention applies, other notice periods may govern. No claim will be entertained until all transportation charges due in connection with this bill of lading have been paid in full. All claims are subject to proof of amount of loss.

TERMS INCORPORATED BY REFERENCE Every service to be performed under this bill of lading is subject to the conditions of carriage contained in this bill of lading, including the terms and conditions contained in Purolator Inc.'s published terms and conditions of carriage and the terms and conditions prescribed by the law of the jurisdiction where the goods originate (including the uniform conditions of carriage thereunder, if any). If the carriage involves an ultimate destination or a stop in a country other than the country of departure, the Convention (as defined below) may apply and limit the liability of the carrier in respect of loss of, damage to or delay of cargo. "Convention" means the Convention for the Unification of Certain Rules relating to International Carriage by Air, signed at Warsaw, Poland, 12 October, 1929, or the Convention for the Unification of Certain Rules for International Carriage by Air, signed at Montreal, Canada, 28 May, 1999, or those Conventions as amended or supplemented as may be applicable to the carriage hereunder.

MISCELLANEOUS Unless otherwise indicated, the consignor's name and address is the sender's name and address indicated on this bill of lading, and the latter is the place of execution and the place of departure; the consignee's name and address is the receiver's name and address indicated on this bill of lading, and the latter is the place of destination; and the date indicated on this bill of lading is the date of execution. There are no specific stopping places which are agreed to, and the carrier reserves the right to select the route and the mode of transportation that the carrier deems appropriate. The consignor warrants that the shipment is properly described on this bill of lading and on any accompanying documentation, and that the shipment is properly marked, addressed and packed to ensure safe transportation in accordance with the carrier's ordinary care in handling. Unless otherwise indicated on this bill of lading, the consignor waives its right to determine the volume or dimensions of the shipment, and to indicate same on this bill of lading. The consignor appoints the carrier as its agent for the performance of customs clearance and selecting a customs broker.

ENTIRE AGREEMENT The terms and conditions contained in this bill of lading, including those incorporated herein by reference, constitute the entire agreement relating to the carriage of the shipment described in this bill of lading, and no agent, servant or representative of the carrier or consignor has the authority to alter, waive or otherwise modify any provision of this agreement. In tendering the shipment described herein for carriage, the consignor agrees to these terms and conditions on his own behalf and on behalf of the consignee and any other party claiming an interest in this shipment.

Client:	ALS Environmental	**Date:**	*17-Oct-18*
Project:	L2168402	**Work Order:**	1809488
Sample ID:	L2168402-1	**Lab ID:**	1809488-1
Legal Location:		**Matrix:**	WATER
Collection Date:	9/15/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**			Prep Date: **10/3/2018**	PrepBy: **CMW**
Ra-226	-0.0021 (+/- 0.0042)	U	0.0097	BQ/l	NA	10/16/2018 11:57
Carr: BARIUM	*78.7*		*40-110*	*%REC*	DL = NA	10/16/2018 11:57

Client:	ALS Environmental	**Date:**	*17-Oct-18*
Project:	L2168402	**Work Order:**	1809488
Sample ID:	L2168402-1	**Lab ID:**	1809488-1
Legal Location:		**Matrix:**	WATER
Collection Date:	9/15/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Batch ID: **RE181002-4-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE181002-4** Units: **BQ/l** Analysis Date: **10/16/2018 11:57**
Client ID: Run ID: **RE181002-4A** Prep Date: **10/3/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.64 (+/- 0.410)	0.00938	1.771		92.5	67-120					P
Carr: BARIUM	16000		17430		91.7	40-110					

LCSD Sample ID: **RE181002-4** Units: **BQ/l** Analysis Date: **10/16/2018 11:57**
Client ID: Run ID: **RE181002-4A** Prep Date: **10/3/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.89 (+/- 0.470)	0.0136	1.771		106	67-120		1.64	0.4	2.1	P,M3
Carr: BARIUM	16800		17430		96.4	40-110		16000			

MB Sample ID: **RE181002-4** Units: **BQ/l** Analysis Date: **10/16/2018 11:57**
Client ID: Run ID: **RE181002-4A** Prep Date: **10/3/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.0013 (+/- 0.0029)	0.0051									U
Carr: BARIUM	16700		17440		95.6	40-110					

The following samples were analyzed in this batch: 1809488-1

Chain of Custody (COC) / Analytical Request Form

L2168402-COFC

COC Number: 15 -

Page of

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Report To	Contact and company name below will appear on the final report
Company:	AGNICO EAGLE
Contact:	JENNIFER BROWN
Phone:	1-819-759-3555 x3996
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	

Report Format	
Select Report Format:	☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	jeffrey.pratt@agnicoeagle.com
Email 2	zcraciunescu@golder.com,kelly_hille@golder.com
Email 3	colleen_prather@golder.com, erichard@golder.com

Invoice To		
	Same as Report To	☑ YES ☐ NO
	Copy of Invoice with Report	☑ YES ☐ NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☑ FAX
Email 1 or Fax	
Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q57496	AFE/Cost Center:	PO#
Job #:	MEL	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	C-TOC-HTC-WP, P-T-L-COL-WP	C-DOC-HTC-WP, P-TD-L-COL-WP	CYANDE - FREE, TOTAL AND WAD	HG-T-L-CVAF-WP, HG-D-L-CVAF-WP	MET-D-NP-U-CCMS-ED	MET-T-NP-U-CCMS-ED	AEG-ROU-LOW-WP	SIO2-L-COL-WP	PO4-DO-L-COL-WP	TKN-L-CFA-ED	NH3-L-CFA-ED	TSS-LOW-VA	RA226-MMER-FC	Number of Containers
	MEL-03-01	15/09/18	11:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human drinking water use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice Packs	☐	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
12.9					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: MH	Date: 21-9-18	Time: 9:20	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

September 07, 2018

Jennifer Brown
Agnico Eagle Mines Limited - Meliadine Project
Meliadine Division
Rankin Inlet NU
X0C 0G0

Dear Jennifer,

Re: Report on Sublethal Toxicity Analysis of Wastewater for MMER - August 2018

Enclosed are the reports for sublethal testing conducted on the sample of MEL-14 collected 2018-08-07. Data are presented in electronic format.

As you are aware, submission of sublethal toxicity data via RISS is a requirement of the MMER regulation. We would be pleased to enter this information on your behalf, for a fee. Please review the attached reports, and in an e-mail to **reporter@aquatox.ca**, provide us with your RISS user name and password (supplied to you by ECCC), along with written permission for AquaTox to access RISS on your behalf. We will then enter your results. In the future, if you would prefer us to enter the data automatically at the time the reports are issued, please indicate this in writing.

If you have any questions about the results, do not hesitate to contact me.

Sincerely,

AQUATOX TESTING & CONSULTING INC.

Martina Rendas
Project Manager

MR/jl

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).

7-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	–	–
LC50	>100%	–	–

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-07-31		
Test Duration :	7 days	Analyst(s) :	MV, RD, MR
IC25 Growth (from Biomass) :	0.87 g/L	LC50 :	1.00 g/L
95% Confidence Limits :	0.78 - 0.93 g/L	95% Confidence Limits :	0.93 - 1.07 g/L
Statistical Method :	Non-Linear Regression (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	0.94 g/L	Historical Mean LC50 :	1.10 g/L
Warning Limits (± 2SD) :	0.71 - 1.24 g/L	Warning Limits (± 2SD) :	0.92 - 1.31 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm18-08	Control/Dilution Water :	Well water (no additional chemicals)
Organism Age :	~07:00 - 21:15 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	0.38 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

COMMENTS

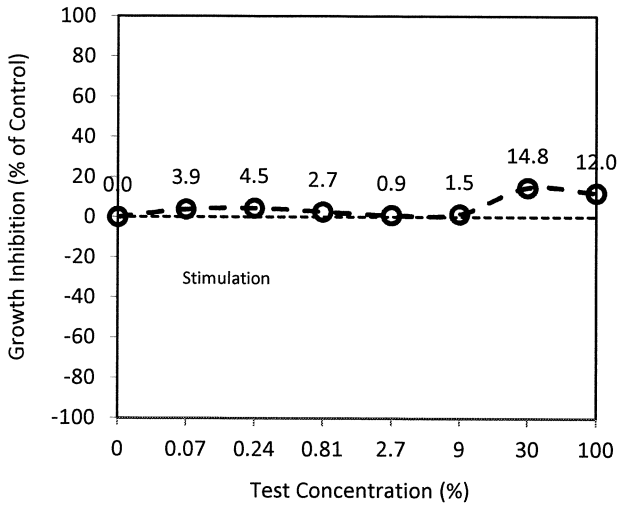
•All test validity criteria as specified in the test method cited above were satisfied.

•No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

•Inflated swim bladders were confirmed in all test organisms used in this test.

Work Order : 236864
Sample Number : 55841

Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b]Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-09-07
yyyy-mm-dd

Approved By : JMdaz
Project Manager

Work Order : 236864
Sample Number : 55841

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2018-08-09	2018-08-10	2018-08-11	2018-08-12	2018-08-13	2018-08-14	2018-08-15	2018-08-16
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 13:45
Initiation Date : 2018-08-09
Completion Date : 2018-08-16

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment Mean Mortality (± SD)
Date :		2018-08-09		2018-08-10		2018-08-11		2018-08-12		2018-08-13		2018-08-14		2018-08-15		2018-08-16		
Analyst(s):		CZN		XD		MW		MV(CG)		CCM		CCM		CCM		XD		
Concentration (%)	Replicate	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	%
Control	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.07	A	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.24	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.81	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2.7	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	1	10	1	10	1	10	6.67 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	10	
30	A	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	
	B	0	0	0	0	0	0	1	10	1	10	1	10	1	10	1	10	10.00 (±0.00)
	C	0	0	0	0	0	0	0	0	1	10	1	10	1	10	1	10	
100	A	0	0	0	0	0	0	1	10	1	10	1	10	1	10	1	10	
	B	0	0	0	0	0	0	2	20	3	30	3	30	3	30	3	30	16.67 (±11.55)
	C	0	0	0	0	1	10	1	10	1	10	1	10	1	10	1	10	

Aberrant behaviour or swimming impairment : None

Data Reviewed By: JC
Date : 2018-09-07

Work Order : 236864
Sample Number : 55841

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
Control	A	10	0.960	0.979	0.031
	B	10	0.962		
	C	10	1.015		
0.07	A	10	0.884	0.941	0.079
	B	10	0.908		
	C	10	1.031		
0.24	A	10	0.987	0.935	0.101
	B	10	0.819		
	C	10	1.000		
0.81	A	10	1.070	0.953	0.102
	B	10	0.888		
	C	10	0.901		
2.7	A	10	0.853[1]	0.970	0.101
	B	10	1.026		
	C	10	1.031		
9	A	10	0.998	0.964	0.049
	B	10	0.986		
	C	10	0.908		
30	A	10	0.706	0.834	0.134
	B	10	0.822		
	C	10	0.974		
100	A	10	0.884	0.861	0.077
	B	10	0.776		
	C	10	0.924		

NOTES :

- [1]Outlier according to Grubbs Test[b]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.
- Control average dry weight per surviving organism = 0.979 mg

Data Reviewed By: _____
Date : 08-09-07

Work Order : 236864
Sample Number: 55841

Fathead Minnow Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	25.0	7.9	7.2	2033	520

		Day 0 - 1 2018-08-09	Day 1 - 2 2018-08-10	Day 2 - 3 2018-08-11	Day 3 - 4 2018-08-12	Day 4 - 5 2018-08-13	Day 5 - 6 2018-08-14	Day 6 - 7 2018-08-15
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		25.0	24.0	24.0	24.0	24.0	25.0	24.0
Dissolved Oxygen (mg/L)		7.9	8.1	9.1	9.4	9.6	9.4	9.7
Dissolved Oxygen % Sat.[2]		99	98	110	113	116	114	117
pH		7.2	7.2	7.3	7.2	7.2	7.2	7.2
Pre-aeration Time (min)[3]		0	0	20	20	20	20	20
Analyst(s) :	Initial	SK	CCM	MV(CG)	MA	MW	TZL(CG)	TZL(CG)
	Final	XD	MA	MA	CCM	CCM	CCM	XD
Control (0%)								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO % Sat.	Initial	99	100	99	99	100	98	100
DO (mg/L)	Initial	8.2	8.1	8.2	8.2	8.3	8.1	8.3
	Final	7.6	7.5	7.1	6.4	6.5	6.8	6.9
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.3	8.4
	Final	8.2	8.2	8.0	7.9	8.0	8.1	8.0
Cond. (µmhos/cm)	Initial	690	695	694	693	690	732	686
0.07 %								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.2	8.2	8.4	8.2	8.3
	Final	7.6	7.5	7.1	6.6	6.8	6.7	6.9
pH	Initial	8.3	8.4	8.2	8.3	8.3	8.3	8.4
	Final	8.2	8.2	8.0	8.0	8.0	8.0	8.0
Cond. (µmhos/cm)	Initial	696	696	698	700	695	738	691
9 %								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.3	8.3	8.4	8.1	8.3
	Final	7.6	7.5	6.7	6.6	6.5	6.7	6.9
pH	Initial	8.2	8.3	8.3	8.3	8.3	8.3	8.3
	Final	8.1	8.1	7.9	7.9	7.9	8.0	7.9
Cond. (µmhos/cm)	Initial	822	819	821	824	820	854	806
100 %								
Temp.(°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	7.8	8.2	8.5	8.7	8.7	8.5	8.8
	Final	7.4	7.5	6.7	6.6	6.5	6.8	6.8
pH	Initial	7.4	7.5	7.5	7.5	7.4	7.4	7.4
	Final	7.4	7.5	7.3	7.2	7.2	7.3	7.3
Cond. (µmhos/cm)	Initial	2052	2044	2039	2050	2045	2041	1917

"–" = not measured

[2] % saturation (adjusted for actual temperature and barometric pressure)

[3] ≤100 bubbles/minute

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AquaTox Testing & Consulting Inc.
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TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Test of Reproduction and Survival using the Cladoceran *Ceriodaphnia dubia*. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/21, 2nd ed. (February 2007).

6-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Reproduction)	>100 %	–	–
LC50	>100 %	–	–

The results reported relate only to the sample tested and as received.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-07-31		
Test Duration :	6 days	Analyst(s) :	MW, MR
IC25 Reproduction :	1.09 g/L	LC50 :	2.74 g/L[2]
95% Confidence Limits :	0.90 - 1.30 g/L	95% Confidence Limits :	2.17 - 3.68 g/L
Statistical Method :	Non-linear Regression[1] (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	1.31 g/L	Historical Mean LC50 :	2.21 g/L
Warning Limits (± 2SD) :	1.00 - 1.72 g/L	Warning Limits (± 2SD) :	1.87 - 2.61 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Sample Filtration :	None	Test Volume per Replicate :	15 mL
Test Aeration :	None	Test Vessel :	19 mL polystyrene vial
pH Adjustment :	None	Depth of Test Solution :	4.8 cm
Hardness Adjustment :	None	Number of Replicates :	10
Renewal Frequency :	Once daily (≤24 h)	Organisms per Replicate :	1
Renewal Method :	Transferred to fresh solutions	Number of Concentrations :	7 + 1 Control
Control/Dilution Water :	Well water (no chemicals added)	Test Method Deviation(s) :	None

COMMENTS

[1]Poisson weighting (CETIS)[a] was applied.

[2]Note: The reference toxicant LC50 test result exceeded the 95% warning limits for historical data. No other unusual circumstances were observed and therefore the test result is considered acceptable.

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 236864
Sample Number : 55841

TEST ORGANISMS

Test Organism :	*Ceriodaphnia dubia*	Range of Age (at start of test) :	07:50 h - 19:50 h
Organism Batch :	Cd18-08	Mean Brood Organism Mortality :	0%
Organism Origin :	Single in-house mass culture	Ephippia in Culture :	No
Test Organism Origin :	Individual in-house cultures		

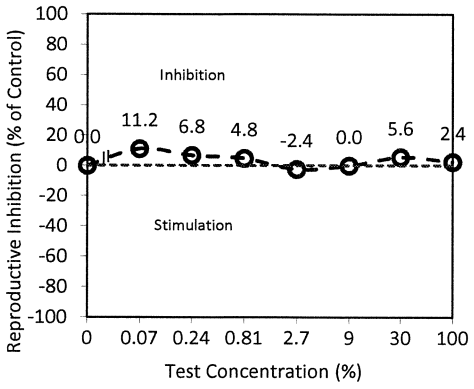
Brood Organism Neonate Production

Replicate :	1	2	3	4	5	6	7	8	9	10	Mean
Total (third or subsequent brood):	12	18	15	12	16	12	12	14	12	15	13.8
Total (first three broods):	25	28	27	25	23	26	27	23	26	25	25.5

No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

TEST DATA

***Ceriodaphnia dubia* Reproductive Inhibition**



Cumulative Daily Test Organism Mortality (%)

		Test Concentration (%)							
Date	**Test Day**	Control	0.07	0.24	0.81	2.7	9	30	100
2018-08-10	1	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0
2018-08-12	3	0	0	0	0	0	0	0	0
2018-08-13	4	0	0	0	0	0	0	0	0
2018-08-14	5	0	0	0	0	0	0	0	0
2018-08-15	6	0	0	0	0	0	0	0	0
Total Mortality (%)		0	0	0	0	0	0	0	0

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b]Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-09-07
yyyy-mm-dd

Approved By : _____
Project Manager

Work Order : 236864
Sample Number : 55841

***Ceriodaphnia dubia* Survival and Reproduction**

Test Initiation Date : 2018-08-09
Initiation Time : 13:50
Test Completion Date : 2018-08-15

Concentration (%) Control	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)	Analyst(s)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0	XD
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0	SEW
2018-08-12	3	5	3	0	0	0	0	0	6	0	2	1.6	SEW
2018-08-13	4	0	0	5	5	4	6	3	0	4	0	2.7	RK
2018-08-14	5	0	9	8	6	9	10	4	8	10	8	7.2	CG
2018-08-15	6	14	12	14	14	13	14	11	14	15	15	13.6	MA
Total		**19**	**24**	**27**	**25**	**26**	**30**	**18**	**28**	**29**	**25**	**25.1 (±4.0)**	

Concentration (%) 2.7	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	5	5	0	0	5	0	0	0	0	1.5
2018-08-13	4	5	0	0	4	7	0	3	3	1	2	2.5
2018-08-14	5	11	9	10	8	11	7	10	6	8	10	9
2018-08-15	6	13	12	12	11	13	14	13	12	13	14	12.7
Total		**29**	**26**	**27**	**23**	**31**	**26**	**26**	**21**	**22**	**26**	**25.7 (±3.1)**

Concentration (%) 0.07	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	0	0	0	0	3	5	0	0	0	0.8
2018-08-13	4	5	6	4	3	3	0	5	6	1	2	3.5
2018-08-14	5	10	7	7	5	10	5	0	6	6	4	6
2018-08-15	6	14	14	10	11	12	12	13	10	11	13	12
Total		**29**	**27**	**21**	**19**	**25**	**20**	**23**	**22**	**18**	**19**	**22.3 (±3.7)**

Concentration (%) 9	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	3	0	0	0	0	0	0	0	0	5	0.8
2018-08-13	4	1	2	5	0	4	4	4	3	5	0	2.8
2018-08-14	5	10	8	9	7	8	8	5	5	6	10	7.6
2018-08-15	6	16	16	11	14	14	13	12	13	14	16	13.9
Total		**30**	**26**	**25**	**21**	**26**	**25**	**21**	**21**	**25**	**31**	**25.1 (±3.5)**

Concentration (%) 0.24	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	2	0	0	0	2	6	0	3	3	4	2
2018-08-13	4	4	5	4	7	0	10	5	0	0	0	3.5
2018-08-14	5	6	6	10	10	7	0	10	5	10	5	6.9
2018-08-15	6	–	11	13	15	12	14	11	11	14	9	11
Total		**12**	**22**	**27**	**32**	**21**	**30**	**26**	**19**	**27**	**18**	**23.4 (±6.1)**

Concentration (%) 30	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	4	0	0	0	0	5	0	0	0	0.9
2018-08-13	4	3	0	4	3	2	0	1	7	2	4	2.6
2018-08-14	5	9	7	5	0	10	6	9	12	5	10	7.3
2018-08-15	6	16	14	9	15	16	7	13	13	12	14	12.9
Total		**28**	**25**	**18**	**18**	**28**	**13**	**28**	**32**	**19**	**28**	**23.7 (±6.2)**

Concentration (%) 0.81	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	2	0	2	0	0	5	4	0	2	0	1.5
2018-08-13	4	0	5	2	6	5	0	0	5	0	3	2.6
2018-08-14	5	7	9	7	6	8	10	6	12	10	9	8.4
2018-08-15	6	14	13	–	12	13	11	12	15	13	11	11.4
Total		**23**	**27**	**11**[3]	**24**	**26**	**26**	**22**	**32**	**25**	**23**	**23.9 (±5.3)**

Concentration (%) 100	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-08-10	1	0	0	0	0	0	0	0	0	0	0	0
2018-08-11	2	0	0	0	0	0	0	0	0	0	0	0
2018-08-12	3	0	0	0	3	5	0	0	0	0	0	0.8
2018-08-13	4	6	4	5	0	0	4	5	4	2	5	3.5
2018-08-14	5	11	8	10	9	10	8	9	3	8	10	8.6
2018-08-15	6	10	10	9	11	13	12	14	12	11	14	11.6
Total		**27**	**22**	**24**	**23**	**28**	**24**	**28**	**19**	**21**	**29**	**24.5 (±3.4)**

NOTES : •All young produced by a test organism during its fourth and subsequent broods were discarded and not included in the above counts. The presence of two or more neonates in any test chamber, during any given day of the test, constitutes a brood.

•[3] Outlier according to Grubbs Test [b]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"x"= test organism mortality
"*"= accidental test organism mortality
"–"=4th brood (see 'NOTES')

Data Reviewed By: JL
Date : 2018-09-07

Work Order : 236864
Sample Number: 55841

Ceriodaphnia dubia Water Chemistry Data

	Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
		25.0	7.9	7.2	2033	520

Date :		Day 0 - 1 2018-08-09	Day 1 - 2 2018-08-10	Day 2 - 3 2018-08-11	Day 3 - 4 2018-08-12	Day 4 - 5 2018-08-13	Day 5 - 6 2018-08-14
Sub-sample Used		1	1	1	2	2	3
Temperature (°C)		25.0	24.0	24.0	24.0	24.0	25.0
Dissolved Oxygen (mg/L)		7.9	8.1	9.1	9.4	9.6	9.4
Dissolved Oxygen % Sat.[3]		99	98	110	113	116	114
pH		7.2	7.2	7.3	7.2	7.2	7.2
Pre-aeration Time (min)[4]		0	0	20	20	20	20
Analyst(s)	Initial	SK	CCM	MV(CG)	MA	MW	TZL(CG)
	Final	XD	MA	MA	RK	AS	TZL(CG)
Control (0%)							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO % Sat.[3]	Initial	99	100	99	99	100	98
DO (mg/L)	Initial	8.2	8.1	8.2	8.2	8.3	8.1
	Final	7.3	7.4	7.7	7.4	7.3	7.4
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.3
	Final	8.2	8.2	8.1	8.2	8.1	8.1
Cond. (µmhos/cm)	Initial	690	695	694	693	690	732
0.07 %							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.2	8.2	8.4	8.2
	Final	7.4	7.4	7.8	7.5	7.3	7.4
pH	Initial	8.3	8.4	8.2	8.3	8.3	8.3
	Final	8.2	8.2	8.2	8.2	8.1	8.2
Cond. (µmhos/cm)	Initial	696	696	698	700	695	738
9 %							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	8.0	8.3	8.3	8.3	8.4	8.1
	Final	7.4	7.4	7.8	7.5	7.3	7.3
pH	Initial	8.2	8.3	8.3	8.3	8.3	8.3
	Final	8.1	8.1	8.1	8.1	8.0	8.1
Cond. (µmhos/cm)	Initial	822	819	821	824	820	854
100 %							
Temp. (°C)	Initial	24.0	25.0	24.0	24.0	24.5	25.0
	Final	24.0	25.0	25.0	25.0	25.0	25.0
DO (mg/L)	Initial	7.8	8.2	8.5	8.7	8.7	8.5
	Final	7.2	7.5	7.8	7.5	7.1	7.3
pH	Initial	7.4	7.5	7.5	7.5	7.4	7.4
	Final	7.5	7.5	7.5	7.5	7.4	7.4
Cond. (µmhos/cm)	Initial	2052	2044	2039	2050	2045	2041

"–" = not measured

[3] % saturation (adjusted for actual temperature and barometric pressure)

[4] ≤100 bubbles/minute

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor*. Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

7-DAY TEST RESULTS

Effect	Value (%)	95% Confidence Limits	Statistical Method
IC25 (Frond Yield)	72.3%	36.4 - 86.5	Linear Interpolation (CETIS)[a]
IC25 (Weight)	>97.0	–	–

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-15	Historical Geometric Mean IC25 :	2.04 g/L
Test Duration :	7 days	Warning Limits (± 2SD) :	1.52 - 2.74 g/L
IC25 (Frond Production) :	2.16 g/L	Growth Medium :	Modified APHA
95% Confidence Limits :	1.95 - 2.39 g/L	Analyst(s) :	MA, CZN
Statistical Method :	Non-Linear Regression (CETIS)[a]		

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm18-07	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	10 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	13.33-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	21:15 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4460 - 5250 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

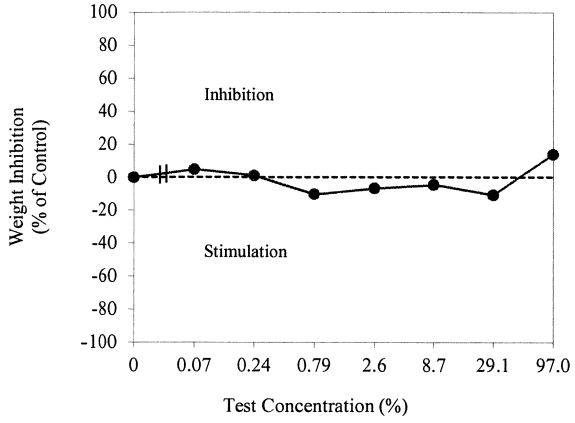
COMMENTS

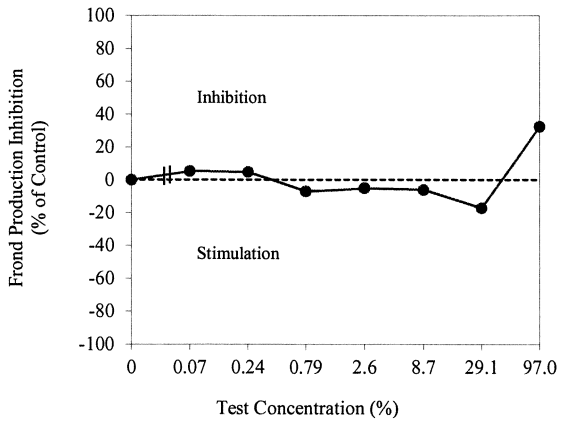
•All test validity criteria as specified in the test method cited above were satisfied.

•Statistical analysis could not be performed using non linear regression, since a suitable model could not be found. Therefore, test results were calculated using Linear Interpolation (CETIS)[a]. In test concentrations where frond production/weights were stimulated (greater than the control), data were replaced with control values for the purposes of statistical analysis, as recommended by Environment Canada (2005).

Work Order : 236864
Sample Number : 55841

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2018-08-10
Intitiation Time : 13:30
Initiated By : MDS

Termination Date : 2018-08-17
Termination Time : 14:00
Terminated By : NK

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2018-08-10	25.0
0	2018-08-10	24.5
1	2018-08-11	25.0
2	2018-08-12	25.0
3	2018-08-13	25.0
4	2018-08-14	25.0
5	2018-08-15	25.0
6	2018-08-16	25.0
7	2018-08-17	25.0

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	7.0	–
Control	8.3	8.4
0.07	8.3	8.4
0.24	–	–
0.79	–	–
2.6	8.3	8.5
8.7	–	–
29.1	–	–
97.0	8.0	8.4

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Environment Canada, 2005. Guidance Document on Statistical Methods for Environmental Toxicity Tests. Environmental Protection Series, Ottawa, Ont., Rept. EPS 1/RM/46.

Date : 2018-09-07
yyyy-mm-dd

Approved By:
Project Manager

Work Order : 236864
Sample Number : 55841

***Lemna minor* Frond Increase**

Test Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
Control	A	6	98	92	79.00	8.87	11.2	Fronds healthy, appearance normal in all replicates.
	B	6	82	76				
	C	6	82	76				
	D	6	78	72				
0.07	A	6	80	74	74.75	0.96	1.3	Fronds healthy, appearance normal in all replicates.
	B	6	81	75				
	C	6	82	76				
	D	6	80	74				
0.24	A	6	83	77	75.25	3.59	4.8	Fronds healthy, appearance normal in all replicates.
	B	6	76	70				
	C	6	84	78				
	D	6	82	76				
0.79	A	6	94	88	84.50	16.60	19.6	Fronds healthy, appearance normal in all replicates.
	B	6	108	102				
	C	6	92	86				
	D	6	68	62				
2.6	A	6	76	70	83.00	15.19	18.3	Fronds healthy, appearance normal in all replicates.
	B	6	110	104				
	C	6	90	84				
	D	6	80	74				
8.7	A	6	102	96	83.75	8.81	10.5	Fronds healthy, appearance normal in all replicates.
	B	6	82	76				
	C	6	85	79				
	D	6	90	84				
29.1	A	6	105	99	92.50	7.51	8.1	Fronds healthy, appearance normal in all replicates.
	B	6	89	83				
	C	6	96	90				
	D	6	104	98				
97.0	A	6	59	53	53.25	1.71	3.2	Fronds healthy, appearance normal in all replicates.
	B	6	57	51				
	C	6	60	54				
	D	6	61	55				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.

•No significant stimulation (α=0.05) of frond increase was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•A 14.2-fold increase in frond number was observed in the control over the testing period.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : JC
Date : 2018-09-07

Work Order : 236864
Sample Number : 55841

Lemna minor Frond Weight Data

Test Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
Control	A	9.41	8.53	0.95
	B	7.22		
	C	9.01		
	D	8.47		
0.07	A	7.66	8.12	0.57
	B	8.51		
	C	7.61		
	D	8.72		
0.24	A	8.62	8.45	0.21
	B	8.35		
	C	8.19		
	D	8.62		
0.79	A	9.75	9.40	1.73
	B	11.49		
	C	9.06		
	D	7.31		
2.6	A	8.68	9.10	0.57
	B	9.93		
	C	8.93		
	D	8.84		
8.7	A	9.54	8.92	0.62
	B	8.23		
	C	8.56		
	D	9.33		
29.1	A	10.37	9.44	1.00
	B	8.27		
	C	8.95		
	D	10.15		
97.0	A	7.41	7.34	0.17
	B	7.27		
	C	7.54		
	D	7.15		

NOTES :

•No significant stimulation (α=0.05) of frond weight was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : JC
Date : 2018-09-07

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata

EPS 1/RM/25

Work Order : 236864
Sample Number : 55841

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-07
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-09
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	23.0 °C
Sampled By :	J. Brown	Date Tested :	2018-08-09
Sample Description :	Clear, yellow, odourless.		

Test Method : Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007).

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91 %	–	–

The results reported relate only to the sample tested.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2018-08-21	Statistical Method :	Non-Linear Regression (CETIS)[a]
Organism Batch :	Ps18-08	Historical Mean IC25 :	10.4 µg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	4.9 - 22.3 µg/L
IC25 Growth :	8.8 µg/L	Analyst(s) :	AS, MDS, CZN
95% Confidence Limits :	7.5 - 10.2 µg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	9818 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:05 h prior to test initiation
Organism Batch :	Ps18-08	Age (at start of test) :	3 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.
•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

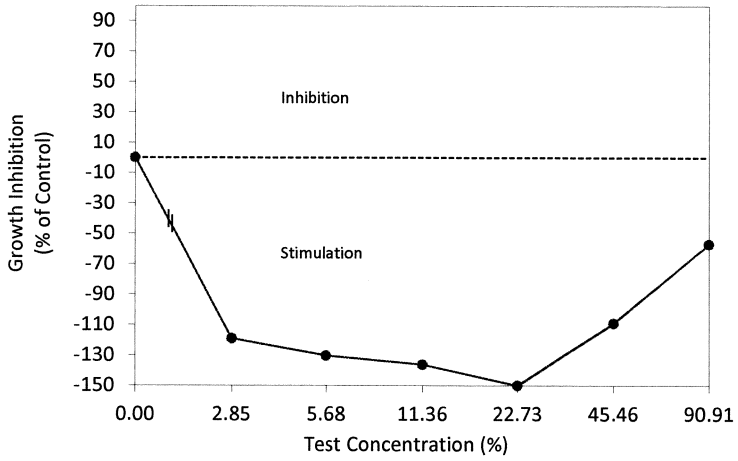
Test Type :	Static	Volume per Replicate :	220 µL
Test Duration :	72 hours	Control Replicates :	10
Mean Temperature (± SD):	24.3°C (± 0.3)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 µm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	3800-4320 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 236864
Sample Number : 55841

***Pseudokirchneriella subcapitata* Growth Inhibition**



CELL ENUMERATION AT 72-HOURS

Initiated By :	SEW	Sample pH (at 0 hours) :	7.0
Completion/Enumeration Date :	2018-08-12	Control pH (at 0 hours) :	7.0
Enumerated By :	RD	Control pH (at 72 hours) :	7.0
Enumeration Method :	Manual (haemocytometer)	Control Cell Increase Factor :	63.2 times growth

Concentration	Cell Concentration (x 10000 cells/mL) Replicate								Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
(%)	1	2	3	4	7	8	9	10				
Control	60.5	59.0	68.5	67.5	62.5	64.5	58.0	56.0	61.08	4.51	7.38	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–	–	–	–	–	–	–	–	–	–
2.85	136.0	125.5	143.0	–	–	–	–	–	133.85	8.81	6.58	119.14
5.68	139.0	144.0	142.0	–	–	–	–	–	140.68	2.52	1.79	130.33
11.36	153.5	138.0	144.5	–	–	–	–	–	144.35	7.78	5.39	136.33
22.73	150.0	153.0	158.0	–	–	–	–	–	152.68	4.04	2.65	149.97
45.46	126.5	128.0	131.5	–	–	–	–	–	127.68	2.57	2.01	109.04
90.91	104.5	95.0	91.0	–	–	–	–	–	95.85	6.93	7.23	56.93

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (α=0.0

- Control replicates 5 and 6 used for pH measurement.
- The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not enumerated/not required

Data Reviewed By : J
Date : 2018-09-07

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Softw LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-09-07 *yyyy-mm-dd*

Approved By : *Project Manager*

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 236864

Shipping Address: AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR #3
Guelph, Ontario Canada N1H 6H9

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	580278
Field Sampler Name (print):	Jennifer Brown
Signature:	
Affiliation:	Agnico Eagle Mines Ltd. - Meliadine Division
Sample Storage (prior to shipping):	Shipped immediately after sampling
Custody Relinquished by:	Jennifer Brown
Date/Time Shipped:	2018-08-07 - 08:00

Client: Agnico Eagle Mines Limited
Meliadine Project
Rankin Inlet, Nunavut, Canada
X0C 0G0
GPS Coordinates 63* 02'15.5" 92* 13'06.3"

Phone: (819) 759-3555

Fax:

Contact: Jennifer Brown

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	RISS Data Entry	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg 2 x 1L, 3 x 10L, etc.)
2018-08-07	07:00	~~EXPP~~ MEL-14 (~~Post-treatment~~)	55841	23.0					✔	✔	✔	✔			✔		3 x 20L

Name change requested by Martin Theriault (email 2018-08-21) JR

For Lab Use Only

Received By:	C2N
Date:	2018-08-09
Time:	10:45
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:
TOXICOLOGY analysis required

Phone number: 819-759-3555 ext 3996

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

September 28, 2018

Jennifer Brown
Agnico Eagle Mines Limited - Meliadine Project
Meliadine Division
Rankin Inlet NU
X0C 0G0

Dear Jennifer,

Re: Report on Sublethal Toxicity Analysis of Wastewater for MMER - August 2018

Enclosed are the reports for sublethal testing conducted with Fathead Minnow, *Lemna minor*, and *Pseudokirchneriella subcapitata* on the sample of MEL-14 collected 2018-08-13. Data are presented in electronic format. The corresponding test with *Ceriodaphnia dubia* was unsuccessful, and requested submission of a sample to retest. Our understanding resampling was not possible at the time of notification.

As you are aware, submission of sublethal toxicity data via RISS is a requirement of the MMER regulation. We would be pleased to enter this information on your behalf, for a fee. Please review the attached reports, and in an e-mail to reporter@aquatox.ca, provide us with your RISS user name and password (supplied to you by ECCC), along with written permission for AquaTox to access RISS on your behalf. We will then enter your results. In the future, if you would prefer us to enter the data automatically at the time the reports are issued, please indicate this in writing.

If you have any questions about the results, do not hesitate to contact me.

Sincerely,

AQUATOX TESTING & CONSULTING INC.

Martina Rendas
Project Manager

MR/jl

AquaTox Testing & Consulting Inc.
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TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 236923
Sample Number : 55913

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-13
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-15
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	21.0 °C
Sampled By :	D. Gorton	Date Tested :	2018-08-16
Sample Description :	Clear, light yellow, odourless.		

Test Method : Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).

7-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	–	–
LC50	>100%	–	–

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-28	Analyst(s) :	MV, RD, MA
Organism Batch :	Fm18-08	Test Duration :	7 days
IC25 Growth (from Biomass) :	0.90 g/L	LC50 :	1.03 g/L
95% Confidence Limits :	0.81 - 0.97 g/L	95% Confidence Limits :	0.96 - 1.11 g/L
Statistical Method :	Non-Linear Regression (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	0.93 g/L	Historical Mean LC50 :	1.09 g/L
Warning Limits (± 2SD) :	0.71 - 1.23 g/L	Warning Limits (± 2SD) :	0.91 - 1.30 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

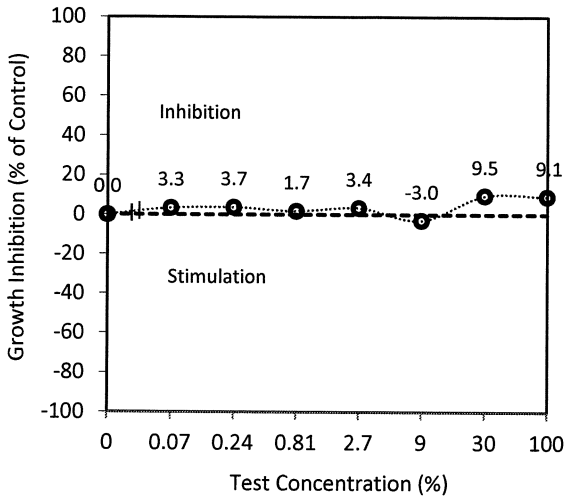
Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm18-08	Control/Dilution Water :	Well water (no additional chemicals)
Organism Age :	~07:00 - 20:35 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	0.77 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

COMMENTS

- All test validity criteria as specified in the test method cited above were satisfied.
- No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.
- Inflated swim bladders were confirmed in all test organisms used in this test.

Work Order : 236923
Sample Number : 55913

Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b] Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-09-27
yyyy-mm-dd

Approved By : Melissa E
Project Manager

AQUATOX

TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 236923
Sample Number : 55913

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2018-08-16	2018-08-17	2018-08-18	2018-08-19	2018-08-20	2018-08-21	2018-08-22	2018-08-23
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 12:15
Initiation Date : 2018-08-16
Completion Date : 2018-08-23

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment Mean Mortality (± SD)
Date :		2018-08-16		2018-08-17		2018-08-18		2018-08-19		2018-08-20		2018-08-21		2018-08-22		2018-08-23		
Analyst(s):		CCM(VC)		CCM(VC)		SEW		CG		SEW		SEW		RK(VC)		CCM(VC)		
Concentration (%)	Replicate	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	Number Dead	% Dead	%
Control	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.07	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.24	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0.81	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2.7	A	0	0	0	0	0	0	0	0	0	0	1	10	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	A	0	0	0	0	0	0	0	0	0	0	0	0	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30	A	0	0	0	0	0	0	0	0	0	0	1	10	1	10	1	10	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.33 (±5.77)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Aberrant behaviour or swimming impairment : None

Data Reviewed By: VC
Date : 2018-09-10

Work Order : 236923
Sample Number : 55913

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
Control	A	10	0.955	0.940	0.015
	B	10	0.926		
	C	10	0.938		
0.07	A	10	0.886	0.909	0.027
	B	10	0.938		
	C	10	0.902		
0.24	A	10	0.871	0.905	0.036
	B	10	0.902		
	C	10	0.943		
0.81	A	10	1.018	0.923	0.085
	B	10	0.897		
	C	10	0.855		
2.7	A	10	0.899	0.908	0.031
	B	10	0.882		
	C	10	0.943		
9	A	10	0.919	0.968	0.045
	B	10	1.007		
	C	10	0.977		
30	A	10	0.799	0.850	0.045
	B	10	0.869		
	C	10	0.883		
100	A	10	0.866	0.854	0.027
	B	10	0.824		
	C	10	0.873		

NOTES :
- No outlying data points were detected according to Grubbs Test[b].
- Control average dry weight per surviving organism = 0.940 mg

Data Reviewed By: VC

Date : 2018-09-10

Work Order : 236923
Sample Number: 55913

Fathead Minnow Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	25.0	8.0	7.2	2021	530

		Day 0 - 1 2018-08-16	Day 1 - 2 2018-08-17	Day 2 - 3 2018-08-18	Day 3 - 4 2018-08-19	Day 4 - 5 2018-08-20	Day 5 - 6 2018-08-21	Day 6 - 7 2018-08-22
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		25.0	24.0	24.0	24.0	25.0	24.0	24.0
Dissolved Oxygen (mg/L)		8.0	8.9	9.2	9.0	9.3	8.9	9.6
Dissolved Oxygen % Sat.[1]		98	109	112	110	112	108	118
pH		7.2	7.3	7.2	7.2	7.2	7.3	7.2
Pre-aeration Time (min)[2]		0	20	20	20	20	20	20
Analyst(s) :	Initial	CCM(VC)	CCM(VC)	RK(VC)	RK(VC)	CCM(VC)	CCM(VC)	SEW
	Final	CCM(VC)	RK(VC)	CG	SEW	SEW	RK(VC)	XD
Control (0%)								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO % Sat.[1]	Initial	100	102	100	102	100	100	100
DO (mg/L)	Initial	8.2	8.5	8.2	8.5	8.3	8.3	8.2
	Final	7.0	6.4	7.1	6.6	6.8	6.8	7.0
pH	Initial	8.3	8.4	8.3	8.4	8.4	8.4	8.4
	Final	8.1	8.0	8.0	7.9	8.1	8.1	8.0
Cond. (µmhos/cm)	Initial	615	611	705	703	615	615	634
0.07 %								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO (mg/L)	Initial	8.3	8.4	8.2	8.4	8.1	8.3	8.2
	Final	6.9	6.5	7.0	6.4	6.8	6.9	7.0
pH	Initial	8.4	8.4	8.4	8.4	8.3	8.4	8.4
	Final	8.1	8.0	8.0	7.9	8.0	8.1	8.0
Cond. (µmhos/cm)	Initial	612	612	710	709	615	614	635
9 %								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO (mg/L)	Initial	8.2	8.6	8.2	8.6	8.3	8.5	8.4
	Final	7.0	6.6	6.9	6.5	6.7	6.8	7.1
pH	Initial	8.3	8.3	8.3	8.3	8.3	8.4	8.3
	Final	8.1	8.0	7.9	7.8	7.9	8.0	8.0
Cond. (µmhos/cm)	Initial	743	739	828	835	746	744	756
100 %								
Temp.(°C)	Initial	25.0	25.0	25.0	25.0	24.0	24.0	24.0
	Final	25.0	25.0	25.0	25.0	25.0	24.0	24.0
DO (mg/L)	Initial	8.1	8.6	8.9	8.8	8.5	8.6	9.1
	Final	7.3	6.8	7.1	6.5	6.8	7.1	7.1
pH	Initial	7.4	7.5	7.5	7.5	7.4	7.6	7.6
	Final	7.5	7.3	7.4	7.3	7.3	7.4	7.5
Cond. (µmhos/cm)	Initial	2034	2021	2012	2035	2024	1999	1987

"–" = not measured

[1] % saturation (adjusted for actual temperature and barometric pressure)

[2] ≤100 bubbles/minute

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TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 236923
Sample Number : 55913

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-13
Location :	Rankin Inlet NU	Time Collected :	07:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-15
Substance :	MEL-14	Time Received :	10:45
Sampling Method :	Grab	Temperature upon Receipt :	21.0 °C
Sampled By :	D. Gorton	Date Tested :	2018-08-16
Sample Description :	Clear, light yellow, odourless.		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor*. Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

7-DAY TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Frond Yield)	38.2%	26.6 - 52.1	Non-Linear Regression* (CETIS)[a]
IC25 (Weight)	42.0%	26.5 - 63.2	Non-Linear Regression (CETIS)[a]

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-15	Statistical Method :	Non-Linear Regression (CETIS)[a]
Organism Batch :	Lm18-08	Historical Geometric Mean IC25 :	2.04 g/L
Test Duration :	7 days	Warning Limits (± 2SD) :	1.52 - 2.74 g/L
IC25 (Frond Production) :	2.16 g/L	Growth Medium :	Modified APHA
95% Confidence Limits :	1.95 - 2.39 g/L	Analyst(s) :	MA, CZN

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

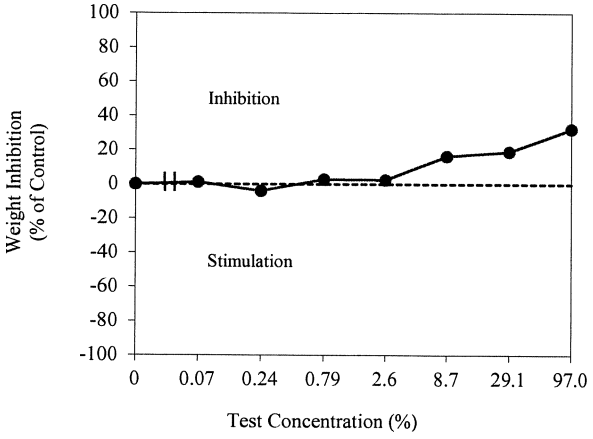
Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm18-08	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	9 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	22.2-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	23:20 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4100 - 5290 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

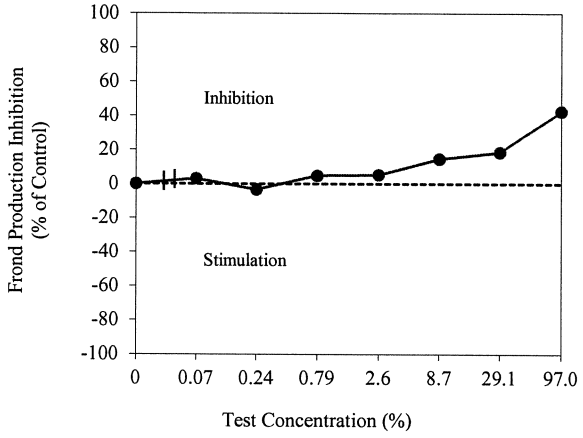
COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.
*Box-Cox weighting (CETIS)[a] was applied.

Work Order : 236923
Sample Number : 55913

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2018-08-16
Intitiation Time : 14:20
Initiated By : CG/MDS

Termination Date : 2018-08-23
Termination Time : 15:00
Terminated By : NK

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2018-08-16	25.0
0	2018-08-16	24.5
1	2018-08-17	24.5
2	2018-08-18	24.0
3	2018-08-19	24.0
4	2018-08-20	24.0
5	2018-08-21	24.0
6	2018-08-22	24.5
7	2018-08-23	24.0

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	7.2	–
Control	8.3	8.5
0.07	8.3	8.6
0.24	–	–
0.79	–	–
2.6	8.3	8.6
8.7	–	–
29.1	–	–
97.0	8.0	8.6

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-09-27
yyyy-mm-dd

Approved By:
Project Manager

Work Order : 236923
Sample Number : 55913

Lemna minor Frond Increase

Test Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
Control	A	6	152	146	125.50	21.67	17.3	Fronds healthy, appearance normal in all replicates.
	B	6	127	121				
	C	6	144	138				
	D	6	103	97[1]				
0.07	A	6	131	125	121.75	2.22	1.8	Fronds healthy, appearance normal in all replicates.
	B	6	127	121				
	C	6	127	121				
	D	6	126	120				
0.24	A	6	139	133	129.75	5.25	4.0	Fronds healthy, appearance normal in all replicates.
	B	6	128	122				
	C	6	139	133				
	D	6	137	131				
0.79	A	6	122	116	119.50	10.91	9.1	Fronds healthy, appearance normal in all replicates.
	B	6	131	125				
	C	6	112	106				
	D	6	137	131				
2.6	A	6	120	114	119.00	5.94	5.0	Fronds healthy, appearance normal in all replicates.
	B	6	133	127				
	C	6	121	115				
	D	6	126	120				
8.7	A	6	120	114	107.25	7.63	7.1	Fronds healthy, appearance normal in all replicates.
	B	6	110	104				
	C	6	119	113				
	D	6	104	98				
29.1	A	6	121	115	102.25	10.24	10.0	Fronds healthy, appearance normal in all replicates.
	B	6	107	101				
	C	6	96	90				
	D	6	109	103				
97.0	A	6	82	76	72.00	6.78	9.4	Fronds healthy, appearance normal in all replicates.
	B	6	85	79				
	C	6	70	64				
	D	6	75	69				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.

•No significant stimulation (α=0.05) of frond increase was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•A 21.9-fold increase in frond number was observed in the control over the testing period.

• [1]Outlier according to Grubbs Test (CETIS)[a]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-09-10

Work Order : 236923
Sample Number : 55913

Lemna minor Frond Weight Data

Test Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
Control	A	13.11	12.54	0.72
	B	12.06		
	C	13.19		
	D	11.79		
0.07	A	13.01	12.41	0.65
	B	11.61		
	C	12.14		
	D	12.87		
0.24	A	13.41	13.03	0.54
	B	12.23		
	C	13.17		
	D	13.30		
0.79	A	12.62	12.19	1.27
	B	12.72		
	C	10.31		
	D	13.12		
2.6	A	12.10	12.23	0.87
	B	13.33		
	C	11.20		
	D	12.29		
8.7	A	11.33	10.49	0.72
	B	10.11		
	C	10.82		
	D	9.71		
29.1	A	11.66	10.16	1.15
	B	9.60		
	C	9.00		
	D	10.39		
97.0	A	9.20	8.49	0.53
	B	8.49		
	C	7.94		
	D	8.32		

NOTES :

- No significant stimulation (α=0.05) of frond weight was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-09-10

AQUATOX
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B-11 Nicholas Beaver Road
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata

EPS 1/RM/25

Work Order : 236923
Sample Number : 55913

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project	Date Collected :	2018-08-13
Location :	Rankin Inlet NU	Time Collected :	7:00
GPS Coordinates :	63° 02' 15.5"N 92° 13' 06.3"W	Date Received :	2018-08-15
Substance :	MEL-14	Time Received :	11:00
Sampling Method :	Grab	Temperature upon Receipt :	21.0 °C
Sampled By :	D. Gorton	Date Tested :	2018-08-16
Sample Description :	Clear, light yellow, odourless.		

Test Method : Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007).

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91 %	–	–

The results reported relate only to the sample tested and as received.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2018-08-21	Statistical Method :	Non-Linear Regression (CETIS)[a]
Organism Batch :	Ps18-08	Historical Mean IC25 :	10.4 µg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	4.9 - 22.3 µg/L
IC25 Growth :	8.8 µg/L	Analyst(s) :	AS, MDS, CZN
95% Confidence Limits :	7.5 - 10.2 µg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	10955 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:10 h prior to test initiation
Organism Batch :	Ps18-08	Age (at start of test) :	3 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.
•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

Test Type :	Static	Volume per Replicate :	220 µL
Test Duration :	72 hours	Control Replicates :	10
Mean Temperature (± SD):	24.1°C (± 0.3)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 µm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	3810-4160 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

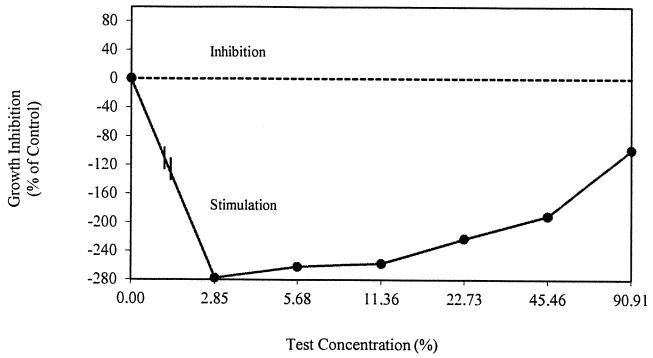
AQUATOX

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata
EPS 1/RM/25

Work Order : 236923
Sample Number : 55913

***Pseudokirchneriella subcapitata* Growth Inhibition**



CELL ENUMERATION AT 72-HOURS

Initiated By : CG/MA
Completion/Enumeration Date : 2018-08-19
Enumerated By : CG
Enumeration Method : Manual (haemocytometer)

Sample pH (at 0 hours) : 7.2
Control pH (at 0 hours) : 7.0
Control pH (at 72 hours) : 7.0
Control Cell Increase Factor : 29.4 times growth

Concentration	Cell Concentration (x 10000 cells/mL) Replicate								Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
(%)	1	2	3	4	7	8	9	10				
Control	26.5	30.5	31.5	38.0	35.5	34.0	30.5	31.0	31.09	3.54	11.40	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–	–	–	–	–	–	–	–	–	–
2.85	122.5	118.5	115.0	–	–	–	–	–	117.57	3.75	3.19	278.14
5.68	116.5	109.0	115.5	–	–	–	–	–	112.57	4.07	3.62	262.06
11.36	118.0	109.0	110.0	–	–	–	–	–	111.24	4.93	4.43	257.77
22.73	96.5	101.0	107.0	–	–	–	–	–	100.40	5.27	5.25	222.93
45.46	101.5	85.0	88.5	–	–	–	–	–	90.57	8.69	9.60	191.30
90.91	54.0	63.5	71.5	–	–	–	–	–	61.90	8.76	14.15	99.10

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (a=0.05).
- Control replicates 5 and 6 used for pH measurement.
- The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not enumerated/not required

Data Reviewed By : VC
Date : 2018-09-10

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-09-27
yyyy-mm-dd

Approved By : *Project Manager*

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 236923

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road,
Puslinch, Ontario, Canada
N0B2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	580278
Field Sampler Name (print):	Dan Gorton
Signature:	
Affiliation:	Agnico Eagle Mines Ltd. - Meliadine Division
Sample Storage (prior to shipping):	Shipped immediately after sampling
Custody Relinquished by:	Dan Gorton
Date/Time Shipped:	2018-08-13 - 08:00

Client: Agnico Eagle Mines Limited
Meliadine Project
Rankin Inlet, Nunavut, Canada
X0C 0G0
GPS Coordinates 63°02'15.5" 92°13'06.3"

Phone: (819) 759-3555

Fax:

Contact: Dan Gorton

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	RISS Data Entry	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2018-08-13	07:00	~~EWTP~~ MEL-14 ~~(Post-treatment)~~	55913	21.0					✓	✓	✓	✓			✓		3 x 20L
		Name change requested by Martin Theriault (email 20180821) JR.															

For Lab Use Only

Received By:	NK/RK
Date:	2018-08-15
Time:	11:00
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions:
TOXICOLOGY analysis required

Phone number: 819-759-3555 ext 3996

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

October 16, 2018

Jennifer Brown
Agnico Eagle Mines Limited - Meliadine Project
Meliadine Division
Rankin Inlet NU
X0C 0G0

Dear Jennifer,

Re: Report on Sublethal Toxicity Analysis of Wastewater for MMER - September 2018

Enclosed are the reports for sublethal testing conducted on the sample of MEL-14 collected 2018-09-03. Data are presented in electronic format.

As you are aware, submission of sublethal toxicity data via RISS is a requirement of the MMER regulation. We would be pleased to enter this information on your behalf, for a fee. Please review the attached reports, and in an e-mail to **reporter@aquatox.ca**, provide us with your RISS user name and password (supplied to you by ECCC), along with written permission for AquaTox to access RISS on your behalf. We will then enter your results. In the future, if you would prefer us to enter the data automatically at the time the reports are issued, please indicate this in writing.

If you have any questions about the results, do not hesitate to contact me.

Sincerely,

AQUATOX TESTING & CONSULTING INC.

Martina Rendas
Project Manager

MR/jl

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Fathead minnow
EPS 1/RM/22

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		
Test Method :	Test of Larval Growth and Survival Using Fathead Minnows. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/22 , 2nd ed. (February 2011).		

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth from Biomass)	>100%	-	-
LC50	>100%	-	-

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-28		
Test Duration :	7 days	Analyst(s) :	MV, RD, MA
IC25 Growth (from Biomass) :	0.90 g/L	LC50 :	1.03 g/L
95% Confidence Limits :	0.81 - 0.97 g/L	95% Confidence Limits :	0.96 - 1.11 g/L
Statistical Method :	Non-Linear Regression (CETIS)[a]	Statistical Method :	Linear Regression (MLE) (CETIS)[a]
Historical Mean IC25 :	0.93 g/L	Historical Mean LC50 :	1.09 g/L
Warning Limits (± 2SD) :	0.71 - 1.23 g/L	Warning Limits (± 2SD) :	0.91 - 1.30 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

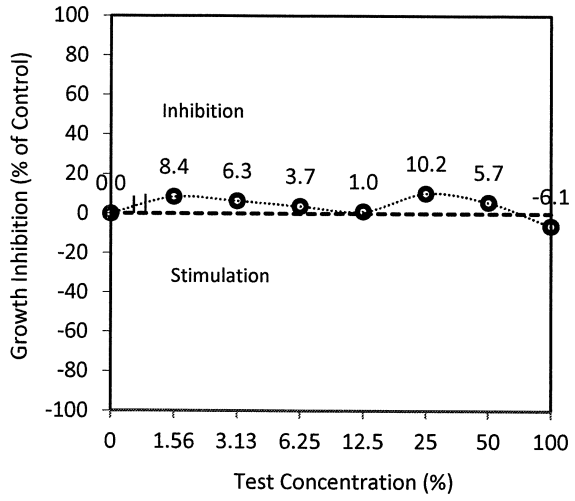
Test Organism :	*Pimephales promelas*	Test Type :	Static Renewal
Organism Batch :	Fm18-09	Control/Dilution Water :	Well water (no chemicals added)
Organism Age :	~07:00 - 23:35 h at start of test	Test Volume / Replicate :	300 mL
Source :	In-house culture	Test Vessel :	420 mL polystyrene beaker
Culture Mortality/Diseased :	1.54 % (previous 7 days)	Depth of Test Solution :	8 cm
pH Adjustment :	None	Organisms per Replicate :	10
Sample Filtration :	None	Number of Replicates :	3
Hardness Adjustment :	None	Daily Renewal Method :	80-85% syphoned and replaced
Test Aeration :	None	Test Method Deviation(s):	None

COMMENTS

- All test validity criteria as specified in the test method cited above were satisfied.
- No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.
- Inflated swim bladders were confirmed in all test organisms used in this test.

Work Order : 237106
Sample Number : 56153

Fathead Minnow Growth Inhibition (based on Biomass)



REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[b] Grubbs, F.E., 1969. Procedures for detecting outlying observations in samples. *Technometrics, 11* :1-21.

Date : 2018-10-16
yyyy-mm-dd

Approved By : _____
Project Manager

Work Order : 237106
Sample Number : 56153

CUMULATIVE DAILY CONTROL MORTALITY AND IMPAIRMENT (±SD)

Date :	2018-09-06	2018-09-07	2018-09-08	2018-09-09	2018-09-10	2018-09-11	2018-09-12	2018-09-13
	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)	0.00% (±0.0)

FATHEAD MINNOW CUMULATIVE DAILY MORTALITY

Initiation Time : 15:45
Initiation Date : 2018-09-06
Completion Date : 2018-09-13

		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Treatment
Date :		2018-09-06		2018-09-07		2018-09-08		2018-09-09		2018-09-10		2018-09-11		2018-09-12		2018-09-13		Mean Mortality (± SD)
Analyst(s):		NK		MV(VC)		RK(VC)		MV(VC)		TL		CCM(VC)		TL		SD(RD)		
Concentration		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	%
(%)	Replicate	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	Dead	
Control	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.56	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2*	0	0.00 (±0.00)*
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3.13	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6.25	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12.5	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
25	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.67 (±11.55)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	2	20	2	20	2	20	2	20	2	20	
100	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00 (±0.00)
	B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Aberrant behaviour or swimming impairment : None

NOTES : *2018-09-13: Replicate 1.56-A was accidentally spilled. Two test organisms were lost from the test vessel, resulting in accidental mortalities (SD/RD). The test organisms that suffered accidental mortalities were excluded from statistical analysis. All test endpoints were calculated from a total of 8 test organisms exposed in replicate 1.56-A (VC).

Test Data Reviewed By: VC
Date : 2018-10-04

Work Order : 237106
Sample Number : 56153

FATHEAD MINNOW DRY WEIGHT AND BIOMASS DATA

Concentration (%)	Replicate	Number of Larvae Exposed	Replicate Mean Dry Weight (mg)	Treatment Mean Biomass (mg)	Standard Deviation
Control	A	10	0.806	0.817	0.022
	B	10	0.802		
	C	10	0.842		
1.56	A	8*	0.758	0.748	0.014
	B	10	0.732		
	C	10	0.755		
3.13	A	10	0.769	0.765	0.042
	B	10	0.805		
	C	10	0.721		
6.25	A	10	0.764	0.786	0.032
	B	10	0.823		
	C	10	0.772		
12.5	A	10	0.843	0.809	0.077
	B	10	0.862		
	C	10	0.721		
25	A	10	0.714[1]	0.733	0.016
	B	10	0.742		
	C	10	0.743		
50	A	10	0.797	0.770	0.070
	B	10	0.823		
	C	10	0.691		
100	A	10	0.875	0.867	0.024
	B	10	0.840		
	C	10	0.885		

NOTES :

- [1]Outlier according to Grubbs Test[b]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.
- Control average dry weight per surviving organism = 0.817 mg

*Two accidental mortalities (see note on pg. 3).

Test Data Reviewed By: VC
Date : 2018-10-04

Work Order : 237106
Sample Number: 56153

WATER CHEMISTRY DATA

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	24.0	8.7	6.8	2184	540

		Day 0 - 1 2018-09-06	Day 1 - 2 2018-09-07	Day 2 - 3 2018-09-08	Day 3 - 4 2018-09-09	Day 4 - 5 2018-09-10	Day 5 - 6 2018-09-11	Day 6 - 7 2018-09-12
Sub-sample Used		1	1	1	2	2	3	3
Temperature (°C)		24.0	24.0	24.0	24.0	25.0	25.0	24.0
Dissolved Oxygen (mg/L)		8.7	8.5	9.1	9.5	9.4	8.9	9.8
Dissolved Oxygen % Sat.[2]		105	103	109	114	113	108	118
pH		6.8	6.9	6.9	6.9	7.0	6.8	6.9
Pre-aeration Time (min)[3]		20	20	20	20	20	20	20
Analyst(s) :	Initial	SD(RD)	SD(RD)	RK(VC)	RK(VC)	SD(RD)	SD(RD)	SD(RD)
	Final	MV(VC)	RK(VC)	MV(VC)	TL	CCM(VC)	SD(RD)	SD(RD)
Control (0%)								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO % Sat.[2]	Initial	100	100	101	100	100	100	98
DO (mg/L)	Initial	8.2	8.3	8.3	8.4	8.4	8.2	8.1
	Final	7.4	7.3	7.1	6.8	6.6	7.0	7.5
pH	Initial	8.4	8.3	8.3	8.3	8.4	8.4	8.4
	Final	8.1	8.0	8.2	8.1	8.0	8.0	8.1
Cond. (µmhos/cm)	Initial	681	678	677	702	693	669	703
1.56 %								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO (mg/L)	Initial	8.4	8.4	8.3	8.4	8.2	8.2	8.2
	Final	7.5	7.5	6.9	6.7	6.7	7.1	7.5
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.4	8.3
	Final	8.1	8.1	8.1	8.0	8.0	8.1	8.1
Cond. (µmhos/cm)	Initial	708	705	698	728	717	746	715
25 %								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO (mg/L)	Initial	8.4	8.4	8.4	8.5	8.3	8.3	8.3
	Final	7.5	7.4	7.2	6.8	6.7	7.0	7.5
pH	Initial	8.1	8.1	8.2	8.2	8.1	8.2	8.2
	Final	8.0	8.0	8.0	7.9	7.9	7.9	8.0
Cond. (µmhos/cm)	Initial	1062	1067	1065	1086	1070	1137	1093
100 %								
Temp.(°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0	25.0
	Final	24.5	24.5	25.0	24.0	24.0	25.0	25.0
DO (mg/L)	Initial	8.5	8.5	8.8	8.9	9.0	8.8	9.2
	Final	7.6	7.7	7.3	7.0	6.8	7.6	7.5
pH	Initial	7.1	7.1	7.2	7.2	7.2	7.3	7.1
	Final	7.3	7.3	7.2	7.1	7.0	7.0	7.2
Cond. (µmhos/cm)	Initial	2185	2188	2188	2188	2183	2330	2222

"–" = not measured

[2] % saturation (adjusted for actual temperature and barometric pressure)

[3] ≤100 bubbles/minute

Test Data Reviewed By : VC
Date: 2018-10-04

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		

Test Method : Test of Reproduction and Survival using the Cladoceran *Ceriodaphnia dubia*. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/21, 2nd ed. (February 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
LC50	>100%	-	-
IC25 (Reproduction)	90.1%	23.3-96.3	Linear Interpolation (TOXSTAT) d

The results reported relate only to the sample tested and as received.

SODIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-08-28		
Test Duration :	6 days	Analyst(s) :	MW, MA
IC25 Reproduction :	1.46 g/L	LC50 :	2.32 g/L
95% Confidence Limits :	0.98 - 1.82 g/L	95% Confidence Limits :	1.80 - 3.00 g/L
Statistical Method :	Linear Interpolation (CETIS)[a]	Statistical Method :	Binomial (CETIS)[a]
Historical Mean IC25 :	1.30 g/L	Historical Mean LC50 :	2.23 g/L
Warning Limits (± 2SD) :	0.98 - 1.73 g/L	Warning Limits (± 2SD) :	1.84 - 2.70 g/L

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

Sample Filtration :	None	Test Volume per Replicate :	15 mL
Test Aeration :	None	Test Vessel :	19 mL polystyrene vial
pH Adjustment :	None	Depth of Test Solution :	4.8 cm
Hardness Adjustment :	None	Organisms per Replicate :	1
Daily Renewal Method :	Transferred to fresh solutions	Number of Replicates :	10
Control/Dilution Water :	Well water (no chemicals added)	Test Method Deviation(s) :	None

COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.
•Statistical analysis could not be performed using non linear regression, since a suitable model could not be found. Therefore, test results were calculated using Linear Interpolation (Toxstat)[d]. In test concentrations where reproduction was stimulated (greater than the control), data were replaced with control values for the purposes of statistical analysis, as recommended by Environment Canada (2005).

Work Order : 237106
Sample Number : 56153

TEST ORGANISMS

Test Organism :	*Ceriodaphnia dubia*	Range of Age (at start of test) :	19:40 h - 23:40 h
Organism Batch :	Cd18-09	Mean Brood Organism Mortality :	3.3%
Organism Origin :	Single in-house mass culture	Ephippia in Culture :	No
Test Organism Origin :	Individual in-house cultures		

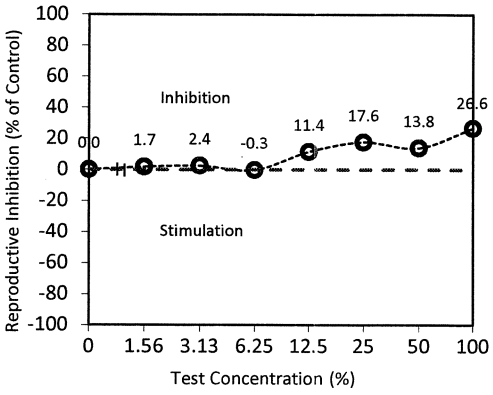
Brood Organism Neonate Production

Replicate :	1	2	3	4	5	6	7	8	9	10	Mean
Total (third or subsequent brood):	16	9	15	15	15	17	12	17	16	15	14.7
Total (first three broods):	23	19	23	19	21	23	21	25	20	23	21.7

No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test.

TEST DATA

***Ceriodaphnia dubia* Reproductive Inhibition**



Cumulative Daily Test Organism Mortality (%)

		Test Concentration (%)							
Date	**Test Day**	Control	1.56	3.13	6.25	12.5	25	50	100
2018-09-07	1	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0
2018-09-09	3	0	0	0	0	0	0	0	0
2018-09-10	4	0	0	0	0	0	0	10	10
2018-09-11	5	0	0	0	0	10	0	10	10
2018-09-12	6	0	0	0	0	10	0	20	10
Total Mortality (%)		0	0	0	0	10	0	20	10

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

[d] West, Inc. and D. Gulley. 1996. Toxstat Release 3.5. Western Ecosystems Technology. Cheyenne, WY, U.S.A.

Environment Canada, 2005. Guidance Document on Statistical Methods for Environmental Toxicity Tests. Environmental Protection Series, Ottawa, Ont., Rept. EPS 1/RM/46.

Date : 2018-10-16
yyyy-mm-dd

Approved By : *Project Manager*

AQUATOX

TOXICITY TEST REPORT

Ceriodaphnia dubia
EPS 1/RM/21

Work Order : 237106
Sample Number : 56153

Ceriodaphnia dubia Survival and Reproduction

Test Initiation Date : 2018-09-06
Initiation Time : 13:40
Test Completion Date : 2018-09-12

Concentration (%) Control	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)	Analyst(s)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0	RD
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0	HR
2018-09-09	3	5	5	6	6	3	6	4	5	7	6	5.3	AW
2018-09-10	4	9	8	8	10	0	12	12	11	8	0	7.8	SK
2018-09-11	5	0	0	0	0	8	0	0	0	0	14	2.2	SK
2018-09-12	6	13	11	11	13	11	14	16	16	14	17	13.6	CCM(VC)
Total		**27**	**24**	**25**	**29**	**22**	**32**	**32**	**32**	**29**	**37**	**28.9 (±4.5)**	

Concentration (%) 12.5	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	5	5	5	4	4	4	5	6	5	4	4.7
2018-09-10	4	10	8	10	8	0	11	9	11	10	0	7.7
2018-09-11	5	0	0	0	0	9	0	0	0	0 x	12	2.1
2018-09-12	6	10	12	11	12	11	13	15	14	0	13	11.1
Total		**25**	**25**	**26**	**24**	**24**	**28**	**29**	**31**	**15**	**29**	**25.6 (±4.4)**

Concentration (%) 1.56	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	4	3	3	6	5	6	5	5	4	5	4.6
2018-09-10	4	0	8	10	7	13	12	13	8	9	1	8.1
2018-09-11	5	11	0	0	0	0	0	0	0	0	11	2.2
2018-09-12	6	12	12	12	13	16	16	11	13	14	16	13.5
Total		**27**	**23**	**25**	**26**	**34**	**34**	**29**	**26**	**27**	**33**	**28.4 (±3.9)**

Concentration (%) 25	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	0	6	3	6	2	1	4	2	4	2	3
2018-09-10	4	9	7	7	10	0	7	10	10	5	12	7.7
2018-09-11	5	0	0	0	0	8	0	0	0	0	0	0.8
2018-09-12	6	14	12	12	15	11	15	13	11	8	12	12.3
Total		**23**	**25**	**22**	**31**	**21**	**23**	**27**	**23**	**17**	**26**	**23.8 (±3.8)**

Concentration (%) 3.13	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	2	6	5	4	4	5	5	4	6	5	4.6
2018-09-10	4	9	10	10	7	0	11	10	11	13	9	9
2018-09-11	5	0	0	0	0	8	0	0	0	0	0	0.8
2018-09-12	6	14	11	14	13	13	16	13	15	16	13	13.8
Total		**25**	**27**	**29**	**24**	**25**	**32**	**28**	**30**	**35**	**27**	**28.2 (±3.4)**

Concentration (%) 50	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	5	2	5	6	4	4	5	4	3	3	4.1
2018-09-10	4	8	11	7	10	8	14	10	9 x	10	11	9.8
2018-09-11	5	0	0	0	0	0	0	0	0	0	0	0
2018-09-12	6	14	15	11	14	12	13	2 x	0	14	15	11
Total		**27**	**28**	**23**	**30**	**24**	**31**	**17**	**13**	**27**	**29**	**24.9 (±5.8)**

Concentration (%) 6.25	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	5	4	3	6	1	5	6	5	4	4	4.3
2018-09-10	4	11	10	9	10	2	13	11	9	11	9	9.5
2018-09-11	5	0	0	0	0	8	0	0	0	0	0	0.8
2018-09-12	6	14	12	15	14	13	14	15	17	14	16	14.4
Total		**30**	**26**	**27**	**30**	**24**	**32**	**32**	**31**	**29**	**29**	**29.0 (±2.6)**

Concentration (%) 100	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Mean Young (±SD)
2018-09-07	1	0	0	0	0	0	0	0	0	0	0	0
2018-09-08	2	0	0	0	0	0	0	0	0	0	0	0
2018-09-09	3	2	6	4	4	4	3	4	4	3	4	3.8
2018-09-10	4	10	10	7	11	12	10	9	0 x	11	12	9.2
2018-09-11	5	0	0	0	0	0	0	0	0	0	0	0
2018-09-12	6	7	3	7	11	13	10	12	0	9	10	8.2
Total		**19**	**19**	**18**	**26**	**29**	**23**	**25**	**4[1]**	**23**	**26**	**21.2 (±7.0)**

NOTES : •All young produced by a test organism during its fourth and subsequent broods were discarded and not included in the above counts. The presence of two or more neonates in any test chamber, during any given day of the test, constitutes a brood.
•[1] Outlier according to Grubbs Test (CETIS)[a]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"x"= test organism mortality
"*"= accidental test organism mortality
"–"=4th brood (see 'NOTES')

Data Reviewed By : VC
Date : 2018-10-04

Work Order : 237106
Sample Number: 56153

Ceriodaphnia dubia Water Chemistry Data

Initial Chemistry:	Temp. (°C)	DO (mg/L)	pH	Conductivity (µmhos/cm)	Hardness (mg/L as $CaCO_3$)
	24.0	8.7	6.8	2184	540

Date :		Day 0 - 1 2018-09-06	Day 1 - 2 2018-09-07	Day 2 - 3 2018-09-08	Day 3 - 4 2018-09-09	Day 4 - 5 2018-09-10	Day 5 - 6 2018-09-11
Sub-sample Used		1	1	1	2	2	3
Temperature (°C)		24.0	24.0	24.0	24.0	25.0	25.0
Dissolved Oxygen (mg/L)		8.7	8.5	9.1	9.5	9.4	8.9
Dissolved Oxygen % Sat.[2]		105	103	109	114	113	108
pH		6.8	6.9	6.9	6.9	7.0	6.8
Pre-aeration Time (min)[3]		20	20	20	20	20	20
Analyst(s)	Initial	SD(RD)	SD(RD)	RK(VC)	RK(VC)	SD(RD)	SD(RD)
	Final	SD(RD)	HR	AW	SK	SK	CCM(VC)
Control (0%)							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO % Sat.[2]	Initial	100	100	101	100	100	100
DO (mg/L)	Initial	8.2	8.3	8.3	8.4	8.4	8.2
	Final	7.7	7.7	7.4	7.1	6.8	7.2
pH	Initial	8.4	8.3	8.3	8.3	8.4	8.4
	Final	8.2	8.2	8.2	8.2	8.2	8.1
Cond. (µmhos/cm)	Initial	681	678	677	702	693	669
1.56 %							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO (mg/L)	Initial	8.4	8.4	8.3	8.4	8.2	8.2
	Final	7.7	7.6	7.5	7.2	7.1	7.3
pH	Initial	8.3	8.3	8.3	8.4	8.3	8.4
	Final	8.2	8.2	8.2	8.2	8.2	8.2
Cond. (µmhos/cm)	Initial	708	705	698	728	717	746
25 %							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO (mg/L)	Initial	8.4	8.4	8.4	8.5	8.3	8.3
	Final	7.6	7.7	7.4	7.2	6.9	7.2
pH	Initial	8.1	8.1	8.2	8.2	8.1	8.2
	Final	8.1	8.0	8.1	8.0	8.0	8.0
Cond. (µmhos/cm)	Initial	1062	1067	1065	1086	1070	1137
100 %							
Temp. (°C)	Initial	25.0	24.0	24.0	24.0	25.0	24.0
	Final	24.0	24.0	24.5	24.0	24.0	24.5
DO (mg/L)	Initial	8.5	8.5	8.8	8.9	9.0	8.8
	Final	7.8	7.9	7.6	7.5	7.2	7.5
pH	Initial	7.1	7.1	7.2	7.2	7.2	7.3
	Final	7.5	7.5	7.5	7.4	7.4	7.3
Cond. (µmhos/cm)	Initial	2185	2188	2188	2188	2183	2330

"–" = not measured

[2] % saturation (adjusted for actual temperature and barometric pressure)

[3] ≤100 bubbles/minute

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TOXICITY TEST REPORT

Lemna minor
EPS 1/RM/37

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		

Test Method : Test for Measuring the Inhibition of Growth using the Freshwater Macrophyte, *Lemna minor.* Method Development and Application Section, Environmental Technology Centre, Environment Canada. Ottawa, Ontario. Report EPS 1/RM/37, 2nd ed. (January 2007).

TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Weight)	>97.0%	-	-
IC25 (Frond Production)	>97.0%	-	-

The results reported relate only to the sample tested and as received.

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Date Tested :	2018-09-12	Statistical Method :	Non-Linear Regression (CETIS)[a]
Test Duration :	7 days	Historical Geometric Mean IC25 :	2.11 g/L
IC25 (Frond Production) :	2.45 g/L	Warning Limits (± 2SD) :	1.57 - 2.85 g/L
95% Confidence Limits :	1.99 - 2.90 g/L	Growth Medium :	Modified APHA
		Analyst(s) :	MDS

The reference toxicant test was performed under the same experimental conditions as those used with the test sample.

TEST CONDITIONS

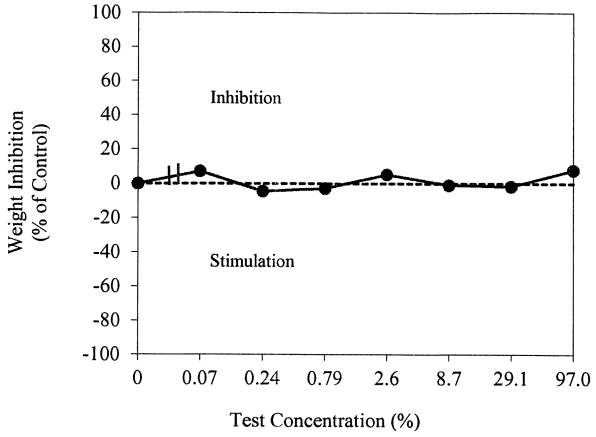
Test Organism :	*Lemna minor* L., Strain 7730	Test Type :	Static (no sub-samples required)
Organism Batch :	Lm18-08	Control/Dilution Medium :	Modified APHA
Culture Origin :	UTCC 492	Medium Preparation Water :	Distilled Water
Test Organism Source :	Axenic in-house culture	Source of Water :	Morning Mist
Culture Medium :	Modified Hoaglands E+	Medium Preparation Chemicals :	Modified APHA stocks A, B, C (10 mL/L)
Age (on Test Day 0) :	9 days	Nutrient Spiking of Sample :	Modified APHA stocks A, B, C (10 mL/L)
Health Criteria (in APHA) :	16.16-fold frond increase in 7 days	Replicates per Concentration :	4
Organism Acclimation :	19:50 h in APHA medium	Test Volume per Replicate :	100 mL
Inoculum (Test Day 0) :	2 plants (3 fronds per plant)	Test Vessel :	250 mL glass Erlenmeyer flask
Sample Filtration :	1 µm (Whatman GF/C)	Depth of Test Solution :	4.0 cm
Sample Pre-aeration :	20 min. at ≤100 bubbles/min.	Photoperiod/Light Intensity :	Continuous, 4290 - 5440 lux
pH Adjustment :	None	Test Method Deviation(s) :	None
Hardness Adjustment :	None		

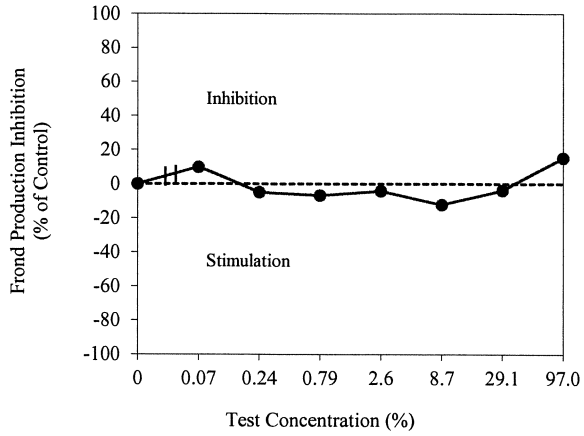
COMMENTS

•All test validity criteria as specified in the test method cited above were satisfied.

Work Order : 237106
Sample Number : 56153

Lemna minor Growth Inhibition





TEST MONITORING

Initiation Date : 2018-09-06
Intitiation Time : 13:15
Initiated By : SEW

Termination Date : 2018-09-13
Termination Time : 13:10
Terminated By : MDS

Temperature Monitoring

Test Day	Date	Temperature (°C)
0 (unmodified sample)	2018-09-06	25.0
0	2018-09-06	25.0
1	2018-09-07	24.0
2	2018-09-08	24.0
3	2018-09-09	24.0
4	2018-09-10	24.0
5	2018-09-11	24.0
6	2018-09-12	24.0
7	2018-09-13	24.0

pH Monitoring

Concentration (%)	Day 0	Day 7
100 (unmodified sample)	6.8	–
Control	8.3	8.4
0.07	8.2	8.4
0.24	–	–
0.79	–	–
2.6	8.3	8.4
8.7	–	–
29.1	–	–
97.0	7.8	9.2

"–" = not required

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-10-16
yyyy-mm-dd

Approved By:
Project Manager

Work Order : 237106
Sample Number : 56153

Lemna minor Frond Increase

Test Concentration (%)	Replicate	Frond Count Day 0*	Frond Count Day 7	Frond Increase	Mean Frond Increase	Standard Deviation	CV (%)	Frond/Root Appearance (Day 7)
Control	A	6	69	63	66.25	8.06	12.2	Fronds healthy, appearance normal in all replicates.
	B	6	83	77				
	C	6	73	67				
	D	6	64	58				
0.07	A	6	77	71	59.75	9.00	15.1	Fronds healthy, appearance normal in all replicates.
	B	6	58	52				
	C	6	69	63				
	D	6	59	53				
0.24	A	6	65	59	69.50	8.23	11.8	Fronds healthy, appearance normal in all replicates.
	B	6	75	69				
	C	6	77	71				
	D	6	85	79				
0.79	A	6	87	81	70.75	10.01	14.2	Fronds healthy, appearance normal in all replicates.
	B	6	79	73				
	C	6	78	72				
	D	6	63	57				
2.6	A	6	68	62	69.00	11.49	16.7	Fronds healthy, appearance normal in all replicates.
	B	6	68	62				
	C	6	92	86				
	D	6	72	66				
8.7	A	6	78	72	74.25	11.15	15.0	Fronds healthy, appearance normal in all replicates. Solutions very pale green in colour.
	B	6	82	76				
	C	6	67	61				
	D	6	94	88				
29.1	A	6	64	58	68.75	13.20	19.2	Fronds healthy, appearance normal in all replicates. Solutions light green in colour.
	B	6	94	88				
	C	6	70	64				
	D	6	71	65				
97.0	A	6	63	57	56.25	7.50	13.3	Fronds healthy, appearance normal in all replicates. Solutions green in colour with some settled solids.
	B	6	72	66				
	C	6	60	54				
	D	6	54	48				

NOTES: *No unusual appearance or treatment of culture prior to testing. Test inoculated with healthy plants.

•No significant stimulation (α=0.05) of frond increase was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.

•A 12.0-fold increase in frond number was observed in the control over the testing period.

•No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-10-04

Work Order : 237106
Sample Number : 56153

Lemna minor Frond Weight Data

Test Concentration (%)	Replicate	Dry Weight of Fronds (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation
Control	A	7.26	7.63	0.85
	B	8.85		
	C	7.52		
	D	6.89		
0.07	A	7.20	7.09	0.55
	B	6.54		
	C	7.80		
	D	6.82		
0.24	A	7.10	7.97	0.80
	B	7.80		
	C	7.94		
	D	9.04		
0.79	A	8.39	7.85	0.70
	B	8.02		
	C	8.16		
	D	6.83		
2.6	A	7.00	7.23	1.01
	B	6.22		
	C	8.63		
	D	7.07		
8.7	A	8.05	7.70	1.45
	B	6.79		
	C	6.36		
	D	9.59		
29.1	A	7.29	7.76	0.62
	B	8.56		
	C	7.25		
	D	7.94		
97.0	A	6.70	7.03	0.75
	B	8.10		
	C	6.96		
	D	6.37		

NOTES :

- No significant stimulation (α=0.05) of frond weight was detected by ANOVA-Dunnett Multiple Comparison Test (CETIS)[a] at any test level compared to the control.
- No outlying data points were detected according to Grubbs Test (CETIS)[a].

"–" = not available/not required

Test Data Reviewed By : VC
Date : 2018-10-04

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B-11 Nicholas Beaver Rd.
Puslinch ON N0B 2J0
Tel: (519) 763-4412 Fax: (519) 763-4419

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata
EPS 1/RM/25

Work Order : 237106
Sample Number : 56153

SAMPLE IDENTIFICATION

Company :	Agnico Eagle Mines Limited - Meliadine Project		
Location :	Rankin Inlet NU	Date Collected :	2018-09-03
Substance :	MEL-14	Time Collected :	07:00
Sampling Method :	Grab	Date Received :	2018-09-06
Sampled By :	J. Brown	Time Received :	09:45
Temp. on arrival :	22.0°C	Date Tested :	2018-09-06
Sample Description :	Clear, yellow, odourless		
Test Method :	Growth Inhibition Test Using a Freshwater Alga. Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/25, 2nd ed. (March 2007), with deviation(s) as noted below.		

72-h TEST RESULTS

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Growth)	>90.91%	-	-

The results reported relate only to the sample tested and as received.

ZINC (AS ZINC SULPHATE) REFERENCE TOXICANT DATA

Date Tested :	2018-09-24	Statistical Method :	Nonlinear Regression* (CETIS)[a]
Organism Batch :	Ps18-09	Historical Mean IC25 :	10.4 µg/L
Test Duration :	72 hours	Warning Limits (± 2SD) :	4.8 - 22.3 µg/L
IC25 Growth :	10.3 µg/L	Analyst(s) :	MA
95% Confidence Limits :	8.6 - 11.9 µg/L		

The reference toxicity test was performed under the same experimental conditions as those used with the test sample.

TEST ORGANISM

Test Organism :	*Pseudokirchneriella subcapitata*	Source :	In-house culture
Culture Origin :	University of Waterloo, Waterloo ON	Cell Density at 0-h :	10409 cells/mL
Strain Number :	CPCC 37	Inoculum Prepared :	00:10 h prior to test initiation
Organism Batch :	Ps18-09	Age (at start of test) :	3 days (in exponential growth)

•Algal growth curve is determined at least twice per year as required by the test method cited above.

•No unusual appearance or treatment of culture prior to testing.

TEST CONDITIONS

Test Type :	Static	Volume per Replicate :	220 µL
Test Duration :	72 hours	Control Replicates:	10
Mean Temperature (± SD):	24.0°C (± 0.0)	Test Replicates :	4
Sample Pre-aeration :	None	Concentrations Tested :	10 + Control
Sample Filtration :	0.45 µm preconditioned filter	Photoperiod :	Continuous light
Volume Filtered:	≥10 mL	Light Intensity :	4160-4350 lux
Control/Dilution Water :	Millipore Milli-Q (no chemicals added)	pH Adjustment :	None
Enrichment Medium :	Stock 2B: EDTA reduced to 25%	Hardness Adjustment :	None
Test Vessel :	U-shaped polystyrene microplate	Test Method Deviation(s) :	None

COMMENTS

Noted Deviation(s) : A reference toxicant test was not started within 14 days of the toxicity test, as required by the test method.

•All test validity criteria as specified in the test method cited above were satisfied.

*Box Cox weighting (CETIS)[a] was applied.

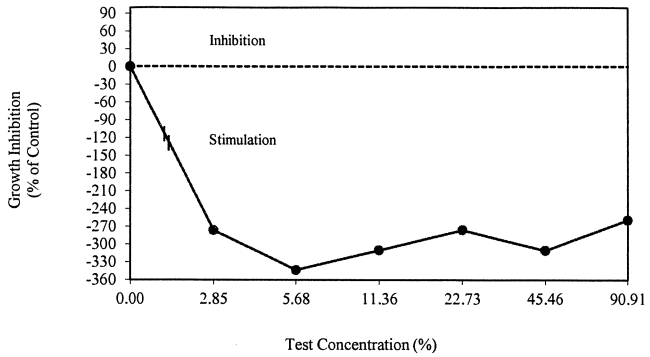
AQUATOX

TOXICITY TEST REPORT

Pseudokirchneriella subcapitata

Work Order : 237106
Sample Number : 56153

***Pseudokirchneriella subcapitata* Growth Inhibition**



CELL ENUMERATION AT 72-HOURS

Initiated By : SEW
Completion/Enumeration Date : 2018-09-09
Enumerated By : SF
Enumeration Method : Manual (haemocytometer)

Sample pH (at 0 hours) : 6.8
Control pH (at 0 hours) : 7.0
Control pH (at 72 hours) : 7.0
Control Cell Increase Factor : 27.6 times growth

Concentration	Cell Concentration (x 10000 cells/mL) Replicate								Cell Yield (x 10000 cells/mL) Mean	Standard Deviation	CV (%)	Stimulation (% of control)**
(%)	1	2	3	4	7	8	9	10				
Control	30.5	22.0	23.5	37.5	27.5	24.5	32.5	32.0	27.71	5.30	19.15	–
0.18	–	–	–	–	–	–	–	–	–	–	–	–
0.35	–	–	–	–	–	–	–	–	–	–	–	–
0.71	–	–	–	–	–	–	–	–	–	–	–	–
1.42	–	–	–	–	–	–	–	–	–	–	–	–
2.85	107.0	110.0	99.0	–	–	–	–	–	104.29	5.69	5.45	276.38
5.68	128.0	123.5	120.5	–	–	–	–	–	122.96	3.77	3.07	343.75
11.36	117.0	118.0	109.0	–	–	–	–	–	113.63	4.93	4.34	310.07
22.73	126.5	111.0	78.0[1]	–	–	–	–	–	104.13	24.77	23.79	275.78
45.46	132.0	107.0	105.5	–	–	–	–	–	113.79	14.89	13.08	310.67
90.91	110.0	94.5	97.0	–	–	–	–	–	99.46	8.32	8.37	258.94

NOTES : **Statistically significant stimulation, according to ANOVA/Dunnett Multiple Comparison Test (CETIS)[a], (a=0.05).
•Control replicates 5 and 6 used for pH measurement.
•The Mann-Kendall test shows that there is no inhibitory gradient (α=0.05).
• [1]Outlier according to Grubbs Test (CETIS)[a]. Outlying data points were not excluded from statistical analysis, since they could not be attributed to error.

"–" = not enumerated/not required

Data Reviewed By : VC
Date : 2018-10-04

REFERENCES

[a] CETIS™, © 2000-2018. V.1.9.4.7. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, LLC, McKinleyville, CA 95519 [Program on disk and printed User's Guide].

Date : 2018-10-16
yyyy-mm-dd

Approved By :
Project Manager

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 237106

Shipping Address: AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR #3
Guelph, Ontario Canada N1H 6H9

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	580278
Field Sampler Name (print):	Jennifer Brown
Signature:	
Affiliation:	Agnico Eagle Mines Ltd. - Meliadine Division
Sample Storage (prior to shipping):	Shipped immediately after sampling
Custody Relinquished by:	Jennifer Brown
Date/Time Shipped:	2018-09-03 - 08:00

Client: Agnico Eagle Mines Limited
Meliadine Project
Rankin Inlet, Nunavut, Canada
X0C 0G0

Phone: (819) 759-3555

Fax:

Contact: Jennifer Brown

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	RISS Data Entry	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2018-09-03	07:00	EWTP MEL-14b (Post-treatment)	56153	22.0					✓	✓	✓	✓			✓		3 x 20L

For Lab Use Only

Received By: EJS/MJT
Date: 2018-09-06
Time: 0945
Storage Location:
Storage Temp.(°C)

Please list any special requests or instructions:

TOXICOLOGY analysis required

Phone number: 819-759-3555 ext 3996

Appendix H-2

EEM and MDMER monthly mean concentrations, pH range and effluent volume

Month	As		Cu		CN		Pb		Ni		Zn		TSS		Ra 226		pH	Number day of discharge	Daily volume	Monthly volume	Results for Rainbow Trout Acute Lethality Tests (mean percentage mortality in 100% effluent test concentration)	Results for Daphnia magna Monitoring Tests (mean percentage mortality in 100% effluent test concentration)
	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L				m^3/day	m^3		
January																						
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	0	NDEP	0	NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)																						
Charge (Kg)																						
February																						
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	0	NDEP	0	NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)																						
Charge (Kg)																						
March																						
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	0	NDEP	0	NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
NDEP	NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)																						
Charge (Kg)																						

NDEP :No Deposit
NMR: No Measurement Required
N/A: Technician forgot to take the reading

Month	As		Cu		CN		Pb		Ni		Zn		TSS		Ra 226		pH	Number day of discharge	Daily volume	Monthly volume	Results for Rainbow Trout Acute Lethality Tests (mean percentage mortality in 100% effluent test concentration)	Results for Daphnia magna Monitoring Tests (mean percentage mortality in 100% effluent test concentration)
	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L				m^3/day	m^3		
April																						
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	0	NDEP	0	NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)																						
Charge (Kg)																						
May																						
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	0	NDEP	0	NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)																						
Charge (Kg)																						
June																						
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	10	NDEP	134272	NDEP	NDEP
NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP				NDEP	NDEP
24-Jun-18	0.00205	0.00205	0.00225	0.00225	< 0.0005	0.00025	0.0003	0.0003	0.0031	0.0031	0.0075	0.0075	5	5	< 0.005	0.0025	7.59		15091		10	0
Monthly concentration (mg/L)		0.00205		0.00225		0.00025		0.0003		0.0031		0.0075		5		0.0025	7.59					
Charge (Kg)		0.2752576		0.302112		0.033568		0.0402816		0.4162432		1.00704		671.36		0.33568						

NDEP :No Deposit
NMR: No Measurement Required
N/A: Technician forgot to take the reading

Month	As		Cu		CN		Pb		Ni		Zn		TSS		Ra 226		pH	Number day of discharge	Daily volume	Monthly volume	Results for Rainbow Trout Acute Lethality Tests (mean percentage mortality in 100% effluent test concentration)	Results for Daphnia magna Monitoring Tests (mean percentage mortality in 100% effluent test concentration)
	1	0.5	0.6	0.3	2	1	0.4	0.2	1	0.5	1	0.5	30	15	1.11	0.37						
	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L				m^3/day	m^3		
July																						
1-Jul-18	0.00110	0.00110	0.00129	0.00129	< 0.005	0.0025	0.00033	0.00033	0.0025	0.0025	0.0054	0.0054	10	10	< 0.005	0.0025	7.11		16070		0	0
10-Jul-18	0.00117	0.00117	0.00139	0.00139	< 0.005	0.0025	< 0.0002	0.0001	0.0025	0.0025	0.0055	0.0055	5	5	< 0.005	0.0025	7.51		17672		NMR	NMR
15-Jul-18	0.00129	0.00129	0.00130	0.00130	< 0.005	0.0025	< 0.0002	0.0001	0.0022	0.0022	< 0.005	0.0025	9	9	< 0.005	0.0025	7.32	31	2590	352,551	NMR	NMR
23-Jul-18	0.00178	0.00178	0.00207	0.00207	< 0.005	0.0025	< 0.0002	0.0001	0.0025	0.0025	0.0086	0.0086	21	21	0.007	0.007	7.34		15691		NMR	NMR
29-Jul-18	0.00185	0.00185	0.00104	0.00104	< 0.005	0.0025	< 0.0002	0.0001	0.0023	0.0023	< 0.005	0.0025	8	8	< 0.005	0.0025	7		12237		NMR	NMR
Monthly concentration (mg/L)		0.001438		0.001418		0.0025		0.000146		0.0024		0.0049		10.60		0.0034						
Charge (Kg)		0.5069683		0.4999173		0.8813775		0.0514724		0.8461224		1.7274999		0		1.1986734						
August																						
5-Aug-18	0.00210	0.00210	0.00112	0.00112	< 0.005	0.0025	< 0.0002	0.0001	0.0028	0.0028	< 0.005	0.0025	8.00	8.00	< 0.005	0.0025	7.26		14846		0	0
13-Aug-18	0.00222	0.00222	0.00850	0.00850	< 0.005	0.0025	0.00022	0.00022	0.003	0.003	0.0085	0.0085	10.00	10.00	< 0.005	0.0025	7.37		4302		NMR	NMR
19-Aug-18	0.00295	0.00295	0.00099	0.00099	< 0.005	0.0025	< 0.0002	0.0001	0.0034	0.0034	0.0067	0.0067	11.00	11.00	0.008	0.008	7.18	26	3634	153,066	NMR	NMR
26-Aug-18	0.00028	0.00028	< 0.0005	0.000250	< 0.005	0.0025	< 0.0002	0.0001	< 0.001	0.0005	< 0.005	0.0025	< 1.00	0.50	< 0.005	0.0025	6.80		103		NMR	NMR
Monthly concentration (mg/L)		0.00189		0.002715		0.0025		0.00013		0.002425		0.00505		7.38		0.00388						
Charge (Kg)		0.28891		0.4155742		0.382665		0.0198986		0.3711851		0.7729833		0		0.5931308						
September																						
3-Sep-18	0.00237	0.00237	0.00062	0.00062	< 0.005	0.0025	< 0.0002	0.0001	0.0027	0.0027	< 0.005	0.0025	14.00	14.00	< 0.005	0.0025	7.08		532		0	0
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	3	NDEP	2,632	NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)		0.00237		0.00062		0.00250		0.00010		0.00270		0.00250		14.00		0.0025	7.08					
Charge (Kg)		0.00624		0.0016318		0.00658		0.0002632		0.0071064		0.00658		36.848		0.00658						
Quarterly charge (Kg)		0.80212		0.91712		1.27062		0.07163		1.22441		2.50706		36.8		1.79838				508249		

NDEP :No Deposit

NMR: No Measurement Required

Month	As		Cu		CN		Pb		Ni		Zn		TSS		Ra 226		pH	Number day of discharge	Daily volume	Monthly volume	Results for Rainbow Trout Acute Lethality Tests (mean percentage mortality in 100% effluent test concentration)	Results for Daphnia magna Monitoring Tests (mean percentage mortality in 100% effluent test concentration)
	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L				m^3/day	m^3		
October																						
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!						
Charge (Kg)		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!						
November																						
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)																						
Charge (Kg)																						
December																						
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP		NDEP		NDEP	NDEP
Monthly concentration (mg/L)																						
Charge (Kg)																						
Quarterly charge (Kg)		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!						

NDEP :No Deposit
NMR: No Measurement Required

AGNICO EAGLE

Location of Meliadine Discharge point: 63˚2'15.5''N 92˚13'06''W

Mois	As	Cu	CN	Pb	Ni	Zn	TSS	Ra 226	Lowest pH	Highest pH	Effluent Volume	Results for Rainbow Trout Acute Lethality Tests (mean percentage mortality in 100% effluent test concentration)	Results for Daphnia magna Monitoring Tests (mean percentage mortality in 100% effluent test concentration)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	Bq/L			m^3		
January	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
February	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
March	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
April	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
May	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
June	0.00205	0.00225	0.00025	0.0003	0.0031	0.0075	5	0.0025	7.59	7.59	134272	10	0
July	0.001438	0.001418	0.0025	0.000146	0.0024	0.0049	10.60	0.0034	7.00	7.51	352551	0	0
August	0.0018875	0.002715	0.0025	0.00013	0.002425	0.00505	7.38	0.0039	6.80	7.37	153,066	0	0
September	0.00237	0.00062	0.0025	0.0001	0.00270	0.00270	14.00	0.0025	7.08	7.08	2,632	0	0
October	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
November	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP
December	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP	NDEP

NDEP: No Deposit
NMR: No Measurement Required

642521

AGNICO EAGLE

	Alkalinity	Aluminium	Ammonia Nitrogen (NH3-NH4)	Cadmium	Hardness	Iron	Mercury	Molybdenum	Nitrate	Selenium	T°	pH	O_2	Conductivity	Arsenic	Ra226	TSS	Nickel	Zinc	Lead	Copper	Cyanide		Sub-Lethal Toxicity			
	mg $CaCO_3$/L	mg/L	mg N/L	mg/L	mg $CaCO_3$/L	mg/L	mg/L	mg/L	mg/L	mg/L	°C		mg/L	µS/cm	mg/L	Bq/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		*Ceriodaphia dubia*	*Pimephales promelas*	*Lemna minor*	*Pseudokirchneriella subcapitata*
Effluent characterization (63°2'15.5"N 92°13'06.3"W) (Mel-14)																											
23-Jul-18	39	4.39	0.47	0.00002	344	0.293	< 0.00001	< 0.001	4.48	< 0.0001	17.7	7.16		1605	0.00178	0.007	21	0.0025	0.0086	< 0.0002	0.00207	< 0.005	8/7/2018	>100.00%	>100.00%	72.30%	>90.90%
13-Aug-18	33	0.705	0.88	< 0.00001	491	0.134	< 0.00001	0.0018	3.18	< 0.0001	9.2	7.22		1925	0.00222	< 0.005	10	0.003	0.0085	0.00022	0.0085	< 0.005	8/13/2018	the Ceriodaphnia test for the sample collected August 13th did not pass the Control validity criteria	>100.00%	38.20%	>90.90%
19-Aug-18	37	1.03	0.8	< 0.00001	557	0.26	< 0.00001	0.0022	3.69	< 0.0001	7.8	7.8		2210	0.00295	0.008	11	0.0034	0.0067	< 0.0002	0.00099	< 0.005					
26-Aug-18	6.3	0.005	4.1	< 0.0001	57.1	< 0.01	< 0.00001	< 0.001	15.3	< 0.0001	14.2	7.49		1527	0.00028	< 0.005	< 1	< 0.001	< 0.005	< 0.0002	< 0.0005	< 0.005					
3-Sep-18	15	1.32	0.91	< 0.0001	544	0.153	< 0.00001	0.0014	5.74	< 0.0001	10	7.01		1998	0.00237	< 0.005	14	0.0027	< 0.005	< 0.0002	0.00062	< 0.005					
Water Quality Monitoring Exposure Area (63°01'44.6"N 92°09'14.6"W) (MEL-13)																											
23-Jul-18	16	6.64	< 0.05	0.000028	485	0.405	< 0.00001	0.0013	< 0.1	0.00011	15.7	7.16	11.7	79.6	0.00283	< 0.005	1	0.0033	0.0107	0.00021	0.00281	< 0.005					
20-Aug-18	17	0.0118	< 0.05	< 0.00001	25.3	0.029	< 0.00001	< 0.001	< 0.1	< 0.0001	10.8	8.16	11.8	81.6	0.00042	< 0.005	1	< 0.001	< 0.005	< 0.0002	0.00079	< 0.005					
26-Aug-18	15	0.0098	0.19	< 0.00001	24.5	0.024	< 0.00001	< 0.001	< 0.1	< 0.0001	10.1	7.75	12.0	84.2	0.00046	< 0.005	1	< 0.001	< 0.005	< 0.0002	0.00077	< 0.005					
4-Sep-18	16	0.0083	< 0.05	< 0.00001	25.2	0.019	< 0.00001	< 0.001	< 0.1	< 0.0001	10	8.19	12.2	85.4	0.00043	< 0.005	1	< 0.001	< 0.005	< 0.0002	0.00076	< 0.005					
Water Quality Monitoring Reference Area (63°06'52.2"N 92°20'23.6"W) (MEL-03-01)																											
25-Jul-18	16	0.00357	< 0.005	< 0.000005	21.1	0.0236	0.0000008	0.000083	1.26	0.00005	10.8	7.7	12.7	65.0	0.000195	< 0.0067	< 1	0.000706	0.00103	< 0.00001	0.00077	< 0.001	9/3/2018	90.10%	>100.00%	>97.00%	>90.90%
20-Aug-18	17.5	0.00283	< 0.005	< 0.000005	20.4	0.0178	0.0000006	0.000064	< 0.005	< 0.00004	10.7	8.52	11.9	71.0	0.000209	< 0.0074	< 1	0.000412	< 0.0008	0.00001	0.00064	< 0.001					
26-Aug-18	18	0.007	< 0.05	< 0.00001	21.4	0.014	< 0.00001	< 0.001	< 0.1	< 0.0001	9.2	6.75	12.4	75.6	0.0002	< 0.005	< 1	< 0.001	< 0.005	< 0.0002	0.00067	< 0.005					
15-Sep-18	17.9	0.00291	< 0.005	< 0.000005	38.7	0.0071	< 0.0000005	0.000067	0.0073	< 0.00004	6.11	7.26	12.5	73.9	0.000186	< 0.0097	< 1	0.000535	< 0.0008	< 0.00001	0.00088	< 0.001					

NDEP :No Deposit

Appendix H-3

Water monitoring stations results

MEL-SR1			Sample Date	5/27/2018	6/3/2018	6/10/2018	6/17/2018	6/25/2018	7/1/2018	7/7/2018	7/16/2018	8/4/2018	8/4/2018	8/11/2018	8/18/2018	8/19/2018	8/24/2018	9/1/2018	9/7/2018	9/16/2018	9/22/2018	9/29/2018
			Sample Name	MEL-SR1	MEL-SR1	MEL-SR1	MEL-SR1	MEL-SR1	MEL-SR1	MEL-SR1	MEL-SR1	MEL-SR1	MEL-SR1 US	MEL-SR1	MEL-SR1	MEL-SR1-US	MEL-SR-1	MEL-SR-1	MEL-SR1	MEL-SR1	MEL-SR-1	MEL-SR-1
Parameters	**MAX GRAB**	**MAX MEAN**	**Units**																			
Conventional Parameters																						
pH	6 - 9.5	6 - 9.5	pH	7.87	7.54	7.66	7.98	7.98	8.03	8.07	7.70	7.90	7.95	7.83	8.04	7.64	8.05	8.03	7.83	7.99	7.88	8.01
Specific conductivity			umhos/cm	240	210	410	570	-	-	-	-	-	-	-	-	-	-	1800	-	-	-	-
Total dissolved solids			mg/L	200	95	150	310															
Total suspended solids	100	50	mg/L	**500**	44	15	13	8	2	2	69	3	**120**	47	2	**990**	1	2	2	1	2	2
Total organic carbon			mg/L	-	-	5.4	-															
Turbidity			NTU	620	22	2	2	-	0.6	0.8	-	1.2	13	5.4	1.0	310	0.5	0.4	0.3	0.4	0.3	0.2
Major Ions																						
Bicarbonate, as CaCO3			mg/L	53	46	79	100															
Carbonate, as CaCO3			mg/L	< 1.0	< 1.0	< 1.0	< 1.0															
Calcium			mg/L					-	-	-	-	-	82	-	-	-	-	-	-	-	-	-
Chloride			mg/L	25	21	41	73	-	150	200	-	360	-	180	270	1100	290	290	310	310	340	350
Cyanide			mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	-	< 0.0050	-	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Fluoride			mg/L					-	0.11	0.13	-	0.13	-	0.13	0.16	0.13	0.12	0.20	0.14	0.13	0.15	0.13
Magnesium			mg/L	-	-	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-
Potassium			mg/L					-	-	-	-	-	13	-	-	-	-	-	-	-	-	-
Sodium			mg/L					-	-	-	-	-	110	-	-	-	-	-	-	-	-	-
Sulphate			mg/L	26	24	40	56	-	140	150	-	160	-	130	240	350	230	250	240	250	240	260
Reactive silica			mg/L	1.9	-	1.2	-															
Nutrients and Chlorophyll a																						
Nitrate			mg/L	0.86	0.16	0.27	0.24	-	0.20	0.16	-	0.78	-	1.64	0.30	-	0.38	0.30	0.42	0.48	0.77	0.74
Nitrite			mg/L	0.014	< 0.010	< 0.010	< 0.010	-	< 0.010	< 0.010	-	< 0.010	-	0.037	< 0.010	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nitrate + nitrite			mg/L					-	0.20	0.16	-	0.78	-	1.68	0.30	-	0.38	0.30	0.42	0.48	0.77	0.74
Total ammonia			mg/L	0.28	0.32	0.3	< 0.050	-	< 0.050	0.076	-	0.068	-	0.18	< 0.050	-	0.13	< 0.050	< 0.050	0.097	0.12	0.073
Total Kjeldahl nitrogen			mg/L	0.6	1.8	0.89	-															
Total phosphorus			mg/L	0.33	0.069	0.038	0.022	-	< 0.020	< 0.020	-	< 0.020	-	0.052	< 0.020	-	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Orthophosphate			mg/L	-	-	< 0.01	< 0.01	-	< 0.010	< 0.010	-	< 0.010	-	< 0.010	< 0.010	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
General Organics																						
Total oil and grease			mg/L	0.6	1.4	0.7	0.9	0.80	-	-	< 0.50	0.80	-	-	-	-	-	-	-	-	-	-
Total Metals																						
Aluminum			mg/L	-	-	0.404	0.272	-	0.0477	0.0355	-	0.0387	-	1.66	0.0684	-	0.0147	0.0131	0.0299	0.0058	0.0175	0.0180
Antimony			mg/L	-	-	0.0005	0.00053	-	< 0.00050	0.00059	-	0.00053	-	0.00131	< 0.00050	-	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic			mg/L	-	-	0.00135	0.00155	-	0.00234	0.00324	-	0.00419	-	0.00518	0.00370	-	0.00414	0.00422	0.00421	0.00370	0.00499	0.00351
Barium			mg/L	-	-	0.0269	0.0293	-	0.0501	0.0586	-	0.0709	-	0.0708	0.0654	-	0.0611	0.0736	0.0602	0.0535	0.0540	0.0612
Beryllium			mg/L	-	-	< 0.00010	< 0.00010	-	< 0.00010	< 0.00010	-	< 0.00010	-	< 0.00010	< 0.00010	-	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Boron			mg/L	-	-	< 0.050	< 0.050	-	0.072	0.061	-	0.119	-	0.078	0.073	-	0.075	0.089	0.083	0.070	0.090	0.086
Cadmium			mg/L	-	-	0.0000150	< 0.000010	-	0.000012	0.000023	-	0.000025	-	0.000029	0.000021	-	0.000023	0.000025	0.000032	0.000031	0.000075	0.000042
Calcium			mg/L	0.026	0.023	38.6	51.4	-	101	130	-	158	87	125	156	-	159	178	163	166	182	172
Chromium			mg/L	-	-	0.0031	0.0021	-	< 0.0010	< 0.0010	-	< 0.0010	-	0.0104	< 0.0010	-	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Copper			mg/L	-	-	0.00482	0.00411	-	0.00329	0.00432	-	0.00430	-	0.0101	0.00458	-	0.00434	0.00458	0.00466	0.00393	0.00530	0.00422
Iron			mg/L	-	-	0.647	0.518	-	0.123	0.158	-	0.277	-	2.58	0.213	-	0.092	0.136	0.131	0.088	0.143	0.111
Lead			mg/L	-	-	0.00044	0.00033	-	< 0.00020	< 0.00020	-	< 0.00020	-	0.00124	< 0.00020	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Lithium			mg/L	-	-	0.0036	0.0033	-	0.0056	0.0069	-	0.0612	-	0.0201	0.0171	-	0.0163	0.0313	0.0288	0.0246	0.0208	0.0180
Magnesium			mg/L	0.018	0.0039	6.95	10	-	19.0	26.3	-	30.8	23	25.5	31.0	-	30.7	32.9	35.2	34.7	38.6	38.8
Manganese			mg/L	-	-	0.0482	0.0264	-	0.0337	0.128	-	0.112	-	0.157	0.0410	-	0.0259	0.0343	0.0341	0.0259	0.0321	0.0286
Mercury			mg/L					-	< 0.00001	< 0.00001	-	< 0.00001	-	< 0.00001	< 0.00001	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum			mg/L	-	-	0.0012	0.0011	-	0.0013	0.0015	-	0.0014	-	0.0020	0.0012	-	0.0011	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nickel			mg/L	-	-	0.0053	0.0064	-	0.0110	0.0186	-	0.0297	-	0.0154	0.0236	-	0.0308	0.0333	0.0425	0.0386	0.0665	0.0639
Potassium			mg/L	0.011	0.003	5.01	5.73	-	10.3	13.0	-	14.3	14	11.8	13.3	-	14.0	15.7	14.3	14.5	14.8	16.0
Selenium			mg/L	-	-	< 0.00010	< 0.00010	-	< 0.00010	0.00011	-	0.00016	-	0.00029	0.00012	-	0.00013	0.00012	0.00013	0.00011	0.00015	0.00012
Silver			mg/L	-	-	< 0.000020	< 0.000020	-	< 0.000020	< 0.000020	-	< 0.000020	-	< 0.000020	< 0.000020	-	< 0.000020	< 0.000020	< 0.000020	< 0.000020	< 0.000020	< 0.000020
Sodium			mg/L	0.021	0.011	24.2	38.9	-	72.1	108	-	135	110	104	118	-	124	135	138	135	153	151
Strontium			mg/L	-	-	0.18	0.219	-	0.467	0.575	-	0.961	-	0.683	0.759	-	0.752	0.993	0.814	0.785	0.788	0.837
Thallium			mg/L	-	-	0.0000120	< 0.000010	-	0.000012	0.000013	-	0.000017	-	0.000035	0.000013	-	0.000012	0.000016	0.000011	< 0.000010	0.000011	0.000011
Tin			mg/L	-	-	< 0.005	< 0.0050	-	< 0.0050	< 0.0050	-	< 0.0050	-	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium			mg/L	-	-	0.0177	0.0117	-	< 0.0050	< 0.0050	-	< 0.0050	-	0.0729	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Uranium			mg/L	-	-	0.00096	0.00132	-	0.00291	0.00379	-	0.00355	-	0.00288	0.00307	-	0.00325	0.00328	0.00329	0.00315	0.00360	0.00342
Vanadium			mg/L	-	-	< 0.005	< 0.0050	-	< 0.0050	< 0.0050	-	< 0.0050	-	0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc			mg/L	-	-	0.0105	0.0121	-	0.0267	0.0458	-	0.0528	-	0.0189	0.0350	-	0.0506	0.0560	0.0942	0.0720	0.136	0.153

MEL-SR2			Sample Date	6/3/2018	6/10/2018	7/1/2018
			Sample Name	MEL-SR2	MEL-SR2	MEL-SR2
Parameters	**MAX GRAB**	**MAX MEAN**	**Units**			
Conventional Parameters						
pH	6 - 9.5	6 - 9.5	pH	7.57	7.55	7.70
Specific conductivity			umhos/cm	180	310	-
Total dissolved solids			mg/L	115	130	
Total suspended solids	100	50	mg/L	38	26	19
Total organic carbon			mg/L	-	6.6	
Turbidity			NTU	22	1.4	24
Major Ions						
Bicarbonate, as CaCO3			mg/L	38	65	
Carbonate, as CaCO3			mg/L	< 1.0	< 1.0	
Calcium			mg/L			-
Chloride			mg/L	14	26	180
Cyanide			mg/L	< 0.0050	< 0.0050	< 0.0050
Fluoride			mg/L			0.11
Magnesium			mg/L	-	-	-
Potassium			mg/L			-
Sodium			mg/L			-
Sulphate			mg/L	23	36	140
Reactive silica			mg/L	-	0.98	
Nutrients and Chlorophyll a						
Nitrate			mg/L	0.18	0.13	0.15
Nitrite			mg/L	< 0.010	< 0.010	< 0.010
Nitrate + nitrite			mg/L			0.15
Total ammonia			mg/L	0.2	0.38	0.46
Total Kjeldahl nitrogen			mg/L	1.8	1.2	
Total phosphorus			mg/L	0.052	0.26	0.032
Orthophosphate			mg/L	-	< 0.01	< 0.010
General Organics						
Total oil and grease			mg/L	< 0.50	-	-
Total Metals						
Aluminum			mg/L	-	0.294	0.306
Antimony			mg/L	-	< 0.0005	< 0.00050
Arsenic			mg/L	-	0.00116	0.00339
Barium			mg/L	-	0.019	0.0710
Beryllium			mg/L	-	< 0.0001	< 0.00010
Boron			mg/L	-	< 0.05	0.057
Cadmium			mg/L	-	0.0000130	0.000013
Calcium			mg/L	0.021	33.4	117
Chromium			mg/L	-	0.002	0.0024
Copper			mg/L	-	0.0037	0.00324
Iron			mg/L	-	0.494	4.01
Lead			mg/L	-	0.00022	0.00023
Lithium			mg/L	-	0.0025	0.0056
Magnesium			mg/L	0.003	5.19	24.5
Manganese			mg/L	-	0.0796	0.404
Mercury			mg/L			< 0.00001
Molybdenum			mg/L	-	< 0.001	0.0017
Nickel			mg/L	-	0.0035	0.0063
Potassium			mg/L	0.003	4.38	11.6
Selenium			mg/L	-	< 0.0001	0.00011
Silver			mg/L	-	< 0.00002	< 0.000020
Sodium			mg/L	0.0073	414	80.8
Strontium			mg/L	-	0.134	0.507
Thallium			mg/L	-	0.0000110	0.000018
Tin			mg/L	-	< 0.005	< 0.0050
Titanium			mg/L	-	0.0107	0.0153
Uranium			mg/L	-	0.00061	0.00289
Vanadium			mg/L	-	< 0.005	< 0.0050
Zinc			mg/L	-	0.0092	0.351

MEL-SR7			Sample Date	6/3/2018	6/10/2018	6/17/2018	6/25/2018	8/4/2018	8/20/2018
			Sample Name	MEL-SR7	MEL-SR7	MEL-SR7	MEL-SR7	MEL-SR7 US	MEL-SR7-US
Parameters	**MAX GRAB**	**MAX MEAN**	**Units**						
Conventional Parameters									
pH	6 - 9.5	6 - 9.5	pH	7.48	7.72	7.87	7.99	8.02	8.14
Specific conductivity			umhos/cm	17	390	480	-	-	-
Total dissolved solids			mg/L	110	170	265			
Total suspended solids	100	50	mg/L	42	2	3	2	81	52
Total organic carbon			mg/L	-	4.3	-			
Turbidity			NTU	21	1.8	1.2	-	8.5	9.3
Major Ions									
Bicarbonate, as CaCO3			mg/L	2.1	79	88			
Carbonate, as CaCO3			mg/L	40	< 1.0	< 1.0			
Calcium			mg/L				-	190	-
Chloride			mg/L	< 1.0	40	60	-	-	160
Cyanide			mg/L	< 0.0050	< 0.0050	< 0.005	-	-	-
Fluoride			mg/L				-	-	0.16
Magnesium			mg/L	-	-	-	-	29	-
Potassium			mg/L				-	20	-
Sodium			mg/L				-	120	-
Sulphate			mg/L	24	39	46	-	-	210
Reactive silica			mg/L	-	1.3	-			
Nutrients and Chlorophyll a									
Nitrate			mg/L	0.13	< 0.1	< 0.1	-	-	-
Nitrite			mg/L	0.016	< 0.01	< 0.01	-	-	-
Total ammonia			mg/L	0.34	< 0.05	< 0.050	-	-	-
Total Kjeldahl nitrogen			mg/L	2.1	0.28	-			
Total phosphorus			mg/L	0.07	0.021	0.033	-	-	-
Orthophosphate			mg/L	-	< 0.01	< 0.01	-	-	-
General Organics									
Total oil and grease			mg/L	190	1.7	< 0.5	1.5	-	-
Total Metals									
Aluminum			mg/L	-	0.346	0.139	-	-	-
Antimony			mg/L	-	< 0.0005	< 0.00050	-	-	-
Arsenic			mg/L	-	0.0012	0.00244	-	-	-
Barium			mg/L	-	0.0241	0.0226	-	-	-
Beryllium			mg/L	-	< 0.0001	< 0.00010	-	-	-
Boron			mg/L	-	< 0.05	< 0.050	-	-	-
Cadmium			mg/L	-	0.0000150	0.0000120	-	-	-
Calcium			mg/L	0.025	39.3	43.5	-	200	-
Chromium			mg/L	-	0.0027	< 0.0010	-	-	-
Copper			mg/L	-	0.00418	0.0043	-	-	-
Iron			mg/L	-	0.493	0.235	-	-	-
Lead			mg/L	-	0.00023	< 0.00020	-	-	-
Lithium			mg/L	-	0.0036	0.0027	-	-	-
Magnesium			mg/L	0.0035	6.7	7.84	-	35	-
Manganese			mg/L	-	0.028	0.0122	-	-	-
Molybdenum			mg/L	-	< 0.001	< 0.0010	-	-	-
Nickel			mg/L	-	0.0035	0.0059	-	-	-
Potassium			mg/L	0.003	4.86	4.3	-	22	-
Selenium			mg/L	-	< 0.0001	< 0.00010	-	-	-
Silver			mg/L	-	< 0.00002	< 0.000020	-	-	-
Sodium			mg/L	0.01	22.9	30.1	-	130	-
Strontium			mg/L	-	0.166	0.168	-	-	-
Thallium			mg/L	-	< 0.00001	< 0.000010	-	-	-
Tin			mg/L	-	< 0.005	< 0.0050	-	-	-
Titanium			mg/L	-	0.0136	0.0056	-	-	-
Uranium			mg/L	-	0.00066	0.00068	-	-	-
Vanadium			mg/L	-	< 0.005	< 0.0050	-	-	-
Zinc			mg/L	-	0.0073	0.0063	-	-	-

MEL-SR9			Sample Date	6/17/2018
			Sample Name	MEL-SR9
Parameters	**MAX GRAB**	**MAX MEAN**	**Units**	
Conventional Parameters				
pH	6 - 9.5	6 - 9.5	pH	7.98
Specific conductivity			umhos/cm	430
Total dissolved solids			mg/L	245
Total suspended solids	100	50	mg/L	**670**
Turbidity			NTU	270
Major Ions				
Bicarbonate, as CaCO3			mg/L	97
Carbonate, as CaCO3			mg/L	< 1.0
Chloride			mg/L	38
Cyanide			mg/L	< 0.005
Sulphate			mg/L	37
Nutrients and Chlorophyll a				
Nitrate			mg/L	2.32
Nitrite			mg/L	0.038
Total ammonia			mg/L	0.21
Total phosphorus			mg/L	0.24
Orthophosphate			mg/L	< 0.010
General Organics				
Total oil and grease			mg/L	< 0.50
Total Metals				
Aluminum			mg/L	19.3
Antimony			mg/L	< 0.00050
Arsenic			mg/L	0.00491
Barium			mg/L	0.069
Beryllium			mg/L	0.00011
Boron			mg/L	< 0.050
Cadmium			mg/L	0.000126
Calcium			mg/L	38.7
Chromium			mg/L	0.223
Copper			mg/L	0.0741
Iron			mg/L	31
Lead			mg/L	0.00578
Lithium			mg/L	0.0183
Magnesium			mg/L	23.3
Manganese			mg/L	0.531
Molybdenum			mg/L	0.0028
Nickel			mg/L	0.0936
Potassium			mg/L	6.48
Selenium			mg/L	0.0005
Silver			mg/L	0.0000440
Sodium			mg/L	35.3
Strontium			mg/L	0.149
Thallium			mg/L	0.0000870
Tin			mg/L	< 0.0050
Titanium			mg/L	0.606
Uranium			mg/L	0.0009
Vanadium			mg/L	0.047
Zinc			mg/L	0.0525

MEL-SR11			Sample Date	5/27/2018	6/3/2018	6/10/2018	6/17/2018	6/20/2018	8/4/2018	8/11/2018	8/18/2018
			Sample Name	MEL-SR11	MEL-SR11	MEL-SR11	MEL-SR11	MEL-SR11	MEL-SR11	MEL-SR11	MEL-SR11
Parameters	**MAX GRAB**	**MAX MEAN**	**Units**								
Conventional Parameters											
pH	6 - 9.5	6 - 9.5	pH	8.08	7.92	7.92	7.93	7.82	7.94	7.94	7.94
Specific conductivity			umhos/cm	290	1100	390	540	-	-	-	-
Total dissolved solids			mg/L	230	640	200	315	-			
Total suspended solids	100	50	mg/L	**1200**	**420**	**160**	19	15	31	3	11
Total organic carbon			mg/L	-	-	4.1	-	-			
Turbidity			NTU	2400	170	41	15	-	0.4	1.6	0.5
Major Ions											
Bicarbonate, as CaCO3			mg/L	86	110	76	89	-			
Carbonate, as CaCO3			mg/L	< 1.0	< 1.0	< 1.0	< 1.0	-			
Chloride			mg/L	34	210	35	64	-	680	480	600
Cyanide			mg/L	< 0.0050	< 0.0050	< 0.005	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050
Fluoride			mg/L						0.55	0.42	0.46
Sulphate			mg/L	21	75	33	44	-	490	300	350
Reactive silica			mg/L	2.5	-	2	-	-			
Nutrients and Chlorophyll a											
Nitrate			mg/L	1.04	2.09	4.58	4.87	-	28.9	26.2	20.5
Nitrite			mg/L	0.037	0.12	0.93	0.084	-	0.416	0.280	0.232
Nitrate + nitrite			mg/L						29.3	26.5	20.7
Total ammonia			mg/L	0.85	2.4	0.99	1.3	-	1.5	2.6	0.94
Total Kjeldahl nitrogen			mg/L	1.5	4	2.3	-	-			
Total phosphorus			mg/L	0.99	0.58	0.072	0.043	-	0.020	0.022	0.031
Orthophosphate			mg/L	-	-	< 0.01	-	-	< 0.010	< 0.010	< 0.010
General Organics											
Total oil and grease			mg/L	0.6	1	< 0.5	0.8	< 0.5	1.4	-	-
Total Metals											
Aluminum			mg/L	-	-	0.00586	0.000937	-	0.0533	0.227	0.150
Antimony			mg/L	-	-	0.00000107	0.00000258	-	0.0349	0.0269	0.0357
Arsenic			mg/L	-	-	0.00000381	0.00000234	-	0.00237	0.00295	0.00215
Barium			mg/L	-	-	0.0000327	0.0000159	-	0.0750	0.0599	0.0548
Beryllium			mg/L	-	-	< 0.0000001	< 0.00000010	-	< 0.00020	< 0.00020	< 0.00020
Boron			mg/L	-	-	0.000055	0.000085	-	0.35	0.28	0.36
Cadmium			mg/L	-	-	0.0000000410	0.0000000130	-	0.000033	0.000029	0.000101
Calcium			mg/L	0.063	0.069	0.0136	0.0164	-	151	112	111
Chromium			mg/L	-	-	0.0000677	0.0000078	-	< 0.0020	< 0.0020	< 0.0020
Copper			mg/L	-	-	0.0000269	0.00000704	-	0.0038	0.0056	0.0037
Iron			mg/L	-	-	0.00957	0.00148	-	0.079	0.365	0.247
Lead			mg/L	-	-	0.00000391	0.00000126	-	< 0.00040	< 0.00040	< 0.00040
Lithium			mg/L	-	-	0.0000067	0.0000024	-	0.0172	0.0136	0.0159
Magnesium			mg/L	0.042	0.038	0.00895	0.00769	-	81.9	57.5	63.7
Manganese			mg/L	-	-	0.000162	0.0000304	-	0.0129	0.0322	0.0216
Mercury			mg/L						< 0.00001	< 0.00001	< 0.00001
Molybdenum			mg/L	-	-	0.0000031	0.000004	-	0.0130	0.0113	0.0119
Nickel			mg/L	-	-	0.0000295	0.0000057	-	0.0042	0.0053	0.0046
Potassium			mg/L	0.018	0.017	0.0059	0.00593	-	36.8	28.2	28.1
Selenium			mg/L	-	-	0.00000054	0.00000049	-	0.00214	0.00144	0.00132
Silver			mg/L	-	-	< 0.00000002	< 0.000000020	-	< 0.000040	< 0.000040	< 0.000040
Sodium			mg/L	0.027	0.12	0.0527	0.0692	-	448	336	360
Strontium			mg/L	-	-	0.000051	0.0000685	-	0.676	0.589	0.565
Thallium			mg/L	-	-	0.0000000440	0.0000000240	-	0.000082	0.000072	0.000066
Tin			mg/L	-	-	< 0.000005	< 0.0000050	-	< 0.010	< 0.010	< 0.010
Titanium			mg/L	-	-	0.000215	0.0000314	-	< 0.010	0.011	< 0.010
Uranium			mg/L	-	-	0.00000112	0.00000222	-	0.0337	0.0287	0.0319
Vanadium			mg/L	-	-	0.0000172	< 0.0000050	-	< 0.010	< 0.010	< 0.010
Zinc			mg/L	-	-	0.000025	< 0.0000050	-	< 0.010	< 0.010	< 0.010

MEL-11 Parameters	Sample Date Units	6/20/2018	7/18/2018	8/15/2018	8/19/2018	9/2/2018	11/4/2018	12/2/2018
Field Parameters								
pH	pH units	7.13	8.24	8.27	8.71	7.86	7.86	-
Temperature	Celcius	6.3	11.8	14.4	10.3	8	6.3	-
Specific conductivity	umhos/cm	90.1	85.8	117.5	80.6	91.5	92.9	-
Conventional Parameters								
pH	pH units	7.11	7.16	7.31	7.24	7.59	7.20	7.28
Specific conductivity	umhos/cm	90	83	92	81	96	87	92
Hardness, as CaCO3	mg/L	24.9	24.6	27.6	22.4	30.0	42.6	26.5
Dissolved hardness, as CaCO3	mg/L	24.7	23.3	26.1	24.9	29.5	25.4	25.2
Total suspended solids	mg/L	1	1	3	2	1	< 1	1
Total dissolved solids	mg/L	185	85	55	60	75	15	80
Total organic carbon	mg/L	4.1	3.3	3.3	2.7	3.0	2.8	2.6
Dissolved organic carbon	mg/L	3.7	3.0	3.3	2.8	3.0	3.0	2.8
Turbidity	NTU	0.4	0.5	0.3	0.3	0.2	0.3	0.3
Major Ions								
Bicarbonate, as CaCO3	mg/L	17	15	16	20	22	21	22
Calcium	mg/L	7.64	7.26	8.22	7.92	9.58	8.01	7.83
Carbonate, as CaCO3	mg/L	<1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloride	mg/L	11	12	13	9.6	12	11	11
Cyanide	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Fluoride	mg/L	-	-	-	-	-	-	< 0.10
Magnesium	mg/L	1.35	1.26	1.35	1.24	1.37	1.3	1.37
Potassium	mg/L	1.12	0.939	0.929	0.934	1.09	1.07	1.13
Sodium	mg/L	5.57	5.16	5.35	5.11	5.02	5.31	5.56
Sulphate	mg/L	4.1	4.2	4.8	3.7	5.8	3.7	4.2
Reactive Silica	mg/L	0.54	0.41	0.33	0.31	0.41	<0.3	0.27
Nutrients and Chlorophyll a								
Nitrate	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrite	mg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nitrate + nitrite	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total ammonia	mg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.080
Total Kjeldahl nitrogen	mg/L	0.20	0.12	0.23	< 0.10	0.22	0.12	0.13
Total phosphorus	mg/L	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Orthophosphate	mg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
General Organics								
Total oil and grease	mg/L	-	1.4	0.80	< 0.50	-	-	-
Total Metals								
Aluminum	mg/L	0.0061	0.235	0.646	0.0227	0.0080	0.735	0.0059
Antimony	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic	mg/L	0.00034	0.00204	0.00280	0.00033	0.00033	0.00038	0.00030
Barium	mg/L	0.0092	0.0107	0.0197	0.0084	0.0100	0.0108	0.0095
Beryllium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Bismuth	mg/L	-	-	-	-	-	-	< 0.001
Boron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/L	< 0.00001	0.000012	0.000014	< 0.00001	< 0.00001	0.000013	< 0.00001
Calcium	mg/L	7.66	7.47	8.50	6.99	9.87	11.6	8.28
Chromium	mg/L	0.0066	0.0010	0.0019	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	-	-	-	-	-	-	< 0.0002
Copper	mg/L	0.00095	0.00263	0.00327	0.00092	0.00099	0.00146	0.00096
Iron	mg/L	0.053	0.538	1.86	0.055	0.015	0.176	0.07
Lead	mg/L	< 0.0002	0.00041	0.00052	< 0.0002	< 0.0002	0.00046	< 0.0002
Lithium	mg/L	< 0.002	< 0.002	0.0021	< 0.002	< 0.002	0.0021	< 0.002
Magnesium	mg/L	1.41	1.44	1.55	1.20	1.29	3.34	1.41
Manganese	mg/L	0.0123	0.0539	0.173	0.0085	0.0031	0.0288	0.0085
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	<0.001	0.0016	0.0028	<0.001	<0.001	<0.001	<0.001
Potassium	mg/L	1.09	0.988	1.13	0.884	1.03	1.17	1.14
Selenium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Silicon	mg/L	-	-	-	-	-	-	0.17
Silver	mg/L	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Sodium	mg/L	5.58	5.09	5.01	4.84	4.90	7.14	5.51
Strontium	mg/L	0.0371	0.0478	0.0561	0.0360	0.0543	0.0456	0.0432
Sulphur	mg/L	-	-	-	-	-	-	< 3
Thallium	mg/L	< 0.00001	< 0.00001	0.000016	< 0.00001	< 0.00001	-	< 0.00001
Tin	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Titanium	mg/L	< 0.005	0.0135	0.0381	< 0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/L	< 0.0001	< 0.0001	0.00013	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vanadium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	mg/L	< 0.005	< 0.005	0.0057	< 0.005	< 0.005	0.179	< 0.005
Zirconium	mg/L	-	-	-	-	-	-	< 0.0001
Dissolved Metals								
Aluminum	mg/L	0.0044	0.0047	0.0054	0.0054	0.0042	0.004	0.0036
Antimony	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic	mg/L	0.00029	0.00058	0.00041	0.00025	0.00032	0.00027	0.00024
Barium	mg/L	0.0092	0.0073	0.0083	0.0079	0.0091	0.0085	0.0084
Beryllium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Bismuth	mg/L	-	-	-	-	-	-	< 0.001
Boron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	-	-	-	-	-	-	< 0.0002
Copper	mg/L	0.00084	0.00069	0.00075	0.00079	0.00093	0.00077	0.00068
Iron	mg/L	0.0338	0.0324	0.0199	0.0080	0.0070	0.011	0.0281
Lead	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Lithium	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Manganese	mg/L	0.0122	0.0075	0.0024	0.0011	< 0.001	0.0041	0.0056
Mercury	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Molybdenum	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Silicon	mg/L	-	-	-	-	-	-	0.141
Silver	mg/L	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Strontium	mg/L	0.0359	0.0462	0.0515	0.0388	0.0514	0.0425	0.0420
Sulphur	mg/L	-	-	-	-	-	-	< 3
Thallium	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Tin	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Titanium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vanadium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Zirconium	mg/L	-	-	-	-	-	-	< 0.0001
Volatile Organics								
Benzene	mg/L	-	< 0.00020	< 0.00020	< 0.00020	-	< 0.00020	< 0.00020
Ethylbenzene	mg/L	-	< 0.00020	< 0.00020	< 0.00020	-	< 0.00020	< 0.00020
Toluene	mg/L	-	< 0.00020	< 0.00020	0.00092	-	< 0.00020	< 0.00020
Xylenes	mg/L	-	< 0.00040	< 0.00040	< 0.00040	-	< 0.00040	< 0.00040
m,p-Xylenes	mg/L	-	< 0.00040	< 0.00040	< 0.00040	-	< 0.00040	< 0.00040
o-Xylene	mg/L	-	< 0.00020	< 0.00020	< 0.00020	-	< 0.00020	< 0.00020
F1 (C6-C10)-BTEX	mg/L	-	< 0.025	< 0.025	< 0.025	-	< 0.025	< 0.025
F1 (C6-C10)	mg/L	-	< 0.025	< 0.025	< 0.025	-	< 0.025	< 0.025
F2 (C10-C16)	mg/L	-	< 0.1	< 0.1	< 0.1	-	< 0.1	< 0.1
F3 (C16-C34)	mg/L	-	< 0.2	< 0.2	< 0.2	-	< 0.2	< 0.2
F4 (C34-C50)	mg/L	-	< 0.2	< 0.2	< 0.2	-	< 0.2	< 0.2
Reached baseline at C50	mg/L	-	YES	YES	YES	-	YES	YES
Radionuclides								
Radium-226	Bq/l	-	< 0.0050	< 0.0050	< 0.0050	-	-	-

MEL-12 Parameters	Max Grab	Max Mean	Sample Date Units	7/10/2018	7/18/2018	8/5/2018	8/12/2018
Conventional Parameters							
pH			pH units	7.5	7.46	7.38	7.62
Specific conductivity			umhos/cm	1700	1800	1900	2100
Hardness			mg CaCO3/L	427	445	516	536
Dissolved Hardness			mg CaCO3/L	421	446	500	507
Total suspended solids			mg/L	8	15	33	140
Total dissolved solids			mg/L	1060	1200	1100	1250
Total organic carbon			mg/L	10	13	22	27
Dissolved organic carbon			mg/L	8.1	9.6	13	15
Turbidity			NTU	2.5	3.7	14	8.3
Major Ions							
Bicarbonate, as CaCO3			mg/L	58	60	48	65
Dissolved Calcium			mg/L	131	139	155	156
Carbonate, as CaCO3			mg/L	< 1.0	< 1.0	< 1.0	< 1.0
Dissolved Chloride			mg/L	410	450	500	560
Free Cyanide			mg/L	< 0.0010	< 0.0010	< 0.0010	2.1
Total Cyanide			mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Dissolved Magnesium			mg/L	22.9	24.3	27.6	28.2
Dissolved Potassium			mg/L	11.7	12.7	14.2	14.7
Dissolved Sodium			mg/L	112	120	139	146
Sulphate			mg/L	50	53	55	54
Reactive Silica			mg/L	0.079	0.12	0.62	1.0
Nutrients and Chlorophyll a							
Nitrate			mg/L	5.18	4.89	3.26	2.63
Nitrite			mg/L	0.135	0.271	0.076	0.248
Nitrate + nitrite			mg/L	5.32	5.16	3.34	2.88
Total ammonia			mg/L	2.2	1.3	0.24	0.89
Total Kjeldahl nitrogen			mg/L	3.3	1.8	1.2	2.1
Total phosphorus			mg/L	0.057	0.096	0.12	0.32
Orthophosphate			mg/L	< 0.010	< 0.010	< 0.010	< 0.010
General Organics							
Total oil and grease			mg/L	<0.5	2.3	1.0	1.1
Total Metals							
Aluminum			mg/L	0.13	0.414	0.893	6.02
Antimony			mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic			mg/L	0.00188	0.00191	0.00352	0.00989
Barium			mg/L	0.108	0.102	0.124	0.163
Beryllium			mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Boron			mg/L	0.117	0.119	0.149	0.174
Cadmium			mg/L	0.000031	0.000021	< 0.000010	0.000046
Calcium			mg/L	135	138	156	164
Chromium			mg/L	< 0.0010	< 0.0010	< 0.0010	0.0027
Copper			mg/L	0.00217	0.00217	0.00251	0.00652
Iron			mg/L	0.295	0.291	0.610	3.47
Lead			mg/L	0.00041	<0.0002	0.00043	0.00149
Lithium			mg/L	0.122	0.124	0.140	0.150
Magnesium			mg/L	22.2	24.4	30.4	30.6
Manganese			mg/L	0.274	0.196	0.406	0.884
Mercury			mg/L	< 0.00001	< 0.00001	< 0.00001	0.00001
Molybdenum			mg/L	<0.001	0.0011	0.0031	0.0023
Nickel			mg/L	0.0033	0.003	0.0042	0.0074
Potassium			mg/L	11.8	12.6	14.6	16.0
Selenium			mg/L	<0.0001	<0.0001	0.00011	0.00014
Silver			mg/L	< 0.000020	< 0.000020	< 0.000020	< 0.000020
Sodium			mg/L	107	120	148	150
Strontium			mg/L	2.48	2.97	3.71	4.71
Thallium			mg/L	0.000035	0.000036	0.000011	0.000047
Tin			mg/L	<0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium			mg/L	< 0.0050	< 0.0050	< 0.0050	0.0342
Uranium			mg/L	0.00061	0.00062	0.00073	0.00147
Vanadium			mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc			mg/L	0.018	0.0065	0.0068	0.0597
Dissolved Metals							
Aluminum			mg/L	0.062	0.324	0.643	0.174
Antimony			mg/L	< 0.0005	< 0.0005	< 0.01	< 0.0005
Arsenic			mg/L	0.00134	0.0017	0.0025	0.00303
Barium			mg/L	0.0937	0.101	0.124	0.146
Beryllium			mg/L	< 0.0001	< 0.0001	< 0.002	< 0.0001
Boron			mg/L	0.125	0.124	< 1.0	0.146
Cadmium			mg/L	0.000015	0.000018	< 0.0002	< 0.00001
Chromium			mg/L	< 0.001	< 0.001	< 0.02	< 0.001
Copper			mg/L	0.00175	0.00172	< 0.004	0.00121
Iron			mg/L	0.0814	0.141	0.35	0.251
Lead			mg/L	< 0.0002	< 0.0002	< 0.004	< 0.0002
Lithium			mg/L	0.12	0.126	0.138	0.148
Manganese			mg/L	0.0189	0.115	0.313	0.537
Mercury			mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum			mg/L	<0.001	0.0011	< 0.02	0.0021
Nickel			mg/L	0.0028	0.0027	< 0.02	0.0038
Selenium			mg/L	< 0.0001	< 0.0001	< 0.002	< 0.0001
Silver			mg/L	< 0.00002	< 0.00002	< 0.0004	< 0.00002
Strontium			mg/L	2.76	2.8	2.82	3.59
Thallium			mg/L	0.00003	0.000033	< 0.0002	< 0.00001
Tin			mg/L	< 0.005	< 0.005	< 0.1	< 0.005
Titanium			mg/L	< 0.005	< 0.005	< 0.1	< 0.005
Uranium			mg/L	0.00059	0.0006	< 0.002	0.00063
Vanadium			mg/L	< 0.005	< 0.005	< 0.1	< 0.005
Zinc			mg/L	0.0115	< 0.005	< 0.1	0.0252
Volatile Organics	**TPH: 5 mg/L**	**TPH: 5 mg/L**					
Benzene			mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Ethylbenzene			mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Toluene			mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Xylenes			mg/L	< 0.00040	< 0.00040	< 0.00040	< 0.00040
m,p-Xylenes			mg/L	< 0.00040	< 0.00040	< 0.00040	< 0.00040
o-Xylene			mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
F1 (C6-C10)-BTEX			mg/L	< 0.025	< 0.025	< 0.025	< 0.025
F1 (C6-C10)			mg/L	< 0.025	< 0.025	< 0.025	< 0.025
F2 (C10-C16)			mg/L	< 0.1	< 0.1	< 0.1	< 0.1
F3 (C16-C34)			mg/L	< 0.2	< 0.2	< 0.2	0.2
F4 (C34-C50)			mg/L	< 0.2	< 0.2	< 0.2	< 0.2
Reached baseline at C50			-	YES	YES	YES	YES
1,4-Difluorobenzene			%	104	104	100	105
4-Bromofluorobenzene			%	83	80	83	98
D10-Ethylbenzene			%	202	100	76	84
D4 1,2-Dichloroethane			%	109	105	103	106
o-Terphenyl			%	99	95	101	100
Radionuclides							
Radium-226			Bq/l	0.007	< 0.005	< 0.005	0.021

MEL-13 Parameters	Sample Date Units	7/23/2018	8/20/2018	8/26/2018	9/4/2018
Conventional Parameters					
pH	pH units	7.03	7.27	7.32	7.44
Dissolved Oxygen	mg/L	-	-	10.3	10.6
Specific conductivity	umhos/cm	88	91	87	84
Total Hardness	mg/L	485	25.3	24.5	25.2
Dissolved Hardness	mg/L	23.7	24.8	25.0	22.7
Total suspended solids	mg/L	1	1	1	1
Total dissolved solids	mg/L	15	400	75	100
Total organic carbon	mg/L	3.1	2.9	3.0	3.0
Dissolved organic carbon	mg/L	3.0	2.9	2.8	2.9
Turbidity	NTU	0.3	0.3	0.3	0.2
Major Ions					
Bicarbonate	mg CaCO3/L	16	17	15	16
Calcium	mg/L	7.39	7.67	7.82	7.02
Carbonate	mg CaCO3/L	< 1	< 1	< 1	< 1
Chloride	mg/L	13	13	13	13
Free Cyanide	mg/L	<0.001	<0.001	<0.001	<0.001
Total Cyanide	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Magnesium	mg/L	1.28	1.37	1.33	1.25
Potassium	mg/L	0.914	0.948	0.986	0.902
Sodium	mg/L	5.22	5.67	5.41	5.34
Sulphate	mg/L	4.8	4.3	3.7	4.5
Silica	mg/L	0.39	0.33	0.29	0.27
Nutrients and Chlorophyll a					
Nitrate	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Nitrite	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate + nitrite	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Total ammonia	mg/L	< 0.05	< 0.05	0.19	< 0.05
Total Kjeldahl nitrogen	mg/L	0.12	0.14	0.27	< 0.1
Total phosphorus	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
Orthophosphate	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
General Organics					
Total oil and grease	mg/L	< 0.5	0.6	-	-
Total Metals					
Aluminum	mg/L	6.64	0.0118	0.0098	0.0083
Antimony	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic	mg/L	0.00283	0.00042	0.00046	0.00043
Barium	mg/L	0.126	0.0082	0.0077	0.0079
Beryllium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	0.156	< 0.05	< 0.05	< 0.05
Cadmium	mg/L	0.000028	< 0.00001	< 0.00001	< 0.00001
Calcium	mg/L	152	7.80	7.61	7.91
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.00281	0.00079	0.00077	0.00076
Iron	mg/L	0.405	0.029	0.024	0.019
Lead	mg/L	0.00021	< 0.0002	< 0.0002	< 0.0002
Lithium	mg/L	0.145	< 0.002	< 0.002	< 0.002
Magnesium	mg/L	25.9	1.43	1.33	1.33
Manganese	mg/L	0.271	0.0048	0.0044	0.0045
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	0.0013	< 0.001	< 0.001	< 0.001
Nickel	mg/L	0.0033	< 0.001	< 0.001	< 0.001
Potassium	mg/L	13.9	0.949	1.00	0.974
Selenium	mg/L	0.00011	< 0.0001	< 0.0001	< 0.0001
Silver	mg/L	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Sodium	mg/L	127	5.59	5.44	5.52
Strontium	mg/L	3.80	0.0494	0.0482	0.0488
Thallium	mg/L	0.000036	< 0.00001	< 0.00001	< 0.00001
Tin	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Titanium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/L	0.00098	< 0.0001	< 0.0001	< 0.0001
Vanadium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	mg/L	0.0107	< 0.005	< 0.005	< 0.005
Dissolved Metals					
Aluminum	mg/L	0.0123	0.0077	0.0054	0.0060
Antimony	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Arsenic	mg/L	0.00031	0.00040	0.00040	0.00034
Barium	mg/L	0.0076	0.0078	0.0076	0.0075
Beryllium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Chromium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.00062	0.00076	0.00075	0.00073
Iron	mg/L	0.0092	0.0113	0.0074	0.0054
Lead	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Lithium	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
Manganese	mg/L	0.0012	< 0.001	< 0.001	< 0.001
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Nickel	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Selenium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Silver	mg/L	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Strontium	mg/L	0.0490	0.0512	0.0491	0.0471
Thallium	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Tin	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Titanium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vanadium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Volatile Organics					
Benzene	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Ethylbenzene	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Toluene	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Xylenes	mg/L	< 0.0004	< 0.0004	< 0.0004	< 0.0004
m,p-Xylenes	mg/L	< 0.0004	< 0.0004	< 0.0004	< 0.0004
o-Xylene	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
F1 (C6-C10)-BTEX	mg/L	< 0.025	< 0.025	< 0.025	< 0.025
F1 (C6-C10)	mg/L	< 0.025	< 0.025	< 0.025	< 0.025
F2 (C10-C16)	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
F3 (C16-C34)	mg/L	< 0.2	< 0.2	< 0.2	< 0.2
F4 (C34-C50)	mg/L	< 0.2	< 0.2	< 0.2	< 0.2
Reached baseline at C50	-	YES	YES	YES	YES
1,4-Difluorobenzene	%	104	99	96	100
4-Bromofluorobenzene	%	99	99	112	96
D10-Ethylbenzene	%	121	93	101	100
D4-1,2-Dichloroethane	%	109	96	94	109
o-Terphenyl	%	91	93	99	97
Radionuclides					
Radium-226	Bq/l	< 0.005	< 0.005	< 0.005	< 0.005

MEL-14 Parameters	MEL-14 MAX GRAB	MEL-14 MAX MEAN	MDMER MAX GRAB	MDMER MAX MONTHLY	Sample Date Units	6/24/2018	7/1/2018	7/10/2018	7/15/2018	7/23/2018	7/29/2018	8/5/2018	8/13/2018	8/19/2018	8/26/2018	9/3/2018
Field Parameters																
pH					pH units	7.46	7.35	7.86	-	7.16	8.08	7.84	7.22	7.8	7.49	7.01
Specific conductivity					umhos/cm	1646	1510	1489	1654	1605	1420	1734	1925	2210	1527	1998
Temperature					Celcius	4.8	10.4	14.1	18.9	17.7	15	11.5	9.2	8.8	14.2	10
Conventional Parameters																
pH	6 - 9.5	6 - 9.5	6 - 9.5	6 - 9.5	pH units	7.59	7.11	7.51	7.32	7.34	7.00	7.26	7.37	7.18	6.80	7.08
Specific conductivity					umhos/cm	1500	1600	1700	1700	1800	1900	1900	2100	2300	1500	2400
Hardness, as CaCO3					mg/L	390	400	410	407	344	482	519	491	557	57.1	544
Dissolved hardness, as CaCO3					mg/L	372	398	416	419	462	470	504	478	565	59.2	510
Total suspended solids	30	15	30	15	mg/L	5	10	5	9	21	8	8	10	11	< 1	14
Total dissolved solids	1400	1400			mg/L	1200	930	1030	1020	1070	1180	1144	1260	1430	870	1360
Total organic carbon					mg/L	7.5	5.9	6.4	6.7	13	8.9	8.4	9.1	12	< 0.50	9.1
Dissolved organic carbon					mg/L	8.1	4.8	5.7	5.6	7.4	7.3	7.3	8.9	11	< 0.50	7.0
Turbidity					NTU	2.5	0.7	0.3	0.7	1.6	0.9	0.3	0.5	1.0	< 0.1	0.4
Major Ions																
Bicarbonate, as CaCO3					mg/L	51	34	47	42	38	27	32	33	37	6.2	15
Calcium					mg/L	118	125	-	130	145	144	156	147	173	17.2	156
Carbonate, as CaCO3					mg/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloride					mg/L	300	400	420	440	400	500	530	590	660	400	660
Cyanide	1.0	0.5	2	1	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Magnesium					mg/L	19.1	21.0	-	22.8	24.3	26.8	27.8	26.6	32.2	3.96	29.1
Potassium					mg/L	10.1	10.9	-	12.2	13.8	13.7	14.6	14.2	16.6	14.0	17.4
Sodium					mg/L	94.1	101	-	117	124	136	144	144	165	236	189
Sulphate					mg/L	38	49	51	51	43	48	53	54	60	7.2	53
Silica					mg/L	0.92	0.28	0.071	0.21	0.21	0.45	0.58	0.96	1.3	0.078	1.2
Nutrients and Chlorophyll a																
Nitrate					mg/L	5.29	5.52	5.31	5.03	4.48	3.65	2.95	3.18	3.69	15.3	5.74
Nitrite					mg/L	0.116	0.092	0.124	0.176	0.304	0.216	0.129	0.242	0.362	0.191	0.331
Nitrate + nitrite					mg/L	5.4	5.61	5.43	5.21	4.78	3.87	3.08	3.42	4.06	15.5	6.07
Total ammonia	18	14			mg/L	3.1	2.6	2.2	1.8	0.47	0.095	0.30	0.88	0.80	4.1	0.91
Total Kjeldahl nitrogen					mg/L	3.4	2.8	3.2	2.1	1.2	1.2	0.88	1.3	1.4	3.6	1.3
Total phosphorus	4.0	2.0			mg/L	0.091	0.034	0.022	0.032	0.099	0.037	< 0.020	< 0.020	0.037	0.021	0.023
Orthophosphate					mg/L		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
General Organics																
Total oil and grease					mg/L	-	1.3	< 0.50	1.0	1.8	< 0.50	< 0.50	1.2	< 0.50	-	-
Total Metals																
Aluminum	3	2			mg/L	0.134	1.22	0.518	1.23	**4.39**	0.811	0.784	0.705	1.03	0.0050	1.32
Antimony					mg/L	<0.00050	< 0.00050	-	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic	0.6	0.3	1	0.5	mg/L	0.00205	0.00110	-	0.00129	0.00178	0.00185	0.00210	0.00222	0.00295	0.00028	0.00237
Barium					mg/L	0.0997	0.0979	-	0.0991	0.0830	0.123	0.124	0.133	0.160	0.0043	0.150
Beryllium					mg/L	<0.00010	< 0.00010	-	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Bismuth					mg/L	-	-	-	-	-	-	-	-	-	-	< 0.0010
Boron					mg/L	0.1	0.100	-	0.157	0.094	0.135	0.154	0.191	0.190	0.770	0.325
Cadmium					mg/L	0.000032	0.000024	-	0.000015	0.000020	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Calcium					mg/L	122	126	-	128	109	152	156	151	171	16.5	168
Chromium					mg/L	<0.001	< 0.0010	-	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Cobalt					mg/L	-	-	-	-	-	-	-	-	-	-	0.00066
Copper	0.4	0.2	0.6	0.3	mg/L	0.00225	0.00129	-	0.00130	0.00207	0.00104	0.00112	0.00085	0.00099	< 0.00050	0.00062
Iron					mg/L	0.374	0.118	-	0.090	0.293	0.083	0.079	0.134	0.260	< 0.010	0.153
Lead	0.4	0.2	0.4	0.2	mg/L	0.0003	0.00033	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	0.00022	< 0.00020	< 0.00020	< 0.00020
Lithium					mg/L	0.11	0.113	-	0.118	0.0917	0.116	0.144	0.138	0.159	0.133	0.157
Magnesium					mg/L	20.7	20.8	-	21.3	17.6	24.5	31.5	27.8	31.4	3.86	30.2
Manganese					mg/L	0.34	0.309	-	0.0609	0.190	0.136	0.237	0.381	0.406	0.0024	0.253
Mercury					mg/L	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum					mg/L	< 0.0010	< 0.0010	-	< 0.0010	< 0.0010	0.0014	0.0018	0.0018	0.0022	< 0.0010	0.0014
Nickel	1.0	0.5	1	0.5	mg/L	0.0031	0.0025	-	0.0022	0.0025	0.0023	0.0028	0.0030	0.0034	< 0.0010	0.0027
Potassium					mg/L	10.7	10.8	-	11.5	9.56	13.5	14.9	14.5	16.7	13.2	18.5
Selenium					mg/L	< 0.00010	< 0.00010	-	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Silicon					mg/L	-	-	-	-	-	-	-	-	-	-	0.65
Silver					mg/L	< 0.000020	< 0.000020	-	< 0.000020	< 0.000020	< 0.000020	< 0.000020	< 0.000020	< 0.000020	< 0.000020	< 0.000020
Sodium					mg/L	100	104	-	111	85.3	120	154	145	161	229	194
Strontium					mg/L	2.41	2.41	-	2.36	2.18	2.59	3.12	3.53	3.97	0.401	4.06
Thallium					mg/L	0.000022	0.000026	-	0.000035	0.000022	0.000033	< 0.000010	< 0.000010	< 0.000010	0.000020	0.000015
Tin					mg/L	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium					mg/L	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Uranium					mg/L	0.00058	0.00011	-	0.00020	0.00064	0.00018	0.00013	0.00012	0.00018	0.00010	0.00013
Vanadium					mg/L	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	0.8	0.4	1	0.5	mg/L	0.0075	0.0054	-	< 0.0050	0.0086	< 0.0050	< 0.0050	0.0085	0.0067	< 0.0050	< 0.0050
Zirconium					mg/L	-	-	-	-	-	-	-	-	-	-	< 0.00010
Dissolved Metals																
Aluminum					mg/L	0.0104	0.0174	-	0.0835	0.0994	0.0908	0.22	0.0561	0.0568	0.0043	0.0233
Antimony					mg/L	< 0.00050	< 0.00050	-	< 0.00050	< 0.00050	< 0.00050	< 0.025	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic					mg/L	0.00138	0.00088	-	0.00122	0.00156	0.00178	< 0.0050	0.00207	0.00274	0.00029	0.00202
Barium					mg/L	0.0888	0.0977	-	0.0933	0.114	0.120	0.126	0.129	0.150	0.0044	0.141
Beryllium					mg/L	< 0.00010	< 0.00010	-	< 0.00010	< 0.00010	< 0.00010	< 0.0050	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Bismuth					mg/L	-	-	-	-	-	-	-	-	-	-	< 0.0010
Boron					mg/L	0.106	0.101	-	0.146	0.138	0.139	< 2.5	0.195	0.206	0.723	0.317
Cadmium					mg/L	0.000024	0.000021	-	0.000015	0.000010	< 0.000010	< 0.00050	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Chromium					mg/L	< 0.0010	< 0.0010	-	< 0.0010	< 0.0010	< 0.0010	< 0.050	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Cobalt					mg/L	-	-	-	-	-	-	-	-	-	-	0.00058
Copper					mg/L	0.00173	0.00099	-	0.00111	0.00117	0.00085	< 0.010	0.00065	0.00065	0.00022	0.00050
Iron					mg/L	0.081	0.0280	-	0.0483	< 0.0050	0.0255	< 0.25	0.0432	0.0324	< 0.0050	0.0414
Lead					mg/L	< 0.00020	< 0.00020	-	< 0.00020	< 0.00020	< 0.00020	< 0.010	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Lithium					mg/L	0.104	0.113	-	0.125	0.135	0.144	0.14	0.144	0.163	0.134	0.158
Manganese					mg/L	0.336	0.302	-	0.0285	0.0605	0.102	0.225	0.331	0.382	0.0025	0.209
Mercury					mg/L	0.00004	-									
Molybdenum					mg/L	< 0.0010	< 0.0010	-	< 0.0010	0.0011	0.0014	< 0.050	0.0019	0.0020	< 0.0010	0.0013
Nickel					mg/L	0.0028	0.0022	-	0.0022	0.0022	0.0022	< 0.050	0.0029	0.0030	< 0.0010	0.0023
Selenium					mg/L	< 0.00010	< 0.00010	-	< 0.00010	< 0.00010	< 0.00010	< 0.0050	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Silicon					mg/L	-	-	-	-	-	-	-	-	-	-	0.59
Silver					mg/L	< 0.000020	< 0.000020	-	< 0.000020	< 0.000020	< 0.000020	< 0.0010	< 0.000020	< 0.000020	< 0.000020	< 0.000020
Strontium					mg/L	2.35	2.44	-	2.58	2.38	2.60	2.72	3.24	4.10	0.422	3.31
Thallium					mg/L	0.000023	0.000027	-	0.000033	0.000033	0.000028	< 0.00050	< 0.000010	< 0.000010	0.000020	0.000016
Tin					mg/L	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.25	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium					mg/L	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.25	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Uranium					mg/L	0.00057	< 0.00010	-	< 0.00010	0.00012	< 0.00010	< 0.0050	< 0.00010	< 0.00010	0.00011	< 0.00010
Vanadium					mg/L	< 0.0050	< 0.0050	-	< 0.0050	< 0.0050	< 0.0050	< 0.25	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc					mg/L	0.0064	0.0068	-	< 0.0050	< 0.0050	< 0.0050	< 0.25	0.0071	< 0.0050	< 0.0050	< 0.0050
Zirconium					mg/L	-	-	-	-	-	-	-	-	-	-	< 0.00010
Volatile Organics																
Benzene					mg/L	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Ethylbenzene					mg/L	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Toluene					mg/L	-	0.00032	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Xylenes					mg/L	-	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
m,p-Xylenes					mg/L	-	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
o-Xylene					mg/L	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
F1 (C6-C10)-BTEX					mg/L	-	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
F1 (C6-C10)					mg/L	-	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
F2 (C10-C16)					mg/L	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F3 (C16-C34)					mg/L	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
F4 (C34-C50)					mg/L	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Reached baseline at C50					mg/L	-	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Radionuclides																
Radium-226			1.11	0.37	Bq/l	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0070	< 0.0050	< 0.0050	< 0.0050	0.0080	< 0.0050	< 0.0050
Toxicology																
Daphnia					Toxic Unit							<1.0				
Rainbow Trout					Toxic Unit							<1.0				

MEL-15			Sample Date	7/23/2018	8/7/2018
Parameters	**Max Grab**	**Max Mean**	**Units**		
Conventional Parameters					
pH			pH units	7.35	7.53
Specific conductivity			umhos/cm	97	98
Hardness			mg/L	172	38.9
Dissolved Hardness			mg/L	168	37.1
Total suspended solids			mg/L	2	< 1
Total dissolved solids			mg/L	40	50
Total organic carbon			mg/L	12	4.3
Dissolved organic carbon			mg/L	3.9	4.0
Turbidity			NTU	0.4	0.4
Major Ions					
Bicarbonate			mg CaCO3/L	33	35
Carbonate			mg CaCO3/L	< 1.0	< 1.0
Calcium			mg/L	56.2	12.6
Magnesium			mg/L	6.82	1.39
Potassium			mg/L	4.1	0.891
Sodium			mg/L	18.8	3.5
Dissolved Chloride			mg/L	7.5	6.9
Total Cyanide			mg/L	< 0.005	< 0.005
Free Cyanide			mg/L	<0.001	<0.001
Sulphate			mg/L	2.9	2.0
Reactive Silica			mg/L	1.4	0.70
Nutrients and Chlorophyll a					
Nitrate			mg/L	< 0.10	< 0.10
Nitrite			mg/L	< 0.010	< 0.010
Nitrate + nitrite			mg/L	< 0.10	< 0.10
Total ammonia			mg/L	< 0.050	< 0.050
Total Kjeldahl nitrogen			mg/L	0.47	0.22
Total phosphorus			mg/L	< 0.020	< 0.020
Orthophosphate			mg/L	< 0.010	< 0.010
Total Metals					
Aluminum			mg/L	0.004	0.0064
Antimony			mg/L	<0.0005	<0.0005
Arsenic			mg/L	0.00116	0.0091
Barium			mg/L	0.0478	0.011
Beryllium			mg/L	<0.0001	<0.0001
Bismuth			mg/L	-	<0.001
Boron			mg/L	<0.05	<0.05
Cadmium			mg/L	<0.00001	<0.00001
Chromium			mg/L	<0.001	<0.001
Copper			mg/L	0.00111	0.00053
Cobalt			mg/L	-	<0.002
Iron			mg/L	0.351	0.094
Lead			mg/L	<0.0002	<0.0002
Lithium			mg/L	0.027	<0.002
Manganese			mg/L	0.0573	0.007
Molybdum			mg/L	<0.001	<0.001
Mercury			mg/L	0.00003	< 0.00001
Nickel			mg/L	0.0017	<0.001
Selenium			mg/L	<0.0001	<0.0001
Silver			mg/L	<0.00002	<0.00002
Silicon			mg/L	-	0.43
Strontium			mg/L	0.678	0.0654
Thallium			mg/L	<0.00001	<0.00001
Uranium			mg/L	0.00013	<0.0001
Vanadium			mg/L	<0.005	<0.005
Zinc			mg/L	<0.005	<0.005
Zirconium			mg/L	-	<0.0001
Calcium			mg/L	57.4	13.2
Magnesium			mg/L	7.02	1.43
Potassium			mg/L	4.25	0.928
Sodium			mg/L	19.3	3.46
Dissolved Metals					
Aluminum			mg/L	<0.003	0.00048
Antimony			mg/L	<0.0005	<0.0005
Arsenic			mg/L	0.0109	0.00087
Barium			mg/L	0.0448	0.0102
Beryllium			mg/L	<0.0001	<0.0001
Bismuth			mg/L	-	<0.001
Boron			mg/L	<0.05	<0.05
Cadmium			mg/L	<0.00001	<0.00001
Chromium			mg/L	<0.001	<0.001
Copper			mg/L	0.001	0.00053
Cobalt			mg/L	-	<0.0002
Iron			mg/L	0.224	0.0839
Lead			mg/L	<0.0002	<0.0002
Lithium			mg/L	0.0277	<0.002
Manganese			mg/L	0.044	0.0092
Molybdum			mg/L	<0.001	<0.001
Mercury			mg/L	< 0.00001	< 0.00001
Nickel			mg/L	0.0015	<0.001
Selenium			mg/L	<0.0001	<0.0001
Silver			mg/L	<0.00002	<0.00002
Silicon			mg/L	-	0.36
Strontium			mg/L	0.668	0.0608
Thallium			mg/L	<0.00001	<0.00001
Uranium			mg/L	0.00012	<0.0001
Vanadium			mg/L	<0.005	<0.005
Zinc			mg/L	<0.005	<0.005
Zirconium			mg/L	-	<0.0001

MEL-16 Parameters	Sample Date Units	7/23/2018	8/7/2018
Field Parameters			
pH	pH units	8.46	8.46
Specific conductivity	uS/cm	0.0782	91.2
Temperature	C	19.1	13.4
Conventional Parameters			
pH	pH units	7.25	7.38
Specific conductivity	umhos/cm	87	91
Hardness	mg CaCO3/L	31.4	36.1
Dissolved hardness	mg CaCO3/L	32.2	33.1
Total suspended solids	mg/L	1	< 1
Total dissolved solids	mg/L	30	60
Total organic carbon	mg/L	3.8	4.1
Dissolved organic carbon	mg/L	3.7	3.8
Turbidity	NTU	0.4	0.5
Major Ions			
Alkalinity	mg CaCO3/L	25	27
Bicarbonate	mg CaCO3/L	25	27
Calcium	mg/L	10.7	11.0
Carbonate	mg CaCO3/L	< 1.0	< 1.0
Dissolved Chloride	mg/L	10	9.7
Free Cyanide	mg/L	<0.001	<0.001
Total Cyanide	mg/L	< 0.0050	< 0.0050
Magnesium	mg/L	1.34	1.36
Potassium	mg/L	0.919	0.970
Sodium	mg/L	2.28	2.43
Sulphate	mg/L	1.5	< 1.0
Silica	mg/L	0.21	0.23
Nutrients and Chlorophyll a			
Nitrate	mg/L	< 0.10	< 0.10
Nitrite	mg/L	< 0.010	< 0.010
Nitrate + nitrite	mg/L	< 0.10	< 0.10
Total ammonia	mg/L	< 0.050	< 0.050
Total Kjeldahl nitrogen	mg/L	0.18	0.23
Total phosphorus	mg/L	< 0.020	< 0.020
Orthophosphate	mg/L	< 0.010	< 0.010
Total Metals			
Aluminum	mg/L	0.0076	0.0108
Antimony	mg/L	< 0.0005	< 0.0005
Arsenic	mg/L	0.00106	0.00105
Barium	mg/L	0.0160	0.0172
Beryllium	mg/L	< 0.0001	< 0.0001
Bismuth	mg/L	-	<0.001
Boron	mg/L	< 0.05	< 0.05
Cadmium	mg/L	< 0.00001	< 0.00001
Calcium	mg/L	10.4	12.1
Chromium	mg/L	< 0.001	< 0.001
Copper	mg/L	0.00077	0.00075
Cobalt	mg/L	-	<0.0002
Iron	mg/L	0.096	0.083
Lead	mg/L	< 0.0002	< 0.0002
Lithium	mg/L	< 0.002	< 0.002
Magnesium	mg/L	1.31	1.41
Manganese	mg/L	0.0094	0.0072
Mercury	mg/L	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.001	< 0.001
Nickel	mg/L	< 0.001	< 0.001
Potassium	mg/L	0.907	1.02
Selenium	mg/L	< 0.0001	< 0.0001
Silicon	mg/L	-	0.15
Silver	mg/L	< 0.00002	< 0.00002
Sodium	mg/L	2.25	2.43
Strontium	mg/L	0.0569	0.0651
Thallium	mg/L	< 0.00001	< 0.00001
Tin	mg/L	< 0.005	< 0.005
Titanium	mg/L	< 0.005	< 0.005
Uranium	mg/L	< 0.0001	< 0.0001
Vanadium	mg/L	< 0.005	< 0.005
Zinc	mg/L	< 0.005	< 0.005
Zirconium	mg/L	-	<0.0001
Dissolved Metals			
Aluminum	mg/L	0.0056	0.0057
Antimony	mg/L	<0.0005	<0.0005
Arsenic	mg/L	0.00096	0.00101
Barium	mg/L	0.0159	0.0161
Beryllium	mg/L	<0.0001	<0.0001
Boron	mg/L	< 0.05	< 0.05
Cadmium	mg/L	< 0.00001	< 0.00001
Chromium	mg/L	< 0.001	< 0.001
Copper	mg/L	0.00068	0.00069
Cobalt	mg/L	-	<0.0002
Iron	mg/L	0.0406	0.0744
Lead	mg/L	< 0.0002	< 0.0002
Lithium	mg/L	< 0.002	< 0.002
Manganese	mg/L	< 0.001	0.0073
Mercury	mg/L	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.001	< 0.001
Nickel	mg/L	< 0.001	<0.001
Selenium	mg/L	< 0.0001	< 0.0001
Silver	mg/L	< 0.00002	< 0.00002
Silicon	mg/L	-	0.11
Strontium	mg/L	0.0590	0.0624
Thallium	mg/L	< 0.00001	< 0.00001
Tin	mg/L	< 0.005	< 0.005
Titanium	mg/L	< 0.005	< 0.005
Uranium	mg/L	< 0.0001	0.00015
Vanadium	mg/L	< 0.005	< 0.005
Zinc	mg/L	< 0.005	< 0.005
Zirconium	mg/L	-	<0.0001

MEL-17 **Parameters**	**Sample Date** **Units**	6/20/2018	7/23/2018	8/7/2018
Field Parameters				
pH	pH units	7.15	8.36	8.77
Specific conductivity	mS/cm	0.252	0.454	0.484
Temperature	C	9.4	19.4	13.0
Conventional Parameters				
pH	pH units	7.45	7.37	7.68
Specific conductivity	umhos/cm	250	97	560
Hardness	mg CaCO3/L	78.1	35.5	198
Dissolved hardness	mg CaCO3/L	77.8	35.9	181
Total suspended solids	mg/L	1	2	2
Total dissolved solids	mg/L	110	30	330
Total organic carbon	mg/L	5.6	3.9	13
Dissolved organic carbon	mg/L	5.2	3.9	12
Turbidity	NTU	0.3	0.4	0.9
Major Ions				
Alkalinity	mg CaCO3/L	28	34	61
Bicarbonate	mg CaCO3/L	28	34	61
Carbonate	mg CaCO3/L	< 1.0	< 1.0	< 1.0
Calcium	mg/L	25.7	12	66.2
Dissolved Chloride	mg/L	44	7.1	120
Free Cyanide	mg/L	<0.001	<0.001	<0.001
Total Cyanide	mg/L	< 0.0050	< 0.0050	< 0.0050
Magnesium	mg/L	3.42	1.37	7.96
Potassium	mg/L	2.01	0.837	4.64
Sodium	mg/L	10.5	3.25	20.9
Reactive Silica	mg/L	0.58	1.4	1.2
Sulphate	mg/L	8.1	2.6	12
Nutrients and Chlorophyll a				
Nitrate	mg/L	0.21	< 0.10	< 0.10
Nitrite	mg/L	< 0.010	< 0.010	< 0.010
Nitrate + nitrite	mg/L	0.21	< 0.10	< 0.10
Total ammonia	mg/L	< 0.050	< 0.050	< 0.050
Total Kjeldahl nitrogen	mg/L	0.36	0.26	0.63
Total phosphorus	mg/L	< 0.020	< 0.020	< 0.020
Orthophosphate	mg/L	< 0.010	< 0.010	< 0.010
Total Metals				
Aluminum	mg/L	0.0059	0.0041	0.0059
Antimony	mg/L	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.00048	0.00095	0.00109
Barium	mg/L	0.0265	0.0113	0.0501
Beryllium	mg/L	<0.0001	<0.0001	<0.0001
Boron	mg/L	<0.05	<0.05	<0.05
Bismuth	mg/L	-	-	<0.001
Cadmium	mg/L	<0.00001	<0.00001	<0.00001
Chromium	mg/L	<0.001	<0.001	<0.001
Cobalt	mg/L	-	-	<0.002
Copper	mg/L	0.00071	0.00056	0.00095
Iron	mg/L	0.151	0.1088	0.325
Lead	mg/L	<0.0002	<0.0002	<0.0002
Lithium	mg/L	0.0124	<0.002	0.0303
Manganese	mg/L	0.0511	0.0124	0.023
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001
Molybdum	mg/L	<0.001	<0.001	<0.001
Nickel	mg/L	0.0013	<0.001	0.0018
Selenium	mg/L	<0.0001	<0.0001	<0.0001
Silver	mg/L	<0.00002	<0.00002	<0.00002
Strontium	mg/L	0.293	0.0613	0.735
Thallium	mg/L	<0.00001	<0.00001	<0.00001
Tin	mg/L	<0.005	<0.005	<0.005
Titanium	mg/L	<0.005	<0.005	<0.005
Uranium	mg/L	<0.0001	<0.0001	0.00016
Vanadium	mg/L	<0.005	<0.005	<0.005
Zinc	mg/L	<0.005	<0.005	<0.005
Zirconium	mg/L	-	-	<0.0001
Calcium	mg/L	25.7	12	66.2
Magnesium	mg/L	3.42	1.37	7.96
Potassium	mg/L	2.01	0.837	4.64
Sodium	mg/L	10.5	3.25	20.9
Dissolved Metals				
Aluminum	mg/L	0.0042	<0.003	0.004
Antimony	mg/L	<0.0005	<0.0005	<0.0005
Arsenic	mg/L	0.00046	0.00079	0.00104
Barium	mg/L	0.0265	0.0112	0.0455
Beryllium	mg/L	<0.0001	<0.0001	<0.0001
Boron	mg/L	<0.05	<0.05	<0.05
Bismuth	mg/L	-	-	<0.001
Cadmium	mg/L	<0.00001	<0.00001	<0.00001
Chromium	mg/L	<0.001	<0.001	<0.001
Cobalt	mg/L	-	-	<0.0002
Copper	mg/L	0.0007	0.0005	0.00087
Iron	mg/L	0.114	0.0519	0.309
Lead	mg/L	<0.0002	<0.0002	<0.0002
Lithium	mg/L	0.0124	<0.002	0.0303
Manganese	mg/L	0.0511	0.0214	0.023
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001
Molybdum	mg/L	<0.001	<0.001	<0.001
Nickel	mg/L	0.0013	<0.001	0.0018
Selenium	mg/L	<0.0001	<0.0001	<0.0001
Silver	mg/L	<0.00002	<0.00002	<0.00002
Strontium	mg/L	0.293	0.0613	0.735
Thallium	mg/L	<0.00001	<0.00001	<0.00001
Tin	mg/L	<0.005	<0.005	<0.005
Titanium	mg/L	<0.005	<0.005	<0.005
Uranium	mg/L	<0.0001	<0.0001	0.00016
Vanadium	mg/L	<0.005	<0.005	<0.005
Zirconium	mg/L	-	-	<0.0001
Zinc	mg/L	<0.005	<0.005	<0.005

MEL-18 **Parameters**	**Sample Date** **Units**	7/23/2018	8/7/2018
Field Parameters			
pH	pH units	8.45	8.77
Specific conductivity	mS/cm	1.054	0.494
Temperature	C	17.1	13.0
Conventional Parameters			
pH	pH units	7.25	7.53
Specific conductivity	umhos/cm	120	98
Hardness	mg CaCO3/L	41.1	49.4
Dissolved hardness	mg CaCO3/L	41.5	45.2
Total suspended solids	mg/L	3	<1
Total dissolved solids	mg/L	50	50
Total organic carbon	mg/L	3.8	3.8
Dissolved organic carbon	mg/L	3.5	3.6
Turbidity	NTU	0.5	0.6
Major Ions			
Alkalinity	mg CaCO3/L	27	35
Bicarbonate	mg CaCO3/L	27	30
Carbonate	mg CaCO3/L	< 1.0	< 1.0
Calcium	mg/L	13.8	15.0
Dissolved chloride	mg/L	17	6.9
Free Cyanide	mg/L	<0.0010	<0.0010
Total Cyanide	mg/L	< 0.0050	< 0.0050
Magnesium	mg/L	1.72	1.89
Potassium	mg/L	0.954	1.06
Sodium	mg/L	3.31	3.85
Dissolved sulphate	mg/L	3.9	2.0
Silica	mg/L	0.47	0.21
Nutrients and Chlorophyll a			
Nitrate	mg/L	< 0.10	< 0.10
Nitrite	mg/L	< 0.010	< 0.010
Nitrate + nitrite	mg/L	< 0.10	< 0.10
Total ammonia	mg/L	< 0.050	< 0.050
Total Kjeldahl nitrogen	mg/L	0.21	0.22
Total phosphorus	mg/L	< 0.020	< 0.020
Orthophosphate	mg/L	< 0.010	< 0.010
Total Metals			
Aluminum	mg/L	0.008	0.0111
Antimony	mg/L	<0.0005	<0.0005
Arsenic	mg/L	0.0022	0.0022
Barium	mg/L	0.0147	0.0156
Beryllium	mg/L	<0.0001	<0.0001
Bismuth	mg/L	-	<0.001
Boron	mg/L	<0.05	<0.05
Cadmium	mg/L	<0.00001	<0.00001
Chromium	mg/L	<0.001	<0.001
Cobalt	mg/L	-	<0.0002
Copper	mg/L	0.00064	0.00075
Iron	mg/L	0.124	0.172
Lead	mg/L	<0.0002	<0.0002
Lithium	mg/L	0.0063	0.0072
Manganese	mg/L	0.0145	0.0101
Mercury	mg/L	< 0.00001	< 0.00001
Molybdenum	mg/L	<0.001	<0.001
Nickel	mg/L	<0.001	<0.001
Selenium	mg/L	<0.0001	<0.0001
Silver	mg/L	<0.0002	<0.0002
Strontium	mg/L	0.107	0.121
Thallium	mg/L	<0.00001	<0.00001
Tin	mg/L	<0.005	<0.005
Titanium	mg/L	<0.005	<0.005
Uranium	mg/L	<0.0001	<0.0001
Vanadium	mg/L	<0.005	<0.005
Zinc	mg/L	<0.005	<0.005
Calcium	mg/L	13.7	16.5
Magnesium	mg/L	1.68	1.98
Potassium	mg/L	0.953	1.11
Sodium	mg/L	3.21	3.99
Dissolved Metals			
Aluminum	mg/L	<0.003	0.0096
Antimony	mg/L	<0.0005	<0.0005
Arsenic	mg/L	0.00168	0.00202
Barium	mg/L	0.0144	0.0141
Beryllium	mg/L	<0.0001	<0.0001
Bismuth	mg/L	-	<0.001
Boron	mg/L	<0.05	<0.05
Cadmium	mg/L	<0.00001	<0.00001
Chromium	mg/L	<0.001	<0.001
Cobalt	mg/L	-	<0.0002
Copper	mg/L	0.00056	0.00063
Iron	mg/L	0.0346	0.137
Lead	mg/L	<0.0002	<0.0002
Lithium	mg/L	0.0068	0.007
Manganese	mg/L	<0.001	0.0096
Mercury	mg/L	< 0.00001	< 0.00001
Molybdenum	mg/L	<0.001	<0.001
Nickel	mg/L	<0.001	<0.001
Selenium	mg/L	<0.0001	<0.0001
Silver	mg/L	<0.00002	<0.00002
Strontium	mg/L	0.108	0.116
Thallium	mg/L	<0.00001	<0.00001
Tin	mg/L	<0.005	<0.005
Titanium	mg/L	<0.005	<0.005
Uranium	mg/L	<0.0001	<0.0001
Vanadium	mg/L	<0.005	<0.005
Zinc	mg/L	<0.005	<0.005

MEL-20 Parameters	Sample Date Units	6/24/2018	7/21/2018	8/12/2018	8/29/2018
Field Parameters					
pH	pH units	8.32	9.44	8.31	8.62
Specific conductivity	uS/cm	177.3	230	265	271
Temperature	mg/L	12.5	17.2	8.1	8.2
Conventional Parameters					
pH	pH units	7.70	7.85	7.86	8.06
Specific conductivity	umhos/cm	180	240	260	290
Hardness	mg CaCO3/L	68.3	98.4	108	123
Dissolved Hardness	mg CaCO3/L	68.3	98.4	108	123
Total dissolved solids	mg/L	205	110	140	190
Total suspended solids	mg/L	2	2	10	3
Total organic carbon	mg/L	8.6	15	16	15
Dissolved organic carbon	mg/L	8.4	14	15	15
Turbidity	NTU	0.5	0.7	1.5	0.8
Major Ions					
Alkalinity	mg CaCO3/L	44	68	76	83
Bicarbonate	mg CaCO3/L	44	68	76	82
Calcium	mg/L	23.0	33.0	36.3	41.2
Carbonate	mg CaCO3/L	< 1.0	< 1.0	< 1.0	< 1.0
Dissolved Chloride	mg/L	-	22	22	24
WAD Cyanide (Free)	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Cyanide	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Magnesium	mg/L	2.60	3.91	4.25	4.80
Potassium	mg/L	1.75	2.31	2.16	2.34
Sodium	mg/L	4.18	5.81	6.14	6.61
Sulphate	mg/L	-	22	21	23
Silica	mg/L	0.78	1.2	1.4	0.66
Nutrients and Chlorophyll a					
Nitrate	mg/L	< 0.10	< 0.10	< 0.10	< 0.10
Nitrite	mg/L	< 0.010	< 0.010	< 0.010	< 0.010
Nitrate + nitrite	mg/L	< 0.10	< 0.10	< 0.10	< 0.10
Total ammonia	mg/L	< 0.050	< 0.050	< 0.050	< 0.050
Total Kjeldahl nitrogen	mg/L	0.40	0.57	0.88	0.81
Total phosphorus	mg/L	< 0.020	< 0.020	< 0.020	< 0.020
Orthophosphate	mg/L	< 0.010	< 0.010	< 0.010	< 0.010
General Organics					
Total oil and grease	mg/L	< 0.50	< 0.50	< 0.50	< 0.50
Total Metals					
Aluminum	mg/L	0.0152	0.0236	0.0359	0.0121
Antimony	mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic	mg/L	0.00119	0.00312	0.00338	0.00221
Barium	mg/L	0.0277	0.0357	0.0406	0.0361
Beryllium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Boron	mg/L	< 0.050	< 0.050	< 0.050	< 0.050
Cadmium	mg/L	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Calcium	mg/L	24.0	31.7	36.1	38.4
Chromium	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Copper	mg/L	0.00163	0.00172	0.00138	0.00104
Iron	mg/L	0.118	0.194	**0.577**	0.200
Lead	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Lithium	mg/L	0.0057	0.0062	0.0064	0.0066
Magnesium	mg/L	2.71	3.79	4.54	4.44
Manganese	mg/L	0.0098	0.0116	0.0258	0.0070
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nickel	mg/L	0.0020	0.0020	0.0024	0.0020
Potassium	mg/L	1.84	2.25	2.28	2.19
Selenium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Silver	mg/L	< 0.000020	< 0.000020	0.000048	< 0.000020
Sodium	mg/L	4.25	5.80	6.35	6.28
Strontium	mg/L	0.156	0.213	0.229	0.222
Thallium	mg/L	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Tin	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Uranium	mg/L	< 0.00010	< 0.00010	0.00011	0.00012
Vanadium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Dissolved Metals					
Aluminum	mg/L	0.0073	0.0165	0.0073	0.0081
Antimony	mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic	mg/L	0.00122	0.00306	0.00256	0.00206
Barium	mg/L	0.0257	0.0343	0.0371	0.0351
Beryllium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Boron	mg/L	< 0.050	< 0.050	< 0.050	< 0.050
Cadmium	mg/L	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Chromium	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Copper	mg/L	0.00141	0.00159	0.00096	0.00112
Iron	mg/L	0.0708	0.134	0.138	0.0789
Lead	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Lithium	mg/L	0.0055	0.0068	0.0067	0.0063
Manganese	mg/L	0.0066	0.0051	0.0082	0.0021
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nickel	mg/L	0.0019	0.0020	0.0021	0.0021
Selenium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Silver	mg/L	< 0.000020	< 0.000020	< 0.000020	< 0.000020
Strontium	mg/L	0.147	0.220	0.219	0.238
Thallium	mg/L	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Tin	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Uranium	mg/L	< 0.00010	< 0.00010	< 0.00010	0.00011
Vanadium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Volatile Organics					
Benzene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Ethylbenzene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Toluene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Xylenes	mg/L	< 0.00040	< 0.00040	< 0.00040	< 0.00040
m,p-Xylenes	mg/L	< 0.00040	< 0.00040	< 0.00040	< 0.00040
o-Xylene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020
F1 (C6-C10)-BTEX	mg/L	-	-	< 0.025	< 0.025
F1 (C6-C10)	mg/L	-	-	< 0.025	< 0.025

MEL-21 Parameters	Sample Date Units	6/24/2018	7/21/2018	8/12/2018	8/29/2018	9/26/2018
Field Parameters						
pH	pH units	8.01	8.91	8.50	8.75	7.61
Specific conductivity	umhos/cm	501	741	838	846	1476
Temperature	C	11.00	15.00	8.40	9.00	0.60
Conventional Parameters						
pH	pH units	7.76	7.85	7.86	7.92	7.54
Specific conductivity	umhos/cm	500	800	840	910	1400
Hardness	mg CaCO3/L	-	283	304	338	543
Dissolved hardness	mg CaCO3/L	175	290	303	336	546
Total suspended solids	mg/L	8	3	53	8	110
Total dissolved solids	mg/L	675	525	605	590	885
Total organic carbon	mg/L	6.8	14	16	16	22
Dissolved organic carbon	mg/L	6.8	13	14	15	20
Turbidity	NTU	1.4	1.4	4.0	2.0	22
Major Ions						
Bicarbonate	mg CaCO3/L	37	69	72	77	160
Calcium	mg/L	59.1	96.8	101	112	181
Carbonate	mg CaCO3/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dissolved chloride	mg/L	-	170	180	180	330
WAD Cyanide (Free)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Cyanide	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Magnesium	mg/L	6.66	11.8	12.2	14.0	23.0
Potassium	mg/L	3.16	4.91	4.79	5.25	6.86
Sodium	mg/L	11.5	20.6	21.0	23.9	32.10
Dissolved sulphate	mg/L	-	36	33	37	35
Reactive Silica	mg/L	0.65	0.90	1.4	0.36	5.6
Nutrients and Chlorophyll a						
Nitrate	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nitrite	mg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nitrate + nitrite	mg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total ammonia	mg/L	< 0.050	< 0.050	< 0.050	0.056	0.96
Total Kjeldahl nitrogen	mg/L	0.42	0.49	0.87	0.72	1.7
Total phosphorus	mg/L	< 0.020	< 0.020	0.038	< 0.020	0.039
Orthophosphate	mg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
General Organics						
Total oil and grease	mg/L	< 0.50	< 0.50	< 0.50	< 0.50	1.7
Total Metals						
Aluminum	mg/L	0.0834	0.0091	0.213	0.0287	0.489
Antimony	mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic	mg/L	0.00219	0.00253	0.00552	0.00321	0.0123
Barium	mg/L	0.0559	0.0792	0.0855	0.0870	0.157
Beryllium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Boron	mg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Cadmium	mg/L	0.000012	< 0.000010	0.000012	< 0.000010	0.000016
Calcium	mg/L	60.1	94.3	101	113	-
Chromium	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.002
Copper	mg/L	0.00199	0.00156	0.00207	0.00133	0.00247
Iron	mg/L	0.546	0.183	1.52	0.451	4.26
Lead	mg/L	< 0.00020	< 0.00020	0.00040	< 0.00020	0.00053
Lithium	mg/L	0.0567	0.0614	0.0615	0.0686	0.0945
Magnesium	mg/L	7.21	11.6	12.7	13.4	-
Manganese	mg/L	0.119	0.0189	0.0600	0.0247	0.644
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.0010	< 0.0010	< 0.0010	0.0010	0.0031
Nickel	mg/L	0.0025	0.0026	0.0039	0.0034	0.0061
Potassium	mg/L	3.43	4.93	5.17	5.22	-
Selenium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.00011
Silver	mg/L	0.000022	< 0.000020	0.000022	< 0.000020	< 0.000020
Sodium	mg/L	11.8	20.8	21.9	23.3	-
Strontium	mg/L	0.873	1.09	1.12	1.11	1.73
Thallium	mg/L	0.000016	< 0.000010	< 0.000010	< 0.000010	0.000015
Tin	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L	< 0.0050	< 0.0050	0.0118	< 0.0050	0.0368
Uranium	mg/L	< 0.00010	0.00017	0.00031	0.00041	0.00118
Vanadium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Dissolved Metals						
Aluminum	mg/L	0.0067	0.0064	0.0093	0.0044	0.0031
Antimony	mg/L	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Arsenic	mg/L	0.00133	0.00237	0.00272	0.00220	0.00782
Barium	mg/L	0.0505	0.0786	0.0795	0.0772	0.15
Beryllium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Boron	mg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Cadmium	mg/L	< 0.000010	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Chromium	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Copper	mg/L	0.00101	0.00144	0.00089	0.00112	0.00051
Iron	mg/L	0.207	0.0939	0.188	0.0957	1.52
Lead	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Lithium	mg/L	0.0517	0.0628	0.0638	0.0657	0.0995
Manganese	mg/L	0.0898	0.0061	0.0154	0.0035	0.621
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0027
Nickel	mg/L	0.0024	0.0026	0.0031	0.0030	0.0046
Selenium	mg/L	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Silver	mg/L	< 0.000020	< 0.000020	< 0.000020	< 0.000020	< 0.000020
Strontium	mg/L	0.809	1.14	1.08	1.12	1.76
Thallium	mg/L	0.000013	< 0.000010	< 0.000010	< 0.000010	< 0.000010
Tin	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Uranium	mg/L	< 0.00010	0.00017	0.00029	0.00040	0.00107
Vanadium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Volatile Organics						
Benzene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Ethylbenzene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Toluene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Xylenes	mg/L	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
m,p-Xylenes	mg/L	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.00040
o-Xylene	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
F1 (C6-C10)-BTEX	mg/L	-	-	< 0.025	< 0.025	< 0.025
F1 (C6-C10)	mg/L	-	-	< 0.025	< 0.025	< 0.025
F2 (C10-C16)	mg/L	-	-	-	-	< 0.1
F3 (C16-C34)	mg/L	-	-	-	-	< 0.2
F4 (C34-C50)	mg/L	-	-	-	-	< 0.2
Reached baseline at C50	mg/L	-	-	-	-	YES

MEL-22 Parameters	Sample Date Units	6/4/2018	6/10/2018	6/13/2018	6/17/2018	6/24/2018	6/27/2018	7/1/2018	7/18/2018	7/29/2018	8/5/2018	8/19/2018	9/2/2018	9/17/2018
Field Parameters														
pH	pH units	8.03	7.95	8.01	8.18	-	8.45	8.48	8.56	8.17	8.16	8.13	7.94	7.40
Specific conductivity	umhos/cm	765	1845	2980	2960	2960	4550	4630	6460	8920	9280	1565	16520	-
Temperature	C	1.3	6.5	3.5	5.9	5.9	11.4	12.4	13.1	12.4	8.40	9.40	7.50	3.40
Conventional Parameters														
pH	pH units	7.43	7.54	7.43	7.54	7.66	7.63	7.62	7.56	7.57	7.35	7.47	7.47	7.27
Specific conductivity	umhos/cm	730	1800	3100	3100	4400	4700	5700	7000	11000	13000	18000	20000	-
Hardness	mg CaCO3/L	198	495	800	822	1090	1300	1530	2010	2990	29660	4030	4860	6040
Dissolved Hardness	mg CaCO3/L	197	484	-	62	1100	-	1500	1890	2670	3590	4290	4880	< 0
Total suspended solids	mg/L	9	8	8	7	8	6	8	11	21	25	14	21	25
Total dissolved solids	mg/L	465	1130	2060	1870	2130	2870	3270	4230	6620	7480	11200	12200	16300
Total organic carbon	mg/L	8.1	7.3	-	8.1	12	-	15	22	25	23	24	27	-
Dissolved organic carbon	mg/L	6.7	6.1	-	7.7	11	-	14	18	21	21	22	24	-
Turbidity	NTU	6.1	4.4	3.1	5	4.6	3.2	3.7	4.6	7.1	3.1	3.7	3.5	3.3
Major Ions														
Bicarbonate	mg CaCO3/L	32	37	50	48	61	64	72	74	76	77	79	86	-
Calcium	mg/L	64.4	153	-	18.2	340	-	473	576	807	1080	1220	1400	-
Carbonate	mg CaCO3/L	< 1	< 1	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1	-
Dissolved chloride	mg/L	150	440	820	830	1300	1400	1700	2100	3600	4300	6400	6600	9500
Cyanide	mg/L	< 0.005	< 0.005	-	< 0.005	-	-	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0082	< 0.005	0.015
Fluoride	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	< 0.10
Magnesium	mg/L	8.74	24.8	-	4.06	60.6	-	78.2	109	159	216	303	339	-
Potassium	mg/L	4.65	11.3	-	9.02	29.1	-	35.9	48.2	67.8	95.6	116	134	-
Sodium	mg/L	42.6	123	-	17.2	320	-	412	565	906	1300	1930	2300	-
Sulphate	mg/L	42	82	120	120	190	190	230	250	350	390	570	630	810
Silica	mg/L	1.8	2.4	-	7.6	1	-	< 0.50	0.70	1.3	1.4	1.8	1.9	-
Nutrients and Chlorophyll a														
Nitrate	mg/L	1.64	5.84	-	10.1	13.3	-	17.1	17.4	27.0	36.1	45.7	-	83.1
Nitrite	mg/L	0.036	0.087	-	0.242	0.335	-	0.267	0.242	0.423	0.616	0.794	-	0.731
Nitrate + nitrite	mg/L	1.68	5.93	-	10.3	13.6	-	17.4	17.6	27.5	36.7	46.5	57.6	83.9
Total ammonia	mg/L	1.8	4.5	-	7.7	10.0	-	13	11	18	22	29	35	48
Total Kjeldahl nitrogen	mg/L	2	3.9	-	7.1	10	-	12	12	19	26	25	30	-
Total phosphorus	mg/L	0.034	0.027	-	0.026	0.02	-	0.023	0.037	0.047	0.034	0.044	0.048	0.046
Orthophosphate	mg/L	< 0.010	< 0.010	-	< 0.010	< 0.010	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
General Organics														
Total oil and grease	mg/L	< 0.5	< 0.5	-	< 0.5	< 0.5	-	1.5	2.7	< 0.50	0.60	< 0.50	1.9	-
Total Metals														
Aluminum	mg/L	0.241	0.263	-	0.249	0.105	-	0.083	0.050	0.047	0.047	0.042	0.039	0.064
Antimony	mg/L	< 0.0005	< 0.0005	-	< 0.001	< 0.0025	-	< 0.0025	< 0.0050	< 0.0025	< 0.0050	< 0.0050	< 0.005	< 0.010
Arsenic	mg/L	0.00341	0.0053	-	0.00559	0.00422	-	0.00437	0.0041	0.00488	0.0040	0.0054	0.0055	0.0064
Barium	mg/L	0.0337	0.0647	-	0.105	0.121	-	0.154	0.176	0.254	0.219	0.311	0.38	0.407
Beryllium	mg/L	< 0.0001	< 0.0001	-	< 0.0002	< 0.0005	-	< 0.00050	< 0.0010	< 0.00050	< 0.0010	< 0.0010	< 0.001	< 0.0020
Boron	mg/L	-	0.103	-	0.17	-	-	0.30	< 0.50	0.52	0.62	0.79	0.88	1.1
Cadmium	mg/L	0.000024	0.000051	-	0.000076	0.000068	-	0.000093	< 0.00010	0.000212	0.00017	0.00086	0.00059	0.00117
Calcium	mg/L	64.6	156	-	261	340	-	481	614	930	869	1150	1390	1650
Chromium	mg/L	0.0016	< 0.001	-	< 0.002	< 0.005	-	< 0.0050	< 0.010	< 0.0050	< 0.010	< 0.010	< 0.001	< 0.020
Copper	mg/L	0.00271	0.00322	-	0.0061	0.0029	-	0.0033	< 0.0050	0.0054	< 0.0050	0.0111	0.097	0.012
Iron	mg/L	0.419	0.542	-	0.473	0.249	-	0.230	0.25	0.219	0.21	0.36	0.24	0.26
Lead	mg/L	0.00046	0.00057	-	0.00048	< 0.001	-	< 0.0010	< 0.0020	< 0.0010	< 0.0020	< 0.0020	< 0.002	0.0049
Lithium	mg/L	0.0397	0.121	-	0.219	0.302	-	0.427	0.597	0.639	0.873	1.13	1.22	1.49
Magnesium	mg/L	8.9	25.7	-	41.5	58.1	-	79.7	116	163	193	278	340	465
Manganese	mg/L	0.177	0.269	-	0.208	0.0972	-	0.0866	0.141	0.173	0.189	0.286	0.23	0.966
Mercury	mg/L	< 0.00001	0.00001	-	< 0.00001	< 0.00001	-	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.001	< 0.001	-	< 0.002	< 0.005	-	< 0.0050	< 0.010	< 0.0050	< 0.010	< 0.010	< 0.01	< 0.020
Nickel	mg/L	0.003	0.0084	-	0.0109	0.0122	-	0.0141	0.017	0.0226	0.025	0.039	0.049	0.059
Potassium	mg/L	4.67	11.7	-	19.4	26.8	-	37.0	50.4	74.8	74.5	113	140	169
Selenium	mg/L	< 0.0001	0.00015	-	< 0.0002	< 0.0005	-	< 0.00050	< 0.0010	< 0.00050	< 0.0010	< 0.0010	< 0.001	< 0.0020
Silver	mg/L	-	-	-	-	-	-	< 0.00010	< 0.00020	< 0.00010	< 0.00020	< 0.00020	-	< 0.00040
Sodium	mg/L	42.5	121	-	219	306	-	416	596	888	1130	1860	2290	3030
Strontium	mg/L	1.08	3.14	-	5.53	7.87	-	10.4	14.5	20.6	21.0	29.6	38	46.3
Thallium	mg/L	0.000018	0.000035	-	0.000046	0.000066	-	0.000107	0.00013	0.000224	0.00022	0.00033	0.00035	0.00032
Tin	mg/L	< 0.005	< 0.005	-	< 0.01	< 0.025	-	< 0.025	< 0.050	< 0.025	< 0.050	< 0.050	< 0.025	< 0.10
Titanium	mg/L	0.0067	0.011	-	< 0.01	< 0.025	-	< 0.025	< 0.050	< 0.025	< 0.050	< 0.050	< 0.05	< 0.10
Uranium	mg/L	0.00029	0.00092	-	0.00147	0.00211	-	0.00335	0.0049	0.00704	0.0064	0.0090	0.0094	0.0105
Vanadium	mg/L	< 0.005	< 0.005	-	< 0.01	< 0.025	-	< 0.025	< 0.050	< 0.025	< 0.050	< 0.050	< 0.05	< 0.10
Zinc	mg/L	0.0056	0.0066	-	0.012	< 0.025	-	< 0.025	< 0.050	< 0.025	< 0.050	< 0.050	< 0.05	< 0.10
Dissolved Metals														
Aluminum	mg/L	0.0108	0.072	-	0.0066	< 0.015	-	0.021	0.032	< 0.015	0.034	< 0.030	< 0.03	-
Antimony	mg/L	< 0.0005	< 0.0005	-	< 0.0005	< 0.0025	-	< 0.0025	< 0.0025	< 0.0025	< 0.0050	< 0.0050	< 0.005	-
Arsenic	mg/L	0.00204	0.00209	-	0.00268	0.00274	-	0.00312	0.00358	0.00398	0.0041	0.0043	0.0044	-
Barium	mg/L	0.0327	0.0619	-	0.0447	0.124	-	0.154	0.170	0.230	0.274	0.317	0.338	-
Beryllium	mg/L	< 0.0001	< 0.0001	-	< 0.0001	< 0.0005	-	< 0.00050	0.00074	< 0.00050	< 0.0010	< 0.0010	< 0.001	-
Boron	mg/L	< 0.05	0.087	-	< 0.05	< 0.25	-	0.31	0.36	0.57	0.67	0.95	0.79	-
Cadmium	mg/L	0.000023	0.000049	-	< 0.00001	0.000058	-	0.000081	0.000151	0.000159	0.00024	0.00061	0.00061	-
Chromium	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.005	-	< 0.0050	< 0.0050	< 0.0050	< 0.010	< 0.010	< 0.01	-
Copper	mg/L	0.00183	0.00197	-	0.0018	0.0024	-	0.0030	0.0039	0.0039	0.0042	0.0084	0.0092	-
Iron	mg/L	0.0258	0.0292	-	0.0281	0.036	-	0.057	0.089	0.055	0.056	< 0.050	0.057	-
Lead	mg/L	< 0.0002	< 0.0002	-	0.00042	< 0.001	-	< 0.0010	< 0.0010	< 0.0010	< 0.0020	< 0.0020	< 0.002	-
Lithium	mg/L	0.0406	0.115	-	< 0.002	0.34	-	0.419	0.552	0.874	0.998	1.19	1.23	-
Manganese	mg/L	0.162	0.255	-	0.202	0.0897	-	0.0509	0.0605	0.0752	0.190	0.238	0.172	-
Mercury	mg/L	< 0.00001	0.00001	-	< 0.00001	< 0.00001	-	-	-	-	-	-	< 0.00001	-
Molybdenum	mg/L	< 0.001	< 0.001	-	< 0.001	< 0.005	-	< 0.0050	< 0.0050	< 0.0050	< 0.010	< 0.010	< 0.01	-
Nickel	mg/L	0.0023	0.0067	-	0.0017	0.012	-	0.0144	0.0162	0.0194	0.027	0.036	0.043	-
Selenium	mg/L	< 0.0001	0.0001	-	< 0.0001	< 0.0005	-	< 0.00050	< 0.00050	< 0.00050	< 0.0010	< 0.0010	< 0.001	-
Silver	mg/L	-	-	-	-	-	-	< 0.00010	< 0.00010	< 0.00010	< 0.00020	< 0.00020	-	-
Strontium	mg/L	1.02	3.04	-	0.0704	7.61	-	10.2	13.5	19.7	24.3	32.8	30.7	-
Thallium	mg/L	0.000013	0.000035	-	< 0.00001	0.000079	-	0.000102	0.000140	0.000206	0.00021	0.00029	0.00033	-
Tin	mg/L	< 0.005	< 0.005	-	< 0.005	< 0.025	-	< 0.025	< 0.025	< 0.025	< 0.050	< 0.050	< 0.05	-
Titanium	mg/L	< 0.005	< 0.005	-	< 0.005	< 0.025	-	< 0.025	< 0.025	< 0.025	< 0.050	< 0.050	< 0.05	-
Uranium	mg/L	0.0003	0.00091	-	0.00013	0.00222	-	0.00333	0.00466	0.00624	0.0077	0.0084	0.0087	-
Vanadium	mg/L	< 0.005	< 0.005	-	< 0.005	< 0.025	-	< 0.025	< 0.025	< 0.025	< 0.050	< 0.050	< 0.05	-
Zinc	mg/L	< 0.005	< 0.005	-	0.0056	< 0.025	-	< 0.025	< 0.025	< 0.025	< 0.050	< 0.050	< 0.05	-
Volatile Organics														
Benzene	mg/L	< 0.0002	< 0.0002	-	< 0.0002	< 0.0002	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.0002	< 0.00020	-
Ethylbenzene	mg/L	< 0.0002	< 0.0002	-	< 0.0002	< 0.0002	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.0002	< 0.00020	-
Toluene	mg/L	< 0.0002	< 0.0002	-	< 0.0002	< 0.0002	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.0002	< 0.00020	-
Xylenes	mg/L	< 0.0004	< 0.0004	-	< 0.0004	< 0.0004	-	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.0004	< 0.00040	-
m,p-Xylenes	mg/L	< 0.0004	< 0.0004	-	< 0.0004	< 0.0004	-	< 0.00040	< 0.00040	< 0.00040	< 0.00040	< 0.0004	< 0.00040	-
o-Xylene	mg/L	< 0.0002	< 0.0002	-	< 0.0002	< 0.0002	-	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.0002	< 0.00020	-
F1 (C6-C10)-BTEX	mg/L	< 0.025	< 0.025	-	< 0.025	< 0.025	-	0.03	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	-
F1 (C6-C10)	mg/L	< 0.025	< 0.025	-	< 0.025	< 0.025	-	0.03	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	-
F2 (C10-C16)	mg/L	< 0.1	< 0.1	-	< 0.1	< 0.1	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-
F3 (C16-C34)	mg/L	< 0.2	< 0.2	-	< 0.2	< 0.2	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
F4 (C34-C50)	mg/L	< 0.2	< 0.2	-	< 0.2	< 0.2	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-
Reached baseline at C50	mg/L	YES	YES	-	YES	YES	-	YES	YES	YES	YES	YES	YES	-
Radionuclides														
Radium-226	Bq/l	< 0.005	< 0.005	-	< 0.005	-	-	0.0060	0.013	0.011	0.030	0.039	-	-

MEL-23 Parameters	Sample Date Units	6/24/2018	7/21/2018	8/29/2018
Field Parameters				
pH	pH units	8.25	9.43	8.6
Specific conductivity	umhos/cm	146.3	261	350
Temperature	C	9.5	19.3	8.6
Conventional Parameters				
pH	pH units	7.38	7.57	7.92
Specific conductivity	umhos/cm	140	280	380
Hardness	mg CaCO3/L	43.3	79.9	104
Dissolved hardness	mg CaCO3/L	41.3	79.3	107
Total dissolved solids	mg/L	220	115	280
Total suspended solids	mg/L	2	3	2
Total organic carbon	mg/L	6.5	13	15
Dissolved organic carbon	mg/L	5.9	12	15
Turbidity	NTU	0.6	0.7	0.6
Major Ions				
Bicarbonate	mg CaCO3/L	27	46	58
Calcium	mg/L	12	22.7	30.8
Carbonate	mg CaCO3/L	<1.0	< 1.0	< 1.0
Chloride	mg/L	24	48	73
WAD Cyanide (Free)	mg/L	< 0.0010	< 0.0010	< 0.0010
Total Cyanide	mg/L	< 0.0050	< 0.0050	< 0.0050
Magnesium	mg/L	2.74	5.48	7.33
Potassium	mg/L	1.02	1.93	2.48
Sodium	mg/L	8.12	18.1	24.9
Sulphate	mg/L	1.2	3.3	6.4
Silica	mg/L	0.13	0.27	0.15
Nutrients and Chlorophyll a				
Nitrate	mg/L	< 0.10	< 0.10	< 0.10
Nitrite	mg/L	< 0.010	< 0.010	< 0.010
Nitrate + nitrite	mg/L	< 0.10	< 0.10	< 0.10
Total ammonia	mg/L	0.093	< 0.050	< 0.050
Total Kjeldahl nitrogen	mg/L	0.41	0.45	0.73
Total phosphorus	mg/L	< 0.020	0.024	< 0.020
Orthophosphate	mg/L	< 0.010	< 0.010	< 0.010
General Organics				
Total oil and grease	mg/L	< 0.50	< 0.50	< 0.50
Total Metals				
Aluminum	mg/L	0.0101	0.0118	0.0087
Antimony	mg/L	< 0.00050	< 0.00050	< 0.00050
Arsenic	mg/L	0.00152	0.00250	0.00184
Barium	mg/L	0.0163	0.0250	0.0287
Beryllium	mg/L	< 0.00010	< 0.00010	< 0.00010
Boron	mg/L	< 0.050	< 0.050	< 0.050
Cadmium	mg/L	< 0.000010	< 0.000010	< 0.000010
Calcium	mg/L	12.4	22.9	30.1
Chromium	mg/L	< 0.0010	< 0.0010	< 0.0010
Copper	mg/L	0.00054	0.00117	0.00097
Iron	mg/L	0.4	0.180	0.151
Lead	mg/L	< 0.00020	< 0.00020	< 0.00020
Lithium	mg/L	<0.0020	0.0036	0.0049
Magnesium	mg/L	3.00	5.52	7.04
Manganese	mg/L	0.0345	0.0140	0.0057
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.0010	< 0.0010	< 0.0010
Nickel	mg/L	<0.001	0.0014	0.0019
Potassium	mg/L	1.03	1.99	2.39
Selenium	mg/L	< 0.00010	< 0.00010	< 0.00010
Silver	mg/L	< 0.000020	< 0.000020	< 0.000020
Sodium	mg/L	8.36	18.4	24.4
Strontium	mg/L	0.0766	0.146	0.180
Thallium	mg/L	< 0.000010	< 0.000010	< 0.000010
Tin	mg/L	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L	< 0.0050	< 0.0050	< 0.0050
Uranium	mg/L	< 0.00010	< 0.00010	< 0.00010
Vanadium	mg/L	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L	< 0.0050	< 0.0050	< 0.0050
Dissolved Metals				
Aluminum	mg/L	0.0032	0.0078	0.0067
Antimony	mg/L	< 0.00050	< 0.00050	< 0.00050
Arsenic	mg/L	0.0012	0.00218	0.00165
Barium	mg/L	0.0155	0.0237	0.0274
Beryllium	mg/L	< 0.00010	< 0.00010	< 0.00010
Boron	mg/L	< 0.050	< 0.050	< 0.050
Cadmium	mg/L	< 0.000010	< 0.000010	< 0.000010
Chromium	mg/L	< 0.0010	< 0.0010	< 0.0010
Copper	mg/L	0.00039	0.00117	0.00097
Iron	mg/L	0.284	0.0983	0.0799
Lead	mg/L	< 0.00020	< 0.00020	< 0.00020
Lithium	mg/L	<0.002	0.0037	0.0044
Manganese	mg/L	0.024	0.0057	0.0027
Mercury	mg/L	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	< 0.0010	< 0.0010	< 0.0010
Nickel	mg/L	<0.0010	0.0013	0.0019
Selenium	mg/L	< 0.00010	< 0.00010	< 0.00010
Silver	mg/L	< 0.000020	< 0.000020	< 0.000020
Strontium	mg/L	0.0717	0.148	0.180
Thallium	mg/L	< 0.000010	< 0.000010	< 0.000010
Tin	mg/L	< 0.0050	< 0.0050	< 0.0050
Titanium	mg/L	< 0.0050	< 0.0050	< 0.0050
Uranium	mg/L	< 0.00010	< 0.00010	< 0.00010
Vanadium	mg/L	< 0.0050	< 0.0050	< 0.0050
Zinc	mg/L	< 0.0050	< 0.0050	< 0.0050
Volatile Organics				
Benzene	mg/L	< 0.00020	< 0.00020	< 0.00020
Ethylbenzene	mg/L	< 0.00020	< 0.00020	< 0.00020
Toluene	mg/L	< 0.00020	< 0.00020	< 0.00020
Xylenes	mg/L	< 0.00040	< 0.00040	< 0.00040
m,p-Xylenes	mg/L	< 0.00040	< 0.00040	< 0.00040
o-Xylene	mg/L	< 0.00020	< 0.00020	< 0.00020
F1 (C6-C10)-BTEX	mg/L	-	-	< 0.025
F1 (C6-C10)	mg/L	-	-	< 0.025

MEL-24 **Parameters**	**Sample Date** **Units**	9/2/2018
Conventional Parameters		
pH	pH units	7.44
Specific conductivity	umhos/cm	3900
Hardness	mg CaCO3/L	1460
Total suspended solids	mg/L	64
Total dissolved solids	mg/L	2810
Turbidity	NTU	23
Major Ions		
Alkalinity	mg CaCO3/L	370
Dissolved chloride	mg/L	810
Cyanide	mg/L	< 0.0050
Free cyanide	mg/L	0.0022
Fluoride	mg/L	< 0.10
Dissolved sulphate	mg/L	440
Nutrients and Chlorophyll a		
Nitrate	mg/L	< 0.10
Nitrite	mg/L	< 0.010
Nitrate + nitrite	mg/L	< 0.10
Total ammonia	mg/L	12
Total phosphorus	mg/L	0.22
Orthophosphate	mg/L	0.026
Total Metals		
Aluminum	mg/L	0.169
Antimony	mg/L	0.0136
Arsenic	mg/L	0.137
Barium	mg/L	0.478
Beryllium	mg/L	< 0.00050
Boron	mg/L	0.54
Cadmium	mg/L	0.000086
Calcium	mg/L	515
Chromium	mg/L	0.0054
Copper	mg/L	0.0103
Iron	mg/L	6.29
Lead	mg/L	< 0.0010
Lithium	mg/L	0.282
Magnesium	mg/L	41.4
Manganese	mg/L	18.0
Mercury	mg/L	< 0.00001
Molybdenum	mg/L	0.0118
Nickel	mg/L	0.0173
Potassium	mg/L	101
Selenium	mg/L	< 0.00050
Silver	mg/L	< 0.00010
Sodium	mg/L	208
Strontium	mg/L	6.57
Thallium	mg/L	< 0.000050
Tin	mg/L	< 0.025
Titanium	mg/L	< 0.025
Uranium	mg/L	0.00459
Vanadium	mg/L	< 0.025
Zinc	mg/L	< 0.025

MEL-25 **Parameters**	**MAX GRAB**	**MAX MEAN**	**Sample Date** **Units**	5/24/2018	6/3/2018	6/9/2018	6/10/2018	6/17/2018	6/27/2018	6/29/2018	8/15/2018	8/31/2018	9/7/2018
Conventional Parameters													
pH	6 - 9.5	6 - 9.5	pH units	8.7	8.19	7.84	8.2	8.18	7.18	8.14	8.11	8.43	8.28
Hardness, as CaCO3			mg/L	-	-	31.8	30.7	-	-	-	56.9	136	135
Total suspended solids	**30**	**15**	mg/L	**53**	**250**	-	16	5	**40**	2	5	1	2
Total dissolved solids			mg/L								685	-	-
Turbidity			NTU								16	-	-
Major Ions													
Alkalinity			mg/L	-	-	-	-	-	-	-	120	-	-
Dissolved Chloride			mg/L	-		-	-	-	-	-	63	-	-
Cyanide			mg/L								< 0.0050	-	-
Fluoride			mg/L		-	-	-	-	-	-	0.65	-	-
Sulphate			mg/L								270	-	-
Nutrients and Chlorophyll a													
Nitrate			mg/L	-							14.4	-	-
Nitrite			mg/L	-							0.056	-	-
Nitrate + nitrite			mg/L	-							14.4	-	-
Total ammonia			mg/L	-	0.68	0.38	0.5	0.47	0.45	0.58	< 0.050	< 0.050	60
Total phosphorus			mg/L	-	0.11	-	-	-	-	-	< 0.020	-	-
Orthophosphate			mg/L	-							< 0.010	-	-
General Organics													
Total oil and grease	5	5	mg/L	0.5	-	-	-	-	-	-	0.70	-	-
Total Metals													
Aluminum			mg/L	-	13	-	-	-	-	0.177	0.460	0.123	0.0895
Antimony			mg/L	-	< 0.00050	-	-	-	-	0.0004	< 0.00050	0.00078	0.00080
Arsenic			mg/L	-	0.0018	0.00052	0.00067	< 0.0010	< 0.0010	< 0.0010	0.00072	0.00120	0.00111
Barium			mg/L	-	0.036	-	-	-	-	0.0125	0.0137	0.0335	0.0339
Beryllium			mg/L	-	< 0.00050	-	-	-	-	<0.0005	< 0.00010	< 0.00010	< 0.00010
Boron			mg/L	-	0.056	-	-	-	-	0.05	0.126	0.295	0.359
Cadmium			mg/L	-	< 0.00010	-	-	-	-	<0.00002	< 0.000010	< 0.000010	< 0.000010
Calcium			mg/L	-	14	-	-	-	-	11.3	11.1	28.0	27.9
Chromium			mg/L	-	0.17	-	-	-	-	<0.0006	0.0055	0.0011	< 0.0010
Cobalt			mg/L	-	0.018	-	-	-	-	<0.0005	0.00318		
Copper			mg/L	-	0.05	0.00834	0.00808	0.0053	0.0019	0.0015	0.705	0.00429	0.00459
Iron			mg/L	-	24	-	-	-	-	0.08	<0.0002	0.160	0.053
Lead	**0.1**	**0.1**	mg/L	0.0015	0.0033	0.00072	0.00066	< 0.00050	< 0.00050	< 0.00050	< 0.00020	0.00032	< 0.00020
Lithium			mg/L	-	-	-	-	-	-	-	< 0.0020	0.0022	0.0024
Magnesium			mg/L	-	16	-	-	-	-	3.86	7.08	16.0	16.0
Manganese			mg/L	-	0.38	-	-	-	-	0.0128	0.0156	0.0068	0.0023
Mercury			mg/L	-	-	-	-	-	-	-	< 0.00001	-	-
Molybdenum			mg/L	-	0.003	-	-	-	-	0.0042	0.0063	0.0144	0.0155
Nickel			mg/L	-	0.064	0.0084	0.0077	0.0056	0.0027	0.0023	0.0041	0.0042	0.0033
Potassium			mg/L	-	5.5	-	-	-	-	5.86	8.69	20.7	20.2
Selenium			mg/L	-	< 0.0020	-	-	-	-	<0.001	0.00106	0.00214	0.00214
Silicon			mg/L	-	22	-	-	-	-	2.70			
Silver			mg/L	-	< 0.00010	-	-	-	-	<0.0001	< 0.000020	< 0.000020	< 0.000020
Sodium			mg/L	-	52	-	-	-	-	76	81.5	193	189
Strontium			mg/L	-	0.03	-	-	-	-	-	0.0552	0.142	0.139
Thallium			mg/L	-	< 0.000050	-	-	-	-	-	0.000017	0.000038	0.000030
Tin			mg/L	-	< 0.0010	-	-	-	-	<0.001	< 0.0050	< 0.0050	< 0.0050
Titanium			mg/L	-	0.58	-	-	-	-	0.001	0.0121	0.0056	< 0.0050
Uranium			mg/L	-	0.0002	-	-	-	-	<0.001	0.00085	0.00221	0.00223
Vanadium			mg/L	-	0.039	-	-	-	-	0.001	< 0.0050	< 0.0050	< 0.0050
Zinc			mg/L	-	0.044	-	-	-	-	0.002	< 0.0050	< 0.0050	< 0.0050
Volatile Organics													
Benzene	0.37	0.37	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Ethylbenzene	0.09	0.09	mg/L	< 0.00020	< 0.00020	0.00054	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Toluene	0.02	0.02	mg/L	< 0.00020	< 0.00020	0.0015	< 0.00020	< 0.00020	< 0.00020	< 0.00020	0.00029	0.00027	< 0.00020
Xylenes			mg/L	< 0.00040	< 0.00020	0.00074	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00040	< 0.00020	< 0.00040
m,p-Xylenes			mg/L	< 0.00040	< 0.00020	0.00046	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00040	< 0.00020	< 0.00040
o-Xylene			mg/L	< 0.00020	< 0.00020	0.00028	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Styrene			mg/L	-	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	-	< 0.00050	-
F1 (C6-C10)-BTEX			mg/L	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
F1 (C6-C10)			mg/L	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
F2 (C10-C16)			mg/L	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F3 (C16-C34)			mg/L	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
F4 (C34-C50)			mg/L	-	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Reached baseline at C50			mg/L	-	-	-	-	-	-	-	YES	YES	YES
Methyl tert-butyl ether			mg/L	-	-	-	-	-	-	-	-	< 0.00050	-

Appendix H-4

Noise monitoring report

AGNICO EAGLE

MELIADINE GOLD PROJECT

2018 Noise Monitoring Report

In Accordance with NIRB Project Certificate No. 006

Prepared by Agnico Eagle Mines Limited –
Meliadine Division

MARCH 2019

EXECUTIVE SUMMARY

In accordance with NIRB Project Certificate No. 006, and as described in the Noise Abatement and Monitoring Plan (March, 2017), Agnico Eagle Mines Ltd. (Agnico Eagle) began outdoor noise monitoring at the Meliadine site near Rankin Inlet in 2016. The objective of the noise monitoring program is to measure noise levels at four previously determined monitoring locations (NPOR006, NPOR008, NPOR014, NPOR017) over at least two 24 h periods. Results are compared to FEIS predictions for the 24-h L_{eq}, and the $L_{eq\text{-}nighttime}$ design target of 40 dBA for reference. Note that according to conditions of the Project Certificate, NPOR014 was not required to be monitored in 2018, since activities related to the Discovery Pit were not occurring. However, maintaining this site as a reference station facilitates interpretation of the dataset, by providing a measure of the general background acoustic environment.

Since high winds in the area tend to significantly reduce the amount of available data, technicians aim to conduct two or more monitoring events for each station, of two to three days each. In 2018, two separate monitoring events were conducted for NPOR006 and NPOR017, while one event was conducted for NPOR008 and NPOR014. These stations are only accessible by boat, and high winds inhibited technician access.

Overall, a very limited dataset was available for calculation of 24-h and night-time L_{eq} values in 2018. This was generally due to sub-optimal weather conditions, near-continuous animal sound interference, and subsequent filtration of the data. For stations NPOR006 and NPOR017, insufficient data was available after filtering to calculate valid 24-h and night-time L_{eq} values for comparison to predictions. For remote stations NPOR008 and NPOR014, L_{eq} values were elevated so sound recordings were reviewed, and no human-associated activity was audible. Significant wind, wave, and animal sounds (bird calls) mainly contributed to the elevated background acoustic environment in these locations.

The data collected in 2018 suggests that background sound levels in this area may regularly exceed those assumed during the FEIS (35 dBA), likely due to predominant high winds and wave action on the shore of Meliadine Lake. Particular care will be taken to ensure future monitoring is conducted when wind speeds are at their lowest, to reduce the significant wind interference and wave noises contributing to background sounds. Timing monitoring events earlier in the season may also help reduce the frequency of bird calls which were especially dominant in recordings this year, and which consistently contributed to recorded sound peaks. In addition, due to frequent use of the cabin at NPOR006 and potential for interference with sound measurements, Agnico will conduct reconnaissance in 2019 to determine whether monitoring at NPOR005 would facilitate analysis of acoustic data in this area.

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1 INTRODUCTION

In February, 2015, Agnico Eagle Mines Ltd. (Agnico Eagle) was issued NIRB Project Certificate No. 006 for the Meliadine Gold Project, near Rankin Inlet, NU. In accordance with this Project Certificate, and as described in the Noise Abatement and Monitoring Plan (March, 2017), Agnico Eagle began conducting outdoor noise monitoring at the Meliadine site in 2016. The objective of the Noise Abatement and Monitoring Plan is to validate predictions of noise levels made in the FEIS, confirm the findings of the noise impact assessment (Vol. 5 – Atmospheric Environment and Impact Assessment, April, 2014), and inform the implementation of noise mitigation measures. If noise monitoring confirms excessive Project-associated noise levels exist, the monitoring data will be used to determine where noise abatement requires improvement.

A summary of the noise monitoring program is shown in Table 1, according to the Noise Abatement and Monitoring Plan (2017).

Table 1. Noise monitoring objectives, frequency, duration, and locations.

Project Phase	Project Objectives	Frequency and Duration of Monitoring	Monitoring Locations
Construction and Operations	To verify that the noise emissions used in the FEIS noise assessment were reasonable, yet conservative. To verify that the mitigation measures considered integral to the Project are incorporated as planned, and are effective.	Yearly monitoring programs, twice per year. A duration of 24+ hours per station.	FEIS receptors NPOR006 NPOR008 NPOR014 NPOR017 Possibility to add NPOR005

2 METHODS

2.1 MONITORING LOCATIONS

In 2018, noise monitoring was conducted at four locations, as identified in the Noise Abatement and Monitoring Plan. These locations coincide with the identified points of reception (PORs) with the greatest predicted changes in noise levels from existing conditions, as determined through the noise impact assessment (FEIS Vol. 5, Section 5.5). The monitoring locations are identified in Figure 1, and summarized in Table 2. Photos of the noise monitoring locations are provided in Section 3. These

monitoring locations will be reviewed and may be adapted throughout the construction and/or operations phases of the Project, as necessary.

It should be noted that based on conditions for monitoring, NPOR014 was not required to be assessed in 2018, since activities associated with the Discovery Pit were not occurring. However, maintaining this station as a reference site facilitates interpretation of the noise data.

Table 2. Noise monitoring locations and conditions for monitoring.

POR	UTM	Project Area	Conditions for Monitoring
NPOR006	15V 538286 / 6991299	Mine	Monitor during the entire Construction and Operations Phases, and initial stages of Closure when extensive activities are occurring.
NPOR008	15V 543707 / 6987276	Mine	Monitor during the entire Construction and Operations Phases, and initial stages of Closure when extensive activities are occurring.
NPOR014	15V 549401 / 6982060	Mine	Monitor only if activities associated with the Discovery Pit are occurring.
NPOR017	15V 544203 / 6970537	AWAR	Monitor during the entire Construction and Operations Phases, and initial stages of Closure when extensive activities are occurring.

All noise monitoring stations are located in close proximity to seasonally occupied cabins, which were identified as being the most sensitive receptors in the noise impact assessment (FEIS Vol. 5, Section 5.5.4.4). However, it is noted that the frequent use of some of these cabins impedes efficient collection of valid noise data that is representative of mine activities.

NPOR006 is located approximately 1 km north of the mine site disturbance area, and approximately 200 m outside the FEIS site study area (SSA). The adjacent cabin was in use at the time of the 2018 noise surveys. The surrounding terrain is a mix of small rock and lichen. The slope is very minimal leaning SW. Meliadine Lake is ~150 m NE and an unnamed small lake is ~120 m SSW.

NPOR008 is located approximately 1.25 km from the SSA, on the east side of the site. The surrounding terrain is on the summit of a small vegetated hill with very little apparent rock. Meliadine Lake is ~ 51 m to the NNE. The mine camp is approximately 2 km to the northwest, and the all weather road is approximately 2.5 km to the southwest.

NPOR014 is located approximately 130 m from the traditionally used ATV trail. This station is at the southern end of Meliadine Lake and is approximately 10 km away from the Meliadine exploration camp and 5 km from the Discovery area. It is located within the SSA. Currently there is no development in this area, so measurements at NPOR014 in 2018 are expected to be indicative of background values.

NPOR017 is located at the southern end of the all-weather access road (AWAR). It is approximately 150 m SW of the road. No SSA was assessed for the AWAR.

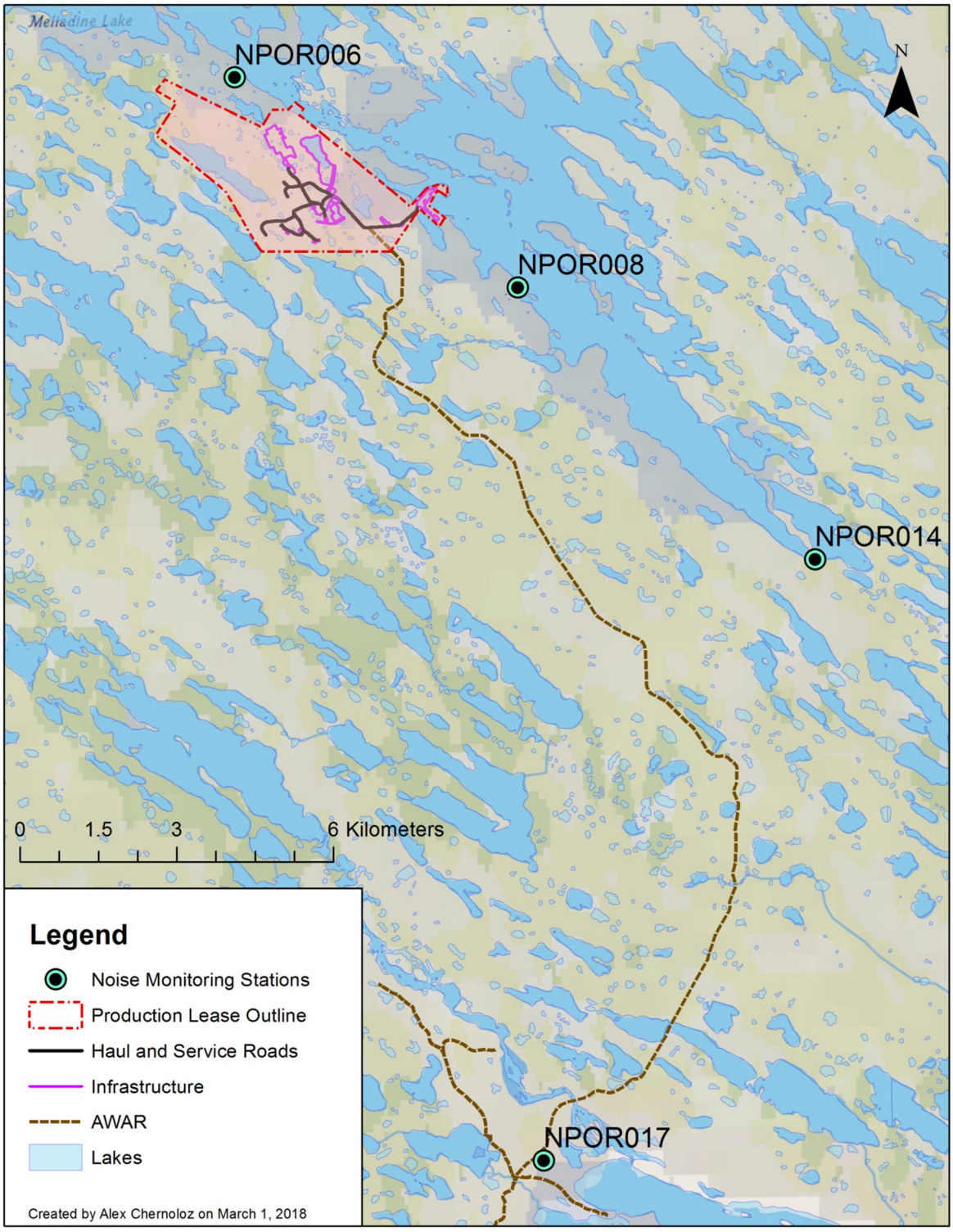


Figure 1. Noise receptors (points of reception - PORs) as identified in the noise impact assessment. Noise monitoring was conducted at NPOR006, NPOR008, NPOR014, and NPOR017 in 2018.

2.2 MONITORING DATES

In accordance with the Noise Abatement and Monitoring Plan, two 24-h+ noise surveys were planned to be conducted for each location. One survey was completed for NPOR008 and NPOR014 due to adverse weather conditions. These sites are accessible by boat only, and high winds prevented technicians from conducted a second monitoring event. Surveys were planned to last approximately 72 - 96 h in duration (extents of battery life), since a significant portion of data is typically filtered out due to sub-optimal weather conditions (see Section 2.4). Monitoring dates and times for each survey are provided in Table 3. Due to equipment malfunction, three surveys recorded less than 24 h of data.

Table 3. Noise monitoring dates in 2018.

Location	Monitoring Start Date (Time)	Monitoring Stop Date (Time)	Duration (h)
NPOR006	8/22/18 11:08	8/22/18 21:44	11
	9/04/18 11:38	9/07/18 16:37	78
NPOR008	8/28/18 17:42	8/29/18 5:52	13
NPOR014	8/25/18 16:26	8/28/18 16:27	73
NPOR017	8/10/18 12:07	8/12/18 23:59	60
	9/09/18 10:11	9/09/18 21:49	12

2.3 SOUND LEVEL METER

For all stations a Bruel and Kjaer Model 2250 integrating sound level meter with secondary wind screen was used to conduct the noise survey. The noise logging rate was set at one-minute intervals, and according to the Noise Abatement and Monitoring Plan, logged parameters included:

- Integrated equivalent A-weighted sound level (L_{Aeq})
- 1/3 octave band sound levels in decibels (dB)
- Statistical data (L_{10}, L_{90})
- Maximum sound level (L_{max}) in dBA
- Minimum sound level (L_{min}) in dBA

Calibration of the instrument was performed before and after each monitoring event using a Bruel and Kjaer Type 4231 Calibrator, to ensure variance was within 0.5 dB (see field notes, Appendix A). Estimated uncertainty, over a yearly time period for the calibrator is better than 0.05 dB at a 96% confidence level.

2.4 WEATHER DATA

Weather data for the noise monitoring periods was collected using the mine site's permanent weather station. Hourly data for wind, temperature, and relative humidity were available from this station.

The Alberta Energy Resource Conservation Board Directive 038 (Directive 038) requires noise data to be collected under appropriate weather conditions, which are represented by an absence of steady precipitation, snow, water, or ice ground cover, as well as restrictions on wind speed. To adhere to these conditions, noise data was filtered out from analyses when relative humidity exceeded 90% (assuming precipitation occurred) and/or wind speed exceeded 15 km/hr. Average hourly humidity and wind speed values were used, since filtering based on maximum values resulted in exclusion of nearly the entire noise dataset. This approach is considered conservative, since higher winds are likely to result in increased noise levels due to wind effects. Weather data (wind speed, wind direction, temperature, and humidity) are provided in Appendix B.

2.5 FIELD NOTES

A pocket weather meter (WeatherHawk® WindMate™, WM-300) was used by field staff to record wind speed, direction, and temperature at the beginning and end of each monitoring period. Other observations included precipitation, cloud cover, and observed noises during instrument set-up and takedown. All field notes are provided in Appendix A.

2.6 DATA ANALYSIS

Data recorded at the four monitoring sites were downloaded for assessment using the Bruel and Kjaer 5503 Measurement Suite software, with some calculations performed using Microsoft Excel. Recorded one-minute L_{Aeq} values were used to calculate hourly equivalent energy noise levels ($L_{eq, 1h}$).

2.6.1 INITIAL DATA FILTERING

All datapoints associated with the first hour of measurement were filtered out to remove noise from technician activity, and to ensure more than 30 min of data contributed to hourly averages. Data was also filtered on the basis of recorded weather conditions to comply with Directive 038 (see Section 2.4).

2.6.2 24-H AND NIGHT-TIME LEQ CALCULATIONS

After the initial filtration, valid hourly L_{eq} values for each monitoring period were used to calculate average 24-h equivalent energy noise levels ($L_{eq, 24\,h}$) for comparison to FEIS model predictions and the site's noise monitoring criteria (see Table 4) . When a data point ($L_{eq, 1\,h}$) was available from more than one day within a monitoring period, values were energy-averaged across calendar days to ensure time points contributed equally to 24-h L_{eq} values. As indicated in the Noise Abatement and Monitoring Plan, night-time (11pm – 7am) L_{eq} values were also calculated, and are compared with the design target of 40 dBA for reference only. It should be noted that this target was designed to apply at a distance of 1.5 km from the site study area (SSA) in remote areas. Since all of the monitoring stations are located closer to or within the SSA (except NPOR017, the AWAR location for which no

SSA was assessed), exceedances of this target value may occur, without an exceedance at the 1.5 km distance. In that case, one or more stations may be added or moved in future monitoring events to coincide with this design target location to more precisely assess FEIS predictions.

According to Directive 038, a noise monitoring survey is considered to be acceptable when there are a minimum of 180 valid minutes during the daytime period and 180 valid minutes during the nighttime period. When insufficient valid data was available from the appropriate time periods, 24-h and night-time L_{eq} values could not be calculated.

Table 4. FEIS predictions for 24-h equivalent sound levels, FEIS design targets for 1.5 km from the site study area perimeter, and proposed noise monitoring criteria from the 2017 Noise Abatement and Monitoring Plan.

Location	FEIS Prediction $L_{eq\text{-}24h}$ (dBA)	Design Target (1.5 km from SSA) $L_{eq\text{-}nighttime}$ (dBA)	Proposed Noise Monitoring Criteria $L_{eq\text{-}24h}$ (dBA)
NPOR006	39.8	40	45
NPOR008	41.7	40	45
NPOR014	44.7	40	45
NPOR017	43.4	40	45

2.6.3 SECONDARY DATA FILTERING

When calculated 24-h or night-time L_{eq} values exceeded the above criteria, sound recordings were reviewed to identify and if necessary, remove noise data containing recordings of abnormal noise sources unrelated to mine activity. In 2018 this was limited to prolonged wind-induced microphone noise, and animal interference in close proximity to the microphone (in particular, very loud bird calls). These noise sources were assumed to be minimal in the FEIS process, since a background sound level of 35 dBA was used. After this second data filtering, the final L_{eq} values were compared to FEIS predictions and the night-time design target.

3 RESULTS

All 1-h L_{eq} values are provided in Appendix B.

3.1 NPOR006

L_{eq} values calculated from 1-min measurements over each monitoring period at NPOR006 are shown in Figures 3 and 4. Invalid data points removed from analyses due to assumed technician interference and sub-optimal weather conditions (as described in Section 2.4) are indicated (LA_{eq}-unfiltered). For event 1 at station NPOR006, 11 h of monitoring were conducted, and 5 h of valid data were available after initial filtering. Since all valid data was from the daytime period (12 – 5 pm), there was insufficient representative data to calculate a 24 h L_{eq} or night-time L_{eq} for this event. For event 2 at NPOR006, 78 h of monitoring were conducted, and 20 h of valid data were available after initial filtering, including 14 daytime and 6 night-time hours.

Audible noises noted in the field log for this location include human activities from a nearby cabin (ATV traffic, construction work), site traffic (including helicopters) and site activities (gravel excavation nearby).

After the initial filtering, the calculated 24-h L_{eq} value for the valid monitoring event (September) was 56.5 dBA, which exceed the FEIS prediction of 39.8 dBA and FEIS impact assessment criteria for "non-significant impacts" (45 dBA). Sound recordings were therefore reviewed. Significant animal interference (bird calls) contributed to peaks, and strong wind induced microphone noise occurred throughout the recording. The dataset was further filtered on this basis. Approximately 6 h were removed due to dominant wind induced noise (evident from listening to sound files and observed elevated L_{min} values), and 24 min were removed due to very prominent bird noises in close proximity to the sound meter. After this secondary filtering, the available dataset consisted of 11 h of data from September 5 – 6, including 2 h from the night-time period, which is insufficient to calculate valid 24-h and night-time L_{eq} values.

Monitoring in 2019 will be conducted earlier in the season, prior to the fall goose migration and when wind speeds tend to be lower, in order to optimize chances of successful data collection.

In 2017, the FEIS impact assessment criteria of 45 dBA was marginally exceeded during one event, and continued monitoring was recommended to determine if elevated noise levels in this location are sustained, and in order to better distinguish mine-related noise from that of the cabin. Since occupancy of the nearby cabin is frequent, and construction works there appear to be ongoing (a second cabin appears to have been built since 2016), it has not been feasible to conduct monitoring during an unoccupied period. Furthermore, near-continuous noise from small mechanical equipment (potentially a generator) is audible on sound files. Agnico will conduct reconnaissance in 2019 to determine the feasibility of monitoring at NPOR005, as described in the Noise Abatement and Monitoring Plan. This station is in a similar location relative to site development, but may have lower occupancy rates.

To date, no noise-related complaints have been received in this area.



Figure 2. Noise monitoring location NPOR006 (September 4, 2018).

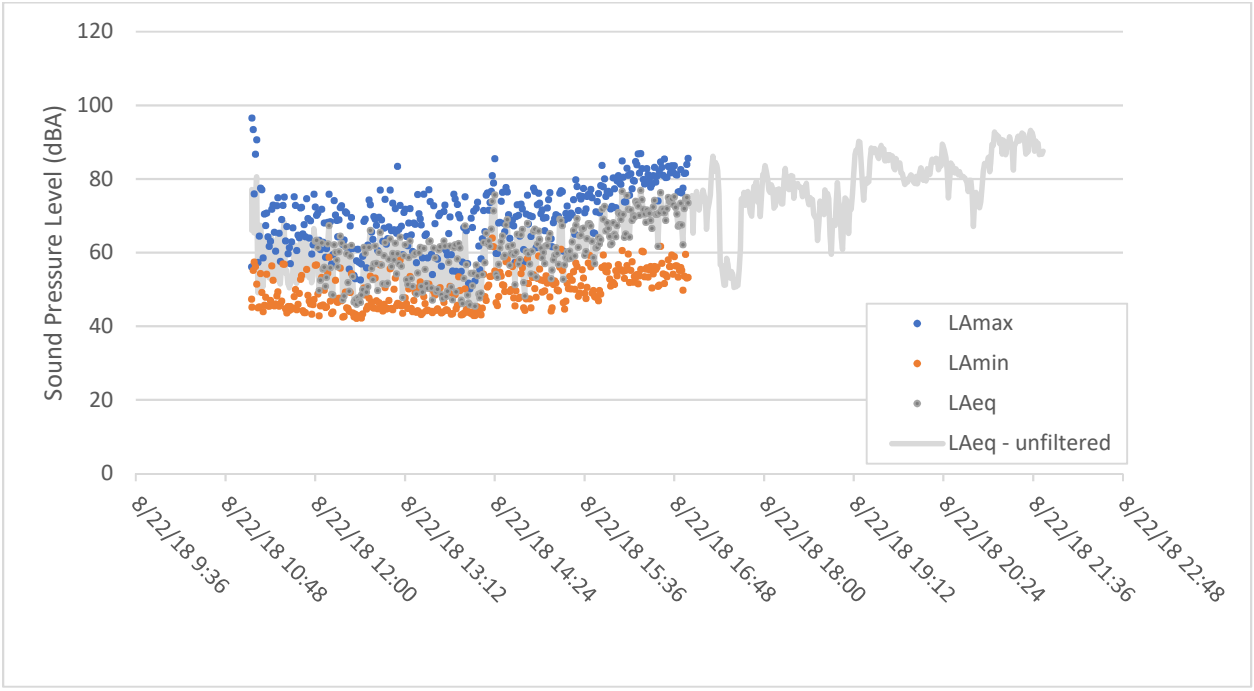


Figure 3. 1-min L_{max}, L_{min}, and L_{eq} values recorded at site NPOR006 during monitoring event 1.

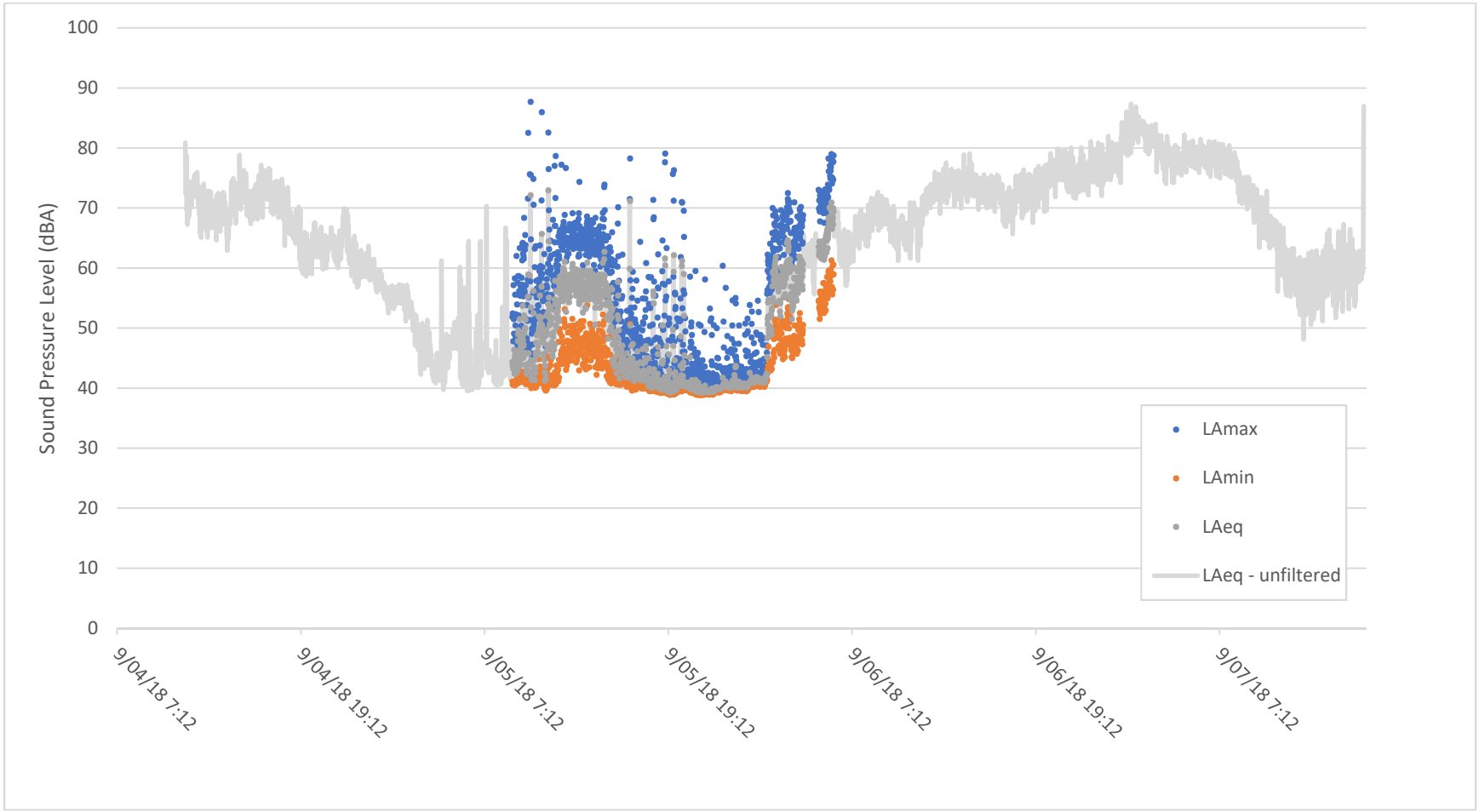


Figure 4. 1-min L_{max}, L_{min}, and L_{eq} values recorded at site NPOR006 during monitoring event 2.

3.2 NPOR008

L_{eq} values calculated from 1-min L_{eq} measurements over the monitoring period at NPOR008 are shown in Figure 6. Invalid data points removed from the analysis due to technician interference and sub-optimal weather conditions (as described in Section 2.4) are indicated. For the monitoring event at this station (August 28 – 29), 12 h of monitoring were successfully conducted, and 5 h of valid data were available after initial filtering. This included one hour from the daytime period, which is insufficient to calculate a valid 24-h L_{eq}s.

Audible noises noted in the field log at this location include occasional boats, helicopters, and wildlife (birds).

After the initial filtering, the $L_{eq\text{-}nighttime}$ for this station was 64.5 dBA, which is above the design target of 40 dBA for 1.5 km from the mine SSA. As a result, sound recordings were reviewed. From this review, no mine-related or other human-associated sounds were audible on the recordings. Wind, wave action, and occasional animal noises appear to be contributing to the recorded acoustic environment at this station. L_{min} values were elevated, further indicating significant background noise. Since no mine activity was audible, the dataset was not further filtered on the basis of the sound review, and the recorded Leq night-time is assumed to be representative of a naturally elevated acoustic environment in this location.

As indicated in Section 3.1, it is recommended for monitoring to be conducted earlier in the season, when wind speeds tend to be lower. It may also be noted that a background noise value of 35 dBA was assumed in the FEIS, which is typical in remote areas. However, in this location adjacent to Meliadine Lake, the combination of greater wind speeds and the nearby shoreline appears to result in an elevated background sound level which should be considered in data interpretation for this site.



Figure 5. Noise monitoring location NPOR008 (2018).

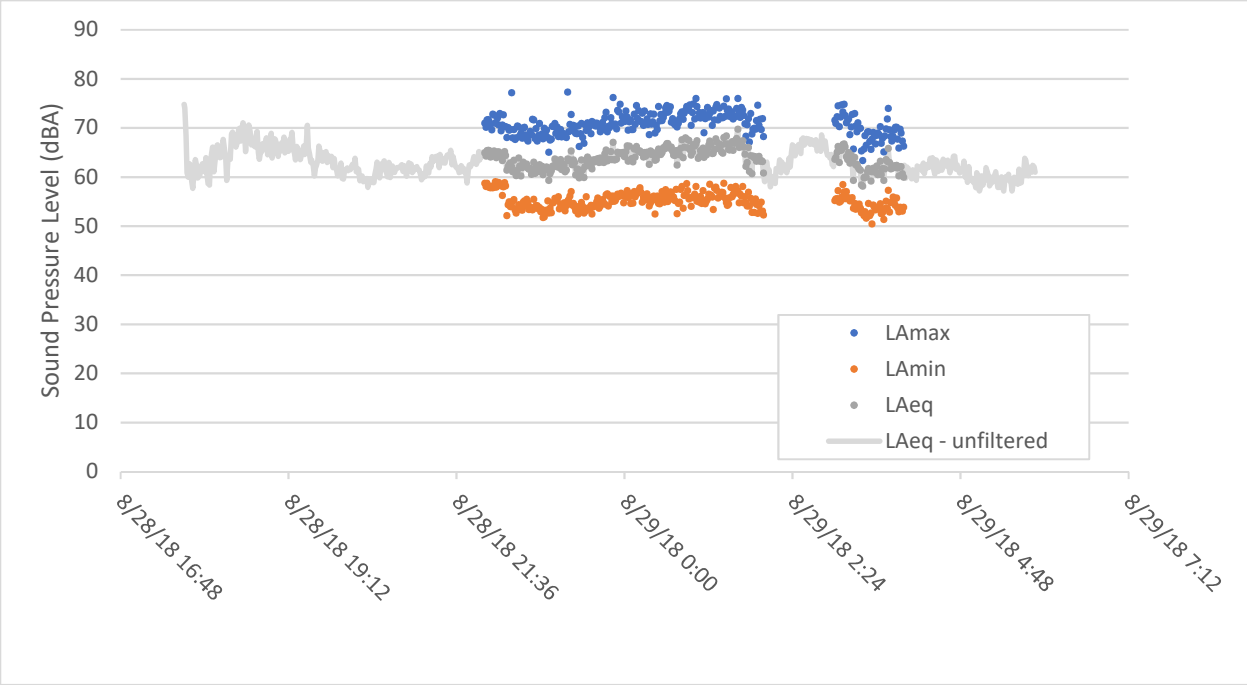


Figure 6. 1-min L_{max}, L_{min}, and L_{eq} values recorded at site NPOR008 during monitoring event 1.

3.3 NPOR014

No development activity is currently occurring in the area of NPOR014, so 2018 monitoring is considered to be representative of the background acoustic environment. L_{eq} values calculated from 1-min L_{eq} measurements over the August 25 - 28 monitoring period at NPOR014 are shown in Figure 8. Invalid data points removed from the analysis due to technician interference and sub-optimal weather conditions based on weather station data (as described in Section 2.4) are indicated. For station NPOR014, 73 h of monitoring were conducted, and 49 h of valid data were available after initial filtering.

Noise sources noted in the field log at this location include potential for boats and ATVs, bird sounds, and hunting sounds.

The calculated 24-h L_{eq} after initial filtering was 63.5 dBA. This is above the value of 44.7 dBA predicted in the FEIS for this location. The $L_{eq\text{-}nighttime}$ was 49.9, which is above the design target of 40 dBA for 1.5 km from the mine SSA. As a result, sound recordings were reviewed. No mine related activity was audible. Significant and frequent animal interference (bird sounds) in close proximity to the noise meter contributed to noise peaks, and background sounds were dominated by wind and wave action, and near-constant bird calls throughout sections of the recording. Insect sounds were also frequently audible. Since no development activity is currently occurring in this area, the recorded sound levels are indicative of the typically elevated acoustic environment near the shore of Meliadine Lake at this time of year.

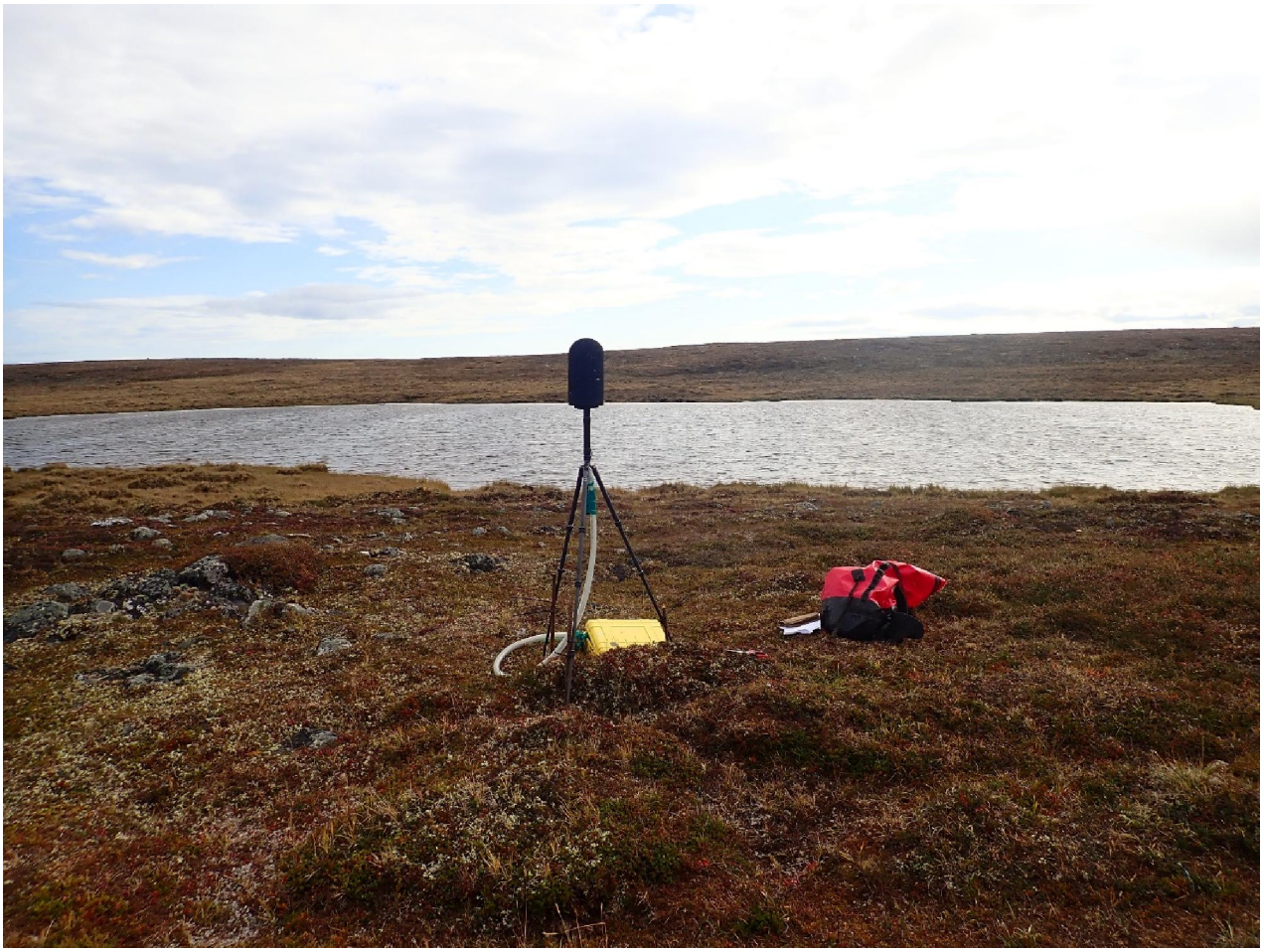


Figure 7. Noise monitoring station NPOR014 (August 28, 2018).

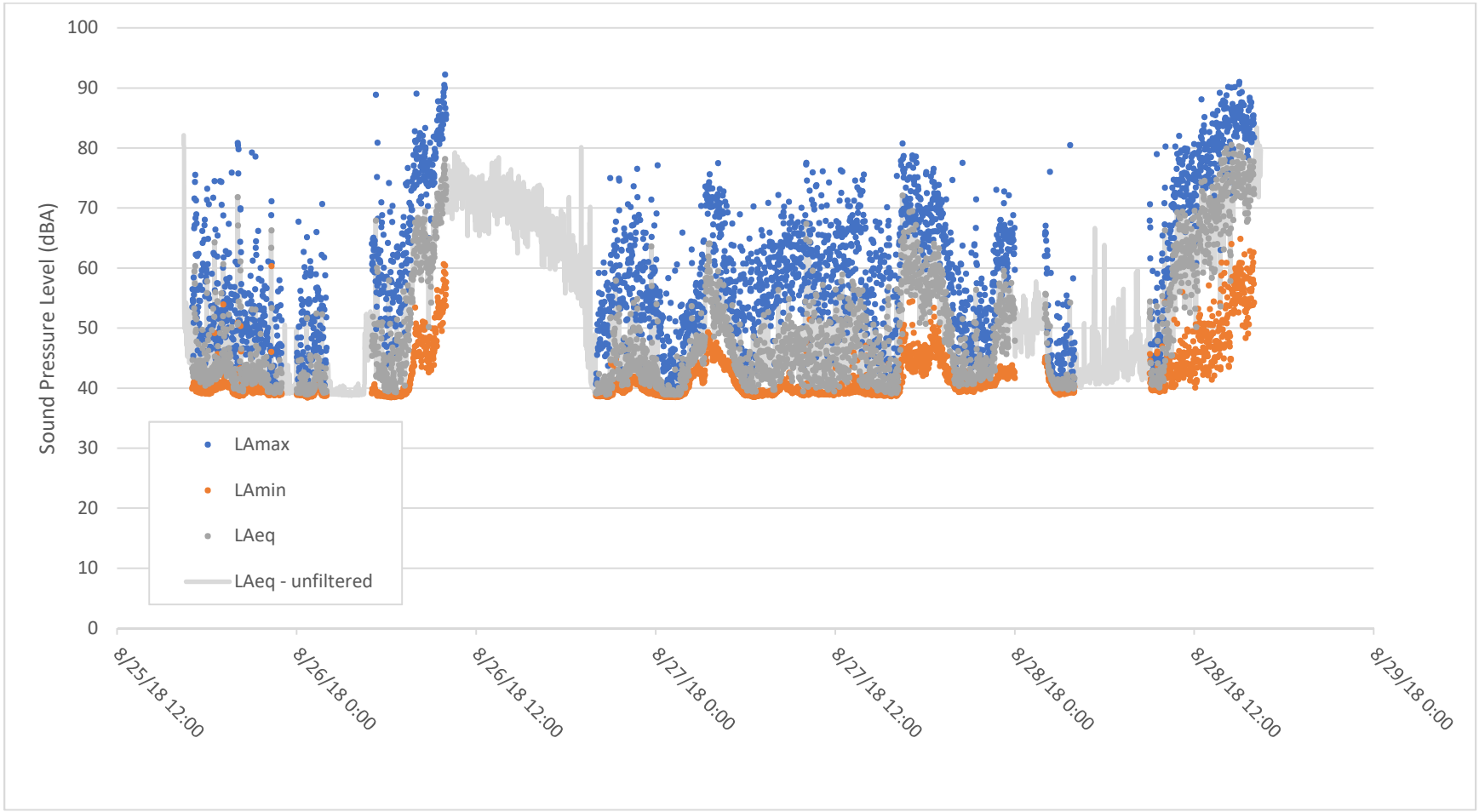


Figure 8. 1-min L_{max}, L_{min}, and L_{eq} values recorded at monitoring site NPOR014.

3.4 NPOR017

L_{eq} values calculated from 1-min L_{eq} measurements over the monitoring periods at NPOR017 are shown in Figure 10 and 11. Invalid data points removed from analysis due to technician interference and sub-optimal weather conditions based on weather station data (as described in Section 2.4) are indicated. For event 1 at station NPOR017 (August 10 - 12), 60 h of monitoring were conducted and 9 h of valid data were available after filtering. This did not include any night-time hours (11 pm – 7 am), so calculation of a valid 24-h L_{eq} or night-time L_{eq} was not possible. For event 2 at station NPOR017 (September 9), 12 h of monitoring were conducted, and 2 h of valid data were available after filtering. As a result it was not possible to calculate any valid day- or night-time measurements for event 2.

This station is located 140 m from the all weather road. Audible noises noted in the field log include light vehicles, transport trucks, ATVs, sounds from the nearby hunting cabin, and bird noises.

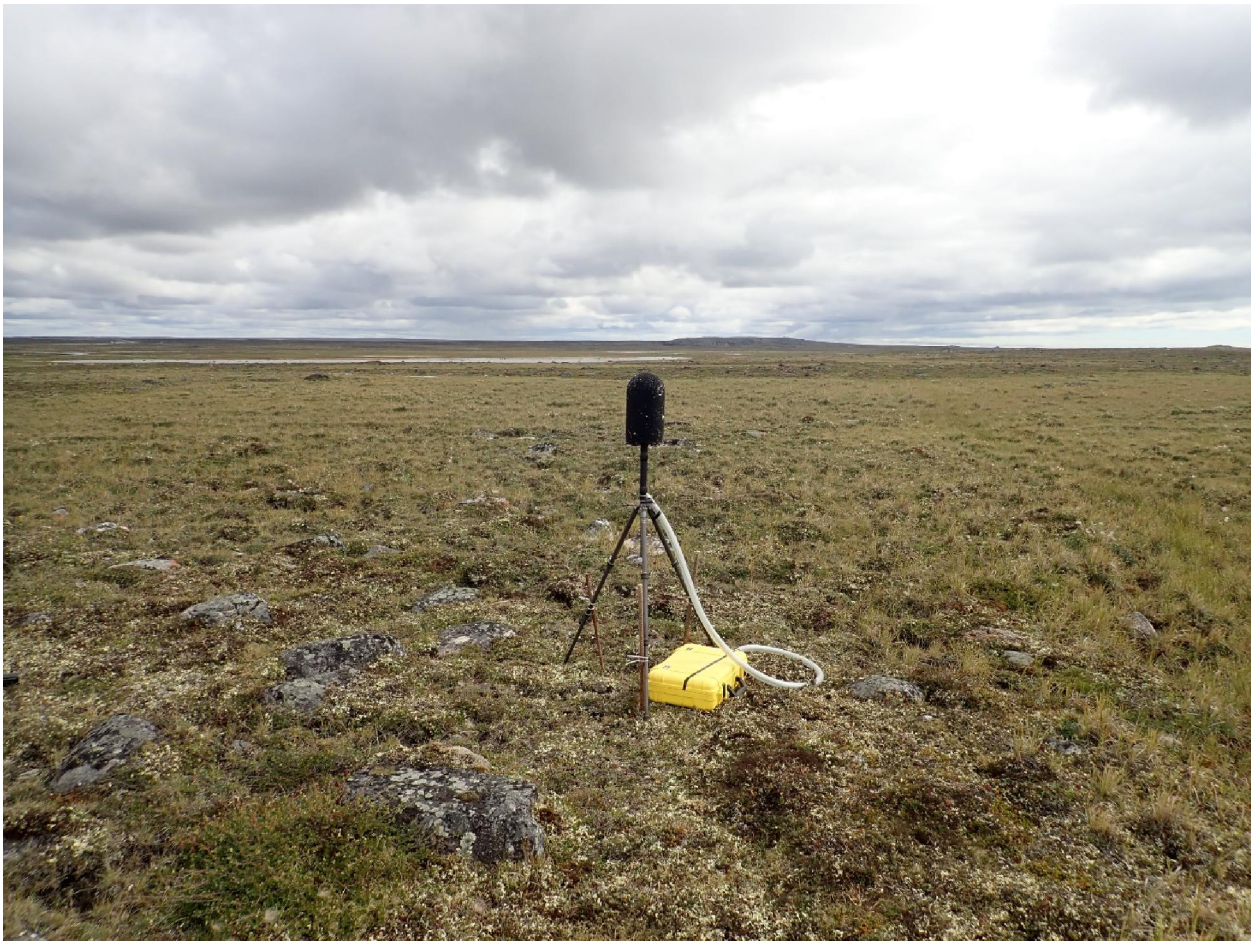


Figure 9. Noise monitoring location NPOR017 (August 10, 2018).

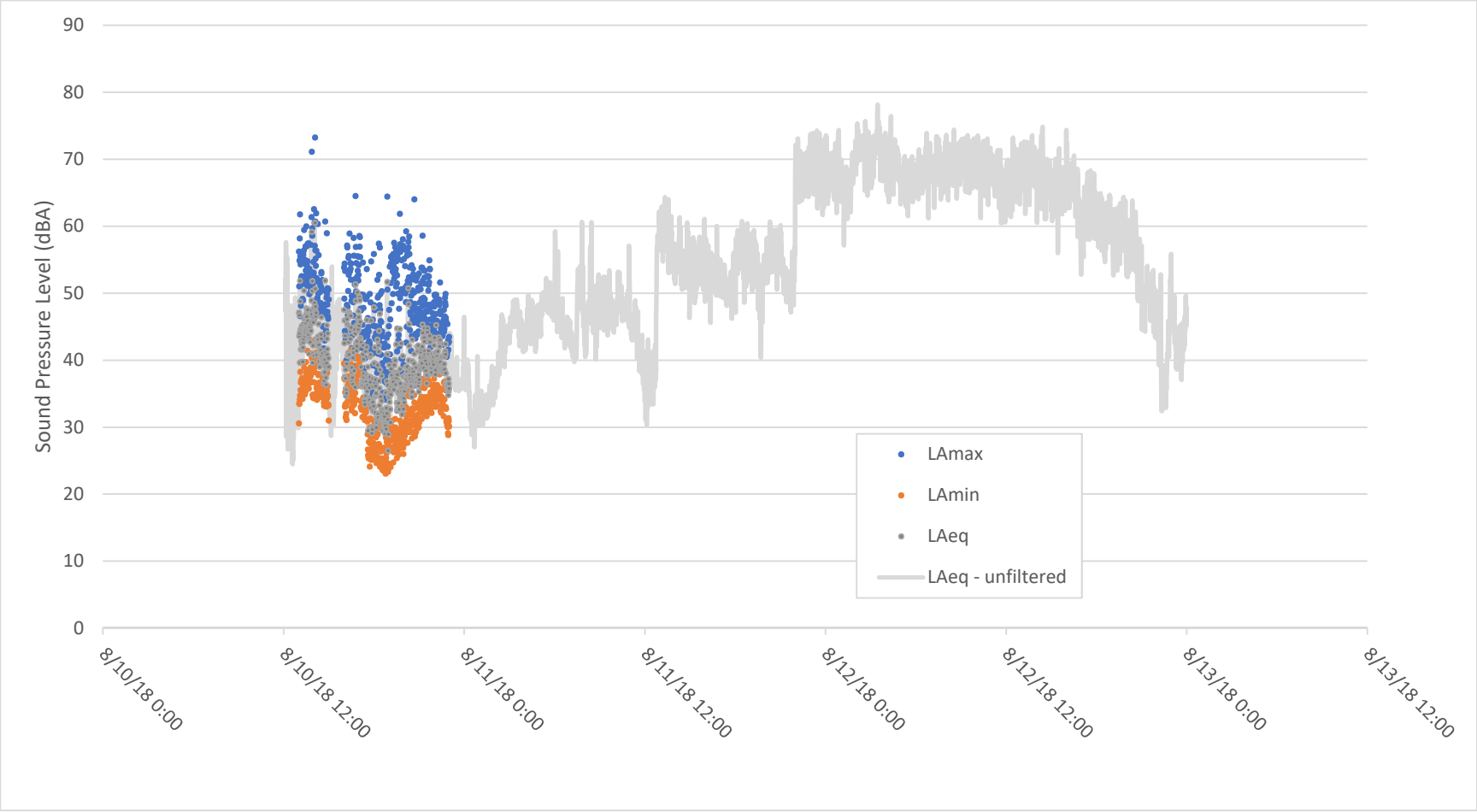


Figure 10. 1-min L_{max}, L_{min}, and L_{eq} values recorded at site NPOR017 during monitoring event 1.

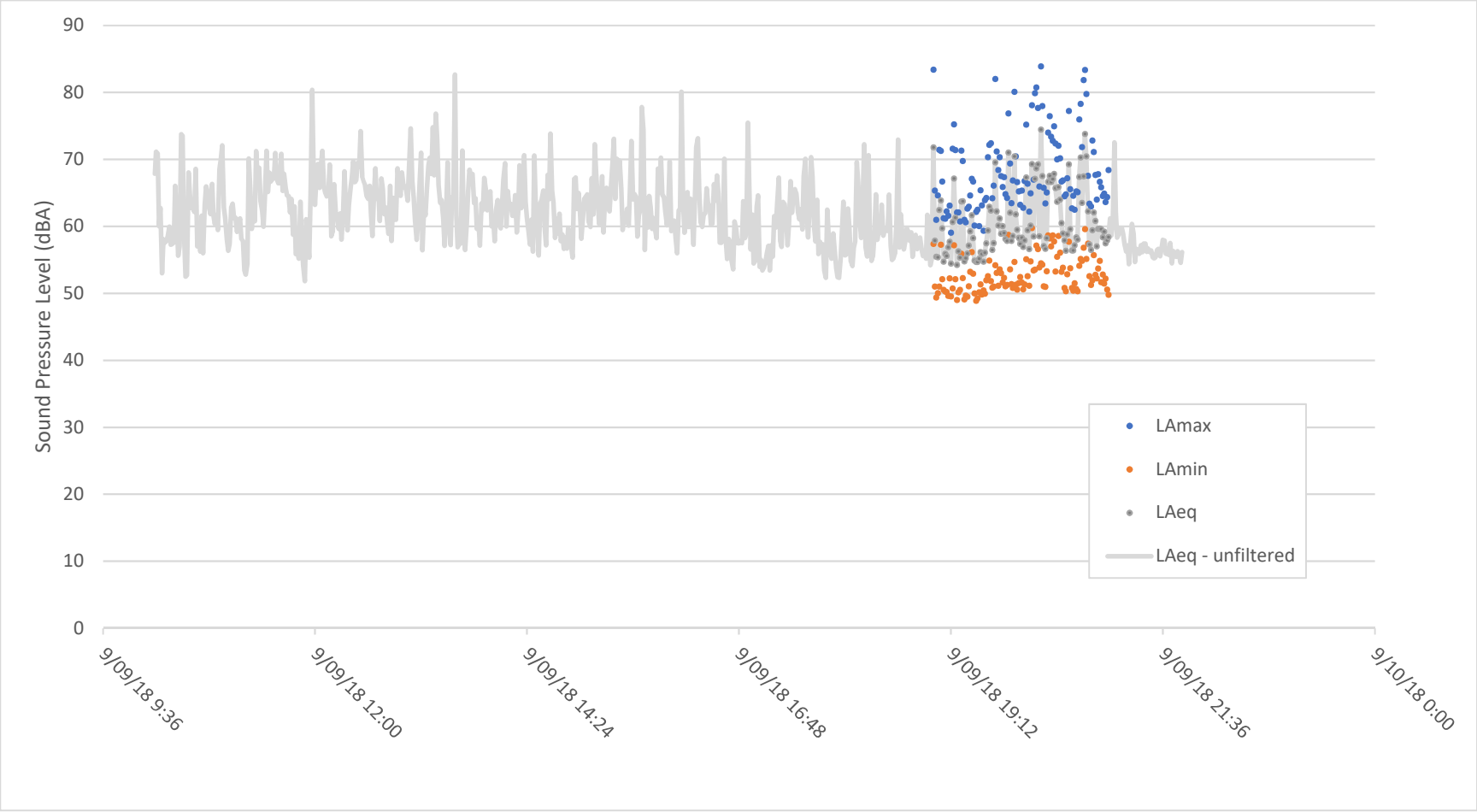


Figure 11. 1-min L_{max}, L_{min}, and L_{eq} values recorded at site NPOR017 during monitoring event 2.

4 SUMMARY AND CONCLUSION

The objective of the noise monitoring program at Meliadine is to measure noise levels at four previously determined monitoring locations over at least two 24 h periods. In 2018 Agnico Eagle conducted two successful rounds of monitoring for stations NPOR006 and NPOR017, and one successful round of monitoring for NPOR008 and NPOR014. However, high winds (both measured and audible) and frequent bird calls in close proximity to the noise meter substantially reduced the quality of the data for comparison to FEIS predictions.

A summary of the available noise monitoring results is provided in Table 5. For station NPOR006 and NPOR017, insufficient valid data was available after initial and/or secondary filtering to calculate 24-h or night-time L_{eq} values. For station NPOR008, only a night-time L_{eq} could be calculated after initial filtering, and that value exceeded the design target of 40 dBA. However, sound recordings were dominated by wind and wave action, and no human-associated activities were audible, so a secondary filtering was not performed. The calculated L_{eq} value is not considered comparable to FEIS predictions or design targets, which assume limited background noise. Similarly for NPOR014, the measured 24-h and night-time L_{eq} values exceeded noise monitoring criteria and the design target, respectively, but no mine-related activity is ongoing in this area, and sound recordings were dominated by wind, waves, and near-continous bird calls for significant portions of the dataset.

Table 5. Summary of noise monitoring results in 2018. "NA" indicates insufficient valid data was available after filtering. *No mine activity is audible at these remote sites, so measured values are assumed representative of baseline; no filtering on the basis of sound recordings was performed.

Location	Monitoring Start	Monitoring End	Noise Monitoring Criterion - $L_{eq(24\ h)}$ (dBA)	FEIS Prediction - $L_{eq(24\ h)}$ (dBA)	Measured $L_{eq(24\ h)}$ (dBA)	Measured L_{eq} (nighttime) (dBA)
NPOR006	08/22 11:08	08/22 21:44	45	39.8	NA	NA
	09/04 11:38	09/07 16:37	45	39.8	NA	NA
NPOR008	08/28 17:42	08/29 5:53	45	41.7	NA	*64.5**
NPOR014	08/25 16:26	08/28 16:27	45	44.7	*63.5**	*49.9**
NPOR017	08/10 12:07	08/12 23:59	45	43.4	NA	NA
	09/09 10:11	09/09 21:50	45	43.4	NA	NA

Overall, a very limited dataset was available for calculation of 24-h and night-time L_{eq} values in 2018. This was generally due to a tendency towards sub-optimal weather conditions, and subsequent

filtration of the data. The data collected in 2018 suggests that measured background sound levels in this area may regularly exceed those assumed during the FEIS (35 dBA), likely due to predominant high winds and wave action on the shore of Meliadine Lake. Particular care will be taken in the future to ensure monitoring is conducted when wind speeds are at their lowest, to reduce the significant wind and wave noises contributing to background sounds. Timing monitoring events earlier in the season may also help reduce the frequency of bird calls which were especially dominant in recordings this year, and which consistently contributed to recorded sound peaks. Continued use of a far-field reference station such as NPOR014 will be considered, in order to better define background noise levels in this area.

5 ACTIONS

The following actions were planned for 2018 and responses of Agnico are indicated:

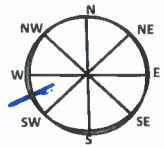
- Additional efforts will be made to conduct monitoring at NPOR006 while the cabin is unoccupied.
    - Attempts were made to fulfill this objective, but the cabin at NPOR006 is regularly occupied and was in use at the time of noise surveys. Agnico will conduct reconnaissance at nearby station NPOR005 (according to the Noise Abatement and Monitoring Plan) in 2019 to determine occupancy rates, and will conduct monitoring at this station if feasible.

The following actions are planned for 2019:

- Noise monitoring surveys will be conducted earlier in the ice-free season when wind speeds and animal interference (bird calls) are minimized.
- Weather data will be reviewed during or immediately following noise monitoring events to estimate the proportion of usable data and the need for supplemental monitoring.
- Reconnaissance and monitoring (if feasible based on occupancy) will be conducted at NPOR005, since high occupancy rates at NPOR006 tend to interfere with assessments of mine-related noise in this location. Monitoring will also be conducted at NPOR006.
- Monitoring will focus on NPOR005, NPOR006, NPOR008 and NPOR017. Since activities at the Discovery Pit are not ongoing, monitoring is not required at NPOR014. However, data will be collected at this station if time and weather conditions permit.

Appendix A: Field Logs

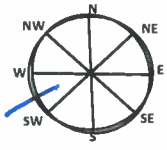
MONITORING STARTS

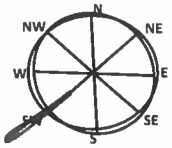
Operator:	Laura Hanson		
Location:	NPR006		
Noise Meter Start Time:			
Date:	2018-08-22.		
Calibration complete ?:	YES		
Sensitivity	3.003 mv / Pa		
Derviation	-0.02 dB		
Time of Calibration:			
Battery Power Check:	Good (circled)	Poor	
Photographs of Setup (Y/N)	YES Y		
Photographs of Surrounding (Y/N)			
Check available disk memory (Y/N)			
Cloud cover:	90%	partly cloudy	sunny
Height of cloud (feet):		10,000-25,000 (circled)	25,000 +
Air Temperature (C):	6.5°C		
Wind Speed (km/hr):	6 Km/hr		
Wind Direction: North wind (wind blows from North)	WSW		
Barometric Pressure (kPa):			
Relative Humidity (%)	65.2 %		
Precipitation:	none (circled)	drizzle	rain

GENERAL SITE DESCRIPTION

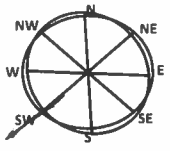
GPS Location	Latitude	Longitude	Altitude
	15V 538286	6891299	
Type of Ground Surface:	Tundra		
Acoustic Environment:	Near Cabin - 20m from ATV trail.		
Traffic	ATV		
Human activities	Carpentry Work. - owner is home.		
Animal	Birds, Arctic Hare, Arctic Fox		
Other noise sources			

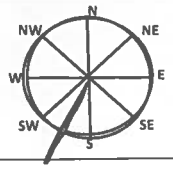
MONITORING ENDS

Operator:	Laura Hanson		
Record Data File Name:			
Total Monitoring Period			
Noise Meter End Time:	NOT SURE DEVICE TURNED OFF.		
Date:	2018-08-25		
Calibration complete ?:	YES		
Sensitivity	3.03 mV/Pa		
Derviation	-8.01 dB		
Time of Calibration:	10:40		
Check file size (GB) ~			
Battery Power Check:	Good (circled)	Poor	
Cloud cover:	cloudy (circled)	partly cloudy	sunny
Height of cloud (feet):	0-10,000 (circled)	10,000-25,000	25,000 +
Air Temperature (C):	6.3°C		
Wind Speed (km/hr):	11.5 Km/hr		
Wind Direction: North wind (wind blows from North)	241°		
Barometric Pressure (kPa):			
Relative Humidity (%)	67.7 %		
Precipitation:	none (circled)	drizzle	rain
Depature Time:			

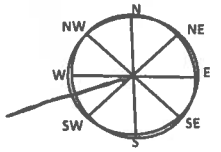
MONITORING STARTS			
Operator:	SA, JB2		
Location:	NPOR06		
Noise Meter Start Time:	11:41a.m.		
Date:	Sept. 4, 2018		
Calibration complete ?:	✓		
Sensitivity	3.05		
Derviation	0.02		
Time of Calibration:	11:39 a.m.		
Battery Power Check:	(Good)	Poor	
Photographs of Setup (Y/N)	✓		
Photographs of Surrounding (Y/N)	✓		
Check available disk memory (Y/N)	✓		
Cloud cover:	overcast	partly cloudy	sunny
Height of cloud (feet):		(10,000-25,000)	25,000 +
Air Temperature (C):	6.8°C		
Wind Speed (km/hr):	30km/hr		
Wind Direction: North wind (wind blows from North)			
Barometric Pressure (kPa):			
Relative Humidity (%)	74.5		
Precipitation:	(none)	drizzle	rain

GENERAL SITE DESCRIPTION			
GPS Location Zone 15V	Latitude	Longitude	Altitude
	6991799 mN	538286 mE	
Type of Ground Surface:	Tundra.		
Acoustic Environment:			
Traffic	ATVs almost daily. Dump trucks. Regular site traffic 1km away excavation of gravel within 500m, during the day. Nearby hunting shack ~~reused~~ used often		
Human activities			
Animal	Dog. Birds. Geese. Wolverine.		
Other noise sources	Hunting cabin within 150m is used regularly. ATVs were observed arrived and leaving almost daily while monitoring was being done. Helicopters also frequently fly by.		

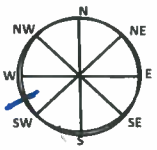
MONITORING ENDS			
Operator:	SA, LS.		
Record Data File Name:	NPOR06.J06		
Total Monitoring Period	~ 76 hrs		
Noise Meter End Time:	4:40 pm		
Date:	Sept 7, 2018		
Calibration complete ?:	✓		
Sensitivity	3.05		
Derviation	0.02		
Time of Calibration:	4:44		
Check file size (GB)			
Battery Power Check:	(Good)	Poor	
Cloud cover:	cloudy	~~partly cloudy~~	sunny
Height of cloud (feet):	0-10,000	(10,000-25,000)	25,000 +
Air Temperature (C):	6.3		
Wind Speed (km/hr):	15.4		
Wind Direction: North wind (wind blows from North)	230° 		
Barometric Pressure (kPa):			
Relative Humidity (%)	48.9		
Precipitation:	(none)	drizzle	rain
Depature Time:	4:50		

MONITORING STARTS			
Operator:	Sean Arruda, Daphne Macin.		
Location:	NPOR08		
Noise Meter Start Time:	17:42		
Date:	2018-08-28		
Calibration complete ?:	✓		
Sensitivity	3.04 mV/Pa		
Derviation	0.01		
Time of Calibration:	17:41		
Battery Power Check:	(Good)	Poor	
Photographs of Setup (Y/N)	✓		
Photographs of Surrounding (Y/N)	✓		
Check available disk memory (Y/N)	✓		
Cloud cover:	70%	(partly cloudy)	sunny
Height of cloud (feet):		(10,000-25,000)	25,000 +
Air Temperature (C):	11.9°C		
Wind Speed (km/hr):	20-25 km/hr		
Wind Direction: North wind (wind blows from North)	SSW 209°		
Barometric Pressure (kPa):			
Relative Humidity (%)	69.4		
Precipitation:	(none)	drizzle	rain

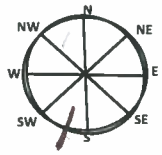
GENERAL SITE DESCRIPTION			
GPS Location Zone 15V	Latitude	Longitude	Altitude
	6987276 mN	543707 mE	
Type of Ground Surface:	Tundra		
Acoustic Environment:			
Traffic	Boats rarely. Helicopters fairly often. Main road ~2-3km away.		
Human activities	Mining camp 2.2km away (to northwest).		
Animal	Swans, geese, birds. Foxes,		
Other noise sources			

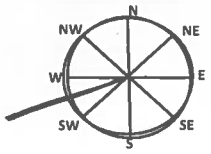
MONITORING ENDS			
Operator:	SA, JB2		
Record Data File Name:	NPOR08.Job		
Total Monitoring Period	~88 hrs		
Noise Meter End Time:	9:40 a.m.		
Date:	Sept. 1, 2018		
Calibration complete ?:	NO		
Sensitivity	X		
Derviation			
Time of Calibration:			
Check file size (GB)			
Battery Power Check:	(Good)	Poor	
Cloud cover:	cloudy	partly cloudy	(sunny)
Height of cloud (feet):	(0-10,000)	10,000-25,000	25,000 +
Air Temperature (C):	16.8°C		
Wind Speed (km/hr):	6.7 Km/hr		
Wind Direction: North wind (wind blows from North)	WSW		
Barometric Pressure (kPa):			
Relative Humidity (%)	55.8		
Precipitation:	(none)	drizzle	rain
Depature Time:	9:55 am.		

Remember to take photos before tear down. - The sd card with photos was broken.

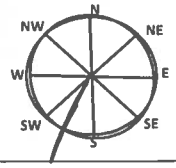
MONITORING STARTS			
Operator:	Laura Hanson		
Location:	NPOR014		
Noise Meter Start Time:	16:27		
Date:	2018-08-25		
Calibration complete ?:	Yes		
Sensitivity	3.04 mv/pa		
Derviation	0.02 dB		
Time of Calibration:	16:20		
Battery Power Check:	(Good)	Poor	
Photographs of Setup (Y/N)	Y		
Photographs of Surrounding (Y/N)	Y		
Check available disk memory (Y/N)	Y		
Cloud cover:	0%	partly cloudy	sunny
Height of cloud (feet):	10 000	10,000-25,000	25,000 +
Air Temperature (C):	13.7°C		
Wind Speed (km/hr):	7 km/hr.		
Wind Direction: North wind (wind blows from North)	WSW 246		
Barometric Pressure (kPa):			
Relative Humidity (%)	47.7		
Precipitation:	(none)	drizzle	rain

GENERAL SITE DESCRIPTION			
GPS Location	Latitude	Longitude	Altitude
	15V 549401	6982060	
Type of Ground Surface:	Tundra.		
Acoustic Environment:	near lake.		
Traffic	poss. bt boats - quads		
Human activities	fish. ing		
Animal	Birds.		
Other noise sources	Gun Fire		

MONITORING ENDS			
Operator:	SEAN ARRUDA		
Record Data File Name:	NPOR014		
Total Monitoring Period	3 days		
Noise Meter End Time:	16:35		
Date:	2018-08-28		
Calibration complete ?:			
Sensitivity	NO		
Derviation			
Time of Calibration:			
Check file size (GB)			
Battery Power Check:	(Good)	Poor	
Cloud cover:	cloudy	partly cloudy	sunny
Height of cloud (feet):	0-10,000	10,000-25,000	25,000 +
Air Temperature (C):	11.0°C		
Wind Speed (km/hr):	20-25		
Wind Direction: North wind (wind blows from North)	304° SSW		
windchill: 11.2c			
Barometric Pressure (kPa):			
Relative Humidity (%)	64.9		
Precipitation:	none	(drizzle)	rain
Depature Time:	16:40		

MONITORING STARTS			
Operator:	SA, PS		
Location:	NPOR17		
Noise Meter Start Time:	12:10 pm		
Date:	Aug 10, 2018		
Calibration complete ?:	Y		
Sensitivity	3.18 mV/Pa		
Derviation	0.00 dB		
Time of Calibration:	12:09		
Battery Power Check:	(Good)	Poor	
Photographs of Setup (Y/N)	Y		
Photographs of Surrounding (Y/N)	Y		
Check available disk memory (Y/N)	N		
Cloud cover:	90% cover	partly cloudy	sunny
Height of cloud (feet):		(10,000-25,000)	25,000 +
Air Temperature (C):	14.2°C		
Wind Speed (km/hr):	10.2 km/hr		
Wind Direction: North wind (wind blows from North)	WSW 		
Barometric Pressure (kPa):	100.9 kPa		
Relative Humidity (%)	77		
Precipitation:	(none)	drizzle	rain

GENERAL SITE DESCRIPTION			
GPS Location Zone 15V	Latitude	Longitude	Altitude
	6970537 m N	544203 m E	
Type of Ground Surface:	Tundra		
Acoustic Environment:			
Traffic	140m from main road. Transports, pickups, ATVs, excavators, etc.		
Human activities	Heavy ATV traffic and nearby cabins,		
Animal	ground squirrel (sik-sik), geese, birds, foxes.		
Other noise sources	Planes, helicopters.		

MONITORING ENDS			
Operator:	PS		
Record Data File Name:	NPOR17		
Total Monitoring Period	~71 hrs		
Noise Meter End Time:	13:00		
Date:	Aug 13, 2018		
Calibration complete ?:	Y		
Sensitivity	3.02 mV/Pa		
Derviation	0.01 dB		
Time of Calibration:	~~12~~		
Check file size (GB)			
Battery Power Check:	(Good)	Poor	
Cloud cover:	cloudy	(partly cloudy)	sunny
Height of cloud (feet):	0-10,000	10,000-25,000	(25,000 +)
Air Temperature (C):	15.1°C		
Wind Speed (km/hr):	11.5 km/hr		
Wind Direction: North wind (wind blows from North)			
Barometric Pressure (kPa):			
Relative Humidity (%)	49.5		
Precipitation:	(none)	drizzle	rain
Depature Time:	13:30		

MONITORING STARTS			
Operator:	Sean Arruda		
Location:	NPOR17		
Noise Meter Start Time:	10:17am		
Date:	Sept. 9, 2018		
Calibration complete ?:	Y		
Sensitivity	3.03mV/Pa		
Derviation	-0.07		
Time of Calibration:	10:00am		
Battery Power Check:	Good	Poor	
Photographs of Setup (Y/N)	Y		
Photographs of Surrounding (Y/N)	Y		
Check available disk memory (Y/N)	29gb		
Cloud cover:		partly cloudy	sunny
Height of cloud (feet):	less than 10,000	10,000-25,000	25,000 +
Air Temperature (C):	8.6C		
Wind Speed (km/hr):	10-15km/hr		
Wind Direction: North wind (wind blows from North)	WSW 240 degrees		
Barometric Pressure (kPa):	100.9kPa		
Relative Humidity (%)	62.8		
Precipitation:	none	drizzle	rain

GENERAL SITE DESCRIPTION			
GPS Location	Latitude	Longitude	Altitude
	6970537.00 m N	544203.00 m E	
Type of Ground Surface:	Tundra		
Acoustic Environment:			
Traffic	~150m from road. ATVs, pickups, transports, dumptrucks, airplanes		
Human activities	Hunting, hunt shack within 150m, ATVs, daily traffic on road.		
Animal	Dogs, ground squirrels, birds, geese.		
Other noise sources			

MONITORING ENDS			
Operator:	Laura Hanson		
Record Data File Name:	NPOR17-SEP9		
Total Monitoring Period	Unknown due to hand held shutting down before returning to retrieve from field		
Noise Meter End Time:			
Date:	9/12/18		
Calibration complete ?:	Yes		
Sensitivity	3.07 mv/PA		
Derviation	0.12 dB		
Time of Calibration:	17:48		
Check file size (GB)			
Battery Power Check:		Poor	Very poor
Cloud cover:	cloudy	partly cloudy	sunny
Height of cloud (feet):	0-10,000	10,000-25,000	25,000 +
Air Temperature (C):	5.6 C		
Wind Speed (km/hr):	16-20 km per hour		
Wind Direction: North wind (wind blows from North)	262		
Barometric Pressure (kPa):			
Relative Humidity (%)	48.10%		
Precipitation:	none	drizzle	rain
Depature Time:	17:58		

Appendix B: Weather Data and Hourly L_{eq} values

Appx B - Table 1. Weather data recorded from the Meliadine site permanent weather station for noise monitoring dates. To comply with Alberta Directive 038, noise data was excluded from analyses when average wind speeds exceeded 15 km/h and when relative humidity exceeded 90% (assuming precipitation occurred). L_{eq} values removed during initial and secondary data filtering steps are shaded gray.

Date and Time	1-h Leq (dBA)	Average Air Temperature (°C)	Average Relative Humidity (%)	Average Wind Speed (km/h)	Average Wind Direction (°)
NPOR017					
8/10/18 12:00	44.8	13.1	76.4	10.3	338.6
8/10/18 13:00	47.1	13.7	70.6	14.3	325.3
8/10/18 14:00	46.2	14.4	62.6	11.3	327.7
8/10/18 15:00	43.9	14.7	59.7	15.3	306.8
8/10/18 16:00	44.2	15.0	57.3	11.2	301.1
8/10/18 17:00	41.1	15.3	55.0	8.9	291.6
8/10/18 18:00	38.6	15.9	51.7	6.6	289.3
8/10/18 19:00	37.6	15.9	51.4	6.9	262.6
8/10/18 20:00	39.9	15.7	53.3	7.4	222.7
8/10/18 21:00	41.1	13.9	71.0	9.6	209.7
8/10/18 22:00	39.9	11.6	86.0	11.7	200.0
8/10/18 23:00	38.2	10.1	91.6	12.2	185.0
8/11/18 0:00	35.1	9.4	94.0	13.7	182.5
8/11/18 1:00	34.1	8.7	93.7	15.4	155.8
8/11/18 2:00	42.5	9.0	94.0	22.0	149.8
8/11/18 3:00	46.1	9.3	95.5	30.7	147.6
8/11/18 4:00	45.6	9.6	94.3	33.9	142.4
8/11/18 5:00	48.6	9.2	94.0	32.8	144.5
8/11/18 6:00	48.7	9.1	95.4	39.5	140.1
8/11/18 7:00	49.1	9.3	97.4	42.3	138.7
8/11/18 8:00	49.4	9.1	98.5	27.8	144.2
8/11/18 9:00	48.3	10.0	99.4	17.0	158.7
8/11/18 10:00	48.8	10.6	99.5	22.5	178.3
8/11/18 11:00	43.4	11.2	99.4	17.5	204.4
8/11/18 12:00	52.4	12.1	99.6	17.7	210.1
8/11/18 13:00	59.7	14.9	93.3	17.3	229.0
8/11/18 14:00	55.4	16.9	61.4	37.2	267.8
8/11/18 15:00	55.1	16.0	61.7	39.4	269.1
8/11/18 16:00	53.6	15.9	64.8	38.2	263.4
8/11/18 17:00	51.9	15.4	69.6	34.3	265.4
8/11/18 18:00	55.5	15.7	71.2	28.8	268.5
8/11/18 19:00	54.2	14.9	77.6	30.8	271.0

Date and Time	1-h Leq (dBA)	Average Air Temperature (°C)	Average Relative Humidity (%)	Average Wind Speed (km/h)	Average Wind Direction (°)
8/11/18 20:00	56.3	13.4	86.7	33.6	276.9
8/11/18 21:00	55.1	12.5	93.0	31.3	277.6
8/11/18 22:00	68.9	11.9	96.0	30.1	285.0
8/11/18 23:00	70.0	10.5	92.6	50.3	292.1
8/12/18 0:00	69.7	9.4	91.8	49.5	289.5
8/12/18 1:00	67.3	9.2	91.3	50.1	289.8
8/12/18 2:00	71.5	9.9	94.2	52.4	298.1
8/12/18 3:00	72.0	10.0	88.8	66.0	312.4
8/12/18 4:00	70.1	9.2	86.5	66.4	313.7
8/12/18 5:00	67.4	8.6	84.3	63.0	315.7
8/12/18 6:00	68.8	8.2	84.0	57.9	320.2
8/12/18 7:00	69.1	7.9	84.0	58.3	317.6
8/12/18 8:00	70.0	7.8	82.2	60.0	317.5
8/12/18 9:00	70.9	7.6	81.0	61.7	317.1
8/12/18 10:00	69.9	7.5	79.8	60.0	318.6
8/12/18 11:00	67.4	7.8	75.7	55.9	320.2
8/12/18 12:00	68.5	8.3	73.5	53.7	321.3
8/12/18 13:00	69.2	8.9	73.3	54.1	316.4
8/12/18 14:00	68.1	9.0	74.2	55.5	311.8
8/12/18 15:00	66.3	9.3	72.0	55.1	315.3
8/12/18 16:00	66.8	10.2	62.7	51.4	320.4
8/12/18 17:00	63.9	10.6	64.4	50.3	318.5
8/12/18 18:00	61.4	9.8	77.0	48.0	313.9
8/12/18 19:00	59.6	10.0	71.2	46.4	312.8
8/12/18 20:00	57.1	10.3	64.6	51.4	305.8
8/12/18 21:00	49.9	9.5	67.5	46.2	309.1
8/12/18 22:00	45.6	8.7	71.3	39.8	314.1
8/12/18 23:00	44.8	8.4	70.1	40.7	307.7
NPOR006					
8/22/18 11:00	67.1	5.6	70.0	10.9	314.6
8/22/18 12:00	59.4	5.9	65.7	11.5	318.9
8/22/18 13:00	58.9	6.3	61.0	10.3	328.4
8/22/18 14:00	64.4	6.6	55.6	8.4	332.4
8/22/18 15:00	64.9	6.9	55.4	10.5	350.6
8/22/18 16:00	72.1	6.8	58.9	8.3	82.2
8/22/18 17:00	76.5	7.3	55.2	20.5	353.5
8/22/18 18:00	77.1	6.9	60.4	17.7	353.6
8/22/18 19:00	84.5	7.6	54.2	23.5	348.1
8/22/18 20:00	82.6	7.2	66.3	26.2	346.4

Date and Time	1-h Leq (dBA)	Average Air Temperature (°C)	Average Relative Humidity (%)	Average Wind Speed (km/h)	Average Wind Direction (°)
8/22/18 21:00	89.9	6.8	71.5	27.5	345.4
NPOR014					
8/25/18 16:00	70.5	8.9	60.3	13.1	352.8
8/25/18 17:00	49.2	9.5	56.8	9.6	0.7
8/25/18 18:00	50.3	9.8	56.6	8.4	1.3
8/25/18 19:00	47.0	9.8	58.1	8.8	337.2
8/25/18 20:00	56.1	8.6	66.5	8.1	325.4
8/25/18 21:00	43.8	7.2	74.9	6.9	4.0
8/25/18 22:00	50.8	6.3	86.4	10.3	121.6
8/25/18 23:00	41.4	5.4	91.5	7.9	131.0
8/26/18 0:00	41.6	4.9	88.5	3.7	141.4
8/26/18 1:00	42.9	5.2	89.6	2.5	124.5
8/26/18 2:00	39.6	4.9	92.1	5.6	121.1
8/26/18 3:00	39.1	4.7	91.5	8.4	124.9
8/26/18 4:00	46.5	4.3	91.8	8.4	130.1
8/26/18 5:00	52.4	4.4	89.7	9.7	109.6
8/26/18 6:00	45.9	4.3	87.8	9.4	96.7
8/26/18 7:00	58.7	4.4	88.0	8.4	97.4
8/26/18 8:00	64.2	4.8	89.3	9.4	95.7
8/26/18 9:00	71.4	5.7	89.7	13.3	100.3
8/26/18 10:00	74.9	7.8	77.3	15.4	106.0
8/26/18 11:00	73.3	8.7	66.1	19.6	99.7
8/26/18 12:00	71.8	9.2	60.7	21.1	83.3
8/26/18 13:00	73.4	9.4	57.4	21.9	79.6
8/26/18 14:00	71.6	9.6	55.5	20.5	79.9
8/26/18 15:00	70.0	9.8	54.9	17.7	84.3
8/26/18 16:00	68.5	9.5	54.6	18.5	82.0
8/26/18 17:00	65.3	8.8	56.3	18.2	78.8
8/26/18 18:00	61.9	8.3	56.2	19.4	64.3
8/26/18 19:00	63.5	8.1	57.3	19.3	63.2
8/26/18 20:00	41.2	7.6	60.3	18.2	64.8
8/26/18 21:00	47.3	6.9	65.9	10.9	59.4
8/26/18 22:00	47.0	6.0	71.8	9.6	37.5
8/26/18 23:00	48.3	5.5	73.8	10.6	32.3
8/27/18 0:00	42.2	5.1	79.6	10.3	21.2
8/27/18 1:00	40.6	4.7	83.1	10.8	25.5
8/27/18 2:00	46.3	4.4	85.3	10.2	19.3
8/27/18 3:00	56.7	3.9	88.4	12.0	0.1
8/27/18 4:00	52.5	4.2	88.6	13.0	4.5

Date and Time	1-h Leq (dBA)	Average Air Temperature (°C)	Average Relative Humidity (%)	Average Wind Speed (km/h)	Average Wind Direction (°)
8/27/18 5:00	45.3	4.4	86.6	11.6	17.4
8/27/18 6:00	43.6	3.5	88.4	9.3	8.7
8/27/18 7:00	45.1	3.6	89.0	8.1	38.7
8/27/18 8:00	47.7	4.3	86.9	7.4	43.5
8/27/18 9:00	46.8	5.0	84.1	9.1	27.3
8/27/18 10:00	54.2	6.3	76.1	8.5	51.8
8/27/18 11:00	46.5	7.1	71.1	8.9	36.5
8/27/18 12:00	50.1	8.3	62.3	9.9	56.3
8/27/18 13:00	51.5	9.4	54.7	9.0	66.4
8/27/18 14:00	44.9	10.1	50.4	8.5	64.4
8/27/18 15:00	45.8	10.1	49.9	7.5	36.7
8/27/18 16:00	61.1	10.3	47.8	5.4	6.2
8/27/18 17:00	60.8	10.4	48.1	5.2	346.7
8/27/18 18:00	59.0	8.7	66.5	13.9	180.8
8/27/18 19:00	53.7	8.3	64.2	13.9	183.2
8/27/18 20:00	43.7	7.0	68.1	10.9	172.1
8/27/18 21:00	45.3	5.1	74.7	9.3	185.6
8/27/18 22:00	48.5	4.6	77.4	11.4	200.8
8/27/18 23:00	53.7	4.2	85.0	14.2	219.4
8/28/18 0:00	50.5	3.8	83.6	15.5	218.7
8/28/18 1:00	52.6	3.8	82.6	15.3	221.1
8/28/18 2:00	46.7	3.4	81.2	13.9	216.9
8/28/18 3:00	42.0	2.6	88.4	7.0	220.7
8/28/18 4:00	42.3	2.8	92.6	5.7	225.0
8/28/18 5:00	52.1	3.0	93.3	3.0	218.9
8/28/18 6:00	45.2	2.7	94.3	4.1	170.7
8/28/18 7:00	46.4	3.3	94.5	3.7	183.7
8/28/18 8:00	49.3	4.4	91.0	4.5	157.9
8/28/18 9:00	46.7	5.9	85.6	6.0	176.2
8/28/18 10:00	60.4	7.3	79.6	7.0	205.0
8/28/18 11:00	63.9	9.5	69.9	8.1	205.3
8/28/18 12:00	67.6	11.2	57.8	11.9	212.2
8/28/18 13:00	71.4	11.8	45.8	14.7	227.7
8/28/18 14:00	75.2	12.6	44.4	14.7	223.1
8/28/18 15:00	75.0	12.8	46.5	13.7	213.5
8/28/18 16:00	78.0	11.8	60.6	18.9	180.8
8/28/18 17:00	70.5	11.5	64.8	18.3	185.5
8/28/18 18:00	49.2	11.3	66.9	15.5	180.1
8/28/18 19:00	50.3	11.4	63.5	17.3	196.9

Date and Time	1-h Leq (dBA)	Average Air Temperature (°C)	Average Relative Humidity (%)	Average Wind Speed (km/h)	Average Wind Direction (°)
8/28/18 20:00	47.0	10.4	66.4	16.4	194.4
8/28/18 21:00	56.1	8.4	75.1	15.0	194.5
8/28/18 22:00	43.8	7.5	78.3	14.6	205.1
8/28/18 23:00	50.8	6.8	78.6	13.3	206.8
8/29/18 0:00	41.4	6.4	81.9	12.4	210.1
8/29/18 1:00	41.6	6.7	81.9	15.0	205.6
8/29/18 2:00	42.9	6.6	81.0	15.8	202.7
8/29/18 3:00	39.6	6.0	82.7	14.4	208.7
8/29/18 4:00	39.1	6.0	86.2	15.8	201.5
NPOR006					
9/04/18 11:00	74.1	5.7	83.7	27.9	152.2
9/04/18 12:00	72.3	5.8	85.4	26.0	155.5
9/04/18 13:00	70.1	6.1	85.4	25.3	156.3
9/04/18 14:00	70.9	6.6	87.0	26.5	154.2
9/04/18 15:00	72.8	6.6	90.3	27.9	150.8
9/04/18 16:00	73.2	6.3	93.2	29.1	152.2
9/04/18 17:00	72.9	6.1	95.2	26.8	152.5
9/04/18 18:00	68.7	6.1	96.3	20.6	156.6
9/04/18 19:00	64.2	6.0	96.7	21.6	149.4
9/04/18 20:00	64.5	6.1	95.5	21.9	148.8
9/04/18 21:00	64.5	5.9	95.1	20.2	151.9
9/04/18 22:00	64.4	5.9	95.6	15.4	156.5
9/04/18 23:00	60.2	5.9	95.8	12.7	159.5
9/05/18 0:00	56.9	5.8	96.1	8.2	163.1
9/05/18 1:00	55.4	5.6	95.8	8.6	153.9
9/05/18 2:00	52.4	5.5	96.1	4.7	146.5
9/05/18 3:00	45.8	5.3	96.5	3.8	160.5
9/05/18 4:00	47.2	5.3	96.8	1.4	192.0
9/05/18 5:00	49.8	5.3	93.3	2.8	279.0
9/05/18 6:00	52.2	5.4	91.7	3.3	352.0
9/05/18 7:00	55.9	5.4	90.9	4.6	23.6
9/05/18 8:00	52.0	5.6	91.0	5.3	61.7
9/05/18 9:00	46.8	5.9	89.6	5.4	17.9
9/05/18 10:00	47.6	6.2	89.2	9.5	346.0
9/05/18 11:00	56.7	6.6	87.6	7.4	4.8
9/05/18 12:00	57.5	7.0	86.3	9.6	338.0
9/05/18 13:00	57.4	7.6	83.3	12.9	330.7
9/05/18 14:00	57.0	7.5	83.9	13.3	330.8
9/05/18 15:00	53.9	7.4	84.9	12.4	336.1

Date and Time	1-h Leq (dBA)	Average Air Temperature (°C)	Average Relative Humidity (%)	Average Wind Speed (km/h)	Average Wind Direction (°)
9/05/18 16:00	54.2	7.0	87.2	11.7	345.5
9/05/18 17:00	42.8	6.8	87.6	8.1	348.5
9/05/18 18:00	41.5	6.8	85.0	6.8	327.5
9/05/18 19:00	41.7	6.8	84.9	7.3	321.6
9/05/18 20:00	41.4	6.4	87.2	7.1	315.8
9/05/18 21:00	39.7	6.3	88.3	6.1	329.1
9/05/18 22:00	40.1	6.0	89.3	6.3	310.0
9/05/18 23:00	40.7	5.8	88.5	5.4	288.4
9/06/18 0:00	40.9	6.0	86.1	8.6	299.3
9/06/18 1:00	48.2	5.7	89.2	6.4	303.6
9/06/18 2:00	58.8	5.8	88.7	10.8	311.4
9/06/18 3:00	59.0	5.7	88.8	12.6	328.8
9/06/18 4:00	62.4	5.8	88.3	16.0	339.8
9/06/18 5:00	66.0	5.9	86.2	14.9	329.3
9/06/18 6:00	65.3	5.8	86.9	17.8	326.2
9/06/18 7:00	66.0	5.7	93.0	19.3	340.6
9/06/18 8:00	69.0	5.5	91.3	20.7	351.4
9/06/18 9:00	68.9	5.6	90.8	21.6	348.7
9/06/18 10:00	65.9	5.9	92.4	24.1	353.1
9/06/18 11:00	68.5	6.4	89.1	22.6	351.5
9/06/18 12:00	72.6	7.0	80.0	23.9	345.0
9/06/18 13:00	74.2	7.4	78.0	30.8	354.0
9/06/18 14:00	74.7	8.0	72.8	32.1	353.1
9/06/18 15:00	73.8	8.6	69.8	34.5	353.7
9/06/18 16:00	73.3	9.0	65.8	32.5	353.1
9/06/18 17:00	71.1	7.9	77.0	18.9	33.2
9/06/18 18:00	73.1	8.8	67.4	25.2	357.3
9/06/18 19:00	74.1	8.8	70.6	27.9	336.0
9/06/18 20:00	76.9	7.6	83.2	29.9	322.8
9/06/18 21:00	76.1	6.8	90.4	33.2	322.1
9/06/18 22:00	77.0	6.4	92.2	35.0	322.7
9/06/18 23:00	77.9	6.1	93.3	34.9	323.2
9/07/18 0:00	79.5	5.7	94.4	36.7	324.3
9/07/18 1:00	83.7	5.4	90.7	35.9	323.9
9/07/18 2:00	82.2	4.8	91.7	38.0	323.6
9/07/18 3:00	79.9	4.4	90.5	37.6	325.9
9/07/18 4:00	78.5	3.9	89.1	36.5	327.8
9/07/18 5:00	79.2	3.6	87.7	34.3	326.6
9/07/18 6:00	78.9	3.2	84.5	35.0	324.4

Date and Time	1-h Leq (dBA)	Average Air Temperature (°C)	Average Relative Humidity (%)	Average Wind Speed (km/h)	Average Wind Direction (°)
9/07/18 7:00	78.3	2.9	77.1	33.8	324.4
9/07/18 8:00	75.4	2.7	74.4	32.9	324.3
9/07/18 9:00	71.1	3.0	71.6	29.0	327.5
9/07/18 10:00	67.3	3.6	68.1	26.5	324.8
9/07/18 11:00	62.4	4.3	65.0	24.1	320.9
9/07/18 12:00	58.0	4.8	64.0	22.2	305.6
9/07/18 13:00	59.0	5.9	59.1	16.3	304.6
9/07/18 14:00	61.0	7.0	54.6	17.0	281.6
9/07/18 15:00	61.3	8.4	52.6	18.1	272.9
9/07/18 16:00	71.9	9.4	53.4	19.0	278.3
NPOR017					
9/09/18 10:00	65.6	4.1	69.7	17.6	322.4
9/09/18 11:00	66.9	4.1	67.0	21.9	326.2
9/09/18 12:00	66.2	4.2	65.2	24.0	320.6
9/09/18 13:00	69.2	4.3	62.7	25.6	312.1
9/09/18 14:00	64.2	4.8	59.5	24.8	312.6
9/09/18 15:00	67.0	5.1	60.5	24.5	309.9
9/09/18 16:00	66.5	5.7	57.1	27.2	309.5
9/09/18 17:00	62.2	6.3	52.6	24.1	311.7
9/09/18 18:00	62.4	6.6	50.7	25.2	305.0
9/09/18 19:00	62.1	6.6	51.8	24.5	295.4
9/09/18 20:00	65.3	6.4	55.8	30.0	297.8
9/09/18 21:00	59.5	5.7	61.5	25.4	293.7

Appendix H-5

Air monitoring report



AGNICO EAGLE

MELIADINE GOLD PROJECT

2018 AIR QUALITY MONITORING REPORT

In Accordance with NIRB Project Certificate No. 006

**Prepared by Agnico-Eagle Mines Limited –
Meliadine Division**

March 2019

EXECUTIVE SUMMARY

In accordance with NIRB Project Certificate No. 006, and as described in the Air Quality Monitoring Plan (November 2015), Agnico Eagle Mines Ltd. (Agnico Eagle) continued ambient air quality monitoring at the Meliadine site, near Rankin Inlet in 2018. Through this program, Agnico Eagle aims to measure airborne particulates, dustfall, and the gaseous compounds (NO_2 and SO_2) using a combination of active and passive sampling methods. In accordance with the Plan, monitoring in 2018 included analysis of dustfall in seven locations, as well as NO_2 and SO_2 in two locations, over one month averaging periods throughout the year. Active sampling of total suspended particulates (TSP), $PM_{2.5}$, and PM_{10} began in December 2018. Available results for all parameters were compared to regulatory guidelines and Final Environmental Impact Statement (FEIS) predictions, and spatial and temporal trends were assessed.

Dustfall results are compared to Alberta's Ambient Air Quality Guidelines (June, 2016) for recreational and industrial areas, for context. In 2018, 2 of 36 samples exceeded the recreational area guideline (DF-3, 25 m from the All Weather Access Road), but no samples exceeded the industrial area guideline. Results indicate very low rates of dustfall overall, despite elevated traffic compared to FEIS predictions. No quantitative predictions were made for dustfall in the FEIS.

Suspended particulates (TSP, $PM_{2.5}$, and PM_{10}) were analyzed in two locations using Partisol air samplers beginning in December, 2018. All available results were below regulatory guidelines (Government of Nunavut Ambient Air Quality Standards/CCME Canadian Ambient Air Quality Standards /BC Ambient Air Quality Objectives) and were below maximum concentrations predicted in the FEIS.

Calculated annual average concentrations of NO_2 and SO_2 were well below the Government of Nunavut Ambient Air Quality Standards, and were below FEIS maximum predicted values. This was the second full year of monitoring for gaseous compounds, and no clear spatial or temporal trends were observed.

As described in the Air Quality Monitoring Plan, a permanent weather station was installed at the Meliadine site, and daily averages for wind speed, direction, temperature, solar radiation, and rainfall are provided.

Incinerator stack testing was performed in September, 2018. All conditions for validity of the test were met, and concentrations of criteria contaminants (dioxins and furans, and mercury) were within relevant GN standards (Environmental Guideline for the Burning and Incineration of Solid Waste, 2012).

Agnico Eagle is required by Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP) to track greenhouse gas emissions. Estimated emissions for the Meliadine site (including

Rankin Inlet operations) in 2018 were 62,051 tonnes CO_2 equivalent (e), which is lower than the FEIS maximum predicted emission rate of 304,000 tonnes/yr CO_2e.

Since monitoring results in 2018 were within applicable air quality criteria and FEIS predictions, no additional adaptive management measures are planned.

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1 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

In February 2015, Agnico Eagle Mines Ltd. (Agnico Eagle) was issued NIRB Project Certificate No. 006 for the Meliadine Gold Project, near Rankin Inlet, NU. In accordance with Conditions 1 and 2 of the Project Certificate, Agnico Eagle has developed the Meliadine Air Quality Monitoring Plan (November, 2015) to describe the program for onsite air quality monitoring.

Through this program, Agnico Eagle aims to measure concentrations of airborne particulate matter and gaseous compounds surrounding the major areas of Project activity, and the deposition of those particles over time, using a combination of active and passive sampling methods. The objective of the Air Quality Monitoring Plan is to compare ambient air quality to regulatory standards, confirm the findings of the air impact assessment in the FEIS (Vol. 5 – Atmospheric Environment and Impact Assessment, April, 2014), and thereby ensure the effectiveness of the planned mitigation measures.

In accordance with the Project Certificate and the Air Quality Monitoring Plan, air quality monitoring for the Meliadine site includes analysis of suspended particulates, dustfall, NO_2 and SO_2. In addition, as meteorological data are a critical input to air dispersion models and emissions estimation, a real time meteorological station has been installed at the site and recorded meteorological data is reported

A summary of the air quality monitoring program is shown in Table 1. Monitoring according to the pre-construction objectives has been ongoing since 2012. In 2017, the project entered the construction phase, which continued in 2018.

Table 1. Air quality monitoring objectives.

Project Phase	Program Objectives	Monitoring Equipment
Pre-construction	To obtain baseline data in order to be able to compare with construction and operation phases	• Three dustfall jars onsite • Three dustfall jars along the AWAR
Construction	To verify compliance with applicable standards. To apply mitigation measures if necessary.	• One continuous TSP/PM_{10} sampling unit (Partisol model 2025) • One passive NO_2-SO_2 monitor (laboratory-supplied) • Four dustfall jars onsite. • Three dustfall jars along the AWAR
Operations Phase	To verify that the TSP, PM_{10}, and $PM_{2.5}$ emission rates used in the assessment were reasonable. To verify the predicted concentrations of TSP, PM_{10}, and $PM_{2.5}$. To verify that the mitigation measures considered integral to the Project are being incorporated as planned, and are effective.	• Two continuous TSP/PM_{10}/$PM_{2.5}$ sampling units (Partisol model 2025) • Two passive NO_2-SO_2 monitors (laboratory-supplied) • Four dustfall jars onsite. • Three dustfall jars along the AWAR

1.2 Monitoring Locations and Dates

According to the construction-phase monitoring objectives, air quality monitoring in 2018 included dustfall sampling at three locations along the AWAR, and four locations onsite (DF-1 through DF-7, described below; Figure 1). Dustfall monitoring was conducted over approximately 30 day periods for all sampling stations from December 31, 2017 through December 12, 2018 (December 2018 - January 2019 samples will be included in the 2019 monitoring report).

Passive samplers for NO_2 and SO_2 were installed at two locations (DF-5 and DF-7). Passive monitoring of NO_2 and SO_2 was conducted over approximately 30 day periods from December 31, 2017 through December 12, 2018.

Active sampling for suspended particulates occurs at DF-5 (South unit) and DF-7 (North unit). Sampling at the South unit (DF-5) began on December 3, 2018 (TSP only), and sampling at the North unit (DF-7) began on December 21, 2018 ($PM_{2.5}$/PM_{10} only). Sampling did not commence until December as a result of delays in shipments of the Partisol units as well as availability of the service personnel to provide onsite set up and training. It is anticipated that both TSP and $PM_{2.5}$/PM_{10} units will be active at both locations in 2019.

Details of the monitoring locations in 2018 are summarized in Table 2. As described in the Air Quality Monitoring Plan, sampling locations will be reviewed and may be adapted throughout the construction and/or operations phases of the Project, as necessary.

Table 2. Air quality monitoring locations and parameters monitored in 2018. *Partisol sampler installed but not functioning properly – samples not collected.

Monitoring Station	UTM	Parameters	General Location	Location Description
DF-1	544073E 6970759N	Dustfall	AWAR	AWAR km 4 South of Iqalugaarjuup Nunanga Park 100 m from road (west/upwind side)
DF-2	546621E 6973334N	Dustfall	AWAR	AWAR km 10 East of Iqalugaarjuup Nunanga Park 100 m from road (west/upwind side)
DF-3	544899E 6981387N	Dustfall	AWAR	AWAR km 23 North of Iqalugaarjuup Nunanga Park 25 m from road (west/upwind side)
DF-4	540014E 6987836N	Dustfall	Onsite	Adjacent to freshwater pumphouse on Lake A8 Downwind of main mine site
DF-5	542226E 6988507N	Dustfall NO_2, SO_2 TSP (PM_{10}, $PM_{2.5}$)*	Onsite	500 m south-east of the exploration camp Downwind of main mine site
DF-6	537586E 6989096N	Dustfall	Onsite	Adjacent to Lake B5, approx. 600 m southwest of main mine site (direction perpendicular to dominant wind)
DF-7	537143E 6991176N	Dustfall NO_2, SO_2 (TSP)* PM_{10}, $PM_{2.5}$	Onsite	Adjacent to emulsion plant, approx. 2 km northwest (upwind) of the camp complex

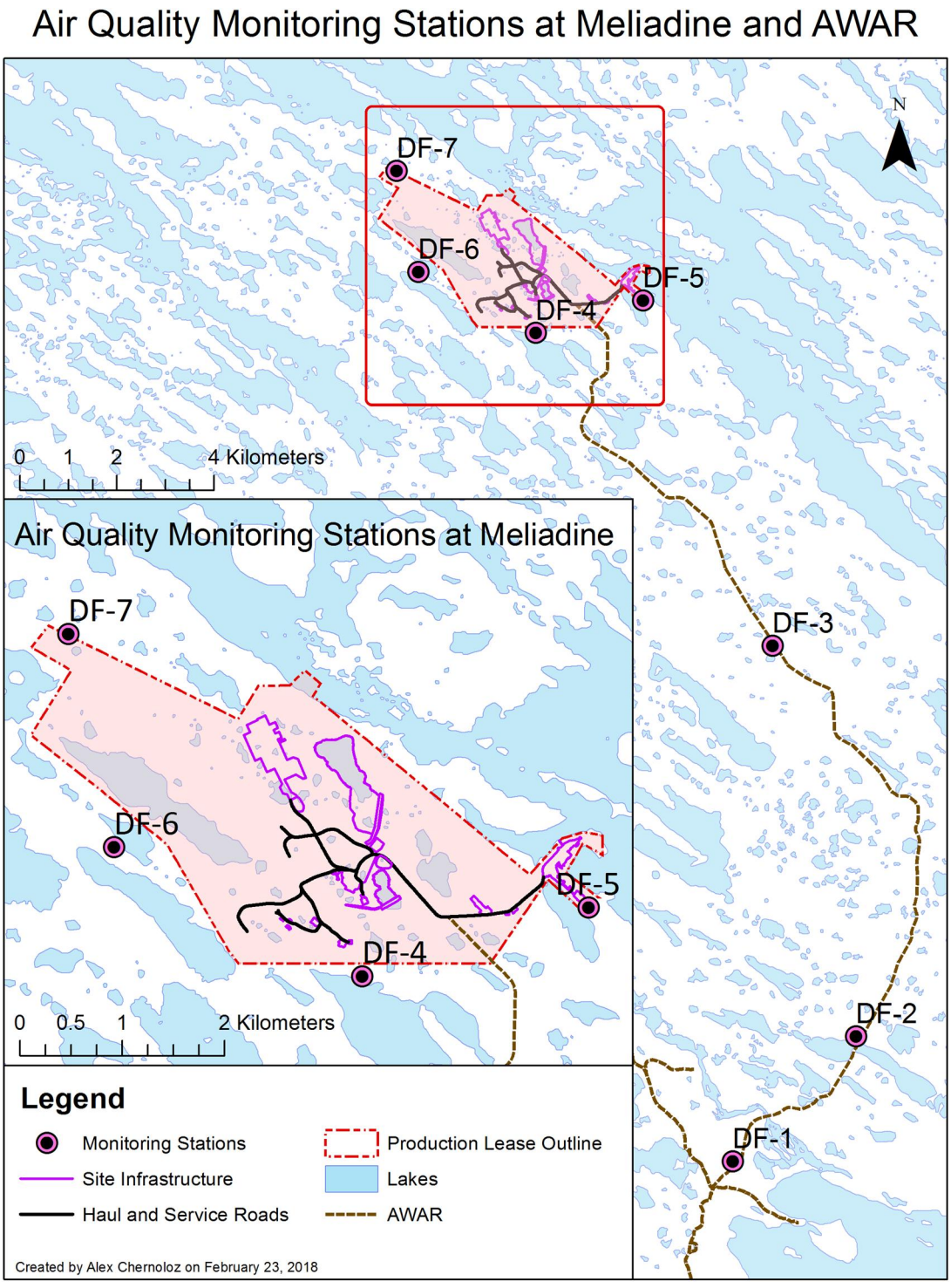

Figure 1. Air quality monitoring locations.

2 METHODS

2.1 SAMPLING METHODOLOGY

2.1.1 DUSTFALL

Dustfall was collected in open vessels containing a purified liquid matrix (de-ionized water and isopropanol), supplied by a commercial analytical laboratory. Particles are deposited and retained in the liquid, which is then analyzed for total and fixed (non-combustible) dustfall by the supplying laboratory. Vessels were deployed according to laboratory specifications for sequential one-month periods at each location, retrieved, re-sealed, and shipped back to the laboratory. Canisters were placed on a 2 m stand with an open bucket-style holder fitted with wires around the rim to deter birds (see Figure 2). Calculated dustfall rates were normalized to 30 days (mg/cm^2/30 days). Dustfall canisters were provided by and analyzed by Maxxam Analytics.

As required by Condition 1 of Project Certificate No. 006, and described in the Air Quality Monitoring Plan, an initial snowpack survey will be conducted in the winter season of 2018-2019 at each of the dustfall stations for analysis of dust content in the snow.



Figure 2. Dustfall sampling stand at the Meliadine site.

2.1.2 *SUSPENDED PARTICULATES*

Suspended particulates (TSP, PM_{10}, $PM_{2.5}$) are sampled over 24-h periods every six days using a Partisol Plus Model 2025i Sequential Air Sampler (TSP) and a Partisol Plus Model 2025-D Dichotomous Sequential Air Sampler ($PM_{2.5}$ and PM_{coarse}). Partisol samplers draw in a stream of ambient air at a controlled flow rate, and particulates are collected on a pre-weighed filter supplied by an accredited laboratory. The exposed filter is then shipped back to the laboratory and re-weighed to measure the total accumulated particulates. Calculations for TSP, PM_{10} and $PM_{2.5}$ were performed according to the Partisol operating manual, as follows.

TSP is calculated as:

$$TSP = M_{TSP}/V$$

Where: TSP = mass concentration of particulates (µg/m^3)

M_{TSP} = final mass of TSP filter – initial mass of filter (µg/filter)

V = volume of air drawn in during the sampling period (~24 m^3)

Since the dichotomous unit splits the intake air stream to determine $PM_{2.5}$ and PM_{coarse} ($PM_{10\text{-}2.5}$), the volume of air is different for each filter. Calculations are performed as follows:

$PM_{2.5}$ is calculated as:

$$PM_{2.5} = M_{2.5}/V_{2.5}$$

Where: $PM_{2.5}$ = mass concentration of particulates (µg/m^3)

$M_{2.5}$ = final mass of $PM_{2.5}$ filter – initial mass of filter (µg/filter)

$V_{2.5}$ = volume of air drawn through the $PM_{2.5}$ filter during the sampling period (~21.7 m^3)

And PM_{coarse} is calculated as:

$$PM_{coarse} = M_{coarse}/V_{total} - PM_{2.5}(V_{coarse}/V_{total})$$

Where: PM_{coarse} = mass concentration of particulates (µg/m^3)

M_{coarse} = final mass of PM_{coarse} filter – initial mass of filter (µg/filter)

V_{total} = total volume of air drawn into unit during sampling (~24m^3)

V_{coarse} = volume of air drawn through the PM_{coarse} filter during the sampling period (~2.4 m^3)

Concentration of PM_{10} is then calculated as PM_{coarse} + $PM_{2.5}$.

For comparison to Government of Nunavut Ambient Air Quality Guidelines (2011), concentrations of particulates need to be calculated using air volumes normalized to 25°C and 101.3kPA (standard temperature and pressure; STP). Standardized volumes were either recorded by the Partisol unit, or calculated from average temperature and pressure recorded by the Partisol unit during the sampling period, whenever possible. Estimates of suspended particulate concentrations using non-standardized volumes are expected to be slightly conservative (higher than actual), since air temperatures are almost always colder than 25°C. In addition, the air sampling unit is housed in an insulated container because winter temperatures inhibit operation. This is standard practice in northern climates. Since the unit's ambient temperature sensor is warmer than actual air temperature for much of the year, intake volumes are inflated compared to calculated volumes, resulting in conservative estimates of particulate concentrations.

In 2018, recorded standardized volumes were available for all sampling dates.

2.1.3 NO_2 AND SO_2

Concentrations of NO_2 and SO_2 by volume (ppb) were analyzed over one-month periods using a passive sampling device provided by Maxxam Analytics and deployed by Agnico Eagle technicians according to laboratory-identified procedures. Following each sampling period, the sampling device was retrieved and shipped to the commercial laboratory for analysis.

2.2 DATA ANALYSIS

2.2.1 DUSTFALL

No standards for dustfall are available for Nunavut or the Northwest Territories. Results of the dustfall analysis are therefore compared to the Alberta Ambient Air Quality Guideline for recreational areas for total dustfall (June, 2016) of 0.53 mg/cm^2/30d and commercial/industrial guideline of 1.58 mg/cm^2/30d, to provide context. These guidelines are based on aesthetic or nuisance concerns, and are to be used for airshed planning and management, as a general performance indicator, and to assess local concerns. Based on predictions for other mine-related roads in Nunavut (Meadowbank site), it is anticipated that guidelines for recreational areas may regularly be exceeded in close proximity to the AWAR or minesite, and that guidelines for industrial areas may occasionally be exceeded.

Dustfall rates were analyzed for indications of spatial and temporal trends (within and between years). Unusual results will trigger investigation, and potentially supplementary monitoring or mitigation measures.

Although modeling was conducted as a component of the Air Quality Impact Assessment (FEIS Volume 5) to determine deposition rates of particulate matter on a 1x1 km grid in the Project area,

quantitative results (isopleths) were not provided in the FEIS documents. Quantitative predictions regarding dustfall (i.e. deposition of TSP) in the FEIS are limited to percent change values based on distance from the centre of the AWAR, in no particular location. According to the Air Quality and Dustfall Monitoring Plan, samples were collected at the 25 m and 100 m distance, but not in the same location. Since deposition rates are strongly influenced by microclimate and topography, no comparisons to FEIS predictions for dustfall are performed. The AWAR dustfall sampling program may be adjusted in future years to facilitate such a comparison, if rates of dustfall appear elevated in comparison to guideline values.

2.2.2 SUSPENDED PARTICULATES

Results of suspended particulate monitoring are compared to Government of Nunavut Environmental Guidelines for Ambient Air Quality (October, 2011). Guidelines for the measured parameters are provided in Table 3.

In 2015, the Canadian Council of Ministers of the Environment adopted new Canadian Ambient Air Quality Standards for $PM_{2.5}$. Although these have not yet been incorporated into Nunavut's guidelines, the published 24-h value for $PM_{2.5}$ of 28 µg/m^3 and annual average of 10 µg/m^3 are addressed here for reference. These values represent voluntary objectives.

No GN standard is available for PM_{10}, therefore results are compared to the BC Air Quality Objective (August, 2013) of 50 µg/m^3.

Results will additionally be compared to FEIS predictions for maximum ground-level concentrations of particulates, which exceed regulatory guidelines in most cases. According to FEIS Volume 5 (Atmospheric Environment), Table 5.2-15, maximum predicted emissions of TSP, PM_{10}, and $PM_{2.5}$ for the Site Study Area where samplers are located are shown in Table 3. These model results assume no contribution from background concentrations, which were not available for remote sites in the North. However, it should be noted that monitoring results will include background contributions, so comparisons to these FEIS predictions are expected to be conservative. Comparisons to predicted peak concentrations (which include influence of meteorological anomalies) may be conducted if such a situation occurs.

Table 3. Government of Nunavut (GN) Environmental Guidelines for Ambient Air Quality (October, 2011), CCME Canadian Ambient Air Quality Standards, and BC Air Quality Objectives for the parameters of concern at Meliadine. All values are for data normalized to standard conditions of 25°C and 101.3 kPa. *Maximum predicted values according to Table 5.2-15 in Golder (2014).

Parameter		Regulatory Guidelines		FEIS Predictions*
	Averaging Time	Jurisdiction	Guideline (µg/m³)	
Fine Particulate Matter ($PM_{2.5}$)	24-h average	GN	30	55.3
		CCME	28	
	Annual average	CCME	10	-
Coarse Particulate Matter (PM_{10})	24-h average	BC	50	104.0
Total Suspended Particulate (TSP)	24-h average	GN	120	213.7
	Annual geometric mean	GN	60	16.8

2.2.3 NO_2 AND SO_2

The analysis of the NO_2 and SO_2 sampling results includes a comparison of results with the GN Environmental Guidelines for Ambient Air Quality (October, 2011), which are equivalent to the Canadian National Ambient Air Quality Objective for these compounds. Concentrations measured on a monthly basis were averaged, and compared to the annual average guidelines for NO_2 (60 µg/m³ or 32 ppb) and SO_2 (30 µg/m³ or 11 ppb).

In order to determine the accuracy of assumptions and predictions made during the Project assessment phase, a comparison to NO_2 and SO_2 concentrations described in the FEIS (Golder, 2014) is also included. For the current construction phase, results were compared to predicted concentrations for "Case 1", where no open-pit mining is occurring. For the site study area, where the sampling station DF-5 is located, the FEIS predicted a maximum annual average of 43.9 µg/m³ (23.3 ppb) for NO_2, and 0.3 µg/m³ (0.1 ppb) for SO_2 for the Case 1 scenario. For the local study area, where the sampling station DF-7 is located, the FEIS predicted a maximum annual average of 22.8 µg/m³ (12.3 ppb) for NO_2, and 0.0 µg/m³ (0.0 ppb) for SO_2 for the Case 1 scenario. It should be noted that model predictions were for emissions produced by mine site activity, so do not include background values, which are included in monitoring results. The background values assumed in the FEIS (Table 5.2-6) of 0.1 µg/m³ (0.05 ppb) for NO_2 and 0.5 µg/m³ (0.2 ppb) for SO_2, are from the Fortune Minerals NICO project. Therefore, results of the monitoring program at Meliadine are compared to the sum of these assumed background values and the predicted concentrations from site activity, as summarized in Table 4.

Table 4. Summary of GN guidelines and FEIS predictions (plus assumed background concentrations) for annual average concentrations of NO_2 and SO_2.

Compound	GN Guideline (Annual Average)	FEIS Prediction (Annual Average)	
		DF-5	DF-7
NO_2	32 ppb	23.4 ppb	12.4 ppb
SO_2	11 ppb	0.3 ppb	0.2 ppb

The measured ambient NO_2 and SO_2 concentrations were also analyzed for spatial and temporal trends.

2.3 QA/QC

According to the Air Quality Monitoring Plan, QA/QC procedures for the monitoring program included the following:

- An accredited laboratory was used for pre-sample preparation and analysis;
- Samples were collected by appropriately trained personnel; and
- An accredited laboratory calculated ambient dustfall deposition rates based on laboratory results;
- Results were interpreted by qualified personnel.

3 MONITORING RESULTS

Laboratory certificates for all analytical results are provided in Appendix A.

3.1 DUSTFALL

Results of the 2018 dustfall sampling program (30-day normalized rates of total dustfall) are provided in Figures 3 and 4. Values below the detection limit (0.001 or 0.002 mg/cm^2/30d) are reported as ½ the limit. Samples are plotted by the collection start date. To provide context, the Alberta Ambient Air Quality Guidelines for recreational/residential and industrial/commercial areas of 0.53 mg/cm^2/30 days and 1.58 mg/cm^2/30 days are indicated for total dustfall. In total, 2 of 36 samples collected in 2018 exceeded the recreational area guideline. These two samples were collected in very close proximity to the AWAR (25 m) at station DF-3. No samples exceeded the industrial area guideline.

Fixed dustfall results since 2012 are provided in Figures 5 (AWAR), 6 and 7 (mine site) for assessment of trends over time, since the non-combustible fraction is more representative of dust generated by mine site activity than total dustfall, which includes organic components (e.g. pollen, plants, animal particles). When results were greater than the detection limit, fixed dustfall accounted for 81% of total dustfall in each sample on average (range of 15 – 100%). In 2018, the greatest dustfall rates were observed at DF-3, which is located only 25 m from the AWAR. Generally, a slight increase

in measured dustfall has occurred since 2012 as site activity has increased, and rates tend to be highest during the summer months when conditions are the driest and traffic rates peak. In 2018, caribou migration in July resulted in road closures as well as decreased application of dust suppressant. However, relatively low dustfall values were measured overall, and no other significant trends are apparent.

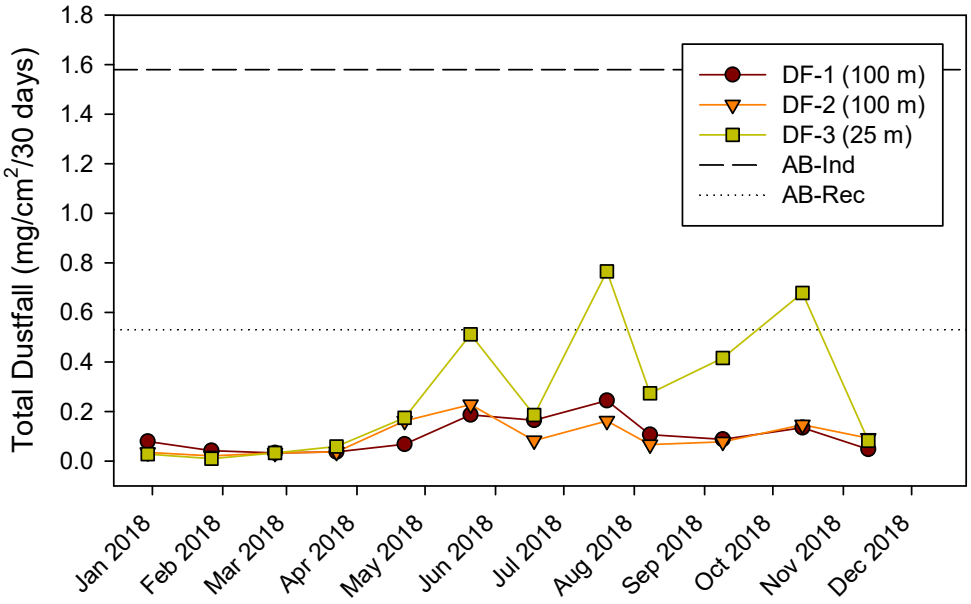

Figure 3. 30-day-normalized rates of total dustfall at AWAR sampling locations (DF-1 – 3) at the Meliadine site in 2018. Symbols represent start date of sample collection. For reference, the dotted line indicates the Alberta Ambient Air Quality Guideline for recreational areas of 0.53 mg/cm²/30d, and the dashed line indicates the industrial area guideline of 1.58 mg/cm²/30d.

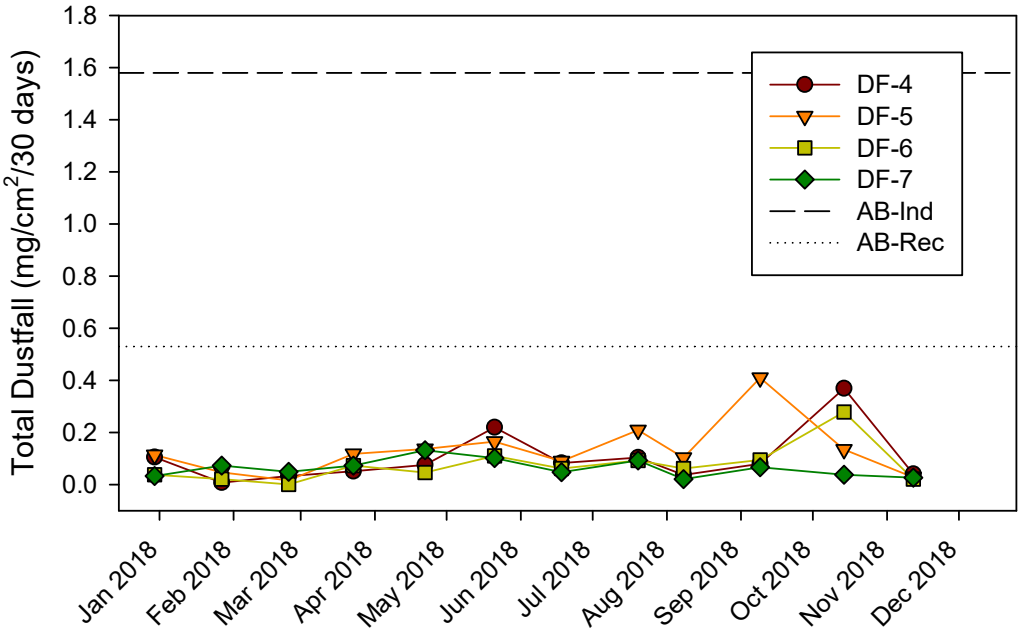

Figure 4. 30-day-normalized rates of fixed dustfall at minesite monitoring locations (DF-4 – 7) at the Meliadine site in 2018. Symbols represent start date of sample collection.

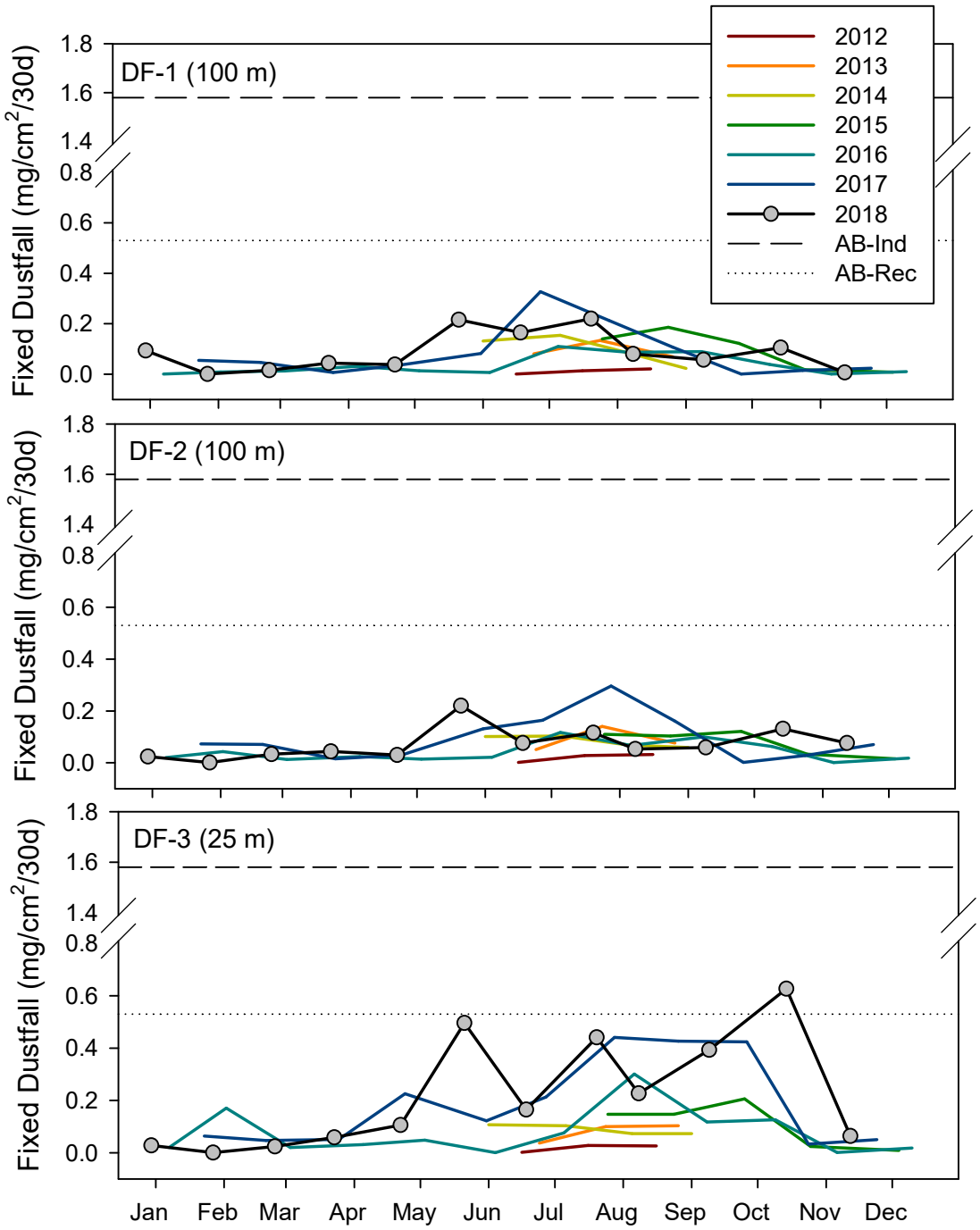

Figure 5. Fixed dustfall measurements for AWAR sampling locations a 25 m and 100 m from the road, since monitoring began in 2012. Alberta Ambient Air Quality Guidelines for total dustfall for recreational areas (AB – Rec.) and industrial areas (AB-Ind.) are indicated for context (fixed dustfall represents 81% of total dustfall, on average).

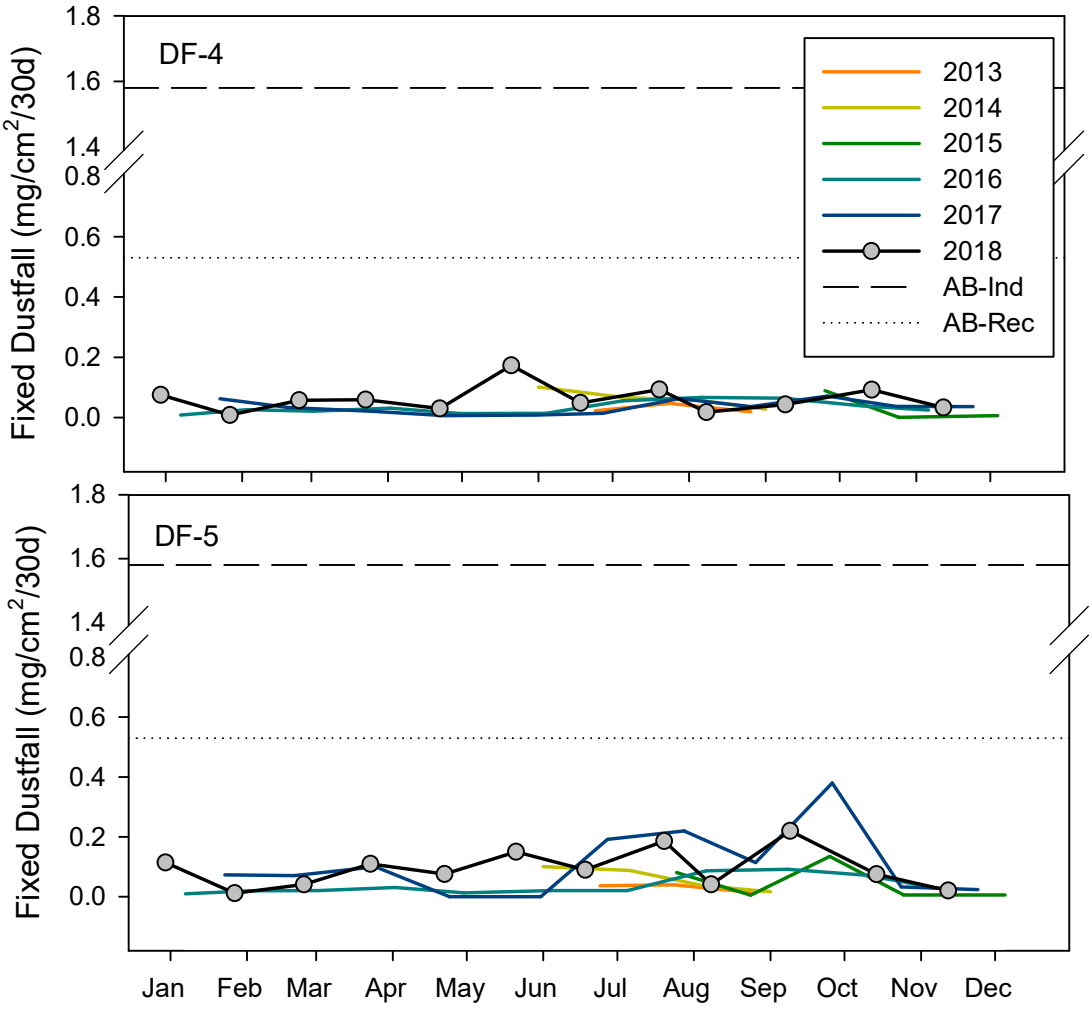

Figure 6. Fixed dustfall measurements for onsite sampling locations DF-4 and DF-5 since monitoring began in 2012. Alberta Ambient Air Quality Guidelines for total dustfall for recreational areas (AB – Rec.) and industrial areas (AB-Ind.) are indicated for context (fixed dustfall represents 81% of total dustfall, on average).

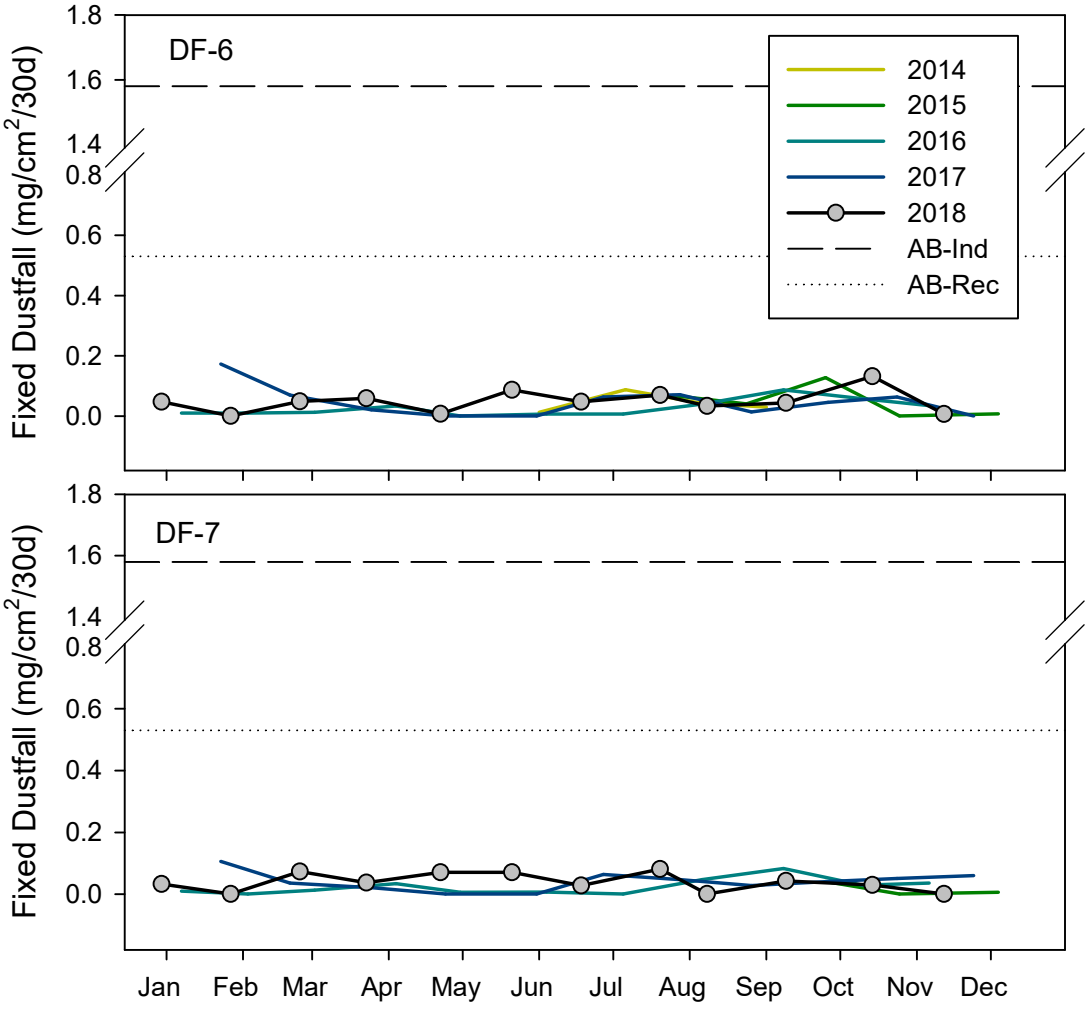

Figure 7. Fixed dustfall measurements for onsite sampling locations DF-6 and DF-7 since monitoring began in 2014. Alberta Ambient Air Quality Guidelines for total dustfall for recreational areas (AB – Rec.) and industrial areas (AB-Ind.) are indicated for context (fixed dustfall represents 81% of total dustfall, on average).

3.2 Suspended Particulates

In 2018, suspended particulate sampling began December 3 at DF-5. Only the TSP unit was functional at this location. Sampling began December 21 at DF-7, and only the $PM_{2.5}/PM_{10}$ unit was functional. Available results are shown in Table 5. All values are below the lowest available regulatory guideline or FEIS prediction for the 24-h average. Since only a maximum of five datapoints were available, the annual averages were not calculated.

Table 5. Concentrations of suspended particulates measured in 2018 at the Meliadine site. *For 24-h averaging time. See Table 3 for full list of regulatory guidelines and FEIS predictions.

Location	Parameter	Lowest Reference Value* (µg/m³)	Sample Start Date & Time	Result (µg/m³)
DF-5	TSP	120	12/03/18 0:00	24.0
			12/09/18 0:00	1.2
			12/15/18 0:00	6.0
			12/21/18 0:00	6.2
			12/27/18 0:00	1.5
DF-7	$PM_{2.5}$	28	12/21/18 0:00	1.6
			12/27/18 0:00	1.5
	PM_{10}	50	12/21/18 0:00	2.1

3.3 NO_2 AND SO_2

Monthly-average NO_2 trends in 2018 are provided in Figure 8. Samples are plotted by the collection start date. Concentrations of NO_2 vary between non-detect (<0.1) and 1.7 ppb.

Annual arithmetic mean concentrations were calculated for each station from the monthly average values. The annual mean concentrations of NO_2 were 0.83 and 0.52 ppb for DF-5 and DF-7, respectively (December 31, 2017 – December 12, 2018). These are both well below the Government of Nunavut Ambient Air Quality Standard of 32 ppb for the annual average. These values are also lower than maximum concentrations predicted in the FEIS, adjusted for assumed background concentrations (23.4 ppb and 12.4 ppb for DF-5 and DF-7, respectively).

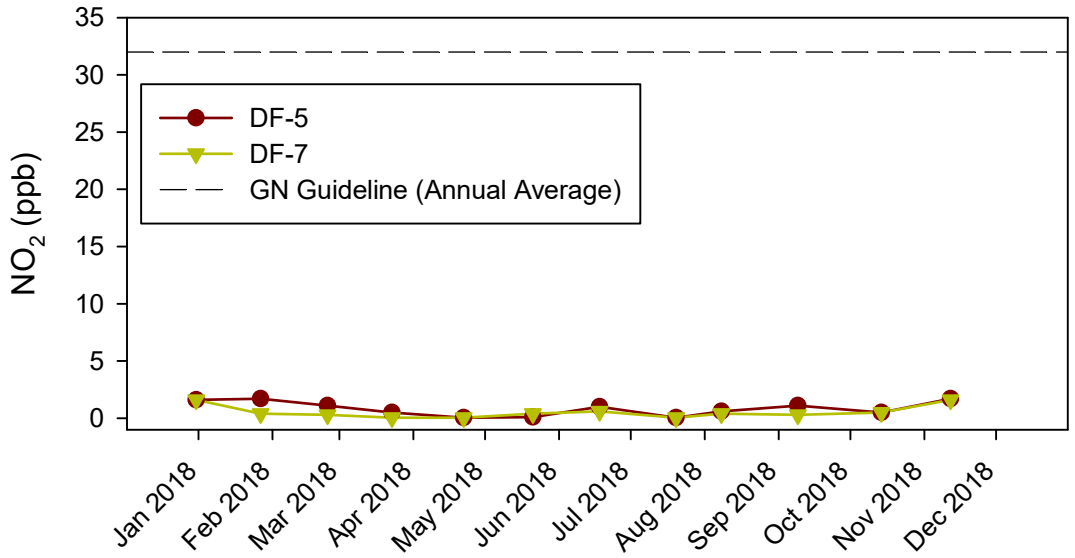

Figure 8. Monthly average concentration of NO_2 at DF-5 and DF-7. Symbols represent the collection start date. Dashed line indicates GN standard for the annual average.

No clear trends between sampling stations or over time are evident. Historical results are presented in Figure 9.

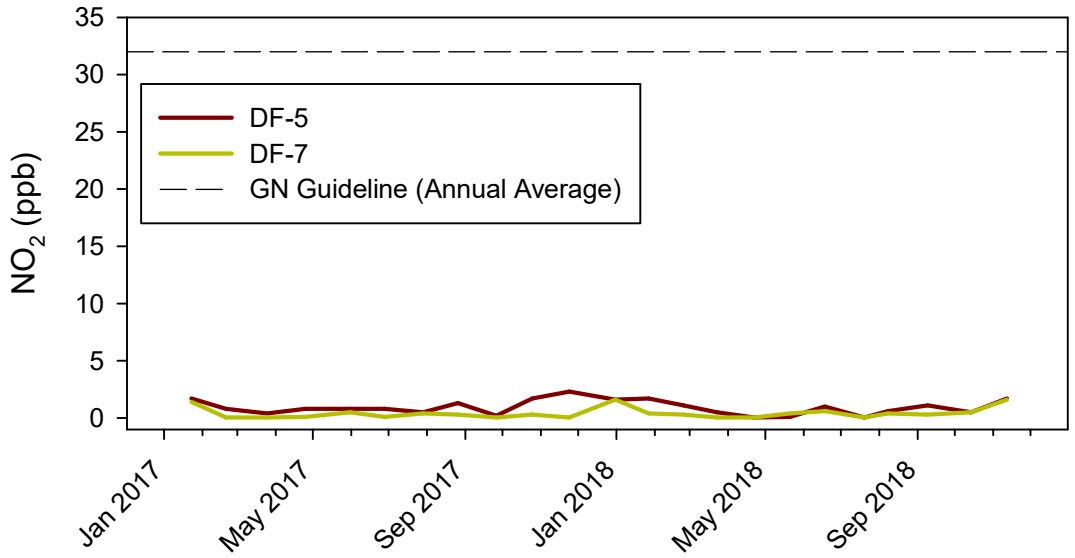

Figure 9. Historical measured monthly average concentration of NO_2 at DF-5 and DF-7. Dashed line indicates GN standard for the annual average, for reference.

Monthly-average SO_2 trends in 2018 are provided in Figure 10. Samples are referred to by the collection start date. Concentrations of SO_2 were non-detect (<0.1 ppb) in 16 of 24 samples, with a maximum of 0.3 ppb.

Annual arithmetic mean concentrations were calculated for each station from the monthly average values. A value of 0.05 ppb was used for samples below the detection limit (0.1 ppb). The annual mean concentrations of SO_2 were 0.07 and 0.10 ppb for DF-5 and DF-7, respectively (December 31. 2017 – December 12, 2018). These are both well below the Government of Nunavut Ambient Air Quality Standard of 11 ppb for the annual average, and FEIS maximum predicted values of 0.3 ppb and 0.2 ppb for DF-5 and DF-7, respectively.

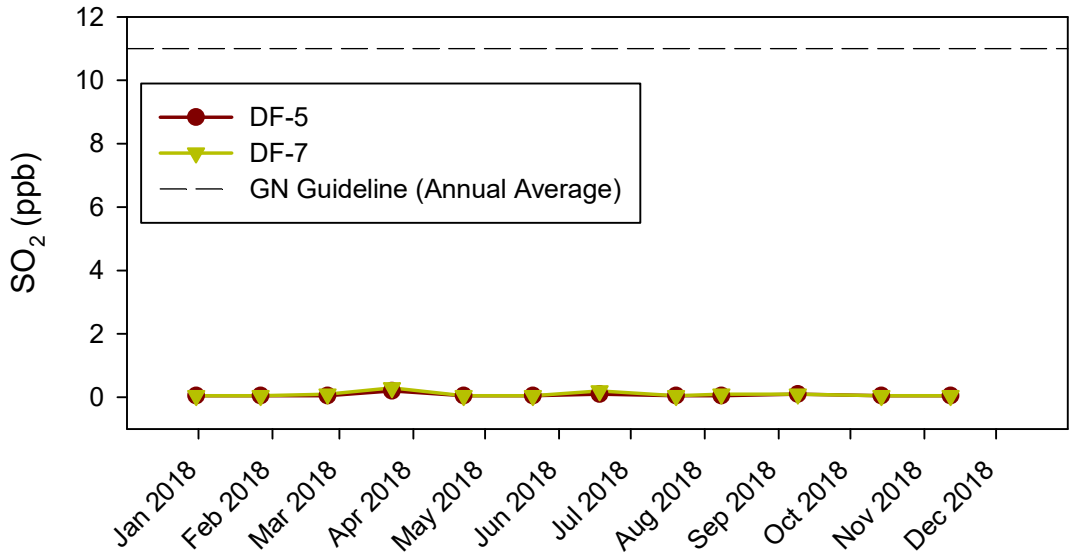

Figure 10. Monthly average concentration of SO_2 at DF-5 and DF-7. Symbols represent the collection start date. Dashed line indicates GN standard for the annual average.

No clear trends between sampling stations or over time are evident. Historical results are presented in Figure 11.

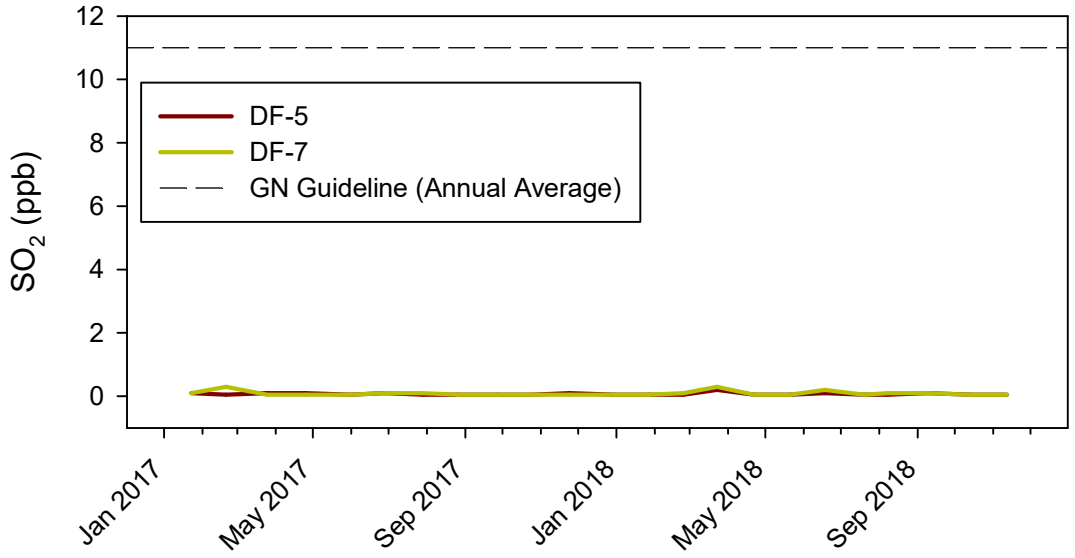

Figure 11. Historical measured monthly average concentration of SO_2 at DF-5 and DF-7. Dashed line indicates GN standard for the annual average, for reference.

4 METEOROLOGICAL MONITORING

As described in the Air Quality Monitoring Plan, a permanent weather station was installed at the Meliadine site, and daily averages for the following parameters in 2018 are provided in Appendix A:

- wind speed;
- wind direction;
- temperature;
- solar radiation;
- rainfall

Total precipitation was also recorded several times per week using two onsite rain gauges (Appendix B).

5 INCINERATOR STACK TESTING

Incinerator stack testing was performed in September, 2018 to ensure standards provided in the GN's Environmental Guideline for the Burning and Incineration of Solid Waste (2012) are not being exceeded. All conditions for validity of the test were met, and concentrations of criteria contaminants

(dioxins and furans, and mercury) were within the guideline values. The full report is provided in Appendix C.

Table 6. Summary of incinerator stack testing results for criteria contaminants (mercury, dioxins and furans).

Contaminant	Test Results	GN Standard
Mercury	0.23 µg/Rm^3 @ 11% v/v O_2	20 µg/Rm^3 @ 11% v/v O_2
Dioxins and Furans	0.042 ng /Rm^3 @ 11% v/v O_2	0.08 ng /Rm^3 @ 11% v/v O_2

6 GREENHOUSE GAS EMISSIONS

Agnico Eagle is required by Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP) to track greenhouse gas emissions based on annual fuel consumption, composition and the US EPA's AP-42 emission factors.

Estimated greenhouse gas emissions for the Meliadine site including Rankin Inlet operations were 62,051 tonnes CO_2 equivalent (e) in 2018.

In the FEIS, total GHG emissions from the mine site were conservatively estimated to be not more than 304,000 tonnes/yr CO_2e. Estimated GHG emissions from the additional marine operations at Rankin Inlet were estimated at approximately 13,000 tonnes/yr CO_2e.

7 MITIGATIVE AND ADAPTIVE STRATEGIES

Fugitive dust abatement measures and pollution prevention strategies were identified in the FEIS for the construction phase as follows, and are being implemented. Since monitoring results in 2018 were within applicable air quality criteria and FEIS predictions, no additional mitigative measures are planned.

- Best management practices to control fugitive particulate emissions onsite and on the AWAR (see Road Management Plan for details).
- Exhaust emissions from non-road vehicles are managed through purchasing equipment that meet Tier 3 emission standards.
- Exhaust emissions from non-road vehicles are managed through regular and routine maintenance of vehicles.
- SO_2 emissions from non-road vehicles and stationary equipment are reduced through the use of diesel fuel with less than 15 ppm of sulfur.

In 2017, the following adjustments to the air quality and dustfall sampling program were planned, with Agnico's actions in 2018 indicated:

- Dustfall monitoring along the AWAR may be adjusted in order to assess declines in rates of deposition with distance. This is proposed to include an additional sampling jar for the DF-3 location at the 125 m distance during the peak dust generation period (July and August). Alternatively, modeled deposition rates will be obtained for the study area, as calculated in the FEIS Air Quality Impact Assessment.
    - Since dustfall samples along the AWAR only occasionally exceed guidelines for recreational areas, even in very close proximity to the road (25 m), Agnico determined that no changes to the sampling program were warranted at this time. However, trends will continue to be monitored to determine whether additional sampling is necessary.
- Adjustments to the monitoring program for metals in dustfall will also be made. Pending further discussion with NIRB and/or the commercial analytical laboratory, this may include analysis of dustfall on filters rather than collection liquid.
    - Through review of the Project Certificate and discussions with the analytical laboratory, Agnico has determined that analysis of metals on TSP filters will be conducted, rather than dustfall liquid. TSP sampling began in December, 2018, and results will be reported in 2020.
- Conduct sampling of dustfall in snowpack, as described in the Air Quality Monitoring Plan.
    - As described in the 2017 Air Quality and Dustfall Monitoring Report, a snowpack survey is planned to be conducted in the winter of 2018/2019.
- Repairs have been planned for to allow the stack testing in the fall of 2018.
    - Completed.

The following monitoring actions are planned for 2019 to improve the program:

- Maintenance and replacement parts will be obtained to ensure all Partisol units are operating, and minimal delays occur due to service requirements.
- Procedures will be developed for the collection of sampled filters, and deployment of new filters to reduce the potential for gaps in the data.
- A schedule of annual calibration of each unit, with bi-annual or quarterly system audits will be implemented.

Outside of these actions monitoring in 2019 will be conducted according to the construction phase schedule, as described in the Air Quality Monitoring Plan.

REFERENCES

Golder (Golder Associates), 2014. Final Environmental Impact Statement – Meliadine Gold Project, Nunavut. Volume 5.0 Atmospheric Environment and Impact Assessment. April, 2014.

APPENDIX A: LABORATORY CERTIFICATES OF ANALYSIS

Maxxam
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Your P.O. #: 573774
Your Project #: 2017/12/31 - 2018/01/27
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/02/08
Report #: R2511448
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B808212
Received: 2018/02/02, 10:42

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2018/02/06	2018/02/08	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis (1)	2	2018/02/06	2018/02/08	PTC SOP-00149	Passive SO2 in Air

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key Levi Manchak
Levi Manchak
Project Manager
12 Feb 2018 09:55:56

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B808212
Report Date: 2018/02/08

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/31 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		SX1812	SX1813		
Sampling Date		2017/12/31	2017/12/31		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	1.6	1.6	0.1	8904113
Calculated SO2	ppb	<0.1	<0.1	0.1	8903571
RDL = Reportable Detection Limit					

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Maxxam Job #: B808212
Report Date: 2018/02/08

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/31 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B808212
Report Date: 2018/02/08

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/31 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
8903571	Calculated SO2	2018/02/06	99	90 - 110	<0.1	ppb
8904113	Calculated NO2	2018/02/06	107	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B808212
Report Date: 2018/02/08

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/31 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/01/27 - 2018/02/24
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/03/12
Report #: R2526710
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B816086
Received: 2018/03/05, 13:05

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2018/03/09	2018/03/12	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis (1)	2	2018/03/07	2018/03/12	PTC SOP-00149	Passive SO2 in Air

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B816086
Report Date: 2018/03/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TB0039	TB0040		
Sampling Date		2018/01/27	2018/01/27		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	1.7	0.4	0.1	8930426
Calculated SO2	ppb	<0.1	<0.1	0.1	8927890
RDL = Reportable Detection Limit					

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Maxxam Job #: B816086
Report Date: 2018/03/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Travel blank result for SO2 exceeded acceptance criteria of >RDL. Possible contamination may have occurred. Sample results have been blank subtracted.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B816086
Report Date: 2018/03/12

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
8927890	Calculated SO2	2018/03/07	99	90 - 110	<0.1	ppb
8930426	Calculated NO2	2018/03/09	99	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B816086
Report Date: 2018/03/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

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Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/02/24 - 2018/03/23
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/04/13
Report #: R2540883
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B826024
Received: 2018/04/09, 14:31

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	2	2018/04/11	2018/04/13	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis (1)	2	2018/04/12	2018/04/13	PTC SOP-00149	Passive SO2 in Air

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B826024
Report Date: 2018/04/13

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TF9584	TF9585		
Sampling Date		2018/02/24	2018/02/24		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	1.1	0.3	0.1	8957253
Calculated SO2	ppb	<0.1	0.1	0.1	8958514
RDL = Reportable Detection Limit					

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B826024
Report Date: 2018/04/13

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B826024
Report Date: 2018/04/13

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
8957253	Calculated NO2	2018/04/11	100	90 - 110	<0.1	ppb
8958514	Calculated SO2	2018/04/12	101	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B826024
Report Date: 2018/04/13

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/03/23 - 2018/04/22
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/05/10
Report #: R2552370
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831994
Received: 2018/04/30, 10:45

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/05/07	2018/05/10	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/05/01	2018/05/10	PTC SOP-00149	Passive SO2 in ATM

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536
==========
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Maxxam Job #: B831994
Report Date: 2018/05/10

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TI5767	TI5768		
Sampling Date		2018/03/23	2018/03/23		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	0.5	<0.1	0.1	8981012
Calculated SO2	ppb	0.2	0.3	0.1	8974705
RDL = Reportable Detection Limit					

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Maxxam Job #: B831994
Report Date: 2018/05/10

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B831994
Report Date: 2018/05/10

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
8974705	Calculated SO2	2018/05/01	100	90 - 110	<0.1	ppb
8981012	Calculated NO2	2018/05/07	99	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B831994
Report Date: 2018/05/10

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

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Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/04/22 - 2018/05/21
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/06/05
Report #: R2563990
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B840597
Received: 2018/05/28, 12:45

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/05/31	2018/06/05	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/06/01	2018/06/05	PTC SOP-00149	Passive SO2 in ATM

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536
==========
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Maxxam Job #: B840597
Report Date: 2018/06/05

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TM8850	TM8851		
Sampling Date		2018/04/22	2018/04/22		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	<0.1	<0.1	0.1	9007285
Calculated SO2	ppb	<0.1	<0.1	0.1	9008659
RDL = Reportable Detection Limit					

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Maxxam Job #: B840597
Report Date: 2018/06/05

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

GENERAL COMMENTS

Travel blank result for NO2 exceeded acceptance criteria of >RDL. Possible contamination may have occurred. Sample results have been blank subtracted.

Results relate only to the items tested.

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Maxxam Job #: B840597
Report Date: 2018/06/05

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9007285	Calculated NO2	2018/06/01	100	90 - 110	<0.1	ppb
9008659	Calculated SO2	2018/06/04	102	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B840597
Report Date: 2018/06/05

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/05/21 - 2018/06/18
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/06/29
Report #: R2580809
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B850807
Received: 2018/06/25, 10:28

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/06/28	2018/06/29	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/06/26	2018/06/29	PTC SOP-00149	Passive SO2 in ATM

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Results relate only to the items tested.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B850807
Report Date: 2018/06/29

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TS4085	TS4086		
Sampling Date		2018/05/21	2018/05/21		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	0.1	0.4	0.1	9042732
Calculated SO2	ppb	<0.1	<0.1	0.1	9039541
RDL = Reportable Detection Limit					

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Maxxam Job #: B850807
Report Date: 2018/06/29

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Travel blank result for SO2 exceeded acceptance criteria of >RDL. Possible contamination may have occurred. Sample results have been blank subtracted.

Results relate only to the items tested.

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Maxxam Job #: B850807
Report Date: 2018/06/29

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9039541	Calculated SO2	2018/06/27	100	90 - 110	<0.1	ppb
9042732	Calculated NO2	2018/06/29	99	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B850807
Report Date: 2018/06/29

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

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Your P.O. #: 664696
Your Project #: 2018/06/18 - 2018/07/20
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/08/15
Report #: R2604114
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B863887
Received: 2018/08/01, 07:49

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/08/02	2018/08/15	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/08/01	2018/08/15	PTC SOP-00149	Passive SO2 in ATM

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Results relate only to the items tested.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536
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Maxxam Job #: B863887
Report Date: 2018/08/15

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TZ2675	TZ2676		
Sampling Date		2018/06/18	2018/06/18		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	1.0	0.6	0.1	9089109
Calculated SO2	ppb	0.1	0.2	0.1	9086691
RDL = Reportable Detection Limit					

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Maxxam Job #: B863887
Report Date: 2018/08/15

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Travel blank result for SO2 exceeded acceptance criteria of >RDL. Possible contamination may have occurred. Sample results have been blank subtracted.

Results relate only to the items tested.

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Maxxam Job #: B863887
Report Date: 2018/08/15

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9086691	Calculated SO2		101	90 - 110	<0.1	ppb
9089109	Calculated NO2		100	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

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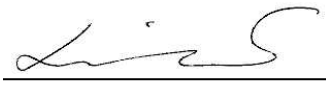
Maxxam Job #: B863887
Report Date: 2018/08/15

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/07/20 - 2018/08/08
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/08/27
Report #: R2609579
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B868265
Received: 2018/08/15, 09:53

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/08/20	2018/08/27	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/08/20	2018/08/27	PTC SOP-00149	Passive SO2 in ATM

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B868265
Report Date: 2018/08/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UB6840	UB6841		
Sampling Date		2018/07/20	2018/07/20		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	<0.1	<0.1	0.1	9109773
Calculated SO2	ppb	<0.1	<0.1	0.1	9109880
RDL = Reportable Detection Limit					

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Maxxam Job #: B868265
Report Date: 2018/08/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B868265
Report Date: 2018/08/27

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9109773	Calculated NO2		99	90 - 110	<0.1	ppb
9109880	Calculated SO2		102	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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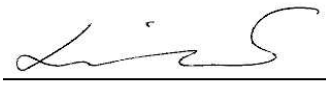
Maxxam Job #: B868265
Report Date: 2018/08/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



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Your P.O. #: 664696
Your Project #: 2018/08/08 - 2018/09/08
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/09/25
Report #: R2624568
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B879862
Received: 2018/09/17, 13:14

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/09/19	2018/09/25	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/09/18	2018/09/25	PTC SOP-00149	Passive SO2 in ATM

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B879862
Report Date: 2018/09/25

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UI3457	UI3458		
Sampling Date		2018/08/08	2018/08/08		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	0.6	0.4	0.1	9148822
Calculated SO2	ppb	<0.1	0.1	0.1	9148107
RDL = Reportable Detection Limit					

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Maxxam Job #: B879862
Report Date: 2018/09/25

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B879862
Report Date: 2018/09/25

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9148107	Calculated SO2		100	90 - 110	<0.1	ppb
9148822	Calculated NO2		100	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B879862
Report Date: 2018/09/25

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

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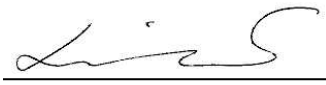

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/09/09 - 2018/10/14
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/10/26
Report #: R2640980
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B892539
Received: 2018/10/23, 08:17

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/10/24	2018/10/26	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/10/23	2018/10/26	PTC SOP-00149	Passive SO2 in ATM

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* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B892539
Report Date: 2018/10/26

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UP5731	UP5732		
Sampling Date		2018/09/09	2018/09/09		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	1.1	0.3	0.1	9197720
Calculated SO2	ppb	0.1	0.1	0.1	9196342
RDL = Reportable Detection Limit					

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Maxxam Job #: B892539
Report Date: 2018/10/26

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B892539
Report Date: 2018/10/26

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9196342	Calculated SO2		98	90 - 110	<0.1	ppb
9197720	Calculated NO2		101	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B892539
Report Date: 2018/10/26

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

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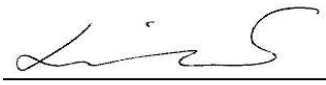

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/10/14 - 2018/11/12
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/11/27
Report #: R2656188
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8A1306
Received: 2018/11/19, 10:57

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/11/21	2018/11/27	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/11/19	2018/11/27	PTC SOP-00149	Passive SO2 in ATM

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B8A1306
Report Date: 2018/11/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/12
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UU4796	UU4797		
Sampling Date		2018/10/14	2018/10/14		
	UNITS	**5**	**7**	**RDL**	**QC Batch**
Passive Monitoring					
Calculated NO2	ppb	0.5	0.5	0.1	9236803
Calculated SO2	ppb	<0.1	<0.1	0.1	9233532
RDL = Reportable Detection Limit					

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Maxxam Job #: B8A1306
Report Date: 2018/11/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/12
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B8A1306
Report Date: 2018/11/27

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/12
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9233532	Calculated SO2		98	90 - 110	<0.1	ppb
9236803	Calculated NO2		100	90 - 110	<0.1	ppb

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Maxxam Job #: B8A1306
Report Date: 2018/11/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/12
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

VALIDATION SIGNATURE PAGE

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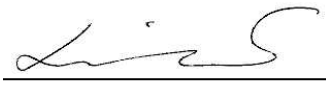

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Your P.O. #: 664696
Your Project #: 2018/11/12 - 2018/12/13
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2019/01/07
Report #: R2671543
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B1539
Received: 2018/12/24, 09:34

Sample Matrix: Air
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis	2	2018/12/26	2019/01/04	PTC SOP-00148	Passive NO2 in ATM
SO2 Passive Analysis	2	2018/12/26	2019/01/04	PTC SOP-00149	Passive SO2 in ATM

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B8B1539
Report Date: 2019/01/07

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/12 - 2018/12/13
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UZ8708	UZ8709		
Sampling Date		2018/11/12	2018/11/12		
	UNITS	5	7	RDL	QC Batch
Passive Monitoring					
Calculated NO2	ppb	1.7	1.6	0.1	9276606
Calculated SO2	ppb	<0.1	<0.1	0.1	9276616
RDL = Reportable Detection Limit					

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Maxxam Job #: B8B1539
Report Date: 2019/01/07

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/12 - 2018/12/13
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B8B1539
Report Date: 2019/01/07

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/12 - 2018/12/13
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**UNITS**
9276606	Calculated NO2		100	90 - 110	<0.1	ppb
9276616	Calculated SO2		100	90 - 110	<0.1	ppb

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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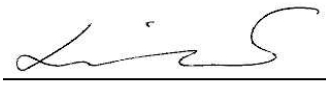
Maxxam Job #: B8B1539
Report Date: 2019/01/07

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/12 - 2018/12/13
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: FA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



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Your P.O. #: 573774
Your Project #: 2017/12/30 - 2018/01/27
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/02/12
Report #: R2513063
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B808223
Received: 2018/02/02, 10:46

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall-mg/cm2/30 days	10	2018/02/12	2018/02/12		PTC SOP-00180
Total & Fixed Dustfall	10	2018/02/12	2018/02/12	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/02/12	2018/02/12	PTC SOP-00146 PTC SOP-00154 PTC SOP-00180	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager
Email: LManchak@maxxam.ca
Phone# (780)468-3536
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Maxxam Job #: B808223
Report Date: 2018/02/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/30 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		SX1835	SX1836		SX1837		SX1838	SX1839		
Sampling Date		2017/12/31	2017/12/31		2017/12/31		2017/12/31	2017/12/31		
	UNITS	DUSTFALL 1	DUSTFALL 2	RDL	DUSTFALL 3	RDL	DUSTFALL 4	DUSTFALL 5	RDL	QC Batch
Industrial										
Exposure	days	28	28	1	28	1	27	27	1	8907993
Dustfall Determination										
Total Dustfall	mg	6	3	2	2	1	8	8	2	8907990
Total Dustfall (30 day)	mg/cm2/30day	0.079	0.035	0.002	0.028	0.001	0.105	0.114	0.002	8907991
Total Fixed Dustfall	mg	7	<2	2	2	1	6	8	2	8907990
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.094	0.024	0.002	0.028	0.001	0.075	0.114	0.002	8907991
RDL = Reportable Detection Limit										

Maxxam ID		SX1840	SX1841		SX1842	SX1843		
Sampling Date		2017/12/31	2017/12/31		2017/12/31	2017/12/31		
	UNITS	DUSTFALL 6	DUSTFALL 7	RDL	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	QC Batch
Industrial								
Exposure	days	27	27	1	28	28	1	8907993
Dustfall Determination								
Total Dustfall	mg	3	2	1	12	11	2	8907990
Total Dustfall (30 day)	mg/cm2/30day	0.038	0.033	0.001	0.153	0.142	0.002	8907991
Total Fixed Dustfall	mg	4	2	1	11	6	2	8907990
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.048	0.033	0.001	0.142	0.079	0.002	8907991
RDL = Reportable Detection Limit								

Maxxam ID		SX1844		
Sampling Date		2017/12/31		
	UNITS	DUSTFALL 2018-0005	RDL	QC Batch
Industrial				
Exposure	days	28	1	8907993
Dustfall Determination				
Total Dustfall	mg	3	2	8907990
Total Dustfall (30 day)	mg/cm2/30day	0.039	0.002	8907991
Total Fixed Dustfall	mg	2	2	8907990
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.026	0.002	8907991
RDL = Reportable Detection Limit				

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Maxxam Job #: B808223
Report Date: 2018/02/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/30 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B808223
Report Date: 2018/02/12

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/30 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
8907990	Total Dustfall	2018/02/12	<1	mg
8907990	Total Fixed Dustfall	2018/02/12	<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B808223
Report Date: 2018/02/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2017/12/30 - 2018/01/27
Site Location: MELIADINE
Your P.O. #: 573774
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/01/27 - 2018/02/24
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/03/27
Report #: R2533209
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B816083
Received: 2018/03/05, 12:53

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall-mg/cm2/30 days	10	2018/03/16	2018/03/16		PTC SOP-00180
Total & Fixed Dustfall	10	2018/03/16	2018/03/16	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/03/16	2018/03/16	PTC SOP-00146 PTC SOP-00154 PTC SOP-00180	
Metals via Dustfall	10	2018/03/09	N/A		

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager
Email: LManchak@maxxam.ca
Phone# (780)468-3536
==========
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Maxxam Job #: B816083
Report Date: 2018/03/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TB0022	TB0023	TB0024	TB0025		TB0026		
Sampling Date		2018/01/27	2018/01/27	2018/01/27	2018/01/27		2018/01/27		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	RDL	DUSTFALL 5	RDL	QC Batch
Industrial									
Exposure	days	28	28	28	28	1	28	1	8936758
Dustfall Determination									
Total Dustfall	mg	3	2	<1	<1	1	4	2	8936755
Total Dustfall (30 day)	mg/cm2/30day	0.042	0.021	0.010	0.008	0.001	0.047	0.002	8936756
Total Fixed Dustfall	mg	<1	<1	<1	<1	1	<2	2	8936755
Total Fixed Dustfall (30 day)	mg/cm2/30day	<0.001	<0.001	<0.001	0.008	0.001	0.012	0.002	8936756
Internal Sublet Analysis									
See Attachment	N/A	1.0	1.0	1.0	1.0	N/A	1.0	N/A	8935268

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam ID		TB0027	TB0028		TB0029	TB0030		
Sampling Date		2018/01/27	2018/01/27		2018/01/27	2018/01/27		
	UNITS	DUSTFALL 6	DUSTFALL 7	RDL	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	QC Batch
Industrial								
Exposure	days	28	28	1	28	28	1	8936758
Dustfall Determination								
Total Dustfall	mg	2	6	1	15	3	2	8936755
Total Dustfall (30 day)	mg/cm2/30day	0.021	0.073	0.001	0.202	0.035	0.002	8936756
Total Fixed Dustfall	mg	<1	<1	1	9	<2	2	8936755
Total Fixed Dustfall (30 day)	mg/cm2/30day	<0.001	<0.001	0.001	0.115	<0.002	0.002	8936756
Internal Sublet Analysis								
See Attachment	N/A	1.0	1.0	N/A	1.0	1.0	N/A	8935268

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B816083
Report Date: 2018/03/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TB0031		
Sampling Date		2018/01/27		
	UNITS	DUSTFALL 2018-0016	RDL	QC Batch
Industrial				
Exposure	days	28	1	8936758
Dustfall Determination				
Total Dustfall	mg	4	1	8936755
Total Dustfall (30 day)	mg/cm2/30day	0.055	0.001	8936756
Total Fixed Dustfall	mg	<1	1	8936755
Total Fixed Dustfall (30 day)	mg/cm2/30day	<0.001	0.001	8936756
Internal Sublet Analysis				
See Attachment	N/A	1.0	N/A	8935268

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B816083
Report Date: 2018/03/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B816083
Report Date: 2018/03/27

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
8936755	Total Dustfall	2018/03/16	<1	mg
8936755	Total Fixed Dustfall	2018/03/16	<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B816083
Report Date: 2018/03/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/01/27 - 2018/02/24
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/02/24 - 2018/03/23
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/04/24
Report #: R2545365
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B826016
Received: 2018/04/09, 14:22

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall-mg/cm2/30 days	10	2018/04/12	2018/04/12		PTC SOP-00180
Total & Fixed Dustfall	10	2018/04/12	2018/04/12	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/04/12	2018/04/12	PTC SOP-00146 PTC SOP-00154 PTC SOP-00180	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

==========

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Maxxam Job #: B826016
Report Date: 2018/04/24

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TF9542	TF9543	TF9544	TF9545	TF9546	TF9547		
Sampling Date		2018/02/24	2018/02/24	2018/02/24	2018/02/24	2018/02/24	2018/02/24		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Industrial									
Exposure	days	27	27	27	27	27	27	1	8958526
Dustfall Determination									
Total Dustfall	mg	2	2	2	2	1	<1	1	8958522
Total Dustfall (30 day)	mg/cm2/30day	0.033	0.033	0.033	0.033	0.016	<0.001	0.001	8958524
Total Fixed Dustfall	mg	1	2	2	4	3	4	1	8958522
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.016	0.033	0.024	0.057	0.041	0.049	0.001	8958524
RDL = Reportable Detection Limit									

Maxxam ID		TF9548	TF9549	TF9550		TF9551		
Sampling Date		2018/02/24	2018/02/24	2018/02/24		2018/02/24		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	DUSTFALL 2018-0023	RDL	QC Batch
Industrial								
Exposure	days	27	27	27	1	27	1	8958526
Dustfall Determination								
Total Dustfall	mg	4	21	5	1	<2	2	8958522
Total Dustfall (30 day)	mg/cm2/30day	0.049	0.286	0.073	0.001	0.012	0.002	8958524
Total Fixed Dustfall	mg	5	19	7	1	<2	2	8958522
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.073	0.253	0.090	0.001	0.024	0.002	8958524
RDL = Reportable Detection Limit								

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Maxxam Job #: B826016
Report Date: 2018/04/24

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B826016
Report Date: 2018/04/24

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
8958522	Total Dustfall	2018/04/12	<1	mg
8958522	Total Fixed Dustfall	2018/04/12	<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B826016
Report Date: 2018/04/24

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/02/24 - 2018/03/23
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

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Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/03/23 - 2018/04/22
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/05/14
Report #: R2553578
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B831988
Received: 2018/04/30, 10:33

Sample Matrix: Air
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	9	2018/05/02	2018/05/02	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	9	2018/05/02	2018/05/02	PTC SOP-00180	AMD 32020
Exposure (Number of days)	9	2018/05/02	2018/05/02	PTC SOP-00154 PTC SOP-00180	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B831988
Report Date: 2018/05/14

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TI5733	TI5734	TI5735	TI5736	TI5737	TI5738		
Sampling Date		2018/03/23	2018/03/23	2018/03/23	2018/03/23	2018/03/23	2018/03/23		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	3	5	4	5	10	6	1	8976444
Total Dustfall (30 day)	mg/cm2/30day	0.037	0.059	0.051	0.059	0.118	0.073	0.001	8976449
Total Fixed Dustfall	mg	4	5	5	5	9	5	1	8976444
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.044	0.059	0.059	0.066	0.110	0.059	0.001	8976449
Physical Properties									
Exposure	days	30	30	30	30	30	30	1	8976461
RDL = Reportable Detection Limit									

Maxxam ID		TI5739	TI5740	TI5741		
Sampling Date		2018/03/23	2018/03/23	2018/03/23		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	QC Batch
Dustfall Determination						
Total Dustfall	mg	6	50	19	1	8976444
Total Dustfall (30 day)	mg/cm2/30day	0.073	0.607	0.235	0.001	8976449
Total Fixed Dustfall	mg	3	45	17	1	8976444
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.037	0.549	0.213	0.001	8976449
Physical Properties						
Exposure	days	30	30	30	1	8976461
RDL = Reportable Detection Limit						

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Maxxam Job #: B831988
Report Date: 2018/05/14

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B831988
Report Date: 2018/05/14

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
8976444	Total Dustfall	2018/05/02	<1	mg
8976444	Total Fixed Dustfall	2018/05/02	<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B831988
Report Date: 2018/05/14

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/03/23 - 2018/04/22
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

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Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/04/22 - 2018/05/21
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/06/19
Report #: R2574336
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B840598
Received: 2018/05/28, 12:47

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2018/05/31	2018/05/31	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2018/05/31	2018/05/31	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/05/31	2018/05/31	PTC SOP-00154 PTC SOP-00180	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

==========

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Maxxam Job #: B840598
Report Date: 2018/06/19

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TM8853	TM8854	TM8855	TM8856	TM8857	TM8858		
Sampling Date		2018/04/22	2018/04/22	2018/04/22	2018/04/22	2018/04/22	2018/04/22		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	5	13	14	6	11	4	1	9007176
Total Dustfall (30 day)	mg/cm2/30day	0.068	0.162	0.175	0.076	0.137	0.046	0.001	9007180
Total Fixed Dustfall	mg	3	2	8	2	6	<1	1	9007176
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.038	0.030	0.106	0.030	0.076	0.008	0.001	9007180
Physical Properties									
Exposure	days	29	29	29	29	29	29	1	9007196
RDL = Reportable Detection Limit									

Maxxam ID		TM8859	TM8860	TM8861	TM8862		
Sampling Date		2018/04/22	2018/04/22	2018/04/22	2018/04/22		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	2018-0042	RDL	QC Batch
Dustfall Determination							
Total Dustfall	mg	10	150	83	8	1	9007176
Total Dustfall (30 day)	mg/cm2/30day	0.132	1.875	1.046	0.101	0.001	9007180
Total Fixed Dustfall	mg	6	140	77	1	1	9007176
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.071	1.761	0.975	0.013	0.001	9007180
Physical Properties							
Exposure	days	29	29	29	29	1	9007196
RDL = Reportable Detection Limit							

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B840598
Report Date: 2018/06/19

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B840598
Report Date: 2018/06/19

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9007176	Total Dustfall	2018/05/31	<1	mg
9007176	Total Fixed Dustfall	2018/05/31	<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B840598
Report Date: 2018/06/19

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/04/22 - 2018/05/21
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: RS

VALIDATION SIGNATURE PAGE

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Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/05/21 - 2018/06/18
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/07/12
Report #: R2587557
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B850792
Received: 2018/06/25, 10:19

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2018/06/29	2018/06/29	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2018/06/29	2018/06/29	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/06/29	2018/06/29	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B850792
Report Date: 2018/07/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TS4048	TS4049	TS4050	TS4051	TS4052	TS4053		
Sampling Date		2018/05/21	2018/05/21	2018/05/21	2018/05/21	2018/05/21	2018/05/21		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	14	17	39	17	13	8	1	9044573
Total Dustfall (30 day)	mg/cm2/30day	0.187	0.228	0.512	0.220	0.165	0.110	0.001	9044574
Total Fixed Dustfall	mg	17	17	38	13	11	7	1	9044573
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.216	0.220	0.496	0.173	0.150	0.087	0.001	9044574
Physical Properties									
Exposure	days	28	28	28	28	28	28	1	9044576
RDL = Reportable Detection Limit									

Maxxam ID		TS4054	TS4055	TS4056		TS4057		
Sampling Date		2018/05/21	2018/05/21	2018/05/21		2018/05/21		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	2018-0047	RDL	QC Batch
Dustfall Determination								
Total Dustfall	mg	8	99	28	1	4	2	9044573
Total Dustfall (30 day)	mg/cm2/30day	0.102	1.294	0.367	0.001	0.052	0.002	9044574
Total Fixed Dustfall	mg	5	95	27	1	<2	2	9044573
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.071	1.249	0.358	0.001	0.013	0.002	9044574
Physical Properties								
Exposure	days	28	28	28	1	28	1	9044576
RDL = Reportable Detection Limit								

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Maxxam Job #: B850792
Report Date: 2018/07/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B850792
Report Date: 2018/07/12

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9044573	Total Dustfall	2018/06/29	<1	mg
9044573	Total Fixed Dustfall	2018/06/29	<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B850792
Report Date: 2018/07/12

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Levi Manchak, Project Manager SR

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Your P.O. #: 664696
Your Project #: 2018/05/21 - 2018/06/18
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/09/18
Report #: R2620853
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B850792
Received: 2018/06/25, 10:19

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2018/06/29	2018/06/29	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2018/06/29	2018/06/29	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/06/29	2018/06/29	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B850792
Report Date: 2018/09/18

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TS4048	TS4049	TS4050	TS4051	TS4052	TS4053		
Sampling Date		2018/05/21	2018/05/21	2018/05/21	2018/05/21	2018/05/21	2018/05/21		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	14	17	39	17	13	8	1	9044573
Total Dustfall (30 day)	mg/cm2/30day	0.187	0.228	0.512	0.220	0.165	0.110	0.001	9044574
Total Fixed Dustfall	mg	17	17	38	13	11	7	1	9044573
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.216	0.220	0.496	0.173	0.150	0.087	0.001	9044574
Physical Properties									
Exposure	days	28	28	28	28	28	28	1	9044576
RDL = Reportable Detection Limit									

Maxxam ID		TS4054	TS4055	TS4056		TS4057		
Sampling Date		2018/05/21	2018/05/21	2018/05/21		2018/05/21		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	2018-0047	RDL	QC Batch
Dustfall Determination								
Total Dustfall	mg	8	99	28	1	4	2	9044573
Total Dustfall (30 day)	mg/cm2/30day	0.102	1.294	0.367	0.001	0.052	0.002	9044574
Total Fixed Dustfall	mg	5	95	27	1	<2	2	9044573
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.071	1.249	0.358	0.001	0.013	0.002	9044574
Physical Properties								
Exposure	days	28	28	28	1	28	1	9044576
RDL = Reportable Detection Limit								

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Maxxam Job #: B850792
Report Date: 2018/09/18

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B850792
Report Date: 2018/09/18

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9044573	Total Dustfall	2018/06/29	<1	mg
9044573	Total Fixed Dustfall	2018/06/29	<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B850792
Report Date: 2018/09/18

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/05/21 - 2018/06/18
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: JM

VALIDATION SIGNATURE PAGE

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Levi Manchak, Project Manager SR

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Your P.O. #: 664696
Your Project #: 2018/06/18 - 2018/07/20
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/08/15
Report #: R2604103
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B863886
Received: 2018/08/01, 07:45

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2018/08/02	2018/08/02	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2018/08/02	2018/08/02	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/08/02	2018/08/02	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B863886
Report Date: 2018/08/15

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		TZ2665	TZ2666	TZ2667	TZ2668	TZ2669	TZ2670		
Sampling Date		2018/06/18	2018/06/18	2018/06/18	2018/06/18	2018/06/18	2018/06/18		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	14	7	16	7	8	5	1	9088537
Total Dustfall (30 day)	mg/cm2/30day	0.165	0.083	0.186	0.083	0.090	0.062	0.001	9088538
Total Fixed Dustfall	mg	14	7	14	4	8	4	1	9088537
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.165	0.076	0.165	0.048	0.090	0.048	0.001	9088538
Physical Properties									
Exposure	days	32	32	32	32	32	32	1	9088540
RDL = Reportable Detection Limit									

Maxxam ID		TZ2671	TZ2672	TZ2673	TZ2674		
Sampling Date		2018/06/18	2018/06/18	2018/06/18	2018/06/18		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	2018-0060	RDL	QC Batch
Dustfall Determination							
Total Dustfall	mg	4	120	96	<1	1	9088537
Total Dustfall (30 day)	mg/cm2/30day	0.048	1.433	1.102	<0.001	0.001	9088538
Total Fixed Dustfall	mg	2	120	92	<1	1	9088537
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.028	1.377	1.054	<0.001	0.001	9088538
Physical Properties							
Exposure	days	32	32	32	32	1	9088540
RDL = Reportable Detection Limit							

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Maxxam Job #: B863886
Report Date: 2018/08/15

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B863886
Report Date: 2018/08/15

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9088537	Total Dustfall		<1	mg
9088537	Total Fixed Dustfall		<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B863886
Report Date: 2018/08/15

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/06/18 - 2018/07/20
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

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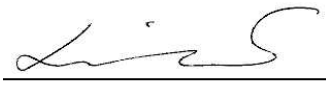

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/07/20 - 2018/08/08
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/08/30
Report #: R2611740
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B868269
Received: 2018/08/15, 09:56

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2018/08/23	2018/08/23	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2018/08/23	2018/08/23	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/08/23	2018/08/23	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B868269
Report Date: 2018/08/30

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UB6846	UB6847	UB6848	UB6849	UB6850	UB6851		
Sampling Date		2018/07/20	2018/07/20	2018/07/20	2018/07/20	2018/07/20	2018/07/20		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	13	8	40	5	11	5	1	9113848
Total Dustfall (30 day)	mg/cm2/30day	0.244	0.162	0.766	0.104	0.209	0.093	0.001	9113853
Total Fixed Dustfall	mg	11	6	23	5	10	4	1	9113848
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.220	0.116	0.441	0.093	0.186	0.070	0.001	9113853
Physical Properties									
Exposure	days	19	19	19	19	19	19	1	9113859
RDL = Reportable Detection Limit									

Maxxam ID		UB6852	UB6853	UB6854	UB6855		
Sampling Date		2018/07/20	2018/07/20	2018/07/20	2018/07/20		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	DUSTFALL MS	RDL	QC Batch
Dustfall Determination							
Total Dustfall	mg	5	62	95	23	1	9113848
Total Dustfall (30 day)	mg/cm2/30day	0.093	1.206	1.844	0.441	0.001	9113853
Total Fixed Dustfall	mg	4	59	89	20	1	9113848
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.081	1.137	1.717	0.394	0.001	9113853
Physical Properties							
Exposure	days	19	19	19	19	1	9113859
RDL = Reportable Detection Limit							

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Maxxam Job #: B868269
Report Date: 2018/08/30

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B868269
Report Date: 2018/08/30

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9113848	Total Dustfall		<1	mg
9113848	Total Fixed Dustfall		<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

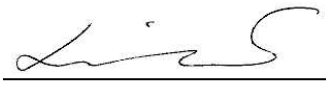
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B868269
Report Date: 2018/08/30

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/07/20 - 2018/08/08
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/09/18
Report #: R2620856
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B868269
Received: 2018/08/15, 09:56

Sample Matrix: Air
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	9	2018/08/23	2018/08/23	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	9	2018/08/23	2018/08/23	PTC SOP-00180	AMD 32020
Exposure (Number of days)	9	2018/08/23	2018/08/23	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B868269
Report Date: 2018/09/18

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UB6846	UB6847	UB6848	UB6849	UB6850	UB6851		
Sampling Date		2018/07/20	2018/07/20	2018/07/20	2018/07/20	2018/07/20	2018/07/20		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	13	8	40	5	11	5	1	9113848
Total Dustfall (30 day)	mg/cm2/30day	0.244	0.162	0.766	0.104	0.209	0.093	0.001	9113853
Total Fixed Dustfall	mg	11	6	23	5	10	4	1	9113848
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.220	0.116	0.441	0.093	0.186	0.070	0.001	9113853
Physical Properties									
Exposure	days	19	19	19	19	19	19	1	9113859
RDL = Reportable Detection Limit									

Maxxam ID		UB6852	UB6853	UB6854		
Sampling Date		2018/07/20	2018/07/20	2018/07/20		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	QC Batch
Dustfall Determination						
Total Dustfall	mg	5	62	95	1	9113848
Total Dustfall (30 day)	mg/cm2/30day	0.093	1.206	1.844	0.001	9113853
Total Fixed Dustfall	mg	4	59	89	1	9113848
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.081	1.137	1.717	0.001	9113853
Physical Properties						
Exposure	days	19	19	19	1	9113859
RDL = Reportable Detection Limit						

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Maxxam Job #: B868269
Report Date: 2018/09/18

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B868269
Report Date: 2018/09/18

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9113848	Total Dustfall		<1	mg
9113848	Total Fixed Dustfall		<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B868269
Report Date: 2018/09/18

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/07/20 - 2018/08/08
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

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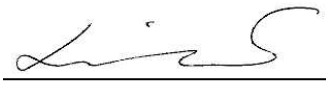

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/08/08 - 2018/09/10
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/09/27
Report #: R2625860
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B879865
Received: 2018/09/17, 13:17

Sample Matrix: Air
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	9	2018/09/25	2018/09/25	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	9	2018/09/25	2018/09/25	PTC SOP-00180	AMD 32020
Exposure (Number of days)	9	2018/09/25	2018/09/25	PTC SOP-00154 PTC SOP-00180	

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Results relate only to the items tested.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B879865
Report Date: 2018/09/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UI3511	UI3512	UI3513	UI3514	UI3515	UI3516		
Sampling Date		2018/08/08	2018/08/08	2018/08/08	2018/08/08	2018/08/08	2018/08/08		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	10	6	25	3	9	5	1	9157650
Total Dustfall (30 day)	mg/cm2/30day	0.107	0.067	0.274	0.037	0.103	0.062	0.001	9157651
Total Fixed Dustfall	mg	7	5	20	2	4	3	1	9157650
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.080	0.053	0.227	0.018	0.041	0.034	0.001	9157651
Physical Properties									
Exposure	days	33	33	33	32	32	32	1	9157653
RDL = Reportable Detection Limit									

Maxxam ID		UI3517	UI3518	UI3519		
Sampling Date		2018/08/08	2018/08/08	2018/08/08		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	RDL	QC Batch
Dustfall Determination						
Total Dustfall	mg	2	120	73	1	9157650
Total Dustfall (30 day)	mg/cm2/30day	0.021	1.393	0.833	0.001	9157651
Total Fixed Dustfall	mg	<1	110	65	1	9157650
Total Fixed Dustfall (30 day)	mg/cm2/30day	<0.001	1.317	0.751	0.001	9157651
Physical Properties						
Exposure	days	32	32	32	1	9157653
RDL = Reportable Detection Limit						

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Maxxam Job #: B879865
Report Date: 2018/09/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Sampling dates differ on sample label from those listed on COC.
Sampling dates from sample label used in calculation of final results.

Results relate only to the items tested.

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Maxxam Job #: B879865
Report Date: 2018/09/27

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9157650	Total Dustfall		<1	mg
9157650	Total Fixed Dustfall		<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B879865
Report Date: 2018/09/27

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/08/08 - 2018/09/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

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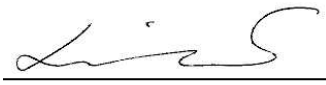

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/09/09 - 2018/10/14
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/11/07
Report #: R2647015
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B892532
Received: 2018/10/23, 08:10

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2018/10/29	2018/10/29	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2018/10/29	2018/10/29	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/10/29	2018/10/29	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B892532
Report Date: 2018/11/07

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UP5712	UP5713	UP5714	UP5715	UP5716	UP5717		
Sampling Date		2018/09/09	2018/09/09	2018/09/09	2018/09/08	2018/09/08	2018/09/08		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	8	7	40	8	40	9	1	9204378
Total Dustfall (30 day)	mg/cm2/30day	0.088	0.078	0.416	0.080	0.410	0.095	0.001	9204379
Total Fixed Dustfall	mg	5	6	37	4	22	4	1	9204378
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.057	0.059	0.393	0.043	0.220	0.044	0.001	9204379
Physical Properties									
Exposure	days	35	35	35	36	36	36	1	9204381
RDL = Reportable Detection Limit									

Maxxam ID		UP5718	UP5719	UP5720	UP5721		
Sampling Date		2018/09/08	2018/09/09	2018/09/09	2018/09/09		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	2018-0108	RDL	QC Batch
Dustfall Determination							
Total Dustfall	mg	7	220	200	6	1	9204378
Total Dustfall (30 day)	mg/cm2/30day	0.067	2.325	2.065	0.063	0.001	9204379
Total Fixed Dustfall	mg	4	210	170	4	1	9204378
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.043	2.210	1.814	0.042	0.001	9204379
Physical Properties							
Exposure	days	36	35	35	35	1	9204381
RDL = Reportable Detection Limit							

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Maxxam Job #: B892532
Report Date: 2018/11/07

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Samples #4,5,6 & 7 start date listed on sample label as 2018/09/08.
Differs from start date listed on COC.

Results relate only to the items tested.

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Maxxam Job #: B892532
Report Date: 2018/11/07

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9204378	Total Dustfall		<1	mg
9204378	Total Fixed Dustfall		<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B892532
Report Date: 2018/11/07

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/09/09 - 2018/10/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

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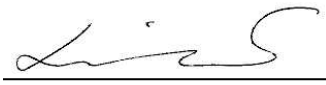

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Your P.O. #: 664696
Your Project #: 2018/10/14 - 2018/11/10
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2018/12/03
Report #: R2658799
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8A1300
Received: 2018/11/19, 10:47

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2018/11/27	2018/11/27	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2018/11/27	2018/11/27	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2018/11/27	2018/11/27	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B8A1300
Report Date: 2018/12/03

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UU4766	UU4767	UU4768	UU4769	UU4770	UU4771		
Sampling Date		2018/10/14	2018/10/14	2018/10/14	2018/10/14	2018/10/14	2018/10/14		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	10	11	50	29	11	22	1	9243638
Total Dustfall (30 day)	mg/cm2/30day	0.135	0.147	0.679	0.369	0.135	0.279	0.001	9243641
Total Fixed Dustfall	mg	8	10	46	7	6	10	1	9243638
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.105	0.131	0.627	0.092	0.075	0.132	0.001	9243641
Physical Properties									
Exposure	days	27	27	27	29	29	29	1	9243644
RDL = Reportable Detection Limit									

Maxxam ID		UU4772	UU4773	UU4774	UU4775		
Sampling Date		2018/10/14	2018/10/14	2018/10/14	2018/10/14		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	2018-0114	RDL	QC Batch
Dustfall Determination							
Total Dustfall	mg	3	47	63	2	1	9243638
Total Dustfall (30 day)	mg/cm2/30day	0.038	0.636	0.863	0.023	0.001	9243641
Total Fixed Dustfall	mg	2	44	61	2	1	9243638
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.030	0.596	0.830	0.023	0.001	9243641
Physical Properties							
Exposure	days	29	27	27	27	1	9243644
RDL = Reportable Detection Limit							

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Maxxam Job #: B8A1300
Report Date: 2018/12/03

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B8A1300
Report Date: 2018/12/03

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9243638	Total Dustfall		<1	mg
9243638	Total Fixed Dustfall		<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B8A1300
Report Date: 2018/12/03

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/10/14 - 2018/11/10
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

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Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 664696
Your Project #: 2018/11/10 - 2018/12/14
Site#: MELIADINE PROJECT
Site Location: MELIADINE

Attention: Meliadine Environment

AGNICO-EAGLE MINES LTD.
Meliadine
10200, Route de Preissac
Rouyn-Noranda, QC
CANADA J0Y1C0

Report Date: 2019/01/08
Report #: R2671872
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B1542
Received: 2018/12/24, 09:37

Sample Matrix: Air
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Determination of Dustfall	10	2019/01/04	2019/01/04	PTC SOP-00180	AMD 32020
Total & Fixed Dustfall	10	2019/01/04	2019/01/04	PTC SOP-00180	AMD 32020
Exposure (Number of days)	10	2019/01/04	2019/01/04	PTC SOP-00154 PTC SOP-00180	

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Encryption Key

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Levi Manchak, Project Manager SR
Email: LManchak@maxxam.ca
Phone# (780)468-3536

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Maxxam Job #: B8B1542
Report Date: 2019/01/08

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/10 - 2018/12/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		UZ8723	UZ8724	UZ8725	UZ8726	UZ8727	UZ8728		
Sampling Date		2018/11/10	2018/11/10	2018/11/10	2018/11/12	2018/11/12	2018/11/12		
	UNITS	DUSTFALL 1	DUSTFALL 2	DUSTFALL 3	DUSTFALL 4	DUSTFALL 5	DUSTFALL 6	RDL	QC Batch
Dustfall Determination									
Total Dustfall	mg	4	9	8	4	2	2	1	9282667
Total Dustfall (30 day)	mg/cm2/30day	0.048	0.093	0.082	0.041	0.028	0.021	0.001	9282669
Total Fixed Dustfall	mg	<1	7	6	3	2	<1	1	9282667
Total Fixed Dustfall (30 day)	mg/cm2/30day	0.007	0.076	0.064	0.033	0.021	0.007	0.001	9282669
Physical Properties									
Exposure	days	34	34	34	31	31	31	1	9282671
RDL = Reportable Detection Limit									

Maxxam ID		UZ8729	UZ8730	UZ8731	UZ8732		
Sampling Date		2018/11/12	2018/11/10	2018/11/10	2018/11/10		
	UNITS	DUSTFALL 7	DUSTFALL OFFICE	DUSTFALL SARLIAQ	2018-0117	RDL	QC Batch
Dustfall Determination							
Total Dustfall	mg	2	35	22	14	1	9282667
Total Dustfall (30 day)	mg/cm2/30day	0.027	0.376	0.233	0.151	0.001	9282669
Total Fixed Dustfall	mg	<1	33	21	11	1	9282667
Total Fixed Dustfall (30 day)	mg/cm2/30day	<0.001	0.355	0.224	0.119	0.001	9282669
Physical Properties							
Exposure	days	31	34	34	34	1	9282671
RDL = Reportable Detection Limit							

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Maxxam Job #: B8B1542
Report Date: 2019/01/08

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/10 - 2018/12/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B8B1542
Report Date: 2019/01/08

QUALITY ASSURANCE REPORT

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/10 - 2018/12/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

			Method Blank	
QC Batch	**Parameter**	**Date**	**Value**	**UNITS**
9282667	Total Dustfall		<1	mg
9282667	Total Fixed Dustfall		<1	mg

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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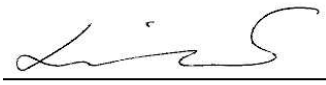
Maxxam Job #: B8B1542
Report Date: 2019/01/08

AGNICO-EAGLE MINES LTD.
Client Project #: 2018/11/10 - 2018/12/14
Site Location: MELIADINE
Your P.O. #: 664696
Sampler Initials: LH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Linda Lin, Supervisor, Centre for Passive Sampling Technology

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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APPENDIX B: DAILY AVERAGE WEATHER DATA

Appendix B Table 1: Daily average temperature, wind speed, wind direction, solar radiation, and rainfall as measured by the Meliadine onsite weather station.

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-01-01	-31.8	14.8	299.8	3.7	0.0
2018-01-02	-33.6	15.8	326.8	3.7	0.0
2018-01-03	-33.1	18.3	325.1	3.8	0.0
2018-01-04	-34.4	16.7	325.7	4.7	0.0
2018-01-05	-35.4	11.1	329.3	3.9	0.0
2018-01-06	-34.5	2.8	49.3	3.8	0.0
2018-01-07	-23.8	10.7	126.2	2.8	0.0
2018-01-08	-22.8	5.6	131.6	2.9	0.0
2018-01-09	-21.7	10.4	213.5	3.1	0.0
2018-01-10	-30.6	42.2	311.9	5.6	0.0
2018-01-11	-35.3	35.1	306.2	7.5	0.0
2018-01-12	-31.7	30.9	304.8	6.0	0.0
2018-01-13	-24.5	43.0	321.6	5.2	0.0
2018-01-14	-26.8	26.2	299.4	10.4	0.0
2018-01-15	-32.4	20.9	317.3	9.5	0.0
2018-01-16	-24.7	21.6	296.0	6.5	0.0
2018-01-17	-17.5	10.8	108.6	8.2	0.0
2018-01-18	-23.3	10.8	315.5	16.7	0.0
2018-01-19	-25.7	5.4	49.7	8.0	0.0
2018-01-20	-27.0	9.3	55.8	9.5	0.0
2018-01-21	-33.6	12.1	337.1	15.3	0.0
2018-01-22	-35.7	13.7	325.2	16.5	0.0
2018-01-23	-35.7	14.1	323.0	16.9	0.0
2018-01-24	-34.2	5.7	301.2	16.5	0.0
2018-01-25	-29.4	2.1	276.9	9.6	0.0
2018-01-26	-21.7	9.9	157.7	11.4	0.0
2018-01-27	-26.6	16.9	342.4	11.9	0.0
2018-01-28	-22.7	30.4	319.7	15.4	0.0
2018-01-29	-24.2	34.6	315.9	17.8	0.0
2018-01-30	-28.5	29.7	309.0	17.5	0.0
2018-01-31	-31.1	7.7	283.4	14.7	0.0
2018-02-01	-36.9	18.6	327.8	20.4	0.0
2018-02-02	-38.2	16.3	328.6	20.0	0.0
2018-02-03	-36.8	22.0	313.8	19.8	0.0
2018-02-04	-35.4	14.6	294.9	20.0	0.0
2018-02-05	-36.8	16.4	339.5	24.6	0.0

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-02-06	-38.2	10.9	326.4	19.2	0.0
2018-02-07	-40.5	21.0	329.0	25.3	0.0
2018-02-08	-39.4	38.0	318.6	19.5	0.0
2018-02-09	-34.3	20.9	288.7	23.5	0.0
2018-02-10	-31.3	13.3	350.7	25.9	0.0
2018-02-11	-38.7	10.1	324.7	26.0	0.0
2018-02-12	-41.0	7.7	320.1	29.6	0.0
2018-02-13	-34.8	4.4	91.7	29.5	0.0
2018-02-14	-29.9	17.6	71.5	30.2	0.0
2018-02-15	-38.2	24.3	306.1	38.2	0.0
2018-02-16	-39.8	18.1	302.2	42.1	0.0
2018-02-17	-43.1	7.3	333.8	37.6	0.0
2018-02-18	-43.9	16.1	330.4	43.3	0.0
2018-02-19	-43.9	19.9	323.3	43.9	0.0
2018-02-20	-36.2	22.9	318.1	44.7	0.0
2018-02-21	-37.7	5.1	315.1	52.7	0.0
2018-02-22	-36.7	1.2	271.8	47.1	0.0
2018-02-23	-26.6	16.7	105.3	34.8	0.0
2018-02-24	-31.8	14.3	253.4	60.4	0.0
2018-02-25	-22.8	14.7	218.4	57.6	0.0
2018-02-26	-28.4	10.4	179.7	64.8	0.0
2018-02-27	-24.7	8.4	151.3	66.2	0.0
2018-02-28	-20.8	17.8	143.9	54.8	0.0
2018-03-01	-16.9	29.6	130.4	49.1	0.0
2018-03-02	-15.1	26.1	123.2	66.4	0.0
2018-03-03	-18.6	7.3	43.3	71.0	0.0
2018-03-04	-23.0	6.5	309.4	89.5	0.0
2018-03-05	-21.7	6.5	139.5	85.8	0.0
2018-03-06	-21.1	8.6	144.1	79.6	0.0
2018-03-07	-17.0	9.2	133.7	64.4	0.0
2018-03-08	-13.7	9.6	133.8	68.1	0.0
2018-03-09	-13.5	5.2	109.1	56.3	0.0
2018-03-10	-19.8	4.1	244.8	82.7	0.0
2018-03-11	-21.8	12.7	127.1	74.0	0.0
2018-03-12	-19.2	16.8	359.1	93.9	0.0
2018-03-13	-26.4	19.3	323.7	115.1	0.0
2018-03-14	-22.8	21.2	79.8	87.0	0.0
2018-03-15	-30.1	13.6	350.4	125.6	0.0
2018-03-16	-23.9	24.5	284.4	105.2	0.0

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-03-17	-32.1	19.3	5.1	128.5	0.0
2018-03-18	-28.2	10.1	330.2	124.7	0.0
2018-03-19	-28.2	11.5	301.4	134.6	0.0
2018-03-20	-19.8	11.7	158.2	108.5	0.0
2018-03-21	-14.1	10.6	223.1	104.9	0.0
2018-03-22	-25.7	25.6	353.9	147.4	0.0
2018-03-23	-28.9	20.3	334.0	152.5	0.0
2018-03-24	-22.8	16.0	191.7	137.7	0.0
2018-03-25	-12.6	17.1	184.4	87.4	0.0
2018-03-26	-13.8	23.8	231.5	135.7	0.0
2018-03-27	-27.9	29.4	278.9	145.1	0.0
2018-03-28	-23.1	24.3	54.4	99.6	0.0
2018-03-29	-19.5	39.8	331.6	120.5	0.0
2018-03-30	-23.4	41.7	330.5	148.4	0.0
2018-03-31	-26.4	24.7	319.3	169.7	0.0
2018-04-01	-25.5	11.0	50.5	160.5	0.0
2018-04-02	-26.9	13.8	331.6	173.7	0.0
2018-04-03	-26.2	14.9	309.9	188.1	0.0
2018-04-04	-17.5	35.2	61.3	157.1	0.0
2018-04-05	-18.1	20.7	68.2	187.4	0.0
2018-04-06	-14.3	29.4	350.2	144.4	0.0
2018-04-07	-23.4	32.6	333.7	178.6	0.0
2018-04-08	-25.0	25.1	323.2	207.9	0.0
2018-04-09	-23.3	19.0	318.0	206.1	0.0
2018-04-10	-24.1	8.4	283.9	209.8	0.0
2018-04-11	-27.9	15.6	322.1	216.9	0.0
2018-04-12	-28.8	18.1	331.7	216.9	0.0
2018-04-13	-23.0	24.0	347.5	215.3	0.0
2018-04-14	-19.8	12.3	313.2	226.6	0.0
2018-04-15	-16.1	12.0	190.0	228.7	0.0
2018-04-16	-9.3	17.3	165.5	230.8	0.0
2018-04-17	-6.9	14.0	277.3	208.5	0.0
2018-04-18	-10.8	12.8	53.8	162.9	0.0
2018-04-19	-5.9	36.0	142.6	203.6	0.0
2018-04-20	-6.7	19.9	230.1	224.3	0.0
2018-04-21	-5.6	27.3	147.9	210.3	0.0
2018-04-22	-5.4	27.5	256.6	216.3	0.3
2018-04-23	-17.7	22.5	357.0	238.5	0.0
2018-04-24	-17.4	17.6	337.4	249.6	0.0

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-04-25	-13.5	14.3	295.5	252.1	0.0
2018-04-26	-19.1	23.0	345.3	265.6	0.0
2018-04-27	-18.0	18.0	321.6	265.4	0.0
2018-04-28	-18.5	17.5	290.8	268.3	0.0
2018-04-29	-11.1	12.5	162.1	194.2	0.0
2018-04-30	-14.1	29.8	320.2	276.1	0.0
2018-05-01	-18.4	28.6	298.1	269.4	0.0
2018-05-02	-16.4	14.1	294.8	289.3	0.0
2018-05-03	-14.5	8.3	147.1	279.2	0.0
2018-05-04	-9.3	15.6	281.5	235.9	0.0
2018-05-05	-15.1	23.8	330.8	294.0	0.0
2018-05-06	-18.2	14.7	321.2	300.3	0.0
2018-05-07	-8.5	21.8	178.8	211.8	0.0
2018-05-08	-12.7	46.2	326.8	256.7	0.9
2018-05-09	-14.4	34.0	319.1	297.9	0.0
2018-05-10	-12.3	14.9	337.6	297.8	0.0
2018-05-11	-11.8	21.8	307.1	260.5	0.0
2018-05-12	-9.5	32.6	324.2	276.2	0.0
2018-05-13	-13.8	9.6	343.5	317.0	0.0
2018-05-14	-13.1	10.1	338.2	276.5	0.0
2018-05-15	-13.6	30.3	328.6	304.7	0.0
2018-05-16	-12.4	22.1	321.3	326.3	0.0
2018-05-17	-9.6	38.9	324.4	258.2	0.0
2018-05-18	-10.0	35.0	316.4	303.0	0.0
2018-05-19	-9.0	20.7	305.6	321.5	0.0
2018-05-20	-6.4	16.6	82.7	195.0	0.0
2018-05-21	-9.3	34.8	321.7	311.5	0.0
2018-05-22	-7.9	20.0	329.4	305.8	0.0
2018-05-23	-6.3	7.1	259.4	302.4	0.0
2018-05-24	-3.0	28.4	133.7	225.3	0.1
2018-05-25	-2.5	12.2	18.3	233.3	0.0
2018-05-26	-4.2	11.0	104.0	308.1	0.0
2018-05-27	-2.5	26.9	155.2	138.2	0.0
2018-05-28	-0.2	13.9	349.2	161.0	0.1
2018-05-29	-3.5	23.6	303.3	290.2	0.0
2018-05-30	-0.8	24.5	112.0	146.5	0.1
2018-05-31	-2.4	41.6	301.4	275.9	0.1
2018-06-01	-4.1	43.7	315.8	309.3	0.0
2018-06-02	-2.2	18.1	299.8	298.4	0.0

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-06-03	-2.9	6.0	80.9	359.5	0.0
2018-06-04	-2.0	10.8	104.1	328.7	0.0
2018-06-05	-0.9	6.7	119.8	309.9	0.0
2018-06-06	0.0	6.2	112.1	329.3	0.0
2018-06-07	-1.5	11.4	83.5	250.5	0.0
2018-06-08	-0.1	18.7	319.0	305.5	0.0
2018-06-09	3.4	9.3	304.0	357.4	0.0
2018-06-10	3.0	18.5	165.0	213.9	0.0
2018-06-11	3.0	17.7	133.8	329.1	0.0
2018-06-12	3.0	22.5	117.7	323.4	0.1
2018-06-13	1.8	44.1	125.2	359.5	0.0
2018-06-14	2.9	16.3	132.8	362.5	0.0
2018-06-15	6.6	4.7	152.1	367.9	0.0
2018-06-16	5.5	7.0	128.9	361.0	0.0
2018-06-17	4.7	12.4	78.3	85.9	0.0
2018-06-18	8.3	12.2	311.1	220.3	0.0
2018-06-19	6.5	17.3	339.1	265.5	0.0
2018-06-20	5.9	18.1	315.3	354.9	0.0
2018-06-21	7.6	15.0	192.8	182.1	0.0
2018-06-22	4.6	32.9	322.2	324.4	0.1
2018-06-23	4.6	24.3	317.7	343.4	0.0
2018-06-24	6.5	12.9	322.6	363.0	0.0
2018-06-25	5.6	21.0	173.2	229.2	0.0
2018-06-26	8.0	25.3	320.7	222.7	0.0
2018-06-27	5.6	18.0	317.2	352.0	0.0
2018-06-28	8.9	7.5	222.7	354.2	0.0
2018-06-29	9.0	13.4	298.4	293.7	0.0
2018-06-30	6.9	6.7	246.7	231.2	0.0
2018-07-01	9.7	16.3	215.6	293.2	0.0
2018-07-02	5.3	11.6	162.1	325.1	0.0
2018-07-03	8.0	8.8	273.1	333.6	0.0
2018-07-04	10.6	16.5	310.9	353.0	0.0
2018-07-05	11.9	12.3	296.2	253.1	0.0
2018-07-06	12.6	11.8	241.8	288.5	0.0
2018-07-07	11.7	12.1	152.7	298.1	0.0
2018-07-08	9.3	25.0	153.7	187.6	0.0
2018-07-09	8.8	25.5	309.7	273.3	0.0
2018-07-10	12.0	21.7	304.8	287.5	0.0
2018-07-11	20.1	14.7	230.7	284.0	0.0

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-07-12	19.6	14.0	168.8	299.3	0.0
2018-07-13	16.0	14.4	152.3	294.9	0.0
2018-07-14	15.0	15.6	19.6	248.5	0.0
2018-07-15	13.5	17.5	25.8	318.4	0.0
2018-07-16	12.4	11.6	22.7	313.2	0.0
2018-07-17	15.3	13.1	311.1	331.5	0.0
2018-07-18	14.6	16.0	138.5	298.4	0.0
2018-07-19	10.3	22.8	116.3	142.7	0.0
2018-07-20	12.4	11.6	1.9	317.6	0.0
2018-07-21	15.1	11.0	297.4	317.0	0.0
2018-07-22	17.1	9.7	264.3	275.8	0.0
2018-07-23	12.0	12.9	175.0	141.6	0.0
2018-07-24	12.0	11.4	50.4	288.8	0.0
2018-07-25	13.1	12.4	232.3	296.9	0.0
2018-07-26	17.6	16.7	297.5	299.6	0.0
2018-07-27	14.4	13.0	148.9	256.6	0.0
2018-07-28	17.2	12.6	197.2	259.0	0.0
2018-07-29	15.4	19.9	323.4	171.9	0.0
2018-07-30	10.0	23.0	350.8	166.1	0.0
2018-07-31	9.1	27.0	323.1	181.1	0.0
2018-08-01	15.2	26.0	263.5	108.2	0.0
2018-08-02	14.3	27.1	271.3	168.3	0.0
2018-08-03	9.1	26.1	313.2	200.1	0.0
2018-08-04	7.6	24.2	169.8	48.9	0.1
2018-08-05	9.9	39.2	297.7	167.9	0.2
2018-08-06	10.3	34.3	301.2	155.0	0.0
2018-08-07	13.7	14.9	204.6	265.6	0.0
2018-08-08	10.7	13.6	160.1	106.1	0.0
2018-08-09	10.7	10.6	283.7	89.4	0.0
2018-08-10	11.9	9.3	154.9	208.8	0.0
2018-08-11	12.1	11.1	158.3	167.5	0.0
2018-08-12	11.9	30.8	217.3	132.9	0.0
2018-08-13	8.9	53.4	312.9	133.3	1.5
2018-08-14	9.4	23.0	263.4	196.4	0.0
2018-08-15	12.6	16.0	179.7	172.2	0.0
2018-08-16	11.6	20.4	299.9	64.5	0.0
2018-08-17	8.6	33.8	314.4	200.9	0.0
2018-08-18	14.4	16.9	236.9	214.5	0.0
2018-08-19	12.0	13.0	134.5	92.6	0.1

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-08-20	6.9	42.4	322.3	167.6	0.4
2018-08-21	7.8	20.3	296.0	174.7	0.0
2018-08-22	7.2	23.7	295.5	139.6	0.0
2018-08-23	5.7	20.0	331.2	116.3	0.0
2018-08-24	5.9	48.5	329.8	154.4	0.3
2018-08-25	6.4	46.7	325.4	138.0	0.9
2018-08-26	5.8	18.1	346.2	160.8	0.0
2018-08-27	6.8	13.6	85.1	171.1	0.0
2018-08-28	6.3	10.1	40.4	155.4	0.0
2018-08-29	7.6	11.5	201.3	120.6	0.0
2018-08-30	8.4	16.1	184.8	82.5	0.0
2018-08-31	9.6	8.1	253.8	127.7	0.0
2018-09-01	8.9	12.4	74.0	115.1	0.0
2018-09-02	8.2	8.7	359.3	197.7	0.0
2018-09-03	4.2	16.8	144.1	84.0	0.0
2018-09-04	4.6	11.4	139.8	161.6	0.0
2018-09-05	5.4	20.5	157.1	54.3	0.0
2018-09-06	6.2	7.2	335.9	64.0	0.0
2018-09-07	6.8	24.3	339.1	82.6	0.0
2018-09-08	5.9	23.8	293.7	166.8	0.0
2018-09-09	6.9	16.4	283.8	94.6	0.0
2018-09-10	4.3	21.4	322.1	108.6	0.0
2018-09-11	5.5	19.8	243.2	69.0	0.0
2018-09-12	3.0	16.0	325.9	41.7	0.0
2018-09-13	1.9	24.7	274.6	127.9	0.0
2018-09-14	2.1	7.3	277.6	161.9	0.0
2018-09-15	2.5	8.4	32.5	115.5	0.0
2018-09-16	0.9	23.9	285.4	84.5	0.0
2018-09-17	0.3	26.2	305.2	94.2	0.0
2018-09-18	2.1	17.0	234.5	82.0	0.0
2018-09-19	2.2	25.8	225.5	49.6	0.0
2018-09-20	-2.7	15.9	247.9	117.4	0.0
2018-09-21	-1.5	15.4	189.4	104.5	0.1
2018-09-22	-2.0	27.9	356.3	66.0	0.0
2018-09-23	-2.2	29.7	337.5	96.7	0.1
2018-09-24	0.0	16.1	227.9	117.5	0.0
2018-09-25	2.1	15.7	222.9	124.6	0.0
2018-09-26	-0.4	17.0	345.1	45.2	0.0
2018-09-27	-1.5	13.6	269.8	44.9	0.0

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-09-28	-2.8	33.7	307.3	61.2	0.0
2018-09-29	-2.3	13.7	282.7	71.9	0.0
2018-09-30	-2.9	15.2	351.4	69.4	0.0
2018-10-01	-5.1	23.2	312.7	70.7	0.0
2018-10-02	-3.2	18.7	265.7	59.2	0.0
2018-10-03	-5.7	5.0	46.4	108.8	0.0
2018-10-04	-6.6	10.7	10.5	90.4	0.0
2018-10-05	-5.6	33.4	329.6	85.6	0.0
2018-10-06	-3.1	23.6	332.8	56.1	0.0
2018-10-07	-5.5	29.8	325.7	69.3	0.0
2018-10-08	-4.8	43.2	296.4	40.9	0.0
2018-10-09	-4.7	34.7	317.1	31.3	0.0
2018-10-10	-5.3	34.5	324.5	40.7	0.0
2018-10-11	-5.3	17.5	315.3	85.1	0.0
2018-10-12	-3.6	4.7	138.9	82.2	0.0
2018-10-13	-1.6	7.8	107.7	38.0	0.0
2018-10-14	-5.8	24.6	340.3	51.0	0.0
2018-10-15	-9.9	16.8	327.2	63.4	0.0
2018-10-16	-9.9	7.8	75.8	51.3	0.0
2018-10-17	-11.5	23.4	334.0	67.4	0.0
2018-10-18	-10.1	18.3	299.8	42.0	0.0
2018-10-19	-7.2	13.5	162.9	49.4	0.0
2018-10-20	-4.2	26.6	67.2	37.6	0.0
2018-10-21	-15.1	16.6	338.2	57.7	0.0
2018-10-22	-5.1	20.4	120.0	47.3	0.0
2018-10-23	-6.9	12.9	29.4	41.8	0.0
2018-10-24	-12.8	4.3	353.1	27.4	0.0
2018-10-25	-22.0	3.9	321.9	64.9	0.0
2018-10-26	-21.7	2.9	317.8	64.0	0.0
2018-10-27	-5.8	26.9	134.1	18.0	0.0
2018-10-28	-2.7	14.4	185.0	17.6	0.0
2018-10-29	-0.6	6.9	200.6	23.9	0.0
2018-10-30	-1.0	7.9	59.2	26.0	0.0
2018-10-31	-1.8	8.5	47.2	24.0	0.0
2018-11-01	-2.8	15.7	45.5	31.3	0.0
2018-11-02	-3.8	18.6	53.7	22.9	0.0
2018-11-03	-8.7	10.0	47.5	24.0	0.0
2018-11-04	-11.4	5.5	95.1	26.2	0.0
2018-11-05	-3.5	24.8	122.4	22.4	0.0

Date	Temperature (°C)	Wind Speed (km/h)	Wind Direction (deg.)	Solar Radiation (watts/m²)	Rain (mm)
2018-11-06	-7.9	8.0	209.7	25.7	0.0
2018-11-07	-15.8	26.1	334.4	29.8	0.0
2018-11-08	-18.7	28.1	322.4	22.5	0.0
2018-11-09	-18.6	31.9	315.7	21.7	0.0
2018-11-10	-21.6	25.5	307.0	21.5	0.0
2018-11-11	-27.1	4.5	313.2	14.1	0.0
2018-11-12	-23.2	11.7	321.5	11.6	0.0
2018-11-13	-24.2	19.0	329.6	11.4	0.0
2018-11-14	-28.3	20.5	325.5	16.6	0.0
2018-11-15	-29.3	19.0	324.3	15.6	0.0
2018-11-16	-30.9	24.3	322.9	13.2	0.0
2018-11-17	-32.3	12.0	325.1	11.7	0.0
2018-11-18	-33.6	10.3	326.4	9.0	0.0
2018-11-19	-33.5	18.4	322.6	11.9	0.0
2018-11-20	-34.4	15.1	327.6	12.5	0.0
2018-11-21	-34.3	20.3	329.4	7.6	0.0
2018-11-22	-34.7	12.7	310.7	11.7	0.0
2018-11-23	-18.2	28.3	126.6	6.3	0.0
2018-11-24	-20.0	23.1	40.5	16.1	0.0
2018-11-25	-32.0	20.6	346.3	13.2	0.0
2018-11-26	-25.5	12.4	9.8	9.7	0.0
2018-11-27	-28.9	14.7	336.4	11.3	0.0
2018-11-28	-25.8	13.9	334.1	7.7	0.0
2018-11-29	-13.3	5.2	0.7	6.0	0.0
2018-11-30	-12.8	2.6	192.7	5.4	0.0
2018-12-01	-14.9	1.1	140.9	3.3	0.0
2018-12-02	-16.5	22.8	292.0	3.9	0.0
2018-12-03	-22.2	16.5	318.3	5.9	0.0
2018-12-04	-14.8	16.7	228.8	4.7	0.0
2018-12-05	-29.6	35.9	330.5	5.1	0.0
2018-12-06	-32.5	38.3	326.6	3.8	0.0
2018-12-07	-32.1	10.0	339.1	6.4	0.0

Appendix B Table 2: Rain gauge readings, 24 h precipitation, and monthly precipitation for rain gauges on the Meliadine site in 2018.

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
1/01/18	15:00	0.04	0.04	0.04	
1/02/18	8:00	0	0	0	
1/03/18	8:00	0	0	0	
1/04/18	8:15	0	0	0	
1/05/18	8:30	0	0	0	
1/06/18	7:45	0	0	0	
1/07/18	10:00	0	0	0	
1/08/18	9:30	0.09	0.08	0.085	Light snow overnight continuing during day
1/09/18	NA	NA	NA	NA	Blizzard Conditions- not checked
1/10/18	7:00	0.02	0.02	0.02	Some snow from Blizzard conditions previous day.
1/11/18	10:00	0	0	0	
1/12/18	11:15	0	0	0	
1/13/18	14:00	0	0	0	
1/14/18	10:00	0	0	0	
1/15/18	9:00	0	0	0	
1/16/18	13:00	0.02	0.02	0.02	
1/17/18	7:10	0	0	0	
1/18/18	11:45	0	0	0	
1/19/18	11:50	0	0	0	
1/20/18	11	0	0	0	
1/21/18	16	0.001	0.001	0.001	
1/22/18	12:30	0.001	0.001	0.001	
1/23/18	13:00	0.002	0.003	0.0025	
1/24/18	10:30	0	0	0	
1/25/18	8:30	0.001	0.001	0.001	
1/26/18					
1/27/18					
1/28/18	7:30	0.03	0.02	0.025	
1/29/18					
1/30/18					
1/31/18					
2/01/18					
2/02/18	6:30	0.01	0.01	0.01	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
2/03/18	13:30	0	0	0	
2/04/18	7:30	0	0	0	
2/05/18	9:00	0	0	0	
2/06/18	12:00	0	0	0	
2/07/18				NA	Blizzard Conditions- not checked
2/08/18	7:30	0.1	0.5	0.3	
2/09/18	8:25	0.02	0.02	0.02	Blowing Snow
2/10/18	13:00	0.01	0.01	0.01	
2/11/18	10:30	0	0	0	
2/12/18	14:00	0	0	0	
2/13/18	10:00	0.01	0.01	0.01	
2/14/18	11:20	0.04	0.04	0.04	Blowing Snow Light Snow
2/15/18	7:30	0.01	0.01	0.01	
2/16/18	7:00	0	0	0	
2/17/18	15:00	0	0	0	
2/18/18	7:00	0	0	0	
2/19/18	7:00	0.3	0.3	0.3	Snow
2/20/18	7:00	t	t	0	trace
2/21/18	7:00	0	0	0	
2/22/18	7:00	0.2	0.2	0.2	Snow
2/23/18	8:00	0	0	0	
2/24/18	7:00	0	0	0	
2/25/18	7:00	0	0	0	
2/26/18	7:00	0.2	0.2	0.2	Snow
2/27/18	7:00	0	0	0	
2/28/18	13:30	0.025	0.02	0.0225	
3/01/18	10:00	0	0	0	Trace
3/02/18	8:30	0	0	0	
3/03/18	7:45	0	0	0	
3/04/18	9:00	0	0	0	
3/05/18	8:20	0	0	0	
3/06/18	13:00	0	0	0	
3/07/18	10:00	0.01	0.01	0.01	
3/08/18	14:00	0	0	0	
3/09/18	18:10	0	0	0	
3/10/18	18:20	0.05	0.05	0.05	Light snow
3/11/18	10:30	0	0	0	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
3/12/18	8:10	0.04	0.04	0.04	Snowing and Wind blown Snow
3/13/18	18:00	0.02	0.02	0.02	Light snow
3/14/18	7:00	0	0	0	
3/15/18	7:00	0	0	0	
3/16/18	7:00	0.02	0.02	0.02	
3/17/18	7:00	0	0	0	
3/18/18	7:00	0	0	0	
3/19/18	7:30	0	0	0	
3/20/18	7:00	0.02	0.02	0.02	Blowing snow from yesterday evening
3/21/18	7:00	0	0	0	
3/22/18	7:00	0	0	0	
3/23/18	7:00	0	0	0	
3/24/18	13:30	0.03	0.03	0.03	Light snow, increasing in volume
3/25/18	-	0	0	0	Blizzard
3/26/18	-	0	0	0	Blizzard
3/27/18	-	0	0	0	Blizzard
3/28/18	-	0	0	0	Blizzard
3/29/18	-	0	0	0	Blizzard
3/30/18	-	0	0	0	Blizzard
3/31/18	7:30	0.32	0.25	0.285	
4/01/18	9:00	0	0	0	
4/02/18	7:45	0	0	0	
4/03/18	11:00	0.015	0.015	0.015	Light snow - Wind Blown Snow
4/04/18	10:00	0	0	0	
4/05/18	8:30	0	0	0	
4/06/18	9:00	0	0	0	
4/07/18	8:30	0	0	0	
4/08/18	10:15	0	0	0	
4/09/18	9:00	0	0	0	
4/10/18	8:45	0	0	0	
4/11/18	7:00	0	0	0	
4/12/18	20:00	0	0	0	
4/13/18	7:00	0.01	0.01	0.01	
4/14/18	7:00	0	0	0	
4/15/18	7:00	0	0	0	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
4/16/18	7:00	0	0	0	
4/17/18	7:00	0	0	0	
4/18/18	8:00	0.02	0.02	0.02	
4/19/18	8:00	0	0	0	
4/20/18	8:00	0	0	0	
4/21/18	8:00	0	0	0	
4/22/18	8:00	0	0	0	
4/23/18	8:00	0	0	0	
4/24/18	10:00	0	0	0	
4/25/18	9:00	0	0	0	
4/26/18	7:30	0	0	0	
4/27/18	7:45	0	0	0	
4/28/18	13:00	0	0	0	
4/29/18	11:45	0	0	0	
4/30/18	10:00	0	0	0	
5/01/18	9:00	0	0	0	
5/02/18	8:30	0	0	0	
5/03/18	11:00	0	0	0	
5/04/18	14:00	0	0	0	
5/05/18	7:00	0	0	0	
5/06/18	9:15	0	0	0	
5/07/18		0	0	0	snow and heavy wind
5/08/18	11:00	0.02	0.035	0.0275	light wind precipitation from previous day
5/09/18	14:00	0	0	0	
5/10/18	7:00	0	0	0	
5/11/18	11:20	0	0	0	
5/12/18	13:50	0	0	0	
5/13/18	7:00	0	0	0	
5/14/18	7:00	0	0	0	
5/15/18	6:15	0	0	0	
5/16/18	6:15	0	0	0	
5/17/18	6:15	0	0	0	
5/18/18	6:15	0	0	0	
5/19/18	6:15	0	0	0	
5/20/18	6:15	0	0	0	
5/21/18	6:15	0	0	0	
5/22/18	6:00	0	0	0	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
5/23/18	8:00	0	0	0	
5/24/18	10:00	0	0	0	
5/25/18	14:00	0	0	0	
5/26/18	7:00	0.025	0.015	0.02	Light snow
5/27/18	7:10	0.68	0.72	0.7	
5/28/18	6:45	0.07	0.07	0.07	
5/29/18	7:50	0.015	0.015	0.015	Light over night snow
5/30/18	7:45	0	0	0	
5/31/18	6:00	0	0	0	
6/01/18	6:30	0	0	0	
6/02/18	7:00	0	0	0	
6/03/18	6:00	0	0	0	
6/04/18	6:10	0	0	0	
6/05/18	6:10	0	0	0	
6/06/18	6:10	0	0	0	
6/07/18	6:10	0	0	0	
6/08/18	6:10	0	0	0	
6/09/18	6:10	0	0	0	
6/10/18	6:10	0	0	0	
6/11/18	6:10	0	0	0	
6/12/18	6:10	0	0	0	
6/13/18	6:10	0	0	0	
6/14/18	11:00	0	0	0	
6/15/18	6:10	0	0	0	
6/16/18	6:10	0	0	0	
6/17/18	6:10	0	0	0	
6/18/18	6:10	0	0	0	
6/19/18		NA	NA	NA	Not checked
6/20/18		NA	NA	NA	Not checked
6/21/18		NA	NA	NA	Not checked
6/22/18	7:00	0	0	0	
6/23/18	6:30	0	0	0	
6/24/18	7:30	0	0	0	
6/25/18	6:45	0.51	0.51	0.51	
6/26/18	7:00	0	0	0	
6/27/18	7:00	0	0	0	
6/28/18	7:00	0	0	0	
6/29/18	6:30	0	0	0	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
6/30/18	7:00	0	0	0	
7/01/18	7:00	0	0	0	
7/02/18	7:30	0	0	0	
7/03/18	7:30	0	0	0	
7/04/18	7:04	0	0	0	
7/05/18	6:30	0	0	0	
7/06/18	13:00	0	0	0	
7/07/18	11:00	0	0	0	
7/08/18	11:00	0	0	0	
7/09/18	11:00	0	0	0	
7/10/18				NA	
7/11/18				NA	
7/12/18				NA	
7/13/18				NA	
7/14/18				NA	
7/15/18				NA	
7/16/18				NA	
7/17/18				NA	
7/18/18				NA	
7/19/18				NA	
7/20/18				NA	
7/21/18				NA	
7/22/18				NA	
7/23/18				NA	
7/24/18				NA	
7/25/18	7:00	0	0	0	
7/26/18	6:15	0	0	0	
7/27/18	7:30	0	0	0	
7/28/18	6:15	0	0	0	
7/29/18	6:00	0	0	0	
7/30/18	6:30	0	0	0	
7/31/18	7:30	0	0	0	
8/01/18	7:30	0	0	0	
8/02/18	6:00	0	0	0	
8/03/18	6:00	0	0	0	
8/04/18	6:00	0.69	0.67	0.68	
8/05/18		0	0	0	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
8/06/18		0	0	0	
8/07/18		0	0	0	
8/08/18		0	0	0	
8/09/18		0	0	0	
8/10/18		0	0	0	
8/11/18		0	0	0	
8/12/18	6:30	0.86	0.86	0.86	
8/13/18		0	0	0	
8/14/18		0	0	0	
8/15/18		0	0	0	
8/16/18		0	0	0	
8/17/18		0	0	0	
8/18/18		0	0	0	
8/19/18		0	0	0	
8/20/18		0	0	0	
8/21/18		0	0	0	
8/22/18	7:00	0.15	0.1	0.125	
8/23/18	6:40	0	0	0	
8/24/18		0	0	0	
8/25/18		0	0	0	
8/26/18		0	0	0	
8/27/18		0	0	0	
8/28/18		0	0	0	
8/29/18		0	0	0	
8/30/18	6:30	0.09	0.095	0.0925	temporary heavy rain during the nightime
8/31/18		0	0	0	
9/01/18		0	0	0	
9/02/18		0	0	0	
9/03/18		0	0	0	
9/04/18		0	0	0	
9/05/18		0	0	0	
9/06/18		0	0	0	
9/07/18		0	0	0	
9/08/18		0	0	0	
9/09/18		0	0	0	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
9/10/18		0	0	0	
9/11/18		0	0	0	Drizzle rain and snow throughout day
9/12/18	6:40	0.16	0.16	0.16	
9/13/18	7:00	0	0	0	
9/14/18	6:10	0	0	0	
9/15/18	6:35	0	0	0	
9/16/18	7:35	0	0	0	
9/17/18	6:20	0	0	0	
9/18/18	6:40	0	0	0	
9/19/18		0	0	0	
9/20/18		0	0	0	
9/21/18	16:00	0.215	0.215	0.215	snow throughout the day
9/22/18	11:00	0.035	0.045	0.04	
9/23/18	7:00	0	0	0	
9/24/18	7:00	0	0	0	
9/25/18	5:10	0	0	0	
9/26/18	7:00	0	0	0	
9/27/18	7:00	0.2	0.2	0.2	
9/28/18	5:00	0.2	0.2	0.2	
9/29/18	7:00	0	0	0	
9/30/18	7:00	0	0	0	
10/01/18	7:00	0	0	0	
10/02/18	7:00	0	0	0	
10/03/18	7:00	0	0	0	
10/04/18	7:00	0	0	0	
10/05/18	7:00	0	0	0	
10/06/18	6:30	0.01	0.005	0.0075	a bit of snow
10/07/18	7:30	0	0	0	
10/08/18	12:00	0	0	0	
10/09/18	7:00	0	0	0	
10/10/18	7:00	0	0	0	
10/11/18	7:00	0	0	0	
10/12/18	7:00	0	0	0	
10/13/18	7:00	0	0	0	
10/14/18	7:00	0	0	0	
10/15/18	7:00	0.03	0.03	0.03	Snow
10/16/18	7:00	0	0	0	

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
10/17/18	7:00	0	0	0	
10/18/18	7:00	0.02	0.02	0.02	
10/19/18	7:00	0.04	0.04	0.04	
10/20/18	7:00	0	0	0	
10/21/18	7:00	0	0	0	
10/22/18	7:00	0.02	0.02	0.02	
10/23/18	7:00	0	0	0	
10/24/18	7:00	0	0	0	
10/25/18	7:00	0	0	0	
10/26/18	7:00	0	0	0	
10/27/18	7:00	0	0	0	
10/28/18	7:00	0	0	0	
10/29/18	10:00	0.21	0.24	0.225	Snow
10/30/18	7:00	0	0	0	
10/31/18	7:00	0	0	0	
11/01/18	7:00	0.05	0.05	0.05	Snow
11/02/18	7:00	0.03	0.03	0.03	snow
11/03/18	7:00	0	0	0	
11/04/18	7:00	0.04	0.035	0.0375	snow
11/05/18	8:00	0.13	0.13	0.13	snow
11/06/18	7:00	0.005	0.005	0.005	Snow
11/07/18	7:00	0	0	0	
11/08/18	7:00	0	0	0	
11/09/18	7:50	0	0	0	
11/10/18	9:00	0.01	0.01	0.01	High winds
11/11/18	7:45	0	0	0	
11/12/18	8:35	0	0	0	
11/13/18	7:00	0	0	0	
11/14/18	7:25	0	0	0	
11/15/18	5:50	0.02	0.02	0.02	
11/16/18	6:00	0	0	0	
11/17/18	6:30	0	0	0	
11/18/18	7:00	0	0	0	
11/19/18	4:30	0	0	0	
11/20/18	7:00	0	0	0	
11/21/18	7:00	0	0	0	
11/22/18	7:00	0	0	0	
11/23/18	12:30	0.12	0.09	0.105	snow

Date	Time	Rain Gauge 1 (inches)	Rain Gauge 2 (inches)	Total 24-h Precipitation (inches)	Comments
11/24/18	7:00	0	0	0	
11/25/18	7:00	0	0	0	
11/26/18	7:00	0	0	0	
11/27/18	7:00	0	0	0	
11/28/18	7:00	0	0	0	
11/29/18	7:00	0.01	0.01	0.01	SNOW
11/30/18	7:00	0	0	0	
12/01/18	8:00	0.04	0.04	0.04	Snow
12/02/18	8:00	0	0	0	
12/03/18	15:00	0.04	0.03	0.035	snow
12/04/18	8:00	0	0	0	
12/05/18	8:00	0	0	0	
12/06/18	8:00	0	0	0	
12/07/18	8:00	0	0	0	
12/08/18	8:00	0.04	0.05	0.045	snow
12/09/18	8:00	0.01	0.01	0.01	overnight snow
12/10/18	7:15	0	0	0	
12/11/18	9:30	0.01	0.01	0.01	
12/12/18	10:00	0	0	0	
12/13/18	7:05	0	0	0	trace
12/14/18	7:30	0	0	0	
12/15/18	9:00	0.02	0.03	0.025	
12/16/18	6:30	0	0	0	
12/17/18	13:30	0	0	0	
12/18/18	6:30	0	0	0	
12/19/18	6:30	0	0	0	
12/20/18	6:00	0.01	0.01	0.01	trace
12/21/18	7:00	0	0	0	
12/22/18	7:00	0	0	0	
12/23/18	7:30	0	0	0	
12/24/18	8:00	0	0	0	
12/25/18	8:00	0	0	0	
12/26/18	8:00	0	0	0	
12/27/18	8:00	0	0	0	
12/28/18	8:00	0	0	0	
12/29/18	8:00	0	0	0	
12/30/18	8:00	0	0	0	
12/31/18	8:00	0	0	0	

APPENDIX C: INCINERATOR STACK TESTING REPORT

CONSULAIR
AIR & ENVIRONMENT GLOBAL MANAGEMENT



PROFESSIONNAL SERVICES
STACK TESTING PROGRAM
AIR EMISSIONS QUANTIFICATION
DOMESTIC WASTE INCINERATOR

AGNICO EAGLE

AGNICO EAGLE MINES LTD,
Rankin Inlet (Nunavut)
MELIADINE DIVISION
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AGNICO EAGLE

Revision history

Version name	Date	Detail	Reviewed by
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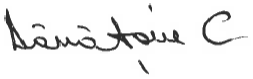
PREPARED BY:



Louis Lawson, project manager

VERIFIED BY:



Cristina Danatoiu, engineer.

Quebec, December 2018

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GLOSSARY

PM: Particulate matter

SVOC (PCDD/F): Dioxins and furans

ME: Metals

O_2: Oxygen

CO_2: Carbon dioxide

CO: Carbone monoxide

NO_X: Nitrogen oxide

ACFM: Actual cubic feet per minute

ECCC: Environment and Climate Change Canada

USEPA: United Stated Environmental Protection Agency

QA/QC: Quality Assurance / Quality Control

ΔP: Differential pressure read at the stack

ΔH: Differential pressure read at the control unit

DL: Detection Limit

SUMMARY

Consulair was mandated by Agnico Eagle Mines, Meliadine Division, to sample the atmospheric emissions at the outlet of an incinerator of its plant located near Rankin Inlet, Nunavut.

The objectives of the characterization of atmospheric emissions were to:

- Evaluate the physical characteristics of the gas flow in the stack;
- Evaluate the concentration and the emission rate of the particulate matter (P), Metals (ME) and Hydrogen chloride (HCl);
- Demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F);
- Ensure that QA/QC of Consulair is respected throughout the stack sampling program.

For this project, the applicable standards are shown below with the tests results. The applicable standards for dioxins and furans (PCDD/F) were met for all tests, as well as the applicable standard for mercury (Hg). The standards come from the "Environmental Guideline for the Burning and Incineration of Solid Waste" emitted by the Department of Environment of the Government of Nunavut base on the Canadian Council of Ministers of the Environment (CCME) Canada - Wide Standards for Dioxins and Furans and Mercury Emissions.

The government of Nunavut presented a guideline document in October 2010, which was revised in January 2012, for the burning and incineration of solid waste. The document presented two criteria for air emissions which are applicable in the current project. A standard for Dioxins and Furans is stated at 80 pg I-TEQ/m^3 and another standard for mercury is stated at 20 µg/Rm^3. The reference conditions are stated at 101.3 kPa and 25°C and both standards are corrected to 11% O_2.

APPLICABLE STANDARDS		
CONTAMINANTS	**TEST RESULTS**	**STANDARDS**
MERCURY (Hg)	0.23 µg / Rm^3 @ 11 % v/v O_2	20 µg / Rm^3 @ 11 % v/v O_2
DIOXINS AND FURANS (PCDD/F)	0.042 ng / Rm^3 @ 11 % v/v O_2	0.08 ng TEQ / Rm^3 @ 11 % v/v O_2

R: Reference conditions 25 °C and 101.3 kPa on a dry basis.

SUMMARY

INORGANIC SAMPLING TRAIN	
STACK GAS PROPERTIES	
TEMPERATURE (°C)	744
MOISTURE (% v/v)	6.0
VELOCITY (m/s)	11.9
VOLUMETRIC FLOW RATE (m^3/h)	22,871
VOLUMETRIC FLOW RATE (Rm^3/h)	6,282
PARTICULATE MATTER	
PARTICULATE MATTER (mg/Rm^3)	26.8
PARTICULATE MATTER (mg/Rm^3) at 7 % O_2	58.3
PARTICULATE MATTER (mg/Rm^3) at 11 % O_2	41.5
PARTICULATE MATTER (kg/h)	0.16
PARTICULATE MATTER (g/s)	0.045
METALS (µg/Rm^3) @ 11% O_2	
CONCENTRATION	7,440
CLASS I (Cu, Pb, V & Zn)	352
CCME GUIDELINE	1,500
CLASS II (As, Cr & Ni)	22
CCME GUIDELINE	500
CLASS III (Cd, Hg & Tl)	2.3
CCME GUIDELINE	150
HCl	
HCl (mg/Rm^3)	25.7
HCl (mg/Rm^3) at 11 % O_2	37.3
HCl (ppm)	17.2
HCl (kg/h)	0.16
ORGANIC SAMPLING TRAIN	
STACK GAS PROPERTIES	
TEMPERATURE (°C)	743
MOISTURE (% v/v)	6.1
VELOCITY (m/s)	12.1
VOLUMETRIC FLOW RATE (m^3/h)	23,252
VOLUMETRIC FLOW RATE (Rm^3/h)	6,386
PCDD/F	
PCDD/F TEQ (ng/Rm^3) at 11 % O_2	0.042
STANDARD (ng/Rm^3) at 11% O_2	0.08
PCDD/F TEQ (µg/h)	0.18
R: Reference conditions 25 °C, 101.3 kPa on a dry basis.	

SUMMARY (Cont'd)

GAS	
OXYGEN (O_2)	
O_2 (% v/v d) - average	14.3
CARBON DIOXIDE (CO_2)	
CO_2 (% v/v d) - average	5.1
CARBON MONOXIDE (CO)	
CO (ppmvd) - average	2.8
CO (mg/Rm^3)	3.3
CO (kg/h)	0.021
NITROGEN OXIDES (NO_X) as NO_2	
NO_X (ppmvd) - average	53
NO_X as equivalent NO_2 (mg/Rm^3)	100
NO_X (kg/h)	0.65
SULPHUR DIOXIDE (SO_2)	
SO_2 (ppmvd) - average	0.2
SO_2 (mg/Rm^3)	0.6
SO_2 (kg/h)	0.004
R: Reference conditions 25 °C, 101.3 kPa on a dry basis.	

The sampling was performed in compliance with the rules of the requirements of the Report No. EPS 3/UP/2, including methods recommended by "Environment and Climate Change Canada" (ECCC) of the Government of Canada inside "Environment Canada, The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology". Report No. EPS 3/UP/2, Ottawa, 1986.

1 INTRODUCTION

Consulair was mandated by Agnico Eagle Mines, Meliadine Division (Nu), to demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F).

1.1 Sampling scope

The objectives of the characterization of atmospheric emissions were to:

- Evaluate the physical characteristics of the gas flow in the stack;
- Evaluate the concentration and the emission rate of particulate matter (P), Metals (ME) and Hydrogen chloride (HCl);
- Demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F);
- Ensure that QA/QC of Consulair is respected throughout the stack sampling program.

The study included sources and pollutants referred in the following table.

Table 1-1 – OVERALL TEST MATRIX

SOURCE	POLLUTANTS	SAMPLING METHODS
Incinerator outlet	Particulate matter (PM)	EPS 1/RM/8 EC
	Hydrogen chloride (HCl)	EPS 1/RM/1 EC
	Metals	USEPA 29
	SVOC (PCDD/F)	EPS 1/RM/2 EC

2 SAMPLING TEAM AND PARTICIPANT

The interveners of this testing program are listed in Table 2-1 and 2-2. The analysis laboratory used is defined in Table 2-3.

Table 2-1 – CLIENT CONTACT

CLIENT	CONTACT	FUNCTION
Agnico Eagle Mines Limited Meliadine Division Rankin Inlet, Nunavut, Canada X0C 0G0	Kevin Buck General Supervisor Environment Tel: 819-759-3555 Kevin.buck@agnicoeagle.com	Test program coordination

Table 2-2 – SAMPLING TEAM

STAFF	TITLE	FUNCTION
Louis Lawson	Project Manager	On-site team leader On-site sampling Report writing
Jean-François Guay	Health and Safety Manager	On-site sampling
Cristina Danatoiu	Engineer	Report validation

Table 2-3 – ANALYSIS LABORATORY

LABORATORY	ANALYSIS	FIELD OF ACCREDITATION DR-12-LLA
Consulair	Particulate Matter	400
	Hydrogen chloride (HCl)	---
Maxxam	Metals	404 - 406
Agat	PCDD/F	510

3 SAMPLING

3.1 Process operation

A representative of the Agnico Eagle mines company had the responsibility to monitor the operating conditions to ensure the representativeness of the sampling. In order to perform the sampling program under representative conditions, a tight liaison was maintained with the operators during testing.

Process operating conditions of the incinerator were under Agnico-Eagle's responsibility. The operating conditions were maintained stable throughout each days of the test program.

3.2 Source description

The number of measuring points in the stack was determined in accordance with the requirements of Environment Canada's EPS 1/RM/8 sampling method entitled: "Reference methods for source testing: measurement of releases of particulate from stationary sources".

Stacks characteristics are described in the following table.

Table 3-1 – SAMPLED SITE CHARACTERISTICS

SOURCE	DIMENSION(S) Stack (m)	DIAMETER NUMBER)		NUMBER OF SAMPLING POINTS	
		A_D	B_D	Number of port used and sampling points	Total
Incinerator outlet	0.826	5.0	2.0	2 x 6	12

3.3 Sampling methodology

Sampling methods used in this project are methods approved and recommended by known organisms such as the United States Environmental Protection Agency (US EPA) and Environment Canada (EC).

The following table shows the sampling methods that were used during testing.

Table 3-2 – SAMPLING METHODS

PARAMETERS	METHODS	SAMPLING DURATION (min)
Manual sampling methods		
Temperature	Thermometer or thermocouple	With isokinetic value
Gas flow	SPE 1/RM/8, method B – Environment Canada	With isokinetic value
O_2, CO_2, CO	SPE 1/RM/8, method C – Environment Canada	With isokinetic value
Moisture content	SPE 1/RM/8, method D – Environment Canada	With isokinetic value
Particulate matter (PM)	SPE 1/RM/8, method E – Environment Canada	120 / 170 / 180
HCl	SPE 1/RM/1 – Environment Canada	
Metals	USEPA, CFR 40, Part 60, Method 29	
SVOC (PCDD/F)	SPE 1/RM/2 – Environment Canada	240 / 150 / 180
Instrumental sampling method		
NO_X	USEPA, CFR 40, Part 60, Method 7E	60
SO_2	USEPA, CFR 40, Part 60, Method 6C	60

The distribution of parameters within the sampling train is presented in the following table.

Table 3-3 – DISTRIBUTION OF PARAMETERS FOR EACH SAMPLING SYSTEM

SAMPLING TRAIN	PARAMETERS
Metals & Particulate matter & HCl	PM & Metals & HCl
SVOC	PCDD/F

3.4 Temperature, moisture content and flowrate

Gas temperature, flowrate, velocity and moisture content will be measured at the sampling sites according to "Reference methods for source testing: measurement of releases of particulate from stationary sources". Methods B and D, Environment Canada, December 1993, EPS 1/RM/8.

3.5 Isokinetic sampling

Isokinetic sampling allows to collect particles in the sampling nozzle at the same velocity as the gas stack velocity. In non-isokinetic conditions, if the sampling velocity is inferior than the gas stack velocity, more large particles would be collected resulting in an overestimation of the true mass concentration. On the opposite, if the sampling velocity is superior than the gas stack velocity, less large particles would be collected resulting in underestimation of the true mass concentration. In either case, the sample collected would not be an accurate reflection of the gas stack stream.

The following table presents a test acceptance criteria according to the methods (sampling systems) used.

Table 3-4 – SAMPLING ACEPTANCE CRITERIA

PARAMETERS	METHOD	ACCEPTANCE CRITERIA
Particulate Matter	SPE 1/RM/8	• Isokinetic rate comprised between 90 % and 110 % • Less than 10% of the sampled points out of the 90 % to 110 % range
Metals	Method 29 from USEPA	
SVOC	SPE 1/RM/2	

3.5.1 Particulate matter (PM), metals & HCl

Particulate matter (PM) and metals (Al, Sb, Ag, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Mo, Ni, Pb, K, Se, Na, Ti, V, Zn, Sr, Tl, Si (Silicium soluble), Hg) were sampled in accordance with the requirements of Environment Canada EPS 1/RM/8 sampling method entitled: "Reference methods for source testing: measurement of releases of particulate from stationary sources". This method was combined with USEPA method 29 entitled “Metals emissions from stationary sources" in order to allow for metals sampling (including Hg). HCl was analyzed in the first impinger of that sampling train.

Table 3-5 – MAIN COMPONENTS OF THE PM/HCl/METALS SAMPLING SYSTEM

SAMPLING PROBE	SAMPLING TRAIN	CONTROL UNIT
• Quartz nozzle; • Quartz probe; • S type Pitot tube for the gas velocity attached to the sample probe; • Thermocouple for temperature attached to the sample probe.	• A 0.3 µm porosity pre-weighted quartz filter mounted in a Pyrex filter holder and placed in a heated oven to avoid moisture condensation; • Seven impingers placed in series and containing: ○ # 1: 100 mL H_2O; ○ # 2 and # 3: 100 mL HNO_3 (5%) / H_2O_2 (10%) solution; ○ # 4: empty; ○ # 5 and # 6: 100 mL $KMnO_4$ (4%) / H_2SO_4 (10%) solution; ○ # 7: silica gel; • Impingers placed in an ice bath to condense all the flue gas moisture.	• Sampling cord that connects the train to the sampling console; • Sampling console with oil manometer, a dry gas meter, an orifice, a temperature reader and temperature controllers; • Diaphragm vacuum pump.

3.5.2 Semivolatile organic compounds (SVOC) (PCDD/DF)

Semi Volatile Organic Compounds (SVOC) are defined as organic compounds with boiling points greater than 100 °C. This class of compounds includes PCDD (PolyChlorinated Dibenzo p Dioxins), PCDF (PolyChlorinated DibenzoFurans),

SVOCs (PCDD/F) were sampled in accordance with the requirements of Environment Canada EPS 1/RM/2 sampling method entitled: " Reference Method for Source Testing: Measurement of Releases of Selected Semi-Volatile Organic Compounds from Stationary Sources ". For this project, SVOCs included polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). A minimal volume of at least 3.0 Rm^3 was sampled during each run.

For one series of three SVOC tests, a blank train was taken to the stack sampling site. A volume of ambient air equal to the sum of all leak check volumes during the SVOC test was pumped through the blank train, according to the requirements of reference method EPS 1/RM/2.

The following table shows the various components of the sampling system for PCDD/F.

Table 3-6 – MAIN COMPONENTS OF A SVOC SAMPLING SYSTEM

SAMPLING PROBE	SAMPLING TRAIN	CONTROL UNIT

• Glass nozzle of a precisely measured diameter to allow isokinetic sampling;
• Glass heated probe to avoid moisture condensation;
• Probe is fastened to an "S" type Pitot tube for gas velocity measurement and to a thermocouple for temperature measurement.
	• A 0.3 µm porosity pre-weighted fiber glass filter mounted on an accurate holder and placed in a heated oven to avoid moisture condensation;
	• Condenser;
	• XAD-2 resin cartridge;
	• Condensate trap;
	• Three impingers placed in series and containing:
	  ○ # 1: 100 mL ethylene glycol;
	  ○ # 2: empty;
	  ○ # 3: silica gel;
	• Impingers placed in an ice bath to condense all the flue gas moisture.
		• Sampling cord that connects the train to the sampling console;
		• Sampling console with oil manometer, a dry gas meter, an orifice, a temperature reader and temperature controllers;
		• Diaphragm vaccum pump.

3.6 Gaseous parameters (O_2, CO_2, CO, SO_2 & NO_X)

One CEM (Continuous Emission Monitoring) systems was used to determine the concentration of O_2, CO_2, CO, SO_2 & NO_X. The CEM system includes a gas extraction system, one analyzer and a data acquisition system. The moisture-free gas was analysed for O_2, CO_2, CO, SO_2 & NO_X with an analyzer as described in the following table.

Graphics of continuous measurements of gas are presented in Appendix 2 of the report.

Table 3-7 – GAS ANALYZER

ANALYZER	O_2/CO_2	CO	SO_2	NO_X
Method	USEPA 3A	USEPA 10	USEPA 6C	USEPA 7E
Brand	Horiba	Horiba	Horiba	Horiba
Model	PG250	PG 250	PG 250	PG 250
Detector	Galvanic Cell / Infrared	Infrared	Infrared	Chemiluminescence
Zero gas	Nitrogen			
Working Scale	0 - 30 %v	0 – 100 ppmv	0 – 500 ppmv	0 – 1,000 ppmv

3.7 Testing schedule

Table 3-8 – TESTING SCHEDULE

SOURCE	DATE	TIME	TEST
Outlet of incinerator	2018-09-22	13:44-17:44	GAS & SVOC # 1
	2018-09-28	11:32-14:02	GAS & SVOC # 2
	2018-09-29	16:13-19:13	GAS & SVOC # 3
	2018-09-22	14:45-16:45	PM/Metal/HCl # 1
	2018-09-28	11:33-14:23	PM/Metal/HCl # 2
	2018-09-29	16:14-19:14	PM/Metal/HCl # 3

3.8 LAWS AND REGULATIONS

The government of Nunavut presented a guideline document in October 2010, which was revised in January 2012, for the burning and incineration of solid waste. The following emission standards apply to existing, new or expanding solid waste incinerators operating in Nunavut and have been adopted from the Canadian Council of Ministers of the Environment (CCME) Canada - Wide Standards for Dioxins and Furans and Mercury Emissions. The document presented two criteria for air emission which are applicable in the current project. A standard for Dioxins and Furans is stated at 80 pg I-TEQ/m^3 and another standard for mercury is stated at 20 µg/Rm^3. The R conditions are stated at 101.3 kPa and 25°C. Both standards are corrected to 11% O_2.

4 QUALITY CONTROL PROCEDURES (QA/QC)

The quality insurance program and control at Consulair has several elements to validate the methodologies used during sampling. The main points are detailed within this section.

4.1 QA/QC – PRE-TEST

4.1.1 Equipment, instruments and reagents

The sampling train glassware and sample containers were cleaned and checked according to the applicable reference methods.

The instruments used were subject of regular maintenance and are calibrated for less than a year. The calibration constants of the equipment used are shown in Tables 4-1 to 4-3. Calibration certificates of equipment are presented in Appendix 3 of the report.

The gas standards used for calibration of the analyzer were valid at the time of use considering the retention periods imposed by the supplier. The standard gases are certified to ± 2% by the supplier.

4.1.2 Field forms

The forms that present field data for the target parameters are shown in Appendix 5.

4.2 Sample tracking

A clean room inside the incinerator building was used for the assembly and the different stages of recovery of sampling trains. Recovery of samples was performed according to the procedures recommended by the methods.

The samples were collected in suitable containers as specified by the methods. All samples were kept cool during the sampling period and until the delivery of samples to analytical laboratories. Consulair used an identification system for the samples that allowed tracking the origin easily by a unique code coupled to a lookup table. Each sample number includes the date, test number, the precise location of the sampling, the nature and destination (analysis, archiving). This information is indicated on the chain of custody listing and the information is available on the analysis reports.

4.3 Validation criteria

Consulair ensured that each step of the air emission characterization program (including QA / QC program) will achieve the defined objectives, while respecting the deadline set by the customer.

4.3.1 Analytical laboratory

The particulate samples analysis was done in the laboratory of Consulair. This laboratory is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for particulate matter (domain 400 of the air chemical section). The metals samples were analysed by Maxxam's laboratory, which is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for metallic analysis (domain 404 of the air chemical section). The PCDD/F samples were analysed by AGAT's laboratory, which is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for PCDD/F analysis (domain 510 of the air chemical section).

The analytical reports have been signed by a chemist and are presented in appendix 4. The laboratory also made available, in its report, the QA/QC program specific to the analysed contaminants.

4.3.2 Validation criteria – Particulate matter / Metals / HCl (PM/ME/HCl)

The following tables show the validation criteria of the methodology used.

Table 4-1 – QA/QC METHODOLOGY – PM/METALS/HCl

SPE 1/RM/8 METHODOLOGICAL INFORMATION				
TEST	ME-1	ME-2	ME-3	**CRITERIA**
CYCLONIC FLOW	0			≤ 15°
REVERSE FLOW	NO			NO
STACK DIAMETER (m)	0.826			≥ 0.3
A_0	2.0			≥ 0.5
B_0	5.0			≥ 2.0
SAMPLING TIME (min)	120	170	180	≥ 120
VOLUME SAMPLED (Rm^3)	2.76	2.83	3.77	≥ 2.8
ISOKINETICITY AVERAGE (%)	102	101	102	90 ≤ ISO ≤ 110
POURCENTAGE OF ISOKINETIC POINTS	100%	100%	100%	≥ 90
SAMPLING VELOCITY	OK	OK	OK	3.0 ≤ V ≤ 30 m/s
PROBE TEMPERATURE	NOT MEASURED			223 ≤ T ≤ 273 °F
FILTER TEMPERATURE	OK	OK	OK	223 ≤ T ≤ 273 °F
OUTLET TEMPERATURE	OK	OK	OK	32 ≤ T ≤ 68 °F
4% D_{MOY} (pi^3/min)	0.03	0.02	0.03	---
FLOW LEAK BEFORE at -15in Hg (ft^3/min)	0.020	0.020	0.020	≤ 0.02 or 4% Dmoy
FLOW LEAK AFTER (ft^3/min)	0.020	0.020	0.020	≤ 0.02 or 4% Dmoy
EQUIPMENT INFORMATION				
SAMPLING MODULE NO.	25	25	25	
METER FACTOR K_C	0.999	0.999	0.999	$0.95 < K_C < 1.05$
ORIFICE FACTOR K_O	0.733	0.733	0.733	
Δh@	2.529	2.529	2.529	
PITOT ID	05-07 5Q-501	05-07 5Q-501	05-07 5Q-501	
PITOT FACTOR	0.774	0.774	0.774	
NOZZLE ID	5Q-502	5Q-434	5Q-434	
NOZZLE DIAMETER (in)	0.4684	0.4366	0.4366	
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.				

The sampling volume for the first test run is slightly lower than the 2.8 m^3 limit of the test method but should not have any impact on the result.

Table 4-2 – QA/QC METHODOLOGY – SVOC

TEST	PCDD/DF-1	PCDD/DF-2	PCDD/DF-3	CRITERIA
EQUIPEMENT INFORMATION				
SAMPLING MODULE NO.	19	19	19	N/A
METER FACTOR K_C	0.997	0.997	0.997	0.95 - 1.05
ORIFICE FACTOR K_O	0.994	0.994	0.994	N/A
PITOT ID	03-06 3Q-371	03-06 3Q-503	03-06 3Q-503	N/A
PITOT FACTOR	0.778	0.781	0.781	N/A
NOZZLE ID	3Q-371	3Q-503	3Q-503	N/A
NOZZLE DIAMETER (in)	0.3741	0.4958	0.4958	N/A
METHODOLOGICAL INFORMATION				
SAMPLING POINTS NUMBER	12	12	12	24
GAS VELOCITY (m/s)	11.7	10.6	13.9	3.0 - 30
SAMPLING TIME (min)	240	150	180	≥ 180
VOLUME SAMPLED (Rm^3)	3.38	3.39	4.99	≥ 3
SAMPLING RATE (pi^3/min)	0.48	0.78	0.95	N/A
ISOKINETICITY AVERAGE (%)	101	101	101	90 - 110
POURCENTAGE OF ISOKINETIC POINTS	100	100	100	≥ 90
PROBE TEMPERATURE (°F)	NOT MEASURED			223 - 273
FILTER TEMPERATURE (°F)	240 - 258	246 – 253	246 - 257	223 - 273
OUTLET TEMPERATURE (°F)	39 - 58	56 - 91	40 - 63	32 - 68
TRAP TEMPERATURE (°F)	46 - 69	38 - 63	41 - 69	33 - 68
FLOW LEAK BEFORE at -15in Hg (ft^3/min)	< 0.020	< 0.020	< 0.020	< 0.02
FLOW LEAK AFTER (ft^3/min)	< 0.020	< 0.020	< 0.020	< 0.02
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.				

The sampling time for the second run of SVOC is under the 180 minutes limit of the method because of a process malfunction and the sampling had to be stopped. However, since the sampling volume for this test run is higher than the 3.0 m^3 limit of the method, this should have no impact on the result.

5 RESULTS

The reference values are reported at a temperature of 25°C and an atmospheric pressure of 101.3 kPa, on a dry basis.

For the inorganic results, a laboratory analysis value preceded of "<" means that the laboratory result is less than the detection limit reported (LDR) and represents a maximum result. In this case, the detection limit reported (LDR) is the value used.

The PCDD / F result tables include all toxic congeners (17) calculated with TEF (Toxic Equivalency Factor). The term "toxic equivalency (TEQ)" is the sum of the 17 toxic congeners calculated according to the TEF and when a congener was not detected by the laboratory analysis, it was replaced by "zero".

Unless otherwise indicated, the averages indicated in the tables below are the average of all tests carried out to the same source for the same operating condition.

Computer compiled data is presented in Appendix 1.

Table 5-1 – STACK GAS PROPERTIES

TESTS SCHEDULE				
TEST	RUN-1	RUN-2	RUN-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
STACK GAS PROPERTIES – METAL SAMPLING TRAIN				
TEMPERATURE (°C)	727	724	782	744
MOISTURE (% v/v)	6.2	5.5	6.3	6.0
VELOCITY (m/s)	12.0	10.2	13.5	11.9
STACK GAS FLOW RATE (m^3/h)	23 080	19 600	25 932	22 871
STACK GAS FLOW RATE (ft^3/min) (ACFM)	6 498	5 503	6 844	6 282
STACK GAS FLOW RATE (Rm^3/h)	13 585	11 536	15 263	13 461
STACK GAS FLOW RATE (Rft^3/min) (SCFM)	3 825	3 239	4 028	3 697
STACK GAS PROPERTIES – SVOC SAMLING TRAIN				
TEMPERATURE (°C)	726	723	780	743
MOISTURE (% v/v)	6.6	5.1	6.6	6.1
VELOCITY (m/s)	11.7	10.6	13.9	12.1
STACK GAS FLOW RATE (m^3/h)	22 509	20 452	26 796	23 252
STACK GAS FLOW RATE (ft^3/min) (ACFM)	13 248	12 038	15 771	13 686
STACK GAS FLOW RATE (Rm^3/h)	6 314	5 774	7 070	6 386
STACK GAS FLOW RATE (Rft^3/min) (SCFM)	3 717	3 398	4 161	3 759
GAS COMPOSITION				
CO_2 (% v/v d)	5.2	4.4	5.6	5.1
O_2 (% v/v d)	14.1	15.1	13.6	14.3
CO (ppmvd)	3	3	3	3
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-2 – RESULTS PM – HCL

TESTS SCHEDULE				
TEST	MEL-ME-1	MEL-ME-2	MEL-ME-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
PARTICULATE MATTER				
PARTICULATE MATTER (mg/Rm^3)	30.9	35.8	13.6	26.8
PARTICULATE MATTER (mg/Rm^3) at 7 % O_2	63.4	85.7	25.9	58.3
PARTICULATE MATTER (mg/Rm^3) at 11 % O_2	45.2	61.0	18.4	41.5
PARTICULATE MATTER (kg/h)	0.20	0.20	0.093	0.16
HCl				
HCl (mg/Rm^3)	32.4	12.0	32.6	25.7
HCl (mg/Rm^3) at 11 % O_2	**47.4**	**20.5**	**44.1**	**37.3**
HCl (ppm)	21.7	8.1	21.8	17.2
HCl (kg/h)	0.210	0.066	0.223	0.167
HCl (g/s)	0.0584	0.0184	0.0619	0.0463
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-3 – METALS CONCENTRATION

SCHEDULE OF TESTS				
TEST	MEL-ME-1	MEL-ME-1	MEL-ME-1	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
METALS (µg/Rm^3) @ 11% O_2				
Aluminium (Al)	307	24	21	118
Antimony(Sb)	129	2.3	78	70
Silver (Ag)	1.5	< 1.6	1.2	1.4
Arsenic (As)	9.2	0.96	11	7.1
Baryum (Ba)	4.1	0.72	0.45	1.7
Beryllium (Be)	< 0.13	< 0.16	< 0.089	< 0.13
Bismuth (Bi)	0.55	0.19	1.8	0.85
Boron (B)	14	8.6	37	20
Cadmium (Cd)	2.0	0.57	3.5	2.0
Calcium (Ca)	1,095	239	142	492
Chromium (Cr)	9.8	3.2	26	13
Cobalt (Co)	0.42	< 0.24	0.18	0.28
Copper (Cu)	48	15	48	37
Tin (Sn)	54	16	68	46
Iron (Fe)	576	331	49	318
Lithium (Li)	5.8	21	13	13
Magnesium (Mg)	167	28	27	74
Manganese (Mn)	36	14	2.1	17
Mercury (Hg)	0.47	0.21	0.018	0.23
Molybdenum (Mo)	3.6	< 1.6	3.9	3.0
Nickel (Ni)	4.6	0.48	0.82	2.0
Lead (Pb)	68	23	160	83
Potassium (K)	5,348	716	3,662	3,242
Selenium (Se)	0.74	0.48	0.36	0.52
Silicium (Si)	409	107	212	243
Sodium (Na)	4,180	520	2,473	2,391
Strontium (Sr)	2.8	0.42	0.25	1.2
Thallium (Tl)	< 0.21	< 0.24	< 0.14	< 0.20
Titanium (Ti)	29	4.2	3.2	12
Vanadium (V)	0.79	< 0.48	0.39	0.55
Zinc (Zn)	274	34	385	231
DETECTED METAL	**12,780**	**2,111**	**7,430**	**7,440**
TOTAL METALS	**12,780**	**2,115**	**7,430**	**7,442**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-4 – METALS EMISSION RATE

SCHEDULE OF TESTS				
TEST	MEL-ME-2	MEL-ME-1	MEL-ME-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
METALS (g/h)				
Aluminium (Al)	1.4	0.078	0.11	0.52
Antimony(Sb)	0.58	0.0076	0.40	0.33
Silver (Ag)	0.0068	< 0.0051	0.0060	0.0060
Arsenic (As)	0.041	0.0031	0.057	0.034
Baryum (Ba)	0.018	0.0023	0.0023	0.0076
Beryllium (Be)	< 0.00059	< 0.00051	< 0.00045	< 0.00052
Bismuth (Bi)	0.0024	0.00062	0.0091	0.0041
Boron (B)	0.063	0.028	0.19	0.093
Cadmium (Cd)	0.0091	0.0018	0.018	0.0096
Calcium (Ca)	4.9	0.78	0.72	2.1
Chromium (Cr)	0.044	0.010	0.13	0.063
Cobalt (Co)	0.0019	< 0.00078	0.00091	0.0012
Copper (Cu)	0.22	0.050	0.24	0.17
Tin (Sn)	0.24	0.051	0.34	0.21
Iron (Fe)	2.6	1.1	0.25	1.3
Lithium (Li)	0.026	0.070	0.064	0.053
Magnesium (Mg)	0.75	0.091	0.14	0.32
Manganese (Mn)	0.16	0.045	0.011	0.072
Mercury (Hg)	0.0021	0.00070	0.000091	0.00096
Molybdenum (Mo)	0.016	< 0.0051	0.020	0.014
Nickel (Ni)	0.020	0.0016	0.0042	0.0087
Lead (Pb)	0.30	0.074	0.81	0.40
Potassium (K)	24	2.3	19	15
Selenium (Se)	0.0033	0.0016	0.0018	0.0022
Silicium (Si)	1.8	0.35	1.1	1.1
Sodium (Na)	19	1.7	13	11
Strontium (Sr)	0.012	0.0014	0.0013	0.0050
Thallium (Tl)	< 0.00094	< 0.00078	< 0.00073	< 0.00082
Titanium (Ti)	0.13	0.014	0.016	0.053
Vanadium (V)	0.0035	< 0.0016	0.0020	0.0024
Zinc (Zn)	1.2	0.11	2.0	1.1
DETECTED METAL	**57**	**6.9**	**38**	**34**
TOTAL METALS	**57**	**6.9**	**38**	**34**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-5 – CONCENTRATION - PCDD/F CONGENERS

SCHEDULE OF TESTS				
SERIAL NUMBER TEST	MEL-COSV-1	MEL-COSV-2	MEL-COSV-3	**AVERAGE**
DATE	2018-09-22	2018-09-28	2018-09-29	**(1 to 3)**
START OF TEST	13:44	11:32	16:13	
END OF TEST	17:44	14:02	19:13	
DURATION OF THE TEST (MINUTES)	240	150	180	
PCDD/DF CONGENERS (ng/Rm^3)				
2,3,7,8 - Tetra CDD	< 0.00030	0.0015	< 0.0014	0.0011
1,2,3,7,8 - Penta CDD	< 0.00089	0.014	0.0046	0.0065
1,2,3,4,7,8 - Hexa CDD	< 0.00089	0.016	0.0056	0.0074
1,2,3,6,7,8 - Hexa CDD	0.00089	0.021	0.013	0.011
1,2,3,7,8,9 - Hexa CDD	< 0.00089	0.024	0.013	0.013
1,2,3,4,6,7,8 - Hepta CDD	0.0050	0.093	0.061	0.053
1,2,3,4,6,7,8,9 - Octa CDD	0.0098	0.047	0.060	0.039
2, 3, 7, 8 - Tetra CDF	0.0044	0.014	0.043	0.021
1,2,3,7,8 - Penta CDF	< 0.0024	0.0062	0.012	0.0070
2,3,4,7,8 - Penta CDF	0.0027	0.013	0.033	0.016
1,2,3,4,7,8 - Hexa CDF	0.0039	0.018	0.065	0.029
1,2,3,6,7,8 - Hexa CDF	0.0027	0.0074	0.024	0.011
2,3,4,6,7,8 - Hexa CDF	0.0024	0.015	0.055	0.024
1,2,3,7,8,9 - Hexa CDF	< 0.0018	< 0.0059	0.0060	0.0046
1,2,3,4,6,7,8 - Hepta CDF	0.0047	0.019	0.095	0.040
1,2,3,4,7,8,9 - Hepta CDF	< 0.0018	0.0024	0.020	0.0081
1,2,3,4,6,7,8,9 - Octa CDF	0.0059	0.0050	0.045	0.019
Total Tetra CDD	0.0027	0.047	0.043	0.031
Total Penta CDD	0.0033	0.13	0.081	0.072
Total Hexa CDD	0.0074	0.27	0.14	0.14
Total Hepta CDD	0.0059	0.099	0.063	0.056
CDD TOTALS	**0.029**	**0.59**	**0.39**	**0.34**
Total Tetra CDF	0.030	0.083	0.23	0.11
Total Penta CDF	0.021	0.12	0.31	0.15
Total Hexa CDF	0.0095	0.051	0.19	0.084
Total Hepta CDF	0.0083	0.036	0.18	0.074
CDF TOTALS	**0.075**	**0.30**	**0.95**	**0.44**
CONGENERS TOTALS TOXIC	**0.051**	**0.32**	**0.56**	**0.31**
TOTAL HOMOLOGUOUS GROUPS	**0.19**	**1.7**	**2.6**	**1.5**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-6 – CONCENTRATION - PCDD/F TEQ

SCHEDULE OF TESTS				
SERIAL NUMBER TEST	MEL-COSV-1	MEL-COSV-2	MEL-COSV-3	**AVERAGE**
TEQ - PCDD/F (ng/Rm^3) at 11 % O_2				
2,3,7,8 - Tetra CDD	< LD	0.0025	< LD	0.0016
1,2,3,7,8 - Penta CDD	< LD	0.024	0.0062	0.010
1,2,3,4,7,8 - Hexa CDD	< LD	0.0027	0.00076	0.0012
1,2,3,6,7,8 - Hexa CDD	0.00013	0.0036	0.0017	0.0018
1,2,3,7,8,9 - Hexa CDD	< LD	0.0041	0.0018	0.0020
1,2,3,4,6,7,8 - Hepta CDD	0.000074	0.0016	0.00083	0.00083
1,2,3,4,6,7,8,9 - Octa CDD	0.0000014	0.0000080	0.0000081	0.0000059
2, 3, 7, 8 - Tetra CDF	0.00065	0.0024	0.0059	0.0030
1,2,3,7,8 - Penta CDF	< LD	0.00053	0.00084	0.00051
2,3,4,7,8 - Penta CDF	0.0020	0.011	0.022	0.012
1,2,3,4,7,8 - Hexa CDF	0.00056	0.0031	0.0088	0.0042
1,2,3,6,7,8 - Hexa CDF	0.00039	0.0013	0.0033	0.0016
2,3,4,6,7,8 - Hexa CDF	0.00035	0.0025	0.0074	0.0034
1,2,3,7,8,9 - Hexa CDF	< LD	< LD	0.00081	0.00069
1,2,3,4,6,7,8 - Hepta CDF	0.000069	0.00032	0.0013	0.00056
1,2,3,4,7,8,9 - Hepta CDF	< LD	0.000040	0.00027	0.00011
1,2,3,4,6,7,8,9 - Octa CDF	0.00000087	0.00000085	0.0000062	0.0000026
TOXIC EQUIVALENT TOTAL	**0.0042**	**0.059**	**0.062**	**0.042**
STANDARD (ng/Nm^3) at 11% O_2	**0.08**			
TEQ / % OF THE STANDARD	5.2	73.8	77.8	52.3
TEQ - PCDD/F (µg/h)				
2,3,7,8 - Tetra CDD	< LD	0.0085	< LD	0.0068
1,2,3,7,8 - Penta CDD	< LD	0.080	0.033	0.039
1,2,3,4,7,8 - Hexa CDD	< LD	0.0090	0.0040	0.0045
1,2,3,6,7,8 - Hexa CDD	0.00056	0.012	0.0089	0.0072
1,2,3,7,8,9 - Hexa CDD	< LD	0.014	0.0092	0.0079
1,2,3,4,6,7,8 - Hepta CDD	0.00032	0.0054	0.0043	0.0034
1,2,3,4,6,7,8,9 - Octa CDD	0.0000062	0.000027	0.000042	0.000025
2, 3, 7, 8 - Tetra CDF	0.0028	0.0082	0.031	0.014
1,2,3,7,8 - Penta CDF	< LD	0.0018	0.0044	0.0023
2,3,4,7,8 - Penta CDF	0.0084	0.037	0.12	0.054
1,2,3,4,7,8 - Hexa CDF	0.0024	0.011	0.046	0.020
1,2,3,6,7,8 - Hexa CDF	0.0017	0.0043	0.017	0.0076
2,3,4,6,7,8 - Hexa CDF	0.0015	0.0085	0.039	0.016
1,2,3,7,8,9 - Hexa CDF	< LD	< LD	0.0042	0.0029
1,2,3,4,6,7,8 - Hepta CDF	0.00030	0.0011	0.0067	0.0027
1,2,3,4,7,8,9 - Hepta CDF	< LD	0.00014	0.0014	0.00055
1,2,3,4,6,7,8,9 - Octa CDF	0.0000037	0.0000029	0.000032	0.000013
TOXIC EQUIVALENT	**0.018**	**0.20**	**0.33**	**0.18**
R: Reference conditions at 101.3 kPa and 25°C, and dry basis.				

Table 5-7 – STACK GAS MEASUREMENTS

SCHEDULE OF TESTS			
SERIAL NUMBER TEST	MEL GAZ E1	MEL GAZ E2	MEL GAZ E3
DATE	2018-09-22	2018-09-28	2018-09-29
START OF TEST	13:50	11:35	16:15
END OF TEST	17:40	14:25	19:05
DURATION OF THE TEST (MINUTES)	230	170	170
OXYGEN (O_2)			
O_2 (% v/v d) average	14.1	15.1	13.6
O_2 (% v/v d) minimum	13.0	14.1	12.6
O_2 (% v/v d) maximum	15.4	15.8	14.6
CARBON DIOXIDE (CO_2)			
CO_2 (% v/v d) average	5.2	4.4	5.6
CO_2 (% v/v d) minimum	4.4	4.0	4.9
CO_2 (% v/v d) maximum	6.0	5.0	6.3
CARBON MONOXIDE (CO)			
CO (ppmvd) average	2.6	3.4	2.6
CO (ppmvd) minimum	1.9	2.6	1.3
CO (ppmvd) maximum	3.9	4.4	3.5
CO (mg/Rm^3)	3.0	3.9	3.0
AVERAGE EMISSION (kg/h)	0.019	0.022	0.021
NITROGEN OXIDES (NO_X as NO_2)			
NO_X (ppmvd) average	44	49	66
NO_X (ppmvd) minimum	28	42	56
NO_X (ppmvd) maximum	59	58	77
NO_X equivalent NO_2 (mg/Rm^3)	84	93	124
AVERAGE EMISSION (kg/h)	0.53	0.54	0.87
SULPHUR DIOXIDES (SO_2)			
SO_2 (ppmvd) average	0	0	0.6
SO_2 (ppmvd) minimum	0	0	0
SO_2 (ppmvd) maximum	0	0	3.6
SO_2 equivalent NO_2 (mg/Rm^3)	0	0	1.7
AVERAGE EMISSION (kg/h)	0	0	0.012
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.			

6 CONCLUSION

According to the sampling methods and procedures combined with a rigorous quality control, the results of concentrations and / or emission rates presented in this report are valid and representative of the process operation conditions sampled for period test results.

The final results obtained are valid and representative of the operating conditions during the tests.

The sampling was made in compliance with the rules of the requirements of the Report No. EPS 3/UP/2, including methods recommended by “Environment and Climate Change Canada” (ECCC) of the Government of Canada inside “Environment Canada, The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology”. Report No. EPS 3/UP/2, Ottawa, 1986.

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7 REFERENCES

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APPENDIX 1
COMPUTED DATA



AEM Meliadine
18-5528
Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
DONNEES DES EQUIPEMENTS D'ECHANTILLONNAGE				
PRESSION BAROMÉTRIQUE ("Hg)	30.10	29.73	29.83	29.89
PRESSION STATIQUE ("H2O)	-0.08	-0.05	-0.05	-0.06
PRESSION STATIQUE (kPa)	-0.02	-0.01	-0.01	-0.01
COEFFICIENT DU COMPTEUR (25,25,25,25,	0.999	0.999	0.999	0.999
COEFFICIENT DU PITOT (05-07 5Q-501,05-(	0.774	0.774	0.774	0.774
DIAMÈTRE DE LA BUSE (po) (5Q-502,5Q-43	0.4684	0.4366	0.4366	0.4472
TEMPÉRATURE COMPTEUR (°F)	91	91	92	91
TEMPÉRATURE COMPTEUR (°C)	33	33	33	33
HUMIDITE DES GAZ & VOLUME ECHANTILLONNE				
VOLUME D'EAU (g)	133.3	121.6	186.7	147.2
VOLUME D'EAU (pi³)	6.40	5.84	8.96	7.07
HUMIDITÉ GAZ (BWO)	0.062	0.055	0.063	0.060
HUMIDITÉ GAZ (%v)	6.2	5.5	6.3	6.0
VOLUME GAZ REFERENCE (pi³R)	97.44	100.04	133.02	110.17
VOLUME GAZ REFERENCE (m³R)	**2.759**	**2.833**	**3.767**	**3.120**
CARACTERISTIQUES DU CONDUIT				
DIAMÈTRES AVANT LES TROUS D'ÉCHANT	5.0	5.0	5.0	
DIAMÈTRES APRÈS LES TROUS D'ÉCHANT	2.0	2.0	2.0	
DIAMÈTRE DU CONDUIT (pi)	2.71	2.71	2.71	
DIAMÈTRE DU CONDUIT (m)	0.826	0.826	0.826	
ÉPAISSEUR DU PORT D'ÉCHANTILLONNAC	7.5	7.5	7.5	
LONGUEUR DU CONDUIT (pi)	0.0	0.0	0.0	
LARGEUR DU CONDUIT (pi)	0.0	0.0	0.0	
DIAMÈTRE ÉQUIVALENT (pi)	#VALEUR!	#VALEUR!	#VALEUR!	
DIAMÈTRE ÉQUIVALENT (m)	#VALEUR!	#VALEUR!	#VALEUR!	
PRESSION CONDUIT ("Hg)	30.09	29.73	29.83	29.88
PRESSION COMPTEUR ("Hg)	30.25	29.81	29.95	30.00
SURFACE DU CONDUIT (pi²)	5.8	5.8	5.8	5.8
SURFACE DU CONDUIT (m²)	0.54	0.54	0.54	0.54
CARACTERISTIQUES DES GAZ				
TEMPÉRATURE CHEMINÉE (°F)	1340	1336	1440	1372
TEMPÉRATURE CHEMINÉE (°C)	727	724	782	744
CO_2 (%vs)	5.2	4.4	5.6	5.1
O_2 (%vs)	14.1	15.1	13.6	14.3
O_2 (%vh)	13.3	14.3	12.7	13.4
CO (ppmvs)	3	3	3	3
SO_2 (%vs)	0	0	0	0
N_2 (%vs)	80.6	80.5	80.8	80.6
Ar (%vs)	0.00	0.00	0.00	0.00
POIDS MOLECULAIRE SEC	29.40	29.31	29.44	29.39
POIDS MOLECULAIRE HUMIDE	28.70	28.69	28.72	28.70
VITESSE DES GAZ (pi/s)	39.3	33.4	44.2	38.9
VITESSE DES GAZ (m/s)	12.0	10.2	13.5	11.9
DEBITS GAZ ACTUELS (pi³/h)	815 078	692 166	915 770	807 671
DEBITS GAZ ACTUELS (m³/h)	23 080	19 600	25 932	22 871
DEBITS GAZ ACTUELS (pi³/min)(APCM)	13 585	11 536	15 263	13 461
DEBITS GAZ NORMALISES (pi³R/h)	229 478	194 320	241 695	221 831
DEBITS GAZ NORMALISES (m³R/h)	**6 498**	**5 503**	**6 844**	**6 282**
DEBITS GAZ NORMALISES (pi³R/min) (RPCI	3 825	3 239	4 028	3 697

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DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
INFORMATIONS D'ECHANTILLONNAGE				
COEFFICIENT DE L'ORIFICE DU COMPTEU	0.733	0.733	0.733	
VITESSE MAXIMALE (m/s)	12.75	11.35	14.34	
VITESSE MINIMALE (m/s)	10.47	9.17	12.30	
10%Vmax (pi/s)	1.28	1.14	1.43	
Pourcentage >10%Vmax	100%	100%	100%	
NOMBRE POINTS ΔP 20% et + de ΔPmoy	2	3	0	
ISOCINETISME MOYEN (%)	102.2	100.8	101.6	
% PTS RESPECT CRITERE ISO	100%	100%	100%	
DEBIT DE POMPAGE MAX (pi³/min)	0.91	0.65	0.82	
PRESSION DE VIDE MAX DURANT ESSAI (-	-2	-9	-4	
TEMPÉRATURE SONDE MAX (°F)	250	252	250	
TEMPÉRATURE SONDE MIN (°F)	250	243	250	
TEMPÉRATURE FILTRE MAX (°F)	260	261	250	
TEMPÉRATURE FILTRE MIN (°F)	260	246	250	
TEMPÉRATURE SORTIE MAX (°F)	67	67	40	
TEMPÉRATURE SORTIE MIN (°F)	40	67	40	
TEMPÉRATURE TRAPPE MAX (°F)	0	0	0	
TEMPÉRATURE TRAPPE MIN (°F)	0	0	0	
TEMPÉRATURE AUX 3 MAX (°F)	0	0	0	
TEMPÉRATURE AUX 3 MIN (°F)	0	0	0	
TEMPÉRATURE MODULE MAX (°F)	0	0	0	
TEMPÉRATURE MODULE MIN (°F)	0	0	0	
DEBIT DE POMPAGE MOYEN (pi³/min)	0.82	0.61	0.76	
4% DEBIT DE POMPAGE MOYEN (pi³/min)	0.033	0.024	0.030	
TEST DE FUITE AVANT LES ESSAIS À 15 "H	< 0.020	< 0.020	< 0.020	
TEST DE FUITE APRÈS LES ESSAIS (pi³/mi	< 0.020	< 0.020	< 0.020	
PARTICULES FILTRABLES SPE 1/RM/8				
MASSE FILTRE (mg)	48.2	48.4	46.0	47.5
MASSE SONDE (mg)	37.0	53.1	5.3	31.8
MASSE BLANC ACÉTONE (mg)	< 1			
VOLUME BLANC ACÉTONE (mL)	91			
RÉSIDUS ACÉTONE (%)	0.001			
MASSE SONDE (mg)	37.0	53.1	5.30	31.8
MASSE TOTALE (mg)	85.2	101.5	51.3	79.3
CONCENTRATION (mg/m³R)	**30.9**	**35.8**	**13.6**	**26.8**
CONCENTRATION (mg/m³R) à 7% O₂	**63.4**	**85.7**	**25.9**	**58.3**
CONCENTRATION (mg/m³R) à 11% O₂	**45.2**	**61.0**	**18.4**	**41.5**
TAUX D'ÉMISSION (kg/h)	0.20	0.20	0.093	0.16
TAUX D'ÉMISSION (g/s)	0.056	0.055	0.026	0.045
ACIDE CHLORHYDRIQUE (HCl)				
BLANC HCl (mg)	< 0.040			
CHLORURES (mg)	86.87	33.16	119.33	
HCl (mg)	89.34	34.10	122.72	82.1
HCl (mg/m³R)	32.4	12.0	32.6	25.67
HCl (ppmvs)	21.7	8.1	21.8	17.21
HCl (mg/m³R) 11% O₂	47.4	20.5	44.1	37.32
HCl (kg/h)	0.21	0.07	0.22	0.167

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DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX				
MÉTAUX PARTICULAIRES (µg)				
Aluminium (Al)	570.0	30.0	46.0	215.3
Antimoine (Sb)	245.0	3.60	219.0	155.9
Argent (Ag)	0.90	< 0.60	1.30	0.93
Arsenic (As)	17.2	1.30	30.9	16.5
Baryum (Ba)	7.28	0.65	1.06	3.00
Béryllium (Be)	< 0.050	< 0.060	< 0.050	< 0.053
Bismuth (Bi)	0.84	0.12	4.83	1.93
Bore (B)	4	4	4	4
Cadmium (Cd)	2.47	0.45	9.52	4.15
Calcium (Ca)	1930.0	309.0	243.0	827.3
Chrome (Cr)	18.20	5	73.4	32.2
Cobalt (Co)	0.50	< 0.10	0.20	0.27
Cuivre (Cu)	89.1	24.7	131.0	81.6
Étain (Sn)	77.4	4.00	166.0	82.5
Fer (Fe)	1070.0	33.0	82.0	395.0
Lithium (Li)	8.00	33.0	32.0	24.3
Magnésium (Mg)	216.0	34.0	36.0	95.3
Manganèse (Mn)	16.5	15.7	4.30	12.2
Molybdène (Mo)	4.80	< 0.60	8.90	4.77
Nickel (Ni)	8.10	0.40	2.00	3.50
Phosphore (P)				
Plomb (Pb)	127.0	36.0	444.0	202.3
Potassium (K)	10100.0	1170.0	10200.0	7156.7
Sélénium (Se)	< 0.50	< 0.50	0.50	0.50
Silicium (Si)	717.0	148.0	397.0	420.7
Sodium (Na)	7900.0	851.0	6890.0	5213.7
Strontium (Sr)	5.00	0.40	0.40	1.93
Tellurium (Te)				
Thallium (Tl)	< 0.10	< 0.10	< 0.10	< 0.10
Titane (Ti)	52.0	4.00	6.00	20.7
Uranium (U)				
Vanadium (V)	0.80	< 0.20	0.40	0.47
Zinc (Zn)	509.0	54.0	1070.0	544.3
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**23697.2**	**2762.4**	**20103.4**	**15521.0**
MÉTAUX TOTAUX	**23697.8**	**2764.6**	**20103.6**	**15522.0**
Proportion de métaux versus particules (%	**27.8**	**2.7**	**39.2**	**23.2**

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DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX GAZEUX (µg)				
Aluminium (Al)	12.00	10.00	14.0	12.00
Antimoine (Sb)	< 0.30	< 0.30	< 0.30	< 0.30
Argent (Ag)	< 2.00	< 2.00	< 2.00	< 2.00
Arsenic (As)	< 0.30	< 0.30	< 0.30	< 0.30
Baryum (Ba)	0.45	0.55	0.20	0.40
Béryllium (Be)	< 0.20	< 0.20	< 0.20	< 0.20
Bismuth (Bi)	< 0.20	< 0.20	< 0.20	< 0.20
Bore (B)	22.5	10.40	99.3	44.1
Cadmium (Cd)	1.40	0.5	0.3	0.73
Calcium (Ca)	144.0	92.0	154.0	130.0
Chrome (Cr)	< 0.30	< 0.30	< 0.30	< 0.30
Cobalt (Co)	< 0.30	< 0.30	< 0.30	< 0.30
Cuivre (Cu)	2.60	1.10	2.30	2.00
Étain (Sn)	24.0	22.00	23.0	23.00
Fer (Fe)	21.00	521.0	54.0	198.7
Lithium (Li)	< 3.00	< 3.00	< 3.00	< 3.00
Magnésium (Mg)	101.0	13.00	39.0	51.0
Manganèse (Mn)	51.2	7.50	1.50	20.1
Molybdène (Mo)	< 2.00	< 2.00	< 2.00	< 2.00
Nickel (Ni)	0.60	0.40	0.30	0.43
Phosphore (P)				
Plomb (Pb)	< 2.00	< 2.00	< 2.00	< 2.00
Potassium (K)	34.0	< 30.0	< 30.0	< 31.3
Sélénium (Se)	0.90	0.30	0.50	0.57
Silicium (Si)	58.0	32.0	196.0	95.3
Sodium (Na)	< 20.0	< 20.0	< 20.0	< 20.0
Strontium (Sr)	< 0.30	< 0.30	< 0.30	< 0.30
Tellurium (Te)				
Thallium (Tl)	< 0.30	< 0.30	< 0.30	< 0.30
Titane (Ti)	< 3.00	< 3.00	< 3.00	< 3.00
Uranium (U)				
Vanadium (V)	< 0.70	< 0.60	< 0.70	< 0.67
Zinc (Zn)	9.70	2.60	5.10	5.80
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**483**	**745**	**622**	**617**
MÉTAUX TOTAUX	**518**	**778**	**654**	**650**

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FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (µg)				
Aluminium (Al)	582.0	40.0	60.0	227.3
Antimoine (Sb)	245.3	3.90	219.3	156.2
Argent (Ag)	2.90	< 2.60	3.30	2.93
Arsenic (As)	17.5	1.60	31.2	16.8
Baryum (Ba)	7.73	1.20	1.26	3.40
Béryllium (Be)	< 0.250	< 0.260	< 0.250	< 0.253
Bismuth (Bi)	1.04	0.32	5.03	2.13
Bore (B)	27	14	103	48
Cadmium (Cd)	3.87	0.95	9.82	4.88
Calcium (Ca)	2074.0	401.0	397.0	957.3
Chrome (Cr)	18.50	5	73.7	32.5
Cobalt (Co)	0.80	< 0.40	0.50	0.57
Cuivre (Cu)	91.7	25.8	133.3	83.6
Étain (Sn)	101.4	26.00	189.0	105.5
Fer (Fe)	1091.0	554.0	136.0	593.7
Lithium (Li)	11.00	36.0	35.0	27.3
Magnésium (Mg)	317.0	47.0	75.0	146.3
Manganèse (Mn)	67.7	23.2	5.80	32.2
Molybdène (Mo)	6.80	< 2.60	10.90	6.77
Nickel (Ni)	8.70	0.80	2.30	3.93
Phosphore (P)				
Plomb (Pb)	129.0	38.0	446.0	204.3
Potassium (K)	10134.0	1200.0	10230.0	7188.0
Sélénium (Se)	1.40	0.80	1.00	1.07
Silicium (Si)	775.0	180.0	593.0	516.0
Sodium (Na)	7920.0	871.0	6910.0	5233.7
Strontium (Sr)	5.30	0.70	0.70	2.23
Tellurium (Te)				
Thallium (Tl)	< 0.40	< 0.40	< 0.40	< 0.40
Titane (Ti)	55.0	7.00	9.00	23.7
Uranium (U)				
Vanadium (V)	1.50	< 0.80	1.10	1.13
Zinc (Zn)	518.7	56.6	1075.1	550.1
Mercure (Hg)	0.89	0.36	0.05	0
MÉTAUX DÉTECTÉS	**24 216**	**3 536**	**20 757**	**16 170**
MÉTAUX TOTAUX	**24 217**	**3 543**	**20 758**	**16 173**

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HORAIRE DES ESSAIS				
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FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX PARTICULAIRE (µg/m^{3}R)				
Aluminium (Al)	207	11	12	76
Antimoine (Sb)	89	1.3	58	49
Argent (Ag)	0.33	< 0.21	0.35	0.29
Arsenic (As)	6.2	0.46	8.2	5.0
Baryum (Ba)	2.6	0.23	0.28	1.0
Béryllium (Be)	< 0.018	< 0.021	< 0.013	< 0.018
Bismuth (Bi)	0.30	0.042	1.3	0.54
Bore (B)	1.5	1.4	0.98	1.3
Cadmium (Cd)	0.90	0.16	2.5	1.2
Calcium (Ca)	699	109	65	291
Chrome (Cr)	6.6	1.8	19	9.3
Cobalt (Co)	0.18	< 0.035	0.053	0.090
Cuivre (Cu)	32	8.7	35	25
Étain (Sn)	28	1.4	44	25
Fer (Fe)	388	12	22	140
Lithium (Li)	2.9	12	8.5	7.7
Magnésium (Mg)	78	12	9.6	33
Manganèse (Mn)	6.0	5.5	1.1	4.2
Molybdène (Mo)	1.7	< 0.21	2.4	1.4
Nickel (Ni)	2.9	0.14	0.53	1.2
Phosphore (P)				
Plomb (Pb)	46	13	118	59
Potassium (K)	3660	413	2708	2260
Sélénium (Se)	< 0.18	< 0.18	0.13	0.16
Silicium (Si)	260	52	105	139
Sodium (Na)	2863	300	1829	1664
Strontium (Sr)	1.8	0.14	0.11	0.69
Tellurium (Te)				
Thallium (Tl)	< 0.036	< 0.035	< 0.027	< 0.033
Titane (Ti)	19	1.4	1.6	7.3
Uranium (U)				
Vanadium (V)	0.29	< 0.071	0.11	0.16
Zinc (Zn)	184	19	284	163
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**8588**	**975**	**5337**	**4967**
MÉTAUX TOTAUX	**8588**	**976**	**5337**	**4967**

AEM Meliadine
18-5528
Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX GAZEUX (µg/m^{3}R)				
Aluminium (Al)	4.3	3.5	3.7	3.9
Antimoine (Sb)	< 0.11	< 0.11	< 0.080	< 0.098
Argent (Ag)	< 0.72	< 0.71	< 0.53	< 0.65
Arsenic (As)	< 0.11	< 0.11	< 0.080	< 0.098
Baryum (Ba)	0.16	0.19	0.053	0.14
Béryllium (Be)	< 0.072	< 0.071	< 0.053	< 0.065
Bismuth (Bi)	< 0.072	< 0.071	< 0.053	< 0.065
Bore (B)	8.2	3.7	26	13
Cadmium (Cd)	0.51	0.18	0.080	0.25
Calcium (Ca)	52	32	41	42
Chrome (Cr)	< 0.11	< 0.11	< 0.080	< 0.098
Cobalt (Co)	< 0.11	< 0.11	< 0.080	< 0.098
Cuivre (Cu)	0.94	0.39	0.61	0.65
Étain (Sn)	8.7	7.8	6.1	7.5
Fer (Fe)	7.6	184	14	69
Lithium (Li)	< 1.1	< 1.1	< 0.80	< 0.98
Magnésium (Mg)	37	4.6	10	17
Manganèse (Mn)	19	2.6	0.40	7.2
Molybdène (Mo)	< 0.72	< 0.71	< 0.53	< 0.65
Nickel (Ni)	0.22	0.14	0.080	0.15
Phosphore (P)				
Plomb (Pb)	< 0.72	< 0.71	< 0.53	< 0.65
Potassium (K)	12	< 11	< 8.0	< 10
Sélénium (Se)	0.33	0.11	0.13	0.19
Silicium (Si)	21	11	52	28
Sodium (Na)	< 7.2	< 7.1	< 5.3	< 6.5
Strontium (Sr)	< 0.11	< 0.11	< 0.080	< 0.098
Tellurium (Te)				
Thallium (Tl)	< 0.11	< 0.11	< 0.080	< 0.098
Titane (Ti)	< 1.1	< 1.1	< 0.80	< 0.98
Uranium (U)				
Vanadium (V)	< 0.25	< 0.21	< 0.19	< 0.22
Zinc (Zn)	3.5	0.92	1.4	1.9
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**175**	**263**	**165**	**201**
MÉTAUX TOTAUX	**188**	**275**	**174**	**212**

AEM Meliadine
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Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (µg/m^{3}R)				
Aluminium (Al)	211	14	16	80
Antimoine (Sb)	89	1.4	58	49
Argent (Ag)	1.1	< 0.92	0.88	0.95
Arsenic (As)	6.3	0.56	8.3	5.1
Baryum (Ba)	2.8	0.42	0.33	1.2
Béryllium (Be)	< 0.091	< 0.092	< 0.066	< 0.083
Bismuth (Bi)	0.38	0.11	1.3	0.61
Bore (B)	9.6	5.1	27	14
Cadmium (Cd)	1.4	0.34	2.6	1.4
Calcium (Ca)	752	142	105	333
Chrome (Cr)	6.7	1.9	20	9.4
Cobalt (Co)	0.29	< 0.14	0.13	0.19
Cuivre (Cu)	33	9.1	35	26
Étain (Sn)	37	9.2	50	32
Fer (Fe)	395	196	36	209
Lithium (Li)	4.0	13	9.3	8.7
Magnésium (Mg)	115	17	20	50
Manganèse (Mn)	25	8.2	1.5	11
Molybdène (Mo)	2.5	< 0.92	2.9	2.1
Nickel (Ni)	3.2	0.28	0.61	1.3
Phosphore (P)				
Plomb (Pb)	47	13	118	60
Potassium (K)	3673	424	2716	2271
Sélénium (Se)	0.51	0.28	0.27	0.35
Silicium (Si)	281	64	157	167
Sodium (Na)	2870	307	1834	1671
Strontium (Sr)	1.9	0.25	0.19	0.78
Tellurium (Te)				
Thallium (Tl)	< 0.14	< 0.14	< 0.11	< 0.13
Titane (Ti)	20	2.5	2.4	8.3
Uranium (U)				
Vanadium (V)	0.54	< 0.28	0.29	0.37
Zinc (Zn)	188	20	285	164
Mercure (Hg)	0.32	0.13	0.013	0.15
MÉTAUX DÉTECTÉS	**8776**	**1248**	**5511**	**5178**
MÉTAUX TOTAUX	**8777**	**1251**	**5511**	**5179**

AEM Meliadine
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Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (ug/m^{3}R) À 11 % DE O_2				
Aluminium (Al)	307	24	21	118
Antimoine (Sb)	129	2.3	78	70
Argent (Ag)	1.5	< 1.6	1.2	1.4
Arsenic (As)	9.2	0.96	11	7.1
Baryum (Ba)	4.1	0.72	0.45	1.7
Béryllium (Be)	< 0.13	< 0.16	< 0.089	< 0.13
Bismuth (Bi)	0.55	0.19	1.8	0.85
Bore (B)	14	8.6	37	20
Cadmium (Cd)	2.0	0.57	3.5	2.0
Calcium (Ca)	1095	239	142	492
Chrome (Cr)	9.8	3.2	26	13
Cobalt (Co)	0.42	< 0.24	0.18	0.28
Cuivre (Cu)	48	15	48	37
Étain (Sn)	54	16	68	46
Fer (Fe)	576	331	49	318
Lithium (Li)	5.8	21	13	13
Magnésium (Mg)	167	28	27	74
Manganèse (Mn)	36	14	2.1	17
Molybdène (Mo)	3.6	< 1.6	3.9	3.0
Nickel (Ni)	4.6	0.48	0.82	2.0
Phosphore (P)				
Plomb (Pb)	68	23	160	83
Potassium (K)	5348	716	3662	3242
Sélénium (Se)	0.74	0.48	0.36	0.52
Silicium (Si)	409	107	212	243
Sodium (Na)	4180	520	2473	2391
Strontium (Sr)	2.8	0.42	0.25	1.2
Tellurium (Te)				
Thallium (Tl)	< 0.21	< 0.24	< 0.14	< 0.20
Titane (Ti)	29	4.2	3.2	12
Uranium (U)				
Vanadium (V)	0.79	< 0.48	0.39	0.55
Zinc (Zn)	274	34	385	231
Mercure (Hg)	0.47	0.21	0.018	0.23
MÉTAUX DÉTECTÉS	**12780**	**2111**	**7430**	**7440**
MÉTAUX TOTAUX	**12780**	**2115**	**7430**	**7442**
CLASSE I (Cu, Pb, V & Zn)	**391**	**72**	**593**	**352**
LIGNE DIRECTRICE DU CCME		**1500**		
CLASSE II (As, Cr & Ni)	**24**	**4.7**	**38**	**22**
LIGNE DIRECTRICE DU CCME		**500**		
CLASSE III (Cd, Hg & Tl)	**2.5**	**0.78**	**3.5**	**2.3**
LIGNE DIRECTRICE DU CCME		**150**		
AUTRES MÉTAUX (Al, Ag, Ba, Be, B, Sn, Fe,	**12363**	**2033**	**6795**	**7064**

AEM Meliadine
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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (g/h)				
Aluminium (Al)	1.4	0.078	0.11	0.52
Antimoine (Sb)	0.58	0.0076	0.40	0.33
Argent (Ag)	0.0068	< 0.0051	0.0060	0.0060
Arsenic (As)	0.041	0.0031	0.057	0.034
Baryum (Ba)	0.018	0.0023	0.0023	0.0076
Béryllium (Be)	< 0.00059	< 0.00051	< 0.00045	< 0.00052
Bismuth (Bi)	0.0024	0.00062	0.0091	0.0041
Bore (B)	0.063	0.028	0.19	0.093
Cadmium (Cd)	0.0091	0.0018	0.018	0.0096
Calcium (Ca)	4.9	0.78	0.72	2.1
Chrome (Cr)	0.044	0.010	0.13	0.063
Cobalt (Co)	0.0019	< 0.00078	0.00091	0.0012
Cuivre (Cu)	0.22	0.050	0.24	0.17
Étain (Sn)	0.24	0.051	0.34	0.21
Fer (Fe)	2.6	1.1	0.25	1.3
Lithium (Li)	0.026	0.070	0.064	0.053
Magnésium (Mg)	0.75	0.091	0.14	0.32
Manganèse (Mn)	0.16	0.045	0.011	0.072
Molybdène (Mo)	0.016	< 0.0051	0.020	0.014
Nickel (Ni)	0.020	0.0016	0.0042	0.0087
Phosphore (P)				
Plomb (Pb)	0.30	0.074	0.81	0.40
Potassium (K)	24	2.3	19	15
Sélénium (Se)	0.0033	0.0016	0.0018	0.0022
Silicium (Si)	1.8	0.35	1.1	1.1
Sodium (Na)	19	1.7	13	11
Strontium (Sr)	0.012	0.0014	0.0013	0.0050
Tellurium (Te)				
Thallium (Tl)	< 0.00094	< 0.00078	< 0.00073	< 0.00082
Titane (Ti)	0.13	0.014	0.016	0.053
Uranium (U)				
Vanadium (V)	0.0035	< 0.0016	0.0020	0.0024
Zinc (Zn)	1.2	0.11	2.0	1.1
Mercure (Hg)	0.0021	0.00070	0.000091	0.00096
MÉTAUX DÉTECTÉS	**57**	**6.9**	**38**	**34**
MÉTAUX TOTAUX	**57**	**6.9**	**38**	**34**

R : Conditions de référence à 101.3 kPa et 25 °C, sur base sèche.

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-1

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
14 h 45	1	1	5	0.15	1.75	1300	79	79	79	534.62	538.31	**3.69**	11.1	98	14.1	5.2	3	-2.0	250	260	40	-	-	-
		1	5	0.15	1.76	1300	82	82	82	538.31	541.93	**3.62**	11.1	96				-2.0	250	260	40	-	-	-
		2	5	0.15	1.77	1300	83	83	83	541.93	545.49	**3.56**	11.1	94				-2.0	250	260	40	-	-	-
		2	5	0.14	1.65	1300	84	84	84	545.49	549.01	**3.52**	10.8	96				-2.0	250	260	40	-	-	-
		3	5	0.18	2.07	1348	84	84	84	549.01	553.11	**4.10**	12.4	100				-2.0	250	260	40	-	-	-
		3	5	0.18	2.07	1349	85	85	85	553.11	557.22	**4.11**	12.4	100				-2.0	250	260	40	-	-	-
		4	5	0.18	2.07	1354	86	86	86	557.22	561.31	**4.09**	12.4	100				-2.0	250	260	40	-	-	-
		4	5	0.18	2.08	1346	88	88	88	561.31	565.42	**4.11**	12.4	100				-2.0	250	260	40	-	-	-
		5	5	0.18	2.08	1348	88	88	88	565.42	569.51	**4.09**	12.4	99				-2.0	250	260	40	-	-	-
		5	5	0.18	2.08	1350	89	89	89	569.51	573.61	**4.10**	12.4	99				-2.0	250	260	40	-	-	-
		6	5	0.18	2.07	1361	89	89	89	573.61	577.68	**4.07**	12.4	99				-2.0	250	260	40	-	-	-
		6	5	0.18	2.07	1362	89	89	89	577.68	581.77	**4.09**	12.4	99				-2.0	250	260	40	-	-	-
	2	6	5	0.19	2.19	1364	92	92	92	581.77	586.08	**4.31**	12.8	102				-2.0	250	260	40	-	-	-
		6	5	0.19	2.21	1352	92	92	92	586.08	590.50	**4.42**	12.7	104				-2.0	250	260	40	-	-	-
		5	5	0.19	2.21	1356	94	94	94	590.50	595.00	**4.50**	12.7	105				-2.0	250	260	40	-	-	-
		5	5	0.19	2.22	1348	94	94	94	595.00	599.50	**4.50**	12.7	105				-2.0	250	260	40	-	-	-
		4	5	0.19	2.22	1352	95	95	95	599.50	604.03	**4.53**	12.7	106				-2.0	250	260	40	-	-	-
		4	5	0.19	2.22	1352	96	96	96	604.03	608.50	**4.47**	12.7	104				-2.0	250	260	40	-	-	-
		3	5	0.18	2.11	1355	97	97	97	608.50	613.00	**4.50**	12.4	108				-2.0	250	260	40	-	-	-
		3	5	0.18	2.11	1355	97	97	97	613.00	617.49	**4.49**	12.4	107				-2.0	250	260	40	-	-	-
		2	5	0.15	1.78	1337	98	98	98	617.49	621.69	**4.20**	11.2	109				-2.0	250	260	67	-	-	-
		2	5	0.15	1.82	1295	98	98	98	621.69	625.82	**4.13**	11.1	106				-2.0	250	260	67	-	-	-
		1	5	0.13	1.54	1337	99	99	99	625.82	629.70	**3.88**	10.5	108				-2.0	250	260	67	-	-	-
		1	5	0.13	1.54	1345	99	99	99	629.70	633.54	**3.84**	10.5	107				-2.0	250	260	67	-	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-2

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O)		Températures (°F)			Orifice	Volume de gaz (pi³)			Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F)					
				ΔP	ΔH	Cheminé	Compteu Entrée	Compteu Sortie		Début	Fin	Total							Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
11 h 33	1	1	5	0.15	1.31	1290	71	71	71	636.82	640.06	3.24	11.2	99	15.1	4.4	3	-7.0	247	250	67	-	-	-
		1	5	0.15	1.28	1341	72	72	72	640.06	643.25	3.19	11.3	99				-7.5	247	256	67	-	-	-
		1	5	0.15	1.27	1349	73	73	73	643.25	646.52	3.27	11.4	101				-8.5	250	252	67	-	-	-
		2	5	0.14	1.19	1352	74	74	74	646.52	649.71	3.19	11.0	102				-8.0	247	255	67	-	-	-
		2	5	0.14	1.19	1354	76	76	76	649.71	652.87	3.16	11.0	101				-7.5	251	252	67	-	-	-
		2	5	0.14	1.20	1354	78	78	78	652.87	656.06	3.19	11.0	102				-7.5	247	253	67	-	-	-
		3	5	0.13	1.12	1344	80	80	80	656.06	659.14	3.08	10.6	101				-7.0	247	252	67	-	-	-
		3	5	0.13	1.13	1340	82	82	82	659.14	662.29	3.15	10.5	103				-7.0	248	249	67	-	-	-
		3	5	0.13	1.13	1348	83	83	83	662.29	665.39	3.10	10.6	101				-9.0	248	250	67	-	-	-
		4	5	0.13	1.13	1347	85	85	85	665.39	668.50	3.11	10.6	101				-9.0	246	250	67	-	-	-
		4	5	0.13	1.13	1345	86	86	86	668.50	671.62	3.12	10.6	101				-6.5	252	253	67	-	-	-
		4	5	0.13	1.14	1348	88	88	88	671.62	674.77	3.15	10.6	102				-6.5	252	253	67	-	-	-
		5	5	0.13	1.15	1334	89	89	89	674.77	677.84	3.07	10.5	99				-9.0	246	249	67	-	-	-
		5	5	0.13	1.15	1330	91	91	91	677.84	680.96	3.12	10.5	100				-9.0	243	249	67	-	-	-
		5	5	0.13	1.15	1337	92	92	92	680.96	684.09	3.13	10.5	100				-9.0	252	252	67	-	-	-
		6	5	0.12	1.07	1334	93	93	93	684.09	687.13	3.04	10.1	101				-9.0	251	255	67	-	-	-
		6	5	0.12	1.07	1335	94	94	94	687.13	690.18	3.05	10.1	101				-9.0	249	251	67	-	-	-
		6	5	0.12	1.07	1340	95	95	95	690.18	693.21	3.03	10.1	101				-9.0	246	255	67	-	-	-
	2	6	5	0.12	1.07	1338	96	96	96	693.21	696.26	3.05	10.1	101				-9.0	248	259	67	-	-	-
		6	5	0.12	1.07	1338	97	97	97	696.26	699.31	3.05	10.1	101				-9.0	246	246	67	-	-	-
		6	5	0.12	1.08	1328	97	97	97	699.31	702.37	3.06	10.1	101				-9.0	251	250	67	-	-	-
		5	5	0.12	1.07	1344	98	98	98	702.37	705.44	3.07	10.1	101				-9.0	251	261	67	-	-	-
		5	5	0.12	1.07	1344	98	98	98	705.44	708.51	3.07	10.1	101				-9.0	249	252	67	-	-	-
		5	5	0.12	1.07	1345	99	99	99	708.51	711.60	3.09	10.1	102				-9.0	249	252	67	-	-	-
		4	5	0.12	1.07	1342	99	99	99	711.60	714.66	3.06	10.1	101				-9.0	249	252	67	-	-	-
		4	5	0.10	0.90	1329	100	100	100	714.66	717.50	2.84	9.2	102				-9.0	249	252	67	-	-	-
		4	5	0.10	0.91	1326	101	101	101	717.50	720.31	2.81	9.2	101				-9.0	249	252	67	-	-	-
		3	5	0.10	0.91	1326	101	101	101	720.31	723.10	2.79	9.2	100				-9.0	249	252	67	-	-	-
		3	5	0.10	0.90	1330	102	102	102	723.10	725.88	2.78	9.2	99				-9.0	249	252	67	-	-	-
		3	5	0.10	0.90	1330	102	102	102	725.88	728.68	2.80	9.2	100				-9.0	249	252	67	-	-	-
		2	5	0.10	0.91	1326	103	103	103	728.68	731.49	2.81	9.2	100				-9.0	249	252	67	-	-	-
		2	5	0.10	0.92	1316	104	104	104	731.49	734.29	2.80	9.2	99				-9.0	249	252	67	-	-	-
		2	5	0.10	0.91	1317	104	104	104	734.29	737.13	2.84	9.2	101				-9.0	249	252	67	-	-	-
		1	5	0.10	0.92	1311	105	105	105	737.13	740.00	2.87	9.2	102				-9.0	249	252	67	-	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-3

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
16:14	1	1	5	0.20	1.74	1327	78	78	78	747.13	750.85	3.72	13.0	99	13.6	5.6	3	-3.0	250	250	40	-	-	-
		1	5	0.20	1.72	1347	79	79	79	750.85	754.60	3.75	13.1	101				-3.0	250	250	40	-	-	-
		1	5	0.20	1.72	1350	80	80	80	754.60	758.43	3.83	13.1	103				-3.0	250	250	40	-	-	-
		2	5	0.20	1.71	1360	81	81	81	758.43	762.18	3.75	13.1	101				-3.0	250	250	40	-	-	-
		2	5	0.20	1.70	1374	81	81	81	762.18	765.96	3.78	13.2	102				-3.0	250	250	40	-	-	-
		2	5	0.20	1.70	1378	82	82	82	765.96	769.75	3.79	13.2	102				-3.0	250	250	40	-	-	-
		3	5	0.22	1.87	1380	83	83	83	769.75	773.68	3.93	13.8	101				-3.0	250	250	40	-	-	-
		3	5	0.23	1.95	1393	84	84	84	773.68	777.76	4.08	14.2	103				-3.0	250	250	40	-	-	-
		3	5	0.23	1.94	1401	85	85	85	777.76	781.76	4.00	14.2	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.93	1410	85	85	85	781.76	785.75	3.99	14.3	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.92	1420	86	86	86	785.75	789.77	4.02	14.3	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.93	1423	87	87	87	789.77	793.77	4.00	14.3	101				-3.0	250	250	40	-	-	-
		5	5	0.23	1.92	1431	88	88	88	793.77	797.79	4.02	14.3	101				-3.0	250	250	40	-	-	-
		5	5	0.20	1.68	1418	89	89	89	797.79	801.59	3.80	13.3	102				-3.0	250	250	40	-	-	-
		5	5	0.20	1.68	1430	90	90	90	801.59	805.38	3.79	13.4	102				-3.0	250	250	40	-	-	-
		6	5	0.20	1.69	1418	90	90	90	805.38	809.19	3.81	13.3	102				-3.0	250	250	40	-	-	-
		6	5	0.20	1.67	1440	90	90	90	809.19	813.00	3.81	13.4	103				-3.0	250	250	40	-	-	-
		6	5	0.20	1.67	1445	91	91	91	813.00	816.78	3.78	13.4	102				-4.0	250	250	40	-	-	-
	2	6	5	0.20	1.66	1451	91	91	91	816.78	820.57	3.79	13.4	102				-4.0	250	250	40	-	-	-
		6	5	0.20	1.66	1460	92	92	92	820.57	824.36	3.79	13.5	102				-4.0	250	250	40	-	-	-
		6	5	0.20	1.65	1467	93	93	93	824.36	828.17	3.81	13.5	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1476	94	94	94	828.17	831.88	3.71	13.2	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1479	95	95	95	831.88	835.60	3.72	13.2	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1481	96	96	96	835.60	839.27	3.67	13.2	101				-4.0	250	250	40	-	-	-
		5	5	0.19	1.55	1502	97	97	97	839.27	842.94	3.67	13.3	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1518	99	99	99	842.94	846.82	3.88	14.0	103				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1518	99	99	99	846.82	850.70	3.88	14.0	103				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1520	100	100	100	850.70	854.57	3.87	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.72	1518	101	101	101	854.57	858.43	3.86	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1525	102	102	102	858.43	862.27	3.84	14.0	101				-4.0	250	250	40	-	-	-
		5	5	0.21	1.72	1522	103	103	103	862.27	866.14	3.87	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.17	1.39	1522	104	104	104	866.14	869.62	3.48	12.6	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.44	1460	105	105	105	869.62	873.16	3.54	12.4	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.46	1436	106	106	106	873.16	876.67	3.51	12.3	100				-4.0	250	250	40	-	-	-
		5	5	0.17	1.47	1429	106	106	106	876.67	880.25	3.58	12.3	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.48	1421	107	107	107	880.25	883.85	3.60	12.3	102				-4.0	250	250	40	-	-	-

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DONNÉES DES ÉQUIPEMENTS D'ÉCHANTILLONNAGE									
PRESSION BAROMÉTRIQUE ("Hg)		30.10		29.73		29.83			29.89
PRESSION STATIQUE ("H2O)		-0.08		-0.05		-0.05			-0.06
PRESSION STATIQUE (kPa)		-0.02		-0.01		-0.01			-0.01
COEFFICIENT DU COMPTEUR (19)		0.997		0.997		0.997			0.997
COEFFICIENT DU PITOT (03-06 3Q-371,03-06 3Q-503)		0.778		0.781		0.781			0.780
DIAMÈTRE DE LA BUSE (po) (3Q-371,3Q-503)		0.3741		0.4958		0.4958			0.4552
TEMPÉRATURE COMPTEUR (°F)		60		60		60			60
TEMPÉRATURE COMPTEUR (°C)		16		16		16			16
HUMIDITÉ DES GAZ & VOLUME ÉCHANTILLONNÉ									
MASSE D'EAU (g)		174.8		134.8		259.1			189.6
VOLUME D'EAU (pi^3)		8.39		6.47		12.44			9.10
HUMIDITÉ GAZ (BWO)		0.066		0.051		0.066			0.061
HUMIDITÉ GAZ (% v/v)		6.6		5.1		6.6			6.1
VOLUME GAZ REFERENCE (pi^3R)		119.19		119.67		176.29			138.38
VOLUME GAZ REFERENCE (m^3R)		**3.375**		**3.389**		**4.992**			**3.919**
CARACTERISTIQUES DU CONDUIT									
DIAMÈTRES AVANT LES TROUS D'ÉCHANTILLONNAG		5.0		5.0		5.00			5.0
DIAMÈTRES APRÈS LES TROUS D'ÉCHANTILLONNAG		2.0		2.0		2.00			2.0
DIAMÈTRE DU CONDUIT (pi)		2.71		2.71		2.71			2.71
DIAMÈTRE DU CONDUIT (m)		0.826		0.826		0.826			0.83
ÉPAISSEUR DU PORT D'ÉCHANTILLONNAGE (po)		7.5		7.5		7.5			
LONGUEUR DU CONDUIT (pi)		0.0		0.0		0.0			
LARGEUR DU CONDUIT (pi)		0.0		0.0		0.0			
PRESSION CONDUIT ("Hg)		30.09		29.73		29.83			29.88
PRESSION COMPTEUR ("Hg)		30.13		29.81		29.95			29.96
SURFACE DU CONDUIT (pi^2)		5.8		5.8		5.8			5.8
SURFACE DU CONDUIT (m^2)		0.54		0.54		0.54			0.54
CARACTERISTIQUES DES GAZ									
TEMPÉRATURE CHEMINÉE (°F)		1339		1333		1435			1369
TEMPÉRATURE CHEMINÉE (°C)		726.0		722.8		779.5			742.7
CO_2 (%vs)		5.2		4.4		5.6			5.1
O_2 (%vs)		14.1		15.1		13.6			14.3
O_2 (%vh)		13.2		14.3		12.7			13.4
CO (ppmvs)		3		3		3			3
SO_2 (%vs)		0		0		0			
N_2 (%vs)		80.6		80.5		80.8			81
Ar (%vs)		0.00		0.00		0.00			0.0
POIDS MOLECULAIRE SEC		29.40		29.31		29.44			29.39
POIDS MOLECULAIRE HUMIDE		28.65		28.73		28.69			28.69
VITESSE DES GAZ (pi/s)		38.3		34.8		45.6			39.6
VITESSE DES GAZ (m/s)		11.7		10.6		13.9			12.1
DEBIT GAZ ACTUELS (pi^3/h)		794 892		722 251		946 277			821 140
DEBIT GAZ ACTUELS (m^3/h)		22 509		20 452		26 796			23 252
DEBIT GAZ ACTUELS (pi^3/min)(APCM)		13 248		12 038		15 771			13 686
DEBIT GAZ NORMALISES (pi^3R/h)		222 994		203 892		249 680			225 522
DEBIT GAZ NORMALISES (m^3R/h)		**6 314**		**5 774**		**7 070**			**6 386**
DEBIT GAZ NORMALISES (pi^3R/min) (RPCM)		3 717		3 398		4 161			3 759
INFORMATIONS D'ÉCHANTILLONNAGE									
VITESSE MAXIMALE (m/s)		13.55		11.89		15.22			13.6
VITESSE MINIMALE (m/s)		9.45		9.25		12.42			10.4
10%Vmax (m/s)		1.35		1.19		1.52			1.4
Pourcentage >10%Vmax		75%		100%		100%			92%
NOMBRE POINTS ΔP 20% et + de ΔPmoy		12		5		0			
ISOCINÉTISME MOYEN (%)		101.1		100.9		101.2			101
% PTS RESPECT CRITERE ISO		100%		100%		100%			100%
DEBIT DE POMPAGE MAX (pi^3/min)		≤ 0.54		≤ 0.89		≤ 1.03			0.8
PRESSION DE VIDE MAX DURANT ESSAI (-"Hg)		-2		-6		-5			-4.00
TEMPÉRATURE SONDE MAX (°F)		250		250		254			251.33
TEMPÉRATURE SONDE MIN (°F)		250		235		238			241
TEMPÉRATURE FILTRE MAX (°F)		250		260		262			257
TEMPÉRATURE FILTRE MIN (°F)		250		244		243			246
TEMPÉRATURE SORTIE MAX (°F)		40		68		68			59
TEMPÉRATURE SORTIE MIN (°F)		40		68		66			58
TEMPÉRATURE TRAPPE MAX (°F)		40		58		56			51
TEMPÉRATURE TRAPPE MIN (°F)		40		43		40			41
DEBIT DE POMPAGE MOYEN (pi^3/min)		0.48		0.78		0.95			
4% DEBIT DE POMPAGE MOYEN (pi^3/min)		0.019		0.031		0.038			
TEST DE FUITE AVANT LES ESSAIS À 15 "Hg (pi^3/min)		< 0.020		< 0.020		< 0.020			
TEST DE FUITE APRÈS LES ESSAIS (pi^3/min)		< 0.020		< 0.020		< 0.020			0.020

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES LIMITES DE DETECTION (pg)									
2,3,7,8 - Tetra CDD		1		2		7			3.3
1,2,3,7,8 - Penta CDD		3		9		10			7.3
1,2,3,4,7,8 - Hexa CDD		3		7		10			6.7
1,2,3,6,7,8 - Hexa CDD		3		6		10			6.3
1,2,3,7,8,9 - Hexa CDD		3		7		10			6.7
1,2,3,4,6,7,8 - Hepta CDD		6		10		10			8.7
1,2,3,4,6,7,8,9 - Octa CDD		20		10		20			16.7
2, 3, 7, 8 - Tetra CDF		4		6		9			6.3
1,2,3,7,8 - Penta CDF		8		9		20			12.3
2,3,4,7,8 - Penta CDF		6		7		10			7.7
1,2,3,4,7,8 - Hexa CDF		4		10		10			8.0
1,2,3,6,7,8 - Hexa CDF		4		10		10			8.0
2,3,4,6,7,8 - Hexa CDF		4		10		10			8.0
1,2,3,7,8,9 - Hexa CDF		6		20		20			15.3
1,2,3,4,6,7,8 - Hepta CDF		3		5		20			9.3
1,2,3,4,7,8,9 - Hepta CDF		6		8		20			11.3
1,2,3,4,6,7,8,9 - Octa CDF		9		7		30			15.3
Total Tetra CDD		1		2		7			3.3
Total Penta CDD		3		9		10			7.3
Total Hexa CDD		3		7		10			6.7
Total Hepta CDD		6		10		10			8.7
Sommation des PCDDs		20		10		20			16.7
Total Tetra CDF		4		6		9			6.3
Total Penta CDF		8		9		20			12.3
Total Hexa CDF		6		20		20			15.3
Total Hepta CDF		6		8		20			11.3
Sommation des PCDFs		9		20		30			19.7
DIOXINES ET FURANNES (pg)									
2,3,7,8 - Tetra CDD	**1**	< 1.00	< LD	5.00	5.00	< 7.00	< LD	4.3	4.3
1,2,3,7,8 - Penta CDD	**1**	< 3.00	< LD	47.0	47.0	23.0	23.0	24.3	24.3
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 3.00	< LD	53.0	5.30	28.0	2.80	2.80	28.0
1,2,3,6,7,8 - Hexa CDD	**0.1**	3.0	0.3	71.0	7.10	63.0	6.30	4.57	45.7
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 3.00	< LD	81.0	8.10	65.0	6.50	4.97	49.7
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	17.0	0.17	316.0	3.16	307.0	3.07	2.13	213.3
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	33.0	0.0033	160.0	0.016	300.0	0.030	0.016	164.3
2, 3, 7, 8 - Tetra CDF	**0.1**	15.0	1.50	48.0	4.80	216.0	21.6	9.30	93.0
1,2,3,7,8 - Penta CDF	**0.05**	< 8.00	< LD	21.0	1.05	62.0	3.10	1.52	30.3
2,3,4,7,8 - Penta CDF	**0.5**	9.00	4.50	43.0	21.5	165.0	82.5	36.2	72.3
1,2,3,4,7,8 - Hexa CDF	**0.1**	13.0	1.30	62.0	6.20	326.0	32.6	13.4	133.7
1,2,3,6,7,8 - Hexa CDF	**0.1**	9.00	0.90	25.0	2.50	120.0	12.0	5.13	51.3
2,3,4,6,7,8 - Hexa CDF	**0.1**	8.00	0.80	50.0	5.00	273.0	27.3	11.0	110.3
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 6.00	< LD	< 20.0	< LD	30.0	3.00	1.9	18.7
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	16.0	0.16	64.0	0.64	474.0	4.74	1.85	184.7
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 6.00	< LD	8.0	0.08	100.0	1.00	0.38	38.0
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	20.0	0.0020	17.0	0.0017	227.0	0.023	0.0088	88.0
Total Tetra CDD	**MDDEFP**	9.00		159.0		214.0			127.3
Total Penta CDD		11.0		446.0		406.0			287.7
Total Hexa CDD		25.0		900.0		718.0			547.7
Total Hepta CDD		20.0		334.0		315.0			223.0
Sommation des PCDDs		99.0		2000.0		1950.0			1349.7
Total Tetra CDF		100.0		282.0		1140.0			507.3
Total Penta CDF		72.0		406.0		1540.0			672.7
Total Hexa CDF		32.0		172.0		963.0			389.0
Total Hepta CDF		28.0		123.0		880.0			343.7
Sommation des PCDFs		253.0		1000.0		4750.0			2001.0
ÉQUIVALENCE TOXIQUE TOTALE			**9.64**		**117.4**		**229.6**	**118.9**	
CONGÉNÈRES TOXIQUES TOTAUX		**173.0**		**1091.0**		**2786.0**			**1350.0**
GROUPES HOMOLOGUES TOTAUX		**649.0**		**5822.0**		**12876.0**			**6449.0**

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES (ng/m³R)									
2,3,7,8 - Tetra CDD	**1**	< 0.00030	< LD	0.0015	0.0015	< 0.0014	< LD	0.0011	0.0011
1,2,3,7,8 - Penta CDD	**1**	< 0.00089	< LD	0.014	0.014	0.0046	0.0046	0.0065	0.0065
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.00089	< LD	0.016	0.0016	0.0056	0.00056	0.00074	0.0074
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.00089	0.000089	0.021	0.0021	0.013	0.0013	0.0011	0.011
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.00089	< LD	0.024	0.0024	0.013	0.0013	0.0013	0.013
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.0050	0.000050	0.093	0.00093	0.061	0.00061	0.00053	0.053
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.0098	0.0000010	0.047	0.0000047	0.060	0.0000060	0.0000039	0.039
2, 3, 7, 8 - Tetra CDF	**0.1**	0.0044	0.00044	0.014	0.0014	0.043	0.0043	0.0021	0.021
1,2,3,7,8 - Penta CDF	**0.05**	< 0.0024	< LD	0.0062	0.00031	0.012	0.00062	0.00035	0.0070
2,3,4,7,8 - Penta CDF	**0.5**	0.0027	0.0013	0.013	0.0063	0.033	0.017	0.0081	0.016
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.0039	0.00039	0.018	0.0018	0.065	0.0065	0.0029	0.029
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.0027	0.00027	0.0074	0.00074	0.024	0.0024	0.0011	0.011
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.0024	0.00024	0.015	0.0015	0.055	0.0055	0.0024	0.024
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.0018	< LD	< 0.0059	< LD	0.0060	0.00060	0.00046	0.0046
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.0047	0.000047	0.019	0.00019	0.095	0.00095	0.00040	0.040
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.0018	< LD	0.0024	0.000024	0.020	0.00020	0.000081	0.0081
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.0059	0.00000059	0.0050	0.00000050	0.045	0.0000045	0.0000019	0.019
Total Tetra CDD	**MDDEFP**	0.0027		0.047		0.043			0.031
Total Penta CDD		0.0033		0.13		0.081			0.072
Total Hexa CDD		0.0074		0.27		0.14			0.14
Total Hepta CDD		0.0059		0.099		0.063			0.056
Sommation des PCDDs		0.029		0.59		0.39			0.34
Total Tetra CDF		0.030		0.083		0.23			0.11
Total Penta CDF		0.021		0.12		0.31			0.15
Total Hexa CDF		0.0095		0.051		0.19			0.084
Total Hepta CDF		0.0083		0.036		0.18			0.074
Sommation des PCDFs		0.075		0.30		0.95			0.44
ÉQUIVALENCE TOXIQUE TOTALE			**0.0029**		**0.035**		**0.046**	**0.028**	
CONGÉNÈRES TOXIQUES TOTAUX		**0.051**		**0.32**		**0.56**			**0.31**
GROUPES HOMOLOGUES TOTAUX		**0.19**		**1.72**		**2.58**			**1.50**
DIOXINES ET FURANNES (ng/m³R) 11 % D'OXYGÈNE									
2,3,7,8 - Tetra CDD	**1**	< 0.00043	< LD	0.0025	0.0025	< 0.0019	< LD	0.0016	0.0016
1,2,3,7,8 - Penta CDD	**1**	< 0.0013	< LD	0.024	0.024	0.0062	0.0062	0.010	0.010
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.0013	< LD	0.027	0.0027	0.0076	0.00076	0.0012	0.012
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.0013	0.00013	0.036	0.0036	0.017	0.0017	0.0018	0.018
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.0013	< LD	0.041	0.0041	0.018	0.0018	0.0020	0.020
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.0074	0.000074	0.16	0.0016	0.083	0.00083	0.00083	0.083
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.014	0.0000014	0.080	0.0000080	0.081	0.0000081	0.0000059	0.059
2, 3, 7, 8 - Tetra CDF	**0.1**	0.0065	0.00065	0.024	0.0024	0.059	0.0059	0.0030	0.030
1,2,3,7,8 - Penta CDF	**0.05**	< 0.0035	< LD	0.011	0.00053	0.017	0.00084	0.00051	0.010
2,3,4,7,8 - Penta CDF	**0.5**	0.0039	0.0020	0.022	0.011	0.045	0.022	0.012	0.023
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.0056	0.00056	0.031	0.0031	0.088	0.0088	0.0042	0.042
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.0039	0.00039	0.013	0.0013	0.033	0.0033	0.0016	0.016
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.0035	0.00035	0.025	0.0025	0.074	0.0074	0.0034	0.034
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.0026	< LD	< 0.010	< LD	0.0081	0.00081	0.00069	0.0069
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.0069	0.000069	0.032	0.00032	0.13	0.0013	0.00056	0.056
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.0026	< LD	0.0040	0.000040	0.027	0.00027	0.00011	0.011
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.0087	0.00000087	0.0085	0.00000085	0.062	0.0000062	0.0000026	0.026
Total Tetra CDD	**MDDEFP**	0.0039		0.080		0.058			0.047
Total Penta CDD		0.0048		0.22		0.11			0.11
Total Hexa CDD		0.011		0.45		0.19			0.22
Total Hepta CDD		0.0087		0.17		0.085			0.087
Sommation des PCDDs		0.043		1.01		0.53			0.53
Total Tetra CDF		0.043		0.14		0.31			0.16
Total Penta CDF		0.031		0.20		0.42			0.22
Total Hexa CDF		0.014		0.086		0.26			0.12
Total Hepta CDF		0.012		0.062		0.24			0.10
Sommation des PCDFs		0.11		0.50		1.29			0.63
ÉQUIVALENCE TOXIQUE TOTALE			**0.0042**		**0.059**		**0.062**	**0.042**	
NORME AU PRMRQA	**0.08**								
CONGÉNÈRES TOXIQUES TOTAUX		**0.075**		**0.55**		**0.76**			**0.46**
GROUPES HOMOLOGUES TOTAUX		**0.28**		**2.93**		**3.49**			**2.23**

AEM Meliadine
18-5528
Incinérateur
COSV

HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES (µg/h)									
2,3,7,8 - Tetra CDD	**1**	< 0.0019	< LD	0.0085	0.0085	< 0.0099	< LD	0.0068	0.0068
1,2,3,7,8 - Penta CDD	**1**	< 0.0056	< LD	0.080	0.080	0.033	0.033	0.039	0.039
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.0056	< LD	0.090	0.0090	0.040	0.0040	0.0045	0.045
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.0056	0.00056	0.12	0.012	0.089	0.0089	0.0072	0.072
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.0056	< LD	0.14	0.014	0.092	0.0092	0.0079	0.079
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.032	0.00032	0.54	0.0054	0.43	0.0043	0.0034	0.34
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.062	0.0000062	0.27	0.000027	0.42	0.000042	0.000025	0.25
2, 3, 7, 8 - Tetra CDF	**0.1**	0.028	0.0028	0.082	0.0082	0.31	0.031	0.014	0.14
1,2,3,7,8 - Penta CDF	**0.05**	< 0.015	< LD	0.036	0.0018	0.088	0.0044	0.0023	0.046
2,3,4,7,8 - Penta CDF	**0.5**	0.017	0.0084	0.073	0.037	0.23	0.12	0.054	0.11
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.024	0.0024	0.11	0.011	0.46	0.046	0.020	0.20
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.017	0.0017	0.043	0.0043	0.17	0.017	0.0076	0.076
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.015	0.0015	0.085	0.0085	0.39	0.039	0.016	0.16
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.011	< LD	< 0.034	< LD	0.042	0.0042	0.0029	0.029
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.030	0.00030	0.11	0.0011	0.67	0.0067	0.0027	0.27
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.011	< LD	0.014	0.00014	0.14	0.0014	0.00055	0.055
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.037	0.0000037	0.029	0.0000029	0.32	0.000032	0.000013	0.13
Total Tetra CDD	**MDDELCC**	0.017		0.27		0.30			0.20
Total Penta CDD		0.021		0.76		0.58			0.45
Total Hexa CDD		0.047		1.5		1.0			0.87
Total Hepta CDD		0.037		0.57		0.45			0.35
Sommation des PCDDs		0.19		3.4		2.8			2.1
Total Tetra CDF		0.19		0.48		1.6			0.76
Total Penta CDF		0.13		0.69		2.2			1.0
Total Hexa CDF		0.060		0.29		1.4			0.57
Total Hepta CDF		0.052		0.21		1.2			0.50
Sommation des PCDFs		0.47		1.7		6.7			3.0
ÉQUIVALENCE TOXIQUE TOTALE			**0.018**		**0.20**		**0.33**	**0.18**	
CONGÉNÈRES TOXIQUES TOTAUX		**0.32**		**1.86**		**3.95**			**2.04**
GROUPES HOMOLOGUES TOTAUX		**1.21**		**9.92**		**18.2**			**9.79**

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-1

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
13 h 44	1	1	5	0.18	0.45	1330	60	60	76	483.04	485.51	2.47	12.4	98	14.1	5.2	3	-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	485.51	488.00	2.49	12.1	102				-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	488.00	490.46	2.46	12.1	101				-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	490.46	492.97	2.51	12.1	103				-1.0	250	250	40	40	-	-
		2	5	0.17	0.43	1352	60	60	78	492.97	495.48	2.51	12.1	103				-1.0	250	250	40	40	-	-
		2	5	0.17	0.43	1356	60	60	79	495.48	497.85	2.37	12.1	97				-1.0	250	250	40	40	-	-
		2	5	0.18	0.45	1354	60	60	80	497.85	500.35	2.50	12.5	100				-1.0	250	250	40	40	-	-
		2	5	0.18	0.45	1353	60	60	80	500.35	502.87	2.52	12.4	100				-1.0	250	250	40	40	-	-
		3	5	0.18	0.45	1361	60	60	82	502.87	505.38	2.51	12.5	100				-1.0	250	250	40	40	-	-
		3	5	0.21	0.53	1366	60	60	82	505.38	508.08	2.70	13.5	100				-1.0	250	250	40	40	-	-
		3	5	0.21	0.52	1381	60	60	84	508.08	510.79	2.71	13.5	101				-1.0	250	250	40	40	-	-
		3	5	0.21	0.52	1377	60	60	83	510.79	513.50	2.71	13.5	101				-1.5	250	250	40	40	-	-
		4	5	0.21	0.52	1379	60	60	84	513.50	516.20	2.70	13.5	100				-1.5	250	250	40	40	-	-
		4	5	0.21	0.52	1380	60	60	85	516.20	518.88	2.68	13.5	100				-1.5	250	250	40	40	-	-
		4	5	0.21	0.53	1373	60	60	85	518.88	521.61	2.73	13.5	101				-1.5	250	250	40	40	-	-
		4	5	0.21	0.53	1373	60	60	85	521.61	524.28	2.67	13.5	99				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1347	60	60	87	524.28	526.84	2.56	12.4	102				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1348	60	60	87	526.84	529.27	2.43	12.4	97				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1350	60	60	88	529.27	531.82	2.55	12.4	101				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1354	60	60	88	531.82	534.26	2.44	12.5	97				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1355	60	60	88	534.26	536.79	2.53	12.5	101				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1359	60	60	90	536.79	539.34	2.55	12.5	102				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1361	60	60	90	539.34	541.87	2.53	12.5	101				-1.5	250	250	40	40	-	-
		6	5	0.17	0.44	1350	60	60	90	541.87	544.36	2.49	12.1	102				-1.5	250	250	40	40	-	-
	2	6	5	0.15	0.38	1357	60	60	93	544.36	546.67	2.31	11.4	101				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1350	60	60	93	546.67	549.00	2.33	11.7	98				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1355	60	60	94	549.00	551.26	2.26	11.7	96				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1352	60	60	96	551.26	553.57	2.31	11.7	98				-1.5	250	250	40	40	-	-
		5	5	0.16	0.42	1348	60	60	97	553.57	555.93	2.36	11.7	100				-1.5	250	250	40	40	-	-
		5	5	0.16	0.41	1350	60	60	97	555.93	558.42	2.49	11.7	105				-1.5	250	250	40	40	-	-
		5	5	0.16	0.42	1345	60	60	97	558.42	560.77	2.35	11.7	99				-1.5	250	250	40	40	-	-
		5	5	0.15	0.39	1340	60	60	98	560.77	563.08	2.31	11.3	100				-1.5	250	250	40	40	-	-
		4	5	0.15	0.39	1332	60	60	99	563.08	565.37	2.29	11.3	99				-1.5	250	250	40	40	-	-
		4	5	0.13	0.35	1280	60	60	100	565.37	567.67	2.30	10.4	106				-1.5	250	250	40	40	-	-
		4	5	0.13	0.35	1300	60	60	100	567.67	569.98	2.31	10.4	107				-1.5	250	250	40	40	-	-
		4	5	0.11	0.29	1306	60	60	101	569.98	572.08	2.10	9.6	106				-1.5	250	250	40	40	-	-
		3	5	0.11	0.29	1304	60	60	101	572.08	574.08	2.00	9.6	100				-0.5	250	250	40	40	-	-
		3	5	0.11	0.30	1280	60	60	102	574.08	576.10	2.02	9.5	101				0.5	250	250	40	40	-	-
		3	5	0.11	0.30	1250	60	60	102	576.10	578.09	1.99	9.5	98				1.5	250	250	40	40	-	-
		3	5	0.11	0.30	1266	60	60	103	578.09	580.17	2.08	9.5	103				2.5	250	250	40	40	-	-
		2	5	0.13	0.35	1318	60	60	103	580.17	582.40	2.23	10.5	103				3.5	250	250	40	40	-	-
		2	5	0.13	0.35	1320	60	60	103	582.40	584.62	2.22	10.5	103				4.5	250	250	40	40	-	-
		2	5	0.13	0.35	1324	60	60	103	584.62	586.87	2.25	10.5	105				5.5	250	250	40	40	-	-
		2	5	0.13	0.35	1310	60	60	102	586.87	589.10	2.23	10.5	103				6.5	250	250	40	40	-	-
		1	5	0.13	0.35	1317	60	60	102	589.10	591.32	2.22	10.5	103				7.5	250	250	40	40	-	-
		1	5	0.13	0.35	1317	60	60	102	591.32	593.56	2.24	10.5	104				8.5	250	250	40	40	-	-
		1	5	0.13	0.35	1318	60	60	102	593.56	595.76	2.20	10.5	102				9.5	250	250	40	40	-	-
		1	5	0.13	0.35	1326	60	60	103	595.76	598.00	2.24	10.5	104				10.5	250	250	40	40	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-2

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
11 h 32	1	6	5	0.16	1.28	1275	60	60	72	600.12	604.57	4.45	11.6	102	15.1	4.4	3	-5.0	246	253	68	44	-	-
		6	5	0.15	1.15	1353	60	60	73	604.57	608.84	4.27	11.5	104				-5.0	246	247	68	48	-	-
		6	5	0.15	1.15	1360	60	60	73	608.84	612.97	4.13	11.5	101				-5.0	247	253	68	49	-	-
		5	5	0.15	1.15	1362	60	60	74	612.97	617.11	4.14	11.5	101				-5.0	247	246	68	51	-	-
		5	5	0.15	1.15	1369	60	60	75	617.11	621.25	4.14	11.5	101				-5.5	249	251	68	52	-	-
		5	5	0.15	1.16	1362	60	60	77	621.25	625.40	4.15	11.5	101				-5.5	245	253	68	57	-	-
		4	5	0.16	1.23	1369	60	60	77	625.40	629.66	4.26	11.9	101				-5.5	248	250	68	52	-	-
		4	5	0.15	1.16	1371	60	60	79	629.66	633.81	4.15	11.5	101				-5.5	249	256	68	46	-	-
		4	5	0.15	1.16	1372	60	60	80	633.81	637.92	4.11	11.5	100				-5.5	249	255	68	47	-	-
		3	5	0.15	1.16	1369	60	60	81	637.92	642.08	4.16	11.5	102				-5.5	247	254	68	47	-	-
		3	5	0.15	1.17	1370	60	60	83	642.08	646.17	4.09	11.5	100				-5.5	247	247	68	48	-	-
		3	5	0.15	1.17	1373	60	60	84	646.17	650.31	4.14	11.5	101				-5.5	245	251	68	49	-	-
		2	5	0.13	1.05	1315	60	60	86	650.31	654.36	4.05	10.6	105				-5.5	249	249	68	50	-	-
		2	5	0.13	1.04	1320	60	60	86	654.36	658.15	3.79	10.6	98				-5.5	246	250	68	52	-	-
		2	5	0.12	0.97	1316	60	60	88	658.15	661.97	3.82	10.1	103				-5.5	248	251	68	55	-	-
		1	5	0.12	0.97	1314	60	60	89	661.97	665.75	3.78	10.1	102				-5.5	247	246	68	58	-	-
		1	5	0.12	0.97	1318	60	60	90	665.75	669.50	3.75	10.2	101				-5.5	250	251	68	54	-	-
		1	5	0.12	0.97	1318	60	60	91	669.50	673.25	3.75	10.2	101				-5.0	235	253	68	46	-	-
	2	1	5	0.12	0.98	1318	60	60	92	673.25	677.00	3.75	10.2	101				-5.0	250	249	68	43	-	-
		1	5	0.12	0.98	1311	60	60	94	677.00	680.74	3.74	10.1	100				-5.0	249	256	68	43	-	-
		1	5	0.12	0.99	1300	60	60	94	680.74	684.49	3.75	10.1	100				-4.5	249	251	68	44	-	-
		2	5	0.12	0.98	1317	60	60	95	684.49	688.23	3.74	10.1	101				-5.5	250	250	68	46	-	-
		2	5	0.12	0.98	1322	60	60	96	688.23	691.97	3.74	10.2	101				-5.5	246	253	68	48	-	-
		2	5	0.12	0.98	1318	60	60	96	691.97	695.73	3.76	10.2	101				-5.5	247	258	68	50	-	-
		3	5	0.12	0.98	1325	60	60	97	695.73	699.41	3.68	10.2	99				-5.5	250	244	68	52	-	-
		3	5	0.11	0.90	1320	60	60	98	699.41	703.00	3.59	9.7	101				-5.5	249	260	68	56	-	-
		3	5	0.11	0.90	1318	60	60	98	703.00	706.58	3.58	9.7	101				-5.5	249	247	68	58	-	-
		4	5	0.10	0.83	1310	60	60	100	706.58	709.94	3.36	9.2	99				-5.5	248	247	68	52	-	-
		4	5	0.10	0.83	1310	60	60	100	709.94	713.35	3.41	9.2	100				-5.5	249	250	68	45	-	-
		4	5	0.10	0.83	1314	60	60	101	713.35	716.79	3.44	9.3	101				-5.5	248	249	68	44	-	-

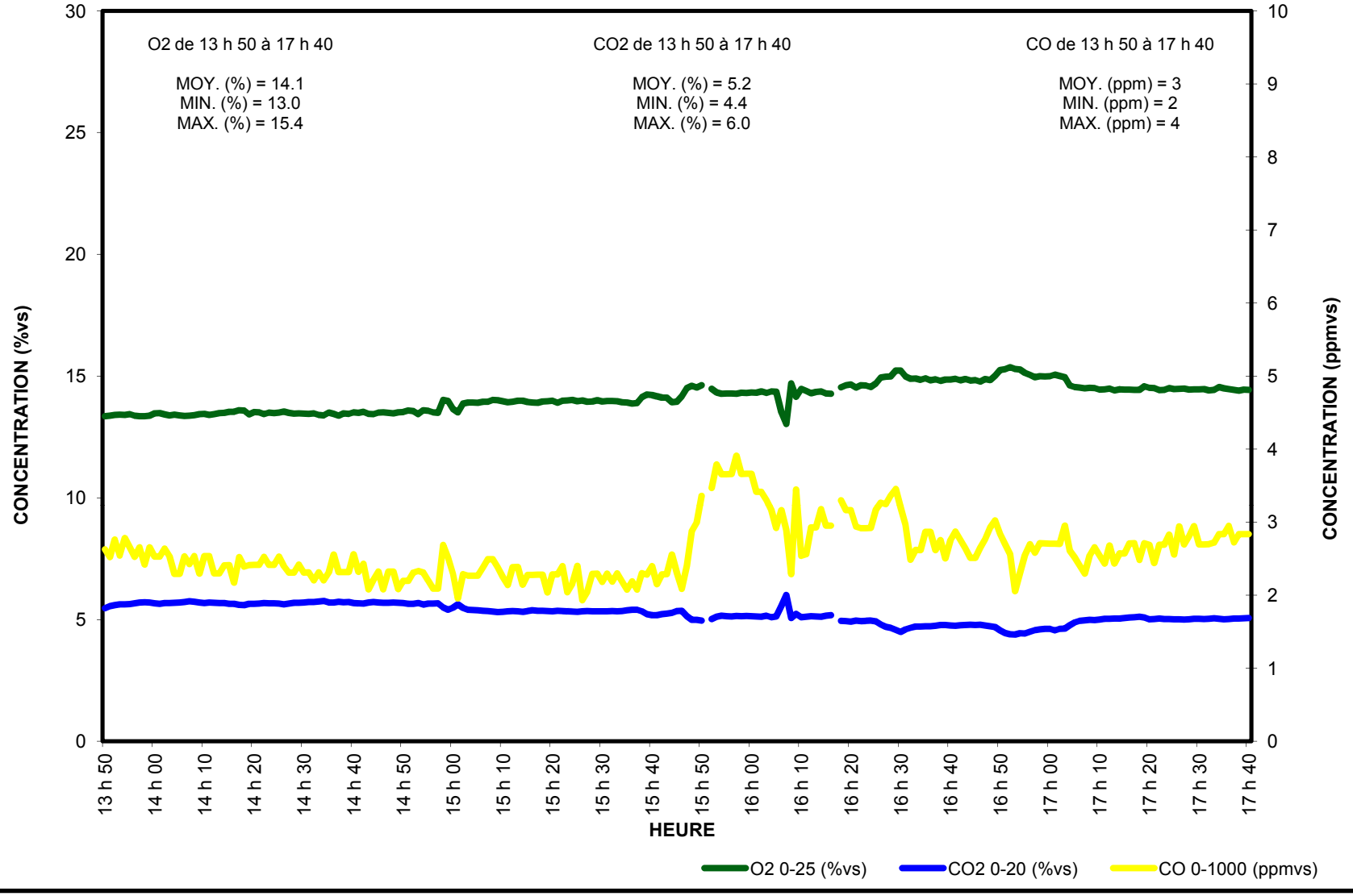
RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-3

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
16 h 13	1	6	5	0.24	1.85	1356	60	60	75	729.20	734.29	5.09	14.5	100	13.6	5.6	3	-4.5	250	251	68	52	-	-
		6	5	0.24	1.83	1377	60	60	76	734.29	739.45	5.16	14.6	102				-4.5	244	252	68	42	-	-
		6	5	0.24	1.82	1386	60	60	76	739.45	744.61	5.16	14.6	102				-4.5	247	252	68	40	-	-
		5	5	0.24	1.83	1385	60	60	78	744.61	749.76	5.15	14.6	102				-4.5	253	250	68	40	-	-
		5	5	0.24	1.82	1405	60	60	79	749.76	754.91	5.15	14.7	102				-4.5	247	253	68	40	-	-
		5	5	0.24	1.81	1410	60	60	80	754.91	760.08	5.17	14.7	103				-4.5	245	247	68	41	-	-
		4	5	0.21	1.63	1366	60	60	81	760.08	764.98	4.90	13.6	103				-4.5	240	247	67	41	-	-
		4	5	0.23	1.77	1380	60	60	82	764.98	770.00	5.02	14.3	101				-4.5	252	252	66	42	-	-
		4	5	0.23	1.77	1387	60	60	82	770.00	775.00	5.00	14.3	101				-4.0	252	243	66	42	-	-
		3	5	0.23	1.76	1396	60	60	83	775.00	780.01	5.01	14.3	101				-4.0	251	262	66	42	-	-
		3	5	0.23	1.76	1403	60	60	84	780.01	785.00	4.99	14.4	101				-4.0	249	250	66	43	-	-
		3	5	0.23	1.75	1409	60	60	84	785.00	789.95	4.95	14.4	100				-4.5	254	244	66	44	-	-
		2	5	0.18	1.39	1382	60	60	84	789.95	794.45	4.50	12.6	102				-4.5	244	251	66	44	-	-
		2	5	0.19	1.48	1381	60	60	86	794.45	799.04	4.59	13.0	102				-4.5	249	250	67	45	-	-
		2	5	0.18	1.40	1387	60	60	87	799.04	803.50	4.46	12.7	102				-4.5	250	251	67	48	-	-
		1	5	0.18	1.40	1380	60	60	87	803.50	807.95	4.45	12.6	101				-4.0	253	250	68	50	-	-
		1	5	0.18	1.39	1400	60	60	88	807.95	812.39	4.44	12.7	101				-4.0	238	250	66	41	-	-
		1	5	0.18	1.38	1410	60	60	89	812.39	816.86	4.47	12.7	102				-4.5	252	253	66	40	-	-
	2	1	5	0.18	1.38	1413	60	60	90	816.86	821.26	4.40	12.8	101				-4.5	250	252	68	40	-	-
		1	5	0.18	1.38	1417	60	60	90	821.26	825.67	4.41	12.8	101				-4.5	250	252	68	47	-	-
		1	5	0.17	1.30	1423	60	60	91	825.67	829.97	4.30	12.4	102				-4.5	245	248	68	49	-	-
		2	5	0.17	1.30	1440	60	60	94	829.97	834.30	4.33	12.5	103				-4.0	247	251	68	49	-	-
		2	5	0.17	1.29	1438	60	60	92	834.30	838.54	4.24	12.5	101				-4.0	252	247	68	49	-	-
		2	5	0.17	1.30	1443	60	60	94	838.54	842.77	4.23	12.5	101				-4.0	249	251	68	51	-	-
		3	5	0.17	1.29	1450	60	60	95	842.77	847.00	4.23	12.5	101				-4.0	250	250	68	51	-	-
		3	5	0.24	1.75	1529	60	60	95	847.00	851.90	4.90	15.2	100				-4.0	243	251	68	54	-	-
		3	5	0.24	1.75	1535	60	60	97	851.90	856.84	4.94	15.2	101				-4.0	245	251	68	54	-	-
		4	5	0.24	1.76	1533	60	60	97	856.84	861.77	4.93	15.2	101				-4.0	253	255	68	56	-	-
		4	5	0.24	1.76	1533	60	60	98	861.77	866.72	4.95	15.2	102				-4.0	241	250	68	56	-	-
		4	5	0.24	1.75	1542	60	60	98	866.72	871.64	4.92	15.2	101				-4.0	252	249	68	56	-	-
		5	5	0.24	1.76	1541	60	60	99	871.64	876.54	4.90	15.2	101				-5.0	248	249	68	56	-	-
		5	5	0.23	1.68	1548	60	60	101	876.54	881.29	4.75	14.9	100				-5.0	251	248	68	51	-	-
		5	5	0.22	1.65	1500	60	60	101	881.29	886.00	4.71	14.4	100				-4.0	252	252	68	50	-	-
		6	5	0.22	1.68	1463	60	60	102	886.00	890.71	4.71	14.3	99				-4.0	254	251	68	51	-	-
		6	5	0.22	1.69	1457	60	60	103	890.71	895.49	4.78	14.3	100				-5.0	254	251	68	54	-	-
		6	5	0.22	1.69	1460	60	60	103	895.49	900.26	4.77	14.3	100				-5.0	248	255	68	55	-	-

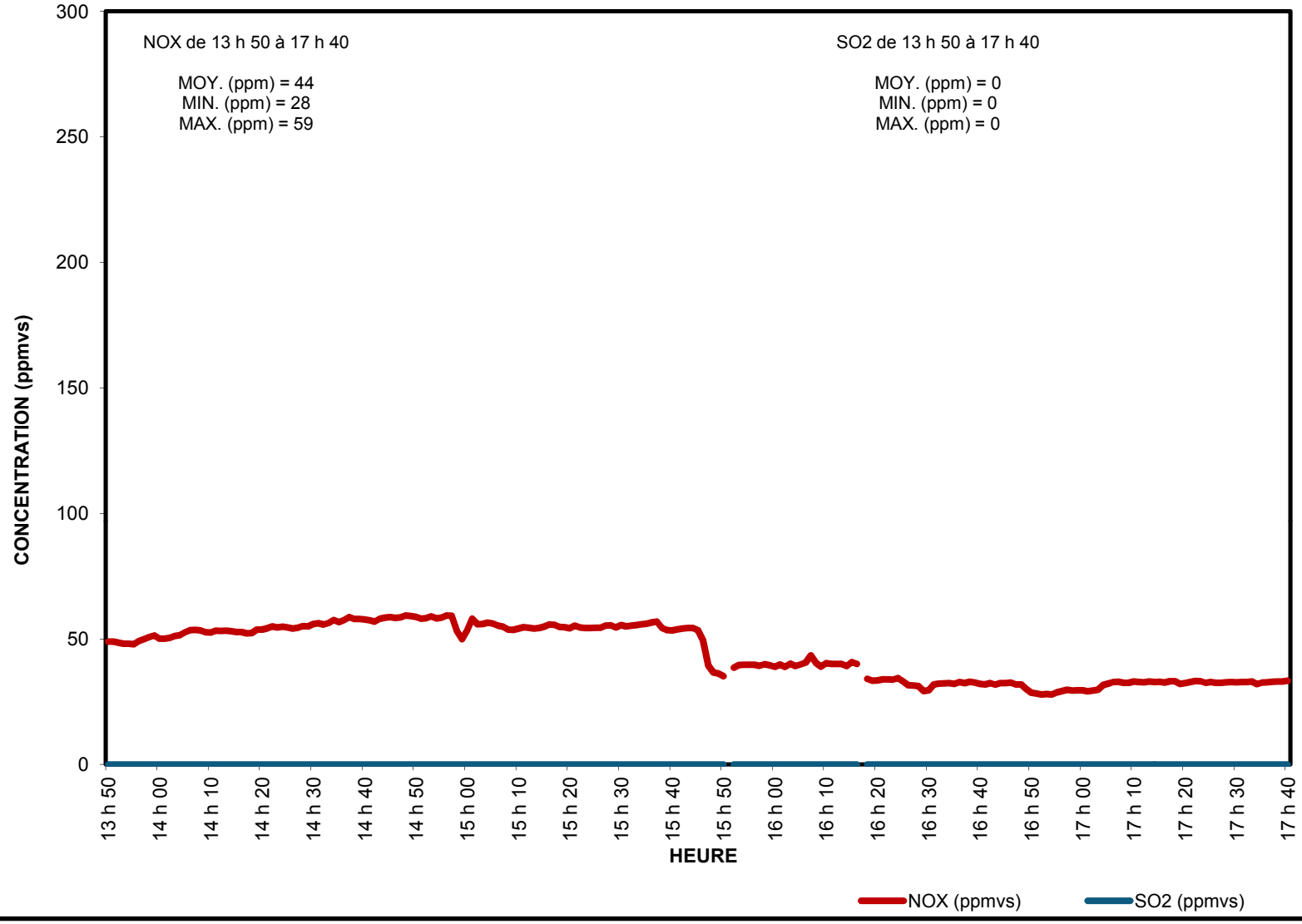
APPENDIX 2
CONTINUOUS MEASUREMENTS OF GAS



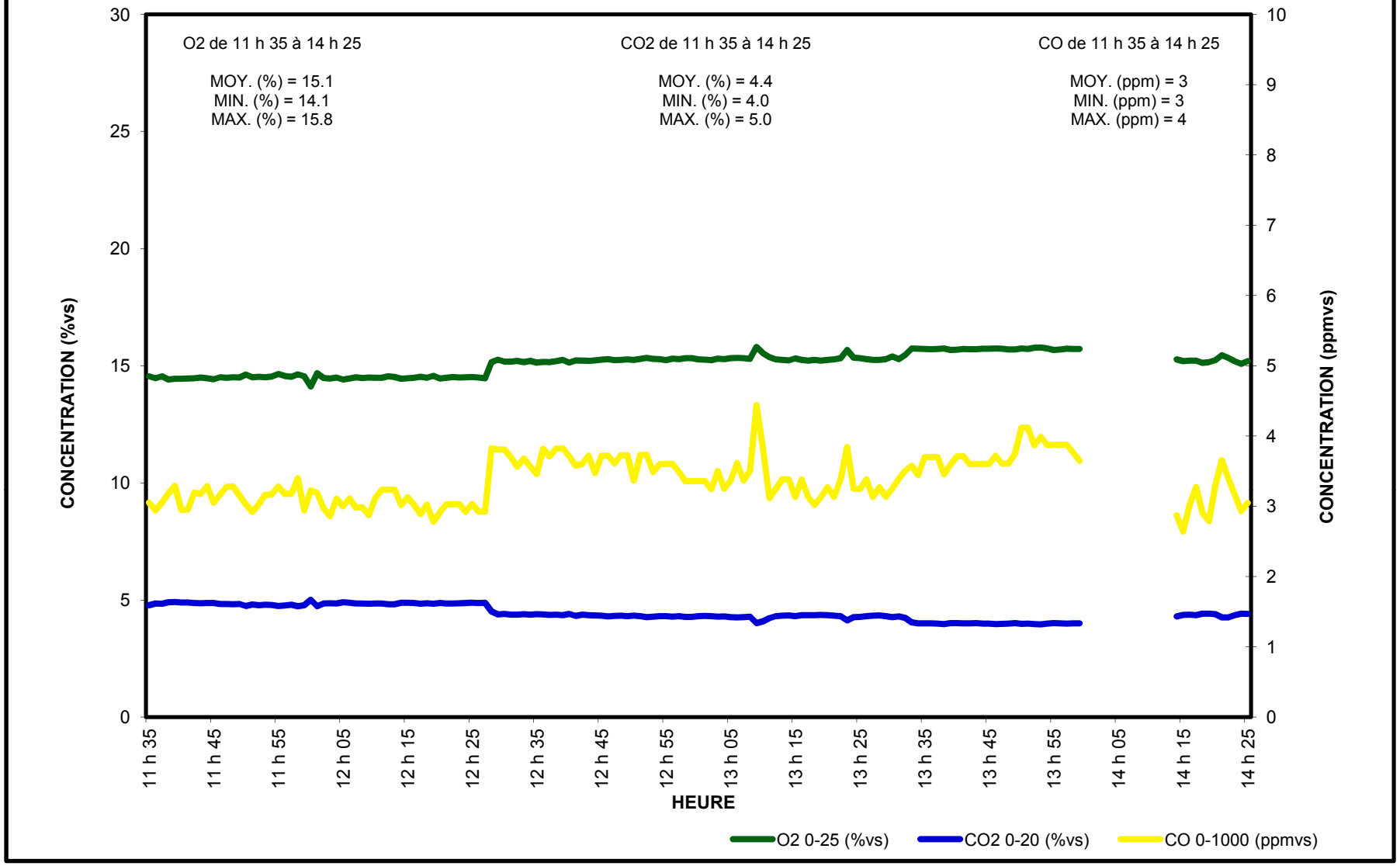
INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 22 SEPTEMBRE 2018 - ESSAI MEL GAZ E1

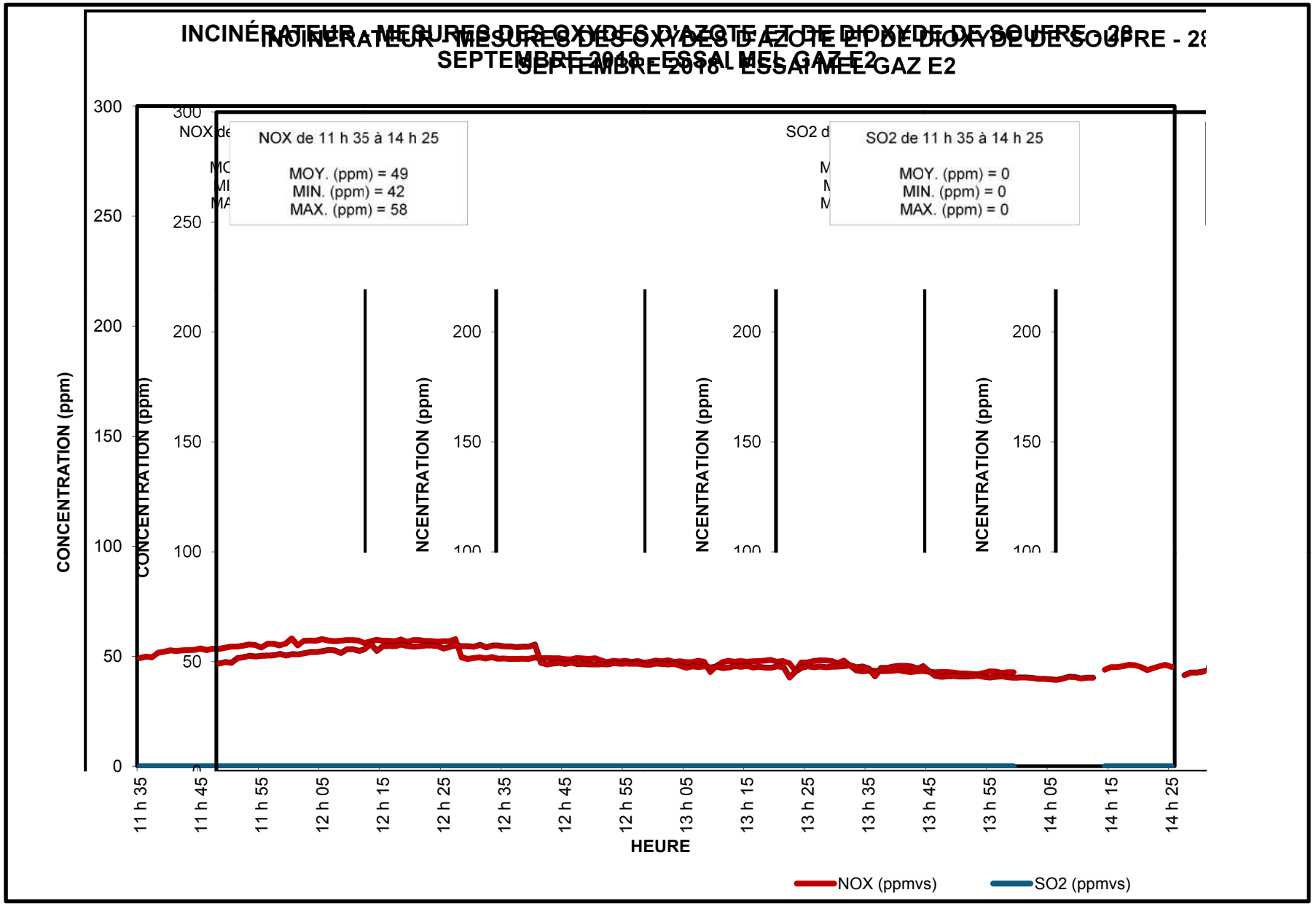


INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 22 SEPTEMBRE 2018 - ESSAI MEL GAZ E1

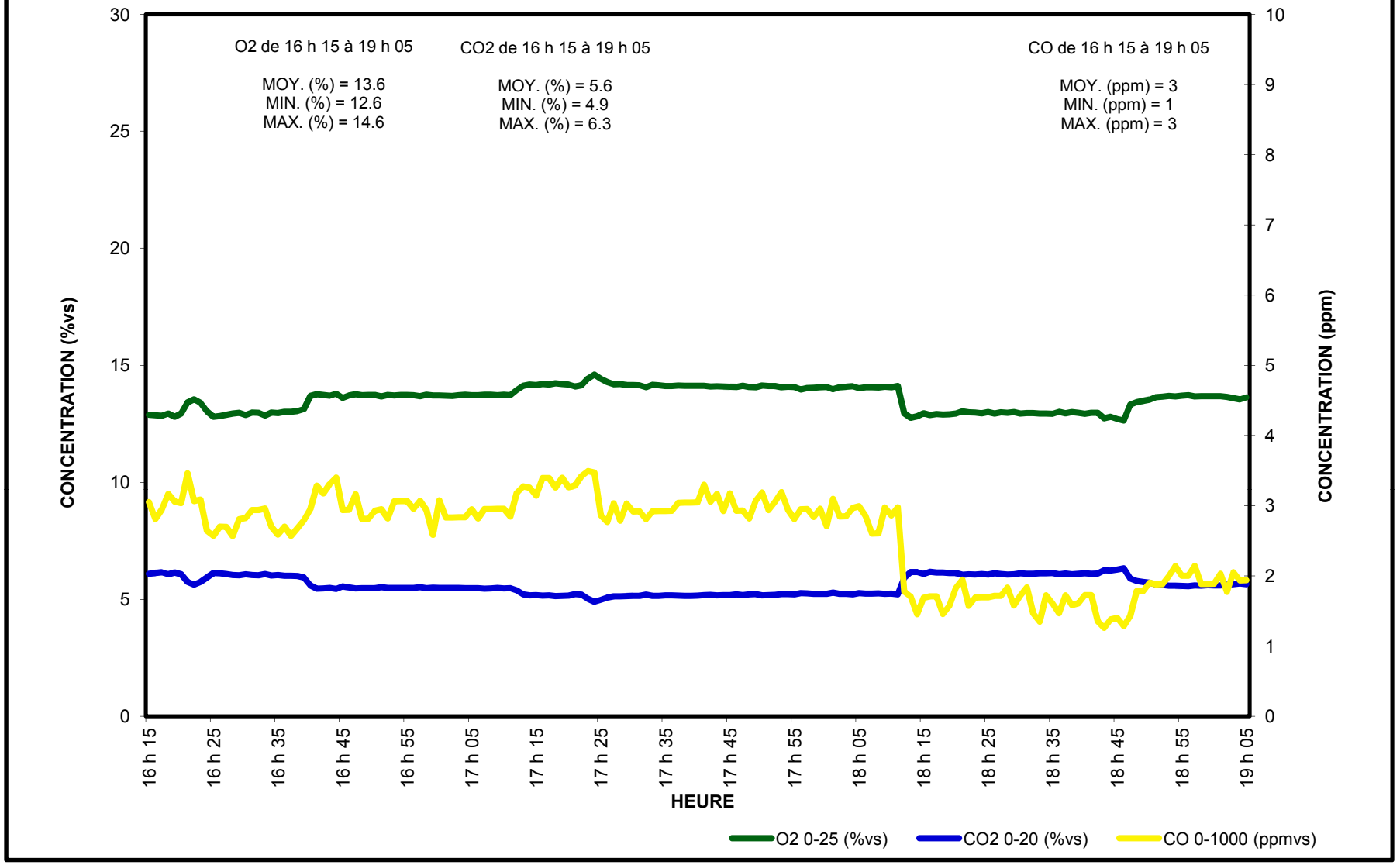


INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 28 SEPTEMBRE 2018 - ESSAI MEL GAZ E2

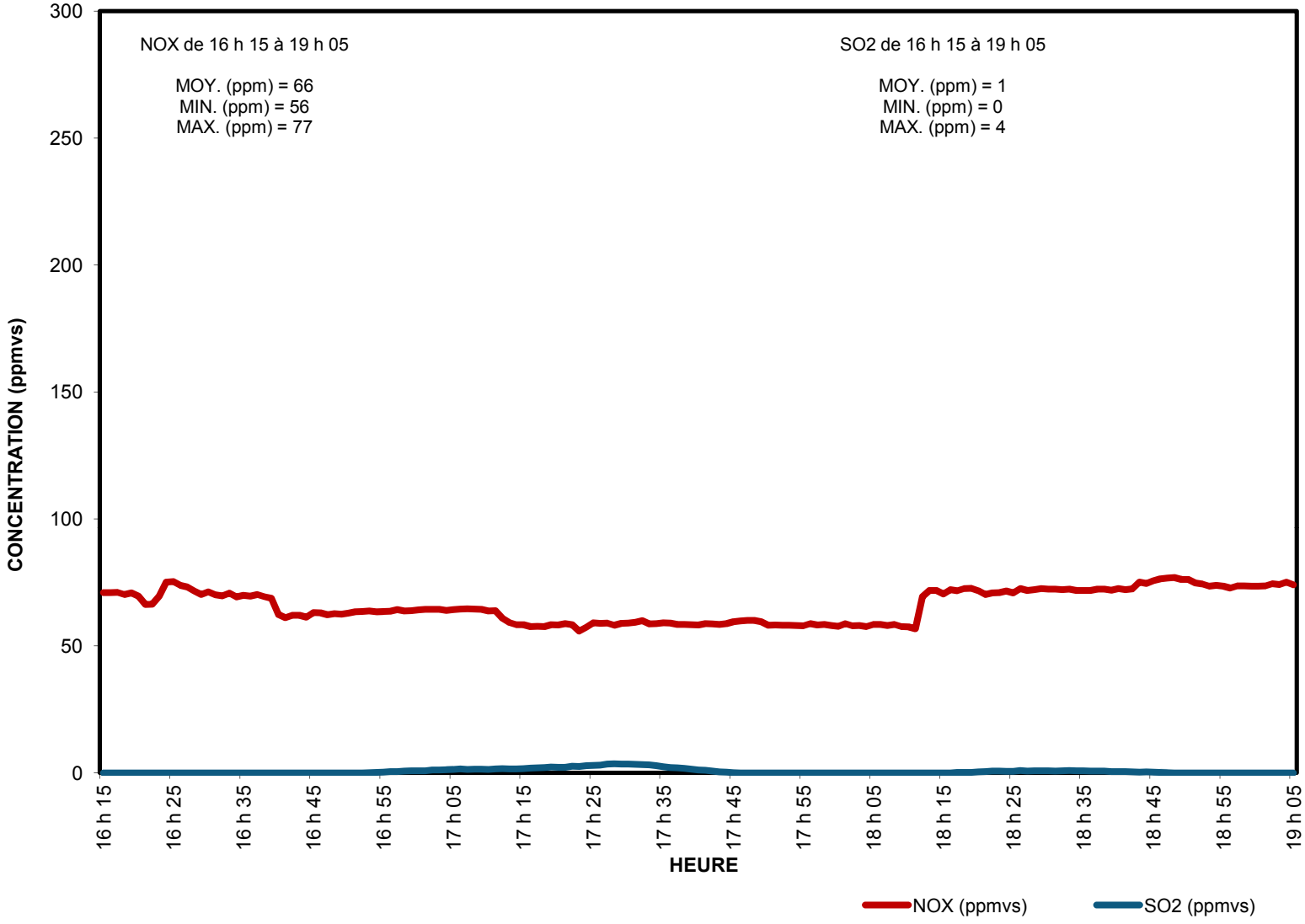



INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 28 SEPTEMBRE 2018 - ESSAI MEL GAZ E2
NOX de 11 h 35 à 14 h 25
MOY. (ppm) = 49
MIN. (ppm) = 42
MAX. (ppm) = 58
SO2 de 11 h 35 à 14 h 25
MOY. (ppm) = 0
MIN. (ppm) = 0
MAX. (ppm) = 0
CONCENTRATION (ppm)
300
250
200
150
100
50
0
11 h 35
11 h 45
11 h 55
12 h 05
12 h 15
12 h 25
12 h 35
12 h 45
12 h 55
13 h 05
13 h 15
13 h 25
13 h 35
13 h 45
13 h 55
14 h 05
14 h 15
14 h 25
HEURE
NOX (ppmvs)
SO2 (ppmvs)

INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 29 SEPTEMBRE 2018 - ESSAI MEL GAZ E3



INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 29 SEPTEMBRE 2018 - ESSAI MEL GAZ E3



	AQ	AR	AS	AT
1		Graphique		
2	**22 sept. 2018**	**2018-09-22**	**2018-09-28**	**2018-09-29**
3	**ESSAIS**	**MEL GAZ E1**	**MEL GAZ E2**	**MEL GAZ E3**
4	**Début**	13 h 50	11 h 35	16 h 15
5	**Fin**	17 h 40	14 h 25	19 h 05
6	**O2 0-25 (%vs) corrigé**	**#1**	**#2**	**#3**
7	**MOY.**	14.1	15.1	13.6
8	**MIN**	13.0	14.1	12.6
9	**MAX**	15.4	15.8	14.6
10	**CO2 0-20 (%vs) corrigé**	**#1**	**#2**	**#3**
11	**MOY.**	5.2	4.4	5.6
12	**MIN**	4.4	4.0	4.9
13	**MAX**	6.0	5.0	6.3
14	**CO 0-1000 (ppmvs) corrigé**	**#1**	**#2**	**#3**
15	**MOY.**	2.6	3.4	2.6
16	**MIN**	1.9	2.6	1.3
17	**MAX**	3.9	4.4	3.5
18	**SO2 (ppmvs) corrigé**	**#1**	**#2**	**#3**
19	**MOY.**	0.0	0.0	0.6
20	**MIN**	0.0	0.0	0.0
21	**MAX**	0.0	0.0	3.6
22	**NOX (ppmvs) corrigé**	**#1**	**#2**	**#3**
23	**MOY.**	44.5	49.3	65.8
24	**MIN**	27.9	41.8	55.8
25	**MAX**	59.4	58.1	76.9

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
7	22-09-2018 13:50:15	13 h 50	13.4	5.5	2.6	0.0	49.0
8	22-09-2018 13:51:15	13 h 51	13.4	5.6	2.5	0.0	49.0
9	22-09-2018 13:52:15	13 h 52	13.4	5.6	2.8	0.0	48.6
10	22-09-2018 13:53:15	13 h 53	13.4	5.6	2.5	0.0	48.1
11	22-09-2018 13:54:15	13 h 54	13.4	5.6	2.8	0.0	48.2
12	22-09-2018 13:55:15	13 h 55	13.4	5.6	2.7	0.0	47.9
13	22-09-2018 13:56:15	13 h 56	13.4	5.7	2.5	0.0	49.2
14	22-09-2018 13:57:15	13 h 57	13.4	5.7	2.7	0.0	49.9
15	22-09-2018 13:58:15	13 h 58	13.4	5.7	2.4	0.0	50.8
16	22-09-2018 13:59:15	13 h 59	13.4	5.7	2.7	0.0	51.4
17	22-09-2018 14:00:15	14 h 00	13.5	5.7	2.5	0.0	50.1
18	22-09-2018 14:01:15	14 h 01	13.5	5.6	2.5	0.0	50.1
19	22-09-2018 14:02:15	14 h 02	13.4	5.7	2.6	0.0	50.4
20	22-09-2018 14:03:15	14 h 03	13.4	5.7	2.5	0.0	51.1
21	22-09-2018 14:04:15	14 h 04	13.4	5.7	2.3	0.0	51.5
22	22-09-2018 14:05:15	14 h 05	13.4	5.7	2.3	0.0	52.6
23	22-09-2018 14:06:15	14 h 06	13.4	5.7	2.5	0.0	53.5
24	22-09-2018 14:07:15	14 h 07	13.4	5.8	2.4	0.0	53.7
25	22-09-2018 14:08:15	14 h 08	13.4	5.7	2.5	0.0	53.4
26	22-09-2018 14:09:15	14 h 09	13.4	5.7	2.3	0.0	52.7
27	22-09-2018 14:10:15	14 h 10	13.4	5.7	2.5	0.0	52.6
28	22-09-2018 14:11:15	14 h 11	13.4	5.7	2.5	0.0	53.3
29	22-09-2018 14:12:15	14 h 12	13.4	5.7	2.3	0.0	53.2
30	22-09-2018 14:13:15	14 h 13	13.5	5.7	2.3	0.0	53.3
31	22-09-2018 14:14:15	14 h 14	13.5	5.7	2.4	0.0	53.0
32	22-09-2018 14:15:15	14 h 15	13.5	5.7	2.4	0.0	52.8
33	22-09-2018 14:16:15	14 h 16	13.5	5.6	2.2	0.0	52.8
34	22-09-2018 14:17:15	14 h 17	13.6	5.6	2.5	0.0	52.2
35	22-09-2018 14:18:15	14 h 18	13.6	5.6	2.4	0.0	52.4
36	22-09-2018 14:19:15	14 h 19	13.4	5.6	2.4	0.0	53.7
37	22-09-2018 14:20:15	14 h 20	13.5	5.7	2.4	0.0	53.7
38	22-09-2018 14:21:15	14 h 21	13.5	5.7	2.4	0.0	54.3
39	22-09-2018 14:22:15	14 h 22	13.4	5.7	2.5	0.0	55.0
40	22-09-2018 14:23:15	14 h 23	13.5	5.7	2.4	0.0	54.6
41	22-09-2018 14:24:15	14 h 24	13.5	5.7	2.4	0.0	54.9
42	22-09-2018 14:25:15	14 h 25	13.5	5.7	2.5	0.0	54.6
43	22-09-2018 14:26:15	14 h 26	13.5	5.6	2.4	0.0	54.2
44	22-09-2018 14:27:15	14 h 27	13.5	5.7	2.3	0.0	54.5
45	22-09-2018 14:28:15	14 h 28	13.5	5.7	2.3	0.0	55.1
46	22-09-2018 14:29:15	14 h 29	13.5	5.7	2.4	0.0	55.0
47	22-09-2018 14:30:15	14 h 30	13.5	5.7	2.3	0.0	56.0
48	22-09-2018 14:31:15	14 h 31	13.4	5.7	2.3	0.0	56.3
49	22-09-2018 14:32:15	14 h 32	13.5	5.7	2.2	0.0	55.7
50	22-09-2018 14:33:15	14 h 33	13.4	5.7	2.3	0.0	56.3
51	22-09-2018 14:34:15	14 h 34	13.4	5.8	2.2	0.0	57.5
52	22-09-2018 14:35:15	14 h 35	13.5	5.7	2.3	0.0	56.6
53	22-09-2018 14:36:15	14 h 36	13.4	5.7	2.6	0.0	57.5
54	22-09-2018 14:37:15	14 h 37	13.4	5.7	2.3	0.0	58.7
55	22-09-2018 14:38:15	14 h 38	13.5	5.7	2.3	0.0	58.0
56	22-09-2018 14:39:15	14 h 39	13.4	5.7	2.3	0.0	58.0
57	22-09-2018 14:40:15	14 h 40	13.5	5.7	2.6	0.0	57.7
58	22-09-2018 14:41:15	14 h 41	13.5	5.7	2.3	0.0	57.5
59	22-09-2018 14:42:15	14 h 42	13.5	5.7	2.4	0.0	56.9
60	22-09-2018 14:43:15	14 h 43	13.5	5.7	2.1	0.0	58.1
61	22-09-2018 14:44:15	14 h 44	13.4	5.7	2.2	0.0	58.5
62	22-09-2018 14:45:15	14 h 45	13.5	5.7	2.3	0.0	58.7
63	22-09-2018 14:46:15	14 h 46	13.5	5.7	2.1	0.0	58.4
64	22-09-2018 14:47:15	14 h 47	13.5	5.7	2.3	0.0	58.6
65	22-09-2018 14:48:15	14 h 48	13.5	5.7	2.3	0.0	59.4
66	22-09-2018 14:49:15	14 h 49	13.5	5.7	2.1	0.0	59.1
67	22-09-2018 14:50:15	14 h 50	13.5	5.7	2.2	0.0	58.8
68	22-09-2018 14:51:15	14 h 51	13.6	5.7	2.2	0.0	58.1
69	22-09-2018 14:52:15	14 h 52	13.6	5.6	2.3	0.0	58.3
70	22-09-2018 14:53:15	14 h 53	13.4	5.7	2.3	0.0	59.0
71	22-09-2018 14:54:15	14 h 54	13.6	5.6	2.3	0.0	58.2
72	22-09-2018 14:55:15	14 h 55	13.6	5.7	2.2	0.0	58.5
73	22-09-2018 14:56:15	14 h 56	13.5	5.7	2.1	0.0	59.4

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
74	22-09-2018 14:57:15	14 h 57	13.5	5.7	2.1	0.0	59.2
75	22-09-2018 14:58:15	14 h 58	14.0	5.5	2.7	0.0	53.1
76	22-09-2018 14:59:15	14 h 59	14.0	5.4	2.5	0.0	49.9
77	22-09-2018 15:00:15	15 h 00	13.6	5.5	2.3	0.0	53.4
78	22-09-2018 15:01:15	15 h 01	13.5	5.6	2.0	0.0	58.0
79	22-09-2018 15:02:15	15 h 02	13.9	5.5	2.3	0.0	55.8
80	22-09-2018 15:03:15	15 h 03	13.9	5.4	2.3	0.0	56.0
81	22-09-2018 15:04:15	15 h 04	13.9	5.4	2.3	0.0	56.4
82	22-09-2018 15:05:15	15 h 05	13.9	5.4	2.3	0.0	56.2
83	22-09-2018 15:06:15	15 h 06	13.9	5.4	2.4	0.0	55.3
84	22-09-2018 15:07:15	15 h 07	14.0	5.4	2.5	0.0	54.9
85	22-09-2018 15:08:15	15 h 08	14.0	5.3	2.5	0.0	53.8
86	22-09-2018 15:09:15	15 h 09	14.0	5.3	2.4	0.0	53.6
87	22-09-2018 15:10:15	15 h 10	14.0	5.3	2.3	0.0	54.1
88	22-09-2018 15:11:15	15 h 11	13.9	5.3	2.1	0.0	54.7
89	22-09-2018 15:12:15	15 h 12	14.0	5.4	2.4	0.0	54.5
90	22-09-2018 15:13:15	15 h 13	14.0	5.3	2.4	0.0	54.2
91	22-09-2018 15:14:15	15 h 14	14.0	5.3	2.1	0.0	54.4
92	22-09-2018 15:15:15	15 h 15	13.9	5.3	2.3	0.0	54.9
93	22-09-2018 15:16:15	15 h 16	13.9	5.4	2.3	0.0	55.8
94	22-09-2018 15:17:15	15 h 17	13.9	5.4	2.3	0.0	55.6
95	22-09-2018 15:18:15	15 h 18	14.0	5.4	2.3	0.0	54.8
96	22-09-2018 15:19:15	15 h 19	14.0	5.4	2.0	0.0	54.7
97	22-09-2018 15:20:15	15 h 20	14.0	5.3	2.3	0.0	54.2
98	22-09-2018 15:21:15	15 h 21	13.9	5.4	2.3	0.0	55.3
99	22-09-2018 15:22:15	15 h 22	14.0	5.4	2.4	0.0	54.6
100	22-09-2018 15:23:15	15 h 23	14.0	5.3	2.0	0.0	54.3
101	22-09-2018 15:24:15	15 h 24	14.0	5.3	2.2	0.0	54.3
102	22-09-2018 15:25:15	15 h 25	14.0	5.3	2.4	0.0	54.5
103	22-09-2018 15:26:15	15 h 26	14.0	5.3	1.9	0.0	54.5
104	22-09-2018 15:27:15	15 h 27	13.9	5.3	2.0	0.0	55.3
105	22-09-2018 15:28:15	15 h 28	14.0	5.3	2.3	0.0	55.4
106	22-09-2018 15:29:15	15 h 29	14.0	5.3	2.3	0.0	54.6
107	22-09-2018 15:30:15	15 h 30	14.0	5.3	2.2	0.0	55.5
108	22-09-2018 15:31:15	15 h 31	14.0	5.3	2.3	0.0	55.0
109	22-09-2018 15:32:15	15 h 32	14.0	5.3	2.2	0.0	55.3
110	22-09-2018 15:33:15	15 h 33	14.0	5.3	2.3	0.0	55.5
111	22-09-2018 15:34:15	15 h 34	13.9	5.3	2.2	0.0	55.8
112	22-09-2018 15:35:15	15 h 35	13.9	5.4	2.1	0.0	56.1
113	22-09-2018 15:36:15	15 h 36	13.9	5.4	2.2	0.0	56.6
114	22-09-2018 15:37:15	15 h 37	13.9	5.4	2.1	0.0	56.9
115	22-09-2018 15:38:15	15 h 38	14.1	5.3	2.3	0.0	54.4
116	22-09-2018 15:39:15	15 h 39	14.2	5.2	2.3	0.0	53.5
117	22-09-2018 15:40:15	15 h 40	14.2	5.2	2.4	0.0	53.4
118	22-09-2018 15:41:15	15 h 41	14.2	5.2	2.2	0.0	53.9
119	22-09-2018 15:42:15	15 h 42	14.1	5.2	2.3	0.0	54.2
120	22-09-2018 15:43:15	15 h 43	14.1	5.2	2.3	0.0	54.4
121	22-09-2018 15:44:15	15 h 44	13.9	5.3	2.6	0.0	54.4
122	22-09-2018 15:45:15	15 h 45	13.9	5.4	2.3	0.0	53.5
123	22-09-2018 15:46:15	15 h 46	14.2	5.4	2.1	0.0	49.5
124	22-09-2018 15:47:15	15 h 47	14.5	5.1	2.4	0.0	39.5
125	22-09-2018 15:48:15	15 h 48	14.6	5.0	2.9	0.0	36.6
126	22-09-2018 15:49:15	15 h 49	14.5	5.0	3.0	0.0	36.2
127	22-09-2018 15:50:15	15 h 50	14.6	5.0	3.4	0.0	35.2
128	22-09-2018 15:51:15	15 h 51					
129	22-09-2018 15:52:15	15 h 52	14.5	5.0	3.5	0.0	38.6
130	22-09-2018 15:53:15	15 h 53	14.3	5.1	3.8	0.0	39.7
131	22-09-2018 15:54:15	15 h 54	14.3	5.2	3.7	0.0	39.8
132	22-09-2018 15:55:15	15 h 55	14.3	5.1	3.7	0.0	39.8
133	22-09-2018 15:56:15	15 h 56	14.3	5.1	3.7	0.0	39.8
134	22-09-2018 15:57:15	15 h 57	14.3	5.2	3.9	0.0	39.3
135	22-09-2018 15:58:15	15 h 58	14.3	5.1	3.7	0.0	39.9
136	22-09-2018 15:59:15	15 h 59	14.3	5.2	3.7	0.0	39.5
137	22-09-2018 16:00:15	16 h 00	14.3	5.1	3.7	0.0	38.9
138	22-09-2018 16:01:15	16 h 01	14.3	5.1	3.4	0.0	39.8
139	22-09-2018 16:02:15	16 h 02	14.4	5.1	3.4	0.0	38.9
140	22-09-2018 16:03:15	16 h 03	14.3	5.2	3.3	0.0	40.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
141	22-09-2018 16:04:15	16 h 04	14.4	5.1	3.2	0.0	39.2
142	22-09-2018 16:05:15	16 h 05	14.4	5.1	2.9	0.0	39.8
143	22-09-2018 16:06:15	16 h 06	13.5	5.6	3.2	0.0	40.6
144	22-09-2018 16:07:15	16 h 07	13.0	6.0	2.9	0.0	43.4
145	22-09-2018 16:08:15	16 h 08	14.7	5.1	2.3	0.0	40.5
146	22-09-2018 16:09:15	16 h 09	14.1	5.2	3.4	0.0	39.0
147	22-09-2018 16:10:15	16 h 10	14.5	5.1	2.5	0.0	40.3
148	22-09-2018 16:11:15	16 h 11	14.4	5.1	2.6	0.0	40.0
149	22-09-2018 16:12:15	16 h 12	14.3	5.1	2.9	0.0	40.0
150	22-09-2018 16:13:15	16 h 13	14.3	5.1	2.9	0.0	40.1
151	22-09-2018 16:14:15	16 h 14	14.4	5.1	3.2	0.0	39.2
152	22-09-2018 16:15:15	16 h 15	14.3	5.2	3.0	0.0	40.8
153	22-09-2018 16:16:15	16 h 16	14.3	5.2	3.0	0.0	40.1
154	22-09-2018 16:17:15	16 h 17					
155	22-09-2018 16:18:15	16 h 18	14.5	4.9	3.3	0.0	34.2
156	22-09-2018 16:19:15	16 h 19	14.6	4.9	3.2	0.0	33.4
157	22-09-2018 16:20:15	16 h 20	14.7	4.9	3.2	0.0	33.5
158	22-09-2018 16:21:15	16 h 21	14.5	5.0	2.9	0.0	33.9
159	22-09-2018 16:22:15	16 h 22	14.6	4.9	2.9	0.0	33.9
160	22-09-2018 16:23:15	16 h 23	14.6	5.0	2.9	0.0	33.8
161	22-09-2018 16:24:15	16 h 24	14.6	5.0	2.9	0.0	34.4
162	22-09-2018 16:25:15	16 h 25	14.7	4.9	3.2	0.0	33.1
163	22-09-2018 16:26:15	16 h 26	14.9	4.8	3.3	0.0	31.6
164	22-09-2018 16:27:15	16 h 27	15.0	4.7	3.2	0.0	31.5
165	22-09-2018 16:28:15	16 h 28	15.0	4.7	3.4	0.0	31.3
166	22-09-2018 16:29:15	16 h 29	15.2	4.6	3.5	0.0	29.2
167	22-09-2018 16:30:15	16 h 30	15.2	4.5	3.2	0.0	29.6
168	22-09-2018 16:31:15	16 h 31	15.0	4.6	3.0	0.0	31.9
169	22-09-2018 16:32:15	16 h 32	14.9	4.7	2.5	0.0	32.2
170	22-09-2018 16:33:15	16 h 33	14.9	4.7	2.6	0.0	32.3
171	22-09-2018 16:34:15	16 h 34	14.8	4.7	2.6	0.0	32.4
172	22-09-2018 16:35:15	16 h 35	14.9	4.7	2.9	0.0	32.1
173	22-09-2018 16:36:15	16 h 36	14.8	4.7	2.9	0.0	32.9
174	22-09-2018 16:37:15	16 h 37	14.9	4.8	2.6	0.0	32.4
175	22-09-2018 16:38:15	16 h 38	14.8	4.8	2.8	0.0	32.9
176	22-09-2018 16:39:15	16 h 39	14.9	4.8	2.5	0.0	32.6
177	22-09-2018 16:40:15	16 h 40	14.9	4.8	2.8	0.0	32.1
178	22-09-2018 16:41:15	16 h 41	14.9	4.8	2.9	0.0	31.9
179	22-09-2018 16:42:15	16 h 42	14.8	4.8	2.8	0.0	32.4
180	22-09-2018 16:43:15	16 h 43	14.9	4.8	2.6	0.0	31.8
181	22-09-2018 16:44:15	16 h 44	14.8	4.8	2.5	0.0	32.4
182	22-09-2018 16:45:15	16 h 45	14.8	4.8	2.5	0.0	32.4
183	22-09-2018 16:46:15	16 h 46	14.8	4.8	2.7	0.0	32.6
184	22-09-2018 16:47:15	16 h 47	14.9	4.8	2.8	0.0	31.9
185	22-09-2018 16:48:15	16 h 48	14.8	4.7	2.9	0.0	31.9
186	22-09-2018 16:49:15	16 h 49	15.0	4.7	3.0	0.0	30.1
187	22-09-2018 16:50:15	16 h 50	15.2	4.6	2.8	0.0	28.6
188	22-09-2018 16:51:15	16 h 51	15.3	4.5	2.7	0.0	28.3
189	22-09-2018 16:52:15	16 h 52	15.4	4.4	2.6	0.0	27.9
190	22-09-2018 16:53:15	16 h 53	15.3	4.4	2.1	0.0	28.1
191	22-09-2018 16:54:15	16 h 54	15.3	4.4	2.3	0.0	27.9
192	22-09-2018 16:55:15	16 h 55	15.1	4.4	2.5	0.0	28.7
193	22-09-2018 16:56:15	16 h 56	15.1	4.5	2.7	0.0	29.2
194	22-09-2018 16:57:15	16 h 57	14.9	4.6	2.6	0.0	29.8
195	22-09-2018 16:58:15	16 h 58	15.0	4.6	2.7	0.0	29.5
196	22-09-2018 16:59:15	16 h 59	15.0	4.6	2.7	0.0	29.6
197	22-09-2018 17:00:15	17 h 00	15.0	4.6	2.7	0.0	29.6
198	22-09-2018 17:01:15	17 h 01	15.1	4.6	2.7	0.0	29.2
199	22-09-2018 17:02:15	17 h 02	15.0	4.6	2.7	0.0	29.5
200	22-09-2018 17:03:15	17 h 03	15.0	4.6	3.0	0.0	29.8
201	22-09-2018 17:04:15	17 h 04	14.6	4.8	2.6	0.0	31.7
202	22-09-2018 17:05:15	17 h 05	14.5	4.9	2.5	0.0	32.2
203	22-09-2018 17:06:15	17 h 06	14.5	4.9	2.4	0.0	32.8
204	22-09-2018 17:07:15	17 h 07	14.5	5.0	2.3	0.0	33.0
205	22-09-2018 17:08:15	17 h 08	14.5	5.0	2.5	0.0	32.5
206	22-09-2018 17:09:15	17 h 09	14.5	5.0	2.7	0.0	32.6
207	22-09-2018 17:10:15	17 h 10	14.4	5.0	2.5	0.0	33.0

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
208	22-09-2018 17:11:15	17 h 11	14.5	5.0	2.4	0.0	32.9
209	22-09-2018 17:12:15	17 h 12	14.5	5.0	2.7	0.0	32.8
210	22-09-2018 17:13:15	17 h 13	14.4	5.0	2.4	0.0	33.1
211	22-09-2018 17:14:15	17 h 14	14.5	5.0	2.6	0.0	32.8
212	22-09-2018 17:15:15	17 h 15	14.4	5.1	2.6	0.0	33.0
213	22-09-2018 17:16:15	17 h 16	14.4	5.1	2.7	0.0	32.7
214	22-09-2018 17:17:15	17 h 17	14.4	5.1	2.7	0.0	33.1
215	22-09-2018 17:18:15	17 h 18	14.4	5.1	2.5	0.0	33.2
216	22-09-2018 17:19:15	17 h 19	14.6	5.1	2.7	0.0	32.1
217	22-09-2018 17:20:15	17 h 20	14.5	5.0	2.7	0.0	32.4
218	22-09-2018 17:21:15	17 h 21	14.5	5.0	2.4	0.0	32.9
219	22-09-2018 17:22:15	17 h 22	14.4	5.0	2.7	0.0	33.3
220	22-09-2018 17:23:15	17 h 23	14.4	5.0	2.7	0.0	33.2
221	22-09-2018 17:24:15	17 h 24	14.5	5.0	2.8	0.0	32.6
222	22-09-2018 17:25:15	17 h 25	14.5	5.0	2.6	0.0	32.9
223	22-09-2018 17:26:15	17 h 26	14.5	5.0	2.9	0.0	32.6
224	22-09-2018 17:27:15	17 h 27	14.5	5.0	2.7	0.0	32.6
225	22-09-2018 17:28:15	17 h 28	14.4	5.0	2.8	0.0	32.7
226	22-09-2018 17:29:15	17 h 29	14.5	5.0	2.9	0.0	32.9
227	22-09-2018 17:30:15	17 h 30	14.5	5.0	2.7	0.0	32.7
228	22-09-2018 17:31:15	17 h 31	14.5	5.0	2.7	0.0	32.9
229	22-09-2018 17:32:15	17 h 32	14.4	5.0	2.7	0.0	32.9
230	22-09-2018 17:33:15	17 h 33	14.4	5.1	2.7	0.0	33.0
231	22-09-2018 17:34:15	17 h 34	14.6	5.0	2.8	0.0	32.0
232	22-09-2018 17:35:15	17 h 35	14.5	5.0	2.8	0.0	32.6
233	22-09-2018 17:36:15	17 h 36	14.5	5.0	3.0	0.0	32.8
234	22-09-2018 17:37:15	17 h 37	14.4	5.0	2.7	0.0	32.9
235	22-09-2018 17:38:15	17 h 38	14.4	5.0	2.8	0.0	33.1
236	22-09-2018 17:39:15	17 h 39	14.4	5.1	2.8	0.0	33.1
237	22-09-2018 17:40:15	17 h 40	14.4	5.1	2.8	0.0	33.4
238	28-09-2018 11:35:51	11 h 35	14.6	4.8	3.1	0.0	49.2
239	28-09-2018 11:36:51	11 h 36	14.5	4.9	2.9	0.0	49.8
240	28-09-2018 11:37:51	11 h 37	14.6	4.8	3.1	0.0	49.5
241	28-09-2018 11:38:51	11 h 38	14.4	4.9	3.2	0.0	51.6
242	28-09-2018 11:39:51	11 h 39	14.4	4.9	3.3	0.0	52.1
243	28-09-2018 11:40:51	11 h 40	14.4	4.9	3.0	0.0	52.7
244	28-09-2018 11:41:51	11 h 41	14.5	4.9	3.0	0.0	52.3
245	28-09-2018 11:42:51	11 h 42	14.5	4.9	3.2	0.0	52.7
246	28-09-2018 11:43:51	11 h 43	14.5	4.9	3.2	0.0	52.8
247	28-09-2018 11:44:51	11 h 44	14.5	4.9	3.3	0.0	52.8
248	28-09-2018 11:45:51	11 h 45	14.4	4.9	3.1	0.0	53.5
249	28-09-2018 11:46:51	11 h 46	14.5	4.8	3.2	0.0	52.8
250	28-09-2018 11:47:51	11 h 47	14.5	4.8	3.3	0.0	53.4
251	28-09-2018 11:48:51	11 h 48	14.5	4.8	3.3	0.0	53.3
252	28-09-2018 11:49:51	11 h 49	14.5	4.8	3.2	0.0	53.8
253	28-09-2018 11:50:51	11 h 50	14.6	4.8	3.0	0.0	54.3
254	28-09-2018 11:51:51	11 h 51	14.5	4.8	2.9	0.0	54.4
255	28-09-2018 11:52:51	11 h 52	14.5	4.8	3.0	0.0	54.8
256	28-09-2018 11:53:51	11 h 53	14.5	4.8	3.2	0.0	55.3
257	28-09-2018 11:54:51	11 h 54	14.5	4.8	3.2	0.0	55.1
258	28-09-2018 11:55:51	11 h 55	14.6	4.7	3.3	0.0	54.0
259	28-09-2018 11:56:51	11 h 56	14.6	4.8	3.2	0.0	55.6
260	28-09-2018 11:57:51	11 h 57	14.5	4.8	3.2	0.0	55.6
261	28-09-2018 11:58:51	11 h 58	14.6	4.7	3.4	0.0	54.9
262	28-09-2018 11:59:51	11 h 59	14.6	4.8	2.9	0.0	55.7
263	28-09-2018 12:00:51	12 h 00	14.1	5.0	3.2	0.0	58.1
264	28-09-2018 12:01:51	12 h 01	14.7	4.7	3.2	0.0	54.9
265	28-09-2018 12:02:51	12 h 02	14.5	4.8	3.0	0.0	57.0
266	28-09-2018 12:03:51	12 h 03	14.4	4.9	2.9	0.0	57.1
267	28-09-2018 12:04:51	12 h 04	14.5	4.9	3.1	0.0	57.0
268	28-09-2018 12:05:51	12 h 05	14.4	4.9	3.0	0.0	57.8
269	28-09-2018 12:06:51	12 h 06	14.5	4.9	3.1	0.0	57.1
270	28-09-2018 12:07:51	12 h 07	14.5	4.9	3.0	0.0	56.8
271	28-09-2018 12:08:51	12 h 08	14.5	4.9	3.0	0.0	57.0
272	28-09-2018 12:09:51	12 h 09	14.5	4.8	2.9	0.0	57.3
273	28-09-2018 12:10:51	12 h 10	14.5	4.9	3.1	0.0	57.3
274	28-09-2018 12:11:51	12 h 11	14.5	4.9	3.2	0.0	57.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
275	28-09-2018 12:12:51	12 h 12	14.6	4.8	3.2	0.0	55.9
276	28-09-2018 12:13:51	12 h 13	14.5	4.8	3.2	0.0	56.7
277	28-09-2018 12:14:51	12 h 14	14.4	4.9	3.0	0.0	57.5
278	28-09-2018 12:15:51	12 h 15	14.5	4.9	3.1	0.0	57.0
279	28-09-2018 12:16:51	12 h 16	14.5	4.9	3.0	0.0	57.1
280	28-09-2018 12:17:51	12 h 17	14.5	4.8	2.9	0.0	56.8
281	28-09-2018 12:18:51	12 h 18	14.5	4.9	3.0	0.0	57.7
282	28-09-2018 12:19:51	12 h 19	14.6	4.8	2.8	0.0	56.5
283	28-09-2018 12:20:51	12 h 20	14.5	4.9	2.9	0.0	57.3
284	28-09-2018 12:21:51	12 h 21	14.5	4.9	3.0	0.0	57.3
285	28-09-2018 12:22:51	12 h 22	14.5	4.9	3.0	0.0	56.9
286	28-09-2018 12:23:51	12 h 23	14.5	4.9	3.0	0.0	56.9
287	28-09-2018 12:24:51	12 h 24	14.5	4.9	2.9	0.0	56.6
288	28-09-2018 12:25:51	12 h 25	14.5	4.9	3.0	0.0	56.8
289	28-09-2018 12:26:51	12 h 26	14.5	4.9	2.9	0.0	56.8
290	28-09-2018 12:27:51	12 h 27	14.5	4.9	2.9	0.0	57.7
291	28-09-2018 12:28:51	12 h 28	15.1	4.5	3.8	0.0	49.5
292	28-09-2018 12:29:51	12 h 29	15.3	4.4	3.8	0.0	48.8
293	28-09-2018 12:30:51	12 h 30	15.2	4.4	3.8	0.0	49.2
294	28-09-2018 12:31:51	12 h 31	15.2	4.4	3.7	0.0	49.5
295	28-09-2018 12:32:51	12 h 32	15.2	4.4	3.6	0.0	48.9
296	28-09-2018 12:33:51	12 h 33	15.1	4.4	3.7	0.0	49.5
297	28-09-2018 12:34:51	12 h 34	15.2	4.4	3.6	0.0	48.8
298	28-09-2018 12:35:51	12 h 35	15.1	4.4	3.5	0.0	49.0
299	28-09-2018 12:36:51	12 h 36	15.2	4.4	3.8	0.0	48.7
300	28-09-2018 12:37:51	12 h 37	15.2	4.4	3.7	0.0	48.7
301	28-09-2018 12:38:51	12 h 38	15.2	4.4	3.8	0.0	48.9
302	28-09-2018 12:39:51	12 h 39	15.3	4.4	3.8	0.0	48.7
303	28-09-2018 12:40:51	12 h 40	15.1	4.4	3.7	0.0	49.3
304	28-09-2018 12:41:51	12 h 41	15.2	4.3	3.6	0.0	49.1
305	28-09-2018 12:42:51	12 h 42	15.2	4.4	3.6	0.0	49.2
306	28-09-2018 12:43:51	12 h 43	15.2	4.4	3.7	0.0	49.1
307	28-09-2018 12:44:51	12 h 44	15.2	4.3	3.5	0.0	49.1
308	28-09-2018 12:45:51	12 h 45	15.3	4.3	3.7	0.0	48.7
309	28-09-2018 12:46:51	12 h 46	15.3	4.3	3.7	0.0	48.5
310	28-09-2018 12:47:51	12 h 47	15.2	4.3	3.6	0.0	49.1
311	28-09-2018 12:48:51	12 h 48	15.2	4.3	3.7	0.0	49.0
312	28-09-2018 12:49:51	12 h 49	15.3	4.3	3.7	0.0	48.7
313	28-09-2018 12:50:51	12 h 50	15.2	4.3	3.4	0.0	49.0
314	28-09-2018 12:51:51	12 h 51	15.3	4.3	3.7	0.0	48.2
315	28-09-2018 12:52:51	12 h 52	15.3	4.3	3.7	0.0	47.3
316	28-09-2018 12:53:51	12 h 53	15.3	4.3	3.5	0.0	47.9
317	28-09-2018 12:54:51	12 h 54	15.3	4.3	3.6	0.0	47.6
318	28-09-2018 12:55:51	12 h 55	15.2	4.3	3.6	0.0	47.9
319	28-09-2018 12:56:51	12 h 56	15.3	4.3	3.6	0.0	47.3
320	28-09-2018 12:57:51	12 h 57	15.3	4.3	3.5	0.0	47.8
321	28-09-2018 12:58:51	12 h 58	15.3	4.3	3.4	0.0	47.1
322	28-09-2018 12:59:51	12 h 59	15.3	4.3	3.4	0.0	47.4
323	28-09-2018 13:00:51	13 h 00	15.3	4.3	3.4	0.0	48.0
324	28-09-2018 13:01:51	13 h 01	15.3	4.3	3.4	0.0	47.7
325	28-09-2018 13:02:51	13 h 02	15.2	4.3	3.2	0.0	48.1
326	28-09-2018 13:03:51	13 h 03	15.3	4.3	3.5	0.0	47.4
327	28-09-2018 13:04:51	13 h 04	15.3	4.3	3.3	0.0	47.7
328	28-09-2018 13:05:51	13 h 05	15.3	4.3	3.4	0.0	47.3
329	28-09-2018 13:06:51	13 h 06	15.3	4.3	3.6	0.0	47.3
330	28-09-2018 13:07:51	13 h 07	15.3	4.3	3.4	0.0	47.9
331	28-09-2018 13:08:51	13 h 08	15.3	4.3	3.5	0.0	47.4
332	28-09-2018 13:09:51	13 h 09	15.8	4.0	4.4	0.0	42.8
333	28-09-2018 13:10:51	13 h 10	15.5	4.1	3.8	0.0	45.6
334	28-09-2018 13:11:51	13 h 11	15.4	4.2	3.1	0.0	47.3
335	28-09-2018 13:12:51	13 h 12	15.3	4.3	3.3	0.0	47.9
336	28-09-2018 13:13:51	13 h 13	15.2	4.3	3.4	0.0	47.5
337	28-09-2018 13:14:51	13 h 14	15.2	4.3	3.4	0.0	47.8
338	28-09-2018 13:15:51	13 h 15	15.3	4.3	3.1	0.0	47.5
339	28-09-2018 13:16:51	13 h 16	15.2	4.4	3.4	0.0	47.7
340	28-09-2018 13:17:51	13 h 17	15.2	4.4	3.1	0.0	47.8
341	28-09-2018 13:18:51	13 h 18	15.2	4.4	3.0	0.0	48.0

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
342	28-09-2018 13:19:51	13 h 19	15.2	4.4	3.1	0.0	48.3
343	28-09-2018 13:20:51	13 h 20	15.3	4.4	3.3	0.0	47.4
344	28-09-2018 13:21:51	13 h 21	15.3	4.3	3.1	0.0	47.7
345	28-09-2018 13:22:51	13 h 22	15.3	4.3	3.4	0.0	46.9
346	28-09-2018 13:23:51	13 h 23	15.7	4.1	3.8	0.0	43.3
347	28-09-2018 13:24:51	13 h 24	15.3	4.3	3.2	0.0	47.2
348	28-09-2018 13:25:51	13 h 25	15.3	4.3	3.2	0.0	47.2
349	28-09-2018 13:26:51	13 h 26	15.3	4.3	3.4	0.0	47.8
350	28-09-2018 13:27:51	13 h 27	15.2	4.3	3.1	0.0	48.1
351	28-09-2018 13:28:51	13 h 28	15.3	4.3	3.3	0.0	48.1
352	28-09-2018 13:29:51	13 h 29	15.3	4.3	3.1	0.0	47.8
353	28-09-2018 13:30:51	13 h 30	15.4	4.3	3.3	0.0	46.8
354	28-09-2018 13:31:51	13 h 31	15.3	4.3	3.4	0.0	48.0
355	28-09-2018 13:32:51	13 h 32	15.5	4.2	3.5	0.0	45.8
356	28-09-2018 13:33:51	13 h 33	15.7	4.0	3.6	0.0	43.6
357	28-09-2018 13:34:51	13 h 34	15.7	4.0	3.4	0.0	43.2
358	28-09-2018 13:35:51	13 h 35	15.7	4.0	3.7	0.0	43.3
359	28-09-2018 13:36:51	13 h 36	15.7	4.0	3.7	0.0	43.5
360	28-09-2018 13:37:51	13 h 37	15.7	4.0	3.7	0.0	43.2
361	28-09-2018 13:38:51	13 h 38	15.7	4.0	3.5	0.0	43.2
362	28-09-2018 13:39:51	13 h 39	15.7	4.0	3.6	0.0	43.4
363	28-09-2018 13:40:51	13 h 40	15.7	4.0	3.7	0.0	43.7
364	28-09-2018 13:41:51	13 h 41	15.7	4.0	3.7	0.0	43.1
365	28-09-2018 13:42:51	13 h 42	15.7	4.0	3.6	0.0	42.8
366	28-09-2018 13:43:51	13 h 43	15.7	4.0	3.6	0.0	43.2
367	28-09-2018 13:44:51	13 h 44	15.7	4.0	3.6	0.0	43.3
368	28-09-2018 13:45:51	13 h 45	15.7	4.0	3.6	0.0	42.9
369	28-09-2018 13:46:51	13 h 46	15.7	4.0	3.7	0.0	42.8
370	28-09-2018 13:47:51	13 h 47	15.7	4.0	3.6	0.0	42.8
371	28-09-2018 13:48:51	13 h 48	15.7	4.0	3.6	0.0	42.8
372	28-09-2018 13:49:51	13 h 49	15.7	4.0	3.7	0.0	42.6
373	28-09-2018 13:50:51	13 h 50	15.7	4.0	4.1	0.0	42.2
374	28-09-2018 13:51:51	13 h 51	15.7	4.0	4.1	0.0	42.2
375	28-09-2018 13:52:51	13 h 52	15.8	4.0	3.9	0.0	41.9
376	28-09-2018 13:53:51	13 h 53	15.8	4.0	4.0	0.0	41.8
377	28-09-2018 13:54:51	13 h 54	15.7	4.0	3.9	0.0	42.3
378	28-09-2018 13:55:51	13 h 55	15.7	4.0	3.9	0.0	43.2
379	28-09-2018 13:56:51	13 h 56	15.7	4.0	3.9	0.0	43.0
380	28-09-2018 13:57:51	13 h 57	15.7	4.0	3.9	0.0	42.4
381	28-09-2018 13:58:51	13 h 58	15.7	4.0	3.8	0.0	42.7
382	28-09-2018 13:59:51	13 h 59	15.7	4.0	3.6	0.0	42.7
383	28-09-2018 14:00:51	14 h 00					
384	28-09-2018 14:01:51	14 h 01					
385	28-09-2018 14:02:51	14 h 02					
386	28-09-2018 14:03:51	14 h 03					
387	28-09-2018 14:04:51	14 h 04					
388	28-09-2018 14:05:51	14 h 05					
389	28-09-2018 14:06:51	14 h 06					
390	28-09-2018 14:07:51	14 h 07					
391	28-09-2018 14:08:51	14 h 08					
392	28-09-2018 14:09:51	14 h 09					
393	28-09-2018 14:10:51	14 h 10					
394	28-09-2018 14:11:51	14 h 11					
395	28-09-2018 14:12:51	14 h 12					
396	28-09-2018 14:13:51	14 h 13					
397	28-09-2018 14:14:51	14 h 14	15.3	4.3	2.9	0.0	43.9
398	28-09-2018 14:15:51	14 h 15	15.2	4.4	2.6	0.0	45.1
399	28-09-2018 14:16:51	14 h 16	15.2	4.4	3.0	0.0	45.1
400	28-09-2018 14:17:51	14 h 17	15.2	4.4	3.3	0.0	45.5
401	28-09-2018 14:18:51	14 h 18	15.1	4.4	2.9	0.0	46.1
402	28-09-2018 14:19:51	14 h 19	15.1	4.4	2.8	0.0	45.9
403	28-09-2018 14:20:51	14 h 20	15.2	4.4	3.3	0.0	45.0
404	28-09-2018 14:21:51	14 h 21	15.5	4.3	3.7	0.0	43.6
405	28-09-2018 14:22:51	14 h 22	15.3	4.3	3.4	0.0	44.6
406	28-09-2018 14:23:51	14 h 23	15.2	4.4	3.2	0.0	45.5
407	28-09-2018 14:24:51	14 h 24	15.1	4.4	2.9	0.0	46.1
408	28-09-2018 14:25:51	14 h 25	15.2	4.4	3.0	0.0	45.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
409	29-09-2018 16:15:41	16 h 15	12.9	6.1	3.1	-2.7	70.9
410	29-09-2018 16:16:41	16 h 16	12.9	6.1	2.8	-2.9	71.0
411	29-09-2018 16:17:41	16 h 17	12.8	6.2	2.9	-2.8	71.1
412	29-09-2018 16:18:41	16 h 18	12.9	6.1	3.2	-2.8	70.3
413	29-09-2018 16:19:41	16 h 19	12.8	6.1	3.1	-2.8	70.9
414	29-09-2018 16:20:41	16 h 20	12.9	6.1	3.0	-2.8	69.6
415	29-09-2018 16:21:41	16 h 21	13.4	5.7	3.5	-2.6	66.3
416	29-09-2018 16:22:41	16 h 22	13.5	5.6	3.1	-2.4	66.4
417	29-09-2018 16:23:41	16 h 23	13.4	5.7	3.1	-2.4	69.6
418	29-09-2018 16:24:41	16 h 24	13.0	5.9	2.6	-2.5	75.1
419	29-09-2018 16:25:41	16 h 25	12.8	6.1	2.6	-2.3	75.4
420	29-09-2018 16:26:41	16 h 26	12.8	6.1	2.7	-2.1	73.8
421	29-09-2018 16:27:41	16 h 27	12.9	6.1	2.7	-2.1	73.2
422	29-09-2018 16:28:41	16 h 28	12.9	6.0	2.6	-2.1	71.6
423	29-09-2018 16:29:41	16 h 29	13.0	6.0	2.8	-1.8	70.2
424	29-09-2018 16:30:41	16 h 30	12.9	6.1	2.8	-1.8	71.3
425	29-09-2018 16:31:41	16 h 31	13.0	6.0	2.9	-1.5	70.1
426	29-09-2018 16:32:41	16 h 32	13.0	6.0	2.9	-1.6	69.8
427	29-09-2018 16:33:41	16 h 33	12.9	6.1	3.0	-1.4	70.8
428	29-09-2018 16:34:41	16 h 34	13.0	6.0	2.7	-1.3	69.3
429	29-09-2018 16:35:41	16 h 35	13.0	6.0	2.6	-1.3	69.9
430	29-09-2018 16:36:41	16 h 36	13.0	6.0	2.7	-1.3	69.6
431	29-09-2018 16:37:41	16 h 37	13.0	6.0	2.6	-1.1	70.3
432	29-09-2018 16:38:41	16 h 38	13.0	6.0	2.7	-1.1	69.4
433	29-09-2018 16:39:41	16 h 39	13.1	5.9	2.8	-1.1	68.7
434	29-09-2018 16:40:41	16 h 40	13.7	5.6	3.0	-1.0	62.4
435	29-09-2018 16:41:41	16 h 41	13.8	5.5	3.3	-1.0	61.1
436	29-09-2018 16:42:41	16 h 42	13.7	5.5	3.2	-1.0	62.0
437	29-09-2018 16:43:41	16 h 43	13.7	5.5	3.3	-1.1	62.0
438	29-09-2018 16:44:41	16 h 44	13.8	5.4	3.4	-0.9	61.3
439	29-09-2018 16:45:41	16 h 45	13.6	5.6	2.9	-0.8	63.1
440	29-09-2018 16:46:41	16 h 46	13.7	5.5	2.9	-0.6	63.0
441	29-09-2018 16:47:41	16 h 47	13.8	5.5	3.2	-0.7	62.3
442	29-09-2018 16:48:41	16 h 48	13.7	5.5	2.8	-0.6	62.7
443	29-09-2018 16:49:41	16 h 49	13.7	5.5	2.8	-0.5	62.5
444	29-09-2018 16:50:41	16 h 50	13.7	5.5	2.9	-0.3	62.9
445	29-09-2018 16:51:41	16 h 51	13.7	5.5	2.9	-0.2	63.4
446	29-09-2018 16:52:41	16 h 52	13.7	5.5	2.8	-0.2	63.6
447	29-09-2018 16:53:41	16 h 53	13.7	5.5	3.1	0.0	63.7
448	29-09-2018 16:54:41	16 h 54	13.7	5.5	3.1	0.2	63.5
449	29-09-2018 16:55:41	16 h 55	13.7	5.5	3.1	0.3	63.5
450	29-09-2018 16:56:41	16 h 56	13.7	5.5	3.0	0.5	63.7
451	29-09-2018 16:57:41	16 h 57	13.7	5.5	3.1	0.5	64.3
452	29-09-2018 16:58:41	16 h 58	13.7	5.5	2.9	0.7	63.7
453	29-09-2018 16:59:41	16 h 59	13.7	5.5	2.6	0.8	63.9
454	29-09-2018 17:00:41	17 h 00	13.7	5.5	3.1	0.8	64.2
455	29-09-2018 17:01:41	17 h 01	13.7	5.5	2.8	0.9	64.4
456	29-09-2018 17:02:41	17 h 02	13.7	5.5	2.8	1.1	64.4
457	29-09-2018 17:03:41	17 h 03	13.7	5.5	2.8	1.2	64.4
458	29-09-2018 17:04:41	17 h 04	13.7	5.5	2.8	1.3	64.0
459	29-09-2018 17:05:41	17 h 05	13.7	5.5	3.0	1.4	64.3
460	29-09-2018 17:06:41	17 h 06	13.7	5.5	2.8	1.6	64.5
461	29-09-2018 17:07:41	17 h 07	13.7	5.5	3.0	1.4	64.6
462	29-09-2018 17:08:41	17 h 08	13.7	5.5	3.0	1.5	64.5
463	29-09-2018 17:09:41	17 h 09	13.7	5.5	3.0	1.5	64.4
464	29-09-2018 17:10:41	17 h 10	13.7	5.5	3.0	1.4	63.8
465	29-09-2018 17:11:41	17 h 11	13.7	5.5	2.8	1.6	63.8
466	29-09-2018 17:12:41	17 h 12	13.9	5.4	3.2	1.7	60.9
467	29-09-2018 17:13:41	17 h 13	14.1	5.2	3.3	1.6	59.2
468	29-09-2018 17:14:41	17 h 14	14.2	5.2	3.3	1.6	58.3
469	29-09-2018 17:15:41	17 h 15	14.2	5.2	3.1	1.7	58.3
470	29-09-2018 17:16:41	17 h 16	14.2	5.2	3.4	1.9	57.6
471	29-09-2018 17:17:41	17 h 17	14.2	5.2	3.4	2.0	57.8
472	29-09-2018 17:18:41	17 h 18	14.2	5.1	3.3	2.1	57.6
473	29-09-2018 17:19:41	17 h 19	14.2	5.2	3.4	2.3	58.4
474	29-09-2018 17:20:41	17 h 20	14.2	5.2	3.3	2.2	58.3
475	29-09-2018 17:21:41	17 h 21	14.1	5.2	3.3	2.2	58.7

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
476	29-09-2018 17:22:41	17 h 22	14.1	5.2	3.4	2.6	58.3
477	29-09-2018 17:23:41	17 h 23	14.4	5.0	3.5	2.6	55.8
478	29-09-2018 17:24:41	17 h 24	14.6	4.9	3.5	2.8	57.3
479	29-09-2018 17:25:41	17 h 25	14.4	5.0	2.9	3.0	59.1
480	29-09-2018 17:26:41	17 h 26	14.3	5.1	2.8	3.1	58.9
481	29-09-2018 17:27:41	17 h 27	14.2	5.1	3.0	3.4	59.0
482	29-09-2018 17:28:41	17 h 28	14.2	5.1	2.8	3.6	58.1
483	29-09-2018 17:29:41	17 h 29	14.2	5.1	3.0	3.4	58.8
484	29-09-2018 17:30:41	17 h 30	14.2	5.2	2.9	3.4	59.0
485	29-09-2018 17:31:41	17 h 31	14.1	5.1	2.9	3.3	59.3
486	29-09-2018 17:32:41	17 h 32	14.1	5.2	2.8	3.3	60.0
487	29-09-2018 17:33:41	17 h 33	14.2	5.1	2.9	3.1	58.7
488	29-09-2018 17:34:41	17 h 34	14.1	5.1	2.9	2.8	58.7
489	29-09-2018 17:35:41	17 h 35	14.1	5.2	2.9	2.4	59.1
490	29-09-2018 17:36:41	17 h 36	14.1	5.2	2.9	2.1	59.0
491	29-09-2018 17:37:41	17 h 37	14.1	5.2	3.0	1.9	58.4
492	29-09-2018 17:38:41	17 h 38	14.1	5.2	3.0	1.7	58.5
493	29-09-2018 17:39:41	17 h 39	14.1	5.2	3.0	1.4	58.4
494	29-09-2018 17:40:41	17 h 40	14.1	5.2	3.0	1.1	58.3
495	29-09-2018 17:41:41	17 h 41	14.1	5.2	3.3	1.1	58.8
496	29-09-2018 17:42:41	17 h 42	14.1	5.2	3.1	0.7	58.7
497	29-09-2018 17:43:41	17 h 43	14.1	5.2	3.2	0.4	58.4
498	29-09-2018 17:44:41	17 h 44	14.1	5.2	2.9	0.3	58.7
499	29-09-2018 17:45:41	17 h 45	14.1	5.2	3.2	0.1	59.5
500	29-09-2018 17:46:41	17 h 46	14.1	5.2	2.9	-0.1	59.8
501	29-09-2018 17:47:41	17 h 47	14.1	5.2	2.9	-0.3	60.0
502	29-09-2018 17:48:41	17 h 48	14.1	5.2	2.8	-0.3	60.0
503	29-09-2018 17:49:41	17 h 49	14.1	5.2	3.1	-0.4	59.5
504	29-09-2018 17:50:41	17 h 50	14.1	5.2	3.2	-0.5	58.2
505	29-09-2018 17:51:41	17 h 51	14.1	5.2	2.9	-0.5	58.2
506	29-09-2018 17:52:41	17 h 52	14.1	5.2	3.1	-0.6	58.1
507	29-09-2018 17:53:41	17 h 53	14.1	5.2	3.2	-0.7	58.1
508	29-09-2018 17:54:41	17 h 54	14.1	5.2	2.9	-0.7	58.0
509	29-09-2018 17:55:41	17 h 55	14.1	5.2	2.8	-0.6	57.9
510	29-09-2018 17:56:41	17 h 56	14.0	5.3	3.0	-0.7	58.8
511	29-09-2018 17:57:41	17 h 57	14.0	5.3	3.0	-0.8	58.3
512	29-09-2018 17:58:41	17 h 58	14.0	5.2	2.8	-0.8	58.4
513	29-09-2018 17:59:41	17 h 59	14.1	5.2	3.0	-0.7	58.0
514	29-09-2018 18:00:41	18 h 00	14.1	5.2	2.7	-0.8	57.7
515	29-09-2018 18:01:41	18 h 01	14.0	5.3	3.1	-0.7	58.8
516	29-09-2018 18:02:41	18 h 02	14.1	5.2	2.8	-0.7	57.9
517	29-09-2018 18:03:41	18 h 03	14.1	5.2	2.9	-0.8	58.1
518	29-09-2018 18:04:41	18 h 04	14.1	5.2	3.0	-0.6	57.7
519	29-09-2018 18:05:41	18 h 05	14.0	5.3	3.0	-0.6	58.4
520	29-09-2018 18:06:41	18 h 06	14.1	5.2	2.9	-0.6	58.4
521	29-09-2018 18:07:41	18 h 07	14.1	5.3	2.6	-0.7	58.0
522	29-09-2018 18:08:41	18 h 08	14.0	5.3	2.6	-0.8	58.5
523	29-09-2018 18:09:41	18 h 09	14.1	5.2	3.0	-0.8	57.6
524	29-09-2018 18:10:41	18 h 10	14.1	5.2	2.9	-0.6	57.5
525	29-09-2018 18:11:41	18 h 11	14.1	5.2	3.0	-0.5	56.8
526	29-09-2018 18:12:41	18 h 12	13.0	5.9	1.8	-0.4	69.4
527	29-09-2018 18:13:41	18 h 13	12.8	6.2	1.7	-0.3	71.8
528	29-09-2018 18:14:41	18 h 14	12.8	6.2	1.5	-0.3	71.8
529	29-09-2018 18:15:41	18 h 15	12.9	6.1	1.7	-0.3	70.5
530	29-09-2018 18:16:41	18 h 16	12.9	6.2	1.7	-0.1	72.2
531	29-09-2018 18:17:41	18 h 17	12.9	6.1	1.7	0.2	71.7
532	29-09-2018 18:18:41	18 h 18	12.9	6.1	1.5	0.1	72.6
533	29-09-2018 18:19:41	18 h 19	12.9	6.1	1.6	0.2	72.6
534	29-09-2018 18:20:41	18 h 20	12.9	6.1	1.8	0.4	71.7
535	29-09-2018 18:21:41	18 h 21	13.0	6.1	1.9	0.5	70.3
536	29-09-2018 18:22:41	18 h 22	13.0	6.1	1.6	0.7	70.9
537	29-09-2018 18:23:41	18 h 23	13.0	6.1	1.7	0.7	71.0
538	29-09-2018 18:24:41	18 h 24	13.0	6.1	1.7	0.6	71.6
539	29-09-2018 18:25:41	18 h 25	13.0	6.1	1.7	0.7	70.9
540	29-09-2018 18:26:41	18 h 26	12.9	6.1	1.7	0.9	72.6
541	29-09-2018 18:27:41	18 h 27	13.0	6.1	1.7	0.7	71.8
542	29-09-2018 18:28:41	18 h 28	13.0	6.1	1.8	0.8	72.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
543	29-09-2018 18:29:41	18 h 29	13.0	6.1	1.6	0.8	72.6
544	29-09-2018 18:30:41	18 h 30	12.9	6.1	1.7	0.8	72.3
545	29-09-2018 18:31:41	18 h 31	13.0	6.1	1.8	0.7	72.3
546	29-09-2018 18:32:41	18 h 32	13.0	6.1	1.5	0.8	72.2
547	29-09-2018 18:33:41	18 h 33	12.9	6.1	1.4	0.9	72.4
548	29-09-2018 18:34:41	18 h 34	12.9	6.1	1.7	0.8	71.8
549	29-09-2018 18:35:41	18 h 35	12.9	6.1	1.6	0.8	71.8
550	29-09-2018 18:36:41	18 h 36	13.0	6.1	1.5	0.7	71.8
551	29-09-2018 18:37:41	18 h 37	12.9	6.1	1.7	0.7	72.3
552	29-09-2018 18:38:41	18 h 38	13.0	6.1	1.6	0.8	72.3
553	29-09-2018 18:39:41	18 h 39	13.0	6.1	1.6	0.5	71.9
554	29-09-2018 18:40:41	18 h 40	12.9	6.1	1.7	0.5	72.5
555	29-09-2018 18:41:41	18 h 41	13.0	6.1	1.7	0.5	72.1
556	29-09-2018 18:42:41	18 h 42	13.0	6.1	1.4	0.4	72.4
557	29-09-2018 18:43:41	18 h 43	12.7	6.2	1.3	0.3	75.2
558	29-09-2018 18:44:41	18 h 44	12.8	6.2	1.4	0.4	74.6
559	29-09-2018 18:45:41	18 h 45	12.7	6.3	1.4	0.3	75.7
560	29-09-2018 18:46:41	18 h 46	12.6	6.3	1.3	0.2	76.4
561	29-09-2018 18:47:41	18 h 47	13.3	5.9	1.4	0.1	76.8
562	29-09-2018 18:48:41	18 h 48	13.4	5.8	1.8	-0.1	76.9
563	29-09-2018 18:49:41	18 h 49	13.5	5.7	1.8	0.0	76.2
564	29-09-2018 18:50:41	18 h 50	13.5	5.7	1.9	-0.2	76.2
565	29-09-2018 18:51:41	18 h 51	13.6	5.6	1.9	-0.4	74.8
566	29-09-2018 18:52:41	18 h 52	13.7	5.6	1.9	-0.3	74.4
567	29-09-2018 18:53:41	18 h 53	13.7	5.6	2.0	-0.5	73.5
568	29-09-2018 18:54:41	18 h 54	13.7	5.6	2.1	-0.4	73.8
569	29-09-2018 18:55:41	18 h 55	13.7	5.6	2.0	-0.7	73.6
570	29-09-2018 18:56:41	18 h 56	13.7	5.6	2.0	-0.5	72.8
571	29-09-2018 18:57:41	18 h 57	13.7	5.6	2.1	-0.8	73.6
572	29-09-2018 18:58:41	18 h 58	13.7	5.6	1.9	-0.7	73.6
573	29-09-2018 18:59:41	18 h 59	13.7	5.6	1.9	-0.8	73.5
574	29-09-2018 19:00:41	19 h 00	13.7	5.6	1.9	-0.8	73.5
575	29-09-2018 19:01:41	19 h 01	13.7	5.6	2.0	-1.0	73.7
576	29-09-2018 19:02:41	19 h 02	13.6	5.6	1.8	-1.1	74.5
577	29-09-2018 19:03:41	19 h 03	13.6	5.7	2.1	-0.8	74.2
578	29-09-2018 19:04:41	19 h 04	13.5	5.7	1.9	-0.9	75.1
579	29-09-2018 19:05:41	19 h 05	13.6	5.6	1.9	-0.9	74.0

APPENDIX 3
CALIBRATION CERTIFICATES



CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

FEUILLE D'ÉTALONNAGE DES MODULES 2018

MODULE	GAMMA (K_c)	ORIFICE (K_o) K_o	ΔH@ moy	DATE ÉTALONNAGE	COMPENSÉ 60 °F
1	1.009	0.999	0.970	13-mars-18	OUI
2	0.999	0.969	1.001	15-mars-18	OUI
3	0.990	0.950	1.188	05-déc-17	NON
4	1.001	0.946	1.040	15-août-18	NON
5	0.996	0.997	0.923	20-mars-18	NON
6	1.004	0.991	1.027	06-sept-18	OUI
7	0.981	0.994	0.928	27-oct-17	NON
8	1.013	1.037	0.958	06-juil-18	OUI
9	0.998	1.012	0.899	14-sept-17	NON
10	1.011	0.993	1.005	20-mars-18	OUI
11	0.989	0.974	1.054	06-sept-18	OUI
12	0.999	0.911	1.208	24-mai-18	NON
13	1.019	0.974	0.921	19-mars-18	NON
14	1.000	1.004	0.975	21-mars-18	OUI
15	1.000	0.982	1.021	13-nov-17	NON
16	1.017	1.027	0.872	15-sept-17	NON
17	0.987	1.050	0.833	15-sept-17	NON
18	1.002	1.013	0.896	07-sept-18	NON
19	0.997	1.000	1.005	06-sept-18	OUI
20	1.005	0.970	1.072	07-sept-18	OUI
21	0.989	1.011	0.984	13-nov-17	OUI
22	0.993	0.996	0.995	04-déc-17	NON
23	1.013	1.029	0.875	15-sept-17	NON
24	1.007	0.995	1.160	04-déc-17	NON
25	0.999	0.733	2.529	24-mai-18	NON

MODULE	GAMMA (K_C)	DATE ÉTALONNAGE
F-1	0.973	27-oct-17
F-2	0.977	05-juil-18
F-3	1.006	13-nov-17
F-4	1.009	17-juil-17
F-5	1.001	26-oct-17
F-6	1.013	22-mars-18

Version: 4
Date: 07-09-2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

FEUILLE D'ÉTALONNAGE DES MODULES 2018

MODULE	GAMMA (K_c)	ORIFICE (K_o) K_o	ΔH@ moy	DATE ÉTALONNAGE	COMPENSÉ 60 °F
1	1.009	0.999	0.970	13-mars-18	OUI
2	0.999	0.969	1.001	15-mars-18	OUI
3	0.990	0.950	1.188	05-déc-17	NON
4	1.001	0.946	1.040	15-août-18	NON
5	0.996	0.997	0.923	20-mars-18	NON
6	1.004	0.991	1.027	06-sept-18	OUI
7	0.981	0.994	0.928	27-oct-17	NON
8	1.013	1.037	0.958	06-juil-18	OUI
9	0.998	1.012	0.899	14-sept-17	NON
10	1.011	0.993	1.005	20-mars-18	OUI
11	0.989	0.974	1.054	06-sept-18	OUI
12	0.999	0.911	1.208	24-mai-18	NON
13	1.019	0.974	0.921	19-mars-18	NON
14	1.000	1.004	0.975	21-mars-18	OUI
15	1.000	0.982	1.021	13-nov-17	NON
16	1.017	1.027	0.872	15-sept-17	NON
17	0.987	1.050	0.833	15-sept-17	NON
18	1.002	1.013	0.896	07-sept-18	NON
19	0.997	1.000	1.005	06-sept-18	OUI
20	1.005	0.970	1.072	07-sept-18	OUI
21	0.989	1.011	0.984	13-nov-17	OUI
22	0.993	0.996	0.995	04-déc-17	NON
23	1.013	1.029	0.875	15-sept-17	NON
24	1.007	0.995	1.160	04-déc-17	NON
25	0.999	0.733	2.529	24-mai-18	NON

MODULE	GAMMA (K_C)	DATE ÉTALONNAGE
F-1	0.973	27-oct-17
F-2	0.977	05-juil-18
F-3	1.006	13-nov-17
F-4	1.009	17-juil-17
F-5	1.001	26-oct-17
F-6	1.013	22-mars-18

Version: 4
Date: 07-09-2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

RÉSUMÉ D'ÉTALONNAGE DES SONDES - S-03 V

Version 1 (02-03-2018)

#	Année	MDF	LV	#	1	2	3	4	5	6	7	8	9	10	11	12	Moy. V	Thermocouple (Validation)	P-T-B	Endroit
				Buse	A-312-1												---			
03-05	2018	O	O	Ct	0.797												0.797	OK	OK	LE-02-W
				E. Rel	0.6												0.6			
				Buse	3Q-371	3Q-431	3Q-503	3Q-682									---			
03-06	2018	N	Q	Ct	0.778	0.779	0.781	0.773									0.778	OK	OK	Atelier
				E. Rel	0.6	0.4	0.6	0.7									0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-07	2018	O	O	Ct	0.779	0.777	0.792	0.790	0.777	0.778	0.782	0.770	0.782	0.781	0.777	0.771	0.780	OK	OK	LE-02-W
				E. Rel	1.0	0.9	0.8	0.8	1.1	1.1	1.0	1.4	1.3	1.1	1.3	1.4	1.1			
				Buse	A-312-3												---			
03-09	2018	O	O	Ct	0.827												0.827	OK	OK	LE-14-B
				E. Rel	0.4												0.4			
				Buse	A-312-3												---			
03-10	2018	O	O	Ct	0.778												0.778	OK	OK	LE-11-V
				E. Rel	1.3												1.3			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-2	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-11	2018	O	O	Ct	0.792	0.795	0.794	0.793	0.796	0.796	0.795	0.798	0.796	0.793	0.793	0.789	0.794	OK	OK	LE-05-O
				E. Rel	1.1	0.8	1.0	1.1	1.1	1.0	1.0	0.6	1.0	1.2	0.9	1.1	1.0			
				Buse	A-312-3												---			
03-12	2018	O	O	Ct	0.791												0.791	OK	OK	LE-14-B
				E. Rel	1.1												1.1			
				Buse	A-312-3												---			
03-13	2018	O	O	Ct	0.772												0.772	OK	OK	LE-11-V
				E. Rel	0.9												0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-14	2018	O	O	Ct	0.801	0.799	0.813	0.811	0.810	0.806	0.808	0.796	0.805	0.802	0.792	0.799	0.804	OK	OK	LE-02-W
				E. Rel	1.2	0.8	1.0	0.7	0.8	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-2	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-15	2018	O	O	Ct	0.808	0.805	0.816	0.811	0.808	0.804	0.800	0.798	0.802	0.800	0.792	0.784	0.802	OK	OK	LE-02-W
				E. Rel	1.2	1.2	1.2	1.0	1.2	1.2	1.3	1.2	1.1	1.3	1.3	1.0	1.2			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-16	2018	O	O	Ct	0.790	0.790	0.794	0.796	0.797	0.794	0.794	0.791	0.800	0.802	0.796	0.793	0.795	OK	OK	LE-02-W
				E. Rel	0.7	1.1	1.3	1.1	1.2	1.3	1.1	1.2	1.4	1.5	1.1	1.1	1.2			
				Buse	A-312-3												---			
03-18	2018	O	O	Ct	0.822												0.822	OK	OK	LE-08-Br
				E. Rel	1.0												1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-19	2018	O	V	Ct	0.765	0.779	0.780	0.772	0.787	0.767	0.774	0.781	0.779	0.781	0.770	0.761	0.775	OK	OK	Atelier Qc
				E. Rel	1.0	0.4	1.0	0.7	0.6	0.0	0.0	0.0	0.0	0.9	1.0	1.0	0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-437-1	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-20	2018	O	V	Ct	0.769	0.779	0.787	0.791	0.795	0.776	0.782	0.788	0.791	0.796	0.785	0.788	0.786	OK	OK	Atelier Qc
				E. Rel	1.3	0.8	1.0	1.1	1.3	1.0	1.1	1.1	1.0	1.1	1.0	1.0	1.1			
				Buse	A-312-3												---			
03-21	2018	O	O	Ct	0.805												0.805	OK	OK	LE-08-Br
				E. Rel	0.4												0.4			
				Buse	A-312-3												---			
03-22	2018	O	N	Ct	0.785												0.785	OK	OK	LE-09-G
				E. Rel	1.1												1.1			
				Buse	A-312-3												---			
03-23	2018	O	O	Ct	0.785												0.785	OK	OK	LE-09-G
				E. Rel	0.0												0.0			

Effectué par: JM / DR / JFG / SA Date: Février 2018

Endroit de la calibration: Université Laval

Vérifié par: Eric Trépanier

Signature:  Date: 2 mars 2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

RÉSUMÉ D'ÉTALONNAGE DES SONDES - S-05 V

Version 1 (02-03-2018)

#	Année	MDF	LV	#	1	2	3	4	5	6	7	8	9	10	11	12	Moy. V	Thermocouple (Validation)	P-T-B	Endroit
				Buse	A-312-3												---			
05-03	2018	N	O	Ct	0.769												0.769	OK	OK	LE-09-G
				E. Rel	1.5												1.5			
				Buse	A-312-3												---			
05-05	2018	O	O	Ct	0.800												0.800	OK	OK	LE-14-B
				E. Rel	1.0												1.0			
				Buse	5Q-374	5Q-434	5Q-501	5Q-681									---			
05-07	2018	N	Q	Ct	0.783	0.786	0.774	0.792									0.784	OK	OK	Atelier
				E. Rel	1.3	1.3	1.2	1.5									1.3			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-08	2018	O	O	Ct	0.786	0.786	0.783	0.780	0.783	0.779	0.779	0.781	0.809	0.804	0.798	0.802	0.789	OK	OK	LE-05-O
				E. Rel	0.4	0.8	0.8	1.3	0.9	1.2	1.3	0.8	1.4	1.2	1.3	1.2	1.1			
				Buse	A-312-3												---			
05-09	2018	O	O	Ct	0.796												0.796	OK	OK	LE-14-B
				E. Rel	1.1												1.1			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-10	2018	O	O	Ct	0.792	0.792	0.795	0.794	0.796	0.791	0.793	0.792	0.795	0.798	0.790	0.794	0.794	OK	OK	LE-05-O
				E. Rel	0.7	0.7	0.8	0.4	0.9	0.6	0.7	0.6	0.8	0.0	0.6	0.4	0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-1	A-437-1	A-500-1	A-562-1	---			
05-11	2018	O	O	Ct	0.803	0.798	0.805	0.805	0.802	0.800	0.806	0.801	0.807	0.805	0.803	0.802	0.803	OK	OK	LE-02-W
				E. Rel	0.6	0.9	1.0	1.0	1.0	1.0	0.8	1.2	1.0	1.0	1.0	1.0	1.0			
				Buse	A-312-3												---			
05-12	2018	O	O	Ct	0.783												0.783	OK	OK	LE-15-B
				E. Rel	1.0												1.0			
				Buse	A-312-3												---			
05-13	2018	O	O	Ct	0.808												0.808	OK	OK	LE-11-V
				E. Rel	0.9												0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-14	2018	O	O	Ct	0.828	0.824	0.830	0.830	0.830	0.825	0.813	0.816	0.839	0.836	0.832	0.826	0.827	OK	OK	LE-02-W
				E. Rel	0.7	0.0	0.4	0.0	0.4	0.9	1.0	1.5	1.4	0.8	0.8	0.8	0.7			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-15	2018	O	O	Ct	0.774	0.778	0.785	0.787	0.783	0.783	0.782	0.783	0.787	0.791	0.777	0.775	0.782	OK	OK	LE-02-W
				E. Rel	1.5	1.3	1.0	1.0	1.1	0.7	0.7	0.7	0.9	0.7	0.4	0.7	0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-16	2018	O	O	Ct	0.823	0.819	0.823	0.824	0.818	0.820	0.823	0.820	0.823	0.821	0.816	0.817	0.821	OK	OK	LE-02-W
				E. Rel	0.8	0.9	0.7	0.7	0.0	0.4	0.7	0.9	0.7	0.0	0.0	0.0	0.5			
				Buse	A-312-3												---			
05-18	2018	O	O	Ct	0.767												0.767	OK	OK	LE-08-Br
				E. Rel	0.7												0.7			
				Buse	A-312-3												---			
05-19	2018	O	O	Ct	0.830												0.830	OK	OK	LE-08-Br
				E. Rel	0.7												0.7			
				Buse	A-312-3												---			
05-20	2018	O	O	Ct	0.777												0.777	OK	OK	LE-08-Br
				E. Rel	1.0												1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-21	2018	O	V	Ct	0.812	0.815	0.812	0.808	0.820	0.811	0.820	0.813	0.815	0.817	0.815	0.809	0.814	OK	OK	Atelier Qc
				E. Rel	0.4	0.4	1.0	1.0	0.4	0.0	0.7	0.9	1.0	1.0	1.0	1.0	0.7			
				Buse	A-312-3												---			
05-22	2018	O	O	Ct	0.786												0.786	OK	OK	LE-09-G
				E. Rel	0.7												0.7			

Effectué par: JM / DR / JFG / SA

Date: Février 2018

Endroit de la calibration: Université Laval

Vérifié par: Eric Trépanier

Signature: 

Date: 2 mars 2018

APPENDIX 4
LABORATORY ANALYSIS REPORT



AGAT Laboratoires

9770 ROUTE TRANSCANADIENNE
ST. LAURENT, QUEBEC
CANADA H4S 1V9
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FAX (514)333-3046
http://www.agatlabs.com

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC
2022 LAVOISIER LOCAL 125
QUEBEC, QC G1N4L5
(418) 650-5960

À L'ATTENTION DE: Eric Trépanier

N° DE PROJET: Agnico Eagle/5528

N° BON DE TRAVAIL: 18M395832

HAUTE RÉSOLUTION VÉRIFIÉ PAR: Anastasia Kazakova, chimiste

DATE DU RAPPORT: 2018-11-01

VERSION*: 1

NOMBRE DE PAGES: 7

Si vous désirez de l'information concernant cette analyse, S.V.P. contacter votre chargé de projets au (514) 337-1000.

*NOTES

Nous disposerons des échantillons dans les 30 jours suivants les analyses. S.V.P. Contactez le laboratoire si vous désirez avoir un délai d'entreposage.

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Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

				501 à 506 - Inc.		507 à 512-Inc.-2		513 à 518-Inc.-3		519 à 524-Inc.
IDENTIFICATION DE L'ÉCHANTILLON:				-1						-BL
MATRICE:				Air		Air		Air		Air
DATE D'ÉCHANTILLONNAGE:				2018-09-22		2018-09-22		2018-09-22		2018-09-22
Paramètre	Unités	C / N	LDR	9616643	LDR	9616650	LDR	9616651	LDR	9616652
2,3,7,8-TCDD (pg total)	pg		1	<1	2	5	7	<7	0.8	<0.8
1,2,3,7,8 PeCDD (pg total)	pg		3	<3	9	47	10	23	2	<2
1,2,3,4,7,8 HxCDD (pg total)	pg		3	<3	7	53	10	28	2	<2
1,2,3,6,7,8 HxCDD (pg total)	pg		3	3	6	71	10	63	2	<2
1,2,3,7,8,9 HxCDD (pg total)	pg		3	<3	7	81	10	65	2	<2
1,2,3,4,6,7,8 HpCDD (pg total)	pg		6	17	10	316	10	307	5	<5
OCDD (pg total)	pg		20	33	10	160	20	300	20	<20
2,3,7,8 TCDF (pg total)	pg		4	15	6	48	9	216	2	<2
1,2,3,7,8 PeCDF (pg total)	pg		8	<8	9	21	20	62	2	<2
2,3,4,7,8-PeCDF (pg total)	pg		6	9	7	43	10	165	2	<2
1,2,3,4,7,8 HxCDF (pg total)	pg		4	13	10	62	10	326	2	<2
1,2,3,6,7,8 HxCDF (pg total)	pg		4	9	10	25	10	120	2	<2
2,3,4,6,7,8-HxCDF (pg total)	pg		4	8	10	50	10	273	2	<2
1,2,3,7,8,9 HxCDF (pg total)	pg		6	<6	20	<20	20	30	3	<3
1,2,3,4,6,7,8 HpCDF (pg total)	pg		3	16	5	64	20	474	2	<2
1,2,3,4,7,8,9 HpCDF (pg total)	pg		6	<6	8	8	20	100	3	<3
OCDF (pg total)	pg		9	20	7	17	30	227	7	<7
Sommation des Tétrachlorodibenzodioxines	pg		1	9	2	159	7	214	0.8	3.3
Sommation des Pentachlorodibenzodioxines	pg		3	11	9	446	10	406	2	8
Sommation des Hexachlorodibenzodioxines	pg		3	25	7	900	10	718	2	5
Sommation des Heptachlorodibenzodioxines	pg		6	20	10	334	10	315	5	<5
Sommation des PCDDs	pg		20	99	10	2000	20	1950	20	<20
Sommation des Tétrachlorodibenzofuranes	pg		4	100	6	282	9	1140	2	20

Certifié par:

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.

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AGAT Laboratoires

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TEL (514)337-1000
FAX (514)333-3046
http://www.agatlabs.com

Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

IDENTIFICATION DE L'ÉCHANTILLON:				501 à 506 - Inc. -1		507 à 512-Inc.-2		513 à 518-Inc.-3		519 à 524-Inc. -BL
MATRICE:				Air		Air		Air		Air
DATE D'ÉCHANTILLONNAGE:				2018-09-22		2018-09-22		2018-09-22		2018-09-22
Paramètre	Unités	C / N	LDR	9616643	LDR	9616650	LDR	9616651	LDR	9616652
Sommation des Pentachlorodibenzofuranes	pg		8	72	9	406	20	1540	2	15
Sommation des Hexachlorodibenzofuranes	pg		6	32	20	172	20	963	3	3
Sommation des Heptachlorodibenzofuranes	pg		6	28	8	123	20	880	3	5
Sommation des PCDFs	pg		9	253	20	1000	30	4750	7	43
2,3,7,8-Tetra CDD (TEF 1.0)	TEQ			0		5.30		0		0
1,2,3,7,8-Penta CDD (TEF 1.0)	TEQ			0		47.2		23.4		0
1,2,3,4,7,8-Hexa CDD (TEF 0.1)	TEQ			0		5.31		2.83		0
1,2,3,6,7,8-Hexa CDD (TEF 0.1)	TEQ			0.296		7.05		6.32		0
1,2,3,7,8,9-Hexa CDD (TEF 0.1)	TEQ			0		8.11		6.46		0
1,2,3,4,6,7,8-Hepta CDD (TEF 0.01)	TEQ			0.171		3.16		3.07		0
Octa CDD (TEF 0.0001)	TEQ			0.00335		0.0160		0.0300		0
2,3,7,8-Tetra CDF (TEF 0.1)	TEQ			1.48		4.84		21.6		0
1,2,3,7,8-Penta CDF (TEF 0.05)	TEQ			0		1.03		3.12		0
2,3,4,7,8-Penta CDF (TEF 0.5)	TEQ			4.36		21.6		82.5		0
1,2,3,4,7,8-Hexa CDF (TEF 0.1)	TEQ			1.30		6.24		32.6		0
1,2,3,6,7,8-Hexa CDF (TEF 0.1)	TEQ			0.926		2.48		12.0		0
2,3,4,6,7,8-Hexa CDF (TEF 0.1)	TEQ			0.818		4.96		27.3		0
1,2,3,7,8,9-Hexa CDF (TEF 0.1)	TEQ			0		0		3.04		0
1,2,3,4,6,7,8-Hepta CDF (TEF 0.01)	TEQ			0.162		0.636		4.74		0
1,2,3,4,7,8,9-Hepta CDF (TEF 0.01)	TEQ			0		0.0830		0.998		0
Octa CDF (TEF 0.0001)	TEQ			0.00201		0.00173		0.0227		0
Sommation des PCDDs et PCDFs (TEQ)				9.51		118		230		0

Certifié par:

La procédure des Laboratoires AGAT concernant les signatures et les signataires se conforme strictement aux exigences d'accréditation ISO 17025:2005 comme le requiert, lorsque applicable, CALA, CCN et MDDELCC. Toutes les signatures sur les certificats d'AGAT sont protégées par des mots de passe et les signataires rencontrent les exigences des domaines d'accréditation ainsi que les exigences régionales approuvées par CALA, CCN et MDDELCC.

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Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

			501 à 506 - Inc.			519 à 524-Inc.
IDENTIFICATION DE L'ÉCHANTILLON:			-1	507 à 512-Inc.-2	513 à 518-Inc.-3	-BL
MATRICE:			Air	Air	Air	Air
DATE D'ÉCHANTILLONNAGE:			2018-09-22	2018-09-22	2018-09-22	2018-09-22
Étalon de recouvrement	Unités	Limites	9616643	9616650	9616651	9616652
13C-2378-TCDF	%	30-140	56	60	45	54
13C-12378-PeCDF	%	30-140	48	48	38	52
13C-23478-PeCDF	%	30-140	71	60	56	55
13C-123478-HxCDF	%	30-140	84	89	72	73
13C-123678-HxCDF	%	30-140	94	95	68	88
13C-234678-HxCDF	%	30-140	104	109	68	86
13C-123789-HxCDF	%	30-140	94	101	60	72
13C-1234678-HpCDF	%	30-140	70	72	49	64
13C-1234789-HpCDF	%	30-140	57	61	51	55
13C-2378-TCDD	%	30-140	75	73	54	74
13C-12378-PeCDD	%	30-140	65	61	50	60
13C-123478-HxCDD	%	30-140	99	103	72	77
13C-123678-HxCDD	%	30-140	103	117	67	98
13C-1234678-HxCDD	%	30-140	58	62	50	57
13C-OCDD	%	30-140	31	37	33	30

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

9616643-9616652 Le résultat en pg total correspond au composite de chacune des parties du train d'échantillonnage.

Certifié par:

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Contrôle de qualité

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC
N° BON DE TRAVAIL: 18M395832
N° DE PROJET: Agnico Eagle/5528
À L'ATTENTION DE: Eric Trépanier
PRÉLEVÉ PAR:
LIEU DE PRÉLÈVEMENT:

Analyse haute résolution

Date du rapport: 2018-11-01			DUPLICATA			MATÉRIAU DE RÉFÉRENCE				BLANC FORTIFIÉ			ÉCH. FORTIFIÉ		
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.
Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)															
2,3,7,8-TCDD (pg total)	1	MR	32	30	0.0	< 0.7	80%	70%	130%	NA	70%	130%	74%	70%	130%
1,2,3,7,8 PeCDD (pg total)	1	MR	165	178	0.0	< 2	82%	70%	130%	NA	70%	130%	89%	70%	130%
1,2,3,4,7,8 HxCDD (pg total)	1	MR	179	180	0.0	< 2	89%	70%	130%	NA	70%	130%	90%	70%	130%
1,2,3,6,7,8 HxCDD (pg total)	1	MR	197	183	0.0	< 2	99%	70%	130%	NA	70%	130%	92%	70%	130%
1,2,3,7,8,9 HxCDD (pg total)	1	MR	201	183	0.0	< 2	100%	70%	130%	NA	70%	130%	91%	70%	130%
1,2,3,4,6,7,8 HpCDD (pg total)	1	MR	184	179	0.0	< 2	92%	70%	130%	NA	70%	130%	89%	70%	130%
OCDD (pg total)	1	MR	376	341	0.0	< 4	94%	70%	130%	NA	70%	130%	85%	70%	130%
2,3,7,8 TCDF (pg total)	1	MR	37	39	0.0	< 2	92%	70%	130%	NA	70%	130%	97%	70%	130%
1,2,3,7,8 PeCDF (pg total)	1	MR	208	214	0.0	< 2	104%	70%	130%	NA	70%	130%	107%	70%	130%
2,3,4,7,8-PeCDF (pg total)	1	MR	204	215	0.0	< 1	102%	70%	130%	NA	70%	130%	107%	70%	130%
1,2,3,4,7,8 HxCDF (pg total)	1	MR	197	194	0.0	< 2	98%	70%	130%	NA	70%	130%	97%	70%	130%
1,2,3,6,7,8 HxCDF (pg total)	1	MR	209	209	0.0	< 2	105%	70%	130%	NA	70%	130%	105%	70%	130%
2,3,4,6,7,8-HxCDF (pg total)	1	MR	209	203	0.0	< 2	105%	70%	130%	NA	70%	130%	102%	70%	130%
1,2,3,7,8,9 HxCDF (pg total)	1	MR	196	197	0.0	< 3	98%	70%	130%	NA	70%	130%	98%	70%	130%
1,2,3,4,6,7,8 HpCDF (pg total)	1	MR	195	187	0.0	< 2	97%	70%	130%	NA	70%	130%	94%	70%	130%
1,2,3,4,7,8,9 HpCDF (pg total)	1	MR	197	190	0.0	< 3	99%	70%	130%	NA	70%	130%	95%	70%	130%
OCDF (pg total)	1	MR	427	401	0.0	< 3	107%	70%	130%	NA	70%	130%	100%	70%	130%

Certifié par:

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Sommaire de méthode

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
Analyse haute résolution					
2,3,7,8-TCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8 PeCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8 HpCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
OCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8 TCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8 PeCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,7,8-PeCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,6,7,8-HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8 HpCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8,9 HpCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
OCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Tétrachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Pentachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Hexachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Heptachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDDs	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Tétrachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Pentachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Hexachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Heptachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDFs	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8-Tetra CDD (TEF 1.0)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8-Penta CDD (TEF 1.0)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8-Hepta CDD (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Octa CDD (TEF 0.0001)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8-Tetra CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8-Penta CDF (TEF 0.05)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,7,8-Penta CDF (TEF 0.5)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR_151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,6,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8-Hepta CDF (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8,9-Hepta CDF (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS

Cette version remplace et annule toute version, le cas échéant. Ce document ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite du laboratoire. Les résultats ne se rapportent qu'aux échantillons soumis pour analyse.

AGAT Laboratoires

9770 ROUTE TRANSCANADIENNE
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CANADA H4S 1V9
TEL (514)337-1000
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http://www.agatlabs.com

Sommaire de méthode

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
Octa CDF (TEF 0.0001)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDDs et PCDFs (TEQ)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-2378-TCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-12378-PeCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-23478-PeCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123478-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123678-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-234678-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123789-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234678-HpCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234789-HpCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-2378-TCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-12378-PeCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123478-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123678-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234678-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-OCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS

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CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

RAPPORT D'ESSAI

Date : 21 novembre 2018

Réf : P2334-1

Client

 # Client : C8

Nom : Trépanier Éric

Téléphone : (418) 650-5960 # 2208

Courriel : eric.trepanier@consul-air.com

Adresse :
CONSULAIR Québec
125-2022,rue Lavoisier
Québec QC
G1N 4L5 Canada

Résumé du projet

Nb. d'objets : 4

 # Projet lab. : P2334

Votre # projet : 18-5528

Chantier : Agnico-Eagle

Résumé des essais

Paramètre(s) non accrédités

ST	Paramètre	Q.	Principe (Méthode)	Matrice
	Chlorures (Cl)	4	Spectrophotométrie	Eau

ST : Paramètre Sous-Traité

Résultats d'essai(s)

ST	Param.	Échantillon (s)		Dates			Résultat(s)		LDR
		# Lab	*# Client*	*Échantillon.*	*Récep.*	*Essai*	*Valeur*	*Unité*	
	Cl	171018-8	**304 - Inc - B1 - 1**	22-09-18	17-10-18	30-10-18	**86.87**	mg	1.76
		171018-9	**312 - Inc - B1 - 2**	28-09-18	17-10-18	30-10-18	**33.16**	mg	0.73
		171018-10	**320 - Inc - B1 - 3**	29-09-18	17-10-18	30-10-18	**119.33**	mg	1.87
		171018-11	**328 - Bl - Eau - Bl**	23-09-18	17-10-18	30-10-18	**< LDR**	mg	0.04

ST : Essai Sous-Traité
LDR : Limite de Détection Rapportée

Commentaire(s)

1.

Contrôle de qualité

ST	Param.	Date	# Réf	Type	Résultat(s)		LDR
					Valeur	***Unité***	
	Cl	30-10-18	BL3010	BL	< LDR	mg/l	0.39
			MR3010	MR	103.4	% Récup.	-
			AD171018-9	AD	103.1	% Récup.	-
			AD171018-11	AD	101.8	% Récup.	-

ST : Contrôle qualité Sous-Traité
 # Réf : Référence du contrôle qualité dans le système de suivi du laboratoire
BL : Blanc
MR : Matériau de Référence
DP : Duplicata
RP : Réplicata
AD : Ajout Dosé
EA : Étalon Analogue
TM: Témoin de l'extraction
LDR : Limite de Détection Rapportée

Signature

Les résultats ne se rapportent qu'aux objets soumis à l'essai
Tout ou partie de ce document ne peut être reproduit sans l'autorisation du laboratoire de CONSULAIR.
Ce rapport d'essai est certifié par la (les) personne(s) mentionnée(s) ci-après.
Pour toute question concernant ce certificat d'analyse, veuillez vous adresser directement à :





Malha Kirèche

Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE
Votre # Bordereau: N/A

Attention: Éric Trépanier

CONSULAIR INC.
2022 Lavoisier
Local 125
Québec, QC
Canada G1N 4L5

Date du rapport: 2018/11/21
Rapport: R2413187
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B847715
Reçu: 2018/10/19, 12:30

Matrice: FILTRE
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles totaux par ICP-MS	4	2018/11/06	2018/11/06	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Matrice: Solution barboteur
Nombre d'échantillons reçus: 16

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Mercure par AAVF	2	2018/10/30	2018/10/31	STL SOP-00042	MA.200–Hg 1.1 R1 m
Mercure par AAVF	2	2018/11/01	2018/11/05	STL SOP-00042	MA.200–Hg 1.1 R1 m
Métaux extractibles	5	2018/11/01	2018/11/05	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Métaux extractibles	3	2018/11/06	2018/11/07	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Métaux extractibles	4	2018/11/14	2018/11/17	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Volume d'échantillon	3	2018/11/02	2018/11/02		

Matrice: SOLVANT
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles	4	2018/11/06	2018/11/07	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Matrice: TRAIN
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles	4	2018/11/01	2018/11/08	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE
Votre # Bordereau: N/A

Attention: Éric Trépanier

CONSULAIR INC.
2022 Lavoisier
Local 125
Québec, QC
Canada G1N 4L5

Date du rapport: 2018/11/21
Rapport: R2413187
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B847715
Reçu: 2018/10/19, 12:30

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

Note : Les paramètres inclus dans le présent certificat sont accrédités par le MDDELCC, à moins d'indication contraire.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Argyro Frangoulis, Chargée de projets
Courriel: afrangoulis@maxxam.ca
Téléphone (514)448-9001 Ext:7066229

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5271	FX5271			FX5389		
Date d'échantillonnage		2018/09/22	2018/09/22			2018/09/22		
# Bordereau		N/A	N/A			N/A		
	Unités	**305-INC-B2345-1 VT:334ML**	**305-INC-B2345-1 VT:334ML Dup. de Lab.**	**LDR**	**Lot CQ**	**307+308-INC-B67-1 VT:615ML**	**LDR**	**Lot CQ**
MÉTAUX								
Aluminium (Al) †	ug	9	8	3	1949070			
Antimoine (Sb) †	ug	<0.3	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	<2	2	1949070			
Arsenic (As) †	ug	<0.3	<0.3	0.3	1949070			
Baryum (Ba) †	ug	0.2	0.2	0.2	1949070			
Béryllium (Be) †	ug	<0.2	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	<0.2	0.2	1949070			
Bore (B) †	ug	2.6	3.6	0.7	1949070			
Cadmium (Cd) †	ug	1.4	1.4	0.2	1949070			
Calcium (Ca) †	ug	126	123	20	1949070			
Chrome (Cr) †	ug	<0.3	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	2.1	1.9	0.3	1949070			
Etain (Sn) †	ug	24	23	2	1949070			
Fer (Fe) †	ug	21	20	20	1949070			
Lithium (Li) †	ug	<3	<3	3	1949070			
Magnésium (Mg) †	ug	96	93	7	1949070			
Manganèse (Mn) †	ug	49.3	49.4	0.3	1949070			
Mercure (Hg)	ug					0.85	0.31	1949380
Mercure (Hg) †	ug	0.4	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	<2	2	1949070			
Nickel (Ni) †	ug	0.4	0.4	0.3	1949070			
Plomb (Pb) †	ug	<2	<2	2	1949070			
Potassium (K) †	ug	34	41	30	1949070			
Sélénium (Se) †	ug	<0.3	<0.3	0.3	1949070			
Silicium (Si) †	ug	46	49	20	1949070			
Sodium (Na) †	ug	<20	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	<3	3	1949070			
Vanadium (V) †	ug	<0.7	<0.7	0.7	1949070			
Zinc (Zn) †	ug	7.5	7.1	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5496			FX5497		
Date d'échantillonnage		2018/09/28			2018/09/28		
# Bordereau		N/A			N/A		
	Unités	**313-INC-B2345-2 VT:323ML**	**LDR**	**Lot CQ**	**315+316-INC-B67-2 VT:625ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	7	3	1949070			
Antimoine (Sb) †	ug	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	2	1949070			
Arsenic (As) †	ug	<0.3	0.3	1949070			
Baryum (Ba) †	ug	0.4	0.2	1949070			
Béryllium (Be) †	ug	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	0.2	1949070			
Bore (B) †	ug	0.9	0.6	1949070			
Cadmium (Cd) †	ug	0.5	0.2	1949070			
Calcium (Ca) †	ug	60	20	1949070			
Chrome (Cr) †	ug	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	0.4	0.3	1949070			
Etain (Sn) †	ug	22	2	1949070			
Fer (Fe) †	ug	<20	20	1949070			
Lithium (Li) †	ug	<3	3	1949070			
Magnésium (Mg) †	ug	13	6	1949070			
Manganèse (Mn) †	ug	3.1	0.3	1949070			
Mercure (Hg)	ug				0.60	0.31	1949380
Mercure (Hg) †	ug	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	2	1949070			
Nickel (Ni) †	ug	<0.3	0.3	1949070			
Plomb (Pb) †	ug	<2	2	1949070			
Potassium (K) †	ug	<30	30	1949070			
Sélénium (Se) †	ug	<0.3	0.3	1949070			
Silicium (Si) †	ug	21	20	1949070			
Sodium (Na) †	ug	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	3	1949070			
Vanadium (V) †	ug	<0.6	0.6	1949070			
Zinc (Zn) †	ug	1.3	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5498			FX5499		
Date d'échantillonnage		2018/09/29			2018/09/29		
# Bordereau		N/A			N/A		
	Unités	**321-INC-B2345-3 VT:330ML**	**LDR**	**Lot CQ**	**323+324-INC-B67-3 VT:625ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	9	3	1949070			
Antimoine (Sb) †	ug	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	2	1949070			
Arsenic (As) †	ug	<0.3	0.3	1949070			
Baryum (Ba) †	ug	<0.2	0.2	1949070			
Béryllium (Be) †	ug	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	0.2	1949070			
Bore (B) †	ug	6.7	0.7	1949070			
Cadmium (Cd) †	ug	0.3	0.2	1949070			
Calcium (Ca) †	ug	137	20	1949070			
Chrome (Cr) †	ug	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	2.3	0.3	1949070			
Etain (Sn) †	ug	23	2	1949070			
Fer (Fe) †	ug	54	20	1949070			
Lithium (Li) †	ug	<3	3	1949070			
Magnésium (Mg) †	ug	39	7	1949070			
Manganèse (Mn) †	ug	1.2	0.3	1949070			
Mercure (Hg)	ug				<0.31	0.31	1948181
Mercure (Hg) †	ug	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	2	1949070			
Nickel (Ni) †	ug	0.3	0.3	1949070			
Plomb (Pb) †	ug	<2	2	1949070			
Potassium (K) †	ug	<30	30	1949070			
Sélénium (Se) †	ug	<0.3	0.3	1949070			
Silicium (Si) †	ug	48	20	1949070			
Sodium (Na) †	ug	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	3	1949070			
Vanadium (V) †	ug	<0.7	0.7	1949070			
Zinc (Zn) †	ug	4.4	0.3	1949070			

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Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5500			FX5502		
Date d'échantillonnage		2018/09/23			2018/09/23		
# Bordereau		N/A			N/A		
	Unités	**329-BL-B123-BL VT:200ML**	**LDR**	**Lot CQ**	**330+331-BL-B56-BL VT:325ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	4	2	1949070			
Antimoine (Sb) †	ug	<0.2	0.2	1949070			
Argent (Ag) †	ug	<1	1	1949070			
Arsenic (As) †	ug	<0.2	0.2	1949070			
Baryum (Ba) †	ug	<0.1	0.1	1949070			
Béryllium (Be) †	ug	<0.1	0.1	1949070			
Bismuth (Bi) †	ug	<0.1	0.1	1949070			
Bore (B) †	ug	0.9	0.4	1949070			
Cadmium (Cd) †	ug	0.8	0.1	1949070			
Calcium (Ca) †	ug	43	10	1949070			
Chrome (Cr) †	ug	0.2	0.2	1949070			
Cobalt (Co) †	ug	<0.2	0.2	1949070			
Cuivre (Cu) †	ug	<0.2	0.2	1949070			
Etain (Sn) †	ug	22	1	1949070			
Fer (Fe) †	ug	19	10	1949070			
Lithium (Li) †	ug	<2	2	1949070			
Magnésium (Mg) †	ug	10	4	1949070			
Manganèse (Mn) †	ug	0.5	0.2	1949070			
Mercure (Hg)	ug				<0.16	0.16	1948181
Mercure (Hg) †	ug	<0.1	0.1	1949070			
Molybdène (Mo) †	ug	<1	1	1949070			
Nickel (Ni) †	ug	<0.2	0.2	1949070			
Plomb (Pb) †	ug	<1	1	1949070			
Potassium (K) †	ug	<20	20	1949070			
Sélénium (Se) †	ug	<0.2	0.2	1949070			
Silicium (Si) †	ug	23	10	1949070			
Sodium (Na) †	ug	<10	10	1949070			
Strontium (Sr) †	ug	<0.2	0.2	1949070			
Thallium (Tl) †	ug	<0.2	0.2	1949070			
Titane (Ti) †	ug	<2	2	1949070			
Vanadium (V) †	ug	<0.4	0.4	1949070			
Zinc (Zn) †	ug	0.5	0.2	1949070			

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† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FZ0589	FZ0590		FZ0591		
Date d'échantillonnage		2018/09/22	2018/09/28		2018/09/29		
# Bordereau		N/A	N/A		N/A		
	Unités	**304-INC-B1-1 VT:180ML**	**312-INC-B1-2 VT:188ML**	**LDR**	**320-INC-B1-3 VT:240ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	3	3	2	5	2	1952598
Antimoine (Sb) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Argent (Ag) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Arsenic (As) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Baryum (Ba) †	ug	0.25	0.15	0.09	0.2	0.1	1952598
Béryllium (Be) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Bismuth (Bi) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Bore (B) †	ug	19.9	9.5	0.4	92.6	0.5	1952598
Cadmium (Cd) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Calcium (Ca) †	ug	18	32	9	17	10	1952598
Chrome (Cr) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Cobalt (Co) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Cuivre (Cu) †	ug	0.5	0.7	0.2	<0.2	0.2	1952598
Etain (Sn) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Fer (Fe) †	ug	<9	521	9	<10	10	1952598
Lithium (Li) †	ug	<2	<2	2	<2	2	1952598
Magnésium (Mg) †	ug	5	<4	4	<5	5	1952598
Manganèse (Mn) †	ug	1.9	4.4	0.2	0.3	0.2	1952598
Mercure (Hg) †	ug	<0.09	0.12	0.09	0.1	0.1	1952598
Molybdène (Mo) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Nickel (Ni) †	ug	0.2	0.4	0.2	<0.2	0.2	1952598
Plomb (Pb) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Potassium (K) †	ug	<20	<20	20	<20	20	1952598
Sélénium (Se) †	ug	0.9	0.3	0.2	0.5	0.2	1952598
Silicium (Si) †	ug	12	11	9	148	10	1952598
Sodium (Na) †	ug	<9	<9	9	<10	10	1952598
Strontium (Sr) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Thallium (Tl) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Titane (Ti) †	ug	<2	<2	2	<2	2	1952598
Vanadium (V) †	ug	<0.4	<0.4	0.4	<0.5	0.5	1952598
Zinc (Zn) †	ug	2.2	1.3	0.2	0.7	0.2	1952598

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FZ0592		
Date d'échantillonnage		2018/09/23		
# Bordereau		N/A		
	Unités	**328-BL-EAU-BL VT:100ML**	**LDR**	**Lot CQ**
MÉTAUX				
Aluminium (Al) †	ug	<1	1	1952598
Antimoine (Sb) †	ug	<0.1	0.1	1952598
Argent (Ag) †	ug	<0.5	0.5	1952598
Arsenic (As) †	ug	<0.1	0.1	1952598
Baryum (Ba) †	ug	0.07	0.05	1952598
Béryllium (Be) †	ug	<0.05	0.05	1952598
Bismuth (Bi) †	ug	<0.05	0.05	1952598
Bore (B) †	ug	0.6	0.2	1952598
Cadmium (Cd) †	ug	<0.05	0.05	1952598
Calcium (Ca) †	ug	<5	5	1952598
Chrome (Cr) †	ug	<0.1	0.1	1952598
Cobalt (Co) †	ug	<0.1	0.1	1952598
Cuivre (Cu) †	ug	<0.1	0.1	1952598
Etain (Sn) †	ug	<0.5	0.5	1952598
Fer (Fe) †	ug	<5	5	1952598
Lithium (Li) †	ug	<1	1	1952598
Magnésium (Mg) †	ug	<2	2	1952598
Manganèse (Mn) †	ug	0.2	0.1	1952598
Mercure (Hg) †	ug	<0.05	0.05	1952598
Molybdène (Mo) †	ug	<0.5	0.5	1952598
Nickel (Ni) †	ug	<0.1	0.1	1952598
Plomb (Pb) †	ug	<0.5	0.5	1952598
Potassium (K) †	ug	<10	10	1952598
Sélénium (Se) †	ug	<0.1	0.1	1952598
Silicium (Si) †	ug	<5	5	1952598
Sodium (Na) †	ug	<5	5	1952598
Strontium (Sr) †	ug	<0.1	0.1	1952598
Thallium (Tl) †	ug	<0.1	0.1	1952598
Titane (Ti) †	ug	<1	1	1952598
Vanadium (V) †	ug	<0.2	0.2	1952598
Zinc (Zn) †	ug	0.3	0.1	1952598

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† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

PARAMÈTRES CONVENTIONNELS (SOLUTION BARBOTEUR)

ID Maxxam		FY0848	FY0856	FY0857	
Date d'échantillonnage		2018/09/22	2018/09/28	2018/09/29	
# Bordereau		N/A	N/A	N/A	
	Unités	**302-INC-BS-HNO3-1**	**310-INC-BS-HNO3-2**	**318-INC-BS-HNO3-3**	**Lot CQ**
CONVENTIONNELS					
Volume final †	ml	88	110	66	1949618

Lot CQ = Lot contrôle qualité
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Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (TRAIN)

ID Maxxam		FY0848		FY0856		FY0857		
Date d'échantillonnage		2018/09/22		2018/09/28		2018/09/29		
# Bordereau		N/A		N/A		N/A		
	Unités	**301+302+303-INC-1**	**LDR**	**309+310+311-INC-2**	**LDR**	**317+318+319-INC-3**	**LDR**	**Lot CQ**
MÉTAUX								
Aluminium (Al) †	ug	570	2	30	2	46	2	1949322
Antimoine (Sb) †	ug	245	0.1	3.6	0.1	219	0.1	1949322
Argent (Ag) †	ug	0.9	0.5	<0.6	0.6	1.3	0.5	1949322
Arsenic (As) †	ug	17.2	0.1	1.3	0.1	30.9	0.1	1949322
Baryum (Ba) †	ug	7.28	0.05	0.65	0.06	1.06	0.05	1949322
Béryllium (Be) †	ug	<0.05	0.05	<0.06	0.06	<0.05	0.05	1949322
Bismuth (Bi) †	ug	0.84	0.05	0.12	0.06	4.83	0.05	1949322
Bore (B) †	ug	4.1	0.5	4.0	0.5	3.7	0.5	1949322
Cadmium (Cd) †	ug	2.47	0.05	0.45	0.06	9.52	0.05	1949322
Calcium (Ca) †	ug	1930	50	309	50	243	50	1949322
Chrome (Cr) †	ug	18.2	0.1	5.1	0.1	73.4	0.1	1949322
Cobalt (Co) †	ug	0.5	0.1	<0.1	0.1	0.2	0.1	1949322
Cuivre (Cu) †	ug	89.1	0.1	24.7	0.1	131	0.1	1949322
Etain (Sn) †	ug	77.4	0.5	4.0	0.6	166	0.5	1949322
Fer (Fe) †	ug	1070	5	33	6	82	5	1949322
Lithium (Li) †	ug	8	1	33	1	32	1	1949322
Magnésium (Mg) †	ug	216	2	34	2	36	2	1949322
Manganèse (Mn) †	ug	16.5	0.1	15.7	0.1	4.3	0.1	1949322
Mercure (Hg)	ug	<0.1	0.1	<0.1	0.1	<0.1	0.1	1949322
Molybdène (Mo) †	ug	4.8	0.5	<0.6	0.6	8.9	0.5	1949322
Nickel (Ni) †	ug	8.1	0.3	0.4	0.3	2.0	0.3	1949322
Plomb (Pb) †	ug	127	0.5	36.0	0.6	444	0.5	1949322
Potassium (K) †	ug	10100	10	1170	10	10200	10	1949322
Sélénium (Se) †	ug	<0.5	0.5	<0.5	0.5	0.5	0.5	1949322
Silicium (Si) †	ug	717	5	148	6	397	5	1949322
Sodium (Na) †	ug	7900	10	851	10	6890	10	1949322
Strontium (Sr) †	ug	5.0	0.1	0.4	0.1	0.4	0.1	1949322
Thallium (Tl) †	ug	<0.1	0.1	<0.1	0.1	<0.1	0.1	1949322
Titane (Ti) †	ug	52	1	4	1	6	1	1949322
Vanadium (V) †	ug	0.8	0.2	<0.2	0.2	0.4	0.2	1949322
Zinc (Zn) †	ug	509	1	54	1	1070	1	1949322

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (TRAIN)

ID Maxxam		FY0858		
Date d'échantillonnage		2018/09/23		
# Bordereau		N/A		
	Unités	**325+326+327-BL-BL**	**LDR**	**Lot CQ**
MÉTAUX				
Aluminium (Al) †	ug	4	3	1949322
Antimoine (Sb) †	ug	<0.3	0.3	1949322
Argent (Ag) †	ug	<2	2	1949322
Arsenic (As) †	ug	<0.3	0.3	1949322
Baryum (Ba) †	ug	0.2	0.2	1949322
Béryllium (Be) †	ug	<0.2	0.2	1949322
Bismuth (Bi) †	ug	<0.2	0.2	1949322
Bore (B) †	ug	4.4	0.6	1949322
Cadmium (Cd) †	ug	<0.2	0.2	1949322
Calcium (Ca) †	ug	<50	50	1949322
Chrome (Cr) †	ug	11.0	0.3	1949322
Cobalt (Co) †	ug	<0.3	0.3	1949322
Cuivre (Cu) †	ug	0.3	0.3	1949322
Etain (Sn) †	ug	<2	2	1949322
Fer (Fe) †	ug	<20	20	1949322
Lithium (Li) †	ug	<3	3	1949322
Magnésium (Mg) †	ug	8	6	1949322
Manganèse (Mn) †	ug	<0.3	0.3	1949322
Mercure (Hg)	ug	<0.2	0.2	1949322
Molybdène (Mo) †	ug	<2	2	1949322
Nickel (Ni) †	ug	<0.3	0.3	1949322
Plomb (Pb) †	ug	<2	2	1949322
Potassium (K) †	ug	<30	30	1949322
Sélénium (Se) †	ug	<0.5	0.5	1949322
Silicium (Si) †	ug	63	20	1949322
Sodium (Na) †	ug	143	20	1949322
Strontium (Sr) †	ug	<0.3	0.3	1949322
Thallium (Tl) †	ug	<0.3	0.3	1949322
Titane (Ti) †	ug	<3	3	1949322
Vanadium (V) †	ug	<0.6	0.6	1949322
Zinc (Zn) †	ug	<1	1	1949322

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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

REMARQUES GÉNÉRALES

MÉTAUX (SOLUTION BARBOTEUR)

Les limites de détection indiquées sont modifiées en fonction du volume d'échantillon reçu.

MÉTAUX (TRAIN)

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.
Les limites de détection indiquées sont modifiées en fonction du volume d'échantillon reçu.

Les résultats ne se rapportent qu'aux échantillons soumis pour analyse

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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
1948181	EHA	Blanc fortifié	Mercure (Hg)	2018/10/31		160 (1)	%
1948181	EHA	Blanc de méthode	Mercure (Hg)	2018/10/31	<0.050		ug
1949070	EHA	Blanc fortifié	Aluminium (Al)	2018/11/05		105	%
			Antimoine (Sb)	2018/11/05		110	%
			Argent (Ag)	2018/11/05		102	%
			Arsenic (As)	2018/11/05		110	%
			Baryum (Ba)	2018/11/05		106	%
			Béryllium (Be)	2018/11/05		104	%
			Bismuth (Bi)	2018/11/05		108	%
			Bore (B)	2018/11/05		112	%
			Cadmium (Cd)	2018/11/05		105	%
			Calcium (Ca)	2018/11/05		107	%
			Chrome (Cr)	2018/11/05		105	%
			Cobalt (Co)	2018/11/05		105	%
			Cuivre (Cu)	2018/11/05		106	%
			Etain (Sn)	2018/11/05		112	%
			Fer (Fe)	2018/11/05		107	%
			Lithium (Li)	2018/11/05		106	%
			Magnésium (Mg)	2018/11/05		105	%
			Manganèse (Mn)	2018/11/05		107	%
			Mercure (Hg)	2018/11/05		119	%
			Molybdène (Mo)	2018/11/05		110	%
			Nickel (Ni)	2018/11/05		104	%
			Plomb (Pb)	2018/11/05		109	%
			Potassium (K)	2018/11/05		101	%
			Sélénium (Se)	2018/11/05		109	%
			Silicium (Si)	2018/11/05		99	%
			Sodium (Na)	2018/11/05		107	%
			Strontium (Sr)	2018/11/05		118	%
			Thallium (Tl)	2018/11/05		107	%
			Titane (Ti)	2018/11/05		102	%
			Vanadium (V)	2018/11/05		107	%
			Zinc (Zn)	2018/11/05		103	%
1949070	EHA	Blanc de méthode	Aluminium (Al)	2018/11/05	<1		ug
			Antimoine (Sb)	2018/11/05	<0.1		ug
			Argent (Ag)	2018/11/05	<0.5		ug
			Arsenic (As)	2018/11/05	<0.1		ug
			Baryum (Ba)	2018/11/05	<0.05		ug
			Béryllium (Be)	2018/11/05	<0.05		ug
			Bismuth (Bi)	2018/11/05	<0.05		ug
			Bore (B)	2018/11/05	<0.2		ug
			Cadmium (Cd)	2018/11/05	<0.05		ug
			Calcium (Ca)	2018/11/05	<5		ug
			Chrome (Cr)	2018/11/05	<0.1		ug
			Cobalt (Co)	2018/11/05	<0.1		ug
			Cuivre (Cu)	2018/11/05	<0.1		ug
			Etain (Sn)	2018/11/05	<0.5		ug
			Fer (Fe)	2018/11/05	<5		ug
			Lithium (Li)	2018/11/05	<1		ug
			Magnésium (Mg)	2018/11/05	<2		ug
			Manganèse (Mn)	2018/11/05	<0.1		ug
			Mercure (Hg)	2018/11/05	<0.05		ug

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
			Molybdène (Mo)	2018/11/05	<0.5		ug
			Nickel (Ni)	2018/11/05	<0.1		ug
			Plomb (Pb)	2018/11/05	<0.5		ug
			Potassium (K)	2018/11/05	<10		ug
			Sélénium (Se)	2018/11/05	<0.1		ug
			Silicium (Si)	2018/11/05	<5		ug
			Sodium (Na)	2018/11/05	<5		ug
			Strontium (Sr)	2018/11/05	<0.1		ug
			Thallium (Tl)	2018/11/05	<0.1		ug
			Titane (Ti)	2018/11/05	<1		ug
			Vanadium (V)	2018/11/05	<0.2		ug
			Zinc (Zn)	2018/11/05	<0.1		ug
1949380	SD2	MRC	Mercure (Hg)	2018/11/05		110	%
1949380	SD2	Blanc fortifié	Mercure (Hg)	2018/11/05		125 (1)	%
1949380	SD2	Blanc de méthode	Mercure (Hg)	2018/11/05	<0.050		ug
1952598	EHA	Blanc fortifié	Aluminium (Al)	2018/11/17		102	%
			Antimoine (Sb)	2018/11/17		100	%
			Argent (Ag)	2018/11/17		115	%
			Arsenic (As)	2018/11/17		104	%
			Baryum (Ba)	2018/11/17		113	%
			Béryllium (Be)	2018/11/17		101	%
			Bismuth (Bi)	2018/11/17		98	%
			Bore (B)	2018/11/17		105	%
			Cadmium (Cd)	2018/11/17		96	%
			Calcium (Ca)	2018/11/17		98	%
			Chrome (Cr)	2018/11/17		102	%
			Cobalt (Co)	2018/11/17		98	%
			Cuivre (Cu)	2018/11/17		100	%
			Etain (Sn)	2018/11/17		106	%
			Fer (Fe)	2018/11/17		98	%
			Lithium (Li)	2018/11/17		100	%
			Magnésium (Mg)	2018/11/17		98	%
			Manganèse (Mn)	2018/11/17		105	%
			Mercure (Hg)	2018/11/17		108	%
			Molybdène (Mo)	2018/11/17		102	%
			Nickel (Ni)	2018/11/17		98	%
			Plomb (Pb)	2018/11/17		101	%
			Potassium (K)	2018/11/17		98	%
			Sélénium (Se)	2018/11/17		103	%
			Silicium (Si)	2018/11/17		98	%
			Sodium (Na)	2018/11/17		104	%
			Strontium (Sr)	2018/11/17		109	%
			Thallium (Tl)	2018/11/17		97	%
			Titane (Ti)	2018/11/17		105	%
			Vanadium (V)	2018/11/17		102	%
			Zinc (Zn)	2018/11/17		111	%
1952598	EHA	Blanc de méthode	Aluminium (Al)	2018/11/17	<1		ug
			Antimoine (Sb)	2018/11/17	<0.1		ug
			Argent (Ag)	2018/11/17	<0.5		ug
			Arsenic (As)	2018/11/17	<0.1		ug
			Baryum (Ba)	2018/11/17	<0.05		ug
			Béryllium (Be)	2018/11/17	<0.05		ug

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
			Bismuth (Bi)	2018/11/17	<0.05		ug
			Bore (B)	2018/11/17	0.2, LDR=0.2		ug
			Cadmium (Cd)	2018/11/17	<0.05		ug
			Calcium (Ca)	2018/11/17	<5		ug
			Chrome (Cr)	2018/11/17	<0.1		ug
			Cobalt (Co)	2018/11/17	<0.1		ug
			Cuivre (Cu)	2018/11/17	<0.1		ug
			Etain (Sn)	2018/11/17	<0.5		ug
			Fer (Fe)	2018/11/17	<5		ug
			Lithium (Li)	2018/11/17	<1		ug
			Magnésium (Mg)	2018/11/17	<2		ug
			Manganèse (Mn)	2018/11/17	<0.1		ug
			Mercure (Hg)	2018/11/17	<0.05		ug
			Molybdène (Mo)	2018/11/17	<0.5		ug
			Nickel (Ni)	2018/11/17	<0.1		ug
			Plomb (Pb)	2018/11/17	<0.5		ug
			Potassium (K)	2018/11/17	<10		ug
			Sélénium (Se)	2018/11/17	<0.1		ug
			Silicium (Si)	2018/11/17	<5		ug
			Sodium (Na)	2018/11/17	<5		ug
			Strontium (Sr)	2018/11/17	<0.1		ug
			Thallium (Tl)	2018/11/17	<0.1		ug
			Titane (Ti)	2018/11/17	<1		ug
			Vanadium (V)	2018/11/17	<0.2		ug
			Zinc (Zn)	2018/11/17	<0.1		ug

LDR = Limite de détection rapportée

MRC: Un échantillon de concentration connue préparé dans des conditions rigoureuses par un organisme externe. Utilisé pour vérifier la justesse de la méthode.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

(1) La récupération ou l'écart relatif (RPD) pour ce composé est en dehors des limites de contrôle, mais l'ensemble du contrôle qualité rencontre les critères d'acceptabilité pour cette analyse

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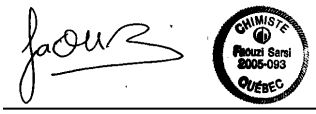
Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Faouzi Sarsi, B. Sc. Chimiste



Miryam Assayag, B.Sc. Chimiste

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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CONSULAIR
GESTION GLOCALE AIR ET ENVIRONNEMENT

CHAÎNE DE RESPONSABILITÉ

2022-125, rue Lavoiser
Québec (Qc) G1N 4L5
Tél..: (418) 650-5960
Fax : (418) 704-2221
www.consul-air.com

Travaux effectués à : Agnico Eagle Meliadine

Projet #: 18-5528

Chargé de Projet : Eric Trépanier

LABORATOIRE RESPONSABLE DES ANALYSES :
Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
301 - Inc - BS-Acétone - 1	Acétone	BS-Acétone	1	2018-09-22	Métaux, Hg	mg	Combiner les échantillons 301 à 303 pour les métaux particulaires de la source Inc - Essai #1
302 - Inc - BS-HNO3 - 1	HNO3	BS-HNO3	1	2018-09-22	Métaux, Hg	mg	Combiner avec les échantillons 301 et 303 pour les métaux particulaires de la source Inc - Essai #1
303 - Inc - Filtre - 1	Filtre	Poids avant : 0.5266 gr	1	2018-09-22	Métaux, Hg	mg	Combiner les échantillons 301 à 303 pour les métaux particulaires de la source Inc - Essai #1
304 - Inc - B1 - 1	Eau	B1 - Vt: 180 mL	1	2018-09-22	Métaux, Hg	mg	
305 - Inc - B2345 - 1	H2O2 10% / HNO3 5%	B2345 - Vt: 334 mL	1	2018-09-22	Métaux, Hg	mg	
307 - Inc - B67 - 1	KMNO4 4%/H2SO4 10%	B67 - Vt: 390 mL	1	2018-09-22	Hg	mg	Combiner les échantillons 307 et 308 pour le Hg de la source Inc - Essai #1

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19-Oct-18 12:30
Argyro Frangoulis
B847715
AM1

REMIS PAR:	DATE:	HEURE:
REÇU PAR: Vilue Daulos	DATE: 2018/10/19	HEURE: 12:30

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DRIVER 7,7,6

ICE : YES
SEAL : NO

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Travaux effectués à : Agnico Eagle Meliadine

Projet #:

Chargé de Projet :

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ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
308 - Inc - B67-HCl - 1	HCl	B67-HCl - Vt: 225 mL	1	2018-09-22	Hg	mg	Combiner les échantillons 307 et 308 pour le Hg de la source Inc - Essai #1
309 - Inc - BS-Acétone - 2	Acétone	BS-Acétone	1	2018-09-28	Métaux, Hg	mg	Combiner les échantillons 309 à 311 pour les métaux particulaires de la source Inc - Essai #2
310 - Inc - BS-HNO3 - 2	HNO3	BS-HNO3	1	2018-09-28	Métaux, Hg	mg	Combiner avec les échantillons 309 et 311 pour les métaux particulaires de la source Inc - Essai #2
311 - Inc - Filtre - 2	Filtre	Poids avant : 0.5248 gr	1	2018-09-28	Métaux, Hg	mg	Combiner les échantillons 309 à 311 pour les métaux particulaires de la source Inc - Essai #2
312 - Inc - B1 - 2	Eau	B1 - Vt: 188 mL	1	2018-09-28	Métaux, Hg	mg	
313 - Inc - B2345 - 2	H2O2 10% / HNO3 5%	B2345 - Vt: 323 mL	1	2018-09-28	Métaux, Hg	mg	

REMIS PAR:	DATE: 10/10/19	HEURE: 12:30
REÇU PAR: VIURI + DAVID	DATE:	HEURE:

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ICE: YES
SEAL: NO

WT: 533.

DRIVEZ

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GESTION GLOBALE AIR ET ENVIRONNEMENT

CHAÎNE DE RESPONSABILITÉ

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Travaux effectués à : Agnico Eagle Meliadine

Projet #:

Chargé de Projet :

LABORATOIRE RESPONSABLE DES ANALYSES :
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Ville St-Laurent (Qc) H4T 1P5
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ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
315 - Inc - B67 - 2	KMNO4 4%/H2SO4 10%	B67 - Vt: 400 mL	1	2018-09-28	Hg	mg	Combiner les échantillons 315 et 316 pour le Hg de la source Inc - Essai #2
316 - Inc - B67-HCl - 2	HCl	B67-HCl - Vt: 225 mL	1	2018-09-28	Hg	mg	Combiner les échantillons 315 et 316 pour le Hg de la source Inc - Essai #2
317 - Inc - BS-Acétone - 3	Acétone	BS-Acétone	1	2018-09-29	Métaux, Hg	mg	Combiner les échantillons 317 à 319 pour les métaux particulaires de la source Inc - Essai #3
318 - Inc - BS-HNO3 - 3	HNO3	BS-HNO3	1	2018-09-29	Métaux, Hg	mg	Combiner avec les échantillons 317 et 319 pour les métaux particulaires de la source Inc - Essai #3
319 - Inc - Filtre - 3	Filtre	Poids avant : 0.5182 gr	1	2018-09-29	Métaux, Hg	mg	Combiner les échantillons 317 à 319 pour les métaux particulaires de la source Inc - Essai #3
320 - Inc - B1 - 3	Eau	B1 - Vt: 240 mL	1	2018-09-29	Métaux, Hg	mg	

ICE: YES
SEAL: NO.

REMIS PAR:		DATE: 2018/10/19	HEURE: 12:30
REÇU PAR:	VILLE DAVIDE	DATE:	HEURE:

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DRIVER 7,7,6

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

CHAÎNE DE RESPONSABILITÉ

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Travaux effectués à : Agnico Eagle Meliadine

Projet #: _____

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ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
321 - Inc - B2345 - 3	H2O2 10% / HNO3 5%	B2345 - Vt: 330 mL	1	2018-09-29	Métaux, Hg	mg	
323 - Inc - B67 - 3	KMNO4 4%/H2SO4 10%	B67 - Vt: 400 mL	1	2018-09-29	Hg	mg	Combiner les échantillons 323 et 324 pour le Hg de la source Inc - Essai #3
324 - Inc - B67-HCl - 3	HCl	B67-HCl - Vt: 225 mL	1	2018-09-29	Hg	mg	Combiner les échantillons 323 et 324 pour le Hg de la source Inc - Essai #3
325 - Bl - BS-Acétone - Bl	Acétone	BS-Acétone - Vt: 100 mL	1	2018-09-23	Métaux, Hg	mg	Combiner les échantillons 325 à 327 pour les métaux particulaires de la source Blanc - Essai #Bl
326 - Bl - BS-HNO3 - Bl	HNO3	BS-HNO3 - Vt: 300 mL	1	2018-09-23	Métaux, Hg	mg	Combiner avec les échantillons 325 et 327 pour les métaux particulaires de la source Blanc - Essai #Bl
327 - Bl - Filtre - Bl	Filtre	Poids avant : 0.5176 gr	1	2018-09-23	Métaux, Hg	mg	Combiner les échantillons 325 à 327 pour les métaux particulaires de la source Blanc - Essai #Bl

REMIS PAR:		DATE: 2018/10/19	HEURE: 12:30
REÇU PAR: Jules DAVIDS		DATE:	HEURE:

ICE : Yes
SEAL : No.

DAVA 7,7,6

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Travaux effectués à : Agnico Eagle - Meliadine

Projet #: _____

Chargé de Projet : _____

LABORATOIRE RESPONSABLE DES ANALYSES :
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889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
328 - BI - Eau - BI	Eau	Eau - Vt: 100 mL	1	2018-09-23	Métaux, Hg	mg	
329 - BI - B123 - BI	H2O2 10% / HNO3 5%	B123 - Vt: 200 mL	1	2018-09-23	Métaux, Hg	mg	
330 - BI - B56 - BI	KMNO4 4%/H2SO4 10%	B56 - Vt: 100 mL	1	2018-09-23	Hg	mg	Combiner les échantillons 330 et 331 pour le Hg de la source Blanc - Essai #BI
331 - BI - B56-HCl - BI	HCl	B56-HCl - Vt: 225 mL	1	2018-09-23	Hg	mg	Combiner les échantillons 330 et 331 pour le Hg de la source Blanc - Essai #BI

REMIS PAR:		**DATE:** 2018/10/19	**HEURE:** 12:30
REÇU PAR:	TROY DAVIS	**DATE:**	**HEURE:**

DRIVER

4,7,6

ICE: YES
SEAL: NO

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CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Québec, le lundi 15 octobre 2018
Argyro Frangoulis
Maxxam
Ligne Directe: 514.448.9001 #6229
Courriel: AFrangoulis@maxxam.ca

Objet : **Explications de la demande d'analyses pour le projet de Agnico Eagle (Meliadine).**
Notre no de projet : #18-5528

Bonjour Argyro,

Voici la demande d'analyse concernant le dossier mentionné précédemment. Les mesures ont été effectuées du 22 au 29 septembre 2018. Les échantillons se retrouvent dans une glacière. À cela suivra plus tard les échantillons des métaux particulaires et les échantillons d'eau (# 304, 312, 320 et 328).

DEMANDE D'ANALYSES / MÉTAUX

Les fractions filtres et buse-sonde acétone vous seront envoyées un peu plus tard afin de faire l'analyse pour les métaux particulaires. Pour chacun des essais, nous voulons un résultat combiné des 2 fractions Buse-Sonde (Acétone et HNO_3) et le Filtre (donc 3 échantillons à combiner ex. éch.# 301, 302 et 303 – 309, 310 et 311 etc. Aussi, pour le Mercure d'un même essai, les fractions de $KmnO_4$ (BB56) et de HCl 8N (BB56-HCL) doivent être combinées (ex. éch.# 307 et 308). Il est important de respecter ces combinaisons exigées.

Il y a aussi les échantillons d'eau, # 304, 312, 320 et 328 qui vont arriver plus tard. L'analyse des métaux et du Hg sera également à faire.

Les métaux à analyser sont les suivants : Al, Sb, Ag, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Mo, Ni, Pb, K, Se, Na, Ti, V, Zn, Sr, Tl, Si (Silicium soluble), Hg

Il est important de ne pas jeter les échantillons et de nous les retourner après l'analyse.

Pour des renseignements supplémentaires n'hésitez pas à communiquer avec nous.

Envoyer les résultats à eric.trepanier@consul-air.com.

Salutations.

Eric Trépanier

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

Envoi pour analyse à Maxxam
Date: 24/10/2018
Chantier: Agnico Eagle(Meliadine)
Projet: 18-5528
Projet Lab: P2333

# du Labo	# de l'échantillon	# Bécher	Date d'envoi	Retour
171018-1	301 - Inc - BS-Acétone - 1	368	24-10-2018	
171018-2	309 - Inc - BS-Acétone - 2	716	24-10-2018	
171018-3	317 - Inc - BS-Acétone - 3	735	24-10-2018	
171018-4	325 - BI - BS-Acétone - BI	#453	24-10-2018	

Note:Nous retourner SVP les béchers aprés analyse dans leurs boîtes à:

Consulair
Bureau de Repentigny
101-800 Rue Leclerc
Repentigny (Qc), J6A 2E5
Tél: (450) 654-8000 poste 2304
Fax: (450) 654-6730
Courriel: laboratoire@consul-air.com



B847715_COC

to Laurie Dowley
2018/10/24
13:00.
ice-me
seal to
driver.

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

RAPPORT D'ESSAI

Date : 25 octobre 2018

Réf : P2338-1

Client

 # Client : C8

Nom : Trépanier Éric

Téléphone : (418) 650-5960 # 2208

Courriel : eric.trepanier@consul-air.com

Adresse :
CONSULAIR Québec
125-2022,rue Lavoisier
Québec QC
G1N 4L5 Canada

Résumé du projet

Nb. d'objets : 7

 # Projet lab. : P2338

Votre # projet : 18-5517

Chantier : Agnico-Eagle

Résumé des essais

Paramètre(s) accrédités

ST	Paramètre	Q.	Principe (Méthode)	Matrice
	Matières particulaires (MP-A)	4	Gravimétrie (LPT1)	Acétone
	Matières particulaires (MP-F)	3	Gravimétrie (LPT2)	Filtre

ST : paramètre Sous-Traité

Résultats d'essai(s)

ST	Param.	Échantillon (s)		Dates			Résultat(s)		LDR
		# Lab	# Client	Échantillon.	Récep.	Essai	Valeur	Unité	
	MP-A	191018-1	**301 - Inc - BS-Acétone - 1**	05-10-18	19-10-18	19-10-18	**37.0**	mg	1.0
		191018-2	**309 - Inc - BS-Acétone - 2**	06-10-18	19-10-18	19-10-18	**53.1**	mg	1.0
		191018-3	**317 - Inc - BS-Acétone - 3**	07-10-18	19-10-18	19-10-18	**5.3**	mg	1.0
		191018-4	**325 - Bl - BS-Acétone - Bl**	06-10-18	19-10-18	19-10-18	**< LDR**	mg	1.0
	MP-F	191018-5	**303 - Inc - Filtre - 1**	05-10-18	19-10-18	24-10-18	**48.2**	mg	0.1
		191018-6	**311 - Inc - Filtre - 2**	06-10-18	19-10-18	24-10-18	**48.4**	mg	0.1
		191018-7	**319 - Inc - Filtre - 3**	07-10-18	19-10-18	24-10-18	**46.0**	mg	0.1

ST : Essai Sous-Traité
LDR : Limite de Détection Rapportée

Commentaire(s)

1. LPT1 & LPT2: Méthode MA.100-Part 1.0 (Domaine 400 de Chimie de l'air)
2. Le volume de l'échantillon 191018-4 ; V= 110 ml.

Contrôle de qualité

ST	Param.	Date	# Réf	Type	Résultat(s)		LDR
					Valeur	***Unité***	
	MP-A	19-10-18	BL1910	BL	< LDR	mg	1.0
			MR1910	MR	100.7	% Récup.	-
	MP-F	24-10-18	AP- 02 Conforme	-	-	mg	0.1

ST : Contrôle qualité Sous-Traité
 # Réf : Référence du contrôle qualité dans le système de suivi du laboratoire
BL : Blanc
MR : Matériau de Référence
DP : Duplicata
RP : Réplicata
AD : Ajout Dosé
EA : Étalon Analogue
TM: Témoin de l'extraction
LDR : Limite de Détection Rapportée

Signature

Les résultats ne se rapportent qu'aux objets soumis à l'essai
Tout ou partie de ce document ne peut être reproduit sans l'autorisation du laboratoire de CONSULAIR.
Ce rapport d'essai est certifié par la (les) personne(s) mentionnée(s) ci-après.
Pour toute question concernant ce certificat d'analyse, veuillez vous adresser directement à :



Malha Kirèche



APPENDIX 5
RAW FIELD DATA



CONSULAIR

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME. E1

February/2017

Usine : ME. Meljadine	Date : 22.05.2018	P. Bar (po Hg) :	# Cold box : ME-1		
Ville: Rankin Inlet		P. Stat. (po H_2O) :			
ID point d'émission : Incinérateur	Sonde N° : 05.07	Module N° : #25 NC	K' : 30.14		
Diamètre : 32.5	Cp : 0.774	Kc : 0.999			
Distance avant : 5 D	Buse N° : 500-502	Ko : 0.733	Niveau du manomètre: ✓		
Distance après : 2 D	Coef : 0.4684	Distance P-T°-B : ✓	Zéro du manomètre: ✓		

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										534.62								
1445	1	1	5	0.15	1.55	1300	79	79		538.31	13.4	5.7	2	-2.0	—	270		
		1		0.15	1.55	1300	82	82		541.93								
		2		0.15	1.55	1300	83	83		545.49						270		
		2		0.19	1.65	1348	84	84		549.01	14.0	5.4	2					
		3		0.18	2.00	1348	84	84		553.11								
		3		0.18	2.00	1349	85	85		557.22	14.0	5.4	2	-2.0		270		
		4		0.18	2.00	1354	86	86		561.31	14.0	5.3	2					
		4		0.18	2.00	1346	88	88		565.42								
		5		0.18	2.00	1348	88	88		569.51	13.9	5.4						
		5		0.18	2.00	1350	89	89		573.61								
		6		0.18	2.00	1361	89	89		577.68								
		6		0.18	2.00	1362	89	89		581.77								
		1		0.19	2.28	1354	92	92		586.08								
		1		0.19	2.28	1356	92	92		590.50	14.3	5.1				270		
		5		0.19	2.20	1356	94	94		595.00								
		5		0.19	2.20	1348	94	94		599.50	14.2	5.1						
		4		0.19	2.20	1352	95	95		604.03								
		4		0.19	2.20	1352	96	96		608.50								
		3		0.18	2.11	1355	97	97		613.00								
		3		0.18	2.11	1355	97	97		617.49	14.3	5.1						
		2		0.15	1.78	1377	98	98		621.69								
		2		0.15	1.80	1295	98	98		625.82								
		1		0.13	1.54	1377	99	99		629.70								
		1	D	0.13	1.54	1341	99	99		633.54				-2.0				

TDF Initial Débit (pi^3/min): < 0.01	Pression (inhg) : -15" Hg	Volume ini (pi^3):	Volume fin (pi^3): Volume (pi^3):
TDF Final Débit (pi^3/min): < 0.01	Pression (inhg) : -12" Hg	Volume ini (pi^3):	Volume fin (pi^3): Volume (pi^3):

Fuite Pitot (ΔP) : ✓

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

$\Delta P \rightarrow 0.17$ 1340

$\Delta P_x \Rightarrow 0.19$

$\Delta P_N \Rightarrow 0.13$

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI : MRE, E1 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie:	AE - MRGIADNZ	Projet:	5528
Source:	Incinérateur	Essai: MRE1	# Cold Box: MR-1
Échantillonnée le:	22.09.2018	Date de l'assemblage : 21.09.2018	Heure:

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	(NON)

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	(NON)

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	~~VIDE (optionnel)~~ OU CMM H_2O déminéralisée (100 ml)	682.1	599.7	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	722.2	693.0	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	567.3	562.3	
4	Barboteur 4 - GS mod	VIDE ✓	517.1	517.7	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	613.0	613.4	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	791.5	792.2	
7	Contenant de dessicant	GEL DE SILICE	1766.2	1747.8	(33.3)
TOTAL			5659.4	5526.1	

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES
8228.4823		

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ~~ACS~~ Optima	153394
Solution d'acide nitrique (HNO_3) 10%	A.148
Solution d'acide nitrique (HNO_3) 0.1 N	A.148
Solution d'acide sulfurique (H_2SO_4) 10%	A.136
Solution d'acide chlorhydrique (HCl) 8N	A.095
Permanganate de potassium ($KMnO_4$)	A.1017
Solution H_2O_2 10% / HNO_3 5%	A.148 / R-387

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (2/2)

August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération :	23-09-2018	Heure de récupération:	8Lxx
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)	BB 1234	✓	✓	334

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec 123	✓	✓	✓

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	390

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB1 → HCl 180 cc

BB4 → Rincé avec BB 123 parce qu'il était vide après les tests

Blancs :

100 mL Acétone		Pour la demande d'analyse, voici les échantillons:
300 mL 0.1 N HNO_3		1a- Métaux sur contenants 1 + 2 + 3
100 mL H_2O		1b- Hg sur contenants 1 + 2 + 3
200 mL Solution H_2O_2 10% / HNO_3 5%		2a- Métaux sur contenant 4
100 mL KMnO4 4% / H2SO4 10%		2b- Hg sur contenant 4
200 mL H_2O + 25 mL HCL 8N		3a- Hg sur contenant 5
Filtre Quartz (x3)		3b- Hg sur contenant 6
		3c- Hg sur contenant 7

Technicien :

Consulair
Échantillonnage de l'air
Conformité environnementale

Formulaire: F_11_V4 janvier-2014

Laboratoire - Décontamination initiale des ensembles de verrerie - MÉTAUX USEPA 29

Compagnie:	Projet:	# du Cold box : ME-1
Source:	Essai:	# du filtre :
Échantillonnée le:	Date décontamination:	Heure:

Décontamination			Rinçage Eau	Eau + Savon	Eau	Rincer H_2O démin.	Tremper HNO_3 10%	Rincer H_2O démin.	Rincer Acétone
Item (dans l'ordre)		Remarques	1 x	1 x	3 x	3 x	4 hres	3 x	3 x
By pass			✓	✓	✓	✓	✓		
Cyclone (si applicable)									
Erlenmeyer (si applicable)									
Cloche femelle									
Support à filtre en téflon									
Cloche mâle									
Coude (bas cloche - barb.)									
Barboteur 1 x1			✓	✓	✓	✓	✓	✓	✓
Barboteur 2			✓	✓	✓	✓	✓	✓	✓
Barboteur 3			✓	✓	✓	✓	✓	✓	✓
Barboteur 4 (si applicable)			✓	✓	✓	✓	✓	✓	✓
Barboteur 5 (si Hg)			✓	✓	✓	✓	✓	✓	✓
Barboteur 6 (si Hg)			✓	✓	✓	✓	✓	✓	✓
Coudes (5 ou ....)			✓	✓	✓	✓	✓	✓	✓
Liner de verre							Rincer		+ Brosser
Vérification initiale de la verrerie et du liner du train d'échantillonnage et conserver le dernier rinçage à l'acétone si nécessaire.									
Buse de verre									+ Brosser
Vérification initiale de la buse, conserver le dernier rinçage à l'acétone si nécessaire.									
N.B. Joint d'étanchéité en téflon									

Commentaires:

Décontaminé par: ID Date: 04/09/2018 Endroit: QC

Consulair
Échantillonnage de l'air
Conformité environnementale

Formulaire: F_11_V4 **janvier-2014**

Laboratoire - Décontamination initiale des ensembles de verrerie - MÉTAUX USEPA 29

Compagnie:	Projet:	# du Cold box :
Source:	Essai:	# du filtre :
Échantillonnée le:	Date décontamination:	Heure:

Décontamination			Rinçage Eau	Eau + Savon	Eau	Rincer H_2O démin.	Tremper HNO_3 10%	Rincer H_2O démin.	Rincer Acétone
Item (dans l'ordre)		**Remarques**	**1 x**	**1 x**	**3 x**	**3 x**	**4 hres**	**3 x**	**3 x**
By pass			✓	✓	✓	✓	✓	✓	✓
Cyclone (si applicable)									
Erlenmeyer (si applicable)									
Cloche femelle			✓	✓	✓	✓	✓	✓	✓
Support à filtre en téflon			✓	✓	✓	✓	✓	✓	✓
Cloche mâle			✓	✓	✓	✓	✓	✓	✓
Coude (bas cloche - barb.)									
Barboteur 1									
Barboteur 2									
Barboteur 3									
Barboteur 4 (si applicable)									
Barboteur 5 (si Hg)									
Barboteur 6 (si Hg)									
Coudes (5 ou ....)									
Liner de verre							**Rincer**		**+ Brosser**
Vérification initiale de la verrerie et du liner du train d'échantillonnage et conserver le dernier rinçage à l'acétone si nécessaire.									
Buse de verre									**+ Brosser**
Vérification initiale de la buse, conserver le dernier rinçage à l'acétone si nécessaire.									
N.B. Joint d'étanchéité en téflon									

Commentaires:

Décontaminé par: [illegible] Date: 04/09/2015 Endroit: QC

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME-EZ

February/2017

Usine : AE Meliadine	Date : 23-09-2018	P. Bar (po Hg) :	# Cold box : ME-1
Ville: Rankin Inlet		P. Stat. (po H_2O) : — 0.01	
ID point d'émission : Incinérateur	Sonde N° : 05-07 (SQ-501)	Module N° : 25 NC	K' : 28.82
Diamètre : 33 1/2"	Cp : 0.724	Kc : 0.599	
Distance avant : 50	Buse N° : SQ-434	Ko : 0.733	Niveau du manomètre: —
Distance après : 20	Coef : 0.4366	Distance P-T°-B : —	Zéro du manomètre: —

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										636.82								
1434	1	1	5	0.15	1.31	1290	72	71		670.06	14.4	4.9	3	-2.0	/	260	/	40
		1		0.15	1.28	1341	73	72		643.21								
		1		0.15	1.28	1349	73	73		646.52								
		2		0.14	1.19	1352	74	74		649.71								
		2		0.14	1.19	1354	76	76		652.87	14.6	4.7						
		2		0.14	1.19	1354	78	78		656.06					—	272	—	
		3		0.13	1.13	1344	80	80		659.14	14.7	4.7						
		3		0.13	1.13	1340	82	82		662.29								
		3		0.13	1.12	1348	83	83		665.19	14.5	4.9	3					
		4		0.13	1.12	1347	85	85		668.50								
		4		0.13	1.12	1345	86	86		671.62	14.5	4.9						
		4		0.13	1.14	1348	83	83		674.77								
		5		0.13	1.15	1334	85	85		677.84	15.2	4.4						
		5		0.13	1.11	1336	91	91		680.96								
		5		0.13	1.15	1337	92	92		684.09	15.1	4.4	4					
		6		0.12	1.06	1334	93	93		687.13								
		6		0.12	1.06	1335	94	94		690.18	15.3	4.3	4	-3.0	/	270		40
		6	▷	0.12	1.06	1340	95	95	↓	693.21								

TDF Initial Débit (pi^3/min): 0.01	Pression (inhg) : 1" Hg	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : ME-ED

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										693.21								
	2	6	5	0.12	1.07	1358	96	96		696.26	15.3	4.3	4	-30	✓	273	40	✓
		6		0.12	1.07	1338	97	97		699.31								
		6		0.12	1.08	1328	97	97		702.37	15.3	4.3	4					
		5		0.12	1.08	1344	98	98		705.44								
		5		0.12	1.08	1344	98	98		708.51					✓	271	40	✓
		5		0.12	1.08	1341	99	99		711.60	15.3	4.3	4					
		4		0.12	1.08	1342	99	99		714.66								
		4		0.10	0.90	1329	100	100		717.50								
		4		0.10	0.90	1326	100	100		720.31								
		3		0.10	0.90	1326	100	101		723.10								
		3		0.10	0.90	1330	102	102		725.88	15.3	4.0						
		3		0.10	0.90	1330	102	102		728.68								
		3		0.10	0.90	1326	103	103		731.49								
		2		0.10	0.90	1316	104	104		734.29	15.3	4.4						
		2		0.10	0.90	1317	104	104		737.13								
		1		0.10	0.90	1311	105	105		740.0								
		1	▷						▷									

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Arrêt procédé (180 min - 15 min)

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI : ME-2 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AEM - M4		Projet: 18-5528	
Source: incinérateur		Essai: 2	# Cold Box: ME-1
Échantillonnée le: 28-05-2018	Date de l'assemblage : 18-09-26		Heure: 10h30

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	NON

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6		✓	✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	NON

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	~~VIDE (optionnel) OU~~ CMM H_2O déminéralisée (100 ml)	682.6	609.7	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	707.5	684.9	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	573.5	565.5	
4	Barboteur 4 - GS mod	VIDE	520.4	520.8	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	611.7	611.2	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	781.4	783.3	
7	Contenant de dessicant	GEL DE SILICE	1782.6	1761.7	121.6
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS	
Solution d'acide nitrique (HNO_3) 10%	
Solution d'acide nitrique (HNO_3) 0.1 N	
Solution d'acide sulfurique (H_2SO_4) 10%	
Solution d'acide chlorhydrique (HCl) 8N	
Permanganate de potassium ($KMnO_4$)	
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (2/2)

August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération : 29-09-2018		Heure de récupération: 8h00	
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3) +4		✓	✓	323

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
~~barboteur 4~~	Avec BB123			

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB1 → HCl → 188cc

BB4 → Vide Rincer Avec BB123

Blancs :

100 mL Acétone	
300 mL 0.1 N HNO_3	
100 mL H_2O	
200 mL Solution H_2O_2 10% / HNO_3 5%	
100 mL KMnO4 4% / H2SO4 10%	
200 mL H_2O + 25 mL HCL 8N	
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

P1

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME - E3

février-2017

Usine : AE Meladine	Date : 29-09-2018	P. Bar (po Hg) :	# Cold box : ME.1
Ville: Ranan Inlet		P. Stat. (po H_2O) :	
ID point d'émission : Incinérateur	Sonde N° : 05-07 Q 501	Module N° : 25 NC	K' : 28,82
Diamètre : 32,5"	Cp : 0,774	Kc : 0,999	
Distance avant : 5D	Buse N° : SQ. 434	Ko : 0,733	Niveau du manomètre: ✓
Distance après : 2D	Coef : 0,4366	Distance P-T°-B : ✓	Zéro du manomètre: ✓

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi^3)	Masse molaire O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										747,13								
16h14	1	1	5	0,20	1,68	1327	78	78		750,81	12,9	6,0	3	-3,0	—	250	50	/
		1		0,20	1,72	1347	79	79		754,60								
		1		0,20	1,77	1350	80	80		758,43	13,0	6,0	3					
		2		0,20	1,71	1360	81	81		762,18								
		2		0,20	1,70	1374	81	81		765,96	12,8	6,1						
		2		0,20	1,70	1378	82	82		769,75								
		3		0,22	1,87	1380	83	83		773,68								
		3		0,23	1,95	1393	84	84		777,76	13,7	5,5				268		
		3		0,23	1,94	1401	85	85		781,76								
		4		0,23	1,94	1410	85	85		785,75								
		4		0,23	1,92	1420	86	86		789,72	13,7	5,5	3					
		4		0,23	1,93	1423	87	87		793,77								
		5		0,23	1,92	1431	88	88		797,79								
		5		0,20	1,68	1418	89	89		801,59								
		5		0,20	1,68	1430	90	90		805,38	14,5	5,2						
		6		0,20	1,69	1418	90	90		809,19	14,2	5,1						
		6		0,20	1,67	1440	90	90		813,00				-4,0		270		
		6	10	0,20	1,67	1445	91	91		816,78								

TDF Initial Débit (pi^3/min): < 0,01	Pression (inhg) :- 15" Hg	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) : ✓

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : ME-E3

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

février-2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										816.78								
	2	6	5	0.20	1.66	145	91	91		820.57	14.1	5.2	3	-3.0	—	220	90	—
		6		0.20	1.66	146	92	92		824.36								
		6		0.20	1.65	146	93	93		828.17								
		5		0.19	1.57	1476	94	94		831.88	14.0	5.3	3					
		5		0.19	1.57	1479	95	95		835.60								
	—	5		0.19	1.57	1481	96	96		839.27								
		4		0.19	1.55	1502	97	97		842.94	12.9	6.2						
		4		0.21	1.72	1518	99	99		846.82								
		4		0.21	1.71	1518	99	99		850.30								
		3		0.21	1.71	1520	100	100		854.57								
		3		0.21	1.72	1518	101	101		858.43								
	—	3		0.21	1.71	1525	101	102		862.07								
		2		0.21	1.71	1522	103	103		866.14								
		2		0.17	1.39	1522	104	104		869.62								
		2		0.17	1.44	1460	105	101		873.16								
		1		0.17	1.46	1436	106	106		876.67								
		1		0.17	1.47	1429	106	106		880.21								
		1	5	0.17	1.48	1421	107	107		883.85								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI: ME-3 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AE Méliadine		Projet: 5128	
Source: Incinérateur		Essai: # 3	# Cold Box: ME-1
Échantillonnée le:	Date de l'assemblage : 28-09-2018		Heure: 7h00

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓

Vérification de la buse et sondes d'échantillonnage à conserver : OUI / NON (NON)

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓

Vérification du train d'échantillonnage à conserver : OUI / NON (NON)

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS APRÈS	POIDS AVANT	POIDS TOTAL
1	Barboteur 1 - GS mod	VIDE (optionnel) OU CMM H_2O déminéralisée (100 ml)	740.1	604.4	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	711.9	684.0	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	575.8	570.9	
4	Barboteur 4 - GS mod	VIDE	519.6	518.9	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	623.3	624.0	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	773.1	774.0	
7	Contenant de dessicant	GEL DE SILICE	1801.7	1783.6	18.1
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS	
Solution d'acide nitrique (HNO_3) 10%	
Solution d'acide nitrique (HNO_3) 0.1 N	
Solution d'acide sulfurique (H_2SO_4) 10%	
Solution d'acide chlorhydrique (HCl) 8N	
Permanganate de potassium ($KMnO_4$)	
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT F_12_V9 (2/2) August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération :	30 Q 2018	Heure de récupération:	9h15
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)	230+100	✓		330

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec BB 123			

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB 1 → HCl → 240 mL

BB4 avec BB 123

Blancs :

100 mL Acétone	
300 mL 0.1 N HNO_3	
100 mL H_2O	
200 mL Solution H_2O_2 10% / HNO_3 5%	
100 mL KMnO4 4% / H2SO4 10%	
200 mL H_2O + 25 mL HCL 8N	
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (1/2) CODE D'ESSAI : ME-BL blanc August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AER - Mel		Projet: 19-5528	
Source: Incinérateur		Essai: BL	# Cold Box: ME-1
Échantillonnée le: 2018-09-23	Date de l'assemblage : 18-09-23		Heure: 9h00

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre			✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	NON

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	NON

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	VIDE (optionnel) OU CMM H_2O déminéralisée (100 ml)		603.0	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)		705.1	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)		560.1	
4	Barboteur 4 - GS mod	VIDE		519.2	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium		620.4	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium		764.1	
7	Contenant de dessicant	GEL DE SILICE		766.7	
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS Optima	153 994
Solution d'acide nitrique (HNO_3) 10%	A-148
Solution d'acide nitrique (HNO_3) 0.1 N	A-148
Solution d'acide sulfurique (H_2SO_4) 10%	A-136
Solution d'acide chlorhydrique (HCl) 8N	A-095
Permanganate de potassium ($KMnO_4$)	AZ0F7
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT F_12_V9 (2/2) August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération : 24-09-2018		Heure de récupération: 10h00	
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)		✓	✓	≈ 300

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec 123	✓	✓	✓

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques: BB1 - HCl → 100 cc

BB4 - Rincer avec BB 123

Blancs :

100 mL Acétone	✓
300 mL 0.1 N HNO_3	✓
100 mL H_2O	✓
200 mL Solution H_2O_2 10% / HNO_3 5%	✓
100 mL KMnO4 4% / H2SO4 10%	✓
200 mL H_2O + 25 mL HCL 8N	✓
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

P1-

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU-E1

February/2017

Usine : AE Methadone	Date : 22-09-2018	P. Bar (po Hg) :		# Cold box : OR-2/U1	
Ville: Rankin Inlet		P. Stat. (po H_2O) :	−0.06		
ID point d'émission : Incinérateur	Sonde N° : 03-06 (371)	Module N° :	19 COMP	K' :	26.18
Diamètre : 32.5	Cp : 0.78	Kc :	0.997		
Distance avant : 5D	Buse N°: 3 371	Ko :	1.000	Niveau du manomètre:	~
Distance après : 2D	Coef : 0.[illegible] (3741)	Distance P-T°-B :	~	Zéro du manomètre:	~

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi³)	Masse molaire O_2 (%v)	Masse molaire CO_2 (%v)	Masse molaire CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Température Filtre (°F)	Température Sortie (°F)	Température Trappe/Filtre (°F)
										483.64								
13h44	1	1	5	0.18	0.45	1330	60	60	76	485.51	13.4	5.3	3	−1.0	~	200	—	37
		1		0.17	0.43	1345			77	488.0								
		1		0.17	0.43	1345			77	490.46	13.4	5.6	3	−1.0				
		1		0.17	0.43	1341			77	493.97	13.4	5.7	3			200		36
		2		0.17	0.43	1352			78	495.48	13.4	5.7	3					
		2		0.17	0.43	1356			79	497.85	13.5	5.7	2					
		2		0.18	0.41	1354			80	500.35	13.5	5.7	2			200		36
		2		0.18	0.41	1353			80	502.87	13.5	5.7	2	−1.0				
		3		0.18	0.41	1361			82	505.38	13.5	5.7	2			200		36
		3		0.21	0.53	1366			82	508.08	13.5	5.7	2	−1.0				
		3		0.21	0.53	1381			84	510.79	13.4	5.8	2					39
		3		0.21	0.53	1377			83	513.50	13.4	5.7	2	−1.5				
14h44	AE	4		0.21	0.53	1379			84	516.20	13.4	5.7	2					
		4		0.21	0.53	1380			85	518.83	13.5	5.7	2					
		4		0.21	0.53	1373			84	521.61	13.7	5.6		−1.5		200		39
		4		0.21	0.53	1373			85	524.28	13.9	5.4						
		5		0.18	0.41	1351			85	526.78	13.9	5.4						39
		5		0.18	0.41	1348			87	529.27	14.0	5.3		−1.5		200		
		5		0.18	0.41	1350			87	531.86	14.0	5.3						
				0.18	0.41	1354			88	534.26	14.0	5.4						
		6		0.18	0.41	1355			88	536.79	14.0	5.3	2					
		6		0.18	0.41	1359			90	539.34	14.0	5.3	2					
		6		0.18	0.41	1361			90	541.87	14.0	5.3	2					
		6	↓	0.17	0.41	1350	↓	↓	90	544.36	14.0	5.3						

TDF Initial Débit (pi³/min): 0.015	Pression (inhg) : ~15"Hg	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	Fuite Pitot (ΔP) : ~
TDF Final Débit (pi³/min):	Pression (inhg) :	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

$\overline{\Delta P} = 0.16$ $\Delta P_{min} = 0.11$

$\Delta P_{max} = 0.21$

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU-E1

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi^3)	Masse molaire O_2 (%v)	Masse molaire CO_2 (%v)	Masse molaire CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Température Filtre (°F)	Température Sortie (°F)	Température Trappe/Filtre (°F)
										544.36								
		6	5	0.15	0.38	1357	60	60	93	546.67						250		
		6		0.16	0.41	1350			93	549.00	14.3	5.1						
		6		0.16	0.41	1355			94	551.26								
		6		0.16	0.41	1357			95	553.57	14.3	5.1						
		5		0.16	0.41	1343			97	555.93								
		5		0.16	0.41	1350			97	558.42								
		5		0.16	0.41	1335			97	560.77	14.3	5.1						
		5		0.15	0.37	1340			98	563.08								
		4		0.15	0.39	1332			99	565.37								
		4		0.13	0.35	1280			100	567.67								
		4		0.13	0.35	1300			100	569.98	14.9	4.7						
		4		0.11	0.29	1306			101	572.08								
		3		0.11	0.29	1304			101	574.08	14.8	4.8						38
		3		0.11	0.29	1280			102	576.10								
		3		0.11	0.29	1250			102	578.09								
		3		0.11	0.29	1266			103	580.17	14.9	4.6	3					
		2		0.13	0.31	1318			103	582.40								
		2		0.13	0.35	1320			103	584.62								
		2		0.13	0.35	1324			103	586.87	14.4	5.0						
		2		0.13	0.31	1310			102	589.10								
		1		0.13	0.35	1317			102	591.32	14.5	5.0						
		1		0.13	0.31	1322			102	593.56								
		1		0.13	0.35	1318			102	595.76								
		1		0.13	0.31	1306			102	598.00								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : MEC COSV - E1

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AE Heliantus	Projet: 5528	# Ensemble de verrerie : 28
Source: Incinérateur	Essai: #1	# Hot Box : OR.2 / V1
Date : 22-05-2018		Heure : 17h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	(NON)

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	(NON)

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 #4781	401.1	382.8	
3	Trappe à condensat	VIDE	502.9	365.3	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-~~150~~ mL)	599.7	586.7	
5	Barboteur modifié	VIDE	446.7	446.20	
6	Contenant de dessicant	GEL DE SILICE	1713.9	1708.0	174.8
			3664.3	3488.0 TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	156309
Acétone (grade optima)	153394
Éthylène glycol	142823
Eau HPLC	135150
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 2018-09-23	Heure de récupération:	
Nettoyage de l'extérieur des différentes pièces : ✓	✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :	✓ ✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	
Résine XAD-2 (environ 40g, 1 tube)	
Eau HPLC	
Éthylène Glycol	
Acétone	
Hexane	

Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AE Metadrive		Projet: 5728	
Échantillonné le: 22-05-2018		Récupéré par:	
Source: Incinérateur	Essai: #1	Date: 21-05-2018	Heure:

CAISSE # 28

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass	OR-28-BP	By pass	✓	✓	✓	✓	✓
Cloche femelle	(N/A)	Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon	(N/A)	Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle	(N/A)	Cloche mâle	✓	✓		✓	✓
Réfrigérant	ORC-28-R	Réfrigérant	✓	✓	✓	✓	✓
Trappe de résine		Trappe de résine					
Trappe à condensat verticale	OR-28TC	Trappe à condensat verticale	✓	✓	✓	✓	✓
Long coude		Tuyau MF pour Réfrigérant	✓	✓	✓	✓	✓
	OR-28-LC	Long coudé	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith	(N/A)	Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude	ORC-28-C	Coude	✓	✓	✓	✓	✓
Barbotteur Std	(N/A)	Barbotteur Std	✓	✓	✓	✓	✓
Bouteille de verre ambrée (1)		Bouteille de verre ambrée	✓	✓	✓		✓
Garnitures (Téflon + Aluminium)							
Nombre total de pièces	10	# Unique	1494				

Décontaminé par:	Date: 30/08/2018	Endroit: Québec
Code de décontamination (pot):	JD-30082018-OR28	
# Lot Des Solvants:	Dichlorométhane: 176773	
	Hexane: 175762	
	Acétone: 161822	

Commentaires

Formulaire mis-à-jour le 2018-05-14

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU. E2

February/2017

Usine : AE McMadine	Date : 28.09.2018	P. Bar (po Hg) :	# Cold box : OR2/U1		
Ville: Rankin Inlet		P. Stat. (po H_2O) : −0.05			
ID point d'émission : Incinerateur	Sonde N° : 03.06 3Q.503	Module N° : 19 COMP	K' : 26.19		
Diamètre : 32 1/2	Cp : 0.781	Kc : 0.997			
Distance avant : 5D	Buse N° : 3Q.503	Ko : 1.000	Niveau du manomètre: ✓		
Distance après : 2D	Coef : 0.4958	Distance P-T°-B : ✓	Zéro du manomètre: ✓		

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi³)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
11:50	1	6	5	0.12	1.08	1375	60	60	72	604.57	14.5	4.6	3	−7.0	—	210		45
		6		0.15	1.26	1353			73	608.84								
		6		0.15	1.15	1360			73	612.97	14.5	4.9	3					
		5		0.15	1.15	1362			74	617.11								
		5		0.15	1.15	1369			75	621.25								
		5		0.15	1.15	1362			77	625.40	14.6	4.7	3	−6.5	—	251		41
		4		0.12	1.23	1369			77	629.66	14.7	4.7	3					
		4		0.15	1.15	1371			79	633.81								
		4		0.15	1.16	1372			80	637.92	14.5	4.9	3					
		3		0.15	1.16	1369			81	642.08								
		3		0.15	1.16	1370			83	646.17	14.5	4.9						
		3		0.15	1.16	1373			84	650.31								
		2		0.13	1.04	1315			86	654.36	15.2	4.4	3					
		2		0.13	1.04	1320			87	658.45								
		2		0.12	0.97	1316			88	661.97	15.1	14.4	4					
		1		0.12	0.97	1314			89	665.75								
		1		0.12	0.97	1318			90	669.50	15.3	4.3	4			210		40
		1	↓	0.12	0.97	1318	↓	↓	91	673.25								

TDF Initial Débit (pi³/min): 20.05	Pression (inhg) : −15"Hg	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	Fuite Pitot (ΔP) :
TDF Final Débit (pi³/min):	Pression (inhg) :	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Changement réfrigérant — Cassé à cause du gel

TECHNICIEN :

P2

CONSULAIR

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COJV-E2

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										673,25								
	2	1	5	0,12	0,98	1318	60	60	92	677,00	15,3	4,3	4	-5,5	~	252	~	34
		1		0,12	0,98	1311			94	680,74								
		1		0,12	0,99	1300			94	684,49	15,3	4,3	4					
		2		0,12	0,98	1317			95	688,23								
		2		0,12	0,98	1322			96	691,97					~	252	~	40
		2		0,12	0,98	1318			96	695,73	15,3	4,3						
		3		0,12	0,98	1325			98	699,41								
		3		0,11	0,90	1320			98	703,00								
		3		0,11	0,90	1318			90	706,53								
		4		0,10	0,82	1310			100	709,94								
		4		0,10	0,82	1310			100	713,38	15,3	4,4						
1417		4		0,10	0,83	1314			101	716,79								
		4		0,10	0,83	1300			101									
		5																
		6																
		6																
		6																

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES | O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Fin bris équipement (réfrigérant) changé de point !

TECHNICIEN :

MEV

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : COSV - 2

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AEM - MV	Projet: 18-5578	# Ensemble de verrerie : 10
Source: Incinérateur	Essai: 2	# Hot Box : OR-2
Date : 28 - 09 - 2018		Heure :

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	NON

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	NON

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2	131.7	125.6	
3	Trappe à condensat	VIDE	375.6	269.5	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	713.9	700.8	
5	Barboteur modifié	VIDE	—	—	
6	Contenant de dessicant	GEL DE SILICE	1723.1	1713.6	134.8
				TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

trappe XAD: 1172

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	
Acétone (grade optima)	
Éthylène glycol	
Eau HPLC	
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération :	28.06.2018	Heure de récupération:	15h00
Nettoyage de l'extérieur des différentes pièces :			
Conditionnement (HA) des contenants **(verre ambré)** de récupération :			

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde				

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine				

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau			

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final			

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite		
Résine XAD-2 (environ 40g, 1 tube)		
Eau HPLC		
Éthylène Glycol		
Acétone		
Hexane		
Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AÉ Meliadine		Projet: 5528	
Échantillonné le: 23-09-2018		Récupéré par: [signature]	
Source: Incinérateur	Essai: ~~[illegible]~~ E-2	Date: 23-09-2018	Heure:

CAISSE # 10

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass		By pass	✓	✓	✓	✓	✓
Cloche femelle		Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon		Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle		Cloche mâle	✓	✓	✓	✓	✓
Réfrigérant		Tuyau MF	✓	✓	✓	✓	✓
		Réfrigérant	✓	✓	✓	✓	✓
		Court MF	✓	✓	✓	✓	✓
Trappe à condensat		Trappe à condensat	✓	✓	✓	✓	✓
Grand L							
		Grand " L"	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith		Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude		Coude	✓	✓	✓	✓	✓
Barbotteur Std		Barbotteur Std	✓	✓	✓	✓	✓
Pot pour le proofing		Pot pour le proofing	✓	✓	✓		✓
Nombre total de pièces		# Unique	988				

Sur le terrain

Verrerie de laboratoire							
Bouteilles de verre ambrée (5)							
Teflon							
Aluminium							
Trappe de résine		Trappe de résine					

Décontaminé par: JD	Date: 24/08/2018	Endroit: Québec
Code de décontamination (pot): JD-24/08/2018-0210		
# Lot Des Solvants:	Dichlorométhane: 162956 Hexane: 182082 Acétone: 181822	

Commentaires

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSV-E3

février-2017

| | | |

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : COSV - E3

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

février-2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										816.86								
	2	1	5	0.18	1.38	1413	60	60	90	821.26	14.1	5.2	3	-60				
		1		0.18	1.38	1417			90	825.67								
		1		0.17	1.30	1423			91	829.97								
		2		0.17	1.30	1440			94	834.34								
		2		0.17	1.29	1433			92	838.54								
		2		0.17	1.30	1443			94	842.77								
		3		0.17	1.29	1450			95	847.00								
		3		0.24	1.33	1529			91	851.90								
		3		0.24	1.35	1535			97	856.84								
		4		0.24	1.36	1533			97	861.77								
		4		0.24	1.36	1533			98	866.72								
		4		0.24	1.36	1542			99	871.64								
		5		0.24	1.36	1541			99	876.54								
		5		0.23	1.68	1548			101	881.29								
		5		0.22	1.65	1500			101	886.00								
		6		0.22	1.68	1463			102	890.71								
		6		0.22	1.69	1457			103	895.49								
		6	↓	0.22	1.69	1460	↓	↓	103	900.26								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR
SECTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : MEL- COSU - E3

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AE Meliadine	Projet: 5528	# Ensemble de verrerie : 1
Source: Imaginatum	Essai: #3	# Hot Box : OR2-V1
Date : 28-09-2018		Heure : 16h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	NON

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	NON

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 1151	121.0	114.1	
3	Trappe à condensat	VIDE	523.10	304.5	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	751.7	729.0	
5	Barboteur modifié	VIDE		—	
6	Contenant de dessicant	GEL DE SILICE	1734.0	1723.1	259.1
				TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT	
Dichlorométhane (grade optima)		
Hexane (grade optima)		
Acétone (grade optima)		
Éthylène glycol		
Eau HPLC		
Résine XAD-2		
Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 30-09-2018		Heure de récupération: 8h20	
Nettoyage de l'extérieur des différentes pièces :		✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :		✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	
Résine XAD-2 (environ 40g, 1 tube)	
Eau HPLC	
Éthylène Glycol	
Acétone	
Hexane	

Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUE

Compagnie: AE Medicine		Projet: 5528	
Échantillonné le:		Récupéré par:	
Source: Mainstream	Essai: ROSU E3	Date:	Heure:

CAISSE # 1

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass		By pass	✓	—	—	—	—
Cloche femelle		Cloche femelle	✓	✓	—	—	—
Support à filtre en téflon		Support à filtre en téflon	—	—	—	—	—
Cloche mâle		Cloche mâle	—	—	—	—	—
Réfrigérant							
		Réfrigérant	✓	✓	—	—	—
Trappe de résine		Trappe de résine					
Trappe à condensat		Trappe à condensat	✓	—	—	—	—
Grand L		Tige MM	✓	✓	—	—	—
		Tige MF	—	—	—	—	—
		Coude 4 po.	✓	—	—	—	—
Barbotteur Greenberg Smith		Barbotteur Greenberg Smith	—	—	—		
Coude		Coude	—	—	—	—	—
Barbotteur Std		Barbotteur Std	—	—	—	—	—
Pot pour le proofing							
Bouteille de verre ambrée (5)		Bouteille de verre ambrée	—	—	—		—
Garnitures (Téflon + Aluminium)							
Nombre total de pièces		# Unique	495				

Décontaminé par: JD	Date: 28/08/2018	Endroit: Québec
Code de décontamination (pot):	JD-28/08/2018	

Lot des Solvants:
Dichlorométhane: 182968
Hexane: 175762
Acétone: 181822

Commentaires

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSV - Blanc

February/2017

Usine : LEM-Mtl	Date :	P. Bar (po Hg) :	# Cold box :
Ville: Montréal		P. Stat. (po H_2O) :	
ID point d'émission : incinérateur	Sonde N° :	Module N° : 25	K' :
Diamètre :	Cp :	Kc : 0.799	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										34.7								
							71	71	71	35.7								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES | O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN : JFC

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI: MEV COSV-2 blanc

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: NE Meliadine	Projet: 5078	# Ensemble de verrerie : 22
Source: Incinérateur	Essai: #2	# Hot Box : OR2-V1
Date : 22-09-2018		Heure : 10h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	(NON)

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	(NON)

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 lisr	123.4	123.3	
3	Trappe à condensat	VIDE	371.8	371.8	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	686.2	687.0	
5	Barboteur modifié	VIDE	—	—	
6	Contenant de dessicant	GEL DE SILICE	1730	1730	
				TOTAL	0

*: Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	156309
Acétone (grade optima)	153394
Éthylène glycol	142823
Eau HPLC	135150
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 24.09.2018	Heure de récupération: 15h00	
Nettoyage de l'extérieur des différentes pièces : ✓	✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :	✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch.	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	✓
Résine XAD-2 (environ 40g, 1 tube)	✓
Eau HPLC	✓
Éthylène Glycol	
Acétone	✓
Hexane	✓

Récupération par : fm	Date : 15-09-20	Endroit : MEL

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AE Meliadine		Projet: 5528	
Échantillonné le: 23-09-2018		Récupéré par:	
Source: Incinérateur	Essai: [illegible] BL	Date: 23-09-2018	Heure: 10h00

CAISSE # 22

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass 125 mm	(N/A)	By pass 125 mm	✓	✓	✓	✓	✓
Cloche femelle	(N/A)	Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon	(N/A)	Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle	B	Cloche mâle	✓	✓	✓	✓	✓
Réfrigérant	OR-13-R1	Réfrigérant	✓	✓	✓	✓	✓
	OR-13-R2	Rallonge de réfrigérant	✓	✓	✓	✓	✓
	(N/A)	~~Coude réfrigérant~~ Tuyau MFo	✓	✓	✓	✓	✓
Trappe de résine	[redacted]	Trappe de résine					
Trappe à condensat verticale	OR-22-TC	Trappe à condensat verticale	✓	✓	✓	✓	✓
Coude	(N/A)	Coude	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith	(N/A)	Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude	(N/A)	Coude	✓	✓	✓	✓	✓
Barbotteur Std	(N/A)	Barbotteur Std	✓	✓	✓	✓	✓
Bouteille de verre ambrée (1)	[redacted]	[redacted]mbrée	✓	✓	✓	[redacted]	✓
Garnitures (Téflon + Aluminium)	[redacted]						
Nombre total de pièces	12	[redacted]	1000				

Bouteille de verre a[illegible]

Décontaminé par: JD	[illegible]018	Endroit: QC
Code de décontamination (pot):	[illegible]: 3[illegible] 08/2018-OR22	
# Lot Des Solvants:	Dichlorométhane: 176773 Hexane: 175762 Acétone: 181822	

Commentaires

Formulaire mis-à-jour le 2018-05-14

Appendix H-6

TEMMP report

Report

Agnico Eagle - Meliadine Division

2018 Terrestrial Effects Monitoring and Mitigation Program Annual Report

Submitted to:

Agnico Eagle Mines Limited

Attention: Martin Theriault/Nancy Duquet Harvey

Submitted by:

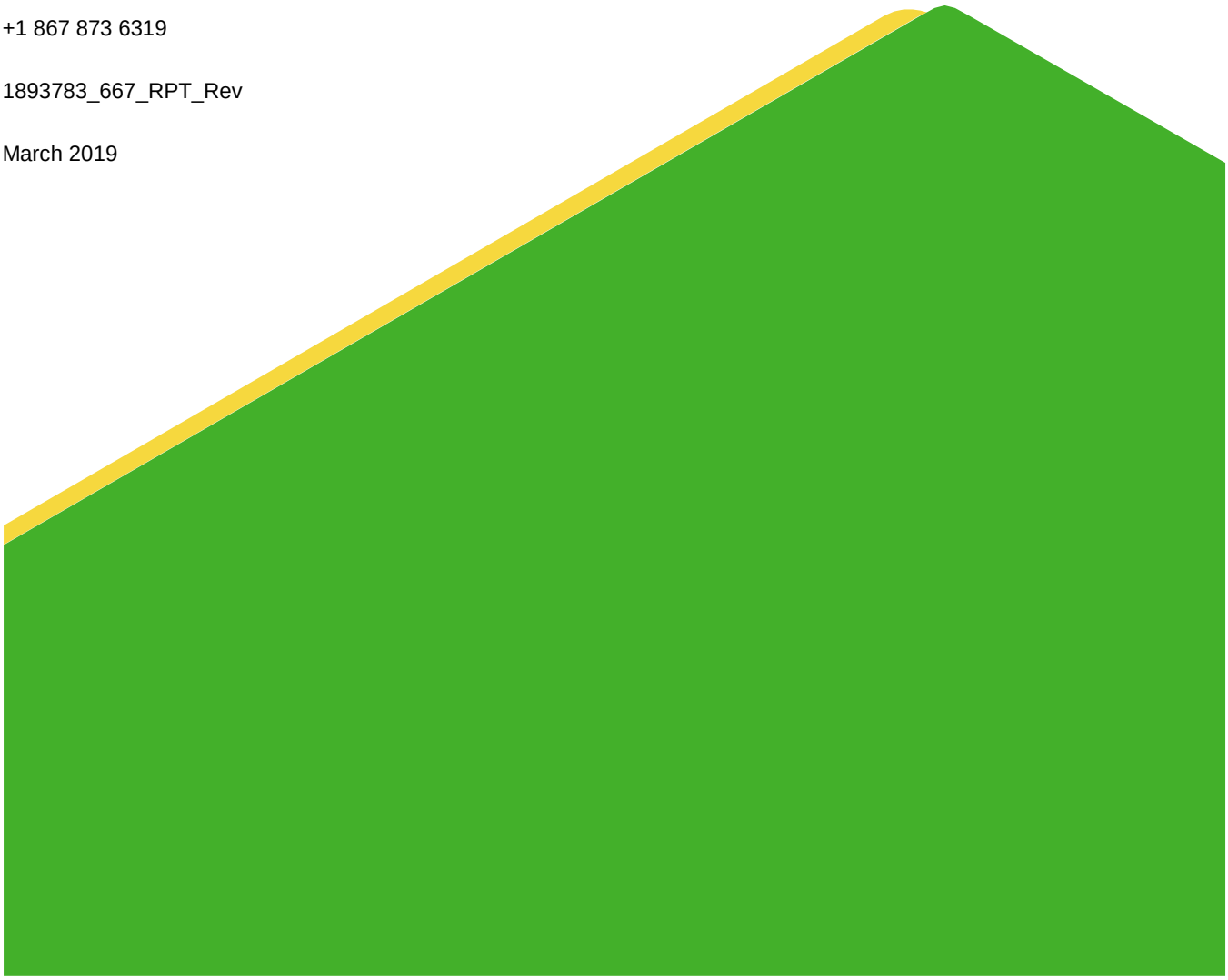
Golder Associates Ltd.

4905 - 48 Street Yellowknife, Northwest Territories, X1A 3S3 Canada

+1 867 873 6319

1893783_667_RPT_Rev

March 2019



Distribution List

Electronic Copy - Agnico Eagle Mines Limited

Electronic Copy - Golder Associates Ltd.

Executive Summary

The Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Mine (the Project), received a Project Certificate (No. 006) from the Nunavut Impact Review Board (NIRB) in February 2015. A conceptual Terrestrial Environment Mitigation and Management Plan (TEMMP) for the Project was prepared for submission with the Project Final Environmental Impact Statement (FEIS) and forms a component of the documentation series produced in accordance with the Project. This report addresses requirements of the Project Certificate (No. 006) (Appendix A).

The objectives of the Terrestrial Effects Monitoring and Mitigation Plan (TEMMP) Report are to summarize annual data (2018) collected from wildlife and vegetation monitoring programs, and to describe natural variation and potential Project-related changes in wildlife populations within and adjacent to the Project. The data was collected according to procedures outlined in the Project's Standard Operating Procedures and the TEMMP. The 2018 annual report describes monitoring objectives and methodology, 2018 annual results, mitigation activities, and management recommendations based on 2018 monitoring results. The following report documents results collected for the 2018 TEMMP for the Meliadine Project located in the Kivalliq Region of Nunavut.

Incorporation of Inuit Quajimajatuquangit

- When possible, field programs in 2018 were guided by Inuit Qaujimajatuqangit (IQ), including the assistance of local field assistants. Annual contributions from Inuit to the monitoring programs are presented in Table 8.1-1.

Direct Habitat Loss

- In 2018, a total area of 484 ha has been altered due to Project construction, representing 29% of the Predicted Project footprint (1,682 ha). Table 1.2-1 summarizes the impacts by each vegetation community/habitat type. Of the total project impacted habitat, 343 ha is vegetated heath types (36% of the predicted impacts), 95 ha is wetland riparian types (22% of the predicted impacts) and 6 ha of un-vegetated sand community (75% of predicted impacts).
- The project has altered 46 ha of unvegetated areas, representing 16% of the Predicted Project footprint. Of these, 40 ha (14% of the predicted project footprint) are associated with waterbodies and watercourses.

Indirect Habitat Loss

- Indirect habitat loss for caribou and wildlife habitat (soils and vegetation) was not assessed in 2018.

Wildlife Observations

- Between 4 January and 27 November there were 214 incidental wildlife observations among 13 different species comprising approximately 7,187 individual animals.

Wildlife Track Surveys

- On-site wildlife track surveys were conducted on 3 and 23 November 2018 and 8, 15 and 25 of December 2018.
- All observations were limited to arctic fox hare tracks - no caribou tracks were observed.
- A predatory mammal observation report was completed for wolf tracks which were observed on the main camp site on April 10, 2018, and for two polar bears observed on November 10, 2018.

Nest Relocation

- In July 2018, an active Common Redpoll nest was observed within an active construction zone.
- A Damage or Danger Permit (the permit) was issued under the Environment Canada Migratory Birds Regulations (MBR), which authorized the relocation of the migratory birds, eggs (3) and nest.
- The nest and eggs were successfully relocated, allowing the birds to fledge.

Incidents and Mortalities

- A gosling was found deceased near the Meliadine Lake gen set area. It is believed to died on the lake of unknown causes and was brought to shore through wave action.
- A total of 22 arctic foxes were trapped and dispatched by on GN DoE officers in 2018. (Table 6.3-1). The mortality rate varies based on frequency of trapping by GN DoE officers.

Wildlife Deterrents

- Bird deterrent canons were initially deployed on P1 and P3 dykes on June 21, 2018. Shortly after deployment, a deterrent canon was moved to the landfarm at the request of the NIRB. Concerns were raised about the canons impacts on caribou and other wildlife at which point canons were removed on July 2, 2018 (D. Gorton, Agnico Eagle, Per. Comm. 2019). No wildlife deterrents were used to deter caribou in 2018.

Barren-ground Caribou

Caribou Advisory

- Mass migration through the Project and AWAR took place between 5 July and 22 July 2018. The caribou work suspension protocol (complete work stoppage) was in effect for periods from 8 July to 17 July 2018 (Table 8.2-1). Closure and restrictions on AWAR took place on 7-20 July (Table 8.2-1).
- There was a complete work stoppage for 191 hours and restricted duties for 93 hours in 2018 (Mine and AWAR).

Caribou Behavior

- Caribou behavior observations were completed on seven groups of caribou in 2018.

Hunter Harvest

- Agnico Eagle is currently in working on a Memorandum of Understanding (M.O.U.) with the Rankin Inlet Inlet Hunters and Trappers Organization (HTO).

Birds

Shoreline Surveys

- All waterbodies within 200 m of mining related infrastructure (excluding the AWAR) were surveyed on foot by trained biologists to locate and identify nesting waterbirds from 12 to 18 June 2018. (Figure 3.8-1).
- A total of eight different species were observed (Table 10.1-1). No fledglings were observed, all observations were nesting adults, and eggs observed in nests. In total, 56 adult birds were recorded with 27 eggs observed among eight different species. Waterbodies within 200 m of the AWAR were not completed due to time constraints.

Point Counts

- Avian point count locations were chosen to be within 1 km on either side of the AWAR (2 km in total) with the first point counts occurring at 50 m from the road on either side, with subsequent plots spaced 100 m from the preceding plot. In 2018, a total of 6 transects were completed for a total of 72 point count surveys. The survey method is described in more detail in the TEMMP (Golder 2015).
- In total, seven passerine (i.e. songbird) species were recorded on the point count surveys (Table 9). The most abundant species was horned lark (*Eremophila alpestris*) and the least abundant species was American robin (*Turdus migratorius*).

PRISM

- Agnico Eagle contributed to the Environment and Climate Change Canada (ECCC) PRISM surveys in 2018 and will continue to do so every three years. For the 2018 surveys, a representative from ECCC, Golder biologists, and two local assistants completed PRISM surveys at the Project at randomly chosen locations (by ECCC). Observers recorded the species encountered, estimated their breeding status, and recorded habitat conditions.
- A total of ten PRISM survey plots were surveyed with a total of thirteen bird species observed (Table 10.3.2). The most common bird species observed in the plots were Lapland longspur (*Calcarius lapponicus*), and savannah sparrow (*Passerculus sandwichensis*). No species-at-risk were observed on survey plots. Breeding evidence of three species of shorebirds was found during the surveys.
- Due to the late spring in 2018, and the relatively early timing of the field work, no actively nesting songbirds were found during PRISM surveys.

Raptors

- The 2018 annual report of the Arctic Raptors Research Program is included in Appendix B.

Soil and Vegetation Monitoring

- Invasive Plant surveys were completed along the AWAR and Project footprint. Two occurrences of common dandelion were recorded along the AWAR. Common dandelion was not observed in the Project footprint or ship loading areas.
- Soil and vegetation contamination (metals and dust) will be monitored in 2019.

Environmental Variables

- The max annual temperature of 27.5°C was recorded on July 11, 2018 and the minimum annual temperature -46.8°C was recorded on February 19, 2018. Snowmelt began June 9, 2018 when the average daily air temperature exceeded 0°C. Environmental variables will continue to be monitored on an on-going basis.

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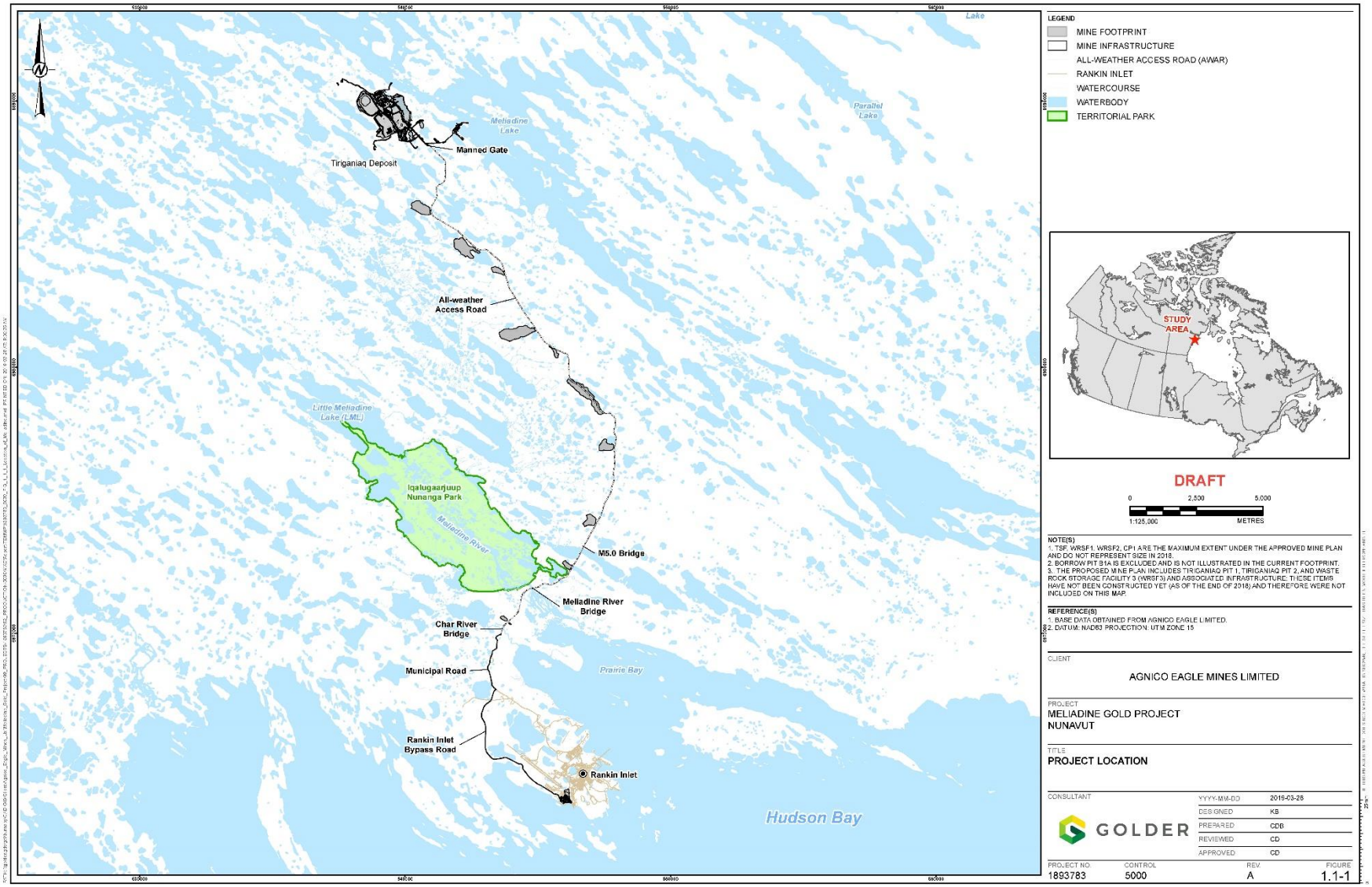
1.0 INTRODUCTION

1.1 Background

The Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Mine (the Project), located in the Kivalliq Region of Nunavut (Figure 1.1-1), received a Project Certificate (No. 006) from the Nunavut Impact Review Board (NIRB) in February 2015. The subsequent Water Licence and leases, allowed for the construction of a gold mine and ancillary facilities including an All-weather Access Road (AWAR), barge unloading facilities, lay-down area, and a fuel tank farm in Rankin Inlet. This report addresses requirements of the Project Certificate (No. 006) (Appendix A). A conceptual Terrestrial Environment Mitigation and Management Plan (TEMMP) for the Project was prepared for submission with the Project Final Environmental Impact Statement (FEIS) and forms a component of the documentation series produced in accordance with the Project. The TEMMP will be reviewed and updated on a regular basis as the Project proceeds into detailed design, construction, operations, closure and post-closure.

The 2018 annual report (this document) is the second of a series of annual TEMMP summary reports for the Project. The purpose of this report is to summarize the 2018 data collected from wildlife and vegetation monitoring programs, and to describe natural variation and potential Project-related changes in wildlife populations within and adjacent to the Project. The 2018 annual report describes monitoring objectives and methodology, 2018 annual results, mitigation activities, and management recommendations based on 2018 monitoring results. It should be noted however, that the Project is not currently active and is in the construction phase of development. The Project is anticipated to be operational from 2019 to 2037, where effects to wildlife may be more realized during open pit operations.

Figure 1.1-1: Project Location



1.2 Project Description

The Project, with an expected operating life of about eight years (until 2027), is located approximately 25 kilometers (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1’23.8’’ N, 92°13’6.42"W), on Inuit Owned Lands (IOL).

The scope of the TEMMP annual report is to report on monitoring of the Project during construction, operation, maintenance, reclamation, and closure. This report includes data collected in 2018, the second year of construction. Project site facilities include a plant site and accommodation buildings, a water management system that includes collection ponds, water diversion channels, retention dikes/berms, and a Water Treatment Plant. Project components include two ore stockpiles, a temporary overburden stockpile, a tailings storage facility, three waste rock storage facilities, a landfarm, incinerator, and landfill.

Environmental baseline studies were completed in the Project area prior to Project approval and integrated into the current project design according to the 2015 TEMMP (Golder 2015). Vegetation and wildlife Valued Ecosystem Components (VECs) were identified in consultation with regulatory agencies, the Kivalliq Inuit Association (KivIA) and the Rankin Inlet Hunters and Trappers Organization (HTO). Vegetation VECs include plant populations and communities, listed (rare) plant species, and traditional use plant species. Wildlife VECs include ungulates (caribou and muskox), carnivores (grey wolf and polar bear), raptors, waterbirds, and upland birds (including migratory birds). Further details on VEC selection can be found in the FEIS (Agnico Eagle 2014) and the TEMMP (Golder 2015).

1.2.1 Concordance with Terms of Reference

The initial purpose of this document was to address the Guidelines issued by the Nunavut Impact Review Board for the Mine (NIRB 2012), and specifically those relating to the presentation of a Wildlife Mitigation and Management Plan (Section 9.4.17 of the Guidelines). Specific requirements set out in the Guidelines relating to the preparation of a Wildlife Mitigation and Management Plan were used to guide this TEMMP and are provided in FEIS Volume 1, Appendix 1.0-A.

NIRB recommends the following related to standardization of data for monitoring programs:

> *“all monitoring plans should be designed so that results from these programs can be coordinated with ongoing regional initiatives or programs with relevant government organizations, or regional authorities.” NIRB guidelines, Section 9.3, page 78-79.*
>
> *“When designing data collection or baseline studies, it is recommended that the Proponent coordinate with ongoing programs with relevant developments, government organizations, regional authorities, and researchers. This recommendation applies to data collected for the Nunavut General Monitoring Program (NGMP), as per Article 12 of the NLCA, the Proponent’s project-specific monitoring programs, as well as any regional monitoring initiatives in which the Proponent will participate. The Proponent is expected to coordinate on any initiatives undertaken by government organizations in respect to the NGMP and to liaise with the NGMP Secretariat whenever possible.” NIRB guidelines, Section 7.7.1, page 40-41.*

Agnico Eagle will comply with these principles and has already established several programs that involve collaborations with regional initiatives and contribute to monitoring cumulative effects. These include:

- **Caribou Collar Program:** Supporting the GN's caribou satellite-collaring program for the Qamanirjuac herd (and other herds in the Kivalliq), facilitating monitoring of cumulative effects at the herd level (Golder (2015), Section 3.4, page 12).
- **Regional Muskoxen Surveys:** Agnico Eagle has provided the GN DoE with in-kind contributions and support for previous muskoxen surveys and will continue to do so when requested.
- **Hunter Harvest Program:** Agnico Eagle will establish a harvest study in association with the Rankin Inlet HTO to document harvest rates, harvesting distribution and seasonality, and monitor these data over time (Golder (2015), Section 3.5, page 13). This will contribute to an understanding of cumulative effects by increasing understanding of the regional distribution and seasonality of hunting.
- **Raptor Monitoring Program:** Agnico Eagle, in collaboration with the Arctic Raptor Project, has developed and implemented the raptor monitoring program (Golder (2015), Section 3.6, page 14). This will directly align monitoring efforts at Meliadine with this long-term regional research program which already involves government, non- government, Indigenous communities, and academic partnerships.
- **Waterfowl and Shorebird Monitoring:** Agnico Eagle, in collaboration with Environment and Climate Change Canada, have agreed to implement the Program for Regional and International Shorebird Monitoring (PRISM) (Golder (2015), Section 4.11, page 39) on a three-year schedule. This will directly align monitoring efforts at Meliadine with other Agnico Eagle properties for waterfowl and shorebirds.
- **Wildlife Surveys:** Agnico Eagle, in collaboration with the HTO, will conduct wildlife surveys twice weekly along the All- Weather Access Road (AWAR) and with environment technicians around the proposed mine site. This will contribute to an understanding of cumulative effects by collecting routine wildlife survey data (including caribou) and assist in anticipating large herd migrations, communicating with the HTO and managing mine activities during migration events. In addition, Agnico Eagle has contributed to regional muskoxen survey programs and will continue to do so in the future.

The Project Certificate (NIRB 006) for the Meliadine Gold Mine was issued on February 26, 2015. This third iteration of the TEMMP addresses the Terms and Conditions of that Project Certificate as they relate to Terrestrial and Wildlife Mitigation and Management.

Table 1.2-1 Concordance Table with Project Certificate Terms and Conditions

Term	Condition	Section
37	The Proponent shall incorporate protocols for monitoring for the potential introduction of invasive vegetation species (e.g. surveys of plant populations in previously disturbed areas) into its Terrestrial Environment and Monitoring Plan. Any introductions of non-indigenous plant species must be promptly reported to the Government of Nunavut Department of Environment.	12.1
38	The Proponent shall conduct sampling to determine baseline levels for metals in soils found in areas with berry-producing plants near the Project area and shall update relevant vegetation sections within the Terrestrial Management and Monitoring Plan to incorporate ongoing monitoring of these parameters prior to commencing operations.	12.0
39	The Proponent shall develop and establish an on-going monitoring program to determine the distribution, abundance, and health of vegetation species used as caribou forage (such as lichens) near Project areas, prior to commencing operations.	12.0
47	The Proponent shall share information with the Government of Nunavut (GN) relating to the migration of caribou and include the GN as a party respecting caribou monitoring and movement through Project development areas, including the all-weather access road and associated roads and trails.	6.1, 8.1.1, 8.2.1 and 8.2.2
52	The Proponent shall undertake periodic surveys and a habitat assessment for muskoxen in the regional study area by partnering with, or complementing, the existing regional muskox monitoring programs.	6.0
55	In consultation with the Government of Nunavut (GN) and other affected parties, the Proponent shall set thresholds for direct mortality of wolf, grizzly bear, polar bear, wolverine, and fox to ensure monitoring and mitigation for the Project is responsive to undesirable rates of mortality. The Proponent shall reach an agreement with the appropriate Designated Inuit Organization regarding compensation or any direct mortality of wildlife resulting from the Project.	6.5
56	The Proponent shall report annually to the NIRB regarding its terrestrial environment monitoring efforts, with inclusion of the following information: a. Description of all updates to terrestrial ecosystem baseline data; b. A description of the involvement of Inuit in its monitoring programs; c. A detailed presentation and analysis of the distribution relative to Project infrastructure and activities for caribou and other terrestrial mammals observed during surveys and incidental sightings; d. Results of the annual monitoring program, including field methodologies and statistical approaches used to support conclusions drawn; and e. An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries.	4.1.2 and 5.0
57	Within its annual report to the NIRB, the Proponent shall incorporate a review section which includes: a. An examination for trends in the measured natural variability of Valued Ecosystem Components in the region relative to the baseline reporting; b. A detailed analysis of wildlife responses to operations with emphasis on wildlife behaviour, mortalities and displacements (if any), and responses to operations of the all-weather access road and associated access roads/trails; c. A demonstration and description of how the monitoring results, including the all-weather access road and associated access roads/trails contribute to cumulative effects of the project; and d. Any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program.	6.3
59	If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance based on the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.	6.2
61	Prior to bird breeding season, the Proponent shall either conduct clearing activities or identify and install nesting deterrents (e.g., flagging) to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities. If clearing is to take place during the nesting season, a nest survey should take place to identify nests and any identified nests must remain undisturbed until the young have fledged or left the nest. Any nests identified shall be included as part of the annual reporting for the Terrestrial Environmental Mitigation and Monitoring Plan (TEMMP).	6.2, 10.1.2 and 10.3.2
62	The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan (TEMMP), until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.	6.2, 10.1.2 and 10.3.2
71	The Proponent shall develop detailed and robust mitigation and monitoring plans for migratory birds, reflecting input from relevant agencies, the Kivalliq Inuit Association and communities.	10, 11
72	The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Protection Plan and Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) prior to construction. The key indicators for follow up monitoring under this plan will include upland birds (including migratory birds), waterbirds, raptors, and seabirds including migration and wintering.	10, 11
73	The Proponent's monitoring program shall assess and report, on annual basis, the extent of terrestrial habitat loss due to the Project to verify impact predictions and provide updated estimates of the total Project footprint.	4.1
105	The Proponent is strongly encouraged to consider incorporating information obtained from local outfitting and guiding businesses into its Hunter Harvest Survey where possible, and to include these organizations as potential respondents to surveys undertaken.	9.0
118	The Proponent shall include in an updated Terrestrial Wildlife Management and Monitoring Plan (TEMMP), plans for increased caribou monitoring efforts including weekly winter track surveying and summer and fall surveys undertaken on foot twice per month. These results shall be reported to the NIRB with the Proponent's annual reporting requirements.	6.1, 8.1.1, 8.2.1 and 8.2.2
119	The Proponent shall include within its updated Terrestrial Wildlife Management and Monitoring Plan, a commitment to establishing deterrents along the AWAR at any areas where it is observed that caribou are attracted to the AWAR and their presence may present a risk of collisions with traffic along the AWAR (such as areas where caribou are utilizing the AWAR to facilitate movement, areas where caribou may be licking minerals/road salt from the road, areas where caribou are gathering to avoid insects, etc.).	TEMMP (Golder 2015) Appendix 3 – Wildlife Protection and Response Plan

1.3 Study Area Boundaries

The Local Study Area (LSA) includes a 500 meter (m) radius buffer centered on the Project footprint and includes 1000 m buffer on the AWAR, Discovery access road and the Rankin Inlet bypass road. The total area of the LSA is 10,598 hectares (ha) (Figure 1.3-1). The Regional Study Area (RSA) encompasses an area that includes a 28 km radius area around the Project, including Rankin Inlet for a total area of 246,300 ha (Figure 1.3-2).

Further details on the justification for study area sizes can be found in the Final Environmental Impact Statement (Agnico Eagle 2014) and the TEMMP (Golder 2015).

Figure 1.3-1: Project Local Study Area

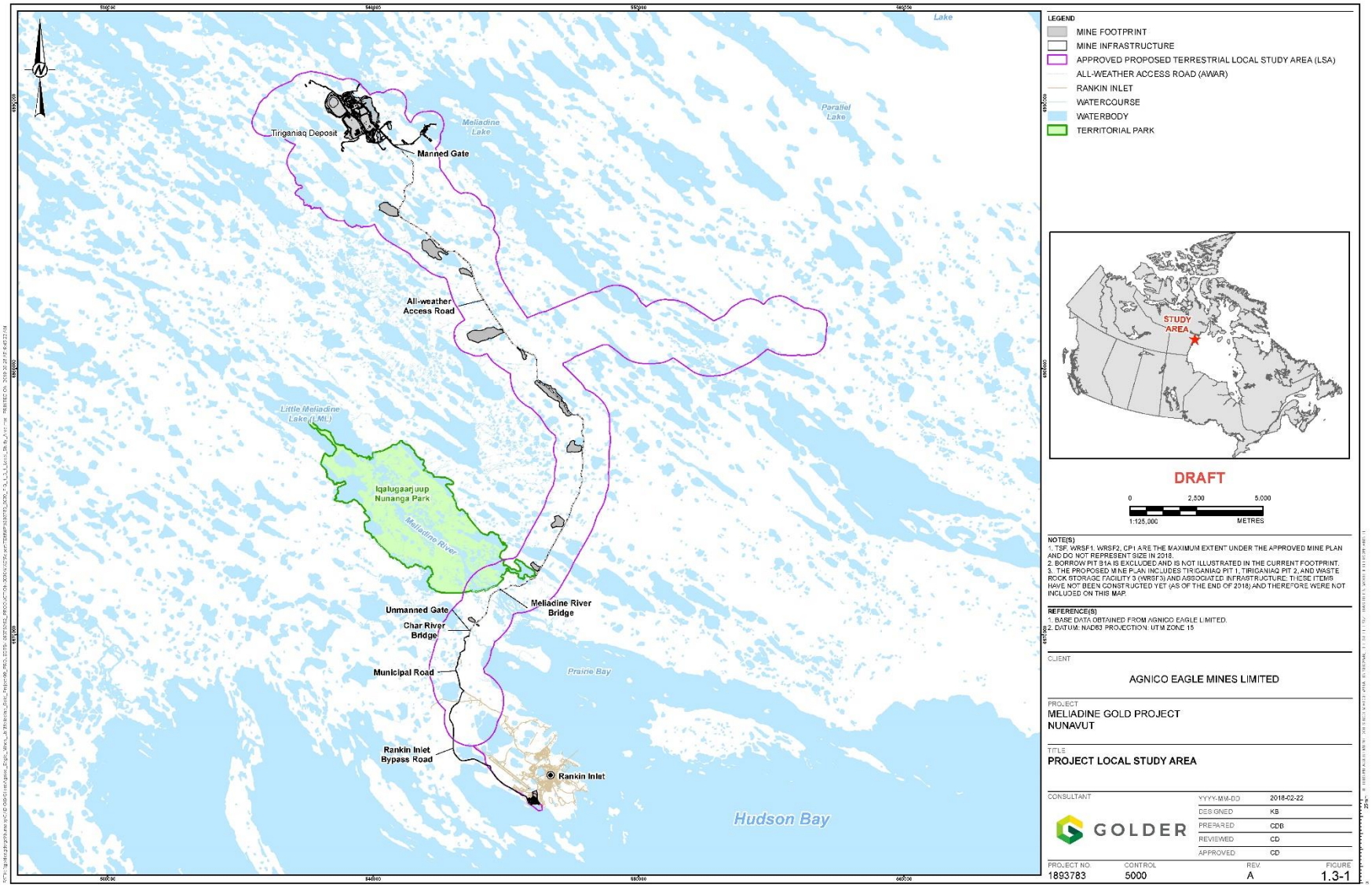
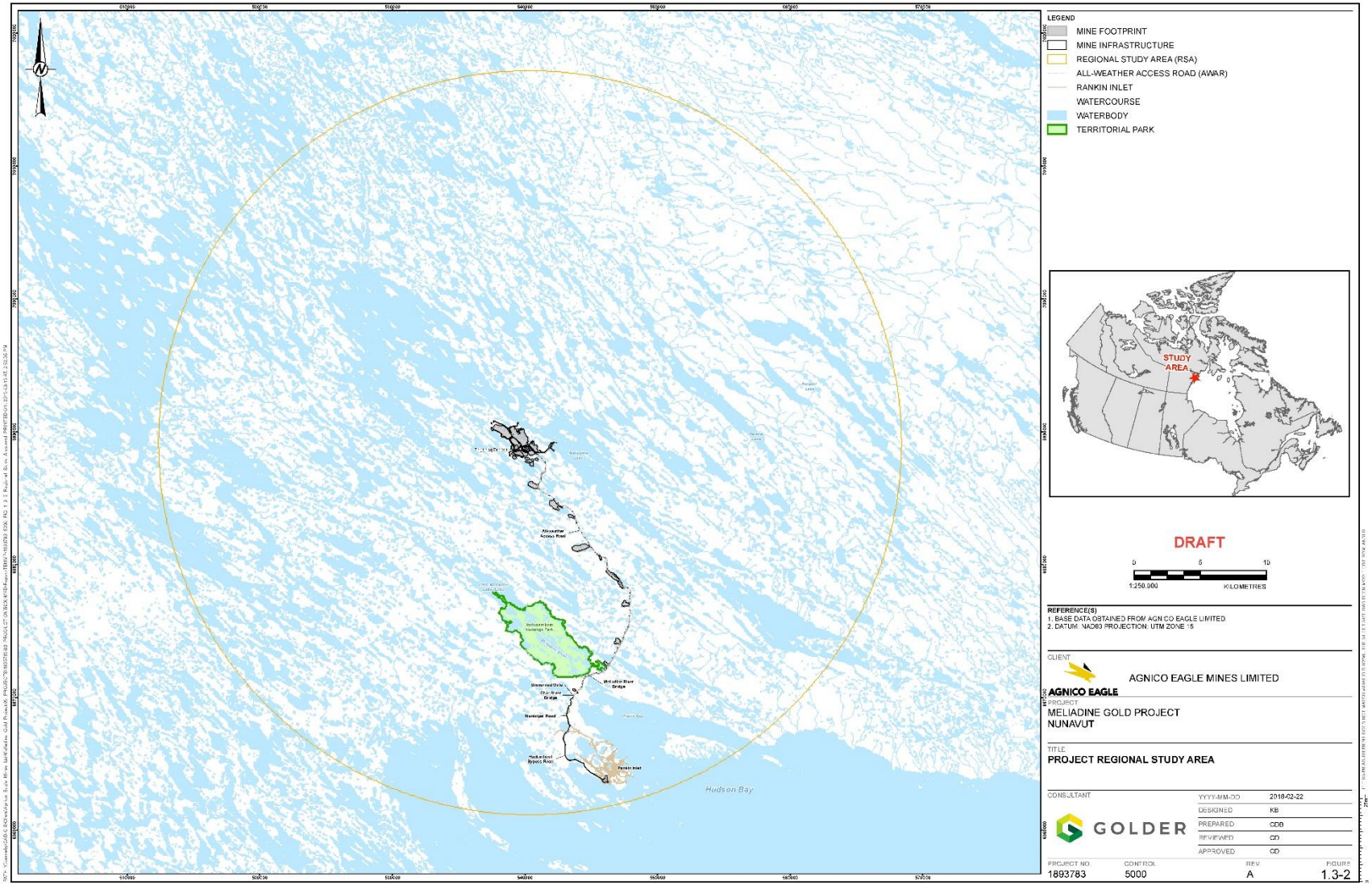


Figure 1.3-2: Project Regional Study Area



1.4 Monitoring Approach

Wildlife monitoring is an essential tool in protecting and maintaining wildlife in the vicinity of the Project. A comprehensive monitoring strategy has been implemented and, as required, is adapted to meet the objectives of the management strategy and methods set out in the TEMMP (Golder 2015). Monitoring programs evaluate the effectiveness of mitigation measures and assess Project-related impact predictions. For all wildlife monitoring programs there is a certain level of uncertainty or unpredictability; therefore, residual effects identified during monitoring may require implementation of adaptive management strategies.

To effectively evaluate the accuracy of impact predictions, a series of quantitative monitoring indicators, which are within the broad categories of habitat distribution, wildlife distribution, wildlife richness, wildlife diversity, wildlife abundance, and environmental health, have been developed. However, as stated earlier, the Project is currently in the construction phase of development and this is the second year of monitoring, consequently not all of the objectives below can be answered at this time.

1.5 Objectives

The primary objectives of the 2018 Annual Report include:

- Collect information that will assist Agnico Eagle to determine if there are effects on wildlife and if these effects were accurately predicted in the FEIS.
- Reporting the results of the 2018 wildlife monitoring programs.
- Summarizing the monitoring strategy implemented over the course of the year.
- Evaluating the function and validity of implemented monitoring strategies.
- Summarizing adaptive management strategies.
- Providing management recommendations for 2018.
- Allowing regulators to contribute advice for improving wildlife management.

1.6 Report Organization

Within each section of this report, data is presented that will be tracked over the life of the Project. Recommendations for enhancement to the TEMMP is presented at the end of each section for consideration and may be incorporated into the TEMMP for subsequent years. The TEMMP is an evolving program that will reflect recommendations during previous years, as well as advances in Project development. Changes will be captured in future revisions of the TEMMP as needed.

2.0 REVIEW OF IMPACT PREDICTIONS

A summary of the impact predictions proposed in the TEMMP (Golder 2015) is provided in Table 2.0-1. Adaptive management will be implemented if the Project impacts exceed the predictions. The corresponding section of this annual report, where monitoring indicators are discussed is also listed. Project related mortalities are defined as those caused as a direct result of project activities and exclude those resulting from trapping conducted by regulatory organizations.

Table 2.0-1: Summary of Predicted Effects, and accuracy of Impact Predictions, 2018

Monitoring Indicator	Proposed thresholds	Surveyed in 2018?	Exceeded in 2018?	Monitoring Methods	Frequency of Data Collection	Section Reference
Vegetation (Wildlife Habitat)						
Habitat Loss	Terrestrial – 2951 ha Aquatic – 515 ha	Yes	No	Ground Surveys, Mapping, GIS Analysis	Annually	4.1
Habitat Degradation by Contamination	No invasive plant species established	Yes	Yes	Invasive Plant Survey of AWAR and Project site	Annually	12.0
Habitat Degradation by Contamination	TBD – SLRA No effects to plant health from dust deposition	No	-	Vegetation and Soil Samples	Every 3 Years	6.0
Habitat Reclamation following Mine Closure	NA	No	-	Ground Surveys, Vegetation Plots, Mapping	Once pre - construction (this year) baseline and 3 times Post-Closure	12.0
Ungulates						
Habitat Loss and Degradation	No greater than 2951 ha of terrestrial habitat loss	Yes	-	Ground Surveys, Mapping, GIS Analysis	Annually	4.1
Sensory Disturbance	<10% caribou deflections from AWAR	No	-	Ground Surveys, Satellite-collaring	Daily/Weekly	4.2
Vehicle Collisions	1 individuals	Yes	No	Ground Surveys	Daily	6.1
Hunting by Rankin Inlet Residents	After 3 years of data collection, in collaboration with GN, establish a threshold level	No	-	Hunter Harvest Study	Collected throughout the year and reported annually	10.0
Other Project-related Mortality	1 Individual	Yes	Yes	Ground Surveys	Daily	6.1
Exposure to Contaminated Water or Vegetation	TBD – SLRA	No	-	Vegetation and Soil Samples	Every 3 Years	4.2
Predatory Mammals						
Project-related Mortality	1 Arctic Fox	Yes	Yes	Ground Surveys, Cameras in attractant areas	Daily	6.1
Raptors						
Disturbance of Nesting Raptors	To be determined in consultation with GN and Alastair Franke, related to occupancy and productivity.	Yes (Appendix B)	TBD	Active Nest Monitoring	Nests within 200 m – Daily Nests from 200-1000 m – Weekly	12.0
Project-related Mortality	To be determined in consultation with GN and Alastair Franke	Yes (Appendix B)	TBD	Ground Surveys, Collision Reporting System	Mine Site-Daily AWAR – 2x/Week	1.0
Waterbirds						
Habitat Loss and Degradation	515 ha of Aquatic Habitat	Yes	No	Ground Surveys, Mapping, GIS Analysis	Annually	4.1
Disturbance of Nesting Waterfowl	TBD once NRV is established through consultation with ECCC and GN	Yes	No	Shoreline Surveys	TBD	10.1
Exposure to Contaminated Water or Vegetation	TBD – SLRA	No	-	Vegetation and Soil Samples	Every 3 Years	4.2
Project-related Mortality	1 Individual	Yes	No	Ground Surveys, Collision Reporting System	Mine Site-Daily AWAR - 2x/Week	6.1
Other Breeding Birds						
Habitat Loss and Degradation	No greater than 2951 ha of terrestrial habitat loss	Yes	No	Ground Surveys, Mapping, GIS Analysis	Annually	4.1
Exposure to Contaminated Water or Vegetation	TBD – SLRA	No	-	Vegetation and Soil Samples	Every 3 Years	4.2
Changes in Breeding Bird Populations	TBD once NRV is established through consultation with ECCC	Yes	-	Breeding Bird Plots and Transects	Every 3 Years	9.0

SLRA = Screening Level Risk Assessment; NRV = Natural Range of Variability; ECCC = Environment and Climate Change Canada; GN = Government of Nunavut Department of Environment; AWAR = All-Weather Access Road; *TEMMP = Terrestrial Environment Management and Monitoring Plan (Golder 2015)

3.0 INCORPORATION OF INUIT QUAJIMAJATUQANGIT

Field programs were guided by Inuit Qaujimajatuqangit (IQ), including the assistance of local field assistants. Annual contributions from Inuit to the monitoring programs are presented below (Table 3.0-1).

Table 3.0-1: IQ Field Contributions from Inuit to Monitoring Programs

Name	Date(s) Worked on Site	Total Days	Programs Contributed To
Brenda Anderson	■ June 11 to June 24, 2018; ■ July 16 to July 20, 2018; and ■ July 26, 2018.	19	■ Breeding bird surveys ■ Shoreline surveys ■ PRISM surveys
John Papak	■ August 6 to August 19, 2018.	14	■ Fish Sampling
Matt Adams	■ June 1 to June 20, 2018; ■ June 22 to June 25, 2018; ■ July 17 to July 27, 2018; and ■ August 13 to August 19, 2018.	32	■ Breeding bird surveys ■ PRISM surveys ■ Shoreline surveys ■ Water/sediment quality sampling ■ Archaeology survey

4.0 HABITAT LOSS

4.1 Direct Habitat Loss

The vegetation component of the TEMMP (Golder 2015) outlines the means by which AEM plans to reduce Project-related effects to vegetation populations and communities, and consequently wildlife habitat. The monitoring plan includes both environmental and follow-up monitoring. Environmental monitoring programs are used to track conditions and implement further mitigation as required, and the follow-up monitoring used to verify the accuracy of impact predictions and adaptively manage. This section provides the results of the follow-up monitoring from Project construction initiation to 2018 and summarizes the current Project impacts to vegetation communities/habitat type.

Direct effects to wildlife populations includes the physical disturbance and loss of habitat (e.g., upland and riparian vegetation, wetlands, and water), which results in the direct displacement of wildlife. Direct habitat disturbance is expected to occur through the construction of the Project footprint, such as the creation of roads, Project rock piles, core Project facilities, and increased water levels in some local lakes and streams. Impacts to vegetation communities/habitat types are considered long-term as the recovery of vegetation is slow in arctic environments (Burt 1997).

The objective of this component of the annual report is to determine if direct vegetation/habitat loss due to Project footprint stays within impact predictions of 2,950 ha (Agnico Eagle 2014).

4.1.1 Methods

The Project development area was delineated through aerial photographs, satellite imagery, or ground surveys, and calculated using ArcGIS software. The actual area of the Project footprint will be compared to the permitted area and monitored over the life of the Project at key phases of development, or at 3 year intervals (Golder 2015).

A shapefile with the most current Project footprint from 2018 was obtained from Agnico Eagle and used to determine impacts to vegetation communities/habitat type due to the Project. The footprint layer was compared against 2017 GoogleEarth imagery and laid over the vegetation unit layer available for the Project and developed by Golder (2012). Each vegetation community/wildlife habitat disturbed by the Project was selected and calculations were made using ArcGIS to determine the area (ha) of each habitat type replaced by the Project footprint.

Changes to vegetation communities/habitat types were assessed for the maximum predicted Project footprint (Golder 2015), which should have the largest magnitude and geographic extent of effects to vegetation. The maximum predicted Project footprint includes Project site and associated infrastructure (e.g., tailings storage facility [TSF], open pits, waste rock storage facilities, and camp), the AWAR between the Project and Rankin Inlet and the proposed infrastructure within the boundary of the Hamlet of Rankin (associated roads, floating dock, laydown yard and tank farm).

A portion of the bypass road connecting Rankin Inlet and the AWAR (Figure 1.3-1) was not included in this assessment because this portion was developed outside the original Project LSA as per the Hamlet's instruction. This portion of the road is 4 km in length and 10 m wide.

4.1.2 Results

As of December 2018, a total area of 484 ha has been altered due to Project construction, representing 29% of the Predicted Project footprint (1,682 ha). Table 2.0-1 summarizes the impacts by each vegetation community/habitat type. A total of 343 ha of vegetated heath types have been impacted by the Project (35 % of the predicted impacts). The wetland riparian types have been impacted by Project by 95 ha (22% of the predicted impacts). In total 6 ha of un-vegetated sand community have been impacted due to the Project (75 % of predicted impacts) (Figure 4.1-1)

Figure 4.1-1: Project Footprint Comparison by Vegetation Community/Habitat Type

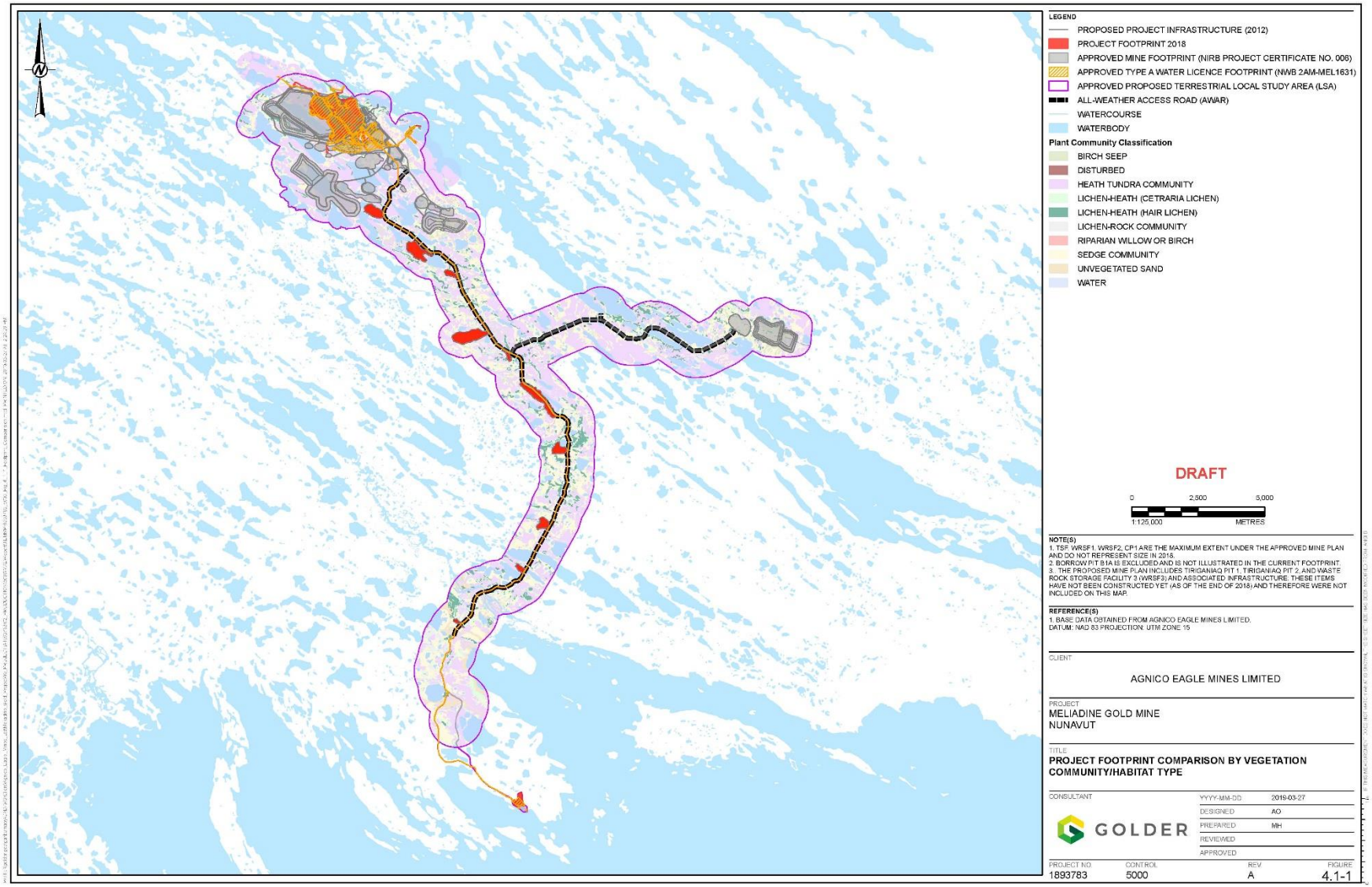


Table 4.1-1: Total and Predicted Vegetation Community/Habitat Type loss from Project approval to 2018

Vegetation Community Type	Vegetation Community Type Description	Total Area of LSA (ha)	Project Predicted Impacts [ha]	2018 Project Impacts [ha] [(a)]
Heath				
Lichen-Rock Community	characterized by crustose lichens growing on the boulders or rocks that predominate on eskers or rocky plateaus	233	37	28
Lichen-Heath (*Cetraria* Lichen)	occurs on lower slope positions, often below the lichen-health – hair lichen community, on more rapidly drained sandy substrates	560	86	35
Lichen-Heath (Hair Lichen)	occurs almost exclusively on the higher ridges of slopes and on drumlin and esker crests, where the ground cover consists of a high percentage of black and green hair lichens	601	110	59
Heath Tundra Community	occurs on uplands and slopes of most ridges characterized by gently rolling to undulating terrain with rapidly to well-drained soils	4,036	722	222
	Heath subtotal	***5,429***	***956***	***343***
Wetland/Riparian				
Birch Seep	occurs on imperfectly poor to poorly drained soils such as the edges of solifluction lobes, on the slopes of some eskers, in stream valleys and along transitions to some sedge associations	305	87	10
Sedge Community	occurs adjacent to lakes and streams on very poorly drained soils and in low-lying areas	2,449	1	85
Riparian Willow or Birch	typically occurs along the banks of stream courses; characterized by imperfectly drained, nutrient enriched soils	12	351	<1
	Wetland/Riparian subtotal	***2,767***	***440***	***95***
Un-vegetated				
Disturbed [(b)]	cleared areas and access roads associated with the Project as well as various natural disturbance features	<1	<1	<1
Un-vegetated (Sand)	associated with steep sandy slopes and the margins of rivers and lakes; limited to no vegetation cover	182	8	6
Water	associated with waterbodies and watercourses	2,221	278	40
	un-vegetated subtotal	***2,403***	***286***	***46***
	Total	**10,598**	**1,682**	**484**

(a) Impacts to vegetation communities/habitat types from Project approval to December 2018.
(b) Disturbance include areas that were already disturbed at baseline conditions when the vegetation community/habitat type mapping was developed.

Note: Some numbers are rounded for presentation purposes; totals may not equal the sum of the individual values.

4.2 Recommendations

Although, Project footprint is currently 29% of the total predicted footprint, follow up monitoring should continue at 3 year intervals, as monitoring studies are used to provide feedback to Project operations to determine if the goals and objectives are being met. Depending on the results, actions may be considered such as modifying and/or implementing additional mitigation.

4.3 Accuracy of Impact Predictions

Impact predictions related to habitat loss is summarized in Table 2.0-1. Terrestrial and aquatic habitat loss is currently below predictions. Effects to plant health from dust deposition were not scheduled for assessment in 2018. Plant health related to dust deposition is assessed every at three years intervals from baseline (2017) as per the TEMMP (Golder 2015), the next assessment was to be completed in 2020 but to align the assessment frequency with the first year of construction, the next assessment will happen in 2019.

5.0 INDIRECT HABITAT LOSS

Indirect effects to wildlife are associated with changes in habitat that can alter the movement and behavior of individuals in the vicinity of the Project as a result of sensory disturbance. Indirect Project effects such as dust deposition on vegetation communities and presence of heavy metals on vegetation tissue and soils were assessed in 2017 and presented in the 2017 Annual report (Golder 2018). Indirect Project effects are assessed every three years, with the next field assessment scheduled for summer 2019 to align sampling years with the first year of construction. The results will be compared against values from samples collected at Reference Areas (10 to 15 km from the site infrastructure).

Indirect habitat loss for caribou and wildlife was not assessed in 2018.

6.0 WILDLIFE OBSERVATIONS

Environmental technicians conduct site surveillance monitoring and road surveillance monitoring regularly of the AWAR and the Project. In addition to planned surveys, all supervisors ask their employees to report wildlife sightings; Wildlife logs are posted throughout the Project and easily accessible to employees to facilitate wildlife reporting before, during, and after work shifts.

In 2018, there were over 214 incidental wildlife observations among 13 different species and approximately 7,187 individual animals (Table 6.0-1). Observations were recorded between 4 January and 27 November 2018.

Table 6.0-1: Incidental Wildlife Observations, 4 January to 27 November 2018

Species	Observations	Individuals
Bald eagle	1	1
Canada goose	6	67
Common Raven	2	2
Duck sp.	2	20
Ptarmigan sp.	4	19
Sandhill crane	1	4
Snow goose	1	100
Snowy owl	2	2
Tundra swan	2	4
Arctic hare	28	31
Caribou	76	6839

Table 6.0-1: Incidental Wildlife Observations, 4 January to 27 November 2018

Species	Observations	Individuals
Arctic fox	97	105
Polar bear	1	2
Sik sik	1	1
Wolverine	1	1

Specific GPS locations were not recorded for incidental wildlife observations in 2018.

6.1 Wildlife Track Surveys

On-site wildlife track surveys were conducted on 3 and 23 November 2018 and 8, 15 and 25 of December 2018. All observations were limited to arctic fox hare tracks - no caribou tracks were observed. In addition to scheduled wildlife track surveys, a predatory mammal observation report was completed for wolf tracks observed on the main camp site on 10 April 2018, and for two polar bears observed on 10 November 2018. A wildlife inspection was completed on 11 April 2018 and no further signs of wolves in the area were observed. Wildlife track surveys will continue to be conducted in 2019.

6.2 Common Redpoll Nest Relocation

In July 2018 an active Common Redpoll nest was observed within an active construction zone within rebar installed for a concrete foundation of a building. A Damage or Danger Permit (the permit) was issued under the Environment Canada Migratory Birds Regulations (MBR) under subsection 4.(1) of the MBR on 27 July, 2018, which authorized the relocation of the migratory birds, eggs (3) and nest. The nest containing the eggs was relocated, and passively monitored daily until successfully fledging.

Summary of events

- Nest was observed at 63.026774N, -92.219641W.
- Prior to relocation, all four eggs hatched.
- The nest was moved a total of 31.5 m from the active construction zone.
- Successful with nestlings fledging from the nest on 7 August 2018.

6.3 Incidents and Mortalities

6.3.1 Methods

Project-related incidents and mortalities are reported to the Environment Department for documentation in a detailed incident investigation for immediate follow-up. All incidental wildlife mortalities are reported immediately to the Government of Nunavut Department of Environment (GN DoE), and the GN DoE is consulted for follow-up mitigation and disposal procedures. In addition, the KivIA will also immediately be notified of wildlife mortalities and the events and circumstances around that mortality. If wildlife had to be deterred to reduce the risk of a wildlife-human incident, then all efforts are made by the environmental technicians to start with the least intrusive method available, and all deterrent actions are recorded.

6.3.2 Results

The following wildlife incidents in Table 6.3-1 were reported at the Project in 2018:

Table 6.3-1: Wildlife Mortality Incidents Recorded at Meliadine (Including AWAR) in 2018

Date	Species	Number	Location	Comments
Jan. 22 – 28	arctic fox	1	n/s[(a)]	trapped and disposed in incinerator[(c)]
Jan. 29 – Feb. 5	arctic fox	1	n/s	trapped; unknown cause of death
Feb. 1	arctic fox	1	snow disposal area /industrial pad	unknown cause of death
Feb. 12 - 19	arctic fox	1	n/s	trapped and disposed in incinerator
Feb. 21	arctic fox	1	n/s	trapped and disposed in incinerator
Mar. 6	arctic fox	3	n/s	trapped and disposed in incinerator
Mar. 7	arctic fox	2	n/s	trapped and disposed in incinerator
Mar.8	arctic fox	1	n/s	trapped and sent to lab for rabies testing (bit employee)
Mar.8	arctic fox	2	n/s	trapped and disposed in incinerator
Mar. 9	arctic fox	1	process plant	aggressive fox chasing people, killed in self-defense and incinerated
Mar. 9	arctic fox	2	n/s	one of animals was aggressive and suggested by GN to have potential for rabies, both incinerated
Mar. 15	arctic fox	1	landfill	trapped - disposed in incinerator
Mar. 22	arctic fox	1	landfill	trapped - disposed in incinerator
Mar. 22	arctic fox	1	landfill	shot – disposed in incinerator
Mar. 23	arctic fox	1	landfill	trapped - disposed in incinerator
Mar.26	arctic fox	1	n/s	snared by fox monitor, and disposed of in incinerator – potential rabies
Jun. 17	arctic fox	1	under explo.kitchen	disposed of in incinerator – potential rabies
Jul. 6	arctic fox	1	Mel esker	found deceased, and disposed of in incinerator – potential rabies
Aug. 2	gosling	1	Mel Lake gen set area	found deceased – retrieved by GN
Aug. 2	arctic fox	1	n/s	trapped and disposed of by GN
Aug. 29	arctic hare	1	behind SWTP	unknown cause of death
Sep. 22	arctic fox	1	n/s	trapped and disposed of by GN
Oct. 3	arctic fox	1	n/s	trapped by GN and disposed of by GN in incinerator (on-site)
Nov. 29[(b)]	arctic fox	1	n/s	trapped and disposed of by GN

(a) n/s – location not specified
(b) no additional mortalities after November 29, 2018.
(c) all trapping and site mortalities were completed by GN

Mortalities were reported to the GN DoE, which collected the gosling and 4 arctic foxes for disposal. Other mortalities were disposed of in the incinerator.

Following initial guidance from the GN DoE, traps were placed around the Project starting 19 September 2017. A total of 22 arctic foxes were trapped and dispatched by on site staff and GN DoE officers from 1 January 2018, to 29 November 2018.

6.4 Recommendations

Mortalities can occur as fox and other wildlife become habituated to mining activities resulting from efforts to locate food or shelter (DDMI 1998). Diligent waste management, employee and environmental awareness, and immediate reporting of wildlife sightings in and around Project infrastructure can limit the mortality of wildlife. In response to incidents, employees of the Environment Department will continue to hold toolbox meetings with various departments and contractors, stressing that the harassment and feeding of wildlife are harmful, unacceptable and against company rules.

6.5 Accuracy of Impact Predictions

A summary of the impact predictions proposed in the TEMMP (Golder 2015) is provided in Table 2.0-1. Through systematically recording the presence of all wildlife within and around the Project footprint, Environmental staff will remain appraised of current and emerging issues and will be able to manage issues as they arise. To use a common example, surveillance monitoring may detect that wildlife has gained access and is taking shelter beneath a building.

Monitoring thresholds are not well established, however, Agnico Eagle will work with the GN DoE to better refine these thresholds and adapt their practices, nevertheless, the following thresholds in Table 6.5-1 are suggested as a starting point for adaptive management and TEMMP (Golder 2015) refinement. Impact predictions related to wildlife incidents are summarized in Table 6.5-1.

Table 6.5-1: Accuracy of Impact Predictions – Wildlife Incidents

Monitoring Indicator	Preliminary Threshold	Exceeded in 2018?	Adaptive Management	Monitoring Method	TEMMP[a] Section
Project Related Mortality[b]	No more than 1 ungulate/year	No	Not Currently Identified	Wildlife Sightings Log, Site Surveillance Monitoring	4.4.2
Project Related Mortality	No more than 1 Arctic fox/year	Yes	On-going waste management and, regular toolbox meetings reiterating that harassing and feeding wildlife are harmful, unacceptable and against company rules	Wildlife Sightings Log, Site Surveillance Monitoring, with particular emphasis around waste management areas	4.4.2
Vehicle Collisions	No more than 1 ungulate/year	No	Not Currently Identified	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	4.4.2
Project Related Mortality	No more than 1 raptor/year	No	Not Currently Identified	Wildlife Sightings Log, Site Surveillance Monitoring	4.9
Project Related Mortality	No more than 1 waterbird/year	No	Not Currently Identified	Wildlife Sightings Log, Site Surveillance Monitoring	4.10

(a)TEMMP = Terrestrial Environment Management and Monitoring Plan (Golder 2015)
(b) Project related Mortality = A death that can be directly linked to the mine or mining activity.

7.0 WILDLIFE DETERRENTS

Bird deterrent canons were initially deployed on P1 and P3 dikes in accordance with Agnico Eagle licence requirements, project certificate TC #74 on June 21, 2018, which states that the Proponent's Terrestrial Management and Monitoring Plan (TEMMP) shall include mitigation measures implemented to prevent the use of water attenuation ponds by waterfowl and waterbirds and monitoring that assesses whether the mitigation measures are working or revised or further deterrent measures are required. Shortly after deployment, NIRB requested a deterrent canon be moved to the landfarm to prevent birds landing and nesting in the sump area. Inuit workers raised concerns (verbally) about the canons impacts on caribou and other wildlife at which point canons were removed on July 2, 2018 (D. Gorton, Agnico Eagle, Per. Comm. 2019). No caribou were deterred in 2018.

8.0 BARREN-GROUND CARIBOU

Barren-ground caribou (including Lorillard and Qamanirjuaq herds) currently have a federal status of 'Threatened' (COSEWIC 2018), but are not listed under the *Species at Risk Act (*SARA 2018) and are considered 'Apparently Secure' in Nunavut by the Canadian Endangered Species Conservation Council (CESCC 2016). Annual home ranges mapped by GN DoE show that the Project is within the annual home range of the Qamanirjuaq (Kaminuriak) Caribou Herd (Campbell et al. 2014; Campbell et al. 2012). However, the Lorillard caribou are migratory (Campbell et al. 2014) and generally distributed north of Chesterfield Inlet, based on radio-telemetry data collected by the GN DoE and the location of their historical calving grounds (Campbell et al. 2012). The likelihood of animals from the Lorillard Herd occurring in the RSA is very low. Baseline survey data documenting the distribution of barren-ground caribou during early winter, spring migration and calving, and post-calving through fall migration and rut periods suggest that the RSA is within the seasonal range of the Qamanirjuaq barren-ground caribou herd (Jalkotzy 1999, 2000a, 2000b).

The annual range of the Qamanirjuaq herd occupies an area from northern Manitoba and Saskatchewan in the south, to southwestern NU and southeastern NT (BQCMB 1999; Campbell et al. 2012). Barren-ground caribou are migratory, and movements and range use varies annually (Wakelyn 1999). The annual distribution and life history of this population has been previously documented (Banfield 1954; Kelsall 1968; Thomas 1969; Parker 1972; Heard 1983). A portion of the Qamanirjuaq herd may pass through the RSA in summer but in some years they may linger from late October through March (Hubert and Associates 2007). Thus, impacts to the Qamanirjuaq herd due to the Project have the potential for transboundary effects. For additional discussion on the Qamanirjuaq herd please refer to the FEIS (Agnico Eagle 2014).

8.1 Caribou Behavior

Concern has been raised regarding the effect of the Project AWAR and mining operations on caribou movement and behavior, particularly during the post-calving migration/aggregation which has occurred over the past 4 to 5 years. The Qamanirjuac herd calves approximately 57 km to the west-northwest of the Project and after calving the herd aggregates into a post-calving movement east towards the coast and then moves back to the west and southwest of the Project where their summer movement and distribution patterns commence. During the post-calving movements to the coast, thousands of caribou can come through the Meliadine Project site and reside within and around the Project area for approximately 5 to 10 days. Once 50 caribou are observed within 5 km of the Project footprint boundary (visual detection or based on collar data), a stop work procedure commences on site. Understanding how caribou interact with the Project infrastructure including roads (i.e., crossing, deflection, walking parallel) and other Project infrastructure, documenting behaviour through activity budgets may better inform appropriate adaptive management and distance triggers and thresholds in the future. Over time, a long-term dataset will be used to evaluate obvious response or lack of obvious response of caribou to mining based on behaviour.

Activity budgets (i.e., time spent feeding, resting, walking, running) of caribou exposed to disturbances from the Project and AWAR will be used to provide inputs for assessing the impact to the energy balance of caribou (Section 4.5.2 of the TEMMP (Golder 2015) for additional discussion). The immediate effect of specific stressors (e.g., aircraft, vehicles, other wildlife) on caribou behavior will also provide general insight into the relative effect of natural versus road stressors on caribou behavior. Essentially this data will contribute to a larger data set from information collected at other mine sites to help determine a weight of evidence of caribou behavioral response to stressors on the Project site and from the AWAR. Consequently, opportunistic surveys should be completed when appropriate to do so during the caribou post-calving migration, without causing additional stress to caribou (based on surveyor opinion).

The objectives of this component of the monitoring program are to:

- determine the effect of the Project AWAR on caribou activity budgets
- determine the effect of other mining activities (e.g., blasting, human presence, light truck traffic) that may elicit a response in caribou
- determine which stressors associated with the Project have the greatest influence on caribou behavior, and the variation in caribou behavior from these stressors

8.1.1 Methods

Ground-based behavioral observations, or scan sampling, are conducted to provide data on changes in caribou behavior as a function of distance from the Project. Two different, but complementary approaches have been used to record the activity budget of caribou around the Project and AWAR. See the TEMMP (Golder 2015) for additional details on the behavior scan method.

8.1.2 Results

Caribou behavior observations were completed on July 11, July 12, July 13, July 15 and July 21, 2018. A summary of caribou behavior observation in 2018 is present in Table 8.1-1. Observations showed no obvious behavioral response to mine activity.

Table 8.1-1: Caribou Behavior Observations (2018)

Date of Observation	Location	Approximate Number of Caribou	Behavior(s) Observed
11 July 2018	Between CP5 and Exploration Camp	8	Bedding, Feeding, Standing
12 July 2018	NW of Old Anfo. Plant	73	Feeding, Walking
13 July 2018	South of Landfarm B	604	Bedding, Feeding, Walking
13 July 2018	Western Edge of Project	520	Feeding, Swimming, Walking
15 July 2018	Between H15and MSB Pad	231	Feeding, Standing, Walking
21 July 2018	NW of Old Anfo. Plant	162	Bedding Feeding, Walking
21 July 2018	West of CP1	1	Feeding, Standing, Walking

8.2 Caribou Advisory

The objective of the Caribou Advisory Monitoring program is ensure workers are aware of the approximate numbers of caribou on and in close proximity the Project, which is related to the potential for interactions between caribou and mining activities. This raises general awareness so that employees are alert to the likelihood that mitigation could be triggered, and what mitigation entails. The number of animals near the Project and in specific areas dictates the type of mitigation practices that will be undertaken (e.g., haul road closure, closing specific areas on the Project site, speed reduction).

8.2.1 Methods

Agnico Eagle in collaboration with the GN and KIA undertook an extensive preparation for caribou migration at Meliadine, including the implementation of a caribou monitoring and work suspension protocol to minimize sensory disturbance at the Project site and along the AWAR. HTO and KIA members assist AEM staff conducting surveys during caribou migration. KIA members, assisted by Government of Nunavut (GN) staff worked with AEM staff to monitor caribou from July 5th to July 22nd, 2018 during the caribou migration period. Communication protocols built into the work suspensions are designed to be broadcast swiftly and broadly among all departments in real time. The environmental department monitored caribou presence as per the caribou migration protocol (Appendix IV; Golder 2015) including the use of collar data and regular surveys, and issued caribou advisories. Regular surveys for caribou, were completed by on site environmental technicians, and consisted of ground surveys at multiple locations, at regular intervals throughout the day (i.e., 06:00, 12:00, 18:00) during caribou migration.

8.2.2 Results

Mass migration through the Project and AWAR took place between 5 July and 22 July 2018. At the Project, the caribou work suspension protocol (complete work stoppage) was in effect for periods of 8 July to 17 July (Table 8.2-1). Closure and restrictions on AWAR took place on 7-20 July (Table 8.2-1). In total for both the Project and AWAR there was a complete work stoppage for 191 hours (~8 days) and restricted duties for 93 hours (~4 days).

Table 8.2-1: Caribou Advisories Meliadine, 2018

Date	Hours	Location	Mitigation
5 July	11.25	Mine[(a)]	Light duties permitted
6 July	14.5	Mine[(a)]	Light duties permitted
6 July	7.5	Mine[(a)]	Light duties at main site, full stoppage at exploration camp
7 July	5.5	Mine[(a)]	Light duties at main site, full stoppage at exploration camp
7 July	6.5	Mine[(a)]	Exploration camp restricted to light duties
7 July	6	Mine[(a)]	Light duties permitted
7 July	4	Mine[(a)]	Light duties at main site, full stoppage at exploration camp
7 July	2	Mine[(a)]	Complete work stoppage
7 July	12	AWAR	Speed limit restricted to 30 km/hr
8 July	24	Mine[(a)]	Complete work stoppage
8 July	18	AWAR	Complete work stoppage
9 July	24	Mine[(a)]	Complete work stoppage
9 July	24	AWAR	Complete work stoppage
10 July	12	Mine[(a)]	Complete work stoppage
10 July	24	AWAR	Complete work stoppage

Table 8.2-1: Caribou Advisories Meliadine, 2018

Date	Hours	Location	Mitigation
11 July	6	Mine[(a)]	Light duties permitted
11 July	12	AWAR	Speed limit restricted to 30 km/hr
12 July	9	AWAR	Speed limit restricted to 30 km/hr
12 July	15	AWAR	Complete work stoppage
13 July	17	Mine[(a)]	Complete work stoppage
13 July	24	AWAR	Complete work stoppage
14 July	6	Mine[(a)]	Complete work stoppage
14 July	12	AWAR	Complete work stoppage
14 July	12	AWAR	Speed limit restricted to 30 km/hr
15 July	20	Mine[(a)]	Complete work stoppage
15 July	24	AWAR	Complete work stoppage
16 July	5	Mine[(a)]	Complete work stoppage
16 July	4	Mine[(a)]	Portal 1 work stoppage
16 July	15	Mine[(a)]	Complete work stoppage
16 July	5	AWAR	Complete work stoppage
16 July	4	AWAR	Speed limit restricted to 30 km/hr
16 July	15	AWAR	Complete work stoppage
17 July	6	Mine[(a)]	Complete work stoppage
17 July	1	Mine[(a)]	Work stopped at industrial pad and portal 1
17 July	2	Mine[(a)]	Light duties at industrial pad and portal 1
17 July	6	AWAR	Complete work stoppage
18 July	16	AWAR	Complete work stoppage
19 July	5	AWAR	Complete work stoppage
19 July	13	AWAR	Speed limit restricted to 30 km/hr
20 July	3	AWAR	Speed limit restricted to 30 km/hr

(a) Mine includes Site vehicle traffic, UG operations, Exploration Camp and Industrial Pad.

8.3 Accuracy of Impact Predictions

A summary of the impact predictions proposed in the TEMMP (Golder 2015) is provided in Table 2.0-1. Though not fully developed, the following thresholds are suggested as a starting point for adaptive management and TEMMP (Golder 2015) refinement and is tested against the results of the 2018 observational data (Table 8.3-1).

Table 8.3-1: Accuracy of Impact Predictions - Caribou

Monitoring Indicator	Preliminary Threshold	Exceeded in 2018?	Adaptive Management	Monitoring Method	TEMMP* Section
Hunting by Rankin Inlet Residents	After 3 years of data collection in collaboration with GN, establish a threshold level	Not assessed in 2018	Not Currently Identified	Hunter Harvest Survey, Collected throughout the year and reported annually	4.8
Sensory Disturbance	<10% caribou deflections from AWAR	Not assessed in 2018	Not Currently Identified	Ground Surveys, Satellite-collaring	4.7

Table 8.3-1: Accuracy of Impact Predictions - Caribou

Monitoring Indicator	Preliminary Threshold	Exceeded in 2018?	Adaptive Management	Monitoring Method	TEMMP* Section
Vehicle Collisions	No more than 1 ungulate/year	No	Not Currently Identified	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	4.4.2
Project Related Mortality	No more than 1 ungulate/year	No	Not Currently Identified	Wildlife Sightings Log, Site Surveillance Monitoring	4.4.2

AWAR = All-Weather Access Road; GN = Government of Nunavut Department of Environment; *TEMMP = Terrestrial Environment Management and Monitoring Plan (Golder 2015)

8.4 Recommendations

To harmonize methods with other Agnico Eagle projects in Nunavut, further discussions between Agnico Eagle and GN DoE should be initiated on establishing the best path forward for determining effects from mining development on caribou and the Zone of Influence and data collection measures to support these analyses.

Agnico Eagle will continue to focus monitoring on caribou activity near the Project and AWAR while continuing to support GN DoE led caribou monitoring and/or research where possible.

9.0 HUNTER HARVEST INFORMATION

Agnico Eagle is currently in working on an Memorandum of Understanding (M.O.U.) with the HTO (M. Theriault, Agnico Eagle, 2019, pers. comm).

10.0 BIRDS

Four types of surveys were completed in 2018 for waterfowl, waterbirds, upland birds and shorebirds including: shoreline surveys, point counts, avian use surveys, and Program for Regional and International Shorebird Monitoring (PRISM) surveys. These surveys are designed to measure mining-related effects on upland bird (i.e., songbirds and waterfowl) and shorebird species richness, diversity, and relative abundance. Specifically, the intent is to measure these parameters in response to mining development and increased traffic along the AWAR.

Shoreline surveys are designed to determine nesting distribution within 200 m of the shore, which is considered to be the approximate zone of influence from sensory disturbance in the FEIS, of mining and Project-related infrastructure (e.g., AWAR). The program will attempt to determine mated pair distribution and nesting success in ponds, wetlands, and lake shorelines within 200 m of Project infrastructure.

Point counts, avian use surveys, and PRISM surveys for upland birds and shorebirds were completed in 2018. The objectives of PRISM include estimating breeding population size; describing the distribution, abundance, and habitat relationships; and monitoring trends in breeding population size of shorebirds (Bart et al. 2005), can be expanded to include upland birds. The PRISM survey methods (CWS 2008), avian use survey and point count methods employed are used consistently across North America so data can be compiled and compared across the continent.

10.1 Shoreline Surveys

This program is designed to determine the nesting distribution of waterfowl and waterbirds on waterbodies within 200 m of mining related infrastructure including the AWAR. All waterbodies within this search area are surveyed on foot by trained biologists to locate and identify nesting waterbirds.

10.1.1 Methods

Survey methods are described in more detail in the TEMMP (Golder 2015). Due to limited survey time, the field crew deviated from described methods and worked separately on shorelines that were completely surveyed. All waterbodies within 200 m of the Project, excluding the AWAR, were surveyed on 12 to 18 June 2018 (Figure 10.1-1).

10.1.2 Results

A total of eight different species were observed (Table 10.1-1). No fledglings were observed, all observations were nesting adults, and eggs were observed in nests. Canada Goose were the most numerous species observed with 28 adults recorded. In total, 56 adult birds were recorded with 27 eggs observed among eight different species. A total of 27 nests were observed, eggs counts were confirmed in 14 nests, 6 nests contained no eggs, and eggs counts could be completed in the remaining 7 nests. Waterbodies within 200 m of the AWAR were not completed due to time constraints.

Figure 10.1-1: Breeding Bird Survey Plot Locations

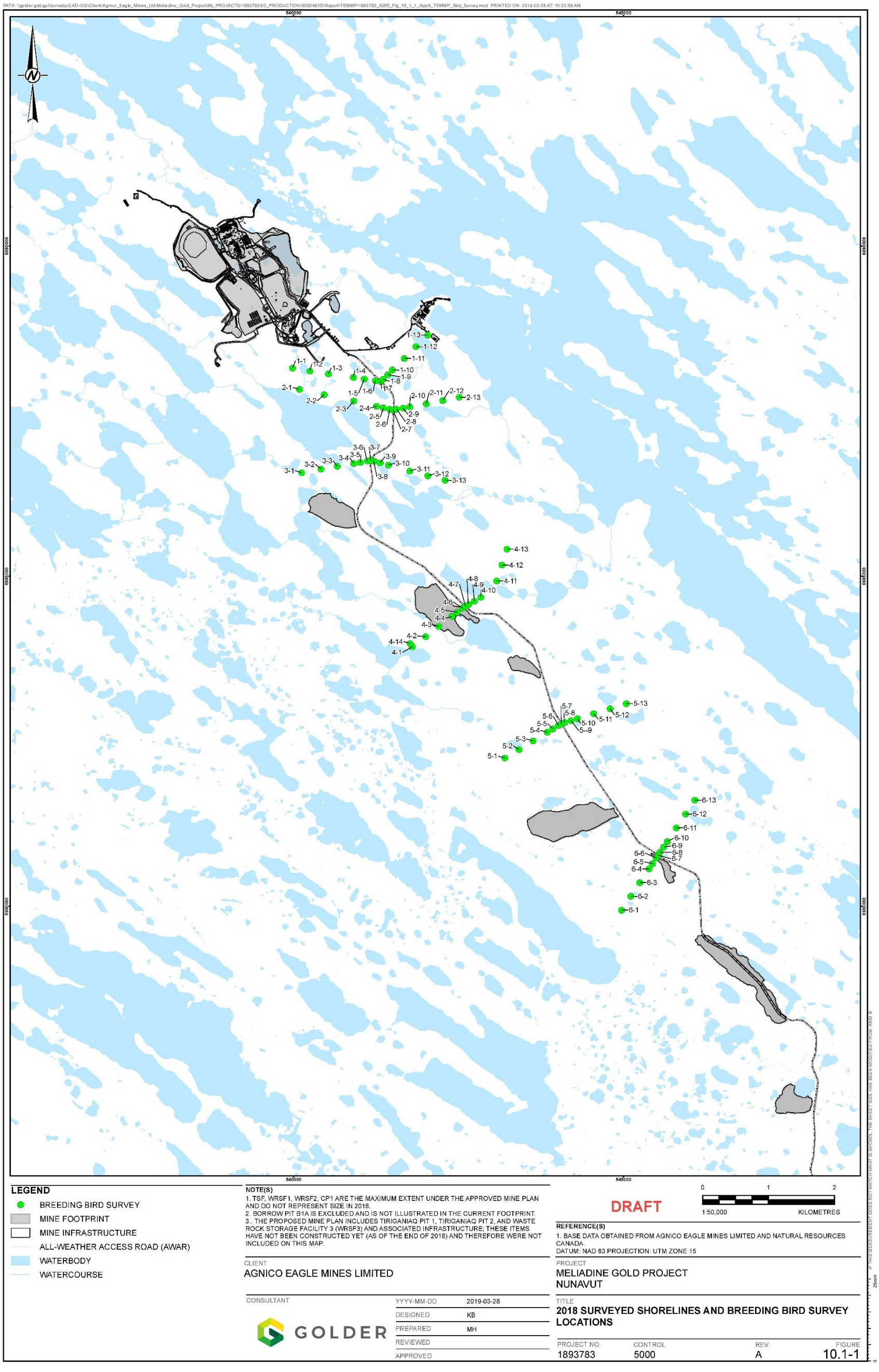


Table 10.1-1: Summary of Adult and EggsObserved during Shoreline Surveys, July 2018

Species	Adult	Eggs[(a)]	Total
Cackling Goose	2	2	4
Canada Goose	28	14	42
Horned Lark	4	1	5
Lapland Longspur	6	3	9
Least Sandpiper	4	2	6
Peregrine Falcon	2	1	3
Tundra Swan	2	1	3
Willow Ptarmigan	6	1	9
Grand Total	56	27	83

(a) Eggs were counted to observers best ability while minimizing disturbance to nests

10.2 Point Counts

In baseline studies, upland bird point count surveys were used to determine the composition and relative abundance of upland bird species and their habitat associations within the RSA (Agnico Eagle 2014). Upland bird point count surveys estimate population densities and species composition of bird communities (Robbins 1970; Kissling and Garton 2006). They provide habitat-specific density data and can be used to measure the effect of land-use practices on breeding bird populations.

10.2.1 Methods

Point count locations were determined to be within 1 km on either side of the AWAR (2 km in total) with the first point counts occurring at 50 m from the road on either side, with subsequent plots spaced 100 m from the preceding plot. Each transect consisted of 12 plots, and were completed with 6 transects in 2018 for a total of 72 point count surveys. Point counts were 5-minutes long and constrained to a radius distance of 100 m. The survey method is described in more detail in the TEMMP (Golder 2015).

10.2.2 Results

In total, just seven passerine (i.e. songbird) species were recorded on the point count surveys with a total of 177 individuals recorded (Table 10.2-1). The most abundant species was horned lark (*Eremophila alpestris*) with 68 total birds observed. The least abundant species was American robin (*Turdis migratorius*) with just 1 individual recorded. An additional 17 species were incidentally recorded during point count surveys, comprising the remaining 108 observations. The small number of observations was likely a result of late spring conditions and field staff being on site early.

Table 10.2-1: Summary table of point count survey results

Species	Total n = 72	Esker Complex n = 1	Gravel Pit n = 2	Heath/Bedrock n = 3	Heath/Boulders n = 17	Heath Tundra n = 22	Low Shrub n = 2	Sedge Wetland n = 7	Tussock/Hummock n = 18
American pipit	22	0	1	1	8	4	0	3	5
American robin	1	0	0	0	0	1	0	0	0
common redpoll	4	0	0	0	0	1	0	0	3
horned lark	68	0	1	4	23	20	3	8	9

Table 10.2-1: Summary table of point count survey results

Species	Total n = 72	Esker Complex n = 1	Gravel Pit n = 2	Heath/Bedrock n = 3	Heath/Boulders n = 17	Heath Tundra n = 22	Low Shrub n = 2	Sedge Wetland n = 7	Tussock/Hummock n = 18
Lapland longspur	53	2	0	1	10	18	1	7	14
savannah sparrow	27	2	0	2	10	4	1	0	8
white-crowned sparrow	2	0	0	0	1	0	0	0	1
Totals:	177	4	2	8	52	48	5	18	40

10.3 PRISM

Agnico Eagle contributed to the Environment and Climate Change Canada (ECCC) PRISM surveys in 2018 and will continue to do so every three years. These surveys are designed to document population numbers of Arctic breeding shorebirds and contribute to regional knowledge in an effort to set population targets and assist with management and conservation of these species (EC 2012). For each PRISM survey, plot locations are randomly chosen by ECCC. For the 2018 field program, a representative from ECCC joined Golder crews at the Project to conduct PRISM surveys in the area. This data will be submitted to ECCC for inclusion in their regional database.

10.3.1 Methods

Monitoring methods adhered to standard techniques for surveying shorebirds (CWS 2008). Ground-based rapid assessment surveys of 12 ha plots were completed from June 19 – 21, 2018. The field crew consisted of two Golder biologists, an ECCC biologist and two local assistants. Observers recorded the species encountered, estimated their breeding status, and recorded habitat conditions.

10.3.2 Results

A total of ten PRISM survey plots were surveyed with a total of eleven bird species observed. The most common bird species observed in the plots were Lapland longspur (*Calcarius lapponicus,*), and savannah sparrow (*Passerculus sandwichensis,*).

Table 10.3-1 Species Observed in 2018 PRISM Surveys

Species	Nests	Probable Nests	Pairs	Males	Females	Unknown Sex
Common redpoll						4
Dunlin		1				
Greater white-fronted goose		1				
Horned lark		2	2			1
Lapland longspur	6	1	4	13	4	
Least sandpiper				1		
Long-tailed duck			2	1		
Sandhill crane	1					2
Savannah sparrow		4	4	14	3	2
Semi-palmated plover		1				
Willow ptarmigan				2		
TOTAL	**7**	**10**	**12**	**31**	**7**	**9**

No species-at-risk were observed on survey plots. Breeding evidence of three species of shorebirds was found during the surveys, including dunlin (*Calidris alpina*), least sandpiper (*Calidris minutilla*), and semipalmated plover (*Charadrius semipalmatus*).

Due to the late spring in 2018, and the relatively early timing of the field work, no actively nesting songbirds were found during PRISM surveys; however, breeding evidence such as singing males and closely associating pairs provides evidence where birds are likely to nest. Only one nest was found overall, which was established by a pair of sandhill cranes (*Grus canadensis)*, and contained a single egg.

10.4 Accuracy of Impact Predictions

A summary of the impact predictions proposed in the TEMMP (Golder 2015) is provided in Table 2.0-1. The primary objective of the waterfowl and waterbird monitoring program is to determine the effects, if any, of sensory disturbance from mining activities, including access along the AWAR on breeding success or changes in distribution of mated pairs (Table 10.4-1).

Threshold triggers for additional mitigation or evaluation of mitigation will be determined through discussions with appropriate ECCC and GN DoE personnel. This thresholds may be difficult to initially establish due to low bird densities and high variability. However, thresholds will likely be based on habitat loss (i.e., 515 ha of aquatic habitat) with no additional habitat loss than FEIS predictions. After initial data collection (first 3 years of operations) and a range of natural variability is determined, breeding and productivity thresholds will be determined.

Table 10.4-1: Accuracy of Impact Predictions – Waterfowl, Waterbirds, Upland Birds and Shorebirds

Monitoring Indicator	Threshold	Exceeded in 2018?	Adaptive Management	Monitoring Method	TEMMP* Section
Habitat Loss and Degradation	515 ha of Aquatic Habitat	To be assessed after first 3 years of operations	Not Currently Identified	Shoreline Surveys, PRISM	4.10.2
Disturbance of Nesting Waterfowl	TBD once NRV is established through consultation with ECCC and GN	No	Not Currently Identified	Shoreline Surveys	4.10
Project-related Mortality	1 Individual Waterbird	No	Not Currently Identified	Wildlife Sightings Log, Site Surveillance Monitoring, AWAR Road Surveillance, Road Surveillance	4.10
Changes in Breeding Bird Populations	TBD once NRV is established through consultation with ECCC	No	Not Currently Identified	Point counts and transects	4.11

SLRA = Screening Level Risk Assessment; NRV = Natural Range of Variability; ECCC = Environment and Climate Change Canada; GN = Government of Nunavut Department of Environment; PRISM = Program for Regional and International Shorebird Monitoring; *TEMMP = Terrestrial Environment Management and Monitoring Plan (Golder 2015)

11.0 RECOMMENDATIONS

It is recommended that Agnico Eagle continue to monitor birds through shoreline surveys, breeding bird point counts and PRISM. The timing of the field programs occurred earlier 2018 to capture breeding activity and avoid overlap with the Qamanirjuaq herd migration through the area. Further discussions with ECCC and GN DoE is required to determine the locations and frequency of surveys.

Agnico Eagle has engaged the Arctic Raptors Research Program (http://www.arcticraptors.ca/) to develop and implement the raptor monitoring program (Franke 2012). The 2018 annual report of the Arctic Raptors Research Program is included in Appendix B.

11.1 Accuracy of Impact Predictions

Thresholds for the raptor monitoring program will be developed in conjunction with the Artic Raptor Research Program and GN DoE personnel. However, a threshold of no more than a 20% difference in occupancy and productivity between nest sites near Project infrastructure (e.g., 1 km) and nest sites far from Project infrastructure (e.g., > 1 km) is proposed. In addition, site-specific monitoring opportunities (e.g., cameras) will be discussed with the Arctic Raptor Research Program to determine potential mechanisms for differences in productivity, which can then be incorporated into adaptive management strategies.

12.0 SOIL AND VEGETATION MONITORING

The 2017 TEMMP Annual Report (Golder 2018) presented the baseline levels of metals in berry producing plants, sedges, lichen, and soil chemistry potentially affected by the Project. To evaluate the potential for adverse health effects to terrestrial life associated with changes in environmental quality due to chemical releases from the Project, the existing (or baseline) conditions of the environment must first be understood. Vegetation (i.e., berries, sedges, and lichens) and soil sampling will occur again in 2019, when Mine production is expected to start. Soil characteristics will be compared to baseline conditions to determine whether there is an accumulation of metals or change in nutrient composition. If there are indications of vegetation stress, poor vigour, or plant die-back, soil sampling will be implemented (as required), to determine whether changes in the growth media is influencing plant health and/or establishment.

Annual monitoring was not conducted in 2018. Monitoring programs will be completed at three-year intervals starting in 2019.

12.1 Invasive plant surveys

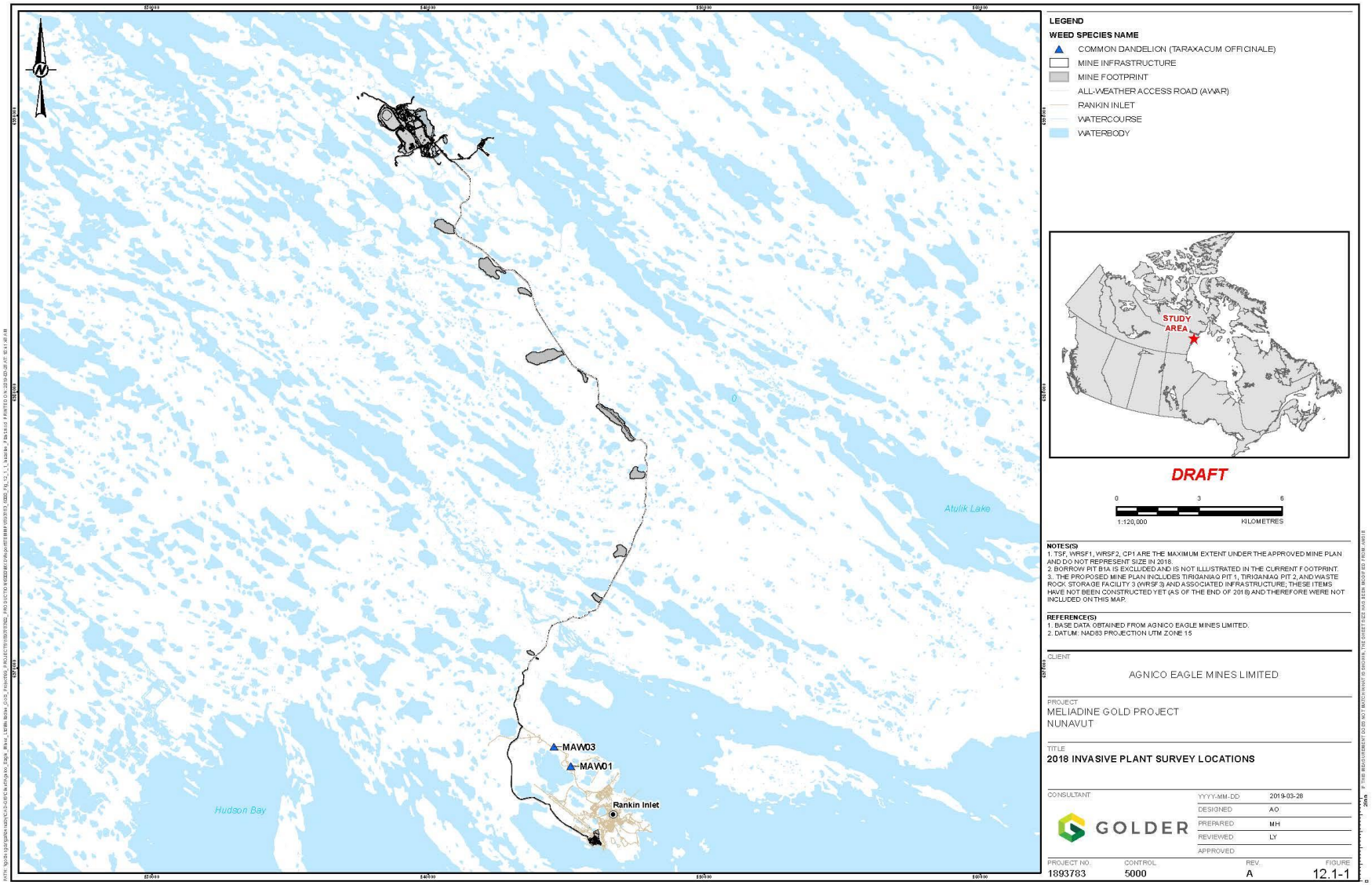
The spread of invasive weed species across the landscape is a concern for the Inuit. Construction equipment and operation activities can result in the introduction of, or spread of, invasive vegetation species. Thus, the Project certificate No 006 (Appendix A) includes Term and Conditions 36 and 37 to prevent and minimize the introduction of invasive plants during pre-construction, construction, operations, temporary closure and maintenance, closure and post closure. Pre-construction surveys were completed during the baseline studies completed during 1998, 2008 and 2009 surveys (Golder 2012).

This section includes the methods and results and mitigation measures to minimize the spread of invasive plant species as a result of Project construction. The next invasive monitoring surveys will occur in 2019, when Project Operations are expected to start. Subsequent surveys will be completed annually.

12.1.1 Methods

A desktop search for invasive plants in Nunavut was completed prior to field surveys. A list of potential non-native and invasive plants was obtained from the Canadian Endangered Species Conservation Council List (CESCC 2010). Invasive plant surveys were completed on July 24, 2018 by a Golder Terrestrial Ecologist. Surveys targeted areas with a high potential of occurrence such as along the AWAR, Project footprint, and ship loading areas. Ten different locations were assessed at each side of the AWAR (Figure 12.1-1). In addition, the Project accommodations footprint was circumnavigated, and the AEM ship loading area in Rankin Inlet will be surveyed. Where invasive plant species were observed, a GPS point and photograph was taken and the size of occurrence was recorded.

Figure 12.1-1: 2018 Invasive Plant Survey Locations



12.1.2 Results

Two occurrences of common dandelion (*Taraxacum officinale*), a listed species under the Non-Native and Invasive species in Nunavut (CESCC 2010) (Appendix A) were recorded along the AWAR.Common dandelion was not observed in the Project footprint or ship loading areas. Figure 10.1-1 shows the location along the AWAR were this invasive species occurred.

12.1.3 Mitigation

The early detection of invasive plant species is important, as preventing these species from becoming established is the most effective mitigation that can be employed. Invasive plants identified as a concern by the GN DoE will be reported to the GN, including location of the species (i.e., GPS coordinated and map), species identification and photographs of the species in question.

In addition, to the early detection of non-native invasive species the following mitigation measures have been implement by AEM during Project operation:

- where possible, utilize existing access trails and roads;
- limit the width of access roads and the size of workspaces;
- inspect and clean new equipment arriving to site from the ship loading area prior to entering the Project Area;
- complete non-native invasive plant monitoring surveys every year during operations to identify problem areas. Surveys should be targeted for areas with a high potential of occurrence such as along the AWAR, Project footprint, and ship loading areas.

12.2 Accuracy of Impact Predictions

Invasive plant species were observed in disturbed area (i.e., along AWAR and around operations camp area). However, invasive plant encroachment was not observed in vegetation communities/habitat types. A summary of the impact predictions proposed in the TEMMP (Golder 2015) is provided in Table 2.0-1. Specific thresholds for vegetation and wildlife habitat monitoring are outlined in Table 12.2-1.

Table 12.2-1: Accuracy of impact Predictions - Vegetation

Monitoring Indicators	Threshold	Exceeded in 2018?	Adaptive Management	Monitoring Method	TEMMP* Section
Habitat Degradation by Contamination	No invasive plant species established	Yes	See Section 12.1.3	Invasive Plant Survey of AWAR and Project site	4.6
Habitat Reclamation following Project Closure	NA	No	Not Currently Identified	Ground Surveys, Vegetation Plots, Mapping	4.6

*TEMMP = Terrestrial Environment Management and Monitoring Plan (Golder 2015)

12.3 Recommendations

For the occurrences found during 2018 surveys, both individuals were hand pulled, and the plant material collected in bags to be disposed of at an offsite location. The CESCC (2010) (Appendix D) has developed posters that show Non-Native species and invasive species in Nunavut. These can easily be displayed at the Project site and incorporated into on-boarding materials. Chemical herbicide treatments are not recommended to be used at this point as the presence and extent of this invasive species is limited.

13.0 ENVIRONMENTAL VARIABLES

A summary of climate conditions collected on site in 2018 are presented in Table 12.3-1

Table 12.3-1: Climate Conditions Recorded in the Project Area

ENVIRONMENTAL VARIABLE	YEAR[(a)]
	2018
TEMPERATURE (°C)	
Mean Annual Temperature	-11.3
Max Annual Temperature	27.5
Min Annual Temperature	-46.8
PRECIPITATION	
Total Annual Rainfall (mm)	139.7
Total Annual Snowfall (mm)	111.8

(a) All values reported were collected via on site meteorological station, with the exception of snowfall which was collected by AE staff

The max annual temperature of 27.5°C was recorded on July 11, 2018 and the minimum annual temperature -46.8°C was recorded on February 19, 2018. Snowmelt began June 9, 2018 when the average daily air temperature exceeded 0°C. Environmental variables will continue to be monitored on an on-going basis.

Signature Page

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APPENDIX A

Project Certificate (No. 006)

In the matter of the
Agreement Between the Inuit of the Nunavut Settlement Area
and Her Majesty the Queen in right of Canada, S.C., 1993, c. 29
Article 12, Part 5

And

In the matter of an application by
Agnico Eagle Mines Limited
for development of the
Meliadine Gold Mine Project Proposal
in the
Kivalliq Region of Nunavut

NIRB PROJECT CERTIFICATE [NO.: 006]

February 26, 2019

Schedule of Amendments to the Nunavut Impact Review Board's Meliadine Gold Mine Project Certificate No. 006

AMENDMENT No.	DATE OF AMENDMENT	TYPE OF AMENDMENT
001	February 26, 2018	Amendments and additions to Terms and Conditions of Project Certificate to reflect significant modifications to the Meliadine Gold Mine Project as proposed in the Saline Effluent Discharge to the Marine Environment proposal and amendments to reflect implementation of project monitoring and reporting requirements: • Updates to the Project Certificate to reflect changes to legislation and references to regulatory agencies; • Update to Term and Condition 25 to specify the required management plans • New Terms and Conditions 128-131 related to development of the pipeline and on-shore infrastructure, and HTO involvement in developing a specific management plan

1.0 BACKGROUND

Whereas:

A. Pursuant to the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*), the Nunavut Impact Review Board (Board or NIRB) has completed a review of the potential ecosystemic and socio-economic effects of the Meliadine Gold Mine Project, NIRB No File. 11MN034 (the Project);

B. The Board has considered the list of commitments made by Agnico Eagle Mines Limited (Agnico Eagle or the Proponent) throughout the NIRB's review and during the NIRB Final Hearing for the Project and the Board has every expectation that the Proponent will fulfill the commitments made during the Final Hearing, within its Final Environmental Impact Statement and contained within supporting documentation submitted during the review of the Project, not just the commitments that are expressly included as terms and conditions in this Project Certificate;

C. The Board has determined, pursuant to Section 12.5.5 of Article 12 of the *Nunavut Agreement*, that, taking into account the implementation of the measures necessary to prevent or mitigate the potential adverse environmental and socio-economic effects associated with the Project and set out as terms and conditions in this Project Certificate, the Meliadine Gold Mine Project is not likely to cause significant adverse ecosystemic and socio-economic effects;

D. The Board has found, pursuant to Section 12.5.5 of Article 12 of the *Nunavut Agreement* and taking into account all matters relevant to its mandate including Section 12.2.5, that the Meliadine Gold Project will enhance and protect the existing and future well being of the residents and communities of the Nunavut Settlement Area;

E. The Minister of Aboriginal Affairs and Northern Development Canada has accepted the NIRB Final Hearing Report for the Meliadine Gold Mine Project (January 2015), and the recommended terms and conditions contained in the Report that are now included in the Project Certificate; and

F. Recognizing the importance of co-ordination, integration and avoiding duplication with other monitoring requirements in permits, licences and other authorizations, the project-specific monitoring program, provided as Appendix A to this Project Certificate, will be issued in final form after key regulatory authorizations, including land use permits, water licences and mineral leases, are issued.

Therefore, the Nunavut Impact Review Board pursuant to Section 12.5.12 of Article 12 of the *Nunavut Agreement*, and as applicable to the Saline Effluent Disposal Proposal, also pursuant to Section 12.8.2 of Article 12 of the *Nunavut Agreement*, s. 112 of the *Nunavut Project and Planning Assessment Act,* S.C. 2013, c 14, s.2 *(NuPPAA)*, issues this amended Project Certificate for the Meliadine Gold Mine Project to Agnico Eagle Mines Limited, subject to the terms and conditions contained herein.

2.0 PROJECT DESCRIPTION

The Meliadine Gold Mine Project (the Project) consists of mining at five gold deposits and processing of the ore at an on-site milling operation at a rate of 8,500 tonnes per day, as well as transportation of the gold bullion south for final refinement and sale. The Project includes the extended exploration, construction, operation, closure, and reclamation of both underground and open-pit mines and associated infrastructure for extraction, processing and transportation of gold. The mining of gold ore would occur at the five deposits through a phased approach, Tiriganiaq, Wesmeg, Pump, F Zone and Discovery, with Tiriganiaq being the only deposit where gold would be mined through both above ground and underground methods, with the other deposits being mined using open pit methods. There are three main Project areas: the Tiriganiaq mine site, the Discovery deposit and the Itivia Harbour. Phase 2 of all-weather access road (AWAR) would be an upgrade of the currently existing and previously approved Phase 1 of the AWAR which is approximately 24 kilometres (km) long and connects the Tiriganiaq exploration site to Rankin Inlet currently. As part of construction of Phase 2 of the AWAR, a spur road would be developed to connect the main road with the south end of Meliadine Lake to allow for public access to the Lake. Agnico Eagle has confirmed that Phase 2 of the AWAR would not be completed until it is ready to develop the Discovery deposit and would entail constructing a second road which would run parallel but separately from the public road, for mine traffic only.

Supplies and equipment required for construction and ongoing Project supply would be received during the open water season only, at the Itivia spud barge at Melvin Bay, near Rankin Inlet. The Itivia area would consist of eight one-million litre tanks for fuel and a laydown area to temporarily store materials received during the open water barging season. This area would be connected to the AWAR by a bypass road which would facilitate mine traffic avoiding the community of Rankin Inlet on route to the Project mine site.

In 2018 Agnico Eagle submitted the Saline Effluent Discharge proposal to the NIRB as required by the original Meliadine Final Hearing Report which directed that, should the preferred method of groundwater disposal change, further assessment would be required. Under the Saline Effluent Discharge proposal, Agnico Eagle sought to discharge saline effluent (salty or saline groundwater) from the Tiriganiaq Underground Mine into the marine environment at Melvin Bay near Rankin Inlet. Specifically, Agnico Eagle proposed to collect and truck the saline groundwater via the all-weather road from the mine site to a holding tank on the shore. The holding tank would be connected to an underwater pipeline and diffuser installed into Melvin Bay which would release the saline water into the ocean. Further, the Nunavut Water Board Type “A” Water Licence for the Project allows Agnico Eagle to manage the salty groundwater flowing into the underground workings by treating the water prior to discharge into collection ponds and Meliadine Lake. Even after the Saline Effluent Discharge proposal is approved to proceed, Agnico Eagle is expected to continue using the previously licensed water management practices but will add the option to discharge a portion of the salty groundwater into the ocean during the open water season, when all the required regulatory authorizations for this activity are in place.

3.0 IMPLEMENTATION

NIRB has the authority to reconsider the terms and conditions of the Project Certificate to ensure that the terms and conditions are achieving their purpose. Clearly the NIRB expects the Proponent to meet its obligations under this Certificate, however, the NIRB may revisit the Certificate if the NIRB determines that the terms and conditions are not achieving their purpose.

If the Kivalliq Inuit Association or other Designated Inuit Organization, or person or body that would normally have standing to seek this type of court determination, has concerns that any term or condition is not being implemented, these parties may seek a determination before the appropriate court regarding whether or not the terms and conditions in the project certificate have been implemented. This Project Certificate is implemented by authorizing agencies in accordance with the reviewability section of the *Nunavut Agreement* (Section 12.9.7):

> "A licence, permit, certificate or other governmental approval which implements or incorporates any term or condition of a NIRB project certificate may not be called into question in a court of law on the grounds that the issuing agency thereby fettered its discretion or otherwise acted without jurisdiction, when implementing any term or condition of a NIRB project certificate."

3.1 Overview of NIRB Monitoring Program

As set out in Sections 12.7.1 and 12.7.2 of Article 12 of the *Nunavut Agreement* and s. 135 of the *NuPPAA,* the NIRB has the jurisdiction to establish a project-specific monitoring program to: measure the ecosystemic and socioeconomic effects of a project; assess whether the project is in compliance with the prescribed project terms and conditions; share information with regulatory agencies to support the enforcement of land, water or resource use approvals and agreements; and to assess the accuracy of predictions contained in the environmental impact statements. Given the Board's application of the precautionary approach to several aspects of the assessment for this Project, in the Board's view project-specific monitoring will play a crucial role in addressing the uncertainty regarding project effects and enabling all parties to adapt mitigation measures on an ongoing basis to ensure the Project's negative effects are prevented or limited to the extent possible.

The role of the Board with respect to the establishment of monitoring programs is to focus the terms and conditions in relation to the Project. With respect to existing or future general regional and territorial monitoring programs that may include some of the same monitoring parameters/indicators as the project-specific monitoring program, the *Nunavut Agreement* and *NuPPAA* also directs the NIRB to avoid duplication but facilitate co-ordination and integration between the project-specific monitoring programs required by the NIRB and more general programs and initiatives such as the Nunavut General Monitoring Plan.[1] Where the requirements of regional or territorial programs are more extensive or substantively different than those established through the Project Certificate, at all times the Proponent must ensure compliance with the Project Certificate terms and conditions.

[1] See the discussion in Section 5.10.3 of the report and Sections 12.7.4 and 12.7.5 of the *Nunavut Agreement*.

In order to co-ordinate, integrate and avoid duplication with other monitoring programs, but also to ensure that the NIRB's project-specific monitoring program yields the information required to measure effects and adequately assess compliance with terms, conditions, regulatory instruments and agreements, the NIRB's monitoring program will continue to be developed through consultation with responsible authorities, the resource and land owners and the proponent as the remaining regulatory instruments for the Project are developed. Following the issuance of the Project Certificate by the NIRB, the framework for a project-specific monitoring program will be developed and will be provided in draft form as Appendix A to the Project Certificate. As noted in the Preamble, this framework cannot be issued in final form until key regulatory authorizations, including land use permits, water licences, mineral leases, etc. are issued so that the monitoring program supplements and supports but does not duplicate the monitoring requirements in regulatory and land use instruments. Prior to finalization, the Proponent will be required to comply with all aspects of the draft framework as directed by the NIRB.

3.2 General Principles of Interpretation Applicable to Terms and Conditions:

In order to view the project-specific terms and conditions set out within this Project Certificate in the appropriate context, the following general principles of interpretation apply to the Project Certificate in its entirety, with all terms and conditions being interpreted in accordance with:

a. The NIRB's Final Hearing Report (namely NIRB File No.: 11MN034, Final Hearing Report for the Meliadine Gold Project Proposal, October 10, 2014 available from the NIRB's registry) and Reconsideration Report and Recommendations for the Saline Effluent Discharge Proposal;

b. The rights, responsibilities, authorities and jurisdiction granted under the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*);

c. The limits and obligations imposed under laws of general application applicable to the Proponent or any party referred to in the term and condition, as those laws may be amended over time (e.g., privacy legislation, worker's health and safety, etc.);

d. The specific jurisdictional and policy limits applicable to authorizing agencies, Nunavut Tunngavik Incorporated, the Kivalliq Inuit Association, or other regulatory authority with jurisdiction in respect of the Project;

e. Where terms and conditions include specific references to items that must be taken into consideration or included in work plans, etc. these specific references are intended to establish minimum expectations but are not intended to limit the Proponent or prevent the Proponent from undertaking additional measures beyond those expressly prescribed in such terms and conditions; and

f. As noted in the Final Hearing Report, for those items where a more stringent version of the precautionary principle has been applied, it is the Board's expectation that the adaptive management strategies chosen will be highly responsive to early warning signs that risks may materialize, and that rather than waiting for impacts to be noted before mitigation measures are triggered, thresholds and triggers will be set to require responses long before adverse impacts are likely.

3.3 Format of Terms and Conditions:

Wherever possible, the NIRB has used the following format for the project-specific terms and conditions set out within this Project Certificate, so as to provide clear direction on the intended application, objectives and reporting requirements:

Category: Identifies the relevant environmental component or project activity to which the term and condition applies. Wherever possible categories have been labelled so as to directly associate back to the Final Environmental Impact Statement and Environmental Impact Statement Guidelines prepared for the Project.

Responsible Parties: Identifies the parties responsible for implementation of the term and condition. While this is generally the Proponent, at times other agencies have been implicated as appropriate.

Project Phase: Identifies the phase(s) of Project development to which the term and condition is applicable. Project phase may include any one or more of the following:

- Pre-Construction - includes site preparation and staging of materials and equipment in advance of construction
- Construction
- Operations
- Temporary Closure /Care and Maintenance
- Closure and Post-Closure Monitoring - includes abandonment, decommissioning and reclamation

Objective: Provides a short description of the impact or effect being mitigated. Where relevant, expectiations regarding the timing for when terms and conditions will be deemed to be satisifed (i.e., sunset clause), who has discretion for determining it is satisfied has been provided.

Term or Condition: Provides specific direction on the required action or follow up. In most instances the NIRB has endeavoured to use generalized wording to allow for maximum flexibility in achieving the stated objective, however more explicit direction has been provided where deemed necessary.

REVISED Term or Condition: Where, upon reconsideration, the Board has recommended an amendment to the Terms or Conditions in the Project Certificate and the Minister has accepted the Board's recommendation, the Board has included the Original Term and Condition, followed by the REVISED Term or Condition, with deletions to the Term or Condition identified by strike through text and additions to the text identified in bold and underlining. Upon issuance of an amendment to the Project Certificate, the Proponent is required to comply with the text of the REVISED Term or Condition.

NEW Term or Condition: Where, upon reconsideration, the Board has recommended that the Project Certificate be amended by adding a new Term and Condition and the Minister has accepted the Board's recommendation, the Board has added the Term or Condition to the relevant section, has identified the Term or Condition as NEW and has added an alphabetical listing to the existing numbered Term or Condition immediately preceding the NEW Term or Condition. Upon issuance of an amendment to the Project Certificate, the Proponent is also required to comply with any NEW Terms or Conditions added to the Project Certificate.

Reporting Requirements: Sets out any specific reporting parameters required to measure achievement of objectives or to demonstrate compliance, as well as the required frequency of reporting. Consideration will be given to coordination of Project Certificate reporting requirements with reporting requirements as established by other regulatory instruments associated with the Project.

It should be noted that, for some of the recommended terms and conditions, a non-binding **Commentary** section has also been added following the specific term and condition as an aid to interpretation. The Commentary section reflects clarification of the term and condition, recording the common understanding and interpretation resulting from discussions and guidance provided at the Project Certificate Workshop held by teleconference on February 23-24, 2015. The Commentary section is offered as a reference only and is not legally binding; in the event of a conflict between the wording in the Project Certificate and the clarification provided in the Commentary, the express wording of the Project Certificate prevails.

3.4 Flexibility

It is acknowledged that the NIRB's monitoring program will have varying requirements over the course of the Project lifecycle, and that monitoring requirements will apply from construction to eventual abandonment and reclamation. In areas where there may be a need for flexibility in relation to the terms and conditions of the Project Certificate or their application, the NIRB has endeavoured to reflect this in the associated language and/or acknowledge that objectives may be achieved through various means.

The NIRB retains the ability to give additional clarification or direction on an ongoing basis through its Monitoring Officer, with respect to compliance requirements for the Project. Upon request by the Proponent or other parties, the NIRB can provide additional clarification or direction regarding implementation of Project Certificate terms and conditions.

Where the objective of a Project Certificate term or condition can be achieved through more efficient alternate means, the Proponent is encouraged to consult with the NIRB (and other parties as required) to seek acceptance of proposed alternatives.

The NIRB has the authority to reconsider the terms and conditions of the Project Certificate to ensure that the terms and conditions are achieving their purpose. Clearly the NIRB expects the Proponent to meet its obligations under this Project Certificate, however, the NIRB may revisit the Project Certificate if the NIRB determines that the terms and conditions are not achieving their purpose. In the event that the monitoring program needs to be modified to better achieve its purpose, the Board, the Proponent, the Designated Inuit Organization or other interested parties may cause the Board, under Section 12.8.2 of the *Nunavut Agreement* to revisit the monitoring program, or any other terms and conditions in the Project Certificate.

3.5 Enforcement

As noted in Section 12.10.3, where the terms and conditions of the Project Certificate are implemented or incorporated by reference into permits, certificates, licences or other governmental approvals, the enforcement of the terms and conditions included in that authorization remains with the agency responsible for the authorization (i.e., Authorizing Agency). Under ss. 74(g) and 219 of the *NuPPAA*, the

Proponent is required to carry out the Project in accordance with the terms and conditions in this Project Certificate; failing to meet the requirements of the terms and conditions in this Project Certificate is an offence. In addition, under Part 8, Article 12 of the *Nunavut Agreement*, if the Board determines that these terms and conditions are not achieving their purpose for any reason, including instances of significant non-compliance, the NIRB may revisit the terms and conditions contained in the Project Certificate.

3.6 Proponent Commitments

The Board expects that Agnico Eagle Mines Ltd. will fulfill all commitments made during: both the original Final Hearing and the Hearing conducted in association with the Board's reconsideration of the Project Certificate associated with the assessment of the Saline Effluent Discharge into the Marine Environment proposal; within its Final Environmental Impact Statement (FEIS) and supporting documentation submitted during the Review; and commitments provided within the FEIS Addendum and associated documents as well, regardless of whether the commitments have been incorporated into the Terms and Conditions of this Project Certificate. The Board further notes that, as indicated in Agnico Eagle's Response to Final Written Submissions, filed in advance of the original Final Hearing and as noted by several intervenors during the Final Hearing, the Proponent had come to "agreement in principle" regarding many requests filed by agencies in final written submissions provided to the Board, and it is the NIRB's expectation that the Proponent will be in a position to demonstrate actions taken in finalizing these commitments in practice.

To support transparency and accountability associated with the Proponent's commitments, the Board encourages the Proponent to provide, in an annual report to the NIRB, a summary of the status of the Proponent's progress with respect to meeting any commitments which are intended to prevent or mitigate adverse ecosystemic or socio-economic effects of the Project and that are beyond the scope of ensuring compliance with Project Certificate terms and conditions.

4.0 PROJECT-SPECIFIC TERMS AND CONDITIONS

4.1 General

NIRB Monitoring Responsibilities

1. The NIRB will appoint Monitoring Officers as required to monitor the Project in accordance with the purpose of a monitoring program as set out in section 12.7.2 of the *Nunavut Agreement* for the full life of the Project, including closure and restoration. Subject to direction from the NIRB, the responsibilities of the NIRB Monitoring Officers will include:
    a. Providing direction to the Proponent, the Terrestrial and Marine Environment Working Groups, regulatory agencies, and the Kivalliq Socio-Economic Monitoring Committee to supply NIRB with reports and information respecting the Project's operations, impacts and the implementation of mitigative measures;
    b. Conducting a periodic evaluation of the monitoring program for the Project;
    c. Compiling a report on the adequacy of the monitoring program and on the ecosystemic and socio-economic impacts of the Project; and
    d. Where appropriate, recommending to the NIRB reconsideration of Project Certificate Terms and Conditions in accordance with section 12.8.2 of the *Nunavut Agreement*.
2. The NIRB will report annually (in English and Inuktitut) on the results of its Monitoring Program for the Project.
3. The NIRB will schedule periodic updates regarding its Monitoring Program for the communities most affected by the Project.
4. The NIRB Monitoring Officers will schedule periodic site inspections at the Project, coordinating with other regulatory agencies to the extent possible.

General Regulatory Requirements

5. The Proponent must obtain all required federal and territorial permits and other approvals, and shall comply with the requirements of such regulatory instruments.
6. The Proponent shall take prompt and appropriate action to remedy any occasion of non-compliance with environmental laws and regulations and/or regulatory instruments, and shall report any non-compliance as required by law immediately. A description of all instances of non-compliance and associated follow up is to be reported annually to the NIRB.
7. The Proponent shall meet with respective licensing authorities prior to the commencement of construction to discuss the posting of adequate performance bonding. Licensing authorities are encouraged to take every measure to require that sufficient security is posted before construction begins.

Monitoring Records

8. All monitoring information collected pursuant to the Project Certificate and various regulatory requirements for the Project shall contain the following information:

a. The name of the person(s) who performed the sampling or took the measurements including any relevant accreditations;

b. The date, time and place of sampling or measurement, and weather conditions;

c. The date of analysis;

d. The name of the person(s) who performed the analysis including any relevant accreditations;

e. A description of the analytical methods or techniques used; and

f. A discussion of the results of any analysis.

9. The Proponent shall make its monitoring results available, to the fullest extent possible, in English and Inuktitut.

10. The Proponent shall keep and maintain the records, including results, of all Project-related monitoring data and analysis for the life of the Project, including closure and post-closure monitoring.

11. The Proponent shall maintain the Final Environmental Impact Statement and the Environmental Effects Monitoring program developed for the Project, with predictions updated as new baseline data is collected. If the results of monitoring programs necessitate updates to effects predictions, the Proponent shall update the associated management programs and plans as required to address or reflect the updated assessment of effects.

12. The Proponent shall establish a Project-specific web portal or web page as a means of making all non-confidential monitoring and reporting information associated with the Project available to the general public. This does not limit what the Proponent may be required to submit to the NIRB or other regulatory authorities to meet reporting requirements.

On-going Engagement in Project Monitoring, Modelling, Management and Reporting

13. The Proponent is encouraged to provide on-going opportunities for consultation and comment on any substantive revisions to the Project-specific monitoring program, modelling, studies, management plans, management measures and reporting under the Project Certificate.

14. To the extent feasible, the NIRB will provide an opportunity for comment on any substantive revisions to the Project-specific monitoring, modelling, studies, management plans, management measures and reporting provided by the Proponent under the Project Certificate.

4.2 Terms and Conditions

Ecosystemic

Air Quality

Term and Condition No.	**1**
Category:	Air Quality – Updated Air Quality Monitoring Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To define plans for the monitoring of data and mechanisms for response with regard to potential air quality impacts arising from the Project
Term or Condition:	Prior to commencing construction activities, the Proponent shall update its Air Quality Monitoring Plan, and shall consider installing two real-time air monitoring stations in advance of mining operations. The updated plan shall include, but is not limited to, details regarding the following: a. Description of real-time air monitoring stations including proposed timing of installation, location, and any factors considered with regards to planning for the installation; b. Plans for the collection of total suspended dust samples year round, including sampling for metals content relevant to the Project; c. Description of snowpack surveys and dustfall collectors; d. Description of lichen surveys; e. Identification of near field, far field and reference sites that are located with consideration of ambient wind conditions; f. Baseline data collected prior to significant construction activity; and g. A description of the proposed annual reporting mechanism and response framework.
Reporting Requirements:	The updated plan should be submitted to the NIRB at least 90 days prior to the start of construction, with results submitted annually thereafter or as may otherwise be required.

Term and Condition No.	**2**
Category:	Air Quality – Emissions monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To provide feedback on Project-related specified emissions
Term or Condition:	The Proponent shall demonstrate through monitoring of air quality at the aboveground emissions points at the mine site and at the Tiriganiaq site that sulphur dioxide (SO_2) and nitrous dioxide (NO_2) emissions remain within predicted levels and, where applicable, within limits established by all applicable guidelines and regulations. In cases where exceedances

	occur, the Proponent shall provide an explanation for the exceedance, a description of planned mitigation, and shall conduct additional monitoring to evaluate the effectiveness of mitigative measures.
Reporting Requirements:	The Proponent shall report on the development and implementation of this Plan and associated monitoring results annually to the NIRB. The report must clearly identify the parameters being evaluated if the results are being compared to predicted levels set out in the Environmental Impact Statement or limits established by applicable guidelines and regulations.

Term and Condition No.	**3**
Category:	Air Quality – Dust management and monitoring plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction
Objective:	To define plans for the monitoring of air quality data, specifically dust deposition arising from the all-weather access road
Term or Condition:	Prior to commencing construction activities the Proponent shall update its dust management and monitoring plan to address and/or include the following additional items: a. Align plan requirements with commitments made in the FEIS and during the Final Hearing to monitor dust along the all-weather access road and associated roads and trails. b. Verify commitments to the utilization of dust suppressants along the all-weather access road including and associated roads and trails, including a description of the type of suppressant to be utilized, the frequency and timing of applications to be made throughout the various seasons of road use. c. Outline the specific adaptive management measures to be considered should monitoring indicate that dust deposition is higher than predicted, specifically where traffic along the all-weather access road is greater than initially predicted.
Reporting Requirements:	The updated plan should be submitted to the NIRB for review and comment at least 60 days prior to commencement of construction activities.

Term and Condition No.	**4**
Category:	Air Quality – Incineration management plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To ensure incineration activities are designed in a manner that mitigates impacts to air quality
Term or Condition:	The Proponent shall develop and implement an Incineration Management Plan that takes into consideration the recommendations provided in Environment Canada's *Technical Document for Batch Waste Incineration* (2010).[2]

[2] Environment Canada, 2010. Technical Document for Batch Waste Incineration.

Reporting Requirements:	The plan should be submitted to the NIRB at least 60 days prior to the commencement of construction activities.

Commentary: *With the recognition that there may be a considerable gap between the commencement of general project related construction and the construction of the incinerator to be used by the Project, the timeline set out under the Reporting Requirements above is intended to require the submission of the Incineration Management Plan at least 60 days prior to the commencement of "construction activities" related to the construction of the incinerator, not general project construction activities.*

Term and Condition No.	**5**
Category:	Air Quality – Stack testing
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To mitigate impacts to air quality from incineration activities
Term or Condition:	The Proponent shall provide all stack testing conducted on temporary or permanent incinerators operated for the Project to the NIRB in the annual report for that year.
Reporting Requirements:	Stack test results are to be reported to the NIRB and to Environment Canada annually, or as may otherwise be required.

Term and Condition No.	**6**
Category:	Air quality – Landfill dust suppression
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure
Objective:	To address potential air quality concerns arising from dust generated at the landfill
Term or Condition:	The Proponent shall employ appropriate dust suppression measures when conducting activities in the landfill such as topping or capping.
Reporting Requirements:	Implementation of these measures shall be reported and discussed in the Proponent's annual report to the NIRB.

Climate and Meteorology (including Climate Change)

Term and Condition No.	**7**
Category:	Climate and Meteorology, Climate Change – Greenhouse gas emissions
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To provide feedback on Project-related emissions
Term or Condition:	The Proponent shall provide within its annual report to the NIRB, calculations of greenhouse gas emissions generated by activities at the Itivia port and other Project sources including mine-related road traffic and aircraft associated with the Project. Calculations shall take into

	consideration, fuel consumption as measured by the Proponent's purchase and use as well as the fuel use of its contractors and sub-contractors.
Reporting Requirements:	Implementation of these measures shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**8**
Category:	Climate and Meteorology, Climate Change – Inuit participation
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To promote public awareness and engagement of affected groups
Term or Condition:	To actively engage Inuit in initiatives related to climate change, where it is feasible, the Proponent shall endeavour to include the participation of Inuit from affected communities when undertaking climate-change related studies and research.
Reporting Requirements:	A summary of consultation and how the information was used to inform planning for the Project shall be provided in the Proponent's annual report to the NIRB.

Term and Condition No.	**9**
Category:	Climate and Meteorology, Climate Change – Greenhouse Gas Emissions Reduction Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction
Objective:	To develop a pro-active approach to limiting greenhouse gas emissions throughout the Project life
Term or Condition:	Prior to the commencement of operations, the Proponent shall develop a Greenhouse Gas Emissions (GHG) Reduction Plan which includes, but is not limited to: a. An estimate of the Project's GHG baseline emissions; b. A description of monitoring measures to be undertaken, including the methods, frequency, parameters, and a description of data analysis; and, c. A description of mitigative and adaptive strategies planned, and taken, toward reducing the Project-related emission of greenhouse gases over the Project's life.
Reporting Requirements:	The plan should be submitted to the NIRB at least 90 days prior to the commencement of operations, and unless otherwise determined within the Plan, the reporting of results requried by this Plan shall be provided in the Proponent's annual report to the NIRB.

Noise and Vibration

Term and Condition No.	**10**
Category:	Noise and Vibration – Noise and Vibration Abatement Plan

Responsible Parties:	The Proponent, Government of Nunavut, Environment Canada and Health Canada
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To minimize the impact of noise and vibration
Term or Condition:	The Proponent shall further develop and implement its noise abatement plan to protect people and wildlife from mine activity noise, including, blasting, drilling, equipment, vehicles and aircraft. The noise abatement plan will be developed in consultation the Government of Nunavut, Environment Canada and Health Canada as appropriate, and at a minimum is to include: a. Restrictions on blasting and drilling when migrating caribou, birds or local carnivores may be affected; b. The establishment of strict standards for noise levels; use of equipment and vehicles with the best noise attenuation devices; c. When practical, the use of fences or berms around noisy machinery or sites; d. Flight corridor restrictions over sensitive areas with known concentrations of wildlife and birds whenever possible; e. Requiring with the exception of take off and approach for landing, a minimum flight altitude of 300 metres above ground level when flights to and from the mine site are passing near sensitive wildlife and bird areas; and, f. The incorporation of the use of sound metres to monitor sound levels at locations in and around the mine site and local study area. The location and design of the sound metres shall be selected in consultation with EC and set up immediately upon issuance of the Project Certificate for the purpose of obtaining baseline data, and shall be maintained for data collection during and after operations.
Reporting Requirements:	The finalized noise abatement plan should be submitted to the NIRB at least 90 days prior to the commencement of construction, and any subsequent monitoring results required within the Plan shall be provided in the Proponent's annual report to the NIRB.

Term and Condition No.	**11**
Category:	Noise and Vibration – Monitoring at accommodations sites
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure monitoring
Objective:	To minimize the impacts of vibration on employees
Term or Condition:	The Proponent shall conduct noise and vibration monitoring at Project accommodations sites located at the Tiraginiaq mine site. Sampling shall

	be undertaken during the summer and winter months during all phases of Project development, with reporting of results and implementation of associated mitigation measures as necessary reported to the NIRB.
Reporting Requirements:	Monitoring results and implementation of these measures shall be reported and discussed in the Proponent's annual report to the NIRB.

Terrestrial Environment

Term and Condition No.	**12**
Category:	Terrestrial Environment – Permafrost and permafrost terrain mapping
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction
Objective:	To further understanding of baseline conditions and to inform design of Project facilities and mitigate impacts to permafrost
Term or Condition:	The Proponent shall conduct further permafrost mapping to document permafrost temperature, thickness of seasonal thaw and amount of ground ice in the Project development area, with such information to be available to inform the detailed design of Project infrastructure (i.e., dikes and tailings storage facility designs and talik predictions for lakes that are to be dewatered or used for saline water storage).
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition as well as the results of mapping to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**13**
Category:	Terrestrial Environment – Terrain and soils, geotechnical investigations
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure
Objective:	To assist with design of Project facilities and mitigate impacts to sensitive landforms
Term or Condition:	The Proponent shall undertake additional geotechnical investigations as required to identify sensitive landforms, modify engineering design for Project infrastructure (i.e., dikes, tailings storage facility, waste rock pile and landfill), and develop and implement preventative and/or mitigation and monitoring measures to minimize the impacts of the Project's activities and infrastructure on sensitive landforms. Plans for the investigations, mitigative and monitoring measures are to be included within an updated Environmental Protection Plan.
Reporting Requirements:	The updated plan is to be submitted to the NIRB within 90 days of the issuance of a Project Certificate. Implementation of these measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	14
Category:	Terrestrial Environment – Dike and tailings storage facility design
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction
Objective:	To ensure Project design features consider thermal analysis and stability
Term or Condition:	The Proponent is encouraged to conduct more detailed thermal analysis to support detailed design of the dikes and the tailings storage facility, including seepage and stability analysis, and shall incorporate the results of the analysis into Project design. Details of the thermal analyses undertaken are to be provided to the NIRB.
Reporting Requirements:	Details are to be provided to the NIRB at least 60 days prior to the commencement of construction, and the results of any required additional reporting shall be submitted to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	15
Category:	Terrestrial Environment – Tailings storage facility design and management
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure Project infrastructure integrity is considered and maintained post-closure
Term or Condition:	The Proponent shall assess the potential environmental effects of a post-closure failure of the geomembrane of the Tailings Storage Facility while tailings are in a thawed state. This assessment shall include, at a minimum: a. A description of the potential environmental effects of such a failure; b. Identification of the monitoring measures employed to detect environmental changes that could result; c. Identification of proposed mitigation measures to address any changes identified during monitoring; and d. Updated Risk Management Plan and Closure and Reclamation Plan reflecting changes which result from the post-closure failure assessment. A summary of the results from this assessment and implications to project infrastructure and operational plans shall be provided to the NIRB.
Reporting Requirements:	A summary of the assessment and updated plans should be submitted to the NIRB 6 months following issuance of the Project Certificate and the results of any required additional reporting shall be submitted to the NIRB through the Proponent's annual monitoring report.

Commentary: *The NIRB recognizes that as the initial submission of updated plans will be within 6 months of the issuance of the Project Certificate, it is expected that the level of detail of the Proponent's initial submission will be largely conceptual and will be supplemented and updated over time.*

Term and Condition No.	**16**
Category:	Terrestrial Environment – Erosion Management Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure appropriate measures for preventing destabilization and erosion of shorelines, stream edges and ensure that diversion channels are maintained
Term or Condition:	The Proponent shall finalize and implement a comprehensive erosion management plan to prevent or minimize the effects of destabilization and erosion resulting from Project activities.
Reporting Requirements:	Finalization of plan, implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**17**
Category:	Terrestrial Environment – Permafrost integrity
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure that impacts to permafrost and permafrost terrain are minimized through all phases of the Project
Term or Condition:	The Proponent shall monitor the effects of the Project on permafrost conditions relative to Project infrastructure, including along the all-weather access road and associated roads, waste rock stockpile, trails and quarries. Through its monitoring the Proponent must demonstrate that permafrost integrity is maintained with implementation of appropriate preventative measures should permafrost degredation be observed.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including the results of monitoring or adaptive management strategies, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**18**
Category:	Terrestrial Environment – As-built drawings and final design plans
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction
Objective:	To ensure the NIRB and public have information available on the Project components to assist in monitoring

Term or Condition:	The Proponent shall provide the NIRB with copies of as-built drawings and final design plans for Project infrastructure as they are developed/finalized to assist with the Board's ongoing monitoring efforts.
Reporting Requirements:	The Proponent shall submit copies of the drawings and final designs as they are completed as well as provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**19**
Category:	Terrestrial Environment – Tailings and waste rock monitoring program
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure, Post-Closure
Objective:	To ensure the integrity of Project infrastructure is maintained, and to establish rigorous safeguards to prevent structural failure
Term or Condition:	The Proponent shall develop and implement a monitoring program for its Tailings Storage Facility and Waste Rock Storage Facility (including dikes). The monitoring progam is to include, but shall not be limited to: a. Plans for monitoring the thermal condition and stability of storage facilities (including deformation of the cover) and dikes, includingthe use of thermistor cables, temperature loggers, and core sampling technology as required to monitor dike stability and tailings freezeback efficiency, including for example, factors such as ice content and stability; and, b. Measures proposed to ensure the safe containment and structural integrity of Project infrastructure, and to prevent contamination of waterbodies. Details of the monitoring program shall provided to the NIRB.
Reporting Requirements:	Details of the monitoring program should be submitted to the NIRB at least 90 days prior to the establishment of either facility, with subsequent plan revisions or updates submitted annually thereafter. Results of any required reporting shall be submitted to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**20**
Category:	Terrestrial Environment – Closure and Reclamation Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure/Care and Maintenance, and Closure
Objective:	To assist in the re-vegetation of reclaimed areas
Term or Condition:	The Proponent shall explore the the feasibility and practicality of topsoil/organic matter salvage as part of phased approach to Project development, with updates to its Closure and Reclamation Plan to reflect any changes based on this investigation. The Closure and Reclamation Plan

	should be updated on an on-going basis as more information becomes available from similar reclamation projects, including experience with implementing closure and reclamation plans at the Meadowbank mine site, as applicable.
Reporting Requirements:	The updated plan is to be submitted to the NIRB within 6 months of the issuance of the Project Certificate. Implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**21**
Category:	Terrestrial Environment – Waste Management Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure permafrost integrity is maintained and that soil contamination is minimized
Term or Condition:	The Proponent shall update its Waste Management Plan to include details which explain how the design employed for Project landfills is expected to protect the integrity of the local environment, including permafrost integrity, and water quality for adjacent waterbodies. The Proponent shall demonstrate its consideration for the use of liners at waste management facilities, where feasible.
Reporting Requirements:	The updated plan is to be submitted to the NIRB at least 90 days prior to operation of Project landfills. Implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Geology (including Geochemistry)

Term and Condition No.	**22**
Category:	Geology (including Geochemistry) – Mine Waste Management Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure
Objective:	To inform parties on the adaptive management progress made relating to mine waste management
Term or Condition:	The Proponent shall report annually to the NIRB on the adaptations it has had made to the Mine Waste Management Plan and practices based on results obtained through monitoring.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including the results of monitoring or adaptive management strategies, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	23
Category:	Geology (including Geochemistry) – Mine Waste Management Plan, Discovery Deposit
Responsible Parties:	The Proponent, Natural Resources Canada
Project Phase:	Construction, Operations
Objective:	To mitigate impacts of Acid Rock Generation and Metal Leaching
Term or Condition:	Prior to the commencement of excavation at the Discovery deposit, the Proponent, in consultation with Natural Resources Canada, shall update its Mine Waste Management Plan to assess the potential for acid rock drainage and to identify any monitoring and mitigation measures that may be required in this development area.
Reporting Requirements:	Details of the Plan should be submitted at least 90 days prior to construction at the Discovery deposit, with subsequent plan revisions submitted annually thereafter; if accompanying the Proponent's annual report to the NIRB the document must be separated so as to be directly retrievable via the NIRB's public registry. Results of any required reporting shall be submitted to the NIRB through the Proponent's annual monitoring report.

Hydrogeology and Groundwater Quantity and Quality

Term and Condition No.	24
Category:	Hydrogeology and Groundwater – Hydraulic data
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations
Objective:	To collect and analyze additional baseline data to use as baseline to monitor for groundwater quality
Term or Condition:	The Proponent shall, reflecting any direction from the Nunavut Water Board during water licensing, collect new hydraulic data (e.g., from new monitoring wells) in key areas during the pre-development, construction and operation phases to better define vertical and horizontal ground flow in the project development area.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

REVISED Term and Condition No.	25
Category:	Hydrogeology and Groundwater – Groundwater Management Plan
Responsible Parties REVISED:	The Proponent, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
Project Phase:	Pre-construction, construction, Operations, temporary closure/care and maintenance, closure, post closure monitoring.

Objective:	To manage saline groundwater and minimize the impacts to permafrost, soil, surface water, vegetation and wildlife
Term or Condition REVISED:	**The Proponent shall submit a detailed Groundwater Management Plan to the NIRB which includes mitigation measures designed to address the potential for higher-than-predicted volumes of saline water inflows into the underground mine, treatment and disposal methods, and details of its plan to monitor saline water at site. The plan must identify uncertainties pertaining to predictions for groundwater quality and quantity and inform adaptive management strategies for the site. CIRNAC should be consulted with respect to the contents of the Plan and any required mitigation measures.**
Reporting Requirements:	An updated plan shall be submitted to the NIRB within 90 days of receipt of the amended Project Certificate. The Proponent shall provide a summary discussion of its implementation of this Term and Condition, including the results of monitoring or adaptive management strategies, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**26**
Category:	Hydrogeology and Groundwater – Pit refill rates
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, construction, Operations, temporary closure/care and maintenance, closure, post closure monitoring
Objective:	To assess the flow of groundwater into the lake
Term or Condition:	The Proponent shall carry out continued analyses over time to confirm and update, accordingly, the approximate fill time for the mine pits as identified in the FEIS.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Hydrology (including Surface Water Quantity) and Water and Sediment Quality

Term and Condition No.	**27**
Category:	Hydrology and Sediment Quality – Aquatics Effects Monitoring Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, construction, Operations, temporary closure/care and maintenance, closure, post closure monitoring
Objective:	To mitigate potential impacts to surface waters
Term or Condition:	The Proponent shall update its Aquatic Effects Monitoring Plan (AEMP) to include, at a minimum: a. Details regarding the monitoring of non-point sources of discharge, selection of appropriate reference sites, measures to ensure the collection of adequate baseline data at Meliadine Lake prior to and during construction activities, including information on chemical

	loading in the snowpack, and the mechanisms proposed to monitor for and treat runoff and sediment; b. A description of measures to be undertaken as relate to dustfall monitoring, designed in accordance with the following: i. To establish Phase 1 all-weather access road baseline data and a description of plans for data collection during Project operations for comparison; ii. To facilitate comparison with existing guidelines; iii. To assess the seasonal deposition (rates, quantities) and chemical composition of dust entering aquatic systems along representative distance transects of the all-weather access road and Rankin Inlet by-pass road; c. A description of water quality monitoring to be conducted at Little Meliadine Lake; and d. Details regarding comparisons of results to be run against predicted values and the analysis of data to be undertaken on an annual basis, or as may be required.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including the results of monitoring or adaptive management strategies, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**28**
Category:	Hydrology and Sediment Quality – Sediment and Erosion Management Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction
Objective:	To develop appropriate sediment and erosion controls to prevent impacts to surface waters and sediment quality
Term or Condition:	The Proponent shall develop and implement a sediment and erosion management plan to prevent or minimize the effects of destabilization and erosion that may occur due to Project activities. The plan should also detail sediment control plans to prevent and/or mitigate sediment loading into surface water within the Project area.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of the plan, including the results of monitoring or adaptive management strategies, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**29**
Category:	Hydrology and Sediment Quality – Water infrastructure monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, temporary closure/care and maintenance, closure, post closure monitoring.
Objective:	To mitigate impacts to natural water flow

Term or Condition:	The Proponent shall develop and implement adequate monitoring and maintenance procedures to ensure that the culverts and other conduits that may be prone to blockage do not significantly hinder or alter the natural flow of water from areas associated with the proposed mine. In addition, the Proponent shall monitor, document and report the withdrawal rates for water removed and utilized for all domestic and industrial purposes.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including the results of monitoring or adaptive management strategies, to the NIRB through the Proponent's annual monitoring report.

Freshwater Aquatic Environment

Term and Condition No.	**30**
Category:	Freshwater Aquatic Environment – Aquatic Effects Monitoring Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To monitor and mitigate potential effects to the freshwater aquatic environment
Term or Condition:	The Proponent shall update its Aquatic Effects Monitoring Plan (AEMP) to include, at a minimum: a. Provide details for additional reference lakes to be included within its sampling and monitoring programs; b. Updates to include sedimentation within relevant monitoring programs; and c. Results from additional testing for mercury in fish tissue, and include test results in updated baseline data.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**31**
Category:	Freshwater Aquatic Environment – Setbacks
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To mitigate impacts of runoff/sedimentation into freshwater aquatic habitat.
Term or Condition:	The Proponent shall maintain an appropriate setback distance between project quarries and fish-bearing or permanent water bodies as required to prevent acid rock drainage or metal leaching into such water bodies.
Reporting Requirements:	Implementation of these measures shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	32
Category:	Freshwater Aquatic Environment – Site Drainage and Silt Control Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To mitigate impacts of the Project on natural drainage and minimize sedimentation
Term or Condition:	Prior to the commencement of construction, the Proponent shall submit to the NIRB, a Site Drainage and Silt Control Plan.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	33
Category:	Freshwater Aquatic Environment – Blasting
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To mitigate impacts of explosives use on fish and fish habitat
Term or Condition:	The Proponent shall meet or exceed the guidelines set by Fisheries and Oceans Canada for blasting thresholds and implement practical and effective measures to ensure that residue and by-products of blasting do not negatively affect fish and fish habitat.
Reporting Requirements:	Implementation of these measures shall be reported and discussed in the Proponent's annual report to the NIRB.

Corrected Term and Condition No.	34
Category:	Freshwater Aquatic Environment – Watercourses
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction
Objective:	To prevent blockages or restrictions to fish passages
Term or Condition:	Unless otherwise approved by regulatory authorities, the Proponent shall ensure that all Project infrastructure in watercourses is designed and constructed in such a manner that it does not obstruct unduly prevent or limit the natural movement of water in fish bearing streams and rivers.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Vegetation

Term and Condition No.	35
Category:	Vegetation – Site footprint
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impacts of the Project on vegetation
Term or Condition:	The Proponent shall ensure that Project components and activities are planned and conducted in such a way as to minimize the Project footprint; this should include input from potentially affected communities where applicable.
Reporting Requirements:	A summary of consultation and how the information was used to inform planning for the Project shall be provided in the Proponent's annual report to the NIRB.

Term and Condition No.	36
Category:	Vegetation – Invasive species
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction
Objective:	To prevent the introduction of invasive species
Term or Condition:	The Proponent shall ensure that equipment and supplies brought to Project sites are clean and free of soils that could contain plant seeds not naturally occurring in the area. Vehicle tires and treads in particular must be inspected, and cleaned if required, prior to transport into Nunavut for use in Project areas.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	37
Category:	Vegetation – Monitoring for invasive species
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize introduction of invasive species
Term or Condition:	The Proponent shall incorporate protocols for monitoring for the potential introduction of invasive vegetation species (e.g. surveys of plant populations in previously disturbed areas) into its Terrestrial Environment and Monitoring Plan. Any introductions of non-indigenous plant species must be promptly reported to the Government of Nunavut Department of Environment.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	38
Category:	Vegetation – Updated baseline and ongoing monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To assess the impact of the Project on berry-producing plants
Term or Condition:	The Proponent shall conduct sampling to determine baseline levels for metals in soils found in areas with berry-producing plants near the Project area, and shall update relevant vegetation sections within the Terrestrial Management and Monitoring Plan to incorporate ongoing monitoring of these parameters prior to commencing operations.
Reporting Requirements:	Monitoring results and implementation of these measures shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	39
Category:	Vegetation – Monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To monitor metal levels in vegetation
Term or Condition:	The Proponent shall develop and establish an on-going monitoring program to determine the distribution, abundance, and health of vegetation species used as caribou forage (such as lichens) near Project areas, prior to commencing operations.
Reporting Requirements:	Details for the program are to be submitted to the NIRB within 6 months of the issuance of the the Project Certificate. Implementation of these measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	40
Category:	Vegetation – Adaptive management
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To mitigate impacts to vegetation abundance, diversity and health
Term or Condition:	The Proponent shall review, on an annual basis, all monitoring information and the vegetation mitigation and management plans developed under its Environmental Management Plan and Terrestrial Environment and Monitoring Plan (TEMMP) and adjust such plans as may be required to effectively prevent or reduce the potential for significant adverse project effects on vegetation abundance, diversity and health, taking into account lessons learned at other northern mining developments where appropriate.

Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**41**
Category:	Vegetation – Reclamation and re-vegetation
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To maximize revegetation in reclaimed areas
Term or Condition:	Prior to the commencement of operations, the Proponent shall develop a progressive re-vegetation program for disturbed areas that are no longer required for operations, such program to incorporate measures for the use of test plots, reseeding and replanting of native plants as necessary. It is further recommended that this program be directly associated with the management plans for erosion control established for the Project and incorporate lessons learned at Meadowbank.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**42**
Category:	Vegetation – Closure and Reclamation Plan
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To maintain an up to date re-vegetation plan for the Project
Term or Condition:	The Proponent shall include re-vegetation strategies in its Closure and Reclamation Plan that support progressive reclamation and that promote natural revegetation and recovery of disturbed areas compatible with the surrounding natural environment and incorporate lessons learned at Meadowbank
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Terrestrial Wildlife and Wildlife Habitat

Term and Condition No.	**43**
Category:	Terrestrial Wildlife and Wildlife Habitat – General
Responsible Parties:	The Proponent and other parties as appropriate
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure appropriate and responsive adaptive management

Term or Condition:	The Proponent shall continue to develop and implement Project-specific monitoring for the terrestrial environment through its Terrestrial Environment Management and Monitoring Plan (TEMMP), and will demonstrate appropriate refinements to design, incorporation of analytical methods and elaboration of methodologies. The TEMMP shall contain clear thresholds to allow for the assessment of long-term trends and cumulative effects where project interactions are identified. Coordination and cooperation will be required where data collection, analysis and interpretation, or responsibility for mitigation and management requires the efforts of multiple parties (e.g., government, Kivalliq Inuit Association, communities).
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**44**
Category:	Terrestrial Wildlife and Wildlife Habitat – Caribou monitoring
Responsible Parties:	The Proponent, Government of Nunavut
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To further define details of monitoring programs
Term or Condition:	In consultation with the Government of Nunavut (GN) and other relevant parties, the Proponent shall further develop its Terrestrial Environment Management and Monitoring Plan (TEMMP) to include increased caribou monitoring across the regional study area and additional details on the scope and design of monitoring programs. The Proponent shall also demonstrate consideration for contributing to exisiting and planned regional monitoring initiatives associated with terrestrial wildlife and wildlife habitat as appropriate. Monitoring should be adequate to test impact predictions, monitor impact thresholds and trends over time, and to support implementation of mitigation measures as proposed in the Final Environmental Impact Statement.
Reporting Requirements:	Results of discussions, implementation of measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**45**
Category:	Terrestrial Wildlife and Wildlife Habitat – General monitoring
Responsible Parties:	The Proponent and other parties as appropriate
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To promote coordination of monitoring efforts
Term or Condition:	The Proponent shall demonstrate consideration for cooperating with exisiting and planned regional and/or community-based monitoring initiatives associated with terrestrial wildlife and wildlife habitat that

	produce information pertinent to mitigating project-induced impacts. The Proponent shall give special consideration for supporting regional studies of population health and harvest programs for Qamanirjuaq caribou which help address areas of uncertainty for Project impact predictions.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including the results of monitoring, adaptive management strategies, consultation, and contribution efforts undertaken, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**46**
Category:	Terrestrial Wildlife and Wildlife Habitat – Harvest study
Responsible Parties:	The Proponent, Government of Nunavut, Hunters and Trappers Organizations, other parties as appropriate
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure harvest study considers appropriate Project-specific factors
Term or Condition:	The Proponent shall update its Terrestrial Environment Management and Monitoring Plan (TEMMP) for the Project to include a detailed harvest study prepared in consultation with the Government of Nunavut (GN) and other affected parties. The design of the harvest study should demonstrate consideration for the following: a. Hiring of a dedicated local survey coordinator through local Hunters and Trappers Organizations (HTOs) and provision of adequate resources for the HTOs to run the program; b. The potential effects on caribou populations and on caribou behaviour resulting from increased human access caused by the all-weather access road and associated roads and trails; and, c. Increasing local knowledge of the project development areas, including establishing baseline harvesting levels prior to unrestricted public access on the all-weather access road.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring, adaptive management strategies, and contribution efforts undertaken) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**47**
Category:	Terrestrial Wildlife and Wildlife Habitat – Monitoring
Responsible Parties:	The Proponent, Government of Nunavut
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To promote coordination of monitoring efforts
Term or Condition:	The Proponent shall share information with the Government of Nunavut (GN) relating to the migration of caribou and include the GN as a party respecting caribou monitoring and movement through Project

	development areas, including the all-weather access road and associated roads and trails.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including any updates to the Plan, to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**48**
Category:	Terrestrial Wildlife and Wildlife Habitat – Management of road access
Responsible Parties:	The Proponent, Government of Nunavut, Kivalliq Inuit Association, Kivalliq Wildlife Board, and local HTOs
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure mitigation and monitoring consider increases to harvesting from improved access
Term or Condition:	In consultation with the Government of Nunavut, the Kivalliq Inuit Association, the Kivalliq Wildlife Board and local Hunters and Trappers Organizations, the Proponent shall develop appropriate monitoring and mitigation measures relating to the harvesting of caribou and improved harvesting access granted by the all-weather access road. These measures shall be included within a Road Access Management Agreement that must be in place prior to construction of phase 2 of the all-weather access road. The Road Management Agreement shall include the following specific measures: ▪ During periods when large aggregations of caribou (greater than 50 individuals) are detected within 1 km of the all-weather access road (AWAR), the road will be closed to public access via car and truck by means of a barrier at the southern gate. Public access using all-terrain vehicles (ATVs) will be allowed. ▪ During periods when large aggregations of caribou (greater than 50 individuals) are observed within 1 km of the AWAR, the road will be closed to public access via barriers at bridges on the AWAR to prevent all vehicle access, including ATVs. This will allow ATVs to enter areas previously accessible along existing trails while not facilitating access via bridges constructed specifically for the Project. ▪ Following consultation with the Nunavut Wildlife Management Board, as required under the *Nunavut Wildlife Act*, it is recommended that a no-shooting zone (1 km wide) on either side of the road should be established as a condition of public access to the AWAR and compliance with this Agnico Eagle policy should be monitored and reported by the Proponent. ▪ Dedicated 'road monitors' should patrol the road to ensure compliance with the provisions of the Road Management Plan (SD 2-9) relating to public safety and wildlife. Monitoring should be

	increased during periods of road closure when large aggregations of caribou are present. ▪ All incidents of hunting involving shooting along or across the AWAR should be reported by the Proponent to the GN. ▪ During periods when large aggregations of caribou are detected near the Project, harvest monitoring intensity should be increased to ensure that levels of caribou harvesting are properly documented.
Reporting Requirements:	Road Access Management Agreement to be submitted to the NIRB at least 60 days prior to the commencement of increased traffic related to the marine outflow activities, with implementation of these measures and monitoring results as well as any subsequent updates to the Plan, reported and discussed in the Proponent's annual report to the NIRB.

Commentary: T*he reference in Bullet 3 above to a no-shooting zone as a condition of public access to the AWAR is a reference to a policy of the Proponent and is not a reference to policy requirements of the Nunavut Wildlife Management Board or Nunavut Wildlife Act.*

Term and Condition No.	**49**
Category:	Terrestrial Wildlife and Wildlife Habitat – Research licensing
Responsible Parties:	The Proponent, Nunavut Research Institute
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To facilitate licensing review
Term or Condition:	The Proponent is encouraged to consult with the Nunavut Research Institute (NRI) on the research permitting process as it relates to the *Nunavut Scientists Act*. The Proponent is encouraged to share monitoring and research study design with the NRI four (4) months prior to the anticipated commencement of research activities to facilitate licensing review.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Commentary: *The NIRB recognizes that the Proponent would only consult with and share monitoring and research study design with the NRI for those research activities undertaken by the Proponent under the Project Certificate that would trigger the requirement for a scientific research licence under the Nunavut Scientists Act.*

Term and Condition No.	**50**
Category:	Terrestrial Wildlife and Wildlife Habitat – Wildlife habitat
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure progressive reclamation of disturbed wildlife habitat

Term or Condition:	The Proponent shall develop a strategy for the recovery of terrestrial wildlife habitat in a progressive manner that is consistent with the *Nunavut Wildlife Act*.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**51**
Category:	Terrestrial Wildlife and Wildlife Habitat – Territorial Park
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize disturbance from helicopter overflights
Term or Condition:	The Proponent shall not conduct routine helicopter flights over, or land in, Iqalugaarjuup Nunanga Territorial Park. The Proponent will communicate this commitment to all helicopter companies contracted by it to undertake work at the Meliadine Project site prior to the start of such contracted work. Emergency flights, specifically medical evacuation flights and/or search and rescue overflights are excepted from adherence to this requirement.
Reporting Requirements:	Information regarding the Proponent's consultation, coordination and other contribution efforts undertaken in fulfillment of this term and condition shall be provided in the Proponent's annual report to the NIRB.

Term and Condition No.	**52**
Category:	Terrestrial Wildlife and Wildlife Habitat – Muskoxen monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To promote coordination of monitoring efforts
Term or Condition:	The Proponent shall undertake periodic surveys and a habitat assessment for muskoxen in the regional study area by partnering with, or complementing, the existing regional muskox monitoring programs.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**53**
Category:	Terrestrial Wildlife and Wildlife Habitat – Furbearer surveying
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize disturbance to furbearers from Project activities

Term or Condition:	Prior to construction of Project infrastructure and Phase 2 of the all-weather access road, the Proponent shall conduct a survey that is sufficient to locate any dens of foxes, bears or wolverines that could be damaged or destroyed during construction or operation of the Project.
Reporting Requirements:	Survey results shall be submitted to the NIRB at least 60 days prior to the commencement of traffic associated with the transport of saline water on the all-weather access road. Implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**54**
Category:	Terrestrial Wildlife and Wildlife Habitat – Movement of wildlife
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure Project infrastructure does not prevent or unduly limit the movement of wildlife
Term or Condition:	The Proponent shall ensure that road safety barriers or berms associated with Project infrastructure, all-weather access road and associated roads/trails are constructed to allow for the safe passage of caribou and other terrestrial wildlife while achieving the objective of separating public road use with Project-related mine traffic.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**55**
Category:	Terrestrial Wildlife and Wildlife Habitat – Wildlife mortality
Responsible Parties:	The Proponent, Government of Nunavut, Designated Inuit Organization
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure clear thresholds exist for Project-related mortality of wildlife species, adequate adaptive management measures and compensation agreements are in place
Term or Condition:	In consultation with the Government of Nunavut (GN) and other affected parties, the Proponent shall set thresholds for direct mortality of wolf, grizzly bear, polar bear, wolverine, and fox to ensure monitoring and mitigation for the Project is responsive to undesirable rates of mortality. The Proponent shall reach an agreement with the appropriate Designated Inuit Organization regarding compensation or any direct mortality of wildlife resulting from the Project.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	56
Category:	Terrestrial Wildlife and Wildlife Habitat – Reporting
Responsible Parties:	The Proponent
Project Phase:	Construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To mitigate and monitor for impacts to wildlife
Term or Condition:	The Proponent shall report annually to the NIRB regarding its terrestrial environment monitoring efforts, with inclusion of the following information: a. Description of all updates to terrestrial ecosystem baseline data; b. A description of the involvement of Inuit in its monitoring programs; c. A detailed presentation and analysis of the distribution relative to Project infrastructure and activities for caribou and other terrestrial mammals observed during surveys and incidental sightings; d. Results of the annual monitoring program, including field methodologies and statistical approaches used to support conclusions drawn; and e. An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring, adaptive management strategies, consultation, and contribution efforts undertaken) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	57
Category:	Terrestrial Wildlife and Wildlife Habitat – Reporting
Responsible Parties:	The Proponent
Project Phase:	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To mitigate and monitor for impacts to wildlife
Term or Condition:	Within its annual report to the NIRB, the Proponent shall incorporate a review section which includes: a. An examination for trends in the measured natural variability of Valued Ecosystem Components in the region relative to the baseline reporting; b. A detailed analysis of wildlife responses to operations with emphasis on wildlife behaviour, mortalities and displacements (if

	any), and responses to operations of the all-weather access road and associated access roads/trails; c. A demonstration and description of how the monitoring results, including the all-weather access road and associated access roads/trails contribute to cumulative effects of the project; and d. Any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program.
Reporting Requirements:	The Proponent shall provide its discussion of these factors to the NIRB through the Proponent's annual monitoring report.

Birds and Bird Habitat

Term and Condition No.	**58**
Category:	Birds and Bird Habitat – Awareness
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To prevent/minimize impacts on birds and bird habitat
Term or Condition:	The Proponent shall ensure all employees working at Project sites receive awareness training regarding the importance of avoiding known nests and nesting areas and avoiding large concentrations of foraging and moulting birds.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	**59**
Category:	Birds and Bird Habitat – Species at Risk
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize impacts on Species at Risk
Term or Condition:	If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance based on the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	**60**
Category:	Birds and Bird Habitat – Species at Risk
Responsible Parties:	The Proponent

Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize impacts to Species at Risk
Term or Condition:	The Proponent shall ensure that the mitigation and monitoring strategies developed for Species at Risk are updated as necessary to maintain consistency with any applicable status reports, recovery strategies, action plans and management plans that may become available during the duration of the Project.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**61**
Category:	Birds and Bird Habitat – Construction/clearing activities
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations
Objective:	To minimize disturbance to birds during the breeding season
Term or Condition:	Prior to bird breeding season, the Proponent shall either conduct clearing activities or identify and install nesting deterrents (e.g., flagging) to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities. If clearing is to take place during the nesting season, a nest survey should take place to identify nests and any identified nests must remain undisturbed until the young have fledged or left the nest. Any nests identified shall be included as part of the annual reporting for the Terrestrial Environmental Mitigation and Monitoring Plan (TEMMP).
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	**62**
Category:	Birds and Bird Habitat – Construction/clearing activities
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impacts on birds during the breeding season
Term or Condition:	The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan (TEMMP), until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	63
Category:	Birds and Bird Habitat – Marine considerations
Responsible Parties:	The Proponent, Environment Canada
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of marine shipping on birds and bird habitat
Term or Condition:	Any incidents of bird mortalities associated with lighting infrastructure, construction activities, and Project vessel operations are to be recorded and reported to Environment Canada (Canadian Wildlife Services). The Proponent shall work with the Canadian Wildlife Services to determine appropriate recording and reporting format and timing.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	64
Category:	Birds and Bird Habitat – Marine considerations
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure appropriate monitoring measures are in place to address the potential impacts of marine fuel spills
Term or Condition:	The Proponent shall develop a framework for monitoring of marine bird species and their habitat in the event of a major marine fuel spill. Specific details regarding the scope of follow-up monitoring may be further refined if and when such an event were to occur.
Reporting Requirements:	The framework should be submitted to the NIRB at least 90 days prior to conducting any Project-related shipping. Implementation of these measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	65
Category:	Birds and Bird Habitat – Marine considerations
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of marine shipping on birds and bird habitat
Term or Condition:	The Proponent shall maintain reduced speeds to sufficiently ensure that wakes are equal or less than the mean natural seasonal wave height to prevent wake action from negatively impacting migratory bird nests in low lying shoreline habitat.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	66
Category:	Birds and Bird Habitat – Marine considerations
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of marine shipping on birds and bird habitat
Term or Condition:	The Proponent shall ensure all Project vessels are checked for bird strikes after a suspected event and include details of its protocol to do so, as well as results, within its updated Terrestrial Environment Mitigation and Monitoring Plan.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	67
Category:	Birds and Bird Habitat – Marine considerations
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of marine shipping on birds and bird habitat
Term or Condition:	The Proponent shall submit an updated Oil Pollution Prevention Plan including measures to avoid adverse effects to species at risk and migratory birds from spills, as well as details regarding monitoring of effects of a spill on species at risk and migratory birds.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	68
Category:	Birds and Bird Habitat – Marine considerations
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of marine shipping on birds and bird habitat
Term or Condition:	The Proponent shall demonstrate consideration for the potential cumulative effects of other development projects and shipping activities (including community resupply) when assessing their cumulative effects on marine birds in the Hudson Strait, in its annual report.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Corrected Term and Condition No.	**69**
Category:	Birds and Bird Habitat – Flight altitude requirements
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of aircraft on birds and bird habitat
Term or Condition:	Subject to safety requirements, the Proponent shall require all Project related aircraft to maintain a cruising altitude of at least: a. 650 m during point to point travel when in areas likely to have migratory birds b. 1100 m vertical and 1500 m horizontal distance from observed concentrations of migratory birds c. 1100 m over the area identified as a key site for moulting snow geese during the moulting period (July-August), and if maintaining this altitude is not possible, maintain a lateral distance of at least 1500 m from key sites for moulting snow geese.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	**70**
Category:	Birds and Bird Habitat – Flight altitude requirements
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of aircraft on bird and bird habitat
Term or Condition:	The Proponent shall ensure that pilots are informed of minimum cruising altitude guidelines and that a daily log or record of flight paths and cruising altitudes of aircraft within all Project areas is maintained and made available for regulatory authorities such as Transport Canada to monitor adherence and to follow up on complaints.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	**71**
Category:	Birds and Bird Habitat – Monitoring
Responsible Parties:	The Proponent, Kivalliq Inuit Association, Kivalliq HTOs and communities
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To develop appropriate mitigation measures and monitoring plans related to birds

Term or Condition:	The Proponent shall develop detailed and robust mitigation and monitoring plans for migratory birds, reflecting input from relevant agencies, the Kivalliq Inuit Association and communities.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**72**
Category:	Birds and Bird Habitat – Monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact to sensitive bird species
Term or Condition:	The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Protection Plan and Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) prior to construction. The key indicators for follow up monitoring under this plan will include upland birds (including migratory birds), waterbirds, raptors, and seabirds including migration and wintering.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**73**
Category:	Birds and Bird Habitat – Monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To assess the extent of terrestrial habitat loss
Term or Condition:	The Proponent's monitoring program shall assess and report, on annual basis, the extent of terrestrial habitat loss due to the Project to verify impact predictions and provide updated estimates of the total Project footprint.
Reporting Requirements:	Monitoring results and implementation of these measures shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**74**
Category:	Birds and Bird Habitat – Monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring

Objective:	To minimize the impact of Project activities on water birds
Term or Condition:	The Proponent's Terrestrial Management and Monitoring Plan (TEMMP) shall include mitigation measures implemented to prevent the use of water attenuation ponds by waterfowl and waterbirds and monitoring that assesses whether the mitigation measures are working or revised, or further deterrent measures are required.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**75**
Category:	Birds and Bird Habitat – Monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To minimize the impact of predatory species on nesting birds
Term or Condition:	The Proponent shall implement mitigation measures and monitoring programs to limit the attraction of predators and scavengers to Project facilities in the TEMMP and other plans such as the Landfill and Waste Management Plan as appropriate.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Marine Environment

Term and Condition No.	**76**
Category:	Marine Environment – General
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure plans and Project design reflect the need to protect the ecosystemic integrity of the marine environment
Term or Condition:	The Proponent shall update all relevant plans including, but not limited to: the Shipping Management Plan, Wildlife Mitigation and Monitoring Plan, and Adaptive Management Plan, in order to address concerns and identify potential impacts of the Project and proposed mitigation measures designed to protect the integrity of the marine environment. The Shipping Management Plan shall also incorporate updates for all Project-related shipping.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition, including the results of monitoring or adaptive management strategies, and any updates to plans to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	77
Category:	Marine Environment – Spill prevention
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure appropriate response capacity for potential spill events
Term or Condition:	The Proponent shall ensure that it maintains the necessary equipment and trained personnel to respond to all sizes of potential spills associated with the Project in a self-sufficient manner.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	78
Category:	Marine Environment – Spill prevention
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure accurate and adequate spill response and emergency preparedness
Term or Condition:	Prior to the shipping of Project supplies, the Proponent shall conduct fuel spill dispersion modeling that will, at a minimum, consider: a. Modeling of oil spills in the following areas: i. Pinch points, including: Hudson Strait, Melvin Bay area including Itivia Harbour and Panorama Island; ii. Shallow water and shorelines; and, iii. Areas that have been identified as having high flows and/or high concentrations of marine mammals, marine fish or seabirds; b. Open water and ice-covered conditions; c. Spill volumes up to and including loss of a full tanker cargo; and, d. Differences in the quantity and properties of each type of bulk fuel transported by vessels when they are at, or in transit to, the port of Rankin Inlet.
Reporting Requirements:	Results of the spill dispersion modeling should be submitted to the NIRB at least 90 days prior to the commencement of construction. Implementation of these measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Commentary: *Modelling considerations related to item (b) should be inclusive of seasonal ice variability, i.e. ice formation and break up.*

Marine Wildlife

Term and Condition No.	79
Category:	Marine Wildlife – Updated baseline
Responsible Parties:	The Proponent, other parties as appropriate
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure updated and accurate marine baseline data is available prior to Project-related shipping
Term or Condition:	Prior to any Project-related shipping, the Proponent will update its marine baseline information to ensure that it includes the most recent information on marine wildlife abundance and distribution, carefully considers seasonal distribution patterns of marine wildlife, and incorporates western scientific and Inuit Qaujimajatuqangit knowledge sources. The updated marine baseline should be made available to appropriate authorities for feedback, then incorporated into the Proponent's Shipping Management Plan (SMP), with continued updates on a regular basis as new information becomes available.
Reporting Requirements:	Updated baseline should be provided to the NIRB and appropriate authorities prior to the commencement of Project-related shipping. The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	80
Category:	Marine Wildlife – Marine baseline
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure updated and accurate marine baseline data is available
Term or Condition:	The Proponent shall assess its available baseline information for Melvin Bay and for the area surrounding the fuel transhipment anchorage to ensure that both are adequate for the detection of Project-related impacts, particularly related to contaminants.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	81
Category:	Marine Wildlife – Wildlife plans
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure relevant plans incorporate mitigation and monitoring programming for marine wildlife

Term or Condition:	Prior to any Project-associated shipping, the Proponent shall revise and update the Terrestrial Environment Management Plan (TEMMP) and/or the Shipping Management Plan (SMP) to include following information: a. a plan for involvement of local hunters in wildlife baseline studies and monitoring program; b. a plan for coordinating wildlife studies/monitoring activities with other organizations, institutions, government departments and/or individual researchers conducting wildlife studies in the regional study area; and c. measures to be applied to avoid or reduce the disturbance, harassment, injury or mortality of marine mammals due to shipping activities.
Reporting Requirements:	Updates to the relevant plan(s) should be provided to the NIRB a minimum of 120 days prior to the commencement of Project-related shipping. Implementation of these measures, updates to the Plan, consultation records, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**82**
Category:	Marine Wildlife – Monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure monitoring of marine wildlife during Project-related ship voyages
Term or Condition:	The Proponent shall require all contracted shipping companies to provide full-time marine wildlife monitoring using trained observers and established data collection and recording protocols. Monitoring plans should include provisions for all *Species At Risk Act* (SARA) and for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed species (birds and mammals).
Reporting Requirements:	Updated monitoring plans should be provided to the NIRB a minimum of 120 days prior to the commencement of Project-related shipping. Implementation of these measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Commentary: *The Proponent is encouraged to consult with the parties involved with marine wildlife management to develop standardized marine wildlife data collection and recording protocols.*

Term and Condition No.	**83**
Category:	Marine Wildlife – Marine mammal interactions
Responsible Parties:	The Proponent

Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To prevent impacts to marine mammals associated with Project shipping
Term or Condition:	The Proponent shall ensure that, subject to vessel and human safety considerations, all Project shipping adhere to the following mitigation procedures while in the vicinity of marine mammals (including polar bear) and birds: a. Marine mammals will be given right of way; b. Ships will when possible, maintain a straight course and constant speed, avoiding erratic behavior; and c. When marine mammals appear to be trapped or disturbed by vessel movements, the vessel will implement appropriate measures to mitigate disturbance, including stoppage of movement until wildlife have moved away from the immediate area.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Term and Condition No.	**84**
Category:	Marine Wildlife – Route planning
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To mitigate potential impacts terrestrial walrus haulouts
Term or Condition:	Prior to any Project-related shipping, the Proponent will prepare a map of terrestrial walrus haulouts (uglit) in the Project area, and use this information for route planning, fuel spill modeling, and sensitive area identification. The map should include all available sources of information on uglit locations, including scientific knowledge and Inuit Qaujimajatuqangit and shall be updated by the Proponent whenever new information becomes available.
Reporting Requirements:	Mapping and associated details should be provided to the NIRB a minimum of 180 days prior to the commencement of Project-related shipping. Implementation of these measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**85**
Category:	Marine Wildlife – Monitoring
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To monitor potential impacts to walruses

Term or Condition:	The Proponent shall consider ways to monitor disturbance to walruses at terrestrial haulout sites, including but not limited to remote monitoring (e.g., time-lapse cameras) and community-based monitoring or Inuit Qaujimajatuqangit surveys.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**86**
Category:	Marine Wildlife – Cumulative effects
Responsible Parties:	The Proponent, other parties as appropriate
Project Phase:	Pre-construction, Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To promote coordinated understanding and mitigation of potential cumulative effects
Term or Condition:	The Proponent is encouraged to liase with relevant stakeholders, regulatory agencies and/or forums (e.g. the Marine Environmental Working Group associated with the Mary River Project), that might allow for participation in relevant research and management initiatives and increasing understanding and mitigation of potential cumulative effects associated with the Project's shipping activities through the Hudson Strait.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB.

Socio-Economic Terms and Conditions

Economic Development, Contracting, and Business Opportunities

Term and Condition No.	**87**
Category:	Economic Development, Contracting and Business Opportunities – Socio-Economic Monitoring, Kivalliq Socio-Economic Monitoring Committee
Responsible Parties:	The Proponent, members of the KSEMC
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Description of the general monitoring framework to be developed in consultation with the Kivalliq Socio-Economic Monitoring Committee.
Term or Condition:	The Proponent is strongly encouraged to participate in the work of the Kivalliq Socio-Economic Monitoring Committee along with other agencies and the communities of the Kivalliq region, and to identify areas of mutual interest and priority for inclusion into a collaborative monitoring framework that includes socio-economic priorities related to the Project, communities, and the Kivalliq region as a whole.

Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this Term and Condition (including the results of monitoring) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**88**
Category:	Economic Development, Contracting and Business Opportunities – Socio-Economic Monitoring
Responsible Parties:	The Proponent, KIA, GN, AANDC also known as Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Kivalliq communities
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Description of a socio-economic monitoring working group to oversee project-specific monitoring program
Term or Condition:	The Proponent is encouraged to work in collaboration with other socio-economic stakeholders including for example, the KIA, GN, AANDC, and communities of the Kivalliq region, to establish a socio-economic working group for the Project to develop and oversee the Meliadine Socio-economic Monitoring Program. The working group should develop a Terms of Reference which outlines each member's roles and responsibilities with regards to, where applicable, project-specific socio-economic monitoring throughout the life of the Project. The Terms of Reference are to be provided to the NIRB upon completion, and within one year of issuance of the Project Certificate.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB. All updates to the Terms of Reference should be submitted to the NIRB during annual socio-economic reporting.

Term and Condition No.	**89**
Category:	Economic Development, Contracting and Business Opportunities – Socio-Economic Monitoring
Responsible Parties:	The Proponent, KSEMC, KIA, GN, AANDC also known as Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Kivalliq communities
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Details regarding the establishment of Project-specific socio-economic monitoring program.
Term or Condition:	The Proponent shall develop the Meliadine Socio-economic Monitoring Program to monitor the predicted impacts outlined in the FEIS as well as regional concerns identified by the Kivalliq Socio-economic Monitoring Committee (SEMC). Where possible, the Proponent is encouraged to work in collaboration with all other socio-economic stakeholders such as the KIA, GN, AANDC and the communities of the Kivalliq region in developing this program, which should include a process for adaptive management and mitigation in the event unanticipated impacts are identified. Details of the

	Meliadine Socio-economic Monitoring Program are to be provided to the NIRB upon finalization, and within one year of issuance of the Project Certificate.
Reporting Requirements:	Details of the Meliadine Socio-economic Monitoring Program should be submitted to the NIRB within one (1) year of issuance of the amended Project Certificate. The Proponent shall produce annual Meliadine socio-economic monitoring reports throughout the life of the Project that are submitted to the NIRB and shared with the wider Socio-Economic Monitoring Committee.

Term and Condition No.	**90**
Category:	Economic Development, Contracting and Business Opportunities – Closure planning and monitoring
Responsible Parties:	The Proponent, KSEMC
Project Phase:	Pre-Construction, Construction
Objective:	To capture and provide analysis of Project-specific and regional data during Project closure(s), and to clarify mitigation measures related to closure
Term or Condition:	Prior to the commencement of operations, the Proponent is required to undertake an analysis of the risk of temporary mine closure, giving consideration to how communities in the Kivalliq region may be affected by temporary and permanent closure of the mine, including economic, social and cultural effects. The results of this analysis are to be provided to the NIRB upon completion.
Reporting Requirements:	This initial results of the Proponent's analysis should be provided to the NIRB within nine (9) months of the issuance of the amended Project Certificate. Any updates to the analyses should be provided to the NIRB as completed by the Proponent and include plans or details in respect of informing the regional socio-economic committee of these results.

Term and Condition No.	**91**
Category:	Economic Development, Contracting and Business Opportunities – Closure planning and monitoring
Responsible Parties:	The Proponent, KSEMC
Project Phase:	Pre-Construction, Construction
Objective:	To capture and provide analysis of Project-specific and regional data during Project closure(s), and to clarify mitigation measures related to closure
Term or Condition:	Within 3 months of the NIRB's acceptance of the Proponent's analysis of the risk of temporary mine closure referenced above, the proponent is expected to update its Socio-Economic Management Plan or to include within a newly developed plan or framework, a description of its plan to collect and analyze Project-specific and regional data at closure and post-closure phases, as well as its defined measures to help mitigate impacts which may result from Project closure(s), both temporary and final.
Reporting Requirements:	The required updates to the Socio-Economic Monitoring Program (and the Socio-Economic Management Plan included within the Program) should be

	provided to the NIRB within three (3) months of the completion of the analysis or updates to the analysis of the risk of temporary mine closure in the term and condition noted above. The Proponent shall reference any updates to its Socio-Economic Monitoring Program and associated management plan in the annual Meliadine socio-economic monitoring reports that are submitted to the NIRB and shared with the wider Socio-economic Monitoring Committee throughout the life of the Project.

Employment

Term and Condition No.	**92**
Category:	Employment – Employment schedule
Responsible Parties:	The Proponent
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	In the interest of producing accurate labour market information and reliable economic and employment forecasting for the current and future labour force, it is important to have up-to-date estimates of the types of employment available through the Project, and what skills are required for these jobs.
Term or Condition:	The Proponent shall submit a detailed staff schedule to the NIRB and to the Government of Nunavut in the first 6 months following the issuance of a Project Certificate. The schedule should, at a minimum, provide a description of: a. Title of positions required by department and division; b. Quantity of positions available by Project phase and year; c. Transferable skills, both certified and uncertified which may be required for, or gained during, employment within each position; and, d. The National Occupational Classification (NOC) code for each individual position. The Proponent is encouraged to consult the Government of Nunavut during development of the schedule. A new schedule should be submitted following any significant deviation from original predictions.
Reporting Requirements:	Within 6 months of Project Certificate issuance and as required thereafter.

Term and Condition No.	**93**
Category:	Employment – Registration of trades workers
Responsible Parties:	The Proponent
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring

Objective:	To ensure that the Government of Nunavut has accurate information to assist it in its role as overseer of the apprenticeship program in Nunavut and in its provision of access to training initiatives and programs.
Term or Condition:	The Proponent is encouraged to register all trades occupations, journeypersons and apprentices working with the Project and to register any trades occupations listed in its forecast, as well as to provide the Government of Nunavut with information regarding the number of registered apprentices and journeypersons from other jurisdictions employed at the Project during each year of the Project's life.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB and shared with the wider regional socio-economic monitoring committee throughout the life of the Project.

Term and Condition No.	**94**
Category:	Employment – Labour force analysis
Responsible Parties:	The Proponent
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To update information provided within the FEIS and monitor Project impacts on labour force characteristics throughout the life of the Project.
Term or Condition:	The Proponent shall update its labour force analysis utilizing current or the most recent baseline information as may be available from the Nunavut Bureau of Statistics or Statistics Canada. The updated labour force analysis is to be provided to the NIRB within 6 months of the Project Certificate being issued. The Proponent is encouraged to work collaboratively with other stakeholders to monitor any impacts the Project may have on the labour force characteristics of the Kivalliq region during all project phases.
Reporting Requirements:	The Proponent should summarize the results of these efforts in the annual Meliadine socio-economic monitoring reports submitted to the NIRB and shared with the wider Socio-Economic Monitoring Committee throughout the life of the Project.

Education and Training

Term and Condition No.	**95**
Category:	Education and Training – Transferable skills and training
Responsible Parties:	The Proponent, Kivalliq Inuit Association, Government of Nunavut, Municipal Training Organization
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Offering training which results in certification that is valid for employment at other sites or in other fields contributes to the long-term employability of Nunavummiut.
Term or Condition:	The Proponent is encouraged to work with training organizations and/or government departments offering mine-related or other training in order

	to provide additional opportunities for residents and employees to gain meaningful and transferable skills and certifications.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB. Updates to the list should be included in the annual Meliadine socio-economic monitoring reports submitted to the NIRB and shared with the wider Socio-Economic Monitoring Committee throughout the life of the Project.

Term and Condition No.	**96**
Category:	Education and Training – Transferable skills and training
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction
Objective:	Offering training which results in certifications that are valid for employment at more than one site or in different fields contributes to the long-term employability of Nunavummiut.
Term or Condition:	Prior to construction, the Proponent shall develop an easily referenced listing of formal certificates and licences that may be acquired via on-site training or training during Proejct employment. The listing shall indicate which of these certifications and licences would be transferable to a similar job site within Nunavut, and should be updated on an annual basis, and is to be provided to the NIRB upon completion and as may be revised.
Reporting Requirements:	The initial listing should be provided to the NIRB at least 60 days prior to the start of construction, and annually thereafter or as may otherwise be required.

Term and Condition No.	**97**
Category:	Education and Training – Monitoring impacts of closure
Responsible Parties:	The Proponent
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To further the understanding of the impacts that Project closure may have on education and training
Term or Condition:	The Proponent's project-specific socio-economic monitoring program should be updated to address the potential impacts to education and training which may arise from temporary, final and/or post-closure phases.
Reporting Requirements:	Information regarding the Proponent's fulfillment of this term and condition shall be included in the Proponent's annual report to the NIRB and shared with the wider regional socio-economic monitoring committee throughout the life of the Project.

Term and Condition No.	**98**
Category:	Education and Training – Monitoring impacts to education system
Responsible Parties:	The Proponent, KSEMC

Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To further the understanding of potential impacts from pressures to the education system in the Kivalliq region and individual communities throughout the life of the Project.
Term or Condition:	The Proponent is encouraged to work with the members identified as potential stakeholders in the socio-economic monitoring working group and with the Kivalliq Socio-Economic Monitoring Committee to review and monitor education utilization rate trends on an on-going basis to understand if the Project can be determined to be having an impact on the education system of the Kivalliq region and/or on any communities in particular.
Reporting Requirements:	The summary of this information should be included in the annual Meliadine socio-economic monitoring reports submitted to the NIRB and shared with the wider Socio-economic Monitoring Committee throughout the life of the Project.

Population Demographics

Term and Condition No.	**99**
Category:	Population Demographics – Monitoring demographic changes
Responsible Parties:	The Proponent, KSEMC
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Monitoring demographic changes affecting the Kivalliq communities is important to understanding trends which may be correlated with the Meliadine Project or other activities in the region.
Term or Condition:	The Kivalliq Socio-Economic Monitoring Committee and its membership are encouraged to engage in the monitoring of demographic changes including the movement of people into and out of the Kivalliq communities and the territory as a whole. This information may be used in conjunction with monitoring data obtained by the Proponent from recent hires and/or out-going employees in order to assess the potential effects of the Project on migration.
Reporting Requirements:	The summary of this information should be included in the annual Meliadine socio-economic monitoring reports submitted to the NIRB and shared with the wider Socio-economic Monitoring Committee throughout the life of the Project.

Term and Condition No.	**100**
Category:	Population Demographics – Survey of Nunavummiut employees
Responsible Parties:	The Proponent, KSEMC, GN
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring

Objective:	Monitoring changes in the circumstances of Nunavummiut employees may provide important information which could be used to evaluate predictions made and the potential impacts to Kivalliq communities.
Term or Condition:	The Proponent is encouraged to work with the Kivalliq Socio-Economic Monitoring Committee to design and implement a voluntary survey to be offered to its Nunavummiut employees on an annual basis in order to identify changes of address, housing status (i.e. public/social, privately owned/rented, government, etc.), and migration intentions, while respecting confidentiality of all persons involved. The survey should be designed in collaboration with the Government of Nunavut, the Nunavut Housing Corporation and other relevant stakeholders. Non-confidential results of the survey are to be reported to the Government of Nunavut and the NIRB.
Reporting Requirements:	The summary of this information should be included in the annual Meliadine socio-economic monitoring reports submitted to the NIRB and shared with the wider Socio-economic Monitoring Committee throughout the life of the Project.

Term and Condition No.	**101**
Category:	Population Demographics – Employee origin
Responsible Parties:	The Proponent
Project Phase:	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Project-specific information regarding employee origin is important to comparing predictions of labour availability and employment opportunities with actual levels of employment from various demographic segments over different geographic areas.
Term or Condition:	The Proponent shall include with its annual reporting to the NIRB a summary of employee origin information as follows: a. The number of Inuit and non-Inuit employees hired from each of the Kivalliq communities, specifying the number from each; b. The number of Inuit and non-Inuit employees hired from each of the Kitikmeot and Qikiqtani regions, specifying the number from each; c. The number of Inuit and non-Inuit employees hired from a southern location or other province/territory outside of Nunavut, specifying the locations and the number from each; and d. The number of non-Canadian foreign employees hired, specifying the locations and number from each foreign point of hire.
Reporting Requirements:	The summary of this information should be included in the annual Meliadine socio-economic monitoring reports submitted to the NIRB and shared with the wider Socio-economic Monitoring Committee throughout the life of the Project.

Traditional Activity and Knowledge

Term and Condition No.	102
Category:	Traditional Activity and Knowledge – Meliadine Lake community boat launch
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Appropriate planning for and consideration of, mitigation in design features and further monitoring of usage is an important component of the public boat launch as proposed in order to ensure public and worker safety.
Term or Condition:	Prior to commencing construction of the Discovery spur road to pass Meliadine Lake, the Proponent shall provide to the NIRB, details regarding the design features for the Meliadine Lake community boat launch, including traffic turnoffs from the all-weather access road, relevant signage, parking areas, considerations for public safety around the boat launch, plans for garbage removal and treatment of other refuse including buildings and equipment which may be stored at the site, as well as plans to monitor and/or maintain the site, including frequency and timing. These details, once finalized, shall also be incorporated, as updates, to various mitigation, monitoring and/or management plans as applicable.
Reporting Requirements:	Initial details to be provided prior to commencement of construction of the Discovery spur road. The Proponent shall provide a summary discussion of its implementation of this term and condition, monitoring results, implementation of adaptive management strategies, and updates to relevant plans to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	103
Category:	Traditional Activity and Knowledge – Community input to monitoring
Responsible Parties:	The Proponent, KIA, KHTO, KSEMC
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Incorporating community input into monitoring plans, programs and mitigation measures is important to ensuring they consider traditional knowledge and activities.
Term or Condition:	The Proponent is encouraged to consult with the Kangiqliniq Hunters and Trappers Organization and the Kivalliq Socio-Economic Monitoring Committee and to make all reasonable efforts to engage Elders and community members of the Kivalliq communities in order to have community level input into updates to its monitoring plans, programs and mitigative measures. This type of engagement will ensure that these programs and measures have been informed by traditional activities, cultural resources, and land use as such may be implicated or impacted by ongoing Project activities. All plans are to include a feedback mechanism for consulting with residents of the Kivalliq, including the provision of

	results from the Proponent's wildlife monitoring programs to each community. The Proponent shall submit updated plans to the NIRB within 30 days of their revision and/or finalization.
Reporting Requirements:	Updated plans shall be submitted to the NIRB 30 days prior to their revision/finalization. Further, the Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring, adaptive management strategies, consultation, and contribution efforts undertaken) to the NIRB through the Proponent's annual monitoring report. Plans should explain specifically how the information will be shared with the wider regional socio-economic monitoring committee throughout the life of the Project.

Non-Traditional Land Use and Resource Use

Term and Condition No.	**104**
Category:	Non-Traditional Land Use and Resource Use – Consultation with outfitters and guides
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	It is important that the Proponent have an accurate understanding of land use patterns near Project activities in order to properly assess safety precautions that may be needed to protect human and environmental health, as well as to understand where these uses may be impacted by Project activities.
Term or Condition:	The Proponent is encouraged to consult with outfitting and guiding businesses that operate in the LSA and RSA regarding use of the area, specifically as it relates to hunting, fishing and guiding within proximity of the AWAR. Results of this consultation should be incorporated into updated plans where applicable.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including results of monitoring, adaptive management strategies, consultation, and contribution efforts) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	**105**
Category:	Non-Traditional Land Use and Resource Use – Hunter harvest survey
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Where possible, relevant information obtained from non-traditional land uses such as outfitting and guiding may help in improving the robustness of the hunter harvest survey to be carried out by the Proponent.
Term or Condition:	The Proponent is strongly encouraged to consider incorporating information obtained from local outfitting and guiding businesses into its

	Hunter Harvest Survey where possible, and to include these organizations as potential respondents to surveys undertaken.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including results of monitoring, adaptive management strategies, consultation, and contribution efforts) to the NIRB through the Proponent's annual monitoring report and shared with the wider regional Socio-Economic Monitoring Committee throughout the life of the Project.

Cultural, Archaeological and Paleontological Resources

Term and Condition No.	**106**
Category:	Cultural, Archaeological and Paleontological Resources – Inspection reporting
Responsible Parties:	The Proponent, GN
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	It is important that the Proponent and the GN determine a mutually agreeable schedule for the Proponent's reporting of inspection results, as this information may be needed for adjustments to mitigation and/or monitoring measures and programs.
Term or Condition:	The Proponent shall, in consultation with the Government of Nunavut's Territorial Archaeologist, determine a reporting frequency for the provision of inspection reports to the Government of Nunavut regarding the status of the Meliadine River Bridge, the Char River Bridge, and the M5 Bridge Crossing during the spring freshet period (mid-May to June) and during the remainder of the ice-free period to freeze-up (July to October).
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Term and Condition No.	**107**
Category:	Cultural, Archaeological and Paleontological Resources – Mitigation of ice buildup
Responsible Parties:	The Proponent, GN
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	It is important that a plan be developed to address ice buildup at various Project bridge crossings in order to ensure the protection of archaeological resources.
Term or Condition:	The Proponent shall consult with the Government of Nunavut – Department of Culture and Heritage in developing a mitigation plan to address ice buildup at the Meliadine River Bridge, the Char River Bridge, and the Bridge Crossing at M5. The Proponent shall submit this mitigation plan to the NIRB once finalized.
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Individual and Community Wellness

Term and Condition No.	108
Category:	Individual and Community Wellness – Counseling and treatment programs
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To make available, necessary treatment and counseling services for employee and family well-being.
Term or Condition:	The Proponent is encouraged to consider providing access to counseling and treatment programs for substance and gambling addictions, and programs which address domestic, parenting, and marital issues that could affect employees and/or their families.
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Term and Condition No.	109
Category:	Individual and Community Wellness – Indirect impacts to health and well-being
Responsible Parties:	The Proponent, KSEMC
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To understand the indirect impacts of the Project upon health and well-being
Term or Condition:	The Proponent is encouraged to work with the Kivalliq Socio-Economic Monitoring Committee to monitor potential indirect effects of the Project, including indicators such as the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases and others as deemed appropriate.
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Term and Condition No.	110
Category:	Individual and Community Wellness – Employee cohesion
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To encourage the on-site cohesion and wellbeing of employees through cultural awareness and wellness programs
Term or Condition:	The Proponent shall provide the NIRB with a description of wellness and cultural diversity/acceptance programming made available to employees and family or community members and shall report the following information with respect to each program to the NIRB annually: a. Language of instruction;

	b. Uptake by employees and/or family members where relevant, noting Inuit and non-Inuit participation rates; c. Completion rates for enrolled participants, noting Inuit and non-Inuit rates; and d. Issues as may relate to program content which may have been noted or present either on site or in the community and which affect Project employment or employee wellness.
Reporting Requirements:	Summaries of all cross-cultural training initiatives should be provided in the annual Meliadine Socio-Economic Monitoring Report.

Term and Condition No.	**111**
Category:	Individual and Community Wellness – Employee training opportunities
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To understand how the Proponent's employee training programs are delivered and received, including uptake and completion rates by Inuit and non-Inuit staff.
Term or Condition:	In its annual reporting to the NIRB, the Proponent is strongly encouraged to provide detailed descriptions of all employee programs and training including: a. Descriptions of the goals of each program offered; b. Language of instruction; c. Schedules and location(s) of when each program was offered; a. Uptake by employees and/or family members where relevant, noting Inuit and non-Inuit participation rates; and, b. Completion rates for enrolled participants, noting Inuit and non-Inuit rates.
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Term and Condition No.	**112**
Category:	Individual and Community Wellness – Access to housing
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To investigate ways that economic development and self-reliance may improve access to housing by employees.
Term or Condition:	The Proponent is encouraged to investigate measures and programs designed to assist Project employees with pursuing home ownership or accessing affordable housing options.
Reporting Requirements:	Provided the sharing of such information is consistent with and not limited by the terms and conditions of any applicable Inuit Impact Benefit Agreement, these efforts should be reported to the NIRB within the annual Meliadine Socio-Economic Monitoring Report.

Community Infrastructure

Term and Condition No.	113
Category:	Community Infrastructure – Access to public housing
Responsible Parties:	The Proponent, KSEMC, GN-Nunavut Housing Corporation
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To inform the territory with respect to current housing rates, needs, and intentions to migrate may provide the GN with insight as to where additional resources may need to be devoted, based on trends that can be identified.
Term or Condition:	The Proponent is encouraged to collaborate with the Kivalliq Socio-Economic Monitoring Committee and the Government of Nunavut – Nunavut Housing Corporation, to design and implement a voluntary employee survey to be completed on an annual basis in order to to identify any changes of address, detailed occupancy status (i.e., public/social, privately owned/rented, government, number of people sharing the resident space, etc.), housing preferences, migration intentions, and reasons for migration while respecting confidentiality of all person involved. Non-confidential results of the survey are to be reported to the Government of Nunavut and the Nunavut Impact Review Board.
Reporting Requirements:	The frequency and content of the survey should be determined by the collaborating parties, but content may include changes to address, housing status (i.e., public/social, privately owned/rented, government, etc.) and migration intentions of Project employees. Non-confidential results of the survey should be reported to the GN and other members of the Socio-economic Monitoring Committee and summary information of these results should be reported to the NIRB within the annual Meliadine Socio-Economic Monitoring Report.

Term and Condition No.	114
Category:	Community Infrastructure – Financial literacy and planning programs
Responsible Parties:	The Proponent, GN-Nunavut Housing Corporation
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure accurate and helpful information is passed to Project employees relating to financial literacy and housing/homeownership.
Term or Condition:	The Proponent is encouraged to collaborate with the Government of Nunavut – Nunavut Housing Corporation prior to the development and inception of its programs relating to financial literacy and planning to ensure that relevant and accurate information about housing and home ownership is available and considered for inclusion.
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Term and Condition No.	115
Category:	Community Infrastructure – Impacts to health services
Responsible Parties:	The Proponent, Government of Nunavut
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	It is important to understand potential Project-specific impacts to the local health services, as well as to ensure a clear procedure is developed for Project employee medical referrals.
Term or Condition:	The Proponent is encouraged to work collaboratively with the Government of Nunavut Department of Health to monitor the impacts of the Meliadine Gold Project on health services within the LSA communities and specifically, Rankin Inlet.
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Public and Worker Health and Safety

Term and Condition No.	116
Category:	Public and Worker Health and Safety – Air quality monitoring
Responsible Parties:	The Proponent, Government of Nunavut
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	Adequate analysis of particulate matter is required in order to understand the potential impacts to human health.
Term or Condition:	The Proponent shall update the air quality monitoring aspect of its environmental and health risk monitoring program to include the following parameters for particulate matter: a. An analysis of the metals content of the dust collected in passive monitoring; and b. Discrete samples to be collected on a frequency to be determined in collaboration with the Government of Nunavut, from the camp, and analyzed for acrolein and aldehyde. Results are to be incorporated into the Proponent's annual reporting for submission to the NIRB.
Reporting Requirements:	If required, updated information regarding mitigation measures or management plans should be provided to the NIRB at least 90 days following issuance of the amended Project Certificate, and subsequent modifications to these plans should be identified and included in the Proponent's annual report to the NIRB.

Other Terms and Conditions

Accidents and Malfunctions

Term and Condition No.	117
Category:	Accidents and Malfunctions – All-weather access road
Responsible Parties:	The Proponent, Kivalliq Inuit Association, Hamlet of Rankin Inlet, community members
Project Phase:	Pre-Construction
Objective:	To ensure overall safety through design and operation of the road, in accordance with relevant legislation and regulatory requirements
Term or Condition:	Prior to construction Phase 2 of the all-weather access road and the Rankin Inlet bypass road, the Proponent shall consult applicable laws in Canada and Nunavut as well as meet with all regulatory agencies and the public as it finalizes its road operations plans.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring, adaptive management strategies, and consultation) to the NIRB through the Proponent's annual monitoring report.

Commentary: *The reference to meeting with "all regulatory agencies" is intended to be all "relevant" regulatory agencies with a mandate in relation to the all-weather access road.*

Term and Condition No.	118
Category:	Accidents and Malfunctions – All-weather access road
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure adequate monitoring of wildlife presence informs road management and operations
Term or Condition:	The Proponent shall include in an updated Terrestrial Wildlife Management and Monitoring Plan (TEMMP), plans for increased caribou monitoring efforts including weekly winter track surveying and summer and fall surveys undertaken on foot twice per month. These results shall be reported to the NIRB with the Proponent's annual reporting requirements.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including results of monitoring, adaptive management strategies, consultation, and contribution efforts) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	119
Category:	Accidents and Malfunctions – All-weather access road
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring

Objective:	To mitigate potential interactions of caribou with traffic along the AWAR
Term or Condition:	The Proponent shall include within its updated Terrestrial Wildlife Management and Monitoring Plan, a commitment to establishing deterrents along the AWAR at any areas where it is observed that caribou are attracted to the AWAR and their presence may present a risk of collisions with traffic along the AWAR (such as areas where caribou are utilizing the AWAR to facilitate movement, areas where caribou may be licking minerals/road salt from the road, areas where caribou are gathering to avoid insects, etc.).
Reporting Requirements:	The updated plan should be submitted to the NIRB at least 90 days prior to the start of construction. Implementation of these measures, updates to the Plan, and monitoring results shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	**120**
Category:	Accidents and Malfunctions – Marine shipping
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure protection of the marine environment
Term or Condition:	The Proponent shall contract only Transport Canada certified shippers to carry cargo for the Project, and will ensure shippers are aware of the requirements of the Shipping Management Plan, the Risk Management and Emergency Response Plan and the Oil Pollution Emergency Plan (OPEP).
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition to the NIRB through the Proponent's annual monitoring report.

Commentary: *As clarified by Transport Canada, Transport Canada certifies "vessels" or "ships" and not the "shippers" themselves. The Term and Condition should be implemented with the recognition that the Proponent intends to use Canadian-flagged ships or vessels only.*

Term and Condition No.	**121**
Category:	Accidents and Malfunctions – Marine shipping
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure protection of the marine environment
Term or Condition:	The Proponent shall monitor the ingress/egress of Project related ships at Rankin Inlet and report any accidents or spills immediately to the regulatory agencies as required by law and to NIRB's Monitoring Officer.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	122
Category:	Accidents and Malfunctions – Marine shipping
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure protection of the marine environment
Term or Condition:	The Proponent shall ensure that best practices are used at all times during ship to shore and other marine-based fuel transfer events, including implementing measures specifically designed to prevent leaks and spills resulting from ice forming on the hoses during fuel transfers.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this term and condition (including the results of monitoring or adaptive management strategies) to the NIRB through the Proponent's annual monitoring report.

Term and Condition No.	123
Category:	Accidents and Malfunctions – Marine shipping
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure protection of the marine environment
Term or Condition:	The Proponent shall ensure that the necessary spill response equipment and training is available prior to commencing project shipping.
Reporting Requirements:	Evidence of meeting the requirements of this term and condition shall be submitted as part of the Proponent's annual reporting to the NIRB.

Term and Condition No.	124
Category:	Accidents and Malfunctions – Spill preparedness
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure protection of local water resources
Term or Condition:	Prior to construction, the Proponent shall update its Spill Contingency Plan specific to a major spill event occurring on the bypass road and within proximity to (and including potential spills into) Nipissar Lake.
Reporting Requirements:	The updated plan should be submitted to the NIRB at least 90 days prior to the start of construction. Implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	125
Category:	Accidents and Malfunctions – All-weather access road
Responsible Parties:	The Proponent

Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure rules for use of the road are clearly communicated in the interest of providing for the health and safety of all users of the AWAR
Term or Condition:	The Proponent shall implement all such measures necessary to protect public and mine traffic on all Project roads. The measures undertaken shall include, but are not limited to: a. Prior to expansion of the AWAR, the Proponent shall update its Roads Management Plan to include a detailed consultation plan specifying the methods the Proponent will use to provide the Kivalliq Inuit Association, members of the Hunters and Trappers Organizations in the area, residents of Rankin Inlet and the Hamlet of Rankin Inlet with information regarding the safety requirements of AWAR use. The updated Plan is to be submitted to the Nunavut Impact Review Board, Kivalliq Inuit Association, Kangiqliniq Hunters and Trappers Organization, and the Government of Nunavut; b. Prior to the opening of the AWAR to the public, and annually thereafter, advertise and hold at least one community meeting in the Hamlet of Rankin Inlet and Chesterfield Inlet to explain to the community the rules for use of the road; c. Prior to the opening of the AWAR to the public, the Proponent shall address enforcement of health and safety rules for the operation of the road (i.e., no shooting zone) and implement necessary communications with the public (i.e., signage and public meetings), which includes, but is not limited to: i. Maintaining manned and unmanned gates as proposed along the all-weather access road; ii. The posting of signs in English and Inuktitut along the road at appropriate intervals (i.e., 10 km and bridge crossings); and iii. Place notices at least quarterly on the radio and television to explain to the community the rules for use of the road; d. Once the AWAR expansion is completed and the road is opened to the public, the Proponent shall conduct a vehicle survey four times annually (once during the weekdays during the winter season, once during the week end days during the winter season, once during the weekdays during the summer season and once during the week end days during the summer season) to record the number and types of mine vehicles and the number and type of public vehicles using the AWAR over a 12 hour period (8:00 am to 8:00 pm). The vehicle survey data shall be collated as indicated above and provided in the Proponent's Annual Report;

	e. Prior to the development of the Discovery deposit, the Proponent shall update its Road Management Plan for the planned operation of the twinned road which could include additional rules, Project infrastructure, or other measures designed to maintain safety for employees and the public; and f. Report all accidents or other safety incidents on the road, to the Government of Nunavut, Kivalliq Inuit Association, the Hamlet of Rankin Inlet and the NIRB immediately.
Reporting Requirements:	The updated plan should be submitted to the NIRB at least 90 days prior to the start of construction of Phase 2 of the AWAR. As noted in the Board's decision on the Saline Effluent Discharge to the Marine Environment proposal, updated plans shall be submitted to the NIRB prior to undertaking transport of saline groundwater from the Meliadine site to the temporary storage tank near Rankin Inlet. Implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Commentary: *The reference under the Reporting Requirements to "90 days prior to the start of construction" is not intended to be tied to general project construction, but rather is intended to be linked to 90 days prior to the construction associated with the expansion of the AWAR (referred to as "Phase 2 of the AWAR development" in the Proponent's Final Environmental Impact Statement).*

Alternatives Analysis

Term and Condition No.	**126**
Category:	Alternatives Analysis – All-weather access road
Responsible Parties:	The Proponent
Project Phase:	Pre-Construction
Objective:	To ensure clear and consistent communication of safety requirements and road use limitations to inform members of the public
Term or Condition:	Prior to expansion of the AWAR, the Proponent shall prepare and add to the finalized Roads Management Plan (SD 2-9), a detailed consultation plan specifying the methods the Proponent will use to provide the Kivalliq Inuit Association, members of the Hunters and Trappers Organizations in the area, residents of Rankin Inlet and the Hamlet of Rankin Inlet with information regarding the safety requirements and any limitations on public AWAR use (i.e. the "rules of the road") and to ensure that this information continues to be clearly communicated on an on-going basis while the public has access to the AWAR.
Reporting Requirements:	The updated plan should be submitted to the NIRB at least 90 days prior to the start of construction. Implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Term and Condition No.	127
Category:	Alternatives Analysis – Marine shipping
Responsible Parties:	The Proponent, Kivalliq Inuit Association, Kivalliq HTOs
Project Phase:	Pre-Construction, Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective:	To ensure adaptive management measures are available to address impacts to marine mammals
Term or Condition:	The Proponent shall, in coordination and consultation with the Kivalliq Inuit Association and the Hunters and Trappers Organizations of the Kivalliq communities, provide updates to its Shipping Management Plan to identify adaptive management measures that will be employed if effects monitoring identifies potential for effects on marine mammal populations along the shipping route.
Reporting Requirements:	The updated plan should be submitted to the NIRB at least 90 days prior to the start of construction. Implementation of these measures and monitoring results as well as any subsequent updates to the Plan, shall be reported and discussed in the Proponent's annual report to the NIRB.

Saline Effluent Disposal New Terms and Conditions

NEW Term and Condition No.	128
Category:	Marine Environment
Responsible Parties:	The Proponent, Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC), Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
Project Phase:	Operations, Care and Maintenance, Closure
Objective:	To assess the environmental impact of the Project on the seabed and marine environment if the effluent discharge pipeline is abandoned in place or removed.
Term or Condition:	The Proponent shall provide the NIRB with a detailed design for the system that includes the location of the pipeline in relation to the saline effluent storage tank at Itivia, the location of submerged collars supporting the pipeline and the design of the diffuser.
Reporting Requirements:	To be provided to the Nunavut Impact Review Board at least 90 days prior to construction of the effluent pipeline and diffuser system.

NEW Term and Condition No.	129
Category:	Marine Environment
Responsible Parties:	The Proponent and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
Project Phase:	Operations, care and maintenance, and closure

Objective:	To assess the environmental impact of the Project on the seabed and marine environment if the effluent discharge pipeline is abandoned in place or removed.
Term or Condition:	The Proponent shall conduct and submit to the Board a hazard and operability assessment of the pipeline and marine outfall system as part of the land authorization process.
Reporting Requirements:	To be provided to the Nunavut Impact Review Board at least 90 days prior to operation of the effluent pipeline and diffuser system.

NEW Term and Condition No.	**130**
Category:	Marine Environment
Responsible Parties:	The Proponent, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Environment and Climate Change Canada (ECCC), and Fisheries and Oceans Canada (DFO)
Project Phase:	Operations, care and maintenance, and closure
Objective:	To assess the environmental impact of the Project on the seabed and marine environment if the effluent discharge pipeline is abandoned in place or removed.
Term or Condition:	The Proponent shall remove the subsea pipeline and diffuser in Melvin Bay when the pipeline is no longer in use unless it can be demonstrated to the satisfaction of the Nunavut Impact Review Board that this infrastructure will provide a net positive environmental effect to the local ecosystem.
Reporting Requirements:	Information necessary to support an application for removal of the subsea pipeline and diffuser must be provided to the Nunavut Impact Review Board for consideration at least 12 months prior to planned removal.

NEW Term and Condition No.	**131**
Category:	Marine Environment
Responsible Parties:	The Proponent
Project Phase:	Operations, care and maintenance, and closure
Objective:	To prevent adverse impacts to community travel and use of local marine areas.
Term or Condition:	The Proponent shall ensure its Marine Environment Management Plan addresses a procedure for engagement with the Kangiqliniq Hunters and Trappers Organization (HTO) to confirm the commencement and ending of the open water season for marine effluent discharge each year. The Proponent shall also engage with the HTO and the community of Rankin Inlet when developing a program for monitoring saline effluent temperature going into the subsea pipeline, ice thickness on Melvin Bay in the vicinity of the discharge and determining appropriate communication and safety protocols applicable for travel by community members through Itivia and Melvin Bay.

Reporting Requirements:	A summary of actions taken are to be included in the Proponent's annual reporting to the NIRB.

APPENDIX A – MONITORING PROGRAM

[To be developed]

APPENDIX B

Arctic Raptor Research Program, 2018

KIVALLIQ PEREGRINE FALCON MONITIRORING: 2017 REPORT TO GOVERNMENT OF NUNAVUT

Introduction

The peregrine falcon (*Falco peregrinus*) is one of the most intensively studied raptor species in the world (for example, Olsen and Olsen 1989, Ratcliffe 1993, Rosenfield et al. 1995, Quinn and Kokorev 2000, Ganusevich et al. 2004, Anctil et al. 2013a). In North America, interest was focused on this species due to well-established population declines associated with contamination from organochlorine pesticides (for example, Enderson et al. 1968, Peakall and Kiff 1979, Peakall et al. 1983, Risebrough and Peakall 1988, Ellis et al. 1989, Court et al. 1990, Franke et al. 2010). Wide-scale population declines in North America were first summarized at the 1965 Madison Peregrine Falcon Conference (Hickey 1969), and were found to be extensive in the United States (virtually total extirpation in the east and severe declines in the west) and throughout southern parts of Canada east of the Rocky Mountains. Of the 3 sub-species that exist in the North America, the American peregrine falcon (*F. p. anatum*) and Arctic peregrine (*F. p. tundrius*) were listed as "endangered" in the United States pursuant to the Endangered Species Act (ESA 1973, as amended) in 1970; the Peale's peregrine (*F. p. pealei*) was never listed in the United States. In Canada, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed the American peregrine as "endangered", the Arctic peregrine as "threatened", and the Peale's peregrine as "special concern" pursuant to the Species at Risk Act (SARA 2002, as amended) in 1978. Historically, the northern portion (boreal, sub-arctic and arctic) of the peregrine falcon population was thought to be large, and potentially accounted for as much as 80% of the total population in North America (Kiff 1988). However, the spatial extent over which surveys can realistically occur constrains data collection over geographic spatial scales (Cade 2013). Northern-breeding American and Arctic peregrines are highly migratory (Yates et al. 1988, Schmutz et al. 1991, Fuller et al. 1998). In the United States, the Arctic peregrine and American peregrine were removed from the list of endangered species in 1994 (USFWS 1998) and in 1999 (USFWS 1999a), respectively. In Canada, the Arctic peregrine and American peregrine were evaluated together (rather than as separate sub-species) and down-listed by COSEWIC to Special Concern in 2007, and were legally listed as such on Schedule 1 of the Species at Risk Act in 2012.

There is one long-term study on Peregrine Falcons in Rankin Inlet, Nunavut. Population monitoring at Rankin Inlet was initially motivated by the need to understand the processes responsible for reproductive failure, and with the exception of one year (2001), has been conducted annually since 1980. Much of the information on the ecology and toxicology of Arctic peregrine falcons has resulted from the research conducted on this population (Court 1986, Court et al. 1988a, Court et al. 1988b, Bradley 1989, Court et al. 1989, Court et al. 1990, Bradley and Oliphant 1991, Johnstone et al. 1996, Bradley et al. 1997, Johnstone 1998, Franke et al. 2010, Franke et al. 2011b, Anctil and Franke 2013, Anctil et al. 2013a, Franke et al. 2013, L'Hérault et al. 2013, Franke et al. 2016, Lamarre et al. 2017). The objective of this work is part of a commitment to provide annual updates to the Government of Nunavut with regard to monitoring of the population of peregrine falcons breeding near Rankin Inlet, Nunavut.

Background

The Rankin Inlet Peregrine Falcon study population was discovered in the late 1970s, but its size and density was not appreciated until intensive surveys were conducted in 1980-81. Critical nesting habitat and an abundance of marine and terrestrial prey make the area ideal for Peregrine Falcons and other nesting predatory birds. The entire area is accessible by snowmobile, ATV, and boat, allowing a systematic search of nesting territories for banded and unbanded adult birds. Acccess to nesting sites for collecting productivity data and banding of young poses few problems.

A variety of research partners and the Government of Nunavut have been involved in the project since 1981. Up to 1996, graduate students from the Universities of Alberta and Saskatchewan conducted and managed the project and the government provided field equipment and logistical support. Research projects included detailed studies of life history, pesticide contamination, diet, and a series of investigations based on individually identified (banded) birds. These studies, and on-going monitoring by the government, have produced one of the longest continuous data sets on reproductive success and contaminant burdens for nesting Peregrine Falcons anywhere in the world. These data allow for an assessment of trends in pesticide residues from peregrines and their primary prey species over three decades. These data, combined with detailed information on Peregrine Falcon reproductive performance, have been referenced numerous times in research journals and status reports that provide management actions for falcons

throughout North America. Additionally, data collected at Rankin Inlet has allowed immediate assessment of factors that may impact falcon populations throughout Nunavut. As such, the falcon population at Rankin Inlet is widely recognized as one of the best "indicator" populations of Peregrine Falcons in North America. The unique, detailed, long-term data set includes demographic attributes such as the annual number of occupied territories, the number of pairs to produce young, and the total number of young fledged. Both the University of Alberta and the University of Saskatchewan were involved closely with graduate students until 1996. No monitoring was conducted in 2001. However, with funding from the Government of Nunavut (GN DoE), Department of Environment, monitoring of the population resumed in earnest in 2002 and 2003.

The GN DoE contributes approximately $20,000.00 per year to the project (or approximately 10% of the overall annual budget required to fund the project). The remaining funding is raised from external sources, primarily ArcticNet, Mitacs, Peregrine Fund, Agnico Eagle Mine, Baffinland Iron Mine, Northern Scientific Training Program, and NSERC.

Study area

The study population of Peregrine Falcons is encompassed within a 1000 km^2 study area (Figure 1) near the hamlet of Rankin Inlet, Nunavut, Canada. At its peak, the density of breeding Peregrine Falcons at Rankin Inlet included 26 territorial pairs at one pair per 17 square km, a density that is among the highest for the species in the world and the highest recorded in the tundra biome. Though relatively southern for Peregrine Falcons in Canadian Arctic, (62°49'N 92°05'W), environmental conditions are as, or more, severe than any encountered in the range of the species. Passerines and small mammals comprise the bulk of the diet and lemming consumption (at least 30% of the diet biomass in any given year) increases significantly during peak abundance; more pairs attempt to breed and more young are produced during peak lemming abundance (Court et al. l988a, l988b, Bradley and Oliphant 1991). Terminology used in describing nesting activities of Peregrine Falcons and a general description of vegetation, climate, and geology of the study area are reported elsewhere (Court 1986, Court et al. l988a, l988b, 1989).

Methods

Survey Methods

Accurate determination of site occupancy and productivity is challenging if effort is limited to a single, short-term survey, particularly if the survey is conducted late in the breeding season (e.g. at a period of time typically associated with brooding or chick rearing). For this reason, between 1982 and 2017, a full census of the entire study area was conducted a minimum of twice annually. Beginning in May of each year, as Peregrine Falcons arrived from their wintering grounds, territories were surveyed by snow machine to determine the presence or absence of territorial, breeding-aged, adults. All unoccupied sites were checked until occupancy by Peregrine Falcons was confirmed or the breeding season was sufficiently advanced to conclude that the site was vacant.

In cases where sites were occupied by individuals previously fitted with unique alphanumeric color-coded leg bands, bands were read using a Questar Field Model telescope, hand held digital camera or Reconyx trail camera. If territories were occupied by unmarked individuals, effort was made to trap and mark these birds with an alphanumeric color band on one leg and a US Fish and Wildlife band on the other. In addition, we measured un-flattened wing chord, body weight, tail length, tarsus width and length, for each bird; a subjective measure of body condition, sharpness of keel, was also recorded.

After breakup of the sea-ice, territories were surveyed by boat to determine occupancy and productivity at each site; inland sites were accessed by all-terrain vehicle for the same purpose. During summer, banded adult Peregrine Falcons were identified by either trapping or visually by telescope. Unmarked individuals were trapped and banded where possible. Once nestlings reached a minimum of 25 days of age (first week of August), they too were banded. Young were considered to be successfully raised after reaching banding age, and yearly productivity is therefore defined as the number of young produced per occupied territory (Steenhof and Newton 2007, Steenhof et al. 2017).

Statistical analysis

Data exploration was carried out following the protocol described in (Zuur et al. 2010). Specifically, histograms and kernel density plots to inspect raw occupancy and productivity values

for normality. In addition, the Shapiro-Wilk test (w) for normality was used to assess whether p-values were >0.05, and w = 1 (Shapiro and Wilk 1965). Boxplots were used to detect outliers; extreme values were removed only when they were considered to be outside of the range of natural variation.

General additive models (GAM) were used to estimate annual trends for each occupancy and productivity area. Each GAM was defined as follows:

$$Y_i = \partial + f(Year_i) + \varepsilon_i \quad (1)$$

where Y_i represents the ith observation of the demographic of interest (occupancy or reproductive success), ∂ is the intercept, $f(Year_i)$ is the smoothing function, and ε_i represents a vector that contains the prediction residuals. Each GAM was estimated using the `mgcv` package in R (R Development Core Team 2017) where the amount of smoothing (effective degrees of freedom) was estimated using cross validation (Wood 2016). After fitting each GAM was validated using histograms and kernel density plots to inspect the residuals for normality. In addition, we applied the Shapiro-Wilk test (w) for normality to assess whether p-values were >0.05, and w = 1. Homogeneity of variance was assessed by plotting residual values against fitted values, and inspecting each plot to ensure that points were uniformly distributed.

Results

Model results (Figure 2, Table 1) indicated that occupancy has remained stable throughout the monitoring period. Productivity appears to have declined over the same period. Potential mechanisms for these patterns have been investigated in standalone studies (Franke et al. 2010, Franke et al. 2011a, Anctil et al. 2013b, Franke et al. 2013, Franke et al. 2016, Lamarre et al. 2017)

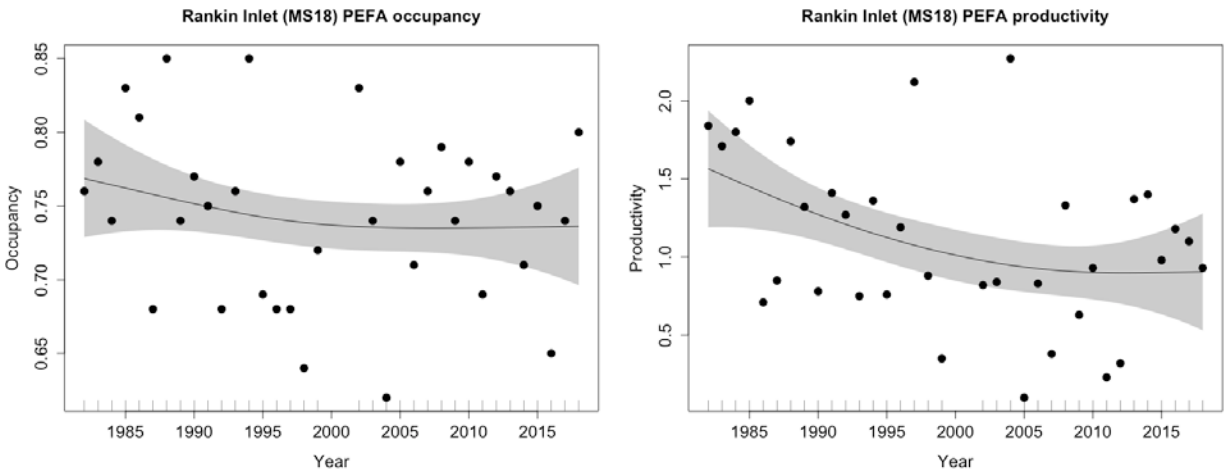

Figure 1. General additive model results for occupancy and productivity for peregrine falcons monitored near Rankin Inlet, Nunavut from 1982 – 2017.

Table 1. Model structure and smoothing terms for peregrine falcon occupancy and productivity at Rankin Inlet, NU. The intercept estimates the grand mean, we do not report a p-value as the intercept is expected to be significantly different from zero *a priori.* Effective degrees of freedom (edf) were estimated by generalized cross-validation, where higher values indicate less smoothing and lower values indicate more smoothing; significant p-values indicate improved model fit (%D, deviance explained) compared to a linear model. Non-significant *p*-values indicate highly variable data.

	Coefficient		smoothing terms				
Model	Intercept	SE	edf	p-value	D (%)	GCV	n
occupancy ~ s(year)	0.74	0.010	1.48	0.44	6.38	0.004	35
productivity ~ s(year)	1.01	0.085	1.67	0.043	19.7	0.27	35

Discussion and management considerations:

In Canada, the conservation status of the peregrine falcon has been down-graded to Special Concern (COSEWIC 2007), and in the United States, the species has been removed from the Federal list of threatened and endangered species (USFW 1999) resulting in legal harvest of wild-caught migratory Peregrine Falcons (which were used regularly for the practice of falconry (Ward and Berry 1972) from 1938 until 1970. Millsap and Allen (2006) recommended that falconry harvest rates for juvenile raptors not exceed one-half of the estimated maximum sustainable yield (MSY) up to a maximum of 5%, depending on species-specific estimates of

capacity to sustain harvest; the authors reported that passage Peregrine Falcons could withstand a harvest rate at MSY of 0.16 of annual production. The USFWS recently increased the harvest quota of passage peregrine falcons from 36 hatch year birds to 144 hatch year birds per year. On-going monitoring of the Rankin Inlet peregrine falcons population contributes to the national management plan goal to "maintain a self-sustaining population of the peregrine falcon anatum/tundrius throughout its Canadian range for the next 10 years" (Canada 2017). In addition, ongoing monitoring of this population fulfills one of Canada's obligation to the Arctic Council's Biodiversity Working Group pan-Arctic biodiversity monitoring plan to detect and report on long-term changes in Arctic biodiversity (Christensen et al. 2018). The plan recognizes a suite of focal ecosystem components (FECs) and multiple FEC attributes that are considered to be suitable indicators for ongoing ecological monitoring at the scale of the circumpolar Arctic. The Terrestrial Ecosystem Working Group (TEWG) of the Circumpolar Biodiversity Monitoring Programme (CBMP) identified the peregrine falcon (*Falco peregrinus*) and the gyrfalcon (*F. rusticolus)* as focal ecosystem components (Christensen et al. 2013), in part due to their role as top predators within Arctic food webs.

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APPENDIX C

Photographs of Non-Native Plant Occurrences



Photo 1. Photo of common Dandelion (*Taraxacum officinale*) AWAR

APPENDIX D

CESCC – Non-Native & Invasive Species In Nunavut

Non-Native & Invasive species
In Nunavut

In 2010 the Canadian Endangered Species Conservation Council (CESCC) identified 17 species not normally found in Nunavut.

These are called "non-native species". Some of these plants and animals can become an "invasive species", which represents a potential major concern for the future health of the Arctic.

What is a non-native species?

A non-native species is defined as an organism that is not normally found in a region. They are introduced by human activities, which can be intentional (e.g. species introduced to control a pest species), accidental (e.g. shipping and ballast water exchange), or environmental (e.g. changes in climate leading to wildlife movements). An example of a non-native species in Nunavut is the European Starling *(Sturnus vulgaris)*, which was introduced to North America from Europe intentionally by humans.

What is an invasive species?

Not all non-native species are considered invasive. This term is reserved for species that do so well in their new habitat that they end up causing harm to the environment, other species, human health, or economic activity (ISAC, 2006). An example of an invasive species in southern Canada is the Zebra Mussel *(Dreissena polymorpha)*, which was introduced to North America by ships releasing their ballast water. The Zebra mussel reproduces quickly and establishes large colonies on any hard surface. In this way they take over habitat occupied by native species, reducing the availability of food for other species, and also attaching themselves in great numbers to boats and other infrastructure in the water. (Benson and Raikow, 2010).

Why should you be concerned about invasive species?

When invasive species are introduced and survive, their populations can increase rapidly because there are no natural predators. Invasive species may feed on native species, compete for food and space, as well as expose native species to new parasites and disease. Invasive species are now widely recognized as a leading cause of endangerment and/or extinction of native species (Lassuy and Lewis, 2010).

There are currently no known species in Nunavut that can be classified as aquatic or terrestrial invasive species.


Scott 2011

Species: Field Sow Thistle *(Sonchus arvensis)*

Impact: The Field Sow Thistle grows quickly, easily and when there are many of them they can reduce the water resources available to other plants. They have the potential to decrease native plant diversity by competing for space and water.

Introduction pathway: Accidently introduced from Europe into North America in a containment of agricultural crop seed. This plant has been able to spread long distances across Canada because the seeds can travel far in the wind.


Sohl 2005

Species: The European Starling *(Sturnus vulgaris)*

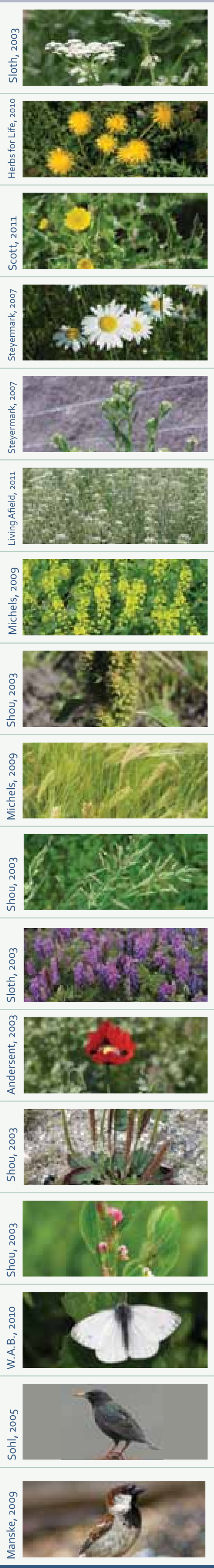
Impact: The European Starling can displace native bird species by taking over nesting sites and competing for food.

Introduction pathway: Introduced intentionally to North America from Europe. These birds then dispersed naturally into Canada through migration.

Non-Native Species in Nunavut

As of 2011, there are 17 species known to be non-native in Nunavut, these are listed below and are all terrestrial species. Please note that it is not currently known what the potential is for any of these species to become invasive and to what extent. Two species, the starling and the sow thistle are described in more detail below.

SCIENTIFIC NAME	COMMON NAME		ORGANISM TYPE
Carum carvi	Wild Caraway	Sloth, 2003	Flowering Plant
Taraxacum officinale	Common Dandelion	Herbs for Life, 2010	Flowering Plant
Sonchus arvensis	Field Sow Thistle	Scott, 2011	Flowering Plant
Leucanthemum vulgare	Oxeye Daisy	Steyermark, 2007	Flowering Plant
Thlaspi arvense	Field Pennycress	Steyermark, 2007	Flowering Plant
Capsella bursa-pastoris	Shepherd's Purse	Living Afield, 2011	Flowering Plant
Barbarea vulgaris	Yellow Rocket	Michels, 2009	Flowering Plant
Amaranthus retroflexus	Green Amaranth	Shou, 2003	Flowering Plant
Hordeum vulgare	Common Barley	Michels, 2009	Flowering Plant
Puccinellia distans	Spreading Alkali Grass	Shou, 2003	Flowering Plant
Vicia cracca	Tufted Vetch	Sloth, 2003	Flowering Plant
Papaver somniferum	Opium Poppy	Andersent, 2003	Flowering Plant
Plantago major	Common Plantain	Shou, 2003	Flowering Plant
Polygonum aviculare	Prostrate Knotweed	Shou, 2003	Flowering Plant
Pieris rapae	Cabbage White	W.A.B., 2010	Butterfly
Sturnus vulgaris	European Starling	Sohl, 2005	Passerine Bird
Passer domesticus	House Sparrow	Manske, 2009	Passerine Bird



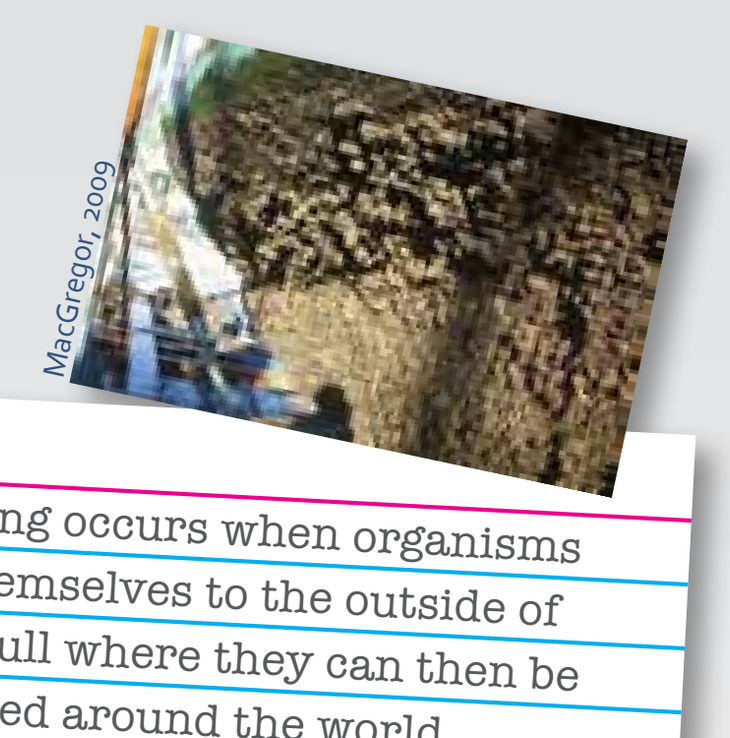
*Species photo references available upon request. Images are not to scale.

How might invasive species get into Nunavut?

Species are transported throughout the world by human activities, like shipping, which allows species to move further distances and over barriers that they could not do on their own. Nunavut remains very remote compared to the rest of Canada and so the lack of major road systems, infrequent shipping and cold climate has limited their introduction and survival.

However, as climate change alters Arctic ecosystems, it creates conditions that are more favorable to the survival and reproduction of non-native species. It also enables greater human activity and development, which gives potential invasive species more opportunities to establish themselves. (Lassuy and Lewis, 2010).

Pathways of introduction for invasive species into Nunavut


MacGregor, 2009

Hull fouling occurs when organisms attach themselves to the outside of a ship's hull where they can then be transported around the world.

* Ballast water exchange and hull fouling have the greatest potential for introducing invasive species into the aquatic ecosystems of Nunavut. Ballast water is used to stabilize ships. It is pumped aboard ships from different ports around the world and often exchanged far from the region it was obtained. This water can contain species that are not native, and may establish themselves locally.

* Seeds, insects and even small mammals can be transported around the world through the shipping of grocery produce, lumber, construction supplies, and packing materials, even dirt from someone's footwear can contain plant seeds (IASC, 2010).

* As climate continues to change in the Arctic, many terrestrial and aquatic plants and animals will move further north looking for the food and habitat they desire. These wildlife movements are not a threat when it comes to invasive species, but it is important to note that some species, (especially rare or threatened ones) may not survive the transition. Others may do well, like flying insects, which are already increasing in number in some areas of Nunavut. (IASC, 2010).

Wildlife movements are often referred to as "range extensions" where a species expands the area they can live in when the habitat and climate is favorable for them.


DeeDee 2011

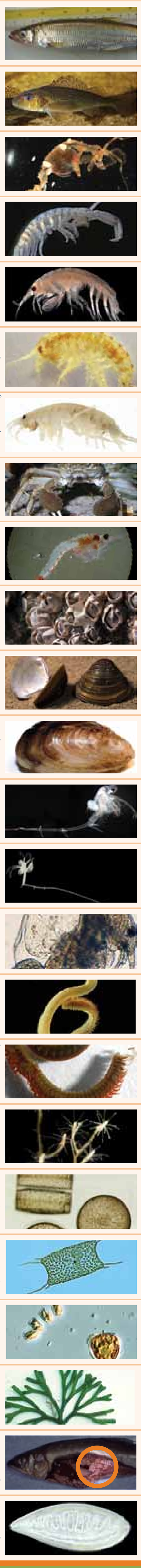
The Migratory Grasshopper *(Melanoplus sanguinipes)* is a winged insect that is widely distributed across Canada and is one example of a species that may expand its range into Nunavut.

Potential Invasive Species in Nunavut

As trade and shipping continues to increase, some aquatic invasive species known to commonly foul ship hulls and ballast waters, like the Chinese Mitten Crab, are more likely to arrive at ports around Nunavut.

A recent report commissioned by Fisheries and Oceans Canada identified a number of potential aquatic invasive species, mainly for the Hudson Bay region. The table below lists only those species considered as "High Risk" to Nunavut and they are found in freshwater & marine environments.

SCIENTIFIC NAME	COMMON NAME		ORGANISM TYPE
Osmerus mordax	**Rainbow Smelt**	NOAA.GOV	Fish
Gymnocephalus cernuus	**Ruffe**	Shou, 2003	Fish
Caprella mutica	**Skeleton Shrimp**	Christensen et.al.1995	Crustacean
Chelicorophium curvispinum	Data unavailable	home.kpn.nl	Crustacean
Dikerogammarus villosus	**Killer Shrimp**	Hillewaert, 2011	Crustacean
Gmelinoides fasciatus	Data unavailable	photosight.ru	Crustacean
Pontogammarus robustoides	Data unavailable	boldsystems.org	Crustacean
Eriocheir sinensis	**Chinese Mitten Crab**	Sloth, 2003	Crustacean
Hemimysis anomala	Data unavailable	Pothoven, 2007	Crustacean
Balanus improvisus	**Acorn Barnacle**	Shou, 2003	Crustacean
Corbicula fluminea	**Asian Clam**	Van Arkel, 2005	Mollusc
Dreissena bugensi	**Quagga Mussel**	CWSD.org	Mollusc
Bythotrephes longimanus	**Spiny Water Flea**	Meihls, 2007	Zooplankton
Cercopagis pengo	**Fishhook Water Flea**	Windsor U, N.D	Zooplankton
Eubosmina maritima	Data unavailable	io-warnemuende.de	Zooplankton
Marenzelleria cf. viridis	Data unavailable	Koli, 2006	Worm
Marenzelleria cf. wireni	Data unavailable	seaonscreen.org	Worm
Cordylophora caspia	**Freshwater Hydroid**	Galea, 2011	Hydrozoa
Coscinodiscus wailesii	Data unavailable	A.W.I., 2006	Phytoplankton
Odontella sinensi	Data unavailable	Uniport, 2002	Phytoplankton
Prorocentrum minimum	Data unavailable	Hallfors, 2002	Phytoplankton
Codium fragile ssp. tomentosoides	**Oyster Thief**	Erickson, N.D.	Algae
Glugea hertwigi	Data unavailable	Kirjastot.fi	Protozoa
Amphilina foliacea	Data unavailable	Michigan U, 1995	Parasite



*Species photo references available upon request. Images are not to scale.

How can you help?

Report

Have you seen a different plant, animal or insect in Nunavut?

You help identifying these species is important. Report the **location** where you observed the species (GPS Coordinates are very helpful) and provide a **detailed description** of the plant, animal, or insect. If possible **take a photo**.

Remember that not all non-native species are considered invasive. If you see an unknown plant or animal, it is very important to report it.

Do not take any extreme actions; the first step is reporting the species so that territorial and federal agencies can respond appropriately. We will report our findings back to you and information about the species you have observed.

Share

Keep yourself informed and educate others about non-native and invasive species. Let them know what to do if they see an unknown or uncommon species.

Report a species to your local Conservation Officer.

For More Information or if your CO is not available please contact:

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Nunavut

This project was undertaken with the financial support of:
Environment Canada Environnement Canada

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Appendix H-7

MMSO report

NUQSANA GOLDER
ENGINEERING AND ENVIRONMENTAL INC.

REPORT

Marine Mammal and Seabird Observer (MMSO) Report for the 2017 and 2018 Shipping Season

Meliadine Gold Mine in Rankin Inlet, Nunavut

Submitted to:

Agnico Eagle Mines Limited

Submitted by:

Golder Associates Ltd.

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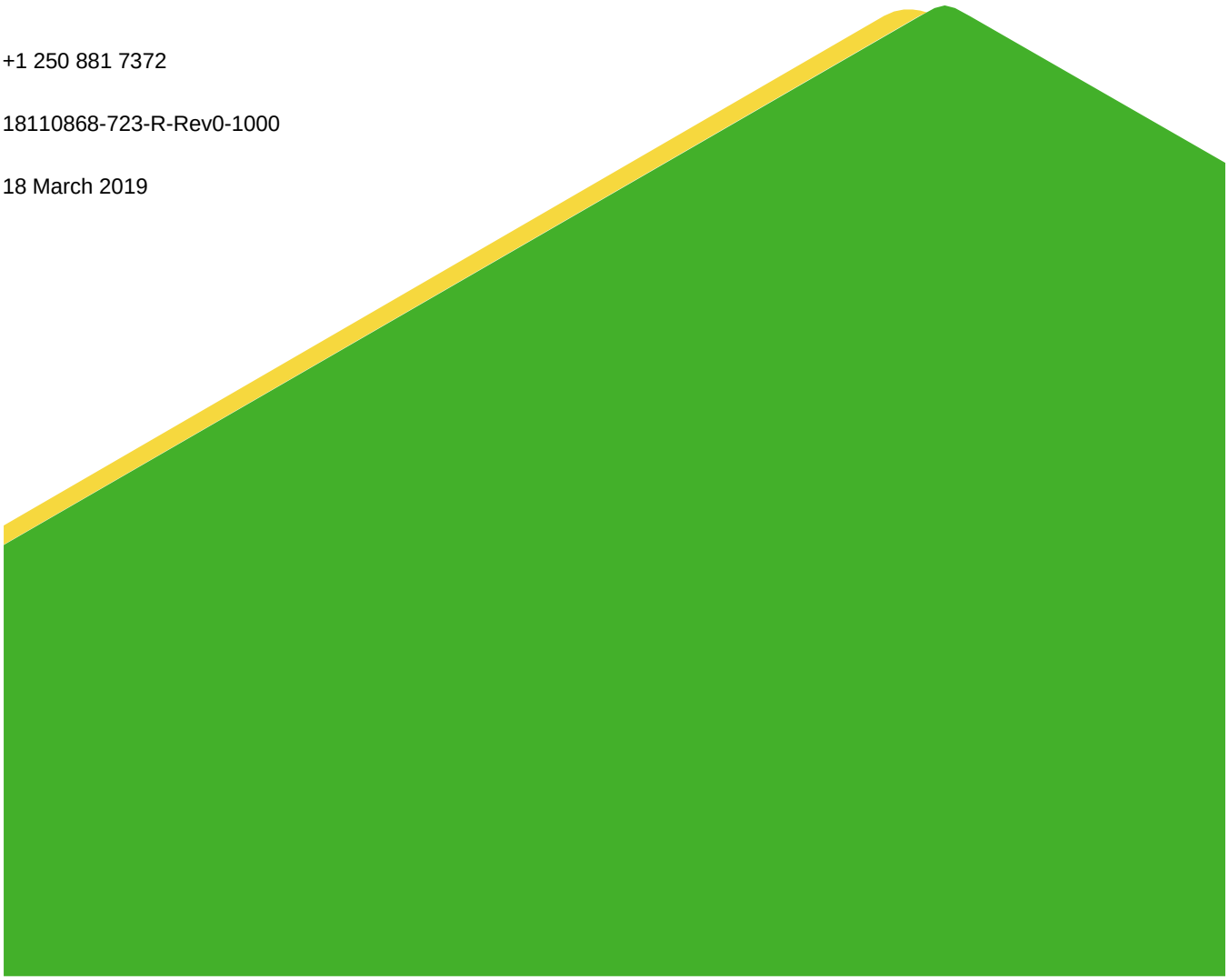
18110868-723-R-Rev0-1000

18 March 2019



Distribution List

Electronic Copy - Agnico Eagle Mines Limited

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Executive Summary

Agnico Eagle Mines Limited ships approximately 40,000 tonnes of dry cargo (equipment and supplies) and 122 million litres of diesel fuel annually for the operations of the Meliadine Gold Mine in Rankin Inlet, Nunavut. The Mine's Shipping Management Plan outlines a Marine Mammal and Seabird Observer (MMSO) program that is to be implemented by Project shipping contractors. The purpose of the MMSO program is to mitigate interactions between marine mammals and seabirds and Project vessels and to collect information on marine wildlife presence. The objective of this report is to provide additional information regarding the 2017 and 2018 MMSO program as requested by the Nunavut Impact Review Board (NIRB) during their review of the Mines 2017 annual report. This report provides an interpretation and discussion of the MMSO data collected in 2017 and 2018 by the shipping contractor Transport Desgagnés.

In 2017 the marine mammal observations were conducted from the Acadia Desgagnés and the Claude A. Desgagnés and in 2018 from the Acadia Desgagnés. Marine mammal observations were reported between 22 July to 21 September 2017 and 26 June to 24 July 2018. Five species of marine mammals were observed in 2017 including the Atlantic walrus, hooded seal, ringed seal, humpback whale, and pilot whale. No marine mammals were observed in 2018.

A maximum of 4 and 12 seabird species were recorded during moving and stationary platform surveys in 2017 (June and July) and 2018 (June to October), respectively. The density of seabirds reported are generally low, although densities estimated from 2018 moving platform data were significantly higher than in 2017.

No marine mammal-vessel interactions or birds-vessel interactions (e.g., strikes) were recorded in 2017 or 2018.

Study Limitations

On behalf of Agnico Eagle Mines Limited (Agnico Eagle), Nuqsana Golder Engineering and Environmental Consulting Inc. (Nuqsana Golder) has prepared this Marine Mammal and Seabird Observer (MMSO) Report for the 2017 and 2018 Shipping Season for the Meliadine Gold Mine in Rankin Inlet, Nunavut. The scope of work for this report was undertaken under the Master Services Agreement (MSA) between Agnico Eagle and Nuqsana Golder, made effective as of 17 April 2018 and as outlined in Nuqsana Golder work plan titled “Proposal – Marine Mammal and Seabird Observer (MMSO) report” and dated 7 January 2019.

This report was prepared, based in part, on information obtained from Transport Desgagnés through Agnico Eagle and other historic information sources. In preparing the report, Nuqsana Golder has relied in good faith on information provided. We accept no responsibility for any deficiency or inaccuracy contained in this report because of our reliance on the aforementioned information.

The findings and conclusions documented in this report have been prepared for the specific application to this Project and have been developed in a manner consistent with that level of care normally exercised by environmental professionals currently practicing under similar conditions in the jurisdiction.

With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations may change over time and should be reviewed regularly.

If new information is discovered during future work, the conclusions of this report should be re-evaluated, and the report amended, as required, prior to any reliance upon the information presented herein.

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APPENDICES

APPENDIX A
Summary of Marine Mammal Sightings and Environmental Variables Recorded by Transport Desgagnés for the 2017 and 2018 Shipping Season

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Data Sheets Recorded by Transport Desgagnés and Provided by Agnico Eagle Mines for Marine Mammal and Seabird Observations for the 2017 and 2018 Shipping Season

1.0 INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) ships approximately 40,000 tonnes of dry cargo (equipment and supplies) and 122 million litres of diesel fuel annually for the operations of the Meliadine Gold Mine (the Mine or the Project) in Rankin Inlet, Nunavut (Agnico Eagle 2018; Figure 1). To meet these needs, approximately eight ships per year are needed to deliver dry cargo and up to four additional ships per year to deliver fuel. Shipping is carried out during the open water season (typically from early July to late October; Agnico Eagle 2018). Shipping activities are carried out by Transport Desgagnés. To support the Terms and Conditions of the Mine Project Certificate, Transport Desgagnés is required to implement a Marine Mammal and Seabird Observer (MMSO) program during shipping activities in the marine Local and Regional Study Areas (Agnico Eagle (2018; Figure 2). The purpose of the MMSO program is to mitigate interactions between marine mammals, seabirds and Project vessels and to collect information on marine wildlife presence.

This report provides an interpretation and discussion of the 2017 and 2018 MMSO observations collected by Transport Desgagnés to support the Mines annual report to the Nunavut Impact Review Board (NIRB).

1.1 Objectives

The objective of this report is to present a summary of the MMSO data collected by Transport Desgagnés during the 2017 and 2018 MMSO programs including a summary of results, interpretation and discussion to support Agnico's 2018 annual report to NIRB. The comments related to the 2017 reporting of the MMSO program provided by NIRB are presented in Table 1.

Table 1: Project Certificate Terms and Conditions and Comments Provided by NIRB on the 2017 Mines Annual Report

Number	Project Certificate Terms and Conditions	Comments by NIRB
66	The Proponent shall ensure all Project vessels are checked for bird strikes after a suspected event and include details of its protocol to do so, as well as results, within its updated Terrestrial Environment Mitigation and Monitoring Plan.	While the raw data is provided in the appendix, the NIRB expects a summary of the results with interpretation and discussion to be provided within the main text of the annual report.
82	The Proponent shall require all contracted shipping companies to provide full-time marine wildlife monitoring using trained observers and established data collection and recording protocols. Monitoring plans should include provisions for all Species At Risk Act (SARA) and for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed species (birds and mammals).	While the raw data is provided, the NIRB expects a summary of the results with interpretation and discussion to be provided within the main text of the annual report. In addition, the NIRB acknowledges Environment and Climate Change Canada's comments regarding standardized protocols and databases and encourages the Proponent to follow-up.

Source: Comments from the Nunavut Impact Review Board were provided by Agnico Eagle Mines.


NUNAVUT
NUNAVUT
Foxe Basin
Hudson Bay
Hudson Strait
Foxe Channel
Cumberland Sound
BAFFIN ISLAND
CUMBERLAND PENINSULA
HALL PENINSULA
FOXE PENINSULA
MELVILLE PENINSULA
META INCOGNITA PENINSULA
BELCHER ISLANDS
Frobisher Bay
Ungava Bay
Northwest Passages
Committee Bay
Rae Strait
Ross Welcome Sound
ARCTIC CIRCLE
NEWFOUNDLAND
QUEBEC
SEE INSET MAP
Iqaluit
Kimmirut
Pangnirtung
Gjoa Haven
Taloyoak
Repulse Bay
Arctic Bay
Resolute
Kangiqsualujjuaq
Kangiqsujuaq
Kinngait
Arviat
Whale Cove
Rankin Inlet
Chesterfield Inlet
Coral Harbour
Naujaat
Kugaaruk
Kugluktuk
Cambridge Bay
Umingmaktok
Ivujivik
Salluit
Inukjuak
Puvirnituq
Akulivik
Aupaluk
Kangiqsualujjuaq
Kangirsuk
Tasiujaq
Quaqtaq
Kangiqsujuaq
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Kangirsuk
Quaqtaq
Kuujjuaq
Kuujjuarapik
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Akulivik
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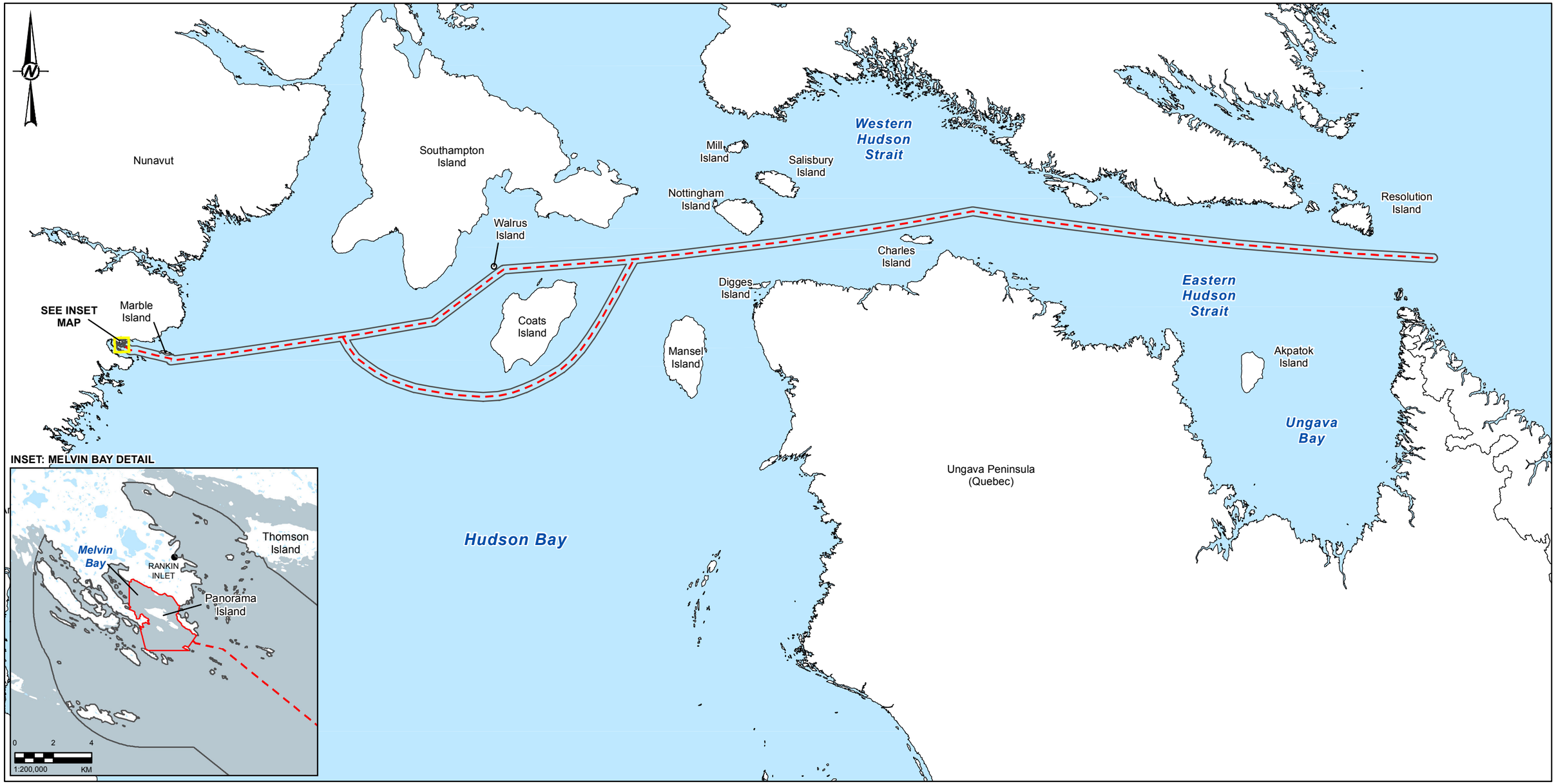

LEGEND

- SHIPPING ROUTE (APPROXIMATE)
- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY

DRAFT

0 100 200
1:4,500,000 KILOMETRES

REFERENCES

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PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
MARINE LOCAL AND REGIONAL STUDY AREA FOR THE MELIADINE GOLD MINE

PROJECT NO.	CONTROL	REV.	FIGURE
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2.0 METHODS

Nuqsana Golder has assumed that the 2017 and 2018 MMSO programs were conducted by Transport Desgagnés in accordance with the methods outlined in the Shipping Management Plan (Agnico Eagle 2018). Appendix A summarizes the MMSO data recorded by Transport Desgagnés and Appendix B provides the raw datasheets used by Transport Desgagnés and provided by Agnico Eagle.

2.1 Marine Mammal Data Analysis

This section outlines the methods used to summarize the environmental conditions, observer effort, and marine mammal sightings related to the marine mammal information recorded by Transport Desgagnés. There were not enough marine mammal sightings recorded during the 2017 and 2018 MMSO programs to conduct a density analysis.

Temporal and Spatial Observation Effort

Temporal (hours) and spatial (km) marine mammal observation effort was defined as the effort dedicated to marine mammal observations as recorded by Transport Desgagnés on the MMSO datasheets (Appendix B). Marine mammal spatial effort was calculated as linear kilometres using GPS coordinates that were recorded by Transport Desgagnés at the start and end of each MWO shift. Start and end times were recorded by Transport Desgagnés on the datasheets (Appendix B) and were used to determine temporal effort (i.e., the time spent completing marine mammal observations).

Environmental Variables

The environmental variables of ice cover (percent), wind speed and direction, sea state (Beaufort scale), weather (e.g., precipitation and cloud conditions), visibility, sun glare and sightability (combination of weather, glare, and sea state, etc.) were recorded by Transport Desgagnés on the datasheets (Appendix B) and were summarized as a percentages of observation effort.

2.2 Seabirds

This section outlines the methods used to summarize the environmental conditions, observer effort, and to provide a density estimate for seabird sightings related to the seabird information recorded by Transport Desgagnés in 2017 and 2018. Additionally, Agnico Eagle requested a comparison of seabird monitoring results from 2017 to 2018 between years to determine if there were differences.

Temporal and Spatial Observation Effort

According to seabird protocols (Agnico Eagle 2018), surveys from moving and stationary platforms are completed in 5-minute intervals. Additionally and similar to marine mammals, the number of survey hours and km were recorded as indices of effort for seabird. Seabird spatial effort was calculated as linear kilometres using GPS coordinates that were recorded by Transport Desgagnés at the start and end of each 5-minute interval. Start and end times were recorded by Transport Desgagnés on the datasheets (Appendix B) and were used to determine temporal effort (i.e., the time spent completing seabird surveys).

Environmental Variables

The same environmental variables of ice cover (percent), wind speed and direction, sea state (Beaufort scale), weather (e.g., precipitation and cloud conditions), visibility, sun glare were recorded by Transport Desgagnés on the datasheets (Appendix B). Environmental conditions were not separately summarized for seabird monitoring but are anticipated to be similar since the MMSO protocol is to alternate these programs numerous times throughout daily monitoring (Agnico Eagle 2018).

2.2.1 Data Analysis

The monitoring records prepared by Transport Desgagnés and provided by Agnico Eagle included observations of seabird counts at varying distances from moving and stationary ships (Appendix B). Sightings data from a moving vessel are analogous to line-transect sampling while observations from stationary vessel are similar to point-counts. Both can be used to estimate the density of seabirds. When distances to seabirds are measured, the density estimate can be corrected for seabirds that are farther away from the ship and harder to detect (i.e., not observed or missed). This correction is employed through use of a distance-based detection function as outlined in Buckland et al. (2001). The analysis was focussed on estimating and then comparing seabird density by year. Densities for stationary and moving surveys are presented without regard for environmental variables because preliminary review of data indicated that low sample sizes were going to be limiting (Buckland et al. 2001) and inclusion of additional model variables would decrease the precision of estimates.

Analysis of stationary and moving platform seabird data was performed using the Conventional Distance Sampling analysis engine of the Distance 7.2 software program (Thomas et. al. 2009). The initial step is to fit a detection distribution that corresponds to the sightings data. The hazard-rate, half-normal, and uniform key functions, all with cosine, simple polynomial, and hermite polynomial series expansions, were tested for fitting the data. The observation data were transformed into intervals for the fitting of the models. There is a possibility that seabirds may actively avoid the ship during the moving platform surveys (e.g., birds may dive when they are close to the ship and resurface further from the ship where they are recorded by observers). To account for this, seabird observations from moving platform surveys that were recorded within 0 to 50 m and 51 to 100 m from observers were pooled together into one distance interval (i.e., 0 to 100 m) for the moving platform data analysis.

The standard analysis method of transect surveys assumes that on average, over multiple replications of the survey, each point within the survey area has an equal likelihood of being sampled (uniform coverage probability). Because the locations of the transect lines were considered random with respect to the location of seabirds, the average density of seabirds was considered to be the same irrespective of distance from the transect line. Thus, any observed change in seabird sightings with increasing distance from the transect line was considered a change in the probability of detection, rather than a true change in bird density. The change in detection probability with respect to sighting distance from the transect line was measured to provide an estimate of the average probability of detection of a bird, which was, in turn, used to estimate the density of seabirds in the survey area. Sample size for modelling detection function should generally be at least 60 to 80 sightings, although for some purposes, as few as 40 sightings may be adequate (Buckland et al. 2001).

Models were selected using the minimum Akaike's Information Criterion (AIC) as well as consideration for fit near zero distance, where fit is most critical and not accounted for in AIC values (Buckland et. al. 2001). For moving platform surveys, these detection functions all assume 100% detection on the trackline (g(0)=1).

Distance truncation of the data was performed to remove sightings past a selected distance (i.e., 300 m), which serves to remove outliers that would otherwise inflate density and abundance estimates (i.e., observation size-bias) as well as remove hard-to-fit portions of the dataset (e.g., obvious data heaping at certain distances).

Observation data used distance analyses included on-transect sightings only. Re-sightings were not used for the estimation of any variables. The sample sizes available for estimating detection functions and seabird densities are provided in Table 2. The sample sizes indicate that accurate species-level densities can not be estimated.

Table 2: Sample Size Available for Distance Analyses

Year	Survey Type	Number of Transects / Stationary Plots for Calculating Detection Function and Density Estimates
2017 – all species	Moving Platform	30
2018 – all species	Moving Platform	54
2017 and 2018 – all species	Moving Platform	84
2017 – all species	Stationary Platform	7
2018 – all species	Stationary Platform	2
2017 and 2018 – all species	Stationary Platform	9

3.0 RESULTS

3.1 Marine Mammals

Marine mammal observations were recorded by Transport Desgagnés and provided by Agnico Eagle during the 2017 and 2018 shipping season. In 2017 the marine mammal observations were conducted from the Acadia Desgagnés and the Claude A. Desgagnés and in 2018 from the Acadia Desgagnés. Surveys were completed between 22 July to 21 September 2017 and 26 June to 24 July 2018. Marine mammal sightings were only recorded in 2017; no marine mammal sightings were recorded in 2018. No record of marine mammal-vessel interactions (e.g., strikes) were recorded by Transport Desgagnés in 2017 or 2018.

A summary of the environmental variables and marine mammal sightings recorded by Transport Desgagnés and provided by Agnico Eagle is provided in Appendix A. Data sheets for marine mammal monitoring recorded by Transport Desgagnés and provided by Agnico Eagle are provided in Appendix B.

3.1.1 Survey Effort

According to the observation records prepared by Transport Desgagnés, marine mammal observer effort included a total of 22.7 hours and 543.45 km in 2017, with six hours of effort while anchored. In 2018, observer effort included a total of 21.5 hours and 1,514.2 km in 2018 and no hours of effort while anchored.

3.1.2 Environmental Variables and Sighting Conditions

Weather

Predominant weather conditions recorded by Transport Desgagnés during the 2017 marine mammal observation program were recorded as < 50% cloud cover with no fog, rain, or snow (62% of survey effort) followed by > 50% cloud cover with no fog, rain, or snow (25% of survey effort), and solid fog (13% of survey effort; Figure 3).

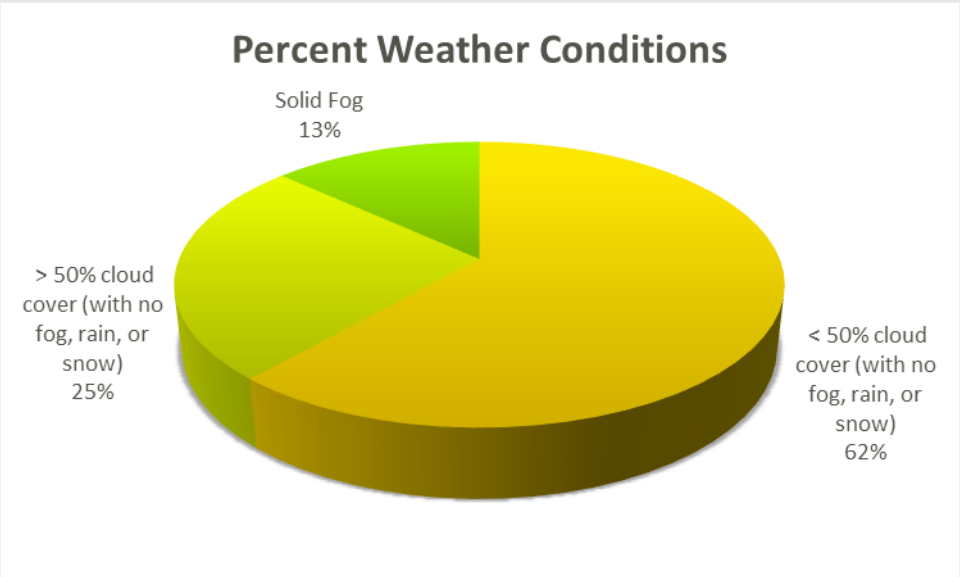


Figure 3: Percent Weather Conditions – 2017 Marine Mammal Observation Program

Predominant weather conditions during the 2018 marine mammal observation program were recorded as < 50% cloud cover with no fog, rain, or snow (44% of survey effort) and > 50% cloud cover with no fog, rain, or snow (44% of survey effort) followed by patchy fog (10% of survey effort) and fog/rain (2% of survey effort; Figure 4).

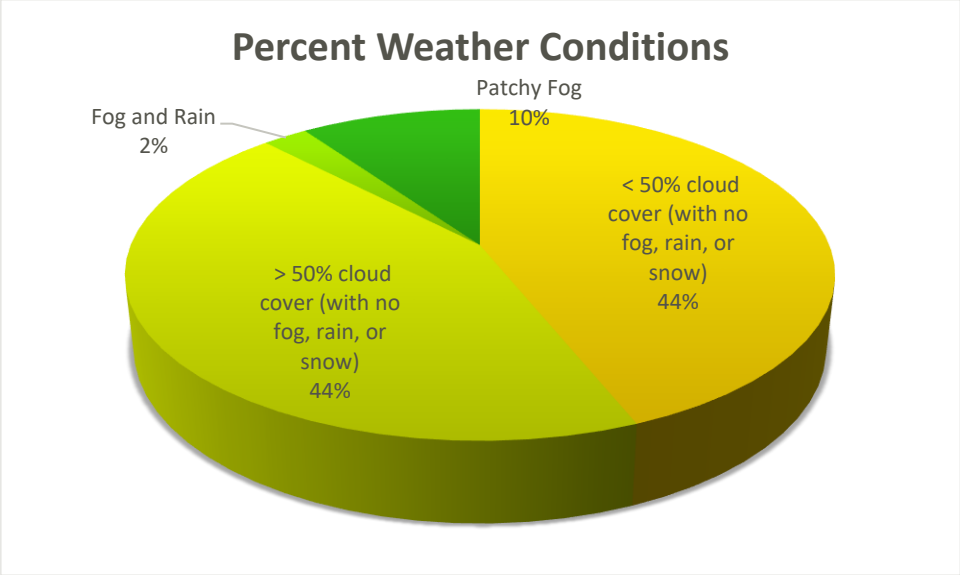


Figure 4: Percent Weather Conditions - 2018 Marine Mammal Observation Program

Visibility

Visibility recorded by Transport Desgagnés during the 2017 marine mammal observation program ranged from 1 to 10 km, on average visibility was recorded to be 9.2 km. In 2018, the marine mammal observation program recorded visibility ranging 8 to 75 km, on average visibility was recorded to be 21.93 km.

Sea State

Sea state recorded by Transport Desgagnés during the 2017 marine mammal observation program ranged from 0 (no waves, glassy) to 4 (1.2 to 2.4 m waves, Moderate Waves, Some Spray). The majority of sea state conditions were recorded as 0 (no waves, glassy; 38% of survey effort), followed by 2 (0.1 to 0.5 m waves, Smooth Wavelets; 27% of survey effort), 1 (0 to 0.1 m waves, small wavelets; 21% of survey effort), 3 (0.5 to 1.2 m waves, slight; small white caps; 9% of survey effort), and 4 (1.2 to 2.4 m waves, moderate waves, some spray; 5% of survey effort; Figure 5).

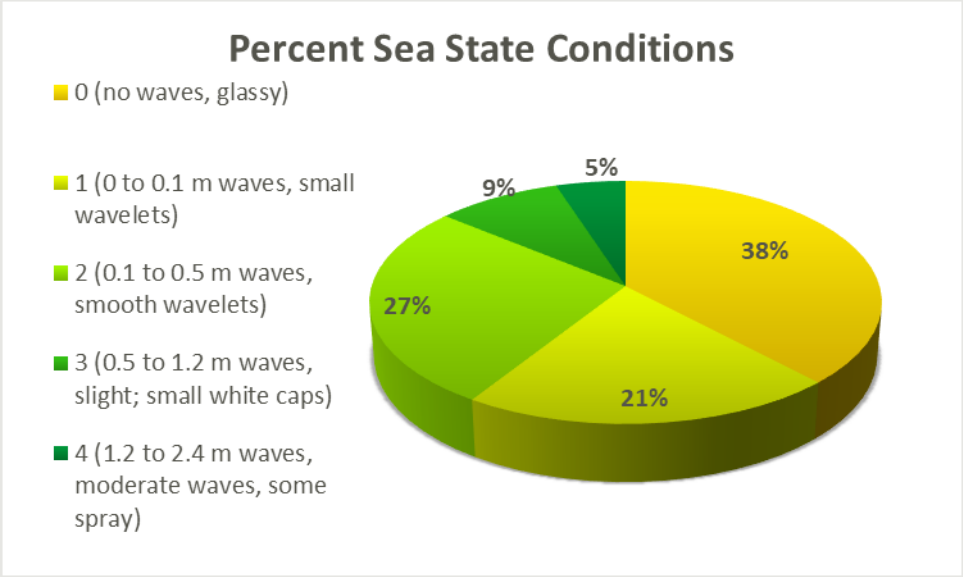


Figure 5: Percent Sea State Conditions – 2017 Marine Mammal Observation Program

In 2018, sea states recorded by Transport Desgagnés ranged from 0 (no waves, glassy) to 4 (1.2 to 2.4 m waves, moderate waves, some spray) during the marine mammal observation program. The majority of sea state conditions were recorded as 4 (1.2 to 2.4 m waves, moderate waves, some spray; 26 % of survey effort), followed by 3 (0.5 to 1.2 m waves, slight; small white caps; 23% of survey effort), 2 (0.1 to 0.5 m waves, smooth wavelets; 21% of survey effort), 1 (0 to 0.1 m waves, small wavelets; 16% of survey effort) and 0 (no waves, glassy; 14% of survey effort; Figure 6).

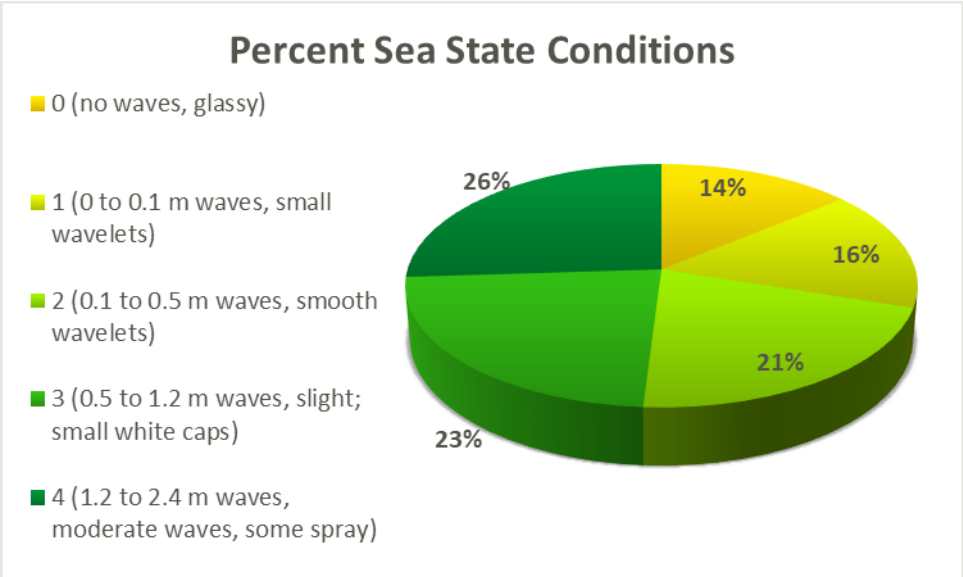


Figure 6: Sea State Conditions – 2018 Marine Mammal Observation Program

Glare Conditions

During the marine mammal observation program in 2017, glare conditions recorded by Transport Desgagnés ranged from 0 (none) to 3 (bright and forward of vessel). The majority of glare conditions were recorded as 0 (none; 41% of survey effort), followed by 2 (bright on the observer's side of the vessel; 24%), 3 (bright and forward of vessel; 24%, and 1(slight/grey) (Figure 7).

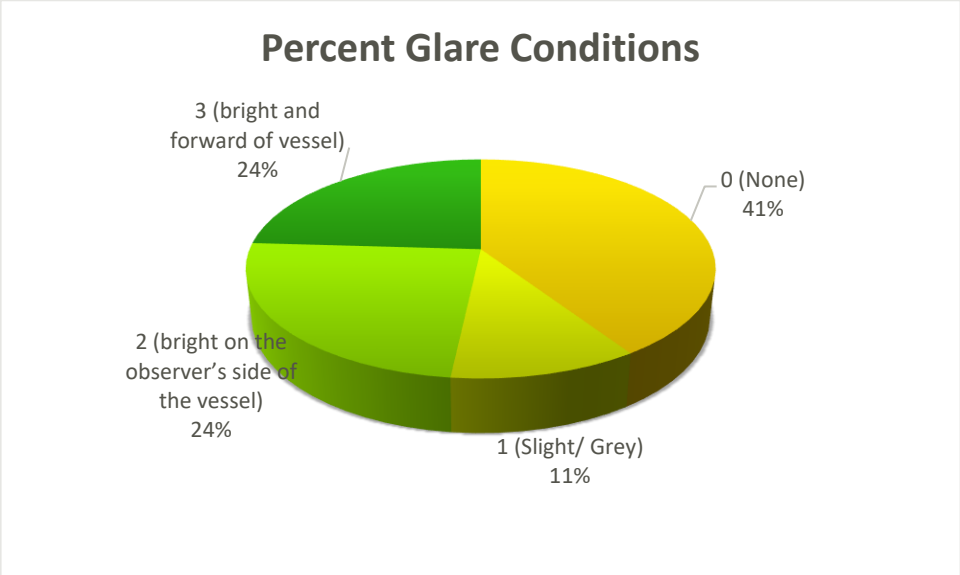


Figure 7: Glare Conditions – 2017 Marine Mammal Observation Program

During the marine mammal observation program in 2018, glare conditions recorded by Transport Desgagnés ranged from 0 (none) to 3 (bright and forward of vessel). The majority of glare conditions were recorded as 0 (none; 58% of survey effort), followed by 1 (slight/grey; 32%), 2 (bright on the observer's side of the vessel; 5%) and 3 (bright and forward of vessel; 5%) (Figure 8).

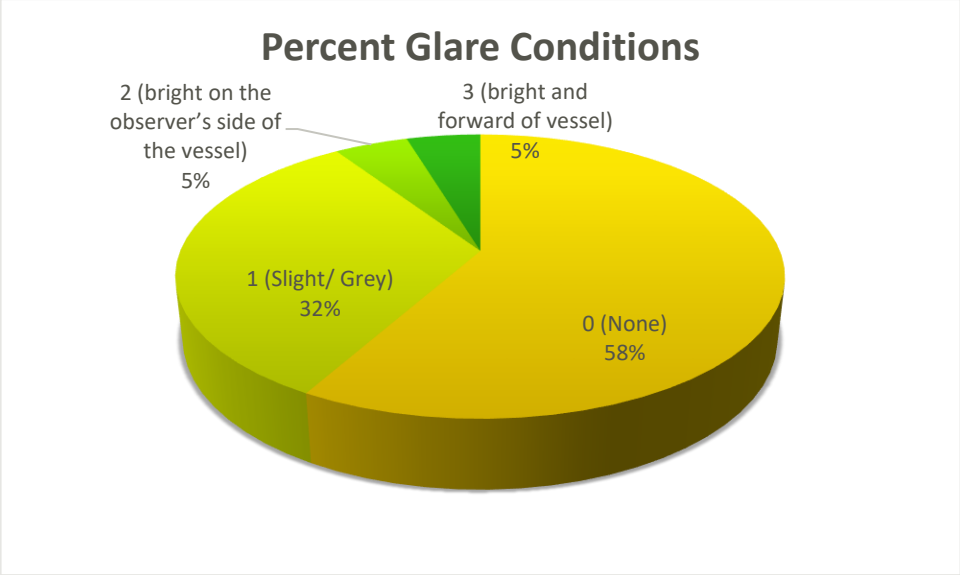


Figure 8: Glare Conditions – 2018 Marine Mammal Observation Program

Ice Concentration

Ice variables were not recorded by Transport Desgagnés during marine mammal observation program in 2017. In 2018, ice concentrations recorded by Transport Desgagnés ranged from 0 (less than one tenth cover, open water) and 5 (seven to eight tenths, close pack). Ice Conditions were predominantly recorded as 0 (none; 80% of survey effort) followed by 1 (two to three tenths, very open drift; 17%) and 5 (seven to eight tenths, close pack; 3%; Figure 9).

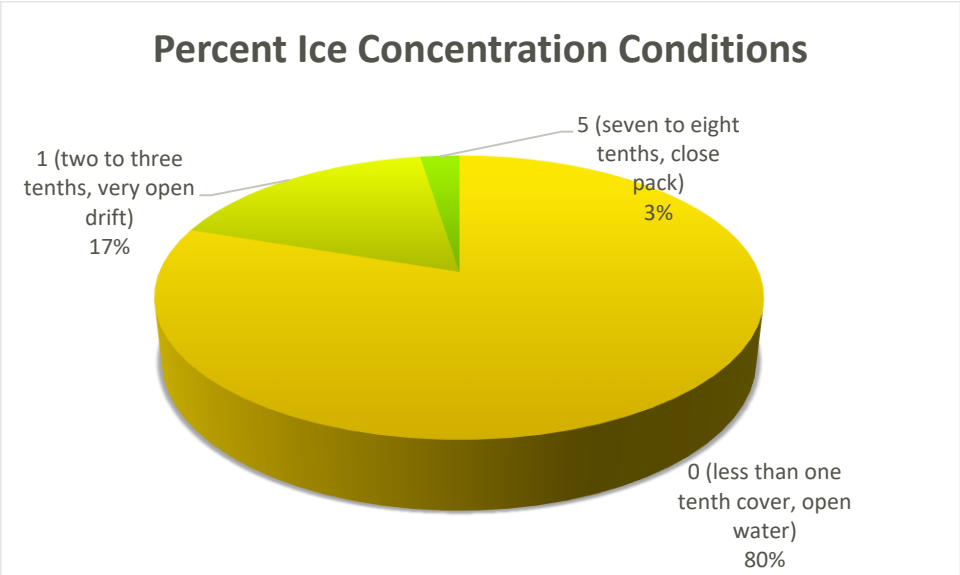


Figure 9: Ice Conditions – 2018 Marine Mammal Observation Program

3.1.3 Sightings

Five species of marine mammals were recorded by Transport Desgagnés during the MMSO Program in 2017: Atlantic walrus (*Odobenus rosmarus rosmarus*), hooded seal (*Cystophora cristata*), ringed seal (*Pusa hispida*), humpback whale (*Megaptera novaeangliae*), and pilot whale (*Globicephala melas* or *G. macrorhynchus*). Unidentified whales and seals were recorded on three occasions. Table 3 summarizes the number of marine mammal sightings recorded by Transport Desgagnés in 2017 and individuals recorded for each species. A total of 13 sightings of 48 individual marine mammals were recorded during MMSO program. All sightings recorded were observed in June and July. The most commonly identified species was Atlantic walrus (five sightings of 14 individuals), followed by ringed seal (three sightings of 12 individuals), pilot whale (one sighting of 10 individuals), and humpback whale (one sighting of five individuals).

Table 3: Marine Mammal Observations During the 2017 MMSO Program

Species	Number of Sightings	Number of Individuals
Atlantic Walrus	5	14
Hooded Seal	1	1
Humpback Whale	1	5
Pilot Whale	1	10
Ringed Seal	3	12
Unidentified Seal Species	2	2
Unidentified Marine Mammal Species	1	4

Hooded Seal

Hooded seals were recorded by Transport Desgagnés in the Eastern Hudson Strait (Figure 10). A total of one sighting of one individual hooded seal was recorded (Table 3).

Ringed Seal

Ringed seals were predominately recorded by Transport Desgagnés near Marble Island (Figure 10). A total of three sightings of 12 individual ringed seals were recorded during observations (Table 3). Group sizes ranged from single animals to a group of 10 individuals.

Unidentified Seal

Unidentified seals were recorded near Melvin Bay by Transport Desgagnés (Figure 10). A total of two sightings of two individual unidentified seals were recorded during observations (Table 3). All unidentified seals recorded by Transport Desgagnés were observed in the water or diving.

Pilot Whale

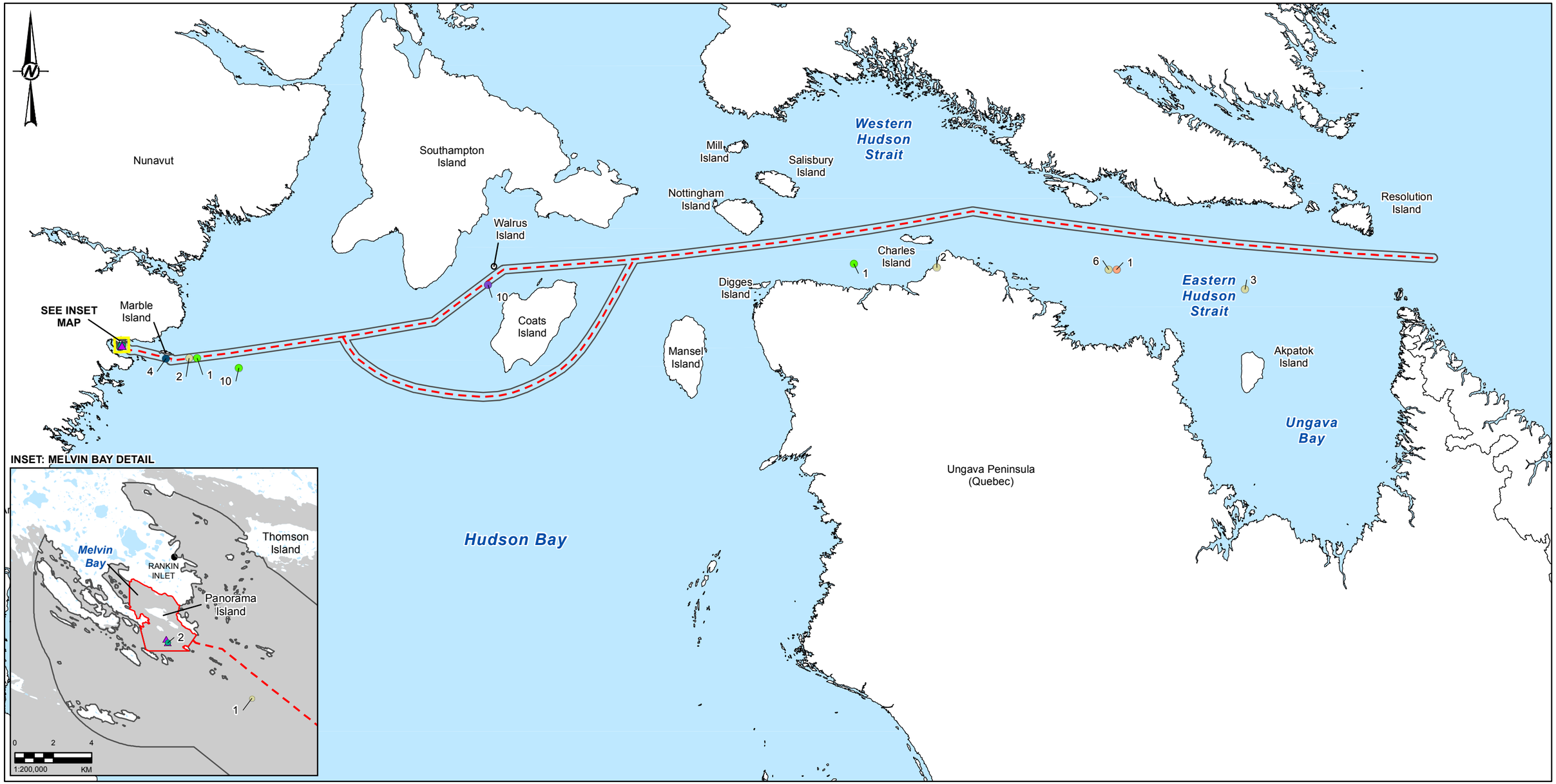
A single sighting of a group of pilot whales was recorded by Transport Desgagnés between Walrus Island and Coats Island during marine mammal observations in 2017 (Figure 10). A total of one sighting of 10 individual pilot whales were recorded during observations (Table 3).

Humpback Whale

Humpback whales were recorded by Transport Desgagnés once during the MMSO program in 2017. Five individual humpback whales were recorded in one group (Table 3; Figure 10).

Atlantic Walrus

Atlantic walruses were recorded by Transport Desgagnés primarily in Eastern Hudson Strait (Figure 10). A total of five sightings of 14 individual Atlantic walruses were recorded (Table 3). Atlantic walruses were primarily observed in groups. Group sizes ranged from a single animal to groups of six individuals. Single walruses and groups of three were recorded as haul-out in 2017. No large walrus haul-outs were recorded during the 2017 or 2018 MMSO programs.



LEGEND

SPECIES

- ATLANTIC WALRUS
- HOODED SEAL
- PILOT WHALE
- RINGED SEAL
- UNIDENTIFIED SEAL
- UNIDENTIFIED MARINE MAMMAL

- ANCHOR LOCATION
- SHIPPING ROUTE (APPROXIMATE)
- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY

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NOTES
1. SPECIES LOCATIONS ARE ANNOTATED WITH THE SURVEY COUNT.

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MARINE MAMMAL SIGHTINGS, 2017

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3.2 Seabirds

Seabird monitoring was completed by Transport Desgagnés daily on 26 June to 24 July 2017, 30 June 2018, 17 July to 4 August 2018, 11 to 21 September 2018, 20 October 2018, and 23 October 2018. No seabird interactions (e.g., strikes) with vessels were recorded by Transport Desgagnés during 2017 or 2018 MMSO programs. Data sheets for seabird monitoring recorded by Transport Desgagnés are provided in Appendix B.

3.2.1 Survey Effort

According to the observation records prepared by Transport Desgagnés, monitoring resulted in 227, 5-minute surveys on moving platforms and 65, 5-minute surveys on stationary platforms. In 2017, 443.3 km were surveyed over 15.9 hours for seabirds using moving platform surveys. In 2018, 389.8 km were surveyed over 17.5 hours for seabirds using moving platform surveys. During stationary platform surveys for seabirds, 7 hours and 1 hour were surveyed in 2017 and 2018, respectively.

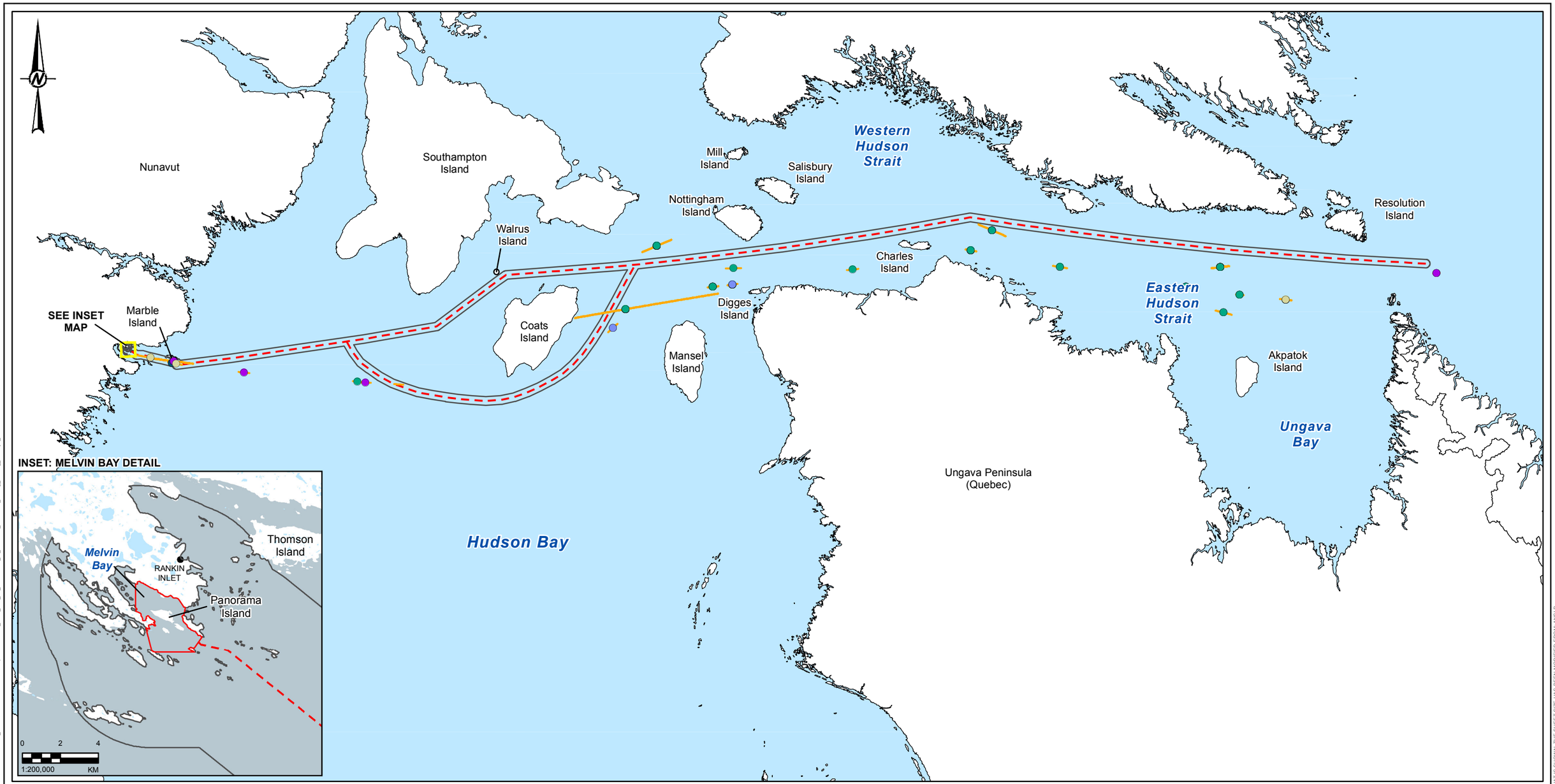
3.2.2 Surveys from Moving Platforms

3.2.2.1 All Species

During all moving platform surveys reported, a total of 12 identified species and individuals in five unidentified species groups were observed (Table 4). Ivory gull, which is an endangered species in Nunavut (SARA 2019), was observed during the surveys in 2018 (Table 4). The most common identified species during the moving platform surveys in 2017 were thick-billed murre (*Uria lomvia*), dovekie (*Alle alle*), and Iceland gull (*Larus glaucoides*) (Table 4; Figure 11). The most common species identified during the surveys in 2018 were thick-billed murre, Iceland gull, glaucous gull (*Larus hyperboreus*), and black guillemot (*Cepphus grylle*) (Table 4; Figure 12).

Table 4: Seabirds Observed During Moving Platform Surveys, 2017 and 2018

Species	Number of Individuals Observed	
	2017	2018
Black guillemot	0	71
Common eider	4	3
Dovekie	19	43
Glaucous gull	0	88
Iceland gull	14	77
Ivory gull	0	2
Long-tailed duck	0	3
Northern fulmar	0	43
Pomarine jaeger	0	1
Sabine's gull	0	3
Thick-billed murre	142	138
Wilson's storm-petrel	0	25
Unidentified duck species	2	0
Unidentified gull species	38	39
Unidentified jaeger species	1	2
Unidentified sandpiper species	0	17
Unidentified bird species	11	3
Total	**231**	**558**



LEGEND

SPECIES
- ICELAND GULL
- COMMON EIDER
- DOVEKIE
- DUCK SP.
- GULL SP.
- JAEGER SP.
- THICK-BILLED MURRE
- UNIDENTIFIED SEABIRD

- SEABIRD TRANSECT
- SHIPPING ROUTE (APPROXIMATE)
- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY

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TITLE
DISTRIBUTION OF SEABIRDS OBSERVED DURING MOVING SURVEYS, 2017

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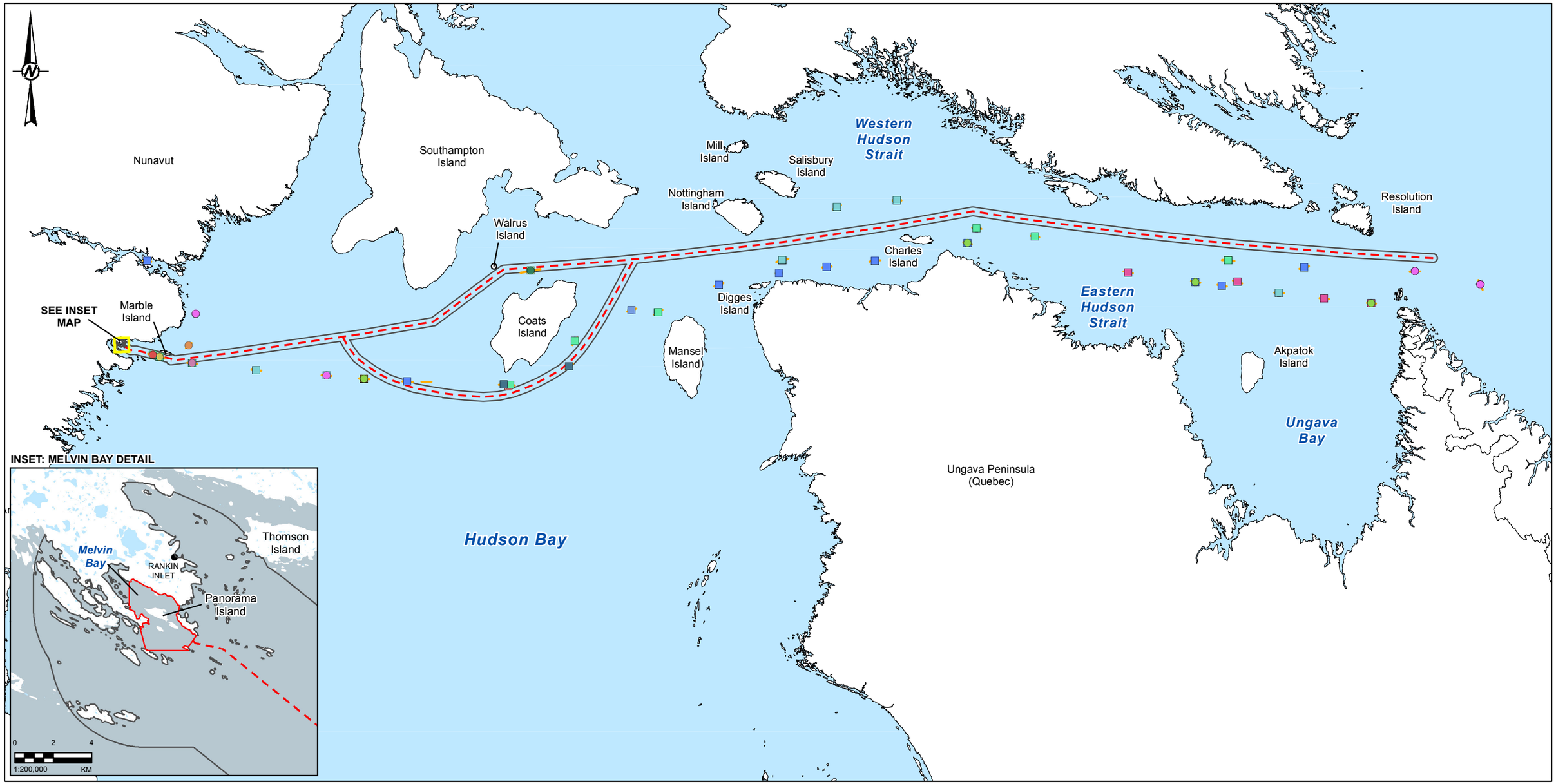

LEGEND

SPECIES

- BLACK GUILLEMOT
- COMMON EIDER
- COMMON LOON
- DOVEKIE
- DUCK SP.
- GLAUCOUS GULL
- GULL SP.
- HARLEQUIN DUCK
- ICELAND GULL
- IVORY GULL
- JAEGER SP.
- LONG-TAILED DUCK
- LONG-TAILED JAEGER
- NORTHERN FULMAR
- POMARINE JAEGER
- SABINE'S GULL
- SANDPIPER SP.
- THICK-BILLED MURRE
- WILSON'S STORM-PETREL
- UNIDENTIFIED SEABIRD

- SEABIRD TRANSECT
- SHIPPING ROUTE (APPROXIMATE)
- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
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PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF SEABIRDS OBSERVED DURING MOVING SURVEYS, 2018

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For the initial step in determining density, the detection distribution with the best fit to the sightings data was determined. The half-normal models with simple polynomial expansions had the lowest AIC scores for the moving platform dataset. Having the lowest AIC score of all detection distributions evaluated meant it was the most appropriate to use. Based on this detection function, the overall probability of detecting seabirds during moving platform surveys in 2017 and 2018 was estimated to be 0.43 (95% Confidence Interval [CI]: 0.39 to 0.48). The density estimate of seabirds in 2017 was 1.2 birds/km^2 (Table 5). The density estimate of seabirds in 2018 was 3.6 birds/km^2 (Table 5). Based on non-overlapping 95% CIs, the density of seabirds was significantly higher in 2018 than in 2017 (Table 5). The analysis of the 2017 data may be inaccurate as the sample size for this year is small (Table 2; Buckland et al. 2001). Density estimates were not generated for individual seabird species because the low sample sizes would yield inaccurate results (Buckland et al. 2001).

Table 5: Density Estimates and 95% Confidence Intervals for Seabirds Observed Along Moving Platform Surveys in 2017 and 2018

Year	Model, AIC Score	Sample Size	Density Estimate (individuals/km^2)	95% Confidence Interval (individuals/km^2)
2017	Half-normal, 354.3	30	1.2	0.7 to 2.0
2018		54	3.6	2.7 to 4.9

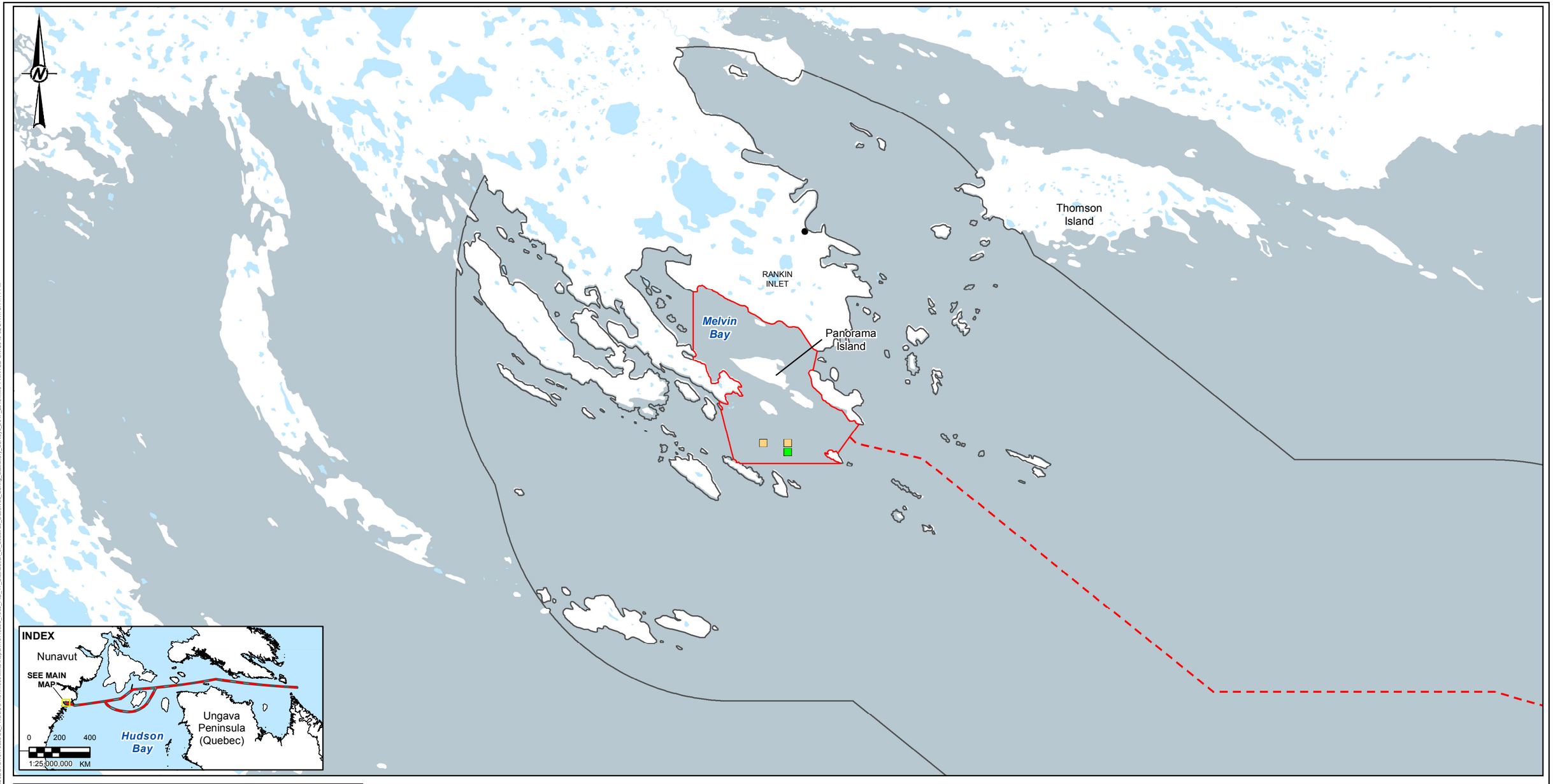
km^2 = square kilometres; AIC = Akaike's Information Criteria.

3.2.3 Surveys from Stationary Platforms

Four identified species and individuals in three unidentified species groups were observed during stationary surveys in 2017 and 2018 (Table 6; Figure 13). Thick-billed murre was the most abundant species observed in 2017, while glaucous gull was the most abundant species observed in 2018.

Table 6: Seabirds Observed During Stationary Platform Surveys, 2017 and 2018

Species	Number of Individuals Observed	
	2017	2018
Common eider	5	4
Glaucous gull	9	14
Iceland gull	5	0
Thick-billed murre	17	0
Unidentified duck species	9	0
Unidentified gull species	12	7
Unidentified bird species	46	0
Total	**103**	**25**



LEGEND

- STATIONARY SURVEY (2017)
- STATIONARY SURVEY (2018)
- SHIPPING ROUTE (APPROXIMATE)
- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY

DRAFT

0 2 4
1:80,000 KILOMETRES

REFERENCES
1. CANVEC DATA OBTAINED FROM © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-21
DESIGNED	DC
PREPARED	CC/CDB
REVIEWED	
APPROVED	

TITLE
DISTRIBUTION OF SEABIRDS OBSERVED DURING STATIONARY SURVEYS, 2017 TO 2018

PROJECT NO.	CONTROL	REV.	FIGURE
18110868	1000	A	13

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As with moving platforms, the half-normal model with a cosine expansion had the lowest AIC score and so is the best model of detection for the 2017 and 2018 combined stationary platform data. Using this model, the overall probability of detecting seabirds during stationary platform surveys in 2017 and 2018 was 0.29 (95% CI: 0.16 to 0.54). The estimated density of seabirds in 2017 was 82.9 birds/km^2 (Table 13). The estimated density of seabirds in 2018 was 158.4 birds/km^2 (Table 7). Based on overlapping 95% CIs, the density of seabirds was not significantly different in each of the survey years (Table 7). The analysis of the stationary data may be inaccurate as the sample size for is small (Table 2; Buckland 2001). Density estimates were not generated for individual seabird species because the low sample sizes would yield inaccurate results (Buckland 2001).

Table 7: Density Estimates and 95% Confidence Intervals for Seabirds Observed During Stationary Platform Surveys in 2017 and 2018

Year	Model, AIC Score	Sample Size	Density Estimate (individuals/km^2)	95% Confidence Interval (individuals/km^2)
2017	Half-normal, 135.29	7	82.9	36.5 to 188.5
2018		2	158.4	29.4 to 851.1

km^2 = square kilometres; AIC = Akaike Information Criteria.

4.0 DISCUSSION

This report presents a summary of the MMSO data collected by Transport Desgagnés during the 2017 and 2018 MMSO programs and includes a summary of results, interpretation and discussion in support of the Mine's 2018 annual report. MMSO programs were conducted from the Acadia Desgagnés and the Claude A. Desgagnés in 2017 and from the Acadia Desgagnés in 2018.

Environmental variables of weather conditions, visibility, sea state, glare and ice conditions were recoded by Transport Desgagnés during the MMSO programs in 2017 and 2018. Summaries of the environmental conditions recorded during the marine mammal monitoring indicated annual variation for each of the variables recorded as might be expected. Environmental conditions were not separately summarized for seabird monitoring but are anticipated to be similar since the MMSO protocol is to alternate these programs numerous times throughout daily monitoring (Agnico Eagle 2018).

Marine mammal observations were completed by Transport Desgagnés between 22 July to 21 September 2017 and 26 June to 24 July 2018. Five species of marine mammals were recorded by Transport Desgagnés in 2017 including the Atlantic walrus, hooded seal, ringed seal, humpback whale, and pilot whale. No marine mammals were recorded by Transport Desgagnés in 2018. There were not enough marine mammal sightings recorded to provide a density analysis. No marine mammal-vessel interactions (e.g., strikes) were recorded by Transport Desgagnés in 2017 or 2018.

A total of 12 seabird species were recorded by Transport Desgagnés during June to July 2017 and during June to October 2018. Observations of seabirds from moving platform surveys were variable between years. Four (common eider, dovekie, Icelandic gull and thick-billed murre) of 12 species were seen in both years and the number of seabirds was considerably higher in 2018. Eight more seabird species were recorded by Transport Desgagnés in 2018 than in 2017. Thick-billed murre was recorded consistently as the most abundant (and in total numbers) seabird observed in both years. Overall, densities of seabirds (all species pooled) from moving platforms were low regardless of year. However, densities in 2018 were significantly higher than in 2017. Stationary platform monitoring recorded two (common eider and glaucous gull) of four species that were present in 2017 and 2018 and both were not numerous but relatively consistent across years. Densities of seabirds from stationary platforms were highly imprecise, so the differences are not considered significant. The higher densities observed in 2018 from moving platforms could be an artifact of the monitoring schedule. In 2018, monitoring included the months of September and October, which may capture migrants. In general, the monitoring to date has resulted in low numbers of observations and samples of seabirds, which limit the type of analyses that can be completed for seabirds (Buckland et al. 2001). No interactions between vessels and seabirds were recorded during the MMSO in either 2017 or 2018.

5.0 CLOSURE

We trust this information is sufficient for your needs at this time. Should you have any questions or concerns, please do not hesitate to contact the undersigned at 604-296-4200.

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Marine Biologist

Reviewed by:

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Associate, Senior Wildlife Ecologist

DWC/KZ/IJ/ah/lmk

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6.0 REFERENCES

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Thomas L, Laake JL, Strindberg S, Marques FFC, Buckland ST, Borchers DL, Anderson DR, Burnham KP, Hedley SL, Pollard JH, Bishop JRB, and Marques TA. 2009. Distance 5.0. Release 2.0. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK. Available at: http://www.ruwpa.st-and.ac.uk/distance/.

APPENDIX A

Summary of Marine Mammal Sightings and Environmental Variables Recorded by Transport Desgagnés for the 2017 and 2018 Shipping Season

Company/Agency	Platform Name and Type	Observer(s)	Date	Survey Type	Time at Start	Time at End	Effort	Zone	UTM Start		UTM End		Platform Activity	Visibility (km)	Weather Code	Glare Code	Sea State Code	Ice Type Code
									Easting	Northing	Easting	Northing						
Desgagnes	Acadia Desgagnes	Michael Galarneceu	16-07-17	T	11:37:00 AM	12:07:00 PM	12:30:00 AM	18	557404	6932420	551475	6932880	Travelling	10	0	1	0	0
Desgagnes	Acadia Desgagnes	Michael Galarneceu	15-07-17	T	7:05:00 PM	7:35:00 PM	12:30:00 AM	19	572450	6786443	564424	6789369	Travelling	10	1	2	1	3
Desgagnes	Claude A. Desgagnes	Sandra Lebon	26-06-17	T	10:30:00 PM	11:00:00 PM	12:30:00 AM	19	546560	6826779	-	-	Travelling	10	1	1	1	3
Desgagnes	Claude A. Desgagnes	Sandra Lebon	27-06-17	T	10:45:00 PM	11:15:00 PM	12:30:00 AM	18	613919	6954318	605771	6960921	Travelling	10	1	0	3	-
Desgagnes	Claude A. Desgagnes	Sandra Lebon	28-06-17	T	10:45:00 PM	11:15:00 PM	12:30:00 AM	17	534804	7007132	522054	7007391	Travelling	10	0	3	4	-
Desgagnes	Claude A. Desgagnes	Sandra Lebon	29-06-17	T	9:30:00 PM	10:00:00 PM	12:30:00 AM	15	620100	6943945	632974	6945366	Travelling	10	0	1	2	3
Desgagnes	Claude A. Desgagnes	Sandra Lebon	29-06-17	T	9:30:00 PM	10:00:00 PM	12:30:00 AM	15	620100	6943945	632974	6945366	Travelling	10	0	1	2	3
Desgagnes	Claude A. Desgagnes	Sandra Lebon	29-06-17	T	9:30:00 PM	10:00:00 PM	12:30:00 AM	15	620100	6943945	632974	6945366	Travelling	10	0	1	2	3
Desgagnes	Claude A. Desgagnes	Sandra Lebon	30-06-17	T	10:30:00 PM	11:00:00 PM	12:30:00 AM	15	554958	6955594	546535	6960664	Travelling	10	0	2	1	2
Desgagnes	Claude A. Desgagnes	Sandra Lebon	30-06-17	S	10:30:00 PM	12:00:00 AM	1:30:00 AM	15	546359	6961034	-	-	Anchored	10	0	2	0	1
Desgagnes	Claude A. Desgagnes	Sandra Lebon	30-06-17	S	10:30:00 PM	12:00:00 AM	1:30:00 AM	15	546359	6961034	-	-	Anchored	10	0	2	0	1
Desgagnes	Claude A. Desgagnes	Sandra Lebon	02-07-17	S	10:30:00 PM	12:00:00 AM	1:30:00 AM	15	546272	6961217	-	-	Anchored	10	0	2	1	1
Desgagnes	Claude A. Desgagnes	Sandra Lebon	04-07-17	S	10:30:00 PM	12:00:00 AM	1:30:00 AM	15	546272	6961217	-	-	Anchored	10	1	0	2	0
Desgagnes	Claude A. Desgagnes	Sandra Lebon	05-07-17	T	10:00:00 PM	11:30:00 PM	1:30:00 AM	15	607467	6942767	642793	6948006	Travelling	10	1	0	3	-
Desgagnes	Claude A. Desgagnes	Kristian Brown	07-07-17	T	10:45:00 PM	12:00:00 AM	1:15:00 AM	17	647093	6886659	396198	6961231	Travelling	10	1	0	2	2
Desgagnes	Claude A. Desgagnes	Kristian Brown	08-07-17	T	8:15:00 PM	9:45:00 PM	1:30:00 AM	20	471046	6731754	479239	6720467	Travelling	5	3	0	2	0
Desgagnes	Claude A. Desgagnes	Kristian Brown	07-08-17	T	7:00:00 PM	8:30:00 PM	1:30:00 AM	19	552601	6768377	571692	6761934	Travelling	10	0	0	4	3
Desgagnes	Claude A. Desgagnes	Kristian Brown	09-07-17	T	7:30:00 PM	9:00:00 PM	1:30:00 AM	21	437998	6306252	449678	6298098	Travelling	1	3	0	1	0

Notes:
Weather code; 0 (< 50% cloud cover with no fog, rain, or snow), 1 (> 50% cloud cover with no fog, rain, or snow), 3 (solid fog); Glare code; 0 (none), 1 (slight/grey), 2 (bright on the observer's side of the vessel), 3 (bright and forward of vessel); sea state code; 0 (calm, mirror-like, glassy), 1 (small wavelets, short but pronounced; crests do not break), 2 (large wavelets, crests begin to break; foam of glassy appearance; perhaps scattered white caps), 3 (small waves, becoming longer; fairly frequent white caps), 4 (moderate waves with more pronounced form; many white caps; chance of some spray); Ice type code; 0 (small, thin, newly formed, dinner plate-sized pieces), 1 (rounded floes 30 cm to 3 m across with ridged rims), 2(broken pieces <2 m across), 3 (level piece 2 to 20 m across); Ice concentration; 0 (less than one tenth cover, open water), 1 (two to three tenths, very open drift), 5 (seven to eight tenths, close pack); deg = degrees; D = diving, S =surfacing; R = resting on ice; M = Mature; 1M = one male; a dash indicated no data provided on the datasheets.

Ice Concentration Code	Wave Height (m)	True Wind Speed (Knots)	True Wind Direction (deg)	True Platform Speed (Knots)	True Platform Direction (deg)	Observation Side	Height of Eye (m)	Outdoors or Indoors	Vessel		Species	Count	Re-Sighting	Sighting Coordinates (UTM)			Distance to Animal	Angle to Sighting (deg)	Behaviour/ Travel Direction	Age	Sex
									Direction	Speed				Zone	Easting	Northing					
0	0.5	2.9	210	11.4	271	starboard	20	Indoors	271	11.4	Atlantic walrus	3	No	18	557404	6932420	50	45	S	M	1M
1	1	18	270	10	295	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
5	1	17	15	7	315	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
-	1	28	270	12	308	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
-	1	13	15	13	275	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
0	1	11	180	13	270	starboard	20	Indoors	270	13	ringed seal	1	No	15	617817	6943119	300	90	R	-	-
0	1	11	180	13	270	starboard	20	Indoors	270	13	Atlantic walrus	2	No	15	617817	6943119	100	90	R	-	-
0	1	11	180	13	270	starboard	20	Indoors	270	13	Atlantic walrus	1	No	15	609686	6942988	100		R	-	-
0	1	14	180	13	300	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
1	0	3	190	0	-	starboard	20	Indoors	-	-	seal sp.	1	No	15	546359	6961034	300	190	D	-	-
1	0	3	190	0	-	starboard	20	Indoors	-	-	seal sp.	1	No	15	546359	6961034	200	70	D	-	-
0	1	12	190	0	-	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
0	1	14	90	0	-	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
-	1	11.6	30	13.5	86	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
0	1	7	300	14	109	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
0	5	22.5	125	9.6	120	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
0	2	8	160	13	110	starboard	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-
0	2	12	28	13.8	144	port	20	Indoors	-	-	-	1	-	-	-	-	-	-	-	-	-

Company/Agency	Platform Name and Type	Observer(s)	Date	Survey Type	Time at Start	Time at End	Effort	Zone	UTM Start		UTM End		Platform Activity	Visibility (km)
									Easting	Northing	Easting	Northing		
Desgagnes	Acadia Desgagnes	Stephen Badcock	12-09-18	Transect	12:00:00 PM	12:30:00 PM	0:30	18	605746	6924131	597009	6928510	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	11-09-18	Transect	10:30:00 PM	11:00:00 PM	0:30	19	511543	6815902	500798	6820710	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	11-09-18	Transect	12:00:00 PM	12:30:00 PM	0:30	20	389696	6718067	379639	6723404	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	11-09-18	Transect	5:00:00 PM	5:30:00 PM	0:30	19	619554	6766291	609508	6770424	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	12-09-18	Transect	5:30:00 PM	6:00:00 PM	0:30	18	479178	6936633	465314	6938420	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	12-09-18	Transect	10:30:00 PM	11:00:00 PM	0:30	18	372312	6949247	363534	6949969	Travelling	16
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	21-09-18	Transect	5:30:00 PM	6:00:00 PM	0:30	19	549453	6797481	560343	6792453	Travelling	16
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	19-09-18	Transect	5:30:00 PM	6:00:00 PM	0:30	16	394524	6924495	406342	6922284	Travelling	12
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	21-09-18	Transect	10:30:00 PM	11:00:00 PM	0:30	19	657429	6748256	344024	6742059	Travelling	16
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	21-09-18	Transect	12:00:00 PM	12:30:00 PM	0:30	19	432042	6854989	441969	6849977	Travelling	16
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	20-09-18	Transect	10:30:00 PM	11:00:00 PM	0:30	18	435993	6941642	448209	6940128	Travelling	16
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	20-09-18	Transect	5:30:00 PM	6:00:00 PM	0:30	17	619516	6950614	631007	6951792	Travelling	16
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	20-09-18	Transect	12:00:00 PM	12:30:00 PM	0:30	17	497510	6930255	505912	6936944	Travelling	16
Agnicio Eagle Meliadine	Acadia Desgagnes	Stephen Badcock	19-09-18	Transect	10:30:00 PM	11:00:00 PM	0:30	16	515586	6901696	527465	6899729	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	14-09-18	Transect	12:30:00 PM	1:00:00 PM	0:30	15	575942	6951181	564628	6949274	Travelling	8
Desgagnes	Acadia Desgagnes	Stephen Badcock	19-09-18	Transect	12:00:00 PM	12:30:00 PM	0:30	15	573651	6950572	583255	6948943	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	13-09-18	Transect	10:30:00 PM	11:00:00 PM	0:30	16	552836	6895390	593198	6898493	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	13-09-18	Transect	5:30:00 PM	6:00:00 PM	0:30	17	352972	6878106	655647	6880721	Travelling	16
Desgagnes	Acadia Desgagnes	Stephen Badcock	13-09-18	Transect	12:30:00 PM	1:00:00 PM	0:30	17	438497	6910207	431609	6902912	Travelling	16
Desgagnes	Acadia Desgagnes	Michael Galarneceu	22-07-18	Transect	2:40:00 PM	4:10:00 PM	1:30	19	646337	6791328	623750	6791276	Travelling	75
Agnicio Eagle Meliadine	Acadia Desgagnes	Michael Galarneceu	23-07-18	Transect	6:30:00 PM	8:00:00 PM	1:30	18	530672	6995353	504175	7001803	Travelling	70
Agnicio Eagle Meliadine	Acadia Desgagnes	Michael Galarneceu	24-07-18	Transect	6:00:00 PM	7:30:00 PM	1:30	17	365792	6876868	646904	6883193	Travelling	20
Agnicio Eagle Meliadine	Acadia Desgagnes	Michael Galarneceu	27-07-18	Transect	6:00:00 PM	7:30:00 PM	1:30	15	582357	7055314	-	-	Travelling	50
Agnicio Eagle Meliadine	Acadia Desgagnes	Michael Galarneceu	01-08-18	Transect	6:30:00 PM	8:00:00 PM	1:30	15	635070	6978167	618695	6956327	Travelling	10
Agnicio Eagle Meliadine	Acadia Desgagnes	Michael Galarneceu	02-08-18	Transect	6:05:00 PM	7:35:00 PM	1:30	16	655471	6882070	375325	6874981	Travelling	10
Agnicio Eagle Meliadine	Acadia Desgagnes	Michael Galarneceu	03-08-18	Transect	6:10:00 PM	7:40:00 PM	1:30	18	582041	6954486	610992	6942864	Travelling	15
Agnicio Eagle Meliadine	Acadia Desgagnes	Michael Galarneceu	04-08-18	Transect	5:10:00 PM	6:40:00 PM	1:30	20	411772	6750366	440467	6739243	Travelling	50

Notes:
Weather code; 0 (< 50% cloud cover with no fog, rain, or snow), 1 (> 50% cloud cover with no fog, rain, or snow), 2 (pathcy fog), 6 (fog and rain); Glare code; 0 (none), 1 (slight/grey), 2 (bright on the observer's side of the vessel), 3 (bright and forward of vessel); sea state code; 0 (calm, mirror-like, glassy), 1 (small wavelets, short but pronounced; crests do not break), 2 (large wavelets, crests begin to break; foam of glassy appearance; perhaps scattered white caps), 3 (small waves, becoming longer; fairly frequent white caps), 4 (moderate waves with more pronounced form; many white caps; chance of some spray); Ice type code; 0 (small, thin, newly formed, dinner plate-sized pieces), 3 (level piece 2 to 20 m across); Ice concentration; 0 (less than one tenth cover, open water), 2 (four tenths, open drift); deg = degrees; a dash indicated no data provided on the datasheets.

Weather Code	Glare Code	Sea State Code	Ice Type Code	Ice Concentration Code	Wave Height (m)	True Wind Speed (Knots)	True Wind Direction	True Platform Speed (Knots)	True Platform Direction (deg)	Observation Side	Height of Eye (m)	Outdoors or Indoors	Species	Count
1	0	4	-	-	2	21	135	10.7	299	starboard	22	Indoors	No Observations	1
0	3	2	-	-	1	8	315	12.8	297	starboard	22	Indoors	No Observations	1
1	0	2	-	-	2	10	235	12.2	297	starboard	22	Indoors	No Observations	1
1	0	1	-	-	1	7	0	11.8	295	starboard	22	Outdoors	No Observations	1
0	0	1	-	-	1	8	135	14.7	279	starboard	22	Indoors	No Observations	1
1	0	4	-	-	2	27	315	8.8	276	starboard	22	Indoors	No Observations	1
0	2	2	-	-	2	14	315	12.8	116	starboard	22	Indoors	No Observations	1
1	2	4	-	-	1	12	270	13.1	98	starboard	22	Indoors	No Observations	1
0	0	1	-	-	1	6	315	13.7	115	starboard	22	Indoors	No Observations	1
1	0	3	-	-	1	18	270	12.5	115	starboard	22	Indoors	No Observations	1
1	0	4	-	-	2	21	315	12.5	98	starboard	22	Indoors	No Observations	1
1	0	3	-	-	2	15	315	12.5	87	starboard	22	Indoors	No Observations	1
1	0	1	-	-	1	4	315	12.6	48	starboard	22	Indoors	No Observations	1
0	0	2	-	-	1	8	270	13.4	100	starboard	22	Indoors	No Observations	1
6	1	3	-	-	2	15	0	12	290	starboard	22	Indoors	No Observations	1
0	3	2	-	-	1	13	270	13.1	76	starboard	22	Indoors	No Observations	1
1	0	2	-	-	2	16	180	12.6	279	starboard	22	Indoors	No Observations	1
1	1	3	-	-	2	16	235	11.8	279	starboard	22	Indoors	No Observations	1
1	0	4	-	-	2	25	235	11.2	223	starboard	22	Indoors	No Observations	1
0	0	0	3	2	1	3	270	7	276	starboard	16	Indoors	No Observations	1
0	0	0	0	0	2	4	260	10.3	283	starboard	16	Indoors	No Observations	1
2	1	3	0	0	1	4	210	12.9	279	starboard	16	Indoors	No Observations	1
0	0	1	0	0	1	5	255	9.3	288	starboard	16	Indoors	No Observations	1
1	1	4	0	0	2	5	235	10.9	225	starboard	16	Indoors	No Observations	1
1	1	3	0	0	1	4	17	12.6	100	starboard	16	Outdoors	No Observations	1
2	1	2	0	0	1.5	4	40	12.5	114	starboard	16	Outdoors	No Observations	1
0	0	4	0	0	1	5	170	13	108	starboard	16	Indoors	No Observations	1

APPENDIX B

Data Sheets Recorded by Transport Desgagnés and Provided by Agnico Eagle Mines for Marine Mammal and Seabird Observations for the 2017 and 2018 Shipping Season

MARINE MAMMAL PROGRAM

AGNICO EAGLE

Fill out one sheet per observation period

Observation Period Information:				
Company/agency	Desgagnes Transarctik		Sea state code ★	0
Platform name and type	Arctic Desgagnes		Wave height (m)	1/2
Observer (s)	Michel Galarneau		True wind speed (knots) **OR** ★ Beaufort code	5.4
Date (DD/MMM/YYYY)	24 Jul 2017		True wind direction	300
Time at start (UTC)	10.56		Ice type code★	0
Time at end (UTC)	11.45		Ice concentration code ★	0
Latitude at start / end	61°52.1 N	61°47.2 N	True platform speed (knots)	13.4
Longitude at start / end	70°29.3 W	70°08.6 W	True platform direction	118
Visibility (km)	20 KM		Observation side	(Starboard) Port (Middle)
Weather code ★	0		Height of eye (m)	20 M
Glare conditions code ★	3		Outdoors or Indoors	(Out) or (In)
Platform Activity	Sailing		Notes	

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
24 Jul 17 10.56	118 13.4		Y x3	61°52.1N 70°59.3W	Hooded seal 1	50	STBD	Curious	adult		
11.15	116 13.1		Yes 6	↕	atlantic walrus 6	from 100 To 30	STBD	Curious	mix		
11.25	116 13.1		Y 3	61°48.3N 70°13.5W	Ringed seal 1	50M	STBD				

Notes:

★ Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnes Transarctik	Sea state code ★	0
Platform name and type	Acadia Desgagnes	Wave height (m)	0
Observer (s)	Michel Galarneau	True wind speed (knots) OR Beaufort code	4.9
Date (DD/MMM/YYYY)	24 Jul 2017	True wind direction (deg)	40
Time at start (UTC)	8.48	Ice type code ★	0
Time at end (UTC)	9.25	Ice concentration code	0
Latitude at start / end	62°05.0 N / 62°01.2 N	True platform speed (knots)	14.2
Longitude at start / end	71°26.1 W / 71°08.9 W	True platform direction (deg)	118
Platform activity	Sailing	Observation side	Starboard Port
Visibility (km)	20 Km	Height of eye (m)	
Weather code	0	Outdoors or Indoors	Out or In
Glare conditions code★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBMU	3	F	Y	50							
TBMU	2	F	Y	50							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transarctik	Sea state code ★	1
Platform name and type	Arctic Desgagnés	Wave height (m)	1/2
Observer (s)	Michel Galarneau	True wind speed (knots) OR Beaufort code ★	13.3
Date (DD/MMM/YYYY)	24 Jul 2017	True wind direction (deg) ★	245
Time at start (UTC)	19.30	Ice type code ★	0
Time at end (UTC)	20.01	Ice concentration code ★	0
Latitude at start / end	61°02.4N / 60°59.3N	True platform speed (knots)	13.1
Longitude at start / end	66°56.0W / 66°42.7W	True platform direction (deg)	118
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 KM	Height of eye (m)	20 M
Weather code	0	Outdoors or Indoors	Out or (In)
Glare conditions code ★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
ICGU	2	F	Y	50							
" "	1	F	Y	10							Fly around ++
" "	1	F	Y	30							
" "	1	F	Y	30							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés (canarctic)	Sea state code ★	5
Platform name and type	Arctic Desgagnés	Wave height (m)	3 m
Observer (s)	Michael Gabarneau	True wind speed (knots) OR Beaufort code ★	11.7
Date (DD/MMM/YYYY)	24 Jul 2017	True wind direction (deg) ★	225
Time at start (UTC)	22212	Ice type code ★	0
Time at end (UTC)	22239	Ice concentration code	0
Latitude at start / end	60°46.9N	True platform speed (knots)	11.4
Longitude at start / end	65°49.8W	True platform direction (deg)	114
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 KM	Height of eye (m)	20 M.
Weather code	0	Outdoors or Indoors	Out or (In)
Glare conditions code ★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Phase[4] ★	Sex	Comments
DOVE	3	W	Y	30							
ICGU	7	F	Y	30							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transarctik	Sea state code ★	1
Platform name and type	Arctic Desgagnés	Wave height (m)	1/2
Observer (s)	M. DeGabriel	True wind speed (knots) OR Beaufort code ★	16.2
Date (DD/MMM/YYYY)	23 Jul 2017	True wind direction (deg) ★	242
Time at start (UTC)	10258	Ice type code ★	0
Time at end (UTC)	11230	Ice concentration code ★	0
Latitude at start / end	62°26.4W / 62°30.5N	True platform speed (knots)	14.6
Longitude at start / end	81°22.3W / 81°08.2W	True platform direction (deg)	57
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 KM	Height of eye (m)	20 m
Weather code	0	Outdoors or Indoors	Out or (In)
Glare conditions code ★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
DOVE	2	F	Y	50 M							
DOVE	1	F	Y	50m							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transsardis	Sea state code ★	0
Platform name and type	Acadia Desgagnés	Wave height (m)	1/2
Observer (s)	Michel Galarneau	True wind speed (knots) OR Beaufort code	6.1
Date (DD/MMM/YYYY)	23 Jul 2017	True wind direction (deg) ★	120
Time at start (UTC)	16h20	Ice type code ★	0
Time at end (UTC)	16h50	Ice concentration code	0
Latitude at start / end	62°42.5N / 62°41.9N	True platform speed (knots)	12.6
Longitude at start / end	79°00.4W / 78°46.3W	True platform direction (deg)	94
Platform activity	Sailing	Observation side	Starboard Port
Visibility (km)	20 km	Height of eye (m)	20 m
Weather code	0	Outdoors or Indoors	Out ~~or~~ In
Glare conditions code★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBMU	13	F	Y	50							3 obs around ship
TBMU	6	W	Y	50							on tide bar
TBMU	6	F	Y	50							fly around ship
TBMU	5	F	Y	50			↗				1 direction
TBMU	2	W	Y	30							
TBMU	3	F	Y	50							

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	Desgagnés Transarctik		Sea state code ★	0
Platform name and type	Arctic Desgagnés		Wave height (m)	0
Observer (s)	Michel Gélinas		True wind speed (knots) **OR** ★ Beaufort code	3.1
Date (DD/MMM/YYYY)	23 Jul 2017		True wind direction	305
Time at start (UTC)	22231		Ice type code★	0
Time at end (UTC)	23201		Ice concentration code ★	0
Latitude at start / end	62°34.8 N	62°33.9 N	True platform speed (knots)	14.6
Longitude at start / end	75°53.2 W	75°37.5 W	True platform direction	96
Visibility (km)	20KM		Observation side	(Starboard) Port Middle
Weather code ★	0		Height of eye (m)	20 M
Glare conditions code ★	3		Outdoors or Indoors	(Out) ~~of~~ (In)
Platform Activity	Sailing		Notes	

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

- Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
23 Jul 2017 22231	23-01		No observation								
Notes:											

★ Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnes Transarctik	Sea state code ★	0
Platform name and type	Arctic Desgagnes	Wave height (m)	0
Observer (s)	Michael Galarneau	True wind speed (knots) OR Beaufort code ★	3.1
Date (DD/MMM/YYYY)	23 Jul 2017	True wind direction (deg) ★	305
Time at start (UTC)	22Q31	Ice type code ★	0
Time at end (UTC)	23Q01	Ice concentration code ★	0
Latitude at start / end	62°34.8N / 62°33.9N	True platform speed (knots)	14.6
Longitude at start / end	75°53.2W / 75°37.5W	True platform direction (deg)	96
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 km	Height of eye (m)	20 m
Weather code	0	Outdoors or Indoors	(Out) of (In)
Glare conditions code ★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBMU	6	F	Y	50m							

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

Fill out one sheet per observation period

Observation Period Information:					
Company/agency	Desgagnés Transarctik		Sea state code ★	0	
Platform name and type	Arctica Desgagnés		Wave height (m)	0	
Observer (s)	Michel Galarneau		True wind speed (knots) **OR** ★ Beaufort code	6.1	
Date (DD/MMM/YYYY)	22 Sul 2017		True wind direction	115	
Time at start (UTC)	22.04		Ice type code★	0	
Time at end (UTC)	22.34		Ice concentration code ★	0	
Latitude at start / end	62°16.4N	62°15.3N	True platform speed (knots)	13.1	
Longitude at start / end	86° 59.2 W	86° 45.1W	True platform direction	098	
Visibility (km)	20km		Observation side	(Starboard) Port Middle	
Weather code ★	0		Height of eye (m)	20 m	
Glare conditions code ★	3		Outdoors or Indoors	(Out) ~~of~~ (In)	
Platform Activity	Sailing		Notes	second observation of the day	

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	Desgagnés Transarctik		Sea state code ★	0
Platform name and type	Arctic Desgagnés		Wave height (m)	0
Observer (s)	Michel Galarneau		True wind speed (knots) **OR** ★ Beaufort code	6.1
Date (DD/MMM/YYYY)	22 Jul 2017		True wind direction	115
Time at start (UTC)	16.02		Ice type code★	0
Time at end (UTC)	16.34		Ice concentration code ★	0
Latitude at start / end	62°29.4 N	62°28.2 N	True platform speed (knots)	13.1
Longitude at start / end	89° 39.7 W	89° 25.1 W	True platform direction	099
Visibility (km)	20 Km		Observation side	(Starboard) Port Middle
Weather code ★	0		Height of eye (m)	20 mt.
Glare conditions code ★	3		Outdoors or Indoors	Out or In
Platform Activity	Sailing		Notes	

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

- Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
22 Jul 1610	099 13.1		Y	62°29.4N 89°39.7W	4	50 M	45°	surfacing	?		

Notes:

★ Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
22 Sept 22:10	098 13.1	0	Y	62°16.4 86°59.2	10 Ringed Seal	50m	90°				

Notes:

★ Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transarctik	Sea state code ★	
Platform name and type	Arctic Desgagnés	Wave height (m)	
Observer (s)	Michel Galarneau	True wind speed (knots) OR Beaufort code ★	
Date (DD/MMM/YYYY)	22 Sep	True wind direction (deg) ★	
Time at start (UTC)	16.02	Ice type code ★	
Time at end (UTC)	16.34	Ice concentration code ★	
Latitude at start / end	62°29.4 N / 62°28.2 N	True platform speed (knots)	13.1
Longitude at start / end	89°39.7 W / 89°25.1 W	True platform direction (deg)	099
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 Km	Height of eye (m)	20 m
Weather code		Outdoors or Indoors	(Out) or (In)
Glare conditions code ★		Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
UNGU	20	W	Y	50m							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transarctik	Sea state code ★	0
Platform name and type	Arctic Desgagnés	Wave height (m)	0
Observer (s)	Michel Galarneau	True wind speed (knots) OR Beaufort code ★	6.1
Date (DD/MMM/YYYY)	22 Jul 2017	True wind direction (deg) ★	115
Time at start (UTC)	22.04	Ice type code ★	0
Time at end (UTC)	22.34	Ice concentration code ★	0
Latitude at start / end	62°16.4 N / 62°15.3 N	True platform speed (knots)	13.1
Longitude at start / end	86°59.2 W / 86°45.1 W	True platform direction (deg)	098
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 KM	Height of eye (m)	20 M
Weather code	0	Outdoors or Indoors	(Out) or (In)
Glare conditions code ★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
ungu	4	W	4	50							

★Refer to "Codes" datasheets

Record sheet for a stationary platform survey

Scan Information:

Company/agency	DESGAGNES TRANSARCTIK	Weather code	0
Platform name and type	ACADIA DESGAGNES	Glare conditions code	1
Observer (s)	18-07-2017	Sea state code	2
Date (DD/MMM/YYYY)	MICHEL LACROIX	Wave height (m)	0.6
Time at start (UTC)	0900 EDT. / 1300 UTC	True wind speed (knots) **OR** Beaufort code	25 KTS
Latitude	62° 46.6' N	True wind direction (deg)	NW 310°
Longitude	092° 06.1' W	Ice type code	Ø
Platform activity	UNLOADING CARGO	Ice concentration code	Ø
Scan type	180° ~~or other (specify:~~)	Height of eye (m)	28 M.
Scan direction	WXN	Outdoors or Indoors	Out or (In)
Visibility (km)	10KMS		IN

Notes: NO OBSERVATION DURING THE DAY, STRONG WIND ALL DAY, OCCASIONAL RAIN, SQUALL.

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GULL	1	FLY	Y	E			ND				LIKELY LOOK FISH

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a stationary platform survey

Scan Information:

Company/agency	DESGAGNES TRANSARCTIC	Weather code	0
Platform name and type	ACADIA DESGAGNES	Glare conditions code	1
Observer (s)	MICHEL LACROIX	Sea state code	1
Date (DD/MMM/YYYY)	19-07-2017	Wave height (m)	0.3
Time at start (UTC)	10:00 U.T.C.	True wind speed (knots) **OR** Beaufort code	15KTS
Latitude	62° 46.6' N	True wind direction (deg)	230°
Longitude	092° 06.1' W	Ice type code	Ø
Platform activity	OFF LOADING ANCHORAGE	Ice concentration code	Ø
Scan type	180° ~~or other (specify:~~)	Height of eye (m)	20
Scan direction	W'LY	Outdoors or Indoors	Out or (In)
Visibility (km)	10KMS		

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	1	FLY	Y	C			ND	A			LIKE LOOK FISH
GLGU	1	FLY	Y	C			SW	A			
GULL	1	FLY	Y	D			W	A			
GULL	2	FLY	Y	D			NE	A			

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a stationary platform survey

Scan Information:

Company/agency	AGNICO EAGLE	Weather code	1
Platform name and type	ACADIA DESGAGNÉS	Glare conditions code	3
Observer (s)	MICHEL LACROIX	Sea state code	4
Date (DD/MMM/YYYY)	20-07-2017	Wave height (m)	0.8M.
Time at start (UTC)	1000 U.T.C.	True wind speed (knots) **OR** Beaufort code	25/30KTS
Latitude	62°46.6' N	True wind direction (deg)	320°
Longitude	092°06.1' W	Ice type code	Ø
Platform activity	ANCHORED/OFF LOAD	Ice concentration code	Ø
Scan type	180° ~~or other (specify:)~~	Height of eye (m)	20 M.
Scan direction	NW'LY	Outdoors or Indoors	Out or (In)
Visibility (km)	12KMS		

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	1	FLY	Y	B			NE	A			
GLGU	1	FLY	Y	B			NE	A			
GLGU	1	FLY	Y	C			NE	A			
GULL	1	FLY	Y	E			ND	A			LIKELY LOOK FISH

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3]*J*(uvenile), *I*(mmature), or *A*(dult); [4]*B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a stationary platform survey

Scan Information:

Company/agency	AGNICO EAGLE	Weather code	0
Platform name and type	ACADIA DESGAGNÉS	Glare conditions code	2
Observer (s)	MICHEL LACROIX	Sea state code	1
Date (DD/MMM/YYYY)	21-07-2017	Wave height (m)	0.3
Time at start (UTC)	1000 UTC	True wind speed (knots) **OR** Beaufort code	10/15
Latitude	62°46.6' N	True wind direction (deg)	290°
Longitude	092°06.1' W	Ice type code	Ø
Platform activity	ANCHORED & OFF LOAD	Ice concentration code	Ø
Scan type	180° ~~or other (specify:~~)	Height of eye (m)	20M
Scan direction	W'LY	Outdoors or Indoors	Out or (In)
Visibility (km)	10 KMS		

Notes: CALM DAY, LESS WIND, MOST OBSERVATION LOOK LIKE FISHING BEHAVIOR UP/DOWN & N.D.

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GULL	1	FLY	Y	D			N'LY	A			
GLGU	1	FLY	Y	B			NW	A			
GLGU	1	FLY	Y	B			NW	A			
GLGU	1	FLY	Y	C			S'LY	A			
GLGU	1	FLY	Y	C			ND	A			LIKELY LOOK. FISH
GULL	2	FLY	Y	D			ND	A			FISHING

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

MARINE MAMMAL PROGRAM

AGNICO EAGLE

Day 4

↗ Fill out one sheet per observation period

Observation Period Information:					
Company/agency	Desgagnés Transarctik		Sea state code ★	0	
Platform name and type	Arctic Desgagnés		Wave height (m)	1 m	
Observer (s)	Michel Gabarneau		True wind speed (knots) **OR** ★ Beaufort code	23.5	
Date (DD/MMM/YYYY)	18 Jul 2017		True wind direction	300	
Time at start (UTC)	9.00		Ice type code★	0	
Time at end (UTC)	9.29		Ice concentration code ★	0	
Latitude at start / end	62°36.8 N	62°38.3 N	True platform speed (knots)	10.2	
Longitude at start / end	91°02.7 W	91°13.1 W	True platform direction	285	
Visibility (km)	20		Observation side	(Starboard)	Port Middle
Weather code ★	0		Height of eye (m)	20 m	
Glare conditions code ★	3		Outdoors or Indoors	Out or	(In)
Platform Activity	Sailing		Notes		

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
18 Jul 2017	No observation										
Notes:											

★ Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transarctik	Sea state code ★	0
Platform name and type	Arctic Desgagnés	Wave height (m)	1 m
Observer (s)	Michel Galarneau	True wind speed (knots) OR Beaufort code ★	23.5
Date (DD/MMM/YYYY)	18 Jul 2017	True wind direction (deg) ★	300
Time at start (UTC)	9.00	Ice type code ★	0
Time at end (UTC)	9.29	Ice concentration code ★	0
Latitude at start / end	62°36.8 N / 62°38.3 N	True platform speed (knots)	10.2
Longitude at start / end	91°02.7 W / 91°13.1 W	True platform direction (deg)	285
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20	Height of eye (m)	20 m
Weather code	0	Outdoors or Indoors	Out or (In)
Glare conditions code ★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Phase[4] ★	Sex	Comments
TBMU	4	F	Y	50							
UNKN	2	F	Y	50							erratic fly
→ COEI	2	F	Y	50	just after	observation					period

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

Fill out one sheet per observation period

Day 3

AGNICO EAGLE

Observation Period Information:				
Company/agency	Desgagnés Transarctik		Sea state code ★	4
Platform name and type	Arctic Desgagnés		Wave height (m)	1.5
Observer (s)	Michel Galarneau		True wind speed (knots) OR ★ Beaufort code	15.9
Date (DD/MMM/YYYY)	17 Jul 2017		True wind direction	300
Time at start (UTC)	22.04		Ice type code ★	0
Time at end (UTC)	22.34		Ice concentration code ★	0
Latitude at start / end	62°16.6 N	62°17.5 N	True platform speed (knots)	11.4
Longitude at start / end	86°57.1 W	87°08.8 W	True platform direction	277
Visibility (km)	20		Observation side	Starboard Port Middle
Weather code ★	0		Height of eye (m)	20 m
Glare conditions code ★	3		Outdoors or Indoors	Out or In
Platform Activity	Sailing		Notes	

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
July 17. 2017				no observation							
Notes:											

★ Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transarctik	Sea state code ★	4
Platform name and type	Arctia Desgagnés	Wave height (m)	1.5 m
Observer (s)	M. Galarneau	True wind speed (knots) OR Beaufort code ★	15.9
Date (DD/MMM/YYYY)	17 Jul 2017	True wind direction (deg) ★	300
Time at start (UTC)	22.04	Ice type code ★	0
Time at end (UTC)	22.34	Ice concentration code ★	0
Latitude at start / end	62° 16.6 N / 62° 17.5 N	True platform speed (knots)	11.4
Longitude at start / end	86° 57.1 W / 87° 08.8 W	True platform direction (deg)	277
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 Km	Height of eye (m)	20 m
Weather code	0	Outdoors or Indoors	Out or (In)
Glare conditions code ★	3	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species ★	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBM1	1	F	Y	50							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transmarine	Sea state code ★	4
Platform name and type	Arctic Desgagnés	Wave height (m)	1.5
Observer (s)	M. Galarneau	True wind speed (knots) OR Beaufort code ★	18
Date (DD/MMM/YYYY)	17 Jul 2017	True wind direction (deg) ★	290
Time at start (UTC)	19.43	Ice type code ★	0
Time at end (UTC)	20.15	Ice concentration code ★	0
Latitude at start / end	62° 12.0 N / 62° 13.1 N	True platform speed (knots)	11.1
Longitude at start / end	86° 02.6 W / 86° 14.8 W	True platform direction (deg)	280
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	20 KM	Height of eye (m)	20 M
Weather code	1	Outdoors or Indoors	Out or (In)
Glare conditions code ★	1	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
No observation.											

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnes Transarctik	Sea state code ★	4
Platform name and type	Acadia Desgagnes	Wave height (m)	2
Observer (s)	M. Galarneau	True wind speed (knots) OR Beaufort code	20
Date (DD/MMM/YYYY)	17 Jul 2017	True wind direction (deg) ★	210
Time at start (UTC)	10.27	Ice type code ★	0
Time at end (UTC)		Ice concentration code	0
Latitude at start / end	62°00.1N	True platform speed (knots)	8.2
Longitude at start / end	82°43.9W	True platform direction (deg)	238
Platform activity	Sailing half speed.	Observation side	Starboard ~~Port~~
Visibility (km)	.1 Km	Height of eye (m)	20 m
Weather code	3	Outdoors or Indoors	Out ~~or In~~
Glare conditions code★	1	Snapshot used?	Yes or No

Notes: No observation held due to dense fog and observer at the wheel.

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments

★Refer to "Codes" datasheets

Day 2

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	Desgagnés Transarctik		Sea state code ★	0
Platform name and type	Arctic Desgagnés		Wave height (m)	.5
Observer (s)	Michel Galarneau		True wind speed (knots) OR ★ Beaufort code	2.9
Date (DD/MMM/YYYY)	16 Jul 2017		True wind direction	210
Time at start (UTC)	11.37		Ice type code★	0
Time at end (UTC)	12.07		Ice concentration code ★	0
Latitude at start / end	62°31.1 N	62°31.4 N	True platform speed (knots)	11.4
Longitude at start / end	73°53.1 W	73°50 W	True platform direction	271
Visibility (km)	10 K		Observation side	(Starboard) Port Middle
Weather code ★	0		Height of eye (m)	20 m
Glare conditions code ★	1		Outdoors or Indoors	Out or (In)
Platform Activity	Sailing		Notes	

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

- Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
16 Sept	271 11.4	0	N	62°31.1 N 73°53.1 W	Atlantic Walrus 3	100 To 50 m	0 moving To 90°	same direction & surfacing	mature Adult 1 male		

Notes:

★ Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

AM

Observation Period Information:

Company/agency	Desg. Transarctik	Sea state code ★	0
Platform name and type	Acadia Desg.	Wave height (m)	0 +
Observer (s)	M. Galarneau	True wind speed (knots) OR Beaufort code	4.7
Date (DD/MMM/YYYY)	16 Jul 2017	True wind direction (deg) ★	250
Time at start (UTC)	09.27	Ice type code ★	0
Time at end (UTC)	10.00	Ice concentration code	0
Latitude at start / end	62° 26.5 N / 62° 29.3	True platform speed (knots)	12.1
Longitude at start / end	72° 59.1 W / 73° 11.8	True platform direction (deg)	296
Platform activity	Sailing	Observation side	Starboard Port
Visibility (km)	10	Height of eye (m)	20m
Weather code	0	Outdoors or Indoors	Out or In
Glare conditions code★		Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBMU	4	Fly	N	B		~~[illegible]~~					
TBMU	2	Fly	Y	B		4/9					
UNGA	1	Fly	Y	B							
TBMU	1	Fly	Y	B							
TBMU	2	Fly	N	B							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

PM

Company/agency	Desgagnés Transarctik		Sea state code ★	0
Platform name and type	Arctic Desgagnés		Wave height (m)	1 m
Observer (s)	M. Galarneau		True wind speed (knots) OR Beaufort code ★	24.5
Date (DD/MMM/YYYY)	16 Jul 2017		True wind direction (deg) ★	220
Time at start (UTC)	19.37		Ice type code ★	0
Time at end (UTC)	19.12		Ice concentration code ★	0
Latitude at start / end	62°37.5 N	62°37.8 N.	True platform speed (knots)	11.8
Longitude at start / end	78°48.5 W	77°00.1 W	True platform direction (deg)	269
Platform activity	Sailing		Observation side	(Starboard) Port
Visibility (km)	10		Height of eye (m)	20 m
Weather code	1		Outdoors or Indoors	Out or (In)
Glare conditions code ★	1		Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Phase[4] ★	Sex	Comments
TBMU	1	F	Y	B							
same flight (TBMU	12	F	Y	B							same group of observation)
COEI	4	F	Y	B							
TBMU	1	W	Y	A		60					
TBMU	3	F	Y	B							
TBMU	1	W	Y	A		60					

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Cue

Observation Period Information:

Company/agency	Desgagnés Transarctik		★ Sea state code	1	
Platform name and type	Arctica Desgagnés		Wave height (m)	1 m	
Observer (s)	M. Gabarreau		True wind speed (knots) OR Beaufort code	8	
Date (DD/MMM/YYYY)	16 Jul 2017		True wind direction (deg)	210	
Time at start (UTC)	22.19		Ice type code ★	0	
Time at end (UTC)	22.49		Ice concentration code	0	
Latitude at start / end	62°41.1 N	62°41.4 N	True platform speed (knots)	12.4	
Longitude at start / end	78°20.41 W	78°33.66 W	True platform direction (deg)	276	
Platform activity	Sailing		Observation side	(Starboard) Port	
Visibility (km)	15 KM		Height of eye (m)	20 M	
Weather code	0		Outdoors or Indoors	Out or (In)	
Glare conditions code★	3		Snapshot used?	Yes or No	

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBMU	6	F	Y	B							
DOVE	2	W	Y	A							
TBMU	1	F	Y	B							
TBMU	10	F	Y	B							
DOVE	12	F	Y	B							
DOVE	2	W	Y	A							

★Refer to "Codes" datasheets

Day 1

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:			
Company/agency	Desgagnés Transarctik	Sea state code ★	1
Platform name and type	Acadia Desgagnés	Wave height (m)	1
Observer (s)	Michel Gobeil	True wind speed (knots) **OR** ★ Beaufort code	18
Date (DD/MMM/YYYY)	15-Jul-2017	True wind direction	270
Time at start (UTC)	19205	Ice type code★	3
Time at end (UTC)	19235	Ice concentration code ★	1
Latitude at start / end	61° 12.34N / 61° 14'	True platform speed (knots)	10
Longitude at start / end	67° 39.11W / 67° 48'	True platform direction	295
Visibility (km)	10 KM	Observation side	Starboard ✓ Port Middle
Weather code ★	1	Height of eye (m)	20 M
Glare conditions code ★	2	Outdoors or Indoors	Out or (In)
Platform Activity	Sailing	Notes	

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

- Fill out one sheet per observation period, if no observation, write "No observation"

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State ★	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals ★	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction ★	Age/Sex	Mitigation Required?	Photo Number (if any)
15 Jul 2017 1905	295	1		61° 12	nA	/	-	-	-	-	-
Notes:											

★ Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés transarctic	Sea state code ★	1
Platform name and type	Arctic Desgagnés	Wave height (m)	1
Observer (s)	Michel Galarneau	True wind speed (knots) OR Beaufort code ★	18
Date (DD/MMM/YYYY)	15 Jul 2017	True wind direction (deg) ★	270
Time at start (UTC)	19205	Ice type code ★	3
Time at end (UTC)	19235	Ice concentration code ★	1
Latitude at start / end	61°12' / 61°14'	True platform speed (knots)	10
Longitude at start / end	67°39' / 67°48	True platform direction (deg)	295
Platform activity	Soulems	Observation side	(Starboard) Port
Visibility (km)	10 Km	Height of eye (m)	20 m
Weather code	1	Outdoors or Indoors	Out or (In)
Glare conditions code ★	2	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBMU	5	Fly	Y	B			NA				
TBMU	7	Fly	Y	B			W				
TBMU	4	Fly	Y	B			N				

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnes transarctic	Sea state code ★	4
Platform name and type	Arctic Desgagnes	Wave height (m)	2
Observer (s)	Michael Galarneau	True wind speed (knots) OR Beaufort code ★	17.6
Date (DD/MMM/YYYY)	15 Jul 2017	True wind direction (deg) ★	270
Time at start (UTC)	22230	Ice type code ★	3
Time at end (UTC)	232	Ice concentration code ★	1
Latitude at start / end	61°27.2 / 61°29.5	True platform speed (knots)	11.7
Longitude at start / end	68°40.9 / 68°52.4	True platform direction (deg)	295
Platform activity	Sailing	Observation side	(Starboard) Port
Visibility (km)	10	Height of eye (m)	20 M
Weather code	1	Outdoors or Indoors	Out or (In)
Glare conditions code ★	2	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
TBMU	2	W	Y	A							
TBMU	1	F	Y	A							
Unga	2	F	Y	A							
TBMU	1	W	Y	A							

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés Transarctic	Sea state code ★	
Platform name and type	Arctic Desgagnés	Wave height (m)	
Observer (s)	M. Galarneau	True wind speed (knots) OR Beaufort code ★	
Date (DD/MMM/YYYY)	15 July 2017	True wind direction (deg) ★	
Time at start (UTC)	60	Ice type code ★	
Time at end (UTC)		Ice concentration code	
Latitude at start / end	60° 32.2	True platform speed (knots)	
Longitude at start / end	64° 48.9	True platform direction (deg)	
Platform activity	Sailing through ice	Observation side	Starboard Port
Visibility (km)		Height of eye (m)	
Weather code		Outdoors or Indoors	Out or In
Glare conditions code ★		Snapshot used?	Yes or No

Notes: no observation possible

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments

★Refer to "Codes" datasheets

seabird survey protocol- moving vessel

species	count	fly or water	in transe	distance	assoc.	behaviour	flight direction	age	plum	sex	comments	date	position
thayers gull	1	sitting on the ship	no	50m	-	sitting on the container	circle	-	-	-	-	2017-01-07	54-21.6N /056-05.3'W
sabine's	2	fly	no	20m	-	flying	circle	-	-	-	-	2017-03-07	59-09'N/021-08'W
thayers gull	2	fly	no	100m	-	flying	circle	-	-	-	-	2017-03-07	59-09'N/021-08'W
pomarine jaeger	1	fly	no	100m	-	flying	circle	-	-	-	-	2017-03-07	59-02'N/029-07'W
black scoter	1	swim	no	30m	-	swimming	-	-	-	-	-	2017-06-07	62-55.6'N/079-07'W
pomarine jaeger	5	fly	no	30m	-	flying	circle	-	-	-	-	2017-03-08	61-30.2'N/068-36.7'W

whales

day	hour observed	posiotion	wind	sky	species	count	remarks	location	certainty				
2017-07-01	2000	54-14.6'N/055-59.0'W	1	1	killer whale	approximilty 4		Labrador	1				
2017-07-02	1030	56-34'N/057-44.5'W	1	2	pilot whale	approximilty 10		Labrador	2				
2017-07-02	1710	57-59.2'N/059-34.3'W	1	0	pilot whale	approximilty 8		labrador					
2017-07-06	0942	62-20'N/074-00'W	1	2	morse	2	1 adult/1 young	charles isl.					
2017-07-15	1420	63-03.0'N/083-50'W	1	2	pilot whale	approximilty 10		coats isl.	3				
2017-07-20	1153	55-05'N/064-23.0'W	1	1	humpback whales	2 / approximitly 5		anticosti	1				
2017-07-30	1945	49-57.7'N/064-36.0'W	1	1	pilot whale	between 5-10		anticosti	1				
2017-07-30	1945	49-57.7'N/064-36.0'W	1	1	humpback whales	between 3-6		anticosti	1				
2017-08-01	0000	53-17'N/055-20'W	1	2	petit rorqual	1		labrador	2				
									1				

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	TRANSPORT DESGAGNES	Sea state code	1
Platform name and type	CLAUDE A. DESGAGNES (CARGO SHIP)	Wave height (m)	<1m
Observer (s)	SANDRA LEBON	True wind speed (knots) **OR** Beaufort code	3-4 (BEAUFORT)
Date (DD/MMM/YYYY)	26/06/2017	True wind direction (deg)	030° (T)
Time at start (UTC)	2100	Ice type code	3-4
Time at end (UTC)	2230	Ice concentration code	5
Latitude at start / end	61°32.1'N / 61°34.3'N	True platform speed (knots)	8 (SOG) 7 (STW)
Longitude at start / end	067°44.7'W / 68°07.4'W	True platform direction (deg)	VAR (NNW)
Platform activity	TRAVELING	Observation side	(Starboard) Port
Visibility (km)	~10	Height of eye (m)	20m
Weather code	1	Outdoors or Indoors	Out or (In)
Glare conditions code	0	Snapshot used?	Yes or (No)

Notes: SHIP IS FOLLOWING ICE-BREAKER ~.6 NM

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	1	FLY	Y	C			SW	?			BLACK, SMALL, FAST
TBMU	1	WATER	Y	C	27		X	?			
TBMU	1	FLY	Y	C	27			?			
TBMU	1	WATER	Y	B	27			?			
TBMU	1	WATER	Y	D	27			?			
TBMU	2	WATER	Y	B	27						PAIRED
UNGU	1	FLY	Y	C	27		NW				WHITE
TBMU	1	WATER	N	E	27						CLOSE TO ICE, DOVE.
TBMU	1	WATER	Y	B	27						
TBMU	5	FLY	Y	D	27		NE				LANDED ON ICE
TBMU	5	WATER	Y	C	27						SAME GROUP ????
TBMU	1	FLY	Y	C	27	71?					
TBMU	2	WATER	Y	C	27						
UNGU	1	FLY	Y	C	27	71?					LIGHT GREY, SOME WHITE
TBMU	1	WATER	Y	B	27						
PAJA?	1	FLY	Y	B	27	49					CIRCLING BY THE SIDE ~20S
TBMU	2	FLY	Y	A	27						

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

TBMU	4	WATER	Y	C	27		
TBMU	3	WATER	Y	C	27		
TBMU	1	WATER	Y	D	27		
THAYER'S GULL	1	FLY	Y	C	27		
TBMU	1	FLY	Y	B	27		PASSED/CROSSED THE BOW ~5m

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
26/06/2017 2230 - 2300	NO SIGHTING										
Notes:											

Observation Period Information:			
Company/agency	~~GEARBOX~~ TRANSP. DESGAGNÉS	Sea state code	1
Platform name and type	CLAUDE A. DESGAGNES (GENERAL CARGO SHIP)	Wave height (m)	<1m
Observer (s)	SANDRA LEBON	True wind speed (knots) OR Beaufort code	4 (BEAUFORT)
Date (DD/MMM/YYYY)	26/06/2017	True wind direction	015°(T) (NNE)
Time at start (UTC)	~~2330~~ 2230	Ice type code	3-4
Time at end (UTC)	~~0000~~ 2300	Ice concentration code	5
Latitude at start / end	61°34.3'N	True platform speed (knots)	7 (STW) 8 (SOG)
Longitude at start / end	68°07.4'W	True platform direction	VAR (NNW)
Visibility (km)	~10 km	Observation side	(Starboard) Port Middle
Weather code	1	Height of eye (m)	20 m
Glare conditions code	1	Outdoors or Indoors	Out or (In)
Platform Activity	NA TRAVELING	Notes	FOLLOWING ICE-BREAKER N.D. 6 NM

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	TRANSPORT DESGAGNES	Sea state code	1 (BEAUFORT)
Platform name and type	CLAUDE A DESGAGNES (GEN. CARGOSHIP)	Wave height (m)	<0.5m
Observer (s)	SANDRA LEBON	True wind speed (knots) **OR** Beaufort code	15 kts
Date (DD/MMM/YYYY)	27/06/2017	True wind direction (deg)	300°(T)
Time at start (UTC)	2115	Ice type code	~~X~~
Time at end (UTC)	2245	Ice concentration code	0
Latitude at start / end	62°30.7'N / 62°42.1'N	True platform speed (knots)	13 (STW) 13 (SOG)
Longitude at start / end	072° 15.6'W / 072°46.4'W	True platform direction (deg)	VAR (NW)
Platform activity	TRAVELLING	Observation side	(Starboard) Port
Visibility (km)	>10km	Height of eye (m)	20m
Weather code	1	Outdoors or Indoors	Out or (In)
Glare conditions code	0	Snapshot used?	Yes or (No)

Notes: NO ICE.

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNGU	1	FLY	Y	C			SE				PASSED BEHIND SHIP, AROUND
UNGU	1	FLY	Y	A	18 120		NW				WHITE GULL
UNGU	1	FLY	Y	B	20		NW				GREY-ISH
UNGU	1	FLY	Y	B	20						
TBMU	4	FLY	N	B							OTHER SIDE OF SHIP

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Observation Period Information:					
Company/agency	TRANSPORT DESGAGNES		Sea state code	3	
Platform name and type	CLAUDE A DESGAGNES (GEN. CARGO SHIP)		Wave height (m)	<1m	
Observer (s)	SANDRA LEBON		True wind speed (knots) OR Beaufort code	6 (BEAUFORT)	
Date (DD/MMM/YYYY)	27/06/2017		True wind direction	270° (T)	
Time at start (UTC)	2245		Ice type code	N/A	
Time at end (UTC)	2315		Ice concentration code	0	
Latitude at start / end	62°42.1'N	62°45.8'N	True platform speed (knots)	12 kts	
Longitude at start / end	072°46.4'W	072°55.7'W	True platform direction	308° (T)	
Visibility (km)	>10 km		Observation side	(Starboard) Port Middle	
Weather code	1		Height of eye (m)	20m	
Glare conditions code	0		Outdoors or Indoors	Out or (In)	
Platform Activity	TRAVELING		Notes	NO ICE	

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
24/06/17 2245 2315	NO SIGHTING										
Notes:											

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Observation Period Information:			
Company/agency	TRANSPORT DESGAGNES	Sea state code	4
Platform name and type	CLAUDE A DESGAGNES (GEN CARGO SHIP)	Wave height (m)	1m
Observer (s)	SANDRA LEBON	True wind speed (knots) OR Beaufort code	13 kts
Date (DD/MMM/YYYY)	28/06/2019	True wind direction	015°
Time at start (UTC)	2245	Ice type code	/ NO ICE
Time at end (UTC)	2315	Ice concentration code	0
Latitude at start / end	63°11.5'N 63°11.7'N	True platform speed (knots)	13 kts
Longitude at start / end	080°18.5'W 80° 33.7'W	True platform direction	275°(T)
Visibility (km)	>10 km	Observation side	(Starboard) Port Middle
Weather code	0	Height of eye (m)	20 m
Glare conditions code	~~2~~ 3	Outdoors or Indoors	Out or (In)
Platform Activity	TRAVELING	Notes	

AGNICO EAGLE

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
Notes:											

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	TRANSPORT DESGAGNES		Sea state code	5	
Platform name and type	CLAUDE A DESGAGNES (CARGO SHIP)		Wave height (m)	1m	
Observer (s)	SANDRA LEBON		True wind speed (knots) **OR** Beaufort code	4 (BEAUFORT)	
Date (DD/MMM/YYYY)	28/06/2017		True wind direction (deg)	000° (T)	
Time at start (UTC)	2115		Ice type code	3	
Time at end (UTC)	2245		Ice concentration code	0	
Latitude at start / end	63°15.5'N	63°11.5'N	True platform speed (knots)	13.7 kts	
Longitude at start / end	079°36.4'W	080°18.5'W	True platform direction (deg)	230° (T)	
Platform activity	TRAVELLING		Observation side	(Starboard) Port	
Visibility (km)	>10 km		Height of eye (m)	20m	
Weather code	0		Outdoors or Indoors	Out or (In)	
Glare conditions code	2		Snapshot used?	Yes or (No)	

Notes: SUN REFLECTING ON WATER MAKES OBSERVATION DIFFICULT

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	7	FLY	Y	D			N				PROBABLY TBMU
UNKN	3	FLY	N	E	27		N				PROBABLY TBMU
UNKN	1	FLY	Y	D			N				PROBABLY TBMU
UNKN	1	FLY	N	E			W				WHITE + DARK (FAR)
UNKN	2	FLY	N	E			W				
TBMU	1	FLY	N	B			W				OTHER SIDE
TBMU	1	FLY	Y	C			E				

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	TRANSPORT DESGAGNES	Sea state code	1
Platform name and type	CLAUDE A. DESGAGNES CARGO SHIP	Wave height (m)	<1m
Observer (s)	SANDRA LEBON	True wind speed (knots) **OR** Beaufort code	8 kts
Date (DD/MMM/YYYY)	29/06/2017	True wind direction (deg)	150°
Time at start (UTC)	2200	Ice type code	3
Time at end (UTC)	2330	Ice concentration code	0
Latitude at start / end	62°36.4'N / 62°40.7'N	True platform speed (knots)	13 kts
Longitude at start / end	090°39.6'W / 091°30.5'W	True platform direction (deg)	290°
Platform activity	>10km, TRAVELING	Observation side	(Starboard) Port
Visibility (km)		Height of eye (m)	20m
Weather code	0	Outdoors or Indoors	Out or (In)
Glare conditions code	3	Snapshot used?	Yes or (No)

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	2	ON ICE	N	E	27						WHITE, FAR
UNDU	2	FLY	Y	B			NW				BLACK
UNKN	~30	FLY	N	E			N				DARK (BROWN?), LOON ON WATER
Thayer's gull	4	ON ICE	Y	C	27						RESTING
↓	1	FLY	Y	B							TOWARDS SHIP
UNGU	1	FLY	Y	C							
UNGU	1	FLY	Y	C	27		W				

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2] Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3] ***J***(uvenile), ***I***(mmature), or ***A***(dult); [4] ***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Observation Period Information:				
Company/agency	TRANSPORT DESGAGNES		Sea state code	2
Platform name and type	CLAUDE A DESGAGNES GEN. CARGO VSL		Wave height (m)	<1m
Observer (s)	SANDRA LEBON		True wind speed (knots) OR Beaufort code	11 kts
Date (DD/MMM/YYYY)	29/06/2017		True wind direction	180°
Time at start (UTC)	2130		Ice type code	3
Time at end (UTC)	2200		Ice concentration code	0
Latitude at start / end	62°36.4'N	62°36.9'N	True platform speed (knots)	13 kts
Longitude at start / end	090°39.6'W	090°24.5W	True platform direction	270°
Visibility (km)	>10km		Observation side	Starboard Port Middle
Weather code	0		Height of eye (m)	20m
Glare conditions code	1		Outdoors or Indoors	Out or (In)
Platform Activity	TRAVELING		Notes	

AGNICO EAGLE

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
JUNE 29, 2019 2130	13kts W	1		62°36.0'N 090°42.3'W	1 RINGED SEAL	~300m	90°	RESTING ON ICE	?		
2136	13kts W	1		62°36.0'N 090°42.3'W	2 WALRUSES	~100m	90°	BLOOD ON ICE → FEEDING? RESTING	?		ONE TOOTH
1758	13kts	1		62°36.08'N 090°51.8'W	1 WALRUS	~1 NM		RESTING ON ICE BIRDS AROUND			

Notes:

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	TRANSPORT DESGAGNES	Sea state code	0
Platform name and type	CLAUDE A DESGAGNES SHIP	Wave height (m)	<1m
Observer (s)	SANDRA LEBON	True wind speed (knots) **OR** Beaufort code	12 kts
Date (DD/MMM/YYYY)	30/06/2017	True wind direction (deg)	190°
Time at start (UTC)	2100	Ice type code	2
Time at end (UTC)	2230	Ice concentration code	1
Latitude at start / end	62°39.3'N / 62°43.6'N	True platform speed (knots)	13 kts
Longitude at start / end	091° 16.3'W / 091° 55.5'W	True platform direction (deg)	285°
Platform activity	TRAVELING	Observation side	(Starboard) Port
Visibility (km)	>10km	Height of eye (m)	20m
Weather code	0	Outdoors or Indoors	~~Out~~ or (In)
Glare conditions code	1	Snapshot used?	Yes or (No)

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
Thayer's Gull	1	FLY	Y	C			ND				WHITE & GREY
Thayer's Gull	1	FLY	Y	C			ND				"

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Observation Period Information:					
Company/agency	TRANSPORT DESGAGNES		Sea state code	1	
Platform name and type	~~De~~ CLAUDE A DESGAGNES		Wave height (m)	<1m	
Observer (s)	SANDRA LEBON		True wind speed (knots) OR Beaufort code	14 kts	
Date (DD/MMM/YYYY)	30/06/2017		True wind direction	180°	
Time at start (UTC)	2230		Ice type code	2	
Time at end (UTC)	2300		Ice concentration code	0	
Latitude at start / end	62°43.6'N	62° 46.4'N	True platform speed (knots)	13 kts	
Longitude at start / end	91° 55.5'W	092° 05.3'W	True platform direction	300°	
Visibility (km)	>10km		Observation side	(Starboard) Port Middle	
Weather code	0		Height of eye (m)	20m	
Glare conditions code	2-3		Outdoors or Indoors	Out or (In)	
Platform Activity	TRAVELING		Notes		

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
30/06/17	NO SIGHTING										

Notes:

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a stationary platform survey

Scan Information:

Company/agency	TRANSPORT DESGAGNES	Weather code	0
Platform name and type	CANDEA DESGAGNES	Glare conditions code	1
Observer (s)	SANDRA LEBON	Sea state code	~~X~~ 0
Date (DD/MMM/YYYY)	01/07/2019	Wave height (m)	0
Time at start (UTC)	2200 → 2230	True wind speed (knots) **OR** Beaufort code	~~X~~ 2-3 kts
Latitude	62°46.6'N	True wind direction (deg)	195°
Longitude	092°05.5'W	Ice type code	1
Platform activity	DISCHARGING CARGO	Ice concentration code	1
Scan type	(180°) or other (specify:)	Height of eye (m)	20 m
Scan direction	150 → 330°	Outdoors or Indoors	Out or (In)
Visibility (km)	>10km (land)		

Notes: ANCHORED NEAR RANKIN INLET

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	2	ICE	Y	C							
UNKN	2	WATER	Y	C							
UNKN	2	ON ICE	Y	C							
~~Northern Fulmar~~	1	FLY	Y	B			ND				
UNKN	2	WATER	Y	C							
UNKN	2	WATER	Y	D							
UNKN	2	WATER	Y	D							BLACK, MEDIUM
UNKN	2	WATER	Y	D							BLACK
~~THAYER'S GULL~~	2	FLY	Y	D			ND				BLACK, SMALL
UNKN	1	WATER	Y	D							
UNGU	1	FLY	Y	D			SW				BLACK WINGS ?
UNDU	1	ON ICE	Y	D							MAYBE WITH 2 SMALLER ONES, BLACK

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Observation Period Information:			
Company/agency	TRANSPORT DESGAGNES	Sea state code	0
Platform name and type	CLAUDE A. DESGAGNES	Wave height (m)	0
Observer (s)	SANDRA LEBON	True wind speed (knots) OR Beaufort code	3kts
Date (DD/MMM/YYYY)	01/07/2017	True wind direction	190°
Time at start (UTC)	2230	Ice type code	1
Time at end (UTC)	2400	Ice concentration code	1
Latitude at start / end	62°46.6'N 62°46.6'N ANCHORED	True platform speed (knots)	0
Longitude at start / end	092°05.5'W 092°05.5'W	True platform direction	X
Visibility (km)	>10km	Observation side	(Starboard) ~~Port~~ ~~Middle~~ ~~ALL AROUND~~
Weather code	0	Height of eye (m)	20m
Glare conditions code	2	Outdoors or Indoors	Out or (In)
Platform Activity	ANCHORED, DISCHARGING CARGO	Notes	STATIONARY

AGNICO EAGLE

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
01/07/17 2255	ANCHORED 0 kts	0			1 SEAL (UNSPECIFIED, TOO FAR & IN WATER)	300 m	190°(T)	IN WATER → DIVE	?		
01/07/17 2310	0 kts	0			1 SEAL (UNSPECIFIED. TOO FAR, BRIEFLY APPEARED & DISSAPPEARED IN WATER.	200 m	070°(T)	IN WATER, CAME OUT & DIVE FAST.	?		

Notes:

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a stationary platform survey

Scan Information:

Company/agency	TRANSPORT DESGAGNES	Weather code	0
Platform name and type	CLAUDE A DESGAGNES (CARGO Ship)	Glare conditions code	2+3
Observer (s)	SANDRA LEBON	Sea state code	1
Date (DD/MMM/YYYY)	02/07/2017	Wave height (m)	<1m
Time at start (UTC)	2200	True wind speed (knots) **OR** Beaufort code	17kts
Latitude	62°46.7'N	True wind direction (deg)	180°
Longitude	092°05.6'W	Ice type code	1
Platform activity	DISCHARGING CARGO AT ANCHOR	Ice concentration code	0
Scan type	(180°) or other (specify:)	Height of eye (m)	20m
Scan direction	110°-290°(T)	Outdoors or Indoors	Out or (In)
Visibility (km)	>10km		

Notes: OTHER BOATS IN THE AREA (FISHING/SEALING)

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	5	W	4	D	28						
UNKN	2	W	4	D	28						
UNKN	1	F/W	4	D	28		ND				
UNKN	2	W	4	C	28						
Thayer's Gull	1	F	4	B			ND				
COEI	2	W	4	D	28					M+F	COUPLE
UNKN	5	W	N	D	28						1 SMALL, CLOSE GROUP
UNKN	4	W	N	E	28						1 STERN OF SHIP, CLOSE TO ISLD
TBMU	2	W	N	C	28						
TBMU	4	W	N	C	28						
UNDU	4	W	4	D	28						
COEI	1	F	4	B	28		ND				
COEI	2	ICE	4	B	27					M+F	ON PIECE OF ICE, RESTING COUPLE

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Observation Period Information:			
Company/agency	TRANSPORT DESGAGNES	Sea state code	1
Platform name and type	CLAUDE A. DESGAGNES (SHIP)	Wave height (m)	<1m
Observer (s)	SANDRA LEBON	True wind speed (knots) OR Beaufort code	12 kts
Date (DD/MMM/YYYY)	02/07/2017	True wind direction	190°
Time at start (UTC)	2230	Ice type code	1
Time at end (UTC)	2400	Ice concentration code	0
Latitude at start≠end ANCHORED	62°46.7'N	True platform speed (knots)	0 (ANCHORED)
Longitude at start≠end	092°05.6'W	True platform direction	N/A
Visibility (km)	>10 km	Observation side	(Starboard) Port Middle
Weather code	0	Height of eye (m)	20m
Glare conditions code	2+3	Outdoors or Indoors	Out or (In)
Platform Activity	DISCHARGING CARGO @ ANCHOR.	Notes	OTHER BOATS IN THE VISCINITY (FISHING/SEALING)

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
02/07/2017	NO SIGHTING										

Notes:

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a stationary platform survey

Scan Information:

Company/agency	TRANSPORT DESGAGNES	Weather code	1
Platform name and type	CLAUDE A DESGAGNES	Glare conditions code	0
Observer (s)	SANDRA LEBON	Sea state code	2
Date (DD/MMM/YYYY)	04/07/2017	Wave height (m)	<1m
Time at start (UTC)	2200	True wind speed (knots) **OR** Beaufort code	13 kts
Latitude	62°46.6'N	True wind direction (deg)	115°
Longitude	092°05.9'W	Ice type code	0
Platform activity	ANCHORED, DISCHARGING CARGO	Ice concentration code	0
Scan type	(180°) or other (specify:)	Height of eye (m)	20m
Scan direction	010-190° (T)	Outdoors or Indoors	Out or (In)
Visibility (km)	>10km		

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Ely or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
Thayer's Gull	1	F	Y	B			ND				
UNGU	1	F	Y	D			ND				
UNKN	3	W	Y	D							
TBMU	9	W	Y	C	28						CLOSE TO AN ISLAND
UNGU	1	F	Y	D	28						LANDED ON AN ISLAND
UNKN	4	W	Y	D	28						WHITE AND/OR GREY
UNKN	1	F	Y	D			NW				WHITE & BLACK.
UNBN	4	W	Y	D							BROWN?
TBMU	2	W	Y	D	28						NEAR ISLAND
UNGU	1	F	N	E	28						OVER THE LAND
UNKN	4	W	Y	D							

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Observation Period Information:				
Company/agency	TRANSPORT DESGAGNES		Sea state code	2
Platform name and type	CLAUDE A DESGAGNES CARGO SHIP		Wave height (m)	~1m
Observer (s)	SANDRA LEBON		True wind speed (knots) OR Beaufort code	14 kts
Date (DD/MMM/YYYY)	04/07/2017		True wind direction	E
Time at start (UTC)	2230		Ice type code	0
Time at end (UTC)	2400		Ice concentration code	0
Latitude at start / end	62°46.6'N	62°46.6'N	True platform speed (knots)	0 → ANCHORED
Longitude at start / end	092°05.9'W	092°05.9'W	True platform direction	FACING E (090°T)
Visibility (km)	>10 km		Observation side	(Starboard) Port Middle
Weather code	1		Height of eye (m)	20m
Glare conditions code	0		Outdoors or Indoors	Out or (In)
Platform Activity	ANCHORED, DISCHARGING CARGO		Notes	

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
04/07/17	NO SIGHTING										
Notes:											

AGNICO EAGLE

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	TRANSPORT DESGAGNES	Sea state code	2
Platform name and type	CLAUDE A DESGAGNES CARGO SHIP	Wave height (m)	< 1 m
Observer (s)	SANDRA LEBON	True wind speed (knots) **OR** Beaufort code	13 kts
Date (DD/MMM/YYYY)	05/07/2017	True wind direction (deg)	~~S~~ 045° (T)
Time at start (UTC)	2130	Ice type code	N/A
Time at end (UTC)	2200	Ice concentration code	0
Latitude at start / end	62°38.0'N / 62°36.0'N	True platform speed (knots)	13.5 kts
Longitude at start / end	091°10.5'W / 090°54.4'W	True platform direction (deg)	110° (T)
Platform activity	TRAVELING	Observation side	(Starboard) Port
Visibility (km)	>10 km	Height of eye (m)	20m
Weather code	1	Outdoors or Indoors	Out or (In)
Glare conditions code	0	Snapshot used?	Yes or (No)

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
Thayer's Gull	1	FLY	Y	C			NE				

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Observation Period Information:			
Company/agency	TRANSPORT DESGAGNÉS	Sea state code	3
Platform name and type	CLAUDE A DESGAGNES	Wave height (m)	<1m
Observer (s)	SANDRA LEBON	True wind speed (knots) OR Beaufort code	11.6 kts
Date (DD/MMM/YYYY)	05/07/2017	True wind direction	030°
Time at start (UTC)	2200	Ice type code	N/A
Time at end (UTC)	2330	Ice concentration code	0
Latitude at start / end	62°36.0'N / 62°38.1'N	True platform speed (knots)	13.5kts
Longitude at start / end	090°54.4'W / 090°12.9'W	True platform direction	086°
Visibility (km)	>10 km	Observation side	(Starboard) Port Middle
Weather code	1	Height of eye (m)	20m
Glare conditions code	0	Outdoors or Indoors	Out or (In)
Platform Activity	TRAVELING	Notes	

AGNICO EAGLE

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (If any)
05/07/2017	NO SIGHTING										
Notes:											

AGNICO EAGLE

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	TRANSPORT DESGAGNES	Sea state code	2
Platform name and type	CLAUDE A DESGAGNES (CARGO SHIP)	Wave height (m)	<1m
Observer (s)	Kristian Brown	True wind speed (knots) **OR** Beaufort code	7 kts
Date (DD/MMM/YYYY)	7/July/2017	True wind direction (deg)	315°
Time at start (UTC)	22:00	Ice type code	3
Time at end (UTC)	22:45	Ice concentration code	0
Latitude at start / end	62.51.8'N / 62.50.1 N	True platform speed (knots)	14kts
Longitude at start / end	78.31.6'W / 78.11.2 W	True platform direction (deg)	095°
Platform activity	TRAVELING	Observation side	(Starboard) Port
Visibility (km)	>10km	Height of eye (m)	20m
Weather code	1	Outdoors or Indoors	Out or (In)
Glare conditions code	0	Snapshot used?	Yes or (No)

Notes:
Thick-Billed murre

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
Thick-billed	1	water	NA	50 m	water	sitting on water	NA				

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Observation Period Information:					
Company/agency	TRANSPORT DESGAGNÉS		Sea state code	2	
Platform name and type	Claude A Desgagne		Wave height (m)	<1m	
Observer (s)	Kristian Brown		True wind speed (knots) OR Beaufort code	7 Kts	
Date (DD/MMM/YYYY)	7 July 2017		True wind direction	300°	
Time at start (UTC)	2245		Ice type code	2	
Time at end (UTC)	~~62.50 N~~ 2300		Ice concentration code	0	
Latitude at start / end	62°.5 N	62°46 N	True platform speed (knots)	14 Kts	
Longitude at start / end	78°.11 W	77°20 W	True platform direction	109°	
Visibility (km)	>10 K		Observation side	~~Starboard~~ (Port)	Middle
Weather code	1		Height of eye (m)	20m	
Glare conditions code	0		Outdoors or Indoors	Out	or (In)
Platform Activity	Traveling		Notes		

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
Notes:											

AGNICO EAGLE

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	Transport Desgagnés	Sea state code	4
Platform name and type	Claude A Desgagnés Cargo	Wave height (m)	5m
Observer (s)	Kristian Bjorn	True wind speed (knots) **OR** Beaufort code	18 KN
Date (DD/MMM/YYYY)	8/7/17	True wind direction (deg)	140°
Time at start (UTC)	~~2245~~ 1945	Ice type code	2
Time at end (UTC)	2015	Ice concentration code	1
Latitude at start / end	60° 44.36 / 60° 43.22	True platform speed (knots)	3.5 KN
Longitude at start / end	63° 39.67 / 63° 31.84	True platform direction (deg)	086°
Platform activity	Traveling	Observation side	(Starboard) Port
Visibility (km)	~~X~~ 10K	Height of eye (m)	20m
Weather code	3	Outdoors or Indoors	Out or (In)
Glare conditions code	0	Snapshot used?	Yes or (~~No~~)

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
Seagull	1	Fly	Y ~~Not~~	20m	~~Not~~		~~South~~				Flying with Ship
Seagull	2	Fly	Y	10m	Ship						Flying with Ship

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Observation Period Information:					
Company/agency	Transport Desgagnés		Sea state code	2	
Platform name and type	Claude A Desgagnés Cargo		Wave height (m)	>5m	
Observer (s)	Kristian Brown		True wind speed (knots) OR Beaufort code	22.5	
Date (DD/MMM/YYYY)	8/7/17		True wind direction	125°	
Time at start (UTC)	2015		Ice type code	0	
Time at end (UTC)	2145		Ice concentration code	0	
Latitude at start / end	60°43.22	60°37.17	True platform speed (knots)	9.6 KN	
Longitude at start / end	63°31.84	63°2276	True platform direction	120.2°	
Visibility (km)	>5K		Observation side	(Starboard)	Port Middle
Weather code	3		Height of eye (m)	20 m	
Glare conditions code	0		Outdoors or Indoors	Out or	(In)
Platform Activity	Traveling		Notes		

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
Notes:											

AGNICO EAGLE

Observation Period Information:			
Company/agency	Transport Desgagnés	Sea state code	4-6
Platform name and type	Claude A Desgagnés	Wave height (m)	>2m
Observer (s)	Kristian Brown Cargo	True wind speed (knots) OR Beaufort code	8KN
Date (DD/MMM/YYYY)	7/8/17	True wind direction	1600
Time at start (UTC)	~~2000~~ 1900	Ice type code	3
Time at end (UTC)	~~2130~~ 2030	Ice concentration code	0
Latitude at start / end	61°02.80 60°59.15	True platform speed (knots)	13 KN
Longitude at start / end	68°01.56 67°40.58	True platform direction	160°
Visibility (km)	>10K.	Observation side	(Starboard) Port Middle
Weather code	0	Height of eye (m)	20 m
Glare conditions code	0	Outdoors or Indoors	Out or (In)
Platform Activity	Traveling	Notes	nothing

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
Notes:											

AGNICO EAGLE

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	Transport Desgagnés	Sea state code	4-6
Platform name and type	Claude A Desgagnés (cargo)	Wave height (m)	~~<2m~~ >2m
Observer (s)	Kristian Beaty	True wind speed (knots) **OR** Beaufort code	8 KN
Date (DD/MMM/YYYY)	8/7/17	True wind direction (deg)	1600
Time at start (UTC)	1830	Ice type code	~~X~~ 3
Time at end (UTC)	~~2000~~ 1900	Ice concentration code	0
Latitude at start / end	61°08.45 / 61°02.80	True platform speed (knots)	13.3 KN
Longitude at start / end	63° 14.67 / 68°01.56	True platform direction (deg)	133.5°
Platform activity	Traveling	Observation side	~~Starboard~~ Port
Visibility (km)	2/10K	Height of eye (m)	~~20m~~ 20M
Weather code	0	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	0	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
TBMU	1	water	N	100 m	water	Sitting	NA				
TBMU	1	FLY	N	10 m	water	Fly away	S				Flying away from ship
											lots of birds
											after ½ hour

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a stationary platform survey

Scan Information:

Company/agency	Transport Desgagnes	Weather code	3
Platform name and type	Claude A Desgagnés Cargo	Glare conditions code	0
Observer (s)	Kristian Brown	Sea state code	light Air
Date (DD/MMM/YYYY)	9/8/17	Wave height (m)	>1m
Time at start (UTC)	start 1900 / end 1930	True wind speed (knots) **OR** Beaufort code	13 KN
Latitude	56° 56.99 / 56° 53.75	True wind direction (deg)	030°
Longitude	58° 01.07 / 57° 56.64	Ice type code	0
Platform activity	Traveling	Ice concentration code	0
Scan type	180° or other (specify: 90°)	Height of eye (m)	20m
~~Scan direction~~ weather code	Glare 0	Outdoors or Indoors	Out or (In)
Visibility (km)	>1K		No Pics

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Observation Period Information:			
Company/agency	Transport Pegagles	Sea state code	Light Air
Platform name and type	Chuka A Pegagles cargo	Wave height (m)	2m
Observer (s)	Kristian Brown	True wind speed (knots) OR Beaufort code	12 KN
Date (DD/MMM/YYYY)	9/7/17	True wind direction	028.3°
Time at start (UTC)	1930 | 2100	Ice type code	0
Time at end (UTC)	~~56°53.75~~ | 2100	Ice concentration code	0
Latitude at start / end	56°53.75 | 56°49.44	True platform speed (knots)	13.8 KN
Longitude at start / end	58°01.07 | 57°49.47	True platform direction	144.6°
Visibility (km)	>1K	Observation side	Starboard (Port) ~~Middle~~
Weather code	3	Height of eye (m)	20m
Glare conditions code	0	Outdoors or Indoors	Out or In
Platform Activity	Traveling	Notes	Can't See

AGNICO EAGLE

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
Notes:											

AGNICO EAGLE

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	Desgagnes	Sea state code	1
Platform name and type	Nordika Desgagnes - Cargo	Wave height (m)	0.3
Observer (s)	Nick Braunstein	True wind speed (knots) **OR** Beaufort code	7 Knots
Date (DD/MMM/YYYY)	30/06/2018	True wind direction (deg)	255°
Time at start (UTC)	0000	Ice type code	4
Time at end (UTC)	0400	Ice concentration code	1
Latitude at start / end	63°04.1'N	True platform speed (knots)	4.5
Longitude at start / end	056°02.1'W	True platform direction (deg)	270
Platform activity	Travelling	Observation side	(Starboard) Port
Visibility (km)	10	Height of eye (m)	25m
Weather code	0	Outdoors or Indoors	Out or (In)
Glare conditions code	2	Snapshot used?	Yes or (No)

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	19	Fly									
UNKN	17	Fly	Yes	D			N				Small, V-shaped flock
UNGU	1	Fly	Yes	C			SW				Large white Gull
UNDU	4	Fly	No	B			WSW				
UNKN	2	Fly	Yes	B			E	A			

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a stationary platform survey

Scan Information:

Company/agency		Weather code	2
Platform name and type		Glare conditions code	
Observer (s)	Cadet Farid Hardy-M.	*Sea state code*	1
Date (DD/MMM/YYYY)	18/07/2018	*Wave height (m)*	< 1 ft
Time at start (UTC)	2130	True wind speed (knots) **OR** Beaufort code	3
Latitude	61° 25.12' N	True wind direction (deg)	North
Longitude	067° 13.2' W	Ice type code	3
Platform activity	SEA PASSAGE	Ice concentration code	1
Scan type	180° or other (specify:)	Height of eye (m)	
Scan direction		Outdoors or Indoors	Out or (In)
Visibility (km)	~ 6		

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNID	10	Water	No	C			ND				

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a ~~stationary~~ moving platform survey

Scan Information:

Company/agency		Weather code	1
Platform name and type		Glare conditions code	0
Observer (s)	Cadet Farid Hedj - M.	*Sea state code*	2
Date (DD/MMM/YYYY)	18/07/2018	*Wave height (m)*	
Time at start (UTC)	1110	True wind speed (knots) **OR** Beaufort code	1
Latitude	62° 01,1' N	True wind direction (deg)	125°
Longitude	069° 42,7' W	Ice type code	0
Platform activity	SEA PASSAGE	Ice concentration code	0
Scan type	180° or other (specify:)	Height of eye (m)	
Scan direction		Outdoors or Indoors	Out or (In)
Visibility (km)			

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	10	Fly	Yes	C			S	A			

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a ~~stationary~~ moving platform survey

Scan Information:

Company/agency		Weather code	1
Platform name and type	NORDIKA DESGAGNÉS	Glare conditions code	0
Observer (s)	Cadet Farid Hedj-M.	*Sea state code*	2
Date (DD/MMM/YYYY)	17/07/2018	*Wave height (m)*	
Time at start (UTC)	2037	True wind speed (knots) **OR** Beaufort code	2
Latitude	63°08,55'N	True wind direction (deg)	080°
Longitude	075°38,0'W	Ice type code	
Platform activity	Sea passage	Ice concentration code	
Scan type	180° or other (specify:)	Height of eye (m)	
Scan direction		Outdoors or Indoors	Out or (In)
Visibility (km)	8		

Notes:
Observation side: sterboard

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNKN	6	Fly	Yes	A			E	A			

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés	Sea state code ★	3
Platform name and type	Nordika	Wave height (m)	2 ft
Observer (s)	C/O	True wind speed (knots) OR Beaufort code	W 10 kts
Date (DD/MMM/YYYY)	23/10/2018	True wind direction (deg)	W
Time at start (UTC)	08:30	Ice type code ★	—
Time at end (UTC)		Ice concentration code	—
Latitude at start / end	60°26.0'N	True platform speed (knots)	13 kts
Longitude at start / end	064°14.5'W	True platform direction (deg)	113
Platform activity	underway	Observation side	Starboard ✓ Port ✓
Visibility (km)	15'	Height of eye (m)	
Weather code	cloudy	Outdoors or Indoors	Out or In
Glare conditions code★	0	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect? ★	* Distance[1]	Assoc.	Behav.	Flight Direc.[2] ★	Age[3] ★	Plum.[4] ★	Sex	Comments
Duck	10	Fly		200 m			S	Adult			

★Refer to "Codes" datasheets

SEABIRD SURVEY PROTOCOL – MOVING VESSEL

AGNICO EAGLE

↗ Fill out one sheet per 30 min observation period

Observation Period Information:

Company/agency	Desgagnés
Platform name and type	Nordik Desgagnés
Observer (s)	Nick Brownstein
Date (DD/MMM/YYYY)	20/10/2018
Time at start (UTC)	1500
Time at end (UTC)	1530
Latitude at start / end	63°07.6'N / 63°08.0'N
Longitude at start / end	83°04.5'W / 82°17.3'W
Platform activity	Underway
Visibility (km)	20
Weather code	0
Glare conditions code★	0

Sea state code ★	2
Wave height (m)	1.0
True wind speed (knots) OR Beaufort code ★	13 knots
True wind direction (deg) ★	(N) 000°
Ice type code ★	0
Ice concentration code	0
True platform speed (knots)	13.3 knots
True platform direction (deg)	090°
Observation side	(Starboard) Port
Height of eye (m)	30m
Outdoors or Indoors	Out or (In)
Snapshot used?	Yes or (No)

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* ★ In transect?	* Distance[1]	Assoc.	Behav.	★ Flight Direc.[2]	★ Age[3]	★ Plum.[4]	Sex	Comments
COLO	1	Fly	No	15			S				
HABD	10	Fly	No	C			SW				
UNKN	5	Water	No	A		93					
UNKN	3	Fly	Yes	D			E				

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	4
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2 m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	21 kts
Date (DD/MMM/YYYY)	12/09/2018		True wind direction	SE
Time at start (UTC)	1200		Ice type code★	N/A
Time at end (UTC)	1230		Ice concentration code ★	0
Latitude at start / end	62° 26.0'N	62° 28.5 N	True platform speed (knots)	10.7 kts
Longitude at start / end	072° 57.1'W	073° 07.1W	True platform direction	299°
Visibility (km)	16 Km		Observation side	Starboard Port Middle
Weather code ★	1		Height of eye (m)	22 m
Glare conditions code ★	0		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	2
Platform name and type	ACADIA DESGAGNES		Wave height (m)	< 1 m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	8 kts
Date (DD/MMM/YYYY)	11/09/2018		True wind direction	NW
Time at start (UTC)	2230		Ice type code★	N/A
Time at end (UTC)	2300		Ice concentration code ★	0
Latitude at start / end	61° 28.6'N	61° 31.2'N	True platform speed (knots)	12.8 kts
Longitude at start / end	068° 47.0'W	068° 59.1'W	True platform direction	297°
Visibility (km)	16 Km		Observation side	Starboard Port Middle
Weather code ★	0		Height of eye (m)	22 m
Glare conditions code ★	3		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	2
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2 m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	10 Kts
Date (DD/MMM/YYYY)	11/09/2018		True wind direction	235°
Time at start (UTC)	1200		Ice type code ★	N/A
Time at end (UTC)	1230		Ice concentration code ★	0
Latitude at start / end	60° 35.0'N	60° 37.7'N	True platform speed (knots)	12.2 Kts
Longitude at start / end	065° 00.8'W	065° 12.0'W	True platform direction	297°
Visibility (km)	16 Km		Observation side	(Starboard) Port Middle
Weather code ★	1		Height of eye (m)	22 m
Glare conditions code ★	0		Outdoors or Indoors	Out or (In)
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	1
Platform name and type	ACADIA DESGAGNES		Wave height (m)	< 1 m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	7 Kts
Date (DD/MMM/YYYY)	11/09/2018		True wind direction	N
Time at start (UTC)	1706		Ice type code★	N/A
Time at end (UTC)	1730		Ice concentration code ★	0
Latitude at start / end	61° 00.8'N	61° 03.2'N	True platform speed (knots)	11.8 kts
Longitude at start / end	066° 47.3'W	066° 58.3'W	True platform direction	295°
Visibility (km)	16 Km		Observation side	Starboard Port Middle
Weather code ★	1		Height of eye (m)	22 m
Glare conditions code ★	0		Outdoors or Indoors	Out or In
Platform Activity	travelling		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	1
Platform name and type	ACADIA DESGAGNES		Wave height (m)	1m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	8 kts
Date (DD/MMM/YYYY)	12/09/2018		True wind direction	SE
Time at start (UTC)	1730		Ice type code★	N/A
Time at end (UTC)	1800		Ice concentration code ★	0
Latitude at start / end	62° 33.6' N	62° 34.5' N	True platform speed (knots)	14.7 kts
Longitude at start / end	075° 24.3' W	075° 40.5' W	True platform direction	279° T
Visibility (km)	16 Km		Observation side	Starboard Port Middle
Weather code ★	0		Height of eye (m)	22m
Glare conditions code ★	0		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	No OBSERVATIONS

★Refer to "Codes" datasheets

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	4
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	27 kts
Date (DD/MMM/YYYY)	12/09/2018		True wind direction	NW
Time at start (UTC)	2230		Ice type code★	N/A
Time at end (UTC)	2300		Ice concentration code ★	0
Latitude at start / end	62° 39.1'N	62° 39.3'N	True platform speed (knots)	8.8 Kts
Longitude at start / end	077° 29.5'W	077° 39.8'W	True platform direction	276°T
Visibility (km)	16 Km		Observation side	Starboard Port Middle
Weather code ★	1		Height of eye (m)	22m
Glare conditions code ★	0		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	No OBSERVATIONS

★Refer to "Codes" datasheets

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE MELIADINE	Sea state code	2
Platform name and type	ACADIA DESGAGNES	Wave height (m)	1m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	7 KTS
Date (DD/MMM/YYYY)	21/09/2018	True wind direction (deg)	NW
Time at start (UTC)	2200	Ice type code	N/A
Time at end (UTC)	2230	Ice concentration code	0
Latitude at start / end	60° 53.0'N / 60° 50.4' N	True platform speed (knots)	14.2 ~~kts~~
Longitude at start / end	066° 17.3'W / 066° 06.3'N	True platform direction (deg)	115° T
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 Km	Height of eye (m)	22m
Weather code	0	Outdoors or Indoors	Out or In
Glare conditions code	0	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNGU	3	FLY	Y	A	IS	39	E	I	NB	M	
LTDU	3	WATER	Y	A	NA	60	ND	A	NB	M	
GLGU	2	FLY	Y	A	N/A	39	N	A	NB	M	
NOFU	4	FLY	Y	A	N/A	39	S	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Company/agency	AGNICO EAGLE MELIADINE		Sea state code	2	
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m	
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	14 kts	
Date (DD/MMM/YYYY)	21/09/2018		True wind direction	NW	
Time at start (UTC)	1730		Ice type code	N/A	
Time at end (UTC)	1800		Ice concentration code	0	
Latitude at start / end	61° 18.5 N	61° 15.7'N	True platform speed (knots)	12.8 kts	
Longitude at start / end	068° 04.6W	067° 525'W	True platform direction	116° T	
Visibility (km)	16 km		Observation side	Starboard	Port Middle
Weather code	0		Height of eye (m)	22m	
Glare conditions code	2		Outdoors or Indoors	Out	or
Platform Activity	TRAVELLING		Notes	NO OBSERVATION	



Observation Period Information:					
Company/agency	AGNICO EAGLE MELIADINE		Sea state code	4	
Platform name and type	ACADIA DESGAGNÉS		Wave height (m)	1m	
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	12 KTS	
Date (DD/MMM/YYYY)	19/09/2018		True wind direction	W	
Time at start (UTC)	1730		Ice type code	N/A	
Time at end (UTC)	1800		Ice concentration code	0	
Latitude at start / end	62° 26.2'N	62° 25.2'N	True platform speed (knots)	13.1 KTS	
Longitude at start / end	089° 02.6'W	088° 48.8'W	True platform direction	098° T	
Visibility (km)	12 Km		Observation side	Starboard Port Middle	
Weather code	1		Height of eye (m)	22m	
Glare conditions code	2		Outdoors or Indoors	Out or In	
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS	

[redacted]

Observation Period Information			
Company/agency	AGNICO EAGLE MELIADINE	Sea state code	1
Platform name and type	ACADIA DESGAGNES	Wave height (m)	1m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	6 KTS
Date (DD/MMM/YYYY)	21/09/2018	True wind direction	NW
Time at start (UTC)	2230	Ice type code	N/A
Time at end (UTC)	2300	Ice concentration code	0
Latitude at start / end	60° 50.3'N / 60° 47.0'N	True platform speed (knots)	13.7 KTS
Longitude at start / end	066° 06.2'W / 065° 51.9'W	True platform direction	115°T
Visibility (km)	16 Km	Observation side	Starboard Port Middle
Weather code	0	Height of eye (m)	22m
Glare conditions code	0	Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING	Notes	NO OBSERVATIONS



Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	3
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	17 kts
Date (DD/MMM/YYYY)	13/09/2018	True wind direction (deg)	SW
Time at start (UTC)	1700	Ice type code	N/A
Time at end (UTC)	1730	Ice concentration code	0
Latitude at start / end	61° 59.5'N / 62° 00.4'N	True platform speed (knots)	11.3 kts
Longitude at start / end	083° 36.4'W / 083° 48.1'N	True platform direction (deg)	278° T
Platform activity	TRAVELLING	Observation side	~~Starboard~~ Port
Visibility (km)	16 km	Height of eye (m)	22m
Weather code	1	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	1	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
WISP	2	FLY	Y	B	N/A	36	N	A	NB	M	
SAGU	1	FLY	Y	A	20	36	S	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE MELIADINE	Sea state code	2
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	12 KTS
Date (DD/MMM/YYYY)	21/09/2018	True wind direction (deg)	NW
Time at start (UTC)	1700	Ice type code	N/A
Time at end (UTC)	1730	Ice concentration code	0
Latitude at start / end	61° 21.2' N / 61° 18.5 N	True platform speed (knots)	12.8 KTS
Longitude at start / end	068° 15.6' W / 068° 04.7 W	True platform direction (deg)	118
Platform activity	TRAVELLING	Observation side	~~Starboard~~ Port
Visibility (km)	16 Km	Height of eye (m)	22m
Weather code	0	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	2	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	4	FLY	Y	B	N/A	36	S	A	NB	M	
GLGU	1	FLY	Y	A	20	39	E	I	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE MELIADINE	Sea state code	3
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	20 K+S
Date (DD/MMM/YYYY)	21/09/2018	True wind direction (deg)	W
Time at start (UTC)	1230	Ice type code	N/A
Time at end (UTC)	1300	Ice concentration code	0
Latitude at start / end	61° 46.6'N / 61° 44.0'N	True platform speed (knots)	12.7 K+S
Longitude at start / end	070° 05.8'W / 069° 54.9'W	True platform direction (deg)	115° T
Platform activity	TRAVELLING	Observation side	~~Starboard~~ Port
Visibility (km)	16 Km	Height of eye (m)	22m
Weather code	1	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	0	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	3	FLY	Y	A	N/A	39	N	A	NB	M	
GLGU	2	FLY	Y	A	N/A	39	N	I	NB	M	
GLGU	4	FLY	Y	A	18	39	W	A	NB	M	
WISP	12-15	FLY	Y	B	N/A	49	S	A	NB	M	
NOFU	2	FLY	Y	A	N/A	39	W	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Company/agency	AGNICO EAGLE- MELIADINE		Sea state code	3	
Platform name and type	ACADIA DESGAGNES		Wave height (m)	1m	
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	18KTS	
Date (DD/MMM/YYYY)	21/09/2018		True wind direction	W	
Time at start (UTC)	1200		Ice type code	N/A	
Time at end (UTC)	1230		Ice concentration code	0	
Latitude at start / end	61° 49.3'N	61° 46.7'N	True platform speed (knots)	12.5 KTS	
Longitude at start / end	070° 17.4W	070° 06.0'W	True platform direction	115	
Visibility (km)	16 km		Observation side	Starboard	Port Middle
Weather code	1		Height of eye (m)	22m	
Glare conditions code	0		Outdoors or Indoors	Out	or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS	



Observation Data					
Company/agency	AGNICO EAGLE MELIADINE		Sea state code	4	
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m	
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	21 kts	
Date (DD/MMM/YYYY)	20/09/2018		True wind direction	NW	
Time at start (UTC)	2230		Ice type code	N/A	
Time at end (UTC)	2300		Ice concentration code	0	
Latitude at start / end	62° 36.0'N	62° 35.3'N	True platform speed (knots)	12.5 kts	
Longitude at start / end	076° 14.8'W	076° 00.5'W	True platform direction	098°T	
Visibility (km)	16 km		Observation side	Starboard	Port Middle
Weather code	1		Height of eye (m)	22m	
Glare conditions code	0		Outdoors or Indoors	Out	or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS	



Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE - MELIADINE	Sea state code	4
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	18kts
Date (DD/MMM/YYYY)	20/09/2018	True wind direction (deg)	NW
Time at start (UTC)	2200	Ice type code	N/A
Time at end (UTC)	2230	Ice concentration code	0
Latitude at start / end	62° 36.6'N / 62° 36.0'N	True platform speed (knots)	13.6 kts
Longitude at start / end	076° 27.0'W / 076° 15.0'W	True platform direction (deg)	095° T
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 km	Height of eye (m)	22m
Weather code	1	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	0	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	1	FLY	Y	B	N/A	49	N	A	NB	M	
SAGU	1	FLY	Y	A	N/A	49	W	A	NB	M	
GLGU	2	FLY	Y	A	N/A	39	S	A	NB	M	
GLGU	5	FLY	Y	A	N/A	39	W	I	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Observation Period Information:					
Company/agency	AGNICO EAGLE MELIADINE		Sea state code	3	
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m	
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	15 kts	
Date (DD/MMM/YYYY)	20/09/2018		True wind direction	NW	
Time at start (UTC)	1730		Ice type code	N/A	
Time at end (UTC)	1800		Ice concentration code	0	
Latitude at start / end	62° 40.0'N	62° 40.4'N	True platform speed (knots)	12.5 kts	
Longitude at start / end	078° 40.0'W	078° 26.5'W	True platform direction	087° T	
Visibility (km)	16 Km		Observation side	Starboard	Port Middle
Weather code	1		Height of eye (m)	22m	
Glare conditions code	0		Outdoors or Indoors	Out	or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS	



Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE MELIADINE		Sea state code	3	
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m	
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	15 kts	
Date (DD/MMM/YYYY)	20/09/2018		True wind direction (deg)	NW	
Time at start (UTC)	1700		Ice type code	N/A	
Time at end (UTC)	1730		Ice concentration code	0	
Latitude at start / end	62° 39.2'N	62° 40.0'N	True platform speed (knots)	12.2 kts	
Longitude at start / end	078° 52.7'W	078° 40.1'W	True platform direction (deg)	085° T	
Platform activity	TRAVELLING		Observation side	Starboard Port	
Visibility (km)	16 Km		Height of eye (m)	22m	
Weather code	1		Outdoors or Indoors	Out or ~~In~~	
Glare conditions code	0		Snapshot used?	Yes or ~~No~~	

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNGU	1	WATER	Y	B	17	44	–	A	NB	M	
GLGU	3	FLY	Y	A	N/A	39	W	A	NB	M	
GLGU	2	FLY	Y	A	N/A	39	W	I	NB	M	
GLGU	2	FLY	Y	A	N/A	49	E	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Observation Period Information:				
Company/agency	AGNICO EAGLE MELIADINE		Sea state code	1
Platform name and type	ACADIA DESGAGNES		Wave height (m)	1 m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	4 Kts
Date (DD/MMM/YYYY)	20/09/2018		True wind direction	NW
Time at start (UTC)	1200		Ice type code	N/A
Time at end (UTC)	1230		Ice concentration code	0
Latitude at start / end	62° 30.2'N	62° 33.8 N	True platform speed (knots)	12.6 Kts
Longitude at start / end	081° 02.9'W	080° 59.1 W	True platform direction	048° T
Visibility (km)	16 Km		Observation side	~~Starboard~~ Port Middle
Weather code	1		Height of eye (m)	22m
Glare conditions code	0		Outdoors or Indoors	Out or ~~OR~~
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS



Changed Course to 078°T during Observation

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE MELIADINE		Sea state code	1	
Platform name and type	ACADIA DESGAGNES		Wave height (m)	1m	
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR Beaufort code	6 kts	
Date (DD/MMM/YYYY)	20/09/2018		True wind direction (deg)	NW	
Time at start (UTC)	1230		Ice type code	N/A	
Time at end (UTC)	1300		Ice concentration code	0	
Latitude at start / end	62° 33.8' N	62° 34.6' N	True platform speed (knots)	12.8 KTS	
Longitude at start / end	080° 52.7' W	080° 40.1' W	True platform direction (deg)	078° T	
Platform activity	TRAVELLING		Observation side	Starboard Port	
Visibility (km)	16 km		Height of eye (m)	22m	
Weather code	1		Outdoors or Indoors	Out or In	
Glare conditions code	0		Snapshot used?	Yes or No	

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
POJA	1	FLY	Y	A	N/A	49	S	A	NB	M	MEDIUM SI
UNGU	1	FLY	Y	B	N/A	39	W	A	NB	M	BROWN COL.
WISP	3	FLY	Y	A	N/A	49	S	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE MELIADINE	Sea state code	3
Platform name and type	ACADIA DESGAGNES	Wave height (m)	1m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) **OR** Beaufort code	17 kts
Date (DD/MMM/YYYY)	19/09/2018	True wind direction (deg)	W
Time at start (UTC)	1700	Ice type code	N/A
Time at end (UTC)	1730	Ice concentration code	0
Latitude at start / end	62° 27.3'N / 62° 26.2'N	True platform speed (knots)	13.2 kts
Longitude at start / end	089° 15.9'N / 089° 03.0'W	True platform direction (deg)	100° T
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 Km	Height of eye (m)	22m
Weather code	0	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	2	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	8	FLY	Y	B	N/A	39	S	A	NB	M	
GLGU	2	FLY	Y	B	N/A	39	S	I	NB	M	
NOFU	2	FLY	Y	A	N/A	49	S	A	NB	M	
WISP	3	FLY	Y	A	20	49	W	A	NB	M	
SANDPIPER	4	FLY	Y	A	20	49	W	A	NB	M	
TBMU	7	WATER	Y	B	N/A	44	–	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Observation Period Information:			
Company/agency	AGNICO EAGLE MELIADINE	Sea state code	2
Platform name and type	ACADIA DESGAGNES	Wave height (m)	1m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	W
Date (DD/MMM/YYYY)	19/09/2018	True wind direction	8 KTS
Time at start (UTC)	2230	Ice type code	N/A
Time at end (UTC)	2300	Ice concentration code	0
Latitude at start / end	62° 14.8'N / 62° 13.7'N	True platform speed (knots)	13.4 KTS
Longitude at start / end	086° 42.0'W / 086° 28.3'W	True platform direction	100° T
Visibility (km)	16 Km	Observation side	Starboard Port Middle
Weather code	0	Height of eye (m)	22m
Glare conditions code	0	Outdoors or Indoors	Out or IN
Platform Activity	TRAVELLING	Notes	NO OBSERVATIONS



Record sheet for a moving platform survey

Observation Period Information:

Company/agency	AGNICO EAGLE MELIADINE	Sea state code	1
Platform name and type	ACADIA DESGAGNES	Wave height (m)	1m
Observer (s)	STEPHEN BADCOCC	True wind speed (knots) OR Beaufort code	7kts
Date (DD/MMM/YYYY)	19/09/2018	True wind direction (deg)	W
Time at start (UTC)	2200	Ice type code	N/A
Time at end (UTC)	2230	Ice concentration code	0
Latitude at start / end	62° 15.9'N / 62° 14.8'N	True platform speed (knots)	13.5 kts
Longitude at start / end	086° 55.4'W / 086° 42.2'W	True platform direction (deg)	100°T
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 km	Height of eye (m)	22m
Weather code	0	Outdoors or Indoors	Out or In
Glare conditions code	0	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
DOVE	3	FLY	Y	B	N/A	39	S	A	NB	M	
GLGU	8	FLY	Y	A	N/A	49	S	A	NB	M	
GLGU	2	FLY	Y	A	N/A	49	S	I	NB	M	
NOFU	3	FLY	Y	B	N/A	49	S	A	NB	M	
IVGU	2	FLY	Y	A	N/A	49	S	A	NB	M	
UNGU	1	WATER	Y	A	N/A	60	—	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	3
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	15 Kts
Date (DD/MMM/YYYY)	14/09/2018		True wind direction	N
Time at start (UTC)	1230		Ice type code★	N/A
Time at end (UTC)	1300		Ice concentration code ★	0
Latitude at start / end	62° 41.0' N	62° 40.103' N	True platform speed (knots)	12.0 KTS
Longitude at start / end	091° 31.0' W	091° 44.3' W	True platform direction	290° T
Visibility (km)	8 Km		Observation side	Starboard Port Middle
Weather code ★	6		Height of eye (m)	22m
Glare conditions code ★	1		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	2
Platform name and type	ACADIA DESGAGNES	Wave height (m)	1 m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	14 KTS
Date (DD/MMM/YYYY)	19/09/2018	True wind direction (deg)	W
Time at start (UTC)	1230	Ice type code	N/A
Time at end (UTC)	1300	Ice concentration code	0
Latitude at start / end	62° 39.7'N / 62° 37.8'N	True platform speed (knots)	13.0 KTS
Longitude at start / end	091° 22.3'W / 091° 09.8'W	True platform direction (deg)	110°T
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 km	Height of eye (m)	22 m
Weather code	0	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	3	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	2	FLY	Y	B	N/A	39	S	A	NB	M	
GLGU	7	FLY	Y	B	N/A	39	S	I	NB	M	
UNGU	1	FLY	Y	B	N/A	49	N	A	NB	M	
DOVE	4	FLY	Y	A	N/A	49	S	A	NB	M	# SMALL BIRDS LOOK
SANDPIPER	12	FLY	Y	B	N/A	49	S	A	NB	M	VERY MUCH LIKE PICTURE OF "LEAST SANDPIPER"

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3]*J*(uvenile), *I*(mmature), or *A*(dult); [4]*B*(reeding), *NB*(non-breeding), *M*(oult)

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	2
Platform name and type	ACADIA DESGAGNES		Wave height (m)	1 m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	13 Kts
Date (DD/MMM/YYYY)	19/09/2018		True wind direction	W
Time at start (UTC)	1200		Ice type code★	N/A
Time at end (UTC)	1230		Ice concentration code ★	0
Latitude at start / end	62° 40.7'N	62° 39.7'N	True platform speed (knots)	13.1 Kts
Longitude at start / end	091° 33.7'W	091° 22.5'W	True platform direction	076° T
Visibility (km)	16 Km		Observation side	Starboard Port Middle
Weather code ★	0		Height of eye (m)	22 m
Glare conditions code ★	3		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	3
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2 m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	13 kts
Date (DD/MMM/YYYY)	14/09/2018	True wind direction (deg)	NE
Time at start (UTC)	1200	Ice type code	N/A
Time at end (UTC)	1230	Ice concentration code	0
Latitude at start / end	62° 39.3'N / 62° 41.0'N	True platform speed (knots)	11.8 kts
Longitude at start / end	091° 18.9'W / 091° 31.0'W	True platform direction (deg)	290°T
Platform activity	TRAVELLING	Observation side	~~Starboard~~ Port
Visibility (km)	7 km	Height of eye (m)	22 m
Weather code	6	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	1	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
WISP	2	Fly	Y	A	19	60	–	A	NB	M	
UNGU	3	Fly	Y	A	N/A	49	N	A	NB	M	
UNGU	2	Fly	Y	A	N/A	49	N	J	NB	M	
TRMU	2	Water	Y	B	N/A	60	–	A	NB	M	
GLGU	1	Fly	Y	A	N/A	36	E	A	NB	M	
DOVE	8	Fly	Y	B	N/A	49	N	A	NB	M	
UNJA	2	Fly	Y	A	N/A	36	E	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3]*J*(uvenile), *I*(mmature), or *A*(dult); [4]*B*(reeding), *NB*(non-breeding), *M*(oult)

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	2
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	16 kts
Date (DD/MMM/YYYY)	13/09/2018		True wind direction	S
Time at start (UTC)	2230		Ice type code★	N/A
Time at end (UTC)	2300		Ice concentration code ★	0
Latitude at start / end	62° 11.2' N	62° 12.4' N	True platform speed (knots)	12.6 kts
Longitude at start / end	085° 59.1' W	085° 12.5' W	True platform direction	279° T
Visibility (km)	16 Km		Observation side	Starboard Port Middle
Weather code ★	1		Height of eye (m)	22m
Glare conditions code ★	0		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	2
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	13 kts
Date (DD/MMM/YYYY)	13/091/2018	True wind direction (deg)	5
Time at start (UTC)	2200	Ice type code	N/A
Time at end (UTC)	2230	Ice concentration code	0
Latitude at start / end	62° 10.3'N / 62° 11.2'N	True platform speed (knots)	12.8 kts
Longitude at start / end	085° 46.2'W / 085° 59.0'N	True platform direction (deg)	279°T
Platform activity	TRAVELLING	Observation side	Starboard / ~~Port~~
Visibility (km)	16 km	Height of eye (m)	22m
Weather code	1	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	0	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
Sandpiper	1	FLY	Y	A	~~N/A~~	49	S	A	NB	M	
GLGU	2	FLY	Y	A	N/A	49	N	A	NB	M	
NOFU	4	FLY	Y	A	N/A	49	W	A	NB	M	
TBMU	2	Water	Y	B	N/A	60	–	A	NB	M	
GLGU	1	FLY	Y	A	N/A	39	E	I	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3]*J*(uvenile), *I*(mmature), or *A*(dult); [4]*B*(reeding), *NB*(non-breeding), *M*(oult)

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	3
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	16 Kts
Date (DD/MMM/YYYY)	13/09/2018		True wind direction	SW
Time at start (UTC)	1730		Ice type code★	N/A
Time at end (UTC)	1800		Ice concentration code ★	0
Latitude at start / end	62° 00.4'N	62° 01.6'N	True platform speed (knots)	11.8 kts
Longitude at start / end	083° 48.5'W	084° 01.5'W	True platform direction	279° T
Visibility (km)	16 Km		Observation side	Starboard ✓ Port Middle
Weather code ★	1		Height of eye (m)	22m
Glare conditions code ★	1		Outdoors or Indoors	Out or In ✓
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	3
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	17 kts
Date (DD/MMM/YYYY)	13/09/2018	True wind direction (deg)	SW
Time at start (UTC)	1700	Ice type code	N/A
Time at end (UTC)	1730	Ice concentration code	0
Latitude at start / end	61° 59.5'N / 62° 00.4'N	True platform speed (knots)	11.3 kts
Longitude at start / end	083° 36.4'W / 083° 48.1'N	True platform direction (deg)	278° T
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 km	Height of eye (m)	22 m
Weather code	1	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	1	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
WISP	2	FLY	Y	B	N/A	36	N	A	NB	M	
SAGU	1	FLY	Y	A	20	36	S	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

MARINE MAMMAL PROGRAM

AGNICO EAGLE

↗ Fill out one sheet per observation period

Observation Period Information:				
Company/agency	DESGAGNÉS		Sea state code ★	4
Platform name and type	ACADIA DESGAGNES		Wave height (m)	2 m
Observer (s)	STEPHEN BADCOCK		True wind speed (knots) OR ★ Beaufort code	25 kts
Date (DD/MMM/YYYY)	13/09/2018		True wind direction	SW
Time at start (UTC)	1230		Ice type code ★	N/A
Time at end (UTC)	1300		Ice concentration code ★	0
Latitude at start / end	62° 19.1'N	62° 15.1'N	True platform speed (knots)	11.2 kts
Longitude at start / end	082° 11.2'W	082° 19.0'W	True platform direction	223°T
Visibility (km)	16 km		Observation side	Starboard Port Middle
Weather code ★	1		Height of eye (m)	22 m
Glare conditions code ★	0		Outdoors or Indoors	Out or In
Platform Activity	TRAVELLING		Notes	NO OBSERVATIONS

★Refer to "Codes" datasheets

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	4
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	20 kts
Date (DD/MMM/YYYY)	13/09/2018	True wind direction (deg)	SW
Time at start (UTC)	1200	Ice type code	N/A
Time at end (UTC)	1230	Ice concentration code	0
Latitude at start / end	62° 23.3'N / 62° 19.2'N	True platform speed (knots)	11.5 kts
Longitude at start / end	082° 03.2'W / 082° 11.0'N	True platform direction (deg)	223° T
Platform activity	TRAVELLING	Observation side	✓Starboard Port
Visibility (km)	16 km	Height of eye (m)	22m
Weather code	1	Outdoors or Indoors	Out or ~~In~~
Glare conditions code	0	Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	1	Fly	Y	A	N/A	49	W	A	NB	M	
UNGU	1	Fly	Y	B	N/A	36	N	A	NB	M	
DOVE	12	Fly	Y	A	N/A	36	W	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3]*J*(uvenile), *I*(mmature), or *A*(dult); [4]*B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES
Platform name and type	ACADIA DESGAGNES
Observer (s)	STEPHEN BADCOCK
Date (DD/MMM/YYYY)	12/09/2018
Time at start (UTC)	1230
Time at end (UTC)	1300
Latitude at start / end	62° 28.6'N / 62° 31.0'N
Longitude at start / end	073° 07.5'W / 073° 17.8'W
Platform activity	TRAVELLING
Visibility (km)	16 Km
Weather code	1
Glare conditions code	0

Sea state code	4
Wave height (m)	2m
True wind speed (knots) OR Beaufort code	22 kts
True wind direction (deg)	SE
Ice type code	N/A
Ice concentration code	0
True platform speed (knots)	11.1 kts
True platform direction (deg)	297°
Observation side	Starboard Port
Height of eye (m)	22 m
Outdoors or Indoors	Out or ~~In~~
Snapshot used?	Yes or ~~No~~

Notes: Vessel changed course to 270°T before 1300 UTC

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	2	FLY	Y	A	N/A	36	N	A	NB	M	
GLGU	1	FLY	Y	A	N/A	36	N	I	NB	M	
UNGU	1	FLY	Y	A	N/A	36	E	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	2
Platform name and type	ACADIA DESGAGNES	Wave height (m)	< 1m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) OR Beaufort code	10 kts
Date (DD/MMM/YYYY)	11/09/2018	True wind direction (deg)	NW
Time at start (UTC)	2200	Ice type code	N/A
Time at end (UTC)	2230	Ice concentration code	0
Latitude at start / end	61° 25.7'N / 61° 28.4'N	True platform speed (knots)	12.5 kts
Longitude at start / end	068° 35.6'W / 068° 46.5'W	True platform direction (deg)	298°
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 km	Height of eye (m)	22 m
Weather code	0	Outdoors or Indoors	Out or In
Glare conditions code	3	Snapshot used?	Yes or No

Notes: [illegible]

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
TBMU	1	Water	Y	B	N/A	60	–	A	NB	M	
UNGU	6	Water	Y	A	N/A	60	–	A	NB	M	
GLGU	1	FLY	Y	A	N/A	39	N	A	NB	M	
UNGU	1	FLY	Y	B	N/A	49	S	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	2
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) **OR** Beaufort code	6 KTS
Date (DD/MMM/YYYY)	11/09/2018	True wind direction (deg)	235°
Time at start (UTC)	1230	Ice type code	N/A
Time at end (UTC)	1300	Ice concentration code	0
Latitude at start / end	60° 37.8'N / 60° 40.1'N	True platform speed (knots)	12.6 KTS
Longitude at start / end	065° 12.5'W / 065° 22.7'W	True platform direction (deg)	297°
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	16 Km	Height of eye (m)	22 m
Weather code	1	Outdoors or Indoors	Out or In
Glare conditions code	0	Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
NOFU	6	Fly	Y	A	N/A	39	280°W	J	NB	M	
NOFU	1	Fly	Y	A	N/A	39	W	A	NB	M	
UNGU	2	Fly	Y	A	N/A	39	S	A	NB	M	
UNGU	1	Fly	Y	A	N/A	36	N	A	NB	M	
NOFU	15	Fly	Y	A	N/A	39	W	A	NB	M	
UNGU	8	WATER	Y	A	N/A	60	-	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3]*J*(uvenile), *I*(mmature), or *A*(dult); [4]*B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES
Platform name and type	ACADIA DESGAGNES
Observer (s)	STEPHEN BADCOCK
Date (DD/MMM/YYYY)	11/09/2018
Time at start (UTC)	1730
Time at end (UTC)	1800
Latitude at start / end	61° 03.2'N / 61° 05.4'N
Longitude at start / end	066° 58.3'W / 067° 09.5'W
Platform activity	TRAVELLING
Visibility (km)	16 km
Weather code	1
Glare conditions code	0

Sea state code	1
Wave height (m)	< 1m
True wind speed (knots) **OR** Beaufort code	6 KTS
True wind direction (deg)	N
Ice type code	N/A
Ice concentration code	0
True platform speed (knots)	11.7 KTS
True platform direction (deg)	297°
Observation side	Starboard Port
Height of eye (m)	22 m
Outdoors or Indoors	Out or In
Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNGU	3	FLY	Y	A	N/A	31	N	A	NB	M	
UNGU	1	WATER	Y	A	N/A	66	-	A	NB	M	
UNGU	1	FLY	Y	A	20	36	W	I	NB	M	
GLGU	6	WATER	Y	A	N/A	60	-	A	NB	M	
TBMU	4	WATER	Y	A	N/A	60	-	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2] Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES		
Platform name and type	ACADIA DESGAGNES		
Observer (s)	STEPHEN BADCOCK		
Date (DD/MMM/YYYY)	12/09/2018		
Time at start (UTC)	1700		
Time at end (UTC)	1730		
Latitude at start / end	62° 32.8'N	62° 33.6'N	
Longitude at start / end	075° 10.2'W	075° 24.2'W	
Platform activity	TRAVELLING		
Visibility (km)	16 km		
Weather code	0		
Glare conditions code	0		

Sea state code	1
Wave height (m)	1m
True wind speed (knots) **OR** Beaufort code	7 kts
True wind direction (deg)	SE
Ice type code	N/A
Ice concentration code	0
True platform speed (knots)	14.3 kts
True platform direction (deg)	279° T
Observation side	~~Starboard~~ Port
Height of eye (m)	22 m
Outdoors or Indoors	Out or ~~In~~
Snapshot used?	Yes or ~~No~~

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
GLGU	2	Water	Y	C	N/A	66	—	A	NB	M	
GLGU	1	Fly	Y	A	N/A	36	W	A	NB	M	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*. *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3]*J*(uvenile), *I*(mmature), or *A*(dult); [4]*B*(reeding), *NB*(non-breeding), *M*(oult)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency	DESGAGNES	Sea state code	4
Platform name and type	ACADIA DESGAGNES	Wave height (m)	2m
Observer (s)	STEPHEN BADCOCK	True wind speed (knots) **OR** Beaufort code	28 kts
Date (DD/MMM/YYYY)	12/09/2018	True wind direction (deg)	NW
Time at start (UTC)	2200	Ice type code	N/A
Time at end (UTC)	2230	Ice concentration code	0
Latitude at start / end	62° 38.5'N / 62° 39.1'N	True platform speed (knots)	9.2 kts
Longitude at start / end	077° 20.5'W / 077° 29.2'W	True platform direction (deg)	280°
Platform activity	TRAVELLING	Observation side	Starboard Port
Visibility (km)	12Km	Height of eye (m)	22m
Weather code	2	Outdoors or Indoors	Out or ~~IN~~
Glare conditions code	1	Snapshot used?	Yes or ~~No~~

Notes: Cleared to 16 Km visibility

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments
UNGU	1	FLY	Y	A	N/A	49	W	I	NB	M	
GLGU	1	FLY	Y	A	N/A	71	N	A	NB	m	

[1] *A* = 0-50m, *B* = 51-100m, *C* = 101-200m, *D* = 201-300m, *E* = > 300m, *3* = within 300m but no distance recorded.
[2]Indicate flight direction (*N*, *NE*, *E*, *SE*, *S*, *SW*, *W*, or *NW*); *ND* = no apparent direction
[3] *J*(uvenile), *I*(mmature), or *A*(dult); [4] *B*(reeding), *NB*(non-breeding), *M*(oult)



golder.com

Appendix H-8

Archaeology report

REPORT

Meliadine Gold Project, Nunavut

2019 Archaeological Site Status Report

Submitted to:

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Territorial Archaeologist
Department of Culture and Heritage
Government of Nunavut
P.O. Box 310
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18101514

March 2019



Distribution List

1 Copy - Department of Culture and Heritage, Government of Nunavut

1 Copy - Agnico Eagle Mines Limited

1 Copy - Golder Associates Ltd.

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Table 3: Status of Archaeological Sites within the Rankin Inlet Local Study Area 16

FIGURES

Figure 1: Cultural Resources Local Study Area 2

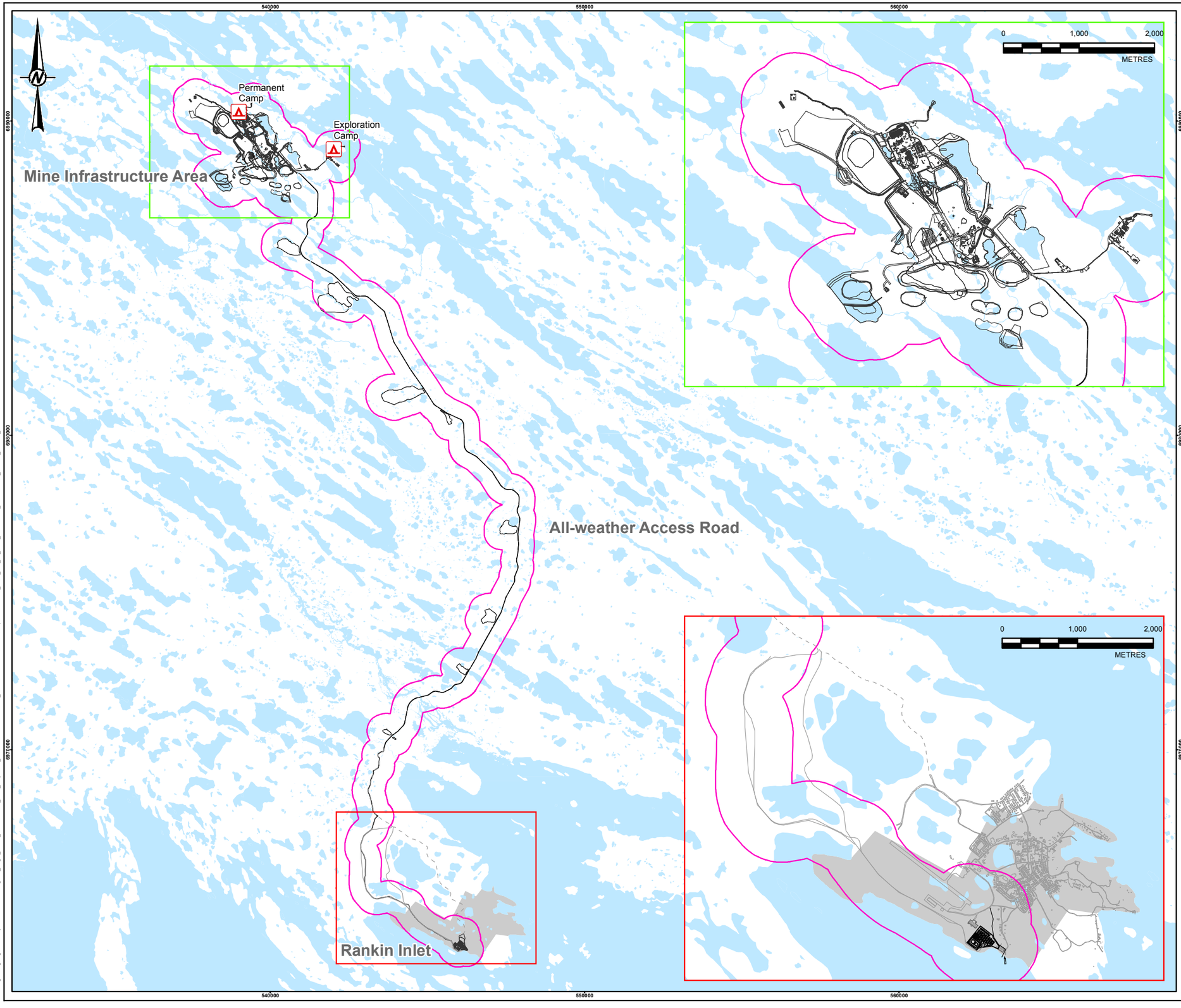
SITE STATUS

The Government of Nunavut has requested that Agnico Eagle Mines Limited (Agnico Eagle) submit a series of maps to help facilitate the management of the archaeological resources that occur within the Meliadine Project Local Study Area (Request GN-30 of the Joint Statement on Suggested Terms and Conditions respecting NIRB Final Hearing on Meliadine Gold Project, Nunavut Department of Justice File #7660-204, issued 20 August, 2014).

This document has been prepared to provide this updated information in years that changes have occurred to the Meliadine Gold Project (Project) footprint or an Archaeological Permit is taken out for work within the Local Study Area (LSA). The version presented here is redacted for public viewing, as it does not show the maps with plotted archaeological sites for their continued protection. Rather, a series of tables that summarize the current status of archaeological sites identified within the Project area and the mitigative measures that have been undertaken to date are presented.

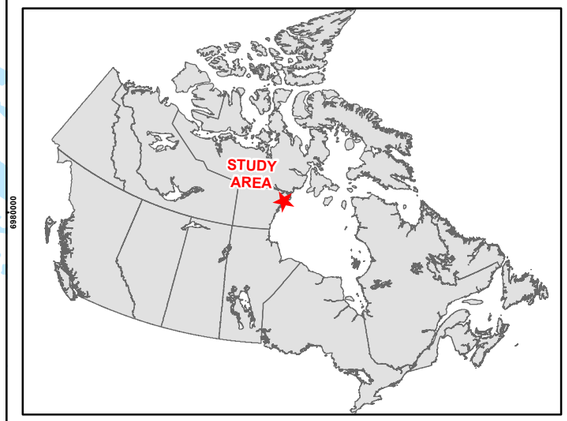
In 2018, Nunavut Archaeologist Permit 2018-16A was issued to Golder Associates Ltd. The assessment focussed on examining the expansion to the Meliadine East Esker borrow pit located north of Lake H17, as well as baseline studies for potential infrastructure under consideration. Two new archaeological sites (KgJm-76 and 77) were identified during the course of the field program and 11 sites were revisited (KgJm-1, 2, 3, 4, 6,11, 37, 38, 39, 47, and 62). The KgJm-11 site area was further assessed through shovel testing, and a potential tent ring and hearth feature at KgJm-4 were mitigated through feature mapping and proportional test excavation. Both of these sites were examined in relation to the Meliadine East Esker borrow pit expansion.

The updated Project footprint and Cultural Resources LSA are shown in Figure 1. The LSA includes a 500 m buffer surrounding proposed project infrastructure/footprint. Table 1 provides an index to the sites associated with the mine infrastructure area, summarizing the site type and mitigative activities conducted to date. Table 2 provides an index to the sites associated with the All-Weather Access Road (AWAR). Table 3 provides an index to sites associated with the community of Rankin Inlet and the airport bypass road.



LEGEND

- CAMP
- PROJECT INFRASTRUCTURE
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- WATERCOURSE
- WATERBODY
- BUILT-UP AREA AROUND RANKIN INLET
- LOCAL STUDY AREA (LSA)



0 2,400 4,800
METRES

REFERENCE(S)

ARCHAEOLOGICAL SITES OBTAINED FROM THE GOVERNMENT NUNAVUT DEPARTMENT OF CULTURE, LANGUAGE ELDERS AND YOUTH. THIS DATA IS FOR INTERNAL USE ONLY AND NOT FOR PUBLIC DISTRIBUTION.
BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

PROJECT

MELIADINE GOLD PROJECT
NUNAVUT

TITLE

CULTURAL RESOURCE LOCAL STUDY AREA

CONSULTANT

GOLDER

YYYY-MM-DD	2019-03-07
DESIGNED	PY
PREPARED	MH
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
18101514	1040	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

0 25mm

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\18101514\02_PRODUCTION\1040\MXD\Report\18101514_1040_FIG_01_2018_CULTURAL_RESOURCE_LOCAL_STUDY_AREA.mxd PRINTED ON: 2019-03-07 AT: 3:52:42 PM

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-1	Neoeskimo	Campsite (tent ring Cache)	low	850 m from emulsion road	Not Mitigated	Site location updated	2018-016A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-2	Neoeskimo	Campsite (pit and hearth)	low	950 m from emulsion road	Not Mitigated	Site location updated	2018-016A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-3	Palaeoeskimo	Campsite (hearth box mid-passage)	high	Database coordinates 710 m from emulsion road	Not Mitigated	Not located; original UTM coordinates appear in error; ATV trail may have impacted site	2018-016A	Continued avoidance by 30 m buffer; further efforts should be made to locate site
KgJm-4	Palaeoeskimo	Tent ring and hearth	high	0 m from esker borrow boundary	Mitigated	Site location updated; Detailed mapping, testing and photo documentation	2018-016A	No further work
KgJm-6/43	Palaeoeskimo (Reported)	Box hearth (Reported)	low	Reported location 0 m from esker borrow boundary	Mitigated	Site revisited on 3 occasions; no evidence of feature; may have been impacted by ATV trail; appears to be same site as KgJm-43; landform where site reported shovel tested, all negative.	2014-016A 2017-014A 2018-016A	No further work
KgJm-7	Neoeskimo	Campsite (Thule pit house)	high	0 m from Lake H17; 65 m from esker borrow pit	Partially Mitigated	Features F1 to F6, F8 mapped, tested and excavated in relation to Lake H17; Features F7 and F9 above high water and not mitigated	2014-016A; 2016-07A	No further concern in relation to lake H17; if F7 and F9 on esker crest to be impacted further work required.

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-8	Neoeskimo	Campsite (Thule pit house)	high	410 m from infrastructure	Not Mitigated	Documented	2011-26A Site form update	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-9	Neoeskimo	Campsite (Thule pit house)	high	680 m from infrastructure	Not Mitigated	Documented	2011-26A Site form update	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-10	Neoeskimo	Campsite	low	40 m from Lake H17; 0 m from current esker borrow boundary	Mitigated	Feature completely excavated in 1976	Linnamae 1977; 2014-016A; 2016-07A	No further work
KgJm-11	Palaeoeskimo (Reported)	Semi-circle stone feature	low to moderate	0 m from esker borrow boundary	Mitigated	Located one feature; Photo documentation; feature mapping; proportional excavation (2017); shovel tested site area (2018); no evidence to suggest Palaeoeskimo	2014-016A; 2016-07A; 2017-014A 2018-016A	No further work
KgJm-12	Neoeskimo	Campsite	low to moderate	60 m from Lake H17; 10 to 40 m from current esker borrow boundary	Not Mitigated	Documented, staked 2014; Feature F8 within 10 m of borrow pit mapped and tested 2017; same site as KgJm-41	2014-016A; 2016-07A; 2017-014A	Continued avoidance of remaining features by 30 m buffer or additional mitigation required
KgJm-13	Palaeoeskimo	Campsite (Box hearth)	high	45 m from lake H17 - higher elevation; 55 m from current esker borrow boundary	Not Mitigated	Documented	2014-016A; 2016-07A; 2017-014A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-14	Neoeskimo	Cache	low	130 m from lake H17; 170 m from current esker borrow boundary	Not Mitigated	Documented	2014-016A; 2016-07A	Continued avoidance by 30 m buffer or additional mitigation required

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-15/42	Neoeskimo	Campsite	low	0 m from current esker borrow boundary	Mitigated	Detailed mapping and excavation; Duplicate site number	2014-016A	No further work
KgJm-16	Neoeskimo	Campsite	low to moderate	75 m from Lake H17, higher elevation	Not Mitigated	Documented	2011-26A site form update	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-17	Neoeskimo	Hunting	low	20 m from lake H17, higher elevation	Not Mitigated	Documented: High accuracy UTM recording, staked 2012, 2016 for avoidance during Lake H17 works	2012-24A; 2014-016A	Continued avoidance/monitor or additional mitigation required
KgJm-18	Neoeskimo	Campsite	low	80 m from Lake H17; higher elevation	Mitigated	Photo documentation, feature mapping, proportional excavation	2012-024A	No further work
KgJm-19	Neoeskimo	Boat stand	high	60 m from Lake H17; higher elevation	Not Mitigated	Documented, staked 2012	2012-024A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-20	undetermined	Campsite	low	Reported location 280 m from infrastructure	Not Mitigated; Reported site location in error	Site location revisited and no evidence of features	2011-26A	Site not positively identified; Continued avoidance by 30 m buffer or additional mitigation required
KgJm-21	undetermined	Cache	low	Reported location 260 m from infrastructure	Not Mitigated; Reported site location in error	Site location revisited and no evidence of features	2011-26A	Site not positively identified; Continued avoidance by 30 m buffer or additional mitigation required

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-22	Palaeoeskimo	Mid passage	high	123 m from infrastructure	Mitigated	Features completely excavated	Linnamae 1977, 2011-26A	No further work
KgJm-23	Neoeskimo	Hunting	low	110 m from infrastructure	Mitigated	Photo documentation, feature mapping proportional excavation	2011-26A; 2012-024A	No further work
KgJm-24	Neoeskimo	Boat stand	high	220 m from infrastructure	Mitigated	Photo documentation, feature mapping proportional excavation	2011-26A; 2012-024A	No further work
KgJm-25	Palaeoeskimo	Mid passage	high	235 m from infrastructure	Mitigated	Photo documentation, feature mapping proportional excavation	2011-26A; 2012-024A	No further work
KgJm-26	Neoeskimo	Campsite	low	300 m from infrastructure; 10 m from ATV trail	Mitigated	Photo documentation, feature mapping proportional excavation	2011-26A; 2012-024A; 2017-14A	No further work
KgJm-27	Neoeskimo	Hunting	low to moderate	355 m from infrastructure	Not Mitigated	Documented and staked	2011-26A; 2012-024A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-28	Neoeskimo	Campsite	low	420 m from infrastructure	Not Mitigated	Documented	2011-26A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-29	Neoeskimo	Campsite	low to moderate	440 m from infrastructure	Not Mitigated	Documented	2011-26A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-30	Neoeskimo	Campsite	Low to moderate	490 m from infrastructure	Mitigated	Photo documentation, feature mapping proportional excavation	2011-26A; 2012-024A	No further work

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-31	Neoeskimo	Campsite	low to moderate	470 m from infrastructure	Not Mitigated	Documented and staked	2011-26A; 2012-024A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-32	Neoeskimo	Hunting blind	low	550 m from infrastructure	Not Mitigated	Documented	2011-26A Site form update	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-33	Neoeskimo	Campsite	low to moderate	625 m from infrastructure	Not Mitigated	Documented	2011-26A Site form update	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-34	Neoeskimo	Campsite	low to moderate	620 m from infrastructure	Not Mitigated	Documented	2011-26A Site form update	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-35	Neoeskimo	Hunting	low	410 m from infrastructure	Mitigated	Photo documentation, feature mapping proportional excavation	2011-26A; 2012-024A	No further work
KgJm-36	Neoeskimo	Campsite	low	0 m from sand quarry	Mitigated	4 features mitigated in 1998, 1 in 2011	1998-876; 2011-26A	No further work
KgJm-37	Neoeskimo	Cache	low	200 m from exploration camp infrastructure	Not Mitigated	Site location updated	1998-876; 2018-016A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-38	Neoeskimo	Marker (stone slab marker)	low	670 m from exploration camp infrastructure	Not Mitigated	Site location updated	1998-876; 2018-016A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-39	Neoeskimo	Campsite (tent ring and hearth)	low	580 m from exploration camp infrastructure	Not Mitigated	Site location updated	1998-876; 2018-016A	Continued avoidance by 30 m buffer or additional mitigation required

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-40	Neoeskimo	Cache	low	335 m from infrastructure	Mitigated	Photographed, mapped	2011-026A	No further work
KgJm-41	Neoeskimo	Campsite	low to moderate	60 m from Lake H17	Not Mitigated	Documented, staked 2014; same site as KgJm-12	2014-016A; 2016-07A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-15/42	Neoeskimo	Campsite	low to moderate	0 m from infrastructure	Mitigated	Features mapped and proportional excavation; Same site as KgJm-15	2014-016A; 2016-07A	No further work
KgJm-43	Palaeoeskimo (Reported)	Stone paving (Reported)	low	Reported location 20 m from freshwater intake	Mitigated	Site revisited on 2 occasions; no evidence of feature; feature may have been impacted by ATV trail; suggested to be same site as KgJm-6; landform where site reported shovel tested, all negative.	1998-876; 2014-016A; 2017-014A	No further work
KgJm-44	Neoeskimo	Hunting	low to moderate	0 m from infrastructure	Mitigated	Photo documentation, feature mapping and surface artifacts sample collected	2014-016A	No further work
KgJm-45	Neoeskimo	Hunting	low to moderate	0 m from infrastructure	Mitigated	Photo documentation, mapping	1998-876; 2010-005A; 2011-026A	No further work
KgJm-46	Neoeskimo	Campsite (recent)	low	0 m from infrastructure	Mitigated	Photo documentation, mapping	1998-876	No further work
KgJm-47	Neoeskimo	Hunting	low	550 m from infrastructure	Mitigated	Photo documentation, mapping (2010)	2008-003A; 2010-005A; 2018-016A	No further work

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-48	Neoeskimo	Boat stand	low	600 m from infrastructure	Mitigated	Photo documentation, feature mapping proportional excavation	2011-026A; 2012-024A	No further work
KgJm-49	Neoeskimo	Cache	low	600 m from infrastructure	Not Mitigated	Documented	2011-026A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-50	Neoeskimo	Cache	low	0 m from infrastructure	Mitigated	location, photo documentation, feature mapping proportional excavation	2011-026A; 2012-024A	No further work
KgJm-51	Neoeskimo	Hunting	low	0 m from emulsion road borrow pit	Mitigated	2012 Hunting blind mapped and excavated; 2014 recent land use features documented	2011-026A; 2012-024A, 2014-016A; 2017-014A	No further work
KgJm-52	Neoeskimo	Cache	low	250 m from infrastructure	Mitigated	Photo documentation, feature mapping, proportional excavation	2011-026A; 2012-024A	No further work
KgJm-53	Neoeskimo	Stone marker / inuksuk	low	0 m from infrastructure	Mitigated	Photo documentation, shovel tests	2011-026A	No further work
KgJm-56	Neoeskimo	Isolated find	low	0 m from infrastructure	Mitigated	Photo documentation, shove tests, collection	2012-024A	No further work
KgJm-61	Neoeskimo	Hunting Blind	low	250 m from infrastructure	Mitigated	Photo documentation, mapped and excavated	2012-024A	No further work
KgJm-62	Neoeskimo	Hunting Blind	Low	45 m from explosives cache	Not Mitigated	Documented, staked (2014)	2014-016A; 2018-016A	Continued avoidance by 30 m buffer or additional mitigation required

Table 1: Status of Archaeological Sites Located in the Mine Infrastructure Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Reports Detailing Status	Recommendations
KgJm-76	Neoeskimo	Look out (Two Inuksuit)	Low	1,500 m from explosives plant	Not Mitigated	Documented	2018-016A	Continued avoidance by 30 m buffer or additional mitigation required
KgJm-77	Neoeskimo	Hunting (Cache)	Low	1,125 m from CP7	Not Mitigated	Documented	2018-016A	Continued avoidance by 30 m buffer or additional mitigation required

Table 2: Status of Archaeological Sites Located in the All-Weather Access Road Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Report Detailing Status	Recommendations
KfJl-1	Neoeskimo	Cache	low	360 m from Discovery Haul Road	Not Mitigated	Documented	2012-024A	Continued avoidance by 30 m buffer or additional mitigation required
KfJl-3	Neoeskimo	Cache	low	230 m from Infrastructure	Not Mitigated	Documented	2011-26A	Continued avoidance by 30 m buffer or additional mitigation required
KfJl-4	Neoeskimo	Stone marker / inuksuk	low	145 m from Infrastructure	Mitigated	Photo documentation	2011-26A	No further work
KfJl-5	Neoeskimo	Hearth	low	490 m from Infrastructure	Not Mitigated	Documented	2011-26A	Continued avoidance by 30 m buffer or additional mitigation required
KfJl-6	Neoeskimo	Hearth	low	250 m from Discovery Haul Road	Not Mitigated	Documented	2012-024A	Continued avoidance by 30 m buffer or additional mitigation required
KfJl-7	Neoeskimo	Campsite	low	120 m from Discovery Haul Road	Not Mitigated	Documented	2012-024A	Continued avoidance by 30 m buffer or additional mitigation required

Table 2: Status of Archaeological Sites Located in the All-Weather Access Road Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Report Detailing Status	Recommendations
KfJm-7	Neoeskimo	Campsite	low	Reported location 150 m from Borrow Pit	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1974	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-33	Undetermined	Unknown	Unknown	Reported location 405 m from Borrow Pit	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1974	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-46	Undetermined	Unknown	Unknown	Reported location 100m from AWAR	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1974	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-63	Palaeoeskimo	Campsite	moderate to high	195 m from AWAR Centreline	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-66	Neoeskimo	Stone marker / inuksuk	low to moderate	40 m from Discovery Haul Road	Not Mitigated	Documented, staked 2012	2008-03A; 2012-024A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-67	Neoeskimo	Stone feature	low to moderate	130 m from Discovery Haul Road	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-80	Neoeskimo	Campsite	low to moderate	180 m from Discovery Haul Road	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-84	Neoeskimo	Campsite / grave	high	400 m from Discovery Haul Road	Not Mitigated	4 features mitigated, possible grave staked 2011; elder confirmed grave 2012	2011-026A; 2012-024A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-87	Neoeskimo	Campsite	low	Reported location 355 m from Discovery Haul Road	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1975	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-88	Neoeskimo	Campsite	low	Reported location 475 m from Discovery Haul Road	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1975	Continued avoidance by 30 m buffer or additional mitigation required

Table 2: Status of Archaeological Sites Located in the All-Weather Access Road Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Report Detailing Status	Recommendations
KfJm-93	Neoeskimo	Campsite	low	370 m from Discovery Haul Road	Mitigated	Photography, feature mapping, test units and shovel tests	2008-03A; 2011-026A	No further work
KfJm-99	Neoeskimo	Stone marker / inuksuk	low	290 m from Discovery Haul Road	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-101	Undetermined	Unknown	Unknown	Reported location 330 m from Discovery Haul Road	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1975	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-102	Neoeskimo	Campsite	low to moderate	avoidance by 175 m from Discovery Haul Road	Mitigated	Photography, mapping, test excavation and shovel testing	2008-03A; 2011-026A	No further work
KfJm-104	Neoeskimo	Stone marker / inuksuk	low	avoidance by 220 m from Discovery Haul Road	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-109	Undetermined	Unknown	Unknown	Reported location 460 m from AWAR	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1975	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-110	Neoeskimo	Campsite	low to moderate	215 m from AWAR	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-112	Undetermined	Unknown	Unknown	Reported location 230 m from AWAR	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1975	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-114	Undetermined	Unknown	Unknown	Reported location 440 m from AWAR	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1975	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-116	Neoeskimo	Caches	low	75 m from AWAR and quarry	Not Mitigated	Documented, staked 2011	2008-003A, 2011-026A, 2012-024A; 2014-016A	Continued avoidance by 30 m buffer or additional mitigation required

Table 2: Status of Archaeological Sites Located in the All-Weather Access Road Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Report Detailing Status	Recommendations
KfJm-118	Neoeskimo	Stone feature	low to moderate	0 m from AWAR	Mitigated	Photo documentation, feature mapping, proportional excavation	2011-026A	No further work
KfJm-128	Neoeskimo	Hunting	low	150 m from AWAR	Not Mitigated	Documented	2011-026A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-131	undetermined	Unknown	Unknown	Reported location 120 m from AWAR	Not Mitigated; Reported site location in error	Site location revisited but no evidence of features	2011-026A	Site not positively identified; Continued avoidance by 30 m buffer or additional mitigation required
KfJm-133	undetermined	Unknown	Unknown	Reported location 80 m from AWAR	Not Mitigated; Reported site location in error	Site location revisited but no evidence of features	2011-026A	Site not positively identified; Continued avoidance by 30 m buffer or additional mitigation required
KfJm-140	undetermined	Unknown	Unknown	Reported location 255 m from Borrow Pit	Not Mitigated	Site not revisited; location not confirmed	Linnamae and Clark 1975	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-167	Neoeskimo	Hunting	low to moderate	270 m from Discovery Haul Road	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-168	Neoeskimo	Campsite	moderate	50 m from AWAR	Not Mitigated	Documented	2008-03A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-169	Neoeskimo	Hunting	low to moderate	0 m from AWAR	Mitigated	Photo documentation, feature mapping, proportional excavation	2008-03A; 2010-005A; 2017-014A	No further work
KfJm-170	Neoeskimo	Campsite	low to moderate	40 - 60 m from AWAR, topographic separation	Not Mitigated	Documented	2008-03A; 2017-014A	Continued avoidance by 30 m buffer or additional mitigation required

Table 2: Status of Archaeological Sites Located in the All-Weather Access Road Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Report Detailing Status	Recommendations
KfJm-171	Neoeskimo	Campsite	High	0 to 70 m from AWAR	Partially Mitigated	8/21 features photo documented, mapped and excavated; remaining features >30 m from road	2008-03A; 2010-005A, 2012-024A, 2014-016A; 2017-014A	Continued avoidance of non-mitigated features by 30 m buffer or additional mitigation required
KfJm-172	Neoeskimo	Campsite	low to moderate	0 m from AWAR	Mitigated	Photo documentation, feature mapping, proportional excavation	2008-03A; 2010-005A; 2017-014A	No further work
KfJm-173	Neoeskimo	Stone marker / inuksuk	low	150 m from AWAR	Not Mitigated	Documented	2008-003A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-174	Neoeskimo	Stone marker / inuksuk	low	0 m from Borrow Pit	Mitigated	Photo documentation, feature mapping, proportional excavation	2008-003A; 2010-005A	No further work
KfJm-175	Neoeskimo	Hunting	low	0 m from Borrow Pit	Mitigated	Photo documentation, feature mapping, shovel testing, proportional excavation	2008-003A; 2011-026A	No further work
KfJm-176	Neoeskimo	Caches	Low	20 m from Borrow Pit	Mitigated	Photo and location documentation,	2008-003A, 2014-016A	No further work
KfJm-177	Neoeskimo	Stone marker / inuksuk	low	0 m from Borrow Pit	Mitigated	Photo documentation, proportional excavation	2008-003A, 2011-026A	No further work
KfJm-178	undetermined	Lithic scatter	low	0 m from Borrow Pit	Mitigated	Photo documentation, feature mapping, proportional excavation (2010)	2008-003A, 2010-005A, 2014-016A	No further work
KfJm-179	Palaeoeskimo	Hunting	low to moderate	75 m from AWAR and quarry	Not Mitigated	Documented	2008-003A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-180	Neoeskimo	Stone marker / inuksuk	low to moderate	240 m from AWAR	Not Mitigated	Documented	2008-003A	Continued avoidance by 30 m buffer or additional mitigation required

Table 2: Status of Archaeological Sites Located in the All-Weather Access Road Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Report Detailing Status	Recommendations
KfJm-181	Neoeskimo	Stone marker / inuksuk	low to moderate	153 m from AWAR	Not Mitigated	Documented	2008-003A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-182	Neoeskimo	Campsite	low	85 m from AWAR	Not Mitigated	Documented and staked 2011	2008-003A, 2011-026A, 2014-016A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-183	Neoeskimo	Campsite	low to moderate	270 m from AWAR	Not Mitigated	Documented	2008-003A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-191	Neoeskimo	Hearth	low to moderate	0 m from AWAR	Mitigated	Photo documentation, feature mapping, proportional excavation	2011-026A	No further work
KfJm-192	Neoeskimo	Cache	low	20 m from Discovery Road	Will be impacted	Documented in conflict	2012-024A	Further work prior to development of Discovery Road
KfJm-193	Neoeskimo	Hunting	low	30 m to 40 m from Discovery Road	Will be impacted	Documented in conflict	2012-024A	Further work prior to development of Discovery Road
KfJm-196	Neoeskimo	Stone marker / inuksuk	low	0 m from Quarry B6 expansion	Mitigated	Photo documentation, feature mapping, testing	2016-07A	No further work
KfJm-197	Neoeskimo	Cache	low	0 m from Quarry B6 expansion	Mitigated	Photo documentation, feature mapping, testing	2016-07A	No further work

Table 3: Status of Archaeological Sites within the Rankin Inlet Local Study Area

Borden Number	Cultural Affiliation	Site Type	Archaeological Significance	Distance from Development	Status of Site	Details of Status	Permit Report Detailing Status	Recommendations
KeJm-5	Neoeskimo	Hunting site	low to moderate	17 m from Airport Bypass Road; 330 m from re-route	Not Mitigated	Documented	2012-024A; 2016-07A	Continued avoidance by 30 m buffer or additional mitigation required
KeJm-10	Palaeoeskimo	Lithic scatter	low to moderate	Reported location 280 m from Itivia Quarry	Not Mitigated	Site not revisited; location not confirmed	Linnamae 1977	Continued avoidance by 30 m buffer or additional mitigation required
KeJm-11	Neoeskimo	Cache	low to moderate	160 m from Airport Road Bypass re-route	Not Mitigated	Documented	2016-07A	Continued avoidance by 30 m buffer or additional mitigation required
KfJm-194	Neoeskimo	Campsite	low	80 to 240 m from Airport Bypass Road; 130 m from re-route	Not Mitigated	Documented	2012-024A; 2016-07A	Continued avoidance by 30 m buffer or additional mitigation required

Signature Page

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Appendix I-1

Management plans updates

AGNICO EAGLE

MELIADINE GOLD PROJECT

Water Management Plan

MARCH 2019
VERSION 6
6513-MPS-11

EXECUTIVE SUMMARY (ENGLISH)

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine Plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine.

The water management objectives are to minimize potential impacts to the quantity and quality of surface water at the Mine. Water management structures (surface ponds, water retention dikes/berms, water diversion channels and culverts) are in place and will be constructed as needed to contain and manage the contact water from the areas affected by the Mine or mining activities. The major water management infrastructure includes: water containment ponds, water retention dikes, berms, channels, a potable Water Treatment Plant (WTP), a Sewage Treatment Plant (STP), a Saline Water Treatment Plant (SWTP), a Reverse Osmosis (RO) Plant, and an Effluent Water Treatment Plant (EWTP).

During mine Construction and Operations, contact water originating from affected areas on surface will be intercepted, diverted and collected within the various containment ponds. The collected water at the Mine will be eventually pumped and stored in Containment Pond 1 (CP1), where the contact water will be treated by the EWTP for removal of Total Suspended Solids (TSS) prior to discharge to the outside environment or as make-up water by the Process Plant. Contact water from the Underground Mine will be collected in underground storage stopes and sumps. Some water from Underground will be reused for underground operations. In addition, due to high saline content, some underground mine water will be stored for treatment at the SWTP or discharged to sea.

The long-term, post-closure water quality in the containment ponds and in the flooded open pit lakes will meet Metal and Diamond Mining Effluent Regulations (MDMER) , Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) for the protection of aquatic life and/or the Site Specific Water Quality Objectives (SSWQO's) developed for the Mine.

During mine closure, the water management infrastructure on site will remain in place until mine closure activities are completed and monitoring demonstrates that the water quality is acceptable for environmental discharge without treatment.

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ᐊᒃᓂᓄ ᐃᐃᒍ ᐅᓴᖅᑕᕆᐊᒃᓂᑦ (ᐊᒃᓂᓄᒃᓂᑦ) ᑕᓯᔾᔨᐊᖏᑦ ᐅᓴᖅᑕᕆᐊᓕᓂᐅᖅᓯᓪᓕᐊᔪᑦ (ᐅᓴᖅᑕᕆᐊᖅ), 25 ᑭᓪᒥᑕᓂᒃ ᐅᖓᓱᒃᑎᑎᔪᖅ ᐅᐊᖓᓇᖓᓂᑦ ᑲᖏᖅᓄᓂᐅᑦ, ᐊᒻᒪᓗ 80 ᑭᓪᒥᑕᓂᒃ ᐅᖓᓱᒃᑎᑎᓪᓗᓂ ᓂᒻᑎᐊᓂᑦ ᐱᖓᖓᓇᖅᓯᓯᐊᓂᑦ ᐃᒃᓗᓪᑎᔾᔨᑦ ᑭᓴᓪᓕᖅᑎᑦ. ᐅᓴᖅᑕᕆᐊᖅᑎᒍ ᓯᖓᓇᐅᑎ ᐅᓴᖅᑕᑦᓂᖅᑎᒍ ᐱᓕᓀᐊᖅᑐᒪᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᒪᔪᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑐᒃᓄᐅᒃ ᐱᓕᓀᐊᓕᐊᓗᒍ ᑎᓪᓗᓂᐊᖅᑐᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑐᒃᓄᐅᒃ ᐱᓕᓀᐊᓕᐊᓗᒍ ᑎᓪᓗᓂᐊᖅᑐᑦ (ᑎᓪᓗᓂᐊᖅ 1 ᐊᒻᒪᓗ ᑎᓪᓗᓂᐊᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᑦᓂᖅ.

ᐃᒪᖏᑦ ᐊᐅᓪᓚᑎᓂᔪᓐᓇᖅᑐᑦ ᐱᕈᓭᔪᑉᑎᓗᓪᓕᑦ ᐊᒃᑐᖅᓯᓂᐅᔨᓴᖅᑐᑦ ᐃᒪᖃᖅᑎᑎᓂᖓᓕ ᐊᒻᒪᓗ ᖃᓄᐃᓕᓂᖓᓕᑕ ᖃᖅᓱᓂᑐᑦ ᐃᒪᐃᑦ ᐅᓴᖅᑕᕆᐊᖏᑦ. ᐃᒪᖏᑦ ᐊᐅᓪᓚᑎᓂᔪᓐᓇᖅᑐᑦ ᐊᑦᖢᑭᐅᒪᔪᑦ (ᓄᓇᐅᑦ ᖃᖅᓱᓂᑦ ᐃᒪᖃᖅᓯᐅᑦ, ᐃᒪᖏᑦ ᐸᐸᑎᓂᔪᓐᓇᖅᑐᑦ ᐊᓂᓵᓗᐃᑦ, ᐃᒪᖏᑦ ᓴᐃᑎᑎᓂᓂᔪᓐᓇᖅᑐᑦ ᓯᑦᓗᐃᑦ ᐊᒻᒪᓗ ᐊᐅᓪᓚᑎᓂᔪᓐᓇᖅᑐᑦ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᑦ ᐃᒪᐃᑦ ᐃᓂᐅᔨᓂᑦ ᐊᒃᑐᖅᑕᐅᓯᓕᔨᓂᑦ ᐅᓴᖅᑕᕆᐊᖏᑦ ᐅᖃᓪᓚᑦᓂᖅᑐᑦ ᐅᓴᖅᑕᖅᑎᑦᓯᑦ. ᐊᖏᓪᓕᖕᒪᔪᑦ ᐃᒪᖏᑦ ᐊᐅᓪᓚᑎᓂᓪᓕᔪᓐᓇᖅᑐᑦ ᐃᓪᓗᐊᑎᑎᔾᔪᐅᔨᓂᑦ ᐃᓪᓚᐅᔨᑦ: ᐃᒪᖏᑦ ᓄᖅᑲᖓᑎᓂᑎᓂᓪᓕᑦ ᑕᓯᔾᔪᐃᑦ, ᐃᒪᖏᑦ ᐸᐸᑎᓂᓪᓕᑦ ᐊᓂᓵᓗᐃᑦ, ᓯᑦᓗᐃᑦ, ᐊᒻᒪᓗ ᐃᒪᓕᓪᓚᔨᐊᑎ (WTP), ᖃᓄᐃᖓᒥᓴᖅᑐᑎᓪᓚᔨᐊᑎ (STP), ᑕᓪᐅᐅᓕᖏᑦ ᐃᒪᓕᓪᓚᔨᐊᑎ, ᐃᒪᓕᕐᑎᐊᓂᐅᖅᓱᖅᑐ (SWTP), ᐃᒪᓕᕐᑎᐊᓂᐅᓪᓚᖕᖅᑐ, ᐊᒻᒪᓗ ᐃᒪᖏᑦ ᑯᐃᔨᓪᓚᖕᖅᑐ (EWTP).

ᐅᓴᖅᑕᕆᐊᖏᑦ ᓴᓇᓂᓕᐊᑎᓯᓗᓂᑦ ᐊᒻᒪᓗ ᐊᐅᓪᓚᓄᑎᕐᓂᐅᑎᓯᓗᓂᔪᓐᓇᐃ, ᐊᑐᖅᑕᐅᔨᓴᖅ ᐃᒪᖅ ᐊᑲᖅᑕᐅᓯᒪᔪᓂᑦ ᐃᓂᐅᔨᓂᑦ ᖃᖅᓱᓂᑦ ᓄᖅᑲᖅᑎᑕᐅᓂᐊᖅᑐᖅᑐᑦ, ᓴᖅᓯᑎᑕᐅᓯᓗᓂᑦ ᑕᓯᔾᔪᐃᑦ ᑲᑎᒪᔨᖅᑎᓂᓪᓗᓂᑦ. ᑲᑎᒪᔨᖅᑎᓂᓪᓗᓂᑦ ᐃᓄᐃᑦ ᑲᑎᒪᔨᖅᑎᓂᓪᓗᓂᑦ ᐃᓄᐃᑦ (CP1), ᐊᑐᖅᑕᐅᔨᖅ ᐃᒪᖅ ᐱᓕᓀᐊᖅᑐᒪᔪᓂᑦ EWTP-ᒪᑦ ᐋᖅᓂᐊᖅᓯᓂᑦ ᑲᓇᐃᓕᖅᑎᑦ ᑕᒪᓂᖅᓴᖅᑐᑦ ᓯᑎᐊᐃᑦ (TSS) ᑯᐃᓇᑕᐅᖅᑲᖅᑎᓪᓗᒍ ᓯᓚᒪᑦ ᐅᖃᓪᓚᑦᓂᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓯᓗᓂ ᐃᒪᖅ ᐱᓕᓀᐅᕐᓇᖕᒥᑦ. ᐊᑐᖅᑕᐅᔨᖅ ᐃᖅ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖏᑦ ᑲᑎᒪᔨᖅᑎᓂᓪᓗᖅᑐᓗᖅ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓗᖅ ᓄᓇᐅᑦ. ᐃᓕᓴᐅ ᐃᒪᖅ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑦ ᐅᓴᖅᑕᕆᐊᖏᑦ ᐃᒪᖅ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓗᖅ ᓄᓇᐅᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓗᖅ ᓄᓇᐅᑦ. ᐊᒻᒪᓗ, ᑕᓪᐅᐅᖃᓗᐊᖅᓯᒪᔪᑦ, ᐃᓕᓴᐅ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖏᑦ ᐃᒪᖅ ᐊᑲᖅᑕᐅᓯᒪᔪᓂᑦ SWTP-ᒥᑦ ᐅᖃᓪᓚᑦᓂᖅᑐᓗᖅ ᑕᓪᐅᐅᓕᖏᑦ.

ᐊᑯᓂᐅᔨᒥᑦ, ᐅᓱᑯᖃᓕᕆᓂᖅᑎᑦᓗᐃ ᐃᒪᐅᖅᑐᑦ ᖃᓄᐃᓕᓂᖓᓕ ᐊᒻᒪᓗ ᐃᒻᒥᑕᐅᓂᐊᖅᑐᑦ ᑕᓯᔾᔪᐃᑦ ᐊᒻᒪᓗ ᐃᓕᓴᐅᓂᖓᓕ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑦ ᐃᓄᐃᑦ ᐅᓴᖅᑕᕆᐊᖏᑦ ᐃᒪᖅ ᐊᑲᖅᑕᐅᓯᒪᔪᓂᑦ ᓄᓇᐅᑦ ᐃᓗᐊᓂ

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
6	March 2019	All	All	Update is to fulfill annual review requirement (NWB)	Environment Department
		1	4	Update to Mine Development Plan information	
		3.1	8-12	Updated Version 6 changes	
		3.2	11-12	Updated existing water management control structures	
		3.3	12-14	Revised structure design semantics; corrections to culvert design; updated CP3, CP4 design parameters and naming convention; removed incorrect artifact pertaining to culvert 1 flow handling	
		3.6	15	Addition of SP3; updates to SP2 design	
		3.8, 3.9	17-21	Included as-built parameter values; updated berm and dike naming convention, thermistor information	
		3.11	21-22	Updated freshwater intake design information; updates to SWTP system; RO management; EWTP monitoring; removed incorrect information pertaining to Freshwater intake	
		4.1, 4.2	25-31	Updated management of saline discharge to sea; revised information proposed in initial design	
		4.6	35	Updated key management activities schedule to include discharge to sea; updated regarding underground inflow management; revised haul road management; revised wash bay management; updated process water quantities	
		6.3	37	Updated impacted waterbodies status	
		7	40	Revised semantics regarding flow paths	
		Figure 1.2		Included additional information regarding July 23rd exceedance	
		Figure 6.1, 6.2		Updated Layout to most recent General Mine Site Plan	
		Figure 7.1a		Specified plan layouts are from feasibility level study	
				Updated Layout with monitoring stations to most recent General Mine Site Plan	

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
AWAR	All Weather Access Road
CCME-WQG	Canadian Council of Ministers of the Environment Water Quality Guidelines
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CP	Containment Pond
ECCC	Environment and Climate Change Canada
EMPP	Environmental Management and Protection Plan
EWTP	Effluent Water Treatment Plant
GWMP	Groundwater Management Plan
IDF	Inflow Design Flood
Licence	Type A Water Licence 2AM-MEL1631
MDMER	Metal and Diamond Mining Effluent Regulations
NWB	Nunavut Water Board
Mine	Meliadine Gold Project
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
STP	Sewage Treatment Plant
SWTP	Saline Water Treatment Plant
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WMP	Water Management Plan
WRSF	Waste Rock Storage Facility
WTP	Water Treatment plant

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
mg/L	milligram per litre
km	kilometer(s)
km^2	kilo square meter(s)
m	metre
mm	millimetre
m^3	cubic metre(s)
m^3/day	cubic metre per day
m^3/s	cubic metre per second
m^3/hour	cubic metre per hour
m^3/year	cubic metre per year
Mm^3/year	million cubic metre (s) per year
Mm^3	million cubic metre(s)
masl	metres above sea level
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) is developing the Meliadine Gold Project (the Mine) located approximately 25 kilometres (km) north of Rankin Inlet (Figure 1.1), Nunavut, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine is subject to the terms and conditions of both the amended Project Certificate issued by the Nunavut Impact Review Board (NIRB) in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on February 26, 2019 (NIRB, 2019) and Type A Water Licence No. 2AM-MEL1631 (the Licence), issued by the Nunavut Water Board (NWB) on April 1, 2016 (NWB, 2016). This report presents an updated version of the Water Management Plan (WMP). The purpose of this update is to incorporate changes related to comments received from Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), and Environment and Climate Change Canada (ECCC), towards Version 5 of the Water Management Plan. Additionally, this update includes all changes related to the approval for discharge to sea that was received with the amended Project Certificate on February 26, 2019.

1.1 Water Management Objectives

The water management objectives are to minimize potential impacts to the quantity and quality of surface water at the Mine and surrounding waterbodies. The purpose of the WMP is to provide information to applicable mine departments (Environment, Engineering, Mine, Energy and Infrastructure, etc.) for sound water management practices, proposed and existing infrastructure, the water balance model, water quality predictions, and for the water quality monitoring plan for the Mine.

Water management structures (culverts, sumps, pipelines, water diversion channels and water retention dikes/berms) are utilized to contain and manage contact water from areas affected by mining activities. Measures have been implemented for the Mine Construction and are being implemented for Mine Operation phases.

1.2 Management and Execution of the Water Management Plan

Revisions of the WMP can be initiated by changes in the Mine Development Plan (Mine Plan), operational performance, personnel or organizational structure, regulatory or social considerations, and/ or design philosophy. The WMP will be reviewed annually by Agnico Eagle and updated as necessary.

SECTION 2 • BACKGROUND

2.1 Site Conditions

The Mine is located in an area of poorly drained lowlands near the northwest coast of Hudson Bay. The dominant terrain in the area consists of glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and many small lakes. The topography is gently rolling with a mean elevation of 65 metres above sea level (masl) and a maximum relief of 20 meters.

The local overburden consists of a thin layer of topsoil overlying silty gravelly sandy glacial till. Cobbles and boulders are present throughout the region at various depths. Bedrock at the Mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite, and mafic volcanic flows (Snowden, 2008; Golder, 2009).

The climate is extreme in the area, with long cold winters and short cool summers, and mean air temperatures of 12°C in July and -31°C in January. The mean annual air temperature at the Mine site is approximately -10.4 °C (Golder, 2012a). Strong winds blow from the north and north-northwest direction more than 30 percent of the time.

The mean annual precipitation in the area is approximately 412 mm and is typically equally split between rainfall and snowfall.

2.1.1 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a water surface area of approximately 107 square kilometres (km^2), a maximum length of 31 km, features a highly convoluted shoreline of 465 km, and has over 200 islands. Unlike most lakes, it has two outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 upstream of its two outflows. Most drainage occurs via the Meliadine River, which originates at the southwest end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Watersheds in the Mine area are comprised of an extensive network of waterbodies, and interconnecting streams. The hydrology of these watersheds is dominated by lake storage and evaporation.

2.1.2 Ice and Winter Flows

Late-winter ice thicknesses on freshwater lakes in the Mine area range between 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely

formed in early November. The spring ice melt (freshet) typically begins in mid-June and is complete by early July (Golder, 2012b).

2.1.3 Spring Melt (freshet) and Freeze-up Conditions

With the exception of the main outlet of Meliadine Lake, which has been observed to flow continuously throughout the year, outlets of waterbodies near the Mine typically start flowing late May or early June, followed by freshet flows in mid-to-late-June. Flows steadily decrease in July and low flows are ongoing from August to the end of October, prior to winter freeze.

2.1.4 Permafrost

The Mine is located in an area of continuous permafrost. The depth of permafrost is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to 3 m adjacent to the lakes. The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder, 2012b).

2.1.5 Local Hydrogeology

Groundwater characteristics at areas of continuous permafrost that are generally present in the Mine area include the following flow regimes:

- A shallow flow regime located in an active layer (seasonally thawed) near the ground surface and above permafrost; and,
- A deep groundwater flow regime beneath the base of the permafrost.

From late spring to early autumn, when temperatures are above 0 ˚C, the shallow active layer thaws. Within the active layer, the water table is projected to be a subdued replica of topography. Groundwater in the active layer flows to local depressions and ponds that drain to larger waterbodies. The talik beneath large waterbodies will be open. The open talik will connect to the deep groundwater flow regime beneath the permafrost.

Elongated waterbodies with terraces and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine. Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder, 2012a). No impact is expected to Lake B7 by mine activities.

2.2 Mine Development Plan

The Mine Plan and key mine development activities, including mine waste management are currently used concurrently with the WMP.

The Mine Plan includes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

The Mine is expected to produce approximately 14.9 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 14.9 Mt of tailings. The following phased approach is proposed for the development of the Tiriganiaq gold deposit;

- Phase 1: 3.5 years for Mine Construction (Q4 Year -5 to Q2 Year -1);
- Phase 2: 8.5 years for Mine Operations, beginning in 2019 (Q2 Year -1 to Year 8);
- Phase 3: 3 years Mine Closure (Year 9 to Year 11); and;
- Phase 4: Post-Closure (Year 11 forward).

Mining facilities on surface will include a plant site and accommodation buildings, two ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a series of water treatment plants. The general mine site layout plan is shown on Figure 1.2.

SECTION 3 • WATER MANAGEMENT CONTROLS AND STRUCTURES

A network of berms, dikes, containment ponds, channels, culverts and sumps are in place and maintained to facilitate water management. The following sections describe the water management design criteria for the infrastructure used at the Mine.

3.1 Water Management Systems

The water management systems, as shown in Figure 1.2, include the following components:

- Five water containment ponds (CP1, CP3, CP4, CP5, and CP6) and their associated dikes or thermal berms (D-CP1, Berm-CP3, Berm-CP4, D-CP5, and D-CP6)
- Three P-Area containment ponds (P1, P2, and P3) and four containment berms (DP1-A, DP1-B, DP2-A, and DP3-A)
- A surface Saline Pond (SP1) and a second saline storage pond (SP2; yet to be commissioned) to support Agnico Eagle's strategies to store, treat (SWTP) and discharge saline water to sea
- A third saline pond (SP3) for final treatment of saline water prior to discharging to sea
- Three diversion berms (Berm 1, Berm 2, and Berm 3)
- Eight water diversion channels (Channel 1 to Channel 8)
- Sixteen water passage culverts to convey water (Culverts 1 to 8, 10, 11, 13, 14 to 16, 18, 19)
- Five evaporators
- A reverse osmosis (RO) treatment plant
- An effluent water treatment plant (EWTP)
- A saline water treatment plant (SWTP)
- A sewage treatment plant (STP)
- A potable water treatment plant (WTP)
- A network of surface pumps and pipelines
- A freshwater intake causeway
- Three jetties and pumping infrastructure (CP1, CP5 and CP6)
- An effluent diffuser located in Meliadine Lake

The status of construction and planned construction dates of the above are listed in Table 1.

Surface contact water is intercepted, diverted and contained within various containment ponds prior to evaporation or treatment. Water contained in CP5 is treated by an RO treatment plant prior to discharging to CP1. Water collected in the P-area is temporarily stored and then actively evaporated. At CP1, the water is treated for total suspended solids (TSS) at the EWTP and discharged through the diffuser located in Meliadine Lake. Water treated through the RO treatment plant at CP5 is moved to CP1 prior to treatment through the EWTP.

Contact water from the Underground Mine is collected in underground sumps and stored in the underground water stope and the saline pond to be recirculated for use in various underground operations. The second saline pond will be used as additional underground water storage, pending commissioning (Section 3.5). Underground contact water that is not used for operations is treated for discharge.

Hatch (2013) investigated groundwater treatment options for the site and concluded that a combination chemical reverse osmosis (RO) and mechanical vapour compression evaporator plant would be the most efficient method of treating excess groundwater for discharge. Agnico Eagle has since acquired and constructed a Salt Water Treatment Plant (SWTP) consisting of two evaporator crystallizers (SaltMakers) and a chemical RO unit that will be used to treat groundwater. Treatment details are found in Section 3.9.3.

As part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle applied to the Nunavut Impact Review Board for approval to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Agnico Eagle received approval with the amended Project Certificate on February 26, 2019. An overview of management around discharge to sea is found in Section 3.11. Further details are found in Appendix A.

During the mine closure, the water management infrastructure will remain in place until closure activities are completed and monitoring demonstrates that water quality is acceptable for discharge to the environment without treatment.

A list of the water management control structures are presented in Table 1 with each respective construction status. Figure 1.2 shows the location of the respective structures over the development stages (Year – 5 to Year 8) of the mine life. Final design details of these structures will be provided to the Regulators for approval at least 30 days prior to construction, as per the Licence.

Table 1: Water Management Control Structures

Mine Phase	Infrastructure Name	Construction Status
Pre-Production Construction (Y-5 to Y 1)	Channel 1	Constructed
	Channel 2	Constructed
	Channel 3	Constructed
	Channel 4	Q2 2019
	Channel 5	Constructed
	Channel 6	Q3 2019*
	Channel 7	Q3 2019
	Channel 8	Q3 2019
	Culvert 1	Constructed
	Culvert 2	Constructed
	Culvert 3	Constructed

	Culvert 4	Constructed
	Culvert 5	Q3 2019*
	Culvert 6	TBD
	Culvert 7	Q3 2019
	Culvert 8	Q3 2019
	Culvert 10	Q3 2019
	Culvert 11	Q3 2019
	Culvert 13	Constructed
	Culvert 14	TBD
	Culvert 15	Constructed
	Culvert 16	Constructed
	Culvert 18	Constructed
	Culvert 19	Q3 2019
	CP1	Constructed
	CP3	Constructed
	CP4	Q2 2019
	CP5	Constructed
	D-CP1	Constructed
	Berm-CP3	Constructed
	Berm-CP4	Q2 2019
	D-CP5	Constructed
	CP1 Jetty	Constructed
	CP5 Jetty	Constructed
	Saline Pond (SP1)	Constructed
	Saline Pond 2 (SP2)	Q1 2019
	Saline Pond 3 (SP3)	Q2 2019
	Berm 1	Q3 2019*
	Berm 2	Constructed
	Berm 3	Constructed
	Freshwater Intake Causeway & Pump Station	Constructed
	Submerged Diffuser	Constructed
	WTP Intake Causeway	Constructed
Sustaining Construction during Mine Operation (Y1 to Y8)	CP6, CP6 Jetty and D-CP6	2022

* Construction tentative based on future water management strategies

3.2 Water Management Structures Design Criteria

The design of the various water management systems in place will meet the following criteria:

- Water quality will meet regulatory criteria of the Licence (described in Appendix F).
- Design capacity of the EWTP is sufficient to ensure that D-CP1 and CP1 will be able to manage the surface contact water from the entire site for a 1:100 wet year spring freshet, or a 1:2 mean year spring freshet in combination with a 1:1000 return 24-hour extreme rainfall.
- D-CP5 and CP5 will be able to manage the water from its catchment area for 3/7 of a 1:100 wet year spring freshet or a 1:1000 return 24-hour extreme rainfall. This design is based on an allowable 3-day delay in initiation of pumping during a 7-day, 1:100 year freshet. Design capacity of pumping from CP5 to CP1 is sufficient to ensure that remaining freshet inflows to CP5 are managed via pumping to CP1.
- Design pumping capacity of each of the other water management ponds (CP3, CP4, and CP6,) will be able to manage the water from their respective catchment area for 3/7 of a 1:100 wet year spring freshet or a 1:1000 return 24-hour extreme rainfall.
- The daily pumping rate for each of the ponds (CP3 to CP6), Tiriganiaq Pit 1 sump, and Tiriganiaq Pit 2 sump will be designed to have sufficient pumping capacity to handle the runoff water, which would result from one day (24.4 mm) of a 1:100 return wet spring freshet plus a 1:2 return one-hour rainfall (9.8 mm).

Channel 2 to Channel 4 are designed to pass an extreme intensity flow under a 5-minute 1:100 return rainfall of 9.2 mm. Channel 1 and Channel 5 to Channel 8 are designed as internal channels where any water overflowing the channels will remain within the catchment areas of various containment ponds. Hydraulic analyses indicated that very wide channels are required to pass an extreme intensity flow under a 5-minute 1:100 return rainfall of 9.2 mm. As a result, these channels were designed to have a reasonable bottom width to pass a flow with lesser intensity, but the water overflowing the channels can be safely managed by berms or temporarily stored in a lower basin nearby. For example, water overflowing Channel 5 can be contained by Berm 3. Water overflowing Channel 7 and Channel 8 (once constructed) can be stored in the lower basin in the drained Pond H13, and Berm 1 (once constructed) will protect Portal No.2 from flooding. Currently, Portal No.2 is protected by compacted, engineered structural fill, and mass till backfill. Water overflowing Channel 1 will flow through the flat ground between Ore Pad 2 (OP2) and future WRSF2 into CP1. Table 2 presents the design parameters for CP1, CP5 and CP6.

Table 2: Design Parameters for CP1, CP5 and CP6

Pond	CP1	CP5	CP6
Pond Volume for Water Elevation at Projected Maximum Pond Operating Water Elevation under Normal Operating Conditions and Mean Precipitation Years (m^3)	742,075	46,674	19,154
Estimated Maximum Operating Water Elevation (m)	66.2	66.0	63.9

Pond	CP1	CP5	CP6
Dike for Pond	D-CP1	D-CP5	D-CP6
Design Crest Elevation of Dike Containment Element (liner system) (m)	66.50	66.30	64.30
Pond Volume for Water Elevation at Design Crest Elevation of Dike Containment Element (m^3)	778,502	66,231	49,627

CP3 and CP4 will be established through sub-excavation of the original ground to increase water storage capacity and help ensure water levels do not reach the thermal protection berms. The key design parameters for CP3 and CP4 are provided in Table 3 and are discussed in further detail within Tetra Tech (2018).

Table 3: Design Parameters for CP3 and CP4

Pond	CP3	CP4
Elevated Pond Bottom Elevation (m)	56.0	56.0
Estimated Maximum Water Elevation during IDF (m)	63.0	63.0
Pond Volume for Water Elevation at Estimated Maximum Water Elevation during IDF (m^3)	28,000	35,093
Pond Surface Area at Estimated Maximum Water Elevation during IDF (m^2)	6,583	8,805
Thermal Berm for Pond	Berm-CP3	Berm-CP4

3.3 Water Containment ponds

Three water containment ponds (CP1, CP3, and CP5) have been constructed to date as part of the water management infrastructure. Two more water containment ponds, CP4 and CP6, will be constructed in 2019 and 2023, respectively. Table 4 presents the locations and the required operational period of the containment ponds. The locations of the five water containment ponds are shown on Figure 1.2.

Table 4: Location of Containment Pond and Required Operation Periods

Containment Pond	Relative Location	Required Operation Period
CP1	Pond H17	Year 2017 to Mine closure
CP3	North of Lake B7 and southwest of TSF	Year 2019 to Mine closure
CP4	Southeast of Lake B7 and south of WRSF1	Year 2019 to Mine closure

CP5	North of Tiriganiaq Pit 2	Year 2017 to Mine closure
CP6	Pond H19 and north of WRSF3	Year 2023 to Mine closure

3.4 P-Area Containment Ponds

The P-area consists of three storage ponds, four water containment berms and five evaporators. This area contains surface runoff and is part of the surface water management system dedicated to saline water. The total storage capacity of the P-Area ponds is 46,041 m^3. P1 is divided by a berm and P1-A (6,131.8 m^3) is the southern section of P1 and P1-B (14,649 m^3) is the northern section. P2 is adjacent and located south of P1-A. P3 was constructed east of the existing south access road, with the primary purpose of collecting seepage originating from the P2 confining berm and its abutments. A pumping station was installed to collect and pump any collected water from P3 to P1.

P1, P2 and P3 are contained by berms DP1-A, DP1-B, DP2-A, and DP3-A. Five evaporators have been installed on DP1-B. Table 5 summarizes the as-built capacities for the P-Area ponds and Figure 3.1 illustrates the P-Area plan view. In Q2 of 2019, SP3 will be installed within southwestern portion of P3. SP3 will act as the final treatment pond for saline water that is to be discharged to sea. Thus, P3 volume will be decreased upon SP3 construction. SP3 will have a minimum storage capacity of 5000 m^3 and will be lined with polyethylene geomembrane to prevent seepage between SP3 and P3. Updated P-Area volumes will be included in the 2020 annual report.

A contaminated snow cell was engineered and installed within the northwest extent of P1 in reaction to the April 8th 2017, 30,000 L diesel spill on Site. The contaminated snow cell was used to store contaminated snow from this event. Since then, the snow cell has been used to store snow containing hydrocarbons (i.e., snow on which spills occur) over the 2017 early spring and 2017/2018 winter. Upon snowmelt an oil-water separator was used to treat the water and was moved to P1. The contaminated snow cell is currently in place as a contingency measure for contaminated snow storage over the 2018/2019 winter period (See Freshet Management Plan in Appendix B).

The snow cell is lined with a polyethylene liner to avoid transfer of melting snow into the other ponds part of the P-area. The cell is designed to contain a volume of 1500 m^3 of snow and to contain 930 m^3 of water at a water surface elevation of 69.5 m.

Table 5: As-Built Capacity for P-Area Ponds

Pond	P1	P2	P3
As-built Capacity (m^3)	20,781	6,828	18,432
Maximum Design Water Elevation (m)	68.5	67.5	67.0
Total P-Area Capacity (m^3)	46,041		

Water monitoring protocols for the P-Area have been implemented to include water quality and transfer data, such as locations and flow volumes for water pumped to and from the containment ponds. This is discussed further in Appendix F.

3.5 Saline Ponds

The Saline Pond (SP1) was constructed in Q3 2016 to accommodate excess saline water from the Underground Mine. The Saline Pond is located east of P3 and north of CP5 (Figure 1.2). Table 6 summarizes the Saline Pond capacity for storage and maximum designed operating water levels. The maximum saline water capacity is the volume that can be stored in the Saline Pond prior to winter freeze. Approximately 9,000 m^3 capacity should be available to accommodate precipitation that may accumulate throughout winter and at freshet.

Based on adaptive management strategies, the project requires a second saline water storage pond (SP2). SP2 will be temporary in nature and is being constructed in bedrock within the footprint of Tiriganiaq Pit 2 (Figure 3.2). Saline Pond 2 is designed to have a minimum storage volume of 75,000 m^3. Groundwater will be pumped to Saline Pond 2 where it may then be treated for TDS removal at the SWTP. Water stored in SP2 will also contribute to saline water being discharged to sea (Section 3.11; Appendix A). Inputs to the second saline pond will be similar in chemical nature to those input to the SP1, mainly originating from the underground water storage system.

Table 6: As-Built Storage Capacity for Saline Pond 1

Item	Water Balance Under Mean Precipitation Conditions
Maximum Design Water Elevation (m)	62.9
Maximum Saline Water Capacity (m^3)	23,686
Estimated Maximum Storage Capacity at Maximum Water Elevation (m^3)	32,686 *

* Includes the capacity for saline water to be pumped into Saline Pond 1 from Underground, a combined capacity for net precipitation, and potential seepage water into the pond.

3.6 Water Diversion Channels, Dikes and Berms

3.6.1 Water Diversion Channels

Four water diversion channels (Channels 1, 2, 3, and 5) have been constructed and form part of the water management infrastructure. Four remaining channels (Channels 4, 6, 7, and 8) have yet to be installed. As outlined in Table 1, Channels 4, 7, and 8 are planned to be constructed in Q2 of 2019, Q3 of 2019 and Q3 of 2019, respectively. Construction of Channel 6 is tentative based on future water management strategies downstream of WRSF2. The as-built and design parameters for the water diversion channels are presented in Table 7.

Table 7: As-Built and Design Parameters for Channels

Item	Channel							
	1 (As-Built)	**2 (As-Built)**	**3**	**4**	**5 (As-Built)**	**6**	**7**	**8**
Approximate Total Length (m)	528	269.5	619	710	429†	69	214	315
Bottom Width (m)	3	1.257	1 or 2*	1 or 2*	2.3 to 2.9	1	1	1
Side Slopes	3(H):1(V)**	1.82(H):1(V)	3(H):1(V)	3(H):1(V)	1.9(H):1(V)	3(H):1(V)	3(H):1(V)	3(H):1(V)
Rip-rap Thickness (m)	0.3 to 0.5	0.277	0.3	0.3	0.2	0.3	0.3	0.3
Minimum Bottom Slope Gradient (%)	0.2	0.30†	0.17	0.13	0.17†	0.44	0.42	0.38

* 1 m bottom width for first 100 m upstream section, and 2 m bottom wide for the remaining channel section

** Except from Sta. 0+050 to 0+130: 2(H):1(V)

† As-built parameter values not available; value displayed is from design

3.6.2 Water Retention Dikes and Berms

In general terms, “dikes” will retain continuous water during normal operations and “berms” may retain water during short-term high level water events. At the end of Mine closure, when the water quality in the corresponding pond meets direct discharge criteria, each of the dikes and berms on site (except for Berm 2) will be breached to restore the original natural drainage paths. Berm 2 will remain in place to prevent non-contact water from flowing into the TSF.

Water retention dikes D-CP1, D-CP5, and future D-CP6 have been designed as a zoned earth fill dam with a geomembrane liner keyed into the expected permafrost foundation to limit the seepage through the dike and its foundation. The characteristics of the dikes and berms required for the WMP are summarized in Table 8.

3.6.2.1 Thermal Monitoring

Horizontal Ground Temperature Cables (GTCs) are installed along the key trenches of D-CP1 and D-CP5 at a depth of approximately 3 m below the original ground level. These installations are in place to verify that the foundations remain frozen and dike integrity is not compromised. D-CP1, Berm-CP3 and D-CP5 contain vertical GTCs installed to a minimum depth of 15 m below the crest of each dike. Thermal records collected from these sensors provide temporal analysis of vertical temperature profiles to assess increasing (or decreasing) temperatures within the dike or berm structure.

During 2018, D-CP1 and D-CP5 readings were obtained, recorded, and assessed every 2 – 3 days during freshet and weekly following freshet until freeze-up. Following freeze-up, readings were then taken monthly. Data loggers set to log every 12-hours were installed in October 2018 at D-CP1 and D-CP5 to provide twice-daily records. Reading frequency at Berm-CP3 and Berm-CP4 (upon construction) will be monthly during the first year following construction and yearly thereafter. Reading frequency at D-CP6 will depend on the construction design provided with the D-CP6 design report. The measured readings are consistently analyzed by an Agnico Eagle geotechnical engineer and will be reported in the annual geotechnical inspection report. This will continue into 2019.

In addition to thermal monitoring, visual geotechnical inspections of water management structures are currently performed, as described in Section 3.12 below.

Table 8: Design Parameters for Water Retention Dike/Berm

Item	D-CP1	Berm-CP3	Berm-CP4	D-CP5	D-CP6	DP1-A	DP1-B	DP2-A	DP3-A	Berm1	Berm2	Berm3
Approximate Maximum Height (m)	5.6	2.0	2.0	3.3	1.8	3.7	3.4	4.0	3.4	1.6	2.5	2.76
Maximum Elevation (m)	67.5	66.1	65.4	67.3	65.3	70.5	70.7	69.5	69.0	68.5	varies	67.37
Maximum Head of Water Retained (m)	3.5	0.2	0.1	1.4	0.5	68.5	68.7	67.5	67.0	0	0	0

3.7 Evaporators

Five evaporators are installed on jetties constructed at DP1-B. The evaporator system is designed for vaporizing water contained at the P-Area. The evaporators are installed to accommodate the quantity of excess saline water before saline water treatment options and disposal plans have been implemented at the Mine. Based on data collected during 2016, the efficiency of one evaporator was estimated to be 22 m^3/hr.

3.8 Freshwater Intake

Freshwater usage at the Mine includes potable uses, fire suppression, make-up water for the mill, and other operational requirements, such as drilling water, dust suppression, batch plant use, and use at the washbay. The main freshwater intake is located northeast of the industrial pad in Meliadine Lake, as shown on Figure 1.2 and an additional freshwater intake pump is located at Lake A8. The intakes consist of vertical filtration wells fitted with vertical turbine pumps that supply water on demand. Both intake pipes are fitted with a screen of an appropriate mesh size to ensure that fish will not be

entrained and shall withdraw water at a rate such that fish do not become impinged on the screen (NWB, 2016).

3.9 Water Treatment

Contact water will be treated (if necessary) to meet Licence requirements prior to being discharged to the environment. TSS mitigation techniques (i.e., attenuation ponds, silt screens, etc.), oil separation treatment, the STP, the SWTP, the RO Plant and the EWTP are used accordingly at various locations at the Mine prior to water being transferred to containment ponds and/or as effluent discharge to Meliadine Lake. Water quality criteria is discussed in Section 7 and Appendix F.

3.9.1 Freshwater Treatment Plant (WTP)

Freshwater from Meliadine Lake will be treated in the WTP before being directed to the camp areas for potable (domestic) water uses. The design flow rate for freshwater for the main camp and accommodations is 216 m^3/day. In the WTP, freshwater will be pumped through cartridge filters, then pumped through ultraviolet units, and finally treated with sodium hypochlorite (chlorine). The treated water will be stored within a potable water tank. Potable water will be monitored according to the Nunavut Health Regulations for total and residual chlorine and microbiological parameters. Operation and maintenance details for the WTP can be reviewed in the Process and Control Narrative (H2O Innovation, 2016).

3.9.2 Sewage Treatment Plant (STP)

Wastewater from the accommodation complex and from satellite sewage tanks will be treated in the STP before being directed to CP1. Operation and maintenance details for the STP can be reviewed in the Operational & Maintenance Manual – Sewage Treatment Plant (Agnico Eagle, 2017c).

3.9.3 Saline Water Treatment Plant (SWTP)

Saline water generated from the Underground Mine is currently being stored underground and on surface at the P-Area and SP1. SP2 will be an addition to this saline water storage system upon completion of its construction. A Saline Water Treatment Plant (SWTP) was constructed in 2018 and is currently being commissioned. The system will be in full operation during Q2, 2019. The SWTP is located in a dome approximately 50 m to the southeast of Portal 1. The SWTP will be used to treat water from the Underground Mine, P-Area or from the saline ponds.

The SWTP will remove excessive total suspended solids (TSS), calcium chloride ($CaCl_2$), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds from the influent saline water. Effluent from the SWTP is intended to be discharged to CP1. In February 2019, the discharge point was moved, temporarily directing effluent to CP5 while a line extension is performed at the CP1 discharge point. This change will be reverted once the line extension is complete. Pre-treatment groundwater and effluent from the SWTP are monitored every 12 hours (night shift and day shift) for

pH and TDS, and weekly for chloride (Cl), ammonia (NH_4), nitrite (NO_2), nitrate (NO_3), TDS, TSS, total phosphorus (P), total cyanide (Cn), total metals and total mercury (Hg). The SWTP Design Report can be found in Appendix E.

The SWTP consists of two parallel units. Each unit can be operated to produce brine or solid by-product. Both units within the SWTP will be operated in Brine Mode for Q1 of 2019. Brine-mode of one unit within the SWTP is expected to operate to the following specs:

- Inlet capacity of 115 m^3/day with a 95% expected operation availability for a corrected average input capacity of 109 m^3/day.
- With an input capacity of 109 m^3/day the effluent and brine will be discharged as follows:
    - 68 m^3/day to CP1
    - 24 m^3/day to Saline Pond as Brine
    - The 17 m^3/day difference is due to evaporation loss through treatment.

Solid-mode of one unit within the SWTP is expected to operate to the following specs:

- Inlet capacity of 69 m^3/day with a 95% expected operation availability for a corrected average input capacity of 66 m^3/day. This full inlet capacity will be discharged to CP1 as effluent
- Decisions regarding the management of solid salt by-product are ongoing by Agnico Eagle. One possible option would be use as a dust suppressant on roads as the material is similar to Calcium Chloride currently approved for such use. Formal approval would be required from the Government of Nunavut Environment Department.

SWTP effluent is currently transferred to CP1 where it will be treated by the EWTP prior to discharge to Meliadine Lake. EWTP effluent discharge to Meliadine Lake was performed in 2018 in accordance with the conditions outlined in Part F, Item 3 of the Water Licence. Discharge to Meliadine Lake is expected to be carried out in 2019. Total discharge to Meliadine Lake, including the treated groundwater, will remain within the permitted daily volume and meet the discharge criteria defined in the License, as well as MDMER discharge limits. Additionally, SSWQO's for EWTP effluent (including treated groundwater) will be met at the edge of the mixing zone in Meliadine Lake. Further details regarding the EWTP are provided in Sections 3.9.4 and Section 4.3 of the WMP.

The saline effluent temperature from the SWTP is expected to be approximately 35 °C (however may be greater during winter months to prevent freezing of pipeline), with an approximate pH of 7.5 (Saltworks 2017). According to pilot testing, SWTP effluent meets the required Water Quality Output Requirements defined in Agnico Eagle's Desalination Water Treatment Plan Design Criteria with the exception of ammonia, nitrite, total cyanide, and selenium (Saltworks 2017). However, weekly sample results from the first months of sampling (December 13, 2018 to February 18, 2019) show the SWTP effluent consistently meets the aforementioned requirements for all constituents aside from ammonia and nitrite. Ammonia exceeded the Water Quality Output Requirement of 35 mg/L on three sampling dates (Jan-16, Jan-18, Feb-10), however the mean ammonia concentration over the

sampling period was 24 mg/L. Nitrite exceeded the Water Quality Output requirement of 0.2 mg/L on all (n=9) sampling dates with a mean concentration of 1.2 mg/L. The cause for these exceedances is that the SWTP system remains in the commissioning phase, specifically the chemical RO unit designed to remove constituents such as ammonia and nitrite has not yet been commissioned. Upon commissioning (expected by end of Q1 2019), the SWTP is expected to meet all Water Quality Output Requirements.

SWTP effluent and CP1 water quality will continue to be monitored according to the SWTP Design Report to identify future exceedances and potential impacts to CP1. Pilot testing predicted that TDS concentrations would be approximately 158 mg/L (condensed water after treatment; Saltworks 2017). During commissioning, mean TDS concentration has been 174 mg/L (n=9) to date. As commissioning continues (i.e., process is refined and RO treatment is commissioned), effluent quality will trend towards lower concentrations as the treatment process is refined for optimal treatment quantity and quality. With respect to toxicology, the SWTP effluent passed acute toxicity tests on Rainbow trout, Three-spined stickleback and Daphnia magna (Saltworks 2017).

3.9.4 Effluent Water Treatment Plant (EWTP)

Approximately 642,521m³ of contact water from CP1 was treated and discharged from the EWTP during 2018. The monthly and daily discharge averages are provided in Table 13 and Figure 7.2, respectively. Based on the anticipated water quality (Appendix F) and water quantity, the EWTP will be continue to be used to remove TSS at CP1 in 2019. The volume of water requiring treatment for TSS removal and discharge will increase to a maximum of 798,000 m³ in 2022 and then decrease to 673,000 m³ during the final year of the life of mine (2027). Based on the maximum flow rate of the Actiflo® system model ACP-600R, the EWTP has a maximum capacity of 520 m³/h (nominal flow). The system will have the capacity to treat the anticipated discharge from CP1 for the life of the mine.

TSS mitigation is ongoing with runoff water from ditch systems that have the potential to discharge directly to receiving waters and is described further in the Freshet Action Plan (Agnico Eagle, 2018b).

Beginning July 2018, water stored in pond CP5 was treated through a Reverse Osmosis (RO) system and then pumped through the EWTP for treatment (prior to discharge into Meliadine Lake). The resultant EWTP effluent was continually monitored for turbidity and electrical conductivity as a surrogate for TSS and TDS, respectively. In addition, Agnico Eagle conducted regular sample monitoring in accordance with the Type A Water License and the MDMER.

With respect to TSS monitoring during CP1 discharge events, Agnico has developed triggers for mitigation. Rating curves predicting TSS concentration as a function of turbidity and TDS as a function of conductivity were developed with simple linear regressions. The regressions applied *in situ* conductivity and turbidity readings and MEL-14 sample results. Rating curves are applied to continuous conductivity and turbidity readings taken from internal probes within the EWTP to predict TDS and TSS, respectively. Regarding conductivity, a trigger limit has been set to 1900 µS/cm which

corresponds to 1,244 mg/L TDS (See rating curve in Figure 3.3). When this trigger is reached, discharge to Meliadine Lake will be stopped. The correlation strength pertaining to the TDS-conductivity rating curve is R^2 = 0.85. Thus, the trigger limit was set below the maximum allowable concentration (1400 mg/L - TDS limit) to allow for uncertainty associated with the correlation.

Regarding turbidity, two trigger limits have been set. The first is set to 1.2 NTU which corresponds to approximately 15 mg/L TSS (See rating curve in Figure 3.4). When this first trigger is reached, sample frequency will be increased to twice per week for TSS at an accredited lab. The second trigger limit is set to 2.3 NTU which corresponds to approximately 25 mg/L TSS (Figure 3.4). When this second trigger is reached, discharge to Meliadine Lake will be stopped. The correlation strength pertaining to the TSS-turbidity rating curve is R2 = 0.79. Thus, the trigger limit was set below the maximum allowable concentration (15mg/L - TSS Max Ave Concentration and 30 mg/L - TSS Max Grab Concentration) to allow for associated uncertainty the correlation.

Agnico will continue to gather calibration/confirmatory paired samples in the future to increase the number of data points and thus to strengthen the turbidity-TSS and conductivity-TDS correlations.

3.9.6 Oil Separators

An oil separation treatment system was installed in 2018 at the Maintenance Shop to collect and separate oil from water used for washing mining equipment. A second oil-water separator is installed at Landfarm A. In the event of water accumulation at Landfarm A due to rainfall or snowmelt, the ponded water will be pumped through the oil-water separator to remove PHC residue and will be analyzed for BTEX, lead, and oil and grease prior to discharge to CP1 or used on the windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged directly to the receiving environment.

3.10 Discharge Diffuser

The discharge diffuser is the final effluent discharge location for the Mine. The overall purpose of the diffuser is to discharge water from CP1 (at sampling station MEL-14) to Meliadine Lake while providing minimal environmental impacts to the Lake. The effluent mixing will be dependent on ambient currents in Meliadine Lake, driven by wind during the open water period. The diffuser modelling was initially conducted by Golder Associates Ltd. (Golder, 2015) and updated design progress was reported by Tetra Tech EBA (Tetra Tech, EBA 2016).

3.11 Saline Water Discharge to Sea

Based on the current standing of saline water stored on site, the rate at which the SWTP can treat saline water (Section 3.9.3), and the forecasted inflows (Appendix A), it was anticipated that a second discharge location was required for long-term groundwater management. Agnico Eagle proposed to treat groundwater and discharge the saline effluent to Melvin Bay at Itivia Harbour via a storage tank

and engineered marine outflow. In 2018, Agnico Eagle applied to the NIRB for approval to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Agnico Eagle received approval for discharge of saline water to sea along with an amended Mine Project Certificate from NIRB on February 26, 2019. A maximum of 800 m^3/day of effluent at a TDS concentration no greater than 39,600 mg/L will be discharged to Melvin Bay at the Itivia Site during the open water seasons of 2019 – 2031. Further details are provided in Appendix A.

Saline effluent quality will meet the Canadian federal end-of-pipe discharge criteria (Metal and Diamond Mining Effluent Regulations – or MDMER [GC 2018]), and Site-Specific Water Quality Objectives, if applicable, at the edge of the mixing zone for the diffuser discharge into Melvin Bay. As per MDMER (GC 2018) Section 9 and Section 10, Agnico Eagle will submit information regarding the final discharge point 60 days before discharge. A preliminary sampling plan is discussed in Appendix A. Refer to section 2.1.3 of Golder's Report: Modelling Assessment of Groundwater Discharge into the Melvin Bay Marine Environment, Rev B for detailed information regarding simulations of the treated groundwater effluent mixing (Appendix A).

3.12 Water Management Structure Monitoring

Pursuant to Part E, Item 15 of the Licence, Agnico Eagle will carry out weekly inspections of all Water management structures during periods of flow and monthly thereafter. The records will be maintained for review upon request of an Inspector. More frequent inspections may be required at the request of an Inspector. Inspections will focus on structures and conditions in Sections 3.12.1 to 3.12.5 to follow. The associated inspection template can be found in Appendix G.

3.12.1 Culvert and Water Crossing Inspections

Culverts listed in Section 3.1, as well as culverts and water crossings along the AWAR, Bypass Road, and at the Itivia site will be inspected for the following conditions. These inspections also satisfy the monitoring procedures outlined in the Sediment and Erosion Management Plan (Appendix D):

- Damage to the inlet or outlet of the culvert which may impede flow capacity;
- Bed erosion upstream and downstream of watercourse crossing structures;
- Scour under bridge abutments and abutment foundations;
- Erosion along cutslopes and fillslopes of embankments (rill and gully erosion);
- Blockages within the culvert including snow, ice, debris; and
- Snow cover or snow piles which would prevent routing of water towards the inlet of the culvert (only applicable prior to freshet).

In the case that any of the above conditions are observed, corrective actions will be taken to optimize culvert/water crossing function and integrity.

3.12.2 Containment Pond Inspections

Water containment ponds discussed in Section 3.3 and P-Area containment ponds discussed in Section 3.4 will be inspected for the following conditions:

- Unplanned inputs via surface runoff which are not part of the water management system; and
- Water level elevation above the operating manual maximum (OMM).

In the case that any of the above conditions are observed, corrective actions will be taken to prevent unaccounted for losses of available water capacity or potential compromise to dike integrity.

3.12.3 Dike Inspections

Dikes discussed in Section 3.6.2 are inspected in order to track natural (expected) movement of the structure. Furthermore, a 'master" sketch of all the issues that were documented in the past is maintained as a means to spot any changes/new issues. Inspections will focus on the upstream slope, the crest, the downstream slope, and downstream toe and observations will include the following:

- New areas of movement/deterioration not previously documented;
- Changes to previously documented areas of movement/deterioration;
- Seepage through the downstream slope;
- Water presence in downstream channel/sump; and
- Areas of movement/deterioration of downstream channel/sump.

Any issues or potential problems identified will be addressed accordingly by a geotechnical engineer in order to mitigate risks and maintain dike integrity.

3.12.4 Water Diversion Channel and Berm Inspections

In addition to the water management structures requiring inspections under the Water Licence, Agnico Eagle will carry out inspections of all channels on site listed within Section 3.6.1 and Table 1 for the following conditions:

- Obstructions to flow (ice, debris);
- Inflows not part of the water management system;

- Structural failure of channel banks;
- Seepage through water diversion berms resulting in water movement to areas not planned within the water management system; and
- Erosion of diversion berms (i.e., undercutting, slope failure).

In the case that any of the above conditions are observed, corrective actions will be taken if there is potential for compromise effectiveness of the channel function or potential for unplanned impact to water quality or quantity in associated containment ponds.

SECTION 4 • WATER MANAGEMENT STRATEGY

There are four major sources of inflow water considered in the Mine water management system; freshwater pumped from Meliadine Lake and Lake A8, natural run off from precipitation, natural groundwater inflow to the Underground Mine and open pits, and water produced during freshet.

A brief summary of the water management strategy for the Mine is presented as follows:

- Contact water from key mine infrastructure will be diverted and/or collected in the containment ponds (CP1, CP3, CP4, CP5, CP6, the Saline Ponds and the P-Area).
- The collected water in CP3 to CP6 will be pumped to CP1. Water collected in CP1 may be reused by the process plant and the excess water will be treated by the EWTP prior to discharge via the diffuser into Meliadine Lake.
- Contact water from the Underground Mine will be contained in underground sumps and the water storage stope and reused for mining operations. Excess water volumes will be stored in the Saline Ponds, treated by the SWTP to be transported to CP1, or will be discharged to Melvin Bay.
- Runoff water in the open pits will be collected in sumps and then pumped to the designated water containment ponds (CP1, CP5).
- Natural flooding of the open pits at end of mining will be supplemented by using freshwater from Meliadine Lake.
- Upon the completion of underground mining, the Underground Mine workings will be allowed to naturally flood by groundwater seepage.

Appendix B presents the Freshet Action Plan, which includes the Freshet Action Procedure and the Snow Management Procedure for the Mine. Table 9 summarizes the overall contact water management plan for the key infrastructure and presents the initial water collection locations and final water destinations. The plans for water management at key areas are described in following sections.

Table 9: Overall Site Surface Contact Water Management Plan

Contact Water Source	Initial Contact Water Collection Location	Final Contact Water Collection Location
Industrial Site Pad Area (camp/process plant area)	CP1	CP1
WRSF1 Area	CP1, CP4 and CP5	
WRSF2 Area	CP1 and CP5	
WRSF3 Area	CP6	
Dry Stack TSF Area	CP1 and CP3	
Ore Stockpiles OP1 to OP2	CP1	
Landfill	CP1	
Landfarm (biopile)	Sump within Landfarm	To CP1 after oil separation
Tiriganiaq Pit 1 Tiriganiaq Pit 2	Open pit sumps	First to CP5 and then to CP1
Tiriganiaq underground	Sumps in underground mine	Sumps in underground mine, surface saline water storage ponds (Saline Pond, P-Area), SWTP to CP1 and/or discharge to sea

The following sections describe the strategy for water management at different areas for the Mine.

4.1 Key Water Management Activities

The activities required for the WMP are summarized in Table 10. Water management activities during closure are described in Section 6.

Table 10: Key Water Management Activities

Mine Year	Major Water Management Activities and Sequence
Q4 of Yr -5 (2015)	• Started to re-use the underground water • Dewatered top 0.5 to 1.0 m of fresh water in Pond H17
Yr -4 (2016)	• Dewatered H17 into Meliadine Lake. • Dewatered Pond A54 in Q3 of Year -4 and pumped the water to CP1. • Started to store the excess groundwater from the underground mine at surface. • Implemented and tested evaporators at P-Area to reduce water volumes stored at surface. • Constructed trenches down gradient from DP1-B and DP3-A to be able to pump collected water and pump back to P1 and P3, respectively.

Mine Year	Major Water Management Activities and Sequence
Yr -3 (2017)	• Started to treat sewage from STP and pump the treated sewage from STP to CP1. • Started to pump the contact water from CP5 to CP1 for treatment (solids removal) • Started to pump water collected in trenches, down gradient from D-CP1, D-CP5, DP1 and DP3 to CP1, CP5, P1 and P3, respectively. • Started to pump the water from the Type A Landfarm to CP1 after oil/water separator treatment. • Started to pump water from washbay to underground for storage until a biological treatment unit for hydrocarbon reduction/removal arrives at the site
Yr -2 (2018)	• Started to pump the water from CP1 to EWTP for treatment prior to discharge via the diffuser to Meliadine Lake. • Pumped the solids sludge from EWTP to CP1. To limit recirculation of the sludge within CP1, the discharge of the sludge was located away from the EWTP intake. • Started diversion of the contact water from industrial pad to CP1 via Channel1 • Constructed and commissioned (in Q4) SWTP to discharge to CP1.
Yr -1 (2019)	• Commission wash bay water treatment unit, monitor water quality monthly and transport treated water to CP1 • Start to pump the contact water in CP3 to the partially drained Pond H13 where the water will flow through Channel1 into CP1 • Discharge up to 800 m^3/day saline water to Melvin Bay at Itivia during the open water season • Start to pump the contact water in CP4 to the partially drained Pond H13 where the water will flow though Channel1 into CP1
Yr 1 (2020)	
Yr 2 (2021)	• Start to pump contact water collected in Tiriganiaq Pit 1 to CP5
Yr 3 (2022)	• Dewater Ponds H19 and H20 in Q3 of Year 3 and pump the water to CP1
Yr 4 (2023)	• Start to pump contact water collected in Tiriganiaq Pit 2 to CP5 • Start to pump contact water in CP6 to CP1
Yr 5 (2024)	• Water management plan similar to Year 4
Yr 6 (2025)	• Water management plan similar to Year 4
Yr 7 (2026)	• Water management plan similar to Year 4 • Stop pumping water from the open pits when the pits are mined-out at end of year • Stop pumping excess water from underground when underground mine is completed
Yr 8 (2027)	• Start to fill the mined-out Tiriganiaq Pits 1 and 2 with active pumping from Meliadine Lake • Start natural flooding of Tiriganiaq Underground mine with groundwater seepage • Stop pumping water to process plant when the processing is completed

4.1.1 Pond Dewatering and Displacement

The initial dewatering at Lake H17 and Lake A54 was conducted in 2016 prior to constructing CP1 and CP5, respectively. The water from these ponds was pumped to Meliadine Lake through a temporarily installed diffuser. Preparation for construction of CP4 facility required dewatering of two shallow ponds into CP1, namely B8 and B9 at CP4. Volumes pumped to CP1 from B8 and B9 occurred in Q4 2018 are approximately 2993 m^3 and 6840m^3, respectively. Preparation for CP3 did not require dewatering as B28 contained insufficient volumes to dewater. Regarding dewatering of Ponds H19 and H20 for CP6 and WRSF3, it is assumed that approximately half the volume of water in these ponds will be pumped to Meliadine Lake if it meets discharge criteria, and the remaining volume of water will be pumped to CP1 to be stored for open water discharge to Meliadine Lake or for use in the Process Plant. Table 11 summarizes the estimated dewatering plan and estimated volume of water to be dewatered for future construction.

Table 11: Estimated Pond Dewatering Plan

Pond	H20	H19
Maximum Pond Water Depth (m)	1.6	1.4
Existing Pond Surface Area (ha)	9.58	2.91
Dewatering Schedule	Sept. to Oct. of Year 3	Sept. to Oct. of Year 3
Estimated Total Volume of Water to be Dewatered (m^3)	90,307	16,431

4.1.2 Underground Water Management

The Underground Mine will extend approximately 650 m below the ground surface and part of the underground workings will be operated below the base of continuous permafrost. The underground excavations will act as a sink for groundwater flow during mining, with water induced to flow through the bedrock to the Underground Mine workings once the Mine has advanced below the base of the permafrost.

Underground contact water is contained within underground sumps and the underground water stope. Excess underground water is pumped to surface to be managed in Saline Pond 1 (SP1). A second Saline Pond (SP2) will be added to the storage system pending commissioning of the structure. Beginning December 2018, the SWTP began treating groundwater to reduce stored saline water on Site (See Section 3 for details). Furthermore, as part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle applied to the Nunavut Impact Review Board for approval to discharge saline water to the sea (Melvin Bay, Rankin

Inlet). Agnico Eagle received approval with the amended Project Certificate on February 26, 2019 (See Section 3.11 and Appendix A for details).

The estimated volume of water to be managed is expected to range from a minimum of about 0.11 Mm^3/year to a maximum of 0.18 Mm^3/year depending on the production. Details of the underground dewatering system are provided in the Mine Plan (Agnico Eagle, 2017a).

Table 12 presents the predicted groundwater inflow rates estimated by Golder (2016) for passive groundwater inflow to the Underground Mine. Details pertaining to model inputs and assumptions are found in Appendix A. Values presented in Table 12 do not include grouting efforts or ventilation loss. Net inflow values to the Underground Mine, which included the impact of grouting, ventilation losses, loss of water in waste rock pore space, treatment by the SWTP, and loss due to re-use of water in mining operations, were estimated based on changes in water volumes stored in the underground water storage system. Changes in storage were calculated on a daily basis and used to produce monthly values of mean daily net inflow rate. Based on these monthly estimates of mean daily inflow, mean net inflow rate over 2018 was 51 m^3/day. This is not the groundwater inflow rate to the mine but rather the balance of inflows, the aforementioned water losses, and water used for operations. Thus, the 51 m^3/day estimate is the surplus of inflows that was placed in storage.

It should be noted that the net inflow rate generally increased over 2018. During Q4 of 2018 the mean daily net inflow rate was approximately 105 m^3/day. The increasing trend is the result of the progression of development, especially development approaching the lower fault (in the vicinity of the ore body), where hydraulic conductivities are expected to be relatively high (1x10-7 m/s). Going forward, daily net inflow rates will increase when stoping within the cryopeg begins (Q1 of 2019). This is because greater surface area of rock will be exposed and stoping will proceed within the ore body where water-bearing structures exist, and grouting of inflows will not be possible within stopes.

Table 12: Predicted Groundwater Inflow to the Underground Mine (2017 to 2032)

Period	Predicted Groundwater Inflow (m^3/day)
2017	230
2018	300
2019	280
2020	300
2021	340
2022	340
2023-2024	420
2025-2026	380
2027-2028	390
2029-2030	380
2031-2032	360

Source: Updated Predictions of Groundwater Inflow to Tiriganiaq Underground Mine (Golder 2016).

4.1.3 Water Management for Haul Road

A network of haul roads are to provide access to infrastructure at the Mine. The majority of the roadways servicing the mining area are located so that drainage is directed by berms, channels and culverts towards CP1, CP3 and CP5. As shown in Appendix C, water diverted to CP3, CP4, CP5 and CP6 will eventually be transferred to CP1. Detailed information about water management on roads is described in the Roads Management Plan (Agnico Eagle, 2019).

4.1.4 Water Management for Landfarm and Landfill

Any water that accumulates at the onsite Landfarm will be pumped through an oil/water separator prior to discharge into CP1. Additional details for Landfarm water management are described in the Landfarm Management Plan (Agnico Eagle, 2015b).

Leachate from the Landfill is anticipated to non- hazardous and non- toxic due to the controls placed on materials acceptable for the landfill. Drainage from the Landfill is expected to freeze within the WRSF with minimal amounts of leachate reporting to the water collection infrastructure placed around the WRSF. Annual Landfill operations will involve clearing of snow prior to spring melt. However, in the event there is leachate from the Landfill due to periods of heavy rainfall or spring freshet, the runoff will be collected, controlled and treated, if necessary (Agnico Eagle, 2015a), and sent to CP1.

4.1.5 Water Management for Emulsion Plant Area

Freshwater will be trucked to the emulsion plant and used for manufacturing emulsion as well as for washing vehicles. Water within the emulsion plant will be re-used when feasible, and excess water will be collected and disposed of either through the onsite STP or in the P-Area holding ponds.

4.1.6 Water Management for the Batch Plant

Freshwater is pumped from Lake A8 to the Batch Plant and used for concrete production. Water used in the Batch Plant will be re-used when feasible and excess used water will be collected and disposed of in the P-Area containment ponds.

4.1.7 Water Management for the Wash Bay

Water used in the Wash Bay is re-used when feasible and excess water is recycled through a biological treatment system designed to reduce or remove hydrocarbons. Waste from the treatment process is removed in the form of solids and disposed of appropriately (landfarm or landfill).

4.2 Freshwater and Sewage Management

Additional freshwater usage and sewage management is described in the following sections.

4.2.1 Freshwater Management

Major freshwater usages on site include potable use, fire suppression, a portion of make-up water for the mill, and other operational needs, such as drilling. Freshwater is sourced from Meliadine Lake through a freshwater intake and pump system. For dust suppression, water is sourced from any ponded water located along the All Weather Access Road (AWAR), small ponds proximal to the road and/or from the Meliadine River.

Freshwater is pumped through an overland pipeline to an insulated main storage tank located at the plant site. Under the Licence, up to 62,000 m^3/year of freshwater may be used during the construction phase. Approximately 318,000 m^3/year of freshwater is permitted during operation phase. Additionally, approximately 4,000,000 m^3 of freshwater is permitted per year to fill the mined-out open pits during the mine closure. These quantities are inclusive of water needs for dust suppression.

The design flow rate for the potable water for the main camp and accommodations (kitchen, laundry) is 136 m^3 per day (based on a 680-people camp capacity and a nominal consumption of 200 L/day/person). There is an onsite Potable Water Treatment System. Treated potable water is piped to areas in the process plant, service complex, and other facilities requiring potable water.

4.2.2 Sewage Management

Sewage is collected from the camp and change-room (dry) facilities and pumped to the STP. The objective of the STP is to treat sewage to an acceptable level for discharge to CP1 via a sewage water discharge pipeline. The STP is housed in a prefabricated (modular) structure, located at south-east of the service complex at the Industrial Pad, as shown in Figure 1.2. The sewage treatment system is designed based on a flow rate of 200 L per day per worker for a peak load of 680 people, for an average daily flow rate of 136 m^3 (5.67 m^3/h).

The STP for the camp facilities is designed to meet appropriate guidelines for wastewater discharge (Agnico Eagle, 2017c). Details regarding STP specifications and operation can be found in the Operation & Maintenance Manual Sewage Treatment Plant (Agnico Eagle, 2017c).

4.2.3 Process Water Management

Process water will be required in the mill for ore processing. Both contact water from CP1 and sludge water from the EWTP may be used as process water. When possible, water from CP1 will be the main source of water for the ore process. Additional water needs will be supplied by freshwater from Meliadine Lake. Approximately 600 m^3/day of process water will be required in Year 1 to Year 3 operations and approximately 770 m^3/day of process water will be required in Year 4 to Year 8.

4.3 Meliadine Lake Diffuser Effluent Flow Rates

Effluent is discharged from the EWTP into Meliadine lake via a diffuser at a design rate of 11,688 m^3/day (a water treatment rate of 12,000 m^3/day minus 312 m^3/day of sludge returned back to CP1).

The pump does not operate continuously. The amount of effluent flow released over each month and over each year was based on the overall water balance for the feasibility study (Tetra Tech EBA, 2016).

Table 13 shows the estimated total volume of effluent released per month per year along with effluent released per month in 2018. Daily effluent discharge rates are provided in Figure 7.2 and discussed in Section 7.

Table 13: Estimated Effluent Flow Rates over Mine Operating Life

Year	Effluent Released Over the Course of the Month (m^3)				
	June	July	August	September	October
Year -2: 2018	134,262	352,551	153,066	2,632	0
Year -1: 2019	175,320	303,888	105,192	93,504	35,064
Year 1: 2020	175,320	292,200	105,192	163,632	70,128
Year 2: 2021	175,320	350,640	128,568	105,192	35,064
Year 3: 2022	175,320	350,640	128,568	93,504	35,064
Year 4: 2023	175,320	350,640	128,568	93,504	35,064
Year 5: 2024	175,320	350,640	128,568	93,504	35,064
Year 6: 2025	175,320	280,512	105,192	81,816	35,064
Year 7: 2026	175,320	292,200	116,880	93,504	35,064
Year 8: 2027	175,320	292,200	116,880	93,504	35,064
Year 9: 2028	175,320	280,512	116,880	93,504	35,064
Year 10: 2029	-	-	-	-	-
Year 11: 2030	-	-	-	-	-

SECTION 5 • WATER BALANCE

5.1 Global Water Balance

A water balance model was developed to assist in the evaluation of the water management infrastructure and estimation of the pumping requirements over the life of the Mine and under closure conditions. The model includes a water balance conducted on both a monthly and yearly basis. The model focuses specifically on contact water management infrastructure and areas that are affected by mining activities.

A monthly site-wide water balance was conducted for CP1, CP3, CP4, CP5, CP6, Tiriganiaq Pit 1, Tiriganiaq Pit 2, water in the underground mine operation, make-up water for the mill, water for the WTPs, and freshwater during mine construction period to mine closure under mean precipitation years.

The following sections present the parameters and assumptions adopted in the water balance model as well as a 2019 model update along with a summary of the water balance results.

5.2 Water Balance Framework

The water balance framework developed for the site-wide water balance model was presented in Version 1 of the WMP (Agnico Eagle, 2015a). To simulate a range of conditions, the model was run for the proposed mine life and closure conditions.

5.3 Water Balance Assumptions

The water balance was based on the following:

- snow accumulates throughout the months of November to May, and thaws in June during the annual spring freshet period;
- average precipitation year climate conditions;
- the open pits and water containment ponds (CP3 to CP6) are not to be used for long-term storage of water during operations;
- the water collection sumps and ponds are empty in the autumn prior to the spring freshet each year; and,
- other water management assumptions described in Section 4 of this WMP.

A general water management flow sheet illustration is presented in Appendix C.

5.4 Water Balance Results

The estimated maximum annual water input/output from each of the various water management facilities under mean precipitation conditions are summarized in Table 14. Results were also provided

for 1:100 year wet and dry conditions, with corresponding basis and assumptions, in a separate technical memorandum (Tetra Tech EBA, 2015). Results of the 2019 water balance update are provided in Appendix H of the plan.

Table 14: Estimated Maximum Annual Volumes from Mine Site Water Balance

Item	Maximum Annual Water Volume (Mm^3)
Contact Water from CP1	0.800
Contact Water from CP3	0.088
Contact Water from CP4	0.087
Contact Water from CP5	0.240
Contact Water from CP6	0.076
Water Pumped from CP1 to EWTP for Treatment	0.798
Fresh Water Pumped from Meliadine Lake during Construction	0.062
Fresh Water Pumped from Meliadine Lake during Operation	0.318
Treated Water from EWTP to be Discharged to Outside Environment	0.730
Underground Water Pumped to Underground TSS Removal Plant	0.696
Excess Water from Underground Mine to be Stored on Surface	0.155
Fresh Water Pumped from Meliadine Lake to Fill Mined-out Tiriganiaq Pit 1	3.068
Fresh Water Pumped from Meliadine Lake to Fill Mined-out Tiriganiaq Pit 2	0.749

5.5 Waterbody Inventory

Three watersheds (Watershed A, Watershed B and Watershed H) will be impacted by the Mine activities. Table 15 presents the waterbodies that are impacted by mining activities. Watersheds and waterbodies in proximity to the Mine location and waterbodies affected by Mine infrastructure are shown on Figure 5.1.

5.6 2019 Water Balance Update

An update to the water balance model was generated to provide monthly water balance and water quality forecasts (Section 7.3) for the 2019 year. The purpose of this update is to identify potential changes to the site water balance as the mine transitions to commercial operation (Appendix H).

The 2019 water balance update is specific to waterbodies that will be affected by the commencement of operations and operational activities taking place throughout the remainder of the 2019 calendar year. The water containment facilities included in this update are CP1, CP3, CP5, Saline Pond,

underground mine operation, and P-Area. Results of the water balance update are provided in Appendix H.

The framework of the 2019 water balance update was designed with the following assumptions:

- Precipitation is based off an average climate scenario;
- The Mine will not discharge saline water to Melvin Bay;
- Additional saline water storage on surface (i.e. Saline Pond 2) is not included;
- The SWTP will be used to treat saline water from the underground mine;
- Winter inputs (snow dumping activities) to CP1 are not accounted for; and
- TSF runoff includes a component of waste rock runoff originating through the waste rock cover.

Table 15: Inventory of Waterbodies Impacted by Mining Activities

Watershed	Waterbody	Maximum Lake Water Depth, m	Total Area (ha)	Water Volume (m^3)	Notes
A	A9	N/A	0.18	-	Flow regimes impacted by the development of Tiriganiaq Pit 1
	A10	0.67	0.26	-	Ponds removed by development of Tiriganiaq Pit 1
	A11	0.45	0.40	-	
	A12	0.87	0.47	-	Pond drained due to construction of Channel 5
	A13	0.30	0.26	-	
	A17	0.30	0.16	-	Covered by WRSF 1
	A38	N/A	0.05	-	Flow regimes impacted by the development of Tiriganiaq Pit 2
	A39	0.48	0.12	-	Ponds removed by development of Tiriganiaq Pit 2
	A54	1.3	5.99	34,545	Dewatered for CP5
	A58	0.50	0.43	-	Covered by WRSF 2
B	B8	0.8	1.43	-	As part of CP4/Berm-CP4
	B9	1.40	0.64	-	Dewatered for CP4
	B10	0.8	0.33	-	Ponds removed by development of Tiriganiaq Pit 1
	B28	N/A	0.45	-	As part of CP3/D-CP3
H	H6	0.58	0.75	-	As part of CP1
	H7	0.67	0.11	-	
	H8	0.59	0.38	-	Partially covered by WRSF2 and haul road
	H9	0.40	0.42	-	Partially covered by WRSF2 and OP2
	H10	0.11	0.10	-	Partially covered by WRSF2 and OP2, drained due to construction of Channel1
	H11	0.27	0.28	-	
	H12	0.81	0.97	-	Drained due to construction of Channel1 and partially covered by OP2
	H13	1.04	3.49	-	Drained due to construction of Channel1 and partially covered by industrial pad
	H14A	0.37	0.15	-	Covered by industrial pad
	H15D	0.30	0.15	-	Partially covered by TSF
	H15G	0.40	0.38	-	
	H17	1.70	15.8	195,700	Dewatered for CP1
	H17A	1.50	0.13	1,365	Dewatered for Meliadine esker
	H17B	1.50	0.69	10,350	Dewatered for Meliadine esker
	H17C	1.50	0.23	3,450	Dewatered for Meliadine esker
	H18	0.67	0.74	-	Covered by OP2
	H19	1.40	2.91	16,431	Dewatered for CP6
	H20	1.60	9.58	90,307	Covered by WRSF3

Watershed	Waterbody	Maximum Lake Water Depth, m	Total Area (ha)	Water Volume (m^3)	Notes
"-" indicates that data not available or not applicable					Ponds to be drained / Ponds to be dewatered

SECTION 6 • WATER MANAGEMENT DURING CLOSURE

The detailed Mine closure and reclamation activities are provided in the Preliminary Closure and Reclamation Plan (Agnico Eagle, 2015d).

Water management during closure and reclamation will involve flooding the open pits using precipitation and freshwater from Meliadine Lake, flooding the Underground Mine workings with groundwater inflows (groundwater seepage), and maintaining contact water management systems on site until monitoring results demonstrate that water quality are acceptable for discharge of all contact water to the environment without further treatment. Once water quality meets the discharge criteria, the water management systems will be decommissioned to allow the water to naturally flow to the environment.

The key water management activities during Mine closure are summarized in Table 16. Figures 6.1 and 6.2 illustrate the WMP during and after Mine closure, respectively. Additional details for the activities are described in the following sections.

Table 16: Key Water Management Activities during Mine Closure

Mine Year	Figure	Key Water Management Activities and Sequence
Yr 9 to 11 (2028 to 2030)	6.1	• Finish flooding the mined-out Tiriganiaq Pit 1 and Tiriganiaq Pit 2 by Q4 of Year 10 • Continue to collect and manage the contact water in CP1, CP3, CP4, CP5 and CP6 • Continue to pump the contact water in CP1 to EWTP, if required, for treatment before being discharged to the outside environment • Remove non-essential site infrastructure • Pump the underflow sludge water from EWTP to CP1 • Continue natural flooding of Tiriganiaq Underground Mine with groundwater seepage • Remove Meliadine Lake pumping system
Post-Closure	6.2	• Treat the contact water until water quality meet direct discharge criteria and then decommission the water management system • Continue natural flooding of Tiriganiaq Underground (progressive reclamation since Year 8) • Breach water retention dikes D-CP1, D-CP3, D-CP4, D-CP5, and D- CP6 once water quality monitoring results meet discharge criteria to allow water to naturally flow to outside environment • Remove culverts and breach remaining water retention dikes/berms in Year 18

6.1 Open Pits Flooding

When flooding the open pits for closure, the maximum pumping rate from Meliadine Lake shall not exceed 4,000,000 m^3/year during closure of the Mine, as stated in Part E Item 2 of the Licence. The planned pumping period will occur during the open water season from mid-June to end of September

for each year. Table 17 summarizes the pit volume and expected water elevations at the completion of flooding activities. It will take approximately three years to fill the pits with an assumed pumping rate of 0.44 m^3/s (38,300 m^3/day). The assumed pumping rate of 0.44 m^3/s from Meliadine Lake during closure will have negligible effect to Meliadine Lake when compared to the average outflow rate at the outlet of Meliadine Lake. The pumping rate will be evaluated further to validate that any possible negative effects to Meliadine Lake do not occur.

Table 17: Pit and Underground Flooding

Pit	Volume (Mm^3)	Final Water Elevation (masl)	Water Source
Tiriganiaq Pit 1	9.20	64.14	Freshwater from Meliadine Lake
Tiriganiaq Pit 2	2.25	64.38	Freshwater from Meliadine Lake
Tiriganiaq Underground	1.4	Groundwater level	Groundwater seepage

The water quality model results indicated that water quality in the flooded pits will meet the discharge criteria and post closure treatment will not be required. The water quality within the pits will be monitored during flooding to verify the prediction of the water quality model. The information will be used to develop a strategy to minimize contamination of the regional surface water system.

6.2 Underground Mine Flooding

Passive flooding of the Tiriganiaq Underground Mine will occur following the completion of mining. The estimated total flooding volume of the underground workings is 1,372,000 m^3. Seepage water into the Underground Mine will be the main water source for flooding. At the predicted seepage rate it is estimated to take 6 years to flood the Underground Mine.

6.3 Containment Ponds, Dikes and Berms

The containment ponds, dikes and berms will remain in place to collect the surface runoff water and seepage from the Mine until the water quality meets discharge criteria. Once the water quality meets discharge criteria, dikes/berms will be breached to allow runoff to follow natural (topographically induced) flow paths. Dikes/berms breaching will involve the removal of a portion of the dikes to a minimum depth of 1 m below average water level or back to original ground levels. Consideration will be given to breach staging, with the above water portions of the dike/berm in the breach area removed during winter periods, when there will be little surface water flow, thereby minimizing the potential release of sediments to the neighbouring waterbodies. The remainder of the breach would be conducted during the open water season following freshet. Turbidity curtains would be deployed to minimize any potential sediment release to surface water.

6.3 Channels and Sumps

Once monitoring results have indicated that contact water conveyed in channels and sumps meets acceptable water quality, the infrastructure will be graded and/or surface treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff, if required. This closure activity is intended to enhance site area development for re-colonization by native plants and wildlife habitat.

SECTION 7 • WATER QUALITY

Water quality monitoring is an important part of the Water Management Plan to verify the predicted water quality trends, conduct adaptive management should differing trends be observed, and to ensure all water quality limits at discharge points are met (i.e., effluent to Meliadine Lake and Melvin Bay). Water quality results and water transfers (i.e., origin, destination, rate) at the Mine are monitored and documented pursuant the Licence.

Water quality monitoring was initiated at the pre-development stage and continued through construction. Monitoring will continue into operations, closure, and post-closure. Monitoring occurs at three levels:

1. Regulated discharge monitoring that occurs at monitoring points specified in the Licence or MDMER regulations.
2. Verification monitoring that is undertaken for operational and water management purposes by Agnico Eagle.
3. General monitoring that is commonly included in the Licence, specifying what is to be monitored according to a schedule. This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

Appendix F details the Water Quality and Flow Monitoring Plan, which will be further defined as the Mine advances. Figure 7.1a and Figure 7.1b depict Monitoring Program Stations on Site and at Itivia.

Water quality predictions for the Mine were generated using the GoldSim database management and simulations code (Version 11.1.2) where Mine contact water flows derived from the Meliadine water balance are combined with chemistry data from materials exposed in mine infrastructure (tailings storage facility, waste rock piles, etc.), and site baseline information. Where site-specific information is not available, data collected at other mine sites in the north were used to supplement input data.

Water quality estimates were generated for the operational and post-closure periods for effluent to Meliadine Lake, each contact water containment pond (CP1, CP3, CP4, CP5, and CP6), for sumps in the two open pits and for the two fully flooded open pit lakes post-closure. These results were submitted with the 2015 Water Management Plan.

The sensitivity of water quality to an added TSS load was evaluated outside of the GoldSim mass balance model. Total parameter concentrations were evaluated at ponds that discharge to the receiving environment (i.e., CP1 during operations, and CP1, CP3, CP4, and CP6 post-closure) based on an addition of 15 mg/L TSS. Given the uncertainties associated with the modelling exercise (i.e., the development stage of the Mine, laboratory-based input values, assumptions where data do not

exist and consideration of an average climate year), the predicted concentrations are considered to be order-of-magnitude estimates. The estimates are sensitive to the assumptions and design elements considered.

Table 18 shows the various MEL-14 (effluent to Meliadine Lake) water quality limits listed under Part F, Item 3 of the Licence, the 2018 water quality results for MEL-14, and the predicted maximum values during operations with respect to end-of-pipe concentrations for MEL-14. As stated above, updated predictions of maximum MEL-14 values will be provided as an addendum to the Water Management Plan when completed.

7.1 Summary of Regulatory Guidelines

Water quality results are compared to MDMER criteria and effluent quality limits listed in the Licence. Water quality pertaining to MEL-14 will be compliant to Part F, Item 3 of the Licence prior to discharging to Meliadine Lake. All surface runoff and/or discharge from drainage management systems associated with the Mine, including laydown areas and All-Weather Access Road, where flow may directly or indirectly enter a Water body, shall not exceed the Effluent quality limits listed in Part D, Item 18 of the Licence. Furthermore, all waters from natural water body dewatering activities shall be directed to Meliadine Lake and shall not exceed the Effluent quality limits listed in Part D, Item 12.

Post-closure discharge water quality will be compared to Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) guidelines or the Meliadine SSWQO developed for aluminum, fluoride, and iron (Golder 2013a, 2013b, 2014). The Meliadine SSWQO criteria was developed as a conservative protection to the aquatic receiving environment and was developed by Golder (2013a, 2014) to assess whether waste rock consisted of a deleterious substance according to Environment Canada (2013). The outcome of the assessment was that Meliadine waste rock is not a deleterious substance (Environment Canada 2014).

7.2 Construction

7.2.1 2018 Discharge to Meliadine Lake (MEL-14) Results

With respect to discharge from CP1 to Meliadine Lake (MEL-14), there was one exceedance of the maximum grab sample total aluminum concentration in effluent under Part F, Item 3 of the Licence (3 mg/L; Table 18). This exceedance was reported to the GN. The sample was taken on July 23rd and produced total aluminum concentrations equal to 4.39 mg/L. Results of the adjacent sampling events, July 15th and July 29th, produced concentrations equal to 1.23 mg/L and 0.811 mg/L, respectively. On July 23rd, results showed a relatively high TSS concentration (21 mg/L) and total aluminum was made up of only 2.1% dissolved aluminum. Thus, the exceedance may be attributed to uncommonly high TSS on the sampling date or a lab error. A re-analysis could not be performed as there was no additional water left from this sample. There were no other exceedances under Part F, Item 3 of the Licence during Construction.

Daily MEL-14 discharge volumes over 2018 are shown in Figure 7.1 and monthly totals are provided in Table 13. Discharge began on June 21st and ended on September 3rd. Daily discharge ranged from 103 m^3/day during the late-season (late-August to early-September) to 18,998 m^3/day during peak discharge (mid- to late-July). Average discharge rate was 9,409 m^3/day between June 21st and September 3rd.

7.2.2 2018 Surface Runoff (MEL-SR-1 to MEL-SR-14) Results

With respect to surface runoff associated with the Mine, there were five TSS exceedances of maximum concentrations of any grab sample listed under Part D, Item 18 of the Licence (100 mg/L TSS). One of these occurred at MEL-SR-1 (500 mg/L TSS) and one at MEL-SR-9 (670 mg/L TSS) on May 27th, and on June 17th, respectively. The remaining three occurred at MEL-SR-11 (1200 mg/L TSS, 420 mg/L TSS, 160 mg/L TSS) on May 27th, June 3rd and June 10th. The high levels of TSS present during these sampling events caused the moving averages to fall above the maximum average TSS concentration limit listed under Part D, Item 18 of the Licence (50 mg/L). Thus, there were four exceedances of maximum average TSS concentration, one at MEL-SR-1 (143 mg/L TSS) and three at MEL-SR-11 (450 mg/L TSS, 154 mg/L TSS, 56 mg/L TSS). The maximum average TSS concentration exceedances were all the direct result of grab sample maximum concentrations exceedances, which were reported to the GN. Once the moving average calculations progressed beyond the inclusion of the grab sample exceedances, the moving average decreased well below the 50 mg/L limit. Thus, the exceedances of average TSS values were not the result of consistently high TSS values, but rather the result of temporally discrete instances of high TSS results.

Visual assessment and upstream sampling suggests the main TSS source to the MEL-SR-1 exceedance originated from infrastructure to the East and Northeast of the Itivia Site, outside of the site boundaries. Upon 2019 snowmelt, sediment control methods (i.e., silt fences, straw logs) will be strategically installed to prevent sediment transport into and through the Itivia site to MEL-SR-1. Agnico Eagle is currently planning permanent structures for sediment control at Itivia. With respect to MEL-SR-11, the cause for the exceedances and source of runoff was sediment-rich snow piles accumulated during construction of the Bypass Road. The snow piles were located to the Southwest of the Itivia fuel storage tanks. Construction of the Bypass Road is now complete and snow will not be placed in this area over the 2018/2019 winter. Furthermore, based on 2018 runoff patterns snow will be managed strategically to prevent sediment rich snow piles and runoff with the potential to entrain TSS (Refer to Snow Management Procedure within the Freshet Management Plan; Appendix B).

7.3 2019 Water Quality Forecast Update

Results from the 2019 model update (Section 5.4) include TDS concentrations for CP1, CP3, CP5, Saline Pond, underground mine operation, and P-Area. These results were calculated through a mass balance model developed in conjunction with the 2019 water balance model update. Pending the commissioning of additional treatment options, the water quality model will be updated to include all additional parameters outlined in Part F of the licence. The results of the mass balance model are provided alongside the water balance results in Appendix H.

Model predictions exhibit heightened instances of TDS loading across the containment ponds. These values can be attributed to several factors. In general, forecasted precipitation and runoff inflow volumes to all containment ponds is considered to be conservative. There is assumed to be a reduced accounting for freshwater inflows, as precipitation values through winter months is misrepresentative of the overall captured snow and ice melt within the catchment areas. This results in reduced TDS concentrations within all containment ponds and in particular, CP1, due to the size of the catchment area. There is also a lack of accounting for freshwater volumes received due to snow removal stockpiling within CP1. Additionally, CP3 TDS concentrations are assumed to be highly conservative due to the static TDS concentration applied to all runoff volumes within the TSF. As such, the results provide more relative concentrations compared to what has been observed in previous years and are better suited to reflect the magnitude of TDS concentrations that can be expected in 2019.

Table 18: Effluent Characteristics of MEL-14 (CP1 to Meliadine Lake)

	MDMER and Licence Part F, Item 3 Maximum Concentrations		2018 MEL-14 End-of-Pipe Concentrations		Maximum MEL-14 End-of-Pipe Concentrations Predictions based on Tiriganiaq Monthly Average	
	Maximum MEL-14 Average Concentration [mg/L]	Maximum MEL-14 Concentration of Any Grab Sample [mg/L]	Maximum MEL-14 Average Concentration [mg/L]	Maximum MEL-14 Concentration Grab Sample [mg/L]	Dissolved Concentration[mg/L]	Total Used in the Model (Dissolved + 15 mg/L TSS) [mg/L]
pH	6 to 9.5	6 to 9.5	7.1 to 7.4	6.8 to 7.5	-	-
Total Dissolved Solids	1400	1400	1254	1430*	204	204
Total Suspended	15	30	12	21	-	15
Total Ammonia as Nitrogen	14	18	2.4	4.1	4.6	4.6
Phosphorus (total)	2	4	0.0475	0.099	0.4	0.4
Total cyanide	0.5	1.0	<0.005	<0.005	0.005	0.005
Aluminum	2	3	1.8	4.39*	0.09	1.20
Arsenic	0.3	0.6	0.002	0.002	0.101	0.191
Copper	0.2	0.4	0.003	0.009	0.0011	0.0037
Lead	0.2	0.4	0.0003	0.0003	0.0011	0.0049
Nickel	0.5	1.0	0.003	0.003	0.0023	0.0032
Zinc	0.4	0.8	0.007	0.009	0.009	0.010
Radium-226	0.37 Bq/L	1.11 Bq/L	0.0058 Bq/L	0.008 Bq/L	-	-
Total Petroleum Hydrocarbon	5	5	1.2	1.8	-	-

*Exceeds effluent quality limit listed under Part F, Item 3 of the Licence (2AM-MEL1631).

Table 19: MEL-SR-1 to MEL-SR-14 runoff quality characteristics - Licence requirements & 2018 results

		TSS (mg/L)	Oil and Grease	pH
Licence Part D, Item 18 Maximum Concentrations	Max. Average Concentration	50	No Visible Sheen	6.0 - 9.5
	Max. Concentration of Any Grab Sample	100	No Visible Sheen	6.0 - 9.5
MEL-SR-1	Max. Average Concentration	143*	No Visible Sheen	7.8 - 8.0
	Max. Concentration of Any Grab Sample	500*	No Visible Sheen	7.5 - 8.1
MEL-SR-2	Max. Average Concentration	N/A[a]	No Visible Sheen	N/A[a]
	Max. Concentration of Any Grab Sample	38	No Visible Sheen	7.6
MEL-SR-7	Max. Average Concentration	12	No Visible Sheen	7.8
	Max. Concentration of Any Grab Sample	42	No Visible Sheen	8.0
MEL-SR-8	Max. Average Concentration	N/A[a]	No Visible Sheen	N/A[a]
	Max. Concentration of Any Grab Sample	3	No Visible Sheen	7.9
MEL-SR-9	Max. Average Concentration	N/A[a]	No Visible Sheen	N/A[a]
	Max. Concentration of Any Grab Sample	670*	No Visible Sheen	8.0
MEL-SR-11	Max. Average Concentration	450*	No Visible Sheen	7.9 - 8.0
	Max. Concentration of Any Grab Sample	1200*	No Visible Sheen	7.8 - 8.1
MEL-SR-12	Max. Average Concentration	N/A[a]	No Visible Sheen	N/A[a]
	Max. Concentration of Any Grab Sample	15	No Visible Sheen	7.0
MEL-SR-13	Max. Average Concentration	N/A[a]	No Visible Sheen	N/A[a]
	Max. Concentration of Any Grab Sample	3	No Visible Sheen	8.0
MEL-SR-14	Max. Average Concentration	N/A[a]	No Visible Sheen	N/A[a]
	Max. Concentration of Any Grab Sample	17	No Visible Sheen	7.9

[a] Insufficient quantity of sample results to calculate an average as it is defined in the Licence (requires 4 sample dates for moving average).

*Exceeds effluent quality limit listed under Part F, Item 3 of the Licence (2AM-MEL1631).

7.2.3 Dewatering and Other Monitoring Program Stations

There were no dewatering activities applicable to Part D, Item 12 of the Licence. Dewatering of Lake B8 and Lake B9 produced modest volumes (Section 4.1.1) and was directed to CP1.

The remaining Monitoring Program Station results will be provided in the 2018 Annual Water Licence Report where the stations have sufficient data to report. These stations are not final discharge points and thus do not have effluent quality limits applied within the Licence. A discussion of these results and trends will be provided in the 2018 Annual Water Licence Report where applicable.

7.3 Operations

According to model predictions, CP3 arsenic concentration may exceed MDMER on occasion if precipitation events or the freshet flows generate drainage from the TSF (Golder, 2012c). The main source of arsenic in CP3 is predicted to be from residual process water that is assumed to be present in the filtered tailings. Arsenic transfer from process water to CP3 water will be minimized by effective dewatering of the tailings prior to placement into the TSF, and from freezing of the tailings in the TSF. Frozen tailings will act to limit infiltration and seepage. Water from CP3 will be pumped to CP1 where it will mix with other site waters before discharge. Dissolved arsenic concentration in CP1 is predicted to meet the MDMER monthly average maximum concentration. All other chemical parameters in CP3 and all chemical parameters in CP1, CP4, CP5, and CP6 are predicted to meet MDMER limits for chemical constituents.

7.4 Post-Closure

Long-term, post-closure water quality in the containment ponds (CP1, CP3, CP4, CP5, and CP6) and in the flooded open pit lakes are anticipated to meet MDMER limits and CCME-WQG for the protection of aquatic life or the SSWQO developed for the Mine for aluminum, fluoride, and iron. Arsenic concentrations in CP3 could slightly exceed the SSWQO post-closure, a criteria that is conservatively protective of the receiving aquatic environment (Golder, 2013a). Concentrations that exceed predictions are minor, much less than the mixing capacity in the receiving environment. These arsenic concentrations (Golder, 2013a) are within the tolerance levels that have been deemed non-deleterious by Environment Canada for the Mine (Environment Canada, 2014).

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FIGURES

Figure 1.1 General Mine Site Location Plan

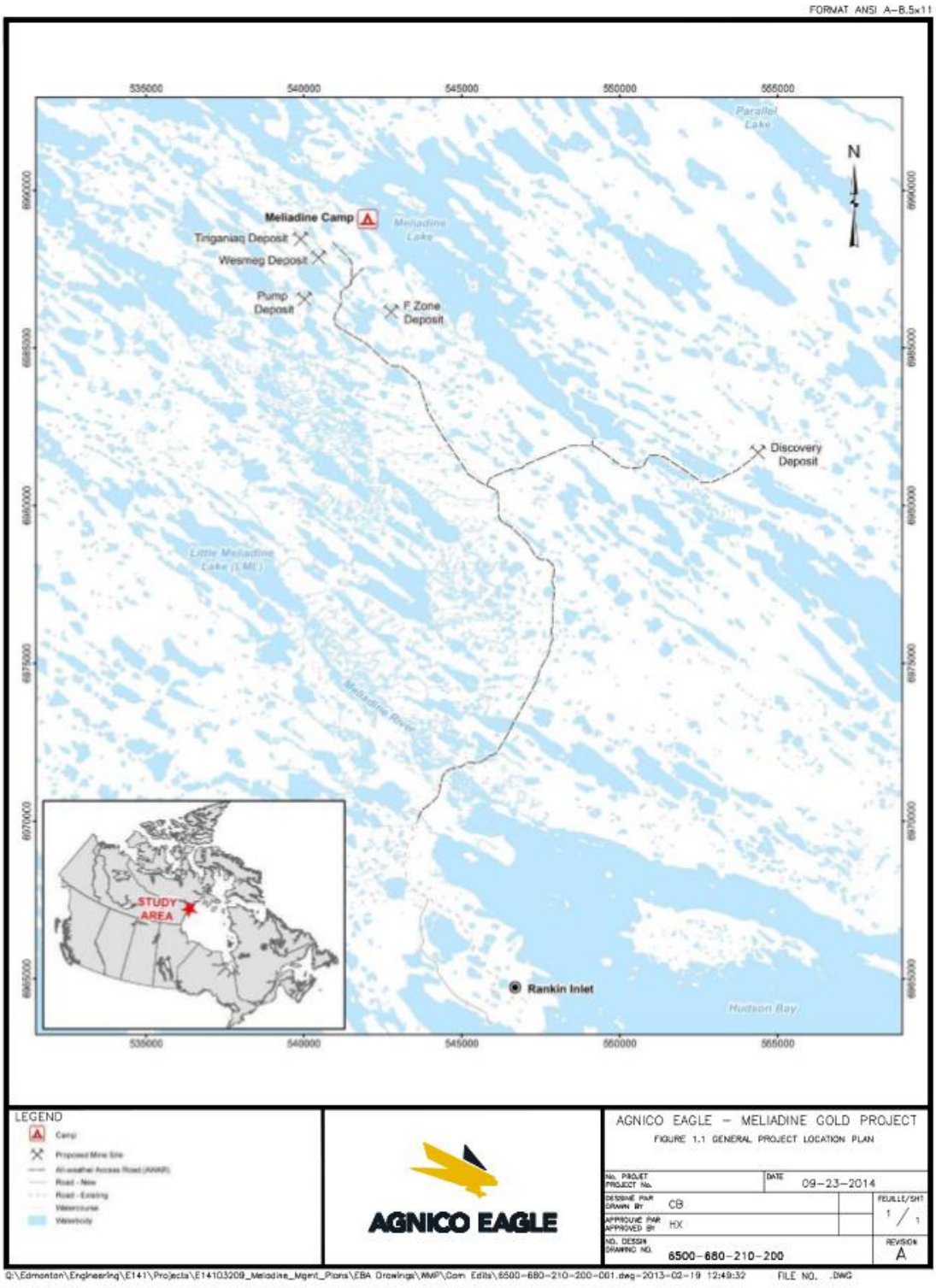


Figure 1.2 General Mine Site Plan Layout

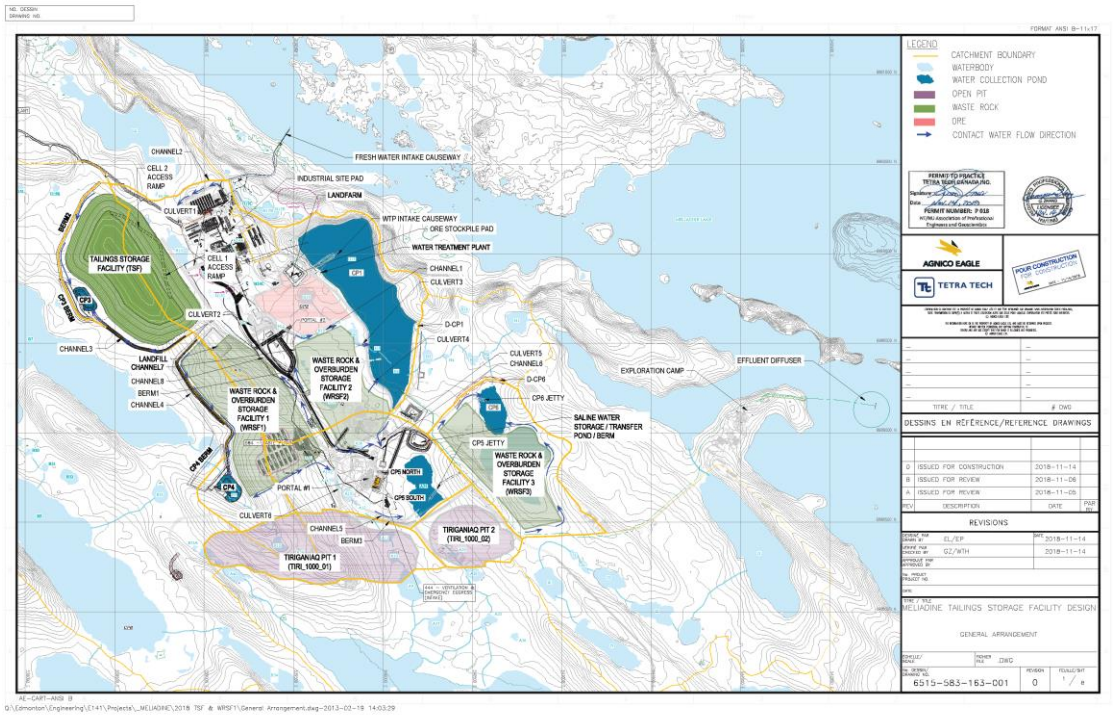


Figure 3.1 P-Area Plan View

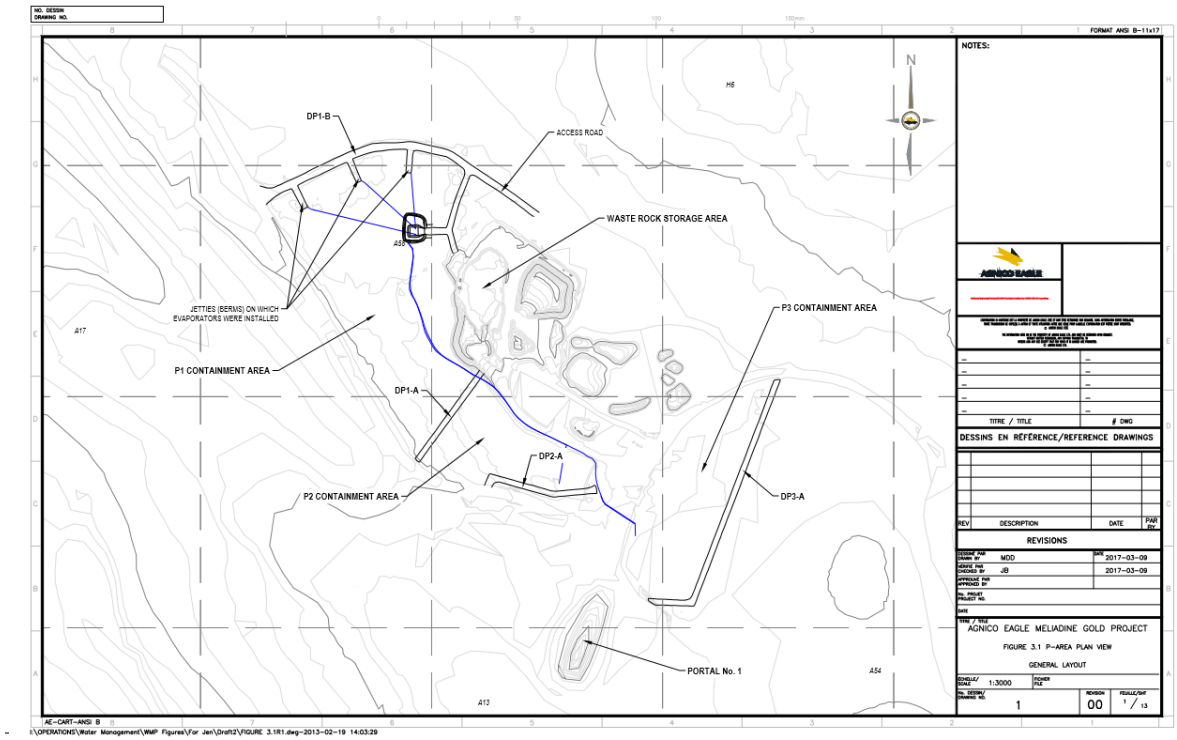


Figure 3.2 Location of Saline Pond 2 within Tiriganiaq Pit 2

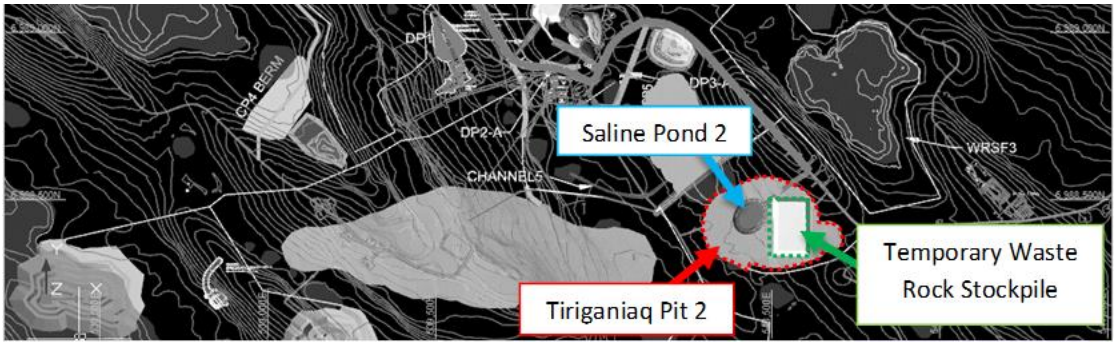


Figure 3.3 Rating curve applied to estimate TDS from conductivity

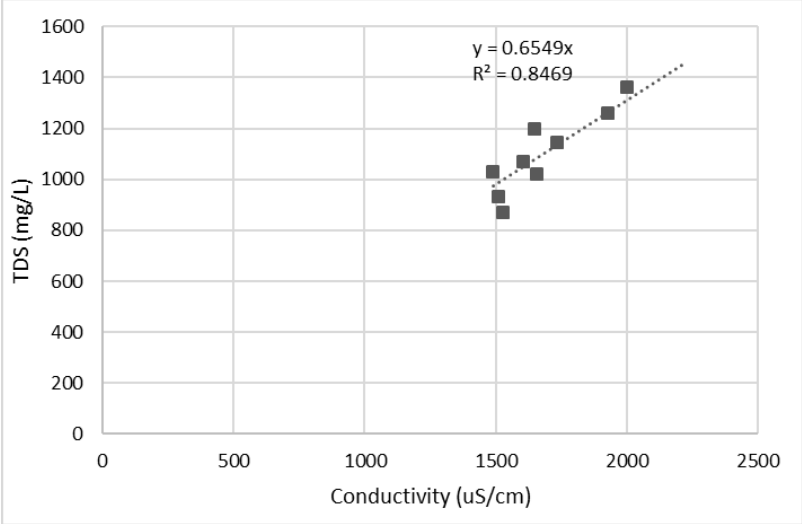


Figure 3.4 Rating curve applied to estimate TSS from turbidity

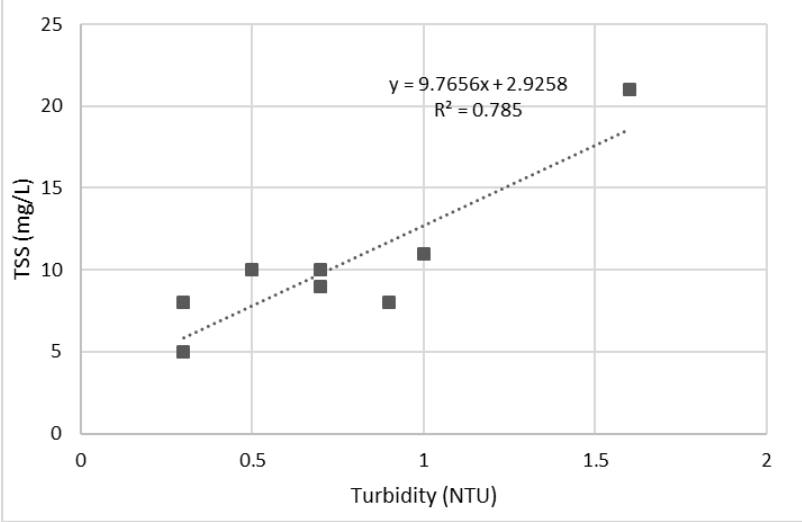


Figure 5.1 Watersheds and Waterbodies in Proximity of Mine Site

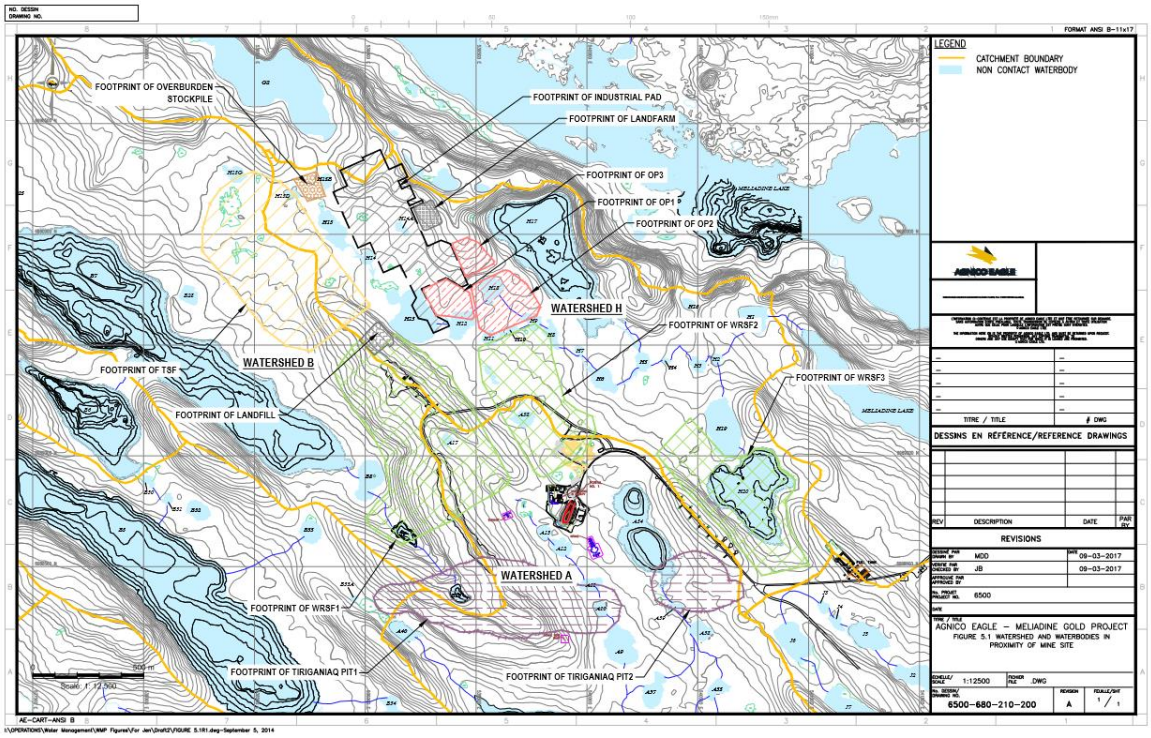


Figure 6.1 Mine Site Layout for Water Management During Closure from Feasibility Level Study. (TetraTech, 2014).

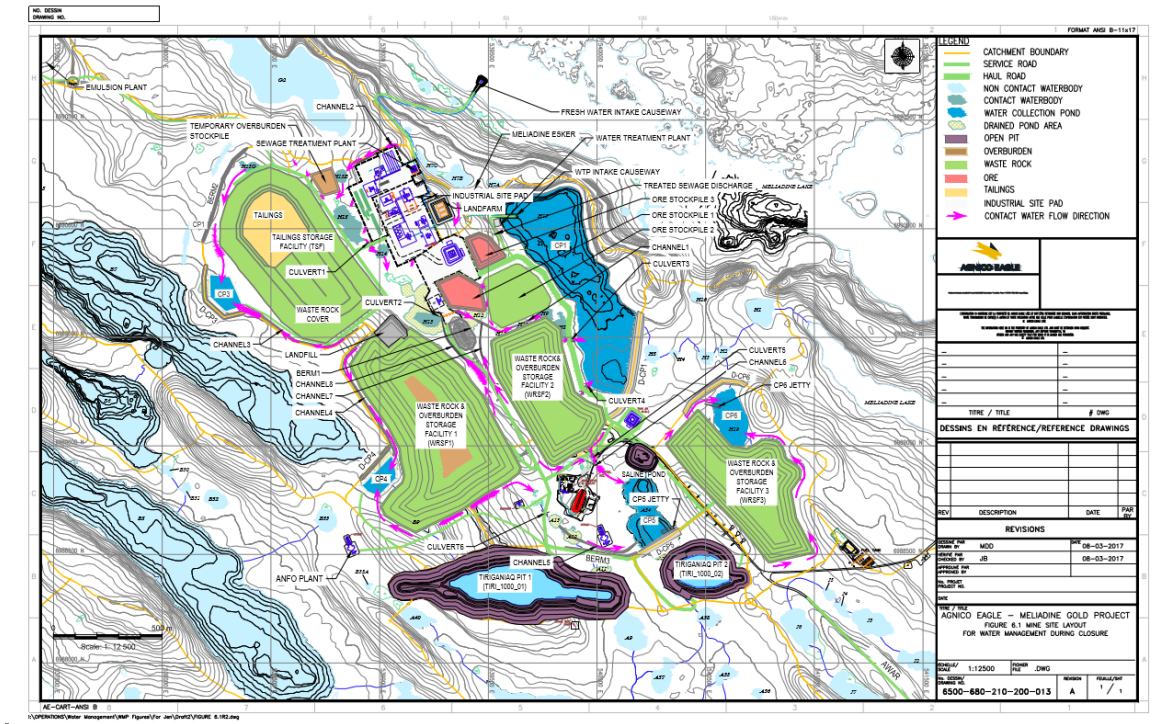


Figure 6.2 Mine Site Layout After Closure from Feasibility Level Study. (TetraTech, 2014).

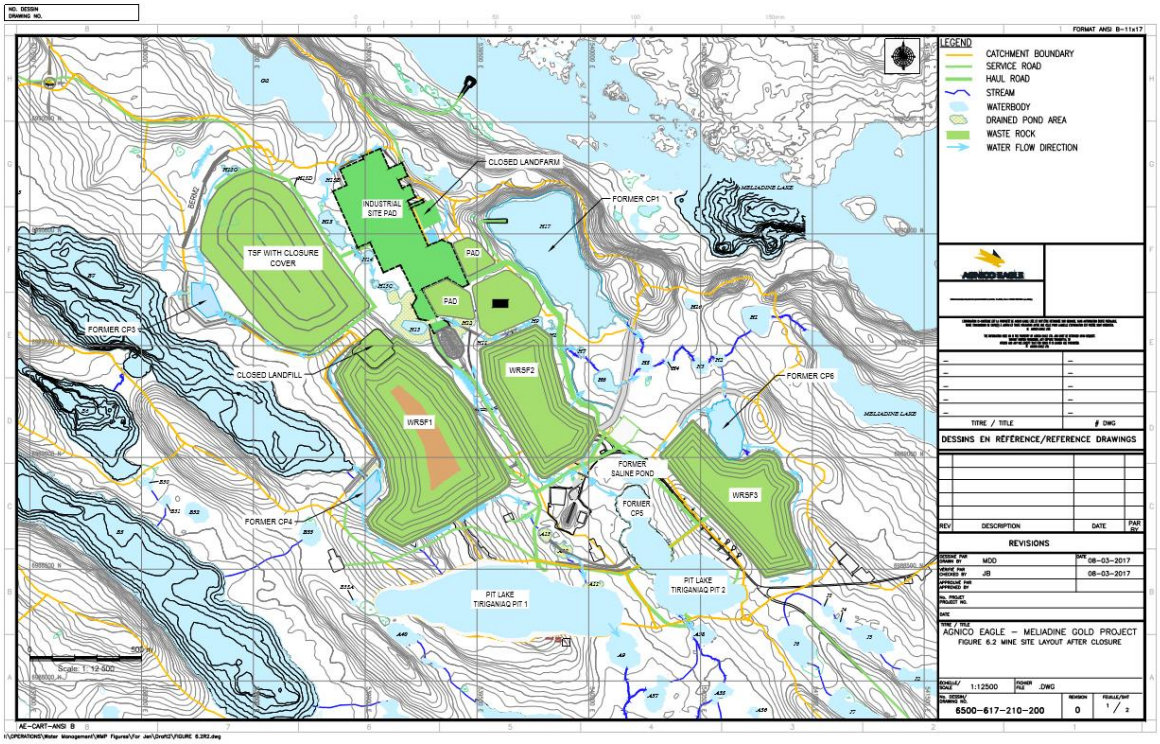


Figure 7.1a Water Quality Monitoring Locations on Site

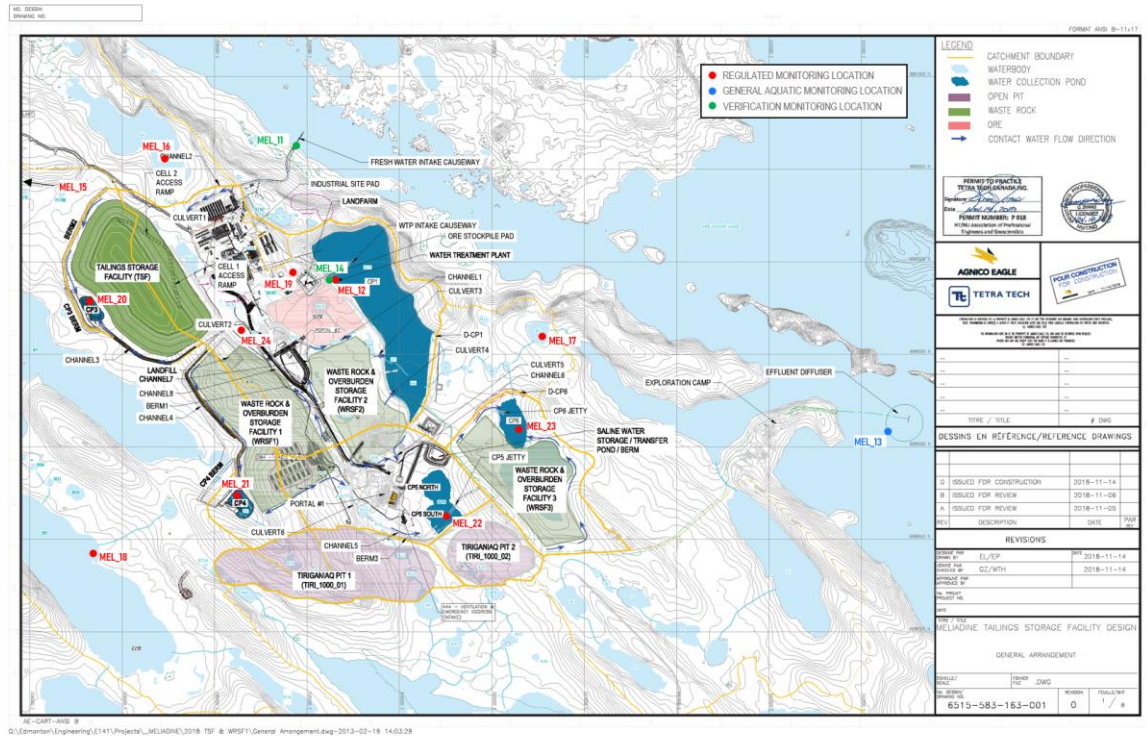
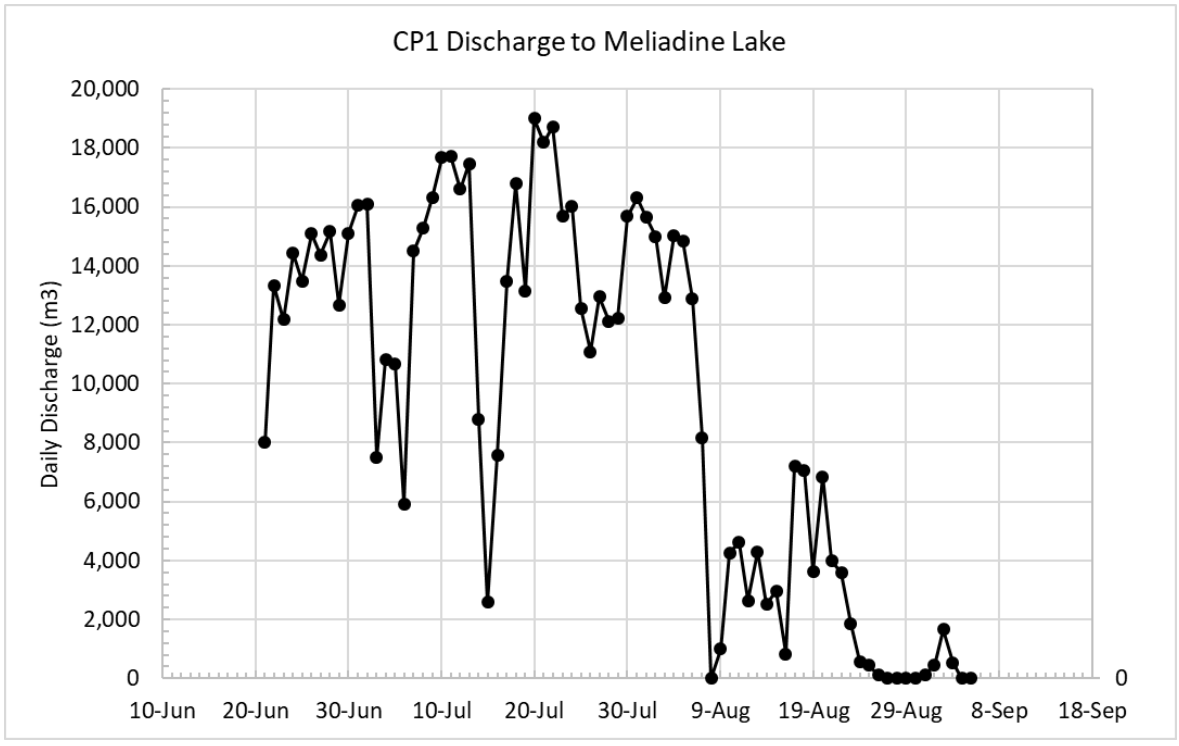


Figure 7.1b Water Quality Monitoring Locations at Itivia



Note – MEL-12 is located to the Northwest along the Bypass road but could not be effectively included in this map due to its distance from Itivia.

Figure 7.2 Daily discharge volumes from through the EWTP at CP1 to Meliadine Lake



APPENDIX A • MELIADINE GROUNDWATER MANAGEMENT PLAN

AGNICO EAGLE

MELIADINE GOLD MINE

Groundwater Management Plan

MARCH 2019
VERSION 4

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut.

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.1 Mt of overburden waste, and 14.9 Mt of tailings (Agnico Eagle 2019). There are four phases to the development of the Mine; just over 4 years of construction (Q4 Year -5 to Q2 Year -1)), 8.5 years of Mine operation (Q2 Year 1 to Year 8), 3 years of closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the Underground Mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the Underground Mine workings once the Mine has advanced below the base of the permafrost. Over 2018, there was a net positive balance of stored underground water. The mean daily addition to underground water storage was estimated at 51 m^3/day. Groundwater quality data from samples taken underground 2017 through 2018 from diamond drillholes (DDHs) indicate TDS concentrations are less than predicted at an average concentration of 56,000 mg/L.

Saline water generated from the Underground Mine is currently stored underground and on surface at the P-Area and in Saline Pond 1 (SP1). A second containment pond, Saline Pond 2 (SP2), is being constructed in Q1 2019 and will be an addition to the surface saline water containment system. Saline groundwater stored on site is currently pumped to the Saline Water Treatment Plan (SWTP) for treatment and discharge to CP1. As part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle received approval from the Nunavut Impact Review Board to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Total dissolved solids of water discharged to sea and daily discharge volumes will not exceed 39,600 mg/L and 800 m^3/day, respectively.

This document presents the Groundwater Management Plan (GWMP) for the collection, treatment, storage and discharge of saline groundwater in accordance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14.

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ᐊᖏᓂᒃ ᐃᐃᒍ ᐅᓴᖅᑕᕆᐊᖏᓂᒃ (ᐊᖏᓂᓂᒃ) ᑕᓯᖅᐸᐊᖅᑎᑦ ᐅᓴᖅᑕᕆᐊᓕᐅᖅᑐᖅᑐᓕᐊᔪᑦ (ᐅᓴᖅᑕᕆᐊᖅ), 25 ᑭᓪᒥᑕᓂᒃ ᐅᖓᓯᓂᑎᒋᔨᖅ ᐅᐊᖓᓇᖓᓂᑦ ᑲᖏᖅᓂᓂᐅᑦ, ᐊᖏᓚᐅ 80 ᑭᓪᒥᑕᓂᒃ ᐅᖓᓯᓂᑎᒋᑐᓗᓂ ᓂᖏᐊᓂᑦ ᐱᖓᓇᖅᑐᓯᐊᓂᑦ ᐃᖏᓗᑎᖅᓱᑐ ᑭᓭᓕᖅᑎᑦ ᓄᓇᕗᖏᓚᑦ.

ᐅᓴᖅᑕᕆᐊᖅᓗᑦ ᐸᖅᓇᐅᑎ ᐅᓴᖅᑕᒋᓂᖅᓗᑦ ᐱᓕᕆᐊᖃᕐᒪᔨᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓂᒃ ᐱᓭᓕᓕᐊᔪᑦ ᑎᓪᓚᑐᓂᐊᖅ ᔪᓕᑕᓕᒃ, ᒪᖁᕐᓂᒃ ᓄᓇᒋᑦ ᐅᑯᐊᖓᓚᐅᖅᓂᒃ (ᑎᓪᓚᑐᓂᐊᖅ 1 ᐊᖏᒪᓗ ᑎᓪᓚᑐᓂᐊᖅ 2) ᐊᖏᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᒋᓂᖅ. ᒪᓕᒃᓴᔪᔪ ᐃᒪᓓᐅᔨᖅ ᐅᓴᖅᑕᕆᐊᖅᓗᑦ ᐸᖅᓇᐅᑎ, ᐅᓴᖅᑕᕆᐊᖅ 14.9 ᒥᓕᒃᓂ ᑕᓐᓄᐊᓂᒃ ᐅᓴᖅᑕᖃᑦᑕᒋᓂᐊᖅᑐᑦ, 31.4 ᒥᓕᒃᓂ ᑕᓐᓄᒃ ᐊᐅᑕᑯᖅᑕᐅᔨᓂᒃ ᐅᓴᖅᖃᓂᒃ, 7.1 ᒥᓕᒃᓂ ᑕᓐᓄᒃ ᐅᖓᓚᑕᑎᔨᓂᒃ ᐊᐅᑕᑯᖅᑕᐅᔨᓂᒃ, ᐊᖏᒪᓗ 14.9 ᒥᓕᒃᓂ ᑕᓐᓄᒃ ᖃᒪᑎᑎᑐᓂᒃ (ᐊᖏᓂᓂᒃ 2019). ᓯᑕᒪᐅᓕᖓᔪᐊᖅᑐᖅ ᐱᓭᓕᓕᐊᖅᖃᑦᑕᕆᐊᖅᑎᑦ; ᓯᑕᒪᓄᑦ ᐅᑭᐅᖓᓯᓇᓄᑦ ᓴᓇᔨᐅᓗᓂ (Q4 ᐅᑭᐅᖅ - 5-ᒥᑦ Q2 ᐅᑭᐅᖅ - 1-ᒧᑦ)), 8.5 ᐅᑭᐅᓂᒃ ᐊᐅᓪᓚᑐᓂ ᐅᓴᖅᑕᕆᐊᖅᓂᖅ (Q2 ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ), ᐱᖓᓱᓂᒃ ᐅᑭᐅᓂᒃ ᐅᓱᑯᖅᐸᓪᓕᐊᓗᒍ (ᐅᑭᐅᖅ 9-ᒥᑦ ᐅᑭᐅᖅ 11-ᒧᑦ), ᐊᖏᒪᓗ ᐅᓱᑯᖅᓯᒪᓕᖅᑎᓪᓚᑐᓗᒍ (ᐅᑭᐅᖅ 11-ᒥᑦ ᐅᖓᓚᒋᓄᑦ).

ᑎᓪᓚᑐᓂᐊᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᒋᓂᖅ ᐊᑎᑎᕐᓯᓂᐊᖅᑕᐅᓱᓄᓂᖅᓂᐅᓴᖅᑐᖅᑐᒍ 625 ᑭᑕᓂᒃ ᓄᓇᐅᐸᑦ ᖃᓄᖓᑕ ᐊᒋᓄᑦ; ᑕᐃᒪᓐᓇᒧᑦ, ᐃᓕᖓᓚ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖅ ᐊᐅᓪᓚᑐᓂᐊᖅᑐᖅᑐᒍ ᑭᓯᓕᕆᔨᖅ ᖃᐅᔨᒪᔭᐃᓇᓄᑦᑐᓂᐸᑦ ᐊᒋᓄᑦ. ᓄᓇᐃᔨᐃᓂᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐃᓕᑦᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᑯᐊᓂᒃ ᐃᒪᖁᑎᒃ ᐊᐅᓪᓚᑐᓂᖅᑎᓂᐅᑎᓪᓗᒍ, ᐃᒪᖅ ᑯᐃᑎᑕᐅᓗᓂᒍ ᐅᓴᖅᑕᕆᐊᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᓕᐅᖅᑐᑦ ᐱᓪᓚᑐᓂᐊᖅᑕᐅᓱᓄᓂᖅᓂᐅᓴᖅᑐᖅᑐᒍ ᐊᐅᓪᓚᑐᓂᐊᖅᑐᖅᑐᒍ 2017-ᒥᑦ 2018-ᒧᑦ ᓯᑎᔨᓂᒃ ᐅᓴᖅᖃᓂᒃ ᐃᑯᑕᖅᑕᐅᓯᒪᔨᓂᑦ, ᓇᓗᓇᐃᖅᓱᔨᑦ TDS ᑲᑎᑎᓯᒪᔨᑦ ᐊᒥᓲᖏᓐᓂᖅᓴᐅᓂᖓᓂᓄᑦ ᓇᓕᐅᑦᑕᖅᑕᐅᓕᐅᖅᑐᓂᐅᓪᓚᑦ ᐊᑕᐅᓯᖏᓪᓗᓂᓗᒍ ᓇᓴᐅᑎᒃ ᑲᑎᑎᓯᒪᔨᓂᑦ 56,000 mg/L-ᖃᓗᑦᓗᓂ.

ᑕᕆᐅᓕᒃ ᐃᒪᖅ ᐱᔨᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖅᑎᑦ ᐃᓕᓴᐅᔨᖅ ᑐᖅᑯᑕᐅᖅᖃᑦᑕᖅᑐᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐊᒋᓚᐅ ᖃᓄᖓᑕ ᑕᕆᐅᓕᒃ P-ᐃᓂᐅᔨᔪᑦ ᐊᒋᓚᐅ ᑕᕆᐅᓕᒃ ᑕᓯᕐᓴᒃ 1-ᒧᑦ (SP1). ᑐᓴᓕᐊ ᑕᓯᕐᓴᒃ, ᑕᕆᐅᓕᒃ ᑕᓯᕐᓴᒃ 2 (SP2), ᓴᓇᔨᐅᓭᓕᐊᔪᖅ Q1 2019-ᒥᑦ ᐊᒋᓚᐅ ᐃᓕᓴᕐᐅᑎᔨᐅᓂᐊᖅᑐᖅ ᖃᓄᖓᓂ ᑕᕆᐅᓕᒃ ᐃᒪᖁᐅᓯᓇᓐᓚᒧᑦ. ᑕᕆᐅᓕᒃ ᓄᓇᒋᑦ ᐃᒪᖅ ᑐᖅᑯᑕᐅᓂᐊᖅᑐᖅᑐᒍ ᐅᓴᖅᑕᕆᐊᖅᑎᑦ ᑯᐃᑎᑕᐅᖅᑕᒋᑕᖅᑐᖅ ᑕᕆᐅᓕᒃ ᐃᒪᓕᕆᓇᓐᓚᒧᑦ (SWTP) ᐱᓕᕆᐊᖅᑐᓂᐊᖅᑐᓗᒍ ᐊᒋᓚᐅ ᑯᐃᑎᑕᐅᓗᓂ CP1-ᒧᑦ. ᐃᓕᒋᔨᐅᓪᓗᒍ ᖃᓄᖓᑕᑐᖅᑐᒍ ᐊᐅᓚᑦᑐᖅᑐᒧᑦ ᐊᑕᖃᓗᐊᖅᑐᓗᒍ ᐱᑕᖃᓗᐊᖅᓂᖅ ᓄᓇᒋᑦ ᐃᒪᖅ ᓴᓗᒪᐃᔨᐃᓐᔪᐊᑎ ᑕᕆᐅᓕᖓᓂᑦ ᐃᒪᖅ ᑕᕆᐅᖅᑎᑦ (ᐃᑎᐃᐊᓗᓂ, ᖃᓄᖓᑕᐅᓂᑦ). ᑲᑎᓪᓗᒋᑦ ᓄᖅᑐᓯᒪᔨᑦ ᓯᑎᔨᐃᑦ ᐃᒪᖅᑎᑦ ᑯᐃᑎᑕᐅᖅᑕᒋᑦ ᑕᕆᐅᖅᑎᑦ ᐊᒋᓚᐅ ᖃᓄᖓᑕᐅᑎᒃᓴᖏᓪᓗᒋᑦ 39,600 mg/ᓂᕐᒥᓂᒃ ᐊᒋᓚᐅ 800 m^3/ᐅᑦᓗᑕᒻᒥᑦ.

ᑕᒪᓐᓇ ᑎᑎᖅᑲᖅ ᐱᔭᔨᑎᖅᑕᐅᖅ ᓄᓇᒋᑦ ᐃᒪᖅᑎᑦ ᐊᐅᓪᓚᑕᑎᓂᓗᑦ ᐸᖅᓇᐅᑎᑎᑦ ᑲᑎᖅᑯᐃᓂᓗᑦ, ᐱᓕᕆᐊᖃᓗᐊᓄᓗᒍ, ᑐᖅᑯᖅᑕᐅᓂᐊᖅᑐᖅ Type A ᐃᒪᖅᑎᑦ ᓪᓚᐃᓐᓯᖓᑦ 2AM-MEL1631, ᐊᐃᔭᓯᓂᖓᓗ E, ᑎᑎᕆᖅᓯᒪᔨᖅ 14.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	February 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited
2	June 2018	4		In compliance with ECCC comments from 16 March 2018	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited
3.	December 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 11	Agnico Eagle Mines Ltd.
		Exec Summary		Updated dates and quantities	
		2.4		Revised mine development plan bullets	
		3.3		Updated saline GW quality	
		3.4		Updated groundwater management strategies	
		4.1		Updated GW monitoring program quantity and quality data	
		4.4		Expanded table 5 monitoring to include SWTP	
4.	March 2019	All		In compliance with Agnico Eagle's amended No. 006 Project Certificate, Condition No. 25	Agnico Eagle Mines Ltd.
		Exec Summary		Updated to include discharge to sea approval	
		1	1-2	Update to include requirements of No. 006 Project Certificate Condition No. 25	
		2.4	5	Addition of SWTP and discharge to sea	
		3.1	6-7	Section revision	
		3.1.1	7-8	Addition of inflow model assumptions/uncertainties	
		3.2	8-9	Updated with discharge to sea	
		3.3	9-10	Interpretation added and table Aug-18 results corrected	
		3.4	11-15	Addition of discharge to sea and update of SWTP performance	
		3.6	16-18	Addition of mitigation measures under greater than expected inflows	
		4.2	19	Addition of second pumping line from UG	
		4.3	21-23	Addition of discharge to sea related sampling/monitoring	

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate/Fuel Oil
CP	Collection Pond
DDH	Diamond Drillhole(s)
EMPP	Environment Management and Protection Plan
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
GWMP	Groundwater Management Plan
MDMER	Metal and Diamond Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
Mine	Meliadine Gold Mine
QA	Quality Assurance
QC	Quality Control
RO	Reverse Osmosis
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
SWTP	Saltwater Treatment Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WMP	Water Management Plan

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
ha	hectare(s)
mg/L	milligram(s) per litre
km	kilometer(s)
km^2	kilo square meter(s)
m	metre(s)
m/day	metre(s) per day
mm	millimetre(s)
m^3	cubic metre(s)
m^3/day	cubic metre(s) per day
m^3/s	cubic metre(s) per second
m^3/hour	cubic metre(s) per hour
m^3/year	cubic metre(s) per year
Mm^3/year	million cubic metre(s) per year
Mm^3	million cubic metre(s)
t	tonne(s)
tpd	tonne(s) per day
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine is subject to the terms and conditions of both the Mine Project Certificate (No. 006) issued by the Nunavut Impact Review Board in accordance with the Nunavut Agreement Article 12.5.12 on February 26, 2015 and Nunavut Water Board Type A Water Licence (No. 2AM-MEL1631, 2016) issued by the Nunavut Water Board (NWB) on April 1, 2016.

This document presents the Groundwater Management Plan (GWMP) for the collection, treatment, storage and discharge of saline groundwater in accordance with the Type A Water Licence 2AM-MEL1631 (Licence) and in accordance with Condition No. 25 of the amended Mine Project Certificate. The overall water management plan for the life of the Mine and post-closure is described in the Agnico Eagle Meliadine Gold Mine 2019 Water Management Plan (WMP) (Version 6). The WMP provides descriptions of the Mine water control structures and associated design criteria. The WMP was updated in March 2019 and reflects the groundwater management strategy presented in this document.

1.1 Concordance

The Mine is subject to the land and resource management processes established by the Nunavut Agreement and other Federal laws and regulations. Agnico Eagle submitted a Licence Application for a Mining and Milling Undertaking (Application) required to use water and to deposit waste in development of the Mine, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and Nunavut Water Regulations.

The Licence was issued on April 1, 2016 and signed by the Minister on May 19, 2016. The GWMP reflects the commitments made with respect to submissions provided during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable, to comply with Part B Section 13, and Part E Section 14 of the Licence.

In 2018, Agnico Eagle submitted a Saline Effluent Discharge proposal to the Nunavut Impact Review Board (NIRB). NIRB provided approval and issued the amended Mine Project Certificate for the Meliadine Gold Mine Project to Agnico Eagle on February 26, 2019. The GWMP reflects the revised Condition No. 25, which states the Proponent shall submit a detailed Groundwater Management Plan to the NIRB that includes mitigation measures under greater than expected groundwater inflow rates, treatment and disposal methods for discharge to sea, and details of its plan to monitor saline water at site.

1.2 Objectives

The objective of the GWMP is to provide consolidated information on groundwater management for the Meliadine Gold Mine. The GWMP is divided into the following components:

- Introductory section (Section 1);
- A brief summary of the physical setting at the mine site and the mine development plan (Section 2);
- A description of groundwater inflow forecasts and management strategies (Section 3); and
- A description of the groundwater monitoring program (Section 4);
- A description of the measures in place to ensure quality control and quality assurance is maintained in groundwater monitoring (Section 5).

The GWMP will be updated as required to reflect any changes in operations or economic feasibility that occurs, and to incorporate new information and latest technology, where appropriate, to comply with Part B Section 15 of the Licence.

SECTION 2 • BACKGROUND

2.1 Site Conditions

The Mine is located in an area of poorly drained lowlands near the northwest coast of Hudson Bay. The dominant terrain in the Mine area consists of glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and many small lakes. The topography is gently rolling with a mean elevation of 65 metres above sea level (masl) and a maximum relief of 20 metres (m).

The local overburden consists of a thin layer of topsoil overlying silty gravelly sand glacial till. Cobbles and boulders are present throughout the region at various depths. Bedrock at the mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite and mafic volcanic flows (Snowden 2008; Golder 2009).

The climate is extreme in the area, with long cold winters and short cool summers, and mean air temperatures of 12 °C in July and -31 °C in January. The mean annual air temperature at the Mine site is approximately -10.4 °C (Golder 2012a). Strong winds blow from the north and north-northwest direction more than 30 percent of the time.

The mean annual precipitation in the area is approximately 412 mm and is typically equally split between rainfall and snowfall.

Late-winter ice thicknesses on freshwater lakes in the mine site area were recorded from 1998 to 2000. The measured data indicated that ice thickness ranges from 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July (Golder 2012b).

2.2 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a surface water area of approximately 107 square kilometres (km^2), a maximum length of 31 km, features a highly convoluted shoreline of 465 km and has over 200 islands. Unlike most lakes, it has two outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 from its two outflows. Most drainage occurs via the Meliadine River, which originates at the southwest end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Watersheds in the Mine area are comprised of an extensive network of waterbodies, and interconnecting streams. The hydrology of these watersheds is dominated by lake storage and evaporation.

2.3 Hydrogeology

The Mine is located in an area of continuous permafrost. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the mine site is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to the lakes. The depth of the permafrost and active layer varies depending on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction (Golder 2012b). The typical permafrost ground temperatures at the depths of zero annual amplitude are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder 2012c).

Groundwater characteristics at the Mine are detailed in Final Environmental Impact Statement (FEIS) Volume 7, Section 7.2 Hydrogeology and Groundwater, and in an updated hydrogeological assessment completed for the Mine (Golder 2016). The groundwater characteristics for the Mine are briefly summarized herein.

Two groundwater flow regimes in areas of continuous permafrost are generally present:

- a deep groundwater flow regime beneath the base of the permafrost; and
- a shallow flow regime located in an active (seasonally thawed) layer near the ground surface.

From late spring to early autumn, when temperatures are above 0 ˚C, the active layer thaws. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Mine area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes.

Taliks exist beneath waterbodies that have sufficient depth such that they do not freeze to the bottom over the winter. Beneath small waterbodies that do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow regime will form (a closed talik). Elongated waterbodies with terraces (where the depth is within the range of winter ice thickness), a central pool(s) (where the depth is greater than the range of winter ice thickness), and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine site. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder 2012a).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the underground mine will be operated below the base of the frozen permafrost (top of the cryopeg). The underground excavations will act as a sink for groundwater flow during

operation, with water induced to flow through the bedrock to the underground mine workings once the mine has advanced below the base of the frozen permafrost.

Both Tiriganiaq Pit 1 and Tiriganiaq Pit 2 will be mined within the frozen permafrost, therefore, groundwater inflows to the open pits is expected to be negligible and were not considered in the WMP.

2.4 Mine Development Plan

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.1 Mt of overburden waste, and 14.9 Mt of tailings (Agnico Eagle 2019). The following phased approach is proposed for the development of the Tiriganiaq gold deposit:

- Tiriganiaq underground mine will be developed and operated from Year -5 to Year 7;
- Tiriganiaq Pit 1 will be mined from Year 2 to Year 7; and
- Tiriganiaq Pit 2 will be mined from Year 4 to Year 7.

Mine facilities on surface include a plant site and accommodation buildings, two ore stockpiles, a temporary overburden stockpile, a tailings storage facility, three waste rock storage facilities, a water management system that includes containment ponds, water diversion channels, retention dikes/berms, a final Effluent Water Treatment Plant (EWTP) and a Saline Water Treatment Plant (SWTP). An additional treatment plant to apply break-point chlorination, oil and grease, and total suspended solids (TSS) removal will be added by end of Q2, 2019 as part of the saline effluent discharge to sea management system.

SECTION 3 • GROUNDWATER MANAGEMENT STRATEGY

3.1 Groundwater Volumes

In the WMP of the water licence application (Agnico Eagle 2015a) it was stated that supplemental hydrogeological investigations were to be undertaken to provide additional information on potential volumes and quality of the saline groundwater to be managed. These investigations were undertaken in 2015 and 2016 and are summarized in Golder (2016). They included the completion of 24 packer tests, two pumping tests, two injection tests, 11 groundwater samples, and seven surface water samples. The work plan for the fieldwork was developed in consultation with two independent technical advisors, Dr. Shaun K. Frape and Dr. Walter A. Illman (both of the University of Waterloo).

The additional hydraulic conductivity measurements resulted in a refined interpretation on the variability of hydraulic conductivity between geological formations and data on the storage properties of the bedrock. A summary of predicted groundwater inflows between 2017 and 2032, based on this refined interpretation, are provided in Table 1. A revision of the modelled inflow volumes is currently being conducted and is scheduled to be completed by the end of April 2019. The purpose of this update is to provide more accurate estimates, thereby increasing informative capabilities regarding planning of management strategies. The results will be submitted in the 2020 WMP or as an addendum to the 2019 WMP.

Table 1: Predicted Groundwater Inflow to Underground Mine (2017 to 2032)

Period	Predicted Groundwater Inflow (m^3/day)
2017	230
2018	300
2019	280
2020	300
2021	340
2022	340
2023-2024	420
2025-2026	380
2027-2028	390
2029-2030	380
2031-2032	360

Source: Updated Predictions of Groundwater Inflow to Tiriganiaq Underground Mine (Golder 2016).

The groundwater inflow predictions presented in Table 1 do not account for grouting currently being conducted as a mitigation to reduce groundwater inflows to the underground development, water being removed in waste rock, or potential losses through the ventilation system. Both mechanisms

reduce the actual groundwater inflows to the Underground Mine relative to that which was predicted. As such, these predicted inflows to the underground development represent unmitigated estimates.

Actual inflow values to the Underground Mine, which included the impact of grouting, ventilation losses, loss of water in waste rock pore space, treatment by the SWTP, and loss due to re-use of water in mining operations were estimated based on changes in water volumes stored in the underground water storage system. Changes in storage were calculated on a daily basis and used to produce monthly values of mean daily net inflow rate. Based on these monthly estimates of mean daily inflow, mean net inflow rate over 2018 was 51 m^3/day. This is not the groundwater inflow rate to the mine but rather the balance of inflows, the aforementioned water losses, and water used for operations. Thus, the 51 m^3/day estimate is the surplus of inflows that was placed in storage.

It should be noted that the net inflow rate generally increased over 2018. During Q4 of 2018 the mean daily inflow rate was approximately 105 m^3/day. The increasing trend is the result of the progression of development, especially development approaching the lower fault (near the ore body), where hydraulic conductivities are expected to be relatively high ($1x10^{-7}$ m/s). Going forward, daily net inflow rates will increase when stoping within cryopeg begins (Q1 of 2019), as greater surface area of rock will be exposed, stoping will proceed within the ore body where water bearing structures exist, and grouting of inflows will not be possible within stopes.

3.1.1 Groundwater Inflow Predictions – Assumptions and Uncertainties

Hydraulic conductivities of both the Hanging Wall and Footwall units are assumed to be reduced by an order of magnitude between the top of the basal cryopeg and the bottom of the cryopeg. This assumption reflects that this portion of the permafrost, which will contain unfrozen groundwater due to freezing point depression (salinity and pressure induced), is expected to have reduced hydraulic conductivity relative to the unfrozen bedrock because of the presence of isolated pockets of frozen groundwater within this zone. Linearly decreasing hydraulic conductivity with temperature is assumed within this zone, with a full order of magnitude decrease assumed at the top of the basal cryopeg, and hydraulic conductivity equivalent to the unfrozen rock at the bottom of the cryopeg.

In crystalline rocks, fault zones may act as groundwater flow conduits, barriers, or a combination of the two in different regions of the fault depending on the direction of groundwater flow and the fault zone architecture. These zones, termed Enhanced Permeability Zones (EPZs), were assigned hydraulic conductivity values based on both field measurements and testing conducted at similar faulting in various locations within the Canadian Shield. Furthermore, EPZs were assumed not to be impacted by isolated freezing in the cryopeg and were therefore assigned similar hydraulic conductivity values within and below the cryopeg. The latter assumption along with the assumption that all faults are considered EPZs is considered conservative. For instance, observations made at other gold mines in the Canadian Shield indicate not all faults are EPZs (Golder, 2016).

Based on the geometry of water bodies, it was assumed that Lake B7, Lake D7, and Meliadine Lake possess open taliks connected to the deep groundwater flow regime. It was conservatively assumed that the surface water/groundwater interaction through open taliks is not impeded by lower-permeability lakebed sediments that may exist.

Combined, the assumptions discussed above result in the following sources of uncertainty in the groundwater inflow model:

- If there is a lack of reduction in hydraulic conductivity between the top of the basal cryopeg and the bottom of the cryopeg, it is likely that greater than expected inflows upon stoping will occur in the cryopeg (300 to 450 m below ground surface).
- If faults within the model do not act as EPZs, then it is expected that inflows resulting from development near these structures will be less than expected. The degree of deviation from expected inflows and timing will be dependent on the location of the structure in relation to development.
- If hydraulic conductivity of faults within the cryopeg are impacted by isolated freezing, then lower than expected inflows will be observed when development in the cryopeg progresses near the structures. The degree of deviation from expected inflows and timing will be dependent on the location of impacted EPZs in relation to development.
- If significant thicknesses of lakebed sediments with relatively low permeability exist within in the flow path connecting surface water to groundwater through open taliks, it is likely that mine-wide inflows will be less than expected due to a reduction in expected recharge to the groundwater flow regime.

Quantification of the uncertainty associated with the realization of the listed scenarios has not been conducted. As the invalidity of the above assumptions would result in less than expected inflows, the model is considered conservative and quantification of associated uncertainty is not required.

3.2 Existing Groundwater Management Control Structures

Contact water in the Underground Mine is contained within underground sumps and the Saline Pond. A proportion of the underground water is recirculated as make-up water for underground drilling. The remaining underground water is stored for treatment by the SWTP. During the open water season of 2019, saline water treated to remove TSS, oil and grease, and ammonia will be discharged to sea at Melvin Bay (Section 3.4.3).

Calcium chloride is currently not added to the underground water but has been used in the past to prevent freezing in drill holes when drilling in permafrost with low salinity drill water. The potential for use again in the future is low due to the existing calcium chloride levels in the groundwater that is used for drilling.

Groundwater inflows to the Underground Mine since 2015 have not been discharged to the environment and are being stored underground and in the surface storage pond, Saline Pond 1. Based

on adaptive management strategies, the project requires a second saline water storage pond, Saline Pond 2 (SP2). Saline Pond 2 is to be temporary in nature and is being constructed in bedrock within the footprint of Tiriganiaq Pit 2. Saline Pond 2 has an initial storage estimate of 78,862 m^3 which will be added to the saline water storage system in Q1 of 2019. Details of the underground dewatering system are provided in the Mine Plan (Agnico Eagle 2015a) and details of the ponds are provided in the WMP (Agnico Eagle 2019). The pond capacities and maximum water elevation for storage of the saline water are presented in Table 2.

Table 2: Salt Water Storage Capacity at the Mine for Groundwater and Water Primarily Influenced by Underground Workings

Surface Pond	Capacity (m^3)	Maximum Water Elevation (m)
Saline Pond	32,686	62.9
Saline Pond 2 (Q1, 2019)	78,862	62.5
P1	20,781	68.5
P2	6,828	66.5
P3	18,432*	67.0

Source: Agnico Eagle (2017).

* Volume excludes Saline Pond 3 capacity (Section 3.4.3.1).

3.3 Groundwater Quality

Groundwater investigations suggested that total dissolved solids (TDS) concentrations are relatively consistent below the permafrost at approximately 64,000 mg/L (Golder 2016). Groundwater quality data from samples taken underground 2017 through 2018 from diamond drillholes (DDHs) indicate mostly stable concentrations for several parameters (Table 3) and indicate that TDS concentrations are less than predicted at an average concentration of 56,000 mg/L. The discrepancy between expected and observed TDS levels is potentially due to the difference of sampling depth between pre-development testing and samples collected during development. Pre-development samples were collected below permafrost (>450 m below ground surface), whereas the bulk of samples collected to-date have been collected in the basal cryopeg (280 m to 450 m below ground surface). Samples and trends will continue to be assessed as development progresses below the cryopeg. It should also be noted that mining operations include drill-and-blast excavation for the development of the Underground Mine, which results in certain parameters in groundwater to be influenced by explosives (particularly ammonia and nitrate due to emulsion explosives).

With respect to high nitrate, nitrite and ammonia concentrations in February 2017, the anomaly is due to one sampling event (Feb. 24) believed to be conducted without proper flushing of the DDH. Thus, the results from this sampling event are similar to those observed in underground contact water (i.e., sump water). The February 24, 2017 DDH sample produced nitrate, nitrite and ammonia results of 344 mg/L, 23.5 mg/L and 300 mg/L, respectively. Whereas Sump 125 (contact water) results from February 12, 2017 show nitrate, nitrite and ammonia concentrations equal to 435 mg/L, 27.2 mg/L

and 400 mg/L, respectively. Considering the similarity, it can be assumed that the February 24, 2017 DDH sample was contaminated with drilling water.

Table 3: Average Saline Groundwater Quality

Source: Groundwater quality data from DDH sample location (Agnico Eagle, December 2018)

Representative Months (average per month)		Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18
Parameters (total metal)	**Units**																							
pH	pH	7.08	6.87	7.11	7.32	7.38	7.27	8.27	7.45	7.33	7.41	7.26	7.18	7.35	7.49	7.80	7.26	7.26	7.79	7.08	7.72	6.99	7.02	7.28
Alkalinity	mg/L	57	61.7	51	64.5	68	68	75	68.2	64	64	69	66	73	73	78	70	62	67	65	85	71	67	57
Conductivity	µmhos/cm	77000	76500	77000	79000	79000	76308	74385	72200	72667	78667	85000	80667	81083	82667	81200	83000	69500	83125	83333	83000	78000	69571	81000
Total Hardness (as $CaCO_3$)	mg/L	13200	18267	12700	18400	12433	12623	12500	12583	11700	12600	14100	12733	13164	14367	12680	13550	13100	13538	13450	13925	13500	11131	16500
Turbidity	NTU	123.75	69	88	90	51	75	61	47.02	104.33	55.00	30.00	53.00	74.83	72.89	27.18	49.33	75.50	27.51	52.00	27.5	83.95	69.43	52
Total Dissolved Solids (TDS)	mg/L	54350	66433	54900	57500	57300	55123	57815	57520	54567	57867	62000	55133	53975	52233	55460	51367	56900	58325	55917	60975	56900	49229	57600
Total Suspended Solids (TSS)	mg/L	45	75.7	63	248.5	102.7	102.2	156	86	102	316.7	30.0	56.0	181.8	108.1	31.0	38.7	37.5	85.4	58.5	50.0	216.0	42.4	46
Aluminum (Al)	mg/L	0.21	0.1	6.02	1.29	0.51	1.45	0.73	0.97	1.75	2.063	0.150	0.250	2.979	1.466	0.270	0.290	0.128	0.798	0.245	0.261	4.145	0.353	0.15
Ammonia Nitrogen (NH_3-NH_4)	mg/L	4.125	7.9	4.5	4.95	5.2	5.508	11.08	4.87	4.7	6.100	4.800	4.700	5.825	4.711	5.180	4.800	4.300	5.250	4.233	6.925	4.550	5.714	6.55
Arsenic (As)	mg/L	0.003	0.005	0.01	0.008	0.004	0.016	0.016	0.102	0.013	0.047	0.006	0.009	0.027	0.057	0.009	0.010	0.004	0.024	0.006	0.005	0.011	0.009	0.0138
Barium (Ba)	mg/L	0.06	0.61	0.1	0.27	0.07	0.09	0.25	0.1	0.07	0.113	0.082	0.094	0.109	0.109	0.098	0.072	0.073	0.100	0.058	0.073	0.170	0.110	0.163
Beryllium (Be)	mg/L	0.003	0.002	0.01	0.002	0.002	0.005	0.008	0.01	0.01	0.008	0.005	0.008	0.010	0.009	0.009	0.007	0.004	0.004	0.006	0.004	0.005	0.009	0.005
Boron (B)	mg/L	1.6	4.98	5	4.9	1.5	2.7	3.97	5	2.5	4.17	2.50	4.17	4.79	4.72	4.50	3.33	2.10	2.28	2.92	2.35	2.80	4.64	3
Total Organic Carbon (TOC)	mg/L	2.23	11.67	2.1	2.95	2.63	3.2	5.3	2.57	2.5	16.27	3.00	2.67	2.50	2.42	2.36	2.47	2.20	3.00	1.97	2.4	2.95	2.73	5.3
Dissolved Organic Carbon	mg/L	1.9	10.17	1.7	2.3	2.37	2.7	4.9	2.32	2.1	13.70	2.80	2.33	2.38	2.27	2.36	2.27	1.90	2.55	1.90	2.4	2.55	2.53	5
Calcium (Ca)	mg/L	1710	3777	1650	3737	1593	1608	1771	1610	1565	1720	1770	1587	1646	1777	1656	1737	1690	1748	1653	1715	2165	1487	2960
Cadmium (Cd)	mg/L	0.0003	0.0002	0.001	0.0003	0.0002	0.0005	0.001	0.001	0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0005
Chloride (Cl - dissolved)	mg/L	31250	38000	31000	31500	32000	31385	31538	32800	29333	32333	34000	33000	33833	34444	34800	34333	32500	33875	33333	36250	33500	27143	35000
Chromium (Cr)	mg/L	0.025	0.017	0.01	0.02	0.017	0.05	0.075	0.1	0.88	0.083	0.050	0.083	0.096	0.094	0.090	0.067	0.035	0.043	0.058	0.043	0.052	0.093	0.05
Copper (Cu)	mg/L	0.01	0.008	0.05	0.01	0.01	0.02	0.04	0.05	0.03	0.042	0.025	0.032	0.048	0.048	0.045	0.028	0.018	0.021	0.029	0.021	0.040	0.046	0.025
Cyanide (Cn)	mg/L	0.005	0.19	0.005	0.028	0.005	0.006	0.01	0.005	0.008	0.005	0.025	0.015	0.017	0.033	0.021	0.012	0.025	0.005	0.005	0.005	0.005	0.005	–
Iron (Fe)	mg/L	4.76	8.96	3.6	8.78	6.19	9.81	6.33	8.24	4.1	10.67	6.46	6.50	14.84	12.79	5.50	5.37	6.36	5.94	7.96	5.36	18.80	5.64	6.81
Lead (Pb)	mg/L	0.005	0.005	0.02	0.004	0.003	0.009	0.015	0.02	0.018	0.017	0.010	0.017	0.020	0.019	0.018	0.013	0.007	0.009	0.012	0.009	0.010	0.019	0.01
Magnesium (Mg)	mg/L	2168	2150	2080	2200	2050	2092	1962	2105	1975	2017	2350	2150	2208	2411	2078	2220	2150	2229	2267	2335	1970	1800	2200
Mercury (Hg)	mg/L	0.00001	0.00001	0.00001	0.000001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum (Mo)	mg/L	0.025	0.055	0.01	0.25	0.026	0.047	0.075	0.1	0.17	0.083	0.050	0.083	0.096	0.094	0.090	0.067	0.035	0.043	0.058	0.043	0.050	0.093	0.061
Nickel (Ni)	mg/L	0.025	0.04	0.1	0.07	0.017	0.05	0.08	0.1	0.35	0.083	0.050	0.083	0.096	0.094	0.090	0.067	0.035	0.043	0.058	0.043	0.050	0.093	0.05
Nitrate (NO_3) as N	mg/L	0.5	116.39	0.1	2.58	0.23	0.89	4.35	0.17	0.34	0.293	0.100	0.213	2.015	0.376	0.240	0.297	0.300	0.420	0.517	0.608	0.455	2.929	0.1
Nitrite (NO_2) as N	mg/L	0.05	8.01	0.1	0.125	0.086	0.14	0.391	0.042	0.027	0.032	0.024	0.023	0.120	0.043	0.042	0.028	0.030	0.044	0.052	0.065	0.039	0.109	0.061
Total Kjeldahl Nitrogen (TKN)	mg/L	3.78	8.7	4.6	5.2	7.83	7.4	12	72.02	4.5	9.00	5.60	4.87	6.12	4.97	5.90	5.27	4.95	5.54	4.18	7.5	4.60	6.77	6.5
Phosphorous (P)	mg/L	0.07	0.14	0.04	0.13	0.12	0.08	0.09	0.1	—	0.390	0.080	0.080	0.075	0.083	0.162	0.073	0.200	0.173	0.118	0.175	0.420	0.154	0.1
Potassium (K)	mg/L	496	595	407	609	433	463	518	488	763	502	528	465	490	532	512	479	474	500	491	539	444	391	680
Radium-226 (Ra 226)	mg/L	0.49	0.33	0.3	1.2	1.95	1.8	1.9	2.2	0.29	2.200	2.400	1.673	1.853	3.678	3.880	2.633	2.050	1.938	1.833	2.450	0.670	0.906	1.8
Selenium (Se)	mg/L	0.003	0.002	0.01	0.002	0.002	0.005	0.0075	0.01	0.007	0.008	0.005	0.008	0.010	0.009	0.009	0.007	0.004	0.004	0.006	0.016	0.005	0.009	0.005
Silver (Ag)	mg/L	0.001	0.0003	0.002	0.0009	0.0004	0.0012	0.0018	0.0002	0.018	0.003	0.001	0.002	0.002	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001
Sodium (Na)	mg/L	14625	14700	13400	15400	13900	14369	14654	14417	9433	14900	17000	15300	15183	16389	14860	14967	14750	15725	15333	16450	13550	12629	16600
Strontium (Sr)	mg/L	43.1	171	38.4	136	40	39	43.5	36.5	23.6	40.03	35.10	35.70	37.24	37.30	37.14	40.10	47.65	43.85	40.00	41.33	61.90	47.40	83.4
Sulphate (SO_4 – dissolved)	mg/L	3125	2700	3100	3100	3233	3169	2969	3120	3067	3200	3500	3433	3367	3500	3320	3367	3350	3250	3467	3625	3200	2829	3200
Thallium (Tl)	mg/L	0.001	0.001	0.001	0.0002	0.0002	0.0005	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.0005
Uranium (U)	mg/L	0.003	0.002	0.01	0.006	0.002	0.005	0.008	0.01	0.09	0.008	0.005	0.008	0.010	0.009	0.009	0.007	0.004	0.004	0.006	0.006	0.005	0.009	0.005
Vanadium (V)	mg/L	0.13	0.08	0.5	0.1	0.08	0.23	0.38	0.5	0.33	0.417	0.250	0.417	0.479	0.472	0.450	0.333	0.175	0.213	0.292	0.213	0.250	0.464	0.25
Zinc (Zn)	mg/L	0.125	0.1	0.5	0.12	0.08	0.23	0.38	0.5	0.34	0.417	0.250	0.417	0.479	0.472	0.450	0.333	0.175	0.259	0.292	0.213	0.250	0.464	0.25

3.4 Groundwater Management Strategy and Associated Control Structures

Based on the Type A Water Licence 2AM-MEL1631 Terms and Conditions, Part E: Conditions Applying to Water Use and Management, No. 14, Agnico Eagle has reviewed the Mine alternatives to apply to the GWMP. Condition No. 14 specifically states:

> *"The Licensee shall submit a Groundwater Management Plan to the Board for approval in writing, at least six (6) months prior to the discharge of any Groundwater. The Plan shall take into consideration all comments raised and commitments made with respect to submissions received during the technical review of the Application as well as final submissions and issues raised during the Public Hearing Process, where applicable."*

Furthermore, based on the NIRB Project Certificate No. 006 Terms and Conditions: Hydrogeology and Groundwater Quantity and Quality, No. 25, Agnico Eagle has updated the groundwater management strategy sections for submission to NIRB within 90 days of receiving the amended Mine Project Certificate. Condition No. 25 specifically states:

> *"The Proponent shall submit a detailed Groundwater Management Plan to the NIRB which includes mitigation measures designed to address the potential for higher-than-predicted volumes of saline water inflows into the underground mine, treatment and disposal methods, and details of its plan to monitor saline water at site. The plan must identify uncertainties pertaining to predictions for groundwater quality and quantity and inform adaptive management strategies for the site. CIRNAC should be consulted with respect to the contents of the Plan and any required mitigation measures."*

Groundwater management strategies were considered for the Mine based on the potential range of groundwater flows and quality that could be generated (Agnico Eagle 2015a).

Based on the groundwater inflow volume, the following options were considered and form part of the short and long-term management of groundwater inflows to the Underground Mine:

- Short-term Strategy: treat saline groundwater and store/use the brine from the treatment process on-site (Section 3.4.1)
- Current Long-term Strategy: treated discharge to receiving environment in Meliadine Lake (Section 3.4.2) and Discharge to sea (see Section 3.4.3).

The short and long-term groundwater management strategies are described below.

3.4.1 Short-Term Management Strategy - Treat and Store/Use Groundwater On-site

This alternative was considered as part of the Type A Water Licence Application and is currently implemented on site as part of the short-term management of groundwater inflow. It involves storing all excess groundwater in underground sumps and in surface water ponds at the Mine. As outlined in the WMP (Agnico Eagle 2019), a total of ten water containment ponds are planned on Site at the Mine surface (CP1, CP3, CP4, CP5, CP6, the P-Area [P1, P2, and P3], SP1 and SP2), seven of which have been

constructed and are in use (CP1, CP3, CP5, P-Area [P1, P2, and P3], and SP1). SP2 is presently being constructed and will be commissioned by the end of Q1 2019. Additional to this are all associated water retention dykes, water diversion berms, channels, and culverts, to manage surface water and underground water (Appendix A).

Five saltwater evaporators have been in-use on site since mid-2017 at P1 to reduce saline groundwater volumes stored in surface water ponds. While evaporators have been used with some success, the combined volumes of realized groundwater inflows with anticipated surface water volumes influenced by underground waste rock to be managed is greater than the available long-term storage at the Mine, and therefore, discharge to environment is required.

3.4.2 Current Long-Term Management Strategy - Treated Groundwater Discharge to Meliadine Lake

Hatch (2013) investigated groundwater treatment options for the site and concluded that a combination chemical reverse osmosis (RO) and mechanical vapour compression evaporator plant would be the most efficient method of treating excess groundwater for discharge. Agnico Eagle has since acquired and constructed a Salt Water Treatment Plant (SWTP) consisting of two evaporator crystallizers (SaltMakers) that will be used to treat groundwater. The SWTP will remove excessive total suspended solids (TSS), calcium chloride ($CaCl_2$), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds from the influent saline water.

The SWTP consists of two parallel units. Each unit can be operated to produce brine or solid by-product. Brine-mode of one unit within the SWTP is expected to operate to the following specifications:

- Inlet capacity of 115 m^3/day with a 95% expected operation availability for a corrected average input capacity of 109 m^3/day.
- With an input capacity of 109 m^3/day the effluent and brine will be discharged as follows:
    - 68 m^3/day to CP1
    - 24 m^3/day to Saline Pond as Brine
    - The 17 m^3/day difference is due to evaporation loss through treatment

Solid-mode of one unit within the SWTP is expected to operate to the following specifications:

- Inlet capacity of 69 m3/day with a 95% expected operation availability for a corrected average input capacity of 66 m3/day. This full inlet capacity will be discharged to CP1 as effluent
- Decisions regarding the management of solid salt by-product are ongoing by Agnico Eagle. One possible option would be use as a dust suppressant on roads as the material is similar to calcium chloride currently approved for such use. Formal approval would be required from the Government of Nunavut Environment Department.

SWTP effluent is currently transferred to CP1 where it will be treated by the EWTP prior to discharge to Meliadine Lake. EWTP effluent discharge to Meliadine Lake was performed in 2018 in accordance with the conditions outlined in Part F, Item 3 of the Water Licence. Discharge to Meliadine Lake is expected to be carried out in 2019. Total discharge to Meliadine Lake, including the treated groundwater, will remain within the permitted daily volume and meet the discharge criteria defined in the License, as well as MDMER discharge limits. Additionally, SSWQOs for EWTP effluent (including treated groundwater) will be met at the edge of the mixing zone in Meliadine Lake. Further details regarding the EWTP are provided in Sections 3.9.4 and Section 4.3 of the WMP.

The saline effluent temperature from the SWTP is expected to be approximately 35 °C, with an approximate pH of 7.5 (Saltworks 2017). According to pilot testing, SWTP effluent meets the required Water Quality Output Requirements defined in Agnico Eagle's Desalination Water Treatment Plan Design Criteria with the exception of ammonia, nitrite, total cyanide, and selenium (Saltworks 2017). However, weekly sample results from the first months of sampling (December 13, 2018 to February 18, 2019) show the SWTP effluent consistently meets the aforementioned requirements for all constituents aside from ammonia and nitrite. Ammonia exceeded the Water Quality Output Requirement of 35 mg/L on three sampling dates (Jan-16, Jan-18, Feb-10), however the mean ammonia concentration over the sampling period is 24 mg/L. Nitrite exceeded the Water Quality Output requirement of 0.2 mg/L on all (n=9) sampling dates with a mean concentration of 1.2 mg/L. The cause for these exceedances is that the SWTP system remains in the commissioning phase, specifically, the chemical RO unit designed to remove constituents such as ammonia and nitrite has not yet been commissioned. Upon commissioning (expected by end of Q1 2019), the SWTP is expected to meet all Water Quality Output Requirements.

SWTP effluent and CP1 water quality will continue to be monitored according to the SWTP Design Report to identify future exceedances and potential impacts to CP1. Pilot testing predicted that TDS concentrations would be approximately 158 mg/L (condensed water after treatment; Saltworks 2017). During commissioning, mean TDS concentration has been 174 mg/L (n=9) to date. As commissioning continues (i.e., process is refined and RO treatment is commissioned), effluent quality will trend towards lower concentrations as the treatment process is refined for optimal treatment quantity and quality. With respect to toxicology, the SWTP effluent passed acute toxicity tests on Rainbow trout, Three-spined stickleback and Daphnia magna (Saltworks 2017).

3.4.3 Current Long-Term Management Strategy - Treated Groundwater Discharge to Melvin Bay at Itivia Harbour

Based on the current standing of saline water stored on site, the rate at which the SWTP can treat saline water (Section 3.4.2) and the forecasted inflows (Section 3.1), it is anticipated that a second discharge location will be required for long-term groundwater management. Agnico Eagle proposed to treat groundwater for TSS, oil and grease, and ammonia and discharge it as saline effluent to the ocean, either as a direct discharge and/or after temporary on-site storage in one or more of the water containment ponds at the Mine. In 2018, Agnico Eagle applied to the NIRB for approval to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Agnico Eagle received approval for discharge of saline water to sea with an amended Mine Project Certificate from NIRB on February 26, 2019.

3.4.3.1 Discharge to Sea Methods for Disposal and Treatment

Treatment, storage and haulage

As discussed in Section 3.4.1, saline water will be stored on surface or underground. Saline water will then be transported to a treatment plant (to be named) for treatment. Initial treatment will be for oil and grease removal via an oil-water separator. The water will then enter a Multiflo system for TSS removal. Next, break-point chlorination treatment will be applied to remove elevated ammonia levels, which are inferred to be the result of the use of emulsion and washing of development faces/muck underground. Excess free chlorine will be removed with activated carbon filters. Following break-point chlorination, water will merge with EWTP effluent prior to entering Saline Pond 3 (SP3) for final settling and storage. Treatment rates and expected treatment performance are currently being assessed and will be provided 30 days prior to operation of the treatment plant.

Treated saline water stored in SP3 will hauled by tanker trucks to Itivia. Truck loads will be up to 50 m^3 per truck and will be unloaded using a flexible 4" HDPE suction pipe. The truck discharge pump will transfer the treated effluent into the 6'' discharge HDPE pipeline and through the diffuser. The truck discharge pump will also be used to transfer effluent into the storage tank until the next day, before it is pumped into sea when necessary.

Pumping and Diffusion Plan

The flow rate to be discharged to Melvin Bay will not exceed 800 m^3/d with a TDS of 39,600 mg/L (Appendix B). The discharge facility will include a 778 m pipeline extending to an engineered diffuser located 20 m below surface in Melvin Bay to ensure proper mixing and prevent interference with traditional activities (See Appendix X for design drawings). Pumping will occur during the open water season from 2019 to 2031. The saline effluent will be discharged in a controlled manner through the diffuser to allow for maximum dilution and minimum environmental impact to the marine environment. Environmental monitoring is discussed in Section 4.3.3.

Agnico Eagle intends to engage with the Kangiqliniq Hunters and Trappers Organization (HTO) and the community of Rankin Inlet to:

- confirm the commencement and end of the open water season for marine effluent discharge each year,
- develop a procedure for monitoring of saline effluent temperature going into the subsea pipeline,
- ice thickness on Melvin Bay in the vicinity of the discharge and determining appropriate communication and safety protocols applicable for travel by community members through Itivia and Melvin Bay.

The effluent discharge system will consist of a truck discharge pump, a back-up discharge truck pump, a 100 000-litre storage tank, as well as suction and discharge pipelines. The 100 000-litre

storage tank will only be used to contain the treated effluent until the next day, if the 800 m^3/d discharge limit is attained upon a truck's arrival. The storage tank will be installed on a containment area, built on a geomembrane with underlying and overlying granular materials and surrounded by berms. The construction drawings are shown in the Appendix B.

A pumping station including two pumps will be installed on the containment area. The truck discharge pump will be used to transfer the effluent from the trucks directly into the sea (or to storage tank). A by-pass pipeline will be installed parallel to the main discharge pipe in case the discharge truck pump malfunctions or maintenance is required. The back-up truck discharge pump will be used to pump the effluent into the by-pass pipe, though the 6'' discharge HDPE pipe and out the diffuser, if necessary.

Treated groundwater effluent quality is required to meet the Canadian federal end-of-pipe discharge criteria (per the amended MDMER; GC 2018) and to be non-acutely lethal. Treated groundwater will be discharge into Melvin Bay via an engineered diffuser (refer to Appendix D or Section 3.5 of the FEIS Addendum; Agnico Eagle 2018g) to meet Canadian Surface Water Quality Guidelines (WQG; CCME 2003), or background concentrations for parameters without guidelines, at the edge of the mixing zone. For information regarding background concentrations and expected mixing zone diffusion, refer to Appendix D (the Conceptual Ocean Discharge Monitoring Plan). Sampling will meet MDMER (GC 2018) requirements, and is outlined in Section 4.3.3, and detailed in Appendix D. A modelling assessment of groundwater discharge into the Melvin Bay marine environment was conducted by Golder (2019) and is included within Appendix B).

3.5 Discharge Schedule

Table 4 outlines the timeline for key activities on the Mine related to the management of saline groundwater, including tasks and facilities for the current short-term and long-term management strategies for discharge to Meliadine Lake (Section 3.4.1 and 3.4.2). A detailed Mine schedule for the overall Mine Water Management (e.g., building of culverts, berms and containment ponds) are presented in the 2019 WMP.

Table 4: High Level Mine Schedule

Activity	Timeline	Notes
On-site water storage	Ongoing	—
Update Groundwater Management Plan (Current Document)	Six months prior to discharge	Type A Water Licence 2AM-MEL1631 requirement
Commissioning of Salt Water Treatment Plants (SaltMaker #1 and #2)	Q4-2018 to Q1-2019	—
Discharge saline water to the sea (Melvin Bay, Rankin Inlet)	2019 open water season (Q2)	

Activity	Timeline	Notes
Active Discharge to Meliadine lake	Annually May thru October to 2031	—
Operation of Salt Water Treatment Plant	24 hr. a day / 7 days a week, year round	In-service as required
Inactive Discharge	Annually November thru April to 2031	Water will be stored underground and in surface containment ponds during the winter
Final Effluent Discharge to Meliadine Lake	End of Mine life 2031	—

Source: Agnico Eagle (2017).

3.6 Mitigation Measures regarding Greater than Expected Inflows

It is possible that realized groundwater inflow rates to the underground mine will be greater than modelled inflow rates. Specifically, this would arise from error in hydraulic conductivities assigned to geological units/structures and invalidity of assumptions listed in Section 3.1.1. Furthermore, it is possible that groundwater TDS levels will deviate from the past and current trends and produce greater than expected concentrations of TDS in groundwater to be managed. Considering both the Golder (2015) TDS forecasts agreeing with the realized groundwater TDS concentrations and the multitude (n = 133) of groundwater samples contributing to the to-date mean concentrations of TDS in groundwater surrounding the Mine, it is unlikely that groundwater TDS concentrations will increase as development and stoping progresses. In the unlikely case that TDS does increase, groundwater discharged to sea will be decreased as less raw groundwater will contribute to the saline water volumes being discharged to sea (due to TDS limit in effluent of 39,600 m^3; Section 3.4.3.1). Thus, greater than expected inflow rates and/or greater than expected TDS values would result in greater than expected groundwater volumes to manage. The following sections discuss mitigations under the occurrence of these scenarios.

3.6.1 Mitigation Measures – Contingency Storage Units

Upon the occurrence of greater than expected groundwater inflows to the underground mine, Agnico Eagle will utilize contingency saline water storage units until inflows can be reduced or SWTP treatment rates are increased to reduce required storage (Section 3.6.2). As of March 2019, the collective contingency saline water storage units produce a total potential storage of approximately 131,000 m^3. These storage units and corresponding capacities are listed below and will be filled in the following order, if required:

1. Level 350 West Block (5,766 m^3)
2. Ramp 1 extending from Level 425 to Level 450 (7,216 m^3)
3. Ramp 3 extending from Level 375 to Level 400 (17,298 m^3)
4. Ramp 3 extending from Level 350 to Level 375 (48,576 m^3)

5. Level 425 (50,530 m^3)

The contingency storage features listed above are not intended for long-term storage. The use of these will affect production, as portions of the mine will be unavailable to operations. Thus, if these units are required then adaptive management practices focused on increasing desalination rates will be implemented by Agnico Eagle in order to empty the features and allow production to continue optimally.

3.6.2 Mitigation Measures – Increased Storage and SWTP Treatment Rate

With respect to volumes of infiltrated groundwater to be managed, Agnico Eagle will apply adaptive management practices focused on increasing desalination rates. Prior to implementation of any changes to groundwater management, Agnico Eagle will submit a proposal for an amendment to the Mine Project Certificate or Water License, as applicable. The following are preliminary plans concerning the ability for Agnico Eagle to manage greater than expected saline water volumes stored on site.

In a scenario when modest increases above expected inflows (< 100 m^3/day) occur and are anticipated to persist, Agnico Eagle will assess the feasibility of running the SWTP in brine-mode (Section 3.4.2). Operating the SWTP in brine-mode rather than solid mode would provide an increase in treatment rate of approximately 86 m^3/day. As discussed in Section 3.4.2, brine would be added to the saline water storage system on site and freshwater effluent would be discharged to CP1 to be further treated to removed TSS prior to discharge to Meliadine Lake.

The addition of SP2 (approximately 75,000 m^3) to the saline water storage system provides further mitigation to greater than expected inflows by providing storage for saline water until inflows can be reduced or treatment can be increased. It will be the goal of Agnico Eagle to reduce the amount of saline water stored in SP1, SP2 and underground as much as possible during the open water season (through discharge to sea) in order to maximize storage potential.

3.6.1 Mitigation Measures – Hydraulic monitoring

As a strategy to increase the confidence of groundwater inflow modelling and decrease uncertainty, seven (7) vibrating wire piezometers are currently installed in the rock mass surrounding the underground mine. These piezometers are currently, and will continue to be applied to, assess response of the groundwater pressure (pressure head) to groundwater inflows. The data records produced by these piezometers will be used to approximate recharge rates and changes thereof, which may then be applied to the groundwater inflow model. Going forward, several additional piezometers will be installed in the rock mass (targeting major water bearing structures) to provide further insight into recharge rates and better inform modelling efforts. Agnico Eagle anticipates installing at least three (3) more piezometers over 2019.

3.6.2 Mitigation Measures – Groundwater Quality Monitoring

Raw groundwater and underground mine water in the underground storage system are sampled monthly. The sample analysis results are used to identify trends and improve predictions regarding

groundwater inflow chemistry. This information is used to improve operational performance at the SWTP and act as a trigger for revision of the groundwater quality predictions. If raw groundwater samples (i.e., from flushed drillholes) collected indicate that the TDS is more than 20% higher than the estimated 64,000 mg/L (Section 3.3), the water quality predictions for underground will be reviewed and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP.

SECTION 4 • GROUNDWATER MONITORING PROGRAM

4.1 Water Quality and Quantity Monitoring

Water quality monitoring is an important part of the Mine water management to verify the predicted water quality and quantity trends and conduct adaptive management should differing trends be observed. Water quality and quantity monitoring has been initiated and will continue during construction, operations, closure and post-closure. Monitoring will occur at three levels:

- Regulated discharge monitoring that occurs at monitoring points specified in the Licence or regulations.
- Verification monitoring that is carried out for operational and water management purposes by Agnico Eagle. This monitoring data will not be reported to the Regulators in the Annual Water License Report, but can be provided upon request by the Regulators.
- General monitoring that is included in the Licence requirements and is subject to compliance assessment to confirm sampling was carried out using established protocols, including quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

All three types of monitoring is used at the Mine. The WMP and Water Quality and Flow Monitoring Plan present the conceptual water quality monitoring plan during construction, operations and closures and more detailed information on monitoring programs.

The groundwater quality monitoring plan summarized in Section 4.4, will be further defined as the Mine advances and will be conducted in agreement with the WMP for the Mine (Agnico Eagle 2019). Required monitoring and frequency for pre- and post- treatment (i.e., monitoring above ground) is presented in the WMP (Agnico Eagle 2019).

4.2 Water Quantity

The volume of groundwater inflow being collected and transferred to surface water management systems is measured using a flow meter installed at the Portal 1 entrance and is fed by Water Stope 75. A second pumping system was commissioned in 2019 to pump directly from Level 300 to surface. Currently this line is used to pump to the SWTP where inflow volumes are tracked via a water level sensor. A flow meter will be installed within this line prior to discharging directly to surface (expected Q2 2019). This data is supplemented by monthly seepage surveys in which visually observed groundwater inflows in the Underground Mine are recorded.

Observed groundwater inflow rates are compared to model predictions (Table 1) on an annual basis. If significant variations from model predictions are observed, the assumptions behind the analysis will

be reviewed and the analysis updated if required. In addition, updates to the groundwater model may be required based on operational changes as the Underground Mine advances.

Variations that would be considered significant and would indicate the need to consider recalibrating the model and updating the inflow analysis include:

- Groundwater inflows to the mine, based on a monthly average of inflow over six consecutive months, is 80% of the model predictions while active grouting is being utilized to mitigate groundwater inflows.
- Groundwater inflows to the mine, based on a monthly average of inflow over six consecutive months, is 30% higher than the predicted groundwater inflows once grouting is ceased.

Changes in underground storage were calculated on a daily basis and used to produce monthly net inflow rate estimates. Based on these monthly averages, mean net inflow rate over 2018 was 51 m^3/day. Golder (2016) predicted a gross inflow rate of 300 m^3/day (Table 1).

Identification of a potential long-term effect associated with the groundwater flow is to be conducted and based on a detailed examination of the groundwater data to assess the potential causes of greater than expected groundwater quantity. If the greater than predicted flows could be correlated to a short term effect such as freshet or transient drainage of a high storage feature, then no further action would be required. However, if the greater than predicted flows could not be correlated to a short term effect, than the effect would be considered to be potentially long term. The duration of six months is based on observed seasonal variations in inflow quantities in mines situated permafrost regions.

If model re-calibration is deemed necessary, future groundwater inflow quantity would be predicted using this re-calibrated model and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP. Currently, an update to the numerical model is underway. The update is not the result of either of the two conditions listed above, but rather is intended to provide more accurate estimates to better inform planning of management strategies.

4.2.1 Underground Water Management System

The underground water management system is designed to prevent water from affecting the workings or production. The system contains a series of sumps (generally one at the access of each level) designed to capture groundwater inflows and runoff from mining operations (i.e., drilling). Presently, underground water is managed by pumping from sump to sump from the lower levels to Level 125. Water collected in Level 125 sump is then moved to the Water Stope to be distributed for mining operation requirements or moved to surface (Section 4.2).

Beginning in approximately Q2 2019, a new pumping system will be implemented underground as follows:

- All groundwater inflows and water used for operations from Level 300 to the bottom of the mine will be pumped to storage containers on Level 300.
- All groundwater inflows and water used for operations on Level 275 to surface will be transported to storage tanks on Level 300. Movement will be directed by gravity from sump to sump via boreholes connecting the sumps.
- Water that is stored on Level 300 will be clarified using a Mudwizard (flocculation) system as a means to ensure pumping efficiency and prevent damage to the system.
- Following clarification, water will be fed by gravity to Level 350, where a main pumping station will move the water to Level 200.
- A second main pumping station on Level 200 will move the water to the SWTP or Saline Ponds on surface (Section 4.2).

4.3 Water Quality

4.3.1 Underground Mine Sump Water and Groundwater Inflows

Water accumulating in sumps underground is sampled on a monthly basis at Sump 125, which is the main collection sump prior to recirculation for underground use. Sump water samples are analyzed for the following parameters: conductivity, TDS, pH, temperature, oil and grease, major anions, radium 226, dissolved and total metals, nitrate and nitrite, ammonia, volatile organic compounds (i.e., benzene, xylene, ethylene, and toluene).

Groundwater quality is also monitored at mine seeps and/or diamond drill holes (DDHs) to verify the quality of formation water flowing into the mine prior to contact and potential contamination by mining and drilling fluids. The DDHs consist of underground holes drilled in advance of mining for ore body delineation purposes. These DDHs are sampled if there is sufficient flow to flush the borehole prior to initiation of grouting. Flushing and sampling techniques used to ensure samples are taken without contamination are described in Section 2.2.3 of the Quality Assurance/Quality Control Plan. Samples are collected quarterly at a minimum but actual sampling frequency may be greater depending on rate of progress, frequency of water intersects, and observed trends in groundwater quality with time. Water samples are analyzed for the following parameters: conductivity, TDS, pH, temperature, major anions, radium 226, dissolved and total metals and toxicity testing.

If water samples are collected that indicate that the TDS is more than 20% higher than the estimated 64,000 mg/L, the water quality predictions for underground will be reviewed and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP.

4.3.2 Saline Water Treatment Plant Influent and Effluent

Water samples are currently collected weekly at both the inlet and outlet of the SWTP. The results of the sample analysis are used by SWTP operators to fine-tune the treatment process and ensure its optimal performance. Samples taken at the outlet of the SWTP are analyzed to provide the quality of treated water produced by the SWTP that is transferred to CP1.

Water samples are analyzed for the following parameters: pH, electrical conductivity, temperature, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), chloride, ammonia, nitrite, nitrate, total phosphorus, total metals, total cyanide, and total mercury.

4.3.3 Discharge to Sea

Prior to haulage of saline water from the Meliadine Site to Itivia for discharge to sea, Agnico Eagle will measure pH, electrical conductivity, and temperature of the effluent as a means to continually advise discharge operations and help ensure discharge parameters are met. Agnico Eagle will also collect weekly samples to be analyzed by an accredited laboratory. Samples will be analyzed for the full suite and Group 3 (MDMER) parameters as listed in the Water License and the Water Quality and Flow Monitoring Management Plan appended to the WMP.

Effluent water at the final discharge point (end-of-pipe) will be measured for pH and analyzed for concentrations of deleterious substances listed in MDMER Schedule 4 (GC 2018). End-of-pipe brine effluent will be sampled once per month for acute lethality testing per MDMER requirements. Acute lethality testing will be conducted on Three-spine stickleback in accordance with the procedures set out in sections 5 or 6 of Reference Method EPS 1/RM/10 (ECCC 2018). Effluent characterization samples (Section 4.1.3) will be collected at the same time to aid in interpretation of acute lethality test results.

Effluent characterization will be conducted once per calendar quarter at least one month apart. Effluent will be sampled and analyzed for the following parameters:

- General parameters, including pH, TDS, TSS, hardness, alkalinity, electrical conductivity, salinity, and temperature;
- Anions including sulphate and chloride; and
- Nutrients, including ammonia and nitrate.
- Total metals and dissolved metals including those listed in MDMER Schedule 4 and Schedule 5 paragraph s. 4.

Sublethal toxicity testing of brine effluent will be conducted twice a year at least one month apart, at the beginning and at the end of discharge for three years, and once a year after the third year. The following tests will be conducted:

- Fish early life stage development test on inland silverside (Menidia beryllina) or topsmelt (Atherinops affinis) (US EPA 2002)
- Invertebrate reproduction test on echinoids (sea urchins or sand dollars) (Environment Canada 1992)
- Algae toxicity test on barrel weed (Champia parvula) (US EPA 2002)

These tests will be conducted on aliquots of the same sample collected for effluent characterization.

Agnico Eagle will adhere to MDMER EEM requirements for fish population surveys, water and sediment quality, and benthic invertebrate community assessments. The sampling plan is conceptually outlined in Table 5. Fish tissue monitoring will be conducted if triggered by MDMER conditions. A study design will be provided to ECCC according to the MDMER requirements (GC 2018), which includes all proposed monitoring locations.

Starting March 2019, a monthly under-ice sampling program was initiated in the area anticipated to be influenced by Agnico Eagle discharge to sea. The sampling program will extend to May 2019. The program included three sampling locations selected to correspond with the location of potential exposure to diffuser discharge In Melvin Bay. The purpose of the sampling program is to develop a baseline for water quality parameters within the potential exposure area prior to initiation of discharge. Details are found in Appendix D.

Further information regarding sampling locations, QA/QC, water quality benchmarks, sediment quality benchmarks, and environmental effect thresholds is provided in the Conceptual Ocean Discharge Monitoring Plan (Appendix D).

Table 5: Conceptual Ocean Discharge Monitoring Program Sampling Summary

Monitoring Component	Sampling Frequency	Monitoring Location	Sample Replication and Number of Samples
Deleterious Substances (MDMER Schedule 4)	Every week	FDP (end-of-pipe)	One grab sample
Acute lethality	Every month (sampled concurrently with effluent characterization)	FDP (end-of-pipe)	One grab sample
Effluent characterization	Four times a year, one month apart during discharge	FDP (end-of-pipe)	One grab sample
Sublethal toxicity	Twice a year, one month apart at the start and finish of the discharge	FDP (end-of-pipe)	One grab sample
In situ Water Column Measurements	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One vertical profile per station
Water Quality	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One sample @1m below the surface and one sample @5 m above the bottom at each station.
Benthic Invertebrate Communities, and sediment quality	Every 3 years in August if triggered by MDMER	Exposure and reference areas	6 stations in the Exposure area and 5 stations in each reference area. Three subsamples per station
Fish population	Every 3 years in August if triggered by MDMER	Exposure and reference areas	20 sexually mature males and 20 sexually mature females of two fish species in each sampling area

Monitoring Component	Sampling Frequency	Monitoring Location	Sample Replication and Number of Samples
Fish tissue	Every 3 years in August if triggered by MDMER	Exposure and reference areas	8 samples of a single species from each sampling area

Notes:

Amended Metal and Diamond Mining Effluent Regulations (MDMER; GC 2018) will be adhered to. Metal Mining Effluent Regulations (MMER) will be adhered to as a minimum while MDMER come into effect.

FDP = Final Discharge Point

4.4 Groundwater Monitoring Plan

Table 6 presents a summary of the underground monitoring plan presented in Sections 4.2 and 4.3. Additional sampling at the surface will be conducted, including pre- and post- SWTP sampling as outlined in the WMP and the Water Quality and Flow Monitoring Plan.

Table 6: Groundwater Monitoring Plan

Monitoring Type	Monitoring Location	Purpose	Frequency
Verification	Portal Water Stope L75	Quantity - Monitor underground water quantity pumped to surface.	Totalized Flow Tabulated Monthly
Verification	Underground Seeps	Quantity - Seepage survey to verify underground flow estimates.	Monthly
Verification	Sump 125	Quality - Monitor underground water quality prior to recirculation for underground use.	Monthly
Verification	Underground seeps/DDHs	Quality – Verify quality of groundwater flowing into underground	Quarterly
Verification	SWTP Inlet and Outlet	Quality – Verify quality of groundwater being treated and monitor final treated effluent prior to continued transfer to CP1	Weekly

Source: Agnico Eagle (2018).

SECTION 5 • QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality. Specific QA and QC procedures that will be followed during sampling performed for the Groundwater Monitoring Program are described in Section 5.1 and 5.2.

5.1 Quality Assurance

Quality assurance protocols are diligently followed so data are of known, acceptable, and defensible quality. There are three areas of internal and external management, which are described in the following three sections.

5.1.1 Field Staff Training and Operations

To make certain that field data collected are of known, acceptable, and defensible quality, field staff are trained to be proficient in standardized field groundwater sampling procedures, data recording, and equipment operations applicable to the Groundwater Monitoring Program. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping protocols.

5.1.2 Laboratory

To make sure that high quality data are generated, accredited laboratories have been selected for sample analysis. Accreditation programs are utilized by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control.

5.1.3 Office Operations

A data management system is utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the Groundwater Monitoring Program. Relevant elements will include, but are not limited to the following:

- all required samples are collected;
- chain-of-custody and analytical request forms are completed and correct;
- proper labelling and documentation procedures are followed, and samples will be delivered to the appropriate locations in a timely manner;
- laboratory data will be promptly reviewed once they are received to validate data quality;
- sample data entered into a Mine-specific groundwater quality database will be compared to final laboratory reports to confirm data accuracy; and

- appropriate logic checks will be completed to ensure the accuracy of the calculations.

5.2 Quality Control

The QC component consists of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples.

Sample bottle preparation, field measurement and sampling handling QC procedures include the following:

- Sample bottles are kept in a clean environment, capped at all times, and stored in clean shipping containers. Samplers keep their hands clean, wear gloves, and refrain from eating or smoking while sampling.
- Where sampling equipment must be reused at multiple sampling locations, sampling equipment is cleaned appropriately between locations.
- Temperature, pH, and specific conductivity are measured in the field using hand held meters. Samples are cooled to between 4 °C and 10˚C as soon as possible after collection. Care is taken when packaging samples for transport to the laboratory to maintain the appropriate temperature (between 4°C and 10˚C) and minimize the possibility of rupture. Where appropriate, samples are treated with preservatives to minimize physical, chemical, biological processes that may alter the chemistry of the sample between sample collection and analysis.
- Samples are shipped to the laboratory as soon as reasonably possible to minimize sample hold times. If for any reason, samples do not reach the laboratory within the maximum sample hold time for individual parameters, the results of the specific parameters will be qualified, or the samples will not be analysed for the specific parameters.
- Chain of custody sample submission forms are completed by field sampling staff and submitted with the samples to the laboratory.
- Only staff with the appropriate training in the applicable sampling techniques conduct water sampling.

Quality control procedures implemented consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and duplicate water samples. These are defined as follows:

- Field Blank: A sample prepared in the field using laboratory-provided deionized water to fill a set of sample containers, which is then submitted to the laboratory for the same analysis as the field water samples. Field blanks are used to detect potential sample contamination during collection, shipping and analysis.
- Travel Blank: A sample prepared and preserved at the analytical laboratory prior to the sampling trip using laboratory-provided deionized water. The sample remains unopened

throughout the duration of the sampling trip. Travel blanks are used to detect potential sample contamination during transport and storage.

- Duplicate Sample: Two samples collected from a sampling location using identical sampling procedures. They are labelled, preserved individually and submitted for identical analyses. Duplicate samples are used to assess variability in water quality at the sampling site. Duplicates are collected and submitted for analyses at approximately, 10% of sampling locations. For smaller batches of samples (less than 10), at least one duplicate will be collected and submitted for analysis.

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APPENDIX A • SITE LOCATION AND MINE SITE LAYOUT

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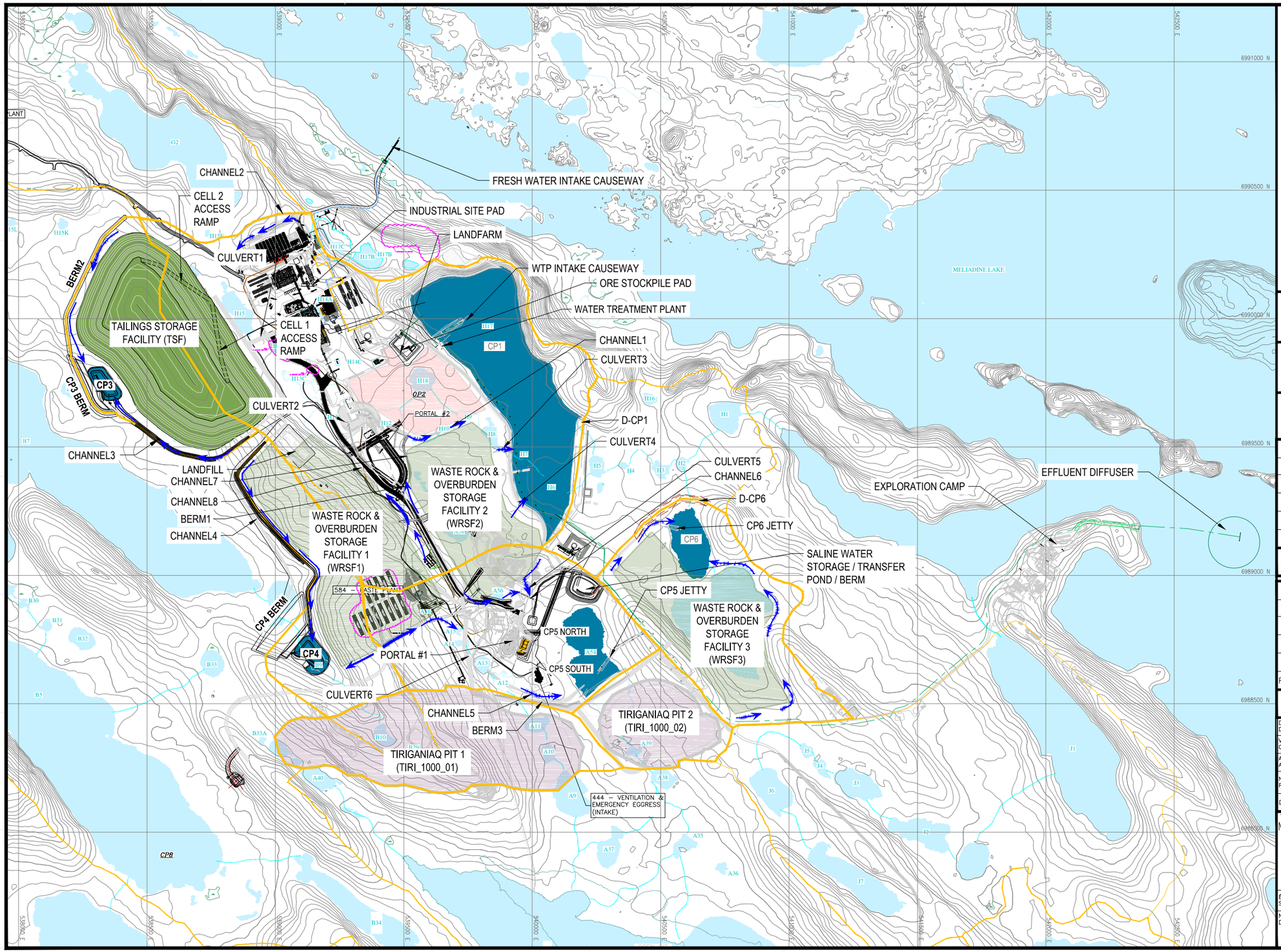

LEGEND

- CATCHMENT BOUNDARY
- WATERBODY
- WATER COLLECTION POND
- OPEN PIT
- WASTE ROCK
- ORE
- CONTACT WATER FLOW DIRECTION

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature
Date Nov. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NWT/NU

AGNICO EAGLE

TETRA TECH

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 11/14/2018

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TITRE / TITLE	# DWG

DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS

REV	DESCRIPTION	DATE	PAR BY
0	ISSUED FOR CONSTRUCTION	2018–11–14	
B	ISSUED FOR REVIEW	2018–11–06	
A	ISSUED FOR REVIEW	2018–11–05	

REVISIONS

DESSINÉ PAR / DRAWN BY	EL/EP	DATE 2018–11–14
VÉRIFIÉ PAR / CHECKED BY	GZ/WTH	2018–11–14
APPROUVÉ PAR / APPROVED BY		
No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

GENERAL ARRANGEMENT

ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
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APPENDIX B • DESIGN REPORT SALINE EFFLUENT DISCHARGE TO MARINE ENVIRONMENT

AGNICO EAGLE
MELIADINE

February 2019

Design Report
Saline Effluent Discharge to Marine Environment

6528-680-132-REP-001

In accordance with NIRB Project No.006 Condition 128

Prepared by:
WSP Canada Inc.

AGNICO EAGLE
MELIADINE

February 2019

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
0	2019-02-15			Design report

Prepared By:

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Appendix C: Sclairpipe Technical Specification
Appendix D: Modelling Assessment of Groundwater Discharge into the Melvin Bay Marine Environment, REV B.

1 INTRODUCTION

1.1 SITE LOCATION AND ACCESS

WSP Canada Inc. (WSP) was retained by Agnico Eagle Mines Limited (Agnico Eagle) to prepare the Design Report of the proposed saline effluent discharge to the marine environment near Rankin Inlet, Nunavut. As part of their long-term groundwater management strategy, Agnico Eagle is planning to collect groundwater from the Meliadine underground mine, treat the influent with respect to quality standards and discharge the treated groundwater effluent into Melvin Bay.

The Meliadine Mine is located approximately 25 km North of Rankin Inlet (63°1'23.8'' N, 92°13'6.42'' W), Nunavut.

The proposed discharge point for the saline groundwater effluent is in Melvin Bay just west of Rankin Inlet. Agnico Eagle will access the area using a bypass road. The area is also accessible by Itivia Street, a gravel road linking the Agnico Eagle Fuel Storage Facility at the Itivia Harbour and Rankin Inlet.

1.2 EXISTING AND FUTURE SITE FACILITIES

Agnico Eagle owns and operates the existing Fuel Storage Facility and plans to use this property to install the saline effluent discharge system. This projected effluent discharge system consists of truck discharge pump, a back-up discharge truck pump, a 100 000-litre storage tank, as well as suction and discharge pipelines. The 100 000-litre storage tank will only be used to contain the treated effluent until the next day, if the 800 m^3/d discharge limit is attained upon a truck's arrival. The storage tank will be installed on a containment area, built on a geomembrane with underlying and overlying granular materials and surrounded by berms. The construction drawings are shown in the Appendix A.

A pumping station including two pumps will be installed on the containment area. The truck discharge pump will be used to transfer the effluent from the trucks directly into the sea (or to storage tank). A back-up truck discharge pump will be installed to by-pass the first pump, if necessary. The truck-discharge pump is connected to a 778 m long HDPE pipeline to pump the effluent from the trucks to 20m below sea level in Melvin Bay. A diffuser is connected at the end of the pipe to ensure effective dilution of the saline effluent into the marine environment. The ballast weights will be attached to the pipe to sink and hold it onto the seabed.

For more detailed information, refer to the construction drawings shown in the Appendix A.

1.3 PURPOSE OF THE DOCUMENT

The purpose of the report is to outline the final design and construction drawings for the saline effluent discharge system which includes the storage tank, the pumping station, the discharge pipe as well as the diffuser that will release the treated groundwater effluent into Melvin Bay.

This report has been prepared in accordance with Condition 128 of NIRB Project Certificate No.006:

‘‘The Proponent shall provide the NIRB with a detailed design for the system that includes the location of the pipeline in relation to the saline effluent storage tank at Itivia, the location of submerged collars supporting the pipeline and the design of the diffuser.’’

The final design was presented to the local stakeholders including the Kangiqliniq Hunters and Trappers Organization (KHTO), the Hamlet of Rankin Inlet and the Government of Nunavut - Nunavut Airports Division and Community and Government Services Department on January 24th, 2019 for final review.

This design report refers to Golder’s Report which assessed the environmental guidelines characterizing Melvin Bay at the location of the proposed diffuser and conducted the numerical modelling to design the diffuser. Golder’s Report was published in February 2019 and is shown in Appendix D.

1.4 SCOPE OF WORK

WSP was retained by Agnico Eagle to design the pumping station and pipeline while Golder was responsible for the assessment of the groundwater effluent plume with respect to environmental guidelines. This report describes the design of the pumping station, the pipeline and the diffuser.

2 GENERAL SITE CONDITIONS AND OTHER DATA INPUT FOR DESIGN

2.1 MODELLING FOR DIFFUSER DESIGN

The model calculates numerical simulations of the treated groundwater effluent mixing in the proposed marine environment. The modelling of the groundwater effluent plume dispersion allows the user to assess the dilution behaviour.

The ambient environmental conditions (e.g. winds, currents, etc.) and treated groundwater effluent characteristics are necessary to calculate numerical simulations of the mixing.

The proposed diffuser pipeline is to extend from the storage tank to be located south of the Aginco Eagle’s Fuel Storage Facility, to south-south-west in Melvin Bay. The diffuser port will be installed on the seabed at a depth of 20 m, to ensure proper mixing and prevent interference with traditional activities.

Refer to section 2.1.3 of Golder’s Report: Modelling Assessment of Groundwater Discharge into the Melvin Bay Marine Environment, Rev B, for detailed information (Golder, 2019).

2.2 ENVIRONMENTAL DATA

For detailed information on the environmental data used, refer to section 2.1.1 of Golder’s Report.

2.3 CHARACTERISTICS OF THE EFFLUENT

For detailed information on the characteristics of the effluent, refer to Appendix B of Golder's Report.

3 DESIGN OF THE STORAGE AND PUMPING STATIONS

3.1 GENERAL

After treatment, the excess groundwater will be stored on site at the Meliadine Mine, before being hauled by tanker trucks to Itivia Harbour. Trucks will unload their treated groundwater effluent by connecting on a flexible 4'' HDPE suction pipe. The truck discharge pump will transfer the treated effluent into the 6'' discharge HDPE pipeline and through the diffuser. The truck discharge pump will also be used to transfer effluent into the storage tank until the next day, before it is pumped into sea when necessary.

A by-pass pipeline will be installed parallel to the main discharge pipe in case the discharge truck pump malfunctions or maintenance is required. The back-up truck discharge pump (spare) will be used to pump the effluent into by-pass pipe, though the 6'' discharge HDPE pipe and out the diffuser, if necessary.

3.2 PUMP NARRATIVE

The flow rate to be discharged to Melvin Bay will not exceed 800 m^3/d with a TDS of 39 600 mg/L (Golder, 2019). The discharge will only occur during open water season. For more detailed information on the modelling scenarios and the input parameters, refer to section 2.1.2 of Golder's Report.

3.3 PUMPING STATION ENCLOSURES

The pumping station will be enclosed inside a heated container to protect the mechanical and electrical equipment from cold temperatures before Winter and at freshet. This precaution will decrease the risks of malfunctions in the system.

3.4 STORAGE TANKS

A 100 000-litre horizontal double wall storage tank will only be used to store the treated groundwater effluent until the next day if the daily discharge limit is attained upon a truck's arrival.

3.5 PIPING

The piping manifold for pumping stations within the container will be made of chlorinated polyvinyl chloride (CPVC) with Victaulic connections to facilitate the dismantlement during maintenance operations.

The 4'' suction and 6'' discharge pipelines outside of the heated container will be made of HDPE DR-9 pipe.

3.6 CONTROLS

The pumping station was designed to control the high and low water levels in the storage tank. The water level in the storage tank will be regulated with an ultrasonic transmitter located in the storage tank. When the water reaches the high level, the pump will automatically start to discharge the treated effluent to Melvin Bay.

A flow meter will be installed downstream of the pumping station to measure the flow rate before discharging into the marine environment. The pH, conductivity and the temperature levels of the effluent will be measured at the Chlorination Treatment Plant before arrival to Agnico Eagle Fuel Storage Facility. This equipment will allow Agnico Eagle to control the discharge operations and to respect the base parameters. This is in accordance with the commitments during the Final Environmental Impact Statement (FEIS) process.

A valve will be installed downstream of the storage tank to allow the sampling according to the Metal and Diamond Effluent Regulation.

The pumping station is designed to facilitate the user's operations and maintenance. The design allows a local control at the pumping station.

4 DESIGN OF THE HDPE PIPELINES

4.1 GENERAL

The present section of the report describes the main components of the effluent discharge pipeline and provides the reader with further details on its design and functionalities.

The groundwater effluent pipeline was designed to prevent interference with local transportation including snowmobiling, boating and ATV's. Our design proposes an ATV and snowmobile crossing constructed over a section of the onshore pipeline and parallel to the laydown area fence line. Furthermore, drawing 65-100-210-200 illustrates the location of the proposed ATV and snowmobile crossing.

The design will not affect the use of traditional land during construction and operation.

4.2 ABOVE-GROUND PIPELINE

4.2.1 ONSHORE

The onshore pipe will be installed permanently on the undisturbed natural ground. Signage will be installed in both directions of the traffic near the onshore pipe to indicate the obstacle and the crossing to motorized vehicles.

4.2.2 SUBMARINE PIPELINE

Unlike the conceptual design presented during the FEIS process, Agnico Eagle is proposing not to bury the pipeline located in the intertidal zone. This proposed design will result in reducing the impacts on the environment and community (i.e. eliminate need to re-open the Itivia quarry, reduce risk of erosion and sedimentation into Melvin Bay during pipe installation and reduce risk of pipe being moved by ice during winter).

The submarine pipeline is segmented into two sections, a temporary (removable) and a permanent section. The first 150 m long section located south of the crossing must be removed from the Melvin Bay before Winter since the formation of ice could damage the pipe. The temporary section will be re-installed at freshet once the ice has broken up. The temporary pipe is removable by its flanges located at the extremities of the 150 m section.

On the other hand, the permanent section of the submarine pipeline will be at least 6 m below sea level and will stay in place year-round. A diffuser is connected at the end of the pipe.

4.3 MATERIAL

4.3.1 PIPELINES

The effluent discharge pipeline will be made of Sclairpipe HDPE DR-9 PE4710. Also, the pipeline will be welded using a fusion welding machine except at it's flanges. The pipe's dimension ratio was selected based on the need for high rigidity. The chemical properties of HDPE pipes make it highly resistant to saline water. Finally, HDPE pipelines are easier to install in a marine environment compared to other materials (e.g. steel).

4.3.2 FLANGES, VALVES AND ACCESSORIES

The pipeline's temporary section has two HDPE flanges at its extremities to enable it to be removed and installed again, when necessary. A back-up ring will be inserted in-between each flange connections and then mechanically fastened to ensure tightness. The ring will be designed to resist low water temperatures as well as salinity.

4.3.3 BALLAST WEIGHTS

The ballast weights will be installed at a 1.52 m interval along the submarine pipeline. The ballast weights must weigh 67.6 pounds to keep the pipeline floating when filled with air, until it is in the projected alignment. Once the pipeline is filled with water, the ballast weights will sink and hold the pipeline onto the seabed. The ballast weight will allow the installation of the pipeline underwater.

4.4 EQUIPMENT

4.4.1 FLOWMETER

As mentioned in section 3.6, a flowmeter will be installed downstream of the pumping station to measure the flow rate before discharge into the marine environment.

5 DESIGN OF DIFFUSER AND MODELLING RESULTS

5.1 DIFFUSER CONFIGURATION

The optimized diffuser has the following configuration:

- Diffuser connection with outfall through a 6'' five-way cross;
- Length of the diffuser: 0.9 m;
- Diameter of the diffuser: 150 mm, DR-9 (nominal);
- Diffuser depth: 20 m (based in 2017 bathymetry survey of Melvin Bay);
- Discharge type: single port;
- Horizontal angle of discharge: Perpendicular to bathymetric contours;
- Vertical angle of discharge: 90°;
- Port diameter: 75 mm, DR-9 (nominal);
- Port height from seabed: 1 m.

For more detailed information, refer to construction drawing 65-100-210-200 in Appendix A.

6 CONSTRUCTION

6.1 GENERAL

Construction is expected to begin in May 2019 and end in August 2019.

6.1.1 PIPELINE

The pipeline sections will be welded on shore into three major segments; the onshore segment as well as the temporary and permanent submarine segments.

The ballast weights will be installed onshore only when the submarine segments are welded together. Initially, the ballast weights will be stockpiled adjacent to the work station. Then, a ramp or skid way, including railroad tracks or steel beams, will be placed to facilitate moving the weights along with the pipe.

The pipeline is ready for launching when all the ballast weights are fixed to the pipeline. To keep the pipeline floating until the sinking operation, the pipe ends are blocked to prevent water from entering the pipe. This will be accomplished by installing a flange assembly with a blind flange at each end.

Before the launch, the ramp of the skidway will extend deep enough into the water so that the weights can be supported by the floating pipe. In case of high currents, an anchorage system will be installed to hold the pipe while it is being launched. A boat with a winch and cable system will be used to move the pipeline into the water. It may be necessary to install guide cables and shore anchors to hold the system over the alignment when it is being sunk.

The sinking process consists of filling the pipe with water at one end and evacuating the air out of the other end.

The construction of the pipeline onshore and under water will not interfere with the local community activities. During construction, vertical lighting signs will be installed onshore to alert incoming traffic at Itivia Harbor. The lighting will be oriented with caution, towards the working area and away from the airstrip take off and landing area.

6.1.2 STORAGE TANK

The installation of the storage tank will require the use of a lifting mobile equipment. The storage tank measures 12.2 m long x 3.3 m wide and weighs 15 m.t. It will be set in place with the M & T KoneCrane ReachStacker Model SMV 4531. Its maximum vertical extension is 18.2 m but just to lift the storage tank off a flat bed and set in place, it would be extended about two thirds that height.

6.1.3 CONTAINMENT PAD (NEAR ITIVIA FUEL STORAGE FACILITY)

The Containment pad will be built to minimize land disturbance and environmental risks. Therefore, the pad is to be built 31 m away from the Highest High Water Large Tide (HHWLT).

Once the subgrade is prepared, an HDPE geomembrane is installed with underlying and overlying granular material. Also, berms are to be constructed around and higher than the containment pad. This gives the pad the capacity to contain the volume of effluent inside the storage tank in case of spillage.

The pad will facilitate daily operations such as maneuvering the tanker trucks to unload the groundwater effluent into the storage tank.

The construction of the containment pad will require an excavator, tandem trucks, a spread dozer and a compactor. The tallest heavy equipment on site will be the CAT 330 excavator. It has a maximum vertical reach of 10.7 m but will not be deployed to this height since the work will occur at ground level only.

6.2 MATERIAL SPECIFICATIONS

All the materials used to fabricate the facility are non-potentially acid generating (NPAG) materials. The granular materials that will be used for building the containment pad will be sourced from a nearby borrow pit.

6.3 CONSTRUCTION QUALITY CONTROL AND SURVEY

Agnico Eagle is responsible for conducting quality control and surveying during construction.

6.4 TESTING AND INSPECTION

Agnico Eagle is responsible for testing and inspecting the saline discharge effluent system according to the manufacturer's recommendations before its start-up. After the pipeline installation, diver's will verify that the ballasts holding the pipeline are all properly sitting on the bottom contours and that the pipeline is not resting on any rocks, debris or material that could cause damage.

7 OPERATIONS

7.1 REMOVABLE AND PERMANENT PIPE

As stated in section 4.2.2, operation of the saline effluent discharge requires installing and removing a temporary segment of the pipeline at freshet and Winter, respectively. The temporary segment will be removed and stored away before the bay freezes up.

The temporary section of pipe can be disconnected from the system at its flanges and will have to be pulled out using heavy equipment. Agnico Eagle is responsible for storing this pipeline segment on their property during Winter.

7.2 MAINTENANCE PROGRAM

Agnico Eagle will have in place a maintenance program based on manufacturer's recommendations. The system will be inspected according to the manufacturer's recommendations and repaired when needed to keep the system in good working condition.

8 REFERENCES

Agnico Eagle. 2018a. Meliadine Gold Project Groundwater Management Plan. Version 1. February 2018.

Golder. 2019. Modelling Assessment of Groundwater Discharge into the Melvin Bay Marine Environment, Rev B. February 2019.

Agnico Eagle (Agnico Eagle Mines Limited). 2014. Final Environmental Impact Statement (FEIS) - Meliadine Gold Project, Nunavut from: ftp://ftp.nirb.ca/02REVIEWS/ACTIVE%20REVIEWS/11MN034-AgnicoEagle%20MELIADINE/2-REVIEW/09-FINAL%20EIS/FEIS Accessed on November 2014.

Agnico Eagle. 2018b. Meliadine Gold Project Water Management Plan. Version 3. 6513-MPS-11. March 2018.

Appendix A: Construction drawings

NO. DESSIN
DRAWING NO. 65-180-230-200-1_R1

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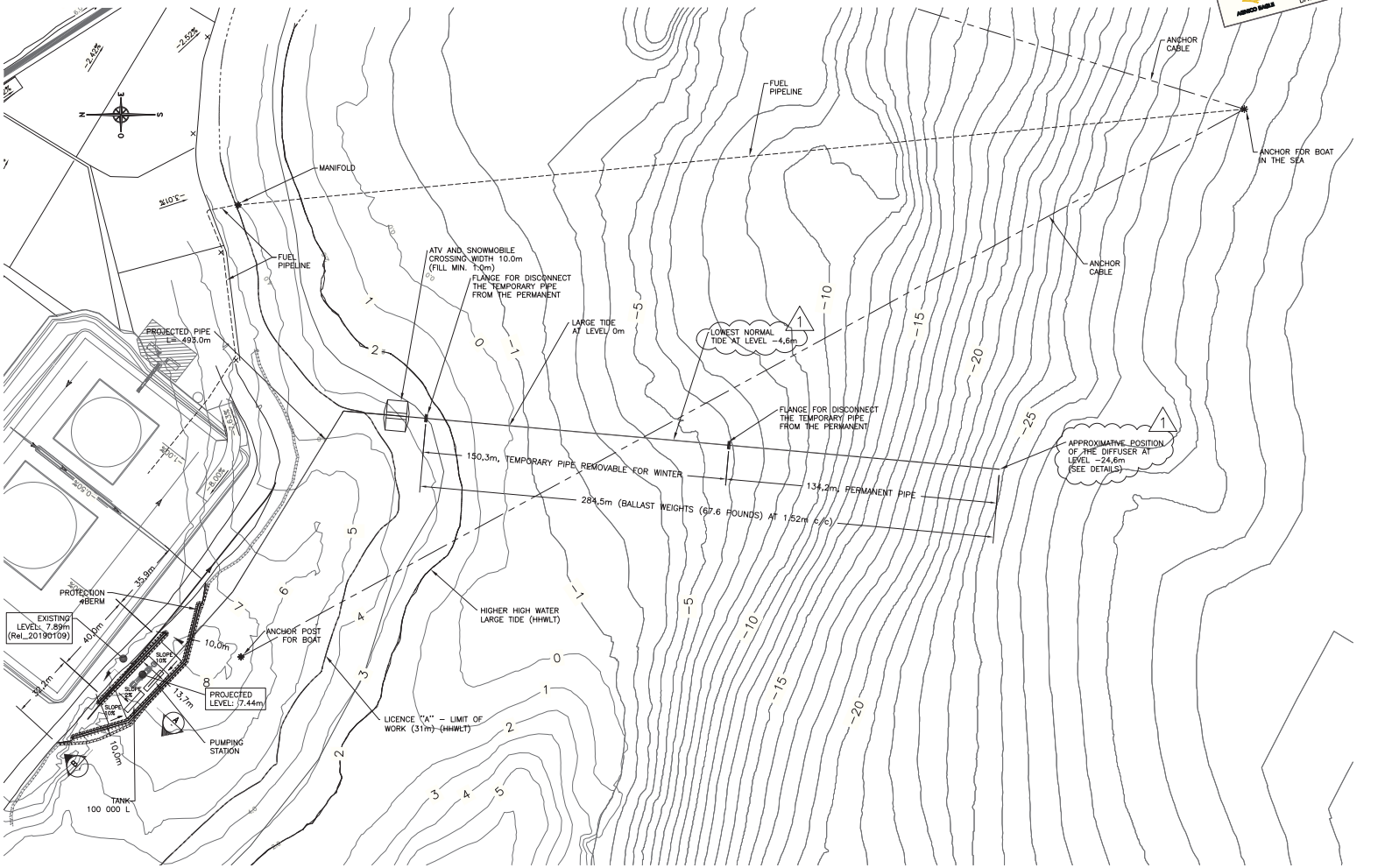

PLAN VIEW
Scale: 1: 1000

PLAN CLÉ
KEY PLAN

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1075, 24e AVENUE E
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"	"

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
1	2019-02-14	ISSUED FOR CONSTRUCTION	J.C.	S.D.	
0	2019-02-06	ISSUED FOR CONSTRUCTION	J.C.	S.D.	

REVISIONS

Stephan Dupuis 139557 PQ/QC
2019-02-14

TITRE / TITLE
AGNICO EAGLE – MEL IADINE DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
230 – GENERAL EARTH WORKS
SALINE WATER STORAGE FACILITY
RANKIN INLET
PLAN VIEW

DESSINÉ PAR / DRAWN BY	JULIE.CROTEAU, tech.	DATE 2018-12-12
VÉRIFIÉ PAR / CHECKED BY	YOUSSEF HESSANI, Ing.	2019-02-06
APPROUVÉ PAR / APPROVED BY	STEPHAN DUPUIS, P. Eng.	2019-02-14
ÉCHELLE / SCALE	INDICATED	DATE 2018-12-12

NO. DESSIN / DRAWING NO. 65-180-230-200-1

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
6528	1	1 / 2

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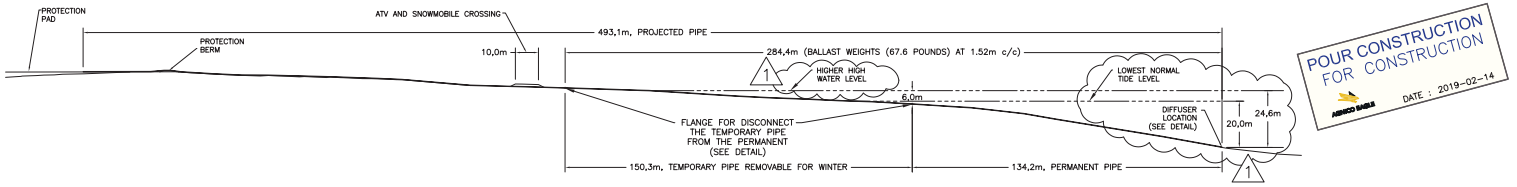

POUR CONSTRUCTION
FOR CONSTRUCTION
AGNICO EAGLE
DATE : 2019-02-14

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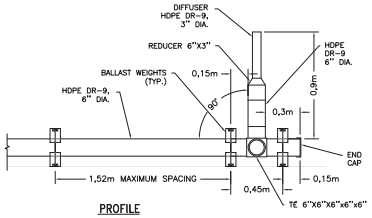

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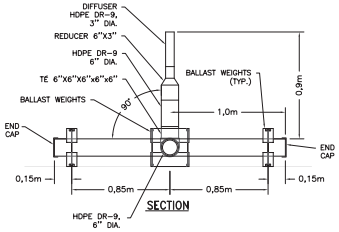

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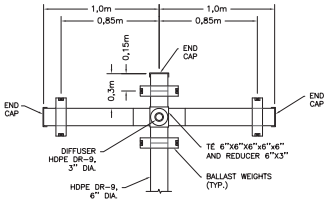

PLAN VIEW

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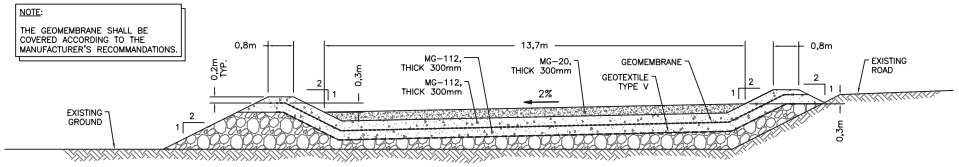

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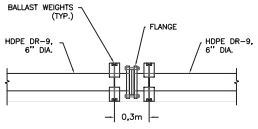

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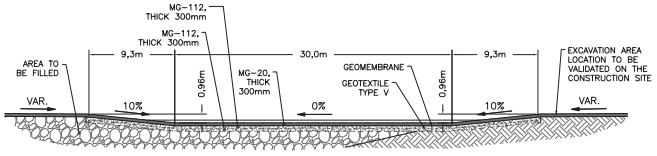

SECTION "B" – PAD
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NOTES:

1) FOR THE INSTALLATION, THE CONTRACTOR NEED TO REFER TO THE HANDBOOK OF PE PIPE CHAPTER 10, MARINE INSTALLATION. EACH SECTION OF PIPE MUST BE JOINT BY FUSION, EXCEPT FOR THE TEMPORATY PIPE REMOVABLE FOR WINTER THEY ARE CONNECTING TO THE PERMANENT PIPES WITH FLANGE FUSED AT EACH END BACK-UP RING.

2) POST-INSTALLATION SURVEY

UPON COMPLETION OF THE INSTALLATION OF A SUBMERGED PIPELINE, IT IS ADVISABLE TO HAVE THE COMPLETE LINE SURVEYED BY A COMPETENT DIVER TO ENSURE THAT:

- THE PIPELINE IS LOCATED WITHIN THE PRESCRIBED RIGHT-OF-WAY;
- THE BALLASTS HOLDING THE PIPELINE ARE ALL PROPERLY SITTING ON THE BOTTOM CONTOUR AND THAT THE LINE IS NOT FORCED TO BRIDGE ANY CHANGES IN ELEVATION;
- THE PIPE IS NOT RESTING ON ANY ROCKS, DEBRIS OR MATERIAL THAT COULD CAUSE DAMAGE;
- ANY AUXILIARY LINES, SUCH AS HOSES, ROPES, BUOYANCY BLOCKS OR ANY OTHER EQUIPMENT USED DURING THE INSTALLATION HAS BEEN REMOVED;
- WHERE REQUIRED, THE PIPE HAS BEEN BACKFILLED AND THE BACKFILLING WAS DONE PROPERLY;
- ALL OTHER INSTALLATION REQUIREMENTS ESTABLISED BY THE DESIGNER FOR THE SUBJECT APPLCATION HAVE BEEN COMPLIED WITH.

PLAN CLÉ
KEY PLAN

wsp
1075, 3e AVENUE E
VAL-D'OR (QUÉBEC) CANADA J9P 0M1
TEL.: +1 (819) 825-5411 TÉLÉC.: +1 (819) 825-5413 WWW.WSPGLOBAL.COM

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"	"
"	"
"	"

AGNICO EAGLE

REV.	DATE	DESCRIPTION	DWN/BY	APP.	CLIENT
1	2019-02-14	ISSUED FOR CONSTRUCTION	J.C.	S.D.	
0	2019-02-06	ISSUED FOR CONSTRUCTION	J.C.	S.D.	

REVISIONS

2019-02-14

TITRE / TITLE
AGNICO EAGLE – MELIADINE DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
230 – GENERAL EARTH WORKS
SALINE WATER STORAGE FACILITY
RANKIN INLET
DETAILS

DESSINÉ PAR / DRAWN BY	JULIE.CROTEAU, tech.	DATE 2018-12-12
VÉRIFIÉ PAR / CHECKED BY	YOUSSEF HESSANI, Ing.	2019-02-06
APPROUVÉ PAR / APPROVED BY	STEPHAN DUPUIS, P. Eng.	2019-02-14
ÉCHELLE / SCALE	INDICATED	DATE 2018-12-12

NO. DESSIN / DRAWING NO. 65-180-230-200-2

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
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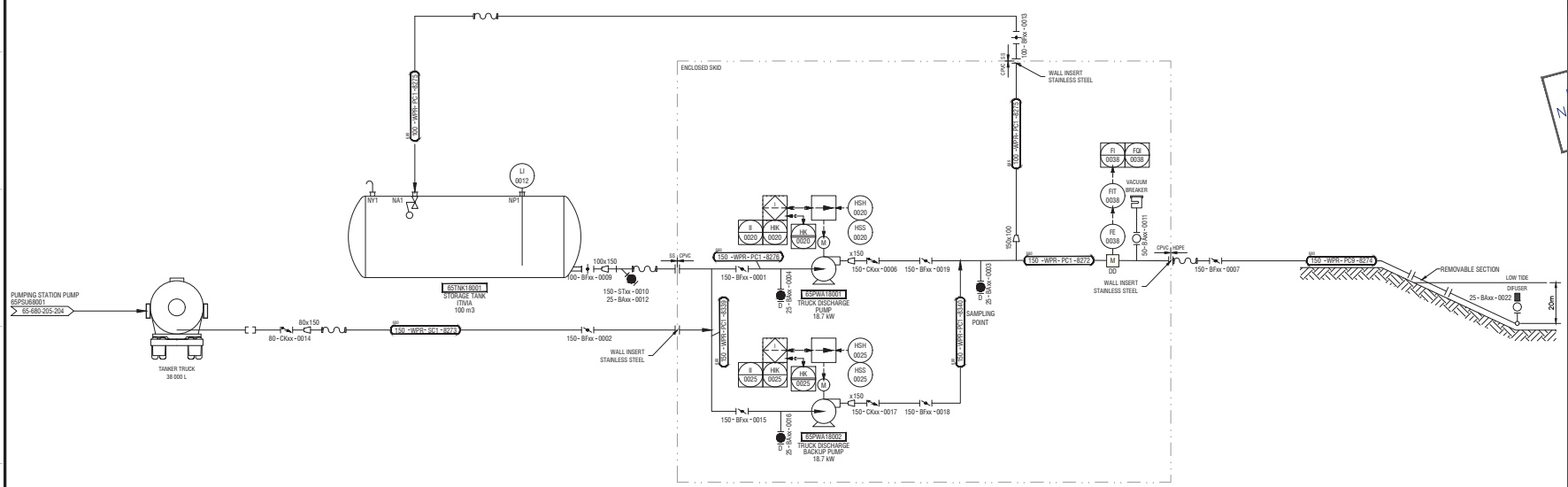

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PLAN CLÉ
KEY PLAN

NOTES GÉNÉRALES / GENERAL NOTES

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REVISIONS

08/02/2019

TYPE / TITLE
AGNICO EAGLE – MEADOWBANK DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
205 – PIPING & INSTRUMENTATION DIAGRAM
RANKIN INLET
ITIVIA

DESSINÉ PAR / DRAWN BY	JONATHAN LAVOIE	DATE 2019-01-17
VÉRIFIÉ PAR / CHECKED BY	SÉBASTIEN PERRON	2019-02-07
APPROUVÉ PAR / APPROVED BY	ÉRIC LAVOIE, P. Eng.	2019-02-07
ÉCHELLE / SCALE	NO SCALE	DATE 2019-01-23

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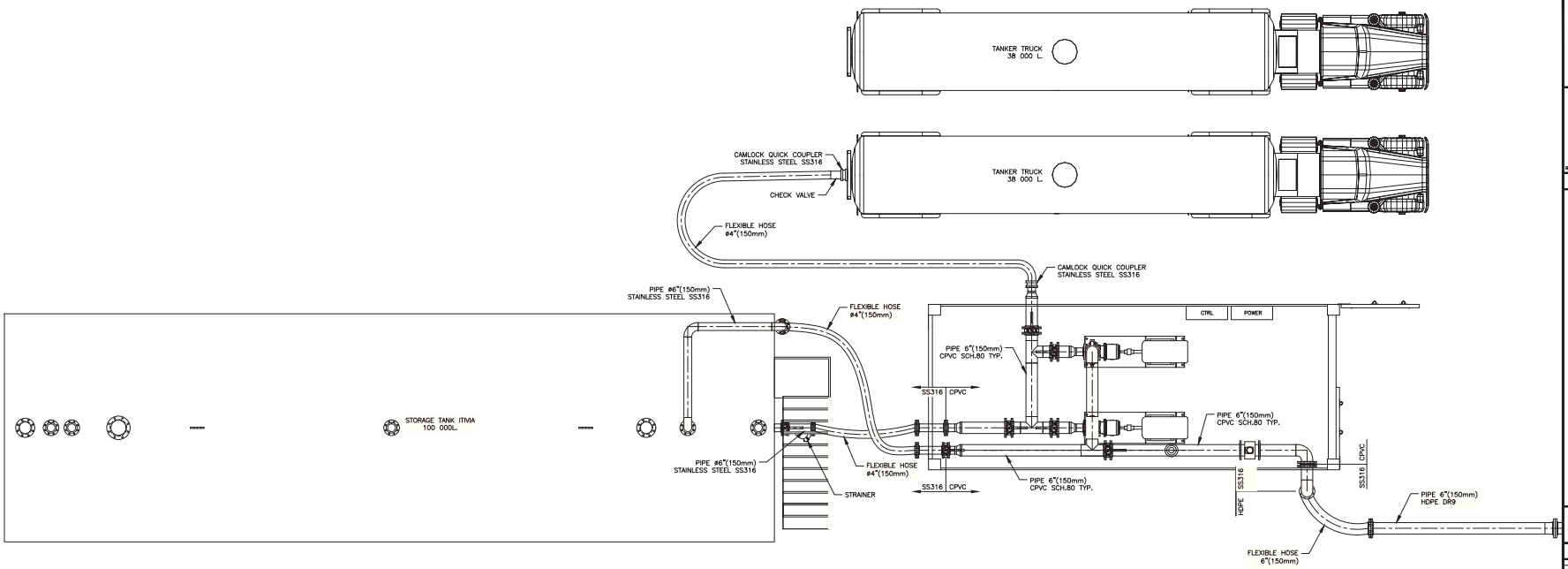

PLAN VIEW – SALINE EFFLUENT DISCHARGE SYSTEM
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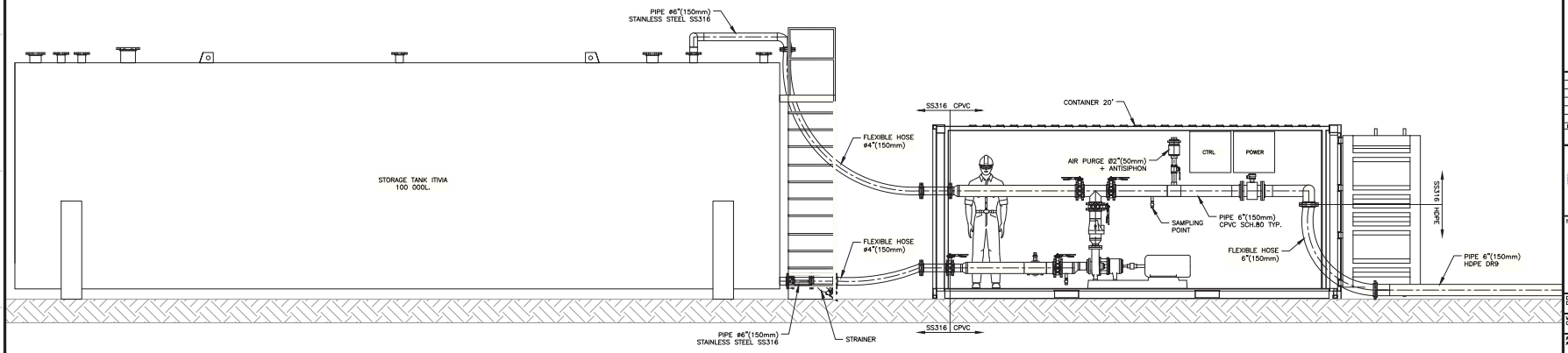

ELEVATION VIEW – SALINE EFFLUENT DISCHARGE SYSTEM
SCL: 1:30

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KEY PLAN

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0	2019-02-06	ISSUED FOR TENDER	C.G.	DJR	

REVISIONS

INGÉNIEUR - CONSEIL
Dominique Richard
30/04/2019
QUÉBEC

REGISTERED PROFESSIONAL ENGINEER
D. RICHARD
RTNU
LIMITED

TITRE / TITLE
AGNICO EAGLE – MELIADINE DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
210 – GENERAL ARRANGEMENT
RANKIN INLET
ITIVIA

DESSINÉ PAR / DRAWN BY	CLAUDIA GILBERT	DATE 2019-01-30
VERIFIÉ PAR / CHECKED BY	SYLVAIN DÉFOSSÉ	2019-02-05
APPROUVÉ PAR / APPROVED BY	DOMINIQUE RICHARD, Eng.	2019-02-05
ÉCHELLE / SCALE	INDICATED	DATE 2019-01-30

NO. DESSIN / DRAWING NO. 65-180-210-200

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
6515	0	1 / 1

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FILE NO. 65-180-210-200_R0.dwg

Appendix B: Pumping Station Functional Description

Functional Description

Saline Effluent Discharge at Sea

6528-680-132-REP-001 – Appendix 2

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2019-02-14	R0	Design Report	Sébastien Perron	Alain Corriveau	Éric Lavoie
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Accepted By**

Table of Contents

1. Document objective 1

2. Description 1

2.1 System description – Saline water truck unloading, storage and discharge at sea 1
2.2 Control description – Saline water truck unloading pump 1

1. Document objective

This document describes the programming of the control logic to be implemented for the control system of the discharging at sea of the treated saline effluent water coming from Meliadine site. The system will be installed close to the existing fuel deposit in Rankin Inlet, near the shore of Melvin Bay. The project is for Agnico Eagle's Meliadine mine.

2. Description

2.1 System description – Saline water truck unloading, storage and discharge at sea

Truck loaded with up to 50 000 liters of treated water ready to discharge at the sea will connect their load to a flexible pipe 150mm in diameter. Once connected, the operator will turn on the pump for about 15 to 30 minutes to transfer the water into a 100 000 liters storage tank or by changing the manual valves, directly to the diffuser in the sea. Overflow of the tank will be prevented by a float valve on the filling port. A mechanical level indicator will be installed on the tank. A flowmeter/totalizer will be installed on the sea discharge line in order to double check the volume of water discharged in sea.

The system will be powered by the existing electrical room at the fuel deposit.

2.2 Control description – Saline water truck unloading pump

Start/Emergency Stop button stations will be installed near the pumps.

Operator will open and close the valves in order to choose:

1. Main Pump or Back up Pump
2. Unload truck to tank, unload truck to sea or unload tank to sea

END OF SECTION

Appendix C: Sclairpipe Technical Specification

uponor

Sclairpipe®

VERSATILE HIGH DENSITY POLYETHYLENE PIPE



Sclairpipe

Sclairpipe® high density polyethylene (HDPE) pipe represents the latest advances in both material and manufacturing techniques. Since 1968, Sclairpipe has been proven in a wide range of municipal and industrial piping applications. It has been used extensively in the municipal market for gravity sewers, sewage forcemains, and pressure water systems. Uponor Infra has special expertise in marine installations of Sclairpipe, including river and lake crossings; and river, lake and deep ocean intakes and outfalls.

Lighter. Stronger. Chemical Resistant.

Sclairpipe is a tough, lightweight, solid wall pipe with a smooth internal surface. Available in various diameters from 4″ to 48″ it can handle internal pressures of up to 380 psi (PE 4710). It is a well suited alternative to copper, PVC, ductile iron and concrete pipe in a variety of applications.

Sclairpipe weighs approximately 1/10 that of a similar sized concrete pipe. Handling requires a minimum of heavy equipment and Sclairpipe can easily be assembled on ice or through wet marshy areas. It will not corrode, tuberculate or support biological growth, making it the material of choice in harsh environments. Sclairpipe is inert to salt water and to chemicals likely to be present in sanitary sewage effluent.

Sclairpipe has a smooth ID and maintains its flow capability over time - Hazen Williams C Factor remains 150, even after years of use.

Easier to Transport and Install. Leak Proof.

Sclairpipe is much easier to handle and install than heavier, rigid concrete pipe, offering potential cost savings during the construction process. It is structurally designed to withstand impact, especially in cold weather installations when other pipes are prone to cracks and breaks. Sclairpipe will float even when full of water. For marine applications long lengths of pipe can be assembled on shore and then floated into position.





Thermal butt fusion provides an economical and fast method of delivering a complete, long, continuous length of pipe. Thermal fusion eliminates potential leak points every 8-20 feet commonly found with gasketed (or bell or spigot) pipe materials. The fused joints provide a continuous leak proof system that eliminates the risk of joint leakage due to ground shifting. Fused joints are fully restrained and as such may reduce or eliminate the need for expensive thrust blocks. With Sclairpipe infiltration and exfiltration problems are eliminated.

Sclairpipe Advantages

- Leak Proof
- Corrosion Resistant
- Chemical Resistant
- Long Life
- Fatigue Resistant
- Impact Resistant
- Lightweight
- Flexible
- UV Resistant
- Environmentally Friendly

Cost Effective. Permanent.

Sclairpipe offers distinct advantages. It can be cold bent to a radius as small as 25 times the pipe's nominal pipe diameter, and the installed bend radius can be as small as 50 times the nominal pipe diameter. Scalirpipe, installed on a radius, eliminates many of the fittings that would be required for directional changes when using other pipe materials. In addition, the flexibility of Sclairpipe allows it to adapt to uneven ground, unconsolidated river bottoms and excavated underwater trenches without the need for expensive foundations or minor degree elbows. It is well suited for dynamic soils and areas prone to earthquake.

Sclairpipe is cost effective in both the short and long term. The fact that it is lightweight makes it easier to transport and install. It is leak proof and fatigue resistant means there will be years of maintenance free use. The Plastics Pipe Institute estimates the service life for HDPE pipe to conservatively be 50-100 years.

Proven performance in a wide range of applications

Since its development in 1955, large diameter HDPE pipe has been successfully used in many installations worldwide. In North America, Sclairpipe high density polyethylene pipe was first introduced in 1968. Since then it has been installed for river, lake and salt water crossings, municipal and industrial fresh and salt water intakes and effluent outfalls. Sclairpipe has also been used extensively for pipeline repair and rehabilitation.



Some popular applications of Sclairpipe include:

- Potable Water Distribution
- Pressure Water Systems
- Sewage Systems
- Water Mains
- Sliplining
- Fire Mains
- Directional Drilling
- Trenchless Technologies
- Slurry Pipe
- Mining
- Marine Pipelines & Crossings
- Deep Water Intakes
- Deep Water Outfalls
- Irrigation Lines
- Biofilters
- Gas Gathering



Potable Water

Sclairpipe is used for both new water main installations and to rehabilitate deteriorated piping systems made from other materials. It can accept repetitive pressure surges that far exceed the static pressure rating of the pipe. Sclairpipe is easy to handle and is available in long lengths that cut down on jointing time. Thermal fusion on site reduces installation time and ensures leakproof joints that eliminate infiltration and exfiltration problems. Sclairpipe is well suited for dynamic soils and areas prone to earthquake.



Sewage Systems

After more than 35 years of use in municipal and industrial sewer applications, Sclairpipe has proven to be a reliable, cost effective, long-term solution for sewer and wastewater systems. It offers resistance to corrosion and chemicals with durability and strength that rigid concrete, PVC or ductile iron pipes can't duplicate. Lightweight Sclairpipe is easy-to-install, extremely flexible and does not corrode or tuberculate over time.



Industry

Long-term reliable piping solutions are always in demand by industry. Sclairpipe offers resistance to corrosion, abrasion and chemicals resulting in a durable, strong and cost-effective installation.



Mining



Sclairpipe solid wall HDPE pipe is commonly used in mining applications for tailings disposal and water management including: river water diversion, reclamation lines, culvert, sewer and sub-drainage systems and slurry pipe. It is lightweight, flexible, durable and abrasion resistant. It is virtually leak proof, and can withstand corrosive chemicals, acids or salts commonly found in mines. Sclairpipe combines strength and durability in above ground applications and is UV resistant.

Irrigation



Sclairpipe is a cost effective solution for irrigation and agricultural drainage applications such as river and canal diversion, agricultural irrigation systems and pipelines, and water conservation. It is lightweight, flexible and leak proof, resistant to corrosion and salt water, and joints can be heat-fused on site for ease of installation. A Sclairpipe irrigation system will withstand the test of time.

Heating & Cooling



Sclairpipe has proven to be a strong, leak proof and chemically inert solution for district cooling applications including dual-purpose projects providing cooling and potable water. It can be assembled on shore in a continuous flexible length, floated on the water's surface and then sunk by a controlled process. The pipe can also be manufactured in specific lengths and connected on site by flanges with the aid of marine divers. Sclairpipe's resistance to both corrosion and zebra mussel fouling makes it an ideal solution.

Choose the size that's right for you

Sclairpipe is available in standard Dimensional Ratio's (DR's), in sizes ranging from 4" to 48" in diameter. Sclairpipe is available in PE 3608 and PE 4710. With the higher allowable stress rating of PE 4710, the pipe wall can be thinner for the same pressure rating (higher DR).

The Dimensional Ratio relates the minimum wall thickness of the pipe to its outside diameter, and is important to define the pressure rating of a particular pipe. The maximum continuous operating pressure stated is based on the allowable hydrostatic design stress of each specific material (per ASTM D3350 and PPI's TR-3), and the pipe wall thickness (DR), at a service temperature of 73.4°F.

Uponor, Sclairpipe Product Range, IPS Size, PE3608

	PE3608			DR32.5 (50 psi)			DR26 (64 psi)			DR21 (80 psi)		
Nominal Pipe Size	Minimum Outside Diameter *(inches)*	Maximum Outside Diameter *(inches)*	Average Outside Diameter *(inches)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
4	4.48	4.52	4.50	4.21	0.138	0.83	4.13	0.173	1.03	4.05	0.214	1.26
5	5.54	5.59	5.56	5.20	0.171	1.27	5.11	0.214	1.57	5.00	0.265	1.93
6	6.60	6.65	6.63	6.19	0.204	1.80	6.08	0.255	2.23	5.96	0.315	2.73
7	7.09	7.16	7.13	6.66	0.219	2.08	6.54	0.274	2.58	6.41	0.339	3.16
8	8.59	8.66	8.63	8.06	0.265	3.05	7.92	0.332	3.78	7.75	0.411	4.63
10	10.70	10.80	10.75	10.05	0.331	4.74	9.87	0.413	5.87	9.66	0.512	7.19
12	12.69	12.81	12.75	11.92	0.392	6.66	11.71	0.490	8.26	11.46	0.607	10.12
13	13.31	13.44	13.38	12.50	0.412	7.33	12.28	0.514	9.09	12.02	0.637	11.14
14	13.94	14.06	14.00	13.09	0.431	8.03	12.86	0.538	9.95	12.59	0.667	12.20
16	15.93	16.07	16.00	14.96	0.492	10.49	14.70	0.615	13.00	14.38	0.762	15.94
18	17.92	18.08	18.00	16.83	0.554	13.28	16.53	0.692	16.46	16.18	0.857	20.17
20	19.91	20.09	20.00	18.70	0.615	16.39	18.37	0.769	20.32	17.98	0.952	24.90
22	21.90	22.10	22.00	20.56	0.677	19.83	20.21	0.846	24.58	19.78	1.048	30.13
24	23.89	24.11	24.00	22.43	0.738	23.60	22.04	0.923	29.25	21.58	1.143	35.85
26	25.88	26.12	26.00	24.30	0.800	27.70	23.88	1.000	34.33	23.38	1.238	42.08
28	27.87	28.13	28.00	26.17	0.862	32.13	25.72	1.077	39.82	25.17	1.333	48.80
30	29.87	30.14	30.00	28.04	0.923	36.88	27.55	1.154	45.71	26.97	1.429	56.02
32	31.86	32.14	32.00	29.91	0.985	41.96	29.39	1.231	52.01	28.77	1.524	63.74
36	35.84	36.16	36.00	33.65	1.108	53.11	33.06	1.385	65.82	32.37	1.714	80.67
40	39.82	40.18	40.00	37.39	1.231	65.56	36.74	1.538	81.26	35.96	1.905	99.59
42	41.81	42.19	42.00	39.26	1.292	72.28	38.58	1.615	89.59	37.76	2.000	109.80
48	47.78	48.22	48.00	44.87	1.477	94.41	44.09	1.846	117.02	43.15	2.286	143.42

Pipe dimensions are in accordance with ASTM F714 and AWWA C906
Pressure Ratings are for water at 73.4 deg F.
Some of the pipe sizes and DR's above are available only on request. Check with your representative for availability.
Other dimensions and DR's not listed may be available upon special request.
All dimensions are in inches unless otherwise noted.
Weights are calculated by the methodology established in PPI's TR-7 and are applicable to PE 3608.

The standard stocked length of Sclairpipe pipe is 50 feet, in sizes above 4″ in diameter with longer lengths available on request.

Please visit our web site (www.uponor.ca) and use our online design tools to determine the pipe size best suited to your specific application.

DR17 (100 psi)			DR13.5 (128 psi)			DR11 (160 psi)			DR9 (200 psi)			DR7.3 (254 psi)		
Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
3.94	0.265	1.54	3.79	0.333	1.90	3.63	0.409	2.29	3.44	0.500	2.73	3.19	0.616	3.26
4.87	0.327	2.35	4.69	0.412	2.91	4.49	0.506	3.50	4.25	0.618	4.18	3.95	0.762	4.99
5.80	0.390	3.33	5.58	0.491	4.12	5.35	0.602	4.96	5.06	0.736	5.92	4.70	0.908	7.08
6.24	0.419	3.85	6.01	0.528	4.77	5.75	0.648	5.74	5.45	0.792	6.85	5.06	0.976	8.18
7.55	0.507	5.65	7.27	0.639	6.99	6.96	0.784	8.41	6.59	0.958	10.04	6.12	1.182	11.99
9.41	0.632	8.77	9.06	0.796	10.86	8.68	0.977	13.07	8.22	1.194	15.59	7.63	1.473	18.63
11.16	0.750	12.34	10.75	0.944	15.28	10.29	1.159	18.38	9.75	1.417	21.94	9.05	1.747	26.21
11.71	0.787	13.58	11.27	0.991	16.81	10.80	1.216	20.23	10.22	1.486	24.14	9.49	1.832	28.84
12.25	0.824	14.88	11.80	1.037	18.42	11.30	1.273	22.17	10.70	1.556	26.45	9.93	1.918	31.60
14.00	0.941	19.44	13.49	1.185	24.06	12.92	1.455	28.95	12.23	1.778	34.55	11.35	2.192	41.27
15.76	1.059	24.60	15.17	1.333	30.45	14.53	1.636	36.64	13.76	2.000	43.72	12.77	2.466	52.23
17.51	1.176	30.37	16.86	1.481	37.59	16.15	1.818	45.24	15.29	2.222	53.98	14.19	2.740	64.48
19.26	1.294	36.75	18.55	1.630	45.48	17.76	2.000	54.74	16.82	2.444	65.31	15.61	3.014	78.02
21.01	1.412	43.74	20.23	1.778	54.13	19.37	2.182	65.14	18.35	2.667	77.73	17.03	3.288	92.85
22.76	1.529	51.33	21.92	1.926	63.52	20.99	2.364	76.45	19.88	2.889	91.22	18.45	3.562	108.97
24.51	1.647	59.53	23.60	2.074	73.67	22.60	2.545	88.66	21.40	3.111	105.80	19.87	3.836	126.38
26.26	1.765	68.34	25.29	2.222	84.57	24.22	2.727	101.78	22.93	3.333	121.45			
28.01	1.882	77.75	26.97	2.370	96.22	25.83	2.909	115.80	24.46	3.556	138.19			
31.51	2.118	98.41	30.35	2.667	121.78	29.06	3.273	146.57						
35.01	2.353	121.49	33.72	2.963	150.35	32.29	3.636	180.95						
36.76	2.471	133.94	35.40	3.111	165.76	33.91	3.818	199.49						
42.01	2.824	174.94	40.46	3.556	216.50									

Sclair IPS Cut Sheet_PE3608_r201407

- All dimensions are in inches unless otherwise specified.
- Pressure ratings are based on load durations of 50 years at a service temperature of 73.4F. The HDS (pipe wall allowable stress) for PE 3608 and PE 4710 are 800 psi and 1,000 psi respectively.
- Dimensions and tolerances per ASTM F714. Pipe weights calculated using PPI TR-7 using PE3608 density of 0.953 gm/cc and 0.958 gm/cc for PE4710 materials.
- The ASTM D3350 cell classifications conform to the requirements of the applicable pipe specification (ASTM F714, AWWA C906, etc.).
- Contact Uponor Infra for sizes, DR's and DIPS offering not shown.

Uponor, Sclairpipe Product Range, IPS Size, PE4710												
	PE4710			DR32.5 (64 psi)			DR26 (80 psi)			DR21 (100 psi)		
Nominal Pipe Size	Minimum Outside Diameter *(inches)*	Maximum Outside Diameter *(inches)*	Average Outside Diameter *(inches)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
4	4.48	4.52	4.50	4.21	0.138	0.840	4.13	0.173	1.030	4.05	0.214	1.27
5	5.54	5.59	5.56	5.20	0.171	1.280	5.11	0.214	1.580	5.00	0.265	1.94
6	6.60	6.65	6.63	6.19	0.204	1.81	6.08	0.255	2.24	5.96	0.315	2.75
7	7.09	7.16	7.13	6.66	0.219	2.09	6.54	0.274	2.59	6.41	0.339	3.18
8	8.59	8.66	8.63	8.06	0.265	3.07	7.92	0.332	3.80	7.75	0.411	4.66
10	10.70	10.80	10.75	10.05	0.331	4.77	9.87	0.413	5.91	9.66	0.512	7.24
12	12.69	12.81	12.75	11.92	0.392	6.70	11.71	0.490	8.31	11.46	0.607	10.18
13	13.31	13.44	13.38	12.50	0.412	7.38	12.28	0.514	9.14	12.02	0.637	11.21
14	13.94	14.06	14.00	13.09	0.431	8.08	12.86	0.538	10.02	12.59	0.667	12.28
16	15.93	16.07	16.00	14.96	0.492	10.56	14.70	0.615	13.08	14.38	0.762	16.04
18	17.92	18.08	18.00	16.83	0.554	13.36	16.53	0.692	16.56	16.18	0.857	20.29
20	19.91	20.09	20.00	18.70	0.615	16.49	18.37	0.769	20.44	17.98	0.952	25.06
22	21.90	22.10	22.00	20.56	0.677	19.96	20.21	0.846	24.74	19.78	1.048	30.32
24	23.89	24.11	24.00	22.43	0.738	23.75	22.04	0.923	29.44	21.58	1.143	36.08
26	25.88	26.12	26.00	24.30	0.800	27.87	23.88	1.000	34.55	23.38	1.238	42.34
28	27.87	28.13	28.00	26.17	0.862	32.33	25.72	1.077	40.07	25.17	1.333	49.11
30	29.87	30.14	30.00	28.04	0.923	37.11	27.55	1.154	46.00	26.97	1.429	56.37
32	31.86	32.14	32.00	29.91	0.985	42.22	29.39	1.231	52.34	28.77	1.524	64.14
36	35.84	36.16	36.00	33.65	1.108	53.44	33.06	1.385	66.24	32.37	1.714	81.18
40	39.82	40.18	40.00	37.39	1.231	65.98	36.74	1.538	81.77	35.96	1.905	100.22
42	41.81	42.19	42.00	39.26	1.292	72.74	38.58	1.615	90.16	37.76	2.000	110.49
48	47.78	48.22	48.00	44.87	1.477	95.01	44.09	1.846	117.76	43.15	2.286	144.32

Pipe dimensions are in accordance with ASTM F714 and AWWA C906
Pressure Ratings are for water at 73.4 deg F.
Some of the pipe sizes and DR's above are available only on request. Check with your representative for availability.
Other dimensions and DR's not listed may be available upon special request.
All dimensions are in inches unless otherwise noted.
Weights are calculated by the methodology established in PPI's TR-7 and are applicable to PE4710

Product innovation and quality assurance

For 50 years Uponor Infra has been a leader in the design, development, manufacture and support of polyethylene piping systems. Uponor Infra's experienced engineers can offer design and engineering assistance, assuring you of a dependable piping system designed to meet your needs. Visit our website (www.uponor.ca) and see how our innovative online calculator can assist you. Extensive R&D in the early 1960's led us to produce 16" diameter polyethylene pipe at a time when many considered large diameter polyethylene pipes a technical impossibility. Today Uponor Infra produces solid wall Sclairpipe in sizes up to 48".

All Uponor Infra products are manufactured from special, high strength resins with complete quality control maintained from raw material to finished pipe product. Uponor Infra was the first North American manufacturer of polyethylene pipe and fittings to have its Quality Management System registered to the ISO 9001:2008 level.

Our strict manufacturing specifications are verified daily, using precise dimensional controls and accelerated long term hydrostatic testing. A continuous quality control process assures you of long-term pipe performance. We certify that the pipe resin used to extrude Sclairpipe has a minimum cell classification of PE 345464C or PE445474C respectively, when classified in accordance with ASTM D3350. Sclairpipe's material classification is based on PPI's (Plastic Pipe Institute) method of determining and validating the Long-Term Hydrostatic Stress (LTHS) of polyethylene pipe.

DR17 (125 psi)			DR13.5 (160 psi)			DR11 (200 psi)			DR9 (250 psi)			DR7.3 (317 psi)		
Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
3.94	0.265	1.55	3.79	0.333	1.91	3.63	0.409	2.30	3.44	0.500	2.75	3.19	0.616	3.28
4.87	0.327	2.36	4.69	0.412	2.93	4.49	0.506	3.52	4.25	0.618	4.20	3.95	0.762	5.02
5.80	0.390	3.35	5.58	0.491	4.15	5.35	0.602	4.99	5.06	0.736	5.96	4.70	0.908	7.12
6.24	0.419	3.88	6.01	0.528	4.80	5.75	0.648	5.78	5.45	0.792	6.89	5.06	0.976	8.23
7.55	0.507	5.68	7.27	0.639	7.03	6.96	0.784	8.47	6.59	0.958	10.10	6.12	1.182	12.07
9.41	0.632	8.83	9.06	0.796	10.93	8.68	0.977	13.15	8.22	1.194	15.69	7.63	1.473	18.75
11.16	0.750	12.42	10.75	0.944	15.37	10.29	1.159	18.50	9.75	1.417	22.08	9.05	1.747	26.37
11.71	0.787	13.67	11.27	0.991	16.92	10.80	1.216	20.36	10.22	1.486	24.29	9.49	1.832	29.02
12.25	0.824	14.98	11.80	1.037	18.53	11.30	1.273	22.31	10.70	1.556	26.62	9.93	1.918	31.79
14.00	0.941	19.56	13.49	1.185	24.21	12.92	1.455	29.13	12.23	1.778	34.76	11.35	2.192	41.53
15.76	1.059	24.76	15.17	1.333	30.64	14.53	1.636	36.87	13.76	2.000	44.00	12.77	2.466	52.56
17.51	1.176	30.56	16.86	1.481	37.82	16.15	1.818	45.52	15.29	2.222	54.32	14.19	2.740	64.89
19.26	1.294	36.98	18.55	1.630	45.77	17.76	2.000	55.08	16.82	2.444	65.72	15.61	3.014	78.51
21.01	1.412	44.01	20.23	1.778	54.47	19.37	2.182	65.55	18.35	2.667	78.22	17.03	3.288	93.44
22.76	1.529	51.65	21.92	1.926	63.92	20.99	2.364	76.93	19.88	2.889	91.80			
24.51	1.647	59.90	23.60	2.074	74.13	22.60	2.545	89.22	21.40	3.111	106.46			
26.26	1.765	68.77	25.29	2.222	85.10	24.22	2.727	102.42	22.93	3.333	122.22			
28.01	1.882	78.24	26.97	2.370	96.83	25.83	2.909	116.53						
31.51	2.118	99.02	30.35	2.667	122.55	29.06	3.273	147.49						
35.01	2.353	122.25	33.72	2.963	151.29									
36.76	2.471	134.78	35.40	3.111	166.80									
42.01	2.824	176.04												

Uponor_Sclair_IPS_PE4710_r201407

Innovative joining methods and equipment

Sclairpipe piping systems can be assembled by heat fusion (butt, electrofusion, socket and saddle fusion), flanged connections, compression couplings and various mechanical couplings. The superior performance of Sclairpipe results from the combination of pipe and fittings designed to work together as a complete system. A full range of pressure rated fittings is available to suit any application.

The most popular method of joining Sclairpipe is thermal butt fusion. This fast and economical technique permits the quick assembly of long continuous lengths and the joining of fittings to the pipe. The fused joints are as reliable and strong as the pipe itself, fully restrained, providing continuous leak proof systems.

Ordering & shipping information

Uponor Infra welcomes your inquiries for non-standard sizes, lengths and pressure ratings of Sclairpipe pipe.

We can meet most special packaging requirements and provide custom pipe fittings. Please contact your local Uponor Infra representative or visit our web site.

The charts below outline standard shipment sizes for straight length and coiled pipe.



Standard Shipments - Straight Lengths

IPS PIPE				
PIPE SIZE	AVG OD	BUNDLE QTY	TRUCK LOAD QTY	CONTAINER QTY
4"	4.50	38	380	480
5"	5.563	23	276	320
6"	6.625	20	200	208
7"	7.125	17	136	180
8"	8.625	14	112	120
10"	10.750	11	66	80
12"	12.750	4	56	52
13"	13.375	42		48
14"	14.000	42		42
16"	16.000	30		30
18"	18.000	25		25
20"	20.000	20		20
22"	22.000	16		16
24"	24.000	16		14
26"	26.000	9		9
28"	28.000	9		9
30"	30.000	9		9
800mm	31.594	9		9
32"	32.000	9*		8
36"	36.000	4		6
1000mm	39.469	4		4
42"	42.000	4		4
1200mm	47.382	4		3
48"	48.000	4*		3

Notes:
* Bunks required
** Drop deck trailer - maximum 42' length
Pipe lengths range from 40 to 50 feet in size



Sclairpipe general specifications & material standards

Pipe and Fittings

REFERENCE SPECIFICATIONS

ASTM F714: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR). Based on outside diameter.
CSA B137.1: Polyethylene Pipe, Tubing and Fittings for Cold Water Pressure Services.
ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
AWWA C901: Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. Through 3 in. for Water Service.
ASTM D3035: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR). Based on Controlled Outside Diameter
ISO 9001:2008: Model for Quality Assurance in Production and Installation.
AWWA C906: Standard for Polyethylene (PE) Pressure Pipe and Fittings 4 in. Through 63 in., for Water Distribution.NSF 14, 61

MATERIAL

The pipe shall be made from polyethylene resin compound with a minimum cell classification of PE 345464C for PE 3608 materials and PE445474C for PE 4710 materials in accordance with ASTM D3350. This material shall have a Long Term Hydrostatic Strength of 1600 psi when tested and analyzed by ASTM D2837, and shall be a Plastic Pipe Institute (PPI) TR4 listed compound. The raw materialshall contain a minimum of 2%, well dispersed, carbon black. Additives, which can be conclusively proven not to be detrimental to the pipe may also be used, provided that the pipe produced meets the requirements of this standard. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification and from the same raw material supplier. Compliance with the requirements of this paragraph shall be certified in writing by the pipe supplier, upon request. Manufacturer's Quality System shall be certified by an appropriate independent body to meet the requirements of the ISO 9001:2008 Quality Management Program.

PIPE DESIGN

The pipe shall be designed in accordance with the relationships of the ISO-modified formula (see ASTM F714).

$$P = \frac{2S}{(D°/t) - 1}$$

where, S = Hydrostatic Design Stress (psi)
P = Design Pressure Rating (psi)
D° = ODavg for IPS Pipe
ODmin for ISO Pipe
t = Minimum Wall Thickness
D°/t = Dimension Ratio

The design pressure rating P shall be derived using the formula above, expressed in pounds per square inch.
The Hydrostatic Design Stress for PE 3608 materials is 800 psi and for the PE4710 materials is 1000 psi.
The pipe dimensions shall be as specified in manufacturer's literature.

MARKING

The following shall be continuously printed on the pipe or spaced at intervals not exceeding 5 feet:
Name and/or trademark of the pipe manufacturer.
Nominal pipe size.
Dimension ratio.
The letters PE followed by the polyethylene grade per ASTM D3350, followed by the Hydrostatic Design stress in 100's of psi e.g. PE 3608.
Manufacturing Standard Reference e.g. ASTM F 714
A production code from which the date and place of manufacture can be determined.

JOINING METHODS

Whenever possible, polyethylene pipe should be joined by the method of thermal butt fusion as outlined in ASTM F2620, Standard Practice for Heat Fusion Joining of PE Pipe and Fittings. Butt fusion joining of pipe and fittings shall be performed in accordance with the procedures recommended by the manufacturer. The temperature of the heater plate should be between 400°F and 450°F. Follow the recommendations of ASTM F2620 regarding interfacial pressures for pipe wall thickness less than or equal to 1.5". Follow the manufacturer's recommendations regarding interfacial pressures for pipe walls thicker than 1.5".

Polyethylene pipe may be connected to fittings or other piping systems by means of a flanged assembly consisting of a polyethylene flange adapter or stub end, and a metal backup ring that has a bolting pattern meeting the dimensional requirements of Class 150, ANSI B16.1/B16.5 in sizes up through 24", and meeting Class 150 Series A, ANSI B16.47 or AWWA C207 Class B for larger sizes. Follow the manufacturer's recommendations regarding bolting techniques and the use of gaskets. Pipe or fittings may be joined by butt fusion only by technicians who have been trained and qualified in the use of the equipment.

GENERAL REQUIREMENTS

The pipe manufacturer shall provide, upon request, an outline of quality control procedures performed on polyethylene system components.

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Appendix D: Modelling Assessment of Groundwater Discharge into Melvin Bay Marine Environment, Rev B (Golder, 2019)

GOLDER

TECHNICAL MEMORANDUM

DATE February 1, 2019 **Project No.** Doc718_1773384 _Rev0

TO Manon Turmel
Agnico Eagle Mines Ltd.

CC Ryan Vanengen, Carolina Leseigneur Torres

FROM Shouhong Wu and Bruce Dean, Golder Associates Ltd. **EMAIL bruce_dean@golder.com**

MODELLING ASSESSMENT OF GROUNDWATER DISCHARGE INTO THE MELVIN BAY MARINE ENVIRONMENT, REV B

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Agnico Eagle Mines Limited (Agnico Eagle) to undertake a modelling assessment of groundwater discharge into the marine environment near Rankin Inlet. This modelling assessment consisted of nearshore oceanographic modelling of the discharge. The study did not include geotechnical, structural or hydraulic engineering assessments of the outfall. This technical memorandum was updated to account for an additional modelling scenario and updated baseline data collected by Golder from Melvin Bay in September 2018 as well as to account for increased discharge velocity resulting from a change to the diffuser port size. This memorandum should be read in conjunction with "Important Information and Limitations of this Report".

1.1 Scope of Work

The objective of this work is to assess the near field mixing of the treated groundwater effluent disposal with respect to relevant environmental guidelines. The scope of the work includes:

- Near field modelling of dispersion of treated groundwater effluent plume using CORMIX (Doneker and Jirka 2007).
- Assess the plume dilution behavior.

For the purpose of this scope of this work, it is assumed that the discharges will consists of only pumped water at quantities and qualities per the estimated underground inflow volumes (Golder 2016) and estimated groundwater inputs to surface storage for management (Agnico Eagle 2017). Section 2.1 describes the modelling conditions.

1.2 Physical Setting

In September 2018, a field program was conducted by Golder in Melvin Bay. Field parameters measured included temperature, conductivity, pH, dissolved oxygen, salinity, and oxidation-reduction potential. The measurement depth ranged from 0.3 m to 26.7 m at three different locations in Melvin Bay (i.e., the exposure area and two new reference areas). The field measurement results are summarized in Appendix A. Nearshore bathymetry (Agnico Eagle 2017 data) and the approximate discharge location is shown in Figure 1, to the south of the Tank Farm at the Itivia Fuel Storage Facility. Based on the bathymetry of Melvin Bay at Itivia Harbour, the diffuser would be placed on the seabed at a depth of approximately 20 m, to ensure an unconstrained mixing zone and to avoid interference with use of Itivia Harbour by ships and boats at high and low tide.

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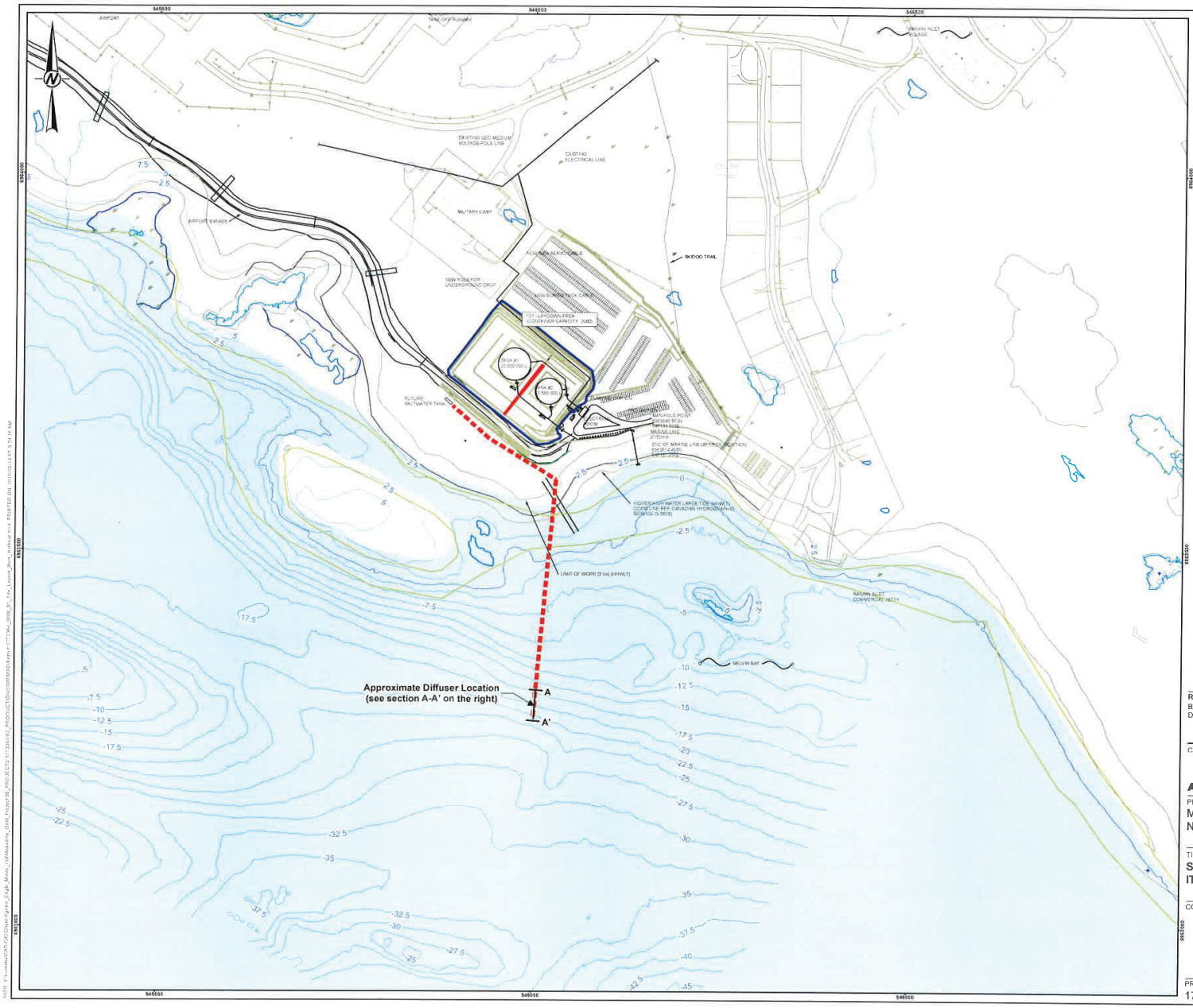
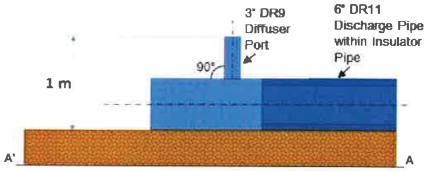


LEGEND

- GENERAL AREA FOR THE DIFFUSER LOCATION
- CROSS SECTION LOCATION
- WATERCOURSE
- WATERBODY
- REEF

End of Discharge Pipe – Diffuser Port Design (HDPE Pipe)



NOT FOR CONSTRUCTION

0 100 200
1:5,000 METRES

REFERENCE(S)
BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED

PROJECT
MELIADINE GOLD MINE
NUNAVUT

TITLE
SITE LAYOUT
ITIVIA HARBOUR SITE

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-14
DESIGNED	CLT
PREPARED	CDB/MH
REVIEWED	BD
APPROVED	MT

PROJECT NO	CONTROL	REV	FIGURE
1773384	9000	0	1

2.0 NEAR FIELD MODELLING

The Cornell Mixing Zone Expert System (CORMIX; Doneker and Jirka 2007) was applied to calculate numerical simulations of the near-field mixing and dilution behavior of treated groundwater effluent entering the nearshore coastal receiving environment in Melvin Bay. CORMIX is one of the most extensively applied models for predicting near-field discharge plume mixing and dilution of both conservative and non-conservative substances in surface water bodies. CORMIX calculates plume boundary interactions to estimate plume fate in terms of dilution and geometry relative to mixing zone regulations (Doneker and Jirka 2007). Nearshore ambient and treated groundwater effluent characteristics required to implement the mixing model are presented in the sections that follow.

2.1 Conditions for Modelling

2.1.1 Ambient Conditions

Assumptions made to characterize the ambient conditions of the receiving marine waters are as follows:

- Weak current: Ambient current velocity of 0.01 m/s and zero wind velocity were considered for this scenario which represented a slack tide condition during ice covered season.
- Mean current: Current speed of 0.2 m/s with no wind was used for this scenario.
- Open water condition: The water temperature and TDS (salinity) were considered to be 0°C (to account for the start and end of the open water season) and 33,300 mg/L, respectively.
- Water depth at discharge location is 20 m.

2.1.2 Discharge Conditions

Following discharge conditions based on estimated underground inflows were used for the near field mixing analysis:

- Flow rate of 800 m^3/d discharged over a 12 hour period (for an equivalent flow rate of 1,600 m^3/day), with TDS of 39,600 mg/L.
- Treated groundwater effluent temperature: 0°C.
- Outfall length: 230 m from the shoreline as shown.
- A single nozzle for discharge which has inside diameter of 68.07 mm (standard 3.0 inch port, DR9 (PE 4710), 252 psi) was used.
- Nozzle elevation from seabed: 1 m.
- Direction of discharge is perpendicular to the bathymetry contour and 90° vertical angle (upward port).

2.1.3 Modelling Scenarios

Table 1 lists the combination of effluent flow rate and ambient current speed in two simulation scenarios. Table 2 lists the CORMIX model input parameters. The target dilution at the edge of the near-field mixing zone is 11 as per analysis presented in Appendix B.

Table 1: Modelling Scenarios

Parameter	Scenario	
	1	2
Treated Groundwater Effluent Rate (m^3/d)[1]	1,600	1,600
Ambient Current Speed (m/s)	0.01	0.20
Discharge Velocity (m/s)	5.1	5.1

Note: 1. Daily flow rate is 800 m^3/day but this volume will be discharged over 12 hours for an equivalent flow rate of 1,600 m^3/day.

Table 2: CORMIX Model Input Parameters

Parameter	Value	Source
Depth at Discharge	20 m	Based on 2017 bathymetry survey completed by Agnico Eagle
Coastal Current (Velocity)	Low = 0.01 m/s Mean = 0.2 m/s	Based on CCG (2008) and assumed
Roughness Value	0.020	Assumed (equivalent to minimum roughness value of similar seabed). This value does not affect vertical jet results.
Wind Speed	0 m/s	Assumed
Water Condition	Saline, non-stratified	Based on Agnico Eagle (2014) and confirmed through Sep. 2018 sampling
Ambient water temperature	Open water season (start and end condition): 0°C	Conservative estimate to capture the start and end of the open water season for discharge
Effluent Flow Rate	1,600 m^3/d[1]	Per underground inflow and storage estimates (Agnico Eagle 2014; Golder 2016)
Effluent Temperature	0°C	Based on Diamond Drill Hole groundwater data (Agnico Eagle 2017)
Effluent Concentration	100%	Assumed
Discharge Type	Single Port	Assumed
Distance from Nearest Bank	230 m	Assumed
Horizontal Angle of Discharge	Perpendicular to bathymetric contour	Assumed
Vertical Angle of Discharge	90°	Assumed
Port Height above Seabed	1.0 m	Assumed
Port Diameter	0.0681 m	Assumed (3.0" port, DR 9, 252 psi)

Note: 1. Daily flow rate is 800 m^3/day but this volume will be discharged over 12 hours for an equivalent flow rate of 1,600 m^3/day.

3.0 RESULTS

Figures 2 and 3 present the near-field treated groundwater effluent plume dilution for a discharge of 800 m^3/day (an effective effluent rate of 1,600 m^3/d) in weak and mean ambient current conditions respectively, via the diffuser. For weak ambient current conditions, the maximum plume (centreline) height is 11.1 m from the seabed. For mean current conditions, the maximum plume (centreline) height is 5.6 m above the seabed. After reaching the maximum height, the negatively buoyant plumes settle towards the bottom as gravity starts to dominate over the initial jet momentum, and this is illustrated by the plume centrelines of Figures 2 and 3. For both scenarios, the plume centreline dilution factor reaches 11 within 1 m horizontal distance and 6 m vertical distance above the port. At

100 m distance from the diffuser, the dilution factors are 70 and 470 for scenarios 1 and 2 respectively, which are much higher than the required dilution of 11.

Figure 4 shows the changes in chloride concentration along the centrelines of the plumes, illustrating that at less than 5 m distance from the diffuser, the chloride concentration meets the required criteria. Figure 5 shows the changes in TDS concentration along the centrelines of the plumes, illustrating that at less than 1 m distance from the diffuser, the TDS concentration meets the required criteria.

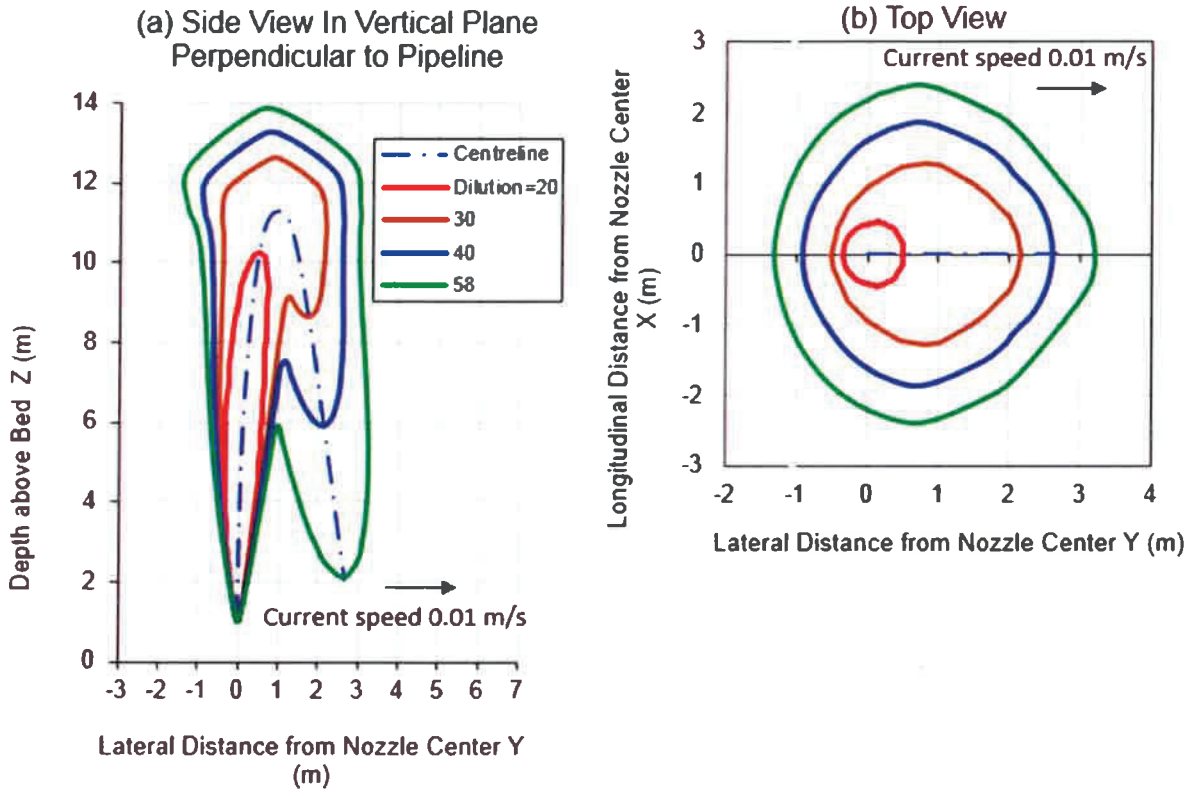


Figure 2: Dilution contours for a flow rate of 800 m^3/day (effective effluent flow rate of 1,600 m^3/d) in weak ambient current

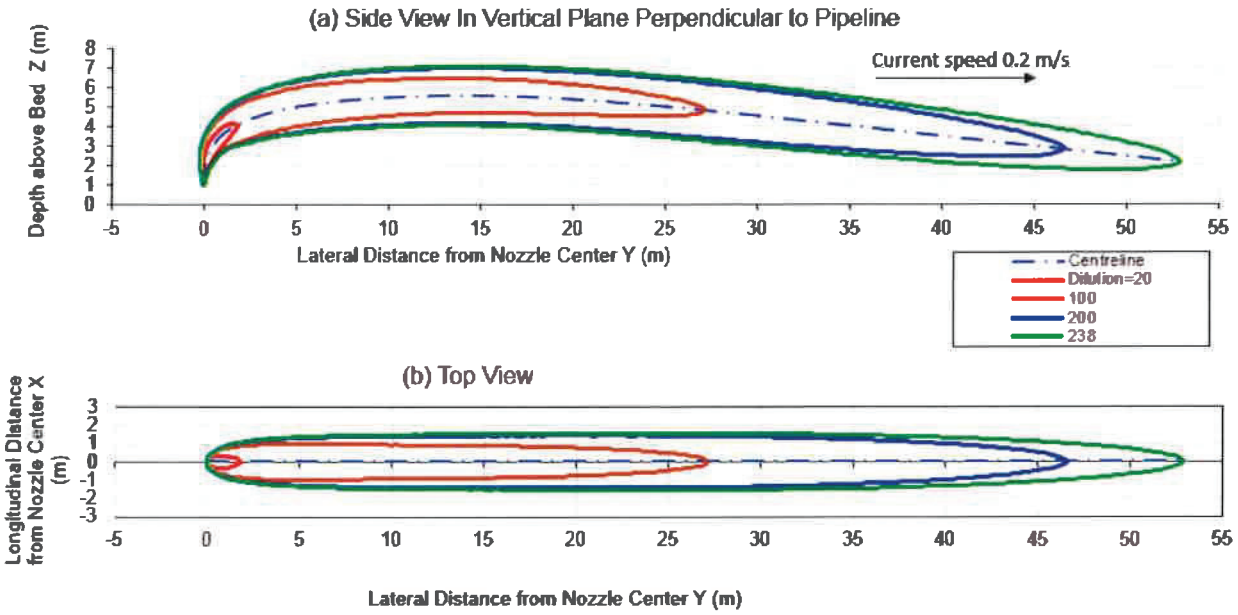


Figure 3: Dilution contours for a flow rate of 800 m³/day (effective effluent flow rate of 1,600 m³/d) in mean ambient current

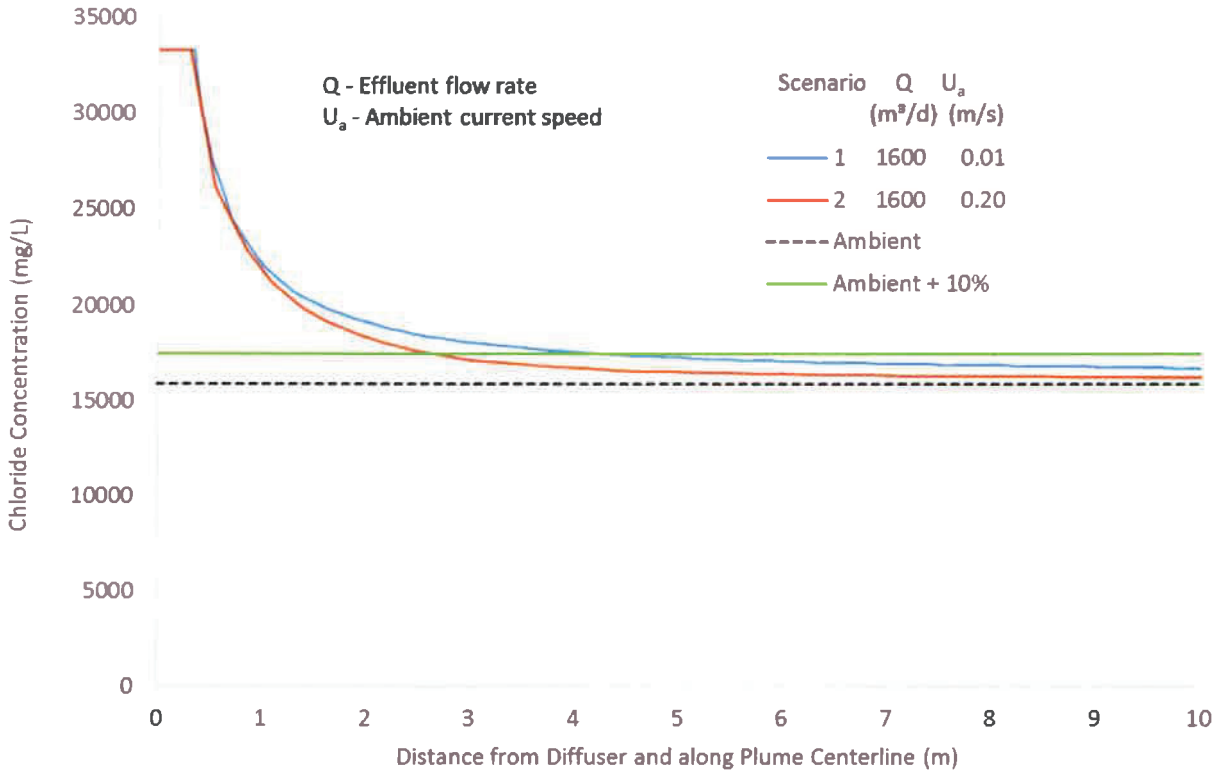


Figure 4: Chloride concentration along the plume centreline for both scenarios

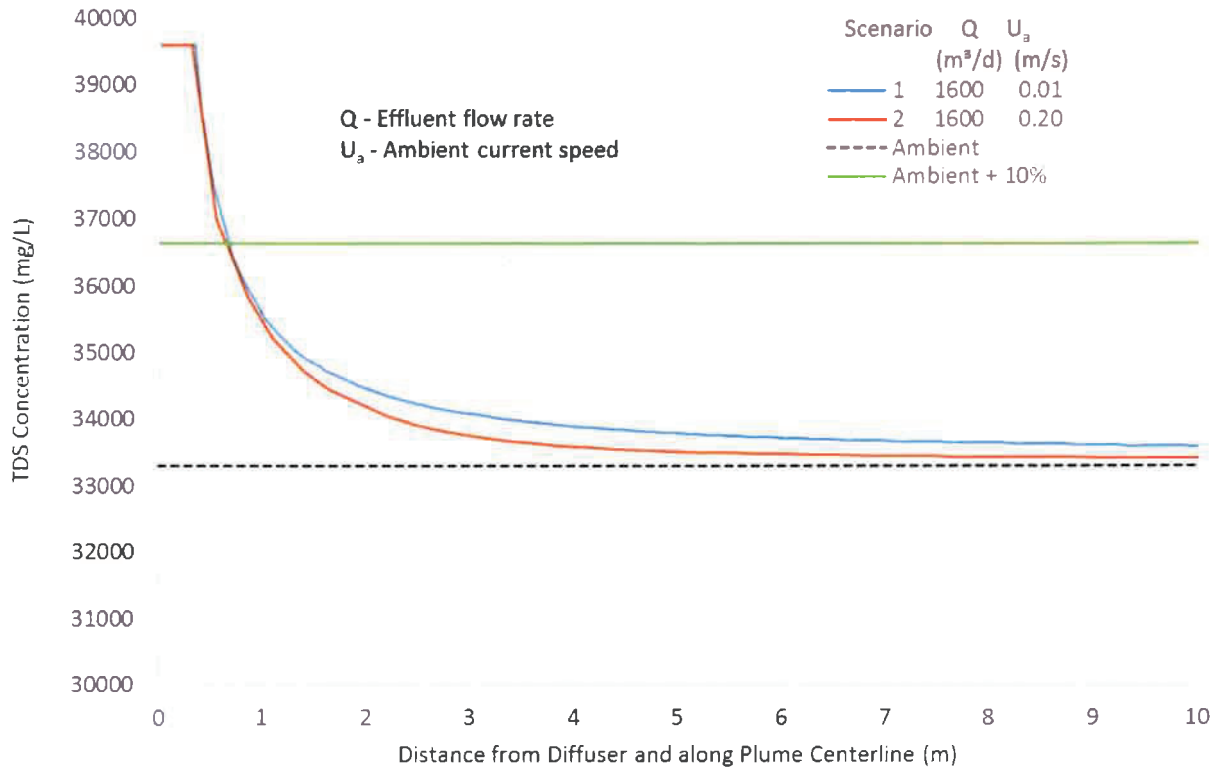


Figure 5: TDS concentration along the plume centreline for both scenarios

3.1 Temperature Sensitivity Analysis

For the simulated scenarios (800 m^3/day discharged over 12 hours for an effective flow rate of 1,600 m^3/day under weak and mean ambient current conditions), a sensitivity analysis simulation was conducted to review the effect of effluent and ambient temperature changes. The simulation conditions were otherwise identical to those for scenarios 1 and 2 except that the effluent temperature was increased to 20°C, and the ambient water temperature was increased to 8.5°C. The 20°C effluent temperature is understood to be the highest (though not expected) possible effluent temperature, as communicated by Agnico Eagle in November 2018. The 8.5°C was the water temperature measured in August 2011 at depth of 13 m below water surface (Stantec 2012).

The effluent temperature change results in effluent density change from 1031.85 kg/m^3 to 1028.30 kg/m^3, and the ambient water temperature change results in ambient water density change from 1026.76 kg/m^3 to 1025.89 kg/m^3. The temperature changes result in a slight change of the density difference between effluent and ambient water from 5.09 kg/m^3 to 2.41 kg/m^3. The plumes remain negatively buoyant with this temperature change, but not as strongly negative as under the original temperature assumptions for the ambient and effluent temperatures (both 0°C).

Table 3 summarizes the simulation results for sensitivity analysis on temperature change for the two scenarios. This table illustrates the following:

- The plumes rise to higher elevations than the plumes with the originally assumed temperature of 0°C due to reduced negative buoyancy.
- Similar to the original discharge plumes, the required dilution is met at less than 1 m distance from the diffuser.
- At an effective flow rate of 1,600 m³/day, the dilution factors at 100 m from the diffuser are increased due to accelerated plume mixing.

Table 3: Summary of simulation results for effluent temperatures of 20°C and ambient temperature of 8.5°C

Parameter	Scenario	
	1	2
Effluent flow rate (m³/d)[1]	1,600	1,600
Ambient current velocity (m/s)	0.01	0.2
Horizontal distance (m) from diffuser where required dilution of 11 is met	<1	<1
Maximum plume (centerline) height (m)	16.2	6.3
Dilution factor at 100 m from diffuser	163	563
Simulation results for originally assumed temperatures of 0°C		
Maximum plume (centerline) height (m)	11.1	5.6
Dilution factor at 100 m from diffuser	70	470

Note: 1. Daily flow rate is 800 m³/day but this volume will be discharged over 12 hours for an equivalent flow rate of 1,600 m³/day.

4.0 CONCLUSIONS

Mixing analysis was conducted for a diffuser designed for Melvin Bay, Rankin Inlet NWT. The simulation results show the following:

1) Dilution of the treated groundwater effluent plume is achieved within 5 m of the diffuser under the assumed conditions for the ambient and discharge conditions tested under assumed and increased temperatures.
2) After initial mixing, the plume migrates along the seabed under gravity and achieves further dilution and mixing with ambient water; concentrations within the 100 m regulatory mixing zone will thus meet discharge criteria per regulatory requirements and/or background concentrations for non-regulated parameters per the modelled conditions.
3) The results are valid for placement of the diffuser in Melvin Bay in water depths of at least 20 m.
4) Sensitivity analysis was performed for increased effluent and ambient temperatures. The required dilution of 11 is met within 1 m of the diffuser and dilution factors at 100 m from the diffuser were increased from the base case.

CLOSURE

Should you require any further information, please contact the undersigned.

Golder Associates Ltd.

Prepared by:

Reviewed By:

REGISTERED PROFESSIONAL ENGINEER
K. B. DEAN
LICENSEE
NT/NU
Feb 8/19

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SW/BD/vm/tt

https://golderassociates.sharepoint.com/sites/17491g/deliverables/diffuser memo/modelling assessment draft/doc718_1773384_modelling assessment of groundwater discharge_final.docx

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature
Date 8 Feb 2019
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

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IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

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Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

APPENDIX A

Field Measurements

Table A1: Results for September 2018 Measurements

Parameter	Minimum	Maximum	Average
pH (pH)	7.96	7.98	7.97
Salinity (psu)	29.7	30.5	30.0
TSS (mg/L)	<2	3.8	2.4
TDS (mg/L)	33,300	36,000	34,727
Hardness (as (CaCO3) (mg/L)	4,890	5,180	5,000
Conductivity (uS/cm)	45,400	46,500	45,782
Temperature (°C)	5.80	6.13	5.92
Chloride (mg/L)	15,900	17,400	16,655

Source: Golder (2018)

APPENDIX B

Environmental Guidelines

The intention of the treated groundwater effluent discharge objectives is to set the allowable effluent concentrations at the end-of-pipe and edge of a regulatory mixing zone. These allowable concentrations can then be used to design the diffuser to achieve the required dilution within the mixing zone. There is no specific definition for size of a mixing zone for discharges to Canadian coastal and estuarine waters. However, a radius of 100 m from the point of discharge is widely used for environmental compliance assessments. For example, the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories (NWT 1992) provide guidance that the limits of initial mixing zone are 100 m from all points of discharge. For the current study, a 100 m regulatory mixing zone was applied.

Final effluent quality included in the model and assessment was based on measured groundwater quality from the borehole samples (see Section 3.4.2, Table 3 of the FEIS Addendum) and constrained by various regulations and guidelines to achieve non-acutely lethal effluent that will meet chronic guidelines or background concentrations at the edge of the regulatory mixing zone. The regulations and guidelines considered included:

- The proposed Metal and Diamond Mining Effluent Regulations (MDMER; GC 2017).
- Acute water quality guidelines for protection of marine aquatic life (CCME 2003; BC MOE 2017a, b).
- Fisheries and Oceans Canada Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013).

Table B1: Meliadine Mine – Assumed Treated Groundwater Effluent Discharge Criteria

Parameter	Units	Discharge Criteria	
		Standard Based [1]	95 UCLM [2]
pH (pH units)	pH units	-	7.634
Alkalinity (as $CaCO_3$)	mg/L	-	71.35
Total Hardness (as $CaCO_3$)	mg/L	-	14101
Turbidity	NTU	-	90.54
Total Dissolved Solids (TDS)	mg/L	-	58,165
Total Suspended Solids (TSS)	mg/L	15	159.4
Aluminium	mg/L	-	1.832
Ammonia (as N)	mg/L	5.91	35.47
Antimony	mg/L	-	0.0047
Arsenic	mg/L	0.0125	0.0193
Barium	mg/L	-	0.299
Beryllium	mg/L	-	0.00165
Bicarbonate (as $CaCO_3$)	mg/L	-	69.09
Boron	mg/L	-	2.389
Total Organic Carbon (TOC)	mg/L	-	6.448
Dissolved Organic Carbon (DOC)	mg/L	-	5.69
Cadmium	mg/L	-	5.83E-04
Calcium	mg/L	-	2164
Chloride (dissolved)	mg/L	-	33274
Chromium	mg/L	-	<0.1[3]
Copper	mg/L	0.003	0.113

Table B1: Meliadine Mine – Assumed Treated Groundwater Effluent Discharge Criteria

Parameter	Units	Discharge Criteria	
		Standard Based (1)	95 UCLM (2)
Cyanide (free)	mg/L	0.001	0.0494
Iron	mg/L	-	13.37
Lead	mg/L	0.14	0.00369
Lithium	mg/L	-	3.33
Magnesium	mg/L	-	2129
Manganese	mg/L	-	1.076
Mercury	mg/L	-	4.01E-05
Molybdenum	mg/L	-	0.0181
Nickel	mg/L	0.5	0.0208
Nitrate (as N)	mg/L	1500	35.65
Nitrite (as N)	mg/L	-	2.156
Total Kjeldahl Nitrogen (TKN)	mg/L	-	55.4
Phosphorus	mg/L	-	0.069
Potassium	mg/L	-	514.2
Radium-226 (Ra 226)	Bq/L	0.37	2.498
Selenium	mg/L	-	0.0457
Silica (reactive)	mg/L	-	19.77
Silver	mg/L	0.003	8.10E-04
Sodium	mg/L	-	14784
Strontium	mg/L	-	65.21
Sulfate	mg/L	-	3160
Thallium	mg/L	-	3.57E-04
Tin	mg/L	-	<0.5(3)
Titanium	mg/L	-	0.187
Uranium	mg/L	-	0.00168
Vanadium	mg/L	-	<0.5(3)
Zinc	mg/L	0.055	0.133

Notes:
"<" Concentration is below the reported detection limit (RDL).
(1) End of pipe discharge criteria is based on the minimum of the following (refer to Tables 8 and 9 of the FEIS Addendum):
Amended Metal and Diamond Mining Effluent Regulations (MDMER; GC 2017) Schedule 4 Authorized Limits of Deleterious Substances - Maximum Authorized Monthly Mean Concentration.
Canadian Council of Ministers of the Environment (CCME 2003) Short-term Water Quality Guidelines (WQG) for the Protection of Aquatic Life - Marine.
British Columbia Ministry of Environment (BC MOE 2017a) Approved Water Quality Guidelines for Marine Aquatic Life (Short-Term).
BC MOE Working Water Quality Guidelines for Marine Aquatic Life (BC MOE 2017b).
(2) 95% Upper Confidence Level of the Mean (UCLM) of the August 2016 to September 2017 diamond drillhole groundwater data provided by Agnico Eagle. 95% UCLM calculated using the US EPA ProUCL Version 5.1 software. Agnico Eagle will monitor groundwater quality and criteria will be updated as necessary based on observed changes.
(3) A 95% UCLM could not be calculated due to low detection rates within the dataset. The maximum concentration has been used for conservative purposes.

In addition to the above and since chloride ions mainly constitute the salt content in the marine water and ultimately the treated groundwater effluent plume, chloride guidelines are used to assess the near-field mixing zone. No local or federal guideline was available for chloride discharges in the marine environment, and therefore, the guideline published by the BC MOE (2017a) was used for the analysis. The guideline states:

> *"Human activities should not cause the chloride of marine and estuarine waters to fluctuate by more than 10% of the natural chloride expected at that time and depth".*

This indicates that the chloride concentration at the mixing zone boundary should not exceed the ambient chloride concentration of 15,900 mg/L by 1,590 mg/L (10%). The behavior of the discharge in the marine environment is influenced by density. For the purposes of this assessment, it is assumed that treatment of the groundwater will be such as to achieve a TDS concentration of the treated groundwater effluent that is +/- 10% (in line with the BC MOE 2017a guideline) of the maximum TDS concentration of 36,000 mg/L measured in September 2018 at Melvin Bay. Therefore, the assumed effluent TDS concentration will be up to approximately 39,600 mg/L. It is conservatively assumed that the chloride concentration of 33,300 mg/L remains unchanged in the treated groundwater effluent.

To reach a chloride concentration difference of no more than 10% at the edge of regulatory mixing zone, the required plume dilution factor via the diffuser is 11, per the equation below:

$$S = \frac{C_{eff} - C_a}{C_{edg} - C_a} = \frac{C_{eff} - C_a}{110\% C_a - C_a} = \frac{33{,}300 - 15{,}900}{110\% * 15{,}900 - 15{,}900} = 11$$

where S is required dilution factor, C_{eff} is effluent chloride concentration (33,300 mg/L), C_a is ambient chloride concentration (15,900 mg/L), and C_{edg} is chloride concentration at the edge of regulatory mixing zone. Per the BC MOE (2017a) guideline, the upper bound of C_{edg} is 10% greater than ambient chloride concentration.

There are also no federal or provincial specific criteria for mixing zone discharges regarding thermal changes to the marine environment. However, per the BC MOE (2017a) guideline:

> *"Temperature at the mixing zone boundary should not change by more or less than 1°C from natural ambient background temperatures, and the hourly rate of change should not exceed 0.5°C."*

This is taken into consideration for the model, which conservatively assumes treated groundwater effluent discharge and ambient ocean temperatures of 0°C, to account for start and end of temperatures for the open water season.

APPENDIX C • SPECIFIC WORK INSTRUCTIONS FOR UNDER-ICE MARINE WATER QUALITY SAMPLING PROGRAM – WINTER 2019

Specific Work Instructions	SWI-001
Project:	Meliadine Gold Mine
Client:	Agnico Eagle Mines Ltd.
Project No.	1773384
Dates for Field Work:	March, April and May 2019
Author:	Arman Ospan
Technical Review by:	K. Bruce Dean
To:	Manon Turmel

SPECIFIC WORK INSTRUCTIONS FOR UNDER-ICE MARINE WATER QUALITY SAMPLING PROGRAM - WINTER 2019 - MELIADINE GOLD MINE

1.0 PURPOSE

The purpose of this document is to provide Specific Work Instructions (SWI) for water quality sample collection at the Meliadine Project Area in Melvin Bay, Rankin Inlet, NWT during under-ice conditions in March, April, and May 2019.

2.0 FIELD PROGRAM

2.1 Marine Environment

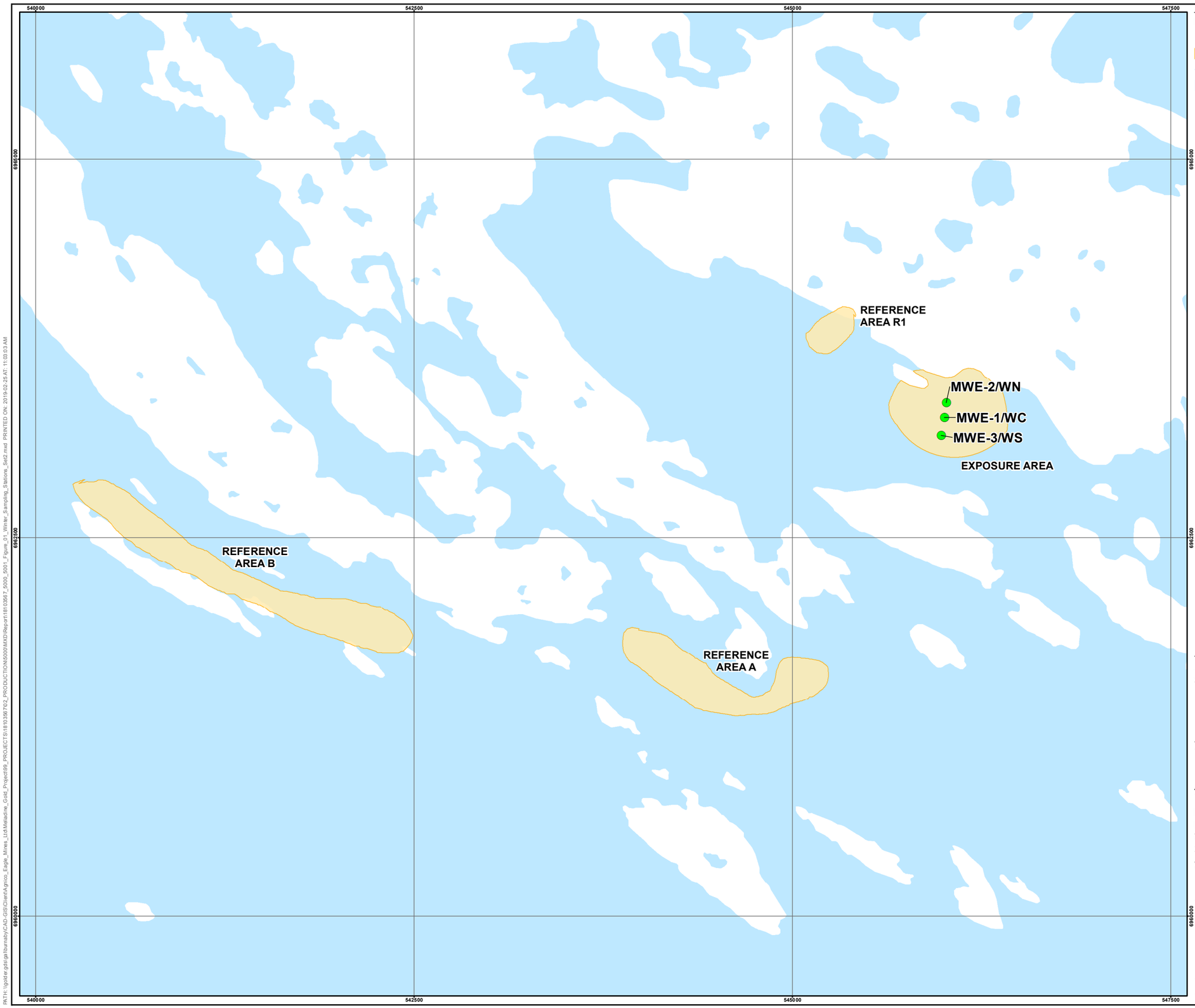
The marine monitoring study area for the under-ice marine water quality survey includes the area anticipated to be potentially influenced by Project activities. The exposure stations to be monitored were selected to correspond with the location of potential exposure to diffuser discharge In Melvin Bay. The exposure area will be monitored at three sampling stations. Station MWE-1/WC, MWE-2/WN and MWE-3/WS are located at, north (offshore) and south (inshore) of the location of the proposed diffuser discharge.

Detailed information on the sampling station locations and sampling parameters is provided in Table 1. Maps illustrating the location of the sampling locations are provided in Figure 1.

Table 1: Sampling Stations and Sampling Parameters for Under-Ice Marine Water Quality Sampling Program

Station ID	NAD 83, 15 V		Expected Water Depth (m)	Sample Depth (m)	No. of Samples by Sample Type	
	Easting (m)	Northing (m)			Discrete Water Quality [(a)]	In situ profiles
MWE-1/WC	546002	6963295	20	1 at 1 m; 1 at 5 m above the bottom	2	1
MWE-2/WN	546014	6963391	10	1 at 1 m; 1 at 5 m above the bottom	2	1
MWE-3/WS	545981	6963176	25	1 at 1 m; 1 at 5 m above the bottom	2	1

(a) Includes 10% blind duplicates for QA/QC.



LEGEND

- SAMPLE LOCATION
- STUDY AREA
- WATERCOURSE
- WATERBODY

DRAFT

0 0.5 1

1:25,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

MELIADINE GOLD MINE
UNDER-ICE MARINE WATER QUALITY SAMPLING PROGRAM - WINTER 2019

TITLE

WINTER SAMPLING STATIONS

CONSULTANT

GOLDER

YYYY-MM-DD	2019-02-25
DESIGNED	AO
PREPARED	CN
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
18103567	5000/5001	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: \\golder.gds.ga\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\18103567\2_PRODUCTION\5000\MXD\Report\18103567_5000_5001_Figure_01_Winter_Sampling_Stations_Set2.mxd PRINTED ON: 2019-02-25 AT: 11:03:03 AM

The following data will be collected at each sampling station (Table 1):

- Measurements of snow cover (m), ice-thickness (m), total water depth (m), and the height of the water head in the augered hole (m).
- In situ vertical physico-chemical profiles at 0.5 m depth intervals throughout the water column.
- Winkler test for confirmation of dissolved oxygen (DO) concentrations if YSI readings fall outside the acceptable ranges.
- Collection and processing of discrete water quality samples at targeted depths for detailed water chemistry analyses.

Standard QC samples (including field duplicates, field blanks, trip blanks, and equipment blanks) will be collected in accordance with established quality assurance (QA) procedures (see Section 3.3).

3.0 PROCEDURES

Each sampling area will be accessed by snowmobile.

Specific sampling stations will be located using a Global Positioning System (GPS) device loaded with Universal Transverse Mercator (UTM) coordinates for each station (North American Datum [NAD] 83, Zone 13V).

At each sampling station, a hole will be drilled through the ice using an ice auger. The diameter of the hole should be wide enough to allow deployment of the sampling equipment. All snow and loose ice will be cleared from the hole with a slotted spoon prior to commencement of sampling.

3.1 Physico-Chemical Profile Measurements

In situ parameters measured at each location included water depth, temperature, conductivity (salinity), dissolved oxygen, turbidity, and chlorophyll concentration (optional). Vertical profiles will be collected using a conductivity / temperature / depth (CTD) probe (e.g. RBR XR-620) or multi-meter probe (e.g. YSI) equipped with dissolved oxygen, turbidity and fluorometer sensors.

Maintenance and calibration of a CTD profiler and associated sensors are normally performed by the instrument provider and are usually completed immediately prior to the reconnaissance program. No field quality checks of any of the parameters are required beyond the cast acceptability check and range checks.

Multi-meter probes, such as YSI, may require calibration on-site.

Multi-meter Calibration

A YSI multi-parameter water quality meter (multi-meter) will be used for conducting in-situ water quality field sampling. This multi-meter is factory-calibrated once per year for pH, water temperature, specific conductivity, and DO concentrations. Calibration records must be maintained.

Prior to collecting field samples, the multi-meter should be tested indoor in a stable environment for DO, pH, and specific conductivity. The multi-meter should be calibrated every four days or if readings are outside of the acceptable ranges, as determined by the parameter headings on the field datasheet (Appendix A). Refer to the YSI manual for further information on calibration.

Calibrate the multi-meter according to accepted protocols and record all necessary data in the multi-meter calibration log and/or field book. Note all out-of-range data in the field notebook and provide this information to the project field coordinators as soon as possible**.**

Under-ice Physico-chemical Water Column Profiling

Water quality profile measurements will be collected at each sampling station using the procedure below:

- Record exact coordinates where measurements were taken on the field datasheet (Appendix A).
- Record snow cover depth (m).
- Drill hole and record ice thickness (m) and height of water head in augered hole (m).
- Measure and record water depth using a hand-held depth sounder.
- Collect water column profile measurements (pH, temperature [°C], DO [mg/L and % saturation], and specific conductivity [µS/cm with the reading corrected to 25°C]) before collecting water samples. Record measurements at the following depths:
  - First measurement just beneath ice bottom (0.1 m).
  - Second measurement at 0.5 m below ice bottom.
  - Third measurement at 1.0 m below the ice bottom.
  - All subsequent measurements taken every 0.5 m depth interval until just above (0.5 m) seafloor.
- At each sampling depth, allow the sensors on the multi-meter to stabilize prior to recording the measurements. This will help to avoid hysteresis (differences in readings during downcast and upcast) and will result in more accurate readings. Record measurements on the field datasheet and log all data with the multi-meter.
- If using a CTD, measurements will be taken throughout the water column by lowering the probe from the surface to the bottom at a vertical speed of approximately 0.5 m/sec while the probe is recording measurements at a frequency of 6 Hz (6 measurements per second).
- Immediately following data collection, all data will be checked for erroneous values, outliers and to be certain that all data and configuration files are present and properly named. If the instrument software allows, all data should be reviewed graphically for outliers as well as trends, and to confirm that all sensors are functioning properly during the deployment. All profile data, datasheets and field notes will be saved to a computer and backed up on an external hard drive.

IMPORTANT: Verify that the multi-meter is calibrated and working properly before starting work for the day, and that calibration procedures and schedule are followed during the course of the program.

3.2 Discrete Water Quality Samples

Discrete water quality samples collected w analyzed for a suite of parameters, including:

- conventional parameters (i.e., conductivity, hardness, laboratory pH, total dissolved solids [TDS], total suspended solids [TSS], total organic carbon [TOC], dissolved organic carbon [DOC], and turbidity)
- major ions (i.e., bicarbonate, calcium, carbonate, chloride, fluoride, hydroxide, magnesium, potassium, sodium, sulphate, sulphide, and silicate)
- nutrients (i.e., nitrate, nitrite, total Kjeldahl nitrogen [TKN], total ammonia, total phosphorus [TP], total dissolved phosphorus [TDP], and orthophosphate)
- total and dissolved metals and metalloids (i.e., aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, cesium, chromium, cobalt, copper, gallium, iron, lead, lithium, manganese, mercury, molybdenum, nickel,

rhenium, rubidium, selenium, silicon, silver, strontium, tellurium, thallium, thorium, tin, titanium, tungsten, uranium, vanadium, yttrium, zinc, and zirconium)

- total and dissolved mercury

3.2.1 Sample Collection

For the marine environment, collect a water sample at the following target depths:

- At deeper (offshore) stations (water depth > 5 m), collect at 1 m below base of ice layer and in mid-column (5 m above the bottom), unless a pycnocline is present, in which case collect the sample below the pycnocline. Note that stratification is not expected during winter.
- Collect in situ readings (multi-meter) at the sample collection depth.

Water quality sampler (e.g. Niskin bottle or Kemmerer) samplers will be used to collect water samples at each station after the water column profiling is completed.

A few basic protocols should be followed when collecting the samples:

- Wear nitrile gloves when using samplers, and when rinsing and filling all bottles and jugs.
- Do not touch the inside of the bottles or the inside of the caps.
- Keep bottles in a clean environment (e.g., clean cooler) while collecting samples.
- Remember to check that the screws at the top and bottom of the Kemmerer samplers are tightened each time they are used.
- All water quality samples collected must have corresponding multi-meter profile measurements.

Follow these steps to collect the water quality samples:

- Triple-rinse the samplers with sea water.
- Collect a water sample from the required depth using the sampler.
- Record the sampling depth on the field datasheet.
- Fill the laboratory provided bottles (See Table 2) following instructions from the laboratory.
- Label the samples as “Station ID” (Table 1)[1] and depth at which the sample was taken.
- Verify that there are field readings for temperature, pH, specific conductivity, and dissolved oxygen at depths corresponding to the water sample collection.
- Make sure that samples do not freeze after collection (e.g., use coolers, heat packs).

The laboratory-provided bottles (Table 2) will be filled directly in the field from the sampler. Be sure to take the complete set of bottles for each station in the field.

ALS bottles do not need to be triple-rinsed with sample water before filling. The only time rinsing is required is if a sample is being transferred from one bottle to another, or if a bottle will be re-used to hold the filtered sample (e.g., dissolved metals). Information on filtering samples is provided in Section 3.2.2. Alternatively, filtration for dissolved metals can be

[1] Pre-printed labels were created for the bottle sets.

done in the laboratory conditions. In this case no preservatives should be added into the sample bottle and appropriate note should be made on the bottle and chain of custody (COC) form.

Table 2: Bottle Sets for Discrete Water Quality Samples

Bottle Type	Numbers of Bottles in Set	Filter	Preserve	Preservative	Number of Vials for Preservative
Nutrients-total: 120-mL amber glass bottle	1	-	Yes	1 mL H_2S0_4 (sulphuric acid)	1
Nutrients-dissolved: 120-mL amber glass bottle	1	Yes	Yes	1 mL H_2S0_4 (sulphuric acid)	1
Routine: 1-L polyethylene	1	-	-	-	-
Sulfide: 125-Ml HDPE bottle	1	-	Yes	2 mL Zn Acetate	1
Metals-total: 60-mL HDPE bottle	1	-	Yes	3 mL ultra-pure HNO_3 (nitric acid)	1
Metals-dissolved: 60-mL HDPE bottle	1	Yes	Yes	3 mL ultra-pure HNO_3 (nitric acid)	1
TOTAL	**8**	-	-	-	**5**

3.2.2 Sample Processing

At the end of each sampling day, the field and laboratory crew members will process (filter and/or preserve) the samples. Samples that require filtering can be processed at the end of the field day[2].

For samples that do not require filtering, but require preservative, the following protocols apply:

- Always wear nitrile gloves and safety glasses when working with preservatives.
- Add the required preservative (Table 2) and invert the bottle numerous times to mix the preservative with the sample.
- Store water samples in the refrigerators (between 4 and 10°C) at the Camp until ready to ship (see Section 3.4 for packing and shipping instructions). Do not allow the samples to freeze.

Samples that may require filtering are dissolved metals. Dissolved metals samples will be filtered into their respective sample bottles using the Millipore vacuum pump or Nalgene hand pumps, and Millipore 0.45 µm membrane filter. Whatman GF/C filters may be useful for pre-filtering of samples with a large amount of suspended solids, which may have difficulty passing through the Millipore filters; after the sample has been passed through a GF/C filter, follow with a 0.45 µm membrane filter. Take extreme care when handling the filter assembly and when processing the samples to avoid the potential for contamination of the filtered sample.

Alternatively, samples for dissolved metal can be filtered in the laboratory. In this case, no preservatives should be added in the sample bottles and respective notes should be made on sample bottles and COCs.

[2] Note that it is preferable for the field crew to filter and process samples at the end of the sampling day. However depending on the length of the field day, in some cases samples may need to be filtered and processed first thing the next morning. If this is the case samples must be kept cold (not frozen) and in the dark – especially chlorophyll a samples.

When filtering, the following considerations apply:

- Always wear nitrile gloves and safety glasses when working with preservatives.
- Use deionized water to rinse the pump and filter apparatus before use.
- Use a new filter for each sample bottle.
- Fill bottles in the following order: dissolved ultra-low metals and then nutrients.
    - As the filtered water will be added to back to the original bottles, triple rinse the bottles with the filtered water before filling the bottles with the filtered water.
- Add the required preservative (Table 2) and invert the bottle numerous times to mix the preservative with the sample.
- Store water samples in the refrigerators at camp until ready to ship (see Section 3.4 for packing and shipping instructions).

Generate a chain of custody (CoC) record after each day of sampling. See example of CoC in Appendix B.

3.3 Quality Assurance and Quality Control

3.3.1 Water Quality QC Samples

As general objective, the number of QC samples to be collected should represent approximately 10% of the total number of planned field samples. The target of QC samples collected during the under-ice program is one set at MLA [e.g., field duplicate, field blank, trip blank and equipment blank]). These are described as follows:

- **Field duplicate**: A second sample will be collected at a randomly selected station and treated as a separate field sample with regards to filtering and preserving.
- **Field blank**: Sample bottles are filled in the field with de-ionized water provided by the laboratory. These samples are therefore exposed to the sampling environment at the sample site and handled in the same manner as the surface water samples collected during the field program (e.g., preserved, filtered).
- **Trip blank**: These sample bottles come from the laboratory pre-filled with deionized water. Take the bottle set out into the field with you; DO NOT open the bottles. Submit bottles as is with the rest of the field samples.
- **Equipment blanks**:
    - For **total analytes**: Run laboratory-provided deionized water through the Kemmerer sampler as you would for regular field samples and use to fill sample bottles. Preserve as per requirements for that parameter.
    - For **dissolved analytes**: Pour deionized water into the filter tower and fill the dissolved ultra-low metals and dissolved nutrient bottles with the filtered blank water.

Use unique sample ID to identify the QC samples. It is best practice to submit QC samples to the lab as blind samples, but clearly note them in the field notebook.

3.3.2 Other QA/QC Protocols

- Record detailed field notes in waterproof field books and field datasheets, and ensure any critical information (e.g., QC type, location, date and time, etc.) is available at the de-brief meeting after the program.
- Have a second person check data sheets and CoCs at the end of each field day for completeness and accuracy.

- Keep track of station name and date sampled in the field binder/field note book.
- At the end of each day, record all data and when possible save all data (database, CoCs, multi-meter data, shipping memos, etc.) to a computer file and/or external USB device.
- Take photos at each station and download photos daily.
- Do not use any laboratory-supplied bottles that you suspect have been used or contaminated.
- Discard used bottles into a garbage bag; at end of field program put these bottles in coolers and include in shipment back to lab for disposal. Clearly label the cooler as having no samples, and include what it does contain (e.g., used bottles). Unused and unopened bottles can be left in the bottle prep area for the next program.

3.4 Sample Shipping

To ship samples:

- Make sure that the CoC forms are filled out correctly; confirm that Arman Ospan is included on the CoC distribution list. Please see the example CoC in Appendix B.
  - Assign a CoC number: Meliadine-WQ-#.
  - Take a photo of the CoC for our records. E-mail a copy of the photo to Arman Ospan.
- All samples for the water quality program (i.e., discrete samples) will be placed in one set of coolers and shipped together.
- Place the CoC in a Ziploc bag inside each cooler corresponding to the samples included in the cooler. Each COC must match the contents of the cooler in which it is placed.
- Mark “CoC enclosed” on the shipping label of the cooler containing the CoC.
- Mark shipping label for each cooler (i.e., “1 of 1”, or in the case of multiple coolers, “1 of 3”, “2 of 3”, etc.)
- Place shipping labels in Ziploc bags and tape to each cooler.
- Place lots of ice packs and padding in each cooler. Glass bottles should be individually wrapped in bubble wrap.
- Each cooler should not exceed 40 lbs (18 kg) in weight.
- Bind each cooler with tape and add “do not freeze” and “keep cool” stickers.
- Arman Ospan will notify laboratory contacts of sample shipments by e-mail and request confirmation when samples are received; please include Arman on all communications.
- Laboratory samples collected as part of the water quality program are to be shipped to ALS in Yellowknife, where the samples will be logged and shipped to their respective analysis locations (i.e., Edmonton or Burnaby). Ensure that ALS Yellowknife is informed that samples are on their way, when they should arrive, and provide them the location where need to be picked up from.
- Check sample receipt confirmations when received from the laboratory to make sure sample integrity has been preserved (e.g. temperature on receipt, damaged samples) and that the correct analysis has been scheduled by the laboratory (correct analytical package and number of samples). Arman Ospan will check these.
- Ship samples to ALS Yellowknife:

Jessica.Spira@ALSGlobal.com

ALS Environmental
#116 - 314 Old Airport Road
Yellowknife, NWT
Canada X1A 3T3
TEL: 867-873-5593

4.0 LIST OF APPENDICES:

Appendix A: Field Datasheet

Appendix B: Chain of Custody Form (ALS)

APPENDIX A: Field Datasheet

Golder Associates	GROUP		DATE:	
	Water Quality Record (Form #1, Version 4)		**TIME:**	
	16820 - 107 Ave, Edmonton, AB, T5P 4C3		**STATION:**	

Project Title: **Project #:** **Phase:** **Page: ___ of ___**

Personnel: _____ GPS or Waypoint (13V NAD83): _____ _____

Weather: _____ Water Colour: _____ Total Depth (m): _____

Secchi Depth (m): _____ Pressure (mm Hg): _____ Field Meter(s): _____

WQ Sample	Depth (m)	Sample ID
Mid		

Winkler taken:		Yes / No
Collection depth (m)		
Winkler DO 1 (mg/L)		Winkler DO Tap (mg/L)
Winkler DO 2 (mg/L)		YSI DO Tap (mg/L)

Zooplankton

Haul 1 Depth (m): _____

Phytoplankton

Sample Depths: _____

Phytoplankton Collected? Y N

Chlorophyll-a Y N

Rep 1 Volume Filtered (mL): _____

Rep 2 Volume Filtered (mL): _____

Rep 3 Volume Filtered (mL):

Notes:

Depth (m)	Temperature (°C)	Conductivity (µS/cm)[c] expected range 17,000 to 35,000	Dissolved Oxygen (%) expected range 95 to 105 (acceptable 60 to110)	Dissolved Oxygen (mg/L)[§] expected range 12 to 15	pH expected 6.7 to 8.5
0.1					
0.5					
1.0					
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
4.5					
5.0					
5.5					

c temperature corrected to 25 °C; § Should not be more than 15 mg/L (supersaturation)

Project Title:	**Project #:**	**Phase:**	**Page: ___ of ___**

Depth (m)	Temperature (°C)				

c temperature corrected to 25 °C; § Should not be more than 15 (supersaturation)

QA check completed by: _____ Date: _____ Photo #: _____

APPENDIX B: Chain of Custody Form (ALS)

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	
Contact:	
Phone:	
Company address below will appear on the final report	
Street:	
City/Province:	
Postal Code:	

Report Format / Distribution

Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☐ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax
Email 2
Email 3

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- **4 day [P4-20%]** ☐
- **3 day [P3-25%]** ☐
- **2 day [P2-50%]** ☐

EMERGENCY
- **1 Business day [E - 100%]** ☐
- **Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]** ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax
Email 2

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS															SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO

Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INIITIAL COOLER TEMPERATURES ºC				FINAL COOLER TEMPERATURES ºC			

SHIPMENT RELEASE (client use)			**INITIAL SHIPMENT RECEPTION (lab use only)**			**FINAL SHIPMENT RECEPTION (lab use only)**		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY NOV 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

APPENDIX D • CONCEPTUAL OCEAN DISCHARGE MONITORING PLAN

AGNICO EAGLE

MELIADINE MINE

Conceptual Ocean Discharge Monitoring Plan

JUNE 2018
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

There are four phases to the development of the Mine; just over 4 years of construction (Q4 2015 to 2019), 8 years of Mine operation (2020 to 2027), 3 years of closure (2028 to 2030), and post-closure (2031 forwards). The underground mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the underground mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the underground mine workings once the Mine has advanced below the base of the permafrost.

Groundwater from the underground mine workings will be collected and pumped for storage on the surface in the water containment ponds to manage surface and groundwater, as described in the Meliadine Mine Water Management Plan (WMP; Agnico Eagle 2017a). The management of groundwater is further described in the Meliadine Mine Groundwater Management Plan (GWMP; Agnico Eagle 2018), which entails for the discharge of saline groundwater to Meliadine Lake after treatment, in compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14. As part of long-term water management, excess groundwater will be treated to meet, as applicable, Metal and Diamond Mining Effluent Regulations (MDMER), Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (Marine; CCME) and/or background conditions at the edge of the mixing zone for discharge into Melvin Bay via an engineered diffuser.

This document presents the conceptual Meliadine Mine Ocean Discharge Monitoring Plan for discharge of treated groundwater effluent into the marine environment. It summarizes the field sampling study design strategy, methods, laboratory requirements, quality assurance and quality control, and reporting.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	June 2018	All	All	Conceptual Plan developed for the Treated Groundwater Effluent Discharge into Melvin Bay	Golder Associates Ltd.

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANOVA	Analysis of variance
CCME	Canadian Council of Ministers of the Environment
CES	Critical effect size
EEM	Environmental Effects Monitoring
FEIS	Final Environmental Impact Statements
FDP	Final discharge point
Golder	Golder Associates Ltd.
GWMP	Groundwater Management Plan
MDMER	Metal and Diamond Mining Effluent Regulations
Mine or Project	Proposed Meliadine Gold Mine
MMER	Metal Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
ODMP	Ocean Discharge Monitoring Plan
QA/QC	Quality Assurance and Quality Control
TDS	Total dissolved solid
WMP	Water Management Plan
WQG	Water Quality Guidelines

SECTION 1 • INTRODUCTION

This document presents the conceptual Ocean Discharge Monitoring Plan (ODMP) for the proposed discharge of excess treated groundwater into the marine environment at Itivia Harbour in Melvin Bay.

The overall water management for the life of the Mine and post-closure is described in the Agnico Eagle Meliadine Gold Mine Water Management Plan (WMP; Agnico Eagle 2018b) and the Groundwater Management Plan (GWMP; Agnico Eagle 2018e). The WMP provides descriptions of the Mine water control structures and associated design criteria, while the GWMP describes management of groundwater for discharge to Meliadine Lake.

This conceptual ODMP outlines objectives, rationale, and details of the data collection strategy, analytical methods and ecological thresholds for protection of water/sediment quality and biological components on the marine environment in Melvin Bay. The conceptual ODMP will be updated pending the necessary approvals and authorizations to include any regulatory conditions, as applicable, and further refine methods and/or thresholds.

1.1 Background

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Mine, located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut, on Inuit Owned Lands. The Meliadine Mine is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

Agnico Eagle has previously completed the environmental assessment for the construction and operation of an All-Weather Access Road (Agnico Eagle 2013) and the Meliadine FEIS (Agnico Eagle 2014), which included nearshore barge operations in Itivia Harbour and seasonal shipping activities in Hudson Bay and Hudson Strait. The projected life of the Meliadine Mine is anticipated to be 13 years but may be extended as exploration continues. This includes an estimated 3 years of construction, 13 years of operations, and 3 years of decommissioning.

The Meliadine Mine proposes mining methods for the development of the Tiriganiaq gold deposit, which includes an underground mine. The underground mine will extend to approximately 625 m below the ground surface, therefore, part of the underground mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the underground mine workings once the Mine has advanced below the base of the permafrost. Inflow of groundwater is expected from 2018 until the end of mine life in 2032. The management of groundwater is further described in the Meliadine Mine GWMP (Agnico Eagle 2018e), which entails for the discharge of saline groundwater to Meliadine Lake after treatment, in compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14.

To support long-term groundwater management for the Mine, Agnico Eagle has proposed to directly discharge excess groundwater effluent into Melvin Bay at Itivia Harbour after treatment of the saline underground inflows to meet discharge water quality criteria for Melvin Bay and/or background conditions.

This conceptual ODMP is submitted along with the Final Environmental Impact Statement Addendum (FEIS Addendum) for the proposed discharge of treated groundwater effluent from the underground mine of the Tiriganiaq deposit at the Meliadine Mine into the marine environment at Melvin Bay. The ODMP includes a description on additional requirements to define triggers and threshold for adaptive management, including additional baseline data collection at Melvin Bay ahead of installation of the engineered marine outfall, as required. This plan was developed to fulfil the NIRB Guidelines received for the FEIS Addendum, for stand-alone management and monitoring plans (EIS Guidelines sections 9.3 and 9.4; NIRB 2018). While the ODMP has been developed as a separate and stand-alone plan, the intent is to align it with Environmental Effects Monitoring (EEM) study design requirements to avoid multiple monitoring plans. The components of the ODMP that are not captured in an EEM study design will be incorporated into existing management plans for the Meliadine Mine (for example, as part of the GWMP [Agnico Eagle 2018e]).

1.2 Objectives and Scope

The ODMP has the purpose of assessing the potential effects of the treated groundwater effluent discharge to the marine environment in Melvin Bay. The ODMP will identify potential changes to water and sediment quality caused by the effluent discharge and the effect of these changes to aquatic life, fish habitat, and fish health. To achieve its purpose, the ODMP has the following objectives:

- To detect short- and long-term effects of the discharge on the receiving environment
- To address the NIRB FEIS Addendum Guidelines, the federal Metal and Diamond Mining Effluent Regulations (MDMER, once they come into effect), Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Aquatic Life, as well as requirements that may be requested from regulators during the permit processes
- Identify unforeseen adverse effects and provide early warnings of undesirable changes in the environment
- To inform mitigation

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FUEL TANK FARM

End- of- pipe
Monitoring

Approximate
Discharge Pipe
Centerline

Approximate
Diffuser Location

A

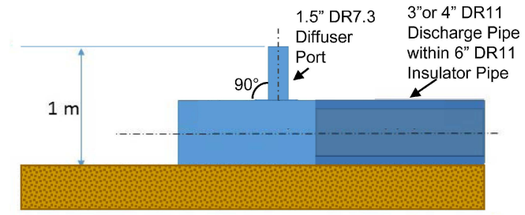
A'

Rankin Inlet

LEGEND

- WATER QUALITY SAMPLING STATION
- BENTHIC INVERTEBRATES AND SEDIMENT QUALITY SAMPLING STATION
- END OF PIPE MONITORING
- GENERAL AREA FOR THE PROPOSED DIFFUSER LOCATION
- CROSS SECTION LOCATION
- WATERBODY

End of Discharge Pipe – Diffuser Port Design (HDPE Pipe)



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NOTE(S)

AGNICO EAGLE IS CONSIDERING TREATMENT AND MANAGEMENT OPTIONS TO MEET APPLICABLE DISCHARGE CRITERIA AND/OR SITE SPECIFIC WATER QUALITY OBJECTIVES, AS REQUIRED. ACTIVITIES AND FACILITIES PRESENTED HEREIN ARE FOR PLANNING PURPOSES ONLY AND SHOULD NOT BE CONSIDERED FINAL DESIGN.

REFERENCE(S)

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED
AGNICO EAGLE

PROJECT
MELIADINE MINE
NUNAVUT

TITLE
CONCEPTUAL MARINE MONITORING PLAN
PROPOSED SAMPLING STATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-05-24
DESIGNED	CLT
PREPARED	CDB/JZ
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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SECTION 2 • REGULATORY FRAMEWORK

The Meliadine Mine is located within the Nunavut Territory and is subject to the regulatory approvals established under the applicable laws and regulations of Canada and of Nunavut.

As per the MMER, including the amended MDMER (GC 2017; anticipated to come into effect in 2018-2019), any discharge exceeding 50 cubic metres (m^3) should conduct EEM studies. The studies include effluent characterization and water quality monitoring accompanied by biological studies, which may include benthic invertebrate community, fish population and fish tissue components.

In consultation with the NIRB, Agnico Eagle has prepared the Final Environmental Impact Statement Addendum (FEIS Addendum) for the authorization to carry out discharge of treated groundwater effluent from the underground mine to the marine environment, in accordance with the Guidance for Final Environmental Impact Statement Addendum for the "Saline Effluent Discharge to Marine Environment, Rankin Inlet, Meliadine Gold Mine" ("project proposal" or "proposed Project activities" in this report; NIRB 2018).

The discharge of the treated groundwater effluent into the marine environment is also subject to authorization under the Section 5 of the *Environmental Protection Act* of Nunavut (GN 1988). In addition, other conditions and/or mitigations outlined by regulatory agencies under the following Acts (or applicable licence requirements) should be adhered to:

- *Federal Fisheries Act* (GC 1985a)
- *Navigation Protection Act* (GC 1985b)
- *Species at Risk Act* (GC 2007)

SECTION 3 • RATIONALE

3.1 Discharge Overview

The ODMP concerns management of the discharge of excess groundwater from the underground mine to the marine environment after treatment during the life of the Project to support long-term water management.

Supplemental hydrogeological investigations were undertaken in 2015 and 2016 to provide additional information on potential volumes and quality of saline groundwater inflows to the underground mine to be managed. Per the results obtained, the total volume of the groundwater inflow in the mine is expected to be up to 420 m^3/day (Golder 2016). Adding to the maximum anticipated groundwater volume to be stored at the Meliadine Mine, this will result in a need to discharge up to 800 m^3/day (Agnico Eagle 2018e). Groundwater inflows to the underground mine since 2015 have not been discharged to the environment and are being stored underground, in the Saline Pond, in the P-Area, or actively evaporated during the open water season (Agnico Eagle 2018b).

Total dissolved solid (TDS) concentrations in groundwater are naturally high, expected to range from 50,000 to 64,000 mg/L per groundwater data collected by Agnico Eagle in 2017 (a summary of the groundwater quality is presented in Table 3, Section 3.4.2 of the FEIS Addendum; Agnico Eagle 2018g). Since mining operations include drill-and-blast excavation, certain parameters of groundwater quality are expected to be influenced by explosives (particularly ammonia and nitrate due to ammonium nitrate, fuel oil [ANFO] and emulsion explosives). Chloride, sodium and calcium are also naturally high in concentration in the untreated groundwater, averaging at higher concentrations than those recorded in Melvin Bay (Table 1 and Table 2). Therefore, to minimize effects to the environment, and to comply with the effluent discharge criteria (GC 2017; CCME 2003; BC MOE 2017a; BC MOE 2017b) and objectives, groundwater will be treated prior to discharge.

Table 1: Summary of Melvin Bay Background Marine Water Temperature and Salinity taken in August 2011 and Average Untreated Groundwater Concentrations taken in 2017

	Melvin Bay		Untreated Groundwater
Parameter	Surface	Bottom	
Temperature (°C; n=3)	8.5 to 9.45	7.93 to 9.07	-3.4°C - +3.8°C(1)
Salinity (ppt; n=3)	29.29 to 29.35(2)	29.30 to 29.38(2)	55 to 56(3)

Source: Melvin Bay - Nunami Stantec 2012. Meliadine Mine Groundwater – Agnico Eagle 2017 data.

(1) Average temperatures per observations of DDH samples, as provided by Agnico Eagle. This does not account for the influence of ambient temperature for groundwater stored in containment ponds at the Meliadine Mine.

(2) *In situ* average salinity measured at Melvin Bay. Average Total Dissolved Solids (TDS) measured at Melvin Bay = 34,300 mg/L.

(3) Estimated average groundwater salinity based on average TDS groundwater concentrations presented in FEIS Addendum, Section 3.4.2, Table 3 (55,700 mg/L average TDS; Agnico Eagle 2018g). Salinity from groundwater has not been measured. TDS values are comparable to salinity as TDS represents an estimate of the level of ions, typically salt ions, that are present in the water. This may however overestimate the salinity of the untreated groundwater, as TDS also includes organic solutes (for example, hydrocarbons and urea) in addition to salt ions.

Table 2: Summary of Select Melvin Bay Background Marine Ion Concentrations taken in August 2011 and Average Untreated Groundwater Concentrations taken in 2017

	Melvin Bay			Untreated Groundwater(1)
Ion	I1	R1	R2	
Chloride (mg/L)	20,000	20,100	20,300	32,315
Sodium (Na) - Total (mg/L)	11,000	10,800	10,800	14,365
Calcium (Ca) - Total (mg/L)	411	399	402	2,032

Source: Melvin Bay - Nunami Stantec 2012; averages from 3 sampling locations (I1, R1 and R2). Meliadine Mine Groundwater – Agnico Eagle 2017 data (Agnico Eagle 2018g).

(1) Averages per untreated groundwater concentrations presented in FEIS Addendum, Section 3.4.2, Table 3; Agnico Eagle 2018g).

Treated groundwater effluent will be trucked to the discharge facility at the Itivia Fuel Storage Facility for discharge during the open water season (May to October). The discharge facility, located at the Itivia Fuel Storage Facility, will include a storage tank and a pipeline outflow extending to an engineered diffuser located in Melvin Bay. The treated groundwater effluent will be discharged seasonally in a controlled manner through a diffuser to allow for maximum dilution and minimum impact on the marine environment. The Final Discharge Point (FDP) is estimated at a distance of approximately 230 m from the shoreline and a depth of approximately 20 m. Facility layout and diffuser specifications are shown in Figure 1.

Treated groundwater effluent quality is required to meet the Canadian federal end-of-pipe discharge criteria (per the amended MDMER; GC 2017) and to be non-acutely lethal. Treated groundwater will be discharge into Melvin Bay via an engineered diffuser (refer to Section 3.5 of the FEIS Addendum; Agnico Eagle 2018g) to meet Canadian Surface Water Quality Guidelines (WQG; CCME 2003), or background concentrations for parameters without guidelines, at the edge of the mixing zone.

3.2 Environmental Conditions

The receiving environment for the effluent discharge is located in Melvin Bay, northwest Hudson Bay at Rankin Inlet. Hudson Bay, and particularly the area including Melvin Bay, is usually ice-covered from November to June and ice-free from July to October (Stewart and Lockhart 2004; Cohen et al. 1994).

- At Rankin Inlet, the tidal range varies between 2.0 and 4.6 m and mean currents flow southward at around 0.22 m/s. Isobath lines are nearly parallel to coastline and depth rapidly increases reaching more than 20 m within 230 m off the coast.
- Marine environmental baseline studies in the Melvin Bay area were conducted in August 2011 by Nunami Stantec (2012; see Appendix B of the FEIS Addendum, Agnico Eagle 2018g).
- Surveys were conducted at three areas in Melvin Bay: near the effluent discharge location (Impact Area 1 [I1]) and two reference areas, one (Reference Area 1 [R1]) located approximately 0.9 km northeast of Itivia Harbour, and the other (Reference Area 2 [R2]) on the southern shore of Melvin Bay, 1.5 m south from Itivia Harbour.

- Water quality measurements conducted by Nunami Stantec (2012) showed no water column stratification with the mean temperature ranging from 8.9^{o} C at the surface to 8.5^{o}C at the bottom (up to approximately 13 m depth), and the mean salinity ranging from 29.32 ppt at the surface to 29.33 ppt at the bottom. Water was well oxygenated with dissolved oxygen saturation ranging from 113.6 to 115.6% (10.8 to 11.2 mg/L). Nutrients and metals were mostly below detection limits and lower than CCME WQG for the Protection of Aquatic Life (Marine; CCME 2003).
- Sediments in the areas with water depths of up to 6.6 m were dominated by coarse material (cobble and gravel) in most samples (Nunami Stantec 2012).
- Sediment chemistry analysis of the fine substrate fraction revealed concentrations below CCME Interim Sediment Quality Guidelines (CCME 2001) for all parameters except chromium. Chromium concentrations slightly exceeded the CCME ISQG of 52.3 mg/kg for this element at all sample stations with mean concentrations (plus/minus standard deviation) ranging from 55.8 ± 5.89 mg/kg at I1 to 60.2 ± 6.12 mg/kg at R2.
- Phytoplankton abundance, richness, and diversity were similar across all sites within the marine local study area, and a total of 33 taxa were recorded. Dinoflagellates, mainly represented by *Peridinium/Gonyaulax* spp. and *Dinophysis* spp., were the dominant taxonomic group at all sampled locations. Ciliates of order Tintinnida were present at low percentages at two of the sampled locations.
- Zooplankton abundance, richness, and diversity varied among sites, and a total of 44 taxa were recorded. Zooplankton were mostly rotifers and calanoid copepods. An unidentified rotifer species, possibly in the family Notommatidae, was the dominant taxon at all sampled locations.
- Macroflora was sparse within Melvin bay (ranging from 2 to 5% coverage). Rockweeds (*Fucus* spp.) were the dominant species and occupied a small band in the low intertidal zone. Kelp (*Laminaria* spp.) was observed in the subtidal areas of the southern shore of the bay. Seaweeds are not locally harvested in Melvin Bay.
- Benthic invertebrates were dominated by different families of polychaetes with lesser abundance of nematodes and amphipods. Among other taxonomic groups observed were sponges (Porifera), hydrozoans, flatworms (Platyhelminthes), three gastropod, and three bivalve taxa, several crustacean taxa (copepods, amphipods, decapods), and sea squirts (Urochordata).
- In general, benthic invertebrate abundance and diversity in the area is low; in the intertidal zone, benthic communities occur seasonally when the habitat is not influenced by ice (Stewart and Lockhart 2005). Abundance in the subtidal habitat was also low in late summer (August) with most of the organisms observed less than 1 cm in length, suggesting a low biomass (Nunami Stantec 2012).
- Locally harvested shellfish species include blue mussels and clams.

- Several species, including Arctic char, Arctic cod, Greenland cod, Arctic sculpin, slender eel blenny and Greenland halibut, are considered important to the local commercial, recreational, and subsistence fisheries.
- Only six species of fish were identified during the baseline study in 2011 (Nunami Stantec 2012). Greenland cod (*Gadus ogac*) represented over 50% of fish captured, followed by slender eelblenny (27%) and minor contributions of different species of sculpins. Arctic char was not observed during the baseline field study, but was reported to be in the area at the time of the field study (west of Melvin Bay near the Barrier Islands).
- At least 43 species of seabirds, shorebirds, waterfowl, and marine-associated raptors frequent offshore, inshore, intertidal, or salt marsh habitats of the Hudson Bay marine ecosystem (see Table B-2 of Appendix B in the Shipping Management Plan; Agnico Eagle 2018f). Few of these species are year-round residents.
- The baseline study conducted in 2011 indicated that most marine birds that occur in the vicinity of Rankin Inlet are summer residents and no SARA listed marine bird species occur near Rankin Inlet (Nunami Stantec 2012).
- Marine mammals potentially present in the north and northwest Hudson Bay for variable periods of time include 4 species of cetaceans (3 toothed whales and one baleen whale), 6 species of pinnipeds (seals and walrus), and polar bear. (see Table B-3 of Appendix B in the Shipping Management Plan; Agnico Eagle 2018f). Polar bears (*Ursus maritimus* – Special Concern under SARA) are uncommon to the area. A summary of listed marine mammal species with potential to occur in marine RSA is provided in Table B-5 of Appendix B in the Shipping Management Plan (Agnico Eagle 2018f).
- Narwhal (*Monodon Monoceros*, uncommon at Rankin Inlet), bowhead whales (*Balaena mysticetus*, uncommon at Rankin Inlet) and beluga (*Delphinapterus leucas*) are known to overwinter in Hudson Strait and in polynyas within Hudson Bay. Atlantic walrus (*Odobenus rosmarus rosmarus*), bearded seal (*Erignathus barbatus*), ringed seal (*Phoca hispida*), and harbour seal (*Phoca vitulina concolor*) are year-round residents to at least portions of Hudson Bay, but largely uncommon at Rankin Inlet in recent years. Harp seal (*Pagophilus groenlandicus*) have increased in number in recent years near Rankin Inlet. The remainder of marine mammals identified in Hudson Bay / Hudson Strait, namely killer whale (*Ocinus orca*) and hooded seal (*Cysophora cristata*), are migratory and seasonal visitors limited largely by the presence of solid land-fast ice throughout the winter and spring.

3.3 Project Management Plans

Agnico Eagle has developed Management Plans that are applicable to the Meliadine Mine site, the All-Weather Access Road (AWAR), and the Itivia Fuel Storage Facility.

Updates to the plans have been developed, as required, and submitted to the NIRB and NWB throughout development of the Mine. Table 3 lists the management plans for the Meliadine Mine as

they apply for the ocean discharge, with indications on any potential changes that may be required in future updates.

Agnico Eagle is committed to adhering to all existing plans that have been developed for the Meliadine Mine as part of NIRB Project Certificate No. 006 and NWB Type A Water Licence 2AM-MEL1631 conditions. This includes reporting requirements required to measure the achievement of objectives as set out by approval conditions or to demonstrate compliance, such as annual reporting on Project monitoring programs.

Table 3: Project Management Plans Applicable to the Proposed Project Activities for Ocean Discharge

Management Plan	Reference	Changes Required due to the Proposed Project Activities
Water Management Plan	FEIS Volume 2, SD 2-6 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018b) NWB Doc 1803312AM-MEL-1631	None
Mine Waste Management Plan	FEIS Volume 2, SD 2-6 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018c) NWB Doc 1803312AM-MEL-1631	None
Roads Management Plan	FEIS Volume 2, SD 2-9 Nunavut. Doc 235-1314280007 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018d) NWB Doc 1803312AM-MEL-1631	None
Hazardous Materials Management Plan	FEIS Volume 2, SD 2-13 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018a) NWB Doc 1803312AM-MEL-1631	None
Risk Management and Emergency Response Plan	FEIS Volume 2, SD 2-15 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2015) NIRB Doc. No. 150623-11MN034	None
Spill Contingency Plan	FEIS Volume 2, SD 2-16 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2017) NWB Doc 1803312AM-MEL-1631	None
Shipping Management Plan (including the Marine Environmental Management Plan as Appendix D)	FEIS Volume 8, SD 8-1 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018f) NIRB Doc. No. 180104-11MN034	None
Groundwater Management Plan	Submitted (Agnico Eagle 2018e, provided in Appendix D of this FEIS Addendum) NWB Doc. No. 180214 2AM-MEL1613	The submission, review, and approval of a Groundwater Management Plan is a requirement of the current Type A Water Licence 2AM-MEL1631 (Part E, Item 14). An updated GWMP will be submitted if appropriate licenses and approvals are obtained prior to ocean discharge.
Ocean Discharge Monitoring Plan	Conceptual plan - provided in Appendix E of this FEIS Addendum.	This document.

Notes:

Updated management plans are resubmitted to the NIRB, and the NWB as appropriate, in compliance with respective NIRB Project Certificate No. 006 or NWB Type A Water Licence (No. 2AM-MEL1631, 2016) conditions, as adaptive management measures or changes are applied as the Project develops.

3.4 Potential Effects

The potential effects from the discharge of treated groundwater effluent to the marine environment were assessed in the FEIS Addendum (Agnico Eagle 2018g). Effect pathways specific to the treated groundwater effluent discharge activity assessed included the following:

- Change in fish habitat quality due to discharge of groundwater effluent
- Change in health and survivorship of fish (including benthic invertebrates) due to the quality of the groundwater effluent discharge
- Change in marine bird and mammal habitat quality due to the quality of the groundwater effluent discharge
- Change in health and survivorship of marine birds and mammals due to the quality of the groundwater effluent discharge
- Accidental release of groundwater effluent from an unknown location along the discharge pipe can have adverse effects on marine water quality and associated indirect effects on marine wildlife (fish, benthic invertebrates, marine birds, marine mammals).

Groundwater will be treated prior to discharge to comply with the effluent discharge criteria (GC 2017; CCME 2003; BC MOE 2017a; BC MOE 2017b). These criteria are set to be protective of the marine aquatic life. For parameters with no regulated guidelines for discharge, the discharged concentration objectives conservatively considered for the assessment are 95% of the Upper Confidence Level of the Mean (UCLM) for groundwater. For most parameters these are below baseline concentrations at Melvin Bay, whereas 11 parameters are expected to exceed baseline concentrations.

The assessment used a numeric simulation to model behaviour of the effluent plume in the marine environment. Modelling has shown that a discharge of 420 m^3/day effluent through the diffuser will reach a dilution factor of 10 or more within 1 m horizontal and 2 m vertical distances from the port at a worst-case scenario. This dilution factor is at least 3 times higher than the requirement for chloride and temperature and the horizontal distance of 1 m is lower than the regulatory mixing zone boundary of 100 m. The plume will have negative buoyancy and the maximum plume height expected is 13.7 m above the seabed.

The assessment concluded that the treated groundwater discharge through the diffuser would result in a minor environmental change, but would have a negligible residual effect on fish and fish habitat and marine birds and marine mammals relative to baseline or guideline values provided that mitigation measures are in place. Mitigation measures include treatment of groundwater to meet regulatory discharge criteria particularly the amended MDMER, once they come into effect (GC 2017), discharge through a diffuser that aids in mixing, and implementation of the EEM program.

SECTION 4 • CONCEPTUAL MONITORING DESIGN

The following are the main components and objectives of the ODMP:

- Effluent monitoring at the FDP (end-of-pipe monitoring) to verify compliance of brine properties with the discharge criteria and to characterize effluent quality under MDMER.
- Environmental effect monitoring studies to assess short- and long-term effects from the discharge of treated groundwater effluent on marine biota that will include:
    - Water quality monitoring
    - Biological monitoring including studies on sediment quality, benthic invertebrate communities and fish

A summary of monitoring components, sampling frequency and design is provided in Table 4.

Table 4: Conceptual Ocean Discharge Monitoring Program Sampling Summary

Monitoring Component	Sampling Frequency	Monitoring Location	Sample Replication and Number of Samples
Deleterious Substances (MDMER Schedule 4)	Every week	FDP (end-of-pipe)	One grab sample
Acute lethality	Every month (sampled concurrently with effluent characterization)	FDP (end-of-pipe)	One grab sample
Effluent characterization	Four times a year, one month apart during discharge	FDP (end-of-pipe)	One grab sample
Sublethal toxicity	Twice a year, at the start and finish of the discharge	FDP (end-of-pipe)	One grab sample
In situ Water Column Measurements	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One vertical profile per station
Water Quality	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One sample @1m below the surface and one sample @5 m above the bottom at each station.
Benthic Invertebrate Communities, and sediment quality	Every 3 years in August if triggered by MDMER	Exposure and reference areas	6 stations in the Exposure area and 5 stations in each reference area. Three subsamples per station
Fish population	Every 3 years in August if triggered by MDMER	Exposure and reference areas	20 sexually mature males and 20 sexually mature females of two fish species in each sampling area
Fish tissue	Every 3 years in August if triggered by MDMER	Exposure and reference areas	8 samples of a single species from each sampling area

Notes:

Amended Metal and Diamond Mining Effluent Regulations (MDMER; GC 2017) will be adhered to. Metal Mining Effluent Regulations (MMER) will be adhered to as a minimum while MDMER come into effect.

FDP = Final Discharge Point

4.1 Effluent Monitoring

4.1.1 Deleterious Substances

Effluent water at the FDP (end-of-pipe) will be measured for pH and analysed for concentrations of deleterious substances listed in MDMER Schedule 4 (GC 2017).

4.1.2 Acute Lethality

End-of-pipe brine effluent will be sampled once per month for acute lethality testing per MDMER requirements. Acute lethality testing will be conducted on threespine stickleback in accordance with the procedures set out in sections 5 or 6 of Reference Method EPS 1/RM/10 (ECCC 2017). Effluent characterization samples (Section 4.1.3) will be collected at the same time to aid in interpretation of acute lethality test results.

4.1.3 Effluent Characterization

Effluent characterization will be conducted one month apart, four times a year. Effluent will be sampled and analysed for the following parameters:

- General parameters, including pH, TDS, total suspended solids, hardness, alkalinity, electrical conductivity, salinity and temperature
- Anions including sulphate and chloride
- Nutrients, including ammonia and nitrate
- Total metals and dissolved metals including those listed in MDMER Schedule 4 and Schedule 5 paragraph s. 4

4.1.4 Sublethal Toxicity Testing

Sublethal toxicity testing of brine effluent will be conducted twice a year, at the beginning and at the end of discharge, for three years and once a year after the third year. The following tests will be conducted:

- Fish early life stage development test on inland silverside (*Menidia beryllina*) or topsmelt (*Atherinops affinis*) (US EPA 2002)
- Invertebrate reproduction test on echinoids (sea urchins or sand dollars) (Environment Canada 1992)
- Algae toxicity test on barrel weed (*Champia parvula*) (US EPA 2002)

These tests will be conducted on aliquots of the same sample collected for effluent characterization (Section 4.1.3 Effluent Characterization).

4.1.5 Environmental Effects Monitoring

Agnico Eagle will adhere to MDMER EEM requirements for fish population surveys, water and sediment quality and benthic invertebrate community assessments conceptually outlined in Table 4. Fish tissue monitoring will be conducted if triggered by MDMER conditions. A study design will be provided to ECCC according to the MDMER requirements (GC 2017) that includes all proposed monitoring locations.

4.2 Quality Assurance/Quality Control (QA/QC)

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality.

Quality assurance protocols will be followed so data are of known, acceptable, and defensible quality. To make certain that field data collected are of known, acceptable, and defensible quality, field staff will be trained to be proficient in standardized sampling procedures, data recording using standardized forms, and equipment operations applicable to the monitoring program. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping protocols. Accredited laboratories will be selected for sample analysis. Accreditation programs are utilised by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control. A data management system will be utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the Marine Monitoring Program.

The QC component will consist of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples. Quality control procedures implemented will consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and duplicate water samples.

SECTION 5 • BENCHMARKS AND EFFECT THRESHOLDS

This section sets quality benchmarks and effect thresholds against which conditions of marine environment are monitored and whose exceedance indicate treated effluent discharge-related effects. The following criteria are discussed here:

- A benchmark is a set concentration of a chemical in a medium (water or sediments) that is expected to be protective of aquatic life, e.g., CCME Guidelines for the protection of aquatic life.
- Effect is a statistical difference in effect endpoint values between the exposure and reference areas.
- The effect threshold is a magnitude of environmental change, which, if reached, indicates a higher risk to the environment. A concept of Critical Effect Size (CES) exists for certain effect indicators, e.g., benthic invertebrate communities and fish population, which is used as an effect threshold.

Benchmarks and effect thresholds for each environmental variable are typically below the significance threshold, which is a magnitude of environmental change which, if reached, would indicate a significant effect (WLWB 2010). Exceedance of a benchmarks or effect thresholds will trigger adaptive management actions.

5.1 Water Quality

The benchmarks used for water quality variable are the CCME WQGs for the Protection of Marine Aquatic Life, British Columbia Ministry of Environment (BC MOE 2017a) Approved WQG for Marine Aquatic Life (Short-Term) and BC MOE Working WQG for Marine Aquatic Life (BC MOE 2017b) at the edge of the mixing zone of 100 m from the diffuser. For parameters for which no WQG exist, concentrations from the exposure area will be compared with the baseline concentrations and concentrations in the reference areas.

For each parameter, whether its concentration is elevated in the exposure area in comparison to the baseline or reference data will be determined based on a statistical test (ANOVA) on a 95% confidence interval or whether the mean or median is greater than 2 standard deviations.

Baseline data will be collected from the exposure and reference areas before the start of effluent discharge.

Table 5: Summary of Water Quality Guidelines

Parameter	Unit	CCME[1]		BC MOE[2]	
		Short-term	Long-term	Short-term	Long-term
Ammonia (total)	mg/L as N	-	-	0.71 – 312[3]	0.11 – 47[3]
Arsenic (total)	µg/L	-	12.5	12.5	-
Boron (total)	mg/L	-	1.2	1.5	-
Beryllium (total)	µg/L	-	-	-	100
Cadmium (total)	µg/L	-	-	0.12	-
Chloride	-	-	-	Narrative[4]	-
Chlorine-produced oxidants	µg/L	-	0.5	40	3
Chromium (III)	µg/L	-	-	-	56
Chromium (VI)	µg/L	-	-	-	1.5
Colour (apparent)	Pt-Co	-	-	Narrative[5]	-
Colour (real)	Pt-Co	-	-	Narrative[6]	-
Copper (total)	µg/L	-	-	3	<2
Cyanide	µg/L	-	-	1	
Dissolved Oxygen	mg/L	-	>8 and Narrative[7]	-	-
Fluoride	µg/L	-	-	1.5	-
Lead (total)	µg/L	-	-	140	<2
Manganese (total)	µg/L	-	-	-	100
Mercury (total)	µg/L	-	0.016	-	0.0001 / (MeHg/total Hg)
Nickel	µg/L	-	-	-	8.3
Nitrate	mg/L as N	1500	200	-	3.7
pH	-	-	7.0 - 8.7[8]	7.0 - 8.7	-
Salinity	-	-	Narrative[9]	-	-
Selenium (total)	µg/L	-	-	-	-
Silver (total)	µg/L	7.5	-	3	1
Temperature	degC	-	± 1 change from ambient background	-	± 1 change from ambient background
Turbidity	UNT	-	Narrative[10]	Narrative[11]	-
Total Suspended Solids	mg/L	-	Narrative [12]	Narrative [13]	-
Vanadium (total)	µg/L	-	-	-	50
Zinc	µg/L	-	-	55	10

Notes:

(1) Canadian Council of Ministers of the Environment (CCME 2003) Water Quality Guidelines (WQG) for the Protection of Aquatic Life - Marine.

(2) British Columbia Ministry of Environment (BC MOE 2017a) Approved Water Quality Guidelines for Marine Aquatic Life. BC MOE Working Water Quality Guidelines for Marine Aquatic Life (BC MOE 2017b).

(3) Guideline is salinity, pH and temperature dependent, minimum and maximum values are presented for a salinity of 30.

(4) Human activities should not cause the Cl^- of marine and estuarine waters to fluctuate by more than 10% of the natural Cl^- expected at that time and depth

(5) 30-day average transmission of white light ≥ 80% of background

(6) 30-day average true colour of filtered water samples shall not exceed background levels by more than 5 mg/L Pt in clear water systems or 20% in coloured systems

(7) The CCME guidelines for DO are as follows:
- Depression of DO below the recommended value should only occur as a result of natural processes. When the natural DO level is less than the recommended interim guideline, the natural concentration should become the interim guideline at that site.
- When ambient DO concentrations are >8.0 mg/L, human activities should not cause DO levels to decrease by more than 10% of the natural concentration expected in the receiving environment at that time.

(8) The pH of marine and estuarine waters should fall within the range of 7.0 – 8.7 units unless it can be demonstrated that such a pH is a result of natural processes. Within this range, pH should not vary by more than 0.2 pH units from the natural pH expected at that time. Where pH is naturally outside this range, human activities should not cause pH to change by more than 0.2 pH units from the natural pH expected at that time, and any change should tend towards the recommended range.

(9) Human activities should not cause the salinity (expressed as parts per thousand [‰]) of marine and estuarine waters to fluctuate by more than 10% of the natural level expected at that time and depth.

(10) The CCME WQG for Turbidity are as follows:
- clear flow: Maximum increase of 8 Nephelometric Turbidity Units (NTU) from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period).

- high flow or turbid waters: Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is > 80 NTUs.

(11) The BC MOE WQG for Turbidity are as follows:

- Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters
- Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters
- Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters
- Change from background of 10% when background is > 50 NTU at any time during high flows or in turbid waters

(12) The CCME WQG for total suspended solids are as follows:

- clear flow: Maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d).
- high flow: Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when background is ≥ 250 mg/L.

(13) The BC MOE WQG for total suspended solids are as follows:

- Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters
- Change from background of 5 mg/L at any one time for a duration of 30 d in all waters during clear flows or in clear waters
- Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters
- Change from background of 10% when background is > 100 mg/L at any time during high flows or in turbid waters

5.2 Sediment Quality

The benchmarks used for sediment quality variables are the CCME sediment quality guidelines (SQGs) for the Protection of Marine Aquatic Life (CCME 2003b) (Table 6). For parameters for which no sediment quality guidelines exist, concentrations from the exposure area will be compared with the baseline concentrations and concentrations in the reference areas.

For each parameter, whether its concentration is elevated in the exposure area in comparison to the baseline and reference data will be determined based on a statistical test (ANOVA) on a 95% confidence interval or whether the mean or median is greater than 2 standard deviations.

Baseline data will be collected from the exposure and reference areas before the start of effluent discharge.

Table 6: Summary Sediment Quality Guidelines

Parameter	Unit	CCME(1)	
		ISQG	PEL
Arsenic	mg/kg	7.24	41.6
Cadmium	mg/kg	0.7	4.2
Chromium	mg/kg	52.3	160
Copper	mg/kg	18.7	108
Lead	mg/kg	30.2	112
Mercury	mg/kg	0.13	0.7
Nickel(2)	mg/kg	30	50
Zinc	mg/kg	124	271

Notes:

(1) Canadian Council of Ministers of the Environment (CCME 2001) Sediment Quality Guidelines (SQG) for the Protection of Aquatic Life - Marine.

(2) British Columbia Ministry of Environment (BC MOE 2017b) Working Sediment Quality Guidelines for Marine Aquatic Life.

SECTION 6 • DECISION FRAMEWORK

A decision framework (Figure 2) will used by the Mine to identify an appropriate path through the EEM program, based on the respective situation. The structure of the decision tree is mainly based on the MDMER regulatory requirements and best scientific knowledge and is aimed to prevent or minimize adverse effects on the receiving environment. If any unforeseen adverse effects are identified during the monitoring and their cause is determined, additional mitigation measures will be applied through adaptive management. Mitigation measures developed and implemented with adaptive management will be dependent on the nature and magnitude of the changes observed.

The requirement to conduct the EEM program biological component studies (benthic communities, fish population and fish tissue) can be lifted if no effect has been found during two previous studies. The Mine will continue effluent and water quality monitoring and reporting the results, as required in the MDMER, independently of the biological monitoring studies and reports.

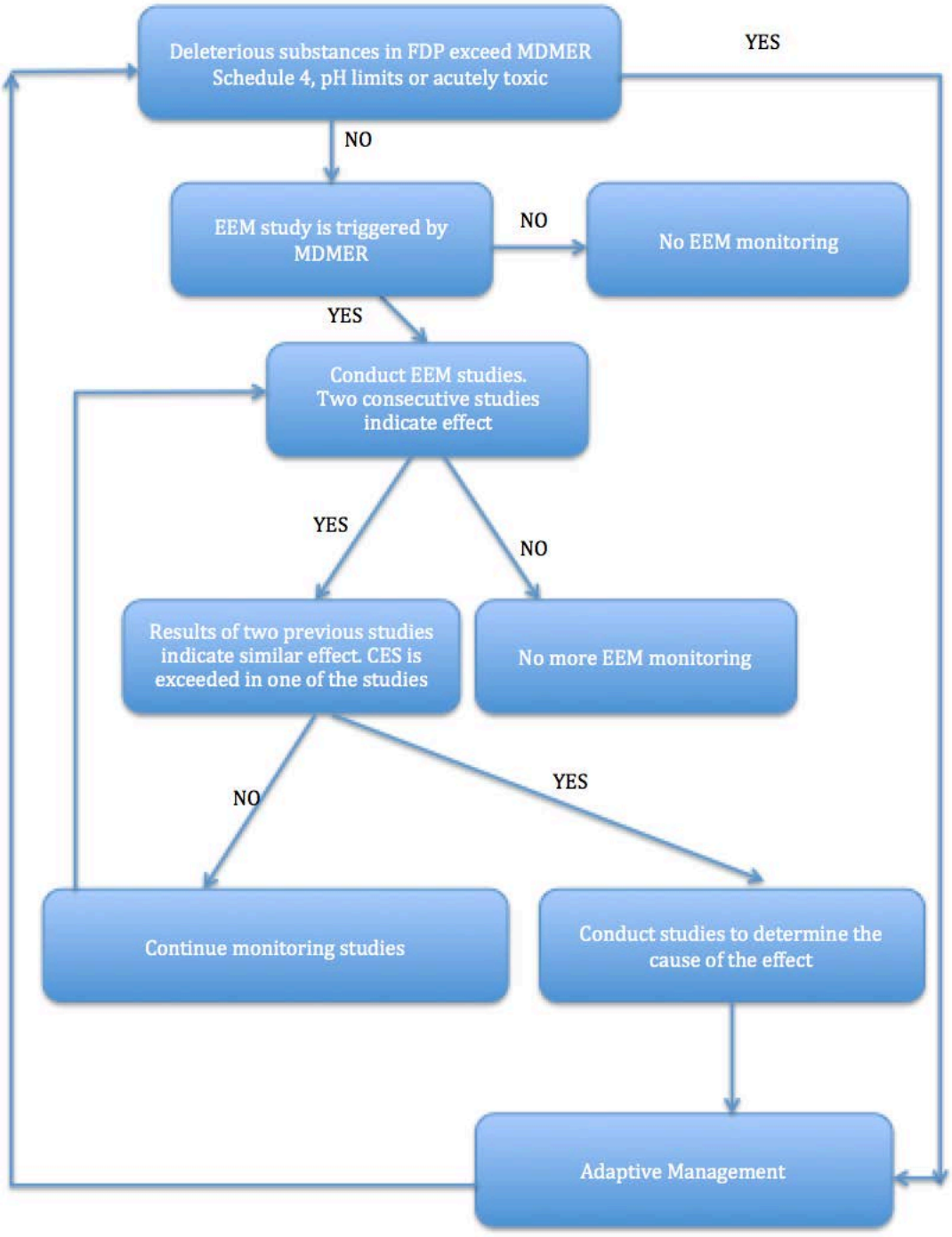

Figure 2: Ocean Discharge Monitoring Plan Decision Tree

SECTION 7 • REPORTING

Reporting will include all the raw data obtained during sampling campaigns, followed by data interpretation, graphical presentation and comparison to applicable guidelines, baseline data and literature data. Results for each component will be synthesized in an integrated manner to evaluate the overall direction of change to the marine ecosystem. The report will have a scientific approach similar to the other documents such as the Aquatic Effects Monitoring Program or EEM reporting and other environmental studies conducted for the Mine.

Comprehensive reports will be prepared and delivered to Environment and Climate Change Canada (as per the MDMER requirements) on the EEM reporting schedule and to NIRB and NWB annually following the discharge of treated groundwater effluent to the marine environment. Reports will be available on the public registry for regulator and stakeholder review and input. Reports filed with ECCC will be reviewed by a Technical Advisory Panel to satisfy the biological components of the MMER EEM program. Data on fish and lower trophic level monitoring will be entered to a federal government website for integration into a national dataset on biological monitoring at metal mines (EC 2012).

SECTION 8 • REFERENCES

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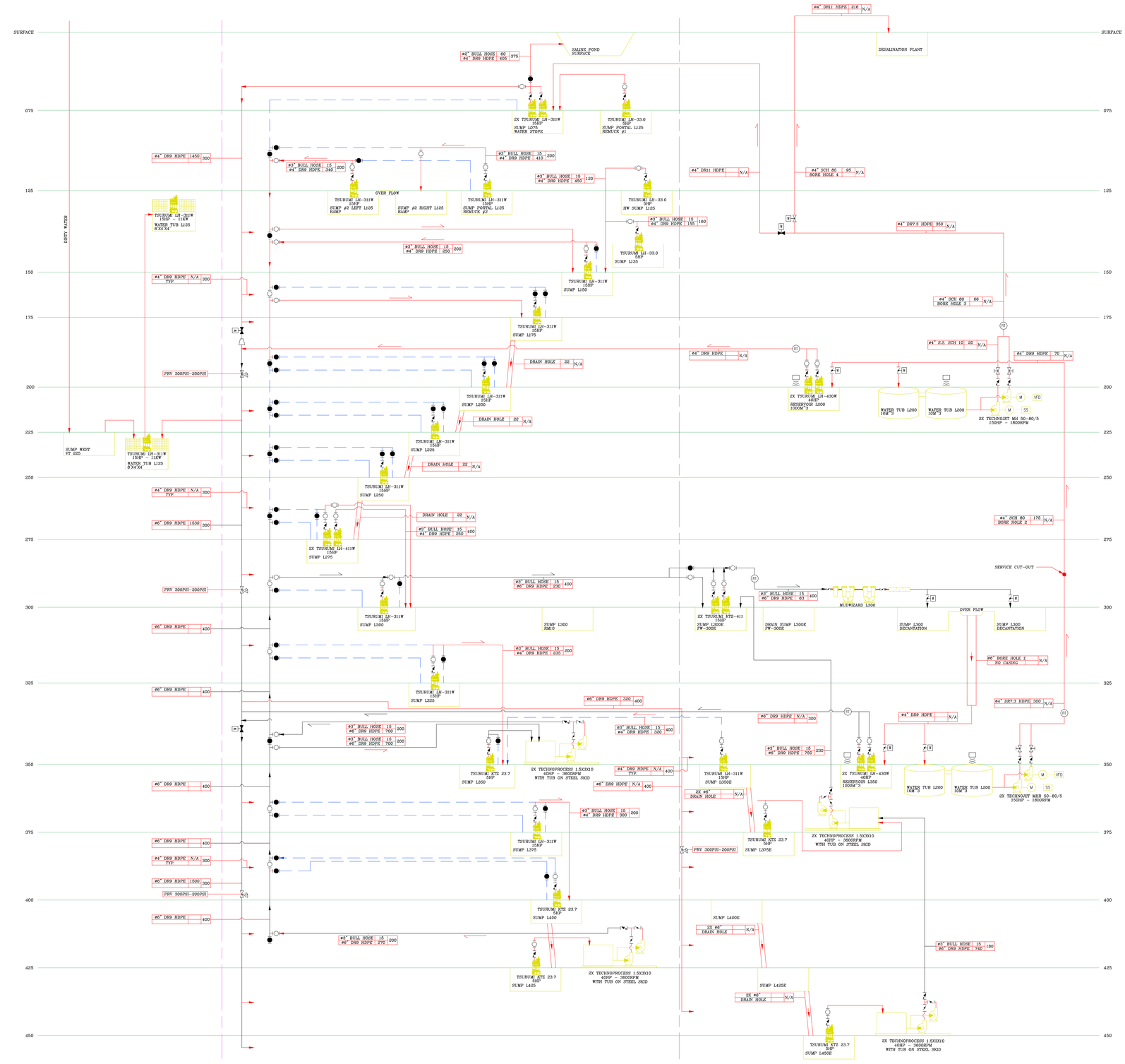
APPENDIX E • UNDERGROUND SUMP FLOW SHEET DIAGRAM



PIPE UNDER PRESSURE
PIPE UNDER PRESSURE 6"
PIPE WITHOUT PRESSURE
EQUIPMENT
LEVEL
SECTOR
FIRST PIPE | LENGHT (M) | #3" BULL HOSE 15
SECOND PIPE | LENGHT (M) | #4" DR9 HDPE 410 | 200 | FLOW (USGPM)
BALL VALVE NC
BALL VALVE NO
GATE VALVE NC
GATE VALVE NO
CHECK VALVE
PRESSURE REDUCING VALVE
BUTTERFLY VALVE
MOTORISED BUTTERFLY VALVE
LEVEL SENSOR
FLOW METER
CONCENTRIC REDUCER

TOTAL HP INSTALLED: 1045 HP

NOTE:

- ESTIMATED LENGTH OF PIPING, TO BE CONFIRMED BY COSTUMER.

NE PAS UTILISER POUR CONSTRUCTION
(NOT FOR CONSTRUCTION)

POUR APPROBATION
(FOR APPROVAL)
DATE : 2018-08-02

REV	DATE	DESCRIPTION	INIT.	INIT.
D	2018-11-15	ISSUED FOR COMMENTS	A.L.	A.L.
C	2018-09-26	ISSUED FOR COMMENTS	P.B.	M.B.
B	2018-09-18	ISSUED FOR COMMENTS	P.B.	M.B.
A	2018-08-08	ISSUED FOR COMMENTS	P.B.	A.L.

ÉMISSION/ISSUED FOR

Techno-Sub

CLIENT:
AGNICO EAGLE
MELIADINE

PROJET/PROJECT:
WATER MANAGEMENT AUDIT
P1806201

TITRE/TITLE:
FLOWSHEET DIAGRAM
MID TERME
NOVEMBER 2018

CONÇU PAR/DESIGNED BY: A. Labbe, P. Eng.	INIT.
DESSIN PAR/DRAWN BY: P. Bellerose	INIT.
VERIFIÉ PAR/CHECKED BY: A. Labbe, P. Eng.	INIT.
APPROUVÉ PAR/APPROVED BY: A. Labbe, P. Eng.	INIT.
ÉCHELLE/SCALE: N/A	DATE DE CRÉATION/CREATION DATE: 2018-08-08
# DE PROJET/PROJECT #: P1806201	
# DE DESSIN/DRAWING #: P1806201-0002	REVISION D

GABARIT/TEMPLATE: TECH_1 FORMAT: ARCH D (24X36)
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IMPRIMÉ LE/PRINT ON: 2018-11-15 15:21:29 - PAR/BY: ALEXANDRE LABBE

FICHIER/FILE: G:\PROJETS\P18-- PROJETS 2018\P1806201 - AGNICO-EAGLE MELIADINE - AUDIT DE GESTION DES EAUX DU SITE\3 - DESSINS\EN PROGRES\MISE EN PLAN\P1806201-0002 (P&ID NOV 2018).DWG
ÉCHELLE DE TRACE/PLOT SCALE: 0.037362

APPENDIX B • FRESHET ACTION PLAN AND SNOW MANAGEMENT PLAN

AGNICO EAGLE

MELIADINE GOLD PROJECT

FRESHET ACTION PLAN

MARCH 2019
VERSION 5

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prepared by	Revised	Date		
01	AGNICO EAGLE	Internally	March 2016	All	
02	AGNICO EAGLE	Internally	March 2017	All	
03	AGNICO EAGLE	Internally	March 2018	All	
04	AGINICO EAGLE	Internally	December 2018	All	
05	AGNICO EAGLE	Internally	March 2019	All 2 3 5-6 9-10 13 Figure 1 Figure 2 Appendix A	Update to reflect transitional changes to Operations phase Include DCP-1 and DCP-5 in areas of risk during Freshet Update section 2.1.2/2.1.3 noting 5 evaporators and discuss SP3 Update Section 2.8, discuss time of pond construction. Update Section 3.1, discussion of SP3 and update on inspections. Update Section 3.6., 3.7, 4 to reflect changes in freshet management. Updated to include structure names Updated to include SP3 Update to include emulsion pad to inspection list

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1 INTRODUCTION

The purpose of this Freshet Action Plan (Plan) is to provide Agnico Eagle with specific management and mitigation measures to address and manage water associated with the freshet season (Freshet), a response plan and procedures to prevent and to minimize potential negative impacts to the surrounding environment at the Meliadine Site (Site).

The term freshet refers to spring thaw, which can result in inundation of floodplains. Freshet at Meliadine typically takes place between May 15 and July 30. In some years, Freshet can also happen in early fall, when freezing re-occurs (mid-October) and then thaws. There are areas at the Site that are vulnerable to excess water produced during Freshet; the objective of this document is to identify those areas, and to develop a plan with defined roles and responsibilities to manage excess water produced on site.

The following guiding principles are applicable to the Plan:

- To ensure that mine contact water from runoff or seepage is managed to prevent adverse environmental impacts;
- To ensure the health and safety of Agnico Eagle employees and contractors; and
- To ensure the Site is in compliance with the Nunavut Water Board (NWB) Type A Water Licence No.: 2AM-MEL1631 (Type A Licence).

The Plan identifies areas of risk during Freshet, risk management and the procedures necessary to address potential concerns.

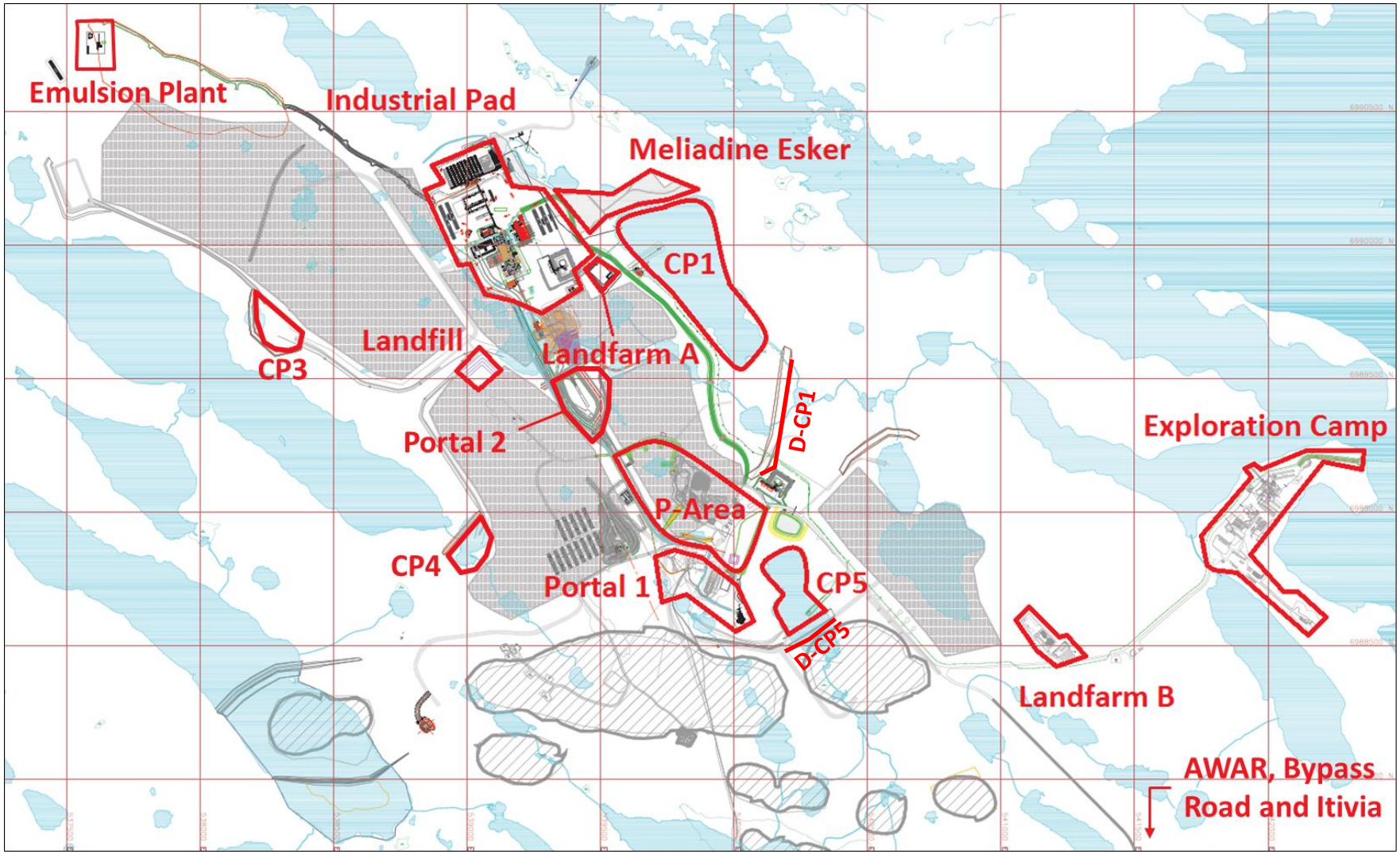
2 AREAS OF RISK DURING FRESHET

The key areas of risk during Freshet at the Site include the following:

- P-Area
- Portal 1 Sump 1 (Sump LV50)
- Portal 2 Sump 1 (Sump LV50)
- New (Type A) and old (Type B) Landfarms
- Landfill
- All Weather Access Road (AWAR) and Quarries along the road
- Infrastructure Areas; including the Exploration Camp area, Portal 1 & 2 and the Industrial Pad Areas
- Containment Pond 1 (CP1), Containment Pond 3 (CP3), Containment Pond 4 (CP4), and Containment Pond 5 (CP5)
- D-CP1 and D-CP5
- Meliadine Esker Quarry
- Bypass Road
- Itivia laydown and fuel handling facility (Itivia)

Identified areas of risk at Site are shown in Figure 1, and are described in the following section.

Figure 1: Site Plan View with Areas of Risk at Site during Freshet



2.1 P-AREA

The P-Area is the initial containment area identified for precipitation events; snow melt or Freshet water that has come in contact with mine waste rock or surface works in the area of the Underground Portals (contact water).

The P-Area includes three containment areas (Figure 2); P1 Containment Area (P1), P2 Containment Area (P2), and P3 Containment Area (P3) and has a cumulative capacity of 46,041 m^3. Periodic pumping to P1, from P2 and P3, is planned to manage water levels and to assist with active evaporation at P1.

2.1.2 P1

P1 is the largest containment of the three ponds that make up the P-Area (20,781 m^3). Precipitation, water drainage from the adjacent waste rock pile, and any water pumped from P2 or P3 will also be contained within P1. Five evaporators are installed at P1 to assist with active evaporation of water contained at P1 during the open water season at Site.

2.1.3 P2

P2 is directly adjacent and down-gradient to P1. P2 allows for additional contact water, precipitation and waste rock drainage water management with a capacity of 6,828 m^3. Additionally, P2 is the main containment area for water pumped to surface from underground Sump 1 (LV50). LV50 is the receptor of surface water that flows from the surface to Portal 1. Water from P2 is pumped to P1 to be actively evaporated.

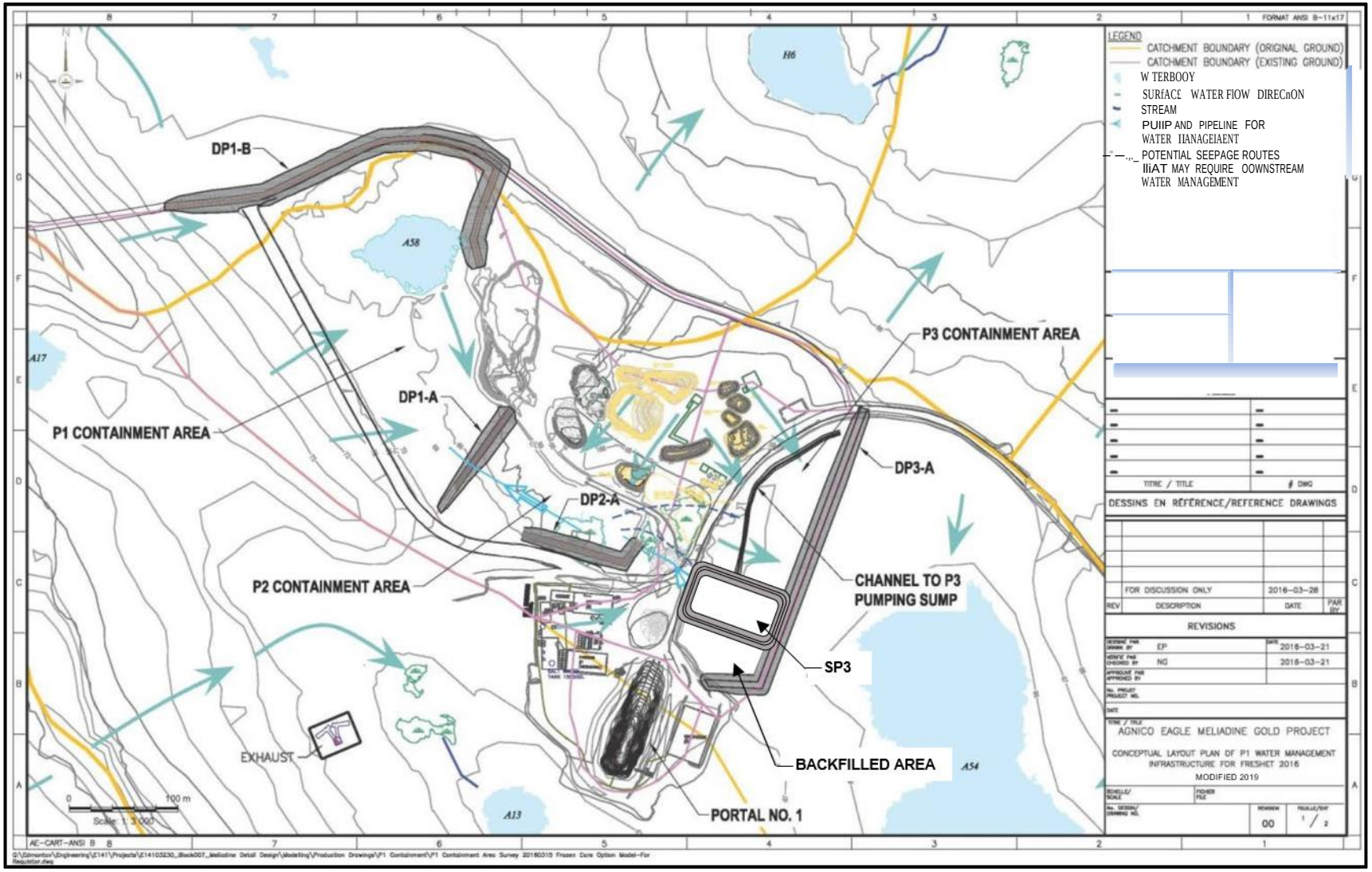
2.1.3 P3

P3 is down-gradient to P1 and P2. P3 contains surface runoff from the surrounding portal entrance surface area, precipitation, and inflow water from Waste Rock Storage Facility 2 (WRSF2) and temporary ore piles to the north-northwest of P3. Snow removed from the selected areas at the Site throughout winter months, will be directed to P3. Water from P3 is pumped to P1 to be actively evaporated.

2.1.4 SALINE POND 3

Saline Pond 3 (SP3) will be constructed within the containment area of P3 and will have a minimum storage capacity of 5000 m^3. The design of the containment structure will use an elevated dike approximately 2 m higher than the adjacent road surface. As such, runoff water in this area should not flow into SP3, but is expected to be contained by the remaining containment area of P3.

Figure 2: P-Area Plan View



2.3 PORTAL 1 SUMP 1 (LV50 SUMP)

LV50 is located 50 meters below grade (mbg) and is the first sump, closest to the entrance of Portal 1. Snowmelt and surface run-off that flows to the portal entrance (the lowest elevation at the Site), down the underground haulage ramp to sump LV50, is pumped from LV50 to the P-Area. The overall capacity for Portal 1 Sump 1 is 29 m^3. Water pumped from Portal 1 Sump 1 to P2 is measured with a volumetric flow meter and recorded daily.

2.4 PORTAL 2 SUMP 1 (LV50 SUMP)

LV50 is located 50 meters below grade (mbg) and is the first sump, closest to the entrance of Portal 2. Snowmelt and surface run-off that flows to the portal entrance, down the underground haulage ramp to sump LV50 is pumped from LV50 to Channel 1. The overall capacity for Portal 2 Sump 1 is 55 m^3. Water pumped from Portal 2 Sump 1 to Channel 1 is measured with a volumetric flow meter and recorded daily.

2.5 LANDFARM

The Type A Licence Landfarm is located adjacent and east of the Industrial Site Pad and is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons such as diesel and gasoline (Agnico Eagle 2016). It was assumed that an annual volume of 500 m^3 of contaminated ice and snow would require management and the landfarm has been designed to account for this volume.

The Landfarm has geotextile liners and is filled with soil. Water that pools, collects or flows from the Landfarm needs to be collected for monitoring and treated before it is discharged to CP1.

2.6 ALL WEATHER ACCESS ROAD (AWAR)

The All-Weather Access Road (AWAR) was built in 2013 to connect the Site to the hamlet of Rankin Inlet. The road is approximately 23.8 km long with twenty-two water crossings; three bridge crossings and nineteen culverts installed (Figure 3).

2.7 INFRASTRUCTURE AREAS

Infrastructure Areas represent buildings, pads and towers installed at the Site and include the Industrial Pad, Exploration Camp, and Emulsion Plant (Figure 1).

2.8 CP1, CP3, CP4 AND CP5

Engineered water containment dikes constructed in 2017 at lakes A54 and H17 were developed as CP5 and CP1, respectively. The dikes are designed to contain contact water within the footprint of the Site and prevent pollution provisions of the *Fisheries Act*. Both CP1 and CP5 will be used for Site contact water and snow and ice collection prior to Freshet. CP1 and CP5 are illustrated in Figure 1 and discussed in Section 4 of this report.

CP3 and CP4 are containment ponds designed to collected runoff from the Tailings Storage Facility (TSF) area and Waste Rock Storage Facility 1 (WRSF1) area, respectively. CP3 construction was completed in Q4 of 2018 and CP4 construction is scheduled to be complete prior to freshet 2019. CP3 and CP4 design plans implement engineered thermal protection berms. Maximum operating levels within CP3 and CP4 are such that D-CP3 and D-CP4 will not be required to retain water (see Water Management Plan).

2.9 BYPASS ROAD

The Bypass Road is a 5.9 km access road that provides a means to divert site-related traffic around the community of Rankin Inlet. The Bypass Road spans from the northwest margin of Itivia to km 2.9 on the AWAR (Figure 4).

2.9 ITIVIA

Itivia is located in Rankin Inlet and is accessed by Site from the AWAR and Bypass Road. In combination with the Bypass Road, Itivia is intended to support the Site to divert site-related traffic around the community of Rankin Inlet. Itivia is also used for fuel storage and as a laydown area for barge shipments. The location of Itivia is shown on Figure 3 and the plan view of the Itivia Site is presented as Figure 5. A culvert is installed to divert runoff around the Itivia Site and to allow passage of run-off from the Itivia laydown area (Figure 5).

Figure 3: AWAR Map Showing Water Crossing Location

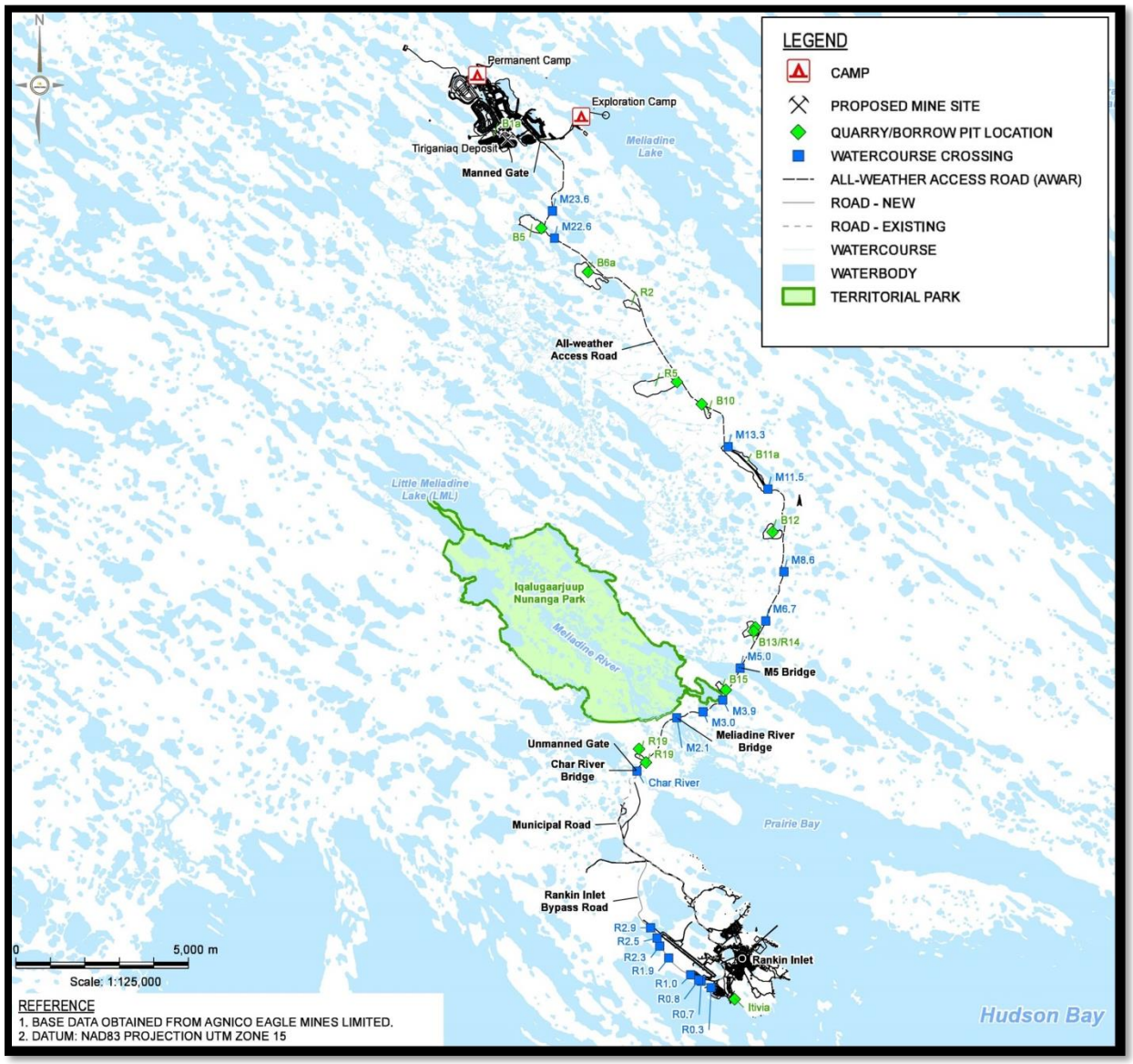
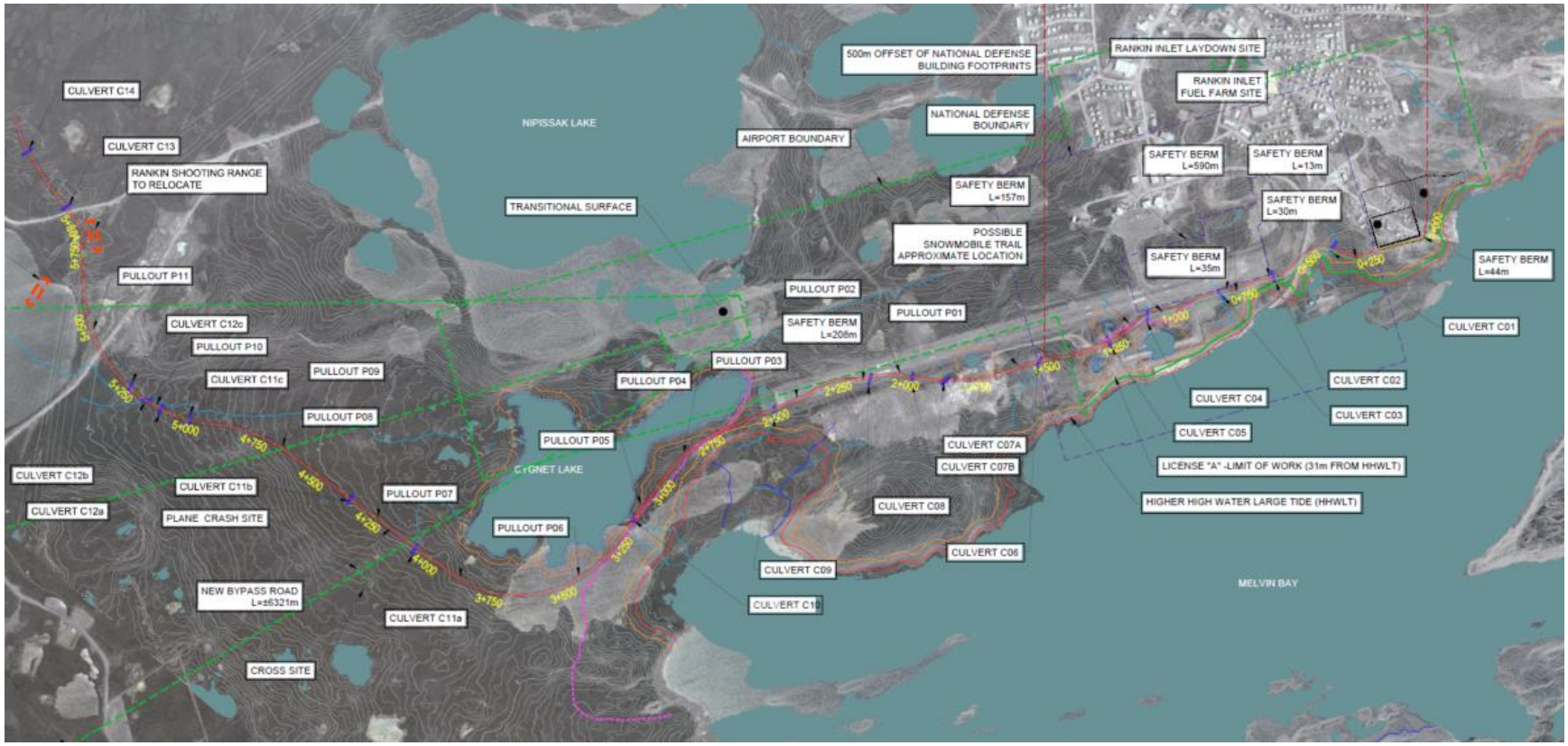


Figure 4: Bypass Road and Culvert Locations



3 FRESHET RISK MANAGEMENT

Managing the risks prior to Freshet is a primary objective at Site. Planning and preparing before Freshet alleviates some of the risk from excess water that may suddenly occur, and ensures compliance with applicable regulations. This is managed by removing water (pumping) at containment pond areas prior to winter freeze (fall) to allow for increased capacity from precipitation, snow and ice removal on roads, road water crossings, culverts, ditches, and select containment ponds after winter freeze and before Freshet (winter and spring).

Risk management for the Site areas during Freshet are described below and Appendix A presents the Freshet Action Plan Procedure for preparation prior to, during and after Freshet. Section 4 describes snow management at Site and Appendix B presents the Snow Management procedure.

3.1 P-AREA RISK MANAGEMENT

The following management practices are maintained at the P-Area during Freshet and are described in more detail in Appendix A:

- Water levels will be monitored. The water level will not exceed the maximum design elevation in any of the three containment ponds (P1, P2 or P3). P3 water levels will be kept as minimal as possible to keep water from affecting the base of Saline Pond 3 (SP3), which will be constructed in the southwest portion of P3 prior to freshet 2019 (see Water Management Plan for details).
- Agnico Eagle will conduct daily visual inspections of the P-Area. These will include visually monitoring the base of the downstream side of dikes DP1-B and DP3-A (see Figure 2) for seepage, sedimentation deposition, and erosion. If seepage or water with increased total suspended solids (TSS) is noted during inspections, water will be sampled, contained, and pumped back to the P-Area. These volumes pumped will be recorded and documented.
- Agnico Eagle will conduct weekly structural inspections of the dikes and note observed seepage. Inspections will also include monitoring the base of SP3 for settling, slumping and cracking.
- Weekly thermistor readings within P-Area berms will be taken and assessed by Engineering to monitor the potential for seepage through the containment berms.
- Active evaporation from use of the evaporators will contribute to managing the quantity of water contained at P-Area.
- Weekly water sampling during Freshet.

If an emergency occurs, such as the dikes/berms indicating compromised integrity, Agnico Eagle will discharge the water to CP5.

If CP5 does not have the capacity for water from the P-Area, water will be diverted to Saline Pond 1 (SP1) or to the Underground Water Stope for storage until a system for suitable water treatment to meet the Type A Licence and/or MMER discharge criteria. Water may also be diverted to Saline Pond 2 (SP2), pending the commissioning of the facility.

3.2 PORTAL 1 SUMP 1 RISK MANAGEMENT

If the P-Area becomes filled to capacity and LV50 sump needs to be pumped, the water from LV50 will flow down gradient to the Underground Water Stope.

3.3 LANDFARM RISK MANAGEMENT

If there is any excess water collected at the Landfarm during freshet and treatment is not immediately possible, the excess volume will be transferred to the contaminated snow cell located in the Northeast extent of P1. If the snow cell is at capacity and the Landfarm contains excess water, the water will be sampled and, pending acceptable results, the water will be moved to CP1. If results do not allow transfer to CP1, water will be stored in totes until treatment is possible.

In the event that the water sample results do not allow transfer to CP1, potential treatment methods are as follows:

- Oil/water Separator
- CI Agent E-VAC Waste Water Filter System
- Carbon Filter System

If a suitable treatment cannot be completed, the water will be shipped south in totes or bladders for disposal in a certified disposal facility.

3.4 AWAR, BYPASS ROAD AND CP3/CP4 ACCESS ROAD RISK MANAGEMENT

The following management practices are maintained to ensure the integrity of the AWAR, Bypass Road and CP3/CP4 access roads before and during the Freshet and are described in further detail in Appendix A:

- Large culverts will be heated/steamed as necessary to allow the free flow of Freshet water.
- Prior to Freshet, water crossings and culverts will have snow removed from ice surface on the up and downstream side of the crossing to allow free flow of water.
- Visual inspections of AWAR will be undertaken as to the structural integrity of the abutments and road integrity by the E&I Supervisor.
- Weekly (minimum) written inspections throughout freshet and daily during excessive rainfall response including TSS transport, culvert/crossing function, flow rates, and integrity of roads will be completed by the Environment Department in conjunction with the E&I Department.

If soil erosion or ground surface scouring are observed, the E&I Department will be notified for repairs. TSS barriers, silt fences, straw logs or other sediment control methods will be implemented as required.

3.5 INFRASTRUCTURE AREAS

Risk management practices for the main Infrastructure Areas at the Site during Freshet are described in the following sections.

3.5.1 CAMP PADS AND SURROUNDINGS

Risk management practices are maintained at the Exploration Camp, Main Camp and surrounding camp areas as follows:

- Clearing off ice and debris from culverts prior to and during freshet;
- Daily visual inspections for excessive water pooling. If pooled water is observed to flow into a water body, a water sample will be collected and monitored for TSS. Follow-up samples will be collected on a weekly basis thereafter;
- Daily visual inspections for snowmelt runoff. If runoff is observed to flow into a water body, a water sample will be collected and monitored for TSS. Follow-up samples will be collected on a weekly basis thereafter;
- Daily visual inspections to ensure flow through culverts and along channels is not impeded; and

- TSS transport will also be monitored at the culvert beside the garage that flows straight to Meliadine Lake. This area will be monitored for TSS, and preventative measures (install straw wattles and/or booms) will be installed to prevent deleterious substances from entering Meliadine Lake.

3.5.2 INDUSTRIAL PAD AND ACCESS ROAD

The following management practices are maintained to ensure the integrity of the industrial pad and access road:

- This area will be monitored for turbidly and preventative measures (install straw wattles and/or booms) will be implemented to prevent deleterious substances from entering Meliadine Lake.

3.6 CP1, CP3, CP4, CP5, AND QUARRIES

Risk management practices for CP1, CP3, CP4, CP5, the Meliadine Esker and Quarries include discharging/pumping the water prior to winter freeze to be treated and/or discharged as per the Type A Water Licence and the Water Management Plan. If water is observed to be flowing or ponding, it will be sampled to ensure deleterious substances and TSS is not released to surrounding water bodies (Part I, Item 11 of the Type A Water Licence). Inspections of CP1, CP3, CP4 and CP5, and associated water management structures or thermal protection berms, will be conducted following Part E Item 15 of the Type A Water Licence and Section 3.12 of the Water Management Plan.

The south side of D-CP5 acts as a natural sump due to it formerly being part of Lake A54, and has the potential to impound water against the rear-side of D-CP5. To mitigate potential impact of any impounded water against the dike, snow will be removed from the downstream slope/toe of D-CP5. Daily inspections will be performed at this location and pumping rates will be maintained to ensure potential impacts are mitigated.

Culvert 3, which is designed to connect flow from Channel 1 to CP1, is prone to blockage due to its elevation relative to CP1 and due to drifting of snow along the roadside. Culvert 3 will be cleared mechanically and/or thermally prior to freshet to ensure flow from Channel 1 to CP1. Culvert 3 will be monitored daily during freshet to ensure flow passage is maintained.

3.7 ITIVIA

The following management practices are maintained to ensure the integrity of Itivia and the Bypass Road:

- The culvert installed between the Itivia laydown and the existing laydown areas (Figure 4) will be cleared of snow and ice prior to freshet and will be monitored closely for TSS transport;
- Rip rap was installed around the culvert to control erosion and a decantation sump will be maintained downstream to collect suspended sediment;
- The upstream and downstream extents of the culvert area will be monitored for turbidity and preventative measures (install straw wattles and/or booms) will be implemented to prevent deleterious substances from entering Hudson's Bay; and
- Weekly water sampling at locations of runoff.

4 SNOW MANAGEMENT

Proper snow management during the winter contributes to risk mitigation from excess water during Freshet and prevents possible environmental impacts. *The Snow Management Procedure* (Procedure Number MEL-ENV-0017) (Appendix B) presents the plan to efficiently manage snow at the Site.

Snow that is collected and moved from the fuel farm, landfarm, the area surrounding the Portal 1 and Portal 2 entrances, waste rock piles and surrounding P-Area will be moved and collected at P3. During construction of SP3, snow and ice within the southwest portion of P3 will be moved to P2. Snow and ice from the other areas at the Site are removed from roadways with a snow blower or plow and /or collected and transported to the CP1 or CP5. Figure 6 illustrates the locations for snow collection during the winter and prior to Freshet. Figure 7 illustrates the snow management and storage areas for Itivia.

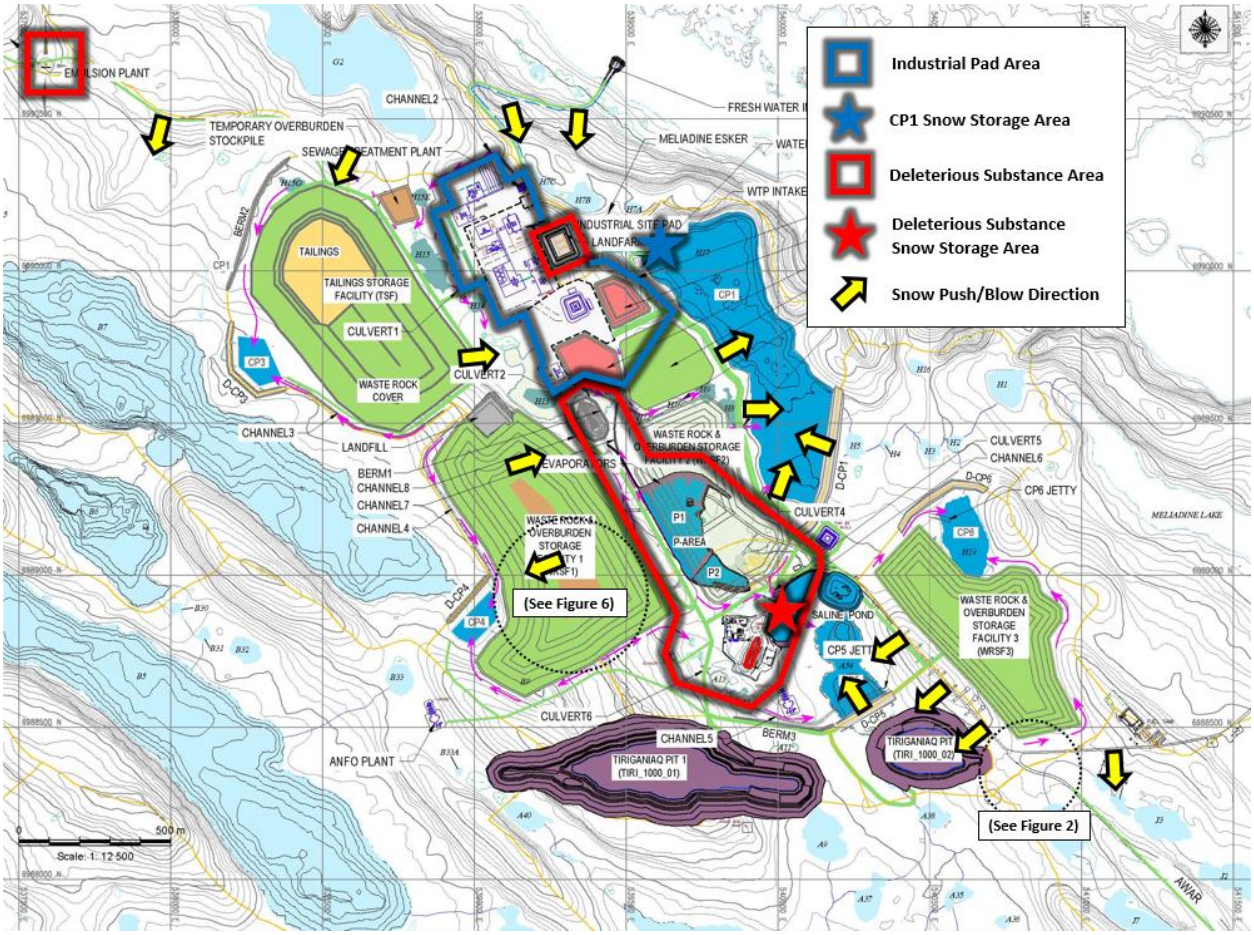


Figure 5: Snow Management Plan on Site

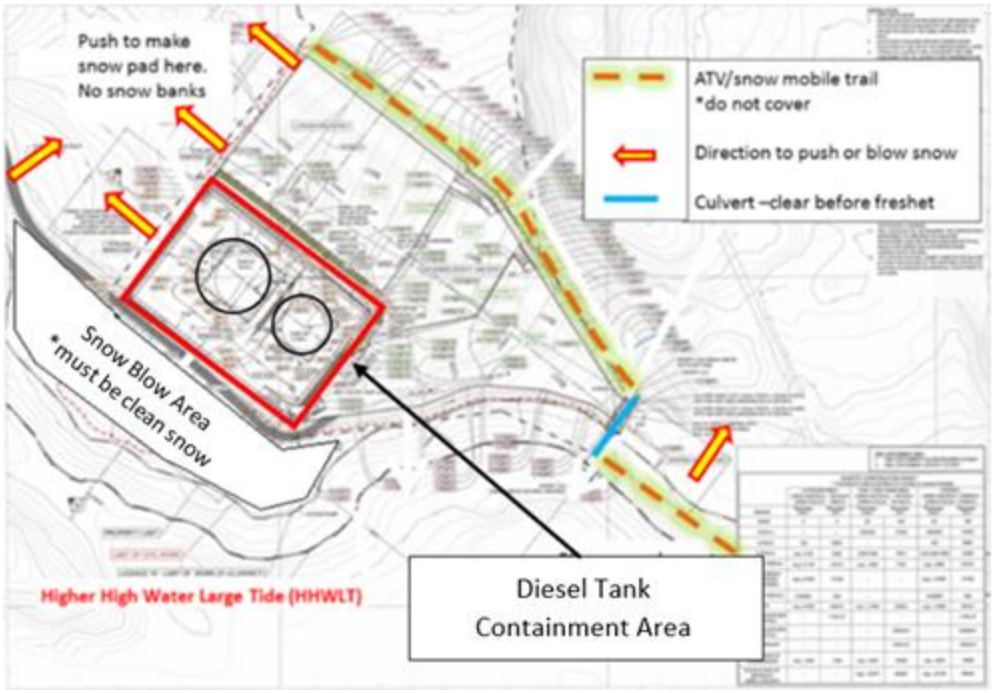


Figure 6: Itivia Snow Management Areas

5 REFERENCES

Agnico Eagle. 2015. Meliadine Gold Project: Landfarm Management Plan. Version 1. April 2015. 6513-MPS-15.

Agnico Eagle. 2016. Meliadine Gold Project: Water Management Plan. Version 2. March 2017.

Nunavut Water Board (NWB). 2015. Type A Water Licence No: 2AM-MEL1631.

APPENDIX A: FRESHET ACTION PLAN PROCEDURE

	DOCUMENT ID: MEL-ENV-Freshet Management Plan Procedure
People concerned: Agnico Eagle employees, contractors, visitors on the Meliadine site	**Effective Date: March 28, 2018**
This procedure corresponds to the required minimum standard. Each and everyone also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.	

Rev #	Date	Description	Initiator
1	2018-03-28	Change to Intelex Format	Matt Gillman
2	2018-12-14	Updated for 2019 Season	Matt Gillman
3	2019-03-12	Updated for 2019 Season, updated snow procedure spreadsheet to include D-CP5 and SP2	Matt Gillman

Objective:

- To provide a plan to prevent potential environmental incidents at the Meliadine Site (Site) caused by the freshet season (Freshet) by recognizing specific areas for risk at the Site, possible actions to be undertaken and the departmental responsibilities to address the required actions.

Definitions (If applicable):

Tool/Equipment Required	PPE Required
• N/A	• N/A

Procedure					
Winter and Spring – Preparation Prior to Freshet[1]					***Risks/ Impacts***
Area for Risk		**Action**	**Responsible Department**	**Approximate Dates**	
P-Area	P1, P2 & P3	• Snow must not be stockpiled to be greater than the containment capacity	Environment to coordinate with Energy & Infrastructure, Engineering and Construction	March - May	
AWAR, Bypass Road & CP3/CP4 Service Roads	Culverts	• Weekly Inspections	Environment	March - May	
	Major Crossings	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts (including the culvert at Itivia) and at major water crossings • Effort is to be made to ensure road surface material is not removed during snow clearing. • Ensure snow is not stockpiled along roadside • Repairs (mark culvert locations, add armouring at downstream around culverts and bridges, replace pipe as needed, and document maintenance and repairs) • Monitor signs of erosion (especially downstream at culverts 14.9 and 16 Km on AWAR) • Notify the Environmental Department about any areas for concern[2, 3]	Energy & Infrastructure	Winter Freeze to May (start of thaw)	
	Overall Roads				
Industrial Pad & Emulsion Pad	Culverts	• Weekly Inspections	Environment		
	Channels and ditches	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs any erosion • Notify the Environmental Department about any areas for concern[2, 3]	Energy & Infrastructure		
	Access Road				
Quarries		• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Re-grade disturbed areas to provide appropriate drainage	Construction Environment (for Sampling)	Winter Freeze to May (start of thaw)	
D-CP5		• Snow will carefully be cleared from the downstream toe of D-CP5. • Care will be taken not to destroy pump control station	Energy & Infrastructure	2-3 weeks prior to freshet (late-April to early-May)	

Note:

[1] See the *Snow Management Procedure* (Procedure No.: MEL-ENV-0017) for additional information for snow removal at the Site.

[2] The Environmental Department will assess the area of concern and action will be undertaken to comply with the Nunavut Water Board (NWB) Water Licence No.: 2AM-MEL1631 (Licence)(i.e. collect field parameters or water samples for analysis of total suspended solids, turbidity, or any deleterious substance).

[3] Areas of concern are defined as high water areas on roads, near the up gradient opening of a culvert, flowing water with sediment, spills, wildlife, etc.

Spring and Summer – During Freshet or During Heavy Rainfall				*Risks/ Impacts*
Area for Risk	**Action**	**Responsible Department**	**Approximate Dates**	
P-Area				
P1, P2, and P3	• Daily visual inspection • Daily monitor and record water levels • Weekly written inspection • Water sampling	Environment	May - October	
	• If water levels or structural integrity of berms are observed to be compromised, immediate action is required. Notify Supervisor	Engineering		
	• P2 and P3 water volume should be kept as minimal as possible. Pumping of this water should occur regularly (daily) • Measure and record pumping volumes daily and report to Environment weekly	Energy & Infrastructure		
Evaporators	• Commission after sub-zero temperatures no longer occur • Operate as efficient as possible	Energy & Infrastructure		
DP1 and DP3 Trenches /Seep	• Install pump and flow meter at trench to collect seep • Pump water to respective containment area (P1 or P3) • Measure and record pumping volumes daily and report to Environment weekly	Energy & Infrastructure		
AWAR, Itivia, Bypass Road, CP3/CP4 Access Roads				
Culverts	• Inspections for free flow water through culverts and major crossings, pooling water on road, and integrity of road and abutments (Weekly (minumum) or after heavy rainfall between May and October and daily during peak flow) • Sample as required[2]	Environment	May - October	
AWAR Major Crossings	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs and erosion/sediment control implementation • Notify the Environmental Department about any areas for concern [2, 3]	Energy & Infrastructure Environment (for Sampling)		
Overall Roads and Itivia				
Quarries	• Repairs and erosion/sediment control implementation • Re-grade disturbed areas to provide appropriate drainage • Notify the Environmental Department about any areas for concern [2, 3]	Construction Environment (for Sampling)		

Spring and Summer – During Freshet or During Heavy Rainfall			
New Camp Pad/Industrial Pad			
Culverts	• Daily inspections for free flow water through culverts and major crossings, pooling water on road, and integrity of road and abutments	Construction Environment (for Sampling)	May - October
Channels and Ditches Access Road	• Snow and ice clearing[1], including ice and snow that may impede free water flow through culverts and at major water crossings • Repairs and erosion/sediment control implementation • Notify the Environmental Department about any areas for concern [2, 3]	Construction Environment (for Sampling)	May - October
Infrastructure Pads			
Exploration Camp	• Daily visual inspections • Water sampling as required	Environment	May - June
Landfarm Structure	• Daily inspection of the landfarm retaining wall • Daily visual inspection for seepage • Collect a seepage water sample for hydrocarbon analysis. If seepage is present it should be immediately sampled and the seep be controlled. Whether by creating a sump and pumping back the water or by other methods.	Environment	
Landfarm	• Visually monitor excess water in containment area • Monitor seep (weekly) and collect water sample • Sample water according to the Licence	Environment	Mid-June and September
	• If excess water is present and cannot be treated immediately, sample in preparation for discharge to CP1		10 days prior to pumping
	• Once sample results have received, and if water is acceptable to be pumped to CP1 meets, water can be pumped to CP1 at a low flow to avoid erosion • Measure and record pumped volume	Energy & Infrastructure	Mid-June and September
Garage (Agnico Eagle)	• Install sump to contain excess water • Install straw wattles for sediment control on the other side of the road	Energy & Infrastructure	May
	• Daily monitoring of TSS and turbidity and possible contaminant runoff	Environment	May - June
Core Box Cemetery and Culvert	• Install straw wattles for sediment control on the other side of the road	Energy & Infrastructure	May
	• Daily monitoring of TSS and turbidity and possible contaminant runoff	Environment	May - June
Emulsion Plant Pad	• Weekly Inspections • Water sampling of runoff as required for ammonia, nitrates, turbidity and TSS	Environment	May - June
	• Daily visual inspection for pooling water and water run off form pad to tundra, if noticed immediately contact environment department	Dyno Nobel	

Note:

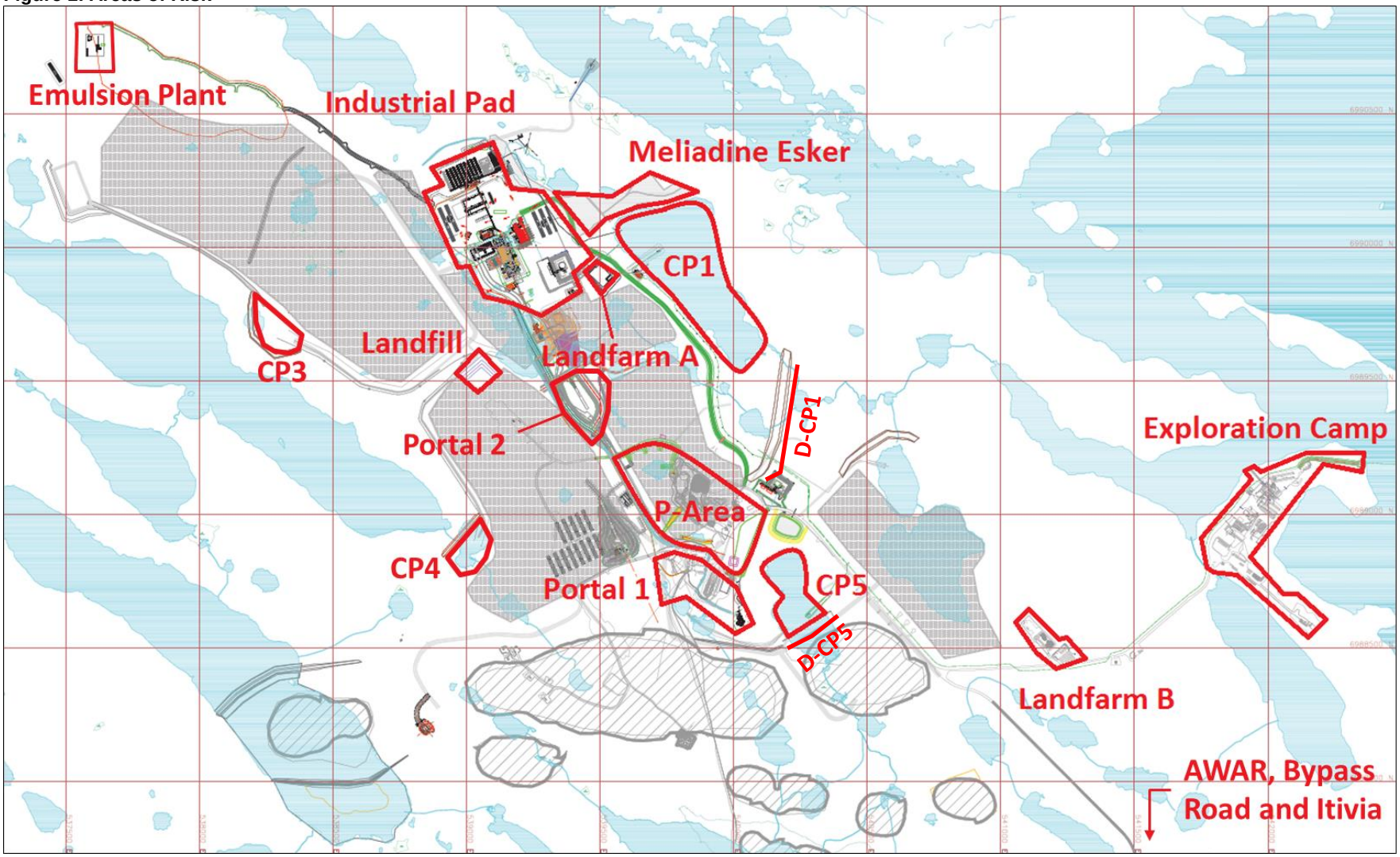
[1] See the *Snow Management Procedure* (Procedure No.: MEL-ENV-0017) for additional information for snow removal at the Site.

[2] The Environmental Department will assess the area of concern and action will be undertaken to comply with the Nunavut Water Board (NWB) Water Licence No.: 2AM-MEL1631 (Licence)(i.e. collect field parameters or water samples for analysis of total suspended solids, turbidity, or any deleterious substance).

[3] Areas of concern are defined as high water areas on roads, near the up gradient opening of a culvert, flowing water with sediment, spills, wildlife, etc.

Fall – Preparation Prior to Winter Freeze					*Risks/ Impacts*
Area for Risk		**Action**	**Responsible Department**	**Approximate Dates**	
LV50		• Survey water level and calculate water volume and provide to Environment, and/or • Measure and record flow meter volume prior to pumping and after pumping and provide to Environment • Remove pumps and prepare equipment for maintenance and winter storage	Mining	Prior to pumping to P2 (Late September)	
		• Pump to P2		Late September/Early October	
Lv75/Water Stope		• Pump to SP1, SP2 (pending approval), or SWTP		June - September	
P-Area	P2 and P3	• Pump water to P1 for active evaporation	Energy & Infrastructure	June - September	
	P1, P2 & P3	• Remove pumps and prepare equipment for maintenance and winter storage		At beginning of winter freeze	
	Evaporators	• Decommission for winter and prepare equipment for maintenance and winter storage		Prior to any sub-zero temperatures	
A8		• Move pump house/pump closer to Site		Late September	
CP1		• Weekly (during flow) or monthly (baseflow) written inspection • Water sampling	Environment	June - September	
		• Pump water to discharge at Meliadine Lake	Process Plant		
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
Downstream D-CP1		• Pump water to CP1	Energy & Infrastructure	June - September	
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
CP5/D-CP5		• Restrict vehicle access on D-CP5 to prevent instrument damage • Pump water to CP1/SWTP		Late September	
Downstream D-CP5		• Pump water to CP5		June - September	
		• Remove pumps and prepare equipment for maintenance and winter storage		Late September/Early October	
Saline Ponds		• Remove pumps and prepare equipment for maintenance and winter storage		First week of October	

Figure 1: Areas of Risk



Related Documentation (If applicable):
• 2018 Freshet Management Plan • MEL-ENV-0017 - Snow Management Procedure

References (If applicable):
• N/A

Authorization (Print Name)	
Approved: _____ Name JOHSC Worker Rep.	Date: _____
Approved: _____ Name Department Superintendent / Delegate	Date: _____
Approved: _____ Name Health & Safety Superintendent / Delegate	Date: _____

APPENDIX B: SNOW MANAGEMENT PROCEDURE

	DOCUMENT ID: MEL-ENV-Snow Management DRAFT
People concerned: All Departments	**Effective Date: 24 November, 2018**
This procedure corresponds to the required minimum standard. Each and every person must comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.	

Rev #	Date	Description	Initiator
1	2018-03-28	Change to Intelex Format	Matt Gillman
2	2018-09-30	Updated for next season	John Baechler Matt Gillman
3	2018-10-11	Updated to include changes to snow management methods at Itivia, bypass road, CP3 and CP4 access roads, and Itivia Gas Boy.	Dan Gorton John Baechler

Objective:

The overall purpose of the snow management procedure (SMP) is to provide an outline for snow management that will assist with preventing adverse environmental impacts to the Meliadine Project (Site) and to mitigate risks from excess water during the freshet season (Freshet).

Definitions (If applicable):

Snow pad area - an area where snow can be pushed and compacted over an existing structure, such as an access road or a rock pad.

Snow storage area - an area where snow can be taken from another area and stockpiled without causing a negative impact at the freshet.

Negative impact of snow melting during freshet - the transport of fine sediments or deleterious substances from Site to the natural environment, body of water, or within 31 m of a water body.

Tool/Equipment Required	PPE Required
• Snow blower • Shovel and haul truck • Grader	• Standard site PPE

Specific Training Requirements
• Equipment operator training

Procedure

Snow Removal at Meliadine Site

1. Prior to starting any snow removal, supervisors and snow removal equipment operators must discuss a removal plan based on the criteria outlined in this procedure.
2. If uncertain, supervisors or snow removal equipment operators must receive authorization from the Environment Department to move snow to a non-designated area. If access is required on dikes or berms, contact Engineering to ensure instrumentation is not damaged.
3. Supervisors must determine if the snow receiving location is:
   - Safe for the snow removal equipment operators
   - Outside a 31 m buffer zone around any water body
   - A designated snow storage area
   - A safety sensitive area
4. Designated snow storage areas are as follows (see Figure 1 in the Appendices):
   - Snow collected from areas of potential contact with contaminants (i.e. the Fuel Farm, Landfarm, Gas Boy, Emulsion Plant, Waste Rock Storage Facility 2 (WRSF2), areas surrounding the Portal 1 and Portal 2 entrances, and areas surrounding the P-Area) must be stockpiled in P3.
   - Clean snow from other areas at Site must be removed from roadways with a snow blower or plow, and/or collected and stockpiled at CP1.

5. The Fuel Farm, Gas Boy locations, Landfarm, and Itivia Diesel Tanks are safety sensitive areas. The valves and piping/hosing must be protected and available for inspection at all times. Snow must NOT be removed with a snow plow or heavy equipment. To improve safety and reduce risk of any contact with fuel tanks, valves, or equipment within these areas, snow must be removed by hand shovelling. The area surrounding the fuel tank valves must be carefully hand shovelled.
6. Snow accumulated at Channel 2 must be left to melt at freshet, as the use of snow removal or plow equipment can damage the geotextile that is installed.
7. Snow storage areas are not authorized along any roadways, including the All Weather Access Road (AWAR), and CP3 and CP4 service roads. Efforts must be made to ensure road surface material is not removed during snow clearing. Snow must be blown, plowed, or maintained as a snow pad area to reduce snow drifts across the road and allow for increased visibility. A level snow pad area may be created over the tundra provided that:
    - Clean snow is used for the pad construction
    - The surface is cleaned after use
    - Is not obstructing existing culverts, structures, or roadways
    - Is within the footprint of the mine
8. Snow storage areas are not authorized at the Exploration Camp. Snow must be maintained as a snow pad, as not to create long-term snow banks (Figure 2). Any snowbanks must be plowed and leveled.
9. Snow between the Main Camp dormitory wings must be removed to mitigate drifting against the wings, which creates confined space under the camp and wildlife habitats. (Figure 3).
10. Snow removed by Contractors at their designated worksite will be stockpiled at the worksite and subsequently removed by the Energy and Infrastructure department (E&I). E&I will collaborate with the Environment department to determine the correct location of the storage area if it is not outlined within this procedure.
11. Snow removal from the Tiriganiaq esker must be pushed or blown to the west side of the road running north-south. Snow from the Batch Plant must be padded on the north side, and any excess snow removed and stockpiled in the south end of P1 (Figure 4).

Snow Removal at Itivia Site

1. Snow storage areas are not authorized at the Itivia Laydown. Snow at the Laydown must be maintained as a snow pad area as not to create-long term snow banks. Any snowbanks must be plowed and leveled. Efforts must be made to ensure road surface material is not removed during snow clearing. The existing ATV/snowmobile trail must not be blocked by snow removal (Figure 5).

2. Snow along the bypass road will be removed by blowing. Operators will adjust the skid height of the snow blower to ensure a sufficient layer of snow remains to create an ice road. Operators will then scarify the road with a grader to improve traction. Sand will not be used along the Bypass road as the blown snow must be clean and free of debris.
3. Snow removal from the Itivia Diesel Tank Farm secondary contaminant area must not be done using heavy equipment as to not damage the installed synthetic liner.
4. Snow accumulated in the Gas Boy secondary containment is to be removed using suitable equipment, to maintain capacity for fuel spill mitigation. Diesel contaminated snow will be disposed of appropriately at the snow cell or landfarm.

Appendix:

Figure 7: Authorized Snow Removal and Snow Storage Areas

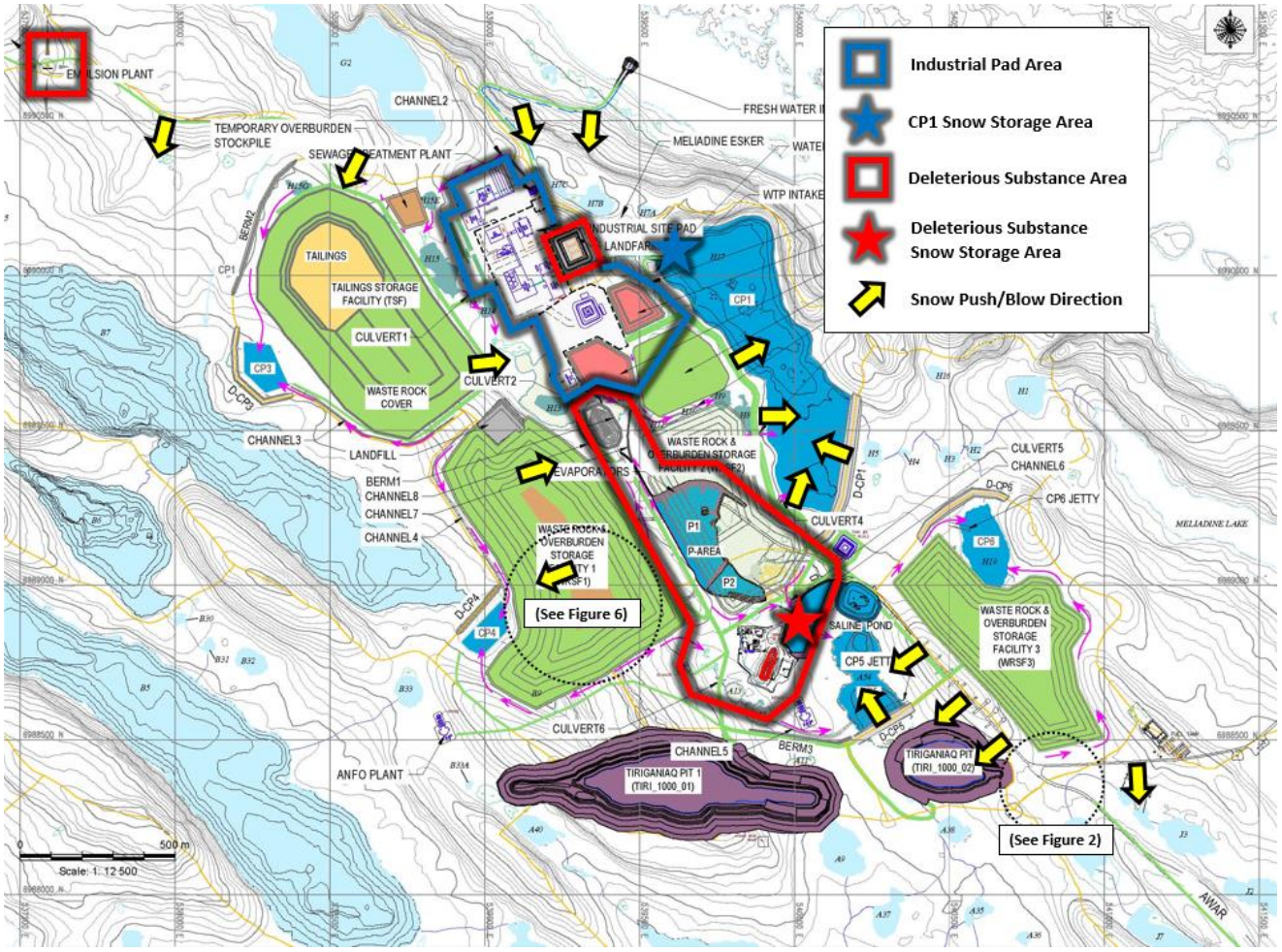


Figure 2: Exploration Camp Snow Pad Area and No Plow Zone Example

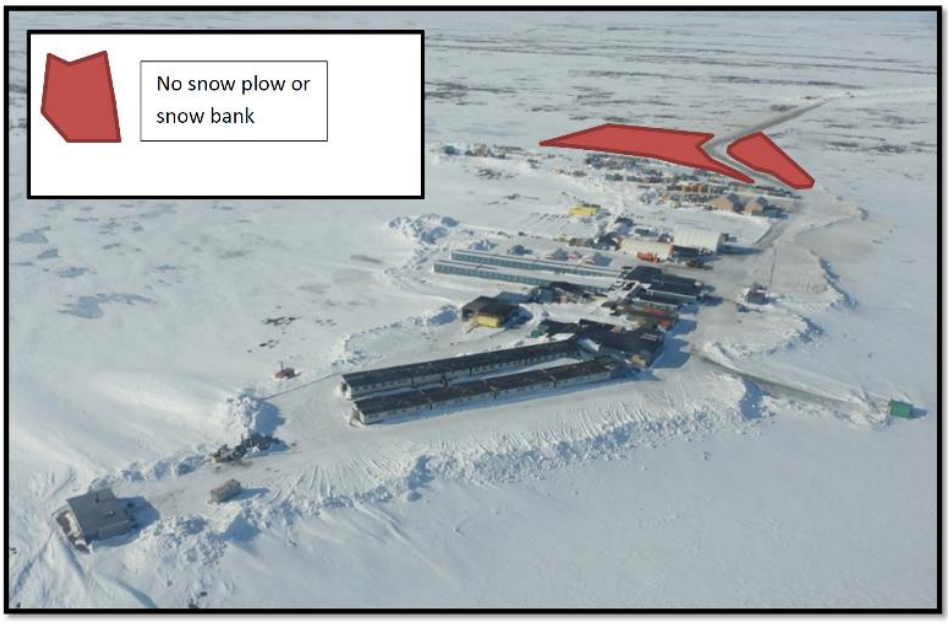


Figure 3: Snow removal from between camp accommodation trailers



Figure 4: Tiriganiaq Esker and Batch Plant Snow Removal Direction

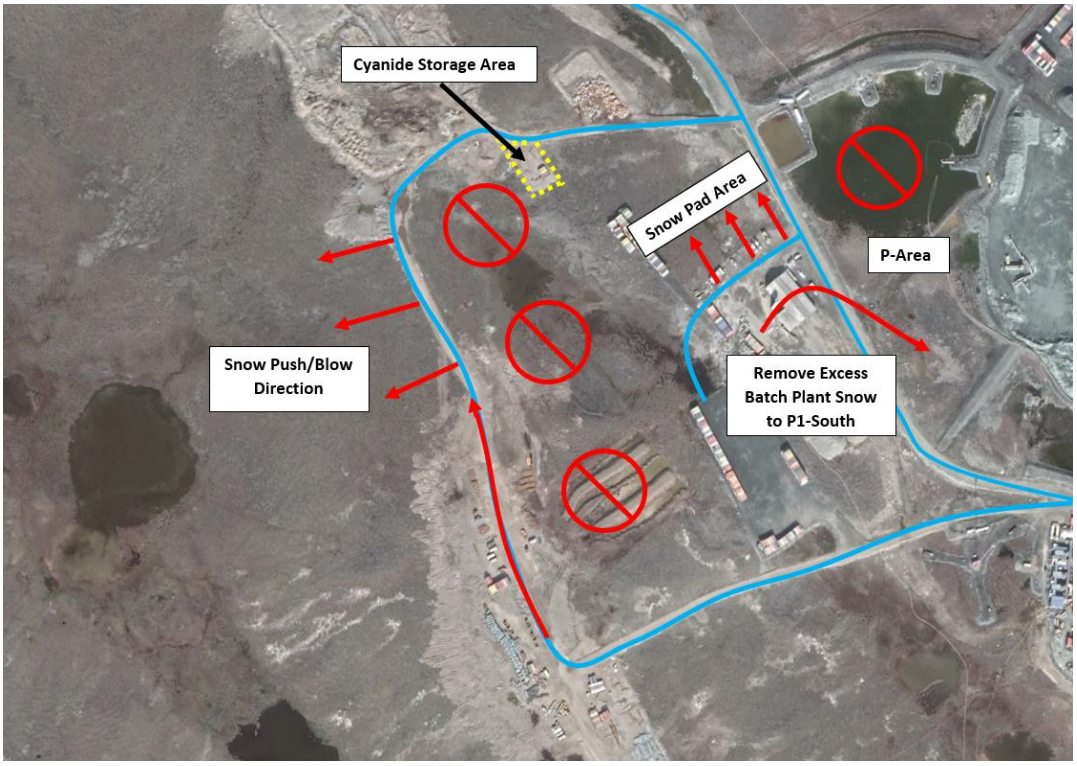
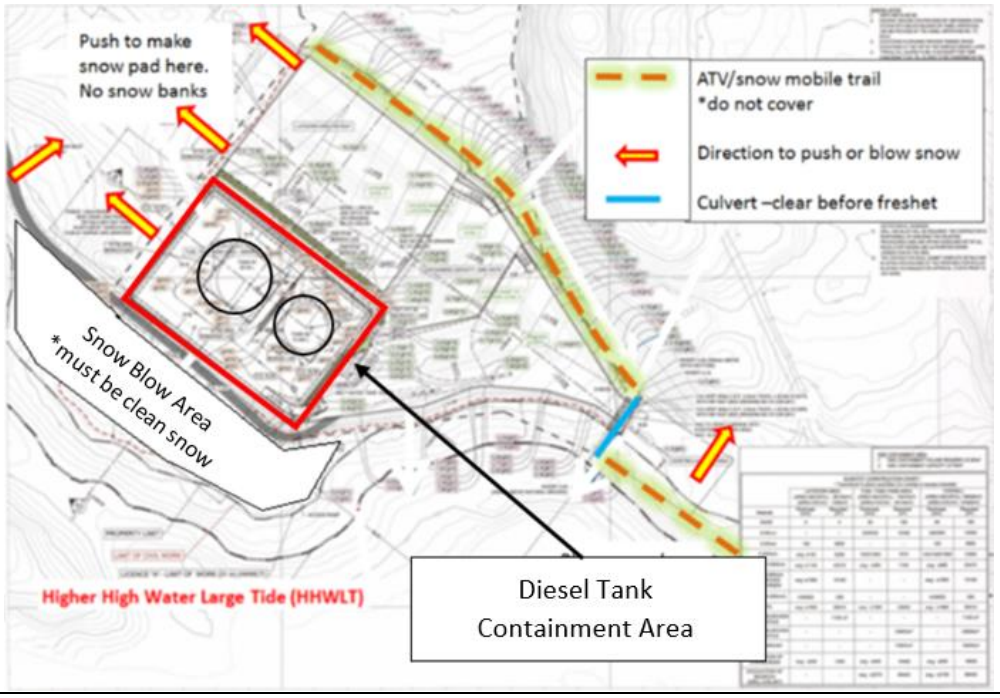
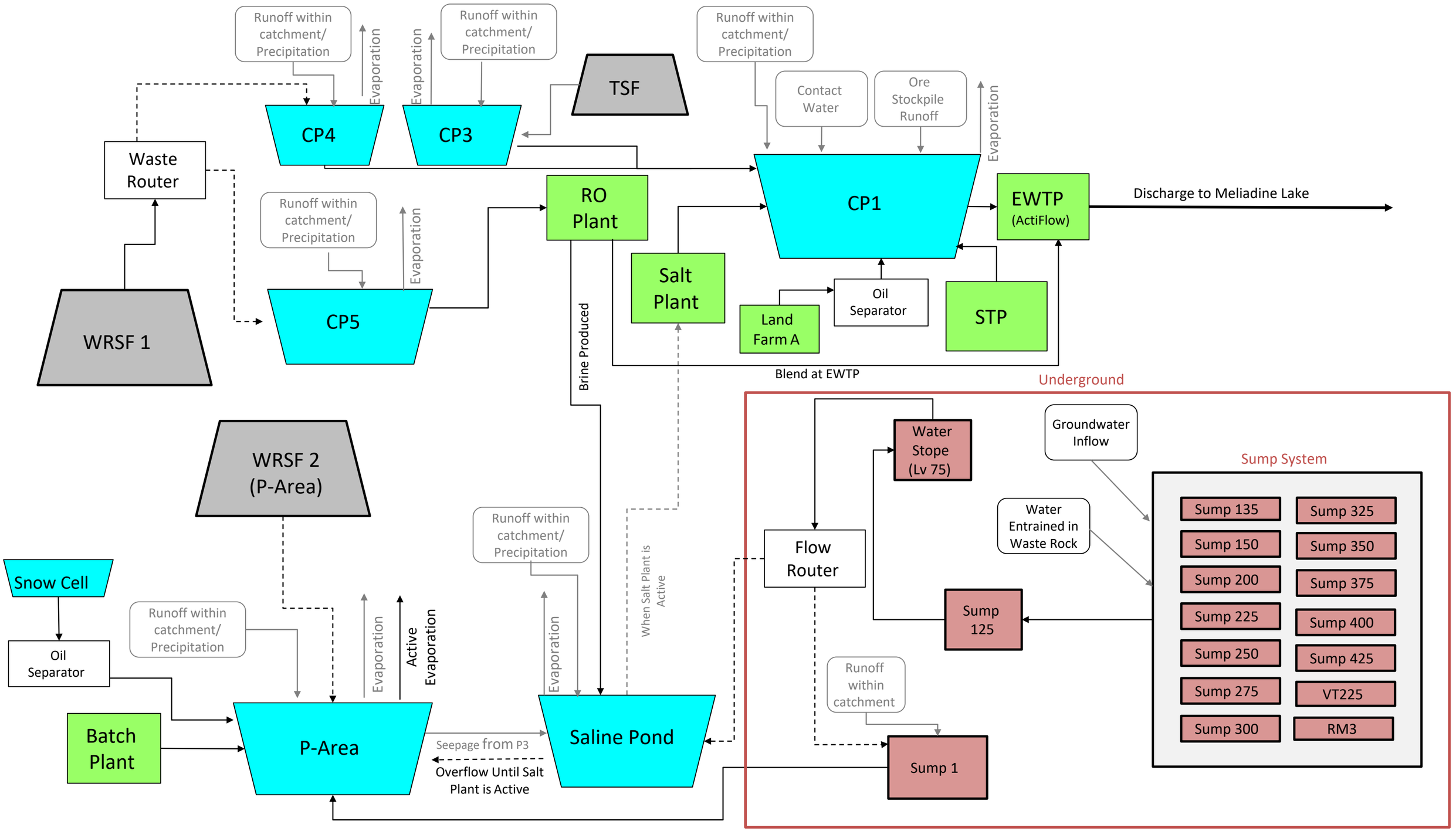


Figure 5: Itivia Snow Pad Area and ATV Access Trail



Authorization (Print Name)	
Approved: _____ Name JOHSC Worker Rep.	Date: _____
Approved: _____ Name Department Superintendent / Delegate	Date: _____
Approved: _____ Name Health & Safety Superintendent / Delegate	Date: _____

APPENDIX C • WATER MANAGEMENT SCHEMATIC FLOW SHEET


Runoff within catchment/ Precipitation
Evaporation
Runoff within catchment/ Precipitation
Evaporation
TSF
Runoff within catchment/ Precipitation
Contact Water
Ore Stockpile Runoff
Evaporation
CP4
CP3
Waste Router
CP1
EWTP (ActiFlow)
Discharge to Meliadine Lake
RO Plant
Runoff within catchment/ Precipitation
Evaporation
Salt Plant
Oil Separator
STP
Land Farm A
CP5
WRSF 1
Brine Produced
Blend at EWTP
Underground
WRSF 2 (P-Area)
Water Stope (Lv 75)
Groundwater Inflow
Sump System
Water Entrained in Waste Rock
Sump 135
Sump 325
Sump 150
Sump 350
Sump 200
Sump 375
Sump 225
Sump 400
Sump 250
Sump 425
Sump 275
VT225
Sump 300
RM3
Flow Router
Sump 125
Runoff within catchment/ Precipitation
When Salt Plant is Active
Snow Cell
Runoff within catchment/ Precipitation
Evaporation
Active Evaporation
Evaporation
Oil Separator
Runoff within catchment
Batch Plant
P-Area
Seepage from P3
Overflow Until Salt Plant is Active
Saline Pond
Sump 1

APPENDIX D • SEDIMENT AND EROSION MANAGEMENT PLAN

AGNICO EAGLE

Meliadine Division

Sediment and Erosion Management Plan

MARCH 2019
VERSION 1

EXECUTIVE SUMMARY

This document presents the Sediment and Erosion management plan (the Plan) at the Meliadine Gold Project. The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by reviewing the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the license requirements, followed by the periods and types of activities subjected to erosion, and the specific monitoring and mitigating measures.

General findings on the effects of TSS on fish and fish habitat have been listed, such as sublethal and lethal effects on fish and their eggs. Federal TSS Guidelines have been cited, distinguishing the short-term and long-term exposure thresholds. Turbidity guidelines are also discussed in the present document. The Plan presents the monitoring and mitigating actions related to three (3) specific periods of activity: Periods of construction near water – during construction and operation; periods of freshet or significant runoff events – during construction, operation and closure; periods of potential impact to waterbodies – during operation. The proposed monitoring and mitigating measures are discussed for those periods of activity.

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ᑎᑎᖅᑲᖅ ᐱᔨᔪᑎᖅᖅᑐᑦ ᐃᒪᐅᐊᒃ ᐊᓗᐊᓄᐊᖅᑐᓂᒃ ᐊᖏᒪᓗ ᓯᕿᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᒋᑦ (ᐸᕐᓇᐅᑎ) ᑕᓯᕐᔪᐊᖅ ᔪᓗᒧᑦ ᐱᓕᕆᕐᒋᑦ. ᐱᔨᔪᑎᖓ ᐸᕐᓇᐅᑎᐅᐸᒃ ᑲᑎᑭᓯᒪᔪᓂᒃ ᑐᓂᓯᐊᕐᓗᓂ ᐊᐅᓚᕐᑎᓂᒧᑦ ᐊᖏᒪᓗ ᖃᐅᔨᓕᐊᖃᖅᑕᕐᓂᕐᒧᑦ ᓯᕿᖅᐸᓪᓕᐊᓂᕐᒧᑦᑐᓇᖅᑐᓂᒃ ᐃᓂᓂᖅᑐᑦ. ᑕᒪᓐᓇ ᐱᐊᓂᖅᑕᐅᖃᑕᖅᑐᖅᓴᖅ ᖃᑎᖅᑭᐸᓕᒋᑦ ᖃᓄᐊᖓᓕᖅᑎᑎᓂᐅᓂᐅᔪᖓᓇᖅᑐᓂᒃ ᑭᒃᓯᖅᓯᒪᓕᒋᑦ ᓯᑎᔪᐃᑦ (TSS) ᐊᖏᒪᓗ ᑕᓚᐅᖃᓗᐊᕐᓂᖅ, ᑲᓇᑕᒥᑦ ᒪᓂᕐᑕᐅᔪᖏᓐᓄᑦ ᐊᖏᒪᓗ ᓪᓚᕆᓯᒪᓕᒋᑦ ᐱᕐᓚᐊᖅᑎᑦᑐᖅᑦ. ᑭᖑᓂᐊᒍᑦ ᐅᐸᓗᐃᑦ ᐊᖏᒪᓗ ᖃᓄᐊᖓᓕᖅᑎᑎᓂᐅᓂᐅᔪᖓᓇᖅᑐᑦ ᓯᕿᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᐱᔪᖅ, ᐊᖏᒪᓗ ᓯᓇᒥᒃ ᖃᐅᔨᕆᐃᓂᕐᒧᑦ ᐊᖏᒪᓗ ᐊᖕᓂᓗᐊᖕᓂᕐᐊᖓᓂᐅᓂᓄᑦ.

ᖃᐅᔨᕆᐅᔪᑦ ᖃᓄᐃᖖᒪᓂᖅᑎᑎᓂᐅᖕᓂᖅᑐᓄᑦ TSS ᐃᖃᓗᖕᓂᖅ ᐃᓂᖕᓂᖅᑐᓄᓪᓗ ᑎᑎᕋᖅᑕᐅᓪᓚᐅᐅᖅᑐᑦ, ᐅᓗᓚᐊᓇᓗᐊᖕᓂᕐᑐᑦ ᐊᖏᒪᓗ ᐅᓗᓚᐊᓇᖅᑐᑦ ᖃᓄᐃᖖᒪᓂᖅᑎᑎᓂᐅᓂᖅᑐᑦ ᐃᖃᓗᖕᓂᖅᑐᑦ ᐊᖏᒪᓗ ᒪᓂᓂᕐᑐᓄᓪᓗ. ᑲᓇᑕᒥᑦ TSS-ᒧᑦ ᒪᓕᒃᑕᐅᔪᖏᓐᓄᑦ ᐅᖃᓕᓂᖅᑕᐅᔨᒪᔪᑦ, ᓇᓗᓇᐃᖅᓯᒪᓂᑦ ᓇᐃᑦᑐᒥᑦ ᐊᖏᒪᓗ ᐊᑯᓂᐅᔪᒥᑦ ᑕᑯᔪᓐᓇᐅᓂᒧᑦ ᑎᑭᐅᑎᓂᓕ. ᑕᓚᐅᖃᓂᓂᒧᑦ ᒪᓕᒃᑕᐅᔪᖏᓐᓄᑦ ᐅᖃᐅᔨᑎᖕᒥᔪᑦ ᑕᑲᓴᓂ ᑎᑎᖅᑲᖅᑎᑦ. ᐸᕐᓇᐅᑎ ᑐᓂᔨᔪᖅ ᖃᐅᔨᕆᐊᖃᖅᑕᕐᓂᕐᒧᑦ ᐊᖏᒪᓗ ᐊᖕᓂᓗᐊᖕᓂᕐᐊᖓᓂᐅᓂᓄᑦᔪᖑᓚᐅᖅᑐᑦ ᐱᖓᓱᓂᓄᑦ ᖃᓄᐃᖖᒪᓂᖅᑎᑎᓂᐅᓂᓄᑦ: ᓴᓇᓴᓪᓕᐊᓂᕐᑎᑦ ᐃᒪᐅᐊᒃ ᖃᓄᑕᖓᓂᒃ - ᓴᓇᓴᓪᓕᐊᑎᓪᓗᑎᑦ ᐊᖏᒪᓗ ᐊᐅᓪᓛᖅᑎᓂᐅᓂᕐᑎᑦ; ᐊᐅᐅᓪᓕᐊᓂᐅᑎᓪᓗᒍ ᐅᖕᓴᓪᓗᓂᒃ ᑯᖖᓂᖃᓗᕐᓂᐅᔨᓂᒃ - ᓴᓇᓴᓪᓕᐊᑎᓪᓗᑎᑦ, ᐊᐅᓪᓛᖅᑎᓂᐅᓂᕐᑎᑦ ᐊᖏᒪᓗ ᐅᑲᑯᖅᐸᓪᓕᐊᓂᐅᓂᕐᑎᑦ; ᐊᑲᑐᖅᑕᐅᓂᖃᖅᑐᐃᓐᓇᓕᐊᖃᖅᓂᕐᒧᖖᓂᑲᓂ ᐃᒪᖃᖅᓂᐅᔨᑦ - ᐊᐅᓪᓛᖅᑎᓂᐅᖃᖅᑎᓪᓗᑎᑦ. ᖃᐅᔨᕆᐊᖃᖅᑕᕐᓂᐅᔨᔪᖅ ᐊᖏᒪᓗ ᐊᖕᓂᓗᐊᖕᓂᕐᐊᖓᓂᐅᓂᓄᑦᔪᖑᓚᐅᖅᑐᑦ ᐅᖃᐅᔨᕆᐅᔨᒪᔪᑦ ᖃᓄᐃᖖᒪᓂᖅᑎᑎᓂᐅᓂᕐᑎᑦ.

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DOCUMENT CONTROL

Version	Date (YM)	Section	Page	Revision
1	March 2019	ALL	-	Comprehensive plan

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Acronyms

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
CCME	Canadian Council of Ministers of the Environment
DFO	Fisheries and Oceans Canada
NIRB	Nunavut Impact Review Board
NTU	Nephelometric Turbidity Units
NWB	Nunavut Water Board
Plan	Sediment and Erosion Management Plan
TSS	Total Suspended Solids

UNITS

h	hour
km	kilometre
km^2	square kilometre
mg/L	milligram per litre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit owned lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

As presented in Table 1.1, there are four phases to the development of the Tiriganiaq deposit: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year -1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Table 1.1 Overview of Timeline and General Activities

Phase	Year	General Activities
Construction	Year -5 to year -1	• Construct site infrastructure • Develop the underground mine ramp • Stockpile ore
Operations	Year -1 to 8	• Mining operations • Stockpile ore • Dry stack tailing deposition
Closure	Year 9 to 11	• Decommission of underground mine surface opening • Cover on top of tailings • Decommission non-essential mine infrastructure • Fill open pits with active pumping
Post-Closure	Year 11 forwards	• Site and surrounding environment monitoring

This document presents the Sediment and Erosion Management Plan (the Plan). The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by presenting first a review of the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the license requirements, followed by the periods and type of activities subjected to erosion, and the specific monitoring and mitigating measures.

As per Nunavut Impact Review Board (NIRB) Meliadine Project Certificate No.006 Condition 28, the Sediment and Erosion Management Plan should be developed to prevent or minimize the effects of destabilization and erosion that may occur due to Project activities. The plan should also detail sediment control plans to prevent and/or mitigate sediment loading into surface water within the Project area.

The objectives of the plan are:

- To prevent the release of sediment into streams and waterbodies during construction activities;
- To reduce and mitigate erosion and the release of sediment during operations activities;
- To specify erosion and sediment control measures that, if implemented and maintained, will help Agnico Eagle maintain compliance with the Federal Fisheries Act, specifically with Section 36(3) of the Act, which prohibits the deposition of deleterious substances into waterbodies frequented by fish; and
- To provide references to approvals, relevant standards, control plans and procedures for training, communications, investigation and corrective action, and audits that are required under the Project Agreement.

SECTION 2 • TOTAL SUSPENDED SOLIDS/TURBIDITY EFFECTS, FEDERAL GUIDELINES AND LICENSE REQUIREMENTS

2.1 Effects of Total Suspended Sediments on Fish Habitat

Suspended sediments, and associated effects on water clarity, have the potential to affect fish and fish habitat in a variety of ways, including but not limited to:

- Smothering of deposited eggs or siltation of spawning habitats;
- Smothering of benthic invertebrate communities;
- Decreased primary productivity caused by reduced light penetration;
- Reduced visibility, which may decrease feeding efficiency and/or increase predator avoidance; and
- Clogging and abrasion of gills.

Moreover, the general findings for effects of TSS on fish and fish habitat indicate the following:

- Effects of TSS depend on both the concentration of TSS and duration of exposure;
- Effects of TSS can also be influenced by the size and shape of suspended particles;
- Lethal concentration of TSS on fish over acute exposure ranges from hundreds to hundreds of thousands of mg/L;
- Sublethal effects on fish (reduced growth, changes in blood chemistry, histological changes) associated with chronic exposures tend to be exhibited at TSS concentrations ranging from the tens to hundreds of mg/L;
- There is considerable uncertainty about potential effects of low TSS concentrations over long time periods;
- Overall, the most sensitive group of aquatic organisms to TSS appears to be salmonids, and guidelines are developed to protect this group;
- Adult salmonids are generally more sensitive to short durations of high concentrations of suspended sediments than juvenile salmonids; and
- Low suspended sediment levels are known to cause egg mortality (40 %) to rainbow trout at long durations (7 mg/L at 48 days). Guidelines for long-term exposure reflect these findings.

More details are located in the report from Fisheries and Oceans Canada (DFO) on the effects of sediments on fish and their habitat (Fisheries and Oceans Canada, 1999).

2.2 Federal Guidelines

2.2.1 TSS Guidelines

The Canadian Council of Ministers of the Environment (CCME) specifies separate guidelines for TSS for clear and high flow periods. The guidelines are derived primarily from Caux *et al*. (1997), with application intended mainly for British Columbia streams. In the case of the application to the Meliadine Project lakes, the clear flow guidelines would be most relevant; even during freshet. The

lakes would not expect to see large natural fluctuations in TSS except in localized areas for short periods.

The guidelines put forth by the CCME recognize that the severity of effects of suspended sediments is a function of both the concentration of suspended sediments and the duration of exposure. Guidelines are intended to protect the most sensitive taxonomic group and the most sensitive life history stages.

Table 2.1 Existing Federal TSS Guidelines (after Agnico Eagle, 2018)

Source	Short-Term Exposure	Long-Term Exposure
CCME (1999)	Anthropogenic activities should not increase suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-h).	For longer term exposure (e.g., 30 days or more), average suspended sediment concentrations should not be increased by more than 5 mg/L over background levels.
MMER (2002)	Maximum authorized concentration in a composite effluent sample = 22.5 mg/L. Maximum authorized concentration in a grab sample of effluent = 30 mg/L.	Maximum authorized monthly mean effluent concentration = 15 mg/L.

2.2.2 Turbidity Guidelines

Turbidity guidelines put forth by the CCME (1999) are based on extrapolation from the TSS guidance above, adjusted by a factor of about 3:1 (a typical average ratio for TSS: turbidity). In the case of turbidity for clear water, CCME (1999) recommends a maximum increase of 8 Nephelometric Turbidity Units (NTU) from background levels for a short-term exposure (e.g., 24-hour period), and a maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., 30-day period).

CCME (1999) notes that in some cases short-term resuspension of sediments and nutrients in the water column can augment primary productivity, and in other cases, changes in light penetration may be inconsequential if a system is limited by other factors such as nutrients. The Caux *et al*. (1997) study considered effects of suspended sediment not only on fish but also on algae and zooplankton. In summary, the recommendations put forth by Caux *et al*. (1997) are based mainly on the most sensitive taxonomic group, which is salmonids.

However, research has shown that widespread, chronic turbidity can result in reduced light penetration and subsequent reductions of primary productivity (Fisheries and Oceans Canada, 1999; Canadian Council of Ministers of the Environment, 1999; Lloyd, Koenings, & Laperriere, 1987). Consequently, water clarity is of concern at broader spatial scales and longer time frames. It should be noted that DFO's report on effects of sediment on fish and their habitat (DFO, 1999) endorses the guidelines for TSS put forth by the CCME (1999), but does not recommend following guidelines for turbidity. Rather, turbidity may be used as a surrogate for suspended sediment only when the relationship between the two parameters is established for a particular waterbody.

2.3 License Requirements for the Protection of Fish and Fish Habitat at Meliadine

The Nunavut Water Board (NWB) Type A Water License for the Meliadine Project includes:

All surface runoff and/or discharge from drainage management systems, at the Monitoring Program Stations MEL-SR-1 to MEL-SR-TBD referred to in Part I, Item 11, during the Construction/Operation of any facilities and infrastructure associated with this project, including laydown areas and All-weather Access Road, where flow may directly or indirectly enter a Water body, shall not exceed the Effluent quality limits in Table 2.3.

Table 2.3 Effluent Quality Limits

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids (TSS) (mg/L)	50.0	100.0
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

SECTION 3 • SEDIMENT AND EROSION MONITORING AND MITIGATION

3.1 Sediment and Erosion During Specific Periods

The purpose of the Plan is to ensure that Agnico Eagle will successfully monitor signs of sedimentation and erosion and minimize its resulting effects. This plan presents the monitoring and mitigating actions related to three (3) specific periods of activity for Meliadine:

- Periods of construction near water – during construction and operation;
- Periods of freshet or significant runoff events – during construction, operation and closure;
- Periods of potential impact to waterbodies – during operation.

The construction of water management infrastructure could potentially lead to excess TSS. Therefore, erosion control methods must be considered during construction of water management infrastructure. In addition, erosion control must be considered during any dewatering activity.

The freshet season at Meliadine occurs approximately from mid-May until the end of June. In addition, there can be periods of high water flow due to rainfall events from late May – early October. As most site construction has been completed at the Meliadine site there are new areas and infrastructure that have become potentially vulnerable to excess water during the freshet season and in response to rainfall, such as, but not limited to:

- Culverts and other water management infrastructures;
- Newly constructed embankments, such as roads and berms;
- Water channels; and
- Surface runoff.

Water transfer and water discharge during operation can also lead to erosion and sedimentation.

3.2. Erosion and Sediment Monitoring

In order to monitor potential erosion and sedimentation, smaller water management infrastructure such as culverts, cross drains, surface runoff and ditches are inspected daily during freshet, on a monthly basis thereafter and daily after significant rain events. Larger culverts and bridges are inspected more often if they represent a risk for daily operations, for the receiving environment or for the health and safety of workers. More specifically, the following aspects are monitored during visual inspections:

- Accumulation of debris near the inlet of the crossings, impeding the free flow of water at those locations;
- Bed erosion upstream and downstream of watercourse crossing structures;
- Scour under bridge abutments and abutment foundations; and
- Erosion along cutslopes and fillslopes of embankments (rill and gully erosion), etc.

Newly excavated channels are inspected on a regular basis and after significant rain events. Erosion signs along the channel flow are monitored and documented. Inspections are carried out during the spring when surficial ice moves towards the inlet of the diversion channels to ensure that no ice

blockage causes water buildup upstream of the channel, which could lead to subsequent erosion problems. It is important to develop a database to determine if adverse trends are occurring. If adverse trends are observed, then mitigation will be undertaken to prevent a major incident.

The frequency of water and turbidity sampling are in accordance with the requirements of the Type A Water License. The frequency will be increased if required during the freshet season or during heavy rainfall events. Procedures for turbidity monitoring include:

- Collection of water at the site of sediment entrance (exposure), and at a reference site (i.e., in the same watercourse/waterbody in an area unaffected by the sedimentation [upstream, at least 50 m away where water does not appear to be impacted]).
- Analyze samples for turbidity using a field turbidity meter and compare the exposure sample to the reference sample.
- If the exposure sample results are higher than the reference then mitigation will be undertaken (ie installation of silt fencing, silt barrier booms, etc) to prevent any impact to watercourses.

If Agnico Eagle is actively working in an area with elevated turbidity – the work will stop until the level of clarity returns to an acceptable level.

Monitoring will be documented with site photographs and inspection forms.

3.3 Mitigating Measures

The following mitigation measures could be used, if required, to reduce risks associated with erosion and sedimentation.

- Riprap or clean non-acid generating/non-metal leaching rockfill could be used to armor shorelines, bridge abutments, culverts inlets and outlets and toe berms;
- Ditches managing high volumes of water could be armored for erosion control and reduce the speed of water flow;
- Sedimentation basins could be constructed at sensitive locations to allow settlement of finer sediments;
- Ditches, culverts and other water crossing structures should be maintained free of debris to allow free flow of runoff water;
- Installation of erosion control material such as turbidity barriers, silt curtains or straw booms;
- Site-specific erosion issues may arise during the mine operation that require specific local corrective actions;
- In-stream construction during periods when streams are expected to be dry or frozen to the bottom (i.e., during winter or fall). Isolation methods will be used for work below the high water mark for streams with flowing water at the time of construction;
- Materials installed below the high water mark (i.e., riprap) will be cleaned prior to installation to avoid adding deleterious substances to watercourses. Where concrete is installed, it will be allowed to cure fully prior to installation;

- Riparian areas will be maintained whenever possible to minimize erosion and impacts to fish habitat, with vegetation removal limited to the width of the workspace footprint. Disturbed areas along the streambanks will be stabilized and allowed to re-vegetate upon completion of work to minimize future erosion;
- Debris and excess materials resulting from construction will be removed from the work site to prevent them reaching water bodies; and
- When using equipment that creates tracks on the surface, run the equipment slowly to create grooves running perpendicular the slope and not parallel to the slope. This type of texture on slopes can slow the speed of runoff and reduce the amount of erosion and sediment transported downhill. This method must also be combined with an additional method of catching sediment at the base of the slope, such as a silt fence, straw log, etc.

SECTION 6 • REFERENCES

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APPENDIX E • SALINE WATER TREATMENT PLAN DESIGN REPORT

August 2018

Design Report
Saline Water Treatment Plant

6515-E-132-013-105-REP-035

In Accordance with Water Licence 2AM-MEL1631

Prepared by:
Agnico Eagle Mines Limited – Meliadine Division

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	2018-08-21			Design report

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1 INTRODUCTION

1.1 SITE LOCATION AND ACCESS

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Project (the Project), a gold mine located approximately 25 km north of Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. The project site is located on the peninsula between the East, South, and West basins of Meliadine Lake (63°01'23.8"N, 92°13'6.42"W). The area is accessible from the all-weather gravel road linking the Meliadine mine site with Rankin Inlet.

A general location plan for the project is shown in Figure 1.

1.2 SITE FACILITIES

The current mine plan focuses on the development of the Tiriganiaq gold deposit which will be mined using both conventional open-pit and underground mining operations. Current or proposed mining facilities to support this development include a plant site and accommodations, tailings storage facility and water management infrastructures.

Several infrastructures such as water retention dikes, berms, culverts, channels, collection ponds, pumping stations, fresh water intake and water treatment plants are required to manage water during pre-production, operation, and interim mine closure.

Facilities that are planned to be constructed for the operation of the future Meliadine Mine include a process plant, power plant, maintenance facilities, tank farms for fuel storage, water treatment plant, sewage treatment plant, saline water treatment plant (SWTP), accommodations, and kitchen facilities for 520 people.

The Nunavut Water Board (NWB) has issued Type “A” Water License No. 2AM-MEL1631 (Water license “A”) to Agnico Eagle Mines Limited (Agnico Eagle) for the Meliadine Gold Project site authorizing the use of water and the disposal of waste required by mining and milling and associated uses.

Figure 2 shows the location of the future SWTP including the pipeline between the Saline Water Pond pumping station and the SWTP, then to the final discharge into the collection pond named CP1.

1.3 PURPOSE OF DOCUMENT

This report includes the final design and construction drawings for the SWTP, including the feed pump and discharge pump to CP1. The water treated at the SWTP will be sourced from the Saline Water Pond. The effluent water from the SWTP will be pumped back through a pipeline in CP1.

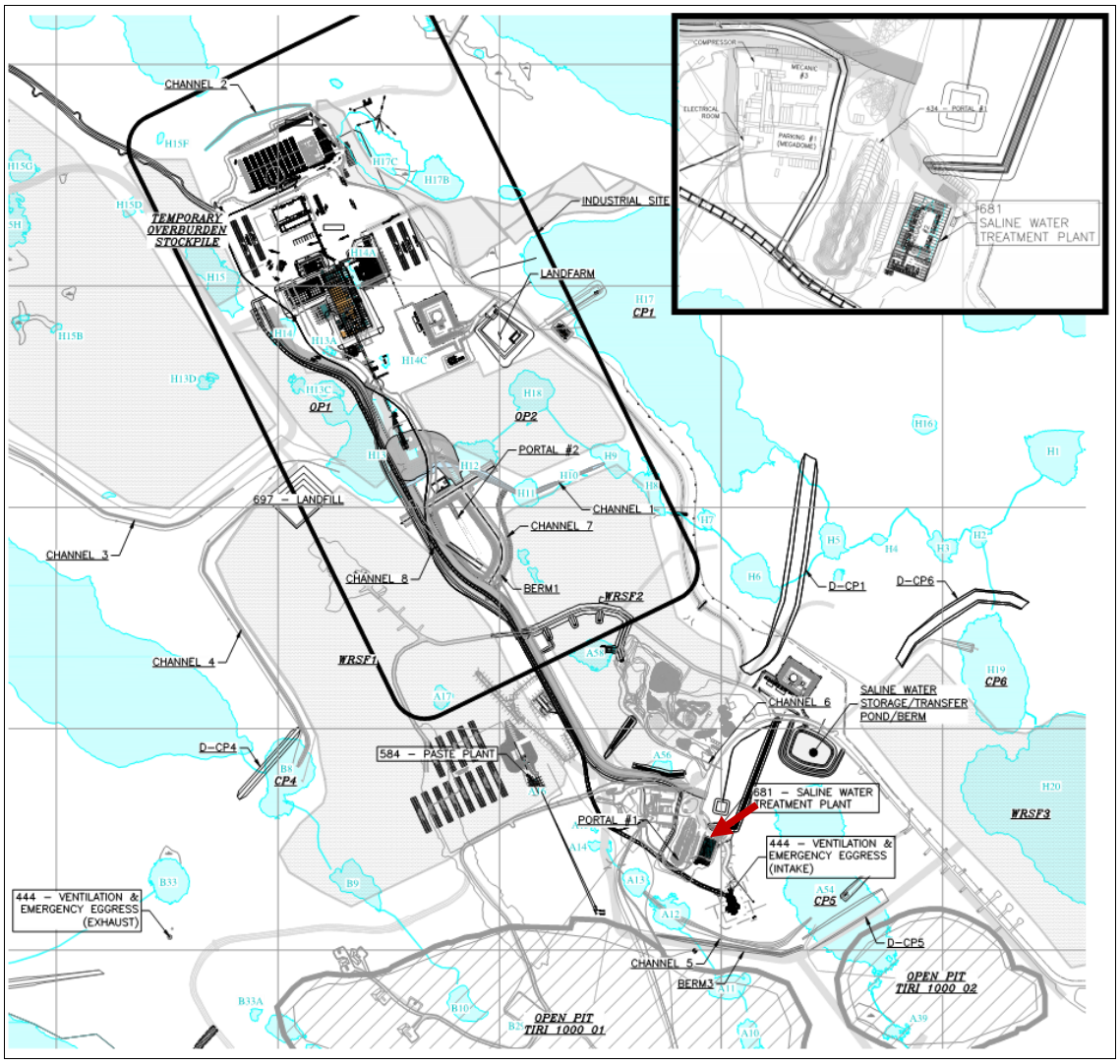

Figure 1 : Location of the SWTP

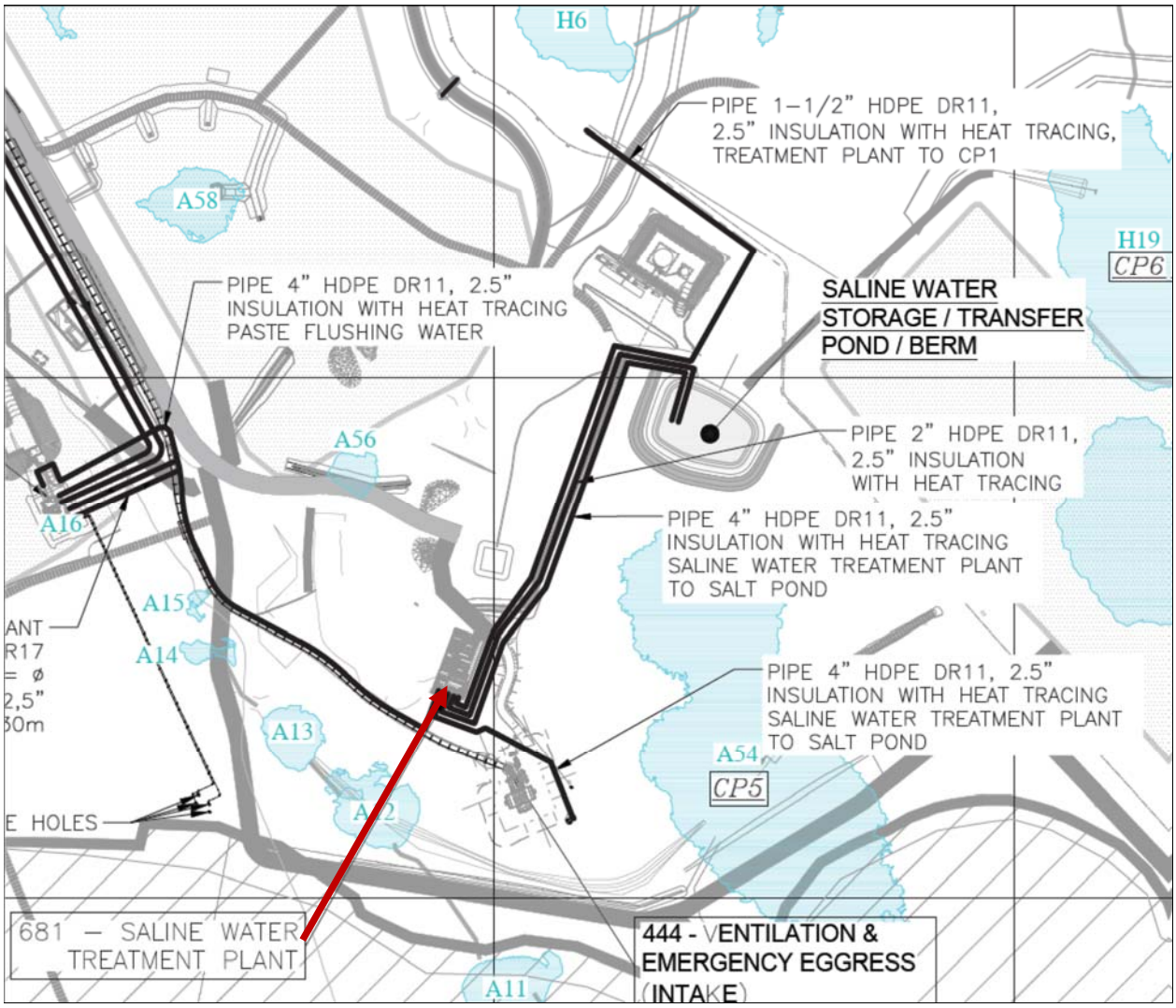

Figure 2 : Location of SWTP and Pipeline

2 DESIGN METHODOLOGY

2.1 SALINE WATER MANAGEMENT STRATEGY

Underground saline water is firstly stored in an underground stope that has a total capacity of approximately 11 000 m^3 and is then transferred to the surface Saline Pond which has a total storage capacity of approximately 33 000 m^3. From there, the saline water will be transferred to the SWTP for treatment. The storage capacity is managed to keep the saline pond and stope volumes as low as possible, in order to have enough space for abnormal flow condition or SWTP shutdown.

2.2 METHODOLOGY

The SWTP design was based on hydrogeology and underground water quality data collected on a regular basis in the underground mine that is currently under development. Effluent quality of the SWTP are set to comply with the Licence A requirements.

2.1 WATER CHARACTERISTICS

The SWTP is designed based on water quality of underground water inflow. Table 1 presents the water quality used for the design of the SWTP.

Table 1 : Feed Water Quality[1]

Representative Months		May 2016	June 2016	August 2016	September 2016	October 2016	November 2016	December 2016	February 2017	March 2017
Parameters (total metal)	**Units**									
Aluminum (Al)	mg/L	9.55	12.5	3.9	0.1	5.85	12.2	6.81	1.2	4.02
Ammonia Nitrogen (NH_3-NH_4)	mg/L	885	827	596	545	230	260	290	400	440
Arsenic (As)	mg/L	6.551	<0.1	0.4	0.22	0.252	0.0646	0.0355	0.011	0.024
Cadmium (Cd)	mg/L	0.00197	0.67	0.37	0.55	0.0002	0.00052	0.00182	<0.0010	0.0017
Chloride	mg/L	86 824	59 000	32 000	39 000	33000	45000	61000	67000	77000
Copper (Cu)	mg/L	0.14	0.15	0.08	0.17	0.014	0.03	0.029	<0.050	<0.050
Iron (Fe)	mg/L	28.5	15.2	1.31	0.37	12.4	23.7	13.4	<1.0	5.4
Lead (Pb)	mg/L	0.0097	0.37	0.32	0.2	0.0081	0.0151	0.0241	<0.020	0.022
Mercury (Hg)	mg/L	0.00154	<0.01	<0.01	<0.01	0.00001	0.00003	<0.00001	nd	<0.00001
Molybdenum (Mo)	mg/L	0.0886	N/A	N/A	N/A	0.059	0.055	0.056	<0.10	<0.10
Nickel (Ni)	mg/L	1.514	0.71	0.41	0.35	0.032	0.061	0.059	<0.10	0.13
Nitrate (NO_3) as N	mg/L	884	928	622	533	235	296	272	435	406
Nitrite (NO_2) as N	mg/L	5.97	71.4	97.5	49	35.9	36.8	31.6	27.2	27.1
Selenium (Se)	mg/L	1.67	0.002	0.002	0.003	0.0025	0.0015	0.008	<0.010	<0.010
Total Dissolved Solids (TDS)	mg/L	144 400*	110 000	62 700	69 000	69 800	74 400	102 000	123 000	163 000
Total Suspended Solids (TSS)	mg/L	806	N/A	136.2	45.4	260	1100	520	1900	260
Thallium (Tl)	mg/L	0.087	0.018	0.005	0.0007	0.00053	0.0155	0.0547	0.0519	0.0872
Uranium (U)	mg/L	0.006	0.006	0.008	0.002	0.0019	0.0029	0.0044	<0.010	<0.010
Zinc (Zn)	mg/L	0.338	0.49	0.43	0.23	0.096	0.091	<0.10	<0.50	<0.50
Silver (Ag)	mg/L	N.A.	<0.01	<0.01	<0.01	0.00023	0.00049	0.00086	<0.0020	<0.0020

Treated water will be sampled for water quality periodically (pH, Total Suspended Solids (TSS), C10-C50, aluminum, arsenic, boron, cadmium, chloride, copper, chromium, mercury, ammonia, nickel, nitrite, nitrate, phosphorus, lead, selenium, total dissolved solids (TDS), thallium, total cyanides and zinc) and sent to a certified laboratory for analysis. Table 2 presents the treatment target which should be reached by the SWTP.

[1] Used for Tender request.

Table 2 : Treatment Objectives of the SWTP[2]

Parameter (Total, mg/L)	Maximum Allowable Salt Plant Effluent Concentration[3]
Aluminum	6
Arsenic	1
Boron	4
Cadmium	0.0003
Chloride	2500
Copper	0.7
Chromium	0.003
Mercury	0.0001
N-NH4	35
Nickel	1.3
N-NO2	0.2
N-NO3	2
Phosphorous	0.1
Lead	0.6
Selenium	0.0025
TDS[4]	1400
Thallium	0.003
Total Cyanide	1.5
Zinc	1.3
pH[5]	5-8
TSS[6]	<10
Temperature[7]	<40°C

2.2 EFFLUENT FLOW RATE

In order to maintain the saline water balance, a treatment flow rate of 120 m^3/d is required which corresponds to the average inflow of saline water underground.

3 DESCRIPTION

3.1 SALINE WATER TREATMENT PLANT (SWTP)

3.1.1 Process Summary

The purpose of the SWTP is to remove total dissolved solids (TDS), which is also referred to as salinity, in underground saline water. The expected TDS in underground water varies from approximately 60 000 to 160 000 mg/L. The treated water will be discharged into CP1. The equipment has an operational flow rate of 120 m^3/d. It is expected that the SWTP will be in use 24 hours, 7 days per week.

[2] Treatment objective values come from geochemical model made by Golder (2017) for a dry climate, taking into account the dilution occurring into CP1 (Ref: 6515-E-132-013-105-DGC-003).
[3] Treatment objective values come from geochemical model made by Golder (2017) for a dry climate, taking into account the dilution occurring into CP1 (Ref: 6515-E-132-013-105-DGC-003). Theses concentrations are guaranteed by the supplier.
[4] Maximum concentration for the final effluent (ref: Water License No. 2AM-MEL1631).
[5] Possibility to adjust pH if required. Will depend on the CP1 alkalinity.
[6] Value expected to be low since effluent is treated in a reverse osmosis process prior to be discharged to CP1.
[7] Reverse osmosis post treatment should be perform below 35-40°C .

The treatment concept is presented in Figure 3. Water is pumped from the underground sump to the saline storage pond or directly into the SWTP. Water then flows into the two SaltMaker S125 units. Three products are generated during the process: distilled water, a salt slurry and a high-salinity blowdown.

The distilled water is treated in an oxidation reactor for nitrite removal, followed by a reverse osmosis (RO) step used to remove ammonia. The RO permeate is then discharged into CP1. The RO brine containing high ammonia concentration is stored in a tank and oxidized with chorine before being cycled back to the two SaltMaker S125 units.

The salt slurry is discharged into a big bag rack. Free water is drained from the bag and recycled to the SaltMaker. The expected solid content into the big bag after drainage is estimated at approximately 80%.

The blowdown is a by-product containing high concentrations of nitrate. Evaporation efficiency depends on the viscosity of the water which can be affected by the high concentrations of nitrate that can occur within the SaltMaker due to its high degree of solubility. Nitrate accumulates within the system as a consequence of the different streams being recirculated.

The SWTP will be installed in the third quarter of 2018 and operational in the last quarter 2018.

The SWTP general flow diagram is illustrated in Figure 4.

The following sections describe the SWTP components.

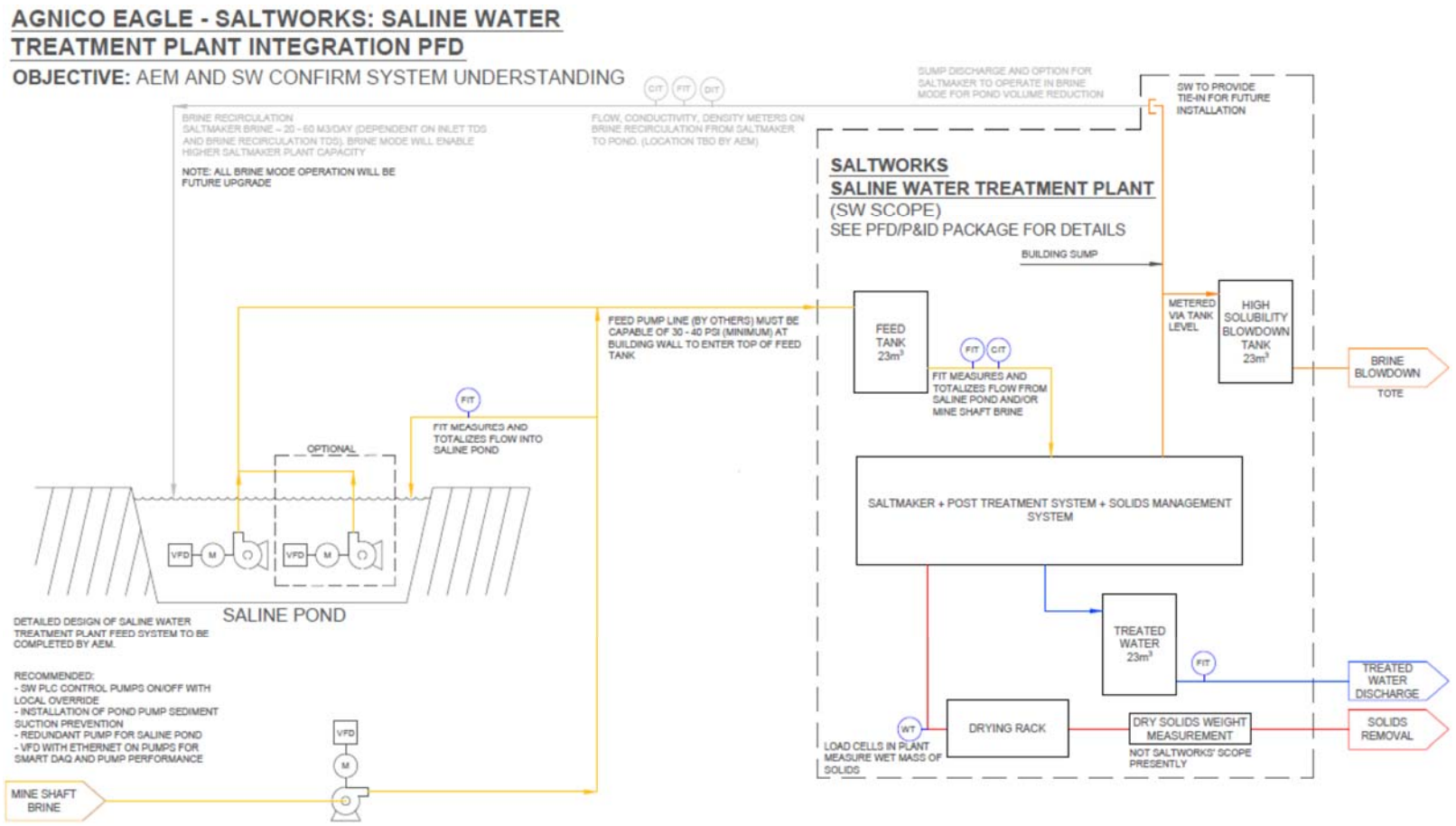

Figure 3 : SWTP Overall Process Concept

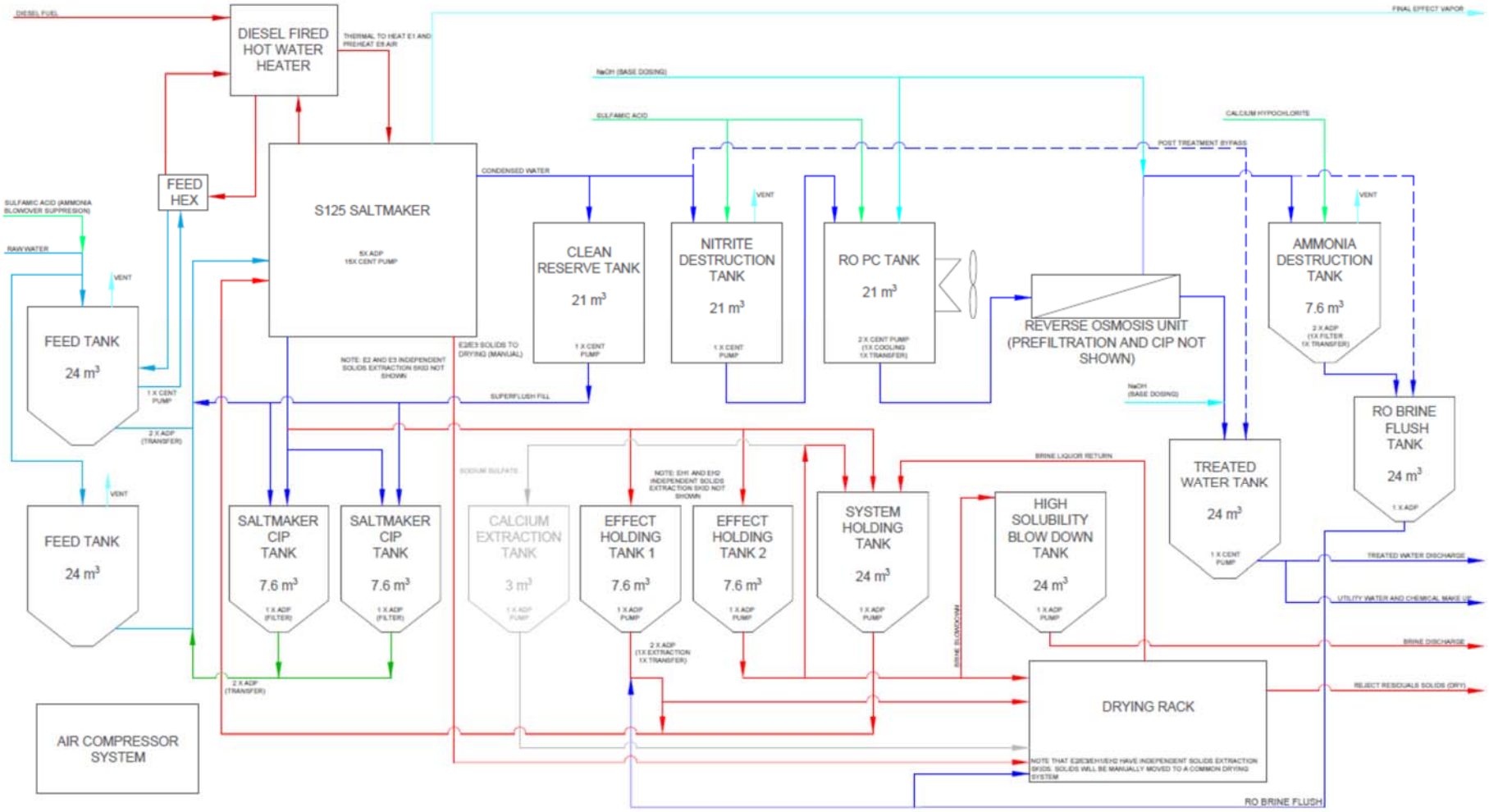

Figure 4 : SWTP Overall Process Flow Diagram

3.2 PRE-TREATMENT

Before being fed to the SaltMaker, water is filtered through strainers, in-line filters and heated to a specific temperature.

3.3 SALTMAKER

The SaltMaker uses a Humidification-Dehumidification (HDH) cycle to concentrate saline water and produce freshwater. The use of a humidified air cycle enables operation at temperatures below 90ºC and pressures near atmospheric (1 bar). These attributes allow the use of engineered plastics in place of more costly corrosion-resistant metallic parts, thereby saving capital cost while also reducing scaling risk due to the much lower surface energy of plastics. In addition, evaporation occurs on a non-heated surface, further reducing scaling and enhancing reliability.

The SaltMaker is a thermally driven plant, producing freshwater and highly concentrated discharge and/or solids via a multiple-effects HDH cycle. The thermal energy is used to evaporate and condense water in successive “effects”. The latent heat of condensation is recycled as it is downgraded, with each effect operating at a temperature approximately 15°C lower than the previous one. Each effect produces freshwater and successively concentrates the saline water. The final effect uses the downgraded heat (<40°C) to concentrate brine into solids.

A simplified process diagram is shown in **Erreur ! Source du renvoi introuvable.**. This diagram describes a four-effect concentration in which the first three effects entail a closed air loop and the fourth effect is open to the atmosphere. The S125 for this application is a five-effect plant which recycles the heat an additional time. The final effect can be a closed air loop for zero air emissions and more water recovery.

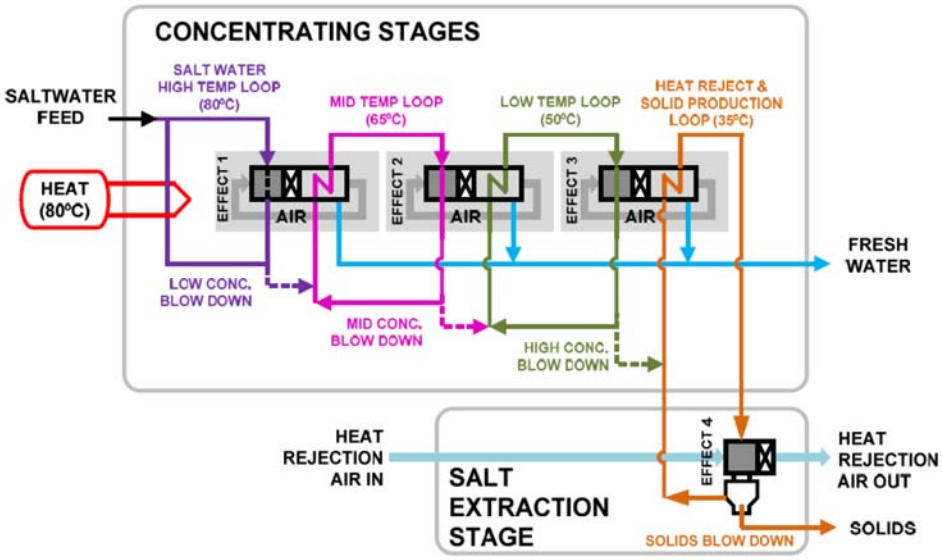

Figure 5 : Conceptual Operation

SaltMaker can accept any wastewater salinity; lower inlet TDS increases system freshwater recovery. Additionally, the scaling potential of the wastewater impacts the frequency of the wash cycles and the plant’s production capacity. However, the built-in cleaning systems are flexible enough to accept almost any water type.

The SaltMaker general flow diagram is illustrated in Figure 6.

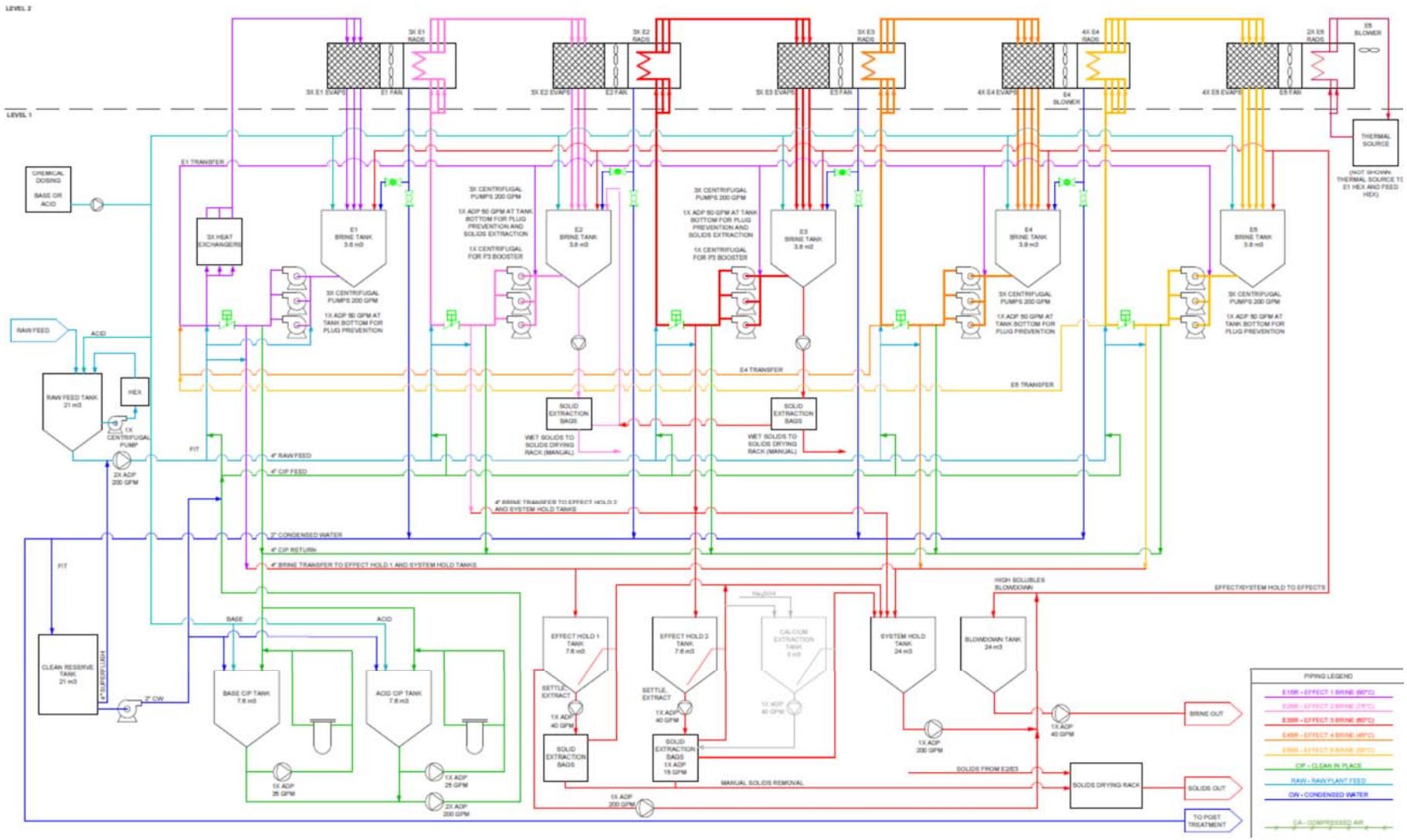

Figure 6 : Saltmaker Process Flow Diagram

3.4 POST-TREATMENT

Distilled water from the SaltMaker unit needs to be treated mainly for volatiles such as ammonia and nitrite (resulting from ammonia oxidation). The proposed chain is a chemical oxidation of nitrite with sulfamic acid followed by a reverse osmosis filtration step.

3.4.1 Nitrite Removal

The overall reaction between nitrite and sulfamic acid is presented below:

$NaNO_2 + H_3NSO_3 \rightarrow N_2 + NaHSO_4 + H_2O$

This reaction leads to the formation of nitrogen as the final product of nitrite removal.

Distilled water from the two SaltMaker units is stored in two 21 m^3 tanks. Sulfamic acid is then added in batch mode to remove nitrite (one reactor is treated while the second one stores distilled water). Acid dosage is controlled by a pH sensor. An optimum pH of 2-3 needs to be reached for effective nitrite removal. The reaction time is about 1-2 minutes in the reactor. The pH of the water from the nitrite removal tank is then adjusted to 4.5 using caustic soda prior to the reverse osmosis process.

3.4.2 Ammonia Removal by Reverse Osmosis

Reverse osmosis (RO) is a water purification technology that uses a semi-permeable membrane to remove ions and molecules. In RO, an applied pressure is used to overcome osmotic pressure. Normally, water to be treated with RO has to be pretreated for suspended solids, bacteria, and scaling compound. In the present case, as the water comes from an evaporation process, no specific pre-treatment would be required. A recovery of 96% is expected.

The RO system operates at variable recovery based on the conductivity (salt and ammonia content) of permeate. If the permeate conductivity is too high, the RO will lower recovery by opening the concentrate valve, allowing more water to flow to the concentrate stream and less water to be directed to the product stream.

Filtration is done at low pH (approximately 5.5) to promote the ammonium form which is best retained by the RO step.

The flowsheet for the RO process is presented in Figure 7.

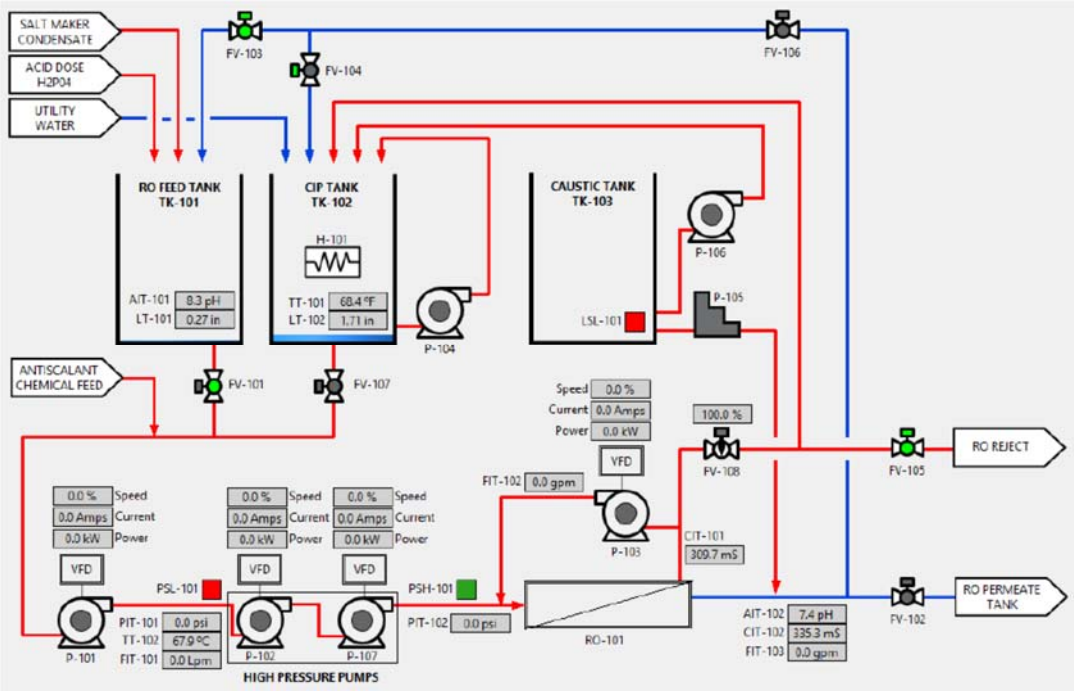

Figure 7 : RO Treatment

3.5 REVERSE OSMOSIS BRINE TREATMENT

Brine from the RO process contains a high concentration of ammonia. In order to prevent a build-up of ammonia in the process, this compound is oxidized with calcium hypochlorite in a 7.6 m^3 tank (this reaction is also commonly called 'breakpoint chlorination'). Two tanks are available for brine storage (one in ammonia destruction mode; the second in brine storage mode). The treatment is done manually in batch mode by the operator. The pH is adjusted to alkaline values. The required quantity of calcium hypochlorite is determined by the operator on the basis of the ammonia analysis obtained with a colorimetric test kit. Calcium hypochlorite is added directly in solid form. The retention time is also determined by the operator and is typically around 10 minutes.

The overall reaction leading to the release of nitrogen and nitrate as a final product is presented below:

$NH_4^+ + 1.5\ HOCl \rightarrow 0.5\ N_2 + 1.5\ H_2O + 2.5\ H^+ + 1.5\ Cl^-$
$NH_4^+ + 4\ HOCl \rightarrow NO_3^- + H_2O + 6\ H^+ + 4\ Cl^-$

Treated water is recirculated back to the SaltMaker units.

3.6 SALT BAGGING SYSTEM

Salt slurry is discharged into a big bag rack. Loading of each big bag is controlled by load cells. An automatic valve discharges the slurry into a big bag until it is full. Once the bag is full, another big bag is positioned to be filled. The big bag is left to drain of free water until it only contains solid salts. Free water (high salinity leachate) is recycled to the SaltMaker unit for further treatment. Figures 8 and 9 present the concept for the salt bagging system. The expected dryness is between 80 and 90 %.

Solid salt produced will be placed in double bags which will be stored into seacans to prevent dissolution of the salt. When required, the salt will be reused for underground mining activities. The exceeding bags of solid salt will be sent south on the barges for final disposal in accordance with regulations.

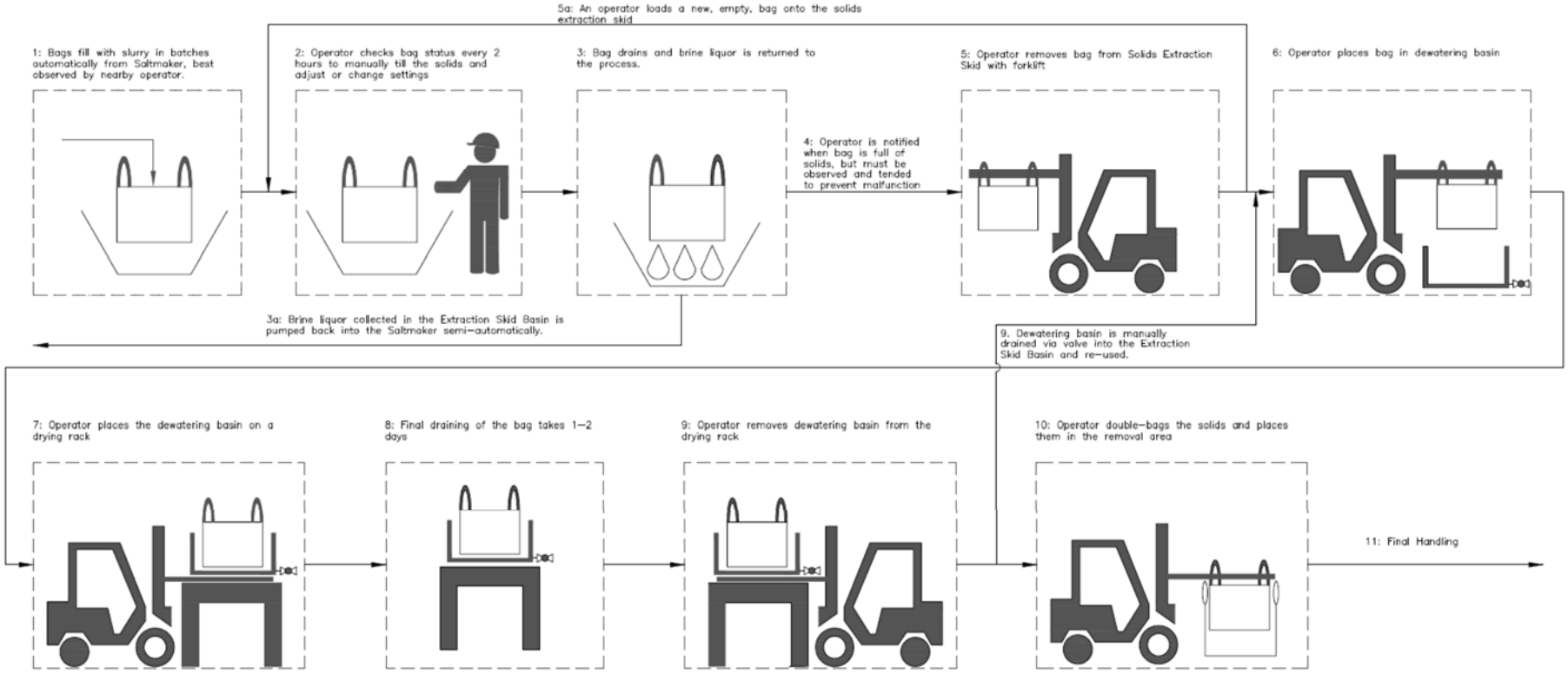

Figure 8 : Salt Bagging Concept

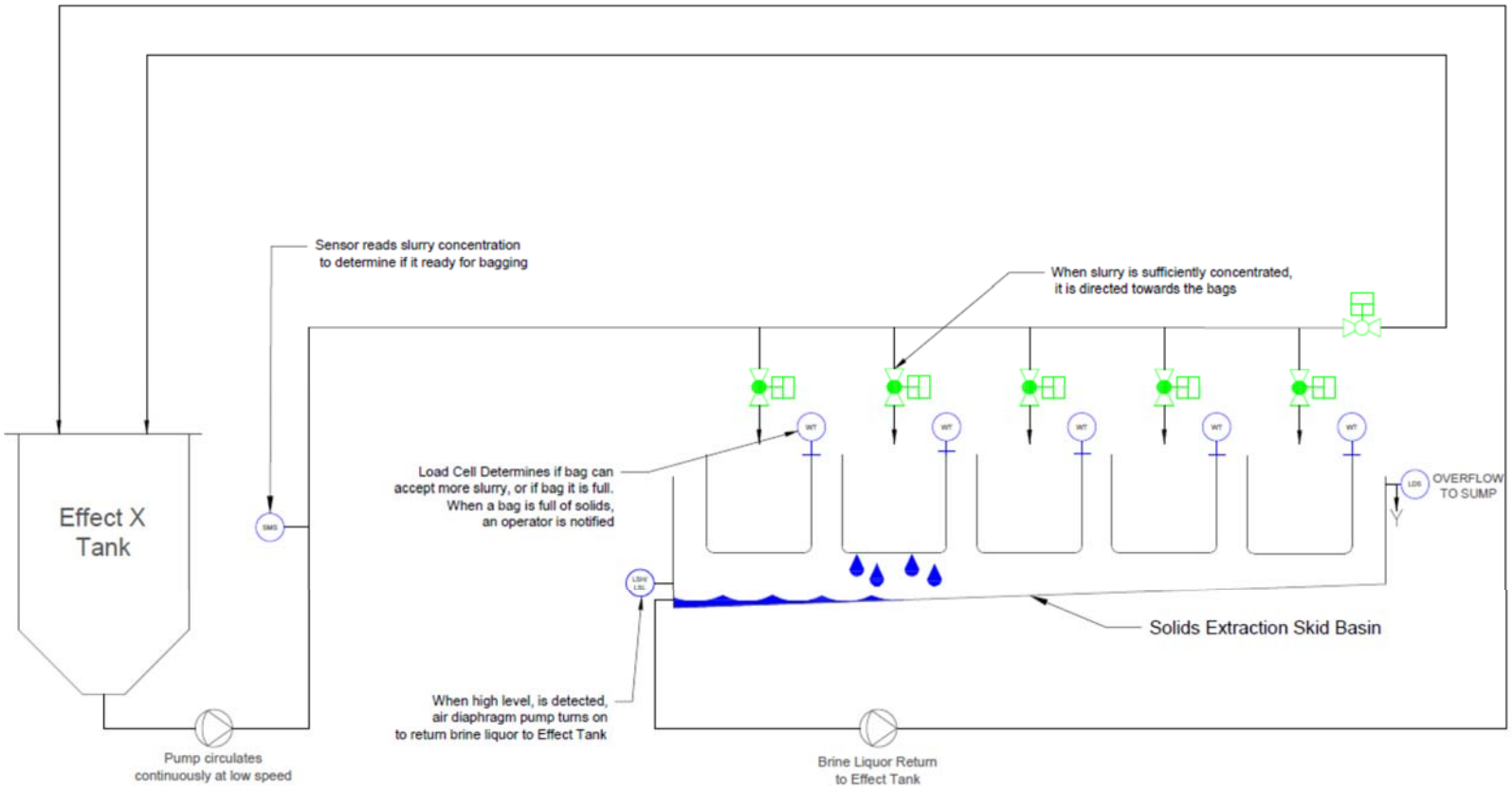

Figure 9 : Salt Bagging Flow Diagram

3.7 BLOWDOWN MANAGEMENT

The salt is mainly composed of Ca, Na and Cl. Underground water also contains a non-negligible amount of nitrate which does not precipitate during the salt production step. Therefore, the nitrate is recirculated in the SaltMaker where it accumulates. Overly high concentrations of nitrate leads to an increase in the viscosity of the water to be treated, causing the efficiency of the Saltmaker to decrease significantly. To prevent a nitrate build-up, approximately 1% of the feed flow should be removed. This corresponds to a volume of approximately 1.2 m^3 per day. During the operation, a volume of 10 m^3 is periodically removed and stored in a blowdown tank.

The blowdown solution is stored in tote tanks within sea cans. Once a year, the sea cans are sent back south whereby the totes are dealt with by a subcontractor who disposes of the solution according to regulations.

3.8 WATER HEATER

Three water heaters are required to heat water to approximately 80ºC (first effect of the SaltMaker unit). Heat plate exchangers are used to transfer heat between the water to be treated and the thermal source. The thermal units are diesel driven.

3.9 SERVICE WATER SYSTEM

The service water system is mainly based on reusing distilled water produced within the plant. A 21 m^3 clean water reserve tank is being used for storage.

3.10 CONTROLS

The SWTP Pump is equipped with a variable frequency drive (VFD) that allows the flow to be modulated.

The SaltMaker system and post-treatment use a variety of sensors and automation hardware to achieve reliable plant operations. Sensors include temperature, pressure, flow, level, conductivity, and pH.

The electrical and control system for the post-treatment consists of a main control panel with multiple alternating current (AC) drives, switch gear, terminal blocks as well as the Programmable Logic Control (PLC) and modules. AC drives allow variable speed on the feed pump, high pressure pumps, and RO recirculation pump. The drives allow the control system to make flow and pressure adjustments to maximize RO recovery and efficiency. The panel houses the Human Machine Interface (HMI), conductivity and pH transmitters for operators. All instrumentation and automation functions are carried out by the PLC based on signals from sensors.

Saltworks is standardized on 4-20 mA analogue sensor outputs to minimize signal loss issues. 4-20 mA signals are read by input/output (I/O) modules on the PLC or Remote I/O units.

The SaltMaker and post-treatment use the following types of instruments:

Pressure:

These sensors are used to measure pump discharge pressure on main water lines on each effect. Trends in pressure readings can help the operator identify pipe scaling issues. They can also be used to identify pump problems. These pressure sensors use piezoresistive measuring cells (similar to a strain gauge) to measure pressure being applied on the sensor connector. A built-in transmitter amplifies this signal and converts it into 4-20 mA to communicate with the PLC modules.

For the post-treatment, these sensors are used to measure the pump inlet/discharge pressures. Trends in pressure readings can help the operator identify filter clogging or membrane fouling issues. They can also be used to identify pump problems.

Level:

These sensors are used to measure the level on SaltMaker tanks and post-treatment. Different types of sensors are used depending on the fluid and process conditions.

> ***Pressure:*** These sensors use piezoresistive measure cells that are calibrated at high resolution to measure level changes in tanks. They are mounted near the bottom of the tank. Because they measure hydrostatic pressure, they are affected by density changes of the fluid.
>
> ***Ultrasonic:*** These sensors send ultrasonic sound pulses and measure the time it takes for the pulses to reflect and bounce back from the process medium below and return to the sensor. This is translated into a level measurement. These sensors are mounted on top of the tank and do not come into direct contact with process fluids.
>
> ***Radar:*** These sensors send radar pulses and measure the time it takes for the pulses to reflect and bounce back from the process medium below and return to the sensor. This is translated into a level measurement. These sensors are mounted on top of the tank and do not come into direct contact with process fluids. In general, radar has performance and reliability advantages over ultrasonic. Suitability of radar versus ultrasonic sensors depends on actual tank conditions and is outside the scope of this manual.

Level sensor feedback allows for automated level control by filling and transfer of water in process tanks. The system is vital to continuous operation of the SaltMaker. Proper SaltMaker operations produce a unique saw-tooth pattern on main effect tanks, with a slow decrease in tank level due to evaporation and a fast increase in levels due to the transfer of process fluids into the tank. Automated level warnings help operators locate issues before they become serious enough to interrupt operations.

For the post-treatment, level sensor feedback allows for automated level control by filling and transfer of water in process tanks. The system is vital to continuous operation of the Post-Treatment RO. Automated level warnings help operators locate issues before they become serious enough to interrupt operations.

Conductivity:

These sensors are used to measure the conductivity of water, which is proportional to the ionic or salt concentration of the water. The SaltMaker deploys two different types of conductivity sensors:

> ***Contacting Conductivity Sensors:*** These sensors employ a potentiometric method. Two or four electrodes are submersed in the sample fluid. The sample fluid completes the electrical

circuit. A potential is proportional to the conductivity of the fluid. Saltworks uses this type of sensor to measure a conductivity range from 0-5 mS.

Inductive Conductivity Sensors: Two coils are wound inside the ring-shaped sensor. One coil drives a magnetic field with a known voltage and induces a current on the second coil. This current is proportional to the conductivity of the measured fluid. This type of sensor is suitable for measuring conductivity in the 5-1000 mS range.

Conductivity sensor signals help operators monitor the concentration of process water in different effects. By tracking an increase in concentration of brine over time, these sensors ensure that the SaltMaker is functioning normally.

For the post-treatment, conductivity sensor signals help operators monitor the concentration of the concentrate and permeate process streams. By tracking conductivity changes over time, these sensors ensure that the Post-Treatment RO is functioning normally.

pH:

These sensors contain a potentiometric cell made of pH-sensitive electrodes. Voltage is measured across the electrodes and the signal is amplified and processed into a 4-20 mA signal. pH sensors help monitor the condition of treated and untreated water. They are also used in optional acid and base dosing systems to monitor and control pH to adjust the solubility of the process water to different salts.

Temperature:

These sensors measure the temperature of the process streams. The SaltMaker and post-treatment use resistive RTDs (resistance temperature detectors) which are sensors that measure a change in resistance due to a change in temperature. This signal is amplified and processed into a 4-20 mA signal with a transmitter. Temperature differences between the effects provide the main driving force for the humidification-dehumidification (HDH) process. Abnormal temperature differences would indicate problems with heat transfer between one effect and the other. These sensors help operators track temperature across all the effects to confirm normal operations.

Weight:

Load cells measure the mass of the salt produced and stored in big bags. This information lets the operator know when to replace the big bag.

3.11 REAGENTS

The following reagents will be used at the SWTP:

- sulfamic acid
- calcium hypochlorite
- trisodium phosphate
- sodium meta-bisulfite
- caustic soda
- Antifoam (AF-64)
- Antisclant (CC 7430)
- Biocide (KATHON™ CF150 BIOCIDE, AQUCAR™ DB 20 Water Treatment Microbiocide)

- Cleaning chemical (BAR COR CWS-55, ROclean L211 and P303, E-Series Blends.

Most of the chemicals are supplied in liquid form (and dosed using a dosing skid pump directly into the process) except for the sulfamic acid, calcium hypochlorite, sodium meta-bisulfite and trisodium phosphate which must be prepared manually before dosing. The solutions made with these products are prepared according to the MSDS provided by the suppliers.

The application for each of these reagents is detailed in the Operation and Maintenance Manual (OMM). The MSDS are available in the OMM as well.

4 PUMPING AND PIPING

For the operation of the SWTP, pumping and piping are required to convey water:

- from underground stope to the Saline Water Pond;
- from the Saline Water Pond to the SWTP;
- treated water from SWTP to the containment pond 1 (CP1).

Appendix A: SWTP Drawings

Appendix B: Pumps selection

APPENDIX F • WATER QUALITY AND FLOW MONITORING PLAN

AGNICO EAGLE

MELIADINE GOLD MINE

Water Quality and Flow Monitoring Plan

JANUARY 2019
VERSION 1

EXECUTIVE SUMMARY

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEL1631. The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Plan* and the *Metal and Diamond Mining Effluent Regulations (MDMER)*.

Section 2 of this Plan includes an overview of the monitoring programs and mine development schedule. Section 3 provides specific details (including sampling locations and parameters to be measured) for the compliance monitoring program, along with general guidance for the event monitoring program. An adaptive management program is described for regulated discharge and non-regulated discharges in Section 3. Requirements of the flow monitoring program are described in Section 4, and an overview of the reporting requirements in Section 5.

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IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEL1631, Part B, Item 10, the proposed implementation schedule for this Plan is outlined below.

This Plan will be implemented immediately (December 2018) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Environmental Superintendent
Environmental Coordinators
Environmental Technicians

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	18/12/16	All	All	Comprehensive plan for Meliadine project. First version composed by Meliadine Environment Department.

Prepared by:

Agnico Eagle Mines Limited - Meliadine Division

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SECTION 1. INTRODUCTION

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEL1631 (the License). The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Plan* and the *Metal and Diamond Mining Effluent Regulations (MDMER)*. The implementation and periodic updates to this Plan are the responsibility of the Meliadine Environment Department under the guidance of the Meliadine Environment Superintendent or designate.

The Plan summarizes the monitoring locations, sampling frequency, monitoring parameters, compliance discharge criteria and an adaptive management plan for water quality at the Meliadine Gold Project.

The purpose of this Water Quality and Flow Monitoring Plan is to establish the program that is to be implemented and followed by AEM's Meliadine environmental management team to monitor the performance of the waste and water management systems at the Meliadine Gold Project. The program includes:

- Verifying and validating the predicted water quality values with empirical measurements of the mine site water quality and flows;
- A comparison of measured water quality data to compliance requirements stipulated in the License; and
- A framework for adaptive management that allows the identification and rectification, where necessary, of unexpected trends or non-compliance in water quality and flows.

The Plan provides information on the locations of the monitoring stations at the various stages of mining. These monitoring locations are used to evaluate the performance of the mine waste and water management system.

The objectives of the monitoring program are:

1) To track the chemistry of the contact and non-contact water prior to and during discharge;

2) To assist in identifying if water treatment is required prior to discharge; and

3) To minimize the potential impacts of mining activities on the surrounding environment.

Additional locations outside the footprint of the mine (and outside the scope of this Plan) will be monitored under the *Meliadine Gold Project Aquatic Effects Management Program* (Golder 2016).

SECTION 2. OVERVIEW

2.1 OVERVIEW OF SITE WATER MANAGEMENT PLAN

Details of overall water management are discussed in the Meliadine Water Management Plan which is updated annually. A network of berms, dikes, containment ponds, channels, culverts and sumps are in place and maintained to facilitate water management (Section 3 of the *Water Management Plan*).

As specified in the *Water Management Plan*, surface contact water is intercepted, diverted and contained within various containment ponds prior to evaporation or treatment. Contact water from the Underground Mine is collected in underground sumps and recirculated for use in various underground operations. Underground contact water that is not used for operations is stored underground and any excess water that cannot be stored underground is pumped to the Saline Ponds or to the Saline Water Treatment Plant (SWTP) for treatment (See Section 3.9 of the *Water Management Plan*). Additional Saline Storage ponds will be developed on the Meliadine site (surface) in the future as groundwater inflows in the underground workings of the mine are greater than predicted. Agnico Eagle has received approval from the Nunavut Impact Review Board to discharge saline water via a diffuser to the sea in Rankin Inlet (Melvin Bay).

2.2 MONITORING PROGRAMS

This Plan has been divided into two levels of monitoring to characterize the range of impacts between the sources of contact water in the individual mine facilities and the point of discharge or release to the receiving environment. The two levels of monitoring include:

1) Compliance monitoring; and

2) Event monitoring.

2.2.1 Compliance Monitoring Program (CM)

The CM sites are those stipulated in the License; these sites vary from contact water collection ponds, structures such as ditches, culverts prior to discharge to the receiving environment and local lakes surrounding the mine site. The requirements of the License, including water quality limits, will be applied at the applicable mine discharge points identified in the CM program.

The CM program provides a mechanism to assess water quality at specified sites, and to confirm and document compliance of discharge with regulatory requirements. As part of adaptive water management, these internal monitoring stations provide protection to the receiving water environment, provide data to predict pit re-flooding water quality and ensure exceedances of predicted or regulated levels are appropriately managed or mitigated to reduce impacts.

2.2.2 Event Monitoring Program (EM)

The EM sites result from unexpected events such as spills, accidents, and malfunctions. The response programs for such events are discussed in greater detail in the following four (4) documents:

- Meliadine Spill Contingency Plan (March 2019;
- Meliadine Emergency Response Plan (May 2018);
- Meliadine Freshet Action Plan (March 2019); and
- Meliadine Water Management Plan (March 2019).

Each accidental release will require mobilization of site equipment to stabilize the release, procedures to contain, neutralize, and dispose of the discharge, and recommendations for monitoring the site following the incident.

2.3 OVERVIEW OF MINE DEVELOPMENT SCHEDULE

The Mine Plan and key mine development activities, including mine waste management are currently used concurrently with the *Water Management Plan*.

The Mine Plan proposes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

The Mine is estimated to produce approximately 14.9 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 14.9 Mt of tailings. The following phased approach is proposed for the development of the Tiriganiaq gold deposit;

- Phase 1: 3.5 years for Mine Construction. Construction began in 2015 and is estimated to be completed in Q2 of 2019 (Q4 Year -5 to Year Q2 -1);
- Phase 2: 8.5 years for Mine Operations, beginning in 2019 (Q2 Year -1 to Year 8);
- Phase 3: 3 years Mine Closure (Year 9 to Year 11); and;
- Phase 4: Post-Closure (Year 11 forward).

Mining facilities on surface will include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a series of water treatment plant

SECTION 3. MONITORING PROGRAM

The monitoring program is presented in three sections; requirements of the compliance monitoring program, an overview of the event monitoring program, and then details of the adaptive management program for monitoring results.

3.1 COMPLIANCE MONITORING PROGRAM

The CM program monitors the chemistry of four local lake surrounding the mine site (E3, G2, H1 and B5) as well as mine contact water collected and diverted at specified locations prior to release into the receiving water environment. The sampling is conducted in order to confirm and document compliance with regulatory requirements. The types of water and the timing of the CM program include:

- Non-contact water from local lakes;
- Mine contact water collected from drainage of different structures; and
- Monitoring points located within the containment ponds prior to release into the receiving water environment

The CM sampling program has multiple monitoring stations across the project site, with sampling at different stages of the mine life. All of the CM stations, a description of their location, parameters to be monitored and sampling frequency are listed in Table 3.1. Specific details for the monitoring parameter groups are provided in Table 3.2. In summary, Agnico Eagle follows 5 groups of parameters, as identified in Meliadine's Type A Water License Schedule I Table 1.

Figures 3.1 shows the approximate location of each of the sampling sites. The actual location of each sampling site is determined by access and safety considerations and are marked by a stake that defines the exact location of the collection point for sampling events with appropriate attached signage in English, Inuktitut and French.

GPS coordinates for all compliance monitoring stations were confirmed, as required in Part I, Item 6 of the NWB Type A water license.

3.1.1 General Sampling and Analysis Program

Samples are collected in clean laboratory-supplied containers and preserved as directed by the analytical laboratory. During all phases, samples are analyzed offsite at an accredited commercial lab (ALS in Burnaby BC, Maxxam Analytics in Ottawa, AquaTox in Puslinch, or H2Lab in Val d'Or). Samples sent to commericial laboratories may change as the site matures and additional requirements occur.

Table 3.3 summarizes the minimum sample volumes, container, preservation, and holding times for each analyte. This information is from the *USEPA Methods for Chemical Analysis of Water and Waste Water* (*EPA-600/4-79-020, 1979*).

Table 3.1: Monitoring Program

Station	Description	Phase	Monitoring Parameters	Frequency
Mine Site				
MEL-D-1	Dewatering: Water transferred from lakes to Meliadine Lake during dewatering of lakes	Construction	As defined in the Water Management Plan referred to in Part D, Item 12	Prior to discharge and Weekly during discharge
			Volume (m3)	Daily during periods of discharge
MEL-SR-1 to TBD	Surface Runoff – runoff downstream of Construction areas at Meliadine Site and Itivia Site, Seeps in contact with the roads, earthworks and any Runoff and/or discharge from borrow pits and quarries	Construction, and Operation	As defined in the Water Management Plan referred to in Part D, Item 18 and Part I, Item 11	Prior to Construction, Weekly during Construction
			Group 1	Monthly during open water or when water is present upon completion
MEL-11	Water Intake from Meliadine Lake	Construction, Operation, and Closure	Full Suite	Monthly during periods of intake
			Volume (m3)	Daily during periods of intake
MEL-12	Water treatment plant (pre-treatment) coming from CP1, off the pipe and not in the pond	Construction (prior to release), Operations, and Closure	Group 1	Monthly during periods of discharge
MEL-03-01 (and AEMP Stations)	Mixing zone in Meliadine Lake, Station 1; and MDMER exposure stations for final discharge point within mixing zone	Construction (prior to release), Operations, and Closure	Full Suite, Group 3 (MDMER)	Monthly during periods of discharge
MEL-14	Water treatment plant from CP-1 (post-treatment), end of pipe (before offsite release) in the plant before release.	Construction (upon effluent release), Operations, and Closure	Full Suite, Group 3	Prior to discharge and Weekly during discharge

			Volume (m3)	Daily during periods of discharge Once prior to discharge and Monthly thereafter
			Acute Lethality	Once prior to discharge and Monthly thereafter
MEl-15	Local lake E-3	Operations, and Closure	Group 2	Bi-annually during open water
MEL-16	Local Lake G2	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-17	Local Pond H1	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-18	Local Lake B5	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-19	CP-2 Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-20	CP-3 Collection of drainage from dry stacked tailings	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-21	CP-4 Collection of drainage from WRSF1	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-22	CP-5 Collection of drainage from WRSF1 and WRSF2	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-23	CP-6 Collection of drainage from WRSF3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-24	Seepage from the Landfill between the landfill and Pond H3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-25	Secondary containment area at the Itivia Site Fuel Storage and Containment Facility	Construction, Operation, Closure	Group 4, Volume (m3)	Prior to discharge or transfer of Effluent

Table 3.2: Monitoring Parameters

Group	Parameters
1	pH, turbidity, hardness, alkalinity, chloride, fluoride, sulphate, total dissolved solids (TDS), total suspended solids (TSS), total cyanide, ammonia nitrogen, nitrate, nitrite, phosphorus, orthophosphate, Total Metals (aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, and zinc).
2	**Total and Dissolved Metals**: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc. **Nutrients**: ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, orthophosphate, total phosphorus, total organic carbon, dissolved organic carbon, and reactive silica. **Conventional Parameters**: bicarbonate alkalinity, chloride, carbonate alkalinity, turbidity, conductivity, hardness, calcium, potassium, magnesium, sodium, sulphate, pH, total alkalinity, TDS, TSS, total cyanide, free cyanide, and weak acid dissociable (WAD) cyanide..
3	**MDMER parameters**: total cyanide, arsenic, copper, lead, nickel, zinc, radium-226, TSS, pH, total ammonia and temperature. **MDMER additional requirements**: Effluent volumes and flow rate of discharge, Acutely Lethality tests (Rainbow Trout and Daphnia magna) and environmental effects monitoring (EEM).
4	Total arsenic, total copper, total lead, total nickel, TSS, ammonia, benzene, toluene, ethylbenzene, xylene, total petroleum hydrocarbons (TPH), and pH
Full Suite	Group 2, Total Petroleum Hydrocarbons, Turbidity. Non Acutely-lethal (Rainbow Trout and Daphnia magna) for discharge only.
Flow	Flow data-logger
Field measurements	Field pH, specific conductivity, dissolved oxygen, and temperature.

Table 3.3: Summary of Sampling Requirements for each Analyte

Parameters	Matrix Holding Time				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Microbiology							
Escherichia coli, total coliforms, A.A.H.B	48h	48h	48h	48h	PPS	TS, E	250ml
Enterococcus	48h	48h	48h	48h	PPS	TS, E	250ml
Thermo tolerant coliforms (fecal)	48h	48h	48h	48h	PPS	TS, E	250ml
Inorganic Chemistry							
Absorbance UV, Transmittance UV				24h	P. T. V	N	125ml
Alkalinity, Acidity, Bicarbonates, Carbonates	14d	14d	14d	14d	P, T, V	N	250ml
Ammonia nitrogen (NH_3-NH_4)	28d	28d	28d	28d	P, T, V	AS	125ml
Kjeldahl ammonia (NTK)		28d	28d	28d	P, T, V	AS	125ml
Anions (Cl, F,SO_4)	28d	28d	28d	28d	P, T, V	N	250ml
Color, Free & total Chlorine	48h	48h	48h	48h	P, T, V	N	125ml
Conductivity	28d	28d	28d	28d	P, T, V	N	250ml
Cyanides total/available, Cyanides	14d	14d	14d	14d	P, T, V	NaOH	250ml
BOD_5/Carbonated BOD_5 (2)		48h/4°	48h/4°		P, T, V	N	250ml
COD (chemical oxygen demand)		28d	28d		P, T, V	AS	125ml
Mercury (Hg)	28d	28d	28d	28d	P, T, V	AN	250ml
Total/dissolved metals (filtered on field)	180d	180d	180d	180d	P, T, V	AN	250ml
Dissolved Metals (filtered in the laboratory)	24h	24h	24h	24h	P, T, V	N	250ml
Total suspended solids & Volatile TSS		7d	7d	7d	P. T. V	N	500ml
NH_3 or NH_4		24h	24h	24h	P.T.V	N+AS	2/125ml
Nitrites (NO_2), Nitrates (NO_3), Turbidity	48h	48h	48h	48h	P, T, V	N	250ml
Nitrites-Nitrates (NO_2-NO_3)	28d	28d	28d	28d	P, T, V	AS	250ml
O-Phosphates (O-PO_4)	48h	48h	48h	48h	P, T, V	N	500ml
pH	24h	24h	24h	24h	P, T, V	N	125ml
Total Phosphorus (P-tot)	28d	28d	28d	28d	P, T, V	AS	125ml
Dissolved solids (TDS)		7d	7d	7d	P. T. V	N	250ml
Total solids		7d	7d	7d	P. T. V	N	250ml
Sulphides (H_2S) (3)	28d	28d	28d	28d	P. T. V	AcZn + NaOH	125ml
Thiosulfates	48h	48h	48h	48h	P. T. V	N	125ml
Radioactive & Organic Chemistry							
Fatty resin acids (S-T)	--	28d	28d	--	VA, VT	AS	1L
Congeners PCB (S-T)	28d	28d	28d	28d	VA, VT	N	1L
Chlorobenzene	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml
Total Organic Carbon (TOC)	28d	28d	28d	28d	P, T, V (B)	AC	100ml
Dissolved Organic Carbon (DOC)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Total Inorganic Carbon (CIT)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Phenolic compound (GC-MS)	28d	28d	28d	28d	VA, VT	AS	1L
Glyphosate (S-T)	14d	14d	14d	14d	P.T	N	500ml
PAH	28d	28d	28d	28d	VB	AS	1L
Oil & Greases (total and non-polar)	28d	28d	28d	28d	VA, VT	AS	1L
C10-C50 HP and/or Petroleum Product Identification	28d	28d	28d	28d	VA, VT	AS	1L

Phenol index	28d	28d	28d	28d	VA, VT	AS	500ml
Radium-226	180d	180d	180d	180d	P, T. V	AN	1L
VOC (MAH, CAH, THM, BTEX) (3)	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml

Type of bottle:
P.S.V.T.: plastic bottle, bag or glass bottle with Teflon cap
P, T: Plastic bottle or plastic bottle with Teflon cap
P.T.V.: Plastic bottle or glass bottle with plastic or Teflon cap
PPS: Sterile propyl ethylene bottle
VA: Clear or amber glass with aluminium or Teflon seal
VB: Amber glass (or clear glass covered with aluminium paper) aluminium seal of Teflon
VT: Clear or amber glass bottle with Teflon seal
Preservative:
AC: 0.1ml (100µl) of HCl per 100ml of sample
AcZn: 0.2ml zinc acetate 2N per 100ml of sample and NaOH 10N to pH >9
AN: HNO3 to pH <2
AS: H2SO4 to pH <2
E: 2.5ml EDTA 1.5% (p/v) per 100ml of sample if heavy metals are suspected
ED: 0.1ml diamine ethylene 45 mg/l per 100 ml of sample
EDTA: 1ml EDTA 0.25M per 100ml of sample
N: No preservative
NaOH: NaOH 10N to >12
TS: Sodium thiosulfate final concentration in the sample of 0.1% (p/v)

3.1.2 Compliance Monitoring Stations and Discharge Criteria

Further details of the specific CM stations and discharge criteria stipulated under the License are provided below.

3.1.2.1 *Dewatering Activities*

All Waters from dewatering activities at Monitoring Program Stations MEL-D-1 through MEL-D-TBD shall be directed to Meliadine Lake and shall not exceed the quality limits presented in Table 3.4 as stipulated in Part D, Item 12 of the License.

Table 3.4: TSS and pH Criteria at CM Stations MEL-D-1 through MEL-D-TBD

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample
TSS	15.0	30
pH	6.0 to 9.5	6.0 to 9.5

All surface runoff and/or discharge from drainage management systems, at the Monitoring Program Stations MEL-SR-1 to MEL-SR-TBD during the Construction/Operation of any facilities and infrastructure associated with this project, including laydown areas and All-weather Access Road, where flow may directly or indirectly enter a Water body, shall not exceed the Effluent quality limits presented in Table 3.5, as stipulated in Part D, Item 18 of the License.

Table 3.5: Effluent Criteria at CM Station MEL-SR-1 to MEL-SR-TBD

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids (TSS) (mg/L)	50.0	100.0
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	6.0 to 9.5	6.0 to 9.5

3.1.2.2 *Water Collection System*

A water collection system comprised of berms, dikes, containment ponds, channels, culverts and sumps was developed to control water at the Meliadine project (Section 3 of the *Water Management Plan*). Diversion berms, diversion channels and culverts will direct surface water towards containment ponds and associated dikes. Pending salinity levels, water in containment pond CP5 will be treated by a Reverse Osmosis (RO) treatment plant prior to be discharged in CP1.

Contact water from the Underground Mine is collected in underground sumps and recirculated for use in various underground operations. Underground contact water that is not used for operations is stored underground and any excess water that cannot be stored underground is pumped to the Saline Ponds. Saline water collected in the Saline Ponds is temporarily stored and then actively evaporated or pumped to the SWTP for treatment prior to being pumped to CP1.

At CP1, the water is treated for total suspended solids (TSS) at the Effluent Water Treatment Plant (EWTP) and either transferred to the process plant for use as make-up water or discharged through the diffuser located in Meliadine Lake

Effluent discharged from CP1 at CM station MEL-14 shall be directed to Meliadine Lake through the Meliadine Lake Outfall Diffuser and shall not exceed the effluent quality limits presented in Table 3.7, as stipulated in Part F, Item 3 of the License.

Table 3.6: Effluent Criteria at CM Station MEL-14

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
pH	6.0 to 9.5	6.0 to 9.5
TSS (mg/L)	15	30
TDS (mg/L)	1400	1400
Total (T)-Al (mg/L)	2.0	3.0
T-As (mg/L)	0.3	0.6
T-CN (mg/L)	0.5	1
T-Cu (mg/L)	0.2	0.4
NH_4-N (mg/L)	14	18
T-Ni (mg/L)	0.5	1
T-Pb (mg/L)	0.2	0.4
T-P (mg/L)	2.0	4.0

T-Zn (mg/L)	0.4	0.8
Total Petroleum Hydrocarbons (TPH) (mg/L)	5	5

The Discharge of Effluent from the Final Discharge Point at Monitoring Program Station MEL-14 shall be demonstrated to be non-Acutely Lethal under the following test in accordance with the Schedule I of the License:

a. Acute Lethality of Effluents to Rainbow Trout (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13 July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time.

Itivia Marshalling Area

Surface water runoff from the bulk fuel tank storage areas is collected within the tank's secondary containment enclosures that are equipped with an HDPE liner; these are designed to contain petroleum products released due to spill events. Water collected in the secondary containment enclosures at CM station MEL-25 is discharged to land in a controlled manner according to the Nunavut Water Board Type A water license # 2AM-MEL16331.

All effluent being discharged from the secondary containment enclosures at the itivia marshalling facility shall not exceed the effluent quality limits presented in Table 3.9, as stipulated in Part F, Item 5 of the water license.

Table 3.7: Effluent Criteria at CM Station MEL-25

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
pH	6.0 to 9.5	6.0 to 9.5
TSS (mg/L)	15.0	30.0
Benzene (ug/L)	370	370
Toluene (ug/l)	2	2
Ethylbenzene (ug/L)	90	90
Lead (mg/L)	0.1	0.1
Oil and Grease (mg/L)	5.0 and no visible sheen	5.0 and no visible sheen

3.1.2.3 *Receiving Environment*

Receiving water quality monitoring is discussed in the Aquatic Effects Management Program (AEMP) (March 2019). Within the AEMP are numerous monitoring programs: water quality, sediment quality, benthic invertebrate communities, and fish health and fish tissue chemistry. The Meliadine Lake monitoring program was designed around the key aspects of Environmental Effects Monitoring (EEM) requirements under the Metal and Diamond Mining Effluent Regulations. Water quality data are analyzed to determine if there are differences between the Near-field exposure area, the Mid-field exposure area, and the pooled reference areas of Meliadine Lake.

3.2 EVENT MONITORING

The Event Monitoring (EM) program addresses the site specific monitoring that is required following any accidental release. A "release" may be caused by:

- Spills, including unidentified seepage (Meliadine Spill Contingency Plan; March 2018); or
- Emergencies (Meliadine Emergency Response Plan; May 2017).

The EM program is designed to verify whether contamination of the surface soil and/or any nearby receiving environment and active zone has occurred as a result of an accidental release of a hazardous material or contaminated water. Verification is done through monitoring of surface runoff and nearby receiving environment during and following remedial activity. It is anticipated that due to the presence of permafrost beneath most of the mine footprint (active layer app 1.5m in depth), there will be minimal impact to groundwater from surface spills or accidental releases.

The EM plan is developed on a site specific basis subsequent to a spill or other incident, and considers the type of product spilled, the potential receptors and the potential for any remaining contamination after clean up. The plan is coordinated by the Environmental Department.

In the event of an accidental release, the water quality of any downstream receptor as well as an upstream reference (background) is sampled to determine severity of impact. Should the spill have happened over snow cover, as much contaminated snow will be removed as possible. Verification sampling would occur in the area after thaw to determine if the clean – up is complete or if further remediation is necessary. The specific parameters monitored as part of the EM program will depend on the nature of the spill, and will be determined for the specific material released.

The EM program for a particular spill will cease upon obtaining satisfactory analytical results from the potentially affected areas or as required by regulators.

3.3 ADAPTIVE MANAGEMENT PROGRAM

Results of the water quality monitoring are reviewed by the Meliadine Environment Department. Chemical trends of constituents of interest are tracked for mine site monitoring and for the AEMP program. This allows for early detection of significant changes in water quality within the mine site prior to discharge. If triggers and thresholds, such as in the AEMP program, are exceeded in the receiving environment action plans are then implemented to ensure that environmental protection objectives are met.

An adaptive management program has been designed for the Meliadine Gold Project to evaluate the monitoring data and provide a framework for action, if necessary. The program has two levels - a trigger level to compare the monitoring data against, and an action plan of mitigative measures for identified exceedances.

The adaptive management program is divided into two sections, one for parameters with regulated discharge criteria at specific monitoring locations, as specified in the License and by the Metal Diamond Mining Effluent Regulations (MDMER). The second section is for measured parameters for which no discharge limits have been identified in the License such as those in the AEMP or EEM.

Saline Water Treatment Plant Influent and Effluent

Water samples are collected weekly at both the inlet and outlet of the SWTP. Samples taken at the inlet of the SWTP represent the water quality of either Sump 75 or the Saline Pond, which will vary depending on the treatment priority for saline water storage. The results of the sample analysis are used by SWTP

operators to fine-tune the treatment process and ensure its optimal performance. Samples taken at the outlet of the SWTP are analyzed to provide the quality of treated water produced by the SWTP that is transferred to CP1.

Water samples are analyzed for the following parameters: pH, conductivity, temperature, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), chloride, ammonia, nitrite, nitrate, total phosphorus, total metals, total cyanide, and total mercury.

3.3.1 Adaptive Management Program for Regulated Discharge

3.3.1.1 *Action Plan*

In the case of an exceedance of a License limit or MDMER discharge limit, an action plan will be implemented. The adaptive management program requires that if one or more of the key monitored parameters exceed the respective limits, a staged sequence of responses will follow. Table 3.12 summarizes the staged adaptive action plan for the CM program for regulated discharge. Figure 3.1 is a logic diagram showing the decision path for evaluating analytical results for regulated discharges.

In addition to the mitigative measures listed above, a number of other possible alternatives are available to reduce or treat contaminants. These mitigation measures include:

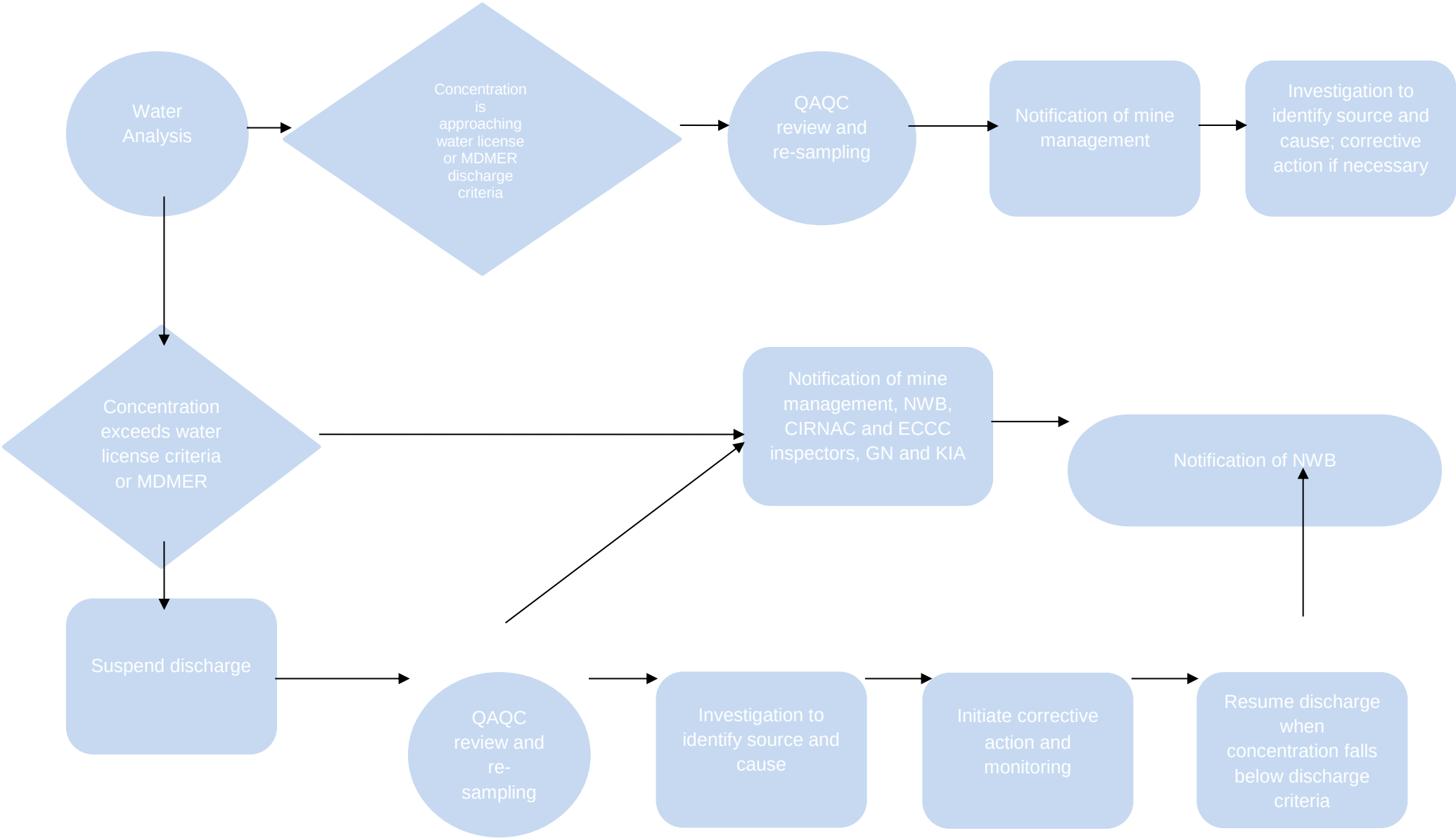
- Best management practices for sediment and erosion control would be employed to reduce TSS concentrations (i.e., flow control, sedimentation basin construction silt fencing, etc; see Sediment and Erosion Management Plan);
- Addition of a coagulant for the reduction of TSS in pond water;
- Use of geotextile or reamouring of banks to filter and reduce TSS in pond/ditch water;
- Deployment of absorbent booms and/or barriers within ponds to isolate surface petroleum hydrocarbon films for removal and/or treatment;
- Adjustments to on-site sewage treatment for the reduction of BOD and E. coli concentrations; Addition of lime to increase a low pH value or reduce metal concentrations;
- Removal of the offending source rock or the prevention of surface waters coming into contact with the offending source rock in the case of ARD; and/or
- Implementation of the *Freshet Action Plan* to proactively identify any issues around areas of concern; conduct additional monitoring, and control and contain seepage or movement of TSS on site.

Table 3.6: Action Plan for Regulated Discharge

Example	Action Plan

Exceeds water license discharge criteria or MDMER	1. Suspension of discharge activities; 2. QA/QC review and analysis, and re-sample water at the particular location if necessary; 3. Notification of mine management (General Mine Manager or designate and Environment Superintendent, or designate) and the regulators: Nunavut Water Board, CIRNAC and ECCC inspectors, GN and the Kivalliq Inuit Association; 4. Investigation to identify possible source(s) and cause(s) of the exceedance; 5. Initiation of corrective actions or water treatment, and follow up monitoring; and 6. Resumption of discharge when concentrations are below the discharge criteria

Figure 3.2: Logic Diagram for Regulated Discharge



3.3.2 Adaptive Management Program for Non-Regulated Discharge

Aside from targeted monitoring studies (i.e. “Effects Assessment Studies”) such as those following construction, the AEMP is the main program aimed at measuring and assessing potential impacts of contaminants in the receiving aquatic environment that are not regulated under MDMER or NWB. This program combines with the Environmental Effects Monitoring (EEM) required under MDMER.

The program is designed to take an integrated, ecosystem-based approach that links mitigation and monitoring of physical/chemical effects to key ecological receptors in the receiving environment. It addresses key issues identified in the Meliadine EA (i.e., mining-related activities with the potential to affect water quality, fish habitat and fish populations). Monitoring results are intended to inform the “adaptive management” process”, supporting the early identification of potential problems and development of mitigation options to address them by comparing results to established threshold and trigger levels.

3.3.2.1 *AEMP Action Level and Significance Threshold*

The AEMP Response Framework links monitoring results to management actions, with the purpose of maintaining the assessment endpoints within acceptable ranges. It is a systematic approach for evaluating AEMP results and responding appropriately, such that potential unexpected effects are identified and mitigation is undertaken to reduce or reverse them, thereby preventing the occurrence of a significant adverse effect. This is accomplished by continually evaluating monitoring data and implementing follow-up actions (e.g., confirmation, further study, mitigation) at pre-defined levels of change in measurement endpoints (i.e., Action Levels). For purposes of this Response Framework, the following terms are used: effect, normal range, benchmark, Action Level, and Significance Threshold.

Action Level – Action Levels (Low, Moderate, and High) are pre-defined levels of environmental change that exceeds normal ranges or benchmarks, or results of statistical tests, or a combination of these. For example, exceedance of the normal range and approach of a benchmark by a water quality parameter in the near-field exposure area may be defined as the Low Action Level. A change that falls within the normal range of variability for the study area would not trigger an Action Level.

Significance Threshold – The Significance Threshold, for the purposes of an AEMP Response Framework, is a magnitude of change that would result in significant adverse effects. It is a clear statement of environmental change that must never be reached. The AEMP Response Framework is designed to prevent reaching the significance threshold for all assessment endpoints.

3.3.2.2 *Action Levels*

The proposed Action Levels are designed to provide an early warning indication of potential adverse effects to plankton and benthos (i.e., food for fish), to fish health, and to the assurance of normal ecological function (including water quality and sediment quality). The proposed Low Action Levels (Table 8-2 and 8-3) are designed such that changes of sufficient magnitude to trigger a Low Action Level response are reported, documented, investigated, and ultimately addressed (i.e., mitigation measures or operation changes are implemented) before Significance Thresholds would ever be reached; if a Low Action Level is reached, Medium and High Action Levels (with response actions) are developed to provide further adaptive management guidance to the Mine to avoid reaching the Significance Thresholds. The type of management response taken after reaching an Action Level will depend on the type and magnitude of effect observed.

Further details on the integrated aquatic effects action plan are provided in Golder, 2018.

SECTION 4. FLOW VOLUMES

Flow volumes within the mine footprint will be measured daily during periods of discharge. Flow volume measurements will be conducted using volumetric flow meters attached to applicable pumps. For permanent pumping arrangements such as fresh water pumping systems flows will be measured using permanent in line flow meters. For periodic batch discharges, such as secondary containment sumps, portable flow meters or calculated pump time and capacity methods will be used.

Detailed pump records are maintained including date, pond/sump number, receiving location of pumped water, pump ID, duration of pumping, and total volume pumped. The average flow rates, total discharge per event and total cumulative discharge will be reported annually.

The monitoring locations for water flow volumes, in accordance with Part I, Item 9, and Table 2 of the Water License, include:

- The volume of fresh Water obtained from Meliadine Lake at Monitoring Program Station MEL-11;
- The volume of fresh Water transferred to the Meliadine Lake during lakes' dewatering activities;
- The volume of fresh Water obtained along the road and Meliadine River for dust suppression activities;
- The volume of Effluent discharged from Final Discharge Point at Monitoring Program Station MEL-14;
- The volume of reclaim Water obtained from CP1;
- The volume of Effluent discharged onto tundra at Monitoring Program Station MEL-25 or transferred to CP1 from the Itivia Site Fuel Storage and Containment Facility; and
- The volume of Effluent and Fresh Water transferred to the pits during pits' flooding.

SECTION 5. REPORTING

Reporting of water quality results is to be conducted on two levels a) monthly and annually with the results of the monitoring program and per MDMER requirements and b) in response to exceedances.

5.1 ANNUAL REPORTING

An annual report is to be submitted to the NWB, KIA, Department of Fisheries and Oceans, Crown-Indigenous Relations and Northern Affairs Canada, Nunavut Impact Review Board, Government of Nunavut, and other interested parties by March 31st of the following year. The report is to summarize the following:

- Monitoring results for each sampling station during the year and for the life of mine (construction to end of closure); activities during the year at each station; and any exceedances at stations, the action plan applied to the exceedance, and the results of the action plan;
- Annual seep water chemistry results; including location of the samples, sources of the water collected, and results of chemical analyses of the samples;
- Receiving water monitoring results;

- Spills and any accidental releases; event monitoring activities conducted following containment, remediation, and reclamation; and the results of EM program, any exceedance in EM results, and the action plan following the exceedance;
- Measured flow volumes;
- Effluent flow rates, volumes and calculated chemical loadings following the requirements of MDMER; and
- Results of QA/QC analytical data.

5.2 EXCEEDANCE REPORTING

Any measured concentration at a CM station exceeding a regulated discharge criterion stipulated in the License or MDMER will be reported to the NWB and Environment Canada and Climate Change upon receipt of the analysis. In addition, results of the action plan will be reported and, where necessary, mitigation options identified within 90 days after receipt of the analyses.

Exceedances in the concentration of a parameter in receiving water will be reported as specified in the AEMP and EEM – MDMER accordingly.

SECTION 6. REFERENCES

Golder Associates Ltd. 2016. Aquatic Effects Monitoring Program (AEMP) Design Plan. Version 1. June 2016. 6513-REP-03.

APPENDIX G • WATER MANAGEMENT STRUCTURE INSPECTION TEMPLATE

Environmental Inspection Report for Meliadine Gold Project

Water Licence 2AM-1424 Part E Item 15 – Water Management Structures – (Site Services Owner)

DATE : Inspected By :

Location :

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
Water Management Plan Section 3.11.1 Culvert and Water Crossing Inspections	Ensure no damage to the inlet or outlet of culverts **on site** which may impede flow capacity.				
Water Management Plan Section 3.11.1 Culvert and Water Crossing Inspections	Ensure no damage to the inlet or outlet of culverts on the **AWAR and Bypass Road and at Itivia** which may impede flow capacity.				
Water Management Plan Section 3.11.1 Culvert and Water Crossing Inspections	Ensure no blockages within the culvert including snow, ice, and debris.				
Water Management Plan Section 3.11.1 Culvert and Water Crossing Inspections	Ensure no snow cover or snow piles, which would prevent routing of water into or out of the culvert (only applicable within 1 month prior to freshet and during freshet).				
Water Management Plan Section 3.11.1 Culvert and Water Crossing Inspections	Ensure no bed erosion upstream and downstream of watercourse crossing structures.				
Water Management Plan Section 3.11.1 Culvert and Water Crossing Inspections	Ensure no scour under bridge abutments and abutment foundations.				

Water Management Plan Section 3.11.1 Culvert and Water Crossing Inspections	Ensure no erosion along cutslopes and fillslopes of embankments (rill and gully erosion)				
Water Management Plan Section 3.11.2 Containment Pond Inspections	Ensure no unplanned inputs to containment ponds via surface runoff which are not part of the water management system				
Water Management Plan Section 3.11.2 Containment Pond Inspections	Ensure water level elevations in containment ponds are not above the operating manual maximum (OMM)				
Water Management Plan Section 3.11.3 Dike Inspections	Monitoring and documentation of **changes** in previously observed movement and /or deterioration of dikes. Weekly during flow and monthly thereafter.				
Water Management Plan Section 3.11.3 Dike Inspections	Monitoring and documentation of **newly** observed movement and /or deterioration dikes. Weekly during flow and monthly thereafter.				
Water Management Plan Section 3.11.3 Dike Inspections	Monitoring and documentation of seepage through the downstream dike slope. Weekly during flow and monthly thereafter.				
Water Management Plan Section 3.11.3 Dike Inspections	Monitoring and documentation of water presence in channel/sump downstream of dike. Weekly during flow and monthly thereafter.				
Water Management Plan Section 3.11.3 Dike Inspections	Monitoring and documentation of areas of deterioration or movement of dike channel/sump. Weekly during flow and monthly thereafter.				

Water Management Plan Section 3.11.3 Dike Inspections	Issues observed as part of dike inspections will be addressed by Agnico Eagle geotechnical engineer				
Water Management Plan Section 3.11.4 Diversion Channel and Berm Inspections	Ensure no obstructions to flow (i.e., ice, debris) within channels on site which would impede maximum flow capacity				
Water Management Plan Section 3.11.4 Diversion Channel and Berm Inspections	Ensure no inflows to channels on site which are not part of the water management system				
Water Management Plan Section 3.11.4 Diversion Channel and Berm Inspections	Ensure no slumping or failure of banks of channels on site which could impede flow or introduce TSS				
Water Management Plan Section 3.11.4 Diversion Channel and Berm Inspections	No seepage through water diversion berms resulting in water movement to areas not planned within the water management system				
Water Management Plan Section 3.11.4 Diversion Channel and Berm Inspections	No erosion of diversion berms (i.e., undercutting, slope failure)				

Comments / Recommendations

Environmental Personnel Name :

Signature :

Actions Corrected:

_____

_____

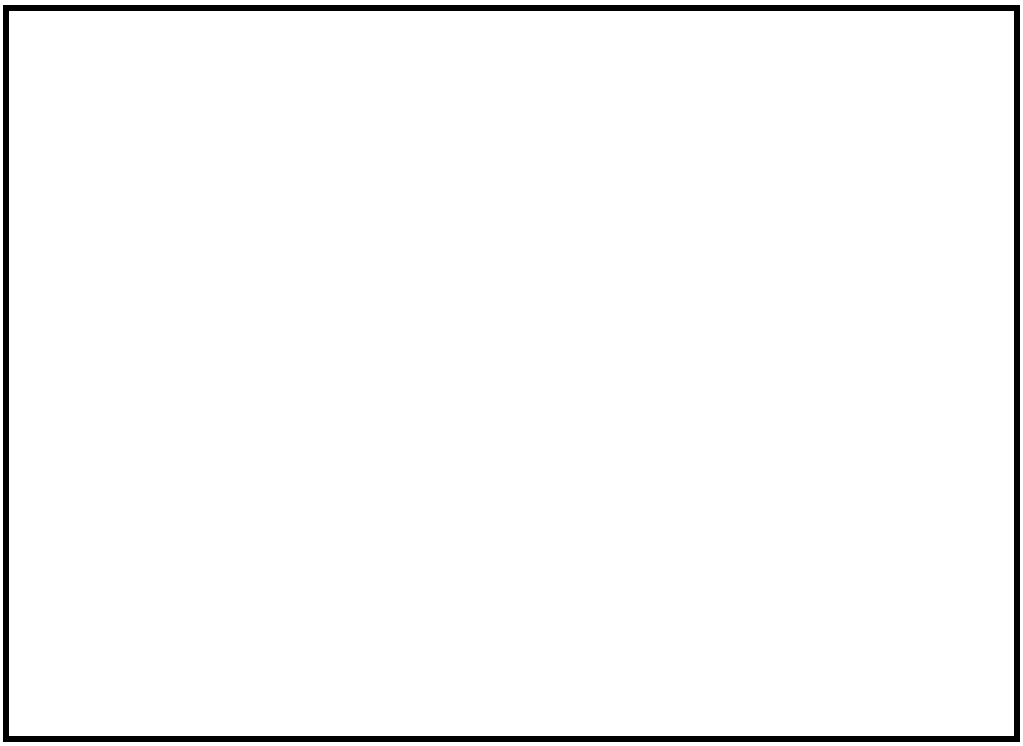
_____

_____

Supervisor Name: _____

Signature: _____

Picture 1:



Picture 2:



Picture 3:

APPENDIX H • 2019 WATER BALANCE AND QUALITY FORECAST RESULTS

Containment Pond 1											
Result:	Volume	TDS	Inflows								
	Volume (end of month)	Monthly Average TDS	South of Esker	H15 Watershed	CP1 East Watershed	CP1 West Watershed	Ore Stockpiles	CP1 West Shore Watershed	Industrial Pad Runoff	Portal 2 Catchment	Crusher Pad Runoff
Unit:	m3	mg/L	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	112247.2	1969.523	0	0	0	0	0	0	0	0	0
2019 Feb	119396.3	1879.312	0	0	0	0	0	0	0	0	0
2019 Mar	126733.5	1797.157	0	0	0	0	0	0	0	0	0
2019 Apr	131650.3	1745.63	0	0	0	0	0	0	0	0	0
2019 May	136730.4	1709.831	0	0	0	0	0	0	0	0	0
2019 Jun	235123.7	1804.616	9371.438	17273.25	11579.31	22168.33	1932.813	11475.49	24239.98	3237.486	1029.42
2019 Jul	262239.8	2329.541	1625.417	2995.935	2125.795	3981.168	521.462	1381.294	6038.066	876.312	278.64
2019 Aug	314478.2	2786.252	2357.999	4346.216	3000.123	5678.327	799.5072	1715.708	7451.265	1046.706	332.82
2019 Sep	365789.9	3026.668	1927.459	3552.654	2414.665	4597.84	484.9281	1156.391	5502.455	754.602	239.94
2019 Oct	390387	3174.841	595.223	1097.103	731.3918	1403.299	66.20123	313.6647	1476.144	194.736	61.92
2019 Nov	398063.8	3222.95	0	0	0	0	0	0	0	0	0
2019 Dec	405744.6	3171.37	0	0	0	0	0	0	0	0	0

Containment Pond 1											
Result:	Inflows										
	Landfill Runoff	H13 Catchment Runoff	WRSF2 Catchment	Direct Precipitation	Runoff from TSF	WRSF1 Runoff	Recirculated from EWTP	Pumped from CP3	Pumped from CP4	Pumped from CP5	SWTP Permeate
Unit:	m3	m3	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	0	0	0	0	0	0	0	0	0	0	3303.72
2019 Feb	0	0	0	0	0	0	0	0	0	0	3696
2019 Mar	0	0	0	0	0	0	0	0	0	0	3493
2019 Apr	0	0	0	0	0	0	0	0	0	0	1200
2019 May	0	0	0	0	0	0	0	0	0	0	1240
2019 Jun	931.266	24362.21	18771.24	15324.5	7095.284	2972.649	0	24074.28	0	0	1551.942
2019 Jul	252.072	4225.471	3554.507	0	1920.528	750.6201	0	10481.84	0	0	4119.5
2019 Aug	301.086	6129.909	4943.415	0	2293.964	908.4846	0	13856.72	0	0	4092
2019 Sep	217.062	5010.668	3944.967	2233.305	1653.788	617.0021	0	10719.85	0	0	3965.5
2019 Oct	56.016	1547.356	1181.911	4082.843	426.784	119.1622	0	3080.324	0	0	4092
2019 Nov	0	0	0	0	0	0	0	0	0	0	3960
2019 Dec	0	0	0	0	0	0	0	0	0	0	3960

Containment Pond 1										
Result:	Inflows			Outflows						
	Truck Wash	STP	RO Permeate	Steady Rate Treatment	Overflow	Discharge to Sea	Evaporation	To CP5	Seepage through DCP1	EWTP
Unit:	m3	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	16	3798.21	0	0	0	0	0	0	0	0
2019 Feb	16	3437.13	0	0	0	0	0	0	0	0
2019 Mar	20	3824.16	0	0	0	0	0	0	0	0
2019 Apr	16	3700.8	0	0	0	0	0	0	0	0
2019 May	16	3824.16	0	0	0	0	0	0	0	0
2019 Jun	20	3700.8	0	0	0	0	0	0	0	106353.2
2019 Jul	16	3824.16	0	0	0	0	18444.97	0	0	4038.207
2019 Aug	16	3824.16	0	0	0	0	7409.704	0	0	4360.83
2019 Sep	20	3700.8	0	0	0	0	0	0	0	2149.706
2019 Oct	16	3824.16	0	0	0	0	0	0	0	0
2019 Nov	16	3700.8	0	0	0	0	0	0	0	0
2019 Dec	20	3700.8	0	0	0	0	0	0	0	0

Containment Pond 3								
Result:	Volume	TDS	Inflows				Outflows	
	Volume (end of month)	Monthly Average TDS	Direct Precipitation	Natural Runoff	Disturbed Runoff	TSF Runoff	To Environment	To CP1
Unit:	m3	mg/l	m3	m3	m3	m3	m3	m3
2019 Jan	0	0	0	0	0	0	0	0
2019 Feb	0	0	0	0	0	0	0	0
2019 Mar	0	0	0	0	0	0	0	0
2019 Apr	0	0	0	0	0	0	0	0
2019 May	0	0	0	0	0	0	0	0
2019 Jun	25454	4872.601	0	30075.3	5054	14398.98	0	24074.28
2019 Jul	25454	5158.659	0	5216.37	1368	3897.468	0	10481.84
2019 Aug	25454	5441.455	0	7567.41	1634	4655.309	0	13856.72
2019 Sep	25454	5460.194	0	6185.7	1178	3356.153	0	10719.85
2019 Oct	25454	5387.477	0	1910.22	304	866.104	0	3080.324
2019 Nov	25454	5349.831	0	0	0	0	0	0
2019 Dec	25454	5349.831	0	0	0	0	0	0

Containment Pond 5											
Result:	Volume	TDS	Inflows							Outflows	
	Volume (end of month)	Monthly Average TDS	CP5 Catchment	WRSF 1 Catchment	Direct Precipitation	WRSF1 Runoff	Pumped from DCP5	Pumped from P3	Pumped from CP1	Overflow to CP1	Overflow to P1
Unit:	m3	mg/L	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	21482.37	12200	0	0	0	0	0	0	0	0	0
2019 Feb	21482.37	12200	0	0	0	0	0	0	0	0	0
2019 Mar	21482.37	12200	0	0	0	0	0	0	0	0	0
2019 Apr	21482.37	12200	0	0	0	0	0	0	0	0	0
2019 May	21482.37	12200	0	0	0	0	0	0	0	0	0
2019 Jun	10000	5592.921	22712.53	18195.42	2956.112	3973.06	0	0	0	0	0
2019 Jul	10000	4334.254	4361.398	3340.417	0	1002.185	0	0	0	0	0
2019 Aug	10000	5705.95	6155.219	4714.314	0	1213.01	0	0	0	0	0
2019 Sep	13591.38	5630.497	4923.284	3794.34	287.2397	824.9692	0	0	0	0	0
2019 Oct	16964.68	6914.495	1431.923	1149.29	633.2043	158.8829	0	0	0	0	0
2019 Nov	16964.68	7950.064	0	0	0	0	0	0	0	0	0
2019 Dec	16964.68	7950.064	0	0	0	0	0	0	0	0	0

Containment Pond 5							
Result:	Outflows						
	Overflow to P2	Overflow to P3	Pumped to CP1	Seepage to DCP5	Evaporation	RO Unit - Brine	RO Unit - Permeate
Unit:	m3	m3	m3	m3	m3	m3	m3
2019 Jan	0	0	0	0	0	0	0
2019 Feb	0	0	0	0	0	0	0
2019 Mar	0	0	0	0	0	0	0
2019 Apr	0	0	0	0	0	0	0
2019 May	0	0	0	0	0	0	0
2019 Jun	0	0	0	0	0	10084.31	49235.18
2019 Jul	0	0	0	0	2460.033	2497.587	3746.38
2019 Aug	0	0	0	0	953.5013	4451.617	6677.425
2019 Sep	0	0	0	0	0	2495.382	3743.073
2019 Oct	0	0	0	0	0	0	0
2019 Nov	0	0	0	0	0	0	0
2019 Dec	0	0	0	0	0	0	0

Saline Pond											
Result:	Volume	TDS	Inflows						Outflows		
	Volume (end of month)	Monthly Average TDS	Catchment Runoff	Direct Precipitation	Pumped P3	RO Brine	SWTP Brine	Pumped from UG	Evaporation	Pumped to SWTP Brine Mode	Pumped to SWTP Solids Mode
Unit:	m3	mg/L	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	13742.88	14808.54	0	0	0	0	1415.88	0	0	0	0
2019 Feb	13742.88	13903.09	0	0	0	0	0	0	0	0	0
2019 Mar	13742.88	13903.09	0	0	0	0	0	0	0	0	0
2019 Apr	13742.88	13903.09	0	0	0	0	0	0	0	0	0
2019 May	13742.88	13903.09	0	0	0	0	0	0	0	0	0
2019 Jun	24627.83	20260.96	1006.166	346.7753	0	10084.31	0	0	0	0	552.3078
2019 Jul	22919.93	19988.99	266.0104	0	0	2497.587	0	0	379.4909	0	4092
2019 Aug	23451.4	19071.36	318.4354	0	0	4451.617	0	0	146.5843	0	4092
2019 Sep	22715.32	18078	229.4377	42.59506	0	2495.382	0	0	0	0	3503.5
2019 Oct	22850.69	17785.79	59.33286	76.04437	0	0	0	0	0	0	0
2019 Nov	22850.69	17736.85	0	0	0	0	0	0	0	0	0
2019 Dec	22850.69	17736.85	0	0	0	0	0	0	0	0	0

Saline Pond		
Result:	Outflows	
	Pumped to P3	Overflow (tracked)
Unit:	m3	m3
2019 Jan	0	0
2019 Feb	0	0
2019 Mar	0	0
2019 Apr	0	0
2019 May	0	0
2019 Jun	0	0
2019 Jul	0	0
2019 Aug	0	0
2019 Sep	0	0
2019 Oct	0	0
2019 Nov	0	0
2019 Dec	0	0

Underground											
Result:	Volume				TDS			Inflows		Outflows	
	Sump System Volume (end of month)	Stope 75 Volume (end of month)	Stope 350 Volume (end of month)	Cumulative Underground Overflow (tracked)	Sump System Monthly Average TDS	Stope 75 Monthly Average TDS	Stope 350 Monthly Average TDS	Truck Wash	Groundwater Inflow	Lost to Rock Water Content	To SWTP Solids Mode
Unit:	m3	m3	m3	m3	mg/L	mg/L	mg/L	m3	m3	m3	m3
2019 Jan	830	4830	1100	0	55800	55794.9	55800	0	1240	0	0
2019 Feb	830	2254	1100	0	55800	55772.9	55800	0	1120	0	3696
2019 Mar	830	1	1100	0	55800	56572.61	55800	0	1240	0	3493
2019 Apr	830	1	1100	0	55800	55800	55800	0	1200	0	1200
2019 May	830	1	1100	0	55800	55800	55800	0	1240	0	1240
2019 Jun	830	168.366	1100	0	55800	55800	55800	0	1200	0	1032.634
2019 Jul	813.2645	1370.033	1100	0	55800	55800	55800	0	1240	55.06886	0
2019 Aug	830	7253.963	1100	0	55800	55800	55800	0	7440	1539.334	0
2019 Sep	830	10000	3543.666	0	55800	55800	55800	0	7200	1553.797	456.5
2019 Oct	830	10000	5169.999	0	55800	55800	55800	0	7440	1721.668	4092
2019 Nov	830	10000	6340	509.5294	55800	55800	55800	0	7200	1560.469	3960
2019 Dec	830	10000	6340	2390.044	55800	55800	55800	0	7200	1359.485	3960

Underground							
Result:	Outflows						
	To SWTP Brine Mode	Pumped to P3	Pumped to P2	Pumped to P1	Pumped to Saline Pond	Discharged to Sea	Uncontained
Unit:	m3	m3	m3	m3	m3	m3	m3
2019 Jan	5244	0	0	0	0	0	0
2019 Feb	0	0	0	0	0	0	0
2019 Mar	0	0	0	0	0	0	0
2019 Apr	0	0	0	0	0	0	0
2019 May	0	0	0	0	0	0	0
2019 Jun	0	0	0	0	0	0	0
2019 Jul	0	0	0	0	0	0	0
2019 Aug	0	0	0	0	0	0	0
2019 Sep	0	0	0	0	0	0	0
2019 Oct	0	0	0	0	0	0	0
2019 Nov	0	0	0	0	0	0	509.5294
2019 Dec	0	0	0	0	0	0	1880.515

P-Area (P1)											
Result:	Volume	TDS	Inflows								
	Volume (end of month)	Monthly Average TDS	Pumped from Portal 2	Overflow from CP5	Natural Runoff	Disturbed Runoff	Direct Precipitation	Waste Rock Runoff	From WRSF1	Batch Plant	Pumped from DP1
Unit:	m3	mg/L	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	4780.69	21869.53	0	0	0	0	0	0	0	0	0
2019 Feb	4780.69	22578.54	0	0	0	0	0	0	0	0	0
2019 Mar	4780.69	23287.54	0	0	0	0	0	0	0	0	0
2019 Apr	4780.69	24020.59	0	0	0	0	0	0	0	0	0
2019 May	4780.69	24753.63	0	0	0	0	0	0	0	0	0
2019 Jun	2519.543	71092.29	0	0	0	10797.06	1339.07	1442.724	0	0	0
2019 Jul	1000	385783.2	0	0	0	3301.09	0	390.5118	0	0	0
2019 Aug	1000	477220.1	0	0	0	3957.756	0	466.4446	0	0	0
2019 Sep	1000	553830.9	0	0	0	2853.266	61.0435	336.274	0	0	0
2019 Oct	2447.435	406213.1	0	0	0	705.5518	171.3472	86.7804	0	0	0
2019 Nov	2447.435	250700.6	0	0	0	0	0	0	0	0	0
2019 Dec	2447.435	252109	0	0	0	0	0	0	0	0	0

P-Area (P1)								
Result:	Inflows				Outflows			
	Cement Truck Water	Pumped from P2	Pumped from P3	Overflow from P3	Evaporators	Seepage to DP1	Evaporation	Overflow (tracked)
Unit:	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	0	0	0	0	0	0	0	0
2019 Feb	0	0	0	0	0	0	0	0
2019 Mar	0	0	0	0	0	0	0	0
2019 Apr	0	0	0	0	0	0	0	0
2019 May	0	0	0	0	0	0	0	0
2019 Jun	0	0	0	0	15840	0	0	0
2019 Jul	0	0	0	0	4641.166	0	569.9786	0
2019 Aug	0	0	0	0	4213.94	0	210.2609	0
2019 Sep	0	0	0	0	3250.583	0	0	0
2019 Oct	0	0	0	513.8342	30.0788	0	0	0
2019 Nov	0	0	0	0	0	0	0	0
2019 Dec	0	0	0	0	0	0	0	0

P-Area (P2)											
Result:	Volume	TDS	Inflows								Outflows
	Volume (end of month)	Monthly Average Concentration	Natural Runoff	Disturbed Runoff	Direct Precipitation	Waste Rock Runoff	Pumped from P3	Pumped from Stope 75	Overflow from CP5	Waste Rock Drainage	Evaporation
Unit:	m3	mg/L	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	104.81	19600	0	0	0	0	0	0	0	0	0
2019 Feb	104.81	19600	0	0	0	0	0	0	0	0	0
2019 Mar	104.81	19600	0	0	0	0	0	0	0	0	0
2019 Apr	104.81	19600	0	0	0	0	0	0	0	0	0
2019 May	104.81	19600	0	0	0	0	0	0	0	0	0
2019 Jun	5563.494	11014.63	378.162	3440.459	463.2935	1176.769	0	0	0	0	0
2019 Jul	6226.724	10836.17	65.5898	880.3659	0	318.524	0	0	0	0	601.2498
2019 Aug	6828.18	11539.06	95.1514	1044.319	0	380.4593	0	0	0	0	238.2542
2019 Sep	6828.18	11569.89	77.778	751.9566	69.43901	274.2846	0	0	0	0	0
2019 Oct	6828.18	11355.95	24.0188	194.0533	124.373	70.78312	0	0	0	0	0
2019 Nov	6828.18	11245.97	0	0	0	0	0	0	0	0	0
2019 Dec	6828.18	11245.97	0	0	0	0	0	0	0	0	0

P-Area (P2)		
Result:	Outflows	
	Pumped to P1	Overflow (to P3)
Unit:	m3	m3
2019 Jan	0	0
2019 Feb	0	0
2019 Mar	0	0
2019 Apr	0	0
2019 May	0	0
2019 Jun	0	0
2019 Jul	0	0
2019 Aug	0	680.2193
2019 Sep	0	1173.458
2019 Oct	0	413.2282
2019 Nov	0	0
2019 Dec	0	0

P-Area (P3)											
Result:	Volume	TDS	Inflows								
	Volume (end of month)	Monthly Average TDS	Natural Runoff	Disturbed Runoff	Direct Precipitation	Waste Rock Runoff	Pumped from DP3	Pumped from Saline Pond	Pumped from Portal 1	Overflow from P2	Pumped from Stope 75
Unit:	m3	mg/L	m3	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	7482.97	20100	0	0	0	0	0	0	0	0	0
2019 Feb	7482.97	20100	0	0	0	0	0	0	0	0	0
2019 Mar	7482.97	20100	0	0	0	0	0	0	0	0	0
2019 Apr	7482.97	20100	0	0	0	0	0	0	0	0	0
2019 May	7482.97	20100	0	0	0	0	0	0	0	0	0
2019 Jun	13783.23	16377.66	0	3433.21	1228.547	0	0	0	1638.5	0	0
2019 Jul	13747.94	14232.56	0	892.0443	0	0	0	0	450	0	0
2019 Aug	15480.77	14502.28	0	1055.891	0	0	0	0	537.5	680.2193	0
2019 Sep	17951.49	13947.89	0	749.296	160.4624	0	0	0	387.5	1173.458	0
2019 Oct	18431.67	13431.39	0	193.3503	287.4392	0	0	0	100	413.2282	0
2019 Nov	18431.67	13259.85	0	0	0	0	0	0	0	0	0
2019 Dec	18431.67	13259.85	0	0	0	0	0	0	0	0	0

P-Area (P3)								
Result:	Inflows	Outflows						
	Overflow from CP5	Evaporation	Pumped to P1	Pumped to P2	Pumped to CP5	Seepage to DP3	Pumped to Saline Pond	Overflow (to P1)
Unit:	m3	m3	m3	m3	m3	m3	m3	m3
2019 Jan	0	0	0	0	0	0	0	0
2019 Feb	0	0	0	0	0	0	0	0
2019 Mar	0	0	0	0	0	0	0	0
2019 Apr	0	0	0	0	0	0	0	0
2019 May	0	0	0	0	0	0	0	0
2019 Jun	0	0	0	0	0	0	0	0
2019 Jul	0	1377.335	0	0	0	0	0	0
2019 Aug	0	540.7764	0	0	0	0	0	0
2019 Sep	0	0	0	0	0	0	0	0
2019 Oct	0	0	0	0	0	0	0	513.8342
2019 Nov	0	0	0	0	0	0	0	0
2019 Dec	0	0	0	0	0	0	0	0

AGNICO EAGLE

Meliadine Division

Meliadine – Greenhouse Gas Reduction Plan

JANUARY 2019
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 km north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

The impacts of climate change have the potential to affect a wide range of environmental, social and economic systems of value to Inuit, as indicated by the observations and changes experienced by rankin Inlet traditional land users. Climate change is a global issue caused by emissions of greenhouse gases (GHG).

This document presents the Greenhouse Gas Reduction Plan as per Nunavut Impact Review Board (NIRB) Project Certificate No.006, Condition 9. It discusses predicted emissions for the Project, sources of GHG, as well as monitoring measures and energy reduction initiatives.

The emissions for the Project are predicted to result in a 57% increase in GHG emissions for Nunavut (FEIS Volume 5, April 2014). When compared to Canada's national emissions (704,000 kt CO2e/yr), the Project contributes to a less than 0.05% increase in national GHG emissions. The project will emit GHGs from combustion sources related to production, heating and transportation

Emissions of GHG for the Meliadine Mine will be calculated on a monthly basis and reported annually through Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP) and NIRB Annual Report. This report will also include a discussion on the monthly variations of GHG emissions, as well as a comparison with FEIS emission predictions.

A number of initiatives are planned to reduce project-related GHG emissions over the Project lifecycle. Some strategies have already been implemented while others are currently being assessed.

DOCUMENT CONTROL

Version	Date (YM)	Section	Page	Revision
1	January 2019	ALL	-	Comprehensive plan for the Meliadine Project.

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Table 1.1 Overview of Timeline and General Activities

Table 2.1 Greenhouse Gas Summary for the Project FEIS GHG Emissions, including Black Carbon

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
ANFO	Ammonium nitrate/fuel oil
FEIS	Final Environmental Impact Statement
GHGRP	Canada's Greenhouse Gas Emissions Reporting Program
NIRB	Nunavut Impact Review Board
Project	Meliadine
TSM	Towards Sustainable Mining
CO_2	carbon dioxide
CH_4	methane
N_2O	nitrogen dioxide

UNITS

<=	less than
%	percent
CO_2e/yr	carbone dioxide equivalents per year
kt CO_2e	kilotonnes of carbone dioxide equivalents
kt CO_2e/yr	kilotonnes of carbone dioxide equivalents per year
t CO_2e/yr	tonnes of carbone dioxide equivalents per year
L	liters
km	kilometre(s)
km^2	square kilometre(s)
kW	kilowatt

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 14.9 Mt of tailings. There are four phases to the development of Tiriganiaq as presented in Table 1.1: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year -1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Mining facilities include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), and a water management system that includes collection ponds (CPs), water diversion channels, and retention dikes/berms, and a Water Treatment Plant (WTP). The general mine site location for the Project and the site layout plan are shown in Figures 1.1 and 1.2, respectively, as attached in Appendix A.

Table 2.1 Overview of Timeline and General Activities

Phase	Year	General Activities
Construction	Year -5 to -1	• Construct site infrastructure • Develop underground mining • Stockpile ore
Operations	Year -1 to 8	• Underground and open pit operations • Transport ore to Meliadine Mill • Stockpile ore • Deposition of dry stack Tailings in Meliadine TSF
Closure	Year 9 to 11	• Remove non-essential site infrastructure • Flood mined-out open pit
Post-Closure	Year 11 forwards	• Site and surrounding environment monitoring

The impacts of climate change have the potential to affect a wide range of environmental, social and economic systems of value to Inuit, as indicated by the observations and changes experienced by Rankin Inlet traditional land users. Climate change is a global issue caused by emissions of greenhouse gases (GHG). Changes to weather and climate have the potential to affect environmental, social and economic systems of value to the Inuit and other regional stakeholders.

This document presents the Greenhouse Gas Reduction Plan. The purpose of this Plan is to provide consolidated information on the management and monitoring of GHG for the Project, by presenting predicted emissions for the Project, sources of GHG, followed by monitoring measures and initiatives taken to reduce emissions.

As per Nunavut Impact Review Board (NIRB) Meliadine Project Certificate No.006 Condition 9, the Greenhouse Gas Reduction Plan should be submitted to the NIRB at least 90 days prior to the commencement of operations

- An estimate of the Project's GHG baseline emissions;
- A description of monitoring measures to be undertaken, including the methods, frequency, parameters, and a description the analysis;
- A description of reduction initiatives planned and taken, to reduce project-related GHG emissions over the Project lifecycle.

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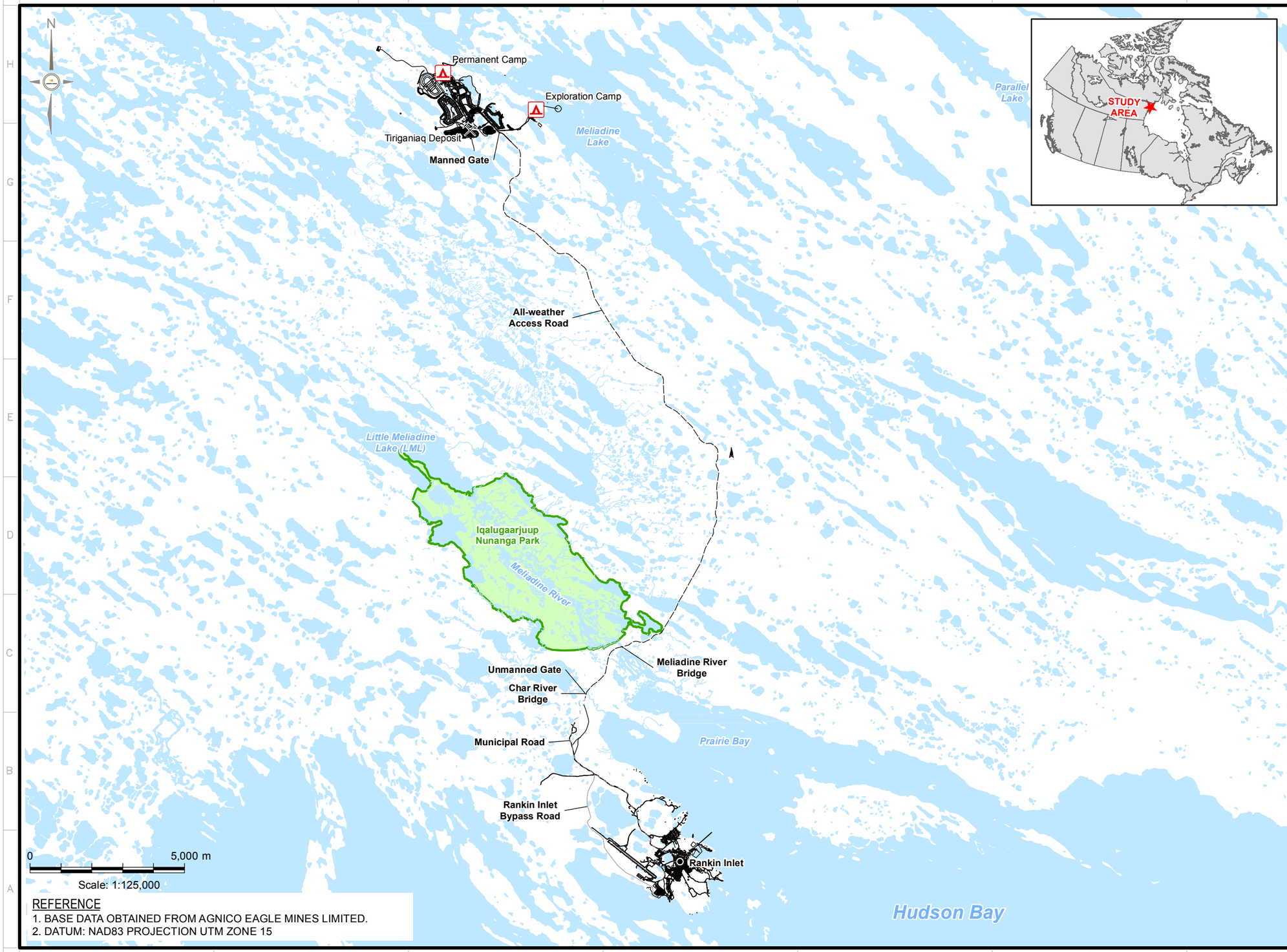

LEGEND

- CAMP
- PROPOSED MINE SITE
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK

REFERENCE
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

AGNICO EAGLE

Golder Associates

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TITRE / TITLE	# DWG

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REV	DESCRIPTION	DATE	PAR BY

REVISIONS

DESSINÉ PAR DRAWN BY	CDB	DATE 08–12–2014
VÉRIFIÉ PAR CHECKED BY	IM	08–12–2014
APPROUVÉ PAR APPROVED BY	JH	08–12–2014
No. PROJET PROJECT NO.	1405283	
DATE	–	

TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION
FIGURE 1.1 GENERAL PROJECT
SITE LAYOUT LOCATION PLAN

ECHELLE/ SCALE	1:125,000	FICHIER FILE	.DWG
No. DESSIN/ DRAWING NO.	–	REVISION 0	FEUILLE/SHT 1 / 1

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N:\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1405283_Meliadine_Water_License\02_PRODUCTION\3000_Application_Preparation\MXD\3200\Report\Mine_Plan\1405283_Figure_1.1_General_Project_Site_Location_Plan.mxd

SECTION 2 • PROJECT BASELINE EMISSIONS

2.1 Project Baseline Emissions Predictions

As presented in the Meliadine FEIS, Volume 5 – Atmospheric Environment, Section 5.4.5 (Agnico Eagle, 2014), an assessment was completed in order to estimate the GHG emissions related to the Project. As part of this assessment, Project-related GHG emissions were calculated using methods consistent with Canada's Greenhouse Gas Emissions Reporting Program (GHGRP).

Table 2.1 includes an explicit quantification of both FEIS (Agnico Eagle 2014) and the FEIS addendum emissions of black carbon, a short a short-lived climate forcing agent (Forster 2007; Myhre 2013), and a compound whose emissions have recently been quantified for Canada (ECCC 2018c). Black carbon's radiative effects in Earth's atmosphere are similar to GHG's, i.e., positive radiative forcing (Hansen et al. 2007; Bond et al. 2013). Of relevance to Nunavut and Arctic Canada, the radiative effects of black carbon are most pronounced over permanent snow and ice found at high altitudes and high latitudes where soot-on-snow has the potential to enhance these effects (Clarke and Noon 1985). The following assumptions regarding black carbon have been adopted.

- Black carbon content of particulate matter produced from the combustion of diesel fuel is assigned a value of 79% by weight (ECCC 2018c).
- Black carbon is assigned a GWP of 900 (Bond et al. 2013).
- Canada's black carbon emissions in 2016 were 34,921 tonnes (ECCC 2018c).

Reportable GHG emissions for the FEIS (Agnico Eagle 2014) were 318 kt CO_{2e}/yr and are 449 kt CO_{2e}/yr when emissions of black carbon are included.

Table 2.1 FEIS GHG Emissions, including Black Carbon

Source	GHG Emissions (kt CO_{2e}/yr)	The Mine as %	GHG's with Black Carbon (kt CO_{2e}/yr)	The Mine as %
Mine Site (Case 3)	305		421	
AWAR	<1		<1	
Marine Shipping (within RSA)	13		28	
The Mine Total	**318**		**449**	
Nunavut - GHGRP (2016)	260	57%	no data	
Nunavut - NIR (2016)	700	25%	no data	
Canada (2016)	704,000	0.05%	735,000	0.06%

2.2 Main Sources of Greenhouse Gas for the Project

There are four (4) main sources of GHG identified for the Project predicted emissions:

- Off-road vehicle exhaust emissions;
- On-road vehicle exhaust emissions;
- Power plant related GHG emissions;
- Camp heater related GHG emissions,

SECTION 3 • DESCRIPTION OF MONITORING MEASURES

3.1 Greenhouse Gas Emission Monitoring

Emissions of GHG for the Meliadine Mine are calculated on a monthly basis. Emissions related to the four (4) main sources described in Section 2 are calculated. Although considered minimal compared to the other sources, emissions produced by the following activities are also calculated and compiled:

- Helicopter transportation
- light truck transportation using gasoline;
- blasting (use of emulsion - ammonium nitrate/fuel oil (ANFO));

Quantity of diesel (in liter) used for the generation of electricity, heating and for light and heavy equipment are recorded on a monthly basis for the Project. The quantities of aviation fuel (liter) and ANFO explosive (tonne) are also recorded on a monthly basis. From those quantities, the direct emissions based on ``Standard Emissions Factors`` are calculated. For each sources, carbon dioxide (CO_2) emissions are calculated (in tonnes), as well as methane (CH_4) and nitrogen dioxide (N_2O) in tonnes of carbon dioxide equivalent (CO_2e tonnes). Emissions calculated for each sources are added to obtain a monthly total Project related emissions in tonnes of carbon dioxide equivalents (t CO_2e/yr).

3.2 Data Analysis and Reporting

Estimated GHG emissions for the Project are compiled and analysed on a monthly basis. Data will be reviewed and variations will be correlated to factor of causes such as seasonal climate, production activities or other factors of influence identified.

GHG emissions will be reported on an annual basis, as per the requirements of the Meliadine NIRB Project Certificate No.006, in the Meliadine Annual Report and to Environment and Climate Change Canada via the GHGRP. The Annual Report will also include a discussion on GHG emissions monthly variations, as well as a comparison with FEIS emission predictions. Emissions related to aviation, blasting, and light truck transportation using gasoline will also be presented and analysed.

SECTION 4 • REDUCTION INITIATIVES

A number of reduction initiatives are planned to reduce project-related GHG emissions over the Project lifecycle. While some have already been implemented others are currently being assessed.

4.1 Strategies to Reduce Fuel Consumption

4.1.1 Diesel Generator – Efficiency

One of the most efficient diesel generators available for procurement on the market were obtained for Meliadine Mine. The purchase of the Model 12V34DF-LQO generators (Wärtsilä, Finland), which each produce 5,564 kW are 5% more efficient than the generators operating at Agnico Eagle's Meadowbank Mine. This efficiency translates to a diesel reduction of approximately 2.5 million litres (ML) per year when compared to the gensets operating at Meadowbank.

The Wärtsilä generators are also configured for 'duel-fuel use', meaning that they can easily be converted to be fueled by liquified natural gas if/when it becomes available for use at the Mine. Use of LNG instead of diesel fuel is would reduce GHG emissions but also result in large reductions of criteria air contaminants, especially diesel particulate matter containing a high proportion (79%), by weight, of black carbon.

4.1.2 Heat Recovery

Operational experience from Agnico Eagles' Meadowbank Mine were incorporated during the construction/operation of the heat recovery system for Meliadine. The improved design/operation of the heat recovery systems results in a heat recovery rate of 0.85 kWth / kWe as compared to the Meadowbank's heat recovery rate of 0.50 kWth / kWe. The improved heat recovery and use of water rather than glycol as the working fluid in the system, is predicted to result in an annual reduction of 2.0 ML of diesel fuel. This represents a 22% reduction in heating-related diesel fuel consumption compared to a predicted total 9.0 ML of diesel fuel required in the absence of heat recovery system.

4.1.3 Strategy to Replace Fuel Consumption by Renewable Energy

Renewable energy alternatives are being assessed and validated on a continuous basis. Windfarm viability is being assess

4.1.4 Strategy Development and Awareness

4.1.4.1 Energy saving staff committee

This committee is formed by a group of employees from various departments, who work together to identify areas of improvement for energy consumption savings and to find innovative ideas to improve energy consumption and reduce GHG emissions.

4.1.4.2 Towards Sustainable Mining flow chart

The Towards Sustainable Mining (TSM) flowchart has been implemented with the Strategic Optimization Group and intends to create a visual approach for employees to understand the energy system and consumption on site, in order to create a venue for discussing energy-savings opportunities.

4.1.4.3 Raising Awareness

On a regular basis, the Environment and Camp Departments send emails and memos, or install posters to remind employees about the importance of saving energy. For example, the Camp Department staff place individual reminders in rooms during cleaning when the lights are left on by guests. The Environment Department sends regular communications about the ``no idling policy`` for vehicles on site, to avoid having vehicles left on idle mode while not in use. Inspections on site are also completed to raise awareness and enforce this policy.

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AGNICO EAGLE

MELIADINE GOLD MINE

Groundwater Management Plan

MARCH 2019
VERSION 4

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut.

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.1 Mt of overburden waste, and 14.9 Mt of tailings (Agnico Eagle 2019). There are four phases to the development of the Mine; just over 4 years of construction (Q4 Year -5 to Q2 Year -1)), 8.5 years of Mine operation (Q2 Year 1 to Year 8), 3 years of closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the Underground Mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the Underground Mine workings once the Mine has advanced below the base of the permafrost. Over 2018, there was a net positive balance of stored underground water. The mean daily addition to underground water storage was estimated at 51 m^3/day. Groundwater quality data from samples taken underground 2017 through 2018 from diamond drillholes (DDHs) indicate TDS concentrations are less than predicted at an average concentration of 56,000 mg/L.

Saline water generated from the Underground Mine is currently stored underground and on surface at the P-Area and in Saline Pond 1 (SP1). A second containment pond, Saline Pond 2 (SP2), is being constructed in Q1 2019 and will be an addition to the surface saline water containment system. Saline groundwater stored on site is currently pumped to the Saline Water Treatment Plan (SWTP) for treatment and discharge to CP1. As part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle received approval from the Nunavut Impact Review Board to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Total dissolved solids of water discharged to sea and daily discharge volumes will not exceed 39,600 mg/L and 800 m^3/day, respectively.

This document presents the Groundwater Management Plan (GWMP) for the collection, treatment, storage and discharge of saline groundwater in accordance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14.

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ᐊᖏᓂᒃ ᐃᐃᒍ ᐅᓴᖅᑕᕆᐊᖏᓂᒃ (ᐊᖏᓂᓂᒃ) ᑕᓯᖅᐸᐊᖅᑎᑦ ᐅᓴᖅᑕᕆᐊᓕᐅᖅᑐᖅᑐᓕᐊᔪᑦ (ᐅᓴᖅᑕᕆᐊᖅ), 25 ᑭᓪᒥᑕᓂᒃ ᐅᖓᓯᓂᑎᒋᔨᖅ ᐅᐊᖓᓇᖓᓂᑦ ᑲᖏᖅᓂᓂᐅᑦ, ᐊᖏᓚᐅ 80 ᑭᓪᒥᑕᓂᒃ ᐅᖓᓯᓂᑎᒋᑐᓗᓂ ᓂᖏᐊᓂᑦ ᐱᖓᓇᖅᑐᓯᐊᓂᑦ ᐃᖏᓗᑎᖅᓱᑐ ᑭᓭᓕᖅᑎᑦ ᓄᓇᕗᖏᓚᑦ.

ᐅᓴᖅᑕᕆᐊᖅᓗᑦ ᐸᖅᓇᐅᑎ ᐅᓴᖅᑕᒋᓂᖅᓗᑦ ᐱᓕᕆᐊᖃᕐᒪᔨᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓂᒃ ᐱᓭᓕᓕᐊᔪᑦ ᑎᓪᓚᑐᓂᐊᖅ ᔪᓕᑕᓕᒃ, ᒪᖁᕐᓂᒃ ᓄᓇᒋᑦ ᐅᑯᐊᖓᓚᐅᖅᓂᒃ (ᑎᓪᓚᑐᓂᐊᖅ 1 ᐊᖏᒪᓗ ᑎᓪᓚᑐᓂᐊᖅ 2) ᐊᖏᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᒋᓂᖅ. ᒪᓕᒃᓴᔪᔪ ᐃᒪᓓᐅᔨᖅ ᐅᓴᖅᑕᕆᐊᖅᓗᑦ ᐸᖅᓇᐅᑎ, ᐅᓴᖅᑕᕆᐊᖅ 14.9 ᒥᓕᒃᓂ ᑕᓐᓄᐊᓂᒃ ᐅᓴᖅᑕᖃᑦᑕᒋᓂᐊᖅᑐᑦ, 31.4 ᒥᓕᒃᓂ ᑕᓐᓄᒃ ᐊᐅᑕᑯᖅᑕᐅᔨᓂᒃ ᐅᓴᖅᖃᓂᒃ, 7.1 ᒥᓕᒃᓂ ᑕᓐᓄᒃ ᐅᖓᓚᑕᑎᔨᓂᒃ ᐊᐅᑕᑯᖅᑕᐅᔨᓂᒃ, ᐊᖏᒪᓗ 14.9 ᒥᓕᒃᓂ ᑕᓐᓄᒃ ᖃᒪᑎᑎᑐᓂᒃ (ᐊᖏᓂᓂᒃ 2019). ᓯᑕᒪᐅᓕᖓᔪᐊᖅᑐᖅ ᐱᓭᓕᓕᐊᖅᖃᑦᑕᕆᐊᖅᑎᑦ; ᓯᑕᒪᓄᑦ ᐅᑭᐅᖓᓯᓇᓄᑦ ᓴᓇᔨᐅᓗᓂ (Q4 ᐅᑭᐅᖅ - 5-ᒥᑦ Q2 ᐅᑭᐅᖅ - 1-ᒧᑦ)), 8.5 ᐅᑭᐅᓂᒃ ᐊᐅᓪᓚᑐᓂ ᐅᓴᖅᑕᕆᐊᖅᓂᖅ (Q2 ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ), ᐱᖓᓱᓂᒃ ᐅᑭᐅᓂᒃ ᐅᓱᑯᖅᐸᓪᓕᐊᓗᒍ (ᐅᑭᐅᖅ 9-ᒥᑦ ᐅᑭᐅᖅ 11-ᒧᑦ), ᐊᖏᒪᓗ ᐅᓱᑯᖅᓯᒪᓕᖅᑎᓪᓚᑐᓗᒍ (ᐅᑭᐅᖅ 11-ᒥᑦ ᐅᖓᓚᒋᓄᑦ).

ᑎᓪᓚᑐᓂᐊᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᒋᓂᖅ ᐊᑎᑎᕐᓯᓂᐊᖅᑕᐅᓱᓄᓂᖅᓂᐅᓴᖅᑐᖅᑐᒍ 625 ᑭᑕᓂᒃ ᓄᓇᐅᐸᑦ ᖃᓄᖓᑕ ᐊᒋᓄᑦ; ᑕᐃᒪᓐᓇᒧᑦ, ᐃᓕᖓᓚ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖅ ᐊᐅᓪᓚᑐᓂᐊᖅᑐᖅᑐᒍ ᑭᓯᓕᕆᔨᖅ ᖃᐅᔨᒪᔭᐃᓇᓄᑦᑐᓂᐸᑦ ᐊᒋᓄᑦ. ᓄᓇᐃᔨᐃᓂᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐃᓕᑦᑐᖅᑕᐅᓂᐊᖅᑐᖅ ᑯᐊᓂᒃ ᐃᒪᖁᑎᒃ ᐊᐅᓪᓚᑐᓂᖅᑎᓂᐅᑎᓪᓗᒍ, ᐃᒪᖅ ᑯᐃᑎᑕᐅᓗᓂᒍ ᐅᓴᖅᑕᕆᐊᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᓕᐅᖅᑐᑦ ᐱᓪᓚᑐᓂᐊᖅᑕᐅᓱᓄᓂᖅᓂᐅᓴᖅᑐᖅᑐᒍ ᐊᐅᓪᓚᑐᓂᐊᖅᑐᖅᑐᒍ 2017-ᒥᑦ 2018-ᒧᑦ ᓯᑎᔨᓂᒃ ᐅᓴᖅᖃᓂᒃ ᐃᑯᑕᖅᑕᐅᓯᒪᔨᓂᑦ, ᓇᓗᓇᐃᖅᓱᔨᑦ TDS ᑲᑎᑎᓯᒪᔨᑦ ᐊᒥᓲᖏᓐᓂᖅᓴᐅᓂᖓᓂᓄᑦ ᓇᓕᐅᑦᑕᖅᑕᐅᓕᐅᖅᑐᓂᐅᓪᓚᑦ ᐊᑕᐅᓯᖏᓪᓗᓂᓗᒍ ᓇᓴᐅᑎᒃ ᑲᑎᑎᓯᒪᔨᓂᑦ 56,000 mg/L-ᖃᓗᑦᓗᓂ.

ᑕᕆᐅᓕᒃ ᐃᒪᖅ ᐱᔨᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᖅᑎᑦ ᐃᓕᓴᐅᔨᖅ ᑐᖅᑯᑕᐅᖅᖃᑦᑕᖅᑐᖅ ᓄᓇᐅᐸᑦ ᐃᓗᐊᓂᑦ ᐊᒋᓚᐅ ᖃᓄᖓᑕ ᑕᕆᐅᓕᒃ P-ᐃᓂᐅᔨᔪᑦ ᐊᒋᓚᐅ ᑕᕆᐅᓕᒃ ᑕᓯᕐᓴᒃ 1-ᒧᑦ (SP1). ᑐᓴᓕᐊ ᑕᓯᕐᓴᒃ, ᑕᕆᐅᓕᒃ ᑕᓯᕐᓴᒃ 2 (SP2), ᓴᓇᔨᐅᓭᓕᐊᔪᖅ Q1 2019-ᒥᑦ ᐊᒋᓚᐅ ᐃᓕᓴᕐᐅᑎᔨᐅᓂᐊᖅᑐᖅ ᖃᓄᖓᓂ ᑕᕆᐅᓕᒃ ᐃᒪᖁᐅᓯᓇᓐᓚᒧᑦ. ᑕᕆᐅᓕᒃ ᓄᓇᒋᑦ ᐃᒪᖅ ᑐᖅᑯᑕᐅᓂᐊᖅᑐᖅᑐᒍ ᐅᓴᖅᑕᕆᐊᖅᑎᑦ ᑯᐃᑎᑕᐅᖅᑕᒋᑕᖅᑐᖅ ᑕᕆᐅᓕᒃ ᐃᒪᓕᕆᓇᓐᓚᒧᑦ (SWTP) ᐱᓕᕆᐊᖅᑐᓂᐊᖅᑐᓗᒍ ᐊᒋᓚᐅ ᑯᐃᑎᑕᐅᓗᓂ CP1-ᒧᑦ. ᐃᓕᒋᔨᐅᓪᓗᒍ ᖃᓄᖓᑕᑐᖅᑐᒍ ᐊᐅᓚᑦᑐᖅᑐᒧᑦ ᐊᑕᖃᓗᐊᖅᑐᓗᒍ ᐱᑕᖃᓗᐊᖅᓂᖅ ᓄᓇᒋᑦ ᐃᒪᖅ ᓴᓗᒪᐃᔨᐃᓐᔪᐊᑎ ᑕᕆᐅᓕᖓᓂᑦ ᐃᒪᖅ ᑕᕆᐅᖅᑎᑦ (ᐃᑎᐃᐊᓗᓂ, ᖃᓄᖓᑕᐅᓂᑦ). ᑲᑎᓪᓗᒋᑦ ᓄᖅᑐᓯᒪᔨᑦ ᓯᑎᔨᐃᑦ ᐃᒪᖅᑎᑦ ᑯᐃᑎᑕᐅᖅᑕᒋᑦ ᑕᕆᐅᖅᑎᑦ ᐊᒋᓚᐅ ᖃᓄᖓᑕᐅᑎᒃᓴᖏᓪᓗᒋᑦ 39,600 mg/ᓂᕐᒥᓂᒃ ᐊᒋᓚᐅ 800 m^3/ᐅᑦᓗᑕᒻᒥᑦ.

ᑕᒪᓐᓇ ᑎᑎᖅᑲᖅ ᐱᔭᔨᑎᖅᑕᐅᖅ ᓄᓇᒋᑦ ᐃᒪᖅᑎᑦ ᐊᐅᓪᓚᑕᑎᓂᓗᑦ ᐸᖅᓇᐅᑎᑎᑦ ᑲᑎᖅᑯᐃᓂᓗᑦ, ᐱᓕᕆᐊᖃᓗᐊᓄᓗᒍ, ᑐᖅᑯᖅᑕᐅᓂᐊᖅᑐᖅ Type A ᐃᒪᖅᑎᑦ ᓪᓚᐃᓐᓯᖓᑦ 2AM-MEL1631, ᐊᐃᔭᓯᓂᖓᓗ E, ᑎᑎᕆᖅᓯᒪᔨᖅ 14.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	February 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited
2	June 2018	4		In compliance with ECCC comments from 16 March 2018	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited
3.	December 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 11	Agnico Eagle Mines Ltd.
		Exec Summary		Updated dates and quantities	
		2.4		Revised mine development plan bullets	
		3.3		Updated saline GW quality	
		3.4		Updated groundwater management strategies	
		4.1		Updated GW monitoring program quantity and quality data	
		4.4		Expanded table 5 monitoring to include SWTP	
4.	March 2019	All		In compliance with Agnico Eagle's amended No. 006 Project Certificate, Condition No. 25	Agnico Eagle Mines Ltd.
		Exec Summary		Updated to include discharge to sea approval	
		1	1-2	Update to include requirements of No. 006 Project Certificate Condition No. 25	
		2.4	5	Addition of SWTP and discharge to sea	
		3.1	6-7	Section revision	
		3.1.1	7-8	Addition of inflow model assumptions/uncertainties	
		3.2	8-9	Updated with discharge to sea	
		3.3	9-10	Interpretation added and table Aug-18 results corrected	
		3.4	11-15	Addition of discharge to sea and update of SWTP performance	
		3.6	16-18	Addition of mitigation measures under greater than expected inflows	
		4.2	19	Addition of second pumping line from UG	
		4.3	21-23	Addition of discharge to sea related sampling/monitoring	

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate/Fuel Oil
CP	Collection Pond
DDH	Diamond Drillhole(s)
EMPP	Environment Management and Protection Plan
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
GWMP	Groundwater Management Plan
MDMER	Metal and Diamond Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
Mine	Meliadine Gold Mine
QA	Quality Assurance
QC	Quality Control
RO	Reverse Osmosis
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
SWTP	Saltwater Treatment Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WMP	Water Management Plan

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
ha	hectare(s)
mg/L	milligram(s) per litre
km	kilometer(s)
km^2	kilo square meter(s)
m	metre(s)
m/day	metre(s) per day
mm	millimetre(s)
m^3	cubic metre(s)
m^3/day	cubic metre(s) per day
m^3/s	cubic metre(s) per second
m^3/hour	cubic metre(s) per hour
m^3/year	cubic metre(s) per year
Mm^3/year	million cubic metre(s) per year
Mm^3	million cubic metre(s)
t	tonne(s)
tpd	tonne(s) per day
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine is subject to the terms and conditions of both the Mine Project Certificate (No. 006) issued by the Nunavut Impact Review Board in accordance with the Nunavut Agreement Article 12.5.12 on February 26, 2015 and Nunavut Water Board Type A Water Licence (No. 2AM-MEL1631, 2016) issued by the Nunavut Water Board (NWB) on April 1, 2016.

This document presents the Groundwater Management Plan (GWMP) for the collection, treatment, storage and discharge of saline groundwater in accordance with the Type A Water Licence 2AM-MEL1631 (Licence) and in accordance with Condition No. 25 of the amended Mine Project Certificate. The overall water management plan for the life of the Mine and post-closure is described in the Agnico Eagle Meliadine Gold Mine 2019 Water Management Plan (WMP) (Version 6). The WMP provides descriptions of the Mine water control structures and associated design criteria. The WMP was updated in March 2019 and reflects the groundwater management strategy presented in this document.

1.1 Concordance

The Mine is subject to the land and resource management processes established by the Nunavut Agreement and other Federal laws and regulations. Agnico Eagle submitted a Licence Application for a Mining and Milling Undertaking (Application) required to use water and to deposit waste in development of the Mine, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and Nunavut Water Regulations.

The Licence was issued on April 1, 2016 and signed by the Minister on May 19, 2016. The GWMP reflects the commitments made with respect to submissions provided during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable, to comply with Part B Section 13, and Part E Section 14 of the Licence.

In 2018, Agnico Eagle submitted a Saline Effluent Discharge proposal to the Nunavut Impact Review Board (NIRB). NIRB provided approval and issued the amended Mine Project Certificate for the Meliadine Gold Mine Project to Agnico Eagle on February 26, 2019. The GWMP reflects the revised Condition No. 25, which states the Proponent shall submit a detailed Groundwater Management Plan to the NIRB that includes mitigation measures under greater than expected groundwater inflow rates, treatment and disposal methods for discharge to sea, and details of its plan to monitor saline water at site.

1.2 Objectives

The objective of the GWMP is to provide consolidated information on groundwater management for the Meliadine Gold Mine. The GWMP is divided into the following components:

- Introductory section (Section 1);
- A brief summary of the physical setting at the mine site and the mine development plan (Section 2);
- A description of groundwater inflow forecasts and management strategies (Section 3); and
- A description of the groundwater monitoring program (Section 4);
- A description of the measures in place to ensure quality control and quality assurance is maintained in groundwater monitoring (Section 5).

The GWMP will be updated as required to reflect any changes in operations or economic feasibility that occurs, and to incorporate new information and latest technology, where appropriate, to comply with Part B Section 15 of the Licence.

SECTION 2 • BACKGROUND

2.1 Site Conditions

The Mine is located in an area of poorly drained lowlands near the northwest coast of Hudson Bay. The dominant terrain in the Mine area consists of glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and many small lakes. The topography is gently rolling with a mean elevation of 65 metres above sea level (masl) and a maximum relief of 20 metres (m).

The local overburden consists of a thin layer of topsoil overlying silty gravelly sand glacial till. Cobbles and boulders are present throughout the region at various depths. Bedrock at the mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite and mafic volcanic flows (Snowden 2008; Golder 2009).

The climate is extreme in the area, with long cold winters and short cool summers, and mean air temperatures of 12 °C in July and -31 °C in January. The mean annual air temperature at the Mine site is approximately -10.4 °C (Golder 2012a). Strong winds blow from the north and north-northwest direction more than 30 percent of the time.

The mean annual precipitation in the area is approximately 412 mm and is typically equally split between rainfall and snowfall.

Late-winter ice thicknesses on freshwater lakes in the mine site area were recorded from 1998 to 2000. The measured data indicated that ice thickness ranges from 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July (Golder 2012b).

2.2 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a surface water area of approximately 107 square kilometres (km^2), a maximum length of 31 km, features a highly convoluted shoreline of 465 km and has over 200 islands. Unlike most lakes, it has two outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 from its two outflows. Most drainage occurs via the Meliadine River, which originates at the southwest end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Watersheds in the Mine area are comprised of an extensive network of waterbodies, and interconnecting streams. The hydrology of these watersheds is dominated by lake storage and evaporation.

2.3 Hydrogeology

The Mine is located in an area of continuous permafrost. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the mine site is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to the lakes. The depth of the permafrost and active layer varies depending on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction (Golder 2012b). The typical permafrost ground temperatures at the depths of zero annual amplitude are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder 2012c).

Groundwater characteristics at the Mine are detailed in Final Environmental Impact Statement (FEIS) Volume 7, Section 7.2 Hydrogeology and Groundwater, and in an updated hydrogeological assessment completed for the Mine (Golder 2016). The groundwater characteristics for the Mine are briefly summarized herein.

Two groundwater flow regimes in areas of continuous permafrost are generally present:

- a deep groundwater flow regime beneath the base of the permafrost; and
- a shallow flow regime located in an active (seasonally thawed) layer near the ground surface.

From late spring to early autumn, when temperatures are above 0 ˚C, the active layer thaws. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Mine area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes.

Taliks exist beneath waterbodies that have sufficient depth such that they do not freeze to the bottom over the winter. Beneath small waterbodies that do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow regime will form (a closed talik). Elongated waterbodies with terraces (where the depth is within the range of winter ice thickness), a central pool(s) (where the depth is greater than the range of winter ice thickness), and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine site. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder 2012a).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the underground mine will be operated below the base of the frozen permafrost (top of the cryopeg). The underground excavations will act as a sink for groundwater flow during

operation, with water induced to flow through the bedrock to the underground mine workings once the mine has advanced below the base of the frozen permafrost.

Both Tiriganiaq Pit 1 and Tiriganiaq Pit 2 will be mined within the frozen permafrost, therefore, groundwater inflows to the open pits is expected to be negligible and were not considered in the WMP.

2.4 Mine Development Plan

The Mine Plan proposes mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one Underground Mine. Based on the current Mine Plan, the Mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.1 Mt of overburden waste, and 14.9 Mt of tailings (Agnico Eagle 2019). The following phased approach is proposed for the development of the Tiriganiaq gold deposit:

- Tiriganiaq underground mine will be developed and operated from Year -5 to Year 7;
- Tiriganiaq Pit 1 will be mined from Year 2 to Year 7; and
- Tiriganiaq Pit 2 will be mined from Year 4 to Year 7.

Mine facilities on surface include a plant site and accommodation buildings, two ore stockpiles, a temporary overburden stockpile, a tailings storage facility, three waste rock storage facilities, a water management system that includes containment ponds, water diversion channels, retention dikes/berms, a final Effluent Water Treatment Plant (EWTP) and a Saline Water Treatment Plant (SWTP). An additional treatment plant to apply break-point chlorination, oil and grease, and total suspended solids (TSS) removal will be added by end of Q2, 2019 as part of the saline effluent discharge to sea management system.

SECTION 3 • GROUNDWATER MANAGEMENT STRATEGY

3.1 Groundwater Volumes

In the WMP of the water licence application (Agnico Eagle 2015a) it was stated that supplemental hydrogeological investigations were to be undertaken to provide additional information on potential volumes and quality of the saline groundwater to be managed. These investigations were undertaken in 2015 and 2016 and are summarized in Golder (2016). They included the completion of 24 packer tests, two pumping tests, two injection tests, 11 groundwater samples, and seven surface water samples. The work plan for the fieldwork was developed in consultation with two independent technical advisors, Dr. Shaun K. Frape and Dr. Walter A. Illman (both of the University of Waterloo).

The additional hydraulic conductivity measurements resulted in a refined interpretation on the variability of hydraulic conductivity between geological formations and data on the storage properties of the bedrock. A summary of predicted groundwater inflows between 2017 and 2032, based on this refined interpretation, are provided in Table 1. A revision of the modelled inflow volumes is currently being conducted and is scheduled to be completed by the end of April 2019. The purpose of this update is to provide more accurate estimates, thereby increasing informative capabilities regarding planning of management strategies. The results will be submitted in the 2020 WMP or as an addendum to the 2019 WMP.

Table 1: Predicted Groundwater Inflow to Underground Mine (2017 to 2032)

Period	Predicted Groundwater Inflow (m^3/day)
2017	230
2018	300
2019	280
2020	300
2021	340
2022	340
2023-2024	420
2025-2026	380
2027-2028	390
2029-2030	380
2031-2032	360

Source: Updated Predictions of Groundwater Inflow to Tiriganiaq Underground Mine (Golder 2016).

The groundwater inflow predictions presented in Table 1 do not account for grouting currently being conducted as a mitigation to reduce groundwater inflows to the underground development, water being removed in waste rock, or potential losses through the ventilation system. Both mechanisms

reduce the actual groundwater inflows to the Underground Mine relative to that which was predicted. As such, these predicted inflows to the underground development represent unmitigated estimates.

Actual inflow values to the Underground Mine, which included the impact of grouting, ventilation losses, loss of water in waste rock pore space, treatment by the SWTP, and loss due to re-use of water in mining operations were estimated based on changes in water volumes stored in the underground water storage system. Changes in storage were calculated on a daily basis and used to produce monthly values of mean daily net inflow rate. Based on these monthly estimates of mean daily inflow, mean net inflow rate over 2018 was 51 m^3/day. This is not the groundwater inflow rate to the mine but rather the balance of inflows, the aforementioned water losses, and water used for operations. Thus, the 51 m^3/day estimate is the surplus of inflows that was placed in storage.

It should be noted that the net inflow rate generally increased over 2018. During Q4 of 2018 the mean daily inflow rate was approximately 105 m^3/day. The increasing trend is the result of the progression of development, especially development approaching the lower fault (near the ore body), where hydraulic conductivities are expected to be relatively high ($1x10^{-7}$ m/s). Going forward, daily net inflow rates will increase when stoping within cryopeg begins (Q1 of 2019), as greater surface area of rock will be exposed, stoping will proceed within the ore body where water bearing structures exist, and grouting of inflows will not be possible within stopes.

3.1.1 Groundwater Inflow Predictions – Assumptions and Uncertainties

Hydraulic conductivities of both the Hanging Wall and Footwall units are assumed to be reduced by an order of magnitude between the top of the basal cryopeg and the bottom of the cryopeg. This assumption reflects that this portion of the permafrost, which will contain unfrozen groundwater due to freezing point depression (salinity and pressure induced), is expected to have reduced hydraulic conductivity relative to the unfrozen bedrock because of the presence of isolated pockets of frozen groundwater within this zone. Linearly decreasing hydraulic conductivity with temperature is assumed within this zone, with a full order of magnitude decrease assumed at the top of the basal cryopeg, and hydraulic conductivity equivalent to the unfrozen rock at the bottom of the cryopeg.

In crystalline rocks, fault zones may act as groundwater flow conduits, barriers, or a combination of the two in different regions of the fault depending on the direction of groundwater flow and the fault zone architecture. These zones, termed Enhanced Permeability Zones (EPZs), were assigned hydraulic conductivity values based on both field measurements and testing conducted at similar faulting in various locations within the Canadian Shield. Furthermore, EPZs were assumed not to be impacted by isolated freezing in the cryopeg and were therefore assigned similar hydraulic conductivity values within and below the cryopeg. The latter assumption along with the assumption that all faults are considered EPZs is considered conservative. For instance, observations made at other gold mines in the Canadian Shield indicate not all faults are EPZs (Golder, 2016).

Based on the geometry of water bodies, it was assumed that Lake B7, Lake D7, and Meliadine Lake possess open taliks connected to the deep groundwater flow regime. It was conservatively assumed that the surface water/groundwater interaction through open taliks is not impeded by lower-permeability lakebed sediments that may exist.

Combined, the assumptions discussed above result in the following sources of uncertainty in the groundwater inflow model:

- If there is a lack of reduction in hydraulic conductivity between the top of the basal cryopeg and the bottom of the cryopeg, it is likely that greater than expected inflows upon stoping will occur in the cryopeg (300 to 450 m below ground surface).
- If faults within the model do not act as EPZs, then it is expected that inflows resulting from development near these structures will be less than expected. The degree of deviation from expected inflows and timing will be dependent on the location of the structure in relation to development.
- If hydraulic conductivity of faults within the cryopeg are impacted by isolated freezing, then lower than expected inflows will be observed when development in the cryopeg progresses near the structures. The degree of deviation from expected inflows and timing will be dependent on the location of impacted EPZs in relation to development.
- If significant thicknesses of lakebed sediments with relatively low permeability exist within in the flow path connecting surface water to groundwater through open taliks, it is likely that mine-wide inflows will be less than expected due to a reduction in expected recharge to the groundwater flow regime.

Quantification of the uncertainty associated with the realization of the listed scenarios has not been conducted. As the invalidity of the above assumptions would result in less than expected inflows, the model is considered conservative and quantification of associated uncertainty is not required.

3.2 Existing Groundwater Management Control Structures

Contact water in the Underground Mine is contained within underground sumps and the Saline Pond. A proportion of the underground water is recirculated as make-up water for underground drilling. The remaining underground water is stored for treatment by the SWTP. During the open water season of 2019, saline water treated to remove TSS, oil and grease, and ammonia will be discharged to sea at Melvin Bay (Section 3.4.3).

Calcium chloride is currently not added to the underground water but has been used in the past to prevent freezing in drill holes when drilling in permafrost with low salinity drill water. The potential for use again in the future is low due to the existing calcium chloride levels in the groundwater that is used for drilling.

Groundwater inflows to the Underground Mine since 2015 have not been discharged to the environment and are being stored underground and in the surface storage pond, Saline Pond 1. Based

on adaptive management strategies, the project requires a second saline water storage pond, Saline Pond 2 (SP2). Saline Pond 2 is to be temporary in nature and is being constructed in bedrock within the footprint of Tiriganiaq Pit 2. Saline Pond 2 has an initial storage estimate of 78,862 m^3 which will be added to the saline water storage system in Q1 of 2019. Details of the underground dewatering system are provided in the Mine Plan (Agnico Eagle 2015a) and details of the ponds are provided in the WMP (Agnico Eagle 2019). The pond capacities and maximum water elevation for storage of the saline water are presented in Table 2.

Table 2: Salt Water Storage Capacity at the Mine for Groundwater and Water Primarily Influenced by Underground Workings

Surface Pond	Capacity (m^3)	Maximum Water Elevation (m)
Saline Pond	32,686	62.9
Saline Pond 2 (Q1, 2019)	78,862	62.5
P1	20,781	68.5
P2	6,828	66.5
P3	18,432*	67.0

Source: Agnico Eagle (2017).

* Volume excludes Saline Pond 3 capacity (Section 3.4.3.1).

3.3 Groundwater Quality

Groundwater investigations suggested that total dissolved solids (TDS) concentrations are relatively consistent below the permafrost at approximately 64,000 mg/L (Golder 2016). Groundwater quality data from samples taken underground 2017 through 2018 from diamond drillholes (DDHs) indicate mostly stable concentrations for several parameters (Table 3) and indicate that TDS concentrations are less than predicted at an average concentration of 56,000 mg/L. The discrepancy between expected and observed TDS levels is potentially due to the difference of sampling depth between pre-development testing and samples collected during development. Pre-development samples were collected below permafrost (>450 m below ground surface), whereas the bulk of samples collected to-date have been collected in the basal cryopeg (280 m to 450 m below ground surface). Samples and trends will continue to be assessed as development progresses below the cryopeg. It should also be noted that mining operations include drill-and-blast excavation for the development of the Underground Mine, which results in certain parameters in groundwater to be influenced by explosives (particularly ammonia and nitrate due to emulsion explosives).

With respect to high nitrate, nitrite and ammonia concentrations in February 2017, the anomaly is due to one sampling event (Feb. 24) believed to be conducted without proper flushing of the DDH. Thus, the results from this sampling event are similar to those observed in underground contact water (i.e., sump water). The February 24, 2017 DDH sample produced nitrate, nitrite and ammonia results of 344 mg/L, 23.5 mg/L and 300 mg/L, respectively. Whereas Sump 125 (contact water) results from February 12, 2017 show nitrate, nitrite and ammonia concentrations equal to 435 mg/L, 27.2 mg/L

and 400 mg/L, respectively. Considering the similarity, it can be assumed that the February 24, 2017 DDH sample was contaminated with drilling water.

Table 3: Average Saline Groundwater Quality

Source: Groundwater quality data from DDH sample location (Agnico Eagle, December 2018)

Representative Months (average per month)		Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18
Parameters (total metal)	**Units**																							
pH	pH	7.08	6.87	7.11	7.32	7.38	7.27	8.27	7.45	7.33	7.41	7.26	7.18	7.35	7.49	7.80	7.26	7.26	7.79	7.08	7.72	6.99	7.02	7.28
Alkalinity	mg/L	57	61.7	51	64.5	68	68	75	68.2	64	64	69	66	73	73	78	70	62	67	65	85	71	67	57
Conductivity	µmhos/cm	77000	76500	77000	79000	79000	76308	74385	72200	72667	78667	85000	80667	81083	82667	81200	83000	69500	83125	83333	83000	78000	69571	81000
Total Hardness (as $CaCO_3$)	mg/L	13200	18267	12700	18400	12433	12623	12500	12583	11700	12600	14100	12733	13164	14367	12680	13550	13100	13538	13450	13925	13500	11131	16500
Turbidity	NTU	123.75	69	88	90	51	75	61	47.02	104.33	55.00	30.00	53.00	74.83	72.89	27.18	49.33	75.50	27.51	52.00	27.5	83.95	69.43	52
Total Dissolved Solids (TDS)	mg/L	54350	66433	54900	57500	57300	55123	57815	57520	54567	57867	62000	55133	53975	52233	55460	51367	56900	58325	55917	60975	56900	49229	57600
Total Suspended Solids (TSS)	mg/L	45	75.7	63	248.5	102.7	102.2	156	86	102	316.7	30.0	56.0	181.8	108.1	31.0	38.7	37.5	85.4	58.5	50.0	216.0	42.4	46
Aluminum (Al)	mg/L	0.21	0.1	6.02	1.29	0.51	1.45	0.73	0.97	1.75	2.063	0.150	0.250	2.979	1.466	0.270	0.290	0.128	0.798	0.245	0.261	4.145	0.353	0.15
Ammonia Nitrogen (NH_3-NH_4)	mg/L	4.125	7.9	4.5	4.95	5.2	5.508	11.08	4.87	4.7	6.100	4.800	4.700	5.825	4.711	5.180	4.800	4.300	5.250	4.233	6.925	4.550	5.714	6.55
Arsenic (As)	mg/L	0.003	0.005	0.01	0.008	0.004	0.016	0.016	0.102	0.013	0.047	0.006	0.009	0.027	0.057	0.009	0.010	0.004	0.024	0.006	0.005	0.011	0.009	0.0138
Barium (Ba)	mg/L	0.06	0.61	0.1	0.27	0.07	0.09	0.25	0.1	0.07	0.113	0.082	0.094	0.109	0.109	0.098	0.072	0.073	0.100	0.058	0.073	0.170	0.110	0.163
Beryllium (Be)	mg/L	0.003	0.002	0.01	0.002	0.002	0.005	0.008	0.01	0.01	0.008	0.005	0.008	0.010	0.009	0.009	0.007	0.004	0.004	0.006	0.004	0.005	0.009	0.005
Boron (B)	mg/L	1.6	4.98	5	4.9	1.5	2.7	3.97	5	2.5	4.17	2.50	4.17	4.79	4.72	4.50	3.33	2.10	2.28	2.92	2.35	2.80	4.64	3
Total Organic Carbon (TOC)	mg/L	2.23	11.67	2.1	2.95	2.63	3.2	5.3	2.57	2.5	16.27	3.00	2.67	2.50	2.42	2.36	2.47	2.20	3.00	1.97	2.4	2.95	2.73	5.3
Dissolved Organic Carbon	mg/L	1.9	10.17	1.7	2.3	2.37	2.7	4.9	2.32	2.1	13.70	2.80	2.33	2.38	2.27	2.36	2.27	1.90	2.55	1.90	2.4	2.55	2.53	5
Calcium (Ca)	mg/L	1710	3777	1650	3737	1593	1608	1771	1610	1565	1720	1770	1587	1646	1777	1656	1737	1690	1748	1653	1715	2165	1487	2960
Cadmium (Cd)	mg/L	0.0003	0.0002	0.001	0.0003	0.0002	0.0005	0.001	0.001	0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0005
Chloride (Cl - dissolved)	mg/L	31250	38000	31000	31500	32000	31385	31538	32800	29333	32333	34000	33000	33833	34444	34800	34333	32500	33875	33333	36250	33500	27143	35000
Chromium (Cr)	mg/L	0.025	0.017	0.01	0.02	0.017	0.05	0.075	0.1	0.88	0.083	0.050	0.083	0.096	0.094	0.090	0.067	0.035	0.043	0.058	0.043	0.052	0.093	0.05
Copper (Cu)	mg/L	0.01	0.008	0.05	0.01	0.01	0.02	0.04	0.05	0.03	0.042	0.025	0.032	0.048	0.048	0.045	0.028	0.018	0.021	0.029	0.021	0.040	0.046	0.025
Cyanide (Cn)	mg/L	0.005	0.19	0.005	0.028	0.005	0.006	0.01	0.005	0.008	0.005	0.025	0.015	0.017	0.033	0.021	0.012	0.025	0.005	0.005	0.005	0.005	0.005	–
Iron (Fe)	mg/L	4.76	8.96	3.6	8.78	6.19	9.81	6.33	8.24	4.1	10.67	6.46	6.50	14.84	12.79	5.50	5.37	6.36	5.94	7.96	5.36	18.80	5.64	6.81
Lead (Pb)	mg/L	0.005	0.005	0.02	0.004	0.003	0.009	0.015	0.02	0.018	0.017	0.010	0.017	0.020	0.019	0.018	0.013	0.007	0.009	0.012	0.009	0.010	0.019	0.01
Magnesium (Mg)	mg/L	2168	2150	2080	2200	2050	2092	1962	2105	1975	2017	2350	2150	2208	2411	2078	2220	2150	2229	2267	2335	1970	1800	2200
Mercury (Hg)	mg/L	0.00001	0.00001	0.00001	0.000001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum (Mo)	mg/L	0.025	0.055	0.01	0.25	0.026	0.047	0.075	0.1	0.17	0.083	0.050	0.083	0.096	0.094	0.090	0.067	0.035	0.043	0.058	0.043	0.050	0.093	0.061
Nickel (Ni)	mg/L	0.025	0.04	0.1	0.07	0.017	0.05	0.08	0.1	0.35	0.083	0.050	0.083	0.096	0.094	0.090	0.067	0.035	0.043	0.058	0.043	0.050	0.093	0.05
Nitrate (NO_3) as N	mg/L	0.5	116.39	0.1	2.58	0.23	0.89	4.35	0.17	0.34	0.293	0.100	0.213	2.015	0.376	0.240	0.297	0.300	0.420	0.517	0.608	0.455	2.929	0.1
Nitrite (NO_2) as N	mg/L	0.05	8.01	0.1	0.125	0.086	0.14	0.391	0.042	0.027	0.032	0.024	0.023	0.120	0.043	0.042	0.028	0.030	0.044	0.052	0.065	0.039	0.109	0.061
Total Kjeldahl Nitrogen (TKN)	mg/L	3.78	8.7	4.6	5.2	7.83	7.4	12	72.02	4.5	9.00	5.60	4.87	6.12	4.97	5.90	5.27	4.95	5.54	4.18	7.5	4.60	6.77	6.5
Phosphorous (P)	mg/L	0.07	0.14	0.04	0.13	0.12	0.08	0.09	0.1	—	0.390	0.080	0.080	0.075	0.083	0.162	0.073	0.200	0.173	0.118	0.175	0.420	0.154	0.1
Potassium (K)	mg/L	496	595	407	609	433	463	518	488	763	502	528	465	490	532	512	479	474	500	491	539	444	391	680
Radium-226 (Ra 226)	mg/L	0.49	0.33	0.3	1.2	1.95	1.8	1.9	2.2	0.29	2.200	2.400	1.673	1.853	3.678	3.880	2.633	2.050	1.938	1.833	2.450	0.670	0.906	1.8
Selenium (Se)	mg/L	0.003	0.002	0.01	0.002	0.002	0.005	0.0075	0.01	0.007	0.008	0.005	0.008	0.010	0.009	0.009	0.007	0.004	0.004	0.006	0.016	0.005	0.009	0.005
Silver (Ag)	mg/L	0.001	0.0003	0.002	0.0009	0.0004	0.0012	0.0018	0.0002	0.018	0.003	0.001	0.002	0.002	0.004	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001
Sodium (Na)	mg/L	14625	14700	13400	15400	13900	14369	14654	14417	9433	14900	17000	15300	15183	16389	14860	14967	14750	15725	15333	16450	13550	12629	16600
Strontium (Sr)	mg/L	43.1	171	38.4	136	40	39	43.5	36.5	23.6	40.03	35.10	35.70	37.24	37.30	37.14	40.10	47.65	43.85	40.00	41.33	61.90	47.40	83.4
Sulphate (SO_4 – dissolved)	mg/L	3125	2700	3100	3100	3233	3169	2969	3120	3067	3200	3500	3433	3367	3500	3320	3367	3350	3250	3467	3625	3200	2829	3200
Thallium (Tl)	mg/L	0.001	0.001	0.001	0.0002	0.0002	0.0005	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.0005
Uranium (U)	mg/L	0.003	0.002	0.01	0.006	0.002	0.005	0.008	0.01	0.09	0.008	0.005	0.008	0.010	0.009	0.009	0.007	0.004	0.004	0.006	0.006	0.005	0.009	0.005
Vanadium (V)	mg/L	0.13	0.08	0.5	0.1	0.08	0.23	0.38	0.5	0.33	0.417	0.250	0.417	0.479	0.472	0.450	0.333	0.175	0.213	0.292	0.213	0.250	0.464	0.25
Zinc (Zn)	mg/L	0.125	0.1	0.5	0.12	0.08	0.23	0.38	0.5	0.34	0.417	0.250	0.417	0.479	0.472	0.450	0.333	0.175	0.259	0.292	0.213	0.250	0.464	0.25

3.4 Groundwater Management Strategy and Associated Control Structures

Based on the Type A Water Licence 2AM-MEL1631 Terms and Conditions, Part E: Conditions Applying to Water Use and Management, No. 14, Agnico Eagle has reviewed the Mine alternatives to apply to the GWMP. Condition No. 14 specifically states:

> *"The Licensee shall submit a Groundwater Management Plan to the Board for approval in writing, at least six (6) months prior to the discharge of any Groundwater. The Plan shall take into consideration all comments raised and commitments made with respect to submissions received during the technical review of the Application as well as final submissions and issues raised during the Public Hearing Process, where applicable."*

Furthermore, based on the NIRB Project Certificate No. 006 Terms and Conditions: Hydrogeology and Groundwater Quantity and Quality, No. 25, Agnico Eagle has updated the groundwater management strategy sections for submission to NIRB within 90 days of receiving the amended Mine Project Certificate. Condition No. 25 specifically states:

> *"The Proponent shall submit a detailed Groundwater Management Plan to the NIRB which includes mitigation measures designed to address the potential for higher-than-predicted volumes of saline water inflows into the underground mine, treatment and disposal methods, and details of its plan to monitor saline water at site. The plan must identify uncertainties pertaining to predictions for groundwater quality and quantity and inform adaptive management strategies for the site. CIRNAC should be consulted with respect to the contents of the Plan and any required mitigation measures."*

Groundwater management strategies were considered for the Mine based on the potential range of groundwater flows and quality that could be generated (Agnico Eagle 2015a).

Based on the groundwater inflow volume, the following options were considered and form part of the short and long-term management of groundwater inflows to the Underground Mine:

- Short-term Strategy: treat saline groundwater and store/use the brine from the treatment process on-site (Section 3.4.1)
- Current Long-term Strategy: treated discharge to receiving environment in Meliadine Lake (Section 3.4.2) and Discharge to sea (see Section 3.4.3).

The short and long-term groundwater management strategies are described below.

3.4.1 Short-Term Management Strategy - Treat and Store/Use Groundwater On-site

This alternative was considered as part of the Type A Water Licence Application and is currently implemented on site as part of the short-term management of groundwater inflow. It involves storing all excess groundwater in underground sumps and in surface water ponds at the Mine. As outlined in the WMP (Agnico Eagle 2019), a total of ten water containment ponds are planned on Site at the Mine surface (CP1, CP3, CP4, CP5, CP6, the P-Area [P1, P2, and P3], SP1 and SP2), seven of which have been

constructed and are in use (CP1, CP3, CP5, P-Area [P1, P2, and P3], and SP1). SP2 is presently being constructed and will be commissioned by the end of Q1 2019. Additional to this are all associated water retention dykes, water diversion berms, channels, and culverts, to manage surface water and underground water (Appendix A).

Five saltwater evaporators have been in-use on site since mid-2017 at P1 to reduce saline groundwater volumes stored in surface water ponds. While evaporators have been used with some success, the combined volumes of realized groundwater inflows with anticipated surface water volumes influenced by underground waste rock to be managed is greater than the available long-term storage at the Mine, and therefore, discharge to environment is required.

3.4.2 Current Long-Term Management Strategy - Treated Groundwater Discharge to Meliadine Lake

Hatch (2013) investigated groundwater treatment options for the site and concluded that a combination chemical reverse osmosis (RO) and mechanical vapour compression evaporator plant would be the most efficient method of treating excess groundwater for discharge. Agnico Eagle has since acquired and constructed a Salt Water Treatment Plant (SWTP) consisting of two evaporator crystallizers (SaltMakers) that will be used to treat groundwater. The SWTP will remove excessive total suspended solids (TSS), calcium chloride ($CaCl_2$), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds from the influent saline water.

The SWTP consists of two parallel units. Each unit can be operated to produce brine or solid by-product. Brine-mode of one unit within the SWTP is expected to operate to the following specifications:

- Inlet capacity of 115 m^3/day with a 95% expected operation availability for a corrected average input capacity of 109 m^3/day.
- With an input capacity of 109 m^3/day the effluent and brine will be discharged as follows:
    - 68 m^3/day to CP1
    - 24 m^3/day to Saline Pond as Brine
    - The 17 m^3/day difference is due to evaporation loss through treatment

Solid-mode of one unit within the SWTP is expected to operate to the following specifications:

- Inlet capacity of 69 m3/day with a 95% expected operation availability for a corrected average input capacity of 66 m3/day. This full inlet capacity will be discharged to CP1 as effluent
- Decisions regarding the management of solid salt by-product are ongoing by Agnico Eagle. One possible option would be use as a dust suppressant on roads as the material is similar to calcium chloride currently approved for such use. Formal approval would be required from the Government of Nunavut Environment Department.

SWTP effluent is currently transferred to CP1 where it will be treated by the EWTP prior to discharge to Meliadine Lake. EWTP effluent discharge to Meliadine Lake was performed in 2018 in accordance with the conditions outlined in Part F, Item 3 of the Water Licence. Discharge to Meliadine Lake is expected to be carried out in 2019. Total discharge to Meliadine Lake, including the treated groundwater, will remain within the permitted daily volume and meet the discharge criteria defined in the License, as well as MDMER discharge limits. Additionally, SSWQOs for EWTP effluent (including treated groundwater) will be met at the edge of the mixing zone in Meliadine Lake. Further details regarding the EWTP are provided in Sections 3.9.4 and Section 4.3 of the WMP.

The saline effluent temperature from the SWTP is expected to be approximately 35 °C, with an approximate pH of 7.5 (Saltworks 2017). According to pilot testing, SWTP effluent meets the required Water Quality Output Requirements defined in Agnico Eagle's Desalination Water Treatment Plan Design Criteria with the exception of ammonia, nitrite, total cyanide, and selenium (Saltworks 2017). However, weekly sample results from the first months of sampling (December 13, 2018 to February 18, 2019) show the SWTP effluent consistently meets the aforementioned requirements for all constituents aside from ammonia and nitrite. Ammonia exceeded the Water Quality Output Requirement of 35 mg/L on three sampling dates (Jan-16, Jan-18, Feb-10), however the mean ammonia concentration over the sampling period is 24 mg/L. Nitrite exceeded the Water Quality Output requirement of 0.2 mg/L on all (n=9) sampling dates with a mean concentration of 1.2 mg/L. The cause for these exceedances is that the SWTP system remains in the commissioning phase, specifically, the chemical RO unit designed to remove constituents such as ammonia and nitrite has not yet been commissioned. Upon commissioning (expected by end of Q1 2019), the SWTP is expected to meet all Water Quality Output Requirements.

SWTP effluent and CP1 water quality will continue to be monitored according to the SWTP Design Report to identify future exceedances and potential impacts to CP1. Pilot testing predicted that TDS concentrations would be approximately 158 mg/L (condensed water after treatment; Saltworks 2017). During commissioning, mean TDS concentration has been 174 mg/L (n=9) to date. As commissioning continues (i.e., process is refined and RO treatment is commissioned), effluent quality will trend towards lower concentrations as the treatment process is refined for optimal treatment quantity and quality. With respect to toxicology, the SWTP effluent passed acute toxicity tests on Rainbow trout, Three-spined stickleback and Daphnia magna (Saltworks 2017).

3.4.3 Current Long-Term Management Strategy - Treated Groundwater Discharge to Melvin Bay at Itivia Harbour

Based on the current standing of saline water stored on site, the rate at which the SWTP can treat saline water (Section 3.4.2) and the forecasted inflows (Section 3.1), it is anticipated that a second discharge location will be required for long-term groundwater management. Agnico Eagle proposed to treat groundwater for TSS, oil and grease, and ammonia and discharge it as saline effluent to the ocean, either as a direct discharge and/or after temporary on-site storage in one or more of the water containment ponds at the Mine. In 2018, Agnico Eagle applied to the NIRB for approval to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Agnico Eagle received approval for discharge of saline water to sea with an amended Mine Project Certificate from NIRB on February 26, 2019.

3.4.3.1 Discharge to Sea Methods for Disposal and Treatment

Treatment, storage and haulage

As discussed in Section 3.4.1, saline water will be stored on surface or underground. Saline water will then be transported to a treatment plant (to be named) for treatment. Initial treatment will be for oil and grease removal via an oil-water separator. The water will then enter a Multiflo system for TSS removal. Next, break-point chlorination treatment will be applied to remove elevated ammonia levels, which are inferred to be the result of the use of emulsion and washing of development faces/muck underground. Excess free chlorine will be removed with activated carbon filters. Following break-point chlorination, water will merge with EWTP effluent prior to entering Saline Pond 3 (SP3) for final settling and storage. Treatment rates and expected treatment performance are currently being assessed and will be provided 30 days prior to operation of the treatment plant.

Treated saline water stored in SP3 will hauled by tanker trucks to Itivia. Truck loads will be up to 50 m^3 per truck and will be unloaded using a flexible 4" HDPE suction pipe. The truck discharge pump will transfer the treated effluent into the 6'' discharge HDPE pipeline and through the diffuser. The truck discharge pump will also be used to transfer effluent into the storage tank until the next day, before it is pumped into sea when necessary.

Pumping and Diffusion Plan

The flow rate to be discharged to Melvin Bay will not exceed 800 m^3/d with a TDS of 39,600 mg/L (Appendix B). The discharge facility will include a 778 m pipeline extending to an engineered diffuser located 20 m below surface in Melvin Bay to ensure proper mixing and prevent interference with traditional activities (See Appendix X for design drawings). Pumping will occur during the open water season from 2019 to 2031. The saline effluent will be discharged in a controlled manner through the diffuser to allow for maximum dilution and minimum environmental impact to the marine environment. Environmental monitoring is discussed in Section 4.3.3.

Agnico Eagle intends to engage with the Kangiqliniq Hunters and Trappers Organization (HTO) and the community of Rankin Inlet to:

- confirm the commencement and end of the open water season for marine effluent discharge each year,
- develop a procedure for monitoring of saline effluent temperature going into the subsea pipeline,
- ice thickness on Melvin Bay in the vicinity of the discharge and determining appropriate communication and safety protocols applicable for travel by community members through Itivia and Melvin Bay.

The effluent discharge system will consist of a truck discharge pump, a back-up discharge truck pump, a 100 000-litre storage tank, as well as suction and discharge pipelines. The 100 000-litre

storage tank will only be used to contain the treated effluent until the next day, if the 800 m^3/d discharge limit is attained upon a truck's arrival. The storage tank will be installed on a containment area, built on a geomembrane with underlying and overlying granular materials and surrounded by berms. The construction drawings are shown in the Appendix B.

A pumping station including two pumps will be installed on the containment area. The truck discharge pump will be used to transfer the effluent from the trucks directly into the sea (or to storage tank). A by-pass pipeline will be installed parallel to the main discharge pipe in case the discharge truck pump malfunctions or maintenance is required. The back-up truck discharge pump will be used to pump the effluent into the by-pass pipe, though the 6'' discharge HDPE pipe and out the diffuser, if necessary.

Treated groundwater effluent quality is required to meet the Canadian federal end-of-pipe discharge criteria (per the amended MDMER; GC 2018) and to be non-acutely lethal. Treated groundwater will be discharge into Melvin Bay via an engineered diffuser (refer to Appendix D or Section 3.5 of the FEIS Addendum; Agnico Eagle 2018g) to meet Canadian Surface Water Quality Guidelines (WQG; CCME 2003), or background concentrations for parameters without guidelines, at the edge of the mixing zone. For information regarding background concentrations and expected mixing zone diffusion, refer to Appendix D (the Conceptual Ocean Discharge Monitoring Plan). Sampling will meet MDMER (GC 2018) requirements, and is outlined in Section 4.3.3, and detailed in Appendix D. A modelling assessment of groundwater discharge into the Melvin Bay marine environment was conducted by Golder (2019) and is included within Appendix B).

3.5 Discharge Schedule

Table 4 outlines the timeline for key activities on the Mine related to the management of saline groundwater, including tasks and facilities for the current short-term and long-term management strategies for discharge to Meliadine Lake (Section 3.4.1 and 3.4.2). A detailed Mine schedule for the overall Mine Water Management (e.g., building of culverts, berms and containment ponds) are presented in the 2019 WMP.

Table 4: High Level Mine Schedule

Activity	Timeline	Notes
On-site water storage	Ongoing	—
Update Groundwater Management Plan (Current Document)	Six months prior to discharge	Type A Water Licence 2AM-MEL1631 requirement
Commissioning of Salt Water Treatment Plants (SaltMaker #1 and #2)	Q4-2018 to Q1-2019	—
Discharge saline water to the sea (Melvin Bay, Rankin Inlet)	2019 open water season (Q2)	

Activity	Timeline	Notes
Active Discharge to Meliadine lake	Annually May thru October to 2031	—
Operation of Salt Water Treatment Plant	24 hr. a day / 7 days a week, year round	In-service as required
Inactive Discharge	Annually November thru April to 2031	Water will be stored underground and in surface containment ponds during the winter
Final Effluent Discharge to Meliadine Lake	End of Mine life 2031	—

Source: Agnico Eagle (2017).

3.6 Mitigation Measures regarding Greater than Expected Inflows

It is possible that realized groundwater inflow rates to the underground mine will be greater than modelled inflow rates. Specifically, this would arise from error in hydraulic conductivities assigned to geological units/structures and invalidity of assumptions listed in Section 3.1.1. Furthermore, it is possible that groundwater TDS levels will deviate from the past and current trends and produce greater than expected concentrations of TDS in groundwater to be managed. Considering both the Golder (2015) TDS forecasts agreeing with the realized groundwater TDS concentrations and the multitude (n = 133) of groundwater samples contributing to the to-date mean concentrations of TDS in groundwater surrounding the Mine, it is unlikely that groundwater TDS concentrations will increase as development and stoping progresses. In the unlikely case that TDS does increase, groundwater discharged to sea will be decreased as less raw groundwater will contribute to the saline water volumes being discharged to sea (due to TDS limit in effluent of 39,600 m^3; Section 3.4.3.1). Thus, greater than expected inflow rates and/or greater than expected TDS values would result in greater than expected groundwater volumes to manage. The following sections discuss mitigations under the occurrence of these scenarios.

3.6.1 Mitigation Measures – Contingency Storage Units

Upon the occurrence of greater than expected groundwater inflows to the underground mine, Agnico Eagle will utilize contingency saline water storage units until inflows can be reduced or SWTP treatment rates are increased to reduce required storage (Section 3.6.2). As of March 2019, the collective contingency saline water storage units produce a total potential storage of approximately 131,000 m^3. These storage units and corresponding capacities are listed below and will be filled in the following order, if required:

1. Level 350 West Block (5,766 m^3)
2. Ramp 1 extending from Level 425 to Level 450 (7,216 m^3)
3. Ramp 3 extending from Level 375 to Level 400 (17,298 m^3)
4. Ramp 3 extending from Level 350 to Level 375 (48,576 m^3)

5. Level 425 (50,530 m^3)

The contingency storage features listed above are not intended for long-term storage. The use of these will affect production, as portions of the mine will be unavailable to operations. Thus, if these units are required then adaptive management practices focused on increasing desalination rates will be implemented by Agnico Eagle in order to empty the features and allow production to continue optimally.

3.6.2 Mitigation Measures – Increased Storage and SWTP Treatment Rate

With respect to volumes of infiltrated groundwater to be managed, Agnico Eagle will apply adaptive management practices focused on increasing desalination rates. Prior to implementation of any changes to groundwater management, Agnico Eagle will submit a proposal for an amendment to the Mine Project Certificate or Water License, as applicable. The following are preliminary plans concerning the ability for Agnico Eagle to manage greater than expected saline water volumes stored on site.

In a scenario when modest increases above expected inflows (< 100 m^3/day) occur and are anticipated to persist, Agnico Eagle will assess the feasibility of running the SWTP in brine-mode (Section 3.4.2). Operating the SWTP in brine-mode rather than solid mode would provide an increase in treatment rate of approximately 86 m^3/day. As discussed in Section 3.4.2, brine would be added to the saline water storage system on site and freshwater effluent would be discharged to CP1 to be further treated to removed TSS prior to discharge to Meliadine Lake.

The addition of SP2 (approximately 75,000 m^3) to the saline water storage system provides further mitigation to greater than expected inflows by providing storage for saline water until inflows can be reduced or treatment can be increased. It will be the goal of Agnico Eagle to reduce the amount of saline water stored in SP1, SP2 and underground as much as possible during the open water season (through discharge to sea) in order to maximize storage potential.

3.6.1 Mitigation Measures – Hydraulic monitoring

As a strategy to increase the confidence of groundwater inflow modelling and decrease uncertainty, seven (7) vibrating wire piezometers are currently installed in the rock mass surrounding the underground mine. These piezometers are currently, and will continue to be applied to, assess response of the groundwater pressure (pressure head) to groundwater inflows. The data records produced by these piezometers will be used to approximate recharge rates and changes thereof, which may then be applied to the groundwater inflow model. Going forward, several additional piezometers will be installed in the rock mass (targeting major water bearing structures) to provide further insight into recharge rates and better inform modelling efforts. Agnico Eagle anticipates installing at least three (3) more piezometers over 2019.

3.6.2 Mitigation Measures – Groundwater Quality Monitoring

Raw groundwater and underground mine water in the underground storage system are sampled monthly. The sample analysis results are used to identify trends and improve predictions regarding

groundwater inflow chemistry. This information is used to improve operational performance at the SWTP and act as a trigger for revision of the groundwater quality predictions. If raw groundwater samples (i.e., from flushed drillholes) collected indicate that the TDS is more than 20% higher than the estimated 64,000 mg/L (Section 3.3), the water quality predictions for underground will be reviewed and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP.

SECTION 4 • GROUNDWATER MONITORING PROGRAM

4.1 Water Quality and Quantity Monitoring

Water quality monitoring is an important part of the Mine water management to verify the predicted water quality and quantity trends and conduct adaptive management should differing trends be observed. Water quality and quantity monitoring has been initiated and will continue during construction, operations, closure and post-closure. Monitoring will occur at three levels:

- Regulated discharge monitoring that occurs at monitoring points specified in the Licence or regulations.
- Verification monitoring that is carried out for operational and water management purposes by Agnico Eagle. This monitoring data will not be reported to the Regulators in the Annual Water License Report, but can be provided upon request by the Regulators.
- General monitoring that is included in the Licence requirements and is subject to compliance assessment to confirm sampling was carried out using established protocols, including quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

All three types of monitoring is used at the Mine. The WMP and Water Quality and Flow Monitoring Plan present the conceptual water quality monitoring plan during construction, operations and closures and more detailed information on monitoring programs.

The groundwater quality monitoring plan summarized in Section 4.4, will be further defined as the Mine advances and will be conducted in agreement with the WMP for the Mine (Agnico Eagle 2019). Required monitoring and frequency for pre- and post- treatment (i.e., monitoring above ground) is presented in the WMP (Agnico Eagle 2019).

4.2 Water Quantity

The volume of groundwater inflow being collected and transferred to surface water management systems is measured using a flow meter installed at the Portal 1 entrance and is fed by Water Stope 75. A second pumping system was commissioned in 2019 to pump directly from Level 300 to surface. Currently this line is used to pump to the SWTP where inflow volumes are tracked via a water level sensor. A flow meter will be installed within this line prior to discharging directly to surface (expected Q2 2019). This data is supplemented by monthly seepage surveys in which visually observed groundwater inflows in the Underground Mine are recorded.

Observed groundwater inflow rates are compared to model predictions (Table 1) on an annual basis. If significant variations from model predictions are observed, the assumptions behind the analysis will

be reviewed and the analysis updated if required. In addition, updates to the groundwater model may be required based on operational changes as the Underground Mine advances.

Variations that would be considered significant and would indicate the need to consider recalibrating the model and updating the inflow analysis include:

- Groundwater inflows to the mine, based on a monthly average of inflow over six consecutive months, is 80% of the model predictions while active grouting is being utilized to mitigate groundwater inflows.
- Groundwater inflows to the mine, based on a monthly average of inflow over six consecutive months, is 30% higher than the predicted groundwater inflows once grouting is ceased.

Changes in underground storage were calculated on a daily basis and used to produce monthly net inflow rate estimates. Based on these monthly averages, mean net inflow rate over 2018 was 51 m^3/day. Golder (2016) predicted a gross inflow rate of 300 m^3/day (Table 1).

Identification of a potential long-term effect associated with the groundwater flow is to be conducted and based on a detailed examination of the groundwater data to assess the potential causes of greater than expected groundwater quantity. If the greater than predicted flows could be correlated to a short term effect such as freshet or transient drainage of a high storage feature, then no further action would be required. However, if the greater than predicted flows could not be correlated to a short term effect, than the effect would be considered to be potentially long term. The duration of six months is based on observed seasonal variations in inflow quantities in mines situated permafrost regions.

If model re-calibration is deemed necessary, future groundwater inflow quantity would be predicted using this re-calibrated model and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP. Currently, an update to the numerical model is underway. The update is not the result of either of the two conditions listed above, but rather is intended to provide more accurate estimates to better inform planning of management strategies.

4.2.1 Underground Water Management System

The underground water management system is designed to prevent water from affecting the workings or production. The system contains a series of sumps (generally one at the access of each level) designed to capture groundwater inflows and runoff from mining operations (i.e., drilling). Presently, underground water is managed by pumping from sump to sump from the lower levels to Level 125. Water collected in Level 125 sump is then moved to the Water Stope to be distributed for mining operation requirements or moved to surface (Section 4.2).

Beginning in approximately Q2 2019, a new pumping system will be implemented underground as follows:

- All groundwater inflows and water used for operations from Level 300 to the bottom of the mine will be pumped to storage containers on Level 300.
- All groundwater inflows and water used for operations on Level 275 to surface will be transported to storage tanks on Level 300. Movement will be directed by gravity from sump to sump via boreholes connecting the sumps.
- Water that is stored on Level 300 will be clarified using a Mudwizard (flocculation) system as a means to ensure pumping efficiency and prevent damage to the system.
- Following clarification, water will be fed by gravity to Level 350, where a main pumping station will move the water to Level 200.
- A second main pumping station on Level 200 will move the water to the SWTP or Saline Ponds on surface (Section 4.2).

4.3 Water Quality

4.3.1 Underground Mine Sump Water and Groundwater Inflows

Water accumulating in sumps underground is sampled on a monthly basis at Sump 125, which is the main collection sump prior to recirculation for underground use. Sump water samples are analyzed for the following parameters: conductivity, TDS, pH, temperature, oil and grease, major anions, radium 226, dissolved and total metals, nitrate and nitrite, ammonia, volatile organic compounds (i.e., benzene, xylene, ethylene, and toluene).

Groundwater quality is also monitored at mine seeps and/or diamond drill holes (DDHs) to verify the quality of formation water flowing into the mine prior to contact and potential contamination by mining and drilling fluids. The DDHs consist of underground holes drilled in advance of mining for ore body delineation purposes. These DDHs are sampled if there is sufficient flow to flush the borehole prior to initiation of grouting. Flushing and sampling techniques used to ensure samples are taken without contamination are described in Section 2.2.3 of the Quality Assurance/Quality Control Plan. Samples are collected quarterly at a minimum but actual sampling frequency may be greater depending on rate of progress, frequency of water intersects, and observed trends in groundwater quality with time. Water samples are analyzed for the following parameters: conductivity, TDS, pH, temperature, major anions, radium 226, dissolved and total metals and toxicity testing.

If water samples are collected that indicate that the TDS is more than 20% higher than the estimated 64,000 mg/L, the water quality predictions for underground will be reviewed and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP.

4.3.2 Saline Water Treatment Plant Influent and Effluent

Water samples are currently collected weekly at both the inlet and outlet of the SWTP. The results of the sample analysis are used by SWTP operators to fine-tune the treatment process and ensure its optimal performance. Samples taken at the outlet of the SWTP are analyzed to provide the quality of treated water produced by the SWTP that is transferred to CP1.

Water samples are analyzed for the following parameters: pH, electrical conductivity, temperature, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), chloride, ammonia, nitrite, nitrate, total phosphorus, total metals, total cyanide, and total mercury.

4.3.3 Discharge to Sea

Prior to haulage of saline water from the Meliadine Site to Itivia for discharge to sea, Agnico Eagle will measure pH, electrical conductivity, and temperature of the effluent as a means to continually advise discharge operations and help ensure discharge parameters are met. Agnico Eagle will also collect weekly samples to be analyzed by an accredited laboratory. Samples will be analyzed for the full suite and Group 3 (MDMER) parameters as listed in the Water License and the Water Quality and Flow Monitoring Management Plan appended to the WMP.

Effluent water at the final discharge point (end-of-pipe) will be measured for pH and analyzed for concentrations of deleterious substances listed in MDMER Schedule 4 (GC 2018). End-of-pipe brine effluent will be sampled once per month for acute lethality testing per MDMER requirements. Acute lethality testing will be conducted on Three-spine stickleback in accordance with the procedures set out in sections 5 or 6 of Reference Method EPS 1/RM/10 (ECCC 2018). Effluent characterization samples (Section 4.1.3) will be collected at the same time to aid in interpretation of acute lethality test results.

Effluent characterization will be conducted once per calendar quarter at least one month apart. Effluent will be sampled and analyzed for the following parameters:

- General parameters, including pH, TDS, TSS, hardness, alkalinity, electrical conductivity, salinity, and temperature;
- Anions including sulphate and chloride; and
- Nutrients, including ammonia and nitrate.
- Total metals and dissolved metals including those listed in MDMER Schedule 4 and Schedule 5 paragraph s. 4.

Sublethal toxicity testing of brine effluent will be conducted twice a year at least one month apart, at the beginning and at the end of discharge for three years, and once a year after the third year. The following tests will be conducted:

- Fish early life stage development test on inland silverside (Menidia beryllina) or topsmelt (Atherinops affinis) (US EPA 2002)
- Invertebrate reproduction test on echinoids (sea urchins or sand dollars) (Environment Canada 1992)
- Algae toxicity test on barrel weed (Champia parvula) (US EPA 2002)

These tests will be conducted on aliquots of the same sample collected for effluent characterization.

Agnico Eagle will adhere to MDMER EEM requirements for fish population surveys, water and sediment quality, and benthic invertebrate community assessments. The sampling plan is conceptually outlined in Table 5. Fish tissue monitoring will be conducted if triggered by MDMER conditions. A study design will be provided to ECCC according to the MDMER requirements (GC 2018), which includes all proposed monitoring locations.

Starting March 2019, a monthly under-ice sampling program was initiated in the area anticipated to be influenced by Agnico Eagle discharge to sea. The sampling program will extend to May 2019. The program included three sampling locations selected to correspond with the location of potential exposure to diffuser discharge In Melvin Bay. The purpose of the sampling program is to develop a baseline for water quality parameters within the potential exposure area prior to initiation of discharge. Details are found in Appendix D.

Further information regarding sampling locations, QA/QC, water quality benchmarks, sediment quality benchmarks, and environmental effect thresholds is provided in the Conceptual Ocean Discharge Monitoring Plan (Appendix D).

Table 5: Conceptual Ocean Discharge Monitoring Program Sampling Summary

Monitoring Component	Sampling Frequency	Monitoring Location	Sample Replication and Number of Samples
Deleterious Substances (MDMER Schedule 4)	Every week	FDP (end-of-pipe)	One grab sample
Acute lethality	Every month (sampled concurrently with effluent characterization)	FDP (end-of-pipe)	One grab sample
Effluent characterization	Four times a year, one month apart during discharge	FDP (end-of-pipe)	One grab sample
Sublethal toxicity	Twice a year, one month apart at the start and finish of the discharge	FDP (end-of-pipe)	One grab sample
In situ Water Column Measurements	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One vertical profile per station
Water Quality	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One sample @1m below the surface and one sample @5 m above the bottom at each station.
Benthic Invertebrate Communities, and sediment quality	Every 3 years in August if triggered by MDMER	Exposure and reference areas	6 stations in the Exposure area and 5 stations in each reference area. Three subsamples per station
Fish population	Every 3 years in August if triggered by MDMER	Exposure and reference areas	20 sexually mature males and 20 sexually mature females of two fish species in each sampling area

Monitoring Component	Sampling Frequency	Monitoring Location	Sample Replication and Number of Samples
Fish tissue	Every 3 years in August if triggered by MDMER	Exposure and reference areas	8 samples of a single species from each sampling area

Notes:

Amended Metal and Diamond Mining Effluent Regulations (MDMER; GC 2018) will be adhered to. Metal Mining Effluent Regulations (MMER) will be adhered to as a minimum while MDMER come into effect.

FDP = Final Discharge Point

4.4 Groundwater Monitoring Plan

Table 6 presents a summary of the underground monitoring plan presented in Sections 4.2 and 4.3. Additional sampling at the surface will be conducted, including pre- and post- SWTP sampling as outlined in the WMP and the Water Quality and Flow Monitoring Plan.

Table 6: Groundwater Monitoring Plan

Monitoring Type	Monitoring Location	Purpose	Frequency
Verification	Portal Water Stope L75	Quantity - Monitor underground water quantity pumped to surface.	Totalized Flow Tabulated Monthly
Verification	Underground Seeps	Quantity - Seepage survey to verify underground flow estimates.	Monthly
Verification	Sump 125	Quality - Monitor underground water quality prior to recirculation for underground use.	Monthly
Verification	Underground seeps/DDHs	Quality – Verify quality of groundwater flowing into underground	Quarterly
Verification	SWTP Inlet and Outlet	Quality – Verify quality of groundwater being treated and monitor final treated effluent prior to continued transfer to CP1	Weekly

Source: Agnico Eagle (2018).

SECTION 5 • QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality. Specific QA and QC procedures that will be followed during sampling performed for the Groundwater Monitoring Program are described in Section 5.1 and 5.2.

5.1 Quality Assurance

Quality assurance protocols are diligently followed so data are of known, acceptable, and defensible quality. There are three areas of internal and external management, which are described in the following three sections.

5.1.1 Field Staff Training and Operations

To make certain that field data collected are of known, acceptable, and defensible quality, field staff are trained to be proficient in standardized field groundwater sampling procedures, data recording, and equipment operations applicable to the Groundwater Monitoring Program. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping protocols.

5.1.2 Laboratory

To make sure that high quality data are generated, accredited laboratories have been selected for sample analysis. Accreditation programs are utilized by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control.

5.1.3 Office Operations

A data management system is utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the Groundwater Monitoring Program. Relevant elements will include, but are not limited to the following:

- all required samples are collected;
- chain-of-custody and analytical request forms are completed and correct;
- proper labelling and documentation procedures are followed, and samples will be delivered to the appropriate locations in a timely manner;
- laboratory data will be promptly reviewed once they are received to validate data quality;
- sample data entered into a Mine-specific groundwater quality database will be compared to final laboratory reports to confirm data accuracy; and

- appropriate logic checks will be completed to ensure the accuracy of the calculations.

5.2 Quality Control

The QC component consists of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples.

Sample bottle preparation, field measurement and sampling handling QC procedures include the following:

- Sample bottles are kept in a clean environment, capped at all times, and stored in clean shipping containers. Samplers keep their hands clean, wear gloves, and refrain from eating or smoking while sampling.
- Where sampling equipment must be reused at multiple sampling locations, sampling equipment is cleaned appropriately between locations.
- Temperature, pH, and specific conductivity are measured in the field using hand held meters. Samples are cooled to between 4 °C and 10˚C as soon as possible after collection. Care is taken when packaging samples for transport to the laboratory to maintain the appropriate temperature (between 4°C and 10˚C) and minimize the possibility of rupture. Where appropriate, samples are treated with preservatives to minimize physical, chemical, biological processes that may alter the chemistry of the sample between sample collection and analysis.
- Samples are shipped to the laboratory as soon as reasonably possible to minimize sample hold times. If for any reason, samples do not reach the laboratory within the maximum sample hold time for individual parameters, the results of the specific parameters will be qualified, or the samples will not be analysed for the specific parameters.
- Chain of custody sample submission forms are completed by field sampling staff and submitted with the samples to the laboratory.
- Only staff with the appropriate training in the applicable sampling techniques conduct water sampling.

Quality control procedures implemented consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and duplicate water samples. These are defined as follows:

- Field Blank: A sample prepared in the field using laboratory-provided deionized water to fill a set of sample containers, which is then submitted to the laboratory for the same analysis as the field water samples. Field blanks are used to detect potential sample contamination during collection, shipping and analysis.
- Travel Blank: A sample prepared and preserved at the analytical laboratory prior to the sampling trip using laboratory-provided deionized water. The sample remains unopened

throughout the duration of the sampling trip. Travel blanks are used to detect potential sample contamination during transport and storage.

- Duplicate Sample: Two samples collected from a sampling location using identical sampling procedures. They are labelled, preserved individually and submitted for identical analyses. Duplicate samples are used to assess variability in water quality at the sampling site. Duplicates are collected and submitted for analyses at approximately, 10% of sampling locations. For smaller batches of samples (less than 10), at least one duplicate will be collected and submitted for analysis.

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APPENDIX A • SITE LOCATION AND MINE SITE LAYOUT

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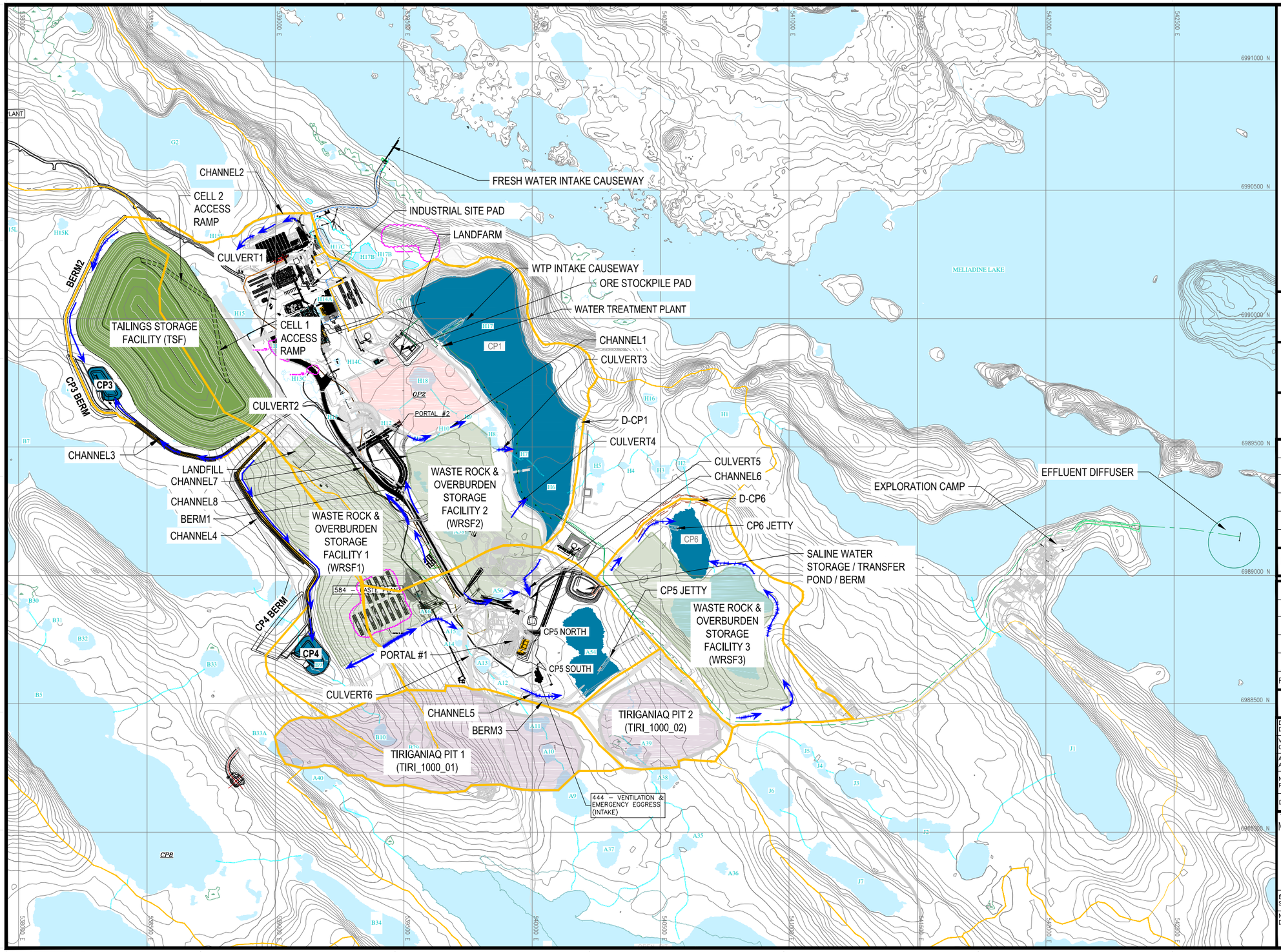

LEGEND

- CATCHMENT BOUNDARY
- WATERBODY
- WATER COLLECTION POND
- OPEN PIT
- WASTE ROCK
- ORE
- CONTACT WATER FLOW DIRECTION

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature
Date Nov. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NWT/NU

AGNICO EAGLE

TETRA TECH

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 11/14/2018

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TITRE / TITLE	# DWG

DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS

REV	DESCRIPTION	DATE	PAR BY
0	ISSUED FOR CONSTRUCTION	2018–11–14	
B	ISSUED FOR REVIEW	2018–11–06	
A	ISSUED FOR REVIEW	2018–11–05	

REVISIONS

DESSINÉ PAR / DRAWN BY	EL/EP	DATE 2018–11–14
VÉRIFIÉ PAR / CHECKED BY	GZ/WTH	2018–11–14
APPROUVÉ PAR / APPROVED BY		
No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

GENERAL ARRANGEMENT

ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
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APPENDIX B • DESIGN REPORT SALINE EFFLUENT DISCHARGE TO MARINE ENVIRONMENT

AGNICO EAGLE
MELIADINE

February 2019

Design Report
Saline Effluent Discharge to Marine Environment

6528-680-132-REP-001

In accordance with NIRB Project No.006 Condition 128

Prepared by:
WSP Canada Inc.

AGNICO EAGLE
MELIADINE

February 2019

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
0	2019-02-15			Design report

Prepared By:

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1 INTRODUCTION

1.1 SITE LOCATION AND ACCESS

WSP Canada Inc. (WSP) was retained by Agnico Eagle Mines Limited (Agnico Eagle) to prepare the Design Report of the proposed saline effluent discharge to the marine environment near Rankin Inlet, Nunavut. As part of their long-term groundwater management strategy, Agnico Eagle is planning to collect groundwater from the Meliadine underground mine, treat the influent with respect to quality standards and discharge the treated groundwater effluent into Melvin Bay.

The Meliadine Mine is located approximately 25 km North of Rankin Inlet (63°1'23.8'' N, 92°13'6.42'' W), Nunavut.

The proposed discharge point for the saline groundwater effluent is in Melvin Bay just west of Rankin Inlet. Agnico Eagle will access the area using a bypass road. The area is also accessible by Itivia Street, a gravel road linking the Agnico Eagle Fuel Storage Facility at the Itivia Harbour and Rankin Inlet.

1.2 EXISTING AND FUTURE SITE FACILITIES

Agnico Eagle owns and operates the existing Fuel Storage Facility and plans to use this property to install the saline effluent discharge system. This projected effluent discharge system consists of truck discharge pump, a back-up discharge truck pump, a 100 000-litre storage tank, as well as suction and discharge pipelines. The 100 000-litre storage tank will only be used to contain the treated effluent until the next day, if the 800 m^3/d discharge limit is attained upon a truck's arrival. The storage tank will be installed on a containment area, built on a geomembrane with underlying and overlying granular materials and surrounded by berms. The construction drawings are shown in the Appendix A.

A pumping station including two pumps will be installed on the containment area. The truck discharge pump will be used to transfer the effluent from the trucks directly into the sea (or to storage tank). A back-up truck discharge pump will be installed to by-pass the first pump, if necessary. The truck-discharge pump is connected to a 778 m long HDPE pipeline to pump the effluent from the trucks to 20m below sea level in Melvin Bay. A diffuser is connected at the end of the pipe to ensure effective dilution of the saline effluent into the marine environment. The ballast weights will be attached to the pipe to sink and hold it onto the seabed.

For more detailed information, refer to the construction drawings shown in the Appendix A.

1.3 PURPOSE OF THE DOCUMENT

The purpose of the report is to outline the final design and construction drawings for the saline effluent discharge system which includes the storage tank, the pumping station, the discharge pipe as well as the diffuser that will release the treated groundwater effluent into Melvin Bay.

This report has been prepared in accordance with Condition 128 of NIRB Project Certificate No.006:

‘‘The Proponent shall provide the NIRB with a detailed design for the system that includes the location of the pipeline in relation to the saline effluent storage tank at Itivia, the location of submerged collars supporting the pipeline and the design of the diffuser.’’

The final design was presented to the local stakeholders including the Kangiqliniq Hunters and Trappers Organization (KHTO), the Hamlet of Rankin Inlet and the Government of Nunavut - Nunavut Airports Division and Community and Government Services Department on January 24th, 2019 for final review.

This design report refers to Golder’s Report which assessed the environmental guidelines characterizing Melvin Bay at the location of the proposed diffuser and conducted the numerical modelling to design the diffuser. Golder’s Report was published in February 2019 and is shown in Appendix D.

1.4 SCOPE OF WORK

WSP was retained by Agnico Eagle to design the pumping station and pipeline while Golder was responsible for the assessment of the groundwater effluent plume with respect to environmental guidelines. This report describes the design of the pumping station, the pipeline and the diffuser.

2 GENERAL SITE CONDITIONS AND OTHER DATA INPUT FOR DESIGN

2.1 MODELLING FOR DIFFUSER DESIGN

The model calculates numerical simulations of the treated groundwater effluent mixing in the proposed marine environment. The modelling of the groundwater effluent plume dispersion allows the user to assess the dilution behaviour.

The ambient environmental conditions (e.g. winds, currents, etc.) and treated groundwater effluent characteristics are necessary to calculate numerical simulations of the mixing.

The proposed diffuser pipeline is to extend from the storage tank to be located south of the Aginco Eagle’s Fuel Storage Facility, to south-south-west in Melvin Bay. The diffuser port will be installed on the seabed at a depth of 20 m, to ensure proper mixing and prevent interference with traditional activities.

Refer to section 2.1.3 of Golder’s Report: Modelling Assessment of Groundwater Discharge into the Melvin Bay Marine Environment, Rev B, for detailed information (Golder, 2019).

2.2 ENVIRONMENTAL DATA

For detailed information on the environmental data used, refer to section 2.1.1 of Golder’s Report.

2.3 CHARACTERISTICS OF THE EFFLUENT

For detailed information on the characteristics of the effluent, refer to Appendix B of Golder's Report.

3 DESIGN OF THE STORAGE AND PUMPING STATIONS

3.1 GENERAL

After treatment, the excess groundwater will be stored on site at the Meliadine Mine, before being hauled by tanker trucks to Itivia Harbour. Trucks will unload their treated groundwater effluent by connecting on a flexible 4'' HDPE suction pipe. The truck discharge pump will transfer the treated effluent into the 6'' discharge HDPE pipeline and through the diffuser. The truck discharge pump will also be used to transfer effluent into the storage tank until the next day, before it is pumped into sea when necessary.

A by-pass pipeline will be installed parallel to the main discharge pipe in case the discharge truck pump malfunctions or maintenance is required. The back-up truck discharge pump (spare) will be used to pump the effluent into by-pass pipe, though the 6'' discharge HDPE pipe and out the diffuser, if necessary.

3.2 PUMP NARRATIVE

The flow rate to be discharged to Melvin Bay will not exceed 800 m^3/d with a TDS of 39 600 mg/L (Golder, 2019). The discharge will only occur during open water season. For more detailed information on the modelling scenarios and the input parameters, refer to section 2.1.2 of Golder's Report.

3.3 PUMPING STATION ENCLOSURES

The pumping station will be enclosed inside a heated container to protect the mechanical and electrical equipment from cold temperatures before Winter and at freshet. This precaution will decrease the risks of malfunctions in the system.

3.4 STORAGE TANKS

A 100 000-litre horizontal double wall storage tank will only be used to store the treated groundwater effluent until the next day if the daily discharge limit is attained upon a truck's arrival.

3.5 PIPING

The piping manifold for pumping stations within the container will be made of chlorinated polyvinyl chloride (CPVC) with Victaulic connections to facilitate the dismantlement during maintenance operations.

The 4'' suction and 6'' discharge pipelines outside of the heated container will be made of HDPE DR-9 pipe.

3.6 CONTROLS

The pumping station was designed to control the high and low water levels in the storage tank. The water level in the storage tank will be regulated with an ultrasonic transmitter located in the storage tank. When the water reaches the high level, the pump will automatically start to discharge the treated effluent to Melvin Bay.

A flow meter will be installed downstream of the pumping station to measure the flow rate before discharging into the marine environment. The pH, conductivity and the temperature levels of the effluent will be measured at the Chlorination Treatment Plant before arrival to Agnico Eagle Fuel Storage Facility. This equipment will allow Agnico Eagle to control the discharge operations and to respect the base parameters. This is in accordance with the commitments during the Final Environmental Impact Statement (FEIS) process.

A valve will be installed downstream of the storage tank to allow the sampling according to the Metal and Diamond Effluent Regulation.

The pumping station is designed to facilitate the user's operations and maintenance. The design allows a local control at the pumping station.

4 DESIGN OF THE HDPE PIPELINES

4.1 GENERAL

The present section of the report describes the main components of the effluent discharge pipeline and provides the reader with further details on its design and functionalities.

The groundwater effluent pipeline was designed to prevent interference with local transportation including snowmobiling, boating and ATV's. Our design proposes an ATV and snowmobile crossing constructed over a section of the onshore pipeline and parallel to the laydown area fence line. Furthermore, drawing 65-100-210-200 illustrates the location of the proposed ATV and snowmobile crossing.

The design will not affect the use of traditional land during construction and operation.

4.2 ABOVE-GROUND PIPELINE

4.2.1 ONSHORE

The onshore pipe will be installed permanently on the undisturbed natural ground. Signage will be installed in both directions of the traffic near the onshore pipe to indicate the obstacle and the crossing to motorized vehicles.

4.2.2 SUBMARINE PIPELINE

Unlike the conceptual design presented during the FEIS process, Agnico Eagle is proposing not to bury the pipeline located in the intertidal zone. This proposed design will result in reducing the impacts on the environment and community (i.e. eliminate need to re-open the Itivia quarry, reduce risk of erosion and sedimentation into Melvin Bay during pipe installation and reduce risk of pipe being moved by ice during winter).

The submarine pipeline is segmented into two sections, a temporary (removable) and a permanent section. The first 150 m long section located south of the crossing must be removed from the Melvin Bay before Winter since the formation of ice could damage the pipe. The temporary section will be re-installed at freshet once the ice has broken up. The temporary pipe is removable by its flanges located at the extremities of the 150 m section.

On the other hand, the permanent section of the submarine pipeline will be at least 6 m below sea level and will stay in place year-round. A diffuser is connected at the end of the pipe.

4.3 MATERIAL

4.3.1 PIPELINES

The effluent discharge pipeline will be made of Sclairpipe HDPE DR-9 PE4710. Also, the pipeline will be welded using a fusion welding machine except at it's flanges. The pipe's dimension ratio was selected based on the need for high rigidity. The chemical properties of HDPE pipes make it highly resistant to saline water. Finally, HDPE pipelines are easier to install in a marine environment compared to other materials (e.g. steel).

4.3.2 FLANGES, VALVES AND ACCESSORIES

The pipeline's temporary section has two HDPE flanges at its extremities to enable it to be removed and installed again, when necessary. A back-up ring will be inserted in-between each flange connections and then mechanically fastened to ensure tightness. The ring will be designed to resist low water temperatures as well as salinity.

4.3.3 BALLAST WEIGHTS

The ballast weights will be installed at a 1.52 m interval along the submarine pipeline. The ballast weights must weigh 67.6 pounds to keep the pipeline floating when filled with air, until it is in the projected alignment. Once the pipeline is filled with water, the ballast weights will sink and hold the pipeline onto the seabed. The ballast weight will allow the installation of the pipeline underwater.

4.4 EQUIPMENT

4.4.1 FLOWMETER

As mentioned in section 3.6, a flowmeter will be installed downstream of the pumping station to measure the flow rate before discharge into the marine environment.

5 DESIGN OF DIFFUSER AND MODELLING RESULTS

5.1 DIFFUSER CONFIGURATION

The optimized diffuser has the following configuration:

- Diffuser connection with outfall through a 6'' five-way cross;
- Length of the diffuser: 0.9 m;
- Diameter of the diffuser: 150 mm, DR-9 (nominal);
- Diffuser depth: 20 m (based in 2017 bathymetry survey of Melvin Bay);
- Discharge type: single port;
- Horizontal angle of discharge: Perpendicular to bathymetric contours;
- Vertical angle of discharge: 90°;
- Port diameter: 75 mm, DR-9 (nominal);
- Port height from seabed: 1 m.

For more detailed information, refer to construction drawing 65-100-210-200 in Appendix A.

6 CONSTRUCTION

6.1 GENERAL

Construction is expected to begin in May 2019 and end in August 2019.

6.1.1 PIPELINE

The pipeline sections will be welded on shore into three major segments; the onshore segment as well as the temporary and permanent submarine segments.

The ballast weights will be installed onshore only when the submarine segments are welded together. Initially, the ballast weights will be stockpiled adjacent to the work station. Then, a ramp or skid way, including railroad tracks or steel beams, will be placed to facilitate moving the weights along with the pipe.

The pipeline is ready for launching when all the ballast weights are fixed to the pipeline. To keep the pipeline floating until the sinking operation, the pipe ends are blocked to prevent water from entering the pipe. This will be accomplished by installing a flange assembly with a blind flange at each end.

Before the launch, the ramp of the skidway will extend deep enough into the water so that the weights can be supported by the floating pipe. In case of high currents, an anchorage system will be installed to hold the pipe while it is being launched. A boat with a winch and cable system will be used to move the pipeline into the water. It may be necessary to install guide cables and shore anchors to hold the system over the alignment when it is being sunk.

The sinking process consists of filling the pipe with water at one end and evacuating the air out of the other end.

The construction of the pipeline onshore and under water will not interfere with the local community activities. During construction, vertical lighting signs will be installed onshore to alert incoming traffic at Itivia Harbor. The lighting will be oriented with caution, towards the working area and away from the airstrip take off and landing area.

6.1.2 STORAGE TANK

The installation of the storage tank will require the use of a lifting mobile equipment. The storage tank measures 12.2 m long x 3.3 m wide and weighs 15 m.t. It will be set in place with the M & T KoneCrane ReachStacker Model SMV 4531. Its maximum vertical extension is 18.2 m but just to lift the storage tank off a flat bed and set in place, it would be extended about two thirds that height.

6.1.3 CONTAINMENT PAD (NEAR ITIVIA FUEL STORAGE FACILITY)

The Containment pad will be built to minimize land disturbance and environmental risks. Therefore, the pad is to be built 31 m away from the Highest High Water Large Tide (HHWLT).

Once the subgrade is prepared, an HDPE geomembrane is installed with underlying and overlying granular material. Also, berms are to be constructed around and higher than the containment pad. This gives the pad the capacity to contain the volume of effluent inside the storage tank in case of spillage.

The pad will facilitate daily operations such as maneuvering the tanker trucks to unload the groundwater effluent into the storage tank.

The construction of the containment pad will require an excavator, tandem trucks, a spread dozer and a compactor. The tallest heavy equipment on site will be the CAT 330 excavator. It has a maximum vertical reach of 10.7 m but will not be deployed to this height since the work will occur at ground level only.

6.2 MATERIAL SPECIFICATIONS

All the materials used to fabricate the facility are non-potentially acid generating (NPAG) materials. The granular materials that will be used for building the containment pad will be sourced from a nearby borrow pit.

6.3 CONSTRUCTION QUALITY CONTROL AND SURVEY

Agnico Eagle is responsible for conducting quality control and surveying during construction.

6.4 TESTING AND INSPECTION

Agnico Eagle is responsible for testing and inspecting the saline discharge effluent system according to the manufacturer's recommendations before its start-up. After the pipeline installation, diver's will verify that the ballasts holding the pipeline are all properly sitting on the bottom contours and that the pipeline is not resting on any rocks, debris or material that could cause damage.

7 OPERATIONS

7.1 REMOVABLE AND PERMANENT PIPE

As stated in section 4.2.2, operation of the saline effluent discharge requires installing and removing a temporary segment of the pipeline at freshet and Winter, respectively. The temporary segment will be removed and stored away before the bay freezes up.

The temporary section of pipe can be disconnected from the system at its flanges and will have to be pulled out using heavy equipment. Agnico Eagle is responsible for storing this pipeline segment on their property during Winter.

7.2 MAINTENANCE PROGRAM

Agnico Eagle will have in place a maintenance program based on manufacturer's recommendations. The system will be inspected according to the manufacturer's recommendations and repaired when needed to keep the system in good working condition.

8 REFERENCES

Agnico Eagle. 2018a. Meliadine Gold Project Groundwater Management Plan. Version 1. February 2018.

Golder. 2019. Modelling Assessment of Groundwater Discharge into the Melvin Bay Marine Environment, Rev B. February 2019.

Agnico Eagle (Agnico Eagle Mines Limited). 2014. Final Environmental Impact Statement (FEIS) - Meliadine Gold Project, Nunavut from: ftp://ftp.nirb.ca/02REVIEWS/ACTIVE%20REVIEWS/11MN034-AgnicoEagle%20MELIADINE/2-REVIEW/09-FINAL%20EIS/FEIS Accessed on November 2014.

Agnico Eagle. 2018b. Meliadine Gold Project Water Management Plan. Version 3. 6513-MPS-11. March 2018.

Appendix A: Construction drawings

NO. DESSIN
DRAWING NO. 65-180-230-200-1_R1

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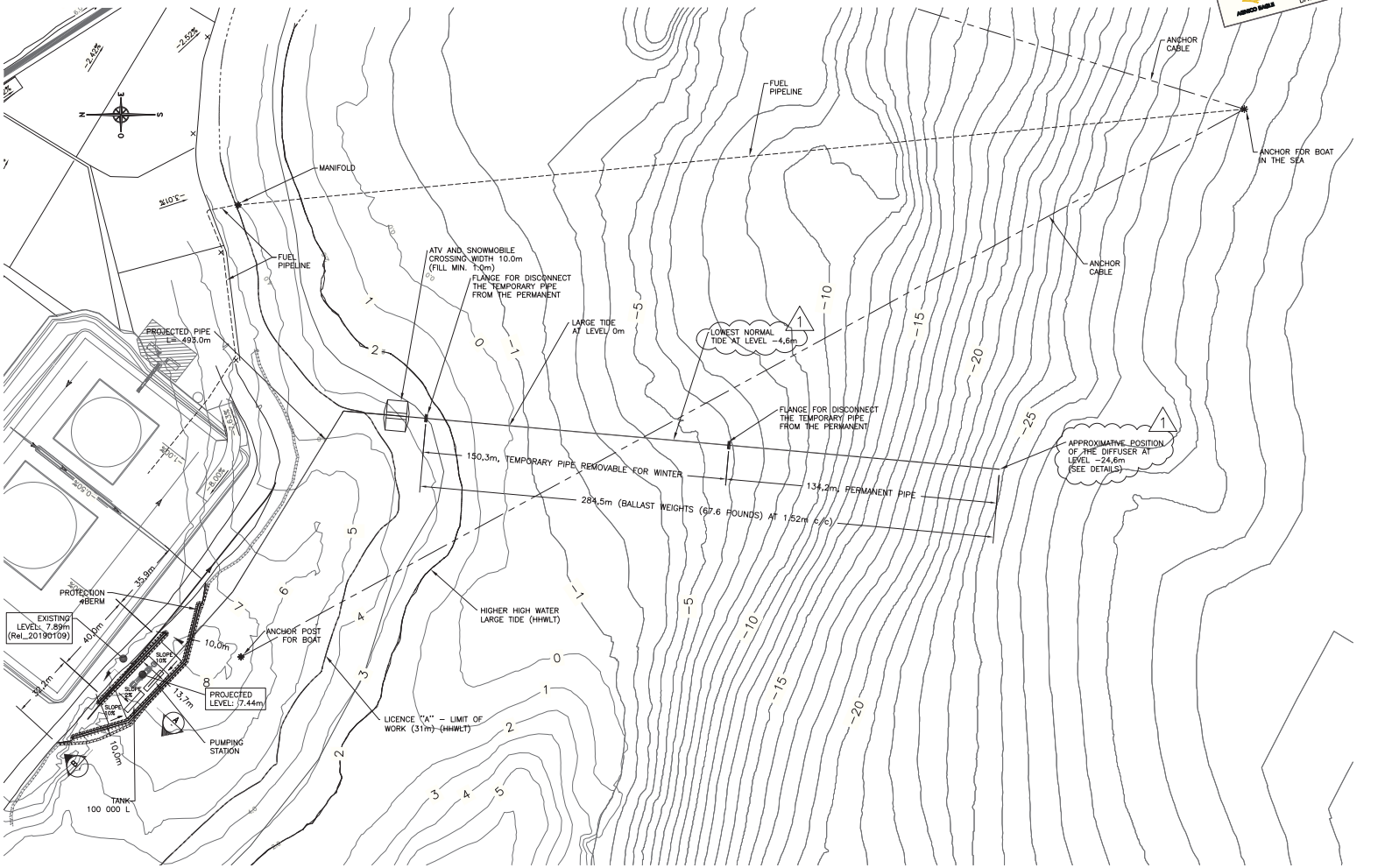

PLAN VIEW
Scale: 1: 1000

PLAN CLÉ
KEY PLAN

wsp
1075, 24e AVENUE E
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AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
1	2019-02-14	ISSUED FOR CONSTRUCTION	J.C.	S.D.	
0	2019-02-06	ISSUED FOR CONSTRUCTION	J.C.	S.D.	

REVISIONS

Stephan Dupuis 139557 PQ/QC
2019-02-14

TITRE / TITLE
AGNICO EAGLE – MEL IADINE DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
230 – GENERAL EARTH WORKS
SALINE WATER STORAGE FACILITY
RANKIN INLET
PLAN VIEW

DESSINÉ PAR / DRAWN BY	JULIE.CROTEAU, tech.	DATE 2018-12-12
VÉRIFIÉ PAR / CHECKED BY	YOUSSEF HESSANI, Ing.	2019-02-06
APPROUVÉ PAR / APPROVED BY	STEPHAN DUPUIS, P. Eng.	2019-02-14
ÉCHELLE / SCALE	INDICATED	DATE 2018-12-12

NO. DESSIN / DRAWING NO. 65-180-230-200-1

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
6528	1	1 / 2

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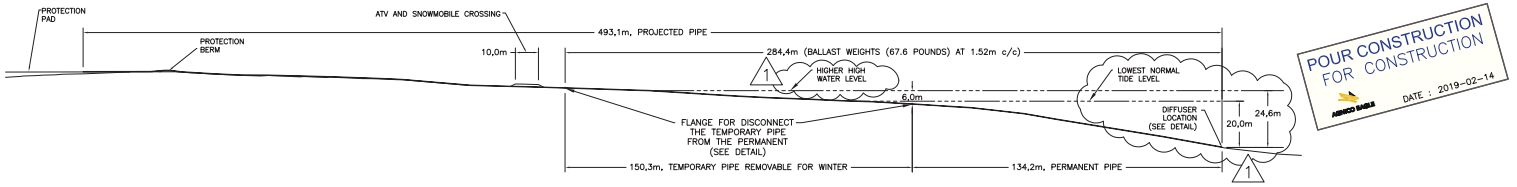

POUR CONSTRUCTION
FOR CONSTRUCTION
AGNICO EAGLE
DATE : 2019-02-14

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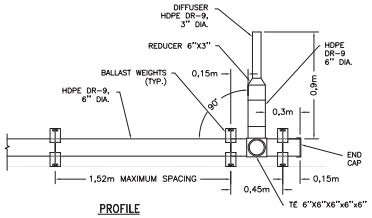

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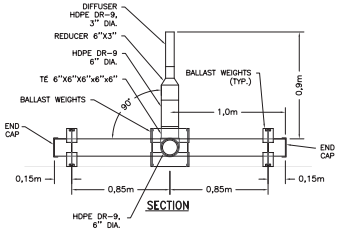

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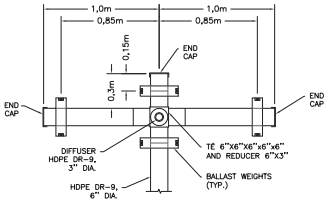

PLAN VIEW

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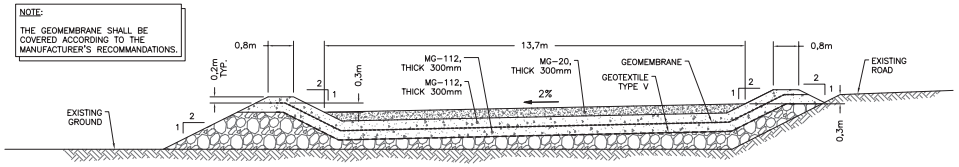

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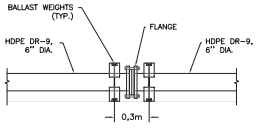

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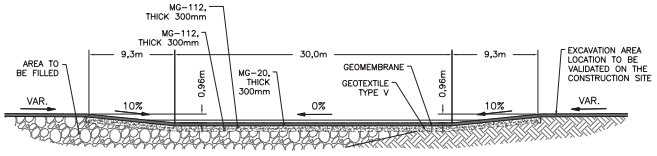

SECTION "B" – PAD
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NOTES:

1) FOR THE INSTALLATION, THE CONTRACTOR NEED TO REFER TO THE HANDBOOK OF PE PIPE CHAPTER 10, MARINE INSTALLATION. EACH SECTION OF PIPE MUST BE JOINT BY FUSION, EXCEPT FOR THE TEMPORATY PIPE REMOVABLE FOR WINTER THEY ARE CONNECTING TO THE PERMANENT PIPES WITH FLANGE FUSED AT EACH END BACK-UP RING.

2) POST-INSTALLATION SURVEY

UPON COMPLETION OF THE INSTALLATION OF A SUBMERGED PIPELINE, IT IS ADVISABLE TO HAVE THE COMPLETE LINE SURVEYED BY A COMPETENT DIVER TO ENSURE THAT:

- THE PIPELINE IS LOCATED WITHIN THE PRESCRIBED RIGHT-OF-WAY;
- THE BALLASTS HOLDING THE PIPELINE ARE ALL PROPERLY SITTING ON THE BOTTOM CONTOUR AND THAT THE LINE IS NOT FORCED TO BRIDGE ANY CHANGES IN ELEVATION;
- THE PIPE IS NOT RESTING ON ANY ROCKS, DEBRIS OR MATERIAL THAT COULD CAUSE DAMAGE;
- ANY AUXILIARY LINES, SUCH AS HOSES, ROPES, BUOYANCY BLOCKS OR ANY OTHER EQUIPMENT USED DURING THE INSTALLATION HAS BEEN REMOVED;
- WHERE REQUIRED, THE PIPE HAS BEEN BACKFILLED AND THE BACKFILLING WAS DONE PROPERLY;
- ALL OTHER INSTALLATION REQUIREMENTS ESTABLISED BY THE DESIGNER FOR THE SUBJECT APPLCATION HAVE BEEN COMPLIED WITH.

PLAN CLÉ
KEY PLAN

wsp
1075, 3e AVENUE E
VAL-D'OR (QUÉBEC) CANADA J9P 0M1
TEL.: +1 (819) 825-5411 TÉLÉC.: +1 (819) 825-5413 WWW.WSPGLOBAL.COM

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AGNICO EAGLE

REV.	DATE	DESCRIPTION	DWN/BY	APP.	CLIENT
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0	2019-02-06	ISSUED FOR CONSTRUCTION	J.C.	S.D.	

REVISIONS

2019-02-14

TITRE / TITLE
AGNICO EAGLE – MELIADINE DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
230 – GENERAL EARTH WORKS
SALINE WATER STORAGE FACILITY
RANKIN INLET
DETAILS

DESSINÉ PAR / DRAWN BY	JULIE.CROTEAU, tech.	DATE 2018-12-12
VÉRIFIÉ PAR / CHECKED BY	YOUSSEF HESSANI, Ing.	2019-02-06
APPROUVÉ PAR / APPROVED BY	STEPHAN DUPUIS, P. Eng.	2019-02-14
ÉCHELLE / SCALE	INDICATED	DATE 2018-12-12

NO. DESSIN / DRAWING NO. 65-180-230-200-2

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
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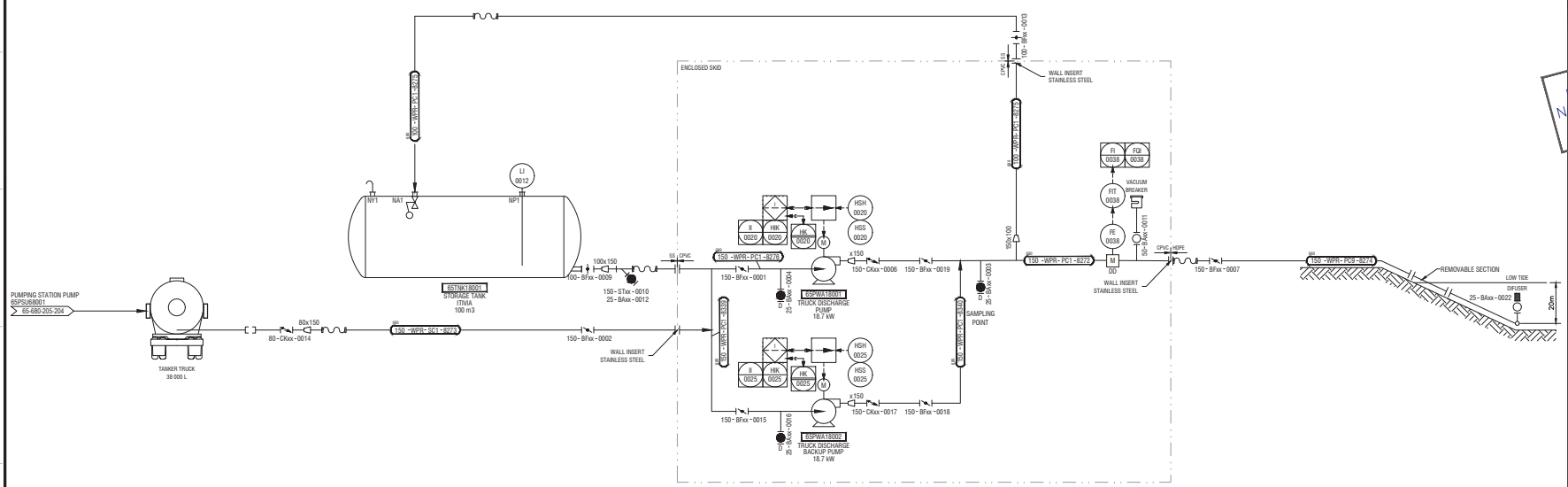

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PLAN CLÉ
KEY PLAN

NOTES GÉNÉRALES / GENERAL NOTES

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REVISIONS

08/02/2019

TYPE / TITLE
AGNICO EAGLE – MEADOWBANK DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
205 – PIPING & INSTRUMENTATION DIAGRAM
RANKIN INLET
ITIVIA

DESSINÉ PAR / DRAWN BY	JONATHAN LAVOIE	DATE 2019-01-17
VÉRIFIÉ PAR / CHECKED BY	SÉBASTIEN PERRON	2019-02-07
APPROUVÉ PAR / APPROVED BY	ÉRIC LAVOIE, P. Eng.	2019-02-07
ÉCHELLE / SCALE	NO SCALE	DATE 2019-01-23

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NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
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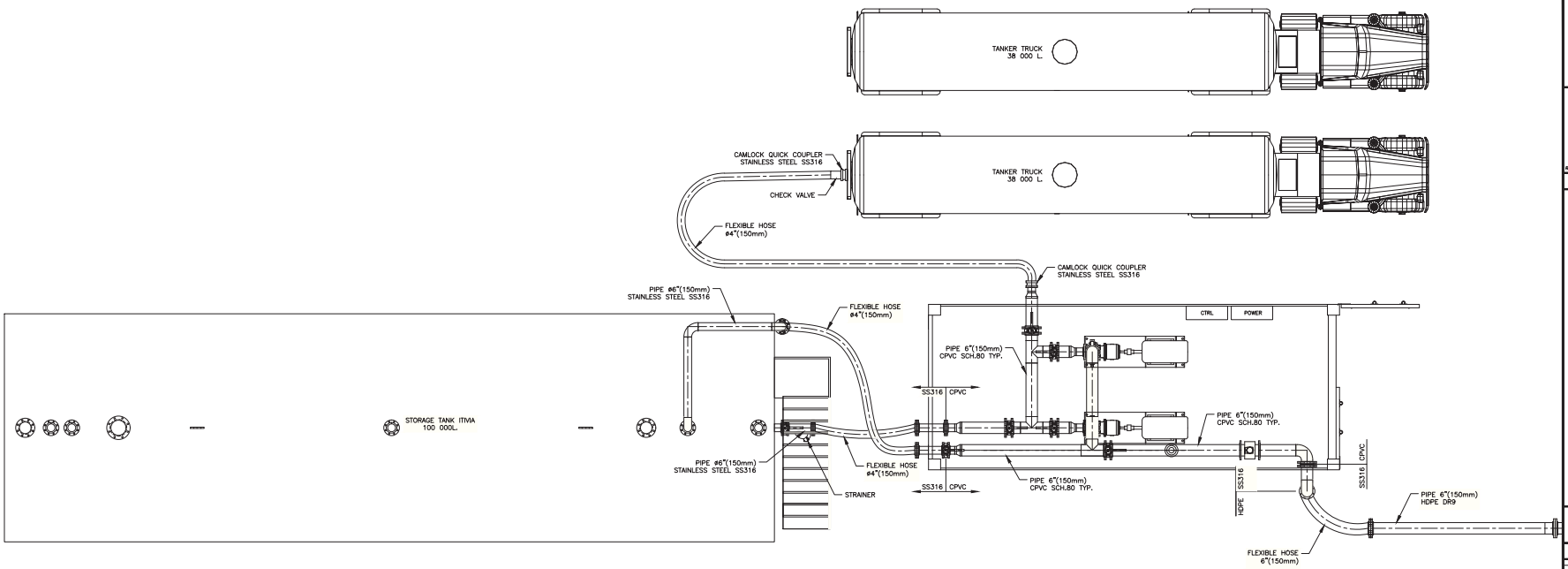

PLAN VIEW – SALINE EFFLUENT DISCHARGE SYSTEM
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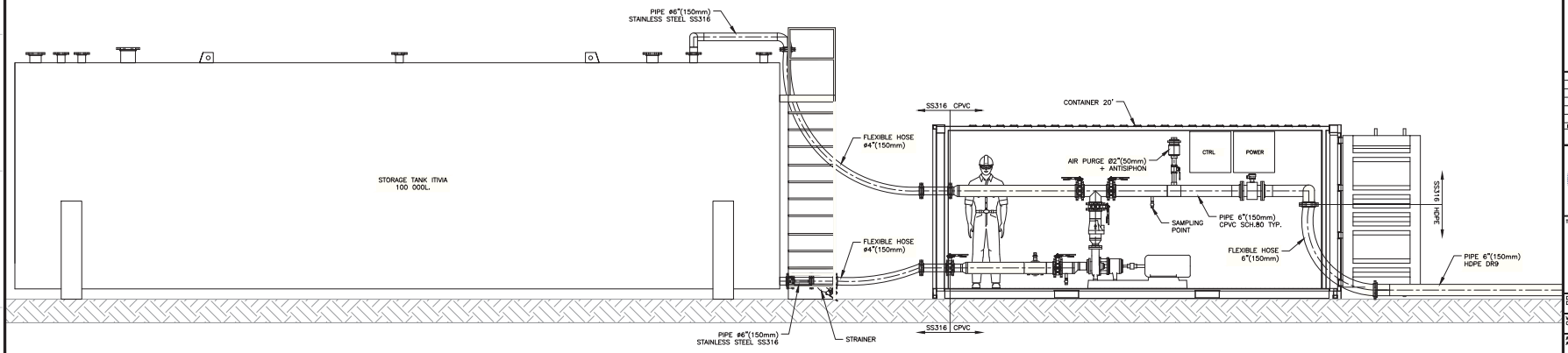

ELEVATION VIEW – SALINE EFFLUENT DISCHARGE SYSTEM
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PLAN CLÉ
KEY PLAN

wsp
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0	2019-02-06	ISSUED FOR TENDER	C.G.	DJR	

REVISIONS

INGÉNIEUR - CONSEIL
Dominique Richard
30/04/2019
QUÉBEC

REGISTERED PROFESSIONAL ENGINEER
D. RICHARD
RTNU
LIMITED

TITRE / TITLE
AGNICO EAGLE – MELIADINE DIVISION
180 – SALINE EFFLUENT DISCHARGE SYSTEM
210 – GENERAL ARRANGEMENT
RANKIN INLET
ITIVIA

DESSINÉ PAR / DRAWN BY	CLAUDIA GILBERT	DATE 2019-01-30
VERIFIÉ PAR / CHECKED BY	SYLVAIN DÉFOSSÉ	2019-02-05
APPROUVÉ PAR / APPROVED BY	DOMINIQUE RICHARD, Eng.	2019-02-05
ÉCHELLE / SCALE	INDICATED	DATE 2019-01-30

NO. DESSIN / DRAWING NO. 65-180-210-200

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
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FILE NO. 65-180-210-200_R0.dwg

Appendix B: Pumping Station Functional Description

Functional Description

Saline Effluent Discharge at Sea

6528-680-132-REP-001 – Appendix 2

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2019-02-14	R0	Design Report	Sébastien Perron	Alain Corriveau	Éric Lavoie
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Accepted By**

Table of Contents

1. Document objective 1

2. Description 1

2.1 System description – Saline water truck unloading, storage and discharge at sea 1
2.2 Control description – Saline water truck unloading pump 1

1. Document objective

This document describes the programming of the control logic to be implemented for the control system of the discharging at sea of the treated saline effluent water coming from Meliadine site. The system will be installed close to the existing fuel deposit in Rankin Inlet, near the shore of Melvin Bay. The project is for Agnico Eagle's Meliadine mine.

2. Description

2.1 System description – Saline water truck unloading, storage and discharge at sea

Truck loaded with up to 50 000 liters of treated water ready to discharge at the sea will connect their load to a flexible pipe 150mm in diameter. Once connected, the operator will turn on the pump for about 15 to 30 minutes to transfer the water into a 100 000 liters storage tank or by changing the manual valves, directly to the diffuser in the sea. Overflow of the tank will be prevented by a float valve on the filling port. A mechanical level indicator will be installed on the tank. A flowmeter/totalizer will be installed on the sea discharge line in order to double check the volume of water discharged in sea.

The system will be powered by the existing electrical room at the fuel deposit.

2.2 Control description – Saline water truck unloading pump

Start/Emergency Stop button stations will be installed near the pumps.

Operator will open and close the valves in order to choose:

1. Main Pump or Back up Pump
2. Unload truck to tank, unload truck to sea or unload tank to sea

END OF SECTION

Appendix C: Sclairpipe Technical Specification

uponor

Sclairpipe®

VERSATILE HIGH DENSITY POLYETHYLENE PIPE



Sclairpipe

Sclairpipe® high density polyethylene (HDPE) pipe represents the latest advances in both material and manufacturing techniques. Since 1968, Sclairpipe has been proven in a wide range of municipal and industrial piping applications. It has been used extensively in the municipal market for gravity sewers, sewage forcemains, and pressure water systems. Uponor Infra has special expertise in marine installations of Sclairpipe, including river and lake crossings; and river, lake and deep ocean intakes and outfalls.

Lighter. Stronger. Chemical Resistant.

Sclairpipe is a tough, lightweight, solid wall pipe with a smooth internal surface. Available in various diameters from 4″ to 48″ it can handle internal pressures of up to 380 psi (PE 4710). It is a well suited alternative to copper, PVC, ductile iron and concrete pipe in a variety of applications.

Sclairpipe weighs approximately 1/10 that of a similar sized concrete pipe. Handling requires a minimum of heavy equipment and Sclairpipe can easily be assembled on ice or through wet marshy areas. It will not corrode, tuberculate or support biological growth, making it the material of choice in harsh environments. Sclairpipe is inert to salt water and to chemicals likely to be present in sanitary sewage effluent.

Sclairpipe has a smooth ID and maintains its flow capability over time - Hazen Williams C Factor remains 150, even after years of use.

Easier to Transport and Install. Leak Proof.

Sclairpipe is much easier to handle and install than heavier, rigid concrete pipe, offering potential cost savings during the construction process. It is structurally designed to withstand impact, especially in cold weather installations when other pipes are prone to cracks and breaks. Sclairpipe will float even when full of water. For marine applications long lengths of pipe can be assembled on shore and then floated into position.





Thermal butt fusion provides an economical and fast method of delivering a complete, long, continuous length of pipe. Thermal fusion eliminates potential leak points every 8-20 feet commonly found with gasketed (or bell or spigot) pipe materials. The fused joints provide a continuous leak proof system that eliminates the risk of joint leakage due to ground shifting. Fused joints are fully restrained and as such may reduce or eliminate the need for expensive thrust blocks. With Sclairpipe infiltration and exfiltration problems are eliminated.

Sclairpipe Advantages

- Leak Proof
- Corrosion Resistant
- Chemical Resistant
- Long Life
- Fatigue Resistant
- Impact Resistant
- Lightweight
- Flexible
- UV Resistant
- Environmentally Friendly

Cost Effective. Permanent.

Sclairpipe offers distinct advantages. It can be cold bent to a radius as small as 25 times the pipe's nominal pipe diameter, and the installed bend radius can be as small as 50 times the nominal pipe diameter. Scalirpipe, installed on a radius, eliminates many of the fittings that would be required for directional changes when using other pipe materials. In addition, the flexibility of Sclairpipe allows it to adapt to uneven ground, unconsolidated river bottoms and excavated underwater trenches without the need for expensive foundations or minor degree elbows. It is well suited for dynamic soils and areas prone to earthquake.

Sclairpipe is cost effective in both the short and long term. The fact that it is lightweight makes it easier to transport and install. It is leak proof and fatigue resistant means there will be years of maintenance free use. The Plastics Pipe Institute estimates the service life for HDPE pipe to conservatively be 50-100 years.

Proven performance in a wide range of applications

Since its development in 1955, large diameter HDPE pipe has been successfully used in many installations worldwide. In North America, Sclairpipe high density polyethylene pipe was first introduced in 1968. Since then it has been installed for river, lake and salt water crossings, municipal and industrial fresh and salt water intakes and effluent outfalls. Sclairpipe has also been used extensively for pipeline repair and rehabilitation.



Some popular applications of Sclairpipe include:

- Potable Water Distribution
- Pressure Water Systems
- Sewage Systems
- Water Mains
- Sliplining
- Fire Mains
- Directional Drilling
- Trenchless Technologies
- Slurry Pipe
- Mining
- Marine Pipelines & Crossings
- Deep Water Intakes
- Deep Water Outfalls
- Irrigation Lines
- Biofilters
- Gas Gathering



Potable Water

Sclairpipe is used for both new water main installations and to rehabilitate deteriorated piping systems made from other materials. It can accept repetitive pressure surges that far exceed the static pressure rating of the pipe. Sclairpipe is easy to handle and is available in long lengths that cut down on jointing time. Thermal fusion on site reduces installation time and ensures leakproof joints that eliminate infiltration and exfiltration problems. Sclairpipe is well suited for dynamic soils and areas prone to earthquake.



Sewage Systems

After more than 35 years of use in municipal and industrial sewer applications, Sclairpipe has proven to be a reliable, cost effective, long-term solution for sewer and wastewater systems. It offers resistance to corrosion and chemicals with durability and strength that rigid concrete, PVC or ductile iron pipes can't duplicate. Lightweight Sclairpipe is easy-to-install, extremely flexible and does not corrode or tuberculate over time.



Industry

Long-term reliable piping solutions are always in demand by industry. Sclairpipe offers resistance to corrosion, abrasion and chemicals resulting in a durable, strong and cost-effective installation.



Mining



Sclairpipe solid wall HDPE pipe is commonly used in mining applications for tailings disposal and water management including: river water diversion, reclamation lines, culvert, sewer and sub-drainage systems and slurry pipe. It is lightweight, flexible, durable and abrasion resistant. It is virtually leak proof, and can withstand corrosive chemicals, acids or salts commonly found in mines. Sclairpipe combines strength and durability in above ground applications and is UV resistant.

Irrigation



Sclairpipe is a cost effective solution for irrigation and agricultural drainage applications such as river and canal diversion, agricultural irrigation systems and pipelines, and water conservation. It is lightweight, flexible and leak proof, resistant to corrosion and salt water, and joints can be heat-fused on site for ease of installation. A Sclairpipe irrigation system will withstand the test of time.

Heating & Cooling



Sclairpipe has proven to be a strong, leak proof and chemically inert solution for district cooling applications including dual-purpose projects providing cooling and potable water. It can be assembled on shore in a continuous flexible length, floated on the water's surface and then sunk by a controlled process. The pipe can also be manufactured in specific lengths and connected on site by flanges with the aid of marine divers. Sclairpipe's resistance to both corrosion and zebra mussel fouling makes it an ideal solution.

Choose the size that's right for you

Sclairpipe is available in standard Dimensional Ratio's (DR's), in sizes ranging from 4" to 48" in diameter. Sclairpipe is available in PE 3608 and PE 4710. With the higher allowable stress rating of PE 4710, the pipe wall can be thinner for the same pressure rating (higher DR).

The Dimensional Ratio relates the minimum wall thickness of the pipe to its outside diameter, and is important to define the pressure rating of a particular pipe. The maximum continuous operating pressure stated is based on the allowable hydrostatic design stress of each specific material (per ASTM D3350 and PPI's TR-3), and the pipe wall thickness (DR), at a service temperature of 73.4°F.

Uponor, Sclairpipe Product Range, IPS Size, PE3608

	PE3608			DR32.5 (50 psi)			DR26 (64 psi)			DR21 (80 psi)		
Nominal Pipe Size	Minimum Outside Diameter *(inches)*	Maximum Outside Diameter *(inches)*	Average Outside Diameter *(inches)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
4	4.48	4.52	4.50	4.21	0.138	0.83	4.13	0.173	1.03	4.05	0.214	1.26
5	5.54	5.59	5.56	5.20	0.171	1.27	5.11	0.214	1.57	5.00	0.265	1.93
6	6.60	6.65	6.63	6.19	0.204	1.80	6.08	0.255	2.23	5.96	0.315	2.73
7	7.09	7.16	7.13	6.66	0.219	2.08	6.54	0.274	2.58	6.41	0.339	3.16
8	8.59	8.66	8.63	8.06	0.265	3.05	7.92	0.332	3.78	7.75	0.411	4.63
10	10.70	10.80	10.75	10.05	0.331	4.74	9.87	0.413	5.87	9.66	0.512	7.19
12	12.69	12.81	12.75	11.92	0.392	6.66	11.71	0.490	8.26	11.46	0.607	10.12
13	13.31	13.44	13.38	12.50	0.412	7.33	12.28	0.514	9.09	12.02	0.637	11.14
14	13.94	14.06	14.00	13.09	0.431	8.03	12.86	0.538	9.95	12.59	0.667	12.20
16	15.93	16.07	16.00	14.96	0.492	10.49	14.70	0.615	13.00	14.38	0.762	15.94
18	17.92	18.08	18.00	16.83	0.554	13.28	16.53	0.692	16.46	16.18	0.857	20.17
20	19.91	20.09	20.00	18.70	0.615	16.39	18.37	0.769	20.32	17.98	0.952	24.90
22	21.90	22.10	22.00	20.56	0.677	19.83	20.21	0.846	24.58	19.78	1.048	30.13
24	23.89	24.11	24.00	22.43	0.738	23.60	22.04	0.923	29.25	21.58	1.143	35.85
26	25.88	26.12	26.00	24.30	0.800	27.70	23.88	1.000	34.33	23.38	1.238	42.08
28	27.87	28.13	28.00	26.17	0.862	32.13	25.72	1.077	39.82	25.17	1.333	48.80
30	29.87	30.14	30.00	28.04	0.923	36.88	27.55	1.154	45.71	26.97	1.429	56.02
32	31.86	32.14	32.00	29.91	0.985	41.96	29.39	1.231	52.01	28.77	1.524	63.74
36	35.84	36.16	36.00	33.65	1.108	53.11	33.06	1.385	65.82	32.37	1.714	80.67
40	39.82	40.18	40.00	37.39	1.231	65.56	36.74	1.538	81.26	35.96	1.905	99.59
42	41.81	42.19	42.00	39.26	1.292	72.28	38.58	1.615	89.59	37.76	2.000	109.80
48	47.78	48.22	48.00	44.87	1.477	94.41	44.09	1.846	117.02	43.15	2.286	143.42

Pipe dimensions are in accordance with ASTM F714 and AWWA C906
Pressure Ratings are for water at 73.4 deg F.
Some of the pipe sizes and DR's above are available only on request. Check with your representative for availability.
Other dimensions and DR's not listed may be available upon special request.
All dimensions are in inches unless otherwise noted.
Weights are calculated by the methodology established in PPI's TR-7 and are applicable to PE 3608.

The standard stocked length of Sclairpipe pipe is 50 feet, in sizes above 4″ in diameter with longer lengths available on request.

Please visit our web site (www.uponor.ca) and use our online design tools to determine the pipe size best suited to your specific application.

DR17 (100 psi)			DR13.5 (128 psi)			DR11 (160 psi)			DR9 (200 psi)			DR7.3 (254 psi)		
Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
3.94	0.265	1.54	3.79	0.333	1.90	3.63	0.409	2.29	3.44	0.500	2.73	3.19	0.616	3.26
4.87	0.327	2.35	4.69	0.412	2.91	4.49	0.506	3.50	4.25	0.618	4.18	3.95	0.762	4.99
5.80	0.390	3.33	5.58	0.491	4.12	5.35	0.602	4.96	5.06	0.736	5.92	4.70	0.908	7.08
6.24	0.419	3.85	6.01	0.528	4.77	5.75	0.648	5.74	5.45	0.792	6.85	5.06	0.976	8.18
7.55	0.507	5.65	7.27	0.639	6.99	6.96	0.784	8.41	6.59	0.958	10.04	6.12	1.182	11.99
9.41	0.632	8.77	9.06	0.796	10.86	8.68	0.977	13.07	8.22	1.194	15.59	7.63	1.473	18.63
11.16	0.750	12.34	10.75	0.944	15.28	10.29	1.159	18.38	9.75	1.417	21.94	9.05	1.747	26.21
11.71	0.787	13.58	11.27	0.991	16.81	10.80	1.216	20.23	10.22	1.486	24.14	9.49	1.832	28.84
12.25	0.824	14.88	11.80	1.037	18.42	11.30	1.273	22.17	10.70	1.556	26.45	9.93	1.918	31.60
14.00	0.941	19.44	13.49	1.185	24.06	12.92	1.455	28.95	12.23	1.778	34.55	11.35	2.192	41.27
15.76	1.059	24.60	15.17	1.333	30.45	14.53	1.636	36.64	13.76	2.000	43.72	12.77	2.466	52.23
17.51	1.176	30.37	16.86	1.481	37.59	16.15	1.818	45.24	15.29	2.222	53.98	14.19	2.740	64.48
19.26	1.294	36.75	18.55	1.630	45.48	17.76	2.000	54.74	16.82	2.444	65.31	15.61	3.014	78.02
21.01	1.412	43.74	20.23	1.778	54.13	19.37	2.182	65.14	18.35	2.667	77.73	17.03	3.288	92.85
22.76	1.529	51.33	21.92	1.926	63.52	20.99	2.364	76.45	19.88	2.889	91.22	18.45	3.562	108.97
24.51	1.647	59.53	23.60	2.074	73.67	22.60	2.545	88.66	21.40	3.111	105.80	19.87	3.836	126.38
26.26	1.765	68.34	25.29	2.222	84.57	24.22	2.727	101.78	22.93	3.333	121.45			
28.01	1.882	77.75	26.97	2.370	96.22	25.83	2.909	115.80	24.46	3.556	138.19			
31.51	2.118	98.41	30.35	2.667	121.78	29.06	3.273	146.57						
35.01	2.353	121.49	33.72	2.963	150.35	32.29	3.636	180.95						
36.76	2.471	133.94	35.40	3.111	165.76	33.91	3.818	199.49						
42.01	2.824	174.94	40.46	3.556	216.50									

Sclair IPS Cut Sheet_PE3608_r201407

- All dimensions are in inches unless otherwise specified.
- Pressure ratings are based on load durations of 50 years at a service temperature of 73.4F. The HDS (pipe wall allowable stress) for PE 3608 and PE 4710 are 800 psi and 1,000 psi respectively.
- Dimensions and tolerances per ASTM F714. Pipe weights calculated using PPI TR-7 using PE3608 density of 0.953 gm/cc and 0.958 gm/cc for PE4710 materials.
- The ASTM D3350 cell classifications conform to the requirements of the applicable pipe specification (ASTM F714, AWWA C906, etc.).
- Contact Uponor Infra for sizes, DR's and DIPS offering not shown.

Uponor, Sclairpipe Product Range, IPS Size, PE4710												
	PE4710			DR32.5 (64 psi)			DR26 (80 psi)			DR21 (100 psi)		
Nominal Pipe Size	Minimum Outside Diameter *(inches)*	Maximum Outside Diameter *(inches)*	Average Outside Diameter *(inches)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
4	4.48	4.52	4.50	4.21	0.138	0.840	4.13	0.173	1.030	4.05	0.214	1.27
5	5.54	5.59	5.56	5.20	0.171	1.280	5.11	0.214	1.580	5.00	0.265	1.94
6	6.60	6.65	6.63	6.19	0.204	1.81	6.08	0.255	2.24	5.96	0.315	2.75
7	7.09	7.16	7.13	6.66	0.219	2.09	6.54	0.274	2.59	6.41	0.339	3.18
8	8.59	8.66	8.63	8.06	0.265	3.07	7.92	0.332	3.80	7.75	0.411	4.66
10	10.70	10.80	10.75	10.05	0.331	4.77	9.87	0.413	5.91	9.66	0.512	7.24
12	12.69	12.81	12.75	11.92	0.392	6.70	11.71	0.490	8.31	11.46	0.607	10.18
13	13.31	13.44	13.38	12.50	0.412	7.38	12.28	0.514	9.14	12.02	0.637	11.21
14	13.94	14.06	14.00	13.09	0.431	8.08	12.86	0.538	10.02	12.59	0.667	12.28
16	15.93	16.07	16.00	14.96	0.492	10.56	14.70	0.615	13.08	14.38	0.762	16.04
18	17.92	18.08	18.00	16.83	0.554	13.36	16.53	0.692	16.56	16.18	0.857	20.29
20	19.91	20.09	20.00	18.70	0.615	16.49	18.37	0.769	20.44	17.98	0.952	25.06
22	21.90	22.10	22.00	20.56	0.677	19.96	20.21	0.846	24.74	19.78	1.048	30.32
24	23.89	24.11	24.00	22.43	0.738	23.75	22.04	0.923	29.44	21.58	1.143	36.08
26	25.88	26.12	26.00	24.30	0.800	27.87	23.88	1.000	34.55	23.38	1.238	42.34
28	27.87	28.13	28.00	26.17	0.862	32.33	25.72	1.077	40.07	25.17	1.333	49.11
30	29.87	30.14	30.00	28.04	0.923	37.11	27.55	1.154	46.00	26.97	1.429	56.37
32	31.86	32.14	32.00	29.91	0.985	42.22	29.39	1.231	52.34	28.77	1.524	64.14
36	35.84	36.16	36.00	33.65	1.108	53.44	33.06	1.385	66.24	32.37	1.714	81.18
40	39.82	40.18	40.00	37.39	1.231	65.98	36.74	1.538	81.77	35.96	1.905	100.22
42	41.81	42.19	42.00	39.26	1.292	72.74	38.58	1.615	90.16	37.76	2.000	110.49
48	47.78	48.22	48.00	44.87	1.477	95.01	44.09	1.846	117.76	43.15	2.286	144.32

Pipe dimensions are in accordance with ASTM F714 and AWWA C906
Pressure Ratings are for water at 73.4 deg F.
Some of the pipe sizes and DR's above are available only on request. Check with your representative for availability.
Other dimensions and DR's not listed may be available upon special request.
All dimensions are in inches unless otherwise noted.
Weights are calculated by the methodology established in PPI's TR-7 and are applicable to PE4710

Product innovation and quality assurance

For 50 years Uponor Infra has been a leader in the design, development, manufacture and support of polyethylene piping systems. Uponor Infra's experienced engineers can offer design and engineering assistance, assuring you of a dependable piping system designed to meet your needs. Visit our website (www.uponor.ca) and see how our innovative online calculator can assist you. Extensive R&D in the early 1960's led us to produce 16" diameter polyethylene pipe at a time when many considered large diameter polyethylene pipes a technical impossibility. Today Uponor Infra produces solid wall Sclairpipe in sizes up to 48".

All Uponor Infra products are manufactured from special, high strength resins with complete quality control maintained from raw material to finished pipe product. Uponor Infra was the first North American manufacturer of polyethylene pipe and fittings to have its Quality Management System registered to the ISO 9001:2008 level.

Our strict manufacturing specifications are verified daily, using precise dimensional controls and accelerated long term hydrostatic testing. A continuous quality control process assures you of long-term pipe performance. We certify that the pipe resin used to extrude Sclairpipe has a minimum cell classification of PE 345464C or PE445474C respectively, when classified in accordance with ASTM D3350. Sclairpipe's material classification is based on PPI's (Plastic Pipe Institute) method of determining and validating the Long-Term Hydrostatic Stress (LTHS) of polyethylene pipe.

DR17 (125 psi)			DR13.5 (160 psi)			DR11 (200 psi)			DR9 (250 psi)			DR7.3 (317 psi)		
Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*	Average Inside Diameter *(inches)*	Minimum Wall Thickness *(inches)*	Average Weight *(lbs/ft)*
3.94	0.265	1.55	3.79	0.333	1.91	3.63	0.409	2.30	3.44	0.500	2.75	3.19	0.616	3.28
4.87	0.327	2.36	4.69	0.412	2.93	4.49	0.506	3.52	4.25	0.618	4.20	3.95	0.762	5.02
5.80	0.390	3.35	5.58	0.491	4.15	5.35	0.602	4.99	5.06	0.736	5.96	4.70	0.908	7.12
6.24	0.419	3.88	6.01	0.528	4.80	5.75	0.648	5.78	5.45	0.792	6.89	5.06	0.976	8.23
7.55	0.507	5.68	7.27	0.639	7.03	6.96	0.784	8.47	6.59	0.958	10.10	6.12	1.182	12.07
9.41	0.632	8.83	9.06	0.796	10.93	8.68	0.977	13.15	8.22	1.194	15.69	7.63	1.473	18.75
11.16	0.750	12.42	10.75	0.944	15.37	10.29	1.159	18.50	9.75	1.417	22.08	9.05	1.747	26.37
11.71	0.787	13.67	11.27	0.991	16.92	10.80	1.216	20.36	10.22	1.486	24.29	9.49	1.832	29.02
12.25	0.824	14.98	11.80	1.037	18.53	11.30	1.273	22.31	10.70	1.556	26.62	9.93	1.918	31.79
14.00	0.941	19.56	13.49	1.185	24.21	12.92	1.455	29.13	12.23	1.778	34.76	11.35	2.192	41.53
15.76	1.059	24.76	15.17	1.333	30.64	14.53	1.636	36.87	13.76	2.000	44.00	12.77	2.466	52.56
17.51	1.176	30.56	16.86	1.481	37.82	16.15	1.818	45.52	15.29	2.222	54.32	14.19	2.740	64.89
19.26	1.294	36.98	18.55	1.630	45.77	17.76	2.000	55.08	16.82	2.444	65.72	15.61	3.014	78.51
21.01	1.412	44.01	20.23	1.778	54.47	19.37	2.182	65.55	18.35	2.667	78.22	17.03	3.288	93.44
22.76	1.529	51.65	21.92	1.926	63.92	20.99	2.364	76.93	19.88	2.889	91.80			
24.51	1.647	59.90	23.60	2.074	74.13	22.60	2.545	89.22	21.40	3.111	106.46			
26.26	1.765	68.77	25.29	2.222	85.10	24.22	2.727	102.42	22.93	3.333	122.22			
28.01	1.882	78.24	26.97	2.370	96.83	25.83	2.909	116.53						
31.51	2.118	99.02	30.35	2.667	122.55	29.06	3.273	147.49						
35.01	2.353	122.25	33.72	2.963	151.29									
36.76	2.471	134.78	35.40	3.111	166.80									
42.01	2.824	176.04												

Uponor_Sclair_IPS_PE4710_r201407

Innovative joining methods and equipment

Sclairpipe piping systems can be assembled by heat fusion (butt, electrofusion, socket and saddle fusion), flanged connections, compression couplings and various mechanical couplings. The superior performance of Sclairpipe results from the combination of pipe and fittings designed to work together as a complete system. A full range of pressure rated fittings is available to suit any application.

The most popular method of joining Sclairpipe is thermal butt fusion. This fast and economical technique permits the quick assembly of long continuous lengths and the joining of fittings to the pipe. The fused joints are as reliable and strong as the pipe itself, fully restrained, providing continuous leak proof systems.

Ordering & shipping information

Uponor Infra welcomes your inquiries for non-standard sizes, lengths and pressure ratings of Sclairpipe pipe.

We can meet most special packaging requirements and provide custom pipe fittings. Please contact your local Uponor Infra representative or visit our web site.

The charts below outline standard shipment sizes for straight length and coiled pipe.



Standard Shipments - Straight Lengths

IPS PIPE				
PIPE SIZE	AVG OD	BUNDLE QTY	TRUCK LOAD QTY	CONTAINER QTY
4"	4.50	38	380	480
5"	5.563	23	276	320
6"	6.625	20	200	208
7"	7.125	17	136	180
8"	8.625	14	112	120
10"	10.750	11	66	80
12"	12.750	4	56	52
13"	13.375	42		48
14"	14.000	42		42
16"	16.000	30		30
18"	18.000	25		25
20"	20.000	20		20
22"	22.000	16		16
24"	24.000	16		14
26"	26.000	9		9
28"	28.000	9		9
30"	30.000	9		9
800mm	31.594	9		9
32"	32.000	9*		8
36"	36.000	4		6
1000mm	39.469	4		4
42"	42.000	4		4
1200mm	47.382	4		3
48"	48.000	4*		3

Notes:
* Bunks required
** Drop deck trailer - maximum 42' length
Pipe lengths range from 40 to 50 feet in size



Sclairpipe general specifications & material standards

Pipe and Fittings

REFERENCE SPECIFICATIONS

ASTM F714: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR). Based on outside diameter.
CSA B137.1: Polyethylene Pipe, Tubing and Fittings for Cold Water Pressure Services.
ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
AWWA C901: Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. Through 3 in. for Water Service.
ASTM D3035: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR). Based on Controlled Outside Diameter
ISO 9001:2008: Model for Quality Assurance in Production and Installation.
AWWA C906: Standard for Polyethylene (PE) Pressure Pipe and Fittings 4 in. Through 63 in., for Water Distribution.NSF 14, 61

MATERIAL

The pipe shall be made from polyethylene resin compound with a minimum cell classification of PE 345464C for PE 3608 materials and PE445474C for PE 4710 materials in accordance with ASTM D3350. This material shall have a Long Term Hydrostatic Strength of 1600 psi when tested and analyzed by ASTM D2837, and shall be a Plastic Pipe Institute (PPI) TR4 listed compound. The raw materialshall contain a minimum of 2%, well dispersed, carbon black. Additives, which can be conclusively proven not to be detrimental to the pipe may also be used, provided that the pipe produced meets the requirements of this standard. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification and from the same raw material supplier. Compliance with the requirements of this paragraph shall be certified in writing by the pipe supplier, upon request. Manufacturer's Quality System shall be certified by an appropriate independent body to meet the requirements of the ISO 9001:2008 Quality Management Program.

PIPE DESIGN

The pipe shall be designed in accordance with the relationships of the ISO-modified formula (see ASTM F714).

$$P = \frac{2S}{(D°/t) - 1}$$

where, S = Hydrostatic Design Stress (psi)
P = Design Pressure Rating (psi)
D° = ODavg for IPS Pipe
ODmin for ISO Pipe
t = Minimum Wall Thickness
D°/t = Dimension Ratio

The design pressure rating P shall be derived using the formula above, expressed in pounds per square inch.
The Hydrostatic Design Stress for PE 3608 materials is 800 psi and for the PE4710 materials is 1000 psi.
The pipe dimensions shall be as specified in manufacturer's literature.

MARKING

The following shall be continuously printed on the pipe or spaced at intervals not exceeding 5 feet:
Name and/or trademark of the pipe manufacturer.
Nominal pipe size.
Dimension ratio.
The letters PE followed by the polyethylene grade per ASTM D3350, followed by the Hydrostatic Design stress in 100's of psi e.g. PE 3608.
Manufacturing Standard Reference e.g. ASTM F 714
A production code from which the date and place of manufacture can be determined.

JOINING METHODS

Whenever possible, polyethylene pipe should be joined by the method of thermal butt fusion as outlined in ASTM F2620, Standard Practice for Heat Fusion Joining of PE Pipe and Fittings. Butt fusion joining of pipe and fittings shall be performed in accordance with the procedures recommended by the manufacturer. The temperature of the heater plate should be between 400°F and 450°F. Follow the recommendations of ASTM F2620 regarding interfacial pressures for pipe wall thickness less than or equal to 1.5". Follow the manufacturer's recommendations regarding interfacial pressures for pipe walls thicker than 1.5".

Polyethylene pipe may be connected to fittings or other piping systems by means of a flanged assembly consisting of a polyethylene flange adapter or stub end, and a metal backup ring that has a bolting pattern meeting the dimensional requirements of Class 150, ANSI B16.1/B16.5 in sizes up through 24", and meeting Class 150 Series A, ANSI B16.47 or AWWA C207 Class B for larger sizes. Follow the manufacturer's recommendations regarding bolting techniques and the use of gaskets. Pipe or fittings may be joined by butt fusion only by technicians who have been trained and qualified in the use of the equipment.

GENERAL REQUIREMENTS

The pipe manufacturer shall provide, upon request, an outline of quality control procedures performed on polyethylene system components.

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Appendix D: Modelling Assessment of Groundwater Discharge into Melvin Bay Marine Environment, Rev B (Golder, 2019)

GOLDER

TECHNICAL MEMORANDUM

DATE February 1, 2019 **Project No.** Doc718_1773384 _Rev0

TO Manon Turmel
Agnico Eagle Mines Ltd.

CC Ryan Vanengen, Carolina Leseigneur Torres

FROM Shouhong Wu and Bruce Dean, Golder Associates Ltd. **EMAIL bruce_dean@golder.com**

MODELLING ASSESSMENT OF GROUNDWATER DISCHARGE INTO THE MELVIN BAY MARINE ENVIRONMENT, REV B

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Agnico Eagle Mines Limited (Agnico Eagle) to undertake a modelling assessment of groundwater discharge into the marine environment near Rankin Inlet. This modelling assessment consisted of nearshore oceanographic modelling of the discharge. The study did not include geotechnical, structural or hydraulic engineering assessments of the outfall. This technical memorandum was updated to account for an additional modelling scenario and updated baseline data collected by Golder from Melvin Bay in September 2018 as well as to account for increased discharge velocity resulting from a change to the diffuser port size. This memorandum should be read in conjunction with "Important Information and Limitations of this Report".

1.1 Scope of Work

The objective of this work is to assess the near field mixing of the treated groundwater effluent disposal with respect to relevant environmental guidelines. The scope of the work includes:

- Near field modelling of dispersion of treated groundwater effluent plume using CORMIX (Doneker and Jirka 2007).
- Assess the plume dilution behavior.

For the purpose of this scope of this work, it is assumed that the discharges will consists of only pumped water at quantities and qualities per the estimated underground inflow volumes (Golder 2016) and estimated groundwater inputs to surface storage for management (Agnico Eagle 2017). Section 2.1 describes the modelling conditions.

1.2 Physical Setting

In September 2018, a field program was conducted by Golder in Melvin Bay. Field parameters measured included temperature, conductivity, pH, dissolved oxygen, salinity, and oxidation-reduction potential. The measurement depth ranged from 0.3 m to 26.7 m at three different locations in Melvin Bay (i.e., the exposure area and two new reference areas). The field measurement results are summarized in Appendix A. Nearshore bathymetry (Agnico Eagle 2017 data) and the approximate discharge location is shown in Figure 1, to the south of the Tank Farm at the Itivia Fuel Storage Facility. Based on the bathymetry of Melvin Bay at Itivia Harbour, the diffuser would be placed on the seabed at a depth of approximately 20 m, to ensure an unconstrained mixing zone and to avoid interference with use of Itivia Harbour by ships and boats at high and low tide.

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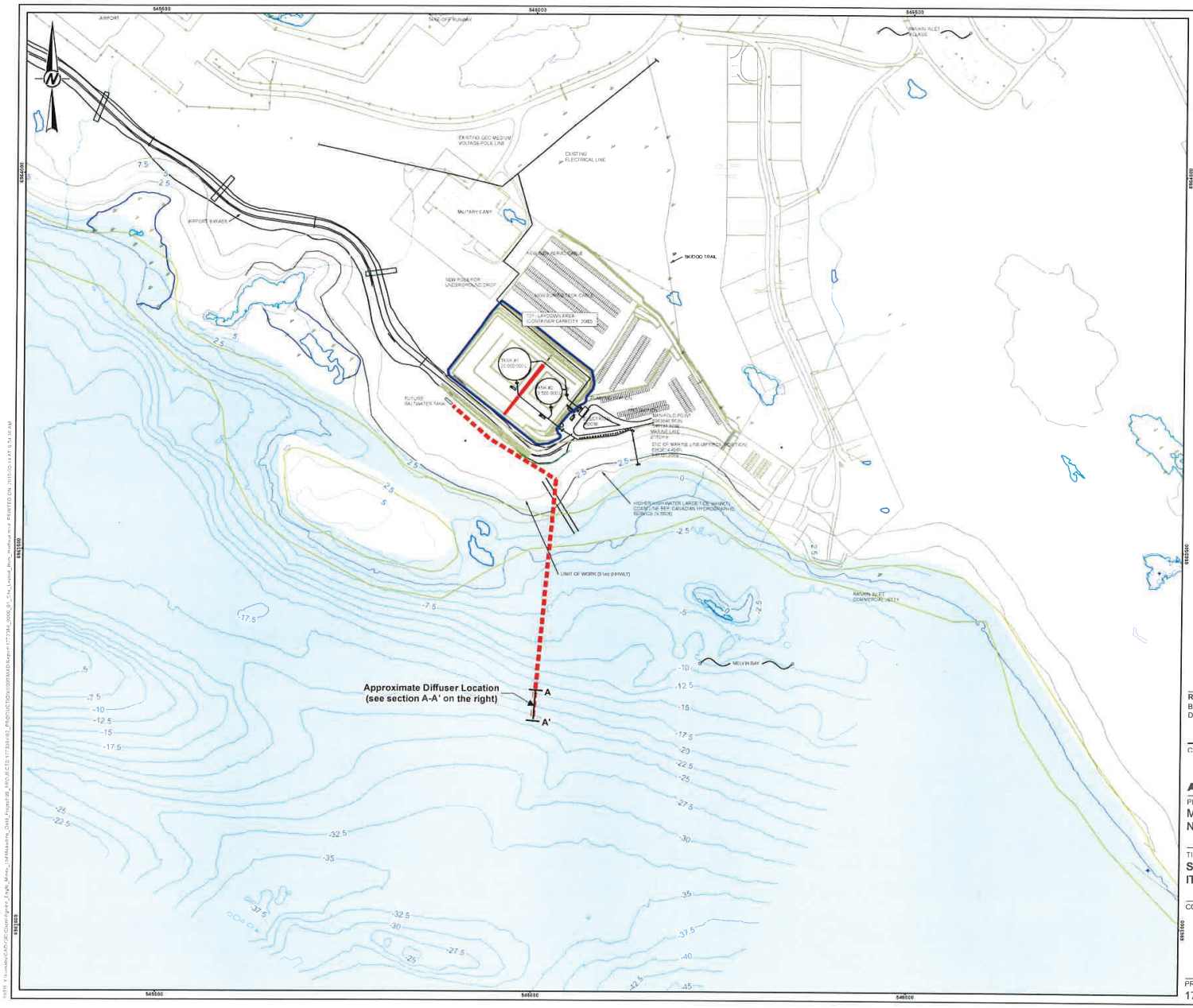
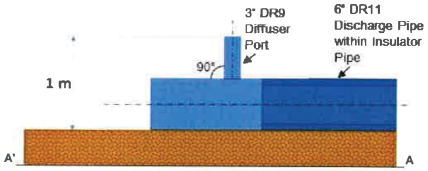


LEGEND

- GENERAL AREA FOR THE DIFFUSER LOCATION
- CROSS SECTION LOCATION
- WATERCOURSE
- WATERBODY
- REEF

End of Discharge Pipe – Diffuser Port Design (HDPE Pipe)



NOT FOR CONSTRUCTION

0 100 200
1:5,000 METRES

REFERENCE(S)
BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED

PROJECT
MELIADINE GOLD MINE
NUNAVUT

TITLE
SITE LAYOUT
ITIVIA HARBOUR SITE

CONSULTANT
GOLDER

YYYY-MM-DD	2019-02-14
DESIGNED	CLT
PREPARED	CDB/MH
REVIEWED	BD
APPROVED	MT

PROJECT NO	CONTROL	REV	FIGURE
1773384	9000	0	1

2.0 NEAR FIELD MODELLING

The Cornell Mixing Zone Expert System (CORMIX; Doneker and Jirka 2007) was applied to calculate numerical simulations of the near-field mixing and dilution behavior of treated groundwater effluent entering the nearshore coastal receiving environment in Melvin Bay. CORMIX is one of the most extensively applied models for predicting near-field discharge plume mixing and dilution of both conservative and non-conservative substances in surface water bodies. CORMIX calculates plume boundary interactions to estimate plume fate in terms of dilution and geometry relative to mixing zone regulations (Doneker and Jirka 2007). Nearshore ambient and treated groundwater effluent characteristics required to implement the mixing model are presented in the sections that follow.

2.1 Conditions for Modelling

2.1.1 Ambient Conditions

Assumptions made to characterize the ambient conditions of the receiving marine waters are as follows:

- Weak current: Ambient current velocity of 0.01 m/s and zero wind velocity were considered for this scenario which represented a slack tide condition during ice covered season.
- Mean current: Current speed of 0.2 m/s with no wind was used for this scenario.
- Open water condition: The water temperature and TDS (salinity) were considered to be 0°C (to account for the start and end of the open water season) and 33,300 mg/L, respectively.
- Water depth at discharge location is 20 m.

2.1.2 Discharge Conditions

Following discharge conditions based on estimated underground inflows were used for the near field mixing analysis:

- Flow rate of 800 m^3/d discharged over a 12 hour period (for an equivalent flow rate of 1,600 m^3/day), with TDS of 39,600 mg/L.
- Treated groundwater effluent temperature: 0°C.
- Outfall length: 230 m from the shoreline as shown.
- A single nozzle for discharge which has inside diameter of 68.07 mm (standard 3.0 inch port, DR9 (PE 4710), 252 psi) was used.
- Nozzle elevation from seabed: 1 m.
- Direction of discharge is perpendicular to the bathymetry contour and 90° vertical angle (upward port).

2.1.3 Modelling Scenarios

Table 1 lists the combination of effluent flow rate and ambient current speed in two simulation scenarios. Table 2 lists the CORMIX model input parameters. The target dilution at the edge of the near-field mixing zone is 11 as per analysis presented in Appendix B.

Table 1: Modelling Scenarios

Parameter	Scenario	
	1	2
Treated Groundwater Effluent Rate (m^3/d)[1]	1,600	1,600
Ambient Current Speed (m/s)	0.01	0.20
Discharge Velocity (m/s)	5.1	5.1

Note: 1. Daily flow rate is 800 m^3/day but this volume will be discharged over 12 hours for an equivalent flow rate of 1,600 m^3/day.

Table 2: CORMIX Model Input Parameters

Parameter	Value	Source
Depth at Discharge	20 m	Based on 2017 bathymetry survey completed by Agnico Eagle
Coastal Current (Velocity)	Low = 0.01 m/s Mean = 0.2 m/s	Based on CCG (2008) and assumed
Roughness Value	0.020	Assumed (equivalent to minimum roughness value of similar seabed). This value does not affect vertical jet results.
Wind Speed	0 m/s	Assumed
Water Condition	Saline, non-stratified	Based on Agnico Eagle (2014) and confirmed through Sep. 2018 sampling
Ambient water temperature	Open water season (start and end condition): 0°C	Conservative estimate to capture the start and end of the open water season for discharge
Effluent Flow Rate	1,600 m^3/d[1]	Per underground inflow and storage estimates (Agnico Eagle 2014; Golder 2016)
Effluent Temperature	0°C	Based on Diamond Drill Hole groundwater data (Agnico Eagle 2017)
Effluent Concentration	100%	Assumed
Discharge Type	Single Port	Assumed
Distance from Nearest Bank	230 m	Assumed
Horizontal Angle of Discharge	Perpendicular to bathymetric contour	Assumed
Vertical Angle of Discharge	90°	Assumed
Port Height above Seabed	1.0 m	Assumed
Port Diameter	0.0681 m	Assumed (3.0" port, DR 9, 252 psi)

Note: 1. Daily flow rate is 800 m^3/day but this volume will be discharged over 12 hours for an equivalent flow rate of 1,600 m^3/day.

3.0 RESULTS

Figures 2 and 3 present the near-field treated groundwater effluent plume dilution for a discharge of 800 m^3/day (an effective effluent rate of 1,600 m^3/d) in weak and mean ambient current conditions respectively, via the diffuser. For weak ambient current conditions, the maximum plume (centreline) height is 11.1 m from the seabed. For mean current conditions, the maximum plume (centreline) height is 5.6 m above the seabed. After reaching the maximum height, the negatively buoyant plumes settle towards the bottom as gravity starts to dominate over the initial jet momentum, and this is illustrated by the plume centrelines of Figures 2 and 3. For both scenarios, the plume centreline dilution factor reaches 11 within 1 m horizontal distance and 6 m vertical distance above the port. At

100 m distance from the diffuser, the dilution factors are 70 and 470 for scenarios 1 and 2 respectively, which are much higher than the required dilution of 11.

Figure 4 shows the changes in chloride concentration along the centrelines of the plumes, illustrating that at less than 5 m distance from the diffuser, the chloride concentration meets the required criteria. Figure 5 shows the changes in TDS concentration along the centrelines of the plumes, illustrating that at less than 1 m distance from the diffuser, the TDS concentration meets the required criteria.

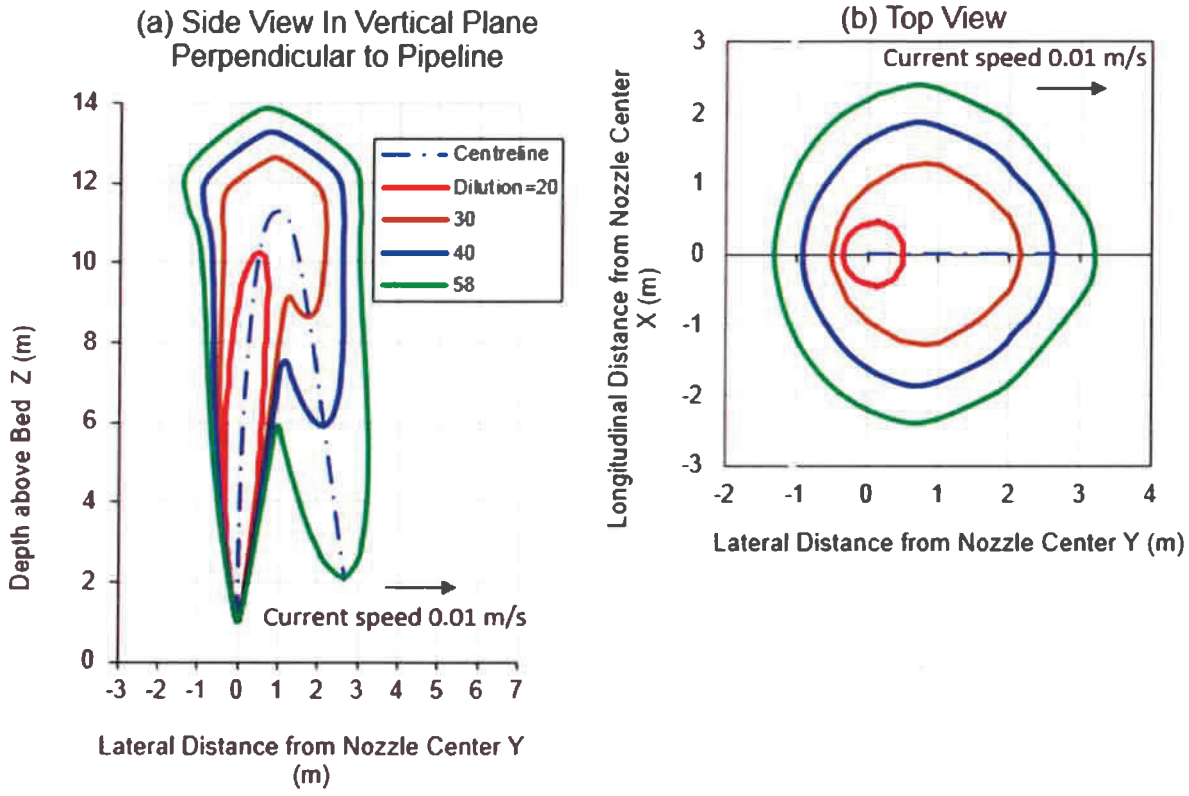


Figure 2: Dilution contours for a flow rate of 800 m^3/day (effective effluent flow rate of 1,600 m^3/d) in weak ambient current

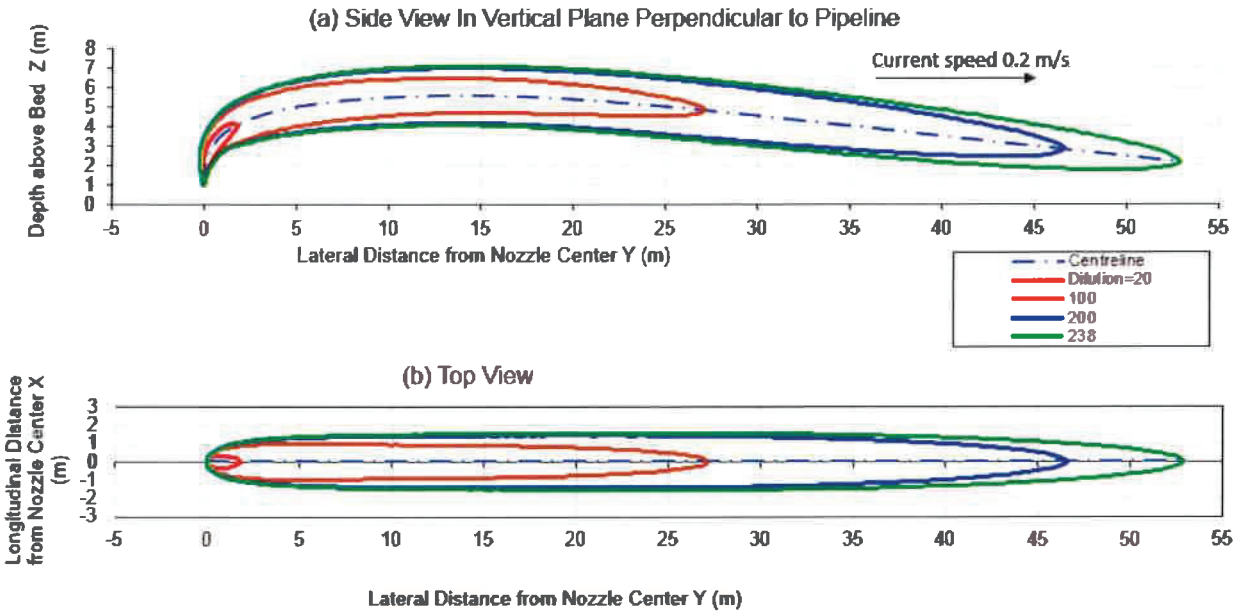


Figure 3: Dilution contours for a flow rate of 800 m³/day (effective effluent flow rate of 1,600 m³/d) in mean ambient current

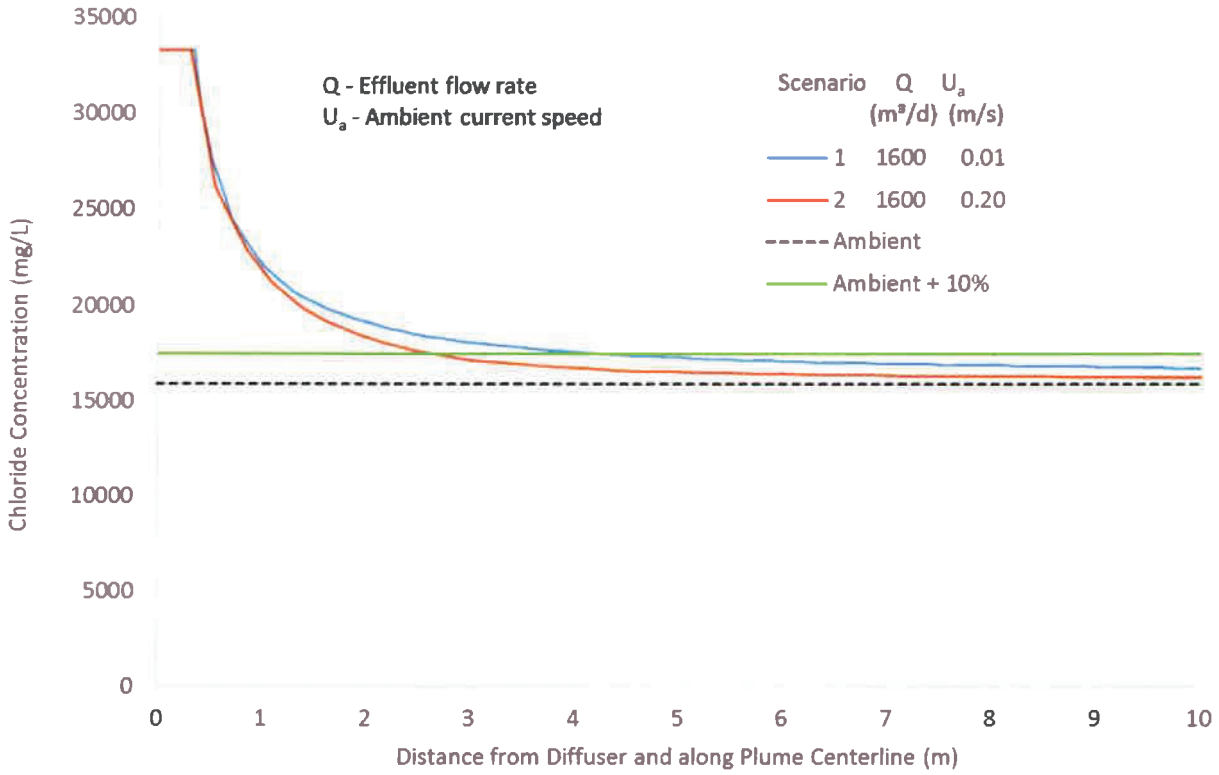


Figure 4: Chloride concentration along the plume centreline for both scenarios

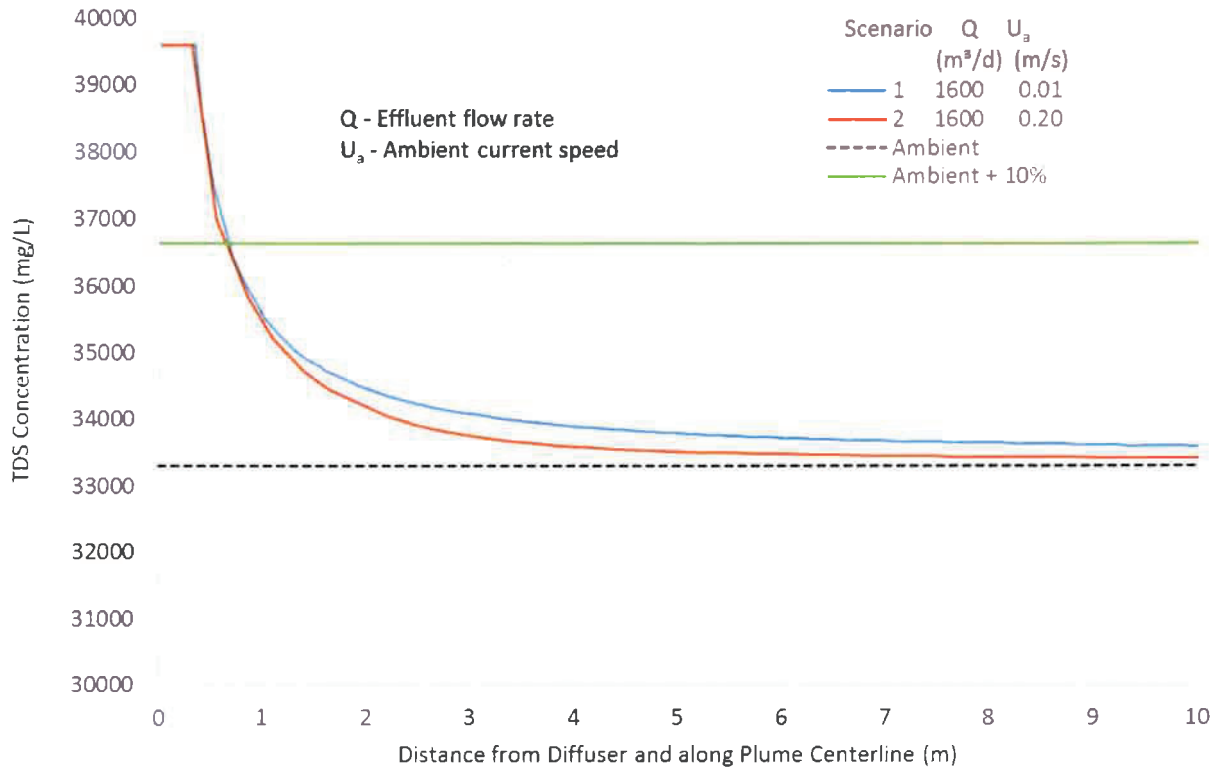


Figure 5: TDS concentration along the plume centreline for both scenarios

3.1 Temperature Sensitivity Analysis

For the simulated scenarios (800 m^3/day discharged over 12 hours for an effective flow rate of 1,600 m^3/day under weak and mean ambient current conditions), a sensitivity analysis simulation was conducted to review the effect of effluent and ambient temperature changes. The simulation conditions were otherwise identical to those for scenarios 1 and 2 except that the effluent temperature was increased to 20°C, and the ambient water temperature was increased to 8.5°C. The 20°C effluent temperature is understood to be the highest (though not expected) possible effluent temperature, as communicated by Agnico Eagle in November 2018. The 8.5°C was the water temperature measured in August 2011 at depth of 13 m below water surface (Stantec 2012).

The effluent temperature change results in effluent density change from 1031.85 kg/m^3 to 1028.30 kg/m^3, and the ambient water temperature change results in ambient water density change from 1026.76 kg/m^3 to 1025.89 kg/m^3. The temperature changes result in a slight change of the density difference between effluent and ambient water from 5.09 kg/m^3 to 2.41 kg/m^3. The plumes remain negatively buoyant with this temperature change, but not as strongly negative as under the original temperature assumptions for the ambient and effluent temperatures (both 0°C).

Table 3 summarizes the simulation results for sensitivity analysis on temperature change for the two scenarios. This table illustrates the following:

- The plumes rise to higher elevations than the plumes with the originally assumed temperature of 0°C due to reduced negative buoyancy.
- Similar to the original discharge plumes, the required dilution is met at less than 1 m distance from the diffuser.
- At an effective flow rate of 1,600 m³/day, the dilution factors at 100 m from the diffuser are increased due to accelerated plume mixing.

Table 3: Summary of simulation results for effluent temperatures of 20°C and ambient temperature of 8.5°C

Parameter	Scenario	
	1	2
Effluent flow rate (m³/d)[1]	1,600	1,600
Ambient current velocity (m/s)	0.01	0.2
Horizontal distance (m) from diffuser where required dilution of 11 is met	<1	<1
Maximum plume (centerline) height (m)	16.2	6.3
Dilution factor at 100 m from diffuser	163	563
Simulation results for originally assumed temperatures of 0°C		
Maximum plume (centerline) height (m)	11.1	5.6
Dilution factor at 100 m from diffuser	70	470

Note: 1. Daily flow rate is 800 m³/day but this volume will be discharged over 12 hours for an equivalent flow rate of 1,600 m³/day.

4.0 CONCLUSIONS

Mixing analysis was conducted for a diffuser designed for Melvin Bay, Rankin Inlet NWT. The simulation results show the following:

1) Dilution of the treated groundwater effluent plume is achieved within 5 m of the diffuser under the assumed conditions for the ambient and discharge conditions tested under assumed and increased temperatures.
2) After initial mixing, the plume migrates along the seabed under gravity and achieves further dilution and mixing with ambient water; concentrations within the 100 m regulatory mixing zone will thus meet discharge criteria per regulatory requirements and/or background concentrations for non-regulated parameters per the modelled conditions.
3) The results are valid for placement of the diffuser in Melvin Bay in water depths of at least 20 m.
4) Sensitivity analysis was performed for increased effluent and ambient temperatures. The required dilution of 11 is met within 1 m of the diffuser and dilution factors at 100 m from the diffuser were increased from the base case.

CLOSURE

Should you require any further information, please contact the undersigned.

Golder Associates Ltd.

Prepared by:

Reviewed By:

REGISTERED PROFESSIONAL ENGINEER
K. B. DEAN
LICENSEE
NT/NU
Feb 8/19

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Principal, Senior Coastal Engineer

SW/BD/vm/tt

https://golderassociates.sharepoint.com/sites/17491g/deliverables/diffuser memo/modelling assessment draft/doc718_1773384_modelling assessment of groundwater discharge_final.docx

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature
Date 8 Feb 2019
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

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IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

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Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

APPENDIX A

Field Measurements

Table A1: Results for September 2018 Measurements

Parameter	Minimum	Maximum	Average
pH (pH)	7.96	7.98	7.97
Salinity (psu)	29.7	30.5	30.0
TSS (mg/L)	<2	3.8	2.4
TDS (mg/L)	33,300	36,000	34,727
Hardness (as (CaCO3) (mg/L)	4,890	5,180	5,000
Conductivity (uS/cm)	45,400	46,500	45,782
Temperature (°C)	5.80	6.13	5.92
Chloride (mg/L)	15,900	17,400	16,655

Source: Golder (2018)

APPENDIX B

Environmental Guidelines

The intention of the treated groundwater effluent discharge objectives is to set the allowable effluent concentrations at the end-of-pipe and edge of a regulatory mixing zone. These allowable concentrations can then be used to design the diffuser to achieve the required dilution within the mixing zone. There is no specific definition for size of a mixing zone for discharges to Canadian coastal and estuarine waters. However, a radius of 100 m from the point of discharge is widely used for environmental compliance assessments. For example, the Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories (NWT 1992) provide guidance that the limits of initial mixing zone are 100 m from all points of discharge. For the current study, a 100 m regulatory mixing zone was applied.

Final effluent quality included in the model and assessment was based on measured groundwater quality from the borehole samples (see Section 3.4.2, Table 3 of the FEIS Addendum) and constrained by various regulations and guidelines to achieve non-acutely lethal effluent that will meet chronic guidelines or background concentrations at the edge of the regulatory mixing zone. The regulations and guidelines considered included:

- The proposed Metal and Diamond Mining Effluent Regulations (MDMER; GC 2017).
- Acute water quality guidelines for protection of marine aquatic life (CCME 2003; BC MOE 2017a, b).
- Fisheries and Oceans Canada Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013).

Table B1: Meliadine Mine – Assumed Treated Groundwater Effluent Discharge Criteria

Parameter	Units	Discharge Criteria	
		Standard Based [1]	95 UCLM [2]
pH (pH units)	pH units	-	7.634
Alkalinity (as $CaCO_3$)	mg/L	-	71.35
Total Hardness (as $CaCO_3$)	mg/L	-	14101
Turbidity	NTU	-	90.54
Total Dissolved Solids (TDS)	mg/L	-	58,165
Total Suspended Solids (TSS)	mg/L	15	159.4
Aluminium	mg/L	-	1.832
Ammonia (as N)	mg/L	5.91	35.47
Antimony	mg/L	-	0.0047
Arsenic	mg/L	0.0125	0.0193
Barium	mg/L	-	0.299
Beryllium	mg/L	-	0.00165
Bicarbonate (as $CaCO_3$)	mg/L	-	69.09
Boron	mg/L	-	2.389
Total Organic Carbon (TOC)	mg/L	-	6.448
Dissolved Organic Carbon (DOC)	mg/L	-	5.69
Cadmium	mg/L	-	5.83E-04
Calcium	mg/L	-	2164
Chloride (dissolved)	mg/L	-	33274
Chromium	mg/L	-	<0.1[3]
Copper	mg/L	0.003	0.113

Table B1: Meliadine Mine – Assumed Treated Groundwater Effluent Discharge Criteria

Parameter	Units	Discharge Criteria	
		Standard Based (1)	95 UCLM (2)
Cyanide (free)	mg/L	0.001	0.0494
Iron	mg/L	-	13.37
Lead	mg/L	0.14	0.00369
Lithium	mg/L	-	3.33
Magnesium	mg/L	-	2129
Manganese	mg/L	-	1.076
Mercury	mg/L	-	4.01E-05
Molybdenum	mg/L	-	0.0181
Nickel	mg/L	0.5	0.0208
Nitrate (as N)	mg/L	1500	35.65
Nitrite (as N)	mg/L	-	2.156
Total Kjeldahl Nitrogen (TKN)	mg/L	-	55.4
Phosphorus	mg/L	-	0.069
Potassium	mg/L	-	514.2
Radium-226 (Ra 226)	Bq/L	0.37	2.498
Selenium	mg/L	-	0.0457
Silica (reactive)	mg/L	-	19.77
Silver	mg/L	0.003	8.10E-04
Sodium	mg/L	-	14784
Strontium	mg/L	-	65.21
Sulfate	mg/L	-	3160
Thallium	mg/L	-	3.57E-04
Tin	mg/L	-	<0.5(3)
Titanium	mg/L	-	0.187
Uranium	mg/L	-	0.00168
Vanadium	mg/L	-	<0.5(3)
Zinc	mg/L	0.055	0.133

Notes:
"<" Concentration is below the reported detection limit (RDL).
(1) End of pipe discharge criteria is based on the minimum of the following (refer to Tables 8 and 9 of the FEIS Addendum):
Amended Metal and Diamond Mining Effluent Regulations (MDMER; GC 2017) Schedule 4 Authorized Limits of Deleterious Substances - Maximum Authorized Monthly Mean Concentration.
Canadian Council of Ministers of the Environment (CCME 2003) Short-term Water Quality Guidelines (WQG) for the Protection of Aquatic Life - Marine.
British Columbia Ministry of Environment (BC MOE 2017a) Approved Water Quality Guidelines for Marine Aquatic Life (Short-Term).
BC MOE Working Water Quality Guidelines for Marine Aquatic Life (BC MOE 2017b).
(2) 95% Upper Confidence Level of the Mean (UCLM) of the August 2016 to September 2017 diamond drillhole groundwater data provided by Agnico Eagle. 95% UCLM calculated using the US EPA ProUCL Version 5.1 software. Agnico Eagle will monitor groundwater quality and criteria will be updated as necessary based on observed changes.
(3) A 95% UCLM could not be calculated due to low detection rates within the dataset. The maximum concentration has been used for conservative purposes.

In addition to the above and since chloride ions mainly constitute the salt content in the marine water and ultimately the treated groundwater effluent plume, chloride guidelines are used to assess the near-field mixing zone. No local or federal guideline was available for chloride discharges in the marine environment, and therefore, the guideline published by the BC MOE (2017a) was used for the analysis. The guideline states:

> *"Human activities should not cause the chloride of marine and estuarine waters to fluctuate by more than 10% of the natural chloride expected at that time and depth".*

This indicates that the chloride concentration at the mixing zone boundary should not exceed the ambient chloride concentration of 15,900 mg/L by 1,590 mg/L (10%). The behavior of the discharge in the marine environment is influenced by density. For the purposes of this assessment, it is assumed that treatment of the groundwater will be such as to achieve a TDS concentration of the treated groundwater effluent that is +/- 10% (in line with the BC MOE 2017a guideline) of the maximum TDS concentration of 36,000 mg/L measured in September 2018 at Melvin Bay. Therefore, the assumed effluent TDS concentration will be up to approximately 39,600 mg/L. It is conservatively assumed that the chloride concentration of 33,300 mg/L remains unchanged in the treated groundwater effluent.

To reach a chloride concentration difference of no more than 10% at the edge of regulatory mixing zone, the required plume dilution factor via the diffuser is 11, per the equation below:

$$S = \frac{C_{eff} - C_a}{C_{edg} - C_a} = \frac{C_{eff} - C_a}{110\% C_a - C_a} = \frac{33{,}300 - 15{,}900}{110\% * 15{,}900 - 15{,}900} = 11$$

where S is required dilution factor, C_{eff} is effluent chloride concentration (33,300 mg/L), C_a is ambient chloride concentration (15,900 mg/L), and C_{edg} is chloride concentration at the edge of regulatory mixing zone. Per the BC MOE (2017a) guideline, the upper bound of C_{edg} is 10% greater than ambient chloride concentration.

There are also no federal or provincial specific criteria for mixing zone discharges regarding thermal changes to the marine environment. However, per the BC MOE (2017a) guideline:

> *"Temperature at the mixing zone boundary should not change by more or less than 1°C from natural ambient background temperatures, and the hourly rate of change should not exceed 0.5°C."*

This is taken into consideration for the model, which conservatively assumes treated groundwater effluent discharge and ambient ocean temperatures of 0°C, to account for start and end of temperatures for the open water season.

APPENDIX C • SPECIFIC WORK INSTRUCTIONS FOR UNDER-ICE MARINE WATER QUALITY SAMPLING PROGRAM – WINTER 2019

Specific Work Instructions	SWI-001
Project:	Meliadine Gold Mine
Client:	Agnico Eagle Mines Ltd.
Project No.	1773384
Dates for Field Work:	March, April and May 2019
Author:	Arman Ospan
Technical Review by:	K. Bruce Dean
To:	Manon Turmel

SPECIFIC WORK INSTRUCTIONS FOR UNDER-ICE MARINE WATER QUALITY SAMPLING PROGRAM - WINTER 2019 - MELIADINE GOLD MINE

1.0 PURPOSE

The purpose of this document is to provide Specific Work Instructions (SWI) for water quality sample collection at the Meliadine Project Area in Melvin Bay, Rankin Inlet, NWT during under-ice conditions in March, April, and May 2019.

2.0 FIELD PROGRAM

2.1 Marine Environment

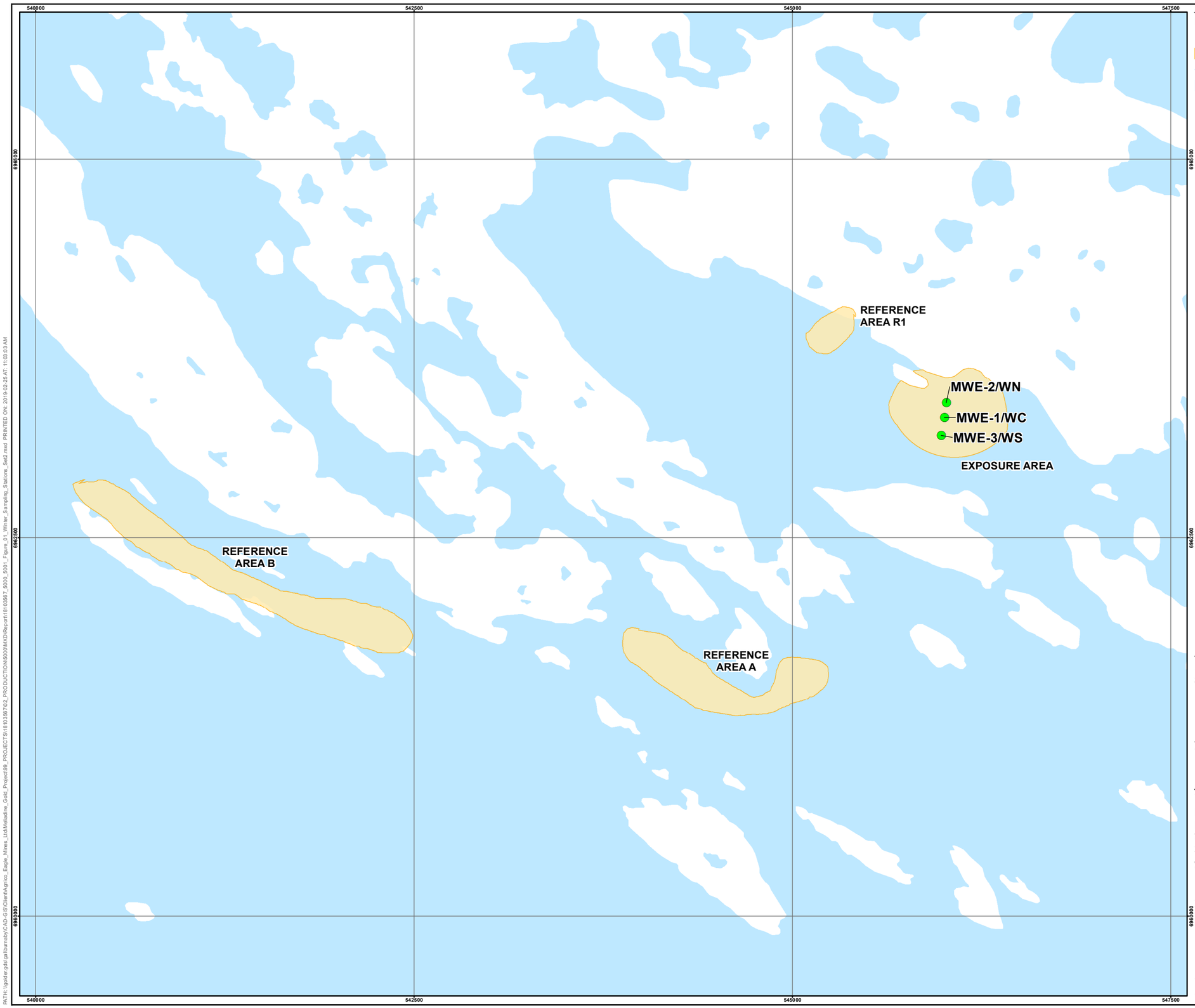
The marine monitoring study area for the under-ice marine water quality survey includes the area anticipated to be potentially influenced by Project activities. The exposure stations to be monitored were selected to correspond with the location of potential exposure to diffuser discharge In Melvin Bay. The exposure area will be monitored at three sampling stations. Station MWE-1/WC, MWE-2/WN and MWE-3/WS are located at, north (offshore) and south (inshore) of the location of the proposed diffuser discharge.

Detailed information on the sampling station locations and sampling parameters is provided in Table 1. Maps illustrating the location of the sampling locations are provided in Figure 1.

Table 1: Sampling Stations and Sampling Parameters for Under-Ice Marine Water Quality Sampling Program

Station ID	NAD 83, 15 V		Expected Water Depth (m)	Sample Depth (m)	No. of Samples by Sample Type	
	Easting (m)	Northing (m)			Discrete Water Quality [(a)]	In situ profiles
MWE-1/WC	546002	6963295	20	1 at 1 m; 1 at 5 m above the bottom	2	1
MWE-2/WN	546014	6963391	10	1 at 1 m; 1 at 5 m above the bottom	2	1
MWE-3/WS	545981	6963176	25	1 at 1 m; 1 at 5 m above the bottom	2	1

(a) Includes 10% blind duplicates for QA/QC.



LEGEND

- SAMPLE LOCATION
- STUDY AREA
- WATERCOURSE
- WATERBODY

DRAFT

0 0.5 1

1:25,000 KILOMETRES

REFERENCE(S)

1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

CLIENT

AGNICO EAGLE MINES LIMITED

AGNICO EAGLE

PROJECT

MELIADINE GOLD MINE
UNDER-ICE MARINE WATER QUALITY SAMPLING PROGRAM - WINTER 2019

TITLE

WINTER SAMPLING STATIONS

CONSULTANT

GOLDER

YYYY-MM-DD	2019-02-25
DESIGNED	AO
PREPARED	CN
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
18103567	5000/5001	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: \\golder.gds.ga\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\18103567\2_PRODUCTION\5000\MXD\Report\18103567_5000_5001_Figure_01_Winter_Sampling_Stations_Set2.mxd PRINTED ON: 2019-02-25 AT: 11:03:03 AM

The following data will be collected at each sampling station (Table 1):

- Measurements of snow cover (m), ice-thickness (m), total water depth (m), and the height of the water head in the augered hole (m).
- In situ vertical physico-chemical profiles at 0.5 m depth intervals throughout the water column.
- Winkler test for confirmation of dissolved oxygen (DO) concentrations if YSI readings fall outside the acceptable ranges.
- Collection and processing of discrete water quality samples at targeted depths for detailed water chemistry analyses.

Standard QC samples (including field duplicates, field blanks, trip blanks, and equipment blanks) will be collected in accordance with established quality assurance (QA) procedures (see Section 3.3).

3.0 PROCEDURES

Each sampling area will be accessed by snowmobile.

Specific sampling stations will be located using a Global Positioning System (GPS) device loaded with Universal Transverse Mercator (UTM) coordinates for each station (North American Datum [NAD] 83, Zone 13V).

At each sampling station, a hole will be drilled through the ice using an ice auger. The diameter of the hole should be wide enough to allow deployment of the sampling equipment. All snow and loose ice will be cleared from the hole with a slotted spoon prior to commencement of sampling.

3.1 Physico-Chemical Profile Measurements

In situ parameters measured at each location included water depth, temperature, conductivity (salinity), dissolved oxygen, turbidity, and chlorophyll concentration (optional). Vertical profiles will be collected using a conductivity / temperature / depth (CTD) probe (e.g. RBR XR-620) or multi-meter probe (e.g. YSI) equipped with dissolved oxygen, turbidity and fluorometer sensors.

Maintenance and calibration of a CTD profiler and associated sensors are normally performed by the instrument provider and are usually completed immediately prior to the reconnaissance program. No field quality checks of any of the parameters are required beyond the cast acceptability check and range checks.

Multi-meter probes, such as YSI, may require calibration on-site.

Multi-meter Calibration

A YSI multi-parameter water quality meter (multi-meter) will be used for conducting in-situ water quality field sampling. This multi-meter is factory-calibrated once per year for pH, water temperature, specific conductivity, and DO concentrations. Calibration records must be maintained.

Prior to collecting field samples, the multi-meter should be tested indoor in a stable environment for DO, pH, and specific conductivity. The multi-meter should be calibrated every four days or if readings are outside of the acceptable ranges, as determined by the parameter headings on the field datasheet (Appendix A). Refer to the YSI manual for further information on calibration.

Calibrate the multi-meter according to accepted protocols and record all necessary data in the multi-meter calibration log and/or field book. Note all out-of-range data in the field notebook and provide this information to the project field coordinators as soon as possible**.**

Under-ice Physico-chemical Water Column Profiling

Water quality profile measurements will be collected at each sampling station using the procedure below:

- Record exact coordinates where measurements were taken on the field datasheet (Appendix A).
- Record snow cover depth (m).
- Drill hole and record ice thickness (m) and height of water head in augered hole (m).
- Measure and record water depth using a hand-held depth sounder.
- Collect water column profile measurements (pH, temperature [°C], DO [mg/L and % saturation], and specific conductivity [µS/cm with the reading corrected to 25°C]) before collecting water samples. Record measurements at the following depths:
  - First measurement just beneath ice bottom (0.1 m).
  - Second measurement at 0.5 m below ice bottom.
  - Third measurement at 1.0 m below the ice bottom.
  - All subsequent measurements taken every 0.5 m depth interval until just above (0.5 m) seafloor.
- At each sampling depth, allow the sensors on the multi-meter to stabilize prior to recording the measurements. This will help to avoid hysteresis (differences in readings during downcast and upcast) and will result in more accurate readings. Record measurements on the field datasheet and log all data with the multi-meter.
- If using a CTD, measurements will be taken throughout the water column by lowering the probe from the surface to the bottom at a vertical speed of approximately 0.5 m/sec while the probe is recording measurements at a frequency of 6 Hz (6 measurements per second).
- Immediately following data collection, all data will be checked for erroneous values, outliers and to be certain that all data and configuration files are present and properly named. If the instrument software allows, all data should be reviewed graphically for outliers as well as trends, and to confirm that all sensors are functioning properly during the deployment. All profile data, datasheets and field notes will be saved to a computer and backed up on an external hard drive.

IMPORTANT: Verify that the multi-meter is calibrated and working properly before starting work for the day, and that calibration procedures and schedule are followed during the course of the program.

3.2 Discrete Water Quality Samples

Discrete water quality samples collected w analyzed for a suite of parameters, including:

- conventional parameters (i.e., conductivity, hardness, laboratory pH, total dissolved solids [TDS], total suspended solids [TSS], total organic carbon [TOC], dissolved organic carbon [DOC], and turbidity)
- major ions (i.e., bicarbonate, calcium, carbonate, chloride, fluoride, hydroxide, magnesium, potassium, sodium, sulphate, sulphide, and silicate)
- nutrients (i.e., nitrate, nitrite, total Kjeldahl nitrogen [TKN], total ammonia, total phosphorus [TP], total dissolved phosphorus [TDP], and orthophosphate)
- total and dissolved metals and metalloids (i.e., aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, cesium, chromium, cobalt, copper, gallium, iron, lead, lithium, manganese, mercury, molybdenum, nickel,

rhenium, rubidium, selenium, silicon, silver, strontium, tellurium, thallium, thorium, tin, titanium, tungsten, uranium, vanadium, yttrium, zinc, and zirconium)

- total and dissolved mercury

3.2.1 Sample Collection

For the marine environment, collect a water sample at the following target depths:

- At deeper (offshore) stations (water depth > 5 m), collect at 1 m below base of ice layer and in mid-column (5 m above the bottom), unless a pycnocline is present, in which case collect the sample below the pycnocline. Note that stratification is not expected during winter.
- Collect in situ readings (multi-meter) at the sample collection depth.

Water quality sampler (e.g. Niskin bottle or Kemmerer) samplers will be used to collect water samples at each station after the water column profiling is completed.

A few basic protocols should be followed when collecting the samples:

- Wear nitrile gloves when using samplers, and when rinsing and filling all bottles and jugs.
- Do not touch the inside of the bottles or the inside of the caps.
- Keep bottles in a clean environment (e.g., clean cooler) while collecting samples.
- Remember to check that the screws at the top and bottom of the Kemmerer samplers are tightened each time they are used.
- All water quality samples collected must have corresponding multi-meter profile measurements.

Follow these steps to collect the water quality samples:

- Triple-rinse the samplers with sea water.
- Collect a water sample from the required depth using the sampler.
- Record the sampling depth on the field datasheet.
- Fill the laboratory provided bottles (See Table 2) following instructions from the laboratory.
- Label the samples as “Station ID” (Table 1)[1] and depth at which the sample was taken.
- Verify that there are field readings for temperature, pH, specific conductivity, and dissolved oxygen at depths corresponding to the water sample collection.
- Make sure that samples do not freeze after collection (e.g., use coolers, heat packs).

The laboratory-provided bottles (Table 2) will be filled directly in the field from the sampler. Be sure to take the complete set of bottles for each station in the field.

ALS bottles do not need to be triple-rinsed with sample water before filling. The only time rinsing is required is if a sample is being transferred from one bottle to another, or if a bottle will be re-used to hold the filtered sample (e.g., dissolved metals). Information on filtering samples is provided in Section 3.2.2. Alternatively, filtration for dissolved metals can be

[1] Pre-printed labels were created for the bottle sets.

done in the laboratory conditions. In this case no preservatives should be added into the sample bottle and appropriate note should be made on the bottle and chain of custody (COC) form.

Table 2: Bottle Sets for Discrete Water Quality Samples

Bottle Type	Numbers of Bottles in Set	Filter	Preserve	Preservative	Number of Vials for Preservative
Nutrients-total: 120-mL amber glass bottle	1	-	Yes	1 mL H_2S0_4 (sulphuric acid)	1
Nutrients-dissolved: 120-mL amber glass bottle	1	Yes	Yes	1 mL H_2S0_4 (sulphuric acid)	1
Routine: 1-L polyethylene	1	-	-	-	-
Sulfide: 125-Ml HDPE bottle	1	-	Yes	2 mL Zn Acetate	1
Metals-total: 60-mL HDPE bottle	1	-	Yes	3 mL ultra-pure HNO_3 (nitric acid)	1
Metals-dissolved: 60-mL HDPE bottle	1	Yes	Yes	3 mL ultra-pure HNO_3 (nitric acid)	1
TOTAL	**8**	-	-	-	**5**

3.2.2 Sample Processing

At the end of each sampling day, the field and laboratory crew members will process (filter and/or preserve) the samples. Samples that require filtering can be processed at the end of the field day[2].

For samples that do not require filtering, but require preservative, the following protocols apply:

- Always wear nitrile gloves and safety glasses when working with preservatives.
- Add the required preservative (Table 2) and invert the bottle numerous times to mix the preservative with the sample.
- Store water samples in the refrigerators (between 4 and 10°C) at the Camp until ready to ship (see Section 3.4 for packing and shipping instructions). Do not allow the samples to freeze.

Samples that may require filtering are dissolved metals. Dissolved metals samples will be filtered into their respective sample bottles using the Millipore vacuum pump or Nalgene hand pumps, and Millipore 0.45 µm membrane filter. Whatman GF/C filters may be useful for pre-filtering of samples with a large amount of suspended solids, which may have difficulty passing through the Millipore filters; after the sample has been passed through a GF/C filter, follow with a 0.45 µm membrane filter. Take extreme care when handling the filter assembly and when processing the samples to avoid the potential for contamination of the filtered sample.

Alternatively, samples for dissolved metal can be filtered in the laboratory. In this case, no preservatives should be added in the sample bottles and respective notes should be made on sample bottles and COCs.

[2] Note that it is preferable for the field crew to filter and process samples at the end of the sampling day. However depending on the length of the field day, in some cases samples may need to be filtered and processed first thing the next morning. If this is the case samples must be kept cold (not frozen) and in the dark – especially chlorophyll a samples.

When filtering, the following considerations apply:

- Always wear nitrile gloves and safety glasses when working with preservatives.
- Use deionized water to rinse the pump and filter apparatus before use.
- Use a new filter for each sample bottle.
- Fill bottles in the following order: dissolved ultra-low metals and then nutrients.
    - As the filtered water will be added to back to the original bottles, triple rinse the bottles with the filtered water before filling the bottles with the filtered water.
- Add the required preservative (Table 2) and invert the bottle numerous times to mix the preservative with the sample.
- Store water samples in the refrigerators at camp until ready to ship (see Section 3.4 for packing and shipping instructions).

Generate a chain of custody (CoC) record after each day of sampling. See example of CoC in Appendix B.

3.3 Quality Assurance and Quality Control

3.3.1 Water Quality QC Samples

As general objective, the number of QC samples to be collected should represent approximately 10% of the total number of planned field samples. The target of QC samples collected during the under-ice program is one set at MLA [e.g., field duplicate, field blank, trip blank and equipment blank]). These are described as follows:

- **Field duplicate**: A second sample will be collected at a randomly selected station and treated as a separate field sample with regards to filtering and preserving.
- **Field blank**: Sample bottles are filled in the field with de-ionized water provided by the laboratory. These samples are therefore exposed to the sampling environment at the sample site and handled in the same manner as the surface water samples collected during the field program (e.g., preserved, filtered).
- **Trip blank**: These sample bottles come from the laboratory pre-filled with deionized water. Take the bottle set out into the field with you; DO NOT open the bottles. Submit bottles as is with the rest of the field samples.
- **Equipment blanks**:
    - For **total analytes**: Run laboratory-provided deionized water through the Kemmerer sampler as you would for regular field samples and use to fill sample bottles. Preserve as per requirements for that parameter.
    - For **dissolved analytes**: Pour deionized water into the filter tower and fill the dissolved ultra-low metals and dissolved nutrient bottles with the filtered blank water.

Use unique sample ID to identify the QC samples. It is best practice to submit QC samples to the lab as blind samples, but clearly note them in the field notebook.

3.3.2 Other QA/QC Protocols

- Record detailed field notes in waterproof field books and field datasheets, and ensure any critical information (e.g., QC type, location, date and time, etc.) is available at the de-brief meeting after the program.
- Have a second person check data sheets and CoCs at the end of each field day for completeness and accuracy.

- Keep track of station name and date sampled in the field binder/field note book.
- At the end of each day, record all data and when possible save all data (database, CoCs, multi-meter data, shipping memos, etc.) to a computer file and/or external USB device.
- Take photos at each station and download photos daily.
- Do not use any laboratory-supplied bottles that you suspect have been used or contaminated.
- Discard used bottles into a garbage bag; at end of field program put these bottles in coolers and include in shipment back to lab for disposal. Clearly label the cooler as having no samples, and include what it does contain (e.g., used bottles). Unused and unopened bottles can be left in the bottle prep area for the next program.

3.4 Sample Shipping

To ship samples:

- Make sure that the CoC forms are filled out correctly; confirm that Arman Ospan is included on the CoC distribution list. Please see the example CoC in Appendix B.
  - Assign a CoC number: Meliadine-WQ-#.
  - Take a photo of the CoC for our records. E-mail a copy of the photo to Arman Ospan.
- All samples for the water quality program (i.e., discrete samples) will be placed in one set of coolers and shipped together.
- Place the CoC in a Ziploc bag inside each cooler corresponding to the samples included in the cooler. Each COC must match the contents of the cooler in which it is placed.
- Mark “CoC enclosed” on the shipping label of the cooler containing the CoC.
- Mark shipping label for each cooler (i.e., “1 of 1”, or in the case of multiple coolers, “1 of 3”, “2 of 3”, etc.)
- Place shipping labels in Ziploc bags and tape to each cooler.
- Place lots of ice packs and padding in each cooler. Glass bottles should be individually wrapped in bubble wrap.
- Each cooler should not exceed 40 lbs (18 kg) in weight.
- Bind each cooler with tape and add “do not freeze” and “keep cool” stickers.
- Arman Ospan will notify laboratory contacts of sample shipments by e-mail and request confirmation when samples are received; please include Arman on all communications.
- Laboratory samples collected as part of the water quality program are to be shipped to ALS in Yellowknife, where the samples will be logged and shipped to their respective analysis locations (i.e., Edmonton or Burnaby). Ensure that ALS Yellowknife is informed that samples are on their way, when they should arrive, and provide them the location where need to be picked up from.
- Check sample receipt confirmations when received from the laboratory to make sure sample integrity has been preserved (e.g. temperature on receipt, damaged samples) and that the correct analysis has been scheduled by the laboratory (correct analytical package and number of samples). Arman Ospan will check these.
- Ship samples to ALS Yellowknife:

Jessica.Spira@ALSGlobal.com

ALS Environmental
#116 - 314 Old Airport Road
Yellowknife, NWT
Canada X1A 3T3
TEL: 867-873-5593

4.0 LIST OF APPENDICES:

Appendix A: Field Datasheet

Appendix B: Chain of Custody Form (ALS)

APPENDIX A: Field Datasheet

Golder Associates	GROUP		DATE:	
	Water Quality Record (Form #1, Version 4)		**TIME:**	
	16820 - 107 Ave, Edmonton, AB, T5P 4C3		**STATION:**	

Project Title: **Project #:** **Phase:** **Page: ___ of ___**

Personnel: _____ GPS or Waypoint (13V NAD83): _____ _____

Weather: _____ Water Colour: _____ Total Depth (m): _____

Secchi Depth (m): _____ Pressure (mm Hg): _____ Field Meter(s): _____

WQ Sample	Depth (m)	Sample ID
Mid		

Winkler taken:		Yes / No
Collection depth (m)		
Winkler DO 1 (mg/L)		Winkler DO Tap (mg/L)
Winkler DO 2 (mg/L)		YSI DO Tap (mg/L)

Zooplankton

Haul 1 Depth (m): _____

Phytoplankton

Sample Depths: _____

Phytoplankton Collected? Y N

Chlorophyll-a Y N

Rep 1 Volume Filtered (mL): _____

Rep 2 Volume Filtered (mL): _____

Rep 3 Volume Filtered (mL):

Notes:

Depth (m)	Temperature (°C)	Conductivity (µS/cm)[c] expected range 17,000 to 35,000	Dissolved Oxygen (%) expected range 95 to 105 (acceptable 60 to110)	Dissolved Oxygen (mg/L)[§] expected range 12 to 15	pH expected 6.7 to 8.5
0.1					
0.5					
1.0					
1.5					
2.0					
2.5					
3.0					
3.5					
4.0					
4.5					
5.0					
5.5					

c temperature corrected to 25 °C; § Should not be more than 15 mg/L (supersaturation)

Project Title:	**Project #:**	**Phase:**	**Page: ___ of ___**

Depth (m)	Temperature (°C)				

c temperature corrected to 25 °C; § Should not be more than 15 (supersaturation)

QA check completed by: _____ Date: _____ Photo #: _____

APPENDIX B: Chain of Custody Form (ALS)

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	
Contact:	
Phone:	
Company address below will appear on the final report	
Street:	
City/Province:	
Postal Code:	

Report Format / Distribution

Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☐ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax
Email 2
Email 3

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- **4 day [P4-20%]** ☐
- **3 day [P3-25%]** ☐
- **2 day [P2-50%]** ☐

EMERGENCY
- **1 Business day [E - 100%]** ☐
- **Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]** ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax
Email 2

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS															SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☐ NO

Are samples for human consumption/ use?
☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INIITIAL COOLER TEMPERATURES ºC				FINAL COOLER TEMPERATURES ºC			

SHIPMENT RELEASE (client use)			**INITIAL SHIPMENT RECEPTION (lab use only)**			**FINAL SHIPMENT RECEPTION (lab use only)**		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY NOV 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

APPENDIX D • CONCEPTUAL OCEAN DISCHARGE MONITORING PLAN

AGNICO EAGLE

MELIADINE MINE

Conceptual Ocean Discharge Monitoring Plan

JUNE 2018
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

There are four phases to the development of the Mine; just over 4 years of construction (Q4 2015 to 2019), 8 years of Mine operation (2020 to 2027), 3 years of closure (2028 to 2030), and post-closure (2031 forwards). The underground mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the underground mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the underground mine workings once the Mine has advanced below the base of the permafrost.

Groundwater from the underground mine workings will be collected and pumped for storage on the surface in the water containment ponds to manage surface and groundwater, as described in the Meliadine Mine Water Management Plan (WMP; Agnico Eagle 2017a). The management of groundwater is further described in the Meliadine Mine Groundwater Management Plan (GWMP; Agnico Eagle 2018), which entails for the discharge of saline groundwater to Meliadine Lake after treatment, in compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14. As part of long-term water management, excess groundwater will be treated to meet, as applicable, Metal and Diamond Mining Effluent Regulations (MDMER), Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (Marine; CCME) and/or background conditions at the edge of the mixing zone for discharge into Melvin Bay via an engineered diffuser.

This document presents the conceptual Meliadine Mine Ocean Discharge Monitoring Plan for discharge of treated groundwater effluent into the marine environment. It summarizes the field sampling study design strategy, methods, laboratory requirements, quality assurance and quality control, and reporting.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	June 2018	All	All	Conceptual Plan developed for the Treated Groundwater Effluent Discharge into Melvin Bay	Golder Associates Ltd.

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANOVA	Analysis of variance
CCME	Canadian Council of Ministers of the Environment
CES	Critical effect size
EEM	Environmental Effects Monitoring
FEIS	Final Environmental Impact Statements
FDP	Final discharge point
Golder	Golder Associates Ltd.
GWMP	Groundwater Management Plan
MDMER	Metal and Diamond Mining Effluent Regulations
Mine or Project	Proposed Meliadine Gold Mine
MMER	Metal Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
ODMP	Ocean Discharge Monitoring Plan
QA/QC	Quality Assurance and Quality Control
TDS	Total dissolved solid
WMP	Water Management Plan
WQG	Water Quality Guidelines

SECTION 1 • INTRODUCTION

This document presents the conceptual Ocean Discharge Monitoring Plan (ODMP) for the proposed discharge of excess treated groundwater into the marine environment at Itivia Harbour in Melvin Bay.

The overall water management for the life of the Mine and post-closure is described in the Agnico Eagle Meliadine Gold Mine Water Management Plan (WMP; Agnico Eagle 2018b) and the Groundwater Management Plan (GWMP; Agnico Eagle 2018e). The WMP provides descriptions of the Mine water control structures and associated design criteria, while the GWMP describes management of groundwater for discharge to Meliadine Lake.

This conceptual ODMP outlines objectives, rationale, and details of the data collection strategy, analytical methods and ecological thresholds for protection of water/sediment quality and biological components on the marine environment in Melvin Bay. The conceptual ODMP will be updated pending the necessary approvals and authorizations to include any regulatory conditions, as applicable, and further refine methods and/or thresholds.

1.1 Background

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Mine, located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut, on Inuit Owned Lands. The Meliadine Mine is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

Agnico Eagle has previously completed the environmental assessment for the construction and operation of an All-Weather Access Road (Agnico Eagle 2013) and the Meliadine FEIS (Agnico Eagle 2014), which included nearshore barge operations in Itivia Harbour and seasonal shipping activities in Hudson Bay and Hudson Strait. The projected life of the Meliadine Mine is anticipated to be 13 years but may be extended as exploration continues. This includes an estimated 3 years of construction, 13 years of operations, and 3 years of decommissioning.

The Meliadine Mine proposes mining methods for the development of the Tiriganiaq gold deposit, which includes an underground mine. The underground mine will extend to approximately 625 m below the ground surface, therefore, part of the underground mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the underground mine workings once the Mine has advanced below the base of the permafrost. Inflow of groundwater is expected from 2018 until the end of mine life in 2032. The management of groundwater is further described in the Meliadine Mine GWMP (Agnico Eagle 2018e), which entails for the discharge of saline groundwater to Meliadine Lake after treatment, in compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14.

To support long-term groundwater management for the Mine, Agnico Eagle has proposed to directly discharge excess groundwater effluent into Melvin Bay at Itivia Harbour after treatment of the saline underground inflows to meet discharge water quality criteria for Melvin Bay and/or background conditions.

This conceptual ODMP is submitted along with the Final Environmental Impact Statement Addendum (FEIS Addendum) for the proposed discharge of treated groundwater effluent from the underground mine of the Tiriganiaq deposit at the Meliadine Mine into the marine environment at Melvin Bay. The ODMP includes a description on additional requirements to define triggers and threshold for adaptive management, including additional baseline data collection at Melvin Bay ahead of installation of the engineered marine outfall, as required. This plan was developed to fulfil the NIRB Guidelines received for the FEIS Addendum, for stand-alone management and monitoring plans (EIS Guidelines sections 9.3 and 9.4; NIRB 2018). While the ODMP has been developed as a separate and stand-alone plan, the intent is to align it with Environmental Effects Monitoring (EEM) study design requirements to avoid multiple monitoring plans. The components of the ODMP that are not captured in an EEM study design will be incorporated into existing management plans for the Meliadine Mine (for example, as part of the GWMP [Agnico Eagle 2018e]).

1.2 Objectives and Scope

The ODMP has the purpose of assessing the potential effects of the treated groundwater effluent discharge to the marine environment in Melvin Bay. The ODMP will identify potential changes to water and sediment quality caused by the effluent discharge and the effect of these changes to aquatic life, fish habitat, and fish health. To achieve its purpose, the ODMP has the following objectives:

- To detect short- and long-term effects of the discharge on the receiving environment
- To address the NIRB FEIS Addendum Guidelines, the federal Metal and Diamond Mining Effluent Regulations (MDMER, once they come into effect), Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Aquatic Life, as well as requirements that may be requested from regulators during the permit processes
- Identify unforeseen adverse effects and provide early warnings of undesirable changes in the environment
- To inform mitigation

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FUEL TANK FARM

End- of- pipe
Monitoring

Approximate
Discharge Pipe
Centerline

Approximate
Diffuser Location

A

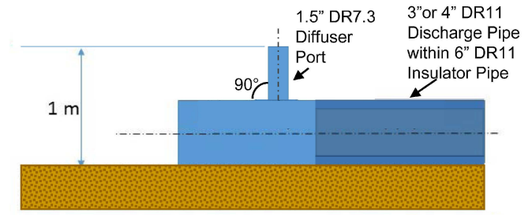
A'

Rankin Inlet

LEGEND

- WATER QUALITY SAMPLING STATION
- BENTHIC INVERTEBRATES AND SEDIMENT QUALITY SAMPLING STATION
- END OF PIPE MONITORING
- GENERAL AREA FOR THE PROPOSED DIFFUSER LOCATION
- CROSS SECTION LOCATION
- WATERBODY

End of Discharge Pipe – Diffuser Port Design (HDPE Pipe)



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NOTE(S)

AGNICO EAGLE IS CONSIDERING TREATMENT AND MANAGEMENT OPTIONS TO MEET APPLICABLE DISCHARGE CRITERIA AND/OR SITE SPECIFIC WATER QUALITY OBJECTIVES, AS REQUIRED. ACTIVITIES AND FACILITIES PRESENTED HEREIN ARE FOR PLANNING PURPOSES ONLY AND SHOULD NOT BE CONSIDERED FINAL DESIGN.

REFERENCE(S)

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

CLIENT
AGNICO EAGLE MINES LIMITED
AGNICO EAGLE

PROJECT
MELIADINE MINE
NUNAVUT

TITLE
CONCEPTUAL MARINE MONITORING PLAN
PROPOSED SAMPLING STATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2018-05-24
DESIGNED	CLT
PREPARED	CDB/JZ
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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SECTION 2 • REGULATORY FRAMEWORK

The Meliadine Mine is located within the Nunavut Territory and is subject to the regulatory approvals established under the applicable laws and regulations of Canada and of Nunavut.

As per the MMER, including the amended MDMER (GC 2017; anticipated to come into effect in 2018-2019), any discharge exceeding 50 cubic metres (m^3) should conduct EEM studies. The studies include effluent characterization and water quality monitoring accompanied by biological studies, which may include benthic invertebrate community, fish population and fish tissue components.

In consultation with the NIRB, Agnico Eagle has prepared the Final Environmental Impact Statement Addendum (FEIS Addendum) for the authorization to carry out discharge of treated groundwater effluent from the underground mine to the marine environment, in accordance with the Guidance for Final Environmental Impact Statement Addendum for the "Saline Effluent Discharge to Marine Environment, Rankin Inlet, Meliadine Gold Mine" ("project proposal" or "proposed Project activities" in this report; NIRB 2018).

The discharge of the treated groundwater effluent into the marine environment is also subject to authorization under the Section 5 of the *Environmental Protection Act* of Nunavut (GN 1988). In addition, other conditions and/or mitigations outlined by regulatory agencies under the following Acts (or applicable licence requirements) should be adhered to:

- *Federal Fisheries Act* (GC 1985a)
- *Navigation Protection Act* (GC 1985b)
- *Species at Risk Act* (GC 2007)

SECTION 3 • RATIONALE

3.1 Discharge Overview

The ODMP concerns management of the discharge of excess groundwater from the underground mine to the marine environment after treatment during the life of the Project to support long-term water management.

Supplemental hydrogeological investigations were undertaken in 2015 and 2016 to provide additional information on potential volumes and quality of saline groundwater inflows to the underground mine to be managed. Per the results obtained, the total volume of the groundwater inflow in the mine is expected to be up to 420 m^3/day (Golder 2016). Adding to the maximum anticipated groundwater volume to be stored at the Meliadine Mine, this will result in a need to discharge up to 800 m^3/day (Agnico Eagle 2018e). Groundwater inflows to the underground mine since 2015 have not been discharged to the environment and are being stored underground, in the Saline Pond, in the P-Area, or actively evaporated during the open water season (Agnico Eagle 2018b).

Total dissolved solid (TDS) concentrations in groundwater are naturally high, expected to range from 50,000 to 64,000 mg/L per groundwater data collected by Agnico Eagle in 2017 (a summary of the groundwater quality is presented in Table 3, Section 3.4.2 of the FEIS Addendum; Agnico Eagle 2018g). Since mining operations include drill-and-blast excavation, certain parameters of groundwater quality are expected to be influenced by explosives (particularly ammonia and nitrate due to ammonium nitrate, fuel oil [ANFO] and emulsion explosives). Chloride, sodium and calcium are also naturally high in concentration in the untreated groundwater, averaging at higher concentrations than those recorded in Melvin Bay (Table 1 and Table 2). Therefore, to minimize effects to the environment, and to comply with the effluent discharge criteria (GC 2017; CCME 2003; BC MOE 2017a; BC MOE 2017b) and objectives, groundwater will be treated prior to discharge.

Table 1: Summary of Melvin Bay Background Marine Water Temperature and Salinity taken in August 2011 and Average Untreated Groundwater Concentrations taken in 2017

	Melvin Bay		Untreated Groundwater
Parameter	Surface	Bottom	
Temperature (°C; n=3)	8.5 to 9.45	7.93 to 9.07	-3.4°C - +3.8°C(1)
Salinity (ppt; n=3)	29.29 to 29.35(2)	29.30 to 29.38(2)	55 to 56(3)

Source: Melvin Bay - Nunami Stantec 2012. Meliadine Mine Groundwater – Agnico Eagle 2017 data.

(1) Average temperatures per observations of DDH samples, as provided by Agnico Eagle. This does not account for the influence of ambient temperature for groundwater stored in containment ponds at the Meliadine Mine.

(2) *In situ* average salinity measured at Melvin Bay. Average Total Dissolved Solids (TDS) measured at Melvin Bay = 34,300 mg/L.

(3) Estimated average groundwater salinity based on average TDS groundwater concentrations presented in FEIS Addendum, Section 3.4.2, Table 3 (55,700 mg/L average TDS; Agnico Eagle 2018g). Salinity from groundwater has not been measured. TDS values are comparable to salinity as TDS represents an estimate of the level of ions, typically salt ions, that are present in the water. This may however overestimate the salinity of the untreated groundwater, as TDS also includes organic solutes (for example, hydrocarbons and urea) in addition to salt ions.

Table 2: Summary of Select Melvin Bay Background Marine Ion Concentrations taken in August 2011 and Average Untreated Groundwater Concentrations taken in 2017

	Melvin Bay			Untreated Groundwater(1)
Ion	I1	R1	R2	
Chloride (mg/L)	20,000	20,100	20,300	32,315
Sodium (Na) - Total (mg/L)	11,000	10,800	10,800	14,365
Calcium (Ca) - Total (mg/L)	411	399	402	2,032

Source: Melvin Bay - Nunami Stantec 2012; averages from 3 sampling locations (I1, R1 and R2). Meliadine Mine Groundwater – Agnico Eagle 2017 data (Agnico Eagle 2018g).

(1) Averages per untreated groundwater concentrations presented in FEIS Addendum, Section 3.4.2, Table 3; Agnico Eagle 2018g).

Treated groundwater effluent will be trucked to the discharge facility at the Itivia Fuel Storage Facility for discharge during the open water season (May to October). The discharge facility, located at the Itivia Fuel Storage Facility, will include a storage tank and a pipeline outflow extending to an engineered diffuser located in Melvin Bay. The treated groundwater effluent will be discharged seasonally in a controlled manner through a diffuser to allow for maximum dilution and minimum impact on the marine environment. The Final Discharge Point (FDP) is estimated at a distance of approximately 230 m from the shoreline and a depth of approximately 20 m. Facility layout and diffuser specifications are shown in Figure 1.

Treated groundwater effluent quality is required to meet the Canadian federal end-of-pipe discharge criteria (per the amended MDMER; GC 2017) and to be non-acutely lethal. Treated groundwater will be discharge into Melvin Bay via an engineered diffuser (refer to Section 3.5 of the FEIS Addendum; Agnico Eagle 2018g) to meet Canadian Surface Water Quality Guidelines (WQG; CCME 2003), or background concentrations for parameters without guidelines, at the edge of the mixing zone.

3.2 Environmental Conditions

The receiving environment for the effluent discharge is located in Melvin Bay, northwest Hudson Bay at Rankin Inlet. Hudson Bay, and particularly the area including Melvin Bay, is usually ice-covered from November to June and ice-free from July to October (Stewart and Lockhart 2004; Cohen et al. 1994).

- At Rankin Inlet, the tidal range varies between 2.0 and 4.6 m and mean currents flow southward at around 0.22 m/s. Isobath lines are nearly parallel to coastline and depth rapidly increases reaching more than 20 m within 230 m off the coast.
- Marine environmental baseline studies in the Melvin Bay area were conducted in August 2011 by Nunami Stantec (2012; see Appendix B of the FEIS Addendum, Agnico Eagle 2018g).
- Surveys were conducted at three areas in Melvin Bay: near the effluent discharge location (Impact Area 1 [I1]) and two reference areas, one (Reference Area 1 [R1]) located approximately 0.9 km northeast of Itivia Harbour, and the other (Reference Area 2 [R2]) on the southern shore of Melvin Bay, 1.5 m south from Itivia Harbour.

- Water quality measurements conducted by Nunami Stantec (2012) showed no water column stratification with the mean temperature ranging from 8.9^{o} C at the surface to 8.5^{o}C at the bottom (up to approximately 13 m depth), and the mean salinity ranging from 29.32 ppt at the surface to 29.33 ppt at the bottom. Water was well oxygenated with dissolved oxygen saturation ranging from 113.6 to 115.6% (10.8 to 11.2 mg/L). Nutrients and metals were mostly below detection limits and lower than CCME WQG for the Protection of Aquatic Life (Marine; CCME 2003).
- Sediments in the areas with water depths of up to 6.6 m were dominated by coarse material (cobble and gravel) in most samples (Nunami Stantec 2012).
- Sediment chemistry analysis of the fine substrate fraction revealed concentrations below CCME Interim Sediment Quality Guidelines (CCME 2001) for all parameters except chromium. Chromium concentrations slightly exceeded the CCME ISQG of 52.3 mg/kg for this element at all sample stations with mean concentrations (plus/minus standard deviation) ranging from 55.8 ± 5.89 mg/kg at I1 to 60.2 ± 6.12 mg/kg at R2.
- Phytoplankton abundance, richness, and diversity were similar across all sites within the marine local study area, and a total of 33 taxa were recorded. Dinoflagellates, mainly represented by *Peridinium/Gonyaulax* spp. and *Dinophysis* spp., were the dominant taxonomic group at all sampled locations. Ciliates of order Tintinnida were present at low percentages at two of the sampled locations.
- Zooplankton abundance, richness, and diversity varied among sites, and a total of 44 taxa were recorded. Zooplankton were mostly rotifers and calanoid copepods. An unidentified rotifer species, possibly in the family Notommatidae, was the dominant taxon at all sampled locations.
- Macroflora was sparse within Melvin bay (ranging from 2 to 5% coverage). Rockweeds (*Fucus* spp.) were the dominant species and occupied a small band in the low intertidal zone. Kelp (*Laminaria* spp.) was observed in the subtidal areas of the southern shore of the bay. Seaweeds are not locally harvested in Melvin Bay.
- Benthic invertebrates were dominated by different families of polychaetes with lesser abundance of nematodes and amphipods. Among other taxonomic groups observed were sponges (Porifera), hydrozoans, flatworms (Platyhelminthes), three gastropod, and three bivalve taxa, several crustacean taxa (copepods, amphipods, decapods), and sea squirts (Urochordata).
- In general, benthic invertebrate abundance and diversity in the area is low; in the intertidal zone, benthic communities occur seasonally when the habitat is not influenced by ice (Stewart and Lockhart 2005). Abundance in the subtidal habitat was also low in late summer (August) with most of the organisms observed less than 1 cm in length, suggesting a low biomass (Nunami Stantec 2012).
- Locally harvested shellfish species include blue mussels and clams.

- Several species, including Arctic char, Arctic cod, Greenland cod, Arctic sculpin, slender eel blenny and Greenland halibut, are considered important to the local commercial, recreational, and subsistence fisheries.
- Only six species of fish were identified during the baseline study in 2011 (Nunami Stantec 2012). Greenland cod (*Gadus ogac*) represented over 50% of fish captured, followed by slender eelblenny (27%) and minor contributions of different species of sculpins. Arctic char was not observed during the baseline field study, but was reported to be in the area at the time of the field study (west of Melvin Bay near the Barrier Islands).
- At least 43 species of seabirds, shorebirds, waterfowl, and marine-associated raptors frequent offshore, inshore, intertidal, or salt marsh habitats of the Hudson Bay marine ecosystem (see Table B-2 of Appendix B in the Shipping Management Plan; Agnico Eagle 2018f). Few of these species are year-round residents.
- The baseline study conducted in 2011 indicated that most marine birds that occur in the vicinity of Rankin Inlet are summer residents and no SARA listed marine bird species occur near Rankin Inlet (Nunami Stantec 2012).
- Marine mammals potentially present in the north and northwest Hudson Bay for variable periods of time include 4 species of cetaceans (3 toothed whales and one baleen whale), 6 species of pinnipeds (seals and walrus), and polar bear. (see Table B-3 of Appendix B in the Shipping Management Plan; Agnico Eagle 2018f). Polar bears (*Ursus maritimus* – Special Concern under SARA) are uncommon to the area. A summary of listed marine mammal species with potential to occur in marine RSA is provided in Table B-5 of Appendix B in the Shipping Management Plan (Agnico Eagle 2018f).
- Narwhal (*Monodon Monoceros*, uncommon at Rankin Inlet), bowhead whales (*Balaena mysticetus*, uncommon at Rankin Inlet) and beluga (*Delphinapterus leucas*) are known to overwinter in Hudson Strait and in polynyas within Hudson Bay. Atlantic walrus (*Odobenus rosmarus rosmarus*), bearded seal (*Erignathus barbatus*), ringed seal (*Phoca hispida*), and harbour seal (*Phoca vitulina concolor*) are year-round residents to at least portions of Hudson Bay, but largely uncommon at Rankin Inlet in recent years. Harp seal (*Pagophilus groenlandicus*) have increased in number in recent years near Rankin Inlet. The remainder of marine mammals identified in Hudson Bay / Hudson Strait, namely killer whale (*Ocinus orca*) and hooded seal (*Cysophora cristata*), are migratory and seasonal visitors limited largely by the presence of solid land-fast ice throughout the winter and spring.

3.3 Project Management Plans

Agnico Eagle has developed Management Plans that are applicable to the Meliadine Mine site, the All-Weather Access Road (AWAR), and the Itivia Fuel Storage Facility.

Updates to the plans have been developed, as required, and submitted to the NIRB and NWB throughout development of the Mine. Table 3 lists the management plans for the Meliadine Mine as

they apply for the ocean discharge, with indications on any potential changes that may be required in future updates.

Agnico Eagle is committed to adhering to all existing plans that have been developed for the Meliadine Mine as part of NIRB Project Certificate No. 006 and NWB Type A Water Licence 2AM-MEL1631 conditions. This includes reporting requirements required to measure the achievement of objectives as set out by approval conditions or to demonstrate compliance, such as annual reporting on Project monitoring programs.

Table 3: Project Management Plans Applicable to the Proposed Project Activities for Ocean Discharge

Management Plan	Reference	Changes Required due to the Proposed Project Activities
Water Management Plan	FEIS Volume 2, SD 2-6 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018b) NWB Doc 1803312AM-MEL-1631	None
Mine Waste Management Plan	FEIS Volume 2, SD 2-6 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018c) NWB Doc 1803312AM-MEL-1631	None
Roads Management Plan	FEIS Volume 2, SD 2-9 Nunavut. Doc 235-1314280007 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018d) NWB Doc 1803312AM-MEL-1631	None
Hazardous Materials Management Plan	FEIS Volume 2, SD 2-13 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018a) NWB Doc 1803312AM-MEL-1631	None
Risk Management and Emergency Response Plan	FEIS Volume 2, SD 2-15 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2015) NIRB Doc. No. 150623-11MN034	None
Spill Contingency Plan	FEIS Volume 2, SD 2-16 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2017) NWB Doc 1803312AM-MEL-1631	None
Shipping Management Plan (including the Marine Environmental Management Plan as Appendix D)	FEIS Volume 8, SD 8-1 (Agnico Eagle 2014) Updated and resubmitted (Agnico Eagle 2018f) NIRB Doc. No. 180104-11MN034	None
Groundwater Management Plan	Submitted (Agnico Eagle 2018e, provided in Appendix D of this FEIS Addendum) NWB Doc. No. 180214 2AM-MEL1613	The submission, review, and approval of a Groundwater Management Plan is a requirement of the current Type A Water Licence 2AM-MEL1631 (Part E, Item 14). An updated GWMP will be submitted if appropriate licenses and approvals are obtained prior to ocean discharge.
Ocean Discharge Monitoring Plan	Conceptual plan - provided in Appendix E of this FEIS Addendum.	This document.

Notes:

Updated management plans are resubmitted to the NIRB, and the NWB as appropriate, in compliance with respective NIRB Project Certificate No. 006 or NWB Type A Water Licence (No. 2AM-MEL1631, 2016) conditions, as adaptive management measures or changes are applied as the Project develops.

3.4 Potential Effects

The potential effects from the discharge of treated groundwater effluent to the marine environment were assessed in the FEIS Addendum (Agnico Eagle 2018g). Effect pathways specific to the treated groundwater effluent discharge activity assessed included the following:

- Change in fish habitat quality due to discharge of groundwater effluent
- Change in health and survivorship of fish (including benthic invertebrates) due to the quality of the groundwater effluent discharge
- Change in marine bird and mammal habitat quality due to the quality of the groundwater effluent discharge
- Change in health and survivorship of marine birds and mammals due to the quality of the groundwater effluent discharge
- Accidental release of groundwater effluent from an unknown location along the discharge pipe can have adverse effects on marine water quality and associated indirect effects on marine wildlife (fish, benthic invertebrates, marine birds, marine mammals).

Groundwater will be treated prior to discharge to comply with the effluent discharge criteria (GC 2017; CCME 2003; BC MOE 2017a; BC MOE 2017b). These criteria are set to be protective of the marine aquatic life. For parameters with no regulated guidelines for discharge, the discharged concentration objectives conservatively considered for the assessment are 95% of the Upper Confidence Level of the Mean (UCLM) for groundwater. For most parameters these are below baseline concentrations at Melvin Bay, whereas 11 parameters are expected to exceed baseline concentrations.

The assessment used a numeric simulation to model behaviour of the effluent plume in the marine environment. Modelling has shown that a discharge of 420 m^3/day effluent through the diffuser will reach a dilution factor of 10 or more within 1 m horizontal and 2 m vertical distances from the port at a worst-case scenario. This dilution factor is at least 3 times higher than the requirement for chloride and temperature and the horizontal distance of 1 m is lower than the regulatory mixing zone boundary of 100 m. The plume will have negative buoyancy and the maximum plume height expected is 13.7 m above the seabed.

The assessment concluded that the treated groundwater discharge through the diffuser would result in a minor environmental change, but would have a negligible residual effect on fish and fish habitat and marine birds and marine mammals relative to baseline or guideline values provided that mitigation measures are in place. Mitigation measures include treatment of groundwater to meet regulatory discharge criteria particularly the amended MDMER, once they come into effect (GC 2017), discharge through a diffuser that aids in mixing, and implementation of the EEM program.

SECTION 4 • CONCEPTUAL MONITORING DESIGN

The following are the main components and objectives of the ODMP:

- Effluent monitoring at the FDP (end-of-pipe monitoring) to verify compliance of brine properties with the discharge criteria and to characterize effluent quality under MDMER.
- Environmental effect monitoring studies to assess short- and long-term effects from the discharge of treated groundwater effluent on marine biota that will include:
    - Water quality monitoring
    - Biological monitoring including studies on sediment quality, benthic invertebrate communities and fish

A summary of monitoring components, sampling frequency and design is provided in Table 4.

Table 4: Conceptual Ocean Discharge Monitoring Program Sampling Summary

Monitoring Component	Sampling Frequency	Monitoring Location	Sample Replication and Number of Samples
Deleterious Substances (MDMER Schedule 4)	Every week	FDP (end-of-pipe)	One grab sample
Acute lethality	Every month (sampled concurrently with effluent characterization)	FDP (end-of-pipe)	One grab sample
Effluent characterization	Four times a year, one month apart during discharge	FDP (end-of-pipe)	One grab sample
Sublethal toxicity	Twice a year, at the start and finish of the discharge	FDP (end-of-pipe)	One grab sample
In situ Water Column Measurements	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One vertical profile per station
Water Quality	Four times a year, once a month during discharge	Exposure and reference areas	7 stations in the Exposure Area, 3 stations in each reference area. One sample @1m below the surface and one sample @5 m above the bottom at each station.
Benthic Invertebrate Communities, and sediment quality	Every 3 years in August if triggered by MDMER	Exposure and reference areas	6 stations in the Exposure area and 5 stations in each reference area. Three subsamples per station
Fish population	Every 3 years in August if triggered by MDMER	Exposure and reference areas	20 sexually mature males and 20 sexually mature females of two fish species in each sampling area
Fish tissue	Every 3 years in August if triggered by MDMER	Exposure and reference areas	8 samples of a single species from each sampling area

Notes:

Amended Metal and Diamond Mining Effluent Regulations (MDMER; GC 2017) will be adhered to. Metal Mining Effluent Regulations (MMER) will be adhered to as a minimum while MDMER come into effect.

FDP = Final Discharge Point

4.1 Effluent Monitoring

4.1.1 Deleterious Substances

Effluent water at the FDP (end-of-pipe) will be measured for pH and analysed for concentrations of deleterious substances listed in MDMER Schedule 4 (GC 2017).

4.1.2 Acute Lethality

End-of-pipe brine effluent will be sampled once per month for acute lethality testing per MDMER requirements. Acute lethality testing will be conducted on threespine stickleback in accordance with the procedures set out in sections 5 or 6 of Reference Method EPS 1/RM/10 (ECCC 2017). Effluent characterization samples (Section 4.1.3) will be collected at the same time to aid in interpretation of acute lethality test results.

4.1.3 Effluent Characterization

Effluent characterization will be conducted one month apart, four times a year. Effluent will be sampled and analysed for the following parameters:

- General parameters, including pH, TDS, total suspended solids, hardness, alkalinity, electrical conductivity, salinity and temperature
- Anions including sulphate and chloride
- Nutrients, including ammonia and nitrate
- Total metals and dissolved metals including those listed in MDMER Schedule 4 and Schedule 5 paragraph s. 4

4.1.4 Sublethal Toxicity Testing

Sublethal toxicity testing of brine effluent will be conducted twice a year, at the beginning and at the end of discharge, for three years and once a year after the third year. The following tests will be conducted:

- Fish early life stage development test on inland silverside (*Menidia beryllina*) or topsmelt (*Atherinops affinis*) (US EPA 2002)
- Invertebrate reproduction test on echinoids (sea urchins or sand dollars) (Environment Canada 1992)
- Algae toxicity test on barrel weed (*Champia parvula*) (US EPA 2002)

These tests will be conducted on aliquots of the same sample collected for effluent characterization (Section 4.1.3 Effluent Characterization).

4.1.5 Environmental Effects Monitoring

Agnico Eagle will adhere to MDMER EEM requirements for fish population surveys, water and sediment quality and benthic invertebrate community assessments conceptually outlined in Table 4. Fish tissue monitoring will be conducted if triggered by MDMER conditions. A study design will be provided to ECCC according to the MDMER requirements (GC 2017) that includes all proposed monitoring locations.

4.2 Quality Assurance/Quality Control (QA/QC)

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality.

Quality assurance protocols will be followed so data are of known, acceptable, and defensible quality. To make certain that field data collected are of known, acceptable, and defensible quality, field staff will be trained to be proficient in standardized sampling procedures, data recording using standardized forms, and equipment operations applicable to the monitoring program. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping protocols. Accredited laboratories will be selected for sample analysis. Accreditation programs are utilised by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control. A data management system will be utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the Marine Monitoring Program.

The QC component will consist of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples. Quality control procedures implemented will consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and duplicate water samples.

SECTION 5 • BENCHMARKS AND EFFECT THRESHOLDS

This section sets quality benchmarks and effect thresholds against which conditions of marine environment are monitored and whose exceedance indicate treated effluent discharge-related effects. The following criteria are discussed here:

- A benchmark is a set concentration of a chemical in a medium (water or sediments) that is expected to be protective of aquatic life, e.g., CCME Guidelines for the protection of aquatic life.
- Effect is a statistical difference in effect endpoint values between the exposure and reference areas.
- The effect threshold is a magnitude of environmental change, which, if reached, indicates a higher risk to the environment. A concept of Critical Effect Size (CES) exists for certain effect indicators, e.g., benthic invertebrate communities and fish population, which is used as an effect threshold.

Benchmarks and effect thresholds for each environmental variable are typically below the significance threshold, which is a magnitude of environmental change which, if reached, would indicate a significant effect (WLWB 2010). Exceedance of a benchmarks or effect thresholds will trigger adaptive management actions.

5.1 Water Quality

The benchmarks used for water quality variable are the CCME WQGs for the Protection of Marine Aquatic Life, British Columbia Ministry of Environment (BC MOE 2017a) Approved WQG for Marine Aquatic Life (Short-Term) and BC MOE Working WQG for Marine Aquatic Life (BC MOE 2017b) at the edge of the mixing zone of 100 m from the diffuser. For parameters for which no WQG exist, concentrations from the exposure area will be compared with the baseline concentrations and concentrations in the reference areas.

For each parameter, whether its concentration is elevated in the exposure area in comparison to the baseline or reference data will be determined based on a statistical test (ANOVA) on a 95% confidence interval or whether the mean or median is greater than 2 standard deviations.

Baseline data will be collected from the exposure and reference areas before the start of effluent discharge.

Table 5: Summary of Water Quality Guidelines

Parameter	Unit	CCME[1]		BC MOE[2]	
		Short-term	Long-term	Short-term	Long-term
Ammonia (total)	mg/L as N	-	-	0.71 – 312[3]	0.11 – 47[3]
Arsenic (total)	µg/L	-	12.5	12.5	-
Boron (total)	mg/L	-	1.2	1.5	-
Beryllium (total)	µg/L	-	-	-	100
Cadmium (total)	µg/L	-	-	0.12	-
Chloride	-	-	-	Narrative[4]	-
Chlorine-produced oxidants	µg/L	-	0.5	40	3
Chromium (III)	µg/L	-	-	-	56
Chromium (VI)	µg/L	-	-	-	1.5
Colour (apparent)	Pt-Co	-	-	Narrative[5]	-
Colour (real)	Pt-Co	-	-	Narrative[6]	-
Copper (total)	µg/L	-	-	3	<2
Cyanide	µg/L	-	-	1	
Dissolved Oxygen	mg/L	-	>8 and Narrative[7]	-	-
Fluoride	µg/L	-	-	1.5	-
Lead (total)	µg/L	-	-	140	<2
Manganese (total)	µg/L	-	-	-	100
Mercury (total)	µg/L	-	0.016	-	0.0001 / (MeHg/total Hg)
Nickel	µg/L	-	-	-	8.3
Nitrate	mg/L as N	1500	200	-	3.7
pH	-	-	7.0 - 8.7[8]	7.0 - 8.7	-
Salinity	-	-	Narrative[9]	-	-
Selenium (total)	µg/L	-	-	-	-
Silver (total)	µg/L	7.5	-	3	1
Temperature	degC	-	± 1 change from ambient background	-	± 1 change from ambient background
Turbidity	UNT	-	Narrative[10]	Narrative[11]	-
Total Suspended Solids	mg/L	-	Narrative [12]	Narrative [13]	-
Vanadium (total)	µg/L	-	-	-	50
Zinc	µg/L	-	-	55	10

Notes:

(1) Canadian Council of Ministers of the Environment (CCME 2003) Water Quality Guidelines (WQG) for the Protection of Aquatic Life - Marine.

(2) British Columbia Ministry of Environment (BC MOE 2017a) Approved Water Quality Guidelines for Marine Aquatic Life. BC MOE Working Water Quality Guidelines for Marine Aquatic Life (BC MOE 2017b).

(3) Guideline is salinity, pH and temperature dependent, minimum and maximum values are presented for a salinity of 30.

(4) Human activities should not cause the Cl^- of marine and estuarine waters to fluctuate by more than 10% of the natural Cl^- expected at that time and depth

(5) 30-day average transmission of white light ≥ 80% of background

(6) 30-day average true colour of filtered water samples shall not exceed background levels by more than 5 mg/L Pt in clear water systems or 20% in coloured systems

(7) The CCME guidelines for DO are as follows:
- Depression of DO below the recommended value should only occur as a result of natural processes. When the natural DO level is less than the recommended interim guideline, the natural concentration should become the interim guideline at that site.
- When ambient DO concentrations are >8.0 mg/L, human activities should not cause DO levels to decrease by more than 10% of the natural concentration expected in the receiving environment at that time.

(8) The pH of marine and estuarine waters should fall within the range of 7.0 – 8.7 units unless it can be demonstrated that such a pH is a result of natural processes. Within this range, pH should not vary by more than 0.2 pH units from the natural pH expected at that time. Where pH is naturally outside this range, human activities should not cause pH to change by more than 0.2 pH units from the natural pH expected at that time, and any change should tend towards the recommended range.

(9) Human activities should not cause the salinity (expressed as parts per thousand [‰]) of marine and estuarine waters to fluctuate by more than 10% of the natural level expected at that time and depth.

(10) The CCME WQG for Turbidity are as follows:
- clear flow: Maximum increase of 8 Nephelometric Turbidity Units (NTU) from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period).

- high flow or turbid waters: Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is > 80 NTUs.

(11) The BC MOE WQG for Turbidity are as follows:

- Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters
- Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters
- Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters
- Change from background of 10% when background is > 50 NTU at any time during high flows or in turbid waters

(12) The CCME WQG for total suspended solids are as follows:

- clear flow: Maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d).
- high flow: Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 and 250 mg/L. Should not increase more than 10% of background levels when background is ≥ 250 mg/L.

(13) The BC MOE WQG for total suspended solids are as follows:

- Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters
- Change from background of 5 mg/L at any one time for a duration of 30 d in all waters during clear flows or in clear waters
- Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters
- Change from background of 10% when background is > 100 mg/L at any time during high flows or in turbid waters

5.2 Sediment Quality

The benchmarks used for sediment quality variables are the CCME sediment quality guidelines (SQGs) for the Protection of Marine Aquatic Life (CCME 2003b) (Table 6). For parameters for which no sediment quality guidelines exist, concentrations from the exposure area will be compared with the baseline concentrations and concentrations in the reference areas.

For each parameter, whether its concentration is elevated in the exposure area in comparison to the baseline and reference data will be determined based on a statistical test (ANOVA) on a 95% confidence interval or whether the mean or median is greater than 2 standard deviations.

Baseline data will be collected from the exposure and reference areas before the start of effluent discharge.

Table 6: Summary Sediment Quality Guidelines

Parameter	Unit	CCME(1)	
		ISQG	PEL
Arsenic	mg/kg	7.24	41.6
Cadmium	mg/kg	0.7	4.2
Chromium	mg/kg	52.3	160
Copper	mg/kg	18.7	108
Lead	mg/kg	30.2	112
Mercury	mg/kg	0.13	0.7
Nickel(2)	mg/kg	30	50
Zinc	mg/kg	124	271

Notes:

(1) Canadian Council of Ministers of the Environment (CCME 2001) Sediment Quality Guidelines (SQG) for the Protection of Aquatic Life - Marine.

(2) British Columbia Ministry of Environment (BC MOE 2017b) Working Sediment Quality Guidelines for Marine Aquatic Life.

SECTION 6 • DECISION FRAMEWORK

A decision framework (Figure 2) will used by the Mine to identify an appropriate path through the EEM program, based on the respective situation. The structure of the decision tree is mainly based on the MDMER regulatory requirements and best scientific knowledge and is aimed to prevent or minimize adverse effects on the receiving environment. If any unforeseen adverse effects are identified during the monitoring and their cause is determined, additional mitigation measures will be applied through adaptive management. Mitigation measures developed and implemented with adaptive management will be dependent on the nature and magnitude of the changes observed.

The requirement to conduct the EEM program biological component studies (benthic communities, fish population and fish tissue) can be lifted if no effect has been found during two previous studies. The Mine will continue effluent and water quality monitoring and reporting the results, as required in the MDMER, independently of the biological monitoring studies and reports.

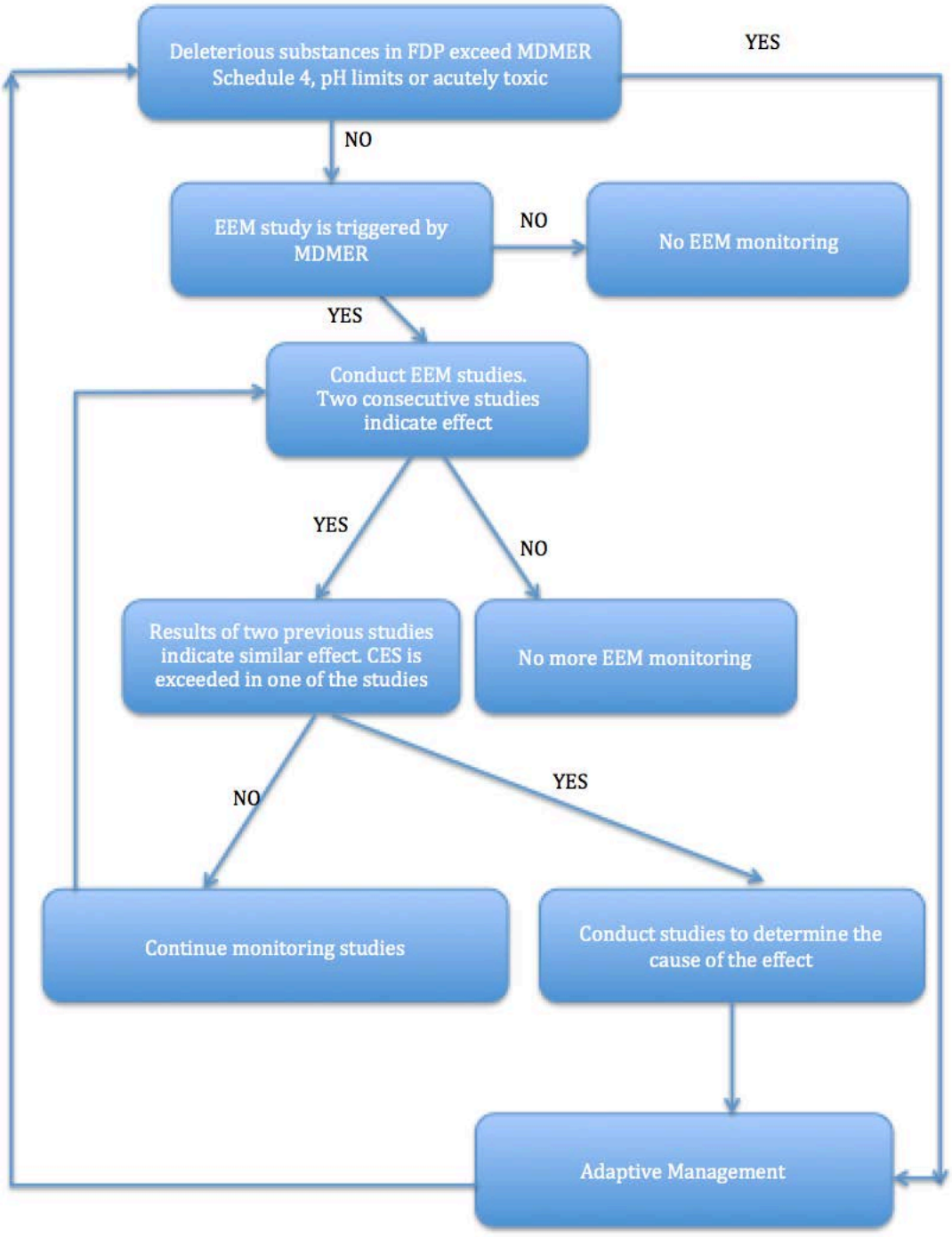

Figure 2: Ocean Discharge Monitoring Plan Decision Tree

SECTION 7 • REPORTING

Reporting will include all the raw data obtained during sampling campaigns, followed by data interpretation, graphical presentation and comparison to applicable guidelines, baseline data and literature data. Results for each component will be synthesized in an integrated manner to evaluate the overall direction of change to the marine ecosystem. The report will have a scientific approach similar to the other documents such as the Aquatic Effects Monitoring Program or EEM reporting and other environmental studies conducted for the Mine.

Comprehensive reports will be prepared and delivered to Environment and Climate Change Canada (as per the MDMER requirements) on the EEM reporting schedule and to NIRB and NWB annually following the discharge of treated groundwater effluent to the marine environment. Reports will be available on the public registry for regulator and stakeholder review and input. Reports filed with ECCC will be reviewed by a Technical Advisory Panel to satisfy the biological components of the MMER EEM program. Data on fish and lower trophic level monitoring will be entered to a federal government website for integration into a national dataset on biological monitoring at metal mines (EC 2012).

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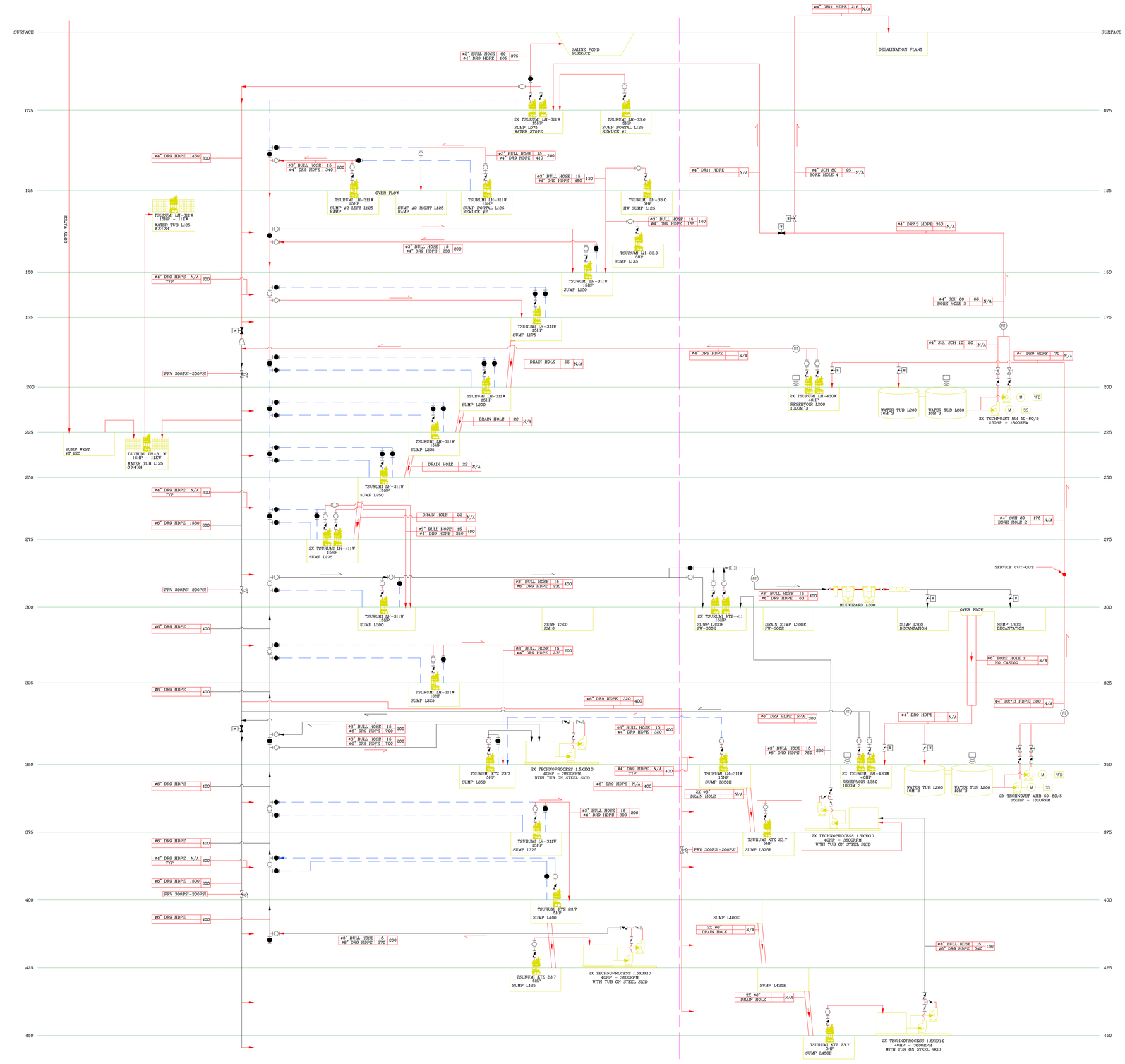
APPENDIX E • UNDERGROUND SUMP FLOW SHEET DIAGRAM



PIPE UNDER PRESSURE
PIPE UNDER PRESSURE 6"
PIPE WITHOUT PRESSURE
EQUIPMENT
LEVEL
SECTOR
FIRST PIPE | LENGHT (M) | #3" BULL HOSE 15
SECOND PIPE | LENGHT (M) | #4" DR9 HDPE 410 | 200 | FLOW (USGPM)
BALL VALVE NC
BALL VALVE NO
GATE VALVE NC
GATE VALVE NO
CHECK VALVE
PRESSURE REDUCING VALVE
BUTTERFLY VALVE
MOTORISED BUTTERFLY VALVE
LEVEL SENSOR
FLOW METER
CONCENTRIC REDUCER

TOTAL HP INSTALLED: 1045 HP

NOTE:

- ESTIMATED LENGTH OF PIPING, TO BE CONFIRMED BY COSTUMER.

NE PAS UTILISER POUR CONSTRUCTION
(NOT FOR CONSTRUCTION)

POUR APPROBATION
(FOR APPROVAL)
DATE : 2018-08-02

REV	DATE	DESCRIPTION	INIT.	INIT.
D	2018-11-15	ISSUED FOR COMMENTS	A.L.	A.L.
C	2018-09-26	ISSUED FOR COMMENTS	P.B.	M.B.
B	2018-09-18	ISSUED FOR COMMENTS	P.B.	M.B.
A	2018-08-08	ISSUED FOR COMMENTS	P.B.	A.L.

ÉMISSION/ISSUED FOR

Techno-Sub

CLIENT:
AGNICO EAGLE
MELIADINE

PROJET/PROJECT:
WATER MANAGEMENT AUDIT
P1806201

TITRE/TITLE:
FLOWSHEET DIAGRAM
MID TERME
NOVEMBER 2018

CONÇU PAR/DESIGNED BY: A. Labbe, P. Eng.	INIT.
DESSIN PAR/DRAWN BY: P. Bellerose	INIT.
VERIFIÉ PAR/CHECKED BY: A. Labbe, P. Eng.	INIT.
APPROUVÉ PAR/APPROVED BY: A. Labbe, P. Eng.	INIT.
ÉCHELLE/SCALE: N/A	DATE DE CRÉATION/CREATION DATE: 2018-08-08
# DE PROJET/PROJECT #: P1806201	
# DE DESSIN/DRAWING #: P1806201-0002	REVISION D

GABARIT/TEMPLATE: TECH_1 FORMAT: ARCH D (24X36)
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ÉCHELLE DE TRACE/PLOT SCALE: 0.037362



AGNICO EAGLE

MELIADINE GOLD PROJECT

WILDLIFE PROTECTION AND RESPONSE PLAN

VER: 8

JANUARY 2019

Document Control

Version	Date (YMD)	Revised by	Section	Page	Revision
August 2012	2012/08/30	David Frenette	2.2.5, 2.2.9.4	7,12	Typo errors (page 7 and 12),
August 2012	2012/08/30	David Frenette	2.2.9.1	11	Precision on the report to send to the authorities during the caribou migration.
November 2012	2012/11/12	David Frenette	2.2.9.1	10	Removal of the 3 monitoring stations as requested by the GN.
June 2013	2013/06/12	David Frenette	App. A	31	Update of the Air Traffic Management Plan
November 2015	2015-11-15	Philip Roy / Jeffrey Pratt	2.2.1 2.2.7.2 2.2.8.1 2.2.9 3.2.2.3 5.3	8 11 12 13-16 20 30	Update speed limits Inclusion of wildlife mortality procedure MEL-ENV-0015 Update steps for dispatching wildlife on the Meliadine project Comprehensive revision of section 2.2.9 - Protocol for dealing with caribou and muskoxen during their migration Environment department protocol for managing problem predatory mammals Delivery of training for site staff
December 2016	2016-12-23	Alexandre Gauthier / Jeffrey Pratt	2.2.9.2 5.3.3		Updated when to activate the work suspension protocol Included Bearwise training outcome
January 2018	2018-01-20	Alexandre Gauthier			Annual review
January 2019	2019-01-10	Martin Theriault	App. A and App. D	32	Annual review, Update of the Air Traffic Management Plan and the problem wildlife procedure

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SECTION 1 – INTRODUCTION

This plan proposes mitigation measures and monitoring initiatives to lessen the likelihood that wildlife will become habituated to the Meliadine site and its infrastructures. The plan identifies measures to deter wildlife from obtaining camp food waste, finding shelter around the site, gaining access to harmful substances present on the project site, being injured as a result of vehicle collisions, and damaging mine property.

Despite these mitigation measures, personnel may occasionally come into contact with wildlife that inhabits the Meliadine area. Incidents must be managed to keep both humans and wildlife safe while using only humane control methods.

Furthermore, all staff must be familiar with the standard operating procedures and best practices aimed at ensuring human-wildlife conflicts are minimized during the construction activities. All personnel, including contractors, on site have a role to play in ensuring human safety, conservation of wildlife and documenting wildlife activities in the mine area.

The plan also provides information on general human-wildlife conflict policies and regulations, species-specific response plans for ungulates and predatory mammals, and general wildlife awareness.

SECTION 2 – HUMAN-WILDLIFE CONFLICTS

2.1 Overview

Wildlife encounters can take many forms. A conflict occurs when either human or wildlife health, and/or safety are put at risk. Human health and safety can be affected by contact or conflict with wildlife in several ways, including direct or indirect physical injury, and exposure to animal diseases that can infect humans (i.e., rabies).

The most common conflict faced by wildlife is the increased risk of mortality from human encounters, which most often occur when wildlife become habituated to human activity and lose their natural fear of people. The most serious form of habituation is directly correlated to animals obtaining food, which is known as food conditioning. Food-conditioned animals become dependent on humans for sources of food. Because these human-induced habits become engrained in the animal, attempts to deter the habituated behavior generally fail with the end result usually being the death of the animal. Loss of habitat effectiveness (how the animal uses its available habitat), and effects to wildlife movement (how the animal travels through its available habitat) can also result from wildlife in conflict with human development. Ultimately, this will affect both the health and safety of the wildlife species involved. While it is impossible to remove all risk to both human and wildlife health and safety, approaches to minimize the risk do exist. Reactive measures do have their place in stopping the conflicts when they occur, but proactive strategies are the most effective means of preventing potential conflicts.

2.2 Agnico Eagle Policies and Regulations

The following summarizes the general rules regarding wildlife on the site and will form the basis of the Wildlife Awareness Orientation and Courses (see below).

Employees and contractors are advised to report all wildlife related activities in the vicinity of the Meliadine site to the Environmental Department.

2.2.1 General Restrictions for Wildlife Protection

The following are general restrictions for site workers and contractors, intended to minimize the potential for negative project-related effects (e.g., increased mortality risk) on wildlife in and around the site.

- Wildlife shall have the right-of-way except where it is judged to be unsafe to do so. All species of wildlife (i.e., from small mammals to large carnivores, songbirds to raptors) when encountered by personnel on foot or in vehicles will be given the right-of-way,
- Non-mine-registered firearms are not permitted on site,
- Feeding wildlife is prohibited at all times,
- Harassment[1] of wildlife is prohibited at all times at the Meliadine site,

[1] defined as to kill, injure, seize, capture or trap, pursue and includes to stalk, track, search for, or lie in wait for all purposes not authorized by the Environmental Department

- The deliberate destruction or disruption of wildlife nests, eggs, dens, burrows, and the like, is prohibited at all times at the Meliadine site,
- Hunting and fishing is prohibited at all times at the site,
- Pets are prohibited at all times at the site,
- Maximum speed limit:
    - On all site roads is 40 km/h.
    - AWAR 50 km/hr
    - 20 km/hr around buildings and infrastructure
    - Between camp and mine road is 10km/hr
- Traffic (including ATVs and snowmobiles) is restricted to designated roads and trails.

The site refers to any facility present during the construction and operation phase, including but not limited to, outbuildings (e.g., machine shop, offices), the portal, waste rock pads, parking areas, drill sites, access roads and borrow pits.

2.2.2 Wildlife Attractants

A list of potential wildlife attractants is provided below. The list is intended as a general summary of attractants but may not be comprehensive of all potential attractants.

- Food wastes and garbage;
- Chemicals (e.g., salt for drilling) and refuse (e.g., empty fuel containers);
- Wildlife carcasses (e.g., road kills, hunter kills);
- Human activity moving around the site; and
- Roads, which may create preferential travel corridors for wildlife, can lead to vehicle collisions and increased exposure to wildlife encounters at the site.

2.2.3 Garbage Management

General recommendations directed to minimize wildlife interactions related to food wastes and garbage is provided below.

- Littering is prohibited on and in the vicinity of the site and along access roads. All garbage (e.g. lunch bags) must be returned to temporary storage containers. Note: organic wastes (e.g., orange peels, apple cores, left over coffee, tea or fruit drinks) are included.
- Food related waste (including packaging) will be incinerated on a daily basis and general waste will be stored for disposal in the landfill and then buried.

- Wastes associated with mechanical maintenance and repairs (e.g., motor oil and antifreeze) will be disposed of as per the Hazardous Materials Management Plan.
- All temporary (small) storage containers for food waste garbage (yellow bin) will be wildlife protective (i.e. have bear proof lids).
- No open top buckets or anything similar will be tolerated outside buildings.
- Feeding wildlife is prohibited at all times on or in the vicinity of the site, including during travel to and from the site on workdays.
- Wildlife incidents related to garbage or human food attractants will be reported as soon as possible. See Section 2.2.7 (Reporting Wildlife Observations and Incidents) for more information.
- Improperly disposed garbage, particularly food wastes will be reported as soon as possible.
- See Section 2.2.7 (Reporting Wildlife Observations and Incidents) for more information.

While arctic fox tends to be the greatest concern with respect to access to garbage, other animals (e.g., wolverines, wolves, grizzly and polar bears) may be attracted to uncontained garbage sources. Problem wildlife data at the Meliadine project to date, indicate that Arctic fox are the most likely species to be attracted to the site.

2.2.4 Wildlife Health

The following recommendations are intended to reduce potential mine-related effects on wildlife health (including non-vehicle related accidents and consumption of toxic substances).

- Feeding wildlife is prohibited at all times on or in the vicinity of the site, including during travel to and from the site. If caught feeding wildlife, employees will be subject to disciplinary action which could include dismissal.
- Company procedures on the safe and prompt clean-up of any chemical spills will be followed.
- See Meliadine Gold Project's Fuel Transportation and Spill Contingency Plan. Any observations of wildlife in and around potential sources of contaminants (e.g., fueling sites) will be reported. See Section 2.2.7 (Reporting Wildlife Observations and Incidents) for details.

2.2.5 Wildlife and Vehicles

The following recommendations are intended to reduce the incidence of wildlife-vehicle collisions and near misses.

- Wildlife has the right-of-way except where it is judged to be unsafe to do so.
- Obey all traffics signs.
- Maximum speed limit:

- On all site roads is 40 km/h.
- AWAR 50 km/hr.
- 20 km/hr around buildings and infrastructure.
- Between camp and mine road is 10kmph.

- Verbally report wildlife carcasses observed on and in the vicinity of the site, and along roads, as soon as possible. See Section 2.2.7 (Reporting Wildlife Observations and Incidents) for more information.
- Restrict traffic (including ATVs and snowmobiles) to designated access roads and trails.
- When clearing snow from roads, push the snow with a dozer or blow the snow away with the snow blower to avoid the build-up of snow banks on the side of the road.
- Report all wildlife-vehicle collisions that results in the death or injury of wildlife as soon as possible. See Section 2.2.7 (Reporting Wildlife Observations and Incidents) for details.
- A near miss between a vehicle and an animal should be reported as a wildlife 'incident'. See Section 2.2.7 (Reporting Wildlife Observations and Incidents) for details.

2.2.6 Wildlife and Buildings

The following recommendations are intended to reduce the risk of close encounters between wildlife and people

- Keep sea-can doors closed at all time to avoid wildlife using them as shelter.
- Open top bins and containers for food waste will not be permitted outside buildings.

2.2.7 Reporting Wildlife Observations and Incidents

2.2.7.1 Reporting Requirements of Project Workers and Contractors

- Workers and contractors are required to verbally notify the Environmental Department of the following wildlife observations or incidents as soon as possible.
  - Signs of animal presence (e.g., scat, nests, burrows) in close proximity (visible to the eye from within the site footprint frequented by workers).
  - Sightings of animals in close proximity (visible to the eye from within the site footprint frequented by workers).
  - Aggressive or unusual wildlife behaviour around site facilities.
  - Instances of workers feeding wildlife.
  - Instances of improper disposal of garbage or other waste materials.
  - Observed maintenance issues (e.g., improper placement or maintenance of garbage containers).
  - Instances of workers not following vehicle use guidelines (e.g. speed limits).
  - Vehicle collisions with wildlife or near misses.

- Observations and locations of dead (e.g., road kill) or injured animals.

Following the verbal report of a wildlife incident or observation, the Environment Department will complete a Wildlife Incident Report and forward to the authorities as necessary. Wildlife fatality reporting will follow the Wildlife Reporting Protocol (MEL-ENV-0015). This can be found in Appendix B.

2.2.7.2 Reporting Requirements of Wildlife Occurrences

Wildlife Incident Reports provide essential information that may identify:

- potentially dangerous situations requiring intervention (e.g., problem wildlife);
- situations that require notification of the Nunavut Department of Environment (GN), KIA and/or the HTO;
- weaknesses in garbage-handling and problem wildlife prevention measures; and
- areas that may require warning signs (e.g., poor visibility road corners).

The Senior Environmental Coordinator or designate(s) should ensure that records of wildlife observations and incidents are thoroughly documented. Reports should attempt to include the following information wherever possible:

- Identification and number of wildlife observed;
- Specific timing and location of the observation(s);
- Details regarding the animal behaviour, including direction of approach and departure, what it was doing, any aggressive behaviour, etc.
- Assessment of local attractants, such as garbage, odours, movement of people, other wildlife, etc.;
- If local attractants are identified as a factor, determination of what steps were or will be taken to address/remove potential attractants; and
- Identification of any potential mitigation measures available to deter wildlife or limit access and how they will be implemented (refer to Section 2.2.8 for additional information on dealing with problem wildlife).

2.2.8 Protocol for Dealing with Problem Wildlife

A problem wildlife situation may arise when an animal acts in an aggressive manner and/or is a repetitive nuisance or threat to worker safety. See the problem wildlife procedure in Appendix D

2.2.8.1 Dispatching Problem Wildlife

1. Prior to dispatching any wildlife on site, the Environment Department will consult with the GN Wildlife Officer for advice/direction. If an animal is destroyed, a description of the lethal measures deployed

(e.g., rifle), statement of the rationale for use of lethal measures (e.g., proximity to workers, repeated incidents, observed condition of the animal, etc.), and indication of what previous non-lethal measures were employed (e.g., deterrents, hazing, trapping and relocating (with permission from GN) etc.).

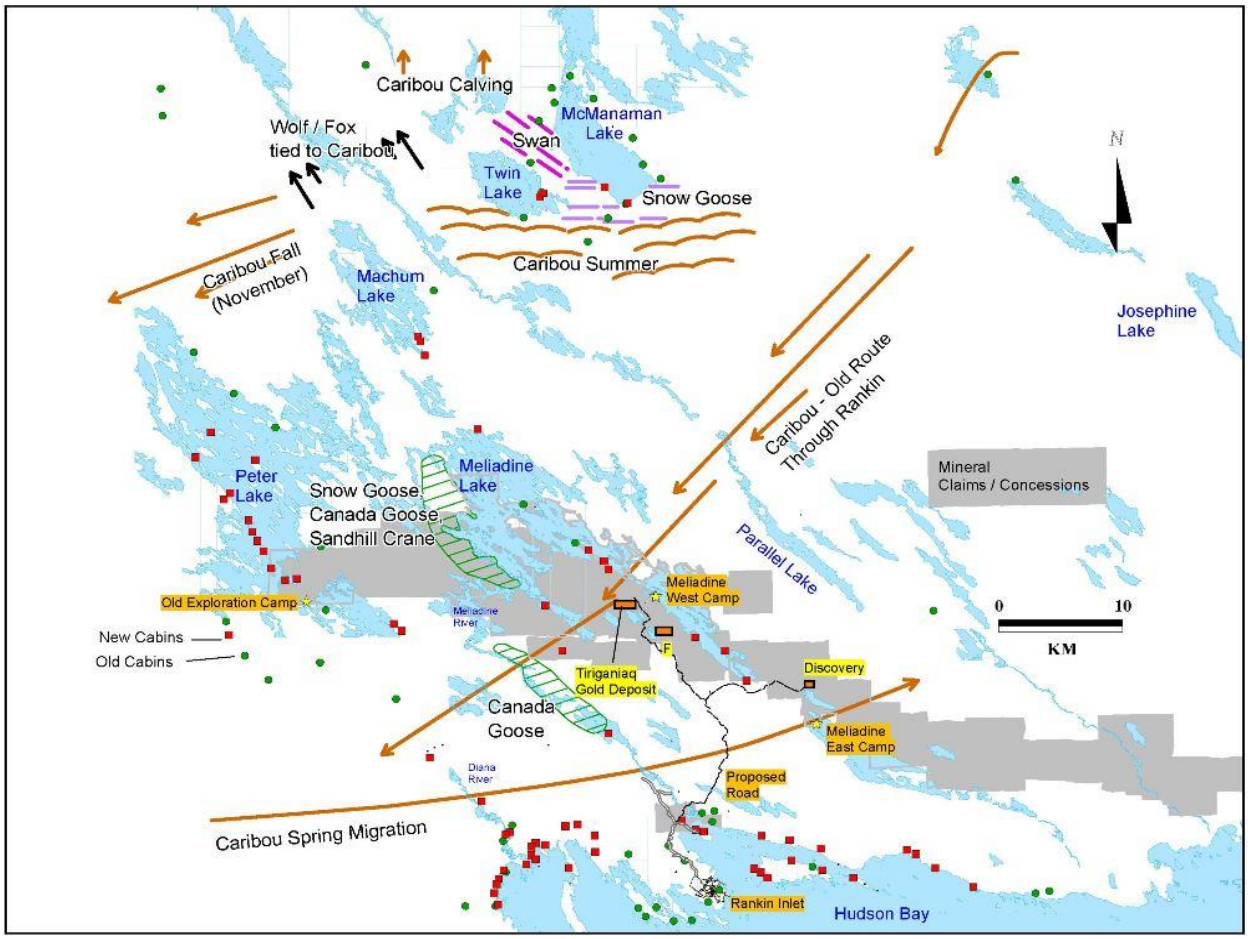
2. Written direction (email) from the GN Wildlife Officer must be obtained prior to dispatching any wildlife. The only exception is if there is an immediate threat to human safety (example carnivorous animal is attacking people) Only authorized personnel are permitted to use lethal and non-lethal projectiles (e.g., rubber bullets) see environment department for list of authorized persons on site.
3. Do not attempt to deal with a problem wildlife issue on your own. Problem wildlife can be dangerous.
4. Conform to recommendations regarding predator safety. All staff will receive wildlife awareness training during their orientation.
5. *An animal may be dispatched without consultation with the GN Wildlife Officer only if actions listed in* 3.2.2.3 have been followed.

2.2.9 Protocol for Dealing with Caribou and Muskoxen during their migration

Results from baseline surveys indicate that caribou and, only recently, muskox are present in the Meliadine Area for parts of the four seasons, but caribou are observed in greatest abundance between May and September.

The baseline study established a map of historical wildlife presence in the region of the Meliadine project, including historical migration routes for the caribou. This map is shown in Figure 1.

Figure: 1 Map of Historical Wildlife Presence in the region of the Meliadine Project



The protocol has 3 components:

- A caribou and muskox herd sighting and protection protocol.
- An activity shutdown protocol including crew change and helicopter flight control.
- An activity restart protocol.

2.2.9.2 Caribou and muskox sighting reporting and protection protocol

When the migration starts around the beginning of July, herds of 1000 to 5000 animals (or greater) can cross the area of Meliadine camp. For a period of 3 to 10 days, the caribou may be present around the site for the annual migration. Historically, migrations have been noted between October-December as well.

Studies of woodland caribou have demonstrated avoidance of up to 1 km for well sites and 250 m for roads and seismic lines (Dyer et al. 2001). Data from the Ekati Diamond Mine suggests that the instantaneous

negative response (alert, stop feeding) of barren-ground caribou to stressors (e.g., truck traffic) increases within 1 km of the source (BHPB 2004).

During this period, Agnico Eagle will report any sighting and prevent human activities that could disturb the herd. Caribou will have the "right-of-way", and will not be blocked or deterred from moving through the Project area.

AEM must take all possible measures to avoid disturbance to the caribou or muskox herd.

At all times, it's *strictly forbidden to harass wildlife*. This includes persistently worrying or chasing animals, or disturbing large groups of animals.

When observing herds of caribou or muskox:

Staff at Meliadine must report immediately the presence of caribou (50 or more) or muskox (10 or more) to the Environmental Department. The Environment Department will notify the KIA, HTO and the Government of Nunavut Environment Department electronically via a "Caribou Migration Alert" (Section 2.2.9.5)

When reporting the presence of the herd, the location and the approximate size of the herd will be specified.

When to activate the work suspension protocol:

During migration of Muskox (10 or more animals) or Caribou (50 or more animals) herds AEM must start implementing the work suspension protocol when the caribou herd is moving in the direction of the activities. In accordance with the IIBA, all off-site and on site-related activities must be stopped once the Herd is within 5 km radius of such activities. Those related activities include; off-site drilling and/or helicopter flight, approved development, construction site development, road traffic and construction; all site, camp, and mine outdoor surface activities. A decision tree was put in place in 2017 to have proper step to follow to activate the work suspension protocol.

2.2.9.3 Work suspension protocol (in this section we are only listing the activities – the actual stoppage protocol is in A) and B) below

The activities below could interfere with the caribou migration and will be suspended if necessary:

- Helicopter flights.
- Drill operations off site.
- Surface mining activities such as transportation to mining areas, non-essential refueling of equipment, service vehicle traffic, etc.
- Surface activities related to underground mining such as surface stockpiling of ore or waste with loaders, scoop trams, etc.

- Surface construction activities such as approved pre-development and development construction, road construction, non-essential waste deposition, transportation of equipment, etc.
- Outside Camp activities.

Upon activation of the work suspension protocol, the following steps will be taken:

A. Drilling and Helicopter Activities Off-Site

- Inform all employees at the drill sites that are in the direction of the caribou migration and within 5km radius of the migration that they will need to shut down the operations such that the drills and associated helicopter flights can cease as quickly as possible.
- Shutdown will include removal of drill rods from the holes and securing of the drill station.
- Organize transport of the affected personnel to the camp. Personnel that do not require air or road transportation will be requested to walk back.
- During helicopter transport of personnel, the Air Traffic Management Plan (in appendix A) will be applied to protect the caribou herd (avoidance distance of 1,000 m vertical and 1,500 m horizontal).

B. Surface Mining and Construction Activities On Site

- Surface mining, construction activities, outside camp activities and surface activities related to underground mining as described in Sec 2.2.9.3 above will be stopped when caribou migration herds or muskox herds are within the 5km radius stop work buffer zone.
- All personnel in such cases will return to camp if necessary.
- Use of helicopter for emergency evacuation of personnel for medical reasons will still be allowed.

2.2.9.4 Road utilization

- For a group of caribou (≥50) or muskoxen (≥10) within 100 m from the AWAR road and Meliadine Camp Access road:
    - Regular vehicle traffic for transport to and from the site will be suspended and /or stopped to allow Caribou herds to cross the road.
    - Wildlife has the right of the way and vehicles must wait without disturbing their movements.
    - The use of the road for mining or construction related activities will cease until Caribou or musk ox herds have moved outside the 5km radius stop work buffer zone.

2.2.9.5 Activity Restart Protocol – Caribou Migration Alert

- AEM Meliadine Environmental personnel will perform a ground based caribou or muskox survey 3 times per day during the migration. The survey will determine the distance to Meliadine on and off site. The location will be marked on a map depicting the 5km radius buffer zone and the location of the caribou or musk ox herd. As stated previously, all mining related work will cease within the 5km radius stop work buffer zone. Mining, drilling and construction activities as well as the camp will be referenced on the map. Surveys will be conducted,
    - Morning
    - Lunch
    - Evening
- Once the survey is completed, a map noting the herd and proximity of any mining, drilling and construction activities as well as a report containing the following information will be forwarded to all Meliadine Departments, Contractors, KIA, GN, and the local HTO:
    - Where the herd(s) have been observed.
    - Estimated number of animals in the area.
    - Where activities can resume.
    - Where activities are suspended.

    This will be referred to as a "***Caribou Migration Alert***"

- No work will resume in a suspended/stop work zone until the next survey can verify that the herds are outside the 5km radius zone. An example of a Caribou Migration Alert can be found in Appendix C

SECTION 3 – SPECIES-SPECIFIC RESPONSE PLANS

3.1 Purpose

Response plans specific to species groups (i.e., ungulates and predatory mammals) are required to ensure that all personnel at the Meliadine site are provided guidance on how to respond in a manner that is safe to both humans and wildlife should they encounter wildlife on or around the project site.

3.2 Species Groups Addressed

Ungulates (caribou and muskoxen) and predatory mammals (polar and grizzly bears, wolverine, wolf and Arctic fox) have the highest potential for interactions with humans during the life of the mine, and thus require specific response plans. If other wildlife is encountered, adaptive management strategies will be implemented if mitigation techniques and the mine policies and regulations mentioned in this document are not effective for these species. The proposed wildlife monitoring program will be the best measure of identifying potential areas in need of new mitigation strategies, or changes in policies or regulations.

For each of the species groups described below, the seasonal activity in the project area is discussed, as well as the protocol in the event of an encounter.

3.2.1 Ungulates

3.2.1.1 Seasonal Activity in the Project Area

Results from baseline surveys indicate that caribou and, only recently, muskoxen are present in the Meliadine area for part of the four seasons, but caribou are observed in greatest abundance in the spring (e.g., July) when thousands of animals may be present in the vicinity of the Meliadine site. This only occurs annually.

3.2.1.2 Response to Encounters

3.2.1.2.1 Caribou

It is extremely rare for humans to have physical altercations with caribou. Caribou rut in the fall when relatively low numbers can be found from time-to-time on the site and the levels of aggression displayed, particularly by males, increases substantially. There is literature suggesting that a bull caribou may attack a person or vehicle during the rut. Therefore, a close encounter with caribou (during the fall) or muskoxen could be dangerous.

If you encounter a single or herds of caribou, the following actions should be taken:

- Back away slowly;
- Ensure animal(s) have an escape route;
- Do not make sudden movements;
- Do not make loud noises or attempt to scare the animal(s);
- Use radio/satellite phone to report presence of the animal(s) to the Environmental Department;
- Stay in radio/phone contact until the animal(s) moves away or you have returned to a safe area;
- (e.g. inside vehicle or building); and
- Wait for the animal(s) to pass before continuing work in the area.

3.2.1.2.2 Muskox

Although considered rare, muskoxen will charge humans if they are threatened (especially lone bulls). Being a sedentary species, the muskoxen will have the tendency to stand their ground when threatened, defending their territory or their young.

If you encounter a single or herds of muskoxen the following actions should be taken:

- Back away slowly;
- Ensure animal(s) have an escape route;
- Do not make sudden movements;
- Do not make loud noises or attempt to scare the animal(s);
- Use radio/satellite phone to report presence of the animal(s) to the Environmental Department;
- Stay in radio/phone contact until the animal(s) moves away or you have returned to a safe area
- (e.g. inside vehicle or building); and
- Leave the area and wait for the animal(s) to go away before continuing work in the area.

3.2.2 Predatory Mammals

3.2.2.1 Seasonal Activity in the Project Area

Polar and Grizzly Bear

Baseline surveys indicated limited use of the Meliadine study area by grizzly bears, which is consistent with what would be expected for grizzly bears in the north, given their wide-ranging habits and low densities. Polar bears are more commonly seen of late. **These are extremely dangerous under all circumstances as they are known to prey on humans. Get help immediately if you see a polar bear.**

Wolverine

Wolverines are thought to occur in the project area on an infrequent basis. Records of wolverine sightings or their sign were not found since baseline studies began in 1998. Similar to grizzly bears, the limited evidence for wolverine in the area is not surprising given their wide-ranging movements and characteristically low population densities.

Wolf

A single wolf was seen one time during the years of baseline studies. They are not common in the study area.

Arctic Fox

Camp personnel have regularly observed Arctic foxes in and around the Meliadine site during most months of operation, including winter. Arctic foxes are the most common predatory mammal species to be encountered at the Meliadine mine.

3.2.2.2 Response to Encounters

Predatory mammals such as wolves, wolverine, arctic fox and bears rarely attack people; however, they are extremely strong and vicious, and should be given respect. **Polar bears are known to attack humans.** Members of the dog family (such as wolves and foxes) are more at risk of carrying rabies, and other zoonotic diseases, and therefore should be avoided. Arctic fox in particular is easily tamed, quickly losing their fear of humans and often approaching very close. Sick or injured animals may no longer be able to feed themselves, and could be in a state of starvation. Often they show few physical signs that something may be wrong, but typically act more aggressively or even 'friendly' towards humans. Therefore, a close encounter with a predatory mammal could be dangerous. All bites and scratches from wildlife should be reported immediately to Health & Safety since animals can be vectors for rabies.

If you encounter a predatory mammal, the following actions should be taken:

- Back away slowly and do not turn your back on the animal;
- Do not make sudden movements;
- Do not make loud noises or attempt to scare the animal if it is simply traveling through the area;
- Use radio/satellite phone to report the presence of the animal to the Environmental department;
- Stay in radio/phone contact until the animal moves away or you have returned to a safe area. (e.g. inside vehicle or building); and
- Wait for the animal to pass before continuing work in the area.

If the predatory mammal does not back away, or shows interest in you:

- Continue to back away slowly and ensure a 10 m distance between yourself and the animal;
- Make sure the animal has a safe route of escape;
- Make noise to alert the animal of your presence or to scare it off;
- Avoid provoking it;
- Return to a safe area as soon as possible (e.g. inside a building or vehicle); and
- Keep the Environmental department informed of situation using the radio/phone.

If the predatory mammal still does not back away, call for deterrent action by the Environment Department

The Environment Department is to treat all predatory mammals that are threatening or aggressive as they would treat a grizzly bear or polar bear, which are perceived to be most dangerous. All predatory mammals that are showing interest in a person or site facilities must be aggressively deterred to prevent habituation to the site. Detailed response recommendations are provided in Section 3.2.2.3 below. If an animal is not of an immediate safety concern, the Environment Department should discuss options to deter or remove the animal with Government of Nunavut conservation personnel.

3.2.2.3 Environment Department Protocols for Managing Problem Predatory Mammals

As part of the detailed response plan, the Environment Department will follow the procedures included here when responding to predatory mammal sightings and encounters. It is assumed that the reporting person(s) has followed procedures for predatory mammal incidents, and has requested the Environment Department to be dispatched due to the failure of human presence to deter the predatory mammal. If an animal is not of an immediate safety concern, the Environment Department should discuss options to deter or remove the animal with Government of Nunavut conservation personnel. All wildlife problems are to be recorded in the wildlife database.

The Environment Department will:

- Collect all deterrent equipment and receive briefing from the Senior Environmental Coordinator or designate on location and circumstances of the call.
- When firearms are to be used there will always be two individuals, one person with a firearm (12 gauge) for deterrent use, the other as back up having a rifle with lethal force or a 12 gauge with lethal rounds. No lethal force will be taken without consent from the Senior Environmental Coordinator or designate in conjunction with the consultation of the Government of Nunavut Wildlife Officer unless the situation is deemed to be life threatening.

- The appropriate action, usually less than lethal deterrent, will be chosen and used in an effort to scare the predatory mammal away.
- If the deterrent is successful, the incident will be recorded in the Wildlife database and should detail the type and level of deterrent used, information on the predatory mammal involved, and all information on the circumstances leading up to the incident.

If the deterrent is not effective and the predatory mammal continues to approach or doesn't move away from the area of human activity or project footprint.

- Increase deterrent efforts to less than lethal projectile (rubber bullet) if not already being employed.
- Ensure the animal has an open escape route.
- Continue aggressive use of less than lethal projectile deterrents to try and chase the animal away.

Dispatching

All but the most aggressive animals should have been deterred at this point. If the situation escalates further the Senior Environmental Coordinator, Superintendent or designate must be contacted and made aware of the situation. No Further action will be taken until consultation with the GN Wildlife Officer has been completed.

NO LETHAL ACTION WILL BE TAKEN UNTIL CONSENT IS GIVEN BY GN WILDLIFE OFFICER.

The following will be determined by the Environmental Superintendent or designate in conjunctions with the H&S Superintendent and the Mine Manager or designate; any and all possible actions will be taken to communicate with the GN wildlife officer prior to making an internal decision.

The risk to human life or property is imminent since the predatory mammal has not responded to non-lethal deterrent options and the safety of the team or site property is now compromised.

- Shoot with the intention of stopping the threat, using buckshot or 1-ounce lead slugs or with the .300 calibre rifle as appropriate, to kill the animal.
- Shots should be aimed at the chest area, not the head or hind quarters.
- If lethal force has been used, the Environment Department must complete a full report detailing the event immediately.
- The GN conservation officers will be notified by phone. Direction will then be given to properly dispose of the carcass.
- Any wildlife showing signs of rabies will be dispatched (never shot in the head) and reported.

NOTE: Lethal action against any wildlife without consent from the GN Wildlife Officer can result legal ramifications. As well, unnecessary deterring of wildlife can be considered harassment and can also result in legal ramifications. The only exception is if there is an immediate threat to human safety (example carnivorous animal is attacking people), however even at this point approval from Environmental Superintendent or designate in conjunctions with the H&S Superintendent and the Mine Manager or designate must be obtained.

Any AEM employee who does not follow the above mentioned steps **will be** subject to disciplinary measures.

SECTION 4 – WILDLIFE AWARENESS INFORMATION AND ENCOUNTER STRATEGIES

This section deals with general predatory mammal (ie. Wolves, wolverines, grizzly bears and polar bears) awareness information and encounter strategies. It does not replace the need for all personnel to take a recognized wildlife awareness course.

4.1 Factors that Influence a Predatory Mammal's Reaction

Wolverines, wolves, grizzly bears and polar bears will react differently to chance encounters with humans, depending upon many factors, including each animal's past experience with humans. Their reaction is difficult to predict because of the variability of factors with each encounter.

- Female mammals may aggressively defend her young (for example, female bears with cubs are more likely to attack than to flee).
- Wolverines or bears may defend a food cache (for example, a bear's main objective is to eat from the time it leaves its den to the time it returns to a winter den. Hunting bears will cache food after eating part of it by covering the food with dirt, branches or leaves. They will often establish a daybed nearby and return later for another meal). Animals will aggressively defend their food cache.
- Individual Space: All predatory mammals have a minimum distance surrounding them within which any intrusion is considered a threat. A cornered or surprised predatory mammal may be dangerous. If there is no cover to retreat to, their usual response to danger is to attack or to stand its ground.
- Old, wounded or predatory mammals with teeth malformations can be dangerous because they are very hungry or starving (e.g. wolves observed at the Meadowbank site in 2009)
- Wolverines, wolves, artic fox and bears are easily attracted to human food sources and may become aggressive to obtain it. Predatory mammals that have obtained food from humans become "human food habituated." These mammals are accustomed to humans and link people as sources for obtaining food.
- Young animals which are inexperienced hunters and/or recently weaned are also at a greater risk to take advantage of human food source opportunities.

4.2 Animal Encounters

Most of animal safety is prevention – avoiding an encounter is the best way to stay safe while working in the home ranges of artic fox, wolverines, wolves, and grizzly bears. Polar Bears are incidental to Meliadine as they wander inland from the shoreline in search of food. **Polar bears are extremely dangerous and help should immediately be sought.**

4.3. How to React to Animal Encounters

Your reaction should depend on circumstances and the behavior of the mammal.

1. Stop and assess the situation before you act.
2. Does the wolverine, arctic fox, wolf or bear know you are there?
3. How is the animal reacting to the nearby activity?
4. Remain calm.
5. Do not turn your back on the animal.

DO NOT RUN – You will trigger the animal's natural response to chase you. Wolverines, wolves and bears are extremely fast and you cannot outrun them.

Some Simple Rules:

- Respect them – they can kill you.
- Be alert at all times.
- Watch for signs.
- Make noise – don't surprise animals.
- Travel in groups when possible.
- Be cautious in noisy areas (streams).
- Know the types of areas animals use during the year.
- Do not approach them.
- Never feed them.
- Get trained and carry deterrents.
- Remember carcass equals danger – look for ravens, strong odours.
- Mentally rehearse encounters.

4.3.1 Specific situations: Animal Encounters

Wolverine, wolf, or bear is not aware of you:

- Leave the area quietly in the same direction that you came from.
- Move while the predatory mammal is not aware of you and stop moving when the mammal lifts its head to check its surroundings.
- Stay downwind so the wolverine, wolf or bear will not pick up your scent.
- When you have moved a safe distance away and preferably to your truck or shop where you can watch and wait until the predatory mammal leaves.
- Report event to Environmental department immediately

If the wolverine, wolf or bear is unaware of you and approaching:

- Allow the mammal the right of way. Make sure there is a safe escape route and that you are not in the way.
- Return to vehicle or building when available or allow animal a wide berth.
- Report event to Environmental department immediately.

If you cannot leave undetected:

- Move upwind so animal can pick up your scent; this will help them identify you as human.
- If possible, try to keep the predatory mammal in your sight.
- Watch to see if the predatory mammal leaves when it smells that a person is nearby.
- Report event to Environmental department immediately.

If the wolverine, wolf or bear is aware of you but in the distance:

- Continue walking at the same general pace and towards a safe area (vehicle or building).
- **DO NOT RUN.**

The wolverine, wolf or bear is aware of you and close:

- A predatory mammal will feel threatened in a close confrontation. Generally, their natural tendency will be to reduce or to remove the threat. Assist the wolverine, wolf or bear by acting as non-threatening as possible.
- Do not make direct eye contact.
- Do not make any sudden moves.
- Do not run.
- In the case of a bear, they need to identify you as a person, so talk in low tones and slowly wave your arms over your head.
- Attempt to give the wolverine, wolf or bear an opportunity to leave. Be sure they have an open escape route.
- Try to back away slowly.
- If the mammal begins to follow you, drop your jacket, or pack or some other article (not food) to distract the wolverine, wolf or bear. This may distract the bear long enough for you to escape.
- Report to Environmental department immediately

The wolverine, wolf or bear is close and threatening:

- If you have a deterrent such as a bear banger or bear spray be prepared to use it depending on how close the predatory mammal is.
- If you do not have a deterrent, or if using the deterrent is not successful, act as non-threatening as possible.
- Talk to the predatory mammal in a calm authoritative tone of voice.
- Do not startle or provoke the predatory mammal by making sudden moves.
- Back slowly away from the wolverine, wolf or bear and drop a pack, jacket, or some other article in order to distract the mammal momentarily.
- Remember that the wolverine, wolf or bear may be defending their cubs that you have not yet seen or they may have a food cache nearby. Attempt to look as non-threatening as possible.
- Report to Environmental department immediately

The wolverine, wolf or bear is very close and approaching:

A distance of less than 50 meters in an open area is considered very close.

- If the predatory mammal continues to approach use your deterrent when in range.
- If the predatory mammal does not respond to the deterrent you must now **STAND YOUR GROUND**!
- Report to Environmental department immediately

The wolverine, wolf or bear charges:

In the case that you have done something that has provoked the wolverine, wolf or bear into showing signs of aggression towards you. It is often not clear to the person what they have done to provoke the mammal until after the attack. It is important that you act passively, humble your posture and do not look directly at the wolverine, wolf or bear. Always keep the mammal in sight. Never yell or throw things as these are obvious signs of aggression

When faced with a charging wolverine, wolf or bear:

- First use your deterrent, either a banger or pepper spray. If authorized (only Environment Department representatives or local security personnel) to carry a firearm, shoot the predatory.
- **DO NOT PLAY DEAD IF THE PREDATORY MAMMAL CONSIDERS YOU FOOD**.
- You must defend yourself with whatever means are available, act aggressively towards the bear.
- Stand up on something high and try to make yourself look bigger. Try to appear dominant. Try to frighten it. Yell, scream, shout and wave your arms. Jump up and down and fight back.
- Hold your jacket or backpack over your head to make yourself look bigger
- If being aggressively attacked in a predatory attack, fight back. Concentrate your efforts on the face, eyes and nose of the bear. Use whatever means you have, rocks, sticks, tools, hardhat, or simply kick and punch with all the strength you can muster.
- Report to Environmental department immediately

There are two types of bear attacks

Provoked Attacks:

- You have done something that has provoked the bear into showing signs of aggression towards you. It is often not clear to the person what they have done to provoke the bear until after the attack.
- It is important that you act passively, humble your posture and do not look directly at the bear. Always keep the bear in sight.
- Lie down on the ground in the prone position (i.e. play dead as this is a sign of submission to the bear and shows the bear that you are no longer a threat to them).
- Never yell at the bear or throw things at the bear, these are obvious signs of aggression towards the bear.
- Report to Environmental department immediately

Predatory Attacks:

- The bear is hunting or stalking you! You are being treated as potential food. DO NOT PLAY DEAD IF THE BEAR CONSIDERS YOU FOOD
- You must defend yourself with whatever means are available, act aggressively towards the bear. Stand up on something high and try to make yourself look bigger.
- Try to appear dominant. Try to frighten the bear. Yell, scream, shout and wave your arms. Jump up and down and fight back. Hold your jacket or backpack over your head to make yourself look bigger.
- Use your deterrent; either a banger or pepper spray.
- If deterrent is unsuccessful. only as an absolute last resort, and If authorized to carry a firearm, shoot the bear.
- Report to Environmental department immediately

4.4 Wildlife Deterrents

4.4.1 Noise

- Pyrotechnics, including bangers, screamers, whistlers and flares. Requires a magazine launcher.

4.4.2 Wildlife chemical Deterrents

Bear Sprays are highly effective but they must be used correctly to be effective. As with all deterrents they have their good points and their bad points.

- The main ingredient in bear spray is “Capsicum” an extract from hot peppers.
- Capsicum needs to strike the eyes, nose or mouth of the mammal, (open membranes) to be effective.
- These sprays can only be used at very close range, 3 to 8 m or 10 to 25 ft.
- You cannot discharge the bear spray too early – or it will be completely ineffective.
- If the predatory mammal comes within the range of the bear spray – aim directly into their face and spray.
- You must be aware of the wind direction. If you the wind is blowing towards you, the spray will be carried by the wind into your face.
- Bear spray may not be effective in sub-zero weather. (Spray cans do not fire well in very cold temperatures.) In colder weather you need to keep the can of bear spray warm in order for it to fire effectively.
- Bear spray will not be effective in the rain. When you fire a can of bear spray, the spray will create a billowing cloud of capsicum and propellant. Rain can/will wash the spray right out of the air before it strikes the bear in the face.
- If you have used your can of bear spray to deter a mammal, wash the nozzle off with soap and water to remove the scent. Replace your can of spray as soon as possible. You do not want to have another bear encounter with a half a can of spray left.
- Bear sprays have a shelf life. Always replace your bear spray when you are nearing the end of the shelf life. The Capsicum does not deteriorate over time; it is the canister seals that deteriorate over time.

- Do not test your can of spray before going out into the field. You need to take a full can of spray into the field, not a partially used one.

Wildlife chemical deterrents are only to be used for the purpose they are intended for. Misuse of wildlife deterrents such as chemical sprays, bangers, and pyrotechnics is considered a criminal offence.

SECTION 5 – TRAINING PROTOCOL

5.1 Scope

The Wildlife Training Protocol outlines recommended levels of training that specific groups of people at the Meliadine division site should receive. It is important that human activity at the site does not result in wildlife encounters that put people or wildlife at risk. All personnel on site have a role to play in ensuring human safety, conservation of wildlife, and documenting wildlife activities in the project area.

5.2 Assumptions and Key Considerations

Meliadine will assign overall accountability, recording and reporting responsibility to the Senior Environmental Coordinator or designate(s).

The Senior Environmental Coordinator or designates (s) will be responsible for ensuring that all employees, contractors and visitors at the Meliadine Division receive wildlife training appropriate to their roles and responsibilities.

The Environment Department will be responsible for all deterrent action whenever it is necessary to deter wildlife from mine infrastructure or personnel. All members of the Environment Department will receive specialized training in various levels of deterrent use. Security personnel and the Environment Department will be the only onsite personnel to have access to a firearm.

5.3 Training

Mandatory wildlife awareness for all staff will be included in the site induction, toolbox meetings, and through print media.

5.3.1 Wildlife-Human Conflict

- General restrictions for wildlife protection.
- Wildlife Attractants.
- Garbage Management.
- Wildlife Health.
- Wildlife and Vehicles.
- Preventing Problem Wildlife.
- Dealing with Problem Wildlife.
- Reporting Wildlife Observations and Incidents.

5.3.2 Wildlife Awareness Training

This training will be aimed at providing awareness of potential wildlife encounters that may occur at the Meliadine Project. The course should review:

- Wildlife that commonly occur near the site.
- Behavior of wildlife that may be encountered near the site.
- Wildlife encounters.
- Wildlife Deterrents.

5.3.3 Environment Department

In addition to the required site orientation, the Environment Department may require additional training. The following training is recommended, especially for those without experience in situations where wildlife occurrences are common.

Bear Safety Training

Provided by qualified contractor or Territorial, Provincial or Federal Wildlife Officer, this course will provide:

- Instruction on the use of lethal and non-lethal deterrents for emergency response to bear incidents;
- Techniques for euthanizing bears during an emergency response;
- Other types of deterrent options available in non-emergency situations;
- In depth aversive conditioning techniques; and
- Practicum.

The Meliadine environmental Department and workers depicted on the MEL-ENV-0007 Use of Firearm procedure have all been trained by the Bearwise trainer; Andy McMullen in 2016 and 2017.

A Bearwise audit of Meliadine site was completed in 2016 and significant improvements were realized compare to 2012. The report mentioned that Meliadine site had developed effective and practical solutions to challenges as they arose over time. The efforts of all departments and employees to make the Meliadine operation safe for both people and wildlife are to be commended.

Carnivore Safety Training

Provided by qualified contractor or Territorial, Provincial or Federal Wildlife Officer to include:

- Biology, ecology and behavior of wolverine, wolf, Arctic fox;
- Rabies and other zoonotic diseases;
- Detailed deterrent and aversive conditioning techniques;

- Instruction on the use of lethal and non-lethal deterrents for emergency response to incidents involving large carnivores; and
- Practicum.

Appendix A – AIR TRAFFIC MANAGEMENT PLAN

AGNICO EAGLE

DATE: April 10, 2018

TO: All helicopter and fixed wing aircraft pilots operating near the Meliadine site

RE: Air Traffic Management Procedure

FROM: Environment Department

Please be advised that AEM is required to implement an air traffic management procedure in the immediate vicinity of the Meliadine Project. The primary objective of this procedure is to minimize to the greatest extent possible all potential impacts to wildlife from low flying aircraft and helicopters.

AEM asks that all pilots of helicopter and fixed wing aircraft abide this procedure when flying to/from the Meliadine Project or in the vicinity of the project area wherever possible (from a safety perspective).

- For long-range transportation flights (i.e. to and from Rankin Inlet), we ask all pilots to follow a practice that sees the aircraft fly at a minimum of 650 m above ground level. Exceptions may exist during takeoff and landing, low-level ceiling conditions, high winds, or other risks to flight safety.

- For relatively shorter transportation flights, we ask that all pilots follow a practice that sees all aircraft (including helicopters) flying at a minimum of 300 m above ground level. Exceptions may exist during takeoff and landing, low-level ceiling conditions, high winds, or other risks to flight safety.

- The Environment Department must be notified if caribou, muskox or other animals are within 1 km of the landing area. The pilot should establish a radio contact on the Meliadine designated camp aircraft frequency and request that the camp radio operator call out the wildlife team to herd animals away from the strip/pad before landing.

- At remote landing areas, we ask that helicopters not land within 1 km of individual or large aggregations of wildlife.

- We ask that when flying over observed large concentrations of caribou (50 or more individuals in close proximity to one another), large concentration of muskoxen (10 or more individuals) or large concentration of migratory birds, to respect a 1,100 m vertical and 1,500 m horizontal distance from the herd whenever possible. We ask that all pilots avoid helicopter flights over known areas of raptor nests, snow geese during their moulting period (from July to August), waterfowl and shorebird staging areas during critical seasons (when birds are present –spring and summer months). The Environment Department can and should inform pilots of these areas. If maintaining this altitude is not possible, maintain a lateral distance of at least 1,500m from key sites.

- Harassment of wildlife (flying below 300 m), especially grizzly bear, muskoxen, caribou, wolves, and wolverine, is expressly forbidden. Exceptions exist only in the rare instance the animal(s) poses an immediate danger to a person in the field.

- Please report any wildlife sighting to the environment department.

- The Iqalugaarjuup Nunanga park is located between the Meliadine camp and Rankin Inlet. To minimize impact on the wildlife and the park's visitors, the pilots shall avoid to flight over or to land in the vicinity of the park. Emergency flights, specifically medical evacuation flights and/or search and rescue overflights are excepted from adherence to this requirement.

Please be also advised that AEM is required that a daily log or record of flight paths and cruising altitudes of aircraft within all Project areas is maintained and made available for regulatory authorities such as Transport Canada to monitor adherence and to follow up on complaints.

Thank you for helping AEM protect the natural resources of Nunavut and for helping demonstrate that mineral exploration and mining can co-exist with the wildlife and population without causing a significant adverse impact.

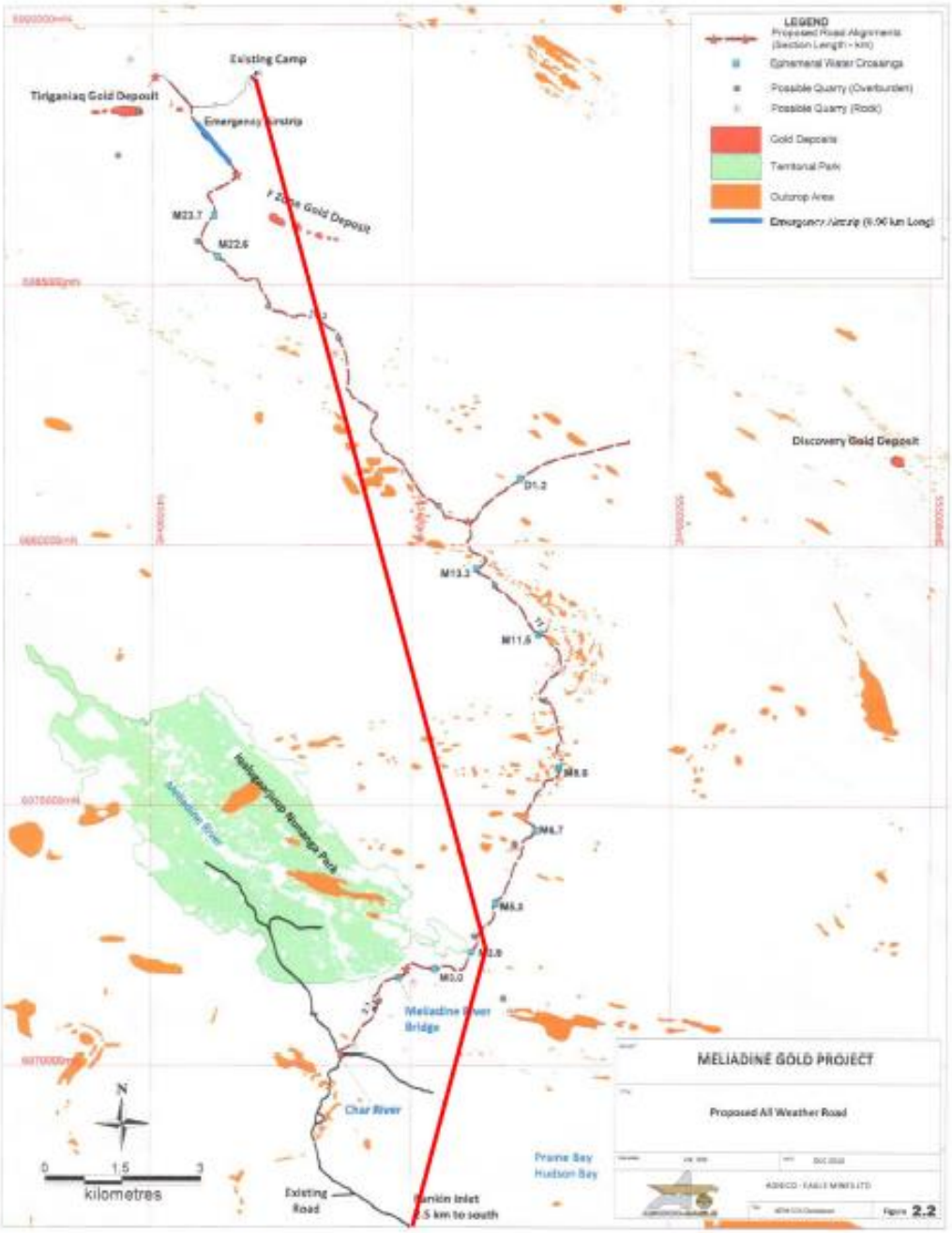
Pilot name : _____

Date: _____

Signature: _____

Agnico Eagle Mines Ltd. Exploration division

Air traffic path between Rankin Inlet and Meliadine camp



Appendix B – MEL-ENV-0015

Wildlife Fatality Reporting

	DOCUMENT ID: MEL-ENV-Wildlife reporting
People concerned: Meliadine Environment Dept.	**Effective Date: 2018-03-08**
This procedure corresponds to the required minimum standard. Each and everyone also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.	

Rev #	Date	Description	Initiator
1	2018-03-08	Change to intelex template	Alexandre Gauthier
2	2018-03-27	Review	Matt Gillman

Objective:

- To ensure that the Meliadine site follows the proper procedure for reporting Wildlife fatalities, to uphold the IIBA agreement and Management plan obligations.

Definitions (If applicable):

- **None**

Tool/Equipment Required	PPE Required
• None	• None

Specific Training Requirements
• None

1. Upon receiving information of a wildlife fatality or upon observing a wildlife fatality during an inspection; a Problem Wildlife Report shall be generated. A blank report form can be located at **\\Camefs02\groups\Environment\WILDLIFE\Wildife Reports\Form\2016 AEM Meliadine Problem Willidfe Report template V 1xls.xls**

2. The carcass of the animal should then be moved to a location that will not attract carnivorous' animals, for the interim.

3. At this point, the GN wildlife officer in Rankin Inlet will need to be contact via telephone for a verbal report and to receive direction on how the carcass will be disposed of.

   Please follow procedure MEL-ENV-0021 located at:\\Camefs02\groups\Environment\MANAGEMENT PLANS & PROCEDURES\Procedures\MEL-ENV-0021 - Problem Wildlife Procedure\MEL-ENV-0021 - Problem Wildlife Ver1.pdf

4. Upon receiving direction from the GN wildlife officer on disposal or transfer method, follow through with directions given. Add the disposal or transfer method to the report generated in step #1.

5. The report can now be sent for review by SR. Coordinator Compliance Counselor.

6. Upon review a final version can be made and saved in PDF. The PDF should now be sent to the Compliance Counselor for distribution to GN, KIA, and HTO. As well a copy should be saved for the annual report.

Related Documentation (If applicable):
• Wildlife management plan

References (If applicable):
• None

Appendix (If applicable):
• None

Authorization (Print Name)
Approved: _____ Date: _____ Name JOHSC Worker Rep.
Approved: _____ Date: _____ Name Department Superintendent / Delegate
Approved: _____ Name Date: _____ Health & Safety Superintendent / Delegate

Appendix C – MIGRATION ALERT

2016-07-09 (12h00) Meliadine Caribou Situation

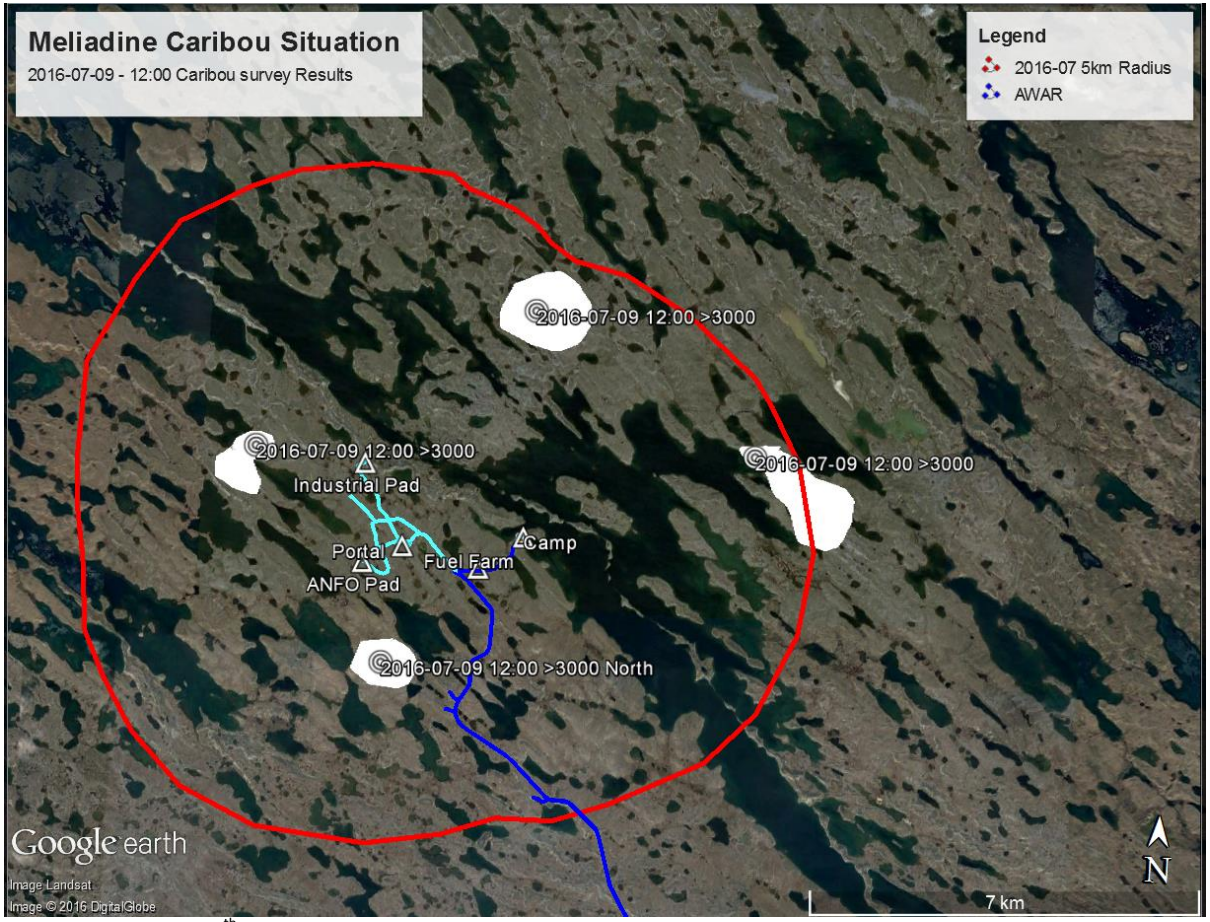


Figure 1: Caribou survey, results for July 9th 12h00. 4 groups over 3000 caribou have been observed going within the 5 km protection zone

Appendix D – MEL-ENV-0021

Problem Wildlife

DOCUMENT ID: MEL-ENV-Problem Wildlife	
People concerned: Agnico Eagle employees, contractors, visitors on the Meliadine site	**Effective Date: 2018-11-13**
This procedure corresponds to the required minimum standard. Each and everyone also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.	

Rev #	Date	Description	Initiator
1	2018-03-09	Change to intelex template	Alexandre Gauthier
2	2018-03-27	Review	Matt Gillman
3	2018-11-13	Communication for Polar Bear observation and required equipment	Martin Theriault

Objective:

- To define the procedure which must take place when dealing with problem wildlife on the Meliadine mine site and associated facilities.
- Problem Wildlife: any wildlife that; have entered buildings or structures, have shown signs of aggression towards employees or equipment, are showing signs of human habituation.

  ***Any large predators observed on the Meliadine site should be treated as potential “problem wildlife”

Definitions (If applicable):

The following procedure is to mitigate the risk of conflict between employees and wildlife at the Meliadine site and to ensure that all actions regarding problem wildlife are done in accordance to our Wildlife Management Plan and that the GN Wildlife Department are kept informed.

Tool/Equipment Required	PPE Required

• Bear spray
• Rifles equipped with live ammunition
  o Tikka T3 0.300 cal. bolt action rifle
• Firearm equipped with noise making ammunition or rubber bullets
  o Stoeger Double Defence 12GA coach gun
  o Remington 870 12GA pump action shotgun
  o Benelli Nova 12GA pump action shot gun
	• Regular PPE

Specific Training Requirements
• Firearm License • Bearwise training

1.Procedure

1.1 On-site personnel who encounter problem wildlife including large carnivore are required to notify the Environment Department immediately.

*any wildlife not deemed problematic, under the definition outlined above, are not required to be reported directly to the Environment Department, but are required to be noted on the wildlife logs located in various locations around camp.

1.2 The Environment Department staff will document all reported sightings of wildlife on the Meliadine project and provide the information to the Government of Nunavut Conservation officer(s) in Rankin Inlet as part of the monthly Wildlife Report**.**

1.3 In the case that there is a recurring sighting of a particular animal including large carnivores in the vicinity of the camp or work areas, the environmental staff shall inform the Environmental Coordinator and/or General Supervisor

1.4 The Environmental Coordinator and/or General Supervisor will then contact the Government of Nunavut Conservation officer(s) in Rankin Inlet to inform them of the recurring problem.

Contact will be made via telephone to the Rankin Inlet GN Wildlife Office. If the officers cannot be reached at the office then a call will be placed to the cellular phone numbers provided below. For each number called, if there is no answer, leave a message for the officer(s). In addition, a follow-up email must be sent to the officers' email address to ensure there is a documented form of communication. All documented communication must be provided to the Compliance Counselor for reporting purposes.

1.5 Any further action will be at the discretion of the Wildlife officer.
**Under no circumstances will any action be taken outside of what the Wildlife Officer has advised, unless approved in writing or via email by the Environmental Superintendent and the General Manager (or designate).

1.6 If the problematic animal continues to be present; return to step 2.4
and repeat until issue is resolved with the problematic animal of concern.
**The harassment or intentional dispatching of any wildlife on the Meliadine site without written permission can result in disciplinary actions.

Exception: If an animal is, without a doubt, threatening the safety of a person or is of immediate concern, the dispatching of an animal would be approved without consent provided by GN Wildlife Officers and Environmental Superintendent. In such a case, approval must still be gained by the designated Environmental Manager and acting Meliadine Manager. The dispatching of any animal must be performed by an individual whom is approved to use a firearm under procedure MEL-ENV-0007.

1.7 A full report of activities and actions will be required for any issues regarding problem wildlife. A template for the Problem Wildlife Report can be found at \\Camefs02\groups\Environment\WILDLIFE\Wildife Reports\Form\2016 AEM Meliadine_Problem Willidfe Report_template V 1xls.xls

2. Communication for Polar Bear Observation

2.1 Notify the Environment Department immediately.

2.2 Notification will be sent by the Environmental Coordinator and/or General Supervisor by e-mail to all employees including contractors and a radio notification will also be done on the camp channel.

2.3 Environmental Coordinator and/or General Supervisor and Environment Technician will keep a radio until the issue is deemed safe. Environment staff will patrol the area to assess whether it is safe.

2.4 Security officer may guard the main door from the main camp and ensure no one goes out of the main camp until the Environmental Coordinator and/or General Supervisor give the authorisation

2.5 All supervisors are responsible to advise their employees to ensure proper precautions are taken. No outside work will be allowed until the situation is deemed safe

2.6 Environment Team will monitor the situation and only the Environmental Coordinator and/or General Supervisor will be allowed to give the clearance.

November 2018 - GN Wildlife Officer Contact Information

Rob Harmer, Regional Manager
Kivalliq Region
Wildlife Management Division – Department of Environment
Government of Nunavut
P.O. Box 120 Arviat, NU X0C 0E0
Ph# 867-857-3172
Cell# 867-222-0067
Fax# 867-857-2986
RHarmer@GOV.NU.CA

Johanne Coutu-Autut, Conservation Officer III
Kivaliq Region
Wildlife Management Division – Department of Environment
Government of Nunavut
P.O. Box 947 Rankin Inlet, NU X0C 0G0
Ph# 867-645-8084
Cell# 867-645-7633
Home# 867-645-3247
JCoutu-autut@GOV.NU.CA

Daniel Kaludjak, Conservation Officer II
Kivaliq Region
Wildlife Management Division – Department of Environment
Government of Nunavut
P.O. Box 947 Rankin Inlet, NU X0C 0G0
Ph# 867-645-8083
Cell# 867-645-6447

DKaludjak2@GOV.NU.CA

Wildlife Management Division – Department of Environment
Government of Nunavut
Polar Bear Line for Rankin Inlet

867-645-2222

Related Documentation (If applicable):
• Wildlife Management Plan • MEL-ENV-Wildlife Procedure

References (If applicable):
• None

Appendix (If applicable):
• None

Authorization (Print Name)

Approved: _____ Date: _____
Name
JOHSC Worker Rep.

Approved: _____ Date: _____
Name
Department Superintendent / Delegate

Approved: _____
Name Date: _____
Health & Safety Superintendent / Delegate

AGNICO EAGLE

MELIADINE GOLD PROJECT

Spill Contingency Plan

February 2019
VERSION 8
6513-MPS-05

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ᑕᑦᓚ ᐸᖃᐅᑎ ᐊᒃᓂᓂᑯᓂᓂ ᐃᓕᐱᔪᓂᓂᑎᔪᖅ ᐊᑐᖅᑐᓗᓄᑕᖅᑕᒃ ᑲᓇᕐᓂ ᐅᑭᐅᖅᑕᖅᑐᒋᑦ ᒪᓕᑦᕋᓂᒃ, ᒪᓕᑦᕋᓕᓂᒃ, ᐊᒃᓚᓗ ᒪᓕᓗ ᐅᓕᐅᑕᐅᔪᓴᒃ ᑯᓂᒍᔪᓂ, ᐊᒃᓚᓗ ᒪᓕᐅᑕᐅᔪᓴᒃ/ᐅᕐᓂᓇᓕᓂ ᔪᑯᒧᑦ. ᑯᓂᔪᓂ ᐃᔪᒪᑎᓕᐅᔪᓂ, "ᐅᖅᐅᔪᓚᕆᐊᖅᖃᑐᑦ ᑯᓂᔪᓂ" ᒪᓕᒃᓴᑎᓂ ᐊᑐᖅᑐᑦ ᒪᓕᑦᕋᐃᓂ ᐊᒃᓚᓗ ᒪᓕᐅᑕᓇᓂ ᐊᒃᓂᓂᑯᑦ ᐅᖅᐅᔪᓂᐅᐊᖅᑕᖓᑦ ᓄᓇᕐᑎᐊᖏᑦᑕ-ᓄᓇᓄᓪᒥ 24 ᐃᑲᖏᕆᓄᑦ ᑯᓂᔪᓂᖅᐸᑦ ᐅᖅᓚᓪᒪᐅᔪᓕᓇᖅᑐᒍᒪᔪᑦ, ᑲᓇᕐᑎᑦ-ᓄᓇᖅᖁᖅᑐᒍᓄᑦ ᓄᓇᕐᑯᑎᑎᑉᐅᔪᓂ ᐊᒃᓚᓗ ᐅᑭᐅᖅᑕᖅᑐᒋᑦ ᑲᒪᓵᖅᑎᑯᓂ, ᑲᓇᕐᑎᑦ ᐊᐊᑎᖅᑎᑦ ᐊᒃᓚᓗ ᔪᓕᐅᑕᐅᔪᓕᓇᖅᑐᒍᒪᔪᑦ, ᐃᖅᓚᓕᓚᓵᓵᖅᑯᓂ, ᑭᓴᓕᓕᖏᑦ ᐃᓕᓴᐅᔪᓂ ᐃᓚᖅᑕᐅᔪᓂ, ᐃᓕᓴᐅᔪᓂ ᐊᐸᖃᑎᑎ ᐃᓕᓴᐅᔪᓂ ᐊᒃᓂᓂᑯᑦ ᐊᒃᓚᓗ ᐃᓕᓴᐅᔪᓂ ᐊᒃᓂᓂᑯᑦ ᐊᐸᖃᑎᑎ.

ᑐᖁᑎᐅᔪᖅ ᐸᖃᐅᑎᒧᑦ ᒥᑭᓕᓱᑯᓕᓪᓕᓂᓂ ᐊᑲᑐᔪᓂᐅᔪᓂ ᑯᓚᓂᔪᓂᐅᔪᓂ MDMER-ᒥᑦ, ᔪᓇᑐᐃᓴᓇᐃᓂ ᐅᖅᔪᓕᓂᑦ, ᑭᓂᖅᑐᑦ ᐊᒃᓚᓗ ᔪᑎᑦᓂ ᐋᓴᓂᑕᐅᔪᓇᖅᑐᑦ ᐃᓕᒥᑦᑕᐅᔪᓂ, ᑕᓂᐅᓕᓚ ᐃᒪᖅ ᐊᒃᓚᓗ ᐳᖅᓪᓚᖅᑎᑕᐅᔪᒪᔪᖅ ᐅᖅᔪᓂᖅ. ᐊᔪᖏᑦ ᑯᓚᓂᐅᔪᓂ ᐃᔪᑎᖅᑎᑦ ᐊᑲᑐᔪᓂᐅᔪᓂ ᐊᐋᑭᑦᑐᓂᐅᔪᓂ ᐅᖅᔪᓂᖅᑐᑦ ᐃᓕᓴᐅᔪᓂ ᐅᖅᐅᔪᑎᑕᐅᔪᓇᖅᑐᑦ ᐃᓕᓴᐅᔪᓂ ᖃᓄᐃᓕᓴᐅᔪᓂ ᐃᓕᓴᐅᔪᓂ ᐅᖅᐅᔪᑎᑕᐅᔪᓇᖅᑐᑦ

ԺՃՎᖏᖅᐸᑦ ᐊᑐᖅᑕᐅᕆᓗᐊᖏᖅᑐᑦ ᐃᓂᒋᑎᑕᐅᔪᑦ ᐃᓂᒋᕆᓗᐊᖏᖅᑕᖏᓐᓂᑦ ᐅᕆᕃᑕᓗᐊᕐᒥᑦ. ᐃᓐᓇᕃᕈᓗᓕᒃᑦ ᐅᕆᕃᑕᓗᐊᕐᒥᑦ (ᓄᓇᐅᐸ ᖃᓐᓇᓂᑦ ᓄᓇᵇᑲᑎᕃᔪᐊᑦ) ᐱᑕᖃᕆᔪᑦ ԺՃՎᖏᖅᐸᑦ ᑐᐊᐃᓇᖅᑐᐅᑲᑦ ᐅᐸᓗᐊᒋᔪᓂᵇ. ᐃᓐᓇᕃᕆᐅᖏᑕᖅᑐᖅ ᐊᐳᑎᓕᓂᕐᓗᑦ ᑐᐊᐃᓇᖅᑐᓕᕆᔨᒃᑲᔪᖅ. ᓱᓕᓂ ᐅᒥᐊᕃᔪᐊᵇᑲᑦ ᐅᓱᐅᐅᖏᑕᖅᑐᑦ ᑐᖅᑯᐊᓂᕐᓗᑦ ᐊᕐᓇᖅᑐᑦ ᐊᑐᖅᑕᐅᕆᓗᐊᖏᖅᑐᓂᓗ ᖃᓂᑕᓕᓂᑦ ᐃᖃᓗᒍᓱᐊᕐᓂᑦ ᐊᑐᖅᑕᐅᖏᖅᑐᑦ ᐊᑐᖅᑕᐅᖏᖅᑐᑦ ᐊᑐᖅᑕᐅᖏᖅᑐ

EXECUTIVE SUMMARY

The Spill Contingency Plan (Plan) for the Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Project (Project) covers: the Meliadine site, Rankin Inlet Itivia land-based facilities, the All-weather Access Road (AWAR) and associated roads on and off site, including the Rankin Inlet bypass road.

This Plan ensures that Agnico Eagle respects all applicable federal and territorial laws, regulations, and guidelines for spills to land, water and/or ice. Spills that are deemed "reportable spills" pursuant to applicable laws and regulations will be reported by Agnico Eagle to the NT-NU 24-Hour Spill Report Line, Crown-Indigenous Relations and Northern Affair, Environment and Climate Change Canada, Department of Fisheries and Oceans, Kivalliq Inuit Association, and Nunavut Water Board.

The goal of the Plan is to minimize the impacts of spills by the establishment of predetermined response procedures and to protect the safety of workers, contractors and the public in the event of a spill. This goal will be achieved by applying best management practices, promoting environmental awareness and safety, encouraging prevention and maintenance, and facilitating efficient cleanup of spills, releases, or discharges to land, water, ice and snow.

Substances covered by the Plan include effluent as defined by the MDMER, hydrocarbon products, liquid and solid hazardous substances, saline water and compressed gas. Other types of spills such as seepage from water containment structures or waste sources that could affect off site receptors are also considered.

For all spill emergencies, priority actions are: (1) ensure safety, (2) respond quickly, and (3) report the spill. The Plan outlines response organization and communication lines, and lists emergency response contacts. The person, who is the primary person involved in a spill, or the first to observe a spill, is the first responder. The first responder contacts a Supervisor or the Incident Coordinator, who is responsible for initiating appropriate spill emergency response.

Agnico Eagle has an Emergency Response Team (ERT) that are trained and provide support in the response of major spills, as needed. All members of the ERT are trained and familiar with emergency and spill response resources, the Plan, and appropriate emergency spill response methodologies. The ERT members receive basic training on hazardous materials handling (Safety Data Sheets) and are equipped to respond safely while wearing Personal Protective Equipment (PPE). The General Mine Manager, Environment Superintendent, Health and Safety Superintendent and Health care personnel or designates are all identified as key elements to spill emergency response.

Spill response kits are strategically located where required on-site. All mobile equipment on-site (surface heavy equipment) are also equipped with an emergency spill kit. A mobile environmental emergency trailer is located on-site. Sea cans with spill response equipment and supplies are located near the Meliadine River at Km 18 and at Itivia (during barge season).

Action plans involve standard and appropriate spill control and containment techniques (e.g., dikes and trenches, floating booms, etc.). In the event of a spill, free-product is recovered as much as possible using vacuums, pumps, etc. and placed in appropriate containers. Absorbent materials are used to soak up residual products. Contaminated materials are salvaged, put into appropriate containers and labelled for temporary storage. Depending on the nature of the contamination, solid materials are either treated on-site (landfarm), or shipped off-site to an approved treatment and disposal facility.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Spill Contingency Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			DEIS re-submission	Rebranding
3	April 2014	7	23-24	Included Tables 7-2 and 7-3 as per Information Request answer (TC_149)	John Witteman, Env. Consultant, Agnico Eagle
		6.5	21	Included commitment from technical review wrt TDGR.	
		App. H	A-32 A-36	Completed regulations table (ref. information requests)	Josée Noël, Env. Coord., Agnico Eagle
4	April 2015			Update for Type A Water License Application	John Witteman, Env. Consultant, Agnico Eagle
5	December 2015			Comprehensive revision and updates. Adapted to licenses B (MEL1424, 2BW-MEL1525 and 8BC-MEL1516) and future Type A Water License	Environment dept., Agnico Eagle
6	March 2017			Spill kit list and spill kit location updated	Alexandre Gauthier, Environment Dept., Agnico Eagle

7	March 2018			Annual review	Jessica Huza Alexandre Gauthier, Environment dept., Agnico Eagle
8	February 2019	All	All	Change of Plan to reflect production, change of MSDS to SDS, change of MMER to MDMER. Inclusion of the MDMER Emergency Plan	Bethany Hodgins, Terry Ternes, Agnico Eagle Environment Department
		Executive Summary		Substance covered including MDMER	
		3	6	Update table 3-1 to include AN	
		5	15-18	Update table 5-1, 5-2, 5-3 contact list	
		6.4 6.5	22-23	Update document for spills on ice and saline spills	
		10	32-33	Update section on MDMER to reflect changes from MMER	
		App H	All	Create Response for Spilled Saline Water	
		App J	All	Latest Spill Response Test Record	
		App H	All	Procedure for saline water spill added	
		App K	All	MDMER Cross Reference table updated	

Approved By: *Nancy Duquet-Harvey – Environmental Superintendent Nunavut*

DISTRIBUTION LIST

Agnico Eagle - Environmental Superintendent AEM – General Mine Manager
Agnico Eagle – Engineering Superintendent
Agnico Eagle – Health and Safety Superintendent AEM – Geology Superintendent
Agnico Eagle – Mill Superintendent
Agnico Eagle – Maintenance Superintendent AEM – Mine Superintendent
Agnico Eagle – Energy & Infrastructure Superintendent
Agnico Eagle – General Services Superintendent

IMPLEMENTATION SCHEDULE

The implementation schedule for this Plan is effective immediately (December 2015) subject to any modification proposed by the NIRB and/or NWB as a result of the review and approval process.

ACRONYMS

CIRNAC	Crown-Indigenous Relation and Northern Affairs Canada
Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate – Fuel Oil, a type of explosive
AWAR	All-Weather Access Road
ECCC	Environment Canada and Climate Change
DFO	Department of Fisheries and Oceans Canada
ERT	Emergency Response Team
FDP	Final Discharge Point
IQ	Inuit Qaujimajatuqangit
KIA	Kivalliq Inuit Association
MDMER	Metal and Diamond Mining Effluent Regulation
NIRB	Nunavut Impact Review Board
NT	Northwest Territories
NU	Nunavut
NWB	Nunavut Water Board
PLAN	Spill Contingency Plan
PPE	Personal Protective Equipment
Project	Meliadine Gold Project
RMMS	Responsible Mining Management System
SDS	Safety Data Sheet
TSF	Tailing Storage Facility
WHMIS	Workplace Hazardous Materials Information Sheet
Water Licence	Type A Water Licence No. 2AM-MEL1631
WRSF	Waste Rock Storage Facility

1.1 Purpose and Scope

The purpose of the Spill Contingency Plan (Plan) is to minimize the impacts of spills by the establishment of predetermined lines of response, plans of action, and to protect the safety of workers and contractors in the event of a spill.

This goal is achieved by applying best management practices, promoting environmental awareness and safety, encouraging prevention and maintenance, and facilitating efficient cleanup of spills, releases, or discharges to land, water, ice, and snow related to Agnico Eagle Mines Limited Meliadine Project (Project).

This plan meets the requirements of section 30 of the Metal and Diamond Mining Effluent Regulation (MDMER) Emergency Response Plan pursuant to the Fisheries Act.

This Plan is designed to facilitate effective communication and efficient cleanup of spills of potentially hazardous materials. Hazardous materials include and are not limited to:

- Hydrocarbon products such as diesel fuel, gasoline, hydraulic oil;
- Soluble solids, such as ammonium nitrate prill;
- Liquids, such as glycols and paints;
- Corrosive liquids, such as sulphuric acid and sodium cyanide;
- Effluent as defined by the MDMER;
- Compressed (inert and flammable) gas; and
- Seepage from waste related structures that could affect off site receptors.

Furthermore, the objectives of this Plan are to:

- Comply with federal and territorial laws, regulations and guidelines;
- Identify roles, responsibilities and reporting procedures;
- Detail plans of action to be followed in the event of a spill at the Project;
- Provide readily accessible emergency information to the cleanup crews, management, and government agencies;
- Promote the safe and effective recovery of spilled materials; and
- Minimize the environmental impacts of spills to land, water, ice and snow.

This Plan applies to all Agnico Eagle employees and contractors associated with:

- The Project site including Itivia fuel storage facility; and
- The All-weather Access Road (AWAR) and associated roads on and off site, including the Rankin Inlet bypass road.

1.2 Related Documents

Documents containing information related to this Plan, submitted as part of the Type A Water Licence No. 2AM-MEL1631 (Water Licence) include the following management plans:

- Environmental Management and Protection Plan;
- Risk Management and Emergency Response Plan;
- Explosives Management Plan;
- Borrow Pits and Quarries Management Plan;
- Roads Management Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan;
- Water Management Plan;
- Waste Management Plan; and
- Oil Pollution Emergency Plan.

1.3 Use of Inuit Qaujimajatuqangit in Spill Management

Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected through IQ can contribute to mine design and planning, as well as monitoring activities. Agnico Eagle is committed to including IQ and public concerns stemming from IQ, where practical, in the design of management and monitoring plans for the Project.

This Plan considers IQ, including traditional ecological knowledge, traditional land use, and concerns regarding Project effects on traditional resources and traditional land use sites. The IQ indicates that the Project area is important for the traditional harvesting of caribou, other land mammals, waterfowl, geese, fish and vegetation, and maintaining the health of these resources so that traditional land use activities can continue. This Plan is designed to minimize the potential impacts of spills to land, water, ice and snow, and focuses on promoting environmental awareness, encouraging prevention and maintenance, and facilitating efficient cleanup of spills, releases, or discharges to land, water, ice, and snow as follows:

- Predetermined lines of response and plans of action are established;
- Spill prevention occurs though regular inspections of storage areas for leaks and hazardous materials, and the training of workers in the use of safe work and spill clean-up procedures;
- Spill response kits are strategically located where required on-site and on all mobile equipment on-site (surface heavy equipment). A mobile environmental emergency trailer and a trained emergency response team (ERT) are located on-site. Sea cans with spill response equipment and supplies are located at km 7 and 18 along the AWAR;
- Spill and emergency response equipment is installed at hazardous material storage areas; and
- To minimize potential impacts to surface water, groundwater, and soil from potential vehicle accidents, a maximum speed of 50 km/hr on the AWAR is applied to all vehicles (empty and

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transporting hazardous materials). All employees and contractors using the roads will carry spill response equipment.

2.1 Classification of Spills

For the purposes of this Plan, a major spill is defined as an accidental release of a large or small quantity of material into the environment that has the potential for adverse impact, and cannot be handled safely without the assistance of the Emergency Response Team (ERT), including all events where a person is injured or material is contaminated. In the event of a major spill, the ERT is notified immediately and responds accordingly. As an example, for the purpose of this Plan, a tanker truck overturned on the AWAR is considered a major spill. Major spills are reported to the NU/NT Spill Report Line @ 867 920 8130, fax 867 873 6924, spills@gov.nt.ca.

A minor spill is defined as any spill of material that does not involve highly toxic, highly reactive, or explosive chemicals, in a situation that is not life threatening to humans, fish or wildlife. Furthermore, this type of spill presents a manageable physical or health hazard to personnel who, when wearing proper PPE, are not exposed to any chemical at a level that exceeds any recognized action levels or permissible exposure limits. Minor spills are reported to the Environment Department but are not expected to involve emergency responders.

2.2 Materials and Reportable Spills on-Site

To ensure compliance with Section 36 (3) of the *Fisheries Act*, all spills and non-authorized releases of effluent, fuel or hazardous materials, regardless of quantity, into a waterbody or onto ice are reported immediately to the NT-NU 24-Hour Spill Report Line[1].

As a precaution, if there is any doubt as to whether the quantity spilled meets the minimum reportable thresholds listed in Table 2-1 (AANDC 2010), the spill incident will be reported to the Spill Report Line. Furthermore, Agnico Eagle will maintain a detailed log of all spills of hazardous materials, including non-reportable spills. As part of Agnico Eagle's overall Responsible Mining Management System (RMMS), and for continuous improvement of environmental performance, procedures are implemented to ensure that employees communicate non-reportable spill incidents and clean them up as required.

[1] Nunavut Environmental Protection Act. *Consolidation of Spill Contingency Planning and Reporting Regulations* R-068-93.

Table 2-1 Spill Quantities to be Reported to the Spill Report Line[(a)]

Transportation Class	Type of Substance	Compulsory Reporting Amount
1	Explosives	Any amount
2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity exceeding 100 L
2.2	Compressed gas (non-corrosive, non-flammable)	Any amount from containers with a capacity exceeding 100 L
2.3	Compressed gas	Any amount
2.4	Compressed gas (corrosive)	Any amount
3.1, 3.2, 3.3	Flammable liquid	100 L
4.1	Flammable solid	25 kg
4.2	Spontaneously combustible solid	25 kg
4.3	Water reactant solids	25 kg
5.1	Oxidizing substances	50 L or 50 kg
5.2	Organic peroxides	1 L or 1 kg
6.1	Poisonous substances	5 L or 5 kg
7	Radioactive substances	Any amount
8	Corrosive substances	5 L or 5 kg
9.1 (in part)	Miscellaneous substances	50 L or 50 kg
9.2	Environmentally hazardous	1 L or 1 kg
9.3	Dangerous wastes	5 L or 5 kg
9.1 (in part)	PCB mixtures of 5 ppm or more	0.5 L or 0.5 kg
None	Other contaminants	100 L or 100 kg

[(a)] *Nunavut Environmental Protection Act*. *Consolidation of Spill Contingency Planning and Reporting Regulations* R-068-93.
Note: PCB = polychlorinated biphenyls; ppm = parts per million.

SECTION 3 • HAZARDOUS MATERIALS ON-SITE

A variety of petroleum products and other hazardous materials are used as part of the mining operations. Explosives are stored on-site; details are available in the Explosives Management Plan. Other hazardous materials are used in smaller quantities (Table 3-1), all these products are considered as potential environmental and safety hazards.

Safety Data Sheets (SDS) of all materials transported, stored and used on-site are available at strategic locations, near where hazardous materials or toxic substances are stored or utilized. As a reference; the up-to-date SDS's can be found on the Agnico Eagle SDS portal called ***3E-Online***. Appendices B to G also provide general response procedures for specific spilled chemical substances.

Table 3-1 Main Hazardous Materials Stored and Used On-Site

Product	Use/Location	Maximum Amount Anticipated On-Site (units)	Maximum Amount by Unit
Process Plant Reagents			
Anionic Flocculants 920	Mill/Grinding	80	750 kg/bag
Copper Sulphate	Mill/Cyanide Destruction	180	1,000 kg/ bag
Caustic Soda Anhydre	Mill/Stripping	40	1,000 kg/bag
Anhydre Borax 12 Mesh Dehybor	Mill/Refinery	50	25 kg/bag
Sodium Nitrate 98% Industrial grade	Mill/Refinery	48	22.7/bag kg
Quick Lime 0-2,5 MM 1152	Mill/Grinding/CIL/Cyanide Destruction	1160	1,700 kg
Activated Carbon PICA 210 AS	Mill/CIL/Stripping	360	500 kg/bag
Metabisulfite	Mill/Cyanide Destruction	960	1,000 kg/bag
Hydrochloric Acid 20 BE	Mill/Stripping	60	193 Liters or 240 kg
Caustic Soda Micropearl	Mill/Stripping	96	Bag/22.67 kg/bag
Lead Nitrate	Mill/CIL	200	25 kg/bag
Lead Nitrate	Mill/CIL	65	1,000 kg/bag
Ferric Sulphate	EWTP	0	1,000 kg/bag
Refractory Backup	Mill/Refinery	48	25 kg/bag
Cap Material	Mill/Refinery	48	25 kg/bag
ILR Acacia LeachAid	Mill/Grinding	100	15 kg /Bucket
Silica Sand	Mill/Refinery	48	22.68 kg/bag
Sodium Cyanide must be Cyplus	Mill/CIL	900	1,000 kg/bag
Cationic Polymer Hydrex 3613	EWTP	48	25 kg/bag

Coagulant Dry Poly Aluminium Chloride	EWTP	10	900 kg/bag Hydrex 3267
Actisand 135 microns	EWTP	192	22.68 kg/bag
Anionic Polymer Hydrex 6105	EWTP	48	25 kg/bag
Scale Control CC7430 Controlchem	Mill/Grinding/Stripping	10	1,000 L or 1233.88 kg/tote
Sodium Sulphate	SWTP	0	1,000 kg/bag
Sulfamic Acid - 100%	SWTP	1200	25 kg/bag
Calcium Hypochlorite - 100%	SWTP	1104	25 kg/bag
Biocide 1 (Kathon CF150 or Microcide WT461)	SWTP	10	200 L (Drum)
Biocide 2 (Aqucar DB20)	SWTP	10	200 L (Drum)
Caustic Soda Anhydre	SWTP	70	1,000 kg/bag
Caustic Soda Micropeal	SWTP	2592	22.67 kg/bag (
Scale Control CC7430 Controlchem	SWTP	0	1,000 L or 1233.88 kg/tote
Antifoam (AF-64)	SWTP	1	(Tote/1000 L)
RO CIP Agent (ROClean)	SWTP	2	(Drum)
RO CIP Agent (ROClean P403)	SWTP	2	(Drum)
Sodium Metabisulfite (SMBS - 100%)	SWTP	16	25 kg/bag
Inhibited Ethylene Glycol 100% (Drum)	SWTP	2	(Drum)
Corrosion Inhibitor (Bar Cor CWS-55) 100%	SWTP	2	(Bottle 20L)
Cyanide Red Dye	Mill	5	20 kg /box
Sodium Hypochlorite	RO	32	5-gal totes
Vitec 7000 (Antiscalant)	RO	2.5	50-gal barrels
RO Clean L211	RO	11	5-gal totes
RO Clean L403	RO	4.2	50-gal barrels
Citric Acid	RO	3	Bags of 40 kg
Sodium Hydroxide	RO	9	Bags of 22.45 kg
Hydrochloric Acid	RO	2	5-gal totes
Avista 158	RO	10	20 Liters bottles
Sodium bisulfite	RO	18	25-kg bags
Water Treatment Reagents			
Ferric Sulfate	Water Treatment Plant	260 t	1 t/bag
Lime	Water Treatment Plant	320 t	1,743 kg/bag
Flocculant	Water Treatment Plant	5 bags	750 kg/bag (15 t/sea can)
Caustic Soda	Sewage Treatment Plant	1 t	22.5 kg/pail

Soda Ash	Sewage Treatment Plant	365 kg	25 kg/bag
Citric Acid	Sewage Treatment Plant	50 kg	25 kg/bag
Chlorine (NaOCl)	Sewage Treatment Plant	962 L	20 L/bucket
Acetylene	Welding	830 bottles	11 m^3 / bottle
Paints	Maintenance	180 gal.	1 gal./pail
Solvents	Maintenance	56 gal.	1 gal./pail
Lead acid batteries (12V)	Maintenance	386	
Fuel Products			
Diesel	**Itivia**		
	1- Itivia Oil Handling Facility	20 ML	
	2- Itivia Oil Handling Facility	13.5 ML	
	3- Itivia Oil Handling Facility	4 ML	
	Industrial Site Tank Farm		
	4- Site Main Fuel Tank	6 ML	
	5- Site Fuel Tank summer	250,000 L	
	6- Powerhouse	50,000 L	
	7- Process Plant	10,000 L	
	8- Mechanical Shop (Oil)	10,000 L	
	Portal #1 Mine Site Tank Farm		
	9- Site Main Fuel Tank	3 ML	
	10- Site Fuel Tank summer	250,000 L	
	11- Site Fuel Tank Measure for UG	2,000 L	
	12- Site Fuel Tank UG Heating Intake West	25,000 L	
	13- Site Fuel Tank UG Heating Intake East	25,000 L	
Other	14 – Gasoline Storage Tank	2,300 L	
	15 – Jet A Tank	75,000 L	
	16 – Jet A drums	38,000 L	
	Underground		
	14- UG Fuel Tank UG Level 325		
Motor Oil	Mechanical Shop	800,000 L	20,800 L/sea can
	Powerhouse		
Hydraulic Fluid	Mechanical Shop		Cubes or Barrels
	Powerhouse		Cubes or Barrels
	Process Plant		Cubes or Barrels
Ethylene glycol	Mechanical Shop	60,000 L	10,000 L/sea can

Emulsion Reagents			
Ammonium Nitrate	Emulsion/ Dyno Nobel	1,330,000 Kg	1000 Kg/ Tote
Sodium Nitrate	Emulsion/ Dyno Nobel	195, 000 Kg	1000 Kg/ Tote
Titan Fuel Phase Oil 68	Emulsion/ Dyno Nobel	65, 280 Kg	960 Kg/ Cube

SECTION 4 • PREVENTION AND INSPECTIONS

Spill response is reactive while spill prevention is proactive. Spill prevention, response, and reporting is part of the online induction, which is mandatory for anyone coming to work at the Meliadine site. As well, all staff are trained to call the Environment Department in the event of a major spill and to notify their supervisor in the event of a minor spill. Spill kits are available to assist with containing the spill and starting cleanup, if safe to do so. Upon arriving and inspection of the spill site, if potential hazards are present, call ERT or initiate a Code 1.

Regular worksite inspections are conducted to identify measures to minimize or prevent the risk of spills. Completion of the online orientation session ensures all staff know the procedure to follow in the event of a spill. The procedure includes reporting, containing and cleaning up all major and minor spills. Following the clean-up of a spill, the Environmental Department inspects the spill site and, if necessary, collects samples to verify clean-up is complete.

All personnel are trained to be aware of the potential hazards associated with the fuel/chemicals they are assigned to work. In addition to work site inspections conducted by area specific employees, the Environmental Department conducts weekly inspections to audit facilities where hazardous materials are handled and stored. Inspection frequencies may change depending if a facility has no non-conformities over a few weekly inspections.

Agnico Eagle is implementing the following general principles for spill prevention:

- Provide up-to-date and accessible SDS for all hazardous materials to designated emergency response personnel, mine health staff, and Rankin Inlet health center staff;
- Regular inspection of fuel/chemical storage areas for leaks (including flex connectors and plumbing) and platform shifting;
- Regular inspection of hazardous materials storage areas;
- Train workers in the use of safe work procedures for hazardous materials, and procedures to clean up spills;
- Encourage workers to take reasonable measures to prevent spills;
- Keep drums/containers sealed or closed;
- Place drums/containers within a suitable form of secondary or spill containment;
- Segregate incompatible materials;
- Ensure chemical storage areas are adequately protected from weather and physical damage; and
- Provide adequate spill response materials at storage areas (details of spill prevention and response equipment are outlined in Section 7 • Response Equipment).

During site orientation, induction training ensures all employees have an understanding of the steps to be undertaken in the event of a spill. All employees and contractors are shown where spill kits are stored, made aware of their contents, and are familiar with using spill equipment and responding to spills.

Figure 5-1 illustrates Agnico Eagle's spill/incident reporting procedure and the following sub-sections list the major responsibilities of site staff that will be participating in the emergency response.

5.1 First Responder

The person who is the primary person involved in a spill, or the first to observe a spill, is the first responder. The responsibilities of the First Responder are as follows:

- If considered safe to do so after initial assessment, STOP the spill using equipment contained in spill response kits, if required;
- In the event that a tanker truck is overturned, and a spill threatens human life or the spill is uncontrollable, initiate Code 1. Remain on radio to provide guidance to the ERT;
- In case of spill to land, ice or water, contact the Supervisor and the Environment Department to report the incident;
- Identify spilled product and contain the spill, IF SAFE TO DO SO; and
- Participate in spill response as a member of the cleanup crew.

5.2 Supervisor

The responsibilities of the Supervisor are as follows:

- Initially assess the severity of the incident;
- Contact the ERT Incident Coordinator and/or the Environment Department;
- Gather facts about the spill; and
- Participate in spill response as a member of the cleanup crew.

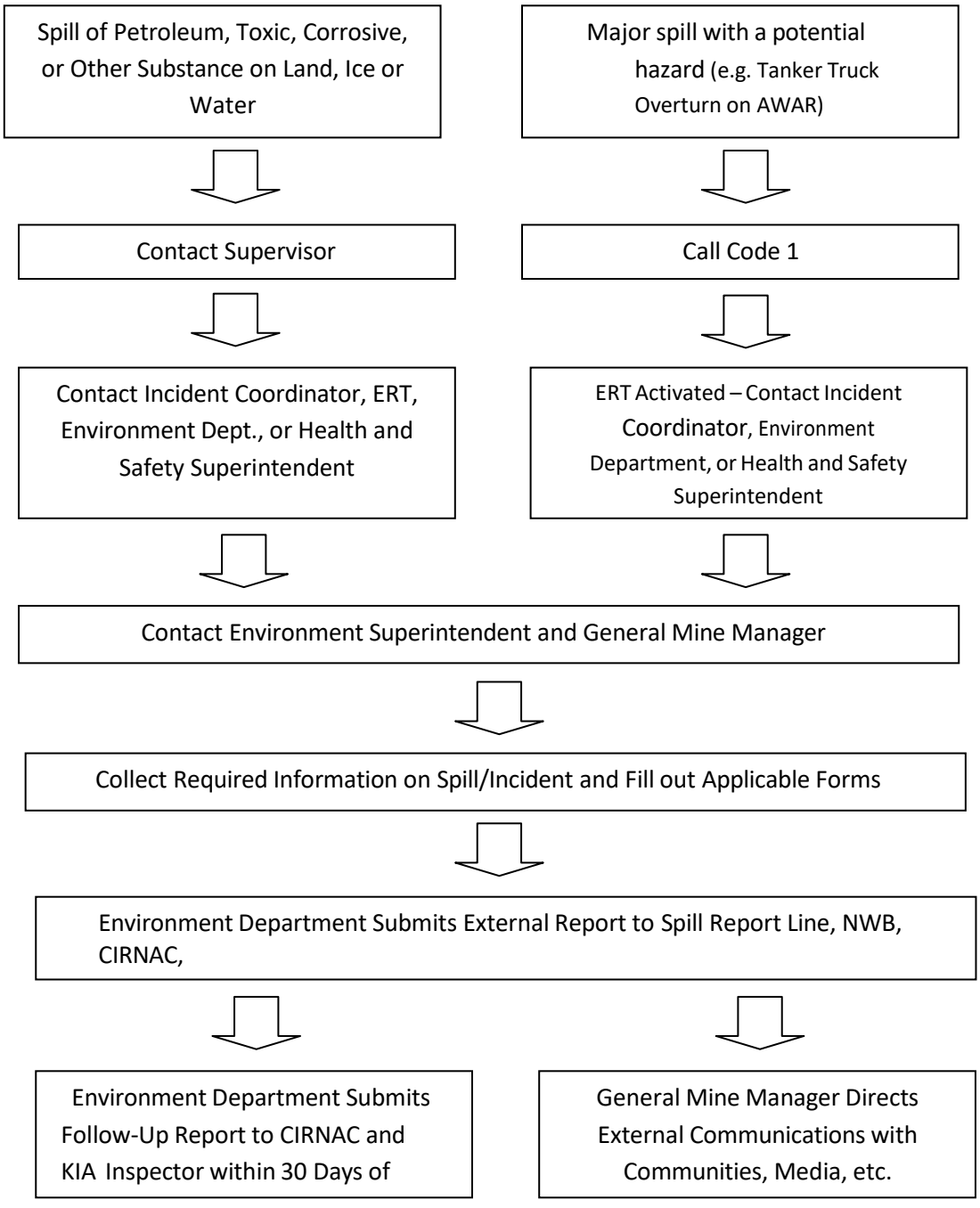

Figure 5-1 Spill/Incident Reporting Procedure

5.3 Environment Incident Coordinator

Responsibilities of the Environment Incident Coordinator are as follows:

- Assume complete authority over cleanup personnel and the spill scene;
- Assume responsibility for all mitigation efforts;
- Evaluate the initial situation and assess the magnitude of the problem;
- Activate the initial response plan;
- Alert and assemble key personnel in the ERT, as deemed appropriate, to handle the situation;
- In consultation with the Environment Superintendent or designate, develop the overall plan of action for containment and cleanup, and direct and implement the plan;
- Ensure assigned responsibilities are carried out and the activities of team members are coordinated;
- Assess the requirements for people, equipment, materials, and tools to contain the spill in light of what resources are immediately available - urgency will depend on the nature of the spill; and
- In consultation with the Environment Superintendent or designate, mobilize any additional resources that may be required and arrange for the transportation of necessary personnel and/or materials to the spill site.

5.4 Emergency Response Team

Since the commencement of construction, Agnico Eagle has an ERT that is trained to assist in controlling major spills. For example, they could be called upon to respond in the event a tanker truck rolled over on the AWAR. These team members attend training sessions in spill response.

5.5 Emergency Response Team Incident Coordinator

The responsibilities of the ERT Incident Coordinator are as follows:

- Assume complete authority over securing the scene prior to cleanup;
- Mobilize all ERT personnel, equipment, PPE, and supplies as required to the site of the spill;
- Assist the Environment Incident Coordinator in obtaining any additional resources not available on-site;
- Ensure that appropriate PPE is worn and used properly;
- Assist in developing and implementing emergency response training programs and exercises; and
- Ensure that all spill response personnel receive adequate training to fulfil their responsibilities as part of the ERT.

5.6 Environment Superintendent or designate

The Environment Superintendent or designate is responsible for implementing and maintaining the

Plan. In addition, the responsibilities of the Environment Superintendent or designate are as follows:

- Liaise with the Environment Incident Coordinator;
- Provide technical advice on the anticipated environmental impacts of the spill;
- Advise on the effectiveness of various containment, recoveries and disposal options;
- Prepare and submit any formal report (see Appendix A for the Spill Report Form) to regulators and Agnico Eagle management detailing the occurrence of a spill;
- Contact the Senior Vice President - Environment and Sustainable Development immediately in case of a major spill;
- Contact the Corporate Director of Communication & Public Affairs immediately in case of a major spill;
- Act as the spokesperson with regulatory and government agencies;
- If authorized by the General Mine Manager or delegate, act as a spokesperson with the public and media, as required;
- Implement a sampling protocol for the collection and analysis of samples to identify and monitor possible contaminant levels resulting from the spill;
- Ensure on-site resources for spill response and cleanup are available;
- Monitor the effectiveness of the cleanup operation and recommend further work, if necessary;
- Review incident occurrences and recommend preventative measures; and
- Assist in implementing training and simulation requirements for spill response personnel.

5.7 General Mine Manager or designate

The General Mine Manager or designate is required to inform ERT members of the detailed nature of the operations to be performed in the event of a facility malfunction causing a spill during the operations phase. The responsibilities of the General Mine Manager or designate are as follows:

- Liaise with appropriate Agnico Eagle personnel and keep them informed of cleanup activities; and
- Assist the Incident Coordinator and ERT as needed, particularly in obtaining any additional personnel and resources not available on-site for spill response and cleanup.

5.8 Health and Safety Superintendent or designate

The following is the responsibilities of the Health and Safety Superintendent or designate in conjunction with the Training Department:

- Maintain emergency and health and safety records;
- Assist in conducting emergency spill response exercises;
- Track all emergency and health and safety training that on-site staff, including contractors, have received, and when retraining is required;
- Notify the Incident Coordinator (related to ERT) when retraining is required;

- Ensure that employees are retrained in appropriate emergency response skills prior to expiry of existing training certification (e.g., Workplace Hazardous Materials Information System (WHMIS), Hazard Communication, Occupational Health and Safety Administration, first aid, respirator fit-testing; and
- Consult with appropriate organizations regarding retraining requirements and schedule.

5.9 On-Site Health Care Providers

On-site nurses are responsible to:

- Provide on-site first aid and other medical support; and
- Provide additional training for ERT members.

In addition to the health care providers on-site, the Rankin Inlet health professionals can be called for assistance, if required. For example, they may be the first to respond to incidences that could occur at Itivia.

5.10 Emergency Response Team Contact Information

Table 5-1 provides contact information for select Agnico Eagle contractors present at the Project. Internal contact information is presented in Table 5-2 for all Agnico Eagle personnel involved in spill recovery and subsequent reporting. Important external contacts relating to spill response, such as regulatory agencies and health organizations, are listed in Table 5-3. Table 5-4 provides contact information for external spill response contractors, should incident warrant assistance from outside sources. These tables are updated on an annual basis at minimum or as required.

5.11 Communication with the Public

Communication with public bodies during the state of emergency is the responsibility of the General Mine Manager or the Communications & Public Affairs Corporate Director.

In the case that the community of Rankin Inlet should need to be evacuated on short notice, the ERT will immediately assist in the evacuation of the community. The General Mine Manager will immediately contact the Mayor of the Hamlet to provide information regarding the situation. If safe to do so, a radio notification is immediately broadcasted on the Rankin Inlet Radio station.

Table 5-1 Contractor Contacts

Title	Telephone No.	Contact in Emergency for:
Nolinor Aviation Services	Protocol Agent 867.759.3700 ext. 8008	Flight services for additional crew, or additional supplies
First Air	(867) 669-6605	Flight services for additional crew, or additional supplies
Calm Air	(867) 793-2873	Flight services for additional crew, or additional supplies
Dyno Nobel Explosives Ltd.	(867) 793-4610 ext. 6804	Heavy Equipment, Man power, Emergency Blasting
Transport Desgagnes Inc. (Shipping)	(418) 692-1000	Fuel Hauler
M&T Entreprises, Rankin Inlet	867 645-2778	Transportation to and from Meliadine

Table 5-2 Internal Contacts

Title	Name	Telephone No.
Sr. Vice President, Environment and Sustainable Development	Louise Grondin	416.847.8656 Cell: 819.724.2020
Vice President of Environment and Sustainable Development	Michel Julien	416-947-1212 ext. 3738 Cell: 514.244.5876
Corporate director, Communications & Public Affairs	Dale Coffin	416.847.8669 Cell: 647.274.4154
Director Shared Services	Jason Allaire	819.759.3555 ext. 4608004 Cell: 819.355.2608
Meliadine General Mine Manager	Martin Plante	819-759-3555 ext 4608058 Cell: 819.856.1873
H&S Superintendent	Dominic Richard	819.759.3555 ext.4603076 Cell: 819.856-4104
H&S General Supervisor	Nathalie Ledoux	819.759.3555 Ext 4603968
Emergency Measure Counsellor	Dave Loder Darren Wilcox	819.759.3555 ext.4603113

Environmental Superintendent	Nancy Duquet Harvey	819.759.3555 ext.4603175 Cell: 819.856.4385
Environmental General Supervisor	Terence Ternes	819.759.3555 Cell:819.860.4515
SR. Environmental Coordinator	Jennifer Brown Daniel Gorton	819.759.3555 ext.4603996
Environmental Department	Environmental Technicians	819.759.3555 ext.4603903 & 4603925
On-site Nurses		819.759.3555 ext.4603011

Table 5-3 External Contacts

Organization/Authority	Telephone Number	Fax Number
NT-NU 24-Hour Spill spills@gov.nt.ca	(867) 920-8130	(867) 873-6924
Workers' Safety & Compensation Commission	(867) 979-8500	(867) 979-8501
Kivalliq Inuit Association (KIA)	(867) 645-5725	(867) 645-2348
Nunavut W ater Board (NWB)	(867) 360-6338	(867) 360-6369
CIRNAC Inspector (Tim Morton Nunavut Regional Office (NRO) – Indigenous and Northern Affairs Canada (INAC) – Iqaluit	(867) 669-2442 (867) 975-4500	(867) 669-2871 (867) 975-4560
Department of Fisheries and Ocean (DFO) – Nunavut Regional Office - Iqaluit	(867) 979-8000	(867) 979-8039
Manager, Environmental Protection, Government of Nunavut – Kristi Lowe	(867) 975-7748	(867) 975-6099
Kivalliq Health Services – Rankin Inlet	(867) 645-8300	(867) 645-8304
Emergency on call Nurse	(867) 645-6700	
Rankin Hamlet Office	(867) 645-2895	(867) 645-2146
Rankin Ambulance or Fire Emergency	(867) 645-2525	
RCMP 24 Hour Emergency Number	(867) 645-0123	

Canadian Coast Guard (in the event of a spill to the marine environment 24 hours) Superintendent, Environmental Response Coast guard e-mail for notification iqanordreg@innav.gc.ca	(800) 265-0237 (519) 383-1954 (867)-979-5724	(519) 337-2498
Transport Canada – Marine Safety Jaideep Johar	(204) 880-0754 or (204) 984-8618 (204) 984-2254	
Ian Salisbury Philip Levesque - Marine Safety Inspector	(780) 495-8360 (250) 754-0290 (204).984.5786 204.801.6951(cell)	

SECTION 6 • ACTION PLAN

Preventative measures are the primary form of ensuring safety. All personnel who have to deal with chemicals are trained in first aid and safe materials handling, including WHMIS. Regular training updates and site-specific exercises/drills are integral to preventing incidents.

Procedures vary depending on the season, hazardous materials spilled and location of the spill (land, water, ice or snow). The SSDS are consulted to ensure safety procedures are followed. Response procedures specific to spills on land, water, snow and ice are presented in the following sub-sections as general guidelines.

6.1 Initial Action

For all spill emergencies, it is required that the following priority actions be undertaken:

- Ensure personal safety;
- Respond quickly; and
- Report the spill.

6.1.1 Respond Safely

Responding safely involves the following:

- Consult the SDS and Product Guides for further information on the substance;
- Control the spill area to prevent unauthorized access by other workers;
- Ensure adequate ventilation;
- Assess whether the spill, leak or system failure can be readily stopped or brought under control;
- Stop product flow or leak if possible and IF SAFE TO DO SO;
- Approach spill from upwind IF SAFE TO DO SO;
- Do not contain compounds (e.g., gasoline, aviation fuel) if vapours might ignite – allow them to evaporate;
- Depending on the type of compound spilled and IF SAFE TO DO SO, contain product using booms, berms, absorbent pads, earthen dike, trenches or improvise with materials at hand and
- Wear appropriate PPE, such as impervious clothing, goggles and gloves when containing the spill.

6.1.2 Respond Quickly

Responding quickly involves the following:

- Identify the spilled material;
- Stop the spill, if safe to do so;

- Be alert – ensure safety of yourself and others by notifying them of the incident;
- Contact the Incident Coordinator if it is a major spill (Code 1), identify the location and request assistance as required. The Incident Coordinator will mobilize the ERT if necessary;
- Shut off ignition sources such as vehicles and unplug electrical equipment – NO SMOKING nearby;
- Attend to the injured if applicable; and
- Assess the severity of the spill.

6.1.3 Report Spill

Reporting the spill includes the following:

- Obtain all necessary information to complete the external spill report and forward to Environment Department (see Appendix A). External reportable spills must be reported by Agnico Eagle Environment Staff to the NT-NU 24-Hour Spill Report Line, CIRNAC, Kivalliq Inuit Association (KIA), ECCC, NWB and NIRB; and
- Submit a detailed spill follow up report to the same external stakeholders no later than 30 days after the spill. This is done by Agnico Eagle Environment Staff. The report contains the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain, cleanup, and restore the spill site.

6.2 Spills on Land

Response to spills on land includes the general procedures detailed in the following section. The main spill control techniques involve the use of two types of barriers: dikes and trenches. Barriers are placed down-gradient (down-slope) from the source of the spill, and as close as possible to the source of the spill. Barriers slow the progression of the spilled material and also serve as containment to allow recovery of the spilled material.

Depending on the spill volume, the site of the spill and available material, a dike may be constructed with soil, booms, lumber, snow, etc. A plastic liner is placed at the foot of and over the dikes to protect the underlying soil or other material and to facilitate recovery of the spill material.

Dikes are constructed to accumulate a thick layer of free product in a single area (V- shaped or U-shaped).

Trenches are useful in the presence of permeable soil and when the spilled material is migrating below the ground surface. If deemed necessary, a material specific liner is placed on the down-gradient edge of the trench to protect the underlying soil. Liners should not be placed on the bottom of the trench to allow water to continue flowing underneath the layer floating material (such as fuel).

The use of large quantities of absorbent materials to recover significant volumes of spilled material should be avoided. Large volumes of free-product should be recovered, as much as possible, by using vacuums and pumps, and containerized. Mixtures of water and fuel may be processed through

an oil-water separator. Absorbent sheets should be used to soak up residual fuel on water, on the ground (soil and rock), and on vegetation. Peat moss may also be sprinkled on vegetation to absorb films of petroleum products. Excavations will be planned for contaminated areas using heavy equipment and contaminated soil will be disposed at the Landfarm or shipped south during the summer barge season.

6.3 Spills on Water

Response to spills on water includes the general procedures provided in the following section. The following elements are taken into consideration when conducting response operations:

- Type of waterbody or watercourse (lake, stream, river);
- Type of spilled material;
- Water depth and surface area;
- Wind speed and direction;
- Water flow and direction;
- Type of shoreline;
- Seasonal considerations (open-water, freeze-up, break-up, frozen); and
- Equipment and personnel available for first response.

Containment of an oil slick in water requires the deployment of mobile floating booms, maritime barriers to intercept, control, contain and concentrate (i.e., increase thickness) the floating oil.

Measures are taken to protect sensitive and accessible shoreline. The spill is monitored to determine the direction of migration. In the absence of strong winds, the material will likely follow water flow direction. Measures are taken to block and concentrate the spilled material at the discharge of a waterbody using booms where it will subsequently be recovered.

In the case of spills in larger rivers, with fast moving currents, diversion booms are used to direct the spilled material ashore for recovery. Single or multiple booms (i.e., cascading) may be used for diversion. Typically, the booms are anchored across the river at an angle. The angle depends on the current velocity. Choosing a section of a river that is both wider (i.e., less current) and shallower makes boom deployment easier. Diversion booming may also be used to direct the spilled material away from a sensitive area to be protected.

6.4 Spills on Snow and Ice

In general, snow and ice will slow the movement of hydrocarbons or other spilled material. Snow is generally a good natural sorbent. Hydrocarbons have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material is limited as much as possible. Snow and frozen ground also prevent spilled material from migrating down into soil or at least slow the migration process. Ice prevents seepage of spilled material into the water. On the other hand, the presence of snow may hide the spilled material (especially oil slicks) and make it more difficult to follow its progression.

Most response procedures for spills on land can be used for spills on snow and ice. The use of dikes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in ice) slow the progression of the spilled material and serve as containment, to allow recovery of the material. Free-product is recovered using a vacuum, pump, or sorbent materials. Contaminated snow and ice are scraped up manually or with heavy equipment, depending on volumes. The contaminated snow and ice are disposed at the Landfarm and treated in spring with the oil and water separator.

In the event a hydrocarbon spill has occurred on a frozen river and the hydrocarbon has migrated under the ice a V trench can be installed downstream of the spill. This would involve a chainsaw cutting through the ice, if the ice is not too thick, and a V structure constructed such that the point of the V is the furthermost point of the structure downstream of the spill. This structure may allow hydrocarbons to accumulate along the sides of the V forcing the hydrocarbons to the point of the V where absorbents can be used to collect the product. This work should only be completed if it is safe to work on the ice and the ice is not too thick that a chainsaw can cut through the ice.

6.5 Disposal of Spilled Material

Contaminated materials are salvaged, put into appropriate containers (e.g., Quatrex bags/drums), and labelled for temporary storage. Water contaminated with oil or fuel is processed with the oil separator. Water contaminated with other products is placed in drums for shipment. Depending on the nature of the contamination, solid materials are treated on-site (landfarm), or shipped off-site to an approved disposal facility.

Soils contaminated with light hydrocarbons (such as gasoline or aviation fuel) are treated on-site in the landfarm. Details on the design and operation of the landfarm are provided in the Landfarm Management Plan.

In the event of a saline spill on land the necessity of cleanup will be determined for each incident. For instance, if a spill occurred on the AWAR, the saline in the water will act as a natural dust suppressant, binding to the road base material. In this situation digging up the saline water may be more detrimental than leaving the saline bound to the road. If the water migrates off of the AWAR or Bypass road a sucker truck or similar type of equipment should be used to pick up the residual saline water. If an area

impacted with saline water needs to be cleaned up the leftover material is to be deposited with the Waste Rock or Overburden Material.

Soils contaminated with other spilled products are segregated, packaged and shipped to an external approved facility for proper treatment and disposal. In this, Agnico Eagle will adhere to the requirements under the *Transportation of Dangerous Goods Regulations*, particularly Part 5. All contaminated materials (dangerous goods) will be shipped in a means of containment required or permitted by Part 5 of the Regulations.

6.6 Seepage management

Seepage from the tailings storage facility (TSF) and waste rock storage facilities (WRSF) are treated as actionable and reportable spills. In the event that seepage is observed, an action plan is implemented to address the problem. The action plan includes: cause identification, mitigation measures used to stop or control the seepage, clean-up actions, disposal of contaminated material if applicable and monitoring requirements.

6.7 Event Monitoring

The Event Monitoring (EM) program addresses the site specific monitoring that is required following any accidental release. A "release" may be caused by a spill or an emergency. The EM program is designed to verify whether contamination of the surface soil, nearby receiving environment and active zone has occurred as a result of an accidental release of a hazardous material or contaminated water, through monitoring of surface runoff and nearby receiving environment following remediation of any release. It is anticipated that owing to the presence of permafrost beneath most of the mine footprint, there will be minimum impact to groundwater.

The EM plan is developed on a site specific basis subsequent to a spill or accidental release, and considers the location, extent of the spill, type of product spilled, potential receptors and the potential for any remaining contamination after clean up. The plan is done in coordination with the Environmental Superintendent, or designate. In the event of an accidental release, the water quality of the downstream receptor and possibly upstream of the receiving point is to be sampled (during the ice-free season) and analyzed. Should the spill have happened over snow cover, water and possibly soil sampling should take place at the earliest feasible time after thaw to determine if there is any impact to the receiving water or soil quality. The specific parameters monitored as part of the EM program depends on the nature of the spill, and is determined for the specific hazardous material released.

This section addresses the emergency response machinery, equipment, tools and other resources that are made available on-site for spill recovery measures (see Tables 7-1, 7-2, and 7-3).

Table 7-1 Equipment for Spill Emergency Response

Mobile Equipment	
Excavators	Pickup trucks
Snowmobiles	Generator
ATV	Fire truck
Vacuum truck	Boats
Loaders	Fuel trucks
Backhoe	Haul truck
Bulldozer	Spill response trailer
Zoomboom	Bobcat
Water trucks	
Temporary Containment Systems	
Booms	Spill absorbent material
Drums Tanks	Packages/pads
Flexible bladder	Silt fencing
Temporary secondary Containment	Maritime barrier
Emergency Transportation	
Helicopter if available	Snow mobile
ATV	Boats
Sno Cat	
Communication Equipment	
Radio	Email
Phone	Wireless communication system

If required, additional on-site equipment is made available to assist with spill recovery. Temporary containment systems are also available on-site and at Itivia. If required, external resources available in Rankin Inlet, they are listed in Table 5-2 and Table 5-4.

Communication equipment on-site includes radios, telephones and other wireless communication systems that are available in the event of an emergency situation.

Spill response kits are strategically located where required on-site. Each department and work area is responsible for providing sufficient spill response kits in their respective work areas. The kits are kept in marked and accessible locations. The locations include all fuel storage areas and chemical storage areas.

All mobile equipment on-site (surface heavy equipment) are equipped with an emergency spill kit and quarterly audit is performed by the Environment Department.

A mobile environmental emergency trailer, which is easily accessible and transportable, is located on-site and contains the items listed in Table 7-2.

Table 7-2 Contents of Mobile Environmental Emergency Trailer

Emergency Response Equipment	
Pump centrifugal (summer only)	White oil spill pads and roll
Pump accessories, Vacuum ends	Universal booms
Tubing or pipes for vacuum or pumping	Quatrex bags
Tyvek suit and glove	Wedge wood, Plug pattie
Diesel fuel jerry can (placed on a miniberm)	Hand shovel
Leak control Kit	Sledge hammer, Re- bars
Drum opener	Pipe patch kit
Wescot (to open empty drum screw)	Absorbent pellet bag
Drums	Crow bar
Absorbent booms	Secondary containment
Tarps	
Ropes	
Evac treatment system	
Yellow liner roll (Bags)	

Environmental emergency sea cans are located near the Meliadine River at km 7 and 18 along the AWAR as well as at Itivia. Each environmental emergency sea can contains material listed in Table 7-3.

Table 7-3 Environmental emergency sea can content

Quantity	Equipment/tool name
3	Empty drum (sealed)
2	Mini berm 36”x 36”
2	4 drums berm 4’x 8’
4	Tarp 20’x 30’
4	Tarp 30’x 50’
10	Oil spill absorbent pad
5	Universal absorbent boom 5”x 10’ (for hydro-soluble chemical)
5	Universal absorbent boom 8”x 10’ (for hydro-soluble chemical)
5	Petroleum base absorbent boom 5”x 10’ (for petroleum product)
3	Maritime barrier (baffle)
2	Cell-U-Sorb (absorbent)
2	Amerisorb peat moss (absorbent)
2	Oil gator absorbent
1	Plug pattie
4	Quatrex bag and liners
2	Fork lift wood pallet
4	Hand shovel
1	Crowbar chisel
1	Ice breaker chisel
1	Sledge hammer
15	Re- bar 4’
1	½ drum containment
1	Yellow liner roll
1	Toolbox
2	Silt fence
2	Silt bag
2	EVAC System
1	45 gallon Spill Kit
1	Yellow Nylon rope roll

TABLE 7-4 Spill kit Location

Area	Location	
	Easting	Northing
Fountain Tire Dome, Fuel Tank	541904	6989004
Jet-A Tank	541941	6988939
Orbit Dome	541861	6988932
Gas Station	541837	6988946
Fuel Farm	541222	6988453
DCP5	540468	6988747
DCP1	540144	6989255
Nuna Yard (beside Nuna Dome)	540048	6989058
Nuna Dome (2 SK available)	540019	6989058
Warehouse Dome	539900	6988854
Dome 1 (Brine shop)	539892	6988800
Fuel Tank Portal (Dome1)	539892	6988791
Mine Compressor Room	539838	6988848
Mine Gen Set	539834	6988853
Waste Rock Area	539806	6989147
Batch Plan Yard 1	539594	6989084
Batch Plan Yard 2	539577	6989067
Batch Plan Yard 3	539541	6989077
Batch Plan Yard 4	539539	6989060
A & K Dome	539198	6990190
A & K Industrial Pad	539138	6990034
BLAIS Industrial Pad	539027	6990361
TANGMAARVIK Industrial Pad	538917	6990253
Camp Gen Set Tank	542034	6989099
Camp Gen Set Building	542038	6989093
ANFO Plant Shop	539567	6988322
Crusher (Meliadine esker, 3 SK available)	539447	6990118
Emulsion Plant Shop	537626	6990745

8.1 Training

8.1.1 On-Site Personnel

A designated ERT consisting of on-site personnel is established. Agnico Eagle ensures that the ERT is trained and present at all times. All members of the team are trained and familiar with emergency and spill response resources, including their location and access, the Spill Contingency Plan, and appropriate emergency spill response methodologies. The ERT receive 4 hours of training per quarter.

The training includes the following:

- A review of the spill response plan and responsibilities of the ERT members;
- The nature, status and location of fuel and chemical storage facilities;
- The on-site and off-site spill response equipment and how to use it;
- Distribution of SDS sheets;
- Emergency contact lists;
- Worker health and safety during emergency interventions;
- Communication methods and signals;
- Desktop exercises of “worst case” scenarios;
- Emergency evacuation;
- Fires or explosions;
- Emergency equipment and use;
- Personal protective equipment and clothing;
- Marine shoreline recovery operations; and,
- Likely causes and possible effects of spills.

Every employee and contractor at the Meliadine site receives basic spill and waste management training during their online induction, enabling them to respond to small spills and raise the alarm if a larger response is required. The ERT members receive in-depth spill response training and learn how to respond while wearing PPE.

The Environment Department regularly attend tool-box sessions to provide information on spill response and reporting procedures. The Health and Safety Department, including the Health Center staff, are familiar with and have up-to-date SDS available.

SECTION 9 • POTENTIAL SPILL ANALYSIS – AWAR

To prepare for emergency spill response, potential spill analysis are conducted for a variety of potential worst case scenarios. The exercise serves to: identify potential risk areas, determines the fate of spilled products and predict environmental effects. The following example, of a tanker truck spill on the AWAR, is used to demonstrate the application of the spill response as part of the spill analysis.

Description of Incident: Rollover of fuel tanker due to poor road conditions. The rollover has resulted in approximately 1,000 L of fuel to the ground along the roadside.

Potential Causes: Vehicle accident, human error.

Hazardous Product(s) Spilled: Diesel fuel.

Maximum Potential Volume Spilled: 45,000 litres.

Immediate Receiving Medium: Land.

Distance and Direction to Nearest Receiving Body of Water: 500 metres.

Resources to Protect: Land and any nearby stream, river or waterbody.

Estimated Emergency Response Time: Maximum time is 90 minutes depending on location of spill (assuming truck driver is injured and cannot commence spill response). Minimum time to respond to a spill on the AWAR is 15 minutes, depending on the distance from the proposed Meliadine site.

Spill Response Procedures: Under this scenario, the truck driver was not injured, and therefore he acted as the first responder and immediately activated the Plan as defined in Section 6. The driver attempted to seal the leak. He tried to use the spill kit carried in the fuel truck and made all attempts to contain and recover the fuel on the ground using dikes, sumps or trenches as described in Section 6.2. A sorbent boom[2] was used to block the flow of the fuel towards the Lake. The first responder notified the Incident Coordinator, ERT and Environment Department by calling a Code 1 on radio. The mobile emergency response trailer was brought to the spill site by the ERT, who assisted in digging trenches to contain and collect free-product for temporary storage. Spilled material was recovered using pumps. The Environment Superintendent, or designate, immediately transmitted the information to the General Mine Manager or designate. The fuel remaining in the tanker was pumped into a temporary storage tank using appropriate equipment. The leak stopped as the tank volume was reduced below the leaking safety valve. Pumping continued until all of the fuel was removed. The empty tanker was righted up and brought back to the site. All soil was cleaned up thereafter and disposed of in the landfarm. The spill was reported to the NT/NU spill report line, KIA, and INAC. After the cleanup had been completed, the Environment Department collected soil samples to verify that no residual fuel remained at the spill

site. A follow-up of the spill causes results in the development of mitigation measures including:

- Fuel deliveries from Itivia to the mine site are suspended during poor weather or poor road conditions;
- Agnico Eagle sands the roads when road ice poses a safety risk to travel; and
- All Agnico Eagle vehicles carry basic spill response equipment and the drivers are trained in its use. This allows the truck driver to act as the first responder and attempt to contain the spill and recover any spilled product, if safe to do so.

These mitigation measures, combined with the procedures outlined in this Plan above, provide protection to Nipissar Lake.

SECTION • 10 • MDMER INFORMATION

The Fisheries Act prohibits the deposit of deleterious substances into fish frequented waters unless authorized by regulation. The Metal and Diamond Mining Effluent Regulations (MDMER) were promulgated under the Fisheries Act and exempts metal and diamond mining industry from subsection 36(3) general prohibition of the Act. The purpose of the MDMER is to improve metal mine effluent management and greater protection of fish, fish habitat and consumption of fish by humans. Being subject to the MDMER sets out limits and parameters that enable industries to deposit deleterious substances into waters frequented by fish. The MDMER includes effluent limits on releases of eight parameters: six metals (arsenic, copper, cyanide, lead, nickel and zinc), radium-226 and total suspended solids (TSS). The MDMER also imposes limits on the pH of effluent and prohibits the discharge of effluent that is acutely lethal to fish, even if it is determined that the eight MDMER parameters and pH effluent is in compliance. Total suspended solid is the parameter in the effluent discharge that is the most likely to give concern. To prevent this the Effluent Treatment Plant was put in place to treat the TSS.

The Final Discharge Point (FDP) means an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent. For example, sampling within the tailings pond would not be classified as a legal sample as the mine still exercises control over the quality of the effluent within a tailings pond.

Before discharging occurs, required samples from the FDP are taken and analyzed to ensure they are compliant. Under the Nunavut Water Board water licence 2AM-MEL1631 Agnico Eagle also has to identify CIRNAC before starting the discharge. If analysis indicates a limit is exceeded or a field measurement indicates a trend towards non-compliance, discharge is stopped. Evaluation is done and if necessary, treatment occurs while re-circulating the water. Agnico Eagle is also required to report the effluent discharge to the Spills line and provide a written report no later than 30 days after the incident. If other potential seepages that enter fish bearing waters are discovered, mitigation measures are taken (building dikes, pumping stations, putting maritime barriers, etc.). As of now, seepage has not been discovered entering fish bearing waters.

The FDP is located downstream of the Effluent Water Treatment Plant; beyond that point Agnico Eagle cannot exercise control over the quality of the effluent.. FDP water quality is assessed with grab and composite samples; the sampling point is located at a valve along the discharge pipe in the Effluent Treatment Plant.

On August 22, 2016 Agnico Eagle, Meliadine Gold Project became subject to the MMER, under the Fisheries Act, as dewatering of the H17 pond into Meliadine Lake occurred at a flow rate greater than 50 m^3 per day. Water was pumped from the H17 pond to a physical filtration device (geotubes) and was then discharged into Meliadine Lake using a 700m pipe. When required, water was treated for TSS through a chemical treatment unit. Water was released into Meliadine Lake via a diffuser, to control erosion and disturbance to bottom sediments. The diffuser was located 38 m offshore and in 4.5 m deep water at location 63°02'35.97'' N 92°13'10.98'' W. There was no routine cleaning procedures for the discharge pipe, as this was considered clean water. Discharge was stopped once dewatering of H17 was completed on September 25, 2016. The MMER final discharge point (FDP # 1 named “MEL-D-1”) was located at 63°02'16.12'' N 92°13'20.98''. The water collected at FDP #1 MEL-D-1 was located

downstream of the chemical treatment plant and beyond Agnico Eagle's control of effluent quality.. On January 3, 2017 EO DIDHAM was informed that the MMER FDP MEL-D-1 had been dismantled and will not be used again. The last report in RISS was the 4th quarter of 2016. The last discharge day for MMER FDP MEL-D-1 was October 1st 2016.

On June 20, 2017, Agnico Eagle Meliadine commissioned a second FDP in Meliadine Lake at 63°01'45.97'' N 92°09'18.12, 100 m from shore. Water is pumped from CP-1 to the Effluent Water Treatment Plant (EWTP). The final control sampling point is located in the EWTP at 'MEL-14' (63°02'15.46'' N 92°13'06.24). When water quality meets Total Suspended Solids compliance standards, water is discharged past MEL-14 into Meliadine Lake. The FDP consists of a diffuser to control erosion and disturbance to bottom sediments.

MDMER came into effect on June 1, 2018. On June 24, 2018 MEL-14 FDP was first discharged and finished discharging on Sept 3, 2018.

SECTION • 11 • REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2014. Oil Pollution Emergency Plan (OPEP), Final Environmental Impact Statement, Meliadine Gold Project, Nunavut, Volume 8, Support Document 8-2.

INAC (Aboriginal Affairs and Northern Development Canada). 2010. Guidelines for Spill Contingency Planning. Last modified- 2010/09/15 http://www.aadnc-INAC.gc.ca/eng/1100100024236/1100100024253#sub1A_6

NWB (Nunavut Water Board). 2010. Guide 4 – Completing and Submitting a Water Licence Application for a New Licence and the Supplemental Information Guide for Mining and Milling (SIG-MM3 Guide).

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

Northwest Territories · Nunavut · Canada

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME	☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS		
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION		
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS			

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ NAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

PAGE 1 OF _____

B.1 Ammonium Nitrate

The first step to prevent potential spills and associated hazards is the application of proper storage procedures for bulk ammonium nitrate, including the following:

- Ensure good housekeeping of the storage facility to prevent spilling and/ cross-contamination of materials;
- Store ammonium nitrate away from combustible materials, fuels, and other blasting accessories (i.e., boosters, delays, detonating cords, and detonators);
- Post proper signage restricting the use/exposure of ammonium nitrate to ignition sources (e.g., no hot work, smoking or vehicle maintenance);
- Ensure the storage facility is well ventilated; and
- Ensure the storage facility is locked at all times with only authorized personnel allowed access.

The following is a general spill response procedure for ammonium nitrate. Consult the SDS to determine whether deviations from the general guidance are required.

For an **ammonium nitrate spill** (solid):

1) Isolate and evacuate the spill area.

2) Contact your Supervisor, who will contact the Incident Coordinator and coordinate appropriate spill response (assemble ERT members and the appropriate spill response materials). **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on appropriate personal protective equipment. For an ammonium nitrate spill, this includes:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Protective eyeglasses or chemical safety goggles or face shield as recommended by the SDS;

    c. Lab coat, coveralls or TyvekTM coveralls as recommended by the SDS; and

    d. Half mask air-purifying respirator with cartridges and/filters as recommended by the SDS or respirator manufacturer.

4) Ventilate (open windows/doors to outdoor) closed spaces before entering.

5) Remove all sources of heat and ignition (no smoking, flares, sparks, or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.) from spill area.

6) For spills on land, protect the spill area from water runoff by constructing a ditch or dike using suitable absorbent materials, soil or other appropriate barrier.

7) AN dissolves quickly in water or snow so it is critical to minimize its interaction with water or snow. If the material is spilled on snow the area should be cleaned up as soon as possible to minimize the amount of AN that gets dissolved. If the spill occurs when it is raining, it may be advantageous to cover the material with an impermeable tarp to minimize the interaction with the rain until the spill is cleaned up.

8) Vacuum or sweep the spill residue using non-metal, non-sparking tools and place the residue in a labelled plastic container (plastic pail with lid or double heavy-duty plastic bags) for re-use or off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

    Note: Minimize dust generation during the operation.

9) Remove and bag PPE for cleaning or disposal at a licensed facility. Thoroughly wash potential skin contact locations after handling.

B.2 Ammonium Nitrate Fuel Oil

Proper storage, handling and disposal of ammonium nitrate fuel oil (ANFO) are an important first step in preventing spills and associated hazards.

The proper storage procedures are as follows:

- Use ANFO under the supervision of authorized trained personnel;
- Keep ANFO away from heat, sparks, and flames, as well as initiating explosives, oxidizing agents, combustibles, and other sources of heat; and
- Protect containers from physical damage and store them in dry, well ventilated conditions.

Explosives that have been identified as deteriorated or damaged need to be disposed of or destroyed. The appropriate method of disposal or destruction and subsequent course of action is determined by authorized personnel or the explosive supplier.

Transportation of explosives-related compounds and materials is in accordance with Section 14 of the *Mine Health and Safety Act* and associated regulations, and the *Transportation of Dangerous Goods Act*. Transport vehicles will be in sound mechanical condition and equipped with proper safety equipment. Loaded vehicles will not be left unattended, and only authorized personnel are responsible for the security of the explosives under their control.

The following is a general spill response procedure for ANFO. The following procedure does not apply to emulsions or other explosives. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For an **ANFO spill** (solid):

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO,** immediately extinguish any open flames and remove ignition sources (no smoking, flares, sparks in immediate area). **Fires involving large quantities of ANFO should not be fought.**

3) Contact the Incident Coordinator who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on appropriate personal protective equipment. For an ANFO spill this includes:

    a. Gloves as recommended by the SDS or glove manufacturer;

b. Protective eyeglasses or chemical safety goggles or face shield as recommended by the SDS;

c. Lab coat, coveralls or TyvekTM coveralls as recommended by the SDS;

d. Shoe covers or rubber boots; and

e. Half mask air-purifying respirator with cartridges and/filters as recommended by the SDS or respirator manufacturer.

5) If the spill occurred outdoors, stay upwind and avoid low lying areas. Ventilate (open windows/doors to outdoors) closed spaces before entering. Ensure adequate explosion proof ventilation for cleanup.

6) Remove all sources of heat and ignition (no smoking, flares, sparks or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.) from spill area.

7) Do not operate radio transmitters within 100 m of electric detonators.

8) For a spill on land, protect the spill area from water runoff by constructing a ditch or dike using suitable absorbent materials, soil or other appropriate barrier. For a spill to water, utilize damming, and/or water diversion to minimize the spread of contamination. ANFO dissolves quickly in water so the material should be covered up with a tarp if it is raining out and if cleanup is delayed. If an ANFO spill occurs on snow this area should be cleaned up as quick as possible as the ANFO will dissolve in the snow.

9) Collect, sweep or shovel spilled material and the other contaminated material/soil using non-metallic, spark-proof tools and place residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility.

   Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and clearly label the container per WHMIS Guidelines.

   Note: The drums/containers/residues are to be stored in ventilated areas away from incompatible materials for eventual off-site disposal at a licensed disposal facility.

10) Remove and bag PPE for cleaning or disposal at a licensed disposal facility. After handling thoroughly wash potential skin contact locations with soap. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.

The following is a general spill response procedure for compressed gases. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **compressed (inert and flammable) gas** leak:

1) **IF SAFE TO DO SO** and if it will stop the gas leak, turn off cylinder valve.

2) If the leak cannot be stopped by closing the cylinder valve and it is **an inert atmospheric gas** (e.g., nitrogen, carbon dioxide, etc.), isolate and evacuate the affected area. If the leak is a **flammable gas** and the leak is outside of a ventilated building enclosure that will contain the gas, immediately activate the fire alarm system and evacuate the area/building.

3) Contact the Incident Coordinator who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) If possible and if safety permits, adjust leaking cylinder so that gas escapes rather than liquid.

5) If possible and if safety permits, eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area) and turn off electrical equipment.

6) If a spill has occurred outdoors, stay upwind and avoid low lying areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shut-down. Allow vapours to ventilate outdoors by opening windows and doors to the exterior.

7) Isolate area until gas has dispersed. Incident Coordinator to verify safe conditions.

APPENDIX D • GENERAL RESPONSE PROCEDURES FOR SPILLED FLAMMABLE OR COMBUSTABLE LIQUIDS

The following is a general spill response procedure for flammable or combustible liquids, particularly petroleum hydrocarbon products. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a spill of flammable or combustible petroleum hydrocarbon product (liquid):

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, immediately extinguishes any open flames and remove ignition sources (no smoking, flares, sparks in immediate area).

3) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 9**).

4) Contact the Incident Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

5) Put on appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat or TyvekTM coveralls; and

    e. Half mask air-purifying respirator with **organic vapour or combination cartridges**, or as otherwise recommended by the SDS or respirator manufacturer.

6) If the spill has occurred outdoors, stay upwind and avoid low lying areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shut-down.

7) Ventilate (open windows/doors to outdoors) closed spaces before entering. Ensure adequate explosion-proof ventilation for cleanup. A vapour suppressing foam or water spray may be used to reduce vapours.

8) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area) and combustible materials (wood, paper, oil, etc.) from within the spill area.

9) Contain spill by using spill absorbent, spill pads or pillows, soil or snow by constructing a dike that will limit flow and prevent entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. If possible, compact soil or snow dikes, and place plastic tarps over the dike and at its foot to allow the product to pool on the plastic for easy recovery.

   Note: Do not use paper towels to absorb spill as this increases the rate of evaporation and vapour concentration in the air.

   Note: Do not flush with water into drainage areas or ditches as this will spread spill.

   Note: Snow works well as a natural absorbent to collect and contain spilled petroleum hydrocarbons. However, its use in containing a spill will result in a water-contaminant mixture that may be more difficult to manage. It is important to scrape up the contaminated snow and ice as soon as possible.

10) Carefully cover the spill area with spill absorbent, spill pads, soil or snow, starting at the outside and working inward. Do not touch or walk through spilled material.

11) Sweep up or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy duty plastic bags). For larger spills to land, excavate impacted absorbent material and soil, place in lined and bermed temporary storage area or directly into sealed drums/containers.

   Note: The drums/containers/residues are to be stored in ventilated areas away from incompatible materials for eventual treatment at the on-site landfarm facility or off-site disposal at a licensed disposal facility. Electrically ground all containers and transporting equipment.

   Note: Larger pools of product may be pumped into empty storage tanks or drums.

12) If a spill is indoors, mop the affected area using detergent and water. Dispose of this water to drums for eventual off-site disposal at a licensed disposal facility. Spills to land may require further excavation or remediation of contaminated soil until acceptable soil quality is achieved. The Incident Coordinator and/or Environment Superintendent, or designate will assess this requirement.

13) For spills to water, immediately limit the area of the spill on water using absorbent pads and booms and similar materials to capture small spills on water. Deploy and slowly draw in absorbent booms to encircle and absorb the spilled product. Recover larger spills on water with floating skimmers and pumps, as required, and discharge recovered product to drums or tanks.

   Note: Petroleum hydrocarbons are generally hydrophobic, and as such, do not readily dissolves in water. They typically tend to float on the water's surface. Absorbent booms are often relied on to recover hydrocarbons that escape land containment and enter water.

   Note: Antifreeze sinks and mixes with water. If released to water, attempt to isolate/confine the spill by damming or diverting the spill. Pump contaminated water to tanks or drums.

14) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated leather articles (including boots and shoes) that cannot be decontaminated.

E.1 Liquids

The following is a general spill response procedure for liquid oxidizer compounds. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **liquid oxidizer** spill:

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 8**).

3) Contact the Incident Coordinator who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat, coveralls or TyvekTM coveralls as recommended by the SDS; and

    e. Half mask air-purifying respirator with cartridges and/or filters as recommended by the SDS or respirator manufacturer.

5) Ventilate closed spaces before entering. Ensure adequate explosion-proof ventilation for cleanup.

6) Remove and/or moisten with water any combustible material (wood, paper, oil, etc.) affected by the spill.

7) Use water spray to reduce vapours or divert vapour cloud drift, if required.

8) Contain spill by using non-combustible spill absorbent, soil or snow to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate.

    Note: Flushing area with flooding quantities of water may also be appropriate assuming this does not make cleanup and waste management more difficult – refer to the SDS.

9) Carefully cover the spill area with chemical spill absorbent, soil or snow, starting at the outside and working inward. Use non-combustible absorbent. Do not touch or walk through spilled material.

10) Sweep up or shovel the spill residue using non-metal, non-sparking tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy-duty plastic bags) for off-site disposal at a licensed disposal facility.

11) For indoor spills, mop the affected area using detergent and water. Flushing area with flooding quantities of water may also be appropriate – refer to the SDS. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate. Spills to land may require further excavation or remediation of contaminated soil until acceptable soil quality is achieved. The Incident Coordinator and/or Environment Superintendent or designate will assess this requirement.

12) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

E.2 Solids

The following is a general spill response procedure for solid oxidizer compounds. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **solid oxidizer** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Coordinator who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator with **N95 or greater protection** particulate filter or as recommended by the SDS or respirator manufacturer.

4) Remove all sources of heat and ignition (no smoking, flares, sparks or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.) from spill area.

5) For spills to land, protect the spill area from water runoff by constructing a ditch or dike using suitable non-combustible absorbent materials, soil or other appropriate barrier. For spills to water, utilize damming and/or water diversion to minimize the spread of contamination.

6) Vacuum, sweep, or shovel the spill residue using non-metal, non-sparking tools, and place the residue into a labelled plastic container (plastic pail with lid or double heavy-duty plastic bags) for re-use or off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and clearly label the container per WHMIS Guidelines.

    Note: Minimize dust generation.

7) If there is still oxidizer residue left in the spill area, neutralize with appropriate agent as recommended by the SDS, or for spills to land, continue to excavate until no visible spilled solid remains. Use non-combustible chemical spill absorbent or soil to absorb the neutralized residue. Place in suitable drums/containers for disposal at a licensed facility.

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer (if the quantity is not too large), process stream or waste drums as appropriate.

9) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

APPENDIX F • GENERAL RESPONSE PROCEDURES FOR SPILLED POISONOUS AND TOXIC SUBSTANCES

F.1 Sodium Cyanide

The following is a general spill response procedure for solid Sodium Cyanide.

For a **Sodium Cyanide (solid)** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Coordinator who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator as recommended by the SDS or respirator manufacturer.

    Note: For worker safety, maintain readily accessible supply of cyanide antidote kits on-site.

4) Ventilate area of spill or leak.

5) Avoid exposure to acids, water or weak alkalis, which can react to form toxic Hydrogen Cyanide gas.

6) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from water runoff by constructing a ditch or dike using absorbent materials, soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent subsequent runoff. For spill to water, utilize damming, and/or water diversion to minimize the spread of contamination.

7) Shovel the spilled material into labelled drums, containers or plastic bags for re-use or off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

    Note: Minimize dust generation.

8) If there residue from the Sodium Cyanide spill remaining in the spill area, neutralize with appropriate agent **as recommended by the SDS** (Sodium or Calcium Hypochlorite solution), or for spills to land, continue to excavate until no visible spilled solid remains. Use suitable spill absorbent or soil to absorb the neutralized residue. Place in suitable drums/containers for disposal to a licensed facility. Collect material and place in a closed container for recovery or disposal.

9) For indoor spills, mop the affected area using detergent and water. Dispose of this water to waste drums/containers for disposal to a licensed facility.

10) Remove and bag PPE for disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

G.1 Acids, Liquids

The following is a general spill response procedure for liquid acid compounds. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **liquid acid** spill:

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 8**).

3) Contact the Incident Coordinator who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat or TyvekTM coveralls; and

    e. Half mask air-purifying respirator with **acid gas or combination** cartridges, or as otherwise recommended by the SDS or respirator manufacturer.

5) If the spill has occurred outdoors, stay upwind and stay out of low areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shut-down.

6) Ventilate (open windows/doors to outdoors) closed spaces before entering.

7) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area).

8) Contain spill by using chemical spill absorbent, spill pads or pillows, or dry soil to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. Ideally, use spill absorbent that contains a mild neutralizing agent as recommended by the SDS.

Note: Many acids, particularly concentrated acids, react violently in the presence of water. Do not flush spill area with water unless the SDS indicates acceptable.

Note: Nitric Acid reacts violently and explosively with organic chemicals and organic material such as wood, cotton and paper; therefore, do not use organic absorbent material on Nitric Acid.

Note: Hydrofluoric Acid will fume during neutralization. Provide adequate ventilation and approach from upwind. Neutralize carefully with Sodium Bicarbonate, soda ash or lime. Use water spray to disperse the gas/vapour if required. Remove all sources of ignition.

9) Carefully cover the spill area with chemical spill absorbent, spill pads or dry soil, starting at the outside and working inward. If practical, neutralize spill using SDS-recommended or commercially available neutralizers. Use pH indicator paper to determine if spill is neutralized (pH 7).

   Note: Use caution as neutralization reactions generate heat.

10) Sweep or shovel the neutralized spill residue using non-metal, non-sparking tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy-duty plastic bags) for off-site disposal at a licensed disposal facility.

11) Check the pH of the spill area. If it is less than pH 6, then further neutralize with a dilute solution of a suitable reagent as identified on the SDS, or for spills to land, continue to excavate contaminated soil.

12) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer (if the quantity is not too large, process stream or waste drums as appropriate.

13) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

14) After the spill has been cleaned up, the area should be free of vapours. However, if personnel note odours or irritation, isolate the spill area, re-clean the area as per Steps 11 and 12 or wait at least 1 hour before re-entering or until considered safe by the Incident Coordinator or Environment Superintendent or designate.

G.2 Acids, Solids

The following is a general spill response procedure for solid acid compounds. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **solid acid** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Coordinator who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator with **N95 or greater protection** particulate filter, or as otherwise recommended by the SDS or respirator manufacturer.

4) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from water runoff by constructing a ditch or dike using absorbent materials, dry soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent reaction and/or subsequent runoff. For spills to water, utilize damming, and/or water diversion to minimize the spread of contamination.

5) If necessary to minimize dust production, slightly moisten the solid. Use water, or if the material is water reactive, another inert liquid as recommended by the SDS.

6) Sweep up or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy- duty plastic bags) for reuse or off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

7) Remaining solid acid residue may be neutralized using a dilute solution of appropriate agent as recommended by the SDS (e.g., Sodium Bicarbonate - baking soda) or, for spills to land

continue to excavate until no visible spilled solid remains. Check the pH of the spill area; the final pH should be between pH 6 and 10. Use spill absorbent, spill pads or dry soil to absorb the neutralized residue.

Note: Use caution as neutralization reactions generate heat.

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer (if the quantity is not too large, process stream or waste drums as appropriate.

9) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

G. 3 Bases/Alkali,Liquids

The following is a general spill response procedure for liquid alkali or base compounds. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **liquid alkali or base** spill:

1) Isolate and evacuate the spill area.

2) **IF SAFE TO DO SO**, stop leak and contain spill (**see Step 8**).

3) Contact the Incident Coordinator who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

4) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Splash goggles or face shield;

    c. Shoe covers or rubber boots;

    d. Lab coat or TyvekTM coveralls; and

    e. Half mask air-purifying respirator with cartridges/filters as recommended by the SDS or respirator manufacturer.

5) If the spill has occurred outdoors, stay upwind and stay out of low areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, it may also be necessary to have it shutdown.

6) Ventilate (open doors/windows to outdoors) closed spaces before entering.

7) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area) and combustible materials (wood, paper, oil, etc.).

8) Contain spill by using spill absorbent, spill pads or pillows, or dry soil to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. Ideally, use chemical spill absorbent that contains a mild neutralizing agent as recommended by SDS.

Note: Use caution as neutralization reactions generate heat.

9) Carefully cover the spill area with chemical spill absorbent, spill pads or dry soil, starting at the outside and working inward. If practical, neutralize spill using SDS-recommended or commercially available neutralizers. Use pH indicator paper to determine if spill is neutralized (pH 7).

   Note: Use caution as neutralization reactions generate heat.

10) Sweep or shovel the neutralized spill residue using non-metal, non-sparking tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy-duty plastic bags) for off-site disposal at a licensed disposal facility.

11) Check the pH of the spill area. If it is greater than pH 10, then further neutralize with a dilute solution of a suitable reagent as identified on the SDS, or for spills to land, continue to excavate contaminated soil.

12) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer(if the quantity is not too large, process stream or waste drums as appropriate.

13) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

14) After the spill is cleaned up, the area should be free of vapours. However, if personnel note odours or irritation, isolate the spill area, re-clean as per Steps 11 and 12 or wait at least 1 hour before re-entering or until it is considered to be safe by the Incident Coordinator or Environment Superintendent or designate.

G.4 Bases/Alkali,Solids

The following is a general spill response procedure for solid alkali or base compounds. Consult the SDS for the specific spilled compound to determine whether deviations from the general guidance are required.

For a **solid alkali or base** spill:

1) Isolate and evacuate the spill area.

2) Contact the Incident Coordinator who will assemble, if required, ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the SDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken.

3) Put on the appropriate PPE. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a. Gloves as recommended by the SDS or glove manufacturer;

    b. Safety glasses or goggles;

    c. Lab coat; and

    d. Half mask air-purifying respirator with **N95 or greater protection** particulate filter or as recommended by the SDS or respirator manufacturer.

4) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from water runoff by constructing a ditch or dike using absorbent materials, dry soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent reaction and/or subsequent runoff. For spills to water, utilize damming, and/or water diversion to minimize the spread of contamination.

5) If necessary to minimize dust production, slightly moisten the solid. Use water or, if the material is water reactive, another inert liquid as recommended by the SDS.

    Note: Do not use water to flush bases in powdered form, such as Calcium Oxide (lime), as this material is not very soluble.

6) Sweep or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled plastic waste container (plastic pail with lid or double heavy-duty plastic bags) for off-site disposal at a licensed disposal facility.

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid and clearly label the container per WHMIS Guidelines.

7) Remaining solid alkali or base residue may be neutralized using a dilute solution of appropriate acid. Check the pH of the spill area; the final pH should be between pH 6 and 10. Use chemical spill absorbent, spill pads or dry soil to absorb the neutralized residue.

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer (if the quantity is not too large, process stream or waste drums as appropriate.

9) Remove and bag PPE for cleaning, inform laundry personnel of contaminant hazards, or dispose at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

The following is a general spill response procedure for saline water. It must be noted that the location and volume of the spill will dictate the types of mitigation practices that will occur.

For a spill of saline water:

1) Isolate the spill area.
2) **IF SAFE TO DO SO**, stop leak and contain spill **(see step 6)**.
3) Contact the Incident Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area.
4) Put on standard PPE;
    a. Nitrile gloves
    b. Protective eyeglasses
    c. Safety boots
    d. Hard hat
    e. High Visibility Clothing
5) For saline spills to land, the mitigation techniques will depend on the location and quantity of the spilled material. These will be divided into 3 general locations with each location having specific requirements:
    a. Spills at the Meladine Mine Site
        - Saline spills on the Meladine Mine Site will be cleaned up or mitigated depending on the quantity and the location that a spill occurs. If a saline spill occurrs in an area that could potentially impact the water quality of a water body such as CP1 or Meladine Lake then the spill will be mitigated such that no saline water enters these water bodies. If there is concern that leaching from the spill may cause an impact to the water then the contaminated soil may be removed and placed into the Waste Rock/Overburden Facilities where the potential leachate is collected at CP4. The effluent from CP4 can then be treated at one of the existing treatment facilities.
        - Saline spills on the Meladine Mine site which occur at a location which does not have a negative impact may not be cleaned up. For instance a spill which occurs upstream of the P area will not cause an impact to the site as any leachate generated will flow towards the P area and this effluent can then be treated by one of the existing treatment facilities.
        - Since Calcium Chloride ($CaCl_2$) is one of the accepted dust suppressants that is used on site, a small amount of Saline Water that is spilled on the ground should not cause

an impact to the site provided that the water does not leave the site or enter a water body which could be impacted. Saline water will have a lower Total Dissolved Solids (TDS) and $CaCl_2$ composition than the dust suppresant which is presently used.

b. Spills on the AWAR and/or Bypass Road

- Calcium Chloride and water is approved to be used on the AWAR as a dust suppressant during the summer months. If there is a spill of saline water that is being trucked to Itivia on the AWAR, the location and magnitude of the spill will determine the mitigation techniques deployed. For instance, if the spilled saline water stayed on the road or if there was no chance of impacting surface water the cleanup process may be more detrimental to the environment than leaving it as is. If a spill occurred close to Nipissar Lake then every effort should be made to contain the spill and minimize impact to the lake. This is reviewed on a case-by-case basis and decided by the Environmental Superintendent or designate.

c. Spills at Itivia during brine release into Melvin Bay

- If there is a spill of saline water during the release to Melvin Bay the location and magnitude of the spill will determine mitigation techniques deployed. If the spilled saline water is flowing to Melvin Bay then mitigation techniques should be applied to stop the discharge of the water. In addition, techniques should be applied to slow the flow of the water and to try to contain the water from entering the Bay. It is not believed that the saline water will cause an impact to the water in the Bay rather it is the sediment which may be picked up as the water flows into the Bay. It is imperative that the velocity of the flow be mitigated such that minimal erosion occurs from the spill. To cleanup, saline water which has not been released into Melvin Bay is reviewed on a case-by-case basis and decided by the Environmental Superintendent or designate

6) If a saline spill occurs on land which may have a detrimental impact to the land or any nearby water bodies then the spill should be contained using ; spill absorbents, spill pads or pillows, dike construction (made of soil or snow), or excavation of trenches/pits to capture spill. If possible, compact soil or snow dikes, and place plastic tarps over the dike and at its foot to allow the product to pool on the plastic for easy recovery. The first priority is to limit saline water entry into ditches, freshwater systems or onto ice (if saline water enters a freshwater system see step 9). After all pathways from the spill to surrounding freshwater systems, ditches and ice are controlled, contain the other areas of the spill.

Note: Do not flush with water into drainage areas or ditches, as this will spread spill.

Note: It is important to scrape up the contaminated snow and ice as soon as possible.

7) If there is a large quantity of saline water and it has been captured in dykes, trenches etc. then it may be possible to collect the water with the vacuum truck. This water will then be discharged to

one of the ponds such as SP1, SP2, or P3. If the volume of saline water is not substantial then the spilled area may be cleaned up using spill absorbents, spill pads, soil or snow, starting at the outside and working inward. Do not touch or walk through spilled material.

8) Sweep up or shovel the residue into a labelled plastic waste container (plastic pail with lid or double heavy-duty plastic bags). For larger spills to land, excavate impacted absorbent material and soil, place in lined and bermed temporary storage area or directly into sealed drums/containers. This solid material may also be placed into the Waste Rock/Overburden Facility such that any leachate that is generated will be captured in CP4 and may be treated in one of the Treatment Facilities.

   Note: Larger pools of product may be pumped into empty storage tanks or drums and taken to SP1, SP2 or P3 if appropriate.

9) Spills to land may require further excavation or remediation of contaminated soil until acceptable soil quality is achieved. The Incident Coordinator and/or Environment Superintendent or designate will assess this requirement.

10) For spills to water, a follow up study will be performed if deemed necessary by the Environmental Superintendent or designate. Post spill monitoring will be dependent upon volume of substance spilled, size of freshwater system affected and presence/ absence of fish. If the spill is believed to have caused an impact then water samples will be taken upstream and downstream of the incident to confirm any potential impact.

Act	Regulation	Guideline
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197) *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301)	CCME - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		
Migratory Birds Convention Act (1994 c.22)	*Migratory Birds Regulations* (C.R.C., c. 1035)	
Canada Water Act (1985 c.11)		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)		
Canada Shipping Act, 2001 (S.C. 2001, c. 26)	*Response Organizations and Oil Handling Facilities Regulations* (SOR/95-405)	
Navigable Waters Protection Act (R.S. 1985 c. N-22)	*Navigable Waters Works Regulations* (C.R.C., c. 1232) *Navigable Waters Bridges Regulations* (C.R.C., c. 1231)	
Marine Liability Act (A.C. 2001, c.6)	*Marine Liability Regulations* (SOR/2002-307)	
Fisheries Act (1985, c. F-14)	*Metal Mining Effluent Regulations* SOR/2002-2222)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges
Transport of Dangerous Goods Act (1992, c. 34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	

Act	Regulation	Guideline
Explosives Act (1985 c.E-17)	*Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	
	Explosives Regulations (C.R.C., c. 599)	
National Fire Code of Canada (2010)		
Nuclear Safety and Control Act (s.c. 1997, c.9)	*General Nuclear Safety and Control Regulations* (SOR/2000-202)	
Canadian Human Rights Act (R.S.C., 1985, c. H-6)		
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986)	
	Canada Occupational Health and Safety Regulations (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516)	
	Territorial Land Use Regulations (C.R.C., c. 1524)	
	Territorial Quarrying Regulations (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c. 10)	*Northwest Territories Waters Regulations* (SOR/93/303)	
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nu*navut Land Claims Agreement Act* (1993, c. 29)		
Territorial		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93)* *Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003)* [The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport.]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste

Act	Regulation	Guideline
		Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's Land
Scientists Act (RSNWT (Nu) 1988, c S-4)	*Scientists Act Administration Regulations* (NWT Reg (Nu) 174-96)	
Historical Resources Act (RSNWT (Nu) 1988, c H-3)		
Territorial Parks Act (RSNTW (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92) *Wildlife Licences and Permits Regulations* (NWT Reg (Nu) 027-92) *Wildlife Management Barren-Ground Caribou Areas Regulations* (NWT Reg (Nu) 099-98) *Wildlife Management Grizzly Bear Areas Regulations* (NWT Reg (Nu) 155-96) *Wildlife Management Zones Regulations* (RRNWT (Nu) 1990 c W-17) *Wildlife Regions Regulations* (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Airport Lands Regulations* (NWT Reg (Nu) 067-97) *Commissioner's Land Regulations* (RRNWT 1990, c C-13)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1) *Work Site Hazardous Materials Information System Regulations* (RSNWT 1988, C 81 (Supp))	
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health And Safety Regulations* (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	*Workers' Compensation General Regulations* (Nu Reg 017-2010)	

Act	Regulation	Guideline
Apprenticeship, Trade and Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	*Apprenticeship, Trade and Occupations Certification Regulations* (RRNWT (Nu) 1990 c A-8)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	*Annual Vacations Regulations* (RRNWT 1990, c.L-1) *Educational Work Experience Regulations* (RRNWT 1990, c.L-2) *Employment of Young Persons Regulations* (RRNWT 1990, c.L-3) *Labour Standards Meal Regulations* (RRNWT 1990, c.L-4) *Notice of Termination Exemption Regulations* (RRNWT 1990 c.L-5) *Pregnancy and Parental Leave Regulations* (RRNWT 1990, c.8(Supp.)) *Reciprocating Jurisdiction Order* (RRNWT 1990, c.L-6) *Wages Regulations* (RRNWT 1990, c.L-7)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	*Electrical Protection Regulations* (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	*Petroleum Products Tax Regulations* (RRNWT (Nu) 1990 c P-3)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Hospital Insurance and Health and Social Services Administration Act (RSNWT 1988, c T-3)	*Territorial Hospital Insurance Services Regulations* (RRNWT (Nu) 1990 c T-12)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	*Camp Sanitation Regulations* (RRNWT (Nu) 1990 c P-12) *General Sanitation Regulations* (RRNWT (Nu) 1990 c P-16)	
All-terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	*All-terrain Vehicles Regulations* (RRNWT (Nu) 1990 c A-1)	
Motor Vehicles Act (RSNWT (Nu) 1988 c M-16)	*Large Vehicle Control Regulations* (RRNWT (Nu) 1990 c M-30)	

Act	Regulation	Guideline
Public Highways Act (RSNWT (Nu) 1988, c P-13)	*Highway Designation and Classification Regulations* (NWT Reg (Nu) 047-92)	
Transportation Of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	*Transportation Of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

AGNICO EAGLE

On August 4, 2018 the AEM Environment Department conducted a mock spill event at the Itivia refueling station/tank farm with AEM emergency response (ERT) members, Orbit Garant Environmental/health and safety AEM warehouse staff, AEM Site Service/HTO vice president and AEM community relations personnel., Spill Training contractor, Nunatta Environmental was on site to assist and provide advice/training, The Rankin Inlet Fire Chief also attended the event as an observer.

An AEM ENV Tech documented the spill response actions and acted as the "Control Room" responder, Rankin Inlet dispatch and the ENV Tech/ENV Coordinator on site.

The mock scenario involved a broken fuel line fitting at the onshore receiving manifold during refueling (from offshore ship) of the fuel storage tanks at Itivia.

14:12 – Spill occurs (4000 L of leaking fuel towards the shoreline) Dave Loder spotted fuel leaking from the broken fitting/line



14:13 – ERT responder calls the vessel to stop transfer of fuel ASAP and relays the message of a leaking fitting to the Captain.

14:18 - Confirmation from the Captain that the transfer has stopped. During that time, AEM Site Service blocked the access to the area and called "CODE 1" to Rankin Inlet dispatch and requested to have environmental personnel contact ERT responder on the radio.

14:19- ERT responder asks ENV Coordinator to contact the coast guard
14:20 – ERT responder requested heavy equipment from construction/site services to dig a trench (no operators in area)

14:25 – Fire Marshall from Rankin Inlet arrived (did not participate but was ready with staff if assistance needed assistance)

14:25- AEM Warehouse staff from Itivia and started deploying booms along coast from emergency sea-can/ ERT responder supported.

14:38- Additional AEM Environment Dep't staff were travelling on the road to Meliadine site when the "CODE 1" was called (came to Itivia to provide support) and helped deploy absorbent booms and rags as ERT responder instructed.

15:50 – full ERT team arrived for assistance- First ERT responder (Commander) instructed immediate deployment of marine curtain (water was too rough 80 km/hr winds- did not want to put anyone's safety at risk; deployed on shore)





16:00 – More absorbent booms are placed in front of the marine barrier to collect spill and prevent it from going under marine barrier- no operators present for heavy equipment; ERT and environment staff attempted to make a trench – did not succeed due to bed rock



16:04 – Absorbent padding was placed on top of spill where visible product was observed behind marine barrier (wind blowing toward shore)





17:25 – ERT, ENV and Agnico staff declare the spill has been contained and absorbed; called off the ”CODE 1” and spill report prepared with follow up investigation of event.

Summary:

Nunatta - guided and assisted AEM staff (total 14 on site) to implement the correct procedures and equipment handling to successfully participate in the mock spill training event (fuel leak/water); the ERT commander did a great job of delegating responsibilities with everyone; all communication was satisfactory during the event. Heavy equipment (excavator) would be required as the area is underlain be bedrock – shovels and picks were not effective to dig a collection trench. It took 23 minutes for the spill to go from the pipe connection to the marine barrier- it would in a realistic scenario take ERT a minimum of 1 hour (It took 1.5hr) to get from Meliadine to Rankin Inlet (includes time to prepare) and Environment Dep’t staff members could mobilize within 50 minutes. In order to provide additional line of defense to capture fugitive oil/fuel spills the overburden on the inter-tidal zone should be removed so that loose absorbent can be spread. Nunatta advised that we contact Department of Fisheries and Oceans and ask if we can remove some rock along the beach in case of an emergency (this is fish habitat). A collection trench or sump would reduce the speed of any spill.

AEM and Nunatta Comments/Recommendations

- Buoys that can be attached to the maritime barrier or the fuel line were not blown up- these should be blown up prior to refueling season
- Sea-cans that contain Emergency environmental spill response should be placed together (one is placed on top of hill- these sea-cans should be placed as close to the shore manifold as possible)
- Shore line where fuel line connects should be cleaned of all obstructions to prevent injury to staff and damaging the containment booms
- Life jackets or mustang suits must be worn while working near the water and/or on boats
- It’s required that AEM warehouse staff working at Itivia area review the OPEP and Emergency Response Plan with ENV Tech prior to barge/fuel transfer season (both rotations)
- AEM observed that the OPEP and Spill Contingency plan was located in the Itivia warehouse office
- Follow up with DFO; if strip of overburden can be removed from inter-tidal zone to facilitate spill response and pro spill prevention measures
- Order more shackles
- OPEP should include the local municipality emergency numbers (I included this document in the PDF)
- AEM and ERT members will conduct annual training with Environment Dep’t staff.
- Lighter anchors (20 pound range) for the boat (ordered); currently have 60 pound anchors

Annual Mock Spill Attendee List

AGNICO EAGLE
MEL IADINE

CREDO
An injury can be avoided: drop the excuses. When we believe in safety, we first follow the instructions. Everyone is responsible for behavior that ensures its safety.

4 m^3 - water truck

ANNUAL MOCK SPILL EVENT

Fill out this form, attach the minutes and handouts

Department: ENV
Supervisor: _____

DATE: 2018-08-04

MEETING (DÉTAILS) :
Topic: Mock Spill event - Itivia refueling area
Safety Concerns: High winds

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Randy Schwandt			
Jean-Francois Demers			
Hugues Dubé			
David Loder			
Claudia Remillay			
Robert Eno			
Candace Ramcharan			
Richard Jackson			
ISRaiel Aliyah			
Matt Caitlin			
Sean Arida			
MARK WYATT			
[illegible]			

Emergency Contact Numbers

Last update: Jan 15, 2017 Version D

Radio: Channel 1; call "CODE 1, CODE 1, CODE 1"

AGNICO EAGLE
MELIADINE

Agnico-Eagle Mines (AEM) Meliadine Project
25 km north-north-west of Rankin Inlet

63.027400 (N), - 92.171700 (W) (Helipad)

Meliadine Site Telephone Number: **819-759-3555**
Rankin Office: (Ext:3199) 867-645-2920

Onsite Health Care Professional: 3911

Medical Emergency		
Rankin Inlet Health Center Head Nurse: Gracy Dcunha	Monday - Friday 8h30 to 17h00 AFTER HOURS EMERGENCY	**(867) 645-8300** **(867) 645-6700**
Rankin Inlet Ambulance Service (Fire Dept.)	**Emergency**	**(867) 645-2525**
Rankin Inlet Search and Rescue		(867) 645-3300
Poison Control Centre (Qikiqtani General Hospital, Iqaluit)	Emergencies General inquiries	(867) 979-7350 (867) 979-7300
Law Enforcement, Rescue, Wildlife		
RCMP in Rankin Inlet (Death on camp or for Search & Rescue) (0123 = General Information, 1111 for emergency, 24H)		(867) 645-1111 (867) 645-0123
Workers' Safety and Compensation Commission (WSCC) Mine Inspector: Lex Lovatt		(800) 661-0792 **Hot Line** (867) 920-3849
Coroner		(867) 975-7292 (867) 975-1063 cell
Conservation & Wildlife officer in Rankin Inlet Officer Johanne Coutut Autut		(867) 645-8084 (867) 645-8085
Hazmat & Spills		
CANUTEC		(613) 996-6666
Spills Hotline	Phone	(867) 920-8130
Agnico-Eagle Mines (AEM)		
Program Manager: Martin Plante martin.plante@agnico-eagle.com	Office	(819) 759-3555 ext:8058 (819) 856-1873 Cell
Others		
Health & Safety Superintendent: Dominic Richard dominic.richard@agnicoeagle.com Environment Superintendent: Nancy Harvey nancy.harvey@agnicoeagle.com Human Resources Superintendent : Sandra Marseille sandra.marseille@agnicoeagle.com		(819) 856-4104 Cell (819) 856-4385 Cell (819) 860-3723 Cell
FM Radio Frequencies		
Channel 1 – CAMP (Emergency call Channel)		Rx & Tx: 167.43000
Channel 2 – CONSTRUCTION		Rx & Tx: 163.32000
Channel 3 – EXPLORATION		Rx: 163.57500 Tx: 168.70500
Channel 8 – ROAD Meliadine		Rx: 162.54000 Tx: 165.57000
Channel 9 – ROAD Rankin		Rx: 162.66000 Tx: 167.64000
Channel 10 – UG OPERATION		
Channel 11 – UG Spare		

MDMER Cross-reference table for section 30(1) to 30(5)

MDMER reference	Information required	Location of information in this emergency plan
s. 30(1)	The owner or operator of a mine shall prepare an emergency response plan that describes the measures to be taken in respect of a deleterious substance within the meaning of subsection 34(1) of the Act to prevent any unauthorized deposit of such a substance or to mitigate the effects of such a deposit.	- Spill Contingency Plan
s. 30(2)	The emergency response plan shall include the following elements:	
s. 30(2)(a)	the identification of any unauthorized deposit that can reasonably be expected to occur at the mine and that can reasonably be expected to result in damage or danger to fish habitat or fish or the use by man of fish, and the identification of the damage or danger;	- Spill Contingency Plan Section 3
s. 30(2)(b)	a description of the measures to be used to prevent, prepare for, respond to and recover from a deposit identified under paragraph (a);	- Spill Contingency Plan Section 4 and 5
s. 30(2)(c)	a list of the individuals who are to implement the plan in the event of an unauthorized deposit, and a description of their roles and responsibilities;	- Spill Contingency Plan Section 5 table 5-2
s. 30(2)(d)	the identification of the emergency response training required for each of the individuals listed under paragraph (c);	- Spill Contingency Plan Section 8
s. 30(2)(e)	a list of the emergency response equipment included as part of the plan, and the equipment's location; and	- Spill Contingency Plan Section 7
s. 30(2)(f)	alerting and notification procedures including the measures to be taken to notify members of the public who may be adversely affected by a deposit identified under paragraph (a).	- Spill Contingency Plan Section 5.11
s. 30(3)	The owner or operator shall complete the emergency response plan and have it available for inspection no later than 60 days after the mine becomes subject to this section.	- Spill Contingency Plan
s. 30(4)	The owner or operator shall update and test the emergency response plan at least once each year to ensure that the plan continues to meet the requirements of subsection (2).	- Spill Contingency Plan Appendix I
s. 30(4.1)	The owner or operator of a mine shall, each time the emergency response plan is tested, record the following information	- Spill Contingency Plan Appendix I

	and keep the record for at least five years: (a) a summary of the test; (b) the test results; and (c) any modifications that are made to the plan as a consequence of the test.	
s. 30(4.2)	The owner or operator of a mine shall ensure that a copy of the most recent version of the emergency response plan is kept at the mine in a location that is readily available to the individuals who are responsible for implementing the plan.	- Spill Contingency Plan Sent to all people and available on the Public server
s. 30(5)	If a mine has not been subject to the requirements of this section for more than one year, a new emergency response plan shall be prepared and completed no later than 60 days after the day on which the mine again becomes subject to this section.	N/A



AGNICO EAGLE

MELIADINE GOLD PROJECT

Mine Waste Management Plan

MARCH 2019
VERSION 5
6513-MPS-09

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ᐊᑉᓂᑦᑯᑦ ᑕᓯᔨᐊᖏᑦ ᒍᓕᒍᑦ ᐅᓴᖅᓂᐅᖏᓐᓇᓂᕐᓂᐊᔪᑦ (ᐱᓂᓗᐊᖅ), 25 ᑭᓱᒥᑕᒥᐳ ᐅᐊᖅᓇᖅᓂᑦ ᐅᖅᓱᓂᑎᑦᓴᓂᐅᖅ ᑲᖏᖅᓯᓂᒥᑦ, ᐊᒪᓗ 80 ᑭᓱᒥᑕᒥᐳ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖅᓖᓇᖅᐸᓯᐊᓂᑦ ᐅᖅᓱᓯᑎᑎᔪᖅ ᐃᓚᓂᒍᖅᔨᒥᑦ ᑭᓴᓂᐊᖏᑦ. ᐅᓴᖅᓂᐅᖏᖅᓴᖅᒍᑦ ᐸᖅᐅᑕᐅᔪᖅ ᐅᑦᑯᐃᖅᓱᒪᔪᑦ ᐊᒪᓗ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᓂᐅᖏᖅᓴᖅᑐᖅᓂᐅᖏᖅᑐᖅᑐᒃ ᐱᓴᓂᐊᓂᖅᒥᑦ ᑎᓕᒐᓂᐅᖏᖅ-ᒥᑦ ᒍᓕᓂᑦ ᐱᓂᖅᒍᑦ, ᒪᖁᑉᓂᑦ ᐅᑦᑯᐃᖅᓱᒪᔨᖅᓂᑦ ᓄᓇᒥᑦ (ᑎᓕᒐᓂᐊᖅ Pit 1 ᐊᒪᓗ ᑎᓕᒐᓂᐊᖅ Pit 2) ᐊᒪᓗ ᐊᑕᐅᔪᖅ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᐅᓴᖅᓂᐅᖏᓂᖅᑐᖅ.

ᔪᑕᒪᐅᓕᖅᓱᖅ ᐱᓴᓂᐊᓂᖅᓱᒃ ᑎᓕᒐᓂᐊᑦ: ᔪᑕᒪᐃᑦ ᐅᑭᐅᑦ ᐅᖅᑎᑎᖏᐊᓄᑦ ᓴᓇᔨᐅᓂᖅᓱᒃ (Q4 ᐅᑭᐅᖅ -5-ᒥᑦ ᐅᑭᐅᖅ -1-ᒧᑦ), 8-ᓄᑦ ᐅᑭᐅᓄᑦ ᐅᓴᖅᓂᐅᖏᖅᓵᒃ ᐊᐅᓪᓚᑦᔭᓗ (ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ), ᐱᖅᓱᔪᑦ ᐅᑭᐅᓂᒃ ᐅᑯᐊᖅᐸᑦᔭᐊᓕᔪᒍ (ᐅᑭᐅᖅ 9-ᒥᑦ ᐅᑭᐅᖅ 11 ᒧᑦ), ᐊᒪᓗ ᐅᑯᐊᖅᔪᒪᓕᖅᑎᑦᔭᒍ (ᐅᑭᐅᖅ 11-ᒥᑦ ᐅᖅᑎᒋᓄᑦ). 14.9 ᒥᓕᑲᓂ ᑕᓂᒃ ᐅᓴᖅᑲᓂᒃ ᐱᓂᐊᖅᑐᑦ. ᐅᓴᖅᑲᐃᑦ ᐱᓴᐅᔪᖅ ᔪᖃᑦᓴᖅᑐᖅᑕᐅᓂᐊᖅᑐᑦ 8-ᓄᑦ ᐅᑭᐅᑦᓗᐊᓄᑦ ᐅᓴᖅᓂᐅᖏᓂᒃᐳᐸ ᐊᐅᓯᑎᓂᓗᖃᖅᓯᒪᓂᑦ 3,000 ᑕᓂᒃ ᐅᑦᓗᑕᒪᑦ (tpd) ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 3-ᒧᑦ ᐊᒪᓗ 5,000 tpd- ᓂᒃ ᐅᑭᐅᖅ 4-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ.

ᐊᑲᑕᔪᖅᑕᐅᔪᑦ ᐅᓴᖅᑲᐃᑦ ᐅᖅᓯᑕᐅᑎᑦᔨᓗ ᓄᓇᑲᔪᐸᑎᑲᔪᑦ ᐊᑎᖅᑕᐅᓂᐊᖅᑐᑦ ᐅᓴᖅᑲᓄᑦ ᐊᑲᑕᔪᓂᐊᓕᒃᓕᒧᑦ (WRSFs) ᑕᐃᑲᓂᓗᑎᒃ ᑭᓱᓂᐅᖅᓱᖅ ᓄᖅᑲᖅᐸᑦ, ᐊᑎᖅᑐᑐᖅᑕᒡᓕᓗᒥᑦ ᒪᓕᓪᓗᒥᑦ ᐊᐸᓚᒪᓕᖅᓴᓕᒧᑦ ᐊᑐᖅᑕᐅᑦᑕᖅᑐᖅ. ᖃᓄᐃᖓᓂᐅᔪᑦ ᓄᓇᐅᑦ ᖃᓄᐃᖓᓂᖓᓄᑦ ᐅᑦᑐᕋᐃᓂᓴᓄᑦ ᓇᓗᓇᐃᖅᓱᔪᖅ ᐊᑲᑕᔪᐃᐃᑦ ᐅᓴᖅᑲᐃᑦ ᐅᖅᓯᑕᐅᑎᑦᔨᓗ ᐋᓱᓂᐅᑦᑕᑐᑎᓄᑦᓄᓇᓄᑦ (NPAG); ᑕᒪᒋᑎᒃ ᐅᓴᖅᑲᐃᑦ ᐊᑲᑕᔪᓂᐊᖅᑐᑦ ᐅᖅᓯᑕᐅᑎᑦᔨᓗ ᓴᐃᓴᖅᑎᑦᑐᓂᐅᓂᖓᓄᑦ. ᐱᖅᓱᔪᐃᑦ ᐃᓂᐅᔪᓄᑦ ᐅᖅᓯᑕᐅᓂᐊᖅᑐᑦ WRSFs-ᖃᓄᖅᓄᑦ. ᐅᑦᔨᐊᖅᑕᐅᑭᐅᑦᓂᐊᖅᑐᑦ WRSFs ᐱᔪᖅᓇᖅᔪᒍᑎᒃ ᐃᓕᓴᐅᔪᑦ ᐅᑎᖅᑎᑎᑎᓇᖅᓯᓂᐊᓂᓕᒧᑦ. WRSFs ᖃᓕᖅᑕᐅᐅᓴᖅᑎᑦᑐᑦ ᐊᒪᓗ ᐱᑭᖅᑐᖅᑐᓕᖅᑕᐅᖅᑎᑦᔨᓗᒃᑎᒃ ᐊᒪᓗ ᖃᓄᐃᖓᓂᖓᓄᑦᑕ ᓇᓂᓄᓂᖓᓄᑦ ᐱᑎᐊᖅᑐᐅᓴᖅᑎᑦᑐᑦ. ᒪᓕᓪᓗᒍ ᐅᑦᔨᐊᖅᐸᑦᔭᐊᓕᒧᑦ ᐅᖅᓱᓂᐊᖅᑐᑦ ᐅᑭᐅᖅ TSF ᐅᑦᔨᐊᖅᑕᐅᓂᖅᓴᓄᑦ. ᒪᓂᒪᔪᓂᑦ ᐅᐳᑐᕋᐃᓂᓗᒥᑦ ᖃᓄᐃᖓᓂᐅᕙᓕᖅᑎᑦᑐᑦ ᐊᒪᓗ ᒪᓕᓪᓗᒍ ᐱᓕᕆᔨᒃᑯᑦ ᐊᑲᑕᔪᐃᐃᑦ ᐊᑲᑕᔪᓂᐊᖅᑐᑦ ᐱᓕᕆᔨᒃᑯᑦ ᐊᑲᑕᔪᐃᐃᑦ ᐊᑲᑕᔪᓂᐊᖅᑐ

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 km north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

There are four phases to the development of Tiriganiaq: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forward). Approximately 14.9 million tonnes (Mt) of ore will be produced. The produced ore will be milled over approximately 8 years of mine life at a rate of approximately 3,000 tonnes per day (tpd) in Year 1 to Year 3 and 5,000 tpd in Year 4 to Year 8.

Waste rock and overburden will be trucked to the waste rock storage facilities (WRSFs) until the end of mine operation, with distribution according to an operation schedule. Results of geochemical testing indicate that the produced waste rock and overburden is non-potentially acid generating (NPAG); both the waste rock and overburden are considered non-metal leaching. Three areas have been identified as the WRSFs. Closure of the WRSFs will begin when practical as part of the progressive reclamation program. The WRSFs will not be covered and vegetated and no additional re-grading activity will be required under the closure plan. Thermistors will be installed within the WRSFs to monitor permafrost development.

Of the 14.9 Mt of tailings produced, about 10.9 Mt of tailings will be placed in the tailings storage facility (TSF) as dry stack tailings, while the remaining 4.0 Mt will be used underground as cemented paste backfill. The produced tailings are considered to be non-acid generating (NAG). The TSF consists of two cells, which will be operated one by one to facilitate progressive closure during mine operation. A layer of overburden and waste rock will be used for the TSF closure. From the available testing results and based on the dry stack tailings design, the Tiriganiaq tailings will not pose an acid generation problem, nor a metal leaching problem in the long-term.

The WRSFs and TSF were designed and will be operated to minimize the impact on the environment and to consider geotechnical and geochemical stability. The surface runoff and seepage water from the storage facilities will be diverted via channels and collected in water collection ponds (CPs). If the water quality does not meet the discharge criteria as per the Type A Water Licence 2AM-MEL1631 requirement, the collected water will be treated accordingly prior to being discharged to the outside environment.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First draft version of Mine Waste Management Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Tetra Tech EBA Inc.
2	June 2016	1.1, 1.2,	1-2	Update to reflect issuance of the Type A Water Licence.	Golder Associates Ltd.
		1.3	12-15	Removal of original Section 1.3 as was specifically linked to the application.	
		3.3	22-24	Update to reflect receipt of Type A Water Licence	
		5.5, 6.1, 9.1, 9.2	34-35; 37-38	The Plan updated to comply with Part B Section 13, and Part F Sections 12, and20 of the Type A Water Licence 2AM-MEL1631 and commitments made during the licensing process.	
3	March 2018			Minor revisions	Environment, Engineering Departments
4	December 2018	All	All	Plan update in response to approved TSF Design Report (6515-583-163-REP-001)	Environment Department
		1.3	11,14	Update of production timeline	
		3.1, 3.2	20-23	Update of tailing quantities	
		4.1, 4.3, 4.4	24, 27-28	Update of closure cover material values	
		4.2	29	Inclusion of temporary waste rock stockpile for construction of saline pond 2 (Figure 4.1.1; Tables 4.1.1, 4.1.2, 4.1.3)	
		5.2, 5.4	30-32		
		5.5, 5.6	33-35	Update of TSF design, parameters and schedule	
		6.1	36-38	Update of tailings placement plan dimensions within each cell of TSF	
		7	43	Update of Water Management based on on TSF design report (6515-583-163-REP-001) and infrastructure updates	
		8.2	46-47	Minor dust management revision	
		9.2	50-52	Updates to closure plan based on approved TSF design report (6515-583-163-REP-001)	
				Monitoring program update based on Type A Water Licence 2AM-MEL1631 requirements and TSF design report (6515-583-163-REP-001)	
		Appendix A		Figs 1.2, 5.1, 5.4 updated. Add Figs 5.2, 5.3	
5	March 2019	Table 1.1		Updated according to current status	Environment Department
		Table 4.2, 4.3, 5.1		Update quantities according to the latest mine plan	

	6.1.1 and 6.1.3		Catchment ponds name changes
	4.1 T 4.1.3 8.1	26 31 45	Name Change from MMER to MDMER

ACRONYMS

ABA	Acid Base Accounting
Agnico Eagle	Agnico Eagle Mines Limited
ARD	Acid Rock Drainage
ML	Metal Leaching
CP	Collection Pond
CRA	Commercial, Recreational, and Aboriginal
DFO	Department of Fisheries and Oceans Canada
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
HCT	Humidity Cell Test
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
MEND	Mining Environment Neutral Drainage
MDMER	Metal and Diamond Mining Effluent Regulations
NAG	Non-Acid Generating
NLCA	Nunavut Land Claims Agreement
NPAG	Non-Potential Acid Generating
NPR	Net Potential Ratio
NWB	Nunavut Water Board
NWR	Nunavut Water Regulations
NWNSRTA	Nunavut Waters and Nunavut Surface Rights Tribunal Act
PAG	Potential Acid Generating
PGA	Peak Ground Acceleration
Project	Meliadine Gold Project
RO	Reverse Osmosis
SWTP	Saline Water Treatment Plant
SFE	Shake Flask Extraction
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility
WTP	Water Treatment Plant
WRTP	Waste Rock Transfer Pad

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per meter
cm/s	centimetre per second
ha	hectare
kPa	kilopascal
km	kilometre(s)
L	liter(s)
m	metre
mg	milligram
m/s	metre per second
mm	millimetre
mm/h	millimetre per hour
m^2/year	square metre(s) per year
m^3	cubic metre(s)
Mm^3	million cubic metre(s)
t	tonne
t/m^3	tonne per cubic metre
Mt	million tonne(s)
µm	micrometre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.1 Mt of overburden waste, and around 14.9 Mt of tailings. There are four phases to the development of Tiriganiaq: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Mining facilities include an industrial pad and accommodation buildings, ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), and a water management system that includes collection ponds (CPs), water diversion channels, and retention dikes/berms, a Reverse Osmosis (RO) system, a Saline Water Treatment Plant (SWTP), an Effluent Water Treatment Plant (EWTP), and a Water Treatment Plant (WTP). The general mine site location for the Project and the site layout plan are shown in Figures 1.1 and 1.2, respectively (Appendix A).

1.1 Concordance

The Project is subject to land and resource management processes established by the Nunavut Land Claims Agreement (NLCA) and other Federal laws and regulations. Agnico Eagle submitted a Type A Water Licence Application for a Mining and Milling Undertaking (Application) to the Nunavut Water Board in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (NWNSRTA) and Nunavut Water Regulations (NWR).

The Type A Water Licence 2AM-MEL1631 was issued on April 15, 2016 and signed by the minister on May 19, 2016. The Mine Waste Management Plan reflects the commitments made with respect to submissions provided during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable, to comply with Part B Section 13, and Part E Section 10 of the Type A Water Licence 2AM-MEL1631. The Plan also reflects current operations at the project site.

1.2 Mine Waste Management Plan Summary

The purpose of the Plan is to provide consolidated information in regard to the management of waste rock, overburden, and tailings and includes strategies for water management (runoff), dust control and monitoring programs for the waste storage facilities. The Plan is divided into the following components:

- Introductory section (Section 1);
- A brief summary of the physical setting at the mine site (Section 2),
- A brief summary of the mine plan (Section 3);
- A description of the waste rock and overburden management plan (Section 4);
- A description of a temporary waste storage pad within footprint of Tiriganiaq Pit 2
- A description of the tailings management plan (Section 5);
- A description of water management associated with mine waste management (Section 6);
- A description of dust management associated with mine waste management (Section 7);
- A description of reclamation and closure related to mine waste management (Section 8); and
- Monitoring program (Section 9).

The Plan will be updated, as required, to reflect changes in operation or design and incorporate any new information and/or latest technology, where appropriate, to comply with Part B Section 15 of the Type A Water Licence 2AM-MEL1631.

1.3 Overall Schedule and General Activities

The construction phase started in the last quarter of Year -5 and has taken about 3.5 years (Q4 Year-5 to Q2 of Year -1). The mine construction period focused primarily on site preparation and the construction of infrastructure, with some mining activities (advancement of the mine ramp) occurring at the Tiriganiaq underground mine. Operation will commence after commissioning is completed at the end of Q2 of Year -1. The operation phase will span approximately 8.5 years (Q2 Year -1 to Year 8). Mining activities are expected to end in Year 7 and ore processing is expected to end in Year 8. Closure will occur within three years (Year 9 to Year 11) after the completion of mining and will include the removal of non-essential site infrastructure. Flooding of the mined-out open pits with water pumped from Meliadine Lake and flooding of the underground mine will occur with natural groundwater seepage which will start in Year 8 as progressive reclamation. The post-closure phase will commence as closure is completed in Year 11 and will continue until it is shown that the site and water quality meets all the regulatory closure objectives. Table 1.1 summarizes the overview of the timeline and general activities.

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Q4 of Yr-5 2015	• Started to construct the industrial pad • Developed the ramp to Tiriganiaq underground mine • Constructed portion of rock pad for stockpiles to store the ore from Tiriganiaq underground ramp development • Constructed Channel2	• Started to re-use the underground water • Dewatered top 0.5 to 1.0 m of fresh water in Pond H17
Yr -4 PC: 2016	• Continued construction of the industrial pad • Started construction of D-CP1 to impound CP1 • Started construction of D-CP5 to impound CP5 • Constructed and operated the temporary landfill • Started temporary storage of waste rock in the future WRSF2 footprint for construction purposes • Constructed and operated P-Area Containment Ponds • Constructed Saline Pond for additional underground saline water storage • Constructed Channel5 • Installed Culverts 3 and 4	• Dewatered H17 into Meliadine Lake. • Dewatered Pond A54 in Q3 of Year -4 and pumped the water to CP1. • Started to store the excess groundwater from the underground mine at surface. • Implemented and tested evaporators at P-Area to reduce water volumes stored at surface. • Constructed trenches down gradient from DP1-B and DP3-A to be able to pump collected water seep and pump back to the associated containment pond.

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Yr -3 PC: 2017	• Constructed and utilized Type A Landfarm • Constructed and operated the operation Type A Landfill • Completed construction of D-CP1, jetty and Pumping station CP1 • Completed construction of D-CP5 jetty and Pumping station CP5 • Erected and closed all main buildings except, Crusher, Paste Plant and Crushed Ore Storage • Erected Incinerator • Erected and operated Effluent Water Treatment plant • Installed fuel tanks 3ML and 250KL at Portal 1 • Started construction Channel 1 • Constructed Berm 3 • Constructed freshwater intake causeway in Meliadine Lake and installed pumping station • Constructed Lv75 water stope for additional underground saline water storage • Installed Culvert 13 • Erected fuel tank 13.5 ML in Rankin	• Pumped the underflow sludge water from the EWTP to CP1. To limit recirculation of the sludge within CP1, the discharge was located away from the EWTP intake. • Started to treat sewage water and pumped the treated sewage water from STP to CP1. • Started to pump the contact water from CP5 to CP1 for treatment • Started to pump water seepage collected in trenches, down gradient from D-CP1, D-CP5, DP1 and DP3 to the associated containment pond. • Started to pump water from washbay to underground for storage until treatment for oil plant arrives at the site • De-iced or diverted water from Lakes H17A, H17B, and H17C to CP1
Yr -2 PC: 2018	• Started construction of Ore Storage Pad 2 (OP2) • Erected and closed Crusher, Paste Plant and Crushed Ore Storage buildings • Erected fuel tank 20ML in Rankin • Erected fuel tanks 6ML and 250KL at Industrial Pad • Completed construction of Channel1 • Started construction Channel 3, Berm CP3 and Pond CP3 • Installed Culverts 1, 2, 15 and 16 • Constructed Berm 2	• Started diversion of the contact water from industrial pad to CP1 via Channel1 • Constructed and commissioned (in Q4) SWTP to discharge to CP1 • Started to pump the water from CP1 to EWTP for treatment prior to discharge to the outside environment via the diffuser in Meliadine Lake • Started to pump the water from the Type A Landfarm to CP1 after pre-treatment for oil.

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
	• Started process commissioning at end of Q4 of Year -2	
Yr -1 PC: 2019	• Install all remaining culverts • Construct Channels 7 & 8 and Berm 1 • Complete the industrial pad • Complete construction of OP2 • Start to place waste rock in WRSF1 • Complete construction of Channel 3, Berm CP3 and Pond CP3 and start to collect contact water • Construct Channel4, Pond CP4 and Berm CP4 and start to collect contact water • Start to place dry stack tailings in Cell 1 of TSF at end of Q1 of Year -1 • Start full capacity of ore processing early Q2 of Year -1 • Create temporary waste rock storage area within footprint of Tiriganiaq Pit 2 from construction of Saline Water Storage Pond 2	• Commission wash bay water treatment unit, monitor water quality monthly and transport treated water to CP1 • Start to pump the contact water in CP3 to the partially drained Pond H13 where the water will flow through Channel1 into CP1 Q2 Year -1 • Construct Saline Water Storage Pond 2 at Tiriganiaq Pit 2 • Start to pump the contact water in CP4 to the partially drained Pond H13 where the water will flow though Channel1 into CP1 • Construction, commissioning and start discharging saline water through the discharge to sea diffuser system
Yr 1 PC: 2020		
Yr 2 2021	• Start to mine Tiriganiaq Pit 1 • Start to place overburden and waste rock from Tiriganiaq Pit 1 in WRSF1	• Start to pump contact water collected in Tiriganiaq Pit 1 to CP5
Yr 3 2022	• Expand process plant to reach the process capacity of 6,000 tpd • Construct temporary overburden stockpile to store the selected ice-poor overburden that will be used for progressive reclamation of TSF • Complete additional ore storage construction (OP1)	• Dewater Ponds H19 and H20 in Q3 of Year 3 and pump the water to CP1

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Yr 4 2023	• Increase mill production to 5,500 tpd for 2023 and 6,000 tpd beyond • Start to mine Tiriganiaq Pit 2 • Start to place waste rock and overburden from Tiriganiaq Pit 2 in WRSF3 • Construct D-CP6 to CP6 and start to collect contact water • Start to place dry stack tailings in Cell 2 of TSF • Start to place low grade ore from the open pits in the OP1 stockpile • Stop placing rock and overburden in WRSF1 when WRSF1 reaches design capacity	• Start to pump contact water collected in Tiriganiaq Pit 2 to CP5 • Start to pump contact water in CP6 to CP1
Yr 5 2024	• Start to place waste rock from Tiriganiaq Pit 1 in WRSF2 • Place final closure cover on top of tailings surface in Cell 1 of TSF (waste rock cover over final Cell 1 perimeter slope to be placed as progressive reclamation -as soon as slope reaches final grade)	• Water management plan similar to Year 4
Yr 6 2025	• Stop placing overburden waste in WRSF3	• Water management plan similar to Year 4
Yr 7 2026	• Stop mining of Tiriganiaq Pit 1 and Tiriganiaq Pit 2 when the open pits reach design elevation • Stop Tiriganiaq underground operation when underground mine reaches design elevation • Stop placing waste rock and overburden in WRSF2 when WRSF2 reaches design capacity • Stop placing waste rock in WRSF3 when WRSF3 reaches design capacity	• Water management plan similar to Year 4 • Stop pumping water from the open pits when the pits are mined-out at end of year • Stop pumping excess water from underground when underground mine is completed

Table 1.1: Key Mine Development and Water Management Activities and Sequence

Mine Year	Mine Development Activities	Water Management Activities
Yr 8 2027	• Process the ore from OP1 and OP2 until all stored ore is processed • Decommission underground mine surface openings as needed	• Start to fill the mined-out Tiriganiaq Pits 1 and 2 with active pumping water from Meliadine Lake • Start natural flooding of Tiriganiaq Underground mine with groundwater seepage • Stop pumping water to process plant when the processing is completed
Closure (Yr 9 to 11)	• Place final closure cover on top of tailing surface in Cell 2 of TSF in Year 9 (waste rock cover over final Cell 2 perimeter slope to be placed as progressive reclamation - as soon as slope reaches final grade) • Decommission non-essential mine infrastructure and support buildings in Years 9 and 10 • Continue to fill the mined-out open pits with active pumping water from Meliadine Lake until Year 10 • Start monitoring and maintenance in Year 9 (start in Year 8 if possible)	• Finish flooding Tiriganiaq Pit 1 and Tiriganiaq Pit 2 by Q4 of Year 10 • Continue to collect and manage the contact water in CP1 to CP6 • Continue to pump the contact water in CP1 to WTP, if required, for treatment before being discharged to the outside environment • Remove non-essential site infrastructure • Pump the underflow sludge water from WTP to CP1 • Continue natural flooding of Tiriganiaq Underground mine with groundwater seepage • Remove Meliadine Lake pumping system
Post-Closure	• Continue monitoring and maintenance until Year 18	• Treat the contact water until water quality meet direct discharge criteria and then decommission the water management system • Continue natural flooding of Tiriganiaq Underground (progressive reclamation since Year 8) • Breach water retention dikes D-CP1, D-CP5 and D-CP6 once water quality monitoring results meet discharge criteria to allow water to naturally flow to outside environment • Remove culverts and breach remaining water retention dikes/berms in Year 18

SECTION 2 • PHYSICAL SETTING

2.1 Site Conditions

The mine site is located in lowlands near the northwest coast of Hudson Bay. The dominant terrain at the mine site area comprises glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and small lakes. The topography is gently rolling with a mean elevation of 65 m above sea level and a maximum relief of 20 m.

The local overburden typically consists of sand and gravel deposits of various thicknesses overlying till with cobbles and boulders. Some of the surfaces are covered by a thin layer of organics. Bedrock at the mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite, and mafic volcanic flows (Snowden 2008; Golder 2009a).

Low-lying areas are poorly drained as a result of a low slope in the landscape and intermittent streams connect numerous shallow ponds and lakes. The following subsections summarize the physical setting at the mine site.

2.2 Climate

The mine site is located in the Kivalliq Region of Nunavut, near the northern border of the southern Arctic terrestrial ecozone, and within the Arctic tundra climate region. Within this region daylight reaches a minimum of 4 hours per day during the winter to a maximum of 20 hours per day during the summer. The climate is extreme with long cold winters and short cool summers. Temperatures are cool, with a mean temperature of 12°C in July and -31°C in January. The mean annual air temperature at the Project site is approximately -10.4 °C (Golder 2012a).

The recorded prevailing winds are from north and north-northwest. The wind blows from the north and north-northwest direction more than 30% of the time, and the least frequent wind direction is west-southwest, with a frequency of 2.1%. The calm frequency is 2.8% of the time. The mean values for wind speed show that the north-northwest together with north and northwest winds have the highest speeds and tend to be the strongest.

Mean annual precipitation at the mine site, based on the hydrological year from 1 October to 30 September, is estimated to be 411.7 mm after accounting for rainfall and snowfall undercatch. Approximately 51% of precipitation occurs as rain (207.1 mm) and 49% occurs as snow (199.1 mm).

2.3 Permafrost

The mine site is located in an area of continuous permafrost, as shown on Figure 2.1 as attached in Appendix A.

Late-winter ice thicknesses on freshwater lakes in the mine site area were recorded from 1998 to 2000. The measured data indicated that ice thickness ranges from 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July (Golder 2012 b).

Published data regarding permafrost were used to recreate the permafrost map of Canada shown in Figure 2.1. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the mine site is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to the lakes. The depth of the permafrost and active layer will vary based on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction (Golder 2012b). The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder, 2012c).

2.4 Taliks

Taliks (areas of unfrozen ground) are to be expected where lake depths are greater than about 1.0 to 2.3 m. Formation of an open-talik, which penetrates through the permafrost, would be expected for lakes that exceed a critical depth and size. It is anticipated that an open-talik exists below Lake B7 based on the depth and geometry of this lake (Golder, 2012b). The salinity of groundwater also influences the temperature at which the groundwater will freeze. The test results on two deep groundwater samples collected below the base of the permafrost for baseline study indicated salinity level leads to a freezing point depression of about 3.2 °C (FEIS Volume 7, Appendix 7.2-A).

2.5 Subsurface Condition

A series of geotechnical site investigation programs had been carried out at the mine site (Golder 1999, 2009b, 2010a, 2010b, 2012d, 2012e, SRK 2007, Tetra Tech EBA 2013a, 2014a, 2016a), and LVM (2015). A total of 175 geotechnical boreholes were drilled and 37 thermistor cables were installed during the site investigation programs.

Fourteen boreholes were drilled within the footprints of the WRSFs during the previous site investigations. In general, a veneer of organic material ranging from 0.02 to 0.70 m was encountered in most of boreholes. The underlying overburden material encountered in most of boreholes consisted of a sand and silt matrix, gravelly, and some gravel with cobbles and boulders. The overburden thickness ranges between 1.5 to 13.6 m and is underlain by greywacke bedrock. Overburden soils with excess ice were observed in most of the boreholes. Massive icy beds up to 1.5 m thick were also encountered.

In 2014, a total of seven boreholes were drilled within the footprint of the TSF. The subsurface soil profile is similar to the soil encountered within the footprint of the WRSFs. Generally, the soil profile consists of a veneer of organic material ranging from 0.1 to 0.75 m, layers of a sand and silt matrix, and overlaid by bedrock. The overburden thickness ranges from 1.3 to 7.3 m. An ice layer up to 1.75 m thick was encountered in one borehole. Soil porewater salinity tests (Tetra Tech EBA, 2013a) indicated that the overburden soils at the mine site may have a porewater salinity of 4 to 12 parts per thousand.

2.6 Seismic Zone

The mine site is situated in an area of low seismic risk. The peak ground acceleration (PGA) for the area was estimated using seismic hazard calculator from the 2010 National Building Code of Canada website (http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index_2010-eng.php). The estimated PGA is 0.019 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.036 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area.

SECTION 3 • MINING PLAN

3.1 Mine Development Plan

Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed as shown in Figure 1.2. Approximately 31.4 Mt of waste rock, 7.1 Mt of overburden material, and about 14.9 Mt of tailings will be produced.

The following mining development sequence is planned:

- Tiriganiaq underground mine will be developed and operated from Year -5 to Year 7;
- Tiriganiaq Pit 1 will be mined from Year 2 to Year 7; and
- Tiriganiaq Pit 2 will be mined from Year 4 to Year 7.

3.2 Mine Waste Development Plan

Three mine waste streams will be produced: waste rock, tailings, and overburden material.

The term “waste rock” designates all fragmented rock mass that has no economic value and needs to be stored separately. Waste rock is also commonly referred to as “mine rock” in the mining industry. Typically, waste rock is produced during the initial stripping and the subsequent development of open pits and underground workings.

The term “overburden” designates all soils above the bedrock that need to be stripped at surface prior to developing the open pits. Generally, the overburden at the site consists of a thin layer of organic material overlying a layer of non-cohesive soil with variable amounts of silt, sand, and gravel.

Tailings are the processed material by-product of the gold recovery process and generally comprise sand, silt, and clay sized particles.

Table 3.1 summarizes the schedule and quantities to be mined from the open pit and underground mining operations. The usage or destination of the three mine waste materials is presented in Table 3.2. Figure 3.1 presents a graphical representation of the mine waste management flow sheet.

Further details on the management of the mine waste materials are presented in Sections 4 and 5 of this plan.

Table 3.1: Summary of Mine Waste Production Schedule

Year	Mine Waste and Ore from Underground (t)		Mine Waste and Ore from Tiriganiaq Pit 1 (t)			Mine Waste and Ore from Tiriganiaq Pit 2 (t)		
	Waste Rock	Ore	Overburden	Waste Rock	Ore	Overburden	Waste Rock	Ore
Yr-5	290,705*	36,911**	0	0	0	0	0	0
Yr-4	355,200	7,646	0	0	0	0	0	0
Yr-3	583,679	5,725	0	0	0	0	0	0
Yr-2	691,529	120,865	0	0	0	0	0	0
Yr-1	764,683	602,440	0	0	0	0	0	0
Yr1	959,950	1,185,403	0	0	0	0	0	0
Yr2	789,614	1,051,472	2,038,237	68,930	0	0	0	0
Yr3	608,626	1,254,293	4,328,239	4,205,799	0	0	0	0
Yr4	336,059	1,237,507	236,246	5,774,071	905,004	391,137	287,727	6,509
Yr5	31,567	1,154,294	0	5,004,160	742,892	97,830	1,667,353	70,586
Yr6	0	967,430	0	3,703,548	781,391	0	2,468,635	123,008
Yr7	0	888,008	0	1,830,060	710,953	0	973,358	254,040
Total (t)	**5,411,612**	**8,511,994**	**6,602,722**	**20,586,568**	**3,140,240**	**488,967**	**5,397,073**	**454,143**

*The amount include approximately 112,775 tonnes of waste rock produced during development of ramp to underground mine before construction phase starting in Year-5

**Volume from 2008-2015 of ore produced during development of ramp to underground mine before construction phase starting in Year-5

Table 3.2: Summary of Mine Waste Tonnage and Destination

Mine Waste Stream	Estimated Quantities		Waste Destination
Overburden	7.1 Mt		Temporary storage in the Overburden Stockpile ~ 0.1 Mt for reclamation of TSF
			Closure and site reclamation for the TSF
			Co-disposed with waste rock within WRSFs
Waste Rock	31.4 Mt		Infrastructure construction
			WRSFs
			Closure and site reclamation for the TSF
Tailings	14.9 Mt	10.9 Mt	As dry stack tailings placed in the TSF
		4.0 Mt	Used in underground mine as cemented paste backfill

3.2 Mine Waste Storage

The overall objective of the site selection for the WRSFs and TSF was to minimize the footprint of the areas occupied by the waste rock, overburden, and tailings, and where possible, avoid environmentally and socially sensitive areas.

3.2.1 Waste Rock and Overburden Storage Area

Three areas were identified for the combined storage of waste rock and overburden material as shown in Figure 1.2 of Appendix A. These areas can be described as follows:

- WRSF1: located north of Tiriganiaq Pit 1 with an approximate footprint of 41.4 ha.
- WRSF2: located south of Pond H17 (CP1) with an approximate footprint of 20.2 ha.
- WRSF3: located north of Tiriganiaq Pit 2, covered H20 pond basin with an approximate footprint of 22.7 ha.

Originally, four main areas were proposed as the waste rock storage areas in the baseline study for the project during the FEIS to store the waste rock and overburden generated from mining the three deposits. Comparatively, the three proposed WRSFs for Tiriganiaq have less impact on existing waterbodies, smaller footprints, shorter haul distances, and it will be easier to manage the surface runoff and seepage from the facilities as shown in Figure 3.2. In addition to the permanent WRSFs, a temporary waste rock storage pad will be generated within the Tiriganiaq Pit 2 footprint to facilitate the construction of Saline Pond 2. The details of this temporary facility are provided in Section 4.2.4 of this plan.

3.2.2 Tailings Storage Area

Tailings will be placed and stored as dry stacked tailings within the TSF. The TSF is located on an area of high ground between the mill and east of Lake B7 as shown on Figure 1.2. It will be constructed on land and will not cover any major waterbodies. A total of approximately 14.9 Mt of tailings will be produced over a mine life of approximately 8.5 years. About 10.9 Mt tailings (73% of total tailings) will be placed in the TSF as dry stack tailings. The remaining 4.0 Mt (27% of total tailings) will be used as underground cemented paste backfill for the primary and longitudinal stopes.

3.3 Use of Traditional Knowledge in the Planning for Mine Waste Management

Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected can contribute to mine design and monitoring.

Agnico Eagle is committed to including IQ and public concerns stemming from IQ, where practical, in the design of management and monitoring plans for the Project. Agnico Eagle will continue active engagement with communities and Inuit organizations as the Project proceeds through permitting,

and if approved, construction, operations and closure. This consultation and engagement should lead to further inclusion of IQ, as it becomes available, in updates to the design and implementation of environmental programs. Section 1.5 of the Main Application Document developed for the Type A Water Licence Application (Agnico Eagle 2015a) summarizes IQ and public concerns. A list of public concerns can be found in the Public Engagement and Consultation Baseline Report, in compliance with the Type A Water Licence 2AM-MEL-1631.

This Mine Waste Management Plan considers IQ, including traditional ecological knowledge (TEK), traditional land use (TLU) and public concerns regarding Project effects on traditional resources and traditional land use sites, through the following Project design and mitigation measures:

- Based on IQ and community consultation, it is clear that clean water and the health of fish, wildlife, birds, and caribou is important to the local population within the surrounding communities. Therefore, the WRSFs and TSF for the Project are designed and will be operated to minimize the impact on the environment. For example, the surface runoff and seepage water from the storage facilities will be diverted via channels, collected in water collection ponds, and treated as needed prior to discharge to the outside environment. In addition, contact water quality will be monitored and assessed throughout the construction, operations, closure, and post-closure phases such that any required changes to how the water is managed on site can be identified. If necessary, appropriate mitigation measures will implemented in a timely fashion.
- Inuit Qaujimajatuqangit indicates that caribou move through the Project area on a regular basis. Therefore, progressive reclamation of Project waste management infrastructure includes closure activities that take place prior to the end of mining (final closure). These closure activities consider minimizing the risk of erosion and sediment loss as a result of on-site runoff, minimizing dust generation and soil drifting and stabilizing slopes. Final landscaping will ensure that caribou will be able to continue to move through the area in the future as they have done in the past.
- Through IQ and community consultation, it is known that people have fished and continue to fish in the Meliadine area. The use of dry stack tailings avoids potentially impacting and/or using significant bodies of water, such as Lake B7, and further limits the amount of seepage potentially reporting from the TSF, both during operations and into closure and post-closure of the proposed mine. The dry stack tailings process also minimizes the traditional “tailings pond” surface area thereby reducing the potential for contact between migratory birds and the tailings “pond”.
- Inuit Qaujimajatuqangit states that berry picking and caribou hunting are important parts of past and present Inuit culture. Community members have expressed concern over dust that could impact the health of the caribou and berries. Therefore, dust suppression measures will be implemented through the design, operation, and closure phases of all waste management infrastructure at the Project. Monitoring programs have been included to monitor the impact

of dust on vegetation near the mine site and to specifically measure uptake of metals by such vegetation.

SECTION 4 • WASTE ROCK AND OVERBURDEN MANAGEMENT

4.1 General Description of Waste Rock and Overburden Management

Approximately 31.4 Mt of waste rock will be mined from the open pits and underground mine operations. The majority of the waste rock produced (about 25.3 Mt) will be placed and stored within the designated WRSFs. The remaining 6.1 Mt of waste rock will be used for other purposes, including: about 2.0 Mt will be backfilled to the underground mine, 1.65 Mt of waste rock will be used for construction activities, and 2.50 Mt of waste rock will be used as TSF closure cover material.

Approximately 7.1 Mt of overburden will be produced with about 7.0 Mt of overburden being co-disposed within the WRSFs. The remaining, approximately 0.1 Mt, will be stored in a temporary overburden stockpile that will be used as cover material for progressive closure and reclamation of the TSF area.

Seepage and runoff water from the WRSFs and the temporary overburden stockpile will be managed by a series of water diversion channels, water retention dikes/berms, and water collection ponds. If the water quality does not meet the discharge criteria the collected contact water will be treated by the appropriate water treatment system (i.e., EWTP, RO) prior to discharge to the outside environment. The contact water quality and the water management structures for the WRSFs will be monitored and assessed according to the Type A Water Licence 2AM-MEL 1631 (See section 9) during each stage of the mine life, including construction, operations, closure, and post-closure. The geochemical characterization of the waste rock, ore, tailings and overburden was submitted as SD 6-3 Geochemical Characterization of Waste Rock, Ore, Tailings and Overburden Meliadine Gold Project, Nunavut (Agnico Eagle 2014).

The waste rock will be managed as one mixed pile; the management plan for waste rock considers the overall leachability of the mixed pile, and aims to limit arsenic leaching during operation and post-closure. Predictive water quality modelling also considered the overall leachability of waste rock and results show that the mine effluent will meet MDMER during operation, and MDMER, Canadian Council of Ministers of the Environment water quality guidelines, or site specific water quality objectives post-closure. No arsenic treatment is anticipated to be needed.

4.2 Waste Rock Storage Facilities

The design location of the WRSFs took into consideration the environmental, social, economic, and technical aspects of waste rock management which included the following:

- maintain a minimum distance of 100 m between the toe of the WRSFs and the open pits;
- maintain a minimum distance of 20 m from the toe of the WRSFs to haul and access roads; and

- maintain a distance between the toe of the WRSFs and adjacent lakes that will ensure stability of the facilities and ensure no effects to lakes not disturbed by mine activities.

Table 4.1 summarizes some of the key physical parameters used for the design of the WRSFs.

Table 4.1: Design Parameters for Waste Rock Storage Facilities

Design Parameters	WRSF1	WRSF2	WRSF3
Height of the first lift above original ground surface (m)	5		
Side slope of each lift of waste rock	1.3(H):1(V)		
Width of the horizontal offset between the first and second lift (m)	15		
Width of the horizontal offset between two adjacent lifts above the second lift (m)	30	20	20
Maximum crest elevation above the sea level (m)	115	102	100
Average overall side slopes of each WRSFs (from bottom toe of first lift to top crest of final lift)	2.5(H):1(V) to 3.4(H):1(V)	2.2(H):1(V) to 2.4(H):1(V)	2.3(H):1(V) to 2.5(H):1(V)
Side slope for each lift of overburden	1.6(H):1(V)		
Internal overburden setback distance from toe of WRSF for the first lift (m)	120	80	88
Assumed waste rock in place bulk density (t/m^3)	1.88		
Assumed overburden in place bulk density (t/m^3)	1.62		

Based on the above design criteria, the WRSFs will provide a 9.4 Mm^3, 3.6 Mm^3, and 5.0 Mm^3 design capacity for WRSF1, WRSF2, and WRSF3, respectively.

All three WRSFs were designed in consideration of both frozen and unfrozen foundation conditions. Thus, the stability of the facilities do not rely on the presence of permafrost foundations even though permafrost foundation conditions are expected to be present over long term based on the geothermal analyses that consider long-term climate change, waste rock placement schedule, and annual thaw of the active layer.

4.2.1 Waste Rock Storage Facility 1

WRSF1 will occupy an area of approximately 41.4 ha and will be located to the north of Tiriganiaq Pit 1. One small shallow pond (Pond A17) is located within the footprint of WRSF1 and will be covered by the facility as shown in Figure 4.1. The pond is less than 2 m deep and freezes to the bottom annually during the winter season. This pond does not provide habitat for fish designated as commercial, recreational, or aboriginal (CRA) fish species (Golder 2015).

WRSF1 will accommodate waste rock produced from Tiriganiaq underground mining and Tiriganiaq Pit 1 and the overburden produced from Tiriganiaq Pit 1. It is anticipated that approximately 10.2 Mt (5.42 Mm^3) of waste rock and 6.5 Mt (4.02 Mm^3) of overburden will be placed in WRSF1.

From Year -2 to Year 4, the majority of the waste rock produced will be placed at WRSF1, with a portion of waste rock being used for underground backfill and TSF progressive closure cover. All overburden material produced from pre-stripping of Tiriganiaq Pit 1 will be placed at WRSF1. To manage the slope stability of the placed overburden, the overburden will be placed within areas that will be surrounded by waste rock. The WRSF1 is expected to reach its design capacity at the end of Year 4.

It is important to note that Agnico Eagle plans to submit the Final Design and Construction Drawings Detailed Report for WRSF 1 to the Nunavut Water Board, for approval, in Q2, 2019. This is in anticipation of operations commencing around Q2 2019. As a result, the volume of waste rock will likely change slightly. Once approved the waste rock volumes will be updated in the Mine Waste Management Plan.

4.2.2 Waste Rock Storage Facility 2

The proposed WRSF2 is located to the south of CP1 (previously Pond H17) with an approximate footprint of 20.2 ha. Five small ponds (Ponds A58, H8, H9, H10, and H11) are located within the footprint of WRSF2 as shown in Figure 4.1. Pond A58 will be fully covered and the other four ponds will be partially covered by waste rock. All five ponds are less than 2.0 m deep and freeze to bottom during the winter (about 8 months of the year). Of the five ponds impacted by WRSF2, only nine-spined stickleback were caught in Ponds A58 and H10. These ponds do not provide habitat for fish designated as CRA fish species and the nine-spine stickleback is not considered to be a species supporting the CRA fisheries (Golder 2015).

WRSF2 will accommodate the majority of waste rock produced from Tiriganiaq Pit 1 from Year 5 to Year 7. The WRSF2 is expected to reach its design capacity by the end of Year 7.

4.2.3 Waste Rock Storage Facility 3

The proposed WRSF3 is located to the north of Tiriganiaq Pit 2, and will cover the basin of Pond H20 with an approximate footprint of 22.7 ha as shown in Figure 4.1. The runoff water from WRSF3 will be collected within Pond H19. Maximum water depths for Ponds H19 and H20 are 1.4 m and 1.6 m, respectively. No fish species were found in these two ponds.

WRSF3 will accommodate overburden from pre-stripping of Tiriganiaq Pit 2 and all waste rock produced from Tiriganiaq Pit 2 with some portions of waste rock from Tiriganiaq Pit 1 in Year 4 and Year 5. The WRSF3 is expected to reach its design capacity by end of Year 7.

4.2.4 Temporary Waste Rock Stockpile for Construction of Saline Pond 2

As part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle applied to the Nunavut Impact Review Board for

approval to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Agnico Eagle has received approval from the Minister for the project.

Based on adaptive management strategies, the project will require a second saline water storage pond (Saline Pond 2). Saline Pond 2 will be temporary in nature and will be constructed in bedrock within the footprint of Tiriganiaq Pit 2 (Figure 4.1.1 below). Saline Pond 2 is designed to have a storage capacity of approximately 75,000 m^3. The groundwater will be pumped to Saline Pond 2 where it may then be treated for salinity removal at the SWTP. Additional details will be developed in regard to treatment quantity and quality. This information will be incorporated in a Saline Water Management Plan.

Construction of Saline Pond 2 will require the extraction of approximately 246,400 tonnes of waste rock within the Tiriganiaq formation (Tiriganiaq Pit 2), comprising of greywacke and siltstone, and sometimes siltstone intersections. The waste rock will be temporally stored immediately east of Saline Pond 2. In addition to the waste rock, 45,600 tonnes of overburden will be removed and placed as part of the mass backfill around Portal 2. Monitoring for seepage and/or runoff from the temporary waste rock stockpile will be undertaken in accordance with Type A Water Licence. These volumes of material are already accounted for in previous sections and would otherwise be deposited at the future WRSF3. Some of the material will be used to construct roads and pads to support the extraction process. Once mining of Tiriganiaq Pit 2 commences, the waste rock will be permanently placed at WRSF3. In addition to the pond itself, the temporary waste rock stockpile will remain entirely within the footprint of Tiriganiaq Pit 2.

The waste rock being extracted for the development of Saline Pond 2 will be non acid-generating and non metal-leaching as per the Meliadine FEIS (Tables 4.1.1, 4.1.2, and 4.1.3). Additional samples will be collected prior to the extraction of the waste rock (confirmation drilling) and also during the extraction of the waste rock.

Figure 4.1.1: Temporary waste rock stockpile for construction of Saline Pond 2 within Tiriganiaq Pit 2.

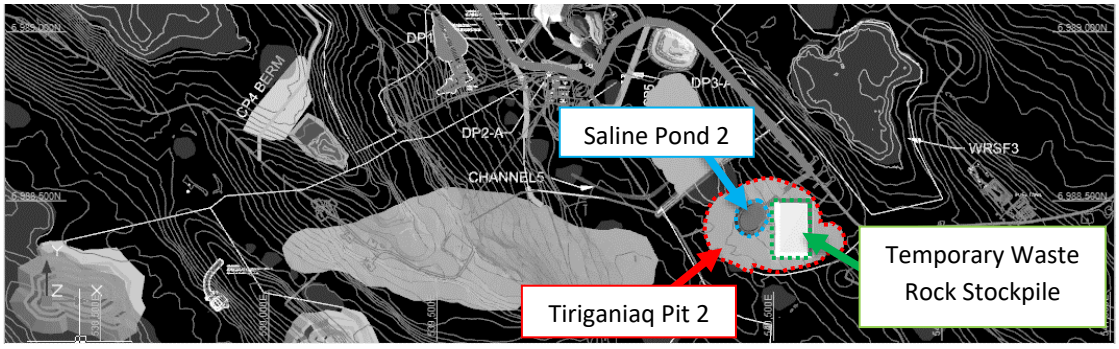

Table 4.1.1: Summary of Total Waste Rock Tonnage and Waste Rock Sample Count

Deposit	Rock Type	Tonnage (tonnes)	Number of Samples

		Estimated Tonnage1 (tonne)	Proportion of Total Tonnage	Count	Proportion of Total
Tiriganiaq	Gabbro	4,856,498	3%	10	4%
	Greywacke/Siltstone	113,694,449	81%	194	77%
	Iron Formation	7,514,454	5%	6	2%
	Mafic Volcanic	14,211,578	10%	43	17%
	Undefined	954,282	1%		
	Total	141,231,271	100%	253	100%

Table 4.1.2: ARD Designation of Selected Kinetic Test Samples and Sample Selection Rationale for Kinetic Testing

Deposit	Rock Type	Estimated Waste Rock Tonnage		Bulk ARD Potential	Sample Information		Ranking of the Sample Based on Static Results per Rock Type		
		Tonnage (Kt)[2]	Proportion[3]		Sample ID	ARD Potential[4]	Total As (ICP)	Leachable As (SFE)	Sulphide Sulphur
Tiriganiaq	Greywacke /Siltstone	113694	81%	non-PAG	M03-508-01	non-PAG	>median	median	75th percentile
					M06-623-01	non-PAG	<median	upper quartile	lower quartile
					M06-625-01	non-PAG	75th percentile	75th percentile	lower quartile
					M97-95-02	non-PAG	upper quartile	median	median
					M98-194-01	non-PAG	upper quartile	upper quartile	75th percentile
					M99-403-03	non-PAG	upper quartile	median-75th	<median
					M04-533-01	non-PAG	upper quartile	median	<median
	Iron Formation	7514	5%	non-PAG	M04-526-01	non-PAG	median	75th percentile	upper quartile
					M96-74-01	non-PAG	upper quartile	upper quartile	median
	Mafic Volcanic	14211	10%	non-PAG	M99-409-05	non-PAG	upper quartile	75th percentile	median
					GT08-04-02	non-PAG	upper quartile	upper quartile	lower quartile
					M05-536A-01	non-PAG	upper quartile	>75th percentile	slightly <75th
					M97-141-01	non-PAG	>median	median	upper quartile

Table 4.1.3: Summary of Waste Rock and Ore Static Leach Test (SFE) Results

Deposit	Rock Type	Number of Samples	Median Final pH	Average As (mg/L)	MDMER (number of samples)
Tiriganiaq	Gabbro	10	8.4	0.007	n.e.
	Greywacke/Siltstone	194	8.2	0.05	As (1)
	PAD waste rock	13	7.9	0.05	n.e.
	PAD WR (-200 µm)	6	7.8	0.02	n.e.
	Iron Formation	6	8.1	0.009	n.e.
	Mafic Volcanic	43	8	0.01	n.e.
	Ore/GW	3	8	0.3	As (1)
	Ore/MV	4	8.1	0.4	As (1)
	Pad Lode 1000	1	7.8	0.3	n.e.
	Pad Lode 1100	1	8	0.2	n.e.

4.3 Waste Rock Distribution

An estimate for the production schedule, quantities, and distribution of waste rock by year is presented in Table 4.2. The development plan for the waste rock placement is shown in Figures 1.2.

Table 4.2: Schedule, Quantities, and Distribution of Waste Rock by Year

Mine Year	Total Waste Rock from Mine Operation (t)	Utilization of Waste Rock (t)			Waste Rock to be Placed in WRSFs(t)		
		Construction	Rockfill for Underground Backfill	TSF Closure Cover	WRSF1	WRSF2	WRSF3
Yr -5	290,705*	290,705	0	0	0	0	0
Yr -4	355,200	355,200	0	0	0	0	0
Yr -3	583,679	583,679	0	0	0	0	0
Yr -2	691,529	691,529	0	0	0	0	0
Yr -1	764,683	291,400	380,517	72,149	20,617	0	0
Yr 1	959,950	0	443,962	192,926	323,062	0	0
Yr 2	858,544	0	316,143	188,949	353,452	0	0
Yr 3	4,814,425		371,743	166,920	4,275,762	0	0
Yr 4	6,397,857	0	518,249	229,319	5,218,166	0	432,123
Yr 5	6,703,080	0	485,926	538,419	0	3,477,400	2,201,335
Yr 6	6,172,183	0	500,187	277,896	0	2,315,500	3,078,600
Yr 7	3,094,123	0	521,941	245,524	0	-861,327	3,187,985
Yr 8	0	0	474,318	99,050	0	-573,368	0
Yr 9	0	0	0	453,339	0	-453,339	0

Table 4.2: Schedule, Quantities, and Distribution of Waste Rock by Year

Mine Year	Total Waste Rock from Mine Operation (t)	Utilization of Waste Rock (t)			Waste Rock to be Placed in WRSFs(t)		
		Construction	Rockfill for Underground Backfill	TSF Closure Cover	WRSF1	WRSF2	WRSF3
Total (t)	31,395,253	2,212,513	2,051,112	2,464,490	10,191,060	3,904,866	8,900,043
Volume (m^3)	16,999,603	1,176,869	1,091,017	1,310,899	5,420,777	2,077,056	4,734,065
*The amount include approximately 112,775 tonnes of waste rock produced during development of ramp to underground mine before construction phase starting in Year-5							

4.4 Overburden Storage and Management

Approximately 7.1 Mt of overburden material will be removed from the surface footprint of the two pits over the mine life. The approximate quantities and proposed placement location of the overburden is presented in Table 4.3.

The overburden material will be mainly stored within the WRSFs. A small volume of overburden (approximately 0.5% of total overburden produced) will be used for site infrastructure construction. The amount of overburden used for site infrastructure construction is included within the quantities of overburden placed into the WRSFs, as presented in Table 4.3. About 0.1 Mt of selected ice-poor overburden will be stored in a temporary overburden stockpile as TSF closure cover material. This temporary overburden stockpile is located at the east side of the TSF and has a footprint of approximately 1.12 ha. The temporary overburden stockpile is approximately 5.0 m high with sideslopes of 3(H):1(V).

The design of the main overburden WRSF was revisited to determine if a portion of the 7.1 M tonnes of overburden removed prior to mining of the Tiriganiaq open pits could be placed in a manner within the same overburden/WRSF footprint that would permit later recovery of this overburden for use in mine site reclamation purposes. Two options were considered (Tetra Tech EBA 2016b), including the placement, storage, and recovery of the overburden material in a zone at the outer edge of the facility; and the recovery of the overburden material from the top of the facility. However, given the small footprint and compactness of the mine layout, there is no available real estate to reconfigure the WRSF's to accommodate the late recovery of overburden materials. There is the potential to recover some of the overburden materials from the top of WRSF1, which would require careful management and would yield approximately 0.15 M tonnes.

Table 4.3: Schedule, Quantities, and Distribution of Overburden by Year

Mine Year	Total Overburden from Mine Operation (t)	Utilization of Overburden (t)		Overburden to be Placed in WRSFs (t)		
		Overburden Stockpile for TSF Closure Cover	Withdraw from Stockpile for TSF Closure Cover	WRSF1	WRSF2	WRSF3
Yr -5	0	0	0	0	0	0
Yr -4	0	0	0	0	0	0
Yr -3	0	0	0	0	0	0
Yr -2	0	0	0	0	0	0
Yr -1	0	0	0	0	0	0
Yr 1	0	0	0	0	0	0
Yr 2	2,038,237	0	0	2,038,237	0	0
Yr 3	4,328,239	94,816	0	4,233,423	0	0
Yr 4	627,383	0	0	0	236,246	391,137
Yr 5	97,830	0	36,704	0	0	61,126
Yr 6	0	0		0	0	0
Yr 7	0	0		0	0	0
Yr 8	0	0		0	0	0
Yr 9	0	0	68,176	0	0	0
Total (t)	**7,091,689**	**94,816**	**104,880**	**6,271,660**	**236,246**	**452,263**
Volume (m^3)	**4,432,306**	**59,260**	**65,550**	**3,919,788**	**147,654**	**282,664**

4.5 Anticipated Design Performance of WRSFs

The WRSFs were designed to minimize the impact on the environment and consider both the physical and geochemical stability of the stored waste rock and overburden.

Slope stability analyses for the WRSFs were carried out during the feasibility study. Using the geometric parameters presented in Section 4.2, the results of the stability analysis indicates that the calculated minimum factors of safety for the WRSFs meet or exceed the acceptable factors of safety. Thermal analyses were conducted to estimate the thermal regime of the WRSFs and foundations during mine operations and after closure. The results indicate that material placed in the winter period will likely stay in a frozen condition while the material placed in the summer period will take two to ten years to freeze back. Information on the stability and thermal studies for the WRSFs is described in the report of *Tailings, Waste and Water Management for Feasibility Level Study, Meliadine Project, Nunavut* (Tetra Tech EBA, 2014b).

It should be noted that the design and performance of the WRSFs are not dependent on freeze-back of waste rock and permafrost conditions continue to exist at the site (i.e., the design has included for thaw of the WRSFs and its foundations). The permafrost development within the WRSFs will provide additional benefits (i.e., more physical stable and less seepage water) during operation and closure of WRSFs.

SECTION 5 • TAILINGS MANAGEMENT

5.1 General Description of Tailings Management

Dry stack tailings produced in the mill at Meliadine will be dewatered to a solids content of approximately 85% and will be trucked to the TSF with haul trucks. The tailings will then be spread out and compacted into thin lifts using a dozer and vibratory compactor.

Site contact water from the TSF will be collected by the perimeter water management system located to the northwest and south of the TSF. The contact water quality and the water management structures for the TSF will be monitored and assessed according to the Type A Water License 2AM-MEL 1631 during each stage of the mine life (See Section 9.2). The geochemical characterization is provided in the document *Meliadine Project Trade-Off Dry-Stack vs. Slurry* (Agnico Eagle 2013).

5.2 Tailings Storage Facility

The TSF is located on high ground west of the proposed mill and east of Lake B7, as shown in Figure 1.2. The direct distance from the mill to the tailings stack ranges from 400 to 800 m. The minimum setback distance from the edge of Lake B7 is approximately 200 m.

With the exception of the southeast corner of the proposed facility, which encompasses the top of the northern tip of the Tiriganiaq esker, the ground surface of the footprint is generally relatively flat. Straddling two watersheds, the majority of the TSF falls within Watershed B and gently slopes (less than 2%) to the southwest towards Lake B7. A portion of the eastern side of the footprint lies within Watershed B and slopes towards the CP1 area. Vegetation in the area consists of moss/peat cover. No major waterbodies are within the footprint, although a few shallow localized depressions hold small volumes of water on a seasonal basis. Polygonal or linear topographic expressions typically associated with the presence of vertical ice wedges are not readily apparent.

The TSF is designed to accommodate approximately 10.9 Mt of tailings. Version 3 of the *Mine Waste Management Plan*, submitted March 2018, included a three (3) cell TSF system design. The *Tailings Storage Facility Design Report and Drawings*, approved December 2018, has been updated to utilize a two (2) cell system (Figure 5.1 to 5.3; Appendix B). The two cell system (Cell 1 and Cell 2) is designed to limit dust generation, control tailings surface erosion, and to facilitate the progressive reclamation and closure of the TSF. As the tailings reach final elevation, the tailings will be progressively encapsulated with either waste rock or a layered combination of waste rock and overburden. The closure plan for TSF is described in Section 8 and the *Tailings Storage Facility Design Report and Drawings* (Appendix B).

The properties of the tailings and TSF operation parameters relevant to the design of the TSF are presented in Table 5.1. Refer to Section 5 of the *Tailings Storage Facility Design Report and Drawings* (Appendix B) for a detailed description of construction methods and procedures.

Table 5.1: Design Parameters for the Tailings Storage Facility Operations

Parameters	Value
Mine design life	8 years
Mill production	3,000 tpd in Years -1 to 3 5,000 tpd per day in Years 4 to 8
Ore processed	14.9 Mt
Tailings to TSF as dry stack	10.9 Mt (or 80% or total tailings)
Tailings backfilled to underground mine	4.0 Mt (or 20% or total tailings)
Average specific gravity of tailings	2.83
Tailings solid content to TSF	85% w/w (weight percentage)
Moisture content of tailings to TSF	17.6% (by mass)
Minimum target dry density of compacted tailings	1.65 t/m^3
Average height of TSF over original ground surface	33 m
Side slope for lower placed tailings (or below elevation 80.2 m)	4H:1V
Side slope for upper placed tailings (or above elevation 80.2 m)	3H:1V
Slope of the final tailings surface at crest	4%
Final top tailings surface area (Cell 1)	46,359 m^2
Final bottom tailings surface area (Cell 1)	179,741 m^2
Final top tailings surface area (Cell 2)	84,655 m^2
Final bottom tailings surface area (Cell 2)	149,632 m^2
TSF storage capacity	10.9 Mt (6.61 Mm^3)

5.3 Tailings Physical and Geotechnical Properties

A laboratory test program on the tailings was conducted for the slurry tailings option with solids contents of 65% and 72%. The test program included physical index tests, a gradation analysis test, settling tests, thermal conductivity tests, a consolidated-undrained triaxial test, a consolidation test, a hydraulic conductivity test, and a direct shear test. The index and gradation analysis tests indicated that the tailings are inorganic silt with low plasticity and low compressibility and consist of 17% sand, 81% silt, and 2% clay size particles. Tailings have the gradation curve of 98% passing 150 µm, 83% passing 75 µm, 40% passing 20 µm, and 5% passing 3 µm (Tetra Tech EBA 2013b).

Additional tailings laboratory geotechnical tests were carried out in 2014 for the dry stack tailings option with a tailings solid content of 85% at disposal (Tetra Tech EBA 2014c). The test included moisture-density relationship (Standard Proctor), consolidation test, soil water characteristic curve, direct shear test, and hydraulic conductivity test. The key finding from the test results are briefly summarized below:

- The moisture-density relationship (Standard Proctor, ASTM D698) test indicated that the maximum dry density of the tailings was 1,800 kg/m^3 at an optimum moisture content of 14.9%.
- The coefficient of consolidation (c_v) of the tailings ranged from 24.6 to 29.8 (m^2/year) under various pressures ranging between 10 and 1,600 kPa.
- The tailings had a soil water characteristic curve with an air entry value of 20 kPa and a residual suction of 900 kPa.
- The shear strength parameters were determined to be an inferred internal angle of friction of 33.5° and an apparent cohesion of 9.9 kPa for the tailings samples with a dry density of 1.7 t/m^3.
- The saturated hydraulic conductivity of the tailings sample was 2.91E-07 m/sec for the tailings sample with a dry density of 1.7t/m^3.

5.4 Schedule, Quantities, and Distribution of Tailings

Commissioning of the process plant started near the end of Q4, 2018. Actual production should commence early Q2, 2019. The production schedule, quantities, and distribution of tailings by year are presented in Table 5.2. Approximately 14.9 Mt of tailings will be produced over an 8.5 year period. Approximately 10.9 Mt or 73% of the tailings will be deposited within the TSF and the remaining 4.0 Mt or 27% will be used as underground cemented paste backfill. Based on a tailings dry density of 1.65 t/m^3, the TSF will have a storage volume of 6.61 Mm^3.

Table 5.2: Schedule, Quantities, and Distribution of Tailings by Year

Year	Mine Year	Tailings Solids from Mill (t)	Tailings Solids to be Used as Underground Backfill (t)	Tailings Solids to be Placed in Dry Stacked TSF (t)
2019	Yr -1	962,543	380,517	582,026
2020	Yr 1	1,328,999	443,962	885,037
2021	Yr 2	1,368,750	316,143	1,052,607
2022	Yr 3	1,368,750	371,743	997,007
2023	Yr 4	2,007,500	518,249	1,489,251
2024	Yr 5	2,196,000	485,926	1,710,074
2025	Yr 6	2,190,000	500,187	1,689,813
2026	Yr 7	2,190,000	521,941	1,668,059
2027	Yr 8	1,320,570	474,318	846,252
Total		**14,933,113**	**4,012,986**	**10,920,127**

5.5 Tailings Placement Plan

The dry stacked tailings will be dewatered to a solid content of approximately 85% by mass in the mill. The following tailings placement and management strategy will be used:

- Prior to tailings placement, surface water and snow within the footprint of placement will be removed.
- A starter waste rock berm will initially be placed along the outside perimeter to contain the initial lifts of the tailings; the berm will become a part of the closure cover. Additional lifts of waste rock (with a maximum lift thickness of 1 m) will be placed as the tailings surface is brought up as erosion and thermal protection. Safety berms will be placed on each lift of the waste rock. The safety berm will also help to reduce dust generation from the tailings surface.
- Tailings placement will start from Cell 1 in the first quarter of Year -1. The dewatered tailings will be hauled to the TSF Cell 1 with haul trucks, end dumped, and bladed into thin lifts using a dozer. Thereafter, the tailings' lifts will be compacted using a vibratory drum roller. This compaction is intended to promote runoff, reduce the potential for oxygen ingress and water infiltration, and maintain geotechnical stability. The thickness of each lift will be approximately 0.3m.
- Based on the tailings production schedule, Cell 1 will reach its design capacity by Year 5 at an average height of 33 m above the original ground. Cell 2 will start operation from Year 4 and will reach design capacity in Year 8.
- At the final elevation, the top of the tailings stack will be progressively capped with a layered combination of overburden and waste rock. This will comprise 0.5 m of overburden followed by 2.5 m of waste rock.

Table 5.3 presents the yearly schedule of deposition per cell, as well as the average height of tailings placed in each cell. Tailings placement progressions corresponding to Year 2, Year 7 and Closure are shown in Figure 5.1, Figure 5.2 and Figure 5.3, respectively. Figure 5.4 shows the typical cross-section of the TSF.

Table 5.3: Tailings Placement Schedule and Estimated Tailings Heights

Year	Mine Year	Tailing Solids to be Placed in Dry Stack TSF (t)		Estimated Average Height of Tailings Placed in Each Cell (m)		Planned Tailings Placement Period	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 2	Cell 3
2019	Yr -1	582,026		1.6		Jan to Dec	
2020	Yr 1	885,037		5.3		Jan to Dec	
2021	Yr 2	1,052,607		10.3		Jan to Dec	
2022	Yr 3	997,007		16.1		Jan to Dec	
2023	Yr 4	868,728	620,522	22.7	2.6	Jan to Jul	Aug to Dec
2024	Yr 5	717,635	992,439	33.0	6.9	Jan to May	Jun to Dec
2025	Yr 6		1,689,813		15.2		Jan to Dec
2026	Yr 7		1,668,059		24.7		Jan to Dec
2027	Yr 8		846,252		33.0		Jan to Aug
Total		**5,103,041**	**5,817,086**				
*Tailings produced during commissioning in the last quarter of Year -2 (construction phase)							

5.6 Tailings Freeze-back

Based on ground temperatures and climate data for the Project site, it is anticipated that the TSF will freeze back in the long term. In order to promote freeze-back of the TSF, the following tailings placement strategies will be adopted during mine operation, when feasible and practical:

- November to March is typically a period of sub-zero temperatures and snowfall, while April to October is a period of thawing/freezing conditions with rainfall. The initial lift of tailings over original ground will be placed during winter conditions whenever feasible.
- During the initial year of placing tailings in a cell, maximum thickness of tailings placed will be limited to 2.6 m while the total yearly thickness of the tailings placed in a cell will be limited to no greater than 10.3 m.
- The tailings will be placed and compacted in a lift no greater than 0.3 m. Each lift of the tailings will be placed over the entire top surface of the planned area in each cell before next lift is placed such that localized placement of thick tailings is avoided. This will promote freeze-back of the tailings placed in winter and limit the overall thickness of the tailings placed in summers.

Preliminary thermal analyses were conducted to estimate the thermal conditions of the tailings and foundations during the TSF operation and after closure. The detailed information of the thermal analysis is described in Section 4.3 of the *Tailings Storage Facility Design Report and Drawings*

(Appendix B) and the report by Tetra Tech (2018). Thermal monitoring will be implemented pursuant Part I Item 13 of the Type A Water Licence 2AM-MEL 1631, and is discussed in Section 9.1 and 9.2 below.

5.7 Anticipated Design Performance of TSF

The TSF is designed to minimize the impact to the environment and the design does not rely on freeze-back of the tailings to meet the design intent of the structure. However, the freeze-back of the TSF and the foundations will provide additional benefits such as increasing stability and minimizing seepage from the TSF during operation and closure of TSF.

The stability analysis of the TSF indicates that the calculated minimum factors of safety meet or exceed the acceptable factors of safety. The information of the stability analysis is described in Section 4 of the *Tailings Storage Facility Design Report and Drawings* (Appendix B) and the Tetra Tech EBA (2014b) report.

SECTION 6 • WATER MANAGEMENT ASSOCIATED WITH MINE WASTE MANAGEMENT

6.1 Water Management

The water management objectives for the Project are to minimize potential impacts to the quantity and quality of surface water at the site. For more detail, refer to the *Water Management Plan* (Agnico Eagle, 2018). Seepage and runoff water from the WRSFs, TSF, and temporary overburden stockpile will be managed with water diversion channels, water retention dikes/berms, and water collection ponds. If the water quality does not meet the discharge criteria, the contact water in the water collection ponds will be treated appropriately (i.e., EWTP) prior to being discharged to the outside environment. No water will be discharged without authorization. Two catchment ponds names were changed from the previous version to ensure continuity with the current site layout identification. Pond H17 now refers to CP-1 so catchment of Pond H17 refers to catchment of CP1. Pond A54 now refers to CP-5 so catchment of Pond A54 refers to catchment of CP5

6.1.1 Water Management Associated with WRSFs

As shown in Figure 4.1, WRSF1 will straddle three catchment areas (catchment of CP1, catchment of Pond CP5, and catchment of Lake B7). WRSF2 will straddle two catchment areas (catchment of CP1 and catchment of CP5), and WRSF3 will be located within the basin of Pond H20.

Seepage and runoff from the WRSFs during construction and operation phases will be managed using the water management system described below:

- Seepage and runoff from WRSF1 within the catchment of CP1 will be diverted to CP1 via Channels 1, 7 and 8;
- Seepage and runoff from WRSF1 within the catchment of CP5 will be diverted to CP5 via Channels 5 and 6;
- Seepage and runoff from WRSF1 within the catchment of Lake B7 will be diverted and collected in CP4 via Channel 4;
- Seepage water and runoff from WRSF2 within the catchment of CP1 will be diverted to CP1 via Channel 1 and Channel 7 or flow directly into CP1;
- Seepage water and runoff from WRSF2 within the catchment of CP5 will be diverted to CP5 via Channel 6;
- Seepage and runoff from WRSF3 will directly report to CP6; and
- The water collected in CP4, CP5, and CP6 will be pumped to CP1, where the contact water will be treated by the EWTP prior to discharging to outside environment.

The WRSFs water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that the contact water quality from the WRSFs meets discharge criteria outlined in Section 7.3 of the *Water Management Plan* (Agnico Eagle, 2018). Once

the water quality from the WRSFs meets the discharge criteria, the water retention dikes/berms will be breached to allow the water from the WRSFs to directly flow to the outside environment. Further details on water management for the WRSFs are described in the Water Management Plan (Agnico Eagle, 2018).

6.1.3 Water Management Associated with TSF

The TSF is located within the catchment of Lake B7 with a small portion straddling the water catchment of CP1, as shown in Figure 4.1. Water sources from the TSF during construction and operation will be managed as follows:

- Seepage and runoff from the placed filtered tailings within the CP1 catchment will stream through Culverts 1, 18, 19, 2 and 3 to deposit in CP1;
- Seepage and runoff within the Lake B7 catchment will be collected in Pond CP3 either directly or via Channel 3. CP3 water quality will be monitored; and
- Water within CP3 will be pumped to H13 where it will flow through Culvert 2, Channel 1, and Culvert 3 into CP1.

The TSF water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that the contact water quality from the TSF meets discharge criteria. Once the water quality from the TSF meets the discharge criteria, the water retention dikes/berms will be breached to allow the water from the TSF to directly flow to the outside environment. Further details on water management for the TSF are described in the *Water Management Plan* (Agnico Eagle, 2018).

SECTION 7 • DUST MANAGEMENT ASSOCIATED WITH MINE WASTE MANAGEMENT

The possible sources of dust related to the waste rock, overburden, and dry stacked tailings management during construction, operation, and closure include:

- Site preparation prior to placement of waste rock, overburden or dry stacked tailings i.e., stripping, excavation and/or placement of foundation pad;
- Wind erosion of fine particles from the WRSFs and TSF surface;
- Vehicle traffic dislodging fine particles from the surface of WRSFs and TSF, and associated service and haul roads to WRSFs and TSF;
- Waste rock, overburden, and dry stack tailings handling and transfer - loading, hauling, unloading, placement and compaction; and
- Placement of closure and capping layers.

Dust suppression measures, which are considered to be typical of the current mine practices (i.e. Meadowbank Mine) and consistent with best management practices, will be considered through design, operation and closure phases to control the dust.

Minimal site preparation is required for the WRSFs and the TSF during the construction phase. Therefore, dust is not expected to be problematic.

Dust is expected to be a minor issue during the operation of the WRSFs as the waste rock produced at the Project site will generally comprise large pieces of rock that will not be susceptible to wind erosion. The overburden contains material that is fine-grained and thus more susceptible to wind erosion. The plan is to store the majority of the overburden materials within the core of the WRSFs. Dust from the overburden materials is not expected to be an issue. Should dusting become an issue, dust control measures such as spraying water and/or other approved chemical dust suppressants, such as calcium chloride, will be used as necessary.

Dry stacked tailings will be placed in lifts and spread with a dozer and then compacted. The surface compaction of the lifts will significantly reduce the potential for wind erosion of the tailings surface. Dust related to TSF operation during the winter season will be further managed by limiting the exposed surface area of the tailings. In the summer period, dust from the TSF will be controlled by spraying water and/or other approved chemical dust suppressants if problematic. Other control measures considered in the design of TSF to minimize dust generation include:

- Place the waste rock cover over the final perimeter tailings slope surface as soon as possible;
- TSF will be operated by cells to limit the tailings surface area exposed to wind and facilitate progressive closure;
- Consideration of prevailing north-northeast wind direction by development of the southern portion of Cell 1 first and progression northward;
- Tailings surface will be covered progressively once it reaches the design elevation; and

- Flat sideslope of 4(H):1(V) for the TSF was adopted to minimize the erosion potential and maintain overall stability of the tailings stack.

Dust generated from vehicles travelling on the surface of the WRSFs, TSF, and associated access roads will be controlled principally by spraying water on the traffic area, which will be carried out regularly by mine services during dry periods in the summer. Watering the haul and access roads is only possible when temperatures are above freezing. When the temperature is below freezing, dust suppression using water or chemical will pose a safety hazard for travel; therefore, reducing the speed limit will be the principal way of controlling dust during these periods. More details on the dust management for traffic are described in the Roads Management Plan.

Other control measures considered in design and operation related to dust generation by vehicles travelling include:

- Road will be designed as narrow and short as possible while maintaining safe construction and operation practices;
- Coarse size rock will be used as much as possible for road construction;
- Roads will be regularly graded to mix the fines found on the road surface with coarser material located deeper in the roadbed; and
- As required, roads and travel areas will be topped with additional aggregate.

Dust from material handling is not expected to be problematic on site. Long end dumps which can generate significant amounts of dust will not occur at site, since waste rock, overburden and dry stack tailings will be dumped in lifts and spread with a dozer. Where possible, multiple handlings of materials that have the potential to generate dust will be avoided. However, should dust related to material handling occur on site, specific control measures will be evaluated and applied, as required.

At closure, the TSF will be fully covered to prevent further wind erosion of the tailings. The proposed closure cover includes a layer of 0.5 m thick overburden followed by a layer of 2.5 m thick waste rock on the top of the facility. The TSF closure slopes cover includes a 3.7 m to 4.2 m thick waste rock layer only. The overburden will be surrounded by waste rock in the WRSFs; therefore, dusting is not expected to be an issue. The need for dust control at closure will be further evaluated during closure activities.

SECTION 8 • RECLAMATION AND CLOSURE OF THE WRSFs AND TSF

Progressive reclamation includes closure activities that take place prior to permanent closure in areas or at facilities that are no longer actively required for current or future mining operations. Reclamation activities can be done during operations with the available equipment and resources to reduce future reclamation costs, minimize the duration of environmental exposure, and enhance environmental protection. Progressive reclamation may shorten the time for achieving reclamation objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure. The WRSFs and TSF will be operated to facilitate progressive reclamation as discussed in the above sections. Detailed mine closure and reclamation activities are provided in the *Preliminary Closure and Reclamation Plan* (Agnico Eagle, 2015).

Monitoring will be carried out during all stages of the mine life to demonstrate geotechnical stability and the safe environmental performance of the facilities (Section 9). If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the Mine Closure and Reclamation Plan.

8.1 Closure and Reclamation of WRSFs

Mine closure and the reclamation of the WRSFs will use currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards.

Geochemical testing indicates that the waste rock and overburden from the Project is non-potentially acid generating (NPAG) and non-metal leaching (NML). Kinetic tests completed on all waste rock types and at various scales show that drainage water quality is expected to meet MDMER monthly mean effluent limits, including results for arsenic. Therefore, a closure cover system is not proposed for the WRSFs. The *Water Management Plan* (Agnico Eagle, 2018) provides the water quality site predictions.

The WRSFs were designed for long-term stability and no additional re-grading will be required at closure. It is anticipated that the native lichen community will naturally re-vegetate the surface of the WRSFs over time.

The contact water management system for the WRSFs and TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the WRSFs are acceptable for the discharge of all contact water to the environment with no further treatment required. Once water quality meets the discharge criteria outlined in Section 7.3 of the *Water Management Plan* (Agnico Eagle, 2018), diversion channels/berms/dikes will be decommissioned to allow the surface runoff and seepage water from the WRSFs to naturally flow to the outside environment.

8.2 Closure and Reclamation of the TSF

Mine closure and reclamation of the TSF will utilize currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards.

Results of geochemical characterization indicates that the tailings produced at the Project are NPAG and ML is not predicted to be an issue as there will be limited seepage from the tailings porewater at closure. The closure plan for the TSF is to progressively place an engineered cover over the tailings surface. The proposed closure cover includes the following:

- A minimum thicknesses of 4.5 m waste rock cover over the lower toe of the final tailings side slopes and a minimum thicknesses of 4.0 m waste rock cover over the upper side slopes; and

- A minimum thicknesses of 2.5 m waste rock cover over 0.5 m thick select overburden till fill over the top surface of final tailings. The top closure cover material will be placed when each cell reaches its operational capacity and sloped 4% to discourage ponding and surface infiltration.

Waste rock cover will consist of 600 mm minus NPAG waste rock. Select overburden till will be placed and compacted over the top surface of the tailings. The till material is intended to reduce surface infiltration and will meet the following specifications:

- Inorganic, sandy silt or silty sand with a fines content of 20% to 60% and maximum particle size of 300 mm; and

- Placed in an unfrozen condition and have a minimum thickness of 0.5 m.

Volumes of waste rock and overburden for TSF closure are provided in Table 8.1.

Table 8.1: Summary of Cover Material Quantities during Mine Operations

Year	Mine Year	Volume of Waste Rock Placed on Side Slopes (m^3)	Volume of Waste Rock Placed on Final Top Surface (m^3)	Total Volume of Waste Rock Placed as Closure Cover (m^3)	Total Volume of Overburden Placed on Top Surface (m^3)
2019	-1	38,377		38,377	
2020	1	102,620		140,997	
2021	2	100,505		241,502	
2022	3	88,787		330,289	
2023	4	121,978		452,267	
2024	5	154,340	132,053	738,660	22,940
2025	6	147,817		886,477	

2026	7	130,598		1,017,075	
2027	8	52,686		1,069,761	
2028	9	--	241,138	1,310,899	42,610
Total		**937,708**	**373,191**	**1,310,899**	**65,550**

The contact water management system for the TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the TSF are acceptable for the discharge of all contact water to the environment with no further treatment required. Once the water quality meets the discharge criteria established through the water licensing process, the TSF water management infrastructure will be decommissioned to allow the water to naturally flow to the outside environment.

An adaptive closure strategy has been adopted for the Project. The preliminary closure cover design adopted for the TSF at this stage will be further evaluated and updated based on the TSF performance monitoring, water quality monitoring and evaluation, and the overall mine closure plan. The final closure cover design for the TSF will be developed before mine closure.

SECTION 9 • MONITORING PROGRAM

This section presents a summary of the monitoring programs that will be carried out during construction and operation related to mine waste storage management. The monitoring program presented here includes; stability and deformation, ground temperature, and annual inspections per the Type A Water Licence 2AM-MEL1631. The detailed information on monitoring of runoff and seepage from the WRSFs and the TSF is described in the *Water Management Plan* (Agnico Eagle, 2018). General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

9.1 Monitoring Activities for WRSFs

Table 9.1 summarizes the monitoring activities for each WRSF. Each monitoring activity will be further defined, including location and type of instrumentation, prior to construction of each WRSF, according to approved environmental protocols. It is important to note that Agnico Eagle plans to submit the Final Design and Construction Drawings Detailed Report for WRSF 1 to the Nunavut Water Board, for approval, in early Q2, 2019. This is in anticipation of operations commencing Q2, 2019. Once approved the monitoring plan (more detailed) will be updated in the Mine Waste Management Plan.

Table 9.1: Waste Rock Storage Facilities Monitoring Activities

Monitoring Component		Monitoring Frequency	Reporting
Verification Monitoring	Quantities of waste rock produced	Monthly	Monitoring data will be used by Agnico Eagle internally.
	Routine visual inspections of WRSFs	Daily during active rock placement, Monthly to semi-annually after placement	
	Elevation and geometry survey	Annually	
	Waste rock and overburden sampling	To be determined	
	Seepage collection and monitoring	Monthly over the open water season	
General Monitoring	Quantities of waste rock placed into facilities	Monthly	Monitoring data will be reported to the Regulators in the annual water licence report or annual inspection report
	Geochemical monitoring	Eight samples per 100,000 tonnes of mined material	
	Thermal and freeze-back monitoring	Quarterly	
	Dust monitoring related to WRSFs	Governed by Air Quality Monitoring Plan	
	Geotechnical inspection by qualified Geotechnical Engineer	Annually or more frequent at the request of an Inspector	

9.1.1 Verification Monitoring Program for WRSF

Verification monitoring data will be used by Agnico Eagle for the management of waste rock and overburden. The following verification monitoring data will be collected, compiled, and managed internally:

- The WRSFs were designed to store approximately 31.4 Mt of waste rock and 7.1 Mt of overburden material during mine operation. Monthly quantities of the waste rock and overburden produced during mine operation will be recorded.
- During the active development of each WRSF, site staff will carry out daily visual inspections in relation to the performance and condition of each structure. When placement activity ceases on an interim or seasonal basis, the inspection frequency will shift to monthly. Following the completion of a WRSF, inspections will continue on a semi-annual basis until closure. The purpose of these inspections is to identify and document any potential hazards or risks to the facility, such as deformations, unusual seepage, slumping, local failure, etc.
- The heights of the WRSFs are estimated to be approximately 35 to 40 m. During operations an annual elevation survey of the WRSFs will be performed to estimate the overall volume placed, determine the reclamation progress, and provide input information to the operation plan.
- Surface runoff and seepage from the WRSFs will be monitored during the construction and operation phases by visual inspection during the ice free season. Additional inspections will be carried out after rainfall events and during the freshet period. The detailed information on the monitoring of surface runoff and seepage from the WRSFs is described in the Water Management Plan.

9.1.2 General Monitoring Program for WRSF

The following general monitoring data will be reported to the NWB through either the Water Licence Annual Report or an Annual Inspection Report:

- Monthly quantities of the waste rock and overburden placed into the WRSFs during mine operation.
- Once production has started waste rock samples will be taken from the production blast holes and analyzed for the percentage of sulphur and carbon. The results from these analyses will be used to differentiate NPAG and PAG based on the derived NPR. To validate the classification method of NPAG/PAG based on NPR, additional samples will be taken evenly at a rate of one sample per 100,000 tonnes of mined material. The collected samples will be sent to an accredited commercial laboratory for ARD and ML using the ABA (the modified Sobek method) and SFE analyses.
- The placed waste rock and overburden are expected to freeze back and permafrost is likely to develop within the WRSFs with time. Thermistors will be installed in each WRSF to monitor the rate of freeze-back and permafrost development progress in the facilities during closure.

Temperature readings will be taken quarterly to track permafrost development within the WRSFs.

- Dust related to waste rock and overburden management is not expected to be an issue by employing the dust suppression measures presented in Section 7.0 through design, operation, and closure phases. Air quality at the mine site will be monitored during construction, operation, and closure through air quality monitoring stations and reported annually.
- The performance of the WRSFs will be inspected and assessed during the annual geotechnical site inspection by a geotechnical or civil engineer registered in Nunavut. The visual assessment and recommended actions to be taken related to the WRSFs will be summarized in the Annual Inspection Report. Inspections may occur more frequently at the request of the Inspector. Records of all inspections will be maintained for the review of the Inspector upon request.

The results from the general monitoring program related to waste rock and overburden management will be reported to the Regulators in the annual water license report or in the annual geotechnical inspection report.

9.2 Monitoring Activities for the TSF

Table 9.2 summarizes the monitoring activities for the TSF. The TSF Detailed Design Report was approved by the Nunavut Water Board on Dec 3, 2018. A more detailed monitoring plan was included in the report and has been incorporated in the following tables.

Table 9.2: Tailings Storage Facility Monitoring Activities

Proposed Monitoring	Monitoring Component	Monitoring Frequency	Reporting
Verification Monitoring	Tailings production rate and solid content	Continuous	Monitoring data will be used by Agnico Eagle internally, and will be reported to the Regulators upon request
	In situ density testing and moisture content determination of recently placed tailings	Quarterly	
	Routine visual inspections of TSF	Weekly when water is being actively managed	
	Elevation and geometry survey	Annually	
	Water quality monitoring of CP3	Monthly over the open water season or when water is present	
General Monitoring	Quantities of tailings placed into facilities	Monthly	Monitoring data will be reported to the Regulators in annual water licence report or annual inspection report
	Thermal and freeze-back monitoring	Monthly during Year -1, Quarterly thereafter	
	Dust monitoring related to TSF	Daily during operation phase	
	Geotechnical inspection by qualified Geotechnical Engineer	Annually or more frequent at the request of an Inspector	

9.2.1 Verification Monitoring Program for TSF

A summary of the verification monitoring program for the TSF is presented below.

- The tailings production rate at the mill and solid content will be continuously monitored during mine operation.
- In situ density testing and moisture content of placed tailings will be carried out quarterly to ensure that dry density of placed tailings meets the design criteria.
- During the active development of the TSF, the procedures and protocols for routine and annual inspections of the WRSFs will also apply, consistent with the inspection of the TSF.
- The average final height of the TSF will be approximately 33 m. An annual elevation survey of the TSF will be performed to estimate the overall volume placed, determine the reclamation progress, and provide input information to the operation plan.
- The runoff and seepage monitoring procedures and protocols for the WRSFs during mine operation will also apply to the TSF. Specifically, CP3 water quality will be monitored at a monthly frequency or when water is present in accordance with Part I Items 14 and 15 of the Type A Water Licence 2AM-MEL1631.
- Pursuant to Part E Item 15 of the Type A Water Licence 2AM-MEL 1631, weekly inspections of water management structures during periods of flow and monthly inspections thereafter will be conducted. These inspections will focus on CP3, D-CP3, Berm 2 and Channel 3.

9.2.2 General Monitoring Program for TSF

A summary of the general monitoring program for the TSF is presented below.

- The monthly quantities of tailings placed into the TSF will be recorded.
- In accordance with Part I Item 13 of the Type A Water Licence 2AM-MEL1631, a TSF thermal monitoring regime will be implemented. This will include a minimum of eight (8) thermistor cables being installed in the TSF to monitor the permafrost development within the facility during operation and closure. The planned locations of these thermistors are shown in Figures 5.1 to 5.3. The temperature readings will be taken monthly during Year -1 and quarterly (i.e. 4 times per year) thereafter to verify thermal conditions and assumptions. The monitoring schedule will be reviewed and modified as necessary. The measured temperatures within the TSF will also provide the background information for the study of permafrost development.
- Dust related to tailings management is not expected to be an issue by employing the dust suppression measures presented in Section 7 through design, operation, and closure phases. Air quality at the mine site will be monitored during construction, operation, and closure through air quality monitoring stations.
- Pursuant Part I Item 14 of the Type A Water Licence 2AM-MEL 1631, the performance of the TSF will be inspected and assessed during the annual geotechnical site inspection by a geotechnical or civil engineer registered in Nunavut. The visual assessment and

recommended actions to be taken related to the TSF will be summarized in the annual inspection report. Inspections may occur more frequently at the request of the Inspector. Records of all inspections will be maintained for the review of the Inspector upon request.

- Visual inspections and monitoring can provide early warning of many conditions that can contribute to structure failures and incidents. Pursuant Part F Item 20 of the Type A Water Licence 2AM-MEL 1631, Agnico Eagle will undertake weekly visual inspections of the TSF and note areas of seepage, unusual settlement or deformation, cracking or other signs of instability. Records of all inspections will be maintained.
- Under Section 3.2 of the Sewage Treatment Plant (STP) Operation and Maintenance Manual (Agnico Eagle, 2017), excess sludge will be disposed of in the TSF. Volume of sewage sludge deposited in TSF will be recorded on a monthly bases pursuant Part I Item 9h of the Type A Water Licence 2AM-MEL 1631.

The results from general monitoring program related to tailings management will be reported to the Regulators in the Annual Water License Report or in the Annual Geotechnical Inspection Report.

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APPENDIX A • FIGURES

Figure 1.1 General Mine Site Location Plan

Figure 1.2 General Site Layout Plan (Year 7 Operation)

Figure 2.1 Permafrost Map of Canada

Figure 3.1 Mine Waste Management Flow Diagram

Figure 3.2 Locations and Footprints of Waste Rock Storage Facilities and TSF

Figure 4.1 Watershed and Waterbodies Affected By Site Infrastructure

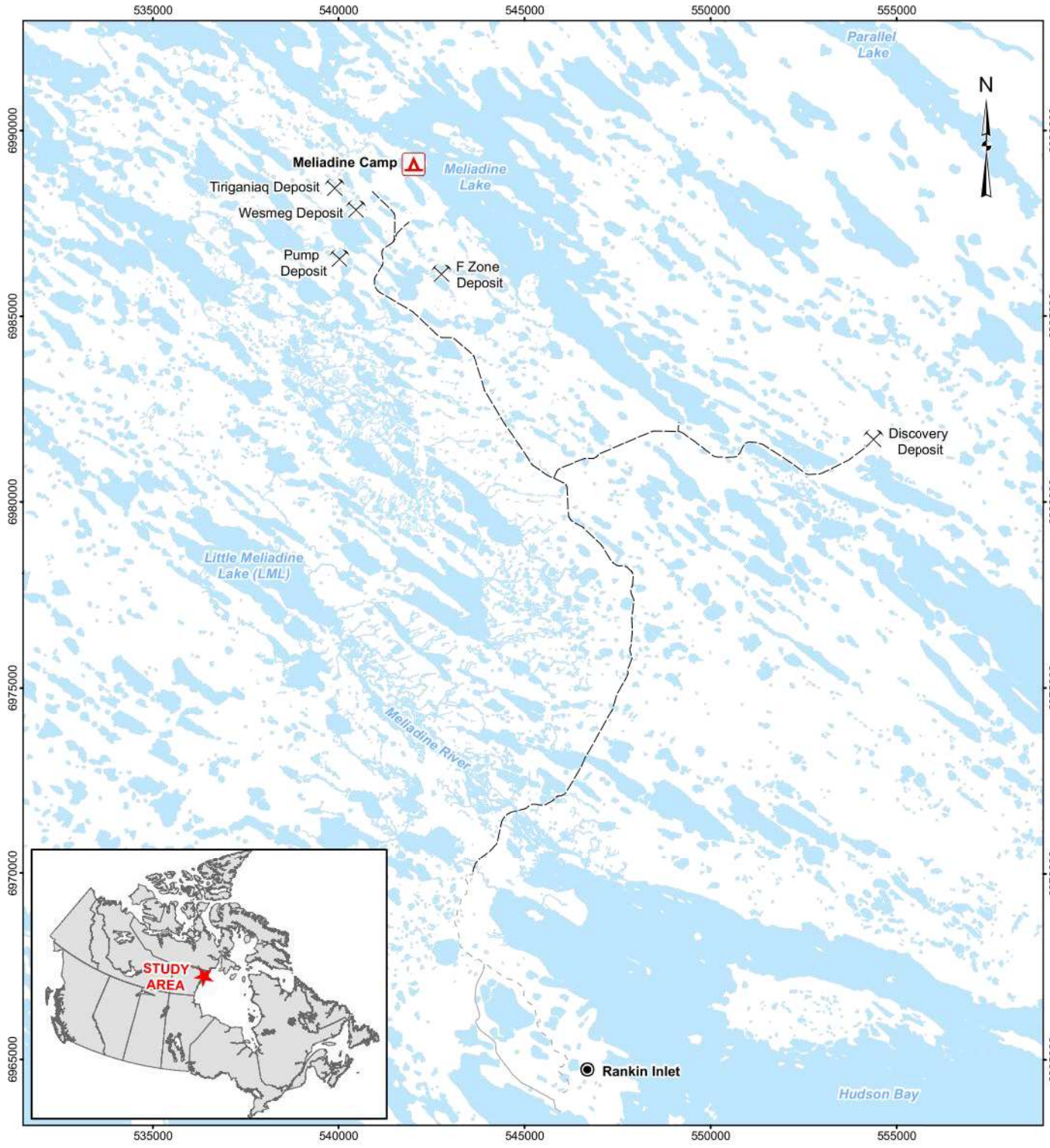
Figure 5.1 Tailings Placement Plan in Cells – Year 2

Figure 5.2 Tailings Placement Plan in Cells – Year 7

Figure 5.3 Tailings Placement Plan in Cells – Closure

Figure 5.4 Typical Design Cross-Section for TSF

APPENDIX B • TAILINGS STORAGE FACILITY DESIGN REPORT AND DRAWINGS



LEGEND

- Camp
- Proposed Mine Site
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody

AGNICO EAGLE

AGNICO EAGLE – MELIADINE GOLD PROJECT

FIGURE 1.1 GENERAL PROJECT LOCATION PLAN

No. PROJET / PROJECT No.		DATE	09–23–2014
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APPROUVÉ PAR / APPROVED BY	HX		
NO. DESSIN / DRAWING NO.	6500–680–210–200		REVISION A

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DRAWING NO.

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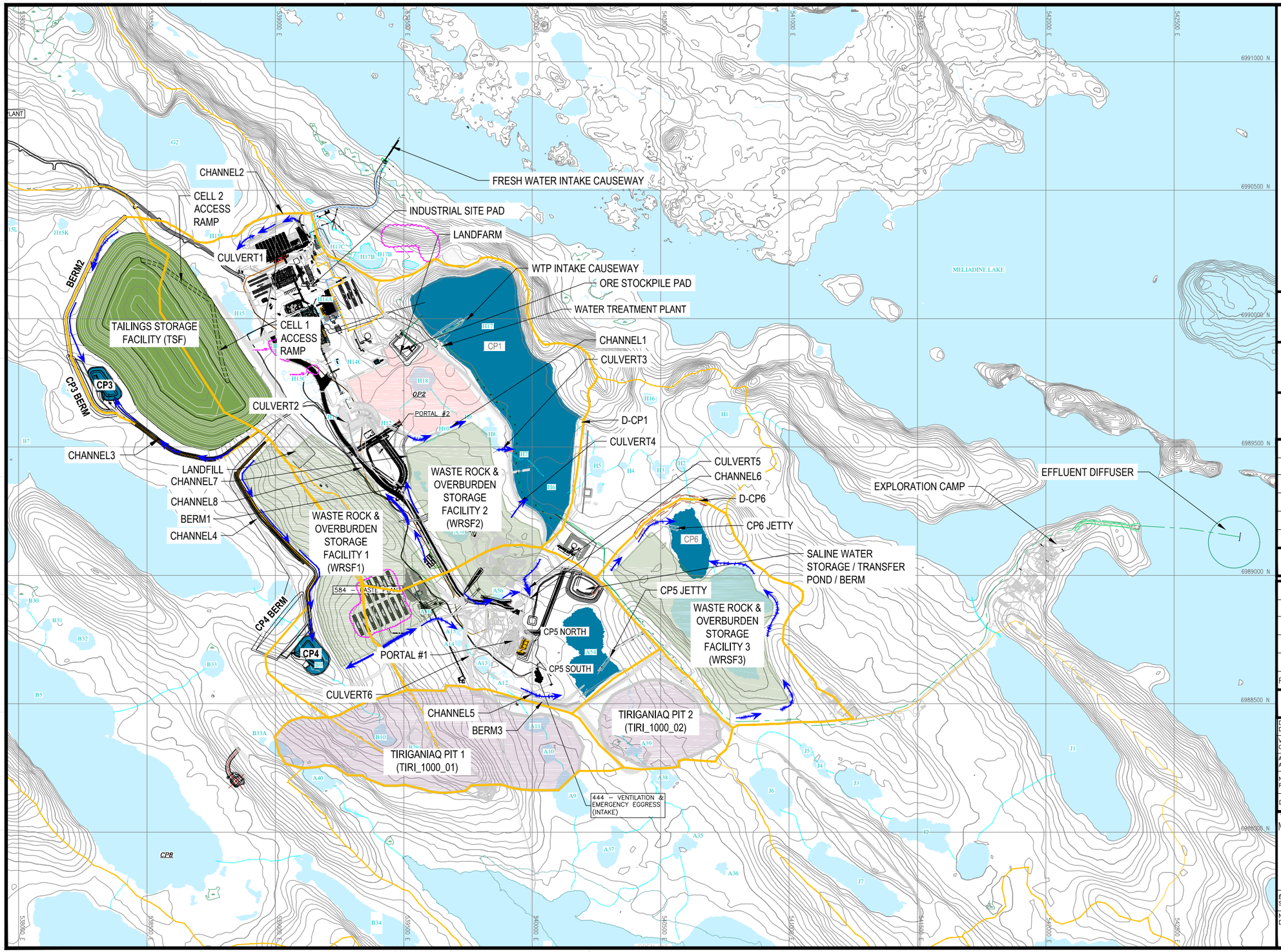

LEGEND

- CATCHMENT BOUNDARY
- WATERBODY
- WATER COLLECTION POND
- OPEN PIT
- WASTE ROCK
- ORE
- CONTACT WATER FLOW DIRECTION

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature
Date Nov. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NWT/NU

AGNICO EAGLE

TETRA TECH

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 11/14/2018

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B	ISSUED FOR REVIEW	2018–11–06	
A	ISSUED FOR REVIEW	2018–11–05	

REVISIONS

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VÉRIFIÉ PAR / CHECKED BY	GZ/WTH	2018–11–14
APPROUVÉ PAR / APPROVED BY		
No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

GENERAL ARRANGEMENT

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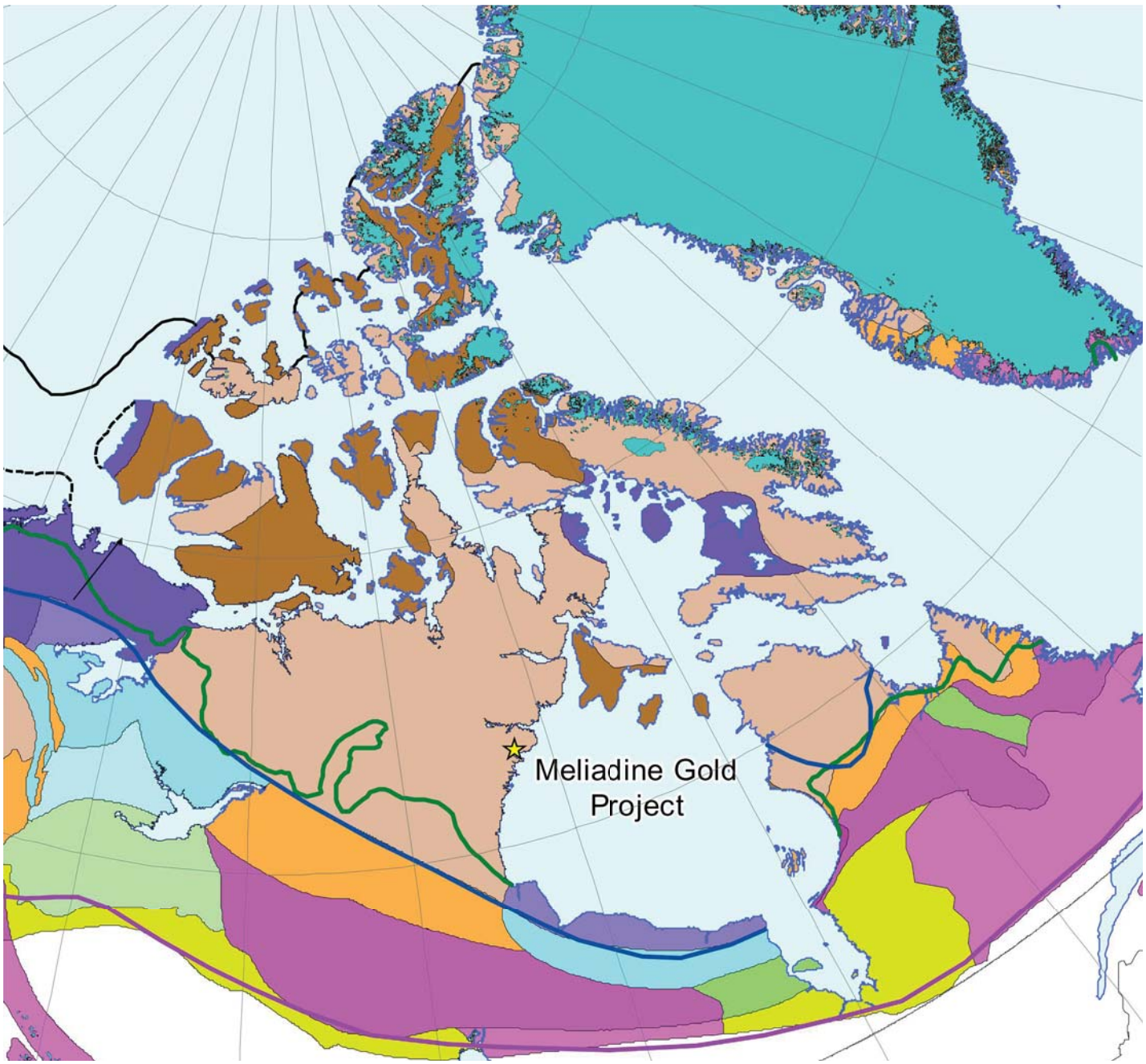

Legend for EASE-Grid Permafrost and Ground Ice Map

Permafrost Extent (percent of area)	Ground Ice Content (visible ice in the upper 10-20 m of the ground; percent by volume)				
	Lowlands, highlands, and intra- and intermontane depressions characterized by thick overburden cover (>5-10m)			Mountains, highlands, ridges, and plateaus characterized by thin overburden cover (<5-10 m) and exposed bedrock)	
	High (> 20%)	Medium (10-20%)	Low (0-10%)	High to medium (>10%)	Low (0-10%)
Continuous (90-100%)	Ch	Cm	Cl	Ch	Cl
Discontinuous (50-90%)	Dh	Dm	Dl	Dh	Dl
Sporadic (10-50%)	Sh	Sm	Sl	Sh	Sl
Isolated Patches (0-10%)	Ih	Im	Il	Ih	Il

Variations in the extent of permafrost are shown by the different colors; variations in the amount of ground ice are shown by the different intensities of color. Letter codes assist in determining to which basic permafrost and ground ice class any particular unit belongs. Letter codes are defined in the documentation that accompanies the data files.

Ice caps and glaciers

LEGEND

- MELIADINE GOLD PROJECT
- SOUTHERN BOUNDARY OF CONTINUOUS PERMAFROST - PRESENT
- SOUTHERN BOUNDARY OF DISCONTINUOUS PERMAFROST - PRESENT
- TREELINE
- SEA-ICE EDGE LIMIT
- SUBSEA PERMAFROST LIMIT

REV	DATE	DESCRIPTION	PAR BY

REVISIONS

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AGNICO EAGLE – MELIADINE GOLD PROJECT

FIGURE 2.1 PERMAFROST MAP OF CANADA

No. PROJET PROJECT No.		DATE	09–23–2014
DESSINÉ PAR DRAWN BY	CB		FEUILLE/SHT 1 / 1
APPROUVÉ PAR APPROVED BY	HX		
NO. DESSIN DRAWING NO.	6500–680–210–200		REVISION A

NO. DESSIN
DRAWING NO.

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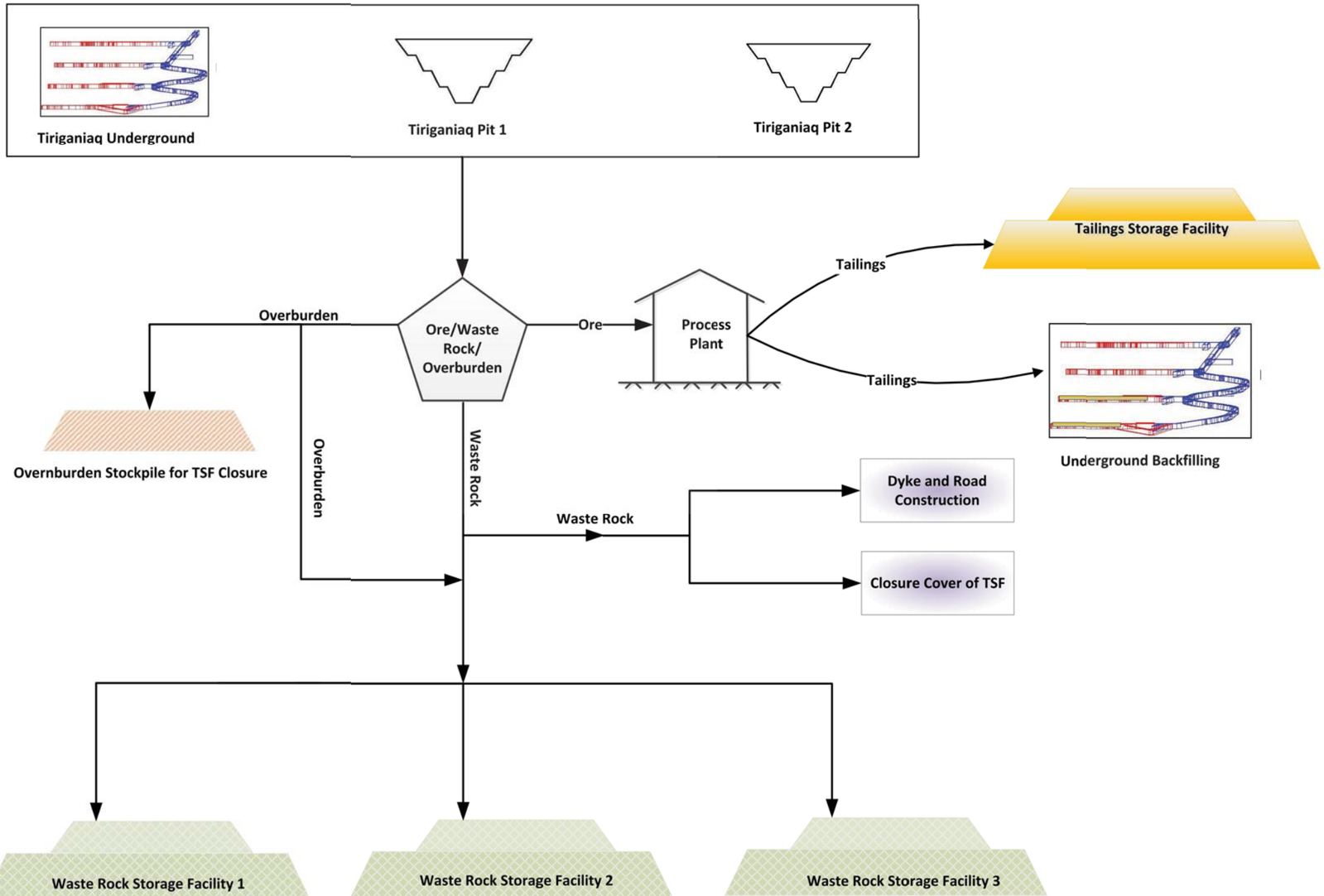

LEGEND

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APPROUVÉ PAR / APPROVED BY		
No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE

AGNICO EAGLE – MELIADINE GOLD PROJECT

FIGURE 3.1 MINE WASTE MANAGEMENT FLOW DIAGRAM

ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
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AE–CART–ANSI B

Q:\Edmonton\Engineering\E141\Projects\E14103209_Meladine_Mgmt_Plans\EBA Drawings\Mine Waste MP\FIGURE 3.1.dwg–September 5, 2014

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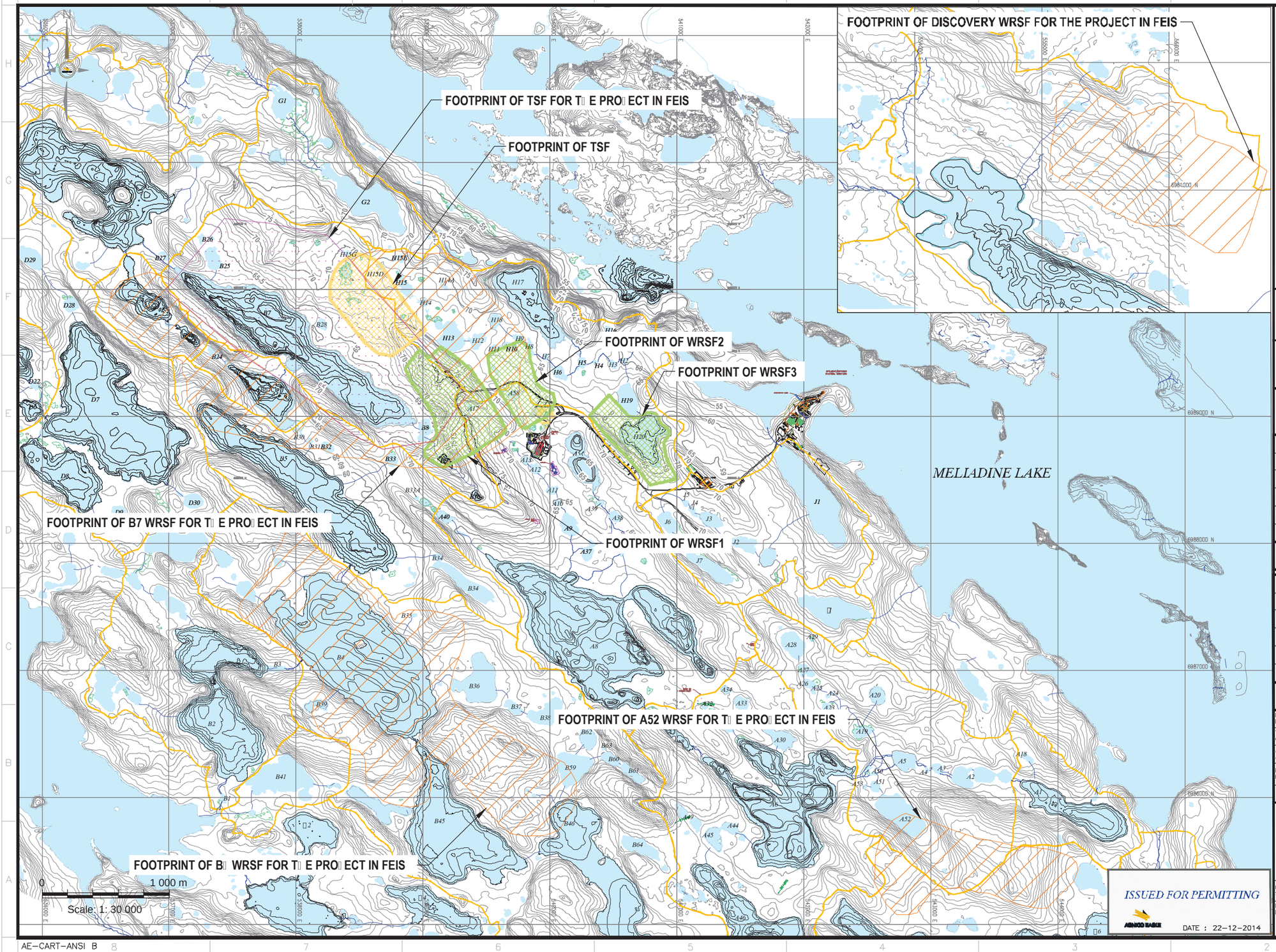
FORMAT ANSI B–11x17



LEGEND

CATCHMENT BOUNDARY
WATERBODY

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REVISIONS

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VÉRIFIÉ PAR CHECKED BY	NG	22-12-2014
APPROUVÉ PAR APPROVED BY		
No. PROJET PROJECT NO.	6500	
DATE		

TITRE / TITLE

AGNICO EAGLE – MELIADINE GOLD PROJECT
FIGURE 3.2 LOCATIONS AND FOOTPRINTS OF WASTE ROCK STORAGE FACILITES AND TAILINGS STORAGE FACILITY

ISSUED FOR PERMITTING
AGNICO EAGLE
DATE : 22-12-2014

ÉCHELLE/ SCALE 1:30000	FICHIER FILE .DWG		
No. DESSIN/ DRAWING NO. 6500-680-210-200		REVISION A	FEUILLE/SHT 1 / 1

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Q:\Edmonton\Engineering\E141\Projects\E14103209_Meladine_Mgmt_Plans\EBA Drawings\Mine Waste MP\CAD_Feb_2015\FIGURE 3.2.dwg–September 5, 2014

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DRAWING NO.

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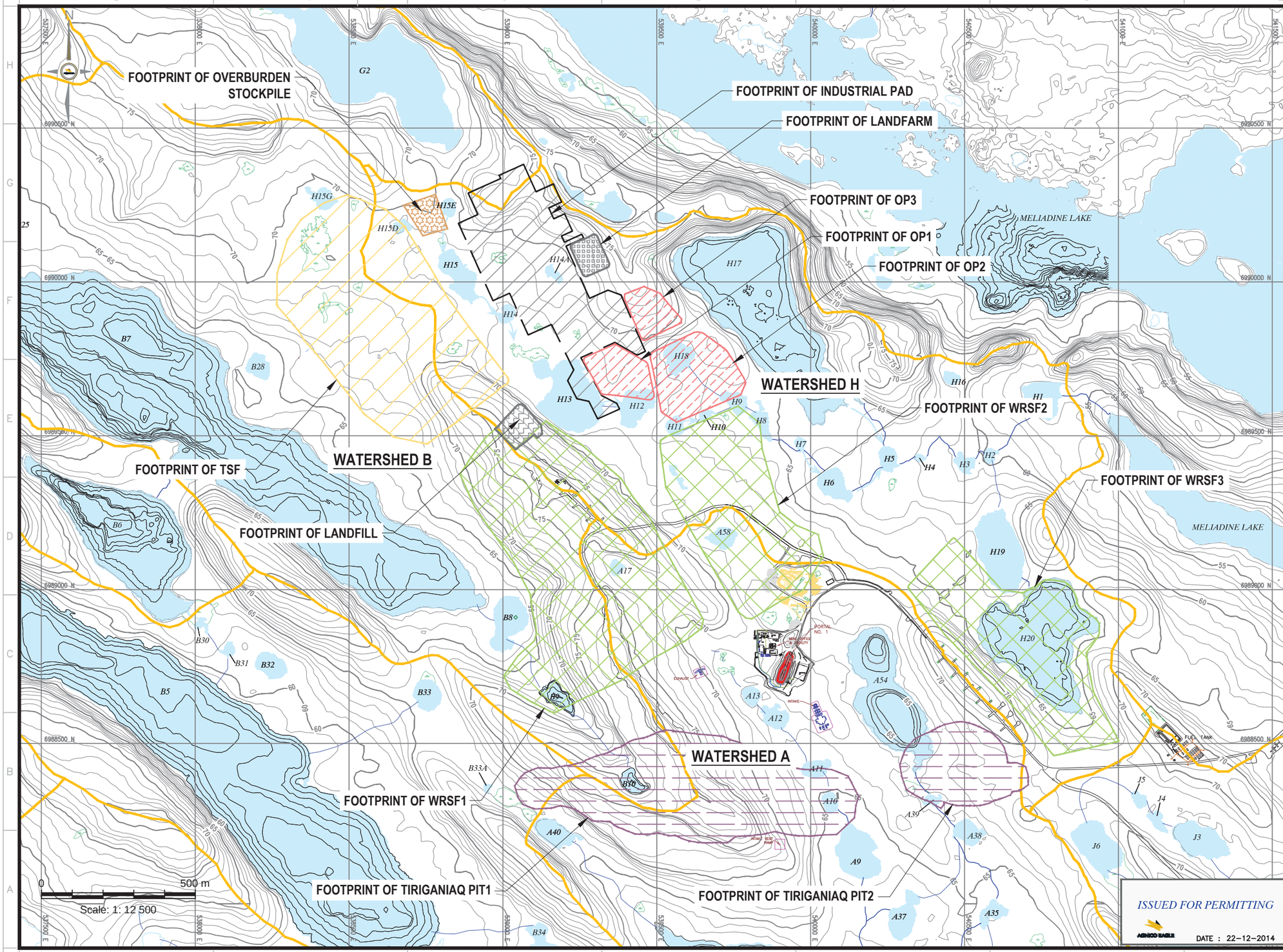

LEGEND

CATCHMENT BOUNDARY
NON CONTACT WATERBODY

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No. PROJET PROJECT NO.	6500		
DATE			

TITRE / TITLE
AGNICO EAGLE – MELIADINE GOLD PROJECT
FIGURE 4.1 WATERSHED AND WATERBODIES AFFECTED BY SITE INFRASTRUCTURE

ISSUED FOR PERMITTING
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DATE : 22–12–2014

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Q:\Edmonton\Engineering\E141\Projects\E14103209_Meladine_Mgmt_Plans\EBA Drawings\Mine Waste MP\CAD_Feb_2015\FIGURE 5.1.dwg–September 5, 2014

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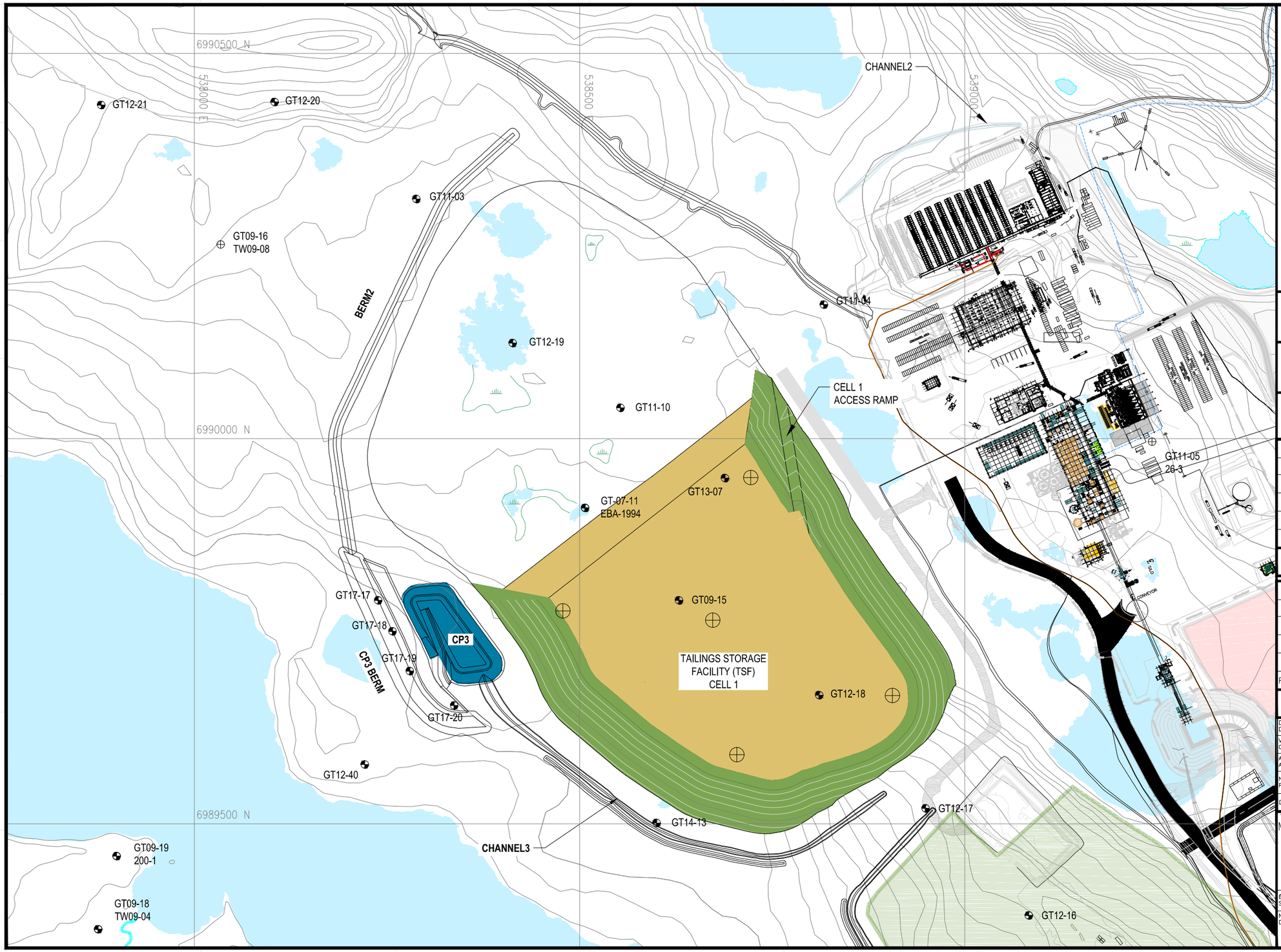

LEGEND

- WASTE ROCK
- ORE
- TAILINGS
- WATER COLLECTION POND
- BOREHOLE
- PROPOSED GROUND TEMPERATURE CABLE LOCATION

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature
Date Nov. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

PROFESSIONAL ENGINEER — G. ZHANG — LICENSEE — NWT/NU

AGNICO EAGLE

TETRA TECH

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 11/14/2018

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A	ISSUED FOR REVIEW	2018–11–05	

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APPROUVÉ PAR / APPROVED BY		
No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

YEAR 2

ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
No. DESSIN/ DRAWING NO.		REVISION	FEUILLE/SHT
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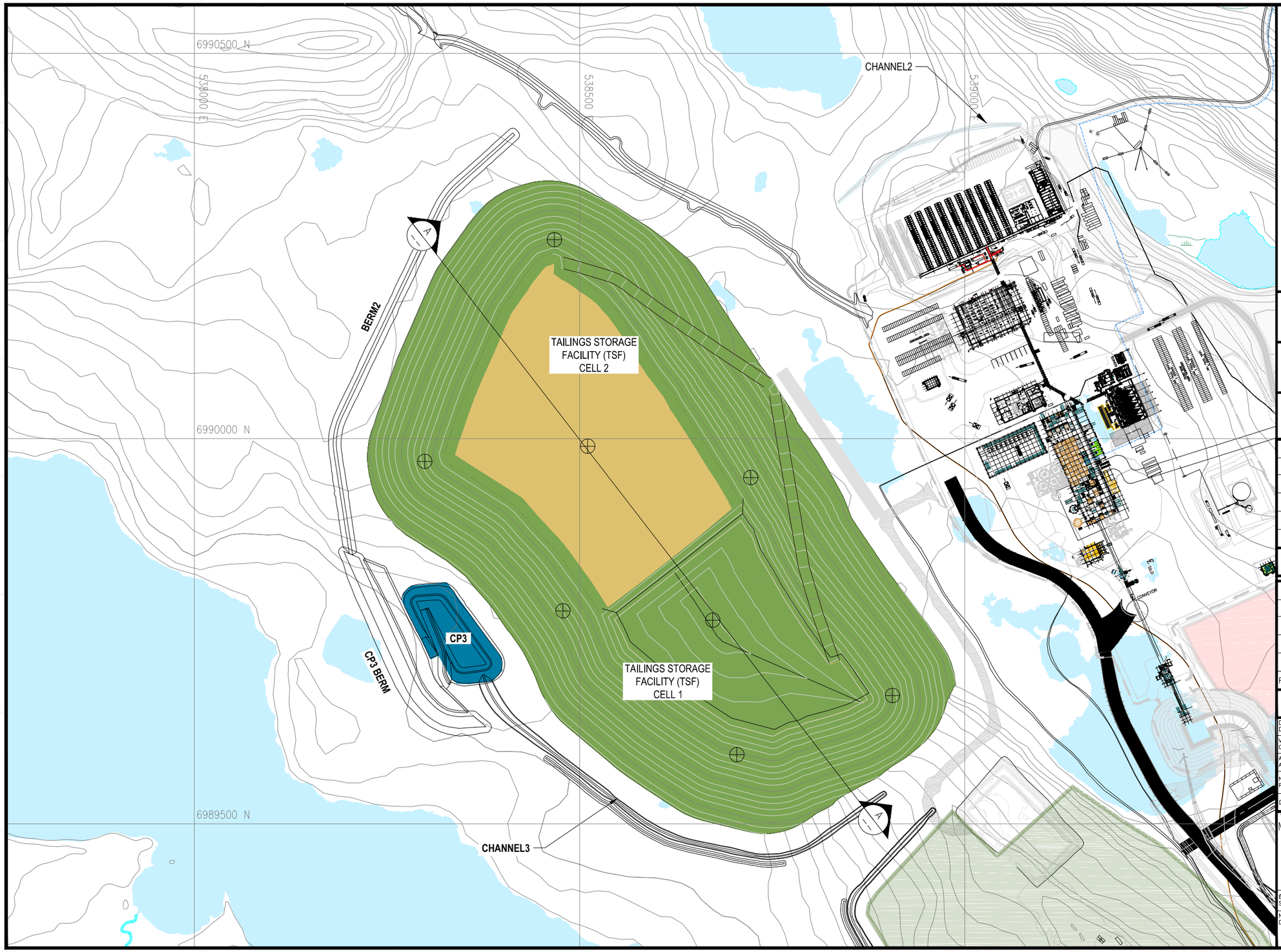

LEGEND

- WASTE ROCK
- ORE
- TAILINGS
- WATER COLLECTION POND
- PROPOSED GROUND TEMPERATURE CABLE LOCATION

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature
Date Nov. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NWT/NU

AGNICO EAGLE

TETRA TECH

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FOR CONSTRUCTION
DATE : 11/14/2018

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DATE			

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

YEAR 7

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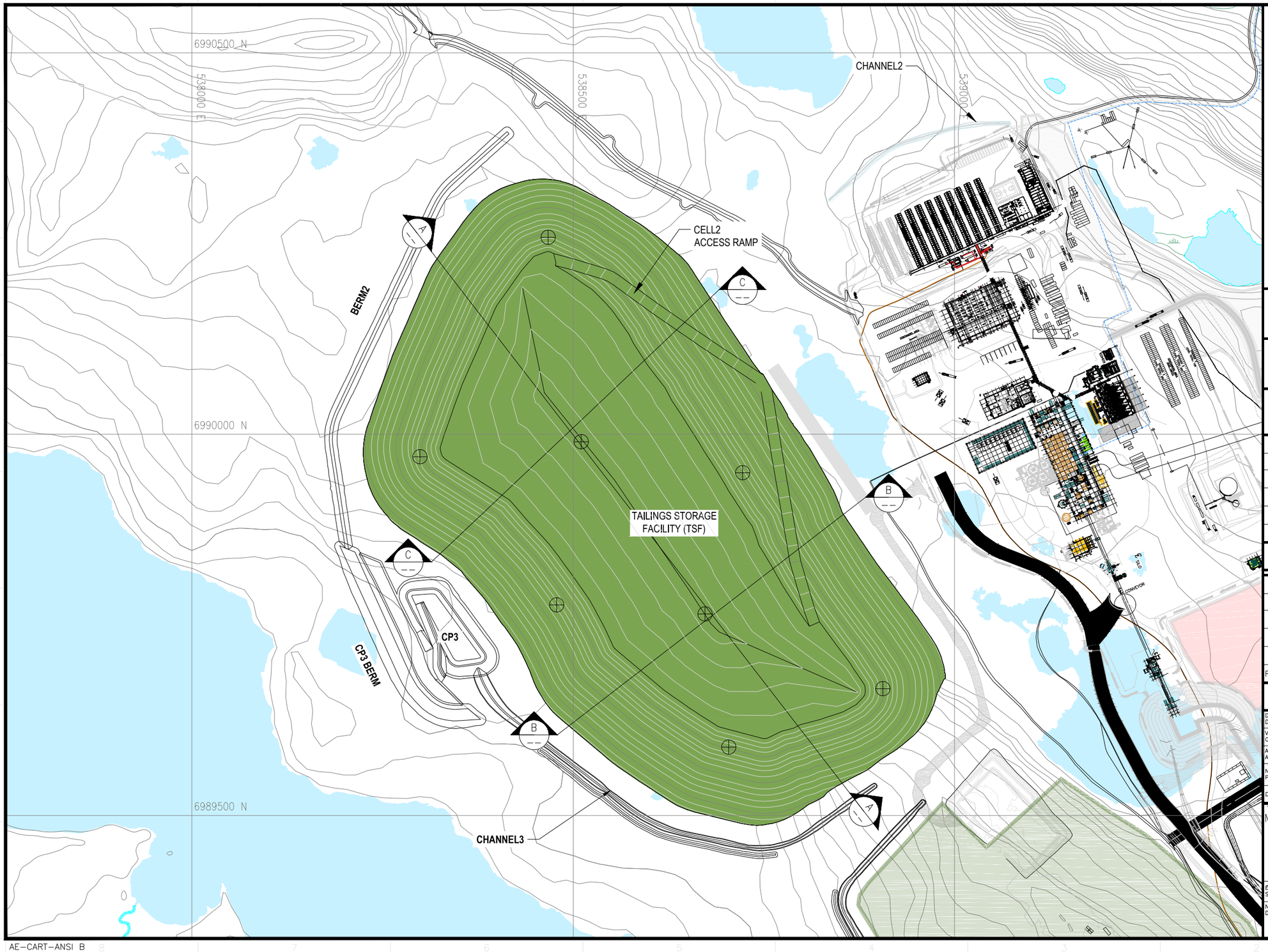

LEGEND

- WASTE ROCK
- ORE
- TAILINGS
- PROPOSED GROUND TEMPERATURE CABLE LOCATION

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature
Date Nov. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NWT/NU

AGNICO EAGLE

TETRA TECH

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 11/14/2018

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A	ISSUED FOR REVIEW	2018–11–05	

REVISIONS

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CLOSURE

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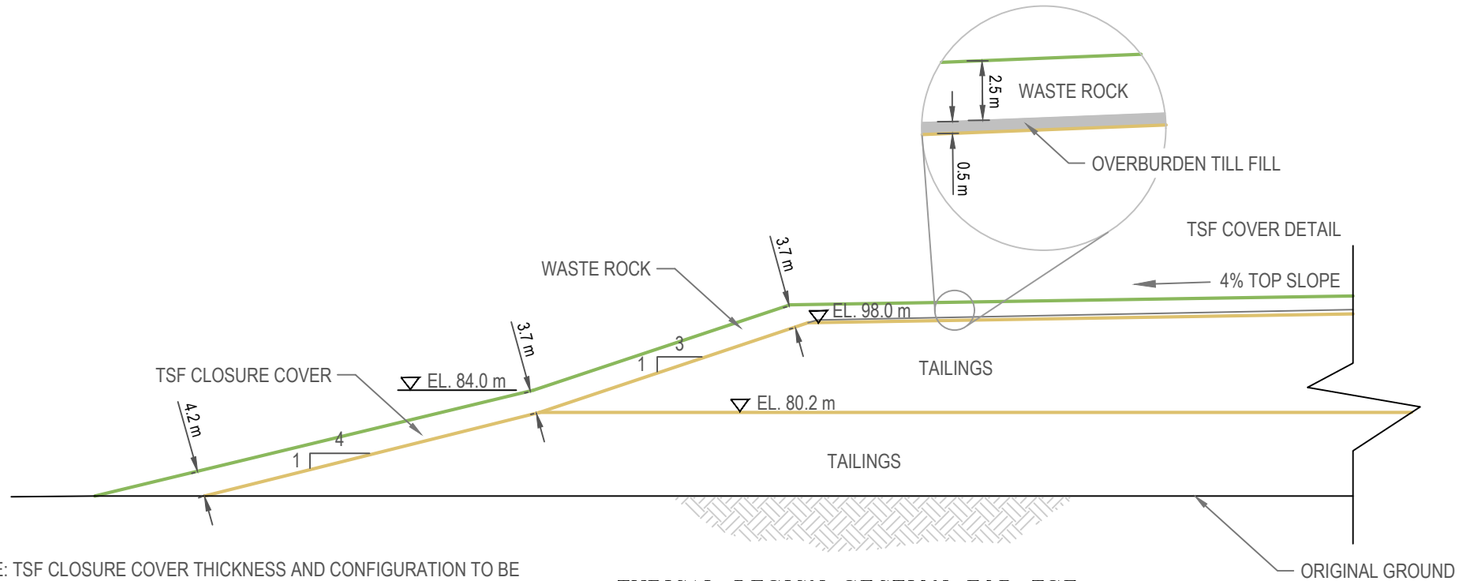
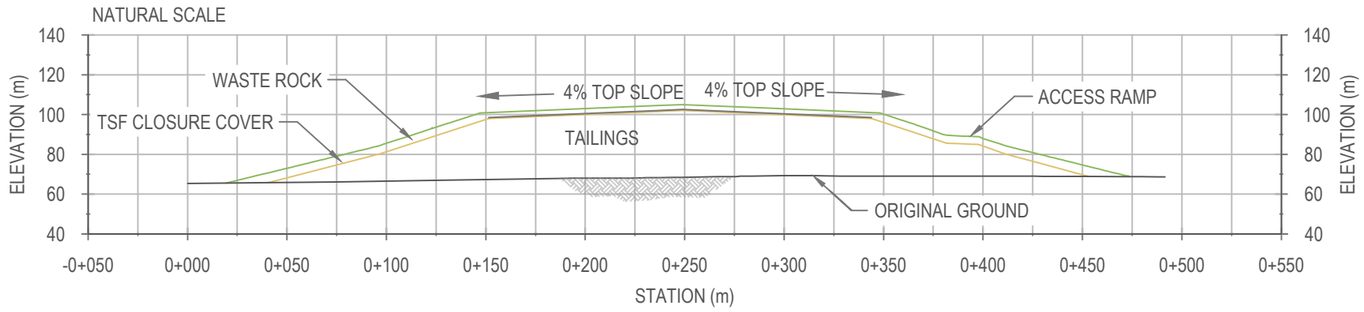


NOTE: TSF CLOSURE COVER THICKNESS AND CONFIGURATION TO BE FINALIZED DURING THE DEVELOPMENT OF THE FINAL CLOSURE COVER DESIGN PENDING PERFORMANCE MONITORING OF DRY STACKED TAILINGS FACILITY DURING OPERATION.

TYPICAL DESIGN SECTION FOR TSF



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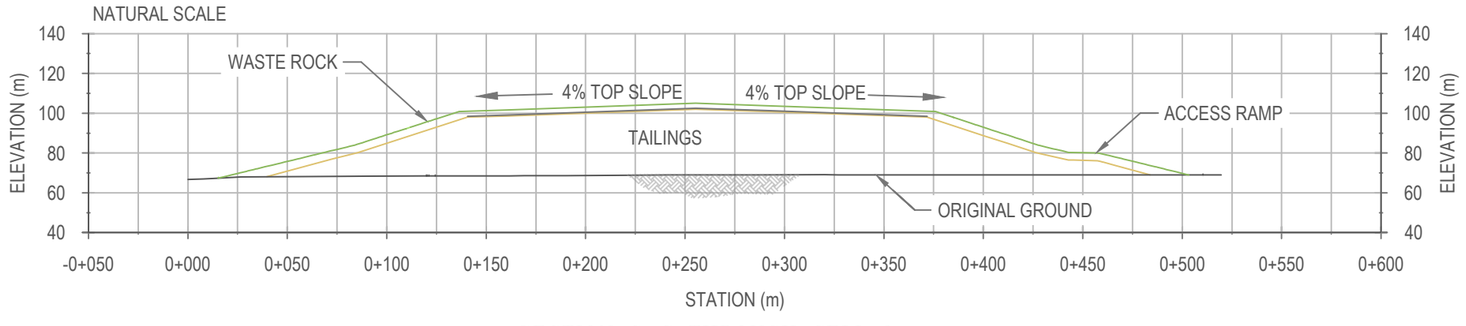

SECTION C–C THROUGH CELL 2

NOTES:

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NWT/NU

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A	ISSUED FOR REVIEW	2018–11–05	

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No. PROJET / PROJECT NO.

DATE

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

TYPICAL DESIGN SECTION OF TSF AND
SECTIONS B–B AND C–C THROUGH CELLS 1 AND 2

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APPENDIX B • TAILINGS STORAGE FACILITY DESIGN REPORT AND DRAWINGS

Tailings Storage Facility (TSF)
Design Report and Drawings
6515-583-163-REP-001

30-Day Notice to Nunavut Water Board
In Accordance with Water License 2AM-MEL1631 (Part D, item 1)

Prepared by:
Agnico Eagle Mines Limited – Meliadine Division

November 2018

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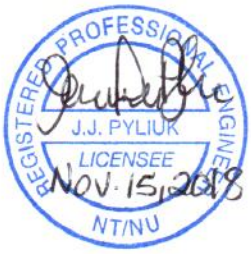
DOCUMENT CONTROL

Version	Date	Section	Page	Revision
1	November 15, 2018			Design Report

Prepared by:



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Engineer of Record

1 INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Project (the Project), a gold mine located approximately 25 km north of Rankin Inlet and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W).

The current mine plan focuses on the development of the Tiriganiaq gold deposit which will be mined using both conventional open-pit and underground mining operations. Existing or proposed mining facilities to support this development include a plant site and accommodations, overburden stockpile, tailings storage facility (TSF) and a water management system comprised of collection ponds, diversion channels, dikes and retention berms. A Type "A" Water License (No. 2AM-MEL-1631) was awarded to Agnico Eagle for the development of this Project in 2016.

Tailings generated from mill production at the Project will be dewatered by pressure filtration to a solids content of approximately 85% by weight. The filtered tailings will have the consistency of damp, sandy silt and will be transported by haul truck to either the paste plant for use underground as backfill or for placement and storage in the TSF in a process conventionally referred to as "dry stacking". Production of filtered tailings is expected to commence in Q1 of 2019 as part of the commissioning process for the mill.

In accordance with Part D of the Type "A" Water License, this report summarizes the design basis and design criteria for the TSF. Also provided are construction and operational procedures, thermal instrumentation and monitoring requirements and issued for construction (IFC) drawings.

2 GENERAL SITE CONDITIONS

2.1 CLIMATE

The Project site lies within the Southern Arctic Climatic Region, where daylight reaches a minimum of four hours per day in winter and a maximum of 20 hours per day in summer. The nearest weather station is Rankin Inlet A (Station 2303401), located approximately 25 km south of the Project site.

The climate is extreme, experiencing long cold winters and short cool summers. The monthly mean air temperature is typically above 0°C for the months of June to September, and is below 0°C between October and May. July is typically the warmest month with a mean temperature of 12°C and January the coldest with a mean temperature of -31°C. The mean annual temperature for the period of record from 1981 to 2009 was -10.4°C.

Mean annual precipitation at the Project site is estimated to be 411.7 mm, after accounting for rainfall and snowfall undercatch (based on the hydrological year from October 1 to September 30). Approximately 51% of the precipitation occurs as rainfall, while 49% occurs as snow.

The region is known for high winds, blowing from the north and north-northwest direction more than 30% of the time. The mean values for wind speed show that the north-northwest, together with north and northwest winds, have the highest speeds and tend to be the strongest. Mean monthly wind speeds are typically between 19 km/hour and 27 km/hour. Calm winds occur at a frequency of only 2.8%.

The climate in the Project region is projected to be warmer for the 2020s, 2050s, and 2080s time horizons when compared to the observed historic values (Agnico Eagle and Golder 2014).

Precipitation shows an increase compared to historical values, but the majority of projections are not significantly different from the annual recorded precipitation value

2.2 PERMAFROST

The Project site is located within the Southern Arctic terrestrial eco-zone in an area of continuous permafrost. Continuous permafrost to depths of between 360 m to 495 m is expected based on ground temperature data from thermistors installed throughout the Project site and as measured in underground development. The measured ground temperature data indicates that the active layer is 1.0 m to 3.0 m in areas of shallow soils and areas away from the influence of lakes. The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at a depth of below 15 m) are in the range of -5.0°C to -7.5°C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012°C/m to 0.02°C/m (Golder 2012a).

2.3 GROUNDWATER

In areas of continuous permafrost, there are generally two groundwater flow regimes: a shallow groundwater flow regime located in the active layer near the ground surface, and a deep groundwater flow regime located beneath permafrost. From late spring to early autumn, when temperatures are above 0˚C, the active layer thaws. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. The Project area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes.

The permafrost in the rock in the Project area would be virtually impermeable to groundwater flow. The shallow groundwater flow regime, therefore, has little to no hydraulic connection with the deep groundwater regime. A numerical hydrogeological model for the deep groundwater flow regime was developed (Golder 2013a). The results of the hydrogeological model have indicated that the rock at the Project site below the base of the permafrost or in taliks is generally of low hydraulic conductivity, on the order of 3×10^{-9} m/s (Golder 2013b).

To a lesser degree, groundwater beneath the permafrost is influenced by density differences due to the upward diffusion of deep-seated brines (density-driven flow). In the Canadian Shield, concentrations of Total Dissolved Solids (TDS) in groundwater increase with depth, primarily in response to upward diffusion of deep-seated brines. Salinity can induce a freezing point depression, creating a cryopeg in permafrost where water can be unfrozen even though the temperature is below 0°C. At the Project site, the freezing point depression was calculated to be equivalent to -3.3°C (Golder 2012a). The portion of the permafrost, where groundwater may be partially or wholly unfrozen due to the freezing point depression, has been estimated to be at a depth of 350 m to 375 m (Golder 2012a).

2.4 SEISMIC ZONE

The Project is situated in an area of low seismic risk. The peak ground acceleration (PGA) for the area was estimated from the 2015 National Building Code of Canada seismic hazard website (http://earthquakesscanada.nrcan.gc.ca). The estimated PGA is 0.022 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.037 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area.

3 DESIGN BASIS

3.1 2018 MINE WASTE MANAGEMENT PLAN

As part of the documentation series produced for the Type "A" Water License application, Agnico Eagle presented a Mine Waste Management Plan (MWMP) for the Project in March of 2018. This plan described the feasibility-level design basis and general operational procedures for the TSF.

Key points for the design and construction of the TSF from the 2018 MWMP included the following:

- A total of 12.1 Mt of tailings will be produced over a mine life of approximately eight (8) years. About 9.7 Mt of tailings (80% of the total) will be placed in the TSF as dry stack tailings, with the remaining 2.4 Mt (20% of the total) to be used as underground cemented paste backfill for the primary and longitudinal stopes.
- Process commissioning and tailings placement is to begin in Q2 of Year -1 (2019), with full ore processing capacity expected at the end of Q3 (Year -1).

3.1.1 Refinements Since 2018 Mine Waste Management Plan

Refinements to the expected production schedule and predicted quantities have been made since the release of the March 2018 MWMP. Specifically, full ore processing capacity is now anticipated in early Q2 of Year -1 (2019), or about six (6) months ahead of the previous schedule. Accordingly, commissioning and early tailings placement have also advanced, with initial commissioning activities now slated to begin at the very end of Q4 of Year -2 (2018).

The current projections of expected tailings quantities have increased, with the total amount over the eight (8) year life-of-mine now anticipated to be approximately 14.9 Mt. A greater proportion of tailings are now slated for use as underground backfill (27% or 4.0 Mt), while a lesser proportion (73% or 10.9 Mt) will be stored in the TSF.

Table 1 summarizes the production schedule, quantities and distribution of the tailings by year.

Table 1: Schedule, Quantities and Distribution of Tailings by Year

Year	Mine Year	Tailing Solids from Mill (t)	Tailing Solids to be Used as Underground Backfill (t)	Tailing Solids to be Placed in Dry Stack TSF (t)
2019	Yr-1*	962,543	380,517	582,026
2020	Yr 1	1,328,999	443,962	885,037
2021	Yr 2	1,368,750	316,143	1,052,607
2022	Yr 3	1,368,750	371,743	997,007
2023	Yr 4	2,007,500	518,249	1,489,251
2024	Yr 5	2,196,000	485,926	1,710,074
2025	Yr 6	2,190,000	500,187	1,689,813
2026	Yr 7	2,190,000	521,941	1,668,059
2027	Yr 8	1,320,570	474,318	846,252
Total		**14,933,113**	**4,012,986**	**10,920,127**

** Includes approximately 60,000 t of tailings produced during commissioning from end Q4 (2018) to Q1 (2019)*

3.2 TAILINGS PROPERTIES AND CHARACTERISTICS

3.2.1 Geotechnical Properties

Laboratory testing to establish the physical and geotechnical properties to guide design of the TSF was conducted by Tetra Tech (EBA, 2013 and Tetra Tech EBA, 2014a). The test program included physical index testing, gradation analysis, moisture-density relationship (Standard Proctor) testing, consolidation, direct shear, hydraulic conductivity and soil water characteristics. The key findings from the test results are summarized as follows:

- The tailings will comprise approximately 17% sand, 81% silt and 2% clay-sized particles. The material is of low plasticity and low compressibility;
- The maximum dry density is 1,800 kg/m^3 at an optimum moisture content of 14.9% (Standard Proctor);
- The coefficient of consolidation (c_v) of the tailings ranges from 24.6 to 29.8 m^2/year under pressures ranging from 10 to 1,600 kPa;
- The tailings have a soil water characteristic curve with an air entry value of 20 kPa and a residual suction of 900 kPa;
- For tailings samples with a dry density of 1,700 kg/m^3, the inferred angle of friction is 33.5º and the apparent cohesion is 9.9 kPa. The saturated hydraulic conductivity for these samples is 2.91 x 10^{-07} m/sec;

3.2.2 Geochemical Characteristics

A series of waste geochemical characterization programs were carried out between 1998 and 2011, with the principle findings presented in Golder 2014. Testing the acid rock drainage and metal leaching potential included mineralogical and chemical composition testing, acid base accounting (ABA), shake flask extraction (SFE), humidity cell tests (HCTs), large column tests and field cell tests. Results of the geochemical characterization indicate that both the tailings from the Tiriganiaq deposit and the waste rock is considered non-potentially acid generating (NPAG) and have low potential for metal leaching (ML).

Salinity content stimulation indicate levels of 8,000 ppm of chlorides can be expected in the steady state process water, assuming a 3% moisture content of the ore (Soutex, 2016).

3.3 LOCATION AND SURFACE CONDITIONS

The TSF will be located on the high ground to the west of the Process Plant and east of Lake B7. Drawing 6515-583-163-001 in Appendix A shows the proposed footprint of the TSF in relation to other site infrastructure, including the TSF water management facilities and haulage roads. Haulage distance from the mill to the TSF ranges from 400 m to 800 m, while a minimum distance of approximately 200 m from the edge of the dry stack pile to Lake B7 is respected.

With the exception of the southeast corner of the proposed facility, which encompasses the top of the northern tip of the Tiriganiaq esker, the ground surface of the proposed footprint is generally relatively flat. Straddling two watersheds, the majority of the TSF falls within Watershed B and gently slopes (less than 2%) to the southwest towards Lake B7. A portion of the eastern side of the footprint lies within Watershed B and slopes towards the CP1 area. Vegetation in the area consists of moss/peat cover. No major waterbodies are within the footprint, although a few shallow localized depressions hold small volumes of water on a seasonal basis. Polygonal or linear topographic expressions typically associated with the presence of vertical ice wedges are not readily apparent.

3.4 SUBSURFACE GEOTECHNICAL CONDITIONS

Numerous site investigation programs have been conducted at Meliadine since 1998, with a total of seven (7) boreholes having been drilled within the proposed TSF footprint. The location of these boreholes is shown on Drawing 6515-583-163-002 and the key geotechnical information summarized in Table 2.

In general, the subsurface of the TSF consists of a thin layer of organic material overlying ice-rich silty sand, gravelly silt and sand, with traces of clay and shells with cobbles. Excess ice was observed in most of the boreholes. The depth to bedrock ranges from 1.3 m on the eastern side of the TSF to 7.3 m at the southeastern side.

Table 2: Summary of Geotechnical Information from Overburden Soils in TSF Area

Borehole No.	Organic Layer Thickness (m)	Overburden Soil Description	Ice Conditions	Bedrock Depth (m)
GT07-11	0.20	Sand, ice-rich fine-grained materials, till (not logged in detail)	~2.25 m (from 0.75 to 2.0 m) ice-rich fine-grained material with up to 75% ice	~5.5
GT09-15	0.30	Low recovery – gravel, silty sand	NA - Thawed during drilling	3.5
GT11-10	0.75	Silty peat, ice and silt, gravelly sandy silt	1.75 m ice and silt from 0.75 m to 2.5 m	6.3
GT12-18	--	Gravelly silty sand, sandy silt, silty sand	Vs from 1 to 2 m	7.3
GT12-19	--	Gravelly silty sand, sandy silt, silty sand	Vs to Vc, Vr from 2 to 2.7 m	3.1
GT13-07	0.10	Boulders, sand and silt	NA – thawed during drilling	1.3
GT14-13	0.10	Silty gravelly sand, sand and silt	Up to 10% Vx, Vc, 5% from 1.8 m to 3.2 m	3.2

3.5 ADDITIONAL KEY DESIGN CONSIDERATIONS

In addition to the expected tailings production schedule, quantities and characteristics, a number of other factors were reflected in the detailed design of the TSF. Additional key considerations include:

- **Site climate conditions**: The geographic location of the site was maximized to promote the tailings freezing process, freeze-back of the underlying foundation soils and encourage permafrost development in the facility;
- **Environmental obligations**: Avoidance of impacts on fish-bearing habitat by maintaining a suitable buffer distance from protected natural lakes, minimizing the overall footprint and limiting surface dust generation;
- **Water management**: Facilitate the collection and management of contact water from the TSF during operations to avoid potentially negative impacts on the outside environment and where feasible, divert clean, natural run-off to avoid contact with the tailings and minimize water flow through the TSF area;
- **Geotechnical issues**: Including favorable geotechnical foundation conditions, controlling surface erosion and maintain the short and long term stability of the facility;
- **Constructability/Operational concerns**: Minimize haulage wherever feasible, reduce pre-production construction and optimize local construction availability;

- **Closure**: Reduce closure costs by facilitating early progressive closure of the facility during mine operations when cover materials are readily available and establish a proper closure cover system to limit the potential for long-term seepage through the tailings.

4 DESIGN OF TAILINGS STORAGE FACILITY

4.1 DESIGN CONCEPT AND PARAMETERS

To address the numerous considerations presented in the design basis for the TSF, filtered tailings will be managed using a two-cell placement system and incorporating a progressive closure cover as placement advances. Table 3 presents the key parameters adopted for the detailed TSF design.

Table 3: Key Design Parameters for the TSF

Design Parameter	Value
Filtered tailings solid content to TSF	85% w/w (weight percentage)
Moisture content of filtered tailings to TSF	17.6% (by mass)
Minimum target dry density of compacted tailings	1,650 kg/m^3
Average height of filtered tailings over original ground surface	33 m
Side slope for lower placed tailings (below elevation 80.2 m)	4H:1V
Side slope for upper placed tailings (above elevation 80.2 m)	3H:1V
Slope of final tailings surface at crest	4%
Final top tailings surface area (Cell 1)	46,359 m^2
Final bottom tailings surface area (Cell 1)	179,741 m^2
Final top tailings surface area (Cell 2)	84,655 m^2
Final bottom tailings surface area (Cell 2)	149,632 m^2

4.1.1 Refinements Since 2018 Mine Waste Management Plan

The 2018 MWMP presented a three-cell management system that had originally been proposed during the 2014 feasibility level scoping assessment. However, a two-cell system has been progressed during detailed design, which offers the following technical advantages over the previously discussed three-cell system:

- **Construction access**. To accommodate the additional 1.2 Mt of tailings expected to be placed in the TSF, both the overall footprint and the average height of the facility have increased slightly from the 2018 MWMP. In order to maintain an acceptable 10% grade on the access ramps to the upper levels of the facility with a three cell system would have required either switch-backs or wrap around ramps, both of which would have further decreased available space and introduced potential safety concerns.
- **Freeze-back**. The two-cell system provides a thinner annual tailings placement which thereby enhances the freeze-back potential of both the underlying ground surface and the placed tailings.

The 2018 MWMP provides a dry density value of 1,710 kg/m^3 for the filtered tailings, which corresponds to 95% compaction when compared to the maximum dry density of 1,800 kg/m^3 (Standard Proctor, ASTM D698) and optimum moisture content of 14.9%. Since the filtered tailings are anticipated to leave the mill at a moisture content that is 2.7% wetter than the optimum, it is anticipated that the 1,710 kg/m^3 dry density will be difficult to achieve in field conditions, particularly during winter placement. For the purposes of detailed design therefore, the more conservative target dry density value of 1,650 kg/m^3 was adopted, which reflects 92% of the maximum dry density value.

4.2 STABILITY ANALYSIS

Limit equilibrium analyses were conducted to calculate the deterministic factor of safety (FoS) against slope failure under both static and pseudo-static (seismic) conditions during the 2014 feasibility study. Typical cross sections of the TSF were evaluated under short and long term construction and closure situations assuming various conditions. The minimum calculated FoS assuming unfrozen tailings and ground conditions under various loading scenarios from this analyses are provided in Table 4.

Table 4: Summary of Slope Stability Analysis Results

Loading Scenario	Calculated Minimum Factor of Safety (Tetra Tech, 2014)	Condition
Short-term static (Construction)	2.1	Unsaturated, unfrozen tailings overlying unfrozen ice-rich silt, water table on ground surface, excess pore water pressures generated
Long-term static (Closure)	1.9	Unsaturated, unfrozen tailings overlying thawing ice-rich silt, water table on ground surface, no excess pore water pressures
Long-term pseudo-static (Closure)	1.7	Same condition as above with addition of appropriate peak ground acceleration for seismic condition

Generally, the selection of a design FoS for an earth structure depends on the importance of the structure, potential failure consequences, and uncertainties involved in design loads and soil parameters. The 2014 stability analysis compared the calculated safety factors to guidelines for mine waste dumps as presented in PAE (1991). Updated guidelines for mine waste dump and stockpile design and suggested stability acceptable criteria based on overall consequence of failure and confidence level on site conditions, input parameters, and supporting data have been presented by Hawley and Cunning (2017). The consequence of failure for the TSF can be classified as “Low” for low risk of structure failure and “Moderate” for potential moderate environmental impacts (but manageable). The confidence level can therefore be classified as “Low” to “Moderate”.

Based on the classifications and site conditions, the minimum FoS for the TSF stability design are adopted as presented in Table 5.

Table 5: Design Factors of Safety for TSF Stability

Conditions	Suggested Factor of Safety in PAE (1991)	Suggested Factor of Safety in Hawley and Cunning (2017)	Design Factor of Safety Adopted for TSF
Long-term, static loading for shallow slip surfaces	1.2	N/A	**1.2**
Short-term, during construction for overall stability (or deep-seated slip surfaces)	1.3 – 1.5	N/A	**1.3**
Long-term static loading for overall stability (or deep-seated slip surfaces)	1.5	1.4 – 1.5	**1.5**
Long–term seismic (pseudo-static) loading for overall stability (or deep-seated slip surfaces)	1.1 - 1.3	1.1 – 1.15	**1.1**

The results indicate that the calculated FoS for the TSF exceed industry and AEM requirements for all loading scenarios assuming unfrozen tailings and ground conditions. The stability analyses did not

consider the freeze back that is expected to occur in the facility and the related accompanying increase in strength parameters. As the 2014 results are therefore considered conservative, and as the general geotechnical parameters of the TSF are unchanged since the initial stability assessment, there are no plans to update this analysis at this time.

4.3 THERMAL ANALYSIS

Thermal analysis was conducted to estimate the thermal conditions of the tailings and the foundation soils during mine operations and closure during the 2014 feasibility study, with a summary of these results reported in the following paragraphs. It is recognized that this analysis is reflective of the tailings placement plan and schedule of the 2018 MWMP and requires updating based on the quantities and schedule presented in this report. However, although overall filtered tailings quantities have increased, the adaptation of a two-cell management system is expected to increase freeze-back capabilities so that the 2014 thermal analysis is anticipated to be conservative.

The results from the 2014 thermal analysis indicated that given the assumed conservative initial tailings temperatures of 15°C to 25°C when placed:

- The original overburden ground below the tailings can freeze back and be maintained in a frozen condition afterwards, with the estimated temperature being around -4°C in the long term;
- The majority of the tailings placed would freeze after one winter and would remain frozen except for the final top thick layer placed during the late stages of cell development or the layer placed within the active layer;
- Almost all the tailings will become frozen within several winters after the final closure cover is placed;
- The predicted temperatures of the placed tailings range from -1°C to -4°C within 100 years of assumed climate change conditions after initial mine closure.

The thermal model will be verified and refined on a periodic basis throughout the life-span of the TSF, as ground/tailings temperature monitoring data and as-built information becomes available.

4.4 CREEP AND LONG TERM DEFORMATION

As noted in Section 3.4, the foundation soils underlying the TSF tend to be ice-rich, with excess or visible ice observed in most of the boreholes drilled throughout the footprint. As frozen soils and ice act as visco-elastic materials under loading and exhibit time dependant deformation (creep), analysis was conducted during the 2014 feasibility assessment to evaluate the potential for creep movements of the ice-rich material in the TSF foundation. The analysis was based on the conservative assumption of the presence of a continuous 1 m thick layer of ice-rich silt beneath the entire TSF footprint. Based on predicted long-term overburden temperatures of -4°C (from the thermal analysis), the results of the creep analysis are summarized as follows:

- Maximum horizontal displacements are expected to occur at the middle of the TSF side slopes, with 0.07 m of horizontal movement predicted ten years after closure and 0.55 m of movement after 100 years;
- Maximum vertical displacements occur at the crest of the TSF side slopes, with 0.02 m of movement predicted ten years after closure and 0.26 m after 100 years;

- The TSF and ice-rich permafrost foundation are expected to deform in secondary creep with a low strain rate of 3.4 x 10^{-7}/hour or less in the long term.

As mentioned, these results are based on conservative assumptions regarding the underlying foundation soils of the TSF and may be updated as required as the thermal model continues to be verified and refined.

4.5 PROGRESSIVE AND FINAL CLOSURE COVER

The TSF final closure cover was designed based on the thermal and stability analysis conducted at the feasibility stage of the project and has the design objectives of controlling erosion and dust generation from the stack, in addition to enhancing the freeze-back capabilities of the facility. To reduce final closure costs and minimize erosion, cover material on the side slopes will be placed progressively with the filtered tailings. The closure cover design may be updated when required pending performance monitoring of the TSF during mine operations.

Cover material placed on the side slopes will:

- Consist of 600 mm minus NPAG waste rock, of varying gradation;
- Be placed in controlled lifts of maximum 1.0 m in height prior to compaction with a 10-ton vibratory roller;
- Be placed in minimum thicknesses of 4.2 m over the lower toe of the final tailings side slopes and in minimum thicknesses of 3.7 m over the upper side slopes.

Final closure cover material will be placed when each cell reaches its operational capacity and sloped 4% to discourage ponding and surface infiltration. In addition to a top capping of 2.5 m thickness of 600 mm minus waste rock, the final cover will incorporate select overburden till placed and compacted over the top surface of the tailings. The till material is intended to reduce surface infiltration and enhance freeze-back potential and enhance thermal protection and will meet the following specifications:

- Inorganic, sandy silt or silty sand with a fines content of 20% to 60% and maximum particle size of 300 mm;
- Placed in an unfrozen condition and have a minimum thickness of 0.5 m.

Volumes of closure cover material distributed by year are provided in Table 6.

Table 6: Summary of Cover Material Quantities during Mine Operations

Year	Mine Year	Volume of Waste Rock Placed on Side Slopes (m3)	Volume of Waste Rock Placed on Final Top Surface (m3)	Total Volume of Waste Rock Placed as Closure Cover (m3)	Total Volume of Overburden Placed on Top Surface (m3)
2019	-1	39,760		39,760	
2020	1	97,036		97,036	
2021	2	89,103		89,103	
2022	3	110,124		110,124	
2023	4	139,379		139,379	
2024	5	117,037	123,942	240,979	22,940
2025	6	154,474		154,474	
2026	7	127,840		127,840	
2027	8	46,250		46,250	
2028	9	--	230,180	230,180	42,610
Total		**921,003**	**354,122**	**1,275,125**	**65,550**

5 CONSTRUCTION METHODS AND PROCEDURES

5.1 PRE-CONSTRUCTION

Limited pre-construction activities are required at the TSF prior to tailings placement. As the facility is generally located on high ground with a series of water management and diversion structures around it, a bottom drainage layer is not necessary and the design assumes that filtered tailings will be placed directly over original ground.

Excess snow and/or ice will be removed from the ground surface before tailings placement and efforts will be made to avoid placement in areas of localized water accumulation.

A topographical survey of each cell will be completed prior to tailings placement.

5.2 OPERATIONAL CONSTRUCTION

After processing, filtered tailings will be deposited via conveyor from the mill to the Tailings Dewatering Building (TDB). The TDB has a maximum storage capacity of approximately 12,000 tonnes of filtered tailings (two to three days at maximum production) in the event that extreme weather conditions or equipment issues prevent haulage.

From the TDB, the tailings will be loaded with a CAT 988 loader into Volvo 40-ton haul trucks and hauled to either the TSF or to the Paste Plant where the filtered tailings will be mixed with cement and used underground as structural backfill for mining operations. The design capacity of the Paste Plant is approximately 3,000 tonnes per day (tpd), with operations expected to commence in Q2 2019.

The general construction sequence of the TSF during mill operations will be as follows:

- Conduct a topographical survey of the original ground surface and place stakes marking the limits of closure material, tailings and lift heights.
- Access from the haul road will be constructed with compacted waste rock cover material.
- Excess snow will be pushed out of the dumping area with the bulldozer during winter placement.
- Tailings will be spread after dumping into controlled lifts of maximum height 0.3 m with a CAT D6 bulldozer.
- Each lift of tailings will be compacted with a CAT CS356 10-ton vibratory drum roller to the target dry density before the next lift is placed.
- Each subsequent lift of tailings material will be “stepped in”, forming a staircase-like structure around the perimeter to establish the required design side slope.
- Waste rock will be placed and compacted around the side slopes as progressive cover material.

Further details regarding the overall deposition plan are provided in Section 6.0.

5.3 QUALITY CONTROL

A quality control plan will be developed and included as part of the Operation, Maintenance and Surveillance (OMS) plan for the TSF. This plan is expected to include on-going verification of design assumptions and parameters, including monitoring of ground/tailings temperatures, moisture content, placement temperatures of the filtered tailings, target dry density (compaction) and pore water salinity.

6 OVERALL TAILINGS DEPOSITION PLAN

The overall tailings deposition plan considers measures to both promote freeze-back of the tailings and the underlying original ground, as well as limit dust generation, control surface erosion and reduce final closure costs. The yearly schedule of deposition per cell, as well as average height of tailings placed in each cell is summarized in Table 7. Drawings 6515-583-163-002 to 6515-583-163-008 in Appendix A illustrate the yearly planned development of the TSF during mine operations and closure.

Table 7: Tailings Placement Schedule and Estimated Tailings Heights

Year	Mine Year	Tailing Solids to be Placed in Dry Stack TSF (t)		Estimated Average Height of Tailings Placed in Each Cell (m)		Planned Tailings Placement Period	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
2019	Yr-1	582,026		1.6		Jan to Dec	
2020	Yr 1	885,037		5.3		Jan to Dec	
2021	Yr 2	1,052,607		10.3		Jan to Dec	
2022	Yr 3	997,007		16.1		Jan to Dec	
2023	Yr 4	868,728	620,522	22.7	2.6	Jan to Jul	Aug to Dec
2024	Yr 5	717,635	992,439	33.0	6.9	Jan to May	Jun to Dec
2025	Yr 6		1,689,813		15.2		Jan to Dec
2026	Yr 7		1,668,059		24.7		Jan to Dec
2027	Yr 8		846,252		33.0		Jan to Aug
Total		**5,103,041**	**5,817,086**				

To promote freeze-back and permafrost development in the tailings and underlying ground surface, the following placement strategies will be adopted:

- Seasonality considerations. November to March is typically a period of sub-zero temperatures and snowfall, while April to October is a period of thawing/freezing conditions with rainfall. The initial lift of tailings over original ground will be placed during winter conditions whenever feasible.
- Restricted yearly tailings thickness. The maximum thickness of tailings placed during the initial year of each cell will be limited to 2.6 m, while the total yearly thickness placed in a cell for subsequent years will be no greater than 10.3 m.

As discussed in Section 5.2, the placed filtered tailings will be spread into thin lifts and compacted, with this placement method expected to reduce the potential for wind erosion and dust generation from the surface. However, dust generation is anticipated to be a challenge during tailings placement in active zones, particularly during the winter months due to freeze drying of the surface. Additional measures to limit dust and control surface erosion of the overall deposition plan will include:

- Placement of progressive closure cover over the final perimeter slopes as soon as possible;
- The final closure cover over the top tailings surface of Cell 1 will be placed when Cell 1 reaches capacity;
- Consideration of prevailing north-northeast wind direction by development of the southern portion of Cell 1 first and progression northward;

- During summer months, dust will be controlled by spraying water and/or other approved chemical dust suppressants if problematic. Winter months will utilize smaller working zones and sealing of the surface through compaction of zones that are finished.

The placement of thin lifts of rock material will be used to facilitate circulation of haul trucks to the deposition point during summer placement if required. These intermittent layers will be covered in tailings when surfaces become trafficable.

Alternate zones for deposition within the TSF, particularly during periods when weather conditions make placement more complex (i.e. heavy rainfall) or if the tailings are produced at less than optimum condition, will be identified.

7 WATER MANAGEMENT

The water management system of the TSF consists of berms, channels and collection ponds designed to collect any seepage and runoff from the filtered tailings, as well as divert water away from the storage facility itself. Design and drawings of the water management infrastructures related to the TSF have been approved by the Nunavut Water Board.

As indicated previously, two catchment systems are impacted by the TSF, with the management strategy for each watershed summarized as follows:

1. CP1 Catchment. Seepage and runoff from the placed filtered tailings within the CP1 catchment area will stream through Culverts 1, 18 and 19 to Channel 1 for deposit in CP1.
2. Lake B7 Catchment. Seepage and runoff will be collected in Pond CP3 either directly or via Channel 3. Water collected in CP3 will be pumped to H13 where it will flow through Channel 1 into CP1. Berm 2 serves to divert surface runoff away from the placed filtered tailings.

All water management infrastructure will remain in place until mine closure activities are complete and monitoring results demonstrate that the contact water quality from the TSF meets the discharge criteria. Further details on water management for the TSF are provided in the Water Management Plan (Agnico Eagle, 2018a).

8 MONITORING AND INSPECTION

Performance monitoring is an integral part of the operation of any structure in an arctic environment. Geotechnical instrumentation is required to monitor the behavior of the placed filtered tailings and the underlying foundation during operation of the TSF. The instrumentation is intended to provide the following information:

- Confirmation that the performance of the foundation soils and placed filtered tailings are consistent with the predictions made during the design studies, notably in terms of stability, deformation, seepage, and thermal analyses.

- Early warning of the development of potentially adverse trends such as seepage, deformation, and permafrost degradation.

The instrumentation plan therefore includes a minimum of eight (8) vertical ground temperature cables (GTCs) throughout the TSF area, installed to a minimum depth of 10 m below the original ground to verify the thermal conditions and assumptions. The proposed locations of the GTCs is presented on Drawing 6515-583-163-004. Additional vertical and horizontal ground temperature cables may be

installed if required after review of monitoring data and operational performance. Thermistor readings will be measured once a month during the first year, and then on a quarterly basis during operation, with the measured readings analyzed and reported in the annual inspection report.

Visual inspection and monitoring can provide early warning of many conditions that can contribute to structure failures and incidents. Agnico Eagle will regularly undertake a visual inspection of the TSF, especially during spring and summer periods and note areas of seepage, unusual settlement or deformation, cracking or other signs of instability. Records of all inspections will be maintained.

An annual inspection, in accordance with Part I, items 14 and 15 of Water Licence-2AM-MEL1631 will be conducted by a qualified Geotechnical Engineer to document the performance of the facility. The reports will be submitted to the Nunavut Water Board as per the water license requirements.

Further details regarding the monitoring and inspection plan for the TSF can be located in the 2018 MWMP (Agnico Eagle, 2018b).

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Appendix A

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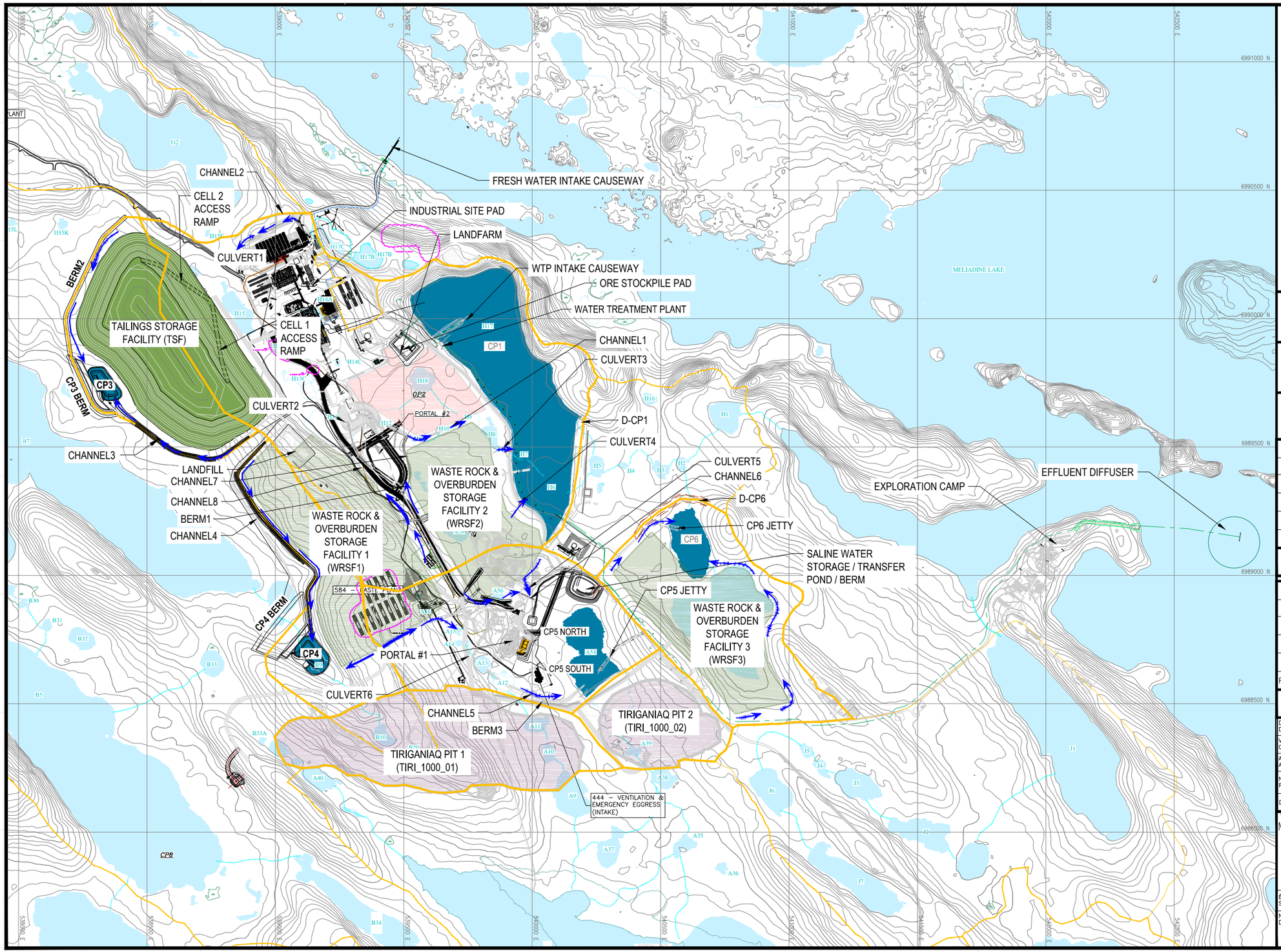

LEGEND

- CATCHMENT BOUNDARY
- WATERBODY
- WATER COLLECTION POND
- OPEN PIT
- WASTE ROCK
- ORE
- CONTACT WATER FLOW DIRECTION

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REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NWT/NU

AGNICO EAGLE

TETRA TECH

POUR CONSTRUCTION
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DATE : 11/14/2018

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B	ISSUED FOR REVIEW	2018–11–06	
A	ISSUED FOR REVIEW	2018–11–05	

REVISIONS

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DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

GENERAL ARRANGEMENT

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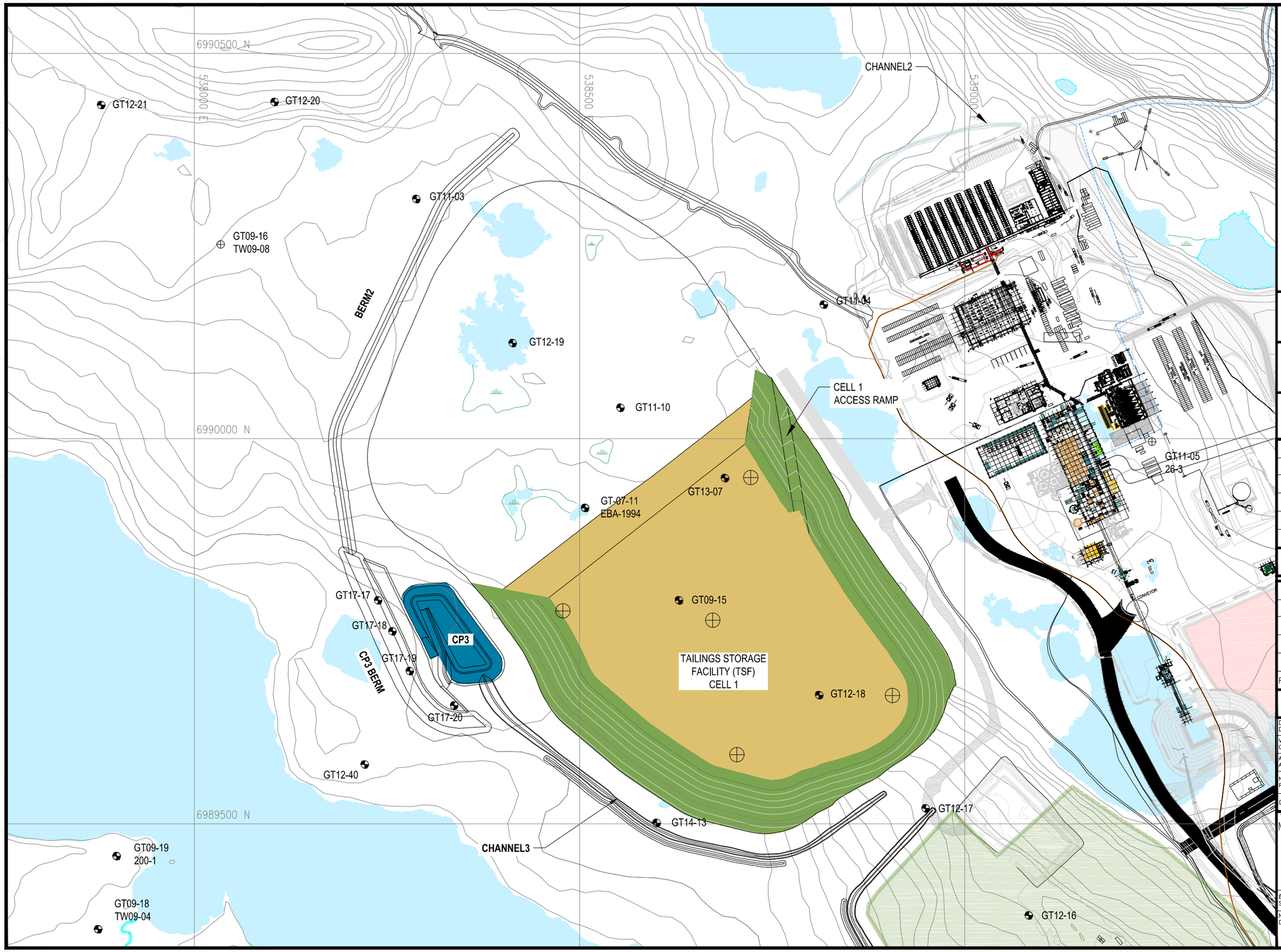

LEGEND

- WASTE ROCK
- ORE
- TAILINGS
- WATER COLLECTION POND
- BOREHOLE
- PROPOSED GROUND TEMPERATURE CABLE LOCATION

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TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

YEAR 2

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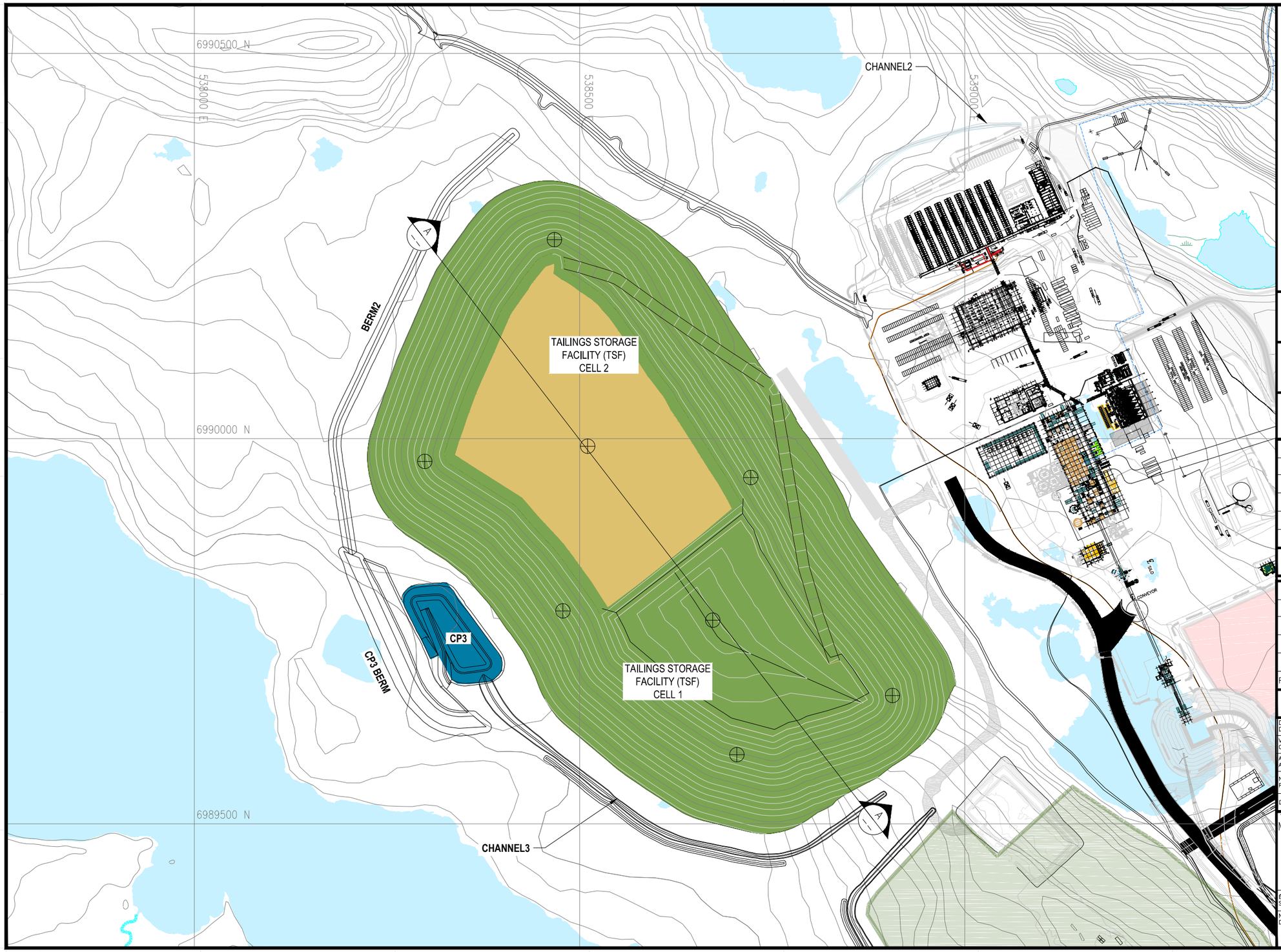

LEGEND

- WASTE ROCK
- ORE
- TAILINGS
- WATER COLLECTION POND
- PROPOSED GROUND TEMPERATURE CABLE LOCATION

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A	ISSUED FOR REVIEW	2018–11–05	

REVISIONS

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TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

YEAR 7

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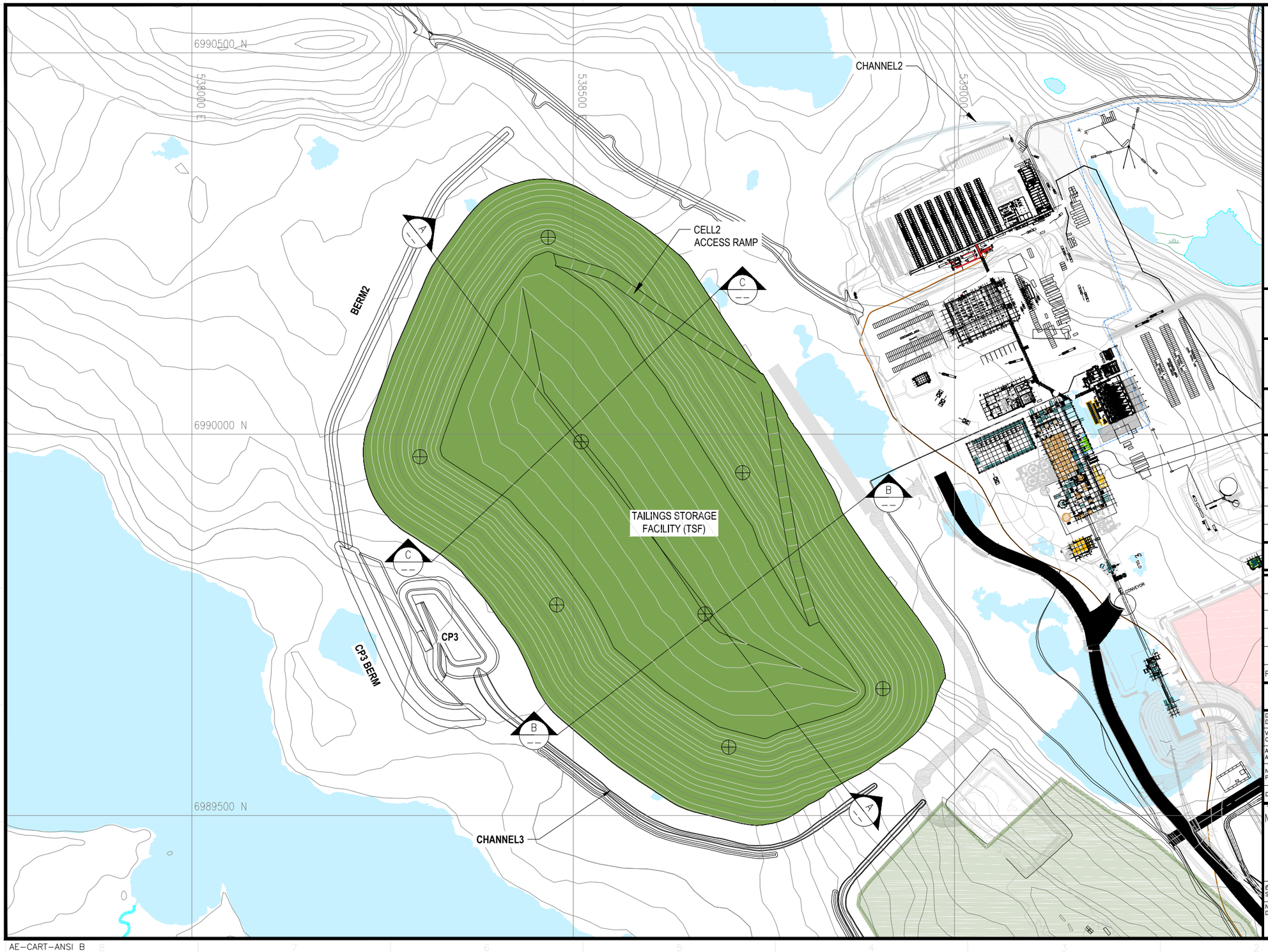

LEGEND

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- TAILINGS
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REVISIONS

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No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

CLOSURE

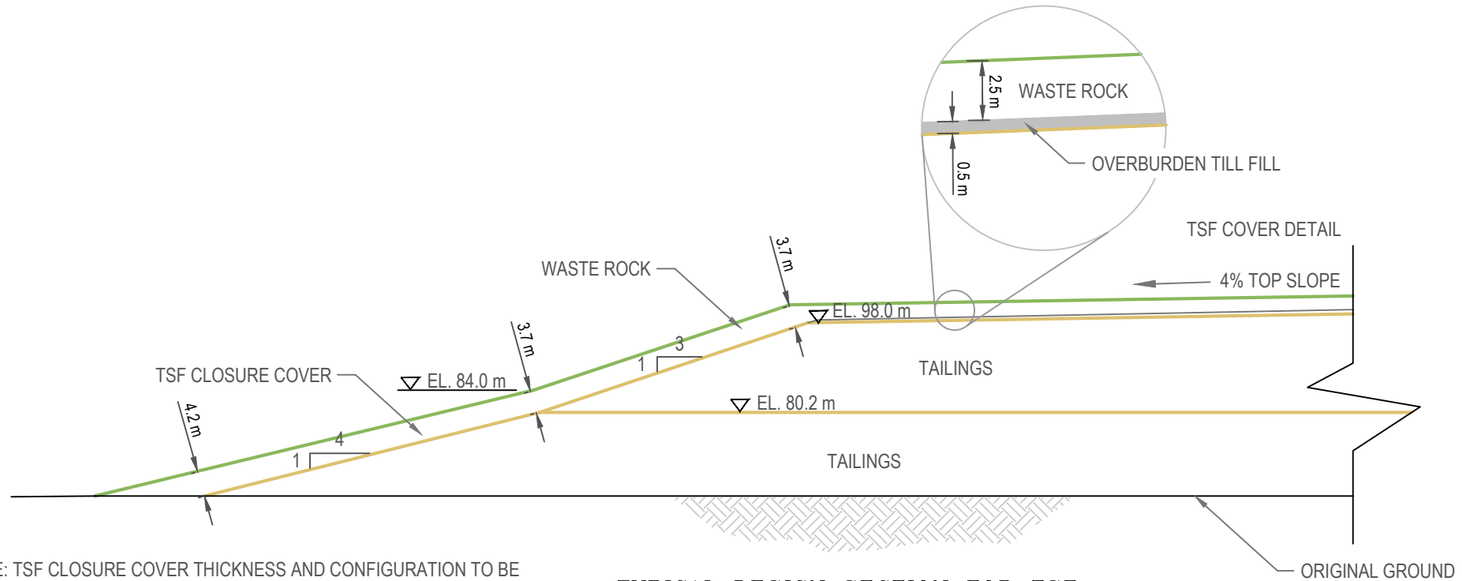
ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
No. DESSIN/ DRAWING NO.		REVISION	FEUILLE/SHT
6515–583–163–004		0	4 / 8

AE–CART–ANSI B

Q:\Edmonton\Engineering\E141\Projects_MELIADINE\2018 TSF & WRSF1\Figure 4.dwg–2013–02–19 14:03:29

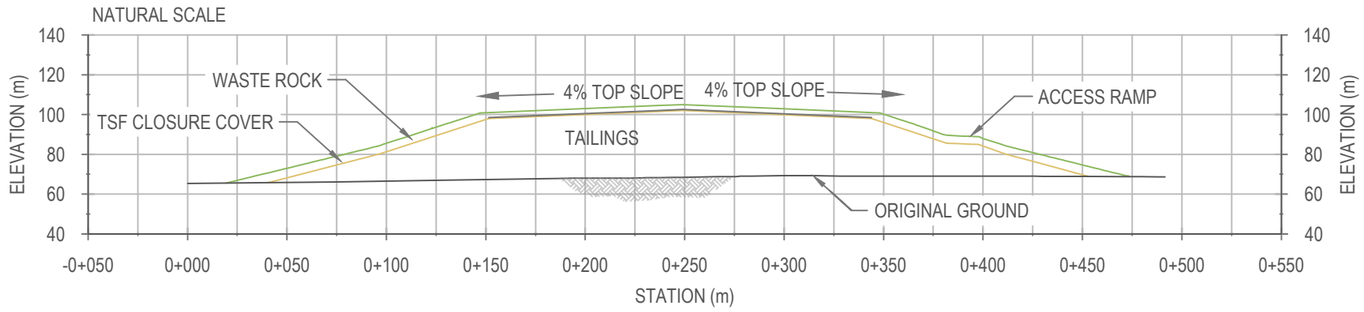
NO. DESSIN
DRAWING NO.

FORMAT ANSI B–11x17

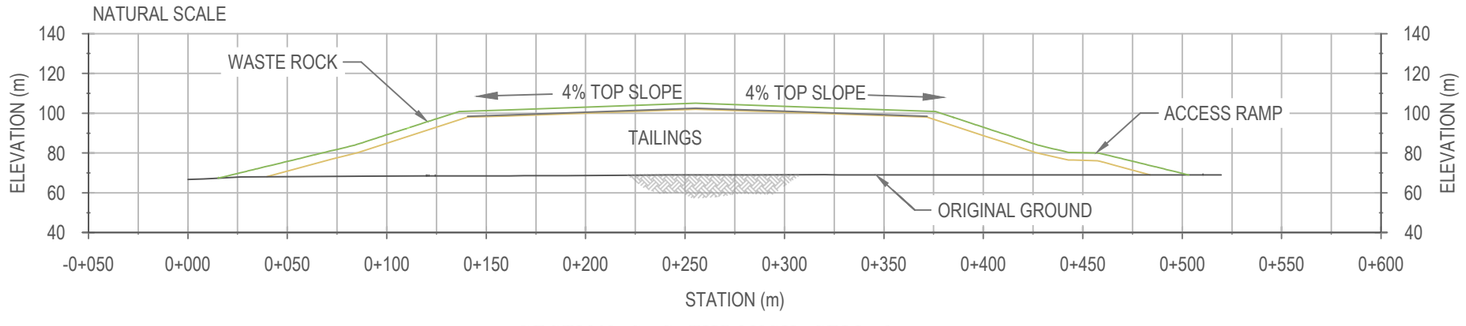


NOTE: TSF CLOSURE COVER THICKNESS AND CONFIGURATION TO BE FINALIZED DURING THE DEVELOPMENT OF THE FINAL CLOSURE COVER DESIGN PENDING PERFORMANCE MONITORING OF DRY STACKED TAILINGS FACILITY DURING OPERATION.

TYPICAL DESIGN SECTION FOR TSF



SECTION B–B THROUGH CELL 1



SECTION C–C THROUGH CELL 2

NOTES:

PERMIT TO PRACTICE
TETRA TECH CANADA INC.
Signature
Date Nov. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NWT/NU

AGNICO EAGLE

TETRA TECH

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 11/14/2018

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No. PROJET / PROJECT NO.

DATE

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

TYPICAL DESIGN SECTION OF TSF AND
SECTIONS B–B AND C–C THROUGH CELLS 1 AND 2

ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
No. DESSIN/ DRAWING NO. 6515–583–163–005		REVISION 0	FEUILLE/SHT 5 / 9

AE–CART–ANSI B

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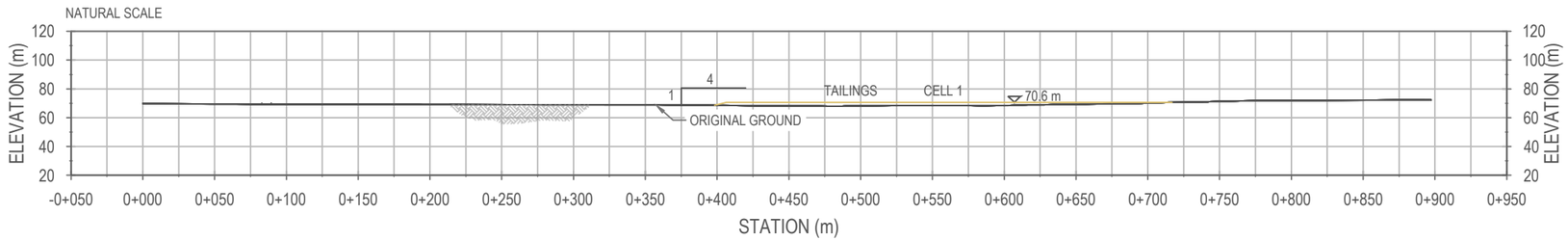
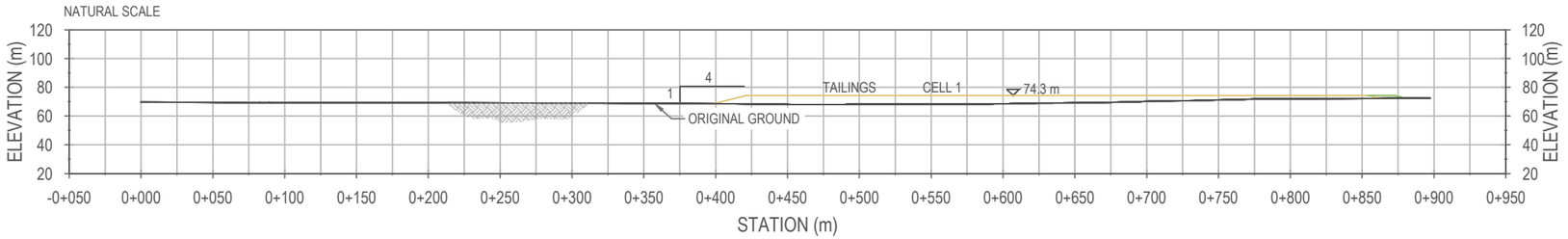
NO. DESSIN
DRAWING NO.

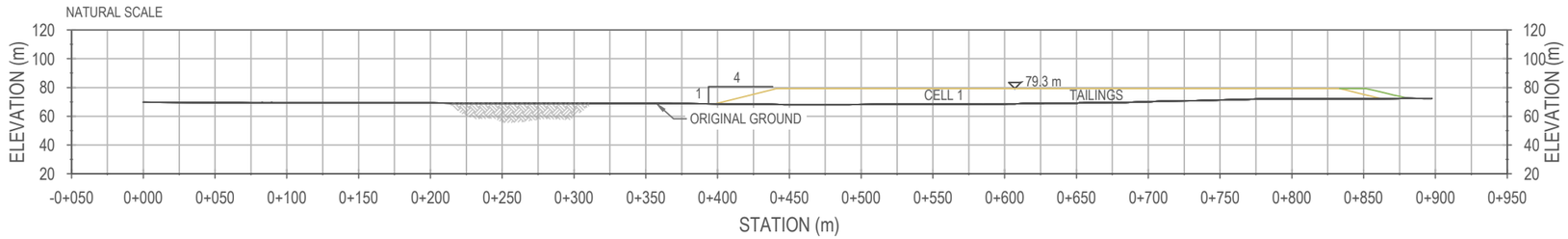
FORMAT ANSI B–11x17



SECTION A–A TSF DURING OPERATION (YEAR –1 SHOWN)



SECTION A–A TSF DURING OPERATION (YEAR 1 SHOWN)



NOTE: TSF CLOSURE COVER THICKNESS AND CONFIGURATION TO BE FINALIZED DURING THE DEVELOPMENT OF THE FINAL CLOSURE COVER DESIGN PENDING PERFORMANCE MONITORING OF DRY STACKED TAILINGS FACILITY DURING OPERATION.

SECTION A–A TSF DURING OPERATION (YEAR 2 SHOWN)

NOTES:

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TETRA TECH CANADA INC.
Signature
Date NOV. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

ENGINEERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NOV. 14, 2018
NWT/NU

AGNICO EAGLE

TETRA TECH

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FOR CONSTRUCTION
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A	ISSUED FOR REVIEW	2018–11–05	
REV	DESCRIPTION	DATE	PAR BY

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No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

SECTION A–A TSF DURING OPERATION
YEARS –1 to 2

ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
No. DESSIN/ DRAWING NO. 6515–583–163–006		REVISION 0	FEUILLE/SHT 6 / 8

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DRAWING NO.

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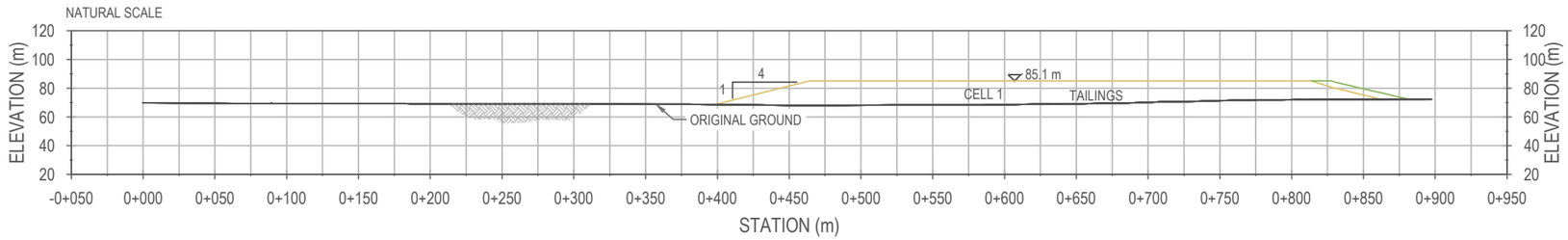
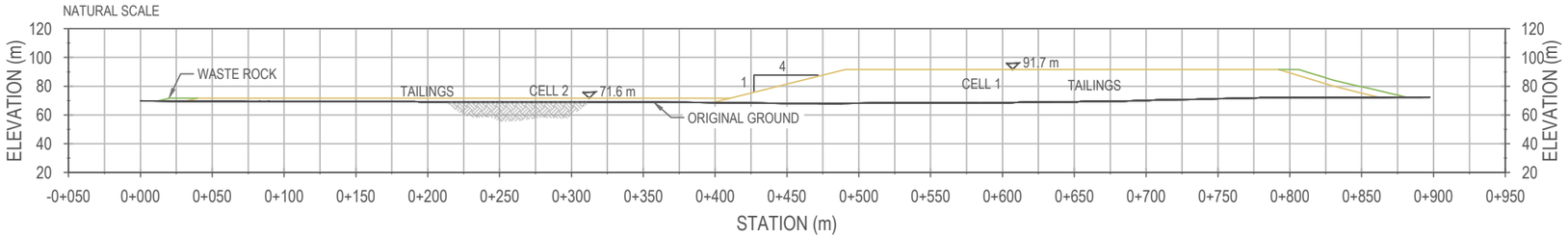
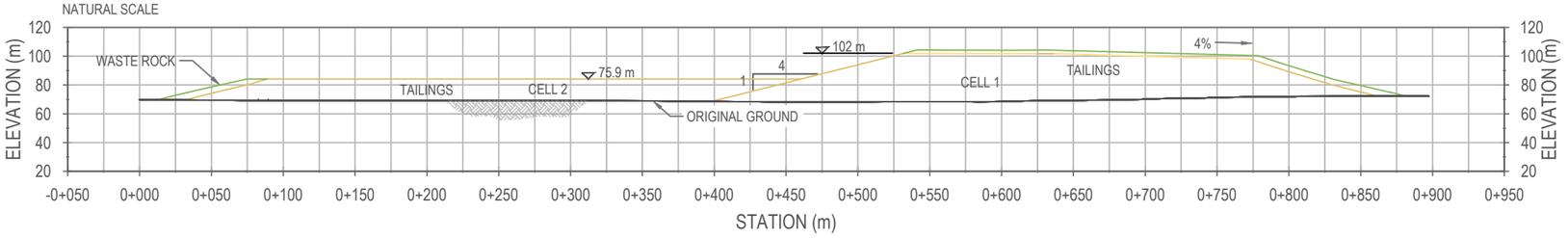


SECTION A–A TSF DURING OPERATION (YEAR 3 SHOWN)



SECTION A–A TSF DURING OPERATION (YEAR 4 SHOWN)



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SECTION A–A TSF DURING OPERATION (YEAR 5 SHOWN)

NOTES:

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Signature
Date NOV. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

REGISTERED PROFESSIONAL ENGINEER
G. ZHANG
LICENSEE
NOV. 14, 2018
NWT/NU

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DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

SECTION A–A TSF DURING OPERATION
YEARS 3 to 5

ÉCHELLE/ SCALE	FICHIER / FILE .DWG		
No. DESSIN/ DRAWING NO.		REVISION	FEUILLE/SHT
6515–583–163–007		0	7 / 8

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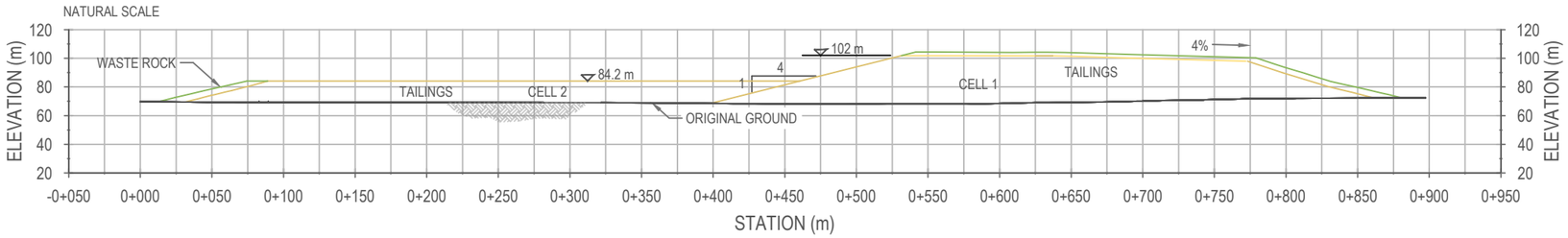
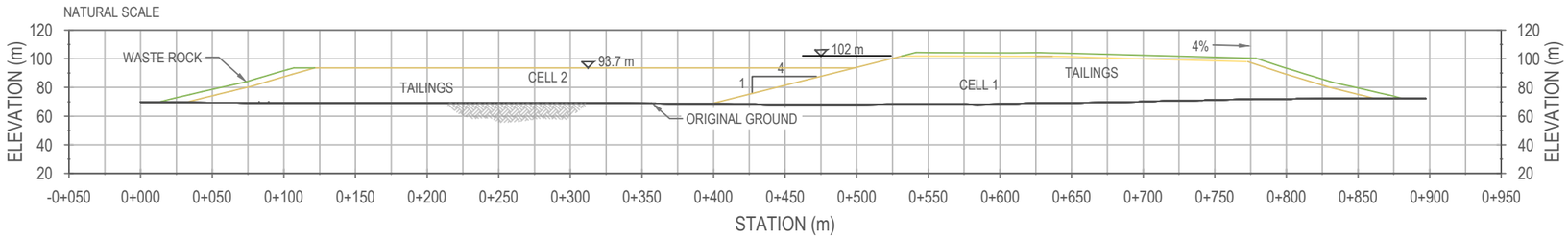
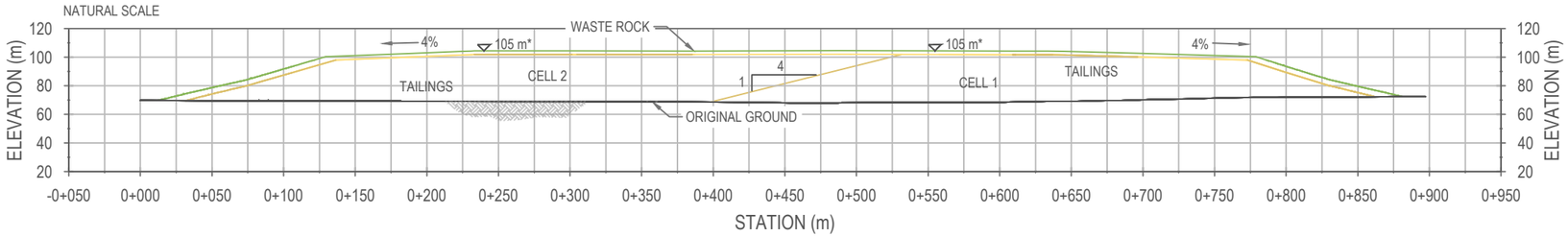


SECTION A–A TSF DURING OPERATION (YEAR 6 SHOWN)



SECTION A–A TSF DURING OPERATION (YEAR 7 SHOWN)



NOTE: * TSF CLOSURE COVER THICKNESS AND CONFIGURATION TO BE FINALIZED DURING THE DEVELOPMENT OF THE FINAL CLOSURE COVER DESIGN PENDING PERFORMANCE MONITORING OF DRY STACKED TAILINGS FACILITY DURING OPERATION.

SECTION A–A TSF DURING CLOSURE (YEAR 8 SHOWN)

NOTES:

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Date NOV. 14, 2018
PERMIT NUMBER: P 018
NT/NU Association of Professional Engineers and Geoscientists

ENGINEERED PROFESSIONAL ENGINEER G. ZHANG LICENSEE NOV. 14, 2018 NWT/NU

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No. PROJET / PROJECT NO.		
DATE		

TITRE / TITLE
MELIADINE TAILINGS STORAGE FACILITY DESIGN

SECTION A–A TSF DURING OPERATION
YEARS 6 to 8

ÉCHELLE/ SCALE	FICHIER FILE .DWG		
No. DESSIN/ DRAWING NO.		REVISION	FEUILLE/SHT
6515–583–163–008		0	8 / 8

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AGNICO EAGLE

MELIADINE GOLD PROJECT

Incineration Management Plan

FEBRUARY 2019
VERSION 6
6513-MPS-01

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ᐊᑦᓂᓄ ᐃᔨᒍ ᐅᓴᖅᑕᕆᐊᓕᓇᔨᓄᑦ (ᐊᑦᓂᓄᓄᑦ) ᑕᓯᔪᐊᖏᑦ ᔨᓗᒍᑦ ᐱᓕᕆᐊᖓᑦ (ᐱᓕᕆᐊᖅ), ᐃᓂᐅᔪᒋᑦᑐᖅ 25 ᑭᓪᓕᑦᓗᐊᓂᒃ ᐅᖓᑕᓯᐅᑎᔪᖅ ᐅᐊᖓᓇᖓᓂᑦ ᑲᖏᖅᓂᓂᐅᐳᑦ, ᐊᑦᓚᓗ 80 ᑭᓪᓕᑦᑐᓂᒃ ᐅᖓᑕᓯᐅᑎᑦᓴᓂ ᓂᕆᖅᐸᓯᐊᓂᑦ ᐅᐊᖓᓇᖅᐸᓯᐊᓂᑦ ᐃᒡᓗᓕᕆᔨᑦᐸ ᑭᓂᓇᖅᐳᑦ. ᐅᓴᖅᑕᕆᐊᖅ ᓄᓇᑦ ᐅᒃᑯᐃᖖᐊᓕᑦ ᐊᑦᓚᓗ ᓄᓇᐅᐸ ᐃᓗᐊᓂᑦ ᐅᓴᖅᑕᕆᐊᓂᒃᑯᑭᔪᑦ ᐱᓭᓪᓕᐊᓂᒃᑯᓂ ᑎᓴᓂᐊᖅ ᔨᓗᑕᓪᓂ, ᒪᑭᕐᓂᒃ ᓄᓇᑦ ᐅᒃᑯᐃᖖᐊᓂᒃ (ᑎᓴᓂᐊᖅ ᓄᓇᑦ ᐃᓗᓪᑐᖅᓯᒪᔪᖅ 1 ᐊᑦᓚᓗ ᑎᓴᓂᐊᖅ ᓄᓇᑦ ᐃᓗᓪᑐᖅᓯᒪᔪᖅ 2) ᐊᑦᓚᓗ ᐊᑕᐅᔪᖅ ᓄᓇᐅᐸ ᐃᓗᐊᓂᑦ ᐊᓴᖅᑕᓪᓗᑎᒃ.

ᑎᑎᖅᑲᖅ ᐱᔨᔪᑎᖃᖅᑐᖅ ᐃᑯᐊᓪᓕᔭᑎᓐᓇᖅᑎᑦ ᐊᐅᓪᓕᑎᓂᔪᑦ ᐸᖅᓇᐅᑎᑦ ᐱᓕᕆᐊᖏᑦ ᐋᖅᑭᒃᑯᔪᓂᓗ ᐃᓕᒋᐅᔾᐅᔨᒃ ᑎᑎᖅᑲᓇᑕ Type “A” ᐃᒪᖏᑦ ᓪᐃᔨᔪᒥᒃ ᑐᑦᔪᐅᑎᒍᑦ. ᑕᒪᓇ ᐸᖅᓇᐅᑎ ᐱᓕᕆᐊᖃᓪᓚᐅᖅᑐᖅ ᒪᓕᒃᓗᑎᓂ ᐱᐅᓪᓴᐃᖅᑎᑦ ᐊᐅᓪᓕᑎᓂᔪᑎᑦ ᐊᑐᖅᑕᐅᖅᑕᖅᑐᑦ, ᑲᓇᑕᐅᐸ ᐊᐸᑎᓕᕆᓇᔨᓄᑦᓯᑦ ᐊᑦᓚᓗ ᓱᓕᐅᐸ ᐊᓱᔨᖅᐸᓪᓕᐊᓱᓕᕆᓇᔨᓄᑦᓯᑦ *ᐱᓕᕆᐊᖏᑦᑎᒍᖅᑲᖅ ᐊᑎᑕᓱᓂᒃ ᐃᓱᐊᓪᓕᔭᑎᓐᓇᖅᑎᑦᓯᑦ*, ᐊᑦᓚᓗ ᒪᓕᒃᓗᑎᓂᒃ ᐱᓕᕆᐊᖏᑦ ᐱᓕᕆᐊᖃᓪᓚᐅᖅᑐᖅ ᐃᓱᐊᓪᓕᔭᑎᓐᓇᖅᑎᑦ ᐱᓕᕆᐊᖏᑦ ᐃᓱᐊᓪᓕᔭᑎᓐᓇᖅᑎᑦ.

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EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine Plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Incineration Management Plan for the Project and forms a component of the documentation series produced for the Type "A" Water Licence Application. This Plan was prepared in accordance with best management practices, Environment and Climate Change Canada's *Technical Document for Batch Waste Incineration,* and guidelines issued by the Nunavut Impact Review Board for the Project.

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act,* and the federal *Environmental Protection Act*. Performance limits for the incinerator at the Project will be in accordance with the emission guidelines set out by the Canadian Council of Ministers of the Environment. Ash produced from the incineration process will be disposed of in accordance with the *Nunavut Environmental Guideline for Industrial Waste Discharges*.

The Project is operating its incinerator based on Environment and Climate Change Canada's *Technical Document for Batch Waste Incineration*. In addition to incinerator technology, the implementation of a waste segregation program is limiting emissions (e.g., dioxins and furans, mercury) from the incinerator.

A typical modern controlled-air, batch, dual chamber incinerator has been installed model - ECO 1.75TN 1PVC100L 16-1MS. Critical process parameters, such as temperature, combustion air flow, and burner are computer-controlled to maintain optimal combustion conditions. The incinerator capacity is approximately 1,500 kilograms per day to accommodate predicted volumes of waste to be generated at the site. It is located in the waste management building[1] and operated by appropriately trained personnel.

Monitoring and testing is planned for incinerator stack emissions, along with the waste oil/fuel to be burned in the incinerator, and the incinerator ash.

To demonstrate conformity with performance limits, an annual incineration management report will be prepared and submitted as part of annual reporting to authorizing agencies. The quantity and type of materials incinerated on-site during operation, together with results from periodic stack emission

[1] Also known as the incinerator building.

and ash monitoring, will be included in the annual report. A report will also be provided, if necessary, to the National Pollutant Release Inventory. Finally, Agnico Eagle is committed to reporting greenhouse gas emissions in support of Canada's Voluntary Challenge Registry.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Incineration Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			DEIS re-submission; rebranding	
3	April 2014	7.4.2	15	Revision made to address review comments and commitments	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			First version of Supporting Documents for Type A Water Licence Application, submitted to Nunavut Water Board for review	John Witteman, Env. Consultant, Agnico Eagle
5	February 2018			Reviewed internally	Agnico Eagle Environment Dept.
6	February 2019			Reviewed internally (added changes that the construction phase brought and review of the grammatical tense)	Agnico Eagle Environment Dept.

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
CCME	Canadian Council of Ministers of the Environment
CEPA	Canadian Environmental Protection Act
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CWS	Canada-Wide Standards
ECCC	Environment and Climate Change Canada
GN	Government of Nunavut
IMP	Incineration Management Plan
Mine	Meliadine Gold Project

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, Nunavut, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The Mine Plan includes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

The Mine is expected to produce approximately 14.9 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 14.9 Mt of tailings. The following phased approach is proposed for the development of the development of the Tiriganiaq gold deposit;

- Phase 1: 3.5 years for Mine Construction (Q4 Year -5 to Year -1);
- Phase 2: 8.5 years for Mine Operations, beginning in 2019 (Q2 Year -1 to Year 8);
- Phase 3: 3 years Mine Closure (Year 9 to Year 11); and
- Phase 4: Post-Closure (Year 11 forwards).

Mining facilities on surface includes a plant site and accommodation buildings; two ore stockpiles; a temporary overburden stockpile; a tailings storage facility (TSF); three waste rock storage facilities (WRSFs); a water management system that includes collection ponds, water diversion channels, and retention dikes/berms; and a series of water treatments plants.

This document presents the annual revision of the Incineration Management Plan (Plan) to support the Type A Water Licence application for the Project.

The purpose of the Plan is to provide consolidated information on the specifications, operations, management, monitoring, and reporting of the incinerator process proposed for the Project. This Plan will be reviewed and updated on a regular basis to reflect changes to the Project.

1.1 Concordance with Project Guidelines

This document was developed under the Guidelines for the Preparation of an Environmental Impact Statement for Agnico Eagle Mines Limited's Meliadine Project (the Guidelines) issued by the Nunavut Impact Review Board for the Project (NIRB, 2012), and specifically those relating to the presentation of the Plan in Section 9.4.9 of the Guidelines. In addition, this Plan has been developed to be consistent with the guidance provided in the Environment and Climate Change Canada's (ECCC) Technical Document for Batch Waste Incineration (EC, 2010). It is one in a series of environmental management plans that have been prepared for the Project. All are included under the umbrella Environmental Management and Protection Plan.

1.2 Linkages to Other Management Plans

Documents included in the application package of this Type A Water Licence, which support this Plan include the:

- Environmental Management and Protection Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan; and
- Preliminary Closure and Reclamation Plan.

The Occupational Health and Safety Plan, submitted with the FEIS also supports this Plan (Agnico Eagle, 2014).

SECTION 2.0 • BACKGROUND INFORMATION

At the Project site, all wastes are safely managed from the time they are produced to their final disposal. All waste are segregated at the mine site and are predominately landfilled, incinerated, or recycled. Used oil burning will be maximized as much as possible using the second chamber of the incinerator. Remaining wastes, including hazardous waste[2], are packaged for shipment to a certified waste management facility for treatment, recycling, and/or disposal.

Incineration is an essential part of waste management at the mine site. The incineration of acceptable solid waste from the accommodation complex, kitchen, lunch rooms, shops, warehouses, and offices diverts waste from directly reporting to the on-site landfill. It has the advantage of eliminating putrescible waste that could potentially attract wildlife to the landfill, thereby reducing possible dangerous interactions between humans and wildlife.

The objectives of this Plan are summarized as follows:

1) To understand the quantity and composition of the waste generated at the mine site, and separate waste acceptable for incineration from waste that is not;
2) To operate the batch waste incinerator based on the characteristics and quantity of waste, and to locate it in an appropriate building away from other site infrastructure;
3) To properly maintain the incinerator's functionality;
4) To operate the incinerator for optimal combustion, and avoid the formation of dioxins and furans in the combustion process;
5) To safely handle and dispose of incinerator residues; and
6) To establish a record keeping system for managing the facility and for future reporting.

As a component of the Project Environmental Management System, the Plan will be updated to ensure that site experience is reflected in the Plan and subsequently communicated to all parties. The Project Environment Superintendent or designate is responsible for managing and implementing the IMP.

2.1 Incinerator Location

The incinerator is located in its own building on the south end of the industrial pad, down-wind of other mine infrastructure.

[2] Please refer to the Hazardous Materials Management Plan for further information on the handling and management of hazardous waste.

SECTION 3 • REGULATORY SETTING

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act,* and the federal *Environmental Protection Act*. Various regulations and guidelines under these Acts, as well as guidelines developed by the Canada Council of Ministers of the Environment (CCME), were reviewed in preparing the Plan. They are as follows:

- *Canadian Environmental Protection Act* (CEPA)
    - Schedule 1: List of Toxic Substances
    - *Interprovincial Movement of Hazardous Waste Regulations*
    - *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*
- ECCC Technical Document for Batch Waste Incineration (EC, 2010)
- Canada-Wide Standard for Dioxins and Furans (CCME, 2001a)
- Canada-Wide Standard for Mercury (CCME, 2000)
- Northwest Territories *Environmental Protection Act*
    - *Used Oil and Waste Fuel Management Regulations*
- Nunavut *Environmental Protection Act*
    - Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (GN, 2011b)
    - Environmental Guideline for the Burning and Incineration of Solid Waste (GN, 2012)
    - Environmental Guideline for Ambient Air Quality (GN, 2011)
    - Environmental Guideline for Mercury-Containing Products and Waste Mercury (GN, 2010)
- Nunavut *Public Health Act*

Provincial and/or territorial regulations that pertain to emissions from incinerators were not found for Nunavut or the Northwest Territories. Therefore, performance limits for the incinerator at the Project will be in accordance with the emission guidelines set out by the CCME: Canada-Wide Standard for Dioxins and Furans (CCME, 2001a), and Canada-Wide Standards for Mercury Emissions (CCME 2000).

The management of used oil is regulated in the Northwest Territories through the *Used Oil and Waste Fuel Management Regulations* (NWT, 2012; Reg. 064-2003). In the absence of Nunavut guidelines/regulations pertaining to used oil and waste fuel, the Northwest Territories regulations will be followed for the Project.

Ash produced from the incineration process will be disposed of in accordance with the Nunavut Environmental Guideline for Industrial Waste Discharges (GN, 2014).

SECTION 4 • BACKGROUND INFORMATION

4.1 Dioxins and Furans

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, commonly known as dioxins and furans, are toxic, persistent, and bioaccumulative chemicals. Their presence in the environment results predominantly from human activity. The biggest source of dioxins and furans in Canada is the large-scale burning of municipal and medical waste. Other major sources include:

- the production of iron and steel;
- backyard burning of household waste, especially plastics;
- fuel burning, including diesel fuel and fuel for agricultural purposes and home heating;
- wood burning, especially if the wood has been chemically treated;
- electrical power generation; and
- tobacco smoke.

Due to their environmental persistence and ability to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under the CEPA, the Environment Canada Toxic Substances Management Policy (EC, 2004) and the CCME *Policy Statement for the Management of Toxic Substances* (CCME, 1998).

4.2 Mercury

Mercury is a naturally occurring substance, which can be transformed through biological processes to methyl mercury, a persistent substance which bioaccumulates in the food chain and is particularly toxic to humans and wildlife. Mercury contamination originates from natural and anthropogenic sources, the latter including combustion of waste. Under a variety of regional, national, bi-national, and internal programs, treaties and agreements, mercury is being targeted for emissions reductions consistent with the CCME *Policy Statement for the Management of Toxic Substances* (CCME, 1998), which identifies that mercury shall be managed through its lifecycle to minimize release.

4.3 Used Oil and Waste Fuel

The following definitions are provided in the *Used Oil and Waste Fuel Management Regulations*.

Used Oil: Any oil, including lubrication oil, hydraulic fluids, metal working fluid, and insulating fluid, that is unsuitable for its intended purpose due to the presence of impurities or the loss of original properties, but does not include waste oil derived from animal or vegetable fat, a petroleum product spilled on land or water, or waste from a petroleum refining operation.

Waste Fuel: A flammable or combustible petroleum hydrocarbon, with or without additives, that is unsuitable for its intended purpose due to the presence of contaminants or the loss of original properties, and includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha, and fuel oil, but does not include paint, solvent, or propane.

SECTION 5 • PERFORMANCE LIMITS

5.1 Incinerator Selection

The Project selected its incinerator based on Environment and Climate Change Canada's *Technical Document for Batch Waste Incineration*. The incinerator for the Project is a camp waste incinerator (model no. ECO 1.75TN 1PVC100L 16-1MS) from Eco-Waste Solutions. The incinerator complies with the guidelines listed in Table 5-1, where the maximum emissions are expressed as a concentration in the exhaust gas exiting the facility's stack. The specifications of the incinerator are available in Appendix A. In addition to incinerator technology, the implementation of a waste segregation program limits emissions of dioxins and furans, and mercury from the incinerator.

Table 5-1 Emission Regulations for Solid Waste Incinerators

Emissions	Sector	Guideline (max)[a]	Units	Reference
Dioxins and Furans	Municipal Solid Waste[b]	80	pg I-TEQ/Rm^3	CCME 2001a
Dioxins and Furans	Sewage Sludge Incineration	80	pg I-TEQ/Rm^3	CCME 2001a
Mercury	Municipal Waste	20	µg/Rm^3	CCME 2000
Mercury	Sewage Sludge Incineration	70	µg/Rm^3	CCME 2000

[a] Stack concentrations are corrected for 11% oxygen.

[b] According to the Canada-Wide Standards (CWS), "municipal solid waste" includes any waste that might be disposed of in a non-secure landfill site if not incinerated (i.e., non-hazardous wastes regardless of origin), but does not include "clean" wood waste.

Compliance to these performance limits are confirmed with annual stack testing.

5.2 Used Oil and Waste Fuel

Agnico Eagle manages used oil and waste fuel according to the *Used Oil and Waste Fuel Management Regulations* (NWT, 2012) as presented in Table 5-2.

Table 5-2 Summary of Used Oil and Waste Fuel Regulations

Activity	Summary of Regulations
Registration	• Waste oil burner shall be registered with the Chief Environmental Protection Officer.
Disposal	• Used oil/waste fuel will not be disposed of directly into the environment.
Storage	• Used oil/waste fuel will be stored in specifically designed container for hydrocarbons to minimize the risk of spills; • Used oil/waste fuel containers will be periodically inspected for leaks or potential leaks; and • Used oil/waste fuel will be stored as per the Hazardous Materials Management Plan.

Sampling and Analysis	• A sample of one month's feedstock of used oil/waste fuel is required to be tested at least once a year;
	• Used oil/waste fuel will be tested for:
	  • Flash point; and
	  • Existence and amount of each impurity Listed in Table 5-3.

Burning	• Used oil/waste fuel will not be openly burned; • Used oil will not be burned in accommodation areas; • Used oil with a flash point of less than 37.7°C will not be burned or blended with another used oil/waste fuel; • Used oil that exceeds guidelines will not be burned; and • A 14-day notice will be given for the burning of waste fuel.

Records	• The following will be recorded in association with the incineration of used oil/waste fuel:
	  • Volume of used oil/waste fuel generated;
	  • Volume of used oil/waste fuel incinerated/consumed;
	  • Name and address of person in charge, management or control of the used oil;
	  • Location of production of used oil/waste fuel;
	  • A summary of maintenance performed on used oil/waste fuel burners or processing equipment; and
	  • Volume and nature of the products produced from the used oil.

Table 5-3 summarizes the maximum level of contaminants in used oil that can be incinerated as stipulated in the *Used Oil and Waste Fuel Management Regulations* (NWT, 2012). Under the regulations blending of used oil that exceeds one of more of the criteria listed in Table 5-3 is not allowed.

Table 5-3 Used Oil Impurity Limit

Impurity	Maximum Level Allowed in Used Oil (ppm)
Cadmium	2
Chromium	10
Lead	100
Total Organic Halogens (as Chlorine)	1,000
Polychlorinated Biphenyls	2

5.3 Incinerator Ash

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials, the incinerator ash should be non-hazardous. Even small quantities of hazardous waste, such as batteries, should not be mixed with waste to be incinerated. The purpose of sampling ash is to determine its acceptability for disposal in the landfill, pursuant to the GN Environmental Guidelines for Industrial Discharge (GN, 2011b). No sampling frequency is specified in those guidelines. To ensure compliance with the Guideline parameters, ash will be sampled quarterly by Agnico-Eagle. Should an exceedance be measured, an investigation will be undertaken to identify the cause and eliminate the source for this exceedance. Agnico-Eagle may increase the testing frequency of the ash following the exceedance. Ash with metals concentrations exceeding the GN Guidelines will be buried within the Tailings Storage Facility (TSF). If deemed necessary, the ash will be packaged in drums to be sent to a certified waste management facility for appropriate treatment, recycling, and/or disposal.

SECTION 6 • INCINERATOR SPECIFICATIONS AND OPERATION

The Project has selected a dual chamber, high-temperature incinerator as the primary incinerator. The technical specifications are included in Appendix A. The incinerator is housed inside a separate building with sufficient floor space to manage all Project wastes in one convenient location.

6.1 Incinerator Specifications

Typical modern, controlled-air, batch, dual chamber incinerators are design using the principles of pyrolysis (starved-air burning condition) in the primary chamber and complete oxidation (high temperature, excess oxygen, and sufficient combustion time) in the secondary chamber. The incineration system is a two-stage process. In the first stage, waste is converted to gas in the primary chamber at approximately 650 to 850 degrees Celsius (°C). This process is self fueling until the volume is reduced by 90 %. Gasses from the primary chamber enter the secondary chamber of oxygen-rich and turbulent conditions, which is typically at a higher temperature – around 1,000°C. Combustion is complete after a retention time of about two seconds. The temperature of combustion gases exiting the stack is anticipated to exceed 700°C and to flash cool in the ambient air, thereby leaving little opportunity for the *de novo* synthesis of dioxins/furans. Heat capture is not used on the exhaust gases.

Critical process parameters, such as temperature, air flow, and burner output is computer-controlled to maintain optimal combustion conditions.

For an incinerator capacity suitable for the predicted volumes of waste to be generated at the Project, the total particulate matter generated is expected to be extremely low. Therefore, dust collection technologies, such as baghouse filters, will not be necessary, as very minor amount of fly ash will be generated. Ash residues generated in the primary chamber are manually removed on a daily basis using a shovel emptied into a metal bin.

6.1.1 Operation Procedures

General operating procedures for the incinerator include:

1. Sort the waste on the basis of origin and heating value. Food waste and waste that has been in contact with food will have priority for incineration.
2. Mix the waste to ensure a calorific value within the incinerator's specification and to achieve good combustion inside the primary chamber.
3. Observe the start of the burn cycle to ensure the incinerator is operating correctly.
4. The door to the incinerator is only opened after the burn cycle is complete and the unit cooled.
5. The ash is removed from the incinerator before it is charged with the next load of waste to be incinerated.
6. The ash is placed in bins digitated for ash.

7. The ash is disposed of in the on-site landfill. If the concentration of trace metals exceeds the Government of Nunavut's *Environmental Guideline for Industrial Waste Discharges* (GN, 2014), ash will be either packaged and sent to an approved disposal facility or buried in the dry stack tailings.

The system has a sizable front door for easy access to manually load/feed waste into the unit with a front-end loader. The proposed waste streams are layered wherever possible during loading to ensure proper combustion.

6.1.2 Emissions

The incinerator is designed to meet performance limits described in Section 5.1. Good engineering practices will be used to ensure required incineration temperatures and dispersion of gases meet applicable air quality standards/guidelines.

The incinerator stack design incorporates appropriate sampling ports, with caps where necessary, at appropriate locations to allow for stack testing to be undertaken during incinerator operation.

6.1.3 Dust/Odour Control Measures

Modern incinerators are commonly designed such that the non-turbulent atmosphere in the primary burn chamber reduces the formation of particulate matter. Therefore, the need for additional dust and/or odour control measures is not anticipated. Organic/putrescible wastes will be given incineration priority to limit odours.

6.1.4 Staffing and Equipment

The computerized incinerator typically requires one operator to interact with the equipment for approximately 1 to 1.5 hour per day, largely for ash removal, loading, and start-up. Operators are not typically required to be in attendance during the rest of the operation, as it is normally a fully automated process. The incinerator is designed, installed and operated so that the operators are not exposed to high temperatures during loading or ash removal due to complete cool down after the burn cycle. Also, the waste is not allowed to combust until the chamber is sealed thus isolating the worker from smoke and high temperatures.

6.1.5 Inspections

Weekly inspections will be undertaken of the incinerator building for cleanliness and the proper management of wastes delivered to the facility. The Environment Department will carry out the inspections.

6.2 Used Oil and Waste Fuel

The incinerator is able to efficiently burn used oil and waste fuel. A quantity of about 365,000 litres of used oil and waste fuel may be incinerated per year. The quantity of waste fuel is expected to be small and will be dependent on the adherence to standard operating procedures. The goal is to avoid

practices that could result in waste fuel. The principal sources of the used oil will be from oil changes on the mining equipment and light vehicles, as well as oil changes to mechanical gearboxes within the mill. Typical used oil and waste fuel furnaces include a storage tank and a filter to recover sludge prior to burning. Sludge collected in the filters will be drummed and shipped, as needed, to a certified waste management facility for treatment, recycling, and/or disposal.

6.3 Shipboard Incinerator

See Section 8 of the Shipping Management Plan (Agnico Eagle, 2018).

6.4 Closure Plan

In accordance with the Preliminary Closure and Reclamation Plan, salvageable buildings and surface structures, including the incinerator and waste management building, will be dismantled and demobilized from the site.

SECTION 7 • WASTE MANAGEMENT

One method of waste reduction is by implementing purchasing policies that focus on reduced packaging. Reduce, reuse, and recycle initiatives as well as the waste segregation program at the Project as per the Landfill and Waste Management Plan minimizes the quantity of waste incinerated or directed to the landfill.

7.1 Approach

A waste segregation program is implemented at the site. This allows materials that are unsuitable for incineration to be either landfilled on-site or shipped off-site to a certified waste management facility for treatment, recycling, and/or disposal.

7.2 Acceptable Waste for Incineration

Acceptable wastes for incineration will include the following:

- organic matter including food;
- food containers and wrappings, including plastics that are contaminated by food;
- medical waste from the Health Care Station;
- paper, cardboard, and the like;
- hydrocarbon spill absorbents;
- plastic and Styrofoam except plastic containing chlorine;
- dead animals; and
- used oils and waste fuel.

7.3 Unacceptable Waste for Incineration

Materials that are not listed above would be unacceptable for incineration. These materials include, but are not limited to:

- chlorinated plastics;
- inert materials, such as concrete, bricks, ceramics, ash, asbestos, drywall;
- bulky materials such as machinery parts or large metal goods such as appliances;
- radioactive materials, such as smoke detectors and laboratory wastes;
- potentially explosive materials, such as propane tanks, other pressurized vessels, unused or ineffective explosives;
- hazardous materials such as organic chemicals (pesticides), other toxic substances (arsenic, cyanide);
- electronics;
- batteries;
- vehicles and machinery;
- fluorescent light bulbs;

- whole tires;
- paint and solvents;
- any materials containing mercury, lead, and cadmium;
- used oil or waste fuel that exceeds the maximum impurity limits for parameters listed in Table 5-3;
- waste oil and waste fuel with a flash point of less than 37.7°C; and
- propane.

7.4 Waste Volumes

7.4.1 Solid Waste and Incinerator Ash

The number of people working on-site and the activities occurring at the time have a direct bearing on the volume of waste destined for the landfill, the incinerator, and the amount removed from waste streams for reuse and recycling.

It has been assumed that each person will produce 1 tonne of refuse per year[3]. Mean camp populations of approximately 200 during construction, 680 during operation, and 50 during closure have been estimated. Fifty percent of the refuse by weight can be incinerated, approximately 30% of incinerated material by mass is converted into ash, thereby reducing the mass of waste by approximately 70 %. Thus for 680 workers, the annual quantity of ash during 8 years of operations would be about 105 tonnes. Table 7-1 estimates the annual tonnes of ash resulting from incineration for each project phase, based on the number of people on site, and cumulatively over the life of mine.

Table 7-1 Estimation of Ash over the Life of the Project

Project Phase	Workers On-Site	Annual Tonnes of Waste Incinerated	Annual Tonnes of Ash	Numbers of Years	Cumulative Tonnes of Ash
Construction	200	100	30	4	120
Operation	680	340	102	8	816
Closure	50	25	7.5	3	22.5
Total					**958.5**

[3] Environment and Climate Change Canada's "State of the Environment InfoBase", Environmental Indicator Series 2003 (http://www.ec.gc.ca), indicates that the per capita non-hazardous solid waste generation in 2000 for Canada was almost 1 tonne per person per year.

7.4.2 Used Oil and Waste Fuel

Approximately 365,000 litres of used oil is anticipate to be used in the incinerator for burning the waste. This is based on the maximum capacity of the incinerator burn rate which is approximately 1000 litres/day. The quantity of waste fuel is expected to be small but may vary between years.

7.5 Waste Incineration Rate

Due to the predicted volumes of waste to be generated at the site, the incinerator will have an approximate incineration capacity of 1,750 kilogram per day. If this cannot be achieved due to a lower volume of waste, the primary chamber could be used as storage of wastes until the desired volume is reached. These wastes will primarily associated with food and small amount of medical waste. The batch cycle will be 6 to 10 hours for the burn cycle, followed by a cool-down of 6 to 8 hours.

SECTION 8 • MONITORING AND TESTING

The following presents the monitoring and testing plan for the incinerator.

8.1 Incinerator Emissions Testing

The incinerator stack design incorporates appropriate sampling ports at appropriate locations, in a right angle configuration, to allow for stack testing to be undertaken during incinerator operation. Table 8-1 summarizes the frequency of testing that will be completed as per relevant guidelines (see also CCME, 2001b). Details of the monitoring program are outlined in Appendix B

Table 8-1 Summary of Incinerator Emissions Testing

	Frequency	Number of Test Required	Reference
Dioxins and Furans	Annual	3	CCME 2001a
Mercury	Annual	3	CCME 2000

8.2 Used Oil/Waste Fuel Testing

A sample of used oil/waste fuel feedstock will be collected each month with one of the monthly samples being tested each year. Used oil/waste fuel not meeting impurity limits or having a flash point less than 37.7°C will be drummed and shipped to a certified management facility for re-refining, treatment, recycling, and/or disposal.

8.3 Ash Testing

An ash testing protocol is implemented on site to ensure that the incinerator ash is suitable for disposal in the landfill. Ash is disposed of and then covered immediately to prevent mobilization.

Ash samples are collected and tested quarterly and compared to the regulatory requirements as outlined in Table 8-2.

If monitoring indicates the ash is above the guidelines and not suitable for landfilling, an investigation will be undertaken to identify the cause and eliminate the source for the exceedance. If deemed necessary, the ash will be packaged in drums and sent to a certified waste management facility for treatment, recycling, and/or disposal.

Table 8-2 Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities

Parameter	Maximum Concentration (mg/L)
Arsenic	2.5
Barium	100
Cadmium	0.5
Chromium	5
Lead	5
Mercury	0.1
Selenium	1
Silver	5
Zinc	5

SECTION 9 • REPORTING

As part of the annual reporting, results from periodic stack emissions and ash monitoring, will be provided.

9.1 National Pollutant Release Inventory

The National Pollutant Release Inventory is a Canadian database containing information on the annual on-site release of specific substances to the air, water, and land from industrial and institutional sources (EC, 2012). The National Pollutant Release Inventory provides a list of tracked substances and requirements for reporting incinerator emissions. Table 9-1 lists the substances under the National Pollutant Release Inventory that the Project expects to report annually. In addition, there are certain substances, as indicated in Table 9-1 that may require reporting depending on the quantity of incinerator emissions. Whether or not reporting is necessary will depend on results of periodic stack emission testing data and the quantity of annual emission calculated with emissions factors.

Table 9-1 National Pollutant Release Inventory Incineration Reportable Substance List

Substance	Note
Hexachlorobenzene	Required to report
Dioxins and Furans	
Carbon Monoxide	Required to report if released to air from facility in a quantity of 20 tonnes or more per annum
Oxides of Nitrogen	
Sulphur Dioxide	
Total Particulate Matter with diameter <100 microns	
Particulate matter with diameter less than or equal to 10 microns (PM_{10})	Required to report if released to air from facility in a quantity of 0.5 tonne or more per annum
Particulate matter with diameter less than or equal to 2.5 microns ($PM_{2.5}$)	Required to report if released to air from facility in a quantity of 0.3 tonne or more per annum

9.2 Greenhouse Gas Emissions and Global Warming

Agnico Eagle is committed to reporting greenhouse gas emissions in support of Canada's Greenhouse Gas Reporting Program.

SECTION 10 • PLAN REVIEW AND ADAPTIVE MANAGEMENT

The Plan is updated regularly to reflect the operating conditions at the Project during construction, operation, and closure. The Plan is reviewed annually and an updated version will be produced every two years of operation at a minimum.

The up-to-date Plan is made available by Agnico Eagle at all times for review by the Government of Nunavut, Kivalliq Inuit Association, Nunavut Water Board, and Crown-Indigenous Relations and Northern Affairs Canada (formerly Aboriginal Affairs and Northern Development Canada and Indigenous and Norther Affairs Canada).

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APPENDIX A • TECHNICAL SPECIFICATIONS OF THE INCINERATOR

AGNICO EAGLE

Vendor Document Status

1 ☐ **Proceed to next submission and status.**

2 ☐ **Proceed with exceptions as noted to next submission and status.**

3 ☐ **Do not proceed.**
Revise as noted and resubmit next submission and status.

4 ☑ **Complete, no further submission required.**

By: Dominique Richard — Signature numérique de Dominique Richard Date : 2017.09.25 11:37:18 -04'00' **Date:**

Review and authorization to fabricate are only for general conformance with the design concept of the Project as expressed in the Contract Documents. Sole responsibility for the accuracy and completeness of this document, including but not limited to dimensions and quantities, remains with the Supplier/Contractor. Agnico Eagle does not warrant the accuracy or completeness of any of the information contained herein, nor does Agnico Eagle authorize or approve any construction means, methods, techniques, sequences or any safety precautions or procedures.

Agnico Eagle No. 6515-S-265-008-154-MNL-0002 **R:** Sub002

DOCUMENT FOR INFORMATION

Bolts and torques for breech and stack installation pg.33 & pg.35
Capacity typo corrected pg.47
Table of content added
Parts list added pg.123-128
Stack erection revised pg.35&36

ECO WASTE SOLUTIONS

Meliadine Incinerator
ECO 1.75TN 1PVC100L
16-1MS

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ECO WASTE SOLUTIONS

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SECTION 1

HEALTH & SAFETY PRECAUTIONS

Health and Safety Precautions

This machine has a number of energy sources:

e.g. Electricity
Heavy mechanical parts which may move due to gravity
High Temperature
Explosive Gases
Flammable Liquids



- **THE INCINERATOR HAS THE POWER TO CAUSE SERIOUS INJURY OR DEATH**
- **KEEP CLEAR OF ANY MOVING PARTS AT ALL TIMES**
- **BEFORE STARTING THE CYCLE ENSURE THAT ALL PERSONNEL ARE CLEAR OF THE INCINERATOR**
- **DO NOT ATTEMPT TO START OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL IS READ THOROUGHLY AND IS UNDERSTOOD**.
- **RESPONSIBILITY FOR THE SAFE OPERATION AND MAINTENANCE OF THE EQUIPMENT SUPPLIED RESTS SOLELY ON THOSE OPERATING IT.**

OBEY THE FOLLOWING SAFETY INSTRUCTIONS:



A qualified person is a person whom the owner of the equipment deems as having the required experience, training and skills to perform the required work.

1. Keep the electrical panel doors closed at all times except when doing electrical trouble-shooting.
2. Allow only qualified people to perform maintenance and troubleshooting on the machine.
3. Open and lockout the Main Disconnect Switch on the electrical control panel while working on the machine.
4. Do not bypass or tie down any of the door safety switches.
5. Do not open any of the doors while the Primary or Secondary Chambers are above 90^0C
6. Do not enter the chamber unless the Emergency Stop Button is pushed in
7. When opening or closing the chamber door keep clear of the door and ensure that the path for the door is clear.
8. Secure the chamber door when it is open so it cannot move accidentally.
9. Immediately correct any fuel leaks.
10. Do not fill the Primary Chamber more than ¾ full. Overfilling can result in poor burning and damage to the oxidizer.
11. Use proper tools, wear goggles, dust mask and gloves while loading and cleaning the oxidizer.
12. This unit is a confined space. Follow the safety rules for working in a confined space.
13. Ensure that all personnel who are going to operate or work on the machine read and understand the above points and are trained in the operation and maintenance of the machine.

SECTION 2

GENERAL DESCRIPTION

General Description - Thermal Oxidation Concept

The **ECO 1.75 TN 1PVC100L Incinerator system** consists of a **Primary Chamber** and a **Secondary Chamber** (also known as the Afterburner). Both chambers are vessels constructed of steel with a special insulating liner known as refractory.

The **Primary Chamber** has **Hydraulic Roof Lifters** installed for loading of the waste material from the top of the **Primary Chamber** and the front door is used for the removal of residual ash.

The waste material is loaded into the **Primary Chamber** until it is ¾ full. Once ¾ full the **Primary Chamber** is sealed and the combustion cycle begins. This type of system is known as *batch-fed* processing.

Primary Chamber

In the first stage, a burner is used to elevate the temperature of the **Primary Chamber** to ignite the waste. Once the **Primary Chamber** reaches a temperature of approximately 650-850°C, the burn process becomes self-fuelling and the burner will shut off. To save fuel and control temperatures, only when the energy contained within the waste is depleted, will the burner periodically turn on. At these operating temperatures, waste is allowed to fully combust and is rendered sterile.

The **Primary Chamber** operates under *controlled temperature* conditions. The amount of heat released, from the burning of the waste, is controlled by limiting the air into the **Primary Chamber** to less than what is required to complete combustion. This is described as *starved air* conditions. With controlled air and temperature the waste is dried, heated and burned thereby releasing moisture and volatile components. The non-volatile, combustible portion of the waste is burned in the **Primary Chamber** to provide heat while the non-combustible portion accumulates as ash.

In the end, the waste volume is reduced by over 90%. Independent tests have shown that the residual ash is non-hazardous, non-leaching and essentially inert. After enduring the combustion process, metals and glass remain intact. Preservation of metals and glass not only protects the refractory lining from damage caused by melted and fused metals and glass, but also allows for post-combustion recycling where possible.

Remaining in the **Primary Chamber** are non-combustibles, such as metal and glass, and carbonaceous residue. The incoming air, subjecting the non-combustibles to high temperatures, further burns the carbonaceous residue. The result is an oxidized ash product.

Controlling the gas velocity through the system is an important factor in limiting pollution. The gases flowing from the **Primary Chamber** are a result of the interaction of the air with the waste during the controlled burning process. Both the quantity and velocity of the gas product vary according to chamber temperature conditions and the type of waste being burned. The integrated controls for the **Primary** and **Secondary Chamber** act to minimize peaking activity thus controlling pollution automatically.

The combustion gases released in the **Primary Chamber** then pass into the **Secondary Chamber** through a turbulent mixing zone where ignition takes place and additional combustion air is provided to complete the burning process.

Secondary Chamber

As waste burns in the **Primary Chamber**, gases containing the products of combustion enter the high temperature zone of the **Secondary Chamber** for cleansing. The **Secondary Chamber** is sized to retain the incoming gases for a minimum of 2 seconds at 1000°C. This chamber utilizes a high output, fully modulating dual fuel (diesel & waste oil) burner to maintain the required temperature (even in the absence of energy input from the first stage which is important when processing wet or low energy waste). This stage employs a large blower, tightly controlled by the control system using a variable frequency drive on the motor. The blower creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour.

The **Secondary Chamber Blower** air is introduced into the **Secondary Chamber** by an air ring manifold that surrounds the **Secondary Chamber**. The manifold has small air jets called tweers that open into the **Secondary Chamber** at the side walls and create a powerful vortex of excess air to mix the incoming gases and ensure complete combustion. The flow of air is tightly managed by the control system using a Variable Frequency Drive (VFD) by controlling the speed of the fan and modulating motors on the blower inlet dampers.

The **Secondary Chamber Blower** is extremely important as it creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour. It also acts to cool the **Primary Chamber** and prevent temperature overruns.

The **Secondary Chamber** burner is a high output burner and its output is self modulated over a broad range for very precise temperature control.

The **Secondary Chamber** is sized to allow two seconds of retention time. This is the time that the gases from the **Primary Chamber** are retained in the **Secondary Chamber** before they exit to the next stage. Two seconds of retention is considered to be ideal to destroy any harmful organic hydrocarbons produced from the **Primary Chamber**.

Main Control Panel

There is one **Main Control Panel** that controls all of the interconnecting modules. The Operator has one simple **Human Machine Interface (HMI)** to start the equipment, view system status and change control settings if required. The system utilizes a PLC (programmable logic controller) to automate its functions. All critical process parameters such as temperature, combustion airflow and burner output are operated using EWS' patented system control program to maintain optimal combustion and air pollution abatement.

Protecting the Environment

Why Incinerate?

As society becomes more environmentally conscious, environmental regulations on the proper disposal of solid waste have become more stringent. As a result, incineration has become an environmentally responsible and socially acceptable alternative for handling waste at the point of need. However, incineration does not eliminate the need to landfill waste but it does reduce the amount of waste that must be placed in landfills.

Primary advantages of incineration are:

- It greatly reduces the weight and volume of waste material that must be disposed of in landfills
- It destroys organic materials that may be harmful or that may be degradable to harmful materials in landfills
- The incinerator sterilizes the waste; that is, the high temperatures in incinerators can destroy any pathogens that may be in infectious waste materials
- The incinerator destroys animal or human pathological wastes that the general public finds objectionable to handle or see.

Environmental Concerns

The general public will not accept incineration as an option for treating waste of any kind, if they do not believe that it is safe environmentally. The primary concerns are about air pollutants produced by the incinerator and the toxicity of the residual ash. This section will present some of the terminology that is important to understanding these concerns. The remainder of the manual will describe how an incineration system can be operated and maintained in a way that keeps environmental releases at an acceptable level.

Air Pollutants of Concern

Particulate matter may be defined as fine liquid or solid matter such as dust, smoke, mist, or fumes found in the gaseous emissions from the incinerator. Particulate matter emissions may have a dark or light color. Particulate matter emissions can be described in terms of opacity. Opacity is the degree to which light is obscured by a polluted gas (a clear window has 0 percent opacity while black paper has 100 percent opacity). Opacity may be measured with the naked eye or using an opacity monitor. Particulate matter is a problem because it can cause or aggravate respiratory problems in humans. It also creates aesthetic problems since it is readily noticed and is a nuisance because of soiling of exposed surfaces on houses and cars.

Hydrochloric (HCl) acid is generated when polyvinyl chloride (PVC) plastic (usually clear plastic) material is burned in the incinerator. The appearance of a white plume or cloud a short distance above the stack indicates that HCl is condensing. The major concerns about HCl are that it causes respiratory problems in humans, contributes to acid rain problems, and causes material damage to metals and concrete.

Toxic metals include cadmium, arsenic, beryllium, chromium, nickel, lead, and mercury. These metals may be found in municipal wastes. These metals are known to be hazardous to human health.

Organic compounds are compounds that contain primarily carbon and hydrogen and may also contain other elements such as oxygen, nitrogen, and chlorine in smaller amounts. Some organic compounds are known to cause or are suspected of causing cancer and are considered hazardous air pollutants. The public's primary concern is related to dioxin and furan emissions, but other organic compounds such as benzene and vinyl chloride may be emitted.

Carbon Monoxide (CO) also is generated during combustion if the combustor is not operated properly. (Your automobile generates some amount of CO.) CO is toxic to humans if concentrations are high enough, and it also is an indicator of combustion quality.

Solid Waste Ash Quality

One of the major objectives of incineration is to generate a high quality ash for land disposal. All pathogens should be destroyed, and almost all organic material should be completely burned. Ideally, no large chunks of unburned waste material (other than metals or glass) should remain in the waste. A measure of ash quality is "burnout," which is the percentage of organic material remaining in the waste. For example, a burnout of 95 percent means that the ash can contain only 5 percent organics. Adequately burned and quenched ash may be disposed of in a sanitary (municipal) landfill. The ash should be stored in covered containers or kept wet prior to transport to the landfill to prevent 'fugitive \ emissions.' Individual landfills may have requirements that must be followed in order for your waste to be accepted. You should familiarize yourself with these requirements to prevent refusal of the waste.

The Operator – Your Role

It is the operator's role and responsibility to protect the environment by:

1 Complying with all emission limits and operating practices specified in the permit to operate.
2 Minimizing emissions of particulate matter, HCl, toxic metals, carbon monoxide, and organic compounds through proper incineration;
3 Operating the incinerator to generate high quality ash that is sterile and can be disposed of in landfills;
4 Minimizing particulate matter emissions from ash handling;
5 Disposing of ash properly by sending it to appropriate disposal sites; and
6 Performing the regular maintenance inspections to catch any operational problems early.

Basic Combustion Principles

The Combustion Process

Combustion of Municipal Solid Waste (MSW) is a chemical reaction. In the incinerator, organic materials and oxygen react rapidly and violently to produce combustion gases and energy in the form of heat and light.

Organic Solid Material + Oxygen $\xrightarrow[\text{Heat}]{}$ Combustion Gas + Solid Residue + Energy(Heat)

For the reaction to begin and to keep going, all three elements - organic material, oxygen, and heat-must be present. The organic material used in the reaction comes from two sources, waste and auxiliary fuel. Some organic material is contained in most solid waste types. Depending on the fraction of organics and the specific organic composition, the waste may be adequate to sustain combustion. Auxiliary fuel may be used to maintain combustion if the waste material does not contain enough organic material to maintain high temperatures. The combustion reaction between the organic material and oxygen that causes the organics to burn will occur only after the temperature of the organic material is raised to the point that combustion can begin.

Energy in the form of heat is required to raise the temperatures of the incinerator chamber and organic material and O_2. This energy usually is supplied by the auxiliary fuel burners.

Rate of Combustion Air

The oxygen needed for the combustion reaction is supplied by the ambient combustion air. Combustion air is supplied to the combustion chambers through air ports by natural draft. In general, this air contains about 21 percent oxygen (O_2) and 79 percent nitrogen (N_2), so about 21 percent of the total combustion air fed to the incinerator is oxygen that is available to react with the organic material in the waste and fuel. The nitrogen passes through the chamber mostly unreacted; some nitrogen oxides are formed.

Oxygen Reaction

Solid waste contains two types of organic materials

1. Volatile Matter
2. Fixed Carbon

These two types of materials are involved in distinct types of combustion reactions, and the operating variables that control the two types of reaction are different.

Volatile matter is that portion of the waste that is vaporized (or evaporated) when the waste is heated. Combustion occurs after the material becomes a gas. The combustion variables that influence this reaction are gas temperature, residence time, and mixing.

- A minimum temperature is needed to start and sustain the chemical reaction.
- Residence time is the length of time, generally measured in seconds that the combustion gas spends in the high temperature combustion chamber. The residence time must be long enough for the reaction to be completed before it leaves the high temperature zone.
- Turbulent mixing of the volatile matter and combustion air is required to ensure that the organic material and oxygen are well mixed.

Fixed carbon is the nonvolatile organic portion of the waste. The combustion reaction is a solid-phase reaction that occurs primarily in the waste bed (although some materials may burn in suspension). Key operating parameters are bed temperature, solids retention time, and mechanical turbulence in the bed.

- The solids retention time is the length of time that the waste bed remains in the Primary Chamber.
- Mechanical turbulence of the bed is needed to expose all the solid waste to oxygen for complete burnout. Without mechanical turbulence, the ash formed during combustion can cover the unburned waste and prevent the oxygen necessary for combustion from contacting the waste.

Products of complete combustion are:

- Carbon dioxide
- Water

One example of volatile waste is backyard charcoal grill with starting fluid. The starting fluid is highly volatile. When put on the charcoal and ignited with a match, it rapidly volatilizes and burns. The charcoal contains less volatile matter and primarily burns slowly as a fixed carbon bed.

Operating Factors Related to Combustion

The three operating factors that have the greatest effects on the combustion reaction are:

- Combustion airflow rate and distribution,
- Operating temperatures, and
- Waste feed rate and characteristics.

These three factors are all related. Controlling them controls the combustion reaction.

Stoichiometric Air

In the chemical reaction between organic materials and oxygen, the amount of oxygen required under ideal or "perfect" conditions to burn all of the organic materials with no oxygen left over is called the stoichiometric (or theoretical) oxygen level. The amount of combustion air associated with that oxygen level is called the stoichiometric air level. At stoichiometric air level the combustion gas would contain no oxygen because it would all be used in the combustion reaction.

Substoichiometric Air

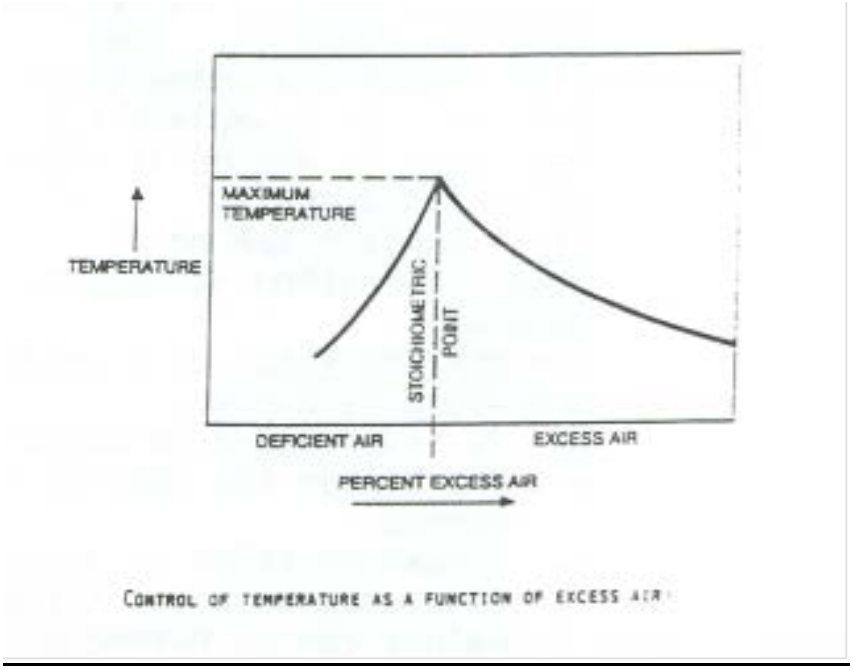
Airflows less than those required at stoichiometric levels are called deficient air or substoichiometric starved-air levels. Under starved-air conditions, the combustion gas would again contain no oxygen, but organics also would remain because combustion is not complete.

Excess Air

Air flows greater than those required at stoichiometric levels are called excess-air levels. Typically an incinerator operates with an overall 140 to 200 percent excess air level. That is, the incinerator operates with one and one-half to two times more air than required at stoichiometric levels. Excess air is used to assure that enough oxygen is available for complete combustion.

Control of Temperature as a Function of Air Level

Maximum combustion temperatures are always attained at stoichiometric conditions. As the amount of excess air is increased above the stoichiometric point, the temperature in the incinerator drops because energy is used to heat the combustion air. If the amount of combustion air is too great, the temperature drops below “good combustion temperature," and undesirable combustion products are generated as a result of incomplete combustion. As the amount of excess air is decreased, the combustion temperature increases until it becomes maximum at the stoichiometric point. Below the stoichiometric point, the temperature decreases because complete combustion has not occurred.



CONTROL OF TEMPERATURE AS A FUNCTION OF EXCESS AIR

The relationship of how combustion air level can affect temperature has just been shown. Temperature also plays an important role in the combustion of waste. Temperatures need to be maintained at levels high enough to ensure pathogen destruction and to sustain the combustion reaction. However, temperatures that are too high also cause problems. Continuous exposure of the combustor refractory to high temperatures is generally not desirable because it can cause the ash to fuse and can cause damage to the refractory.

Waste Characteristics

The primary characteristics of the waste that affect the combustion reaction are:

- The heating value
- The moisture content
- The chlorine content

Different wastes have different heating values and moisture contents. They will affect the combustion process.

The HEATING VALUE of a waste is a measure of the energy released when the waste is burned. It is measured in units of Btu/lb (J/kg). A heating value of about 5,000 Btu/lb (11.6×10^{-6} J/kg) or greater is needed to sustain combustion. Wastes with lower heating values can be burned but they will not maintain adequate temperature without the addition of auxiliary fuel. The heating value of the waste can be used to calculate total heat input to the incinerator where:

Heat Input (Btu/h) = Feed Rate (lb/h) x Heating Value (Btu/lb)

Heat input to the incinerator will affect temperature. More heat input yields higher temperature. Heat input also will affect air requirements; more air is required (1 SCF/100 Btu).

MOISTURE is evaporated from the waste as the temperature of the waste is raised in the combustion chamber. It passes through the incinerator, unchanged, as water vapor. Evaporation of moisture uses energy and reduces the temperature in the combustion chamber.

CHLORINE in plastics or solvents in the waste feed will react to form hydrochloric acid (HCl). This HCl can be an emission problem. It can create corrosion problems of the equipment downstream from the incinerator.

The heating value (Btu value) and moisture varies widely. Compare plastics (high Btu, no moisture) to beddings, shavings, etc. to anatomical.

Summary of Key Operation Factors Affecting Combustion

1 Key factors are interrelated.
2 Air quality/distribution
3 Sufficient air for complete reaction
4 Distributed to promote mixing
5 Mixing
6 Assure contact of oxygen and organics
7 Temperature
8 High enough to sustain combustion
9 High enough to have complete reaction
10 Residence/retention time
11 Sufficient time to allow reaction to complete

Waste Characteristics are also important

12 Heating value
13 Measure of energy released

14 Heat input determines air required
15 Moisture content
16 Requires energy to vaporize water
17 Chlorine content
18 Affects HCl emissions

This summarizes the key parameters affecting combustion.

Products of Combustion Reaction

Complete Combustion

The primary products of waste incineration are:

- Combustion gases
- Solid residue (ash)
- Energy

The primary objectives of the combustion process are to generate an ash residue that is sterile (free of pathogens) and does not contain unburned, recognizable wastes; and to minimize air pollutants in the combustion gas stream.

The organic materials that enter the incinerator with the waste and fuel are primarily made up of carbon, hydrogen, and oxygen. Ideally, these organic materials react with oxygen in the combustion gas to form carbon dioxide and water vapor. The chemical reaction for this ideal situation is

$$\text{Organics} + O_2 + \text{Heat} \longrightarrow CO_2 + H_2O + \text{Heat}$$
(C, H, 0)

This ideal reaction represents complete combustion.

Incomplete Combustion

However, this ideal reaction does not occur in operating waste combustion systems. Factors that lead to a less than ideal reaction are poor mixing, too little combustion air, and low temperatures. Under those conditions products of incomplete combustion are emitted with the stack gases. The most common product of incomplete combustion is CO. Another product of incomplete combustion that often is emitted under poor mixing conditions or high temperature, low excess air conditions, is elemental carbon (or soot). The soot particles are very fine and generally result in high opacity at the combustion stack. Other products of incomplete combustion that cause concern because of their health impacts are hazardous organic compounds such as benzene, dioxins, and furans. Although these compounds are not found in the waste, under incomplete combustion conditions they can be formed as intermediate combustion products.

The waste feed also includes inorganic materials; generally, they are not involved in the combustion reaction. The inorganic materials in the waste feed (ash) are either retained in the ash or are emitted as particulate matter in the combustion gas. Air velocities in the combustion bed are controlled to reduce the amount of inorganic material entrained (picked up by) the combustion gas and emitted with the combustion gas. If combustion is not complete, organics

will remain in ash; this is typical…it is atypical to have 100 percent combustion of ash bed. Under poor conditions (low temperature, low turbulence in ash bed) may have pathogens remaining in ash; i.e., may not sterilize ash.

Combustion Indicators

The information presented in the above section suggests that the following indicators can be used to monitor combustion quality.

Opacity

The opacity of the combustion gas stream is a measure of the degree to which the stack gas plume blocks light.

- High opacities indicate high emissions.
- Opacity is primarily caused by noncombustible ash or uncombusted carbon (soot) in the flue gas.
- High opacities can indicate poor mixing or low levels of combustion air.
- High opacities also may be generated by high levels of HCl emissions or poor burner operation in the secondary chamber.

If a large amount of water vapor is present in the combustion gas, the water can condense when it cools as it leaves the stack forming a dense white "steam plume." This is not an indicator of poor combustion and should not be confused with a black or white smoke plume caused by soot or acid gases. Opacity can be visually determined by a person or measured by an instrument.

Other indicators which provide information about combustion conditions are measurements of the combustion gas oxygen and CO levels. However, these measurements require instruments and most facilities do not have those instruments.

Ash Quality

Visual appearance of ash can be an indicator of combustion problems. If an incinerator is operating properly, little organic material will remain in the ash. Whitish gray ash indicates better burnout and less carbon than black. The extent of organics combustion can be measured by the quantity of combustible materials remaining in the ash. Noted increases in combustibles in the ash indicate a combustion problem which may include bed temperatures that are too low, improper distribution of combustion air in the bed, or insufficient waste retention times.

SECTION 3

PHOTOS OF THE INCINERATOR

NOTE some of these are sample photos and may not depict the actual Incinerator components

Primary (right) & Secondary (left) Chambers

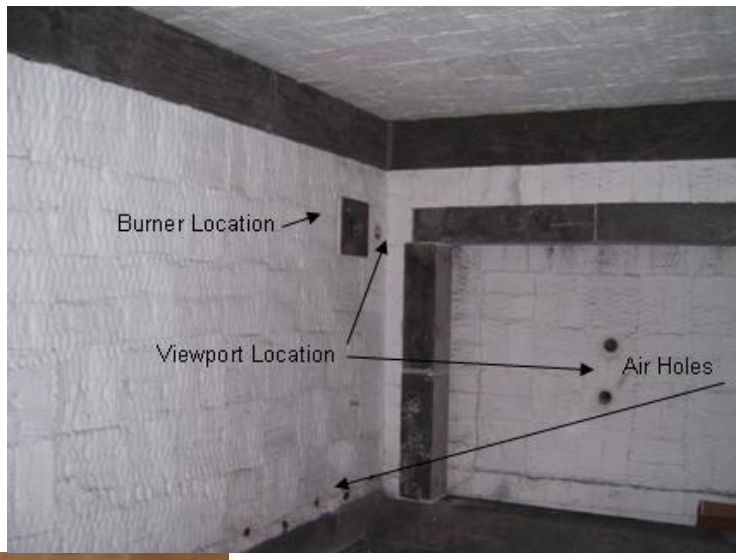


NOTE **Stack sections and breech have not been installed.**

Primary Chamber Access Door View

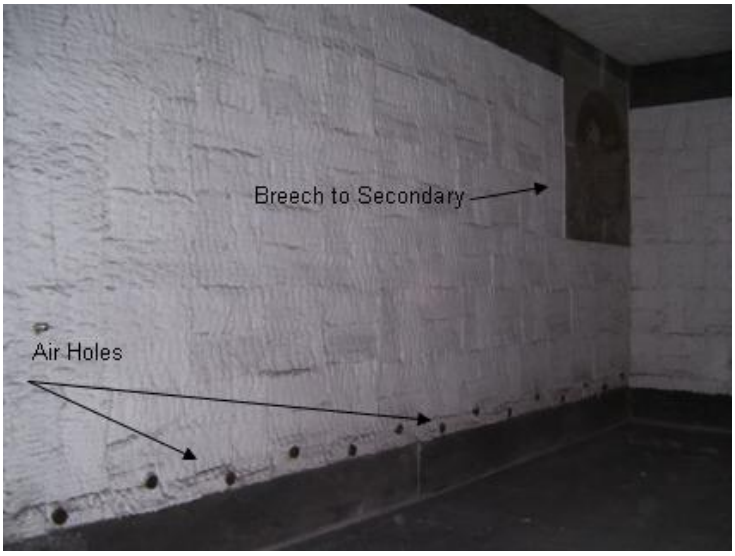


Primary Chamber Interior View (sample picture)





Floor and grate detail



Secondary Chamber Door View



Secondary Chamber / T-section View



Primary Chamber Blower



Secondary Chamber Blower

Adjustable Damper and Modutrol Motor



Primary Chamber Burner



NOTE **Burner is shown without cover installed.**

Diesel Tank (4,500lt)



Secondary Chamber Burner



Waste Oil Tank (5,000lt)



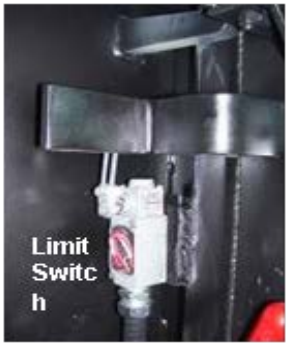
Main Control Panel



Thermocouple, Viewport and Limit Switch







T-Stack and Stack Sections



Spark Arrestor



SECTION 4

ASSEMBLY & INSTALLATION INSTRUCTIONS

General Assembly and Installation Overview

The incinerator is factory pre-assembled to ensure proper fit then shipped disassembled. On-site assembly by certified trade's people is required. Trades people (Riggers, Mechanical Contractors, Millwrights, Electricians, Gas Fitters, etc) are to be arranged by Purchaser and/or Contractor.

This is a **general overview**, therefore, project specific details must still be considered. Please refer to relevant data and drawings supplied by EWS.

Purchaser/Contractor Responsibilities

These responsibilities include, but are not limited to, the following:

1. Ensure all concrete and structural steelwork, as may be required, is adequate to support the incinerator and associated equipment. The Purchaser/Contractor is responsible for all concrete design such as slab thickness, footing depths and dimensions and any placement reinforcement so as to be consistent with all applicable building codes.

2. Supply of any anchor bolts when applicable.

3. Provide all utility services to the equipment including fuel, electrical, water, air, etc, as may be required.

4. Provide adequate air makeup to the incinerator room through forced air circulation blowers, air intakes and/or opened louvers to avoid the creation of negative pressures within the building.

5. Observe caution in the selection of materials and coating of building walls or other structural components to the incinerator area giving due consideration to high-localized temperatures of the incinerator.

6. Provide all external thermal insulation when required on steam piping, water piping, etc.

   NOTE External thermal insulation should never be applied to any surface of the incinerator or refractory lined stacks and breeching. If applied to these surfaces, structural damage may result.

7. Provide proper roof thimbles, clearances, flashing and counter flashing around all roof penetrations, including the incinerator stack.

8. Guying of all stacks (if required) is to be done by the Purchaser/Contractor. Guying should be at three points at 120° apart or four points at 90° apart. The Purchaser/Contractor provides design of guying and guying connection points to the stacks. Torque draw band bolts to 35 lbs. during stack assembly.

9. Provide proper protection of all equipment from damage, vandalism and weather, while on-site and/or when installation is in progress.

10. Provide all touch up painting and cleanup of equipment after erection.

11. Inspect and field weld miscellaneous flanges, when applicable.

12. Supply all main fuel line regulators at connection points to the Incinerator. Fuel lines should be sized for maximum pressures and instantaneous fuel flow at cold starting. Pressures should be based under flow conditions, not static. Static pressure should never exceed the design pressure of the pressure regulator. Gas volume includes burner pilot requirements.

13. General Arrangement drawings are normally provided by EWS. As soon as possible after acknowledgement of a Purchaser/Contractor's order, it is the responsibility of the Purchaser/Contractor to provide EWS with all applicable sketches, layouts, building drawings, roof and floor elevations and other pertinent information to allow preparation of the General Arrangement drawings. With this information, the Purchaser/Contractor's will provide desired orientation of the chambers.

14. The Purchaser/Contractor must recognize the importance of proper waste material descriptions concerning physical and chemical properties. Changes in waste composition to be incinerated should be made known to EWS, as soon as possible.

15. It is the Purchaser/Contractor's responsibility to obtain all construction, operating and environmental/air emissions permits as may be required in the area of jurisdiction for the incinerator equipment. EWS will assist in supplying all technical information required for these permits to the Purchaser/Contractor.

16. The Purchaser/Contractor must be aware that certain components will be broken down for shipment purposes and reassembly will be required in the field by the Purchaser/Contractor.

17. Locating and mounting the incinerator in a confined area should be avoided. The Purchaser/Contractor should maintain ample space around all equipment for maintenance, cleaning and safety considerations. A rule of thumb would be to provide a minimum of six feet from all major equipment surfaces and edges. Always allow proper space for the swing radius of loading doors, cleanout doors and electrical panel doors. If space limitations exist, it is the Purchaser/Contractor's responsibility to make EWS aware of these dimensional restraints so that modifications may be considered.

18. Do not scale drawings: If certain dimensions are required which are not shown on drawings, the Purchaser/Contractor should contact EWS Project Manager. EWS will not be responsible for any dimensional conflicts resulting from dimensions not shown on a certified drawing. Do not use general sales literature or other general equipment submittals for construction unless so indicated. EWS reserves the right to change equipment dimensions as required for design purposes.

19. All drawing dimensions are typically subject to ¼"tolerances.

20. If the refractory is shipped in the green condition, the refractory has not been heat cured. This curing process must be accomplished in the field after final erection and assembly. It is understood that the Purchaser/Contractor will provide all required utilities for this curing process and initial equipment operation for adjustments at no expense to EWS including but not limited to fuel, electrical, water, etc.

21. Due to the physical size of the incinerator, the unit is shipped partially dismantled and will, therefore, require reassembly in the field. Consult EWS for maximum component weights so that properly sized cranes are available at the site for unloading and erecting. Purchaser/Contractor may, also therefore, have to reinstall electrical components and control connections, burners, blowers, lifters, etc. These connections are normally of the flexible type with leads marked.

22. Lifting lugs are provided on chambers, stacks, and major accessories. These lugs should be used in setting the pieces into position. Do not attach lifting chains or cables to piping, control panel or mounting flanges as they may be damaged. Avoid dragging lifting gear across painted surfaces as this will cause damage to the high temperature paint. When placing the incinerator into position be extremely careful not to subject the refractory to mechanical shock as this may result in refractory damage.

Step by Step Assembly and Installation Instructions

The following **sequence** applies specifically to the Meliadine Waste Incinerator.

Trades-people required for the following steps:

Forklift Operator, Crane Operator, Riggers, Electrician and Mechanical Contractors (pipe and gas fitter)

Please refer to the supplied drawings and data.

Foundation Drawing: Anchor Bolt and Loading Diagram ECO1.75TN1PVC100L-00D rev.0

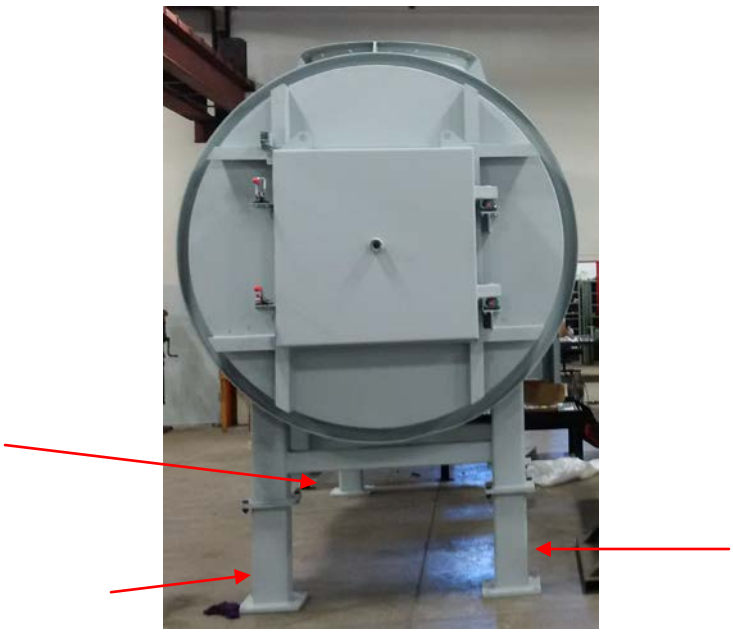
1. The incinerator and related components must be installed on a level concrete pad. It is recommended that appropriate consultation with civil engineers and/or architects is taken before designing an appropriate foundation for the equipment.

2. Please refer to General Arrangement Drawing ECO1.75TN1PVC100L-00A rev.1 and its Bill of Materials.

Place the Primary Chamber and Secondary Chamber on the Foundation

3. Locate leg extension for the Secondary Chamber and put into position.

4. Once the leg extensions have been put into place, using a crane, lift the **Secondary Chamber** into position and connect the leg extensions.



Leg extensions

5. Position the Secondary Chamber (item 2) beside the Primary Chamber (Item 1) on the level concrete pad. Ensure that the breech openings on each Chamber are facing each other.

6. Shim with steel shim plates to ensure the Secondary Chamber is level. This is required to prevent rocking, or any movement of the **Secondary Chamber.**



Connecting the Breech to the Secondary Chamber

1. Install the **Secondary Breech Gasket,** by spraying the gasket adhesive on the Breech connecting flange and on the gasket material. Line up holes of the **Secondary Breech Gasket** to line up with the flange bolt holes. Press **Secondary Breech Gasket** onto flange securely.



Gasket adhesive spray being applied



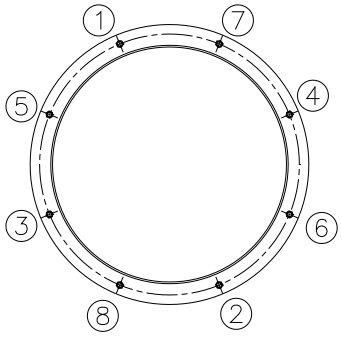
Correctly Installed Gasket

2. Raise the **Breech** (Item 7) with forklift and slings, once the **Breech** is 8 to 13 cm from the flange, use alignment bars to help with the final alignment of the two (2) breech flanges, as shown below.





3. Once breech flanges are aligned and together bolt flanges together using the numerical order described in the pattern below using hardware provided.





Correctly installed Breech on Secondary Chamber

Position the Primary Chamber

1. Install the **Primary Breech Gasket,** by spraying the gasket adhesive on the Breech connecting flange and on the gasket material. Line up holes of the **Primary Breech Gasket** to line up with the flange bolt holes. Press **Primary Breech Gasket** onto flange securely.



Gasket NOT installed



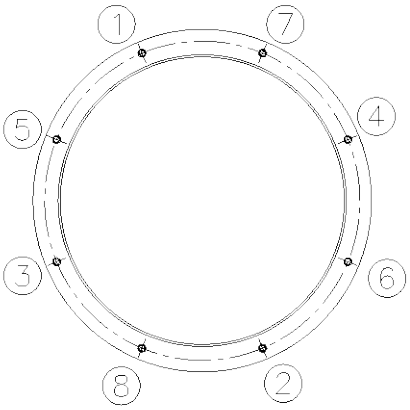
Correctly Installed Gasket

2. While constantly checking alignment of the **Breech** move **Primary Chamber** along the floor using the forklift and skates until the flanges are aligned.

NOTE Do NOT pull the Primary Chamber closer to the Secondary Chamber with the flange bolts. Doing so will bow the steep plate, in turn damaging the breech refractory.

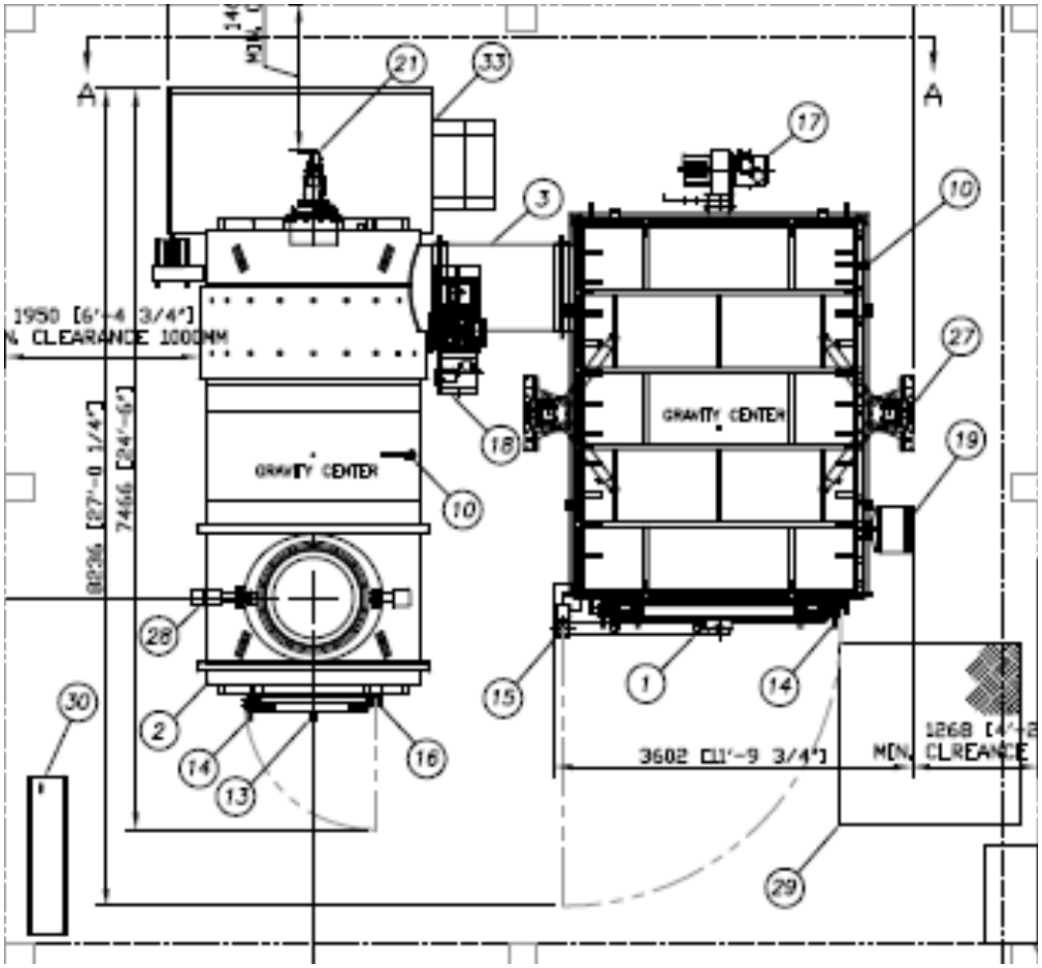
3. Once breech flanges are aligned bolt flanges together, shim and level the Primary Chamber with steel shim plates. Support pads should be shimmed as required to prevent rocking, or any movement of the Primary Chamber.

4. Using the numerical order described in the pattern below using hardware provided.





Correctly Installed Breech on Primary Chamber



NOTE The diagram above shows the burners and blowers already attached to the Primary and Secondary Chambers. When positioning the Primary Chamber, Breech and Secondary Chamber, these items will not be attached.

Installing the Stack

Install stack gaskets between stack sections.



Install refractory-lined *T-Stack Section* on top of the *Secondary Chamber* using the hardware provided. Then install the next four *Stack Sections and the spark arrestor* as per the drawing using hardware provided.



T-Stack and Stack Sections

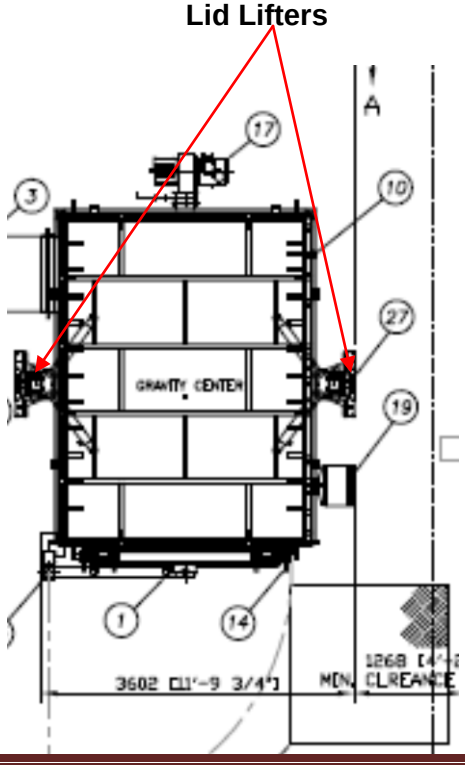


This is a Sample Photo only of Erection of the Stack Sections

Installing the Lid Lifters

1. Place the lid lifters (item 27) on either end of the Primary Chamber. The slave column, the one without the hydraulic power pack, is to be located in between the chambers.

Lid Lifters



2. Once lifters are in place, shim and level, do not exceed 2.54 cm under the column. Anchor the columns to the floor.

3. Install the pre-assembled hydraulic pump on the master column reinforcement and connect the hydraulic hose and piping.

4. Install the limit switches, proximity switches and solenoid valves with the hardware provided.

5. Install the control stations for the lid lifters (attached to junction box at the master column). Location determined by customer.

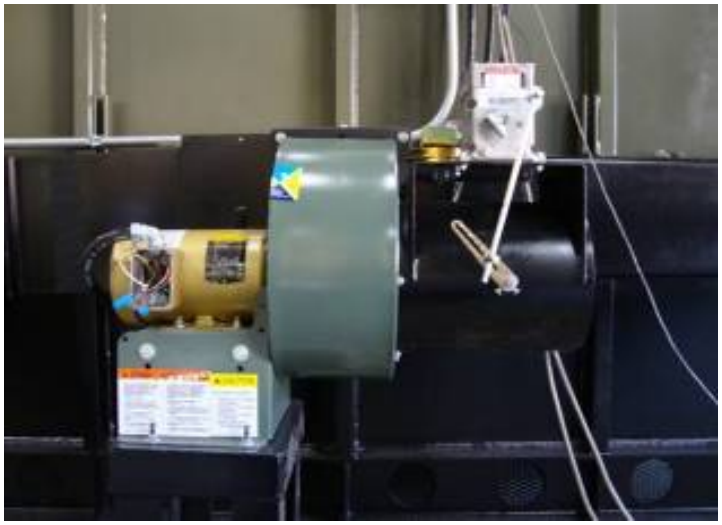
For further detail consult the OEM manual of this lifter in 6515-S-265-008-280-EDS-0015_Sub002.pages175to190

Assembling and Installing the Primary Chamber Blower

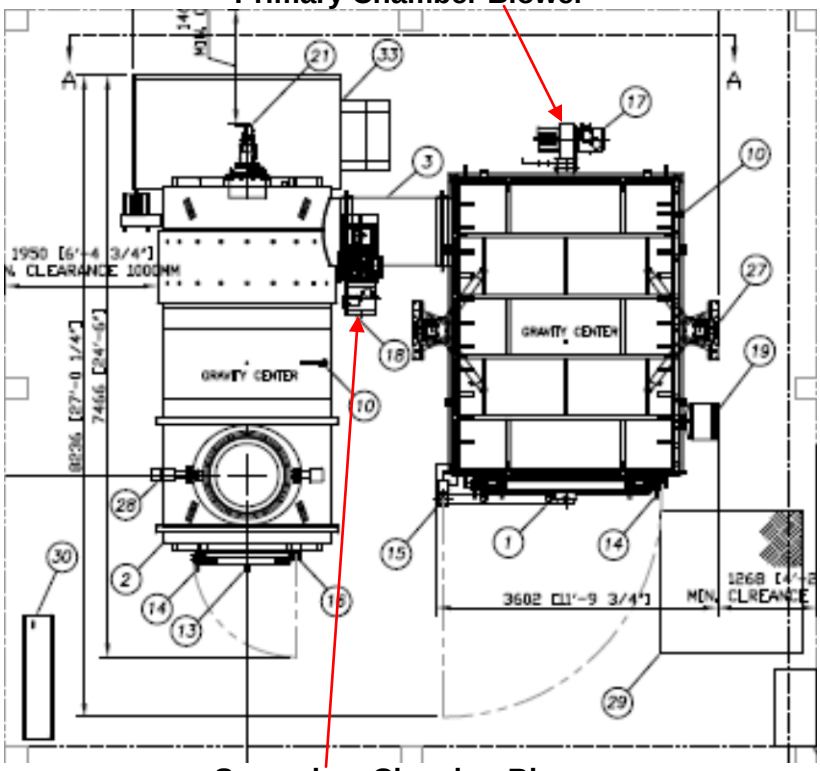
1. Place the **Primary Blower** mounting frame where the **Primary Blower** is to be installed.

2. Install **Primary Blower**, shim and level as required with steel shim plates until the flanges are align. Support pads should be shimmed as required to prevent rocking.

3. Bolt together using bolts provided after alignment of all bolt holes



Primary Chamber Blower



Secondary Chamber Blower

Assembling and Installing the Secondary Chamber Blower

1. Place the **Secondary Blower** mounting frame where the **Secondary Blower** is to be installed.

2. Install **Secondary Blower**, shim and level as required with steel shim plates until the connecting flanges are level.

3. Bolt together using bolts provided after alignment of all bolt holes.

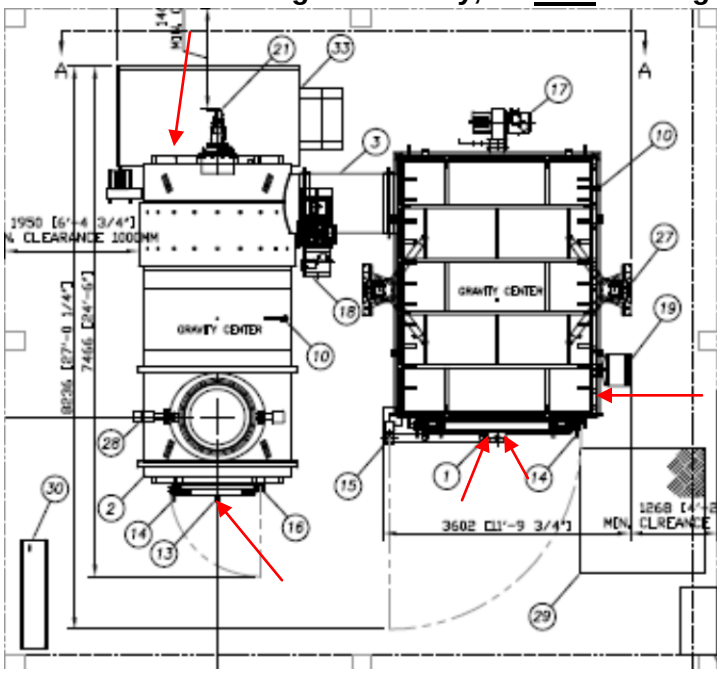


Secondary Chamber Blower

Installing the View Ports

1. Install four (5) 2" threaded **Viewports** at positions indicated in red below on **Primary Chamber** door, the left hand side of the **Primary Chamber Burner,** the **Secondary Chamber** door and the right hand side of the **Secondary Chamber Burner.**

NOTE **The viewports should be hand tightened only, do NOT over tighten.**



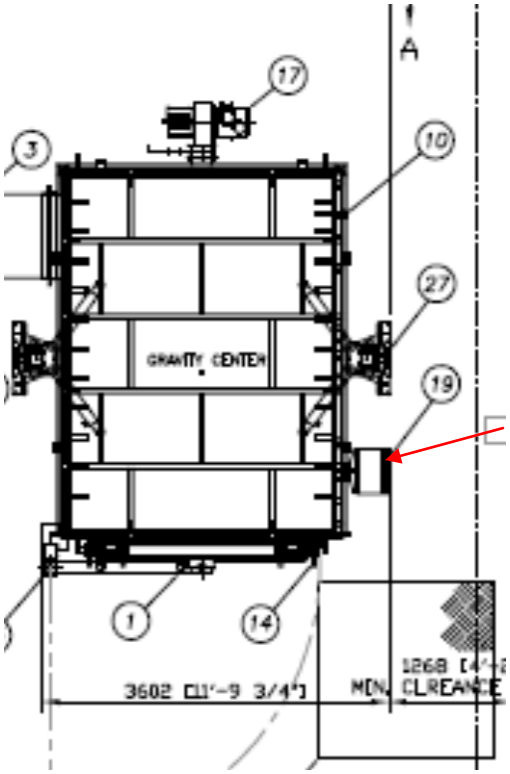
Installing the Primary Chamber Burner

1. Install the **Primary Burner** and burner gasket in the burner port located on the right side of the **Primary Chamber**.

2. Bolt together using provided hardware after alignment of all bolt holes.



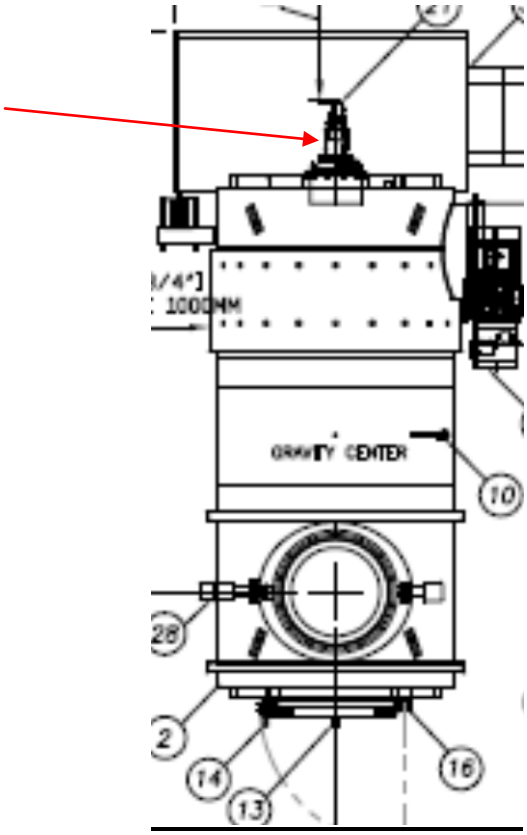
Primary Burner shown without red cover installed.



Installing the Secondary Chamber Dual Burner

1. Install the **Secondary Chamber Burner** and gasket in secondary burner ports using the hardware provided. The fuel train is pre-assembled and the final installation to follow the P&ID drawing





It is the customer's responsibility to conform to any local codes when installing the Waste Oil System.



Positioning and Installing the Diesel Tank

The Fuel Tanks are to be installed at ground level as per the site layout. Locations are to be determined by the customer to satisfy all local codes. Interconnecting piping and filters for each burner have been shipped with the equipment

Fuel Connections

Reference: General Arrangement ECO1.75TN1PVC100L-00A rev.1 and P&ID ECO1.75TN1PVC100L-00B rev.1 drawings

NOTE All fuel connections to be done by a certified technician and should satisfy all local codes (all lines to be pressure tested), including the distance between the incinerator system and the fuel tanks. If not properly installed and maintained, the waste oil tank (see image) can become a serious threat to the environment. Ensure the installation follows all local regulations and environmental protection measures.

Even though the tank is double walled, it is highly recommended that the installation site of the storage tank be equipped with a secondary containment system consisting of the following: dikes, berms, or retaining walls and a floor. The floor should cover the entire area within the dike, berm or retaining wall.

WASTE OIL PIPING TRAIN
The Waste Oil piping train consists of:
1. Pump skid.
2. Interconnecting piping.
3. Fuel train to dual burner.

When installing the waste oil piping train check to ensure that:
- Piping is clean.
- That the pipe has been reamed and free of burrs
- The work is done to trade standards

To perform the installation a (½" and 1") pipe threader is needed.

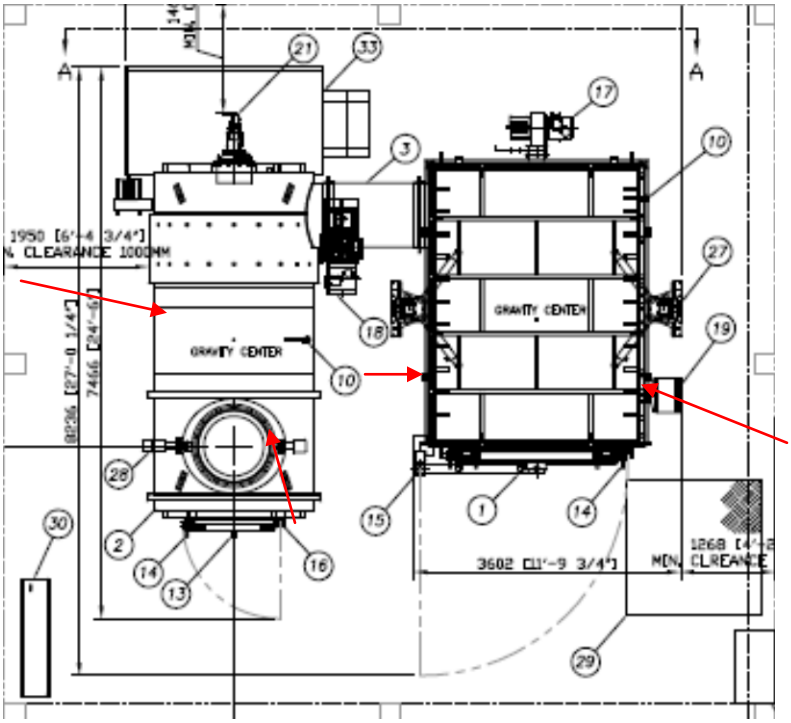
Note: When the pipe installation is complete flush out the line to remove any sediment and dirt that may have contaminated the pipes.

This incinerator system includes two (2) waste oil totes and their correspondent containment, as well as spill kits according to the volume, these items are to be deployed by the customer according with their waste management plan.

Also, two (2) ash bins are included for the storage of the ash removed from the incinerator.

Installing the Thermocouples

1. Install the four (4) ¾" threaded **Thermocouples** at the positions indicated in red below: two (2) in the **Primary Chamber,** one (1) on **Secondary Chamber** and one (1) on **T-Stack**



Installing the Weigh Scale

The weigh scale is to be installed closer to the loading point (to be determined by customer) and anchor it (note: the loading of this incinerator is intended to be through the roof when the lid is in the open position.

Electrical Connections

Reference: Electrical Drawings ECO1.75TN1PVC100L-10A / B/ C/ D rev.0 (17drawings)

NOTE All electrical connections, terminations and conduit installation to be done by a certified electrician and should satisfy all local codes.

1. The **Main Control Panel** should be installed at a minimum of 8' from the Incinerator system.

2. Wiring is necessary (customer's scope) from the power source to the **Main Control Panel** and between the **Main Control Panel** and the **Junction Boxes** on the incinerator and all Teck Cable from the junction boxes to the components.

3. The **Thermocouples** must be wired directly to the thermocouple input card on the **PLC** with the thermocouple wire provided, without splicing the wire. Interconnecting cable has been shipped with the equipment

4. Connect terminal wires. Connect main electrical feed through conduit connection in the bottom of the panel enclosure to the line terminals on the disconnect switch.

5. Run cables to scale and tank

Start Up and Commissioning EWS Field Services



Do not attempt to place the equipment into operation until an EWS Service Technician has inspected all equipment and interlocks.

1. Upon completion of mechanical erection, interconnection of equipment and provisions of utilities as described above, arrangements should be made with the EWS field service department for scheduling of a service technician for initial start-up.

2. An EWS representative must perform start-up of all incinerator systems unless specifically arranged otherwise in writing by EWS.

3. Attempts to start-up incinerator systems by the buyer without prior written approval may result in revocation of all expressed or implied warranties.

SECTION 5

OPERATING INSTRUCTIONS

Important Information

Proper operating and maintenance procedures must be followed in order for the ECO Model Incinerator system to perform at maximum efficiency.



Do not attempt to start or operate this equipment until this Operator Manual is read thoroughly and is understood.

The equipment has been designed with many safety features, however, like all thermal processes; this equipment is not free from the inherent hazards of high temperature processes.



Safety procedures and precautions must be followed at ALL times during operation.

There are safety procedures outlined in this Manual, however, no amount of written instruction can replace good judgment and safe operating practices.



Responsibility for the safe operation and maintenance of the equipment supplied rests solely on those operating it.

There are many engineered features incorporated into the ECO Model Incinerator system to free the operator of repetitive chores. They do not, however, relieve the operator of maintenance responsibilities. In order to maximize the operating life of the equipment, it is strongly recommended that the maintenance procedures, outlined in Section 6, be followed diligently. It is advisable to keep an equipment log for recording maintenance activities along with unusual operation.

NOTE

In the event that the equipment is not operating in the normal manner, contact Eco Waste Solutions immediately at (905) 634-7022 and ask for Customer Service Manager. It is important to report problems as soon as they are noticed to minimize damage that faulty operation could cause.

Design Specification Criteria

The **ECO 1.75 TN 1PVC100L incinerator systems** was designed specifically for the **Meliadine Mine.** Based on information provided, the EWS team designed an incinerator with the following criteria in mind.

Waste Description and Assumptions

Solid waste:

- Food waste (food, food packaging and containers, plastic and paper waste from food preparation) - 50%
- Domestic waste (paper, plastics, bottles, newsprint, cans, cardboard) - 40% Packaging (cardboard boxes, paper, plastic containers, plastic film, Styrofoam, poly-weave bags) - 10%
- Absorbents (Rags, wipes, spill cleanup materials) - negligible
- Medical waste (bandages, dressings, gloves, swabs, syringes, sharps) - Negligible

Waste Oil:

- Used Oils (hydraulic, transmission, motor, crankcase, gear box, synthetic and brake fluids)

The waste is expected to be bagged or stored in skips/bins around the mine operation and then brought to the incinerator building by truck. The waste oils will be brought to the incinerator by totes (handling by forklift or pallet jack).

Waste Quantity

The incinerator is designed to process and treat the waste generated on site, up to 1,750 kg per day. Therefore the ECO 1.75TN 1PVC100L incinerator system was selected, as it will process up to 1,750 kg of camp waste per day in a single batch.

Incinerator Design Parameters

Incinerator Design Parameters	Unit	Details
Secondary Chamber Operating Temperature	°C	1000
Secondary Chamber Retention Time	s	2 (minimum)
Incineration capacity	Kg/day	~~1700~~ 1750
Charge per cycle	Kg	1700
Burn Cycle Duration for entire load	h	less than 10
Cool Down Cycle Duration	h	8 to 12

NOTE

This incinerator was only designed for the type of waste and amount of waste mentioned above. It is important that the waste quantities and characteristics described above are processed in the incinerator. Otherwise, the incinerator system will not operate properly.

It is also important to note that some waste-streams are unacceptable and SHOULD NOT be processed in the incinerator.

Unacceptable Waste-streams

The following is a list of some of the waste streams that should not be processed in this system.

Waste Materials Not Suitable for Processing in Eco Waste Solutions Technology

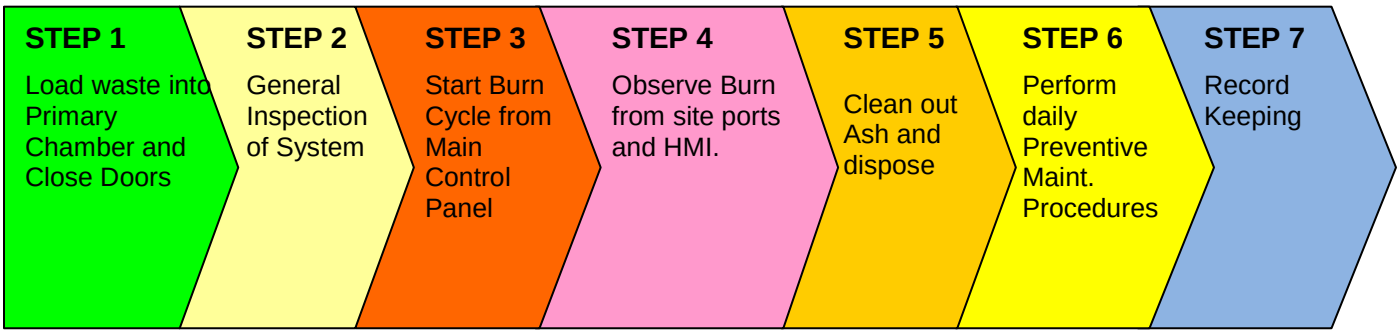
Solid Waste	Description	Origin
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions	From vehicles and equipment maintenance shop
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils	Construction activity
Radioactive Materials	Smoke detectors, laboratory wastes	From Buildings, laboratories
Potentially Explosive Materials	Large propane tanks, other pressurized vessels. Actual explosives	From warehouse, plant and production facilities
Heavy Metals	Items containing lead, mercury, cadmium, for example: batteries, electronic devices, fittings, old pipe work, fluorescent light bulbs, electrical switches, thermometers, PVC plastics, aluminum solder, photovoltaic cells	From maintenance activities, operations and construction activities
Liquid Waste	**Description**	**Origin**
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels	From warehouse, plant and production facilities
Solvents	Solvents such as acetone, xylene, methanol	From vehicles and equipment maintenance shop

Important Notes:

1. These lists are guides and should not be assumed to be an exhaustive list of materials
2. A waste and procurement audit is highly recommended and encouraged to ensure that all sources of heavy metals (especially mercury) are identified and diverted from the incinerator

General Operating Overview

The operation of the **ECO 1.75TN 1PVC100L Incinerator** package follows 7 general steps that take place over a 24-hour period.



Although all 7 steps are critical in the general operation of the incinerator system, this section of the manual focuses on **Step 1, Step 3** and **Step 4** and how to start the system and monitor it during operation.

It is assumed, at this point, that the waste material is properly loaded with the weight, density and type the incinerator is designed for, as outlined on page 5 of this section.

It is also assumed that the waste is loaded after the ash has been removed from the previous burn cycle and any daily maintenance routines have been completed.

This section will also cover **Step 7** on how to use the historical charts, store incinerator data, and access incinerator historical information for record keeping purposes.

Monitoring and Data Acquisition System

Overview

The **Human Machine Interface (HMI)** system automatically monitors the entire process and all system inputs are recorded and logged for record-keeping purposes and also allows for historical trending of key operating conditions.

The integrated **Human Machine Interface (HMI)** in the Main Control Panel monitors and records the following:

1. Temperature sensors
2. Differential pressure sensor with transmitter (draft)
3. Monitoring of burner functions
4. Auxiliary burner operation and fan amperage monitoring via current transducer
5. Door position interlock monitoring
6. High temperature limit and interlock
7. Low Fuel level limit and interlock
8. Air proving switch interlocks
9. Waste loading records

All data can be transferred to storage by using USB port (to transfer to PC to print)

HMI Operator Interface

Main Control Panel Components



Number	Name	Purpose
1	**Main Disconnect Switch**	Isolates the incinerator from its source of electric power.
2	**Human Machine (Operator) Interface**	Displays various screens reflecting system performance.
3	**Control Power ON**	1. Green light indicates the control power in the panel is on. 2. Pushing it if the **Emergency-Stop** is out will turn on the control power.
4	**Emergency Stop Pushbutton**	When pushed, shuts down the system and disables any possibility of starting it.
5	**Communications Port**	Allows for communication to/from the PLC
6	**Start Switch**	Activates the system

The Human Machine Interface (HMI)

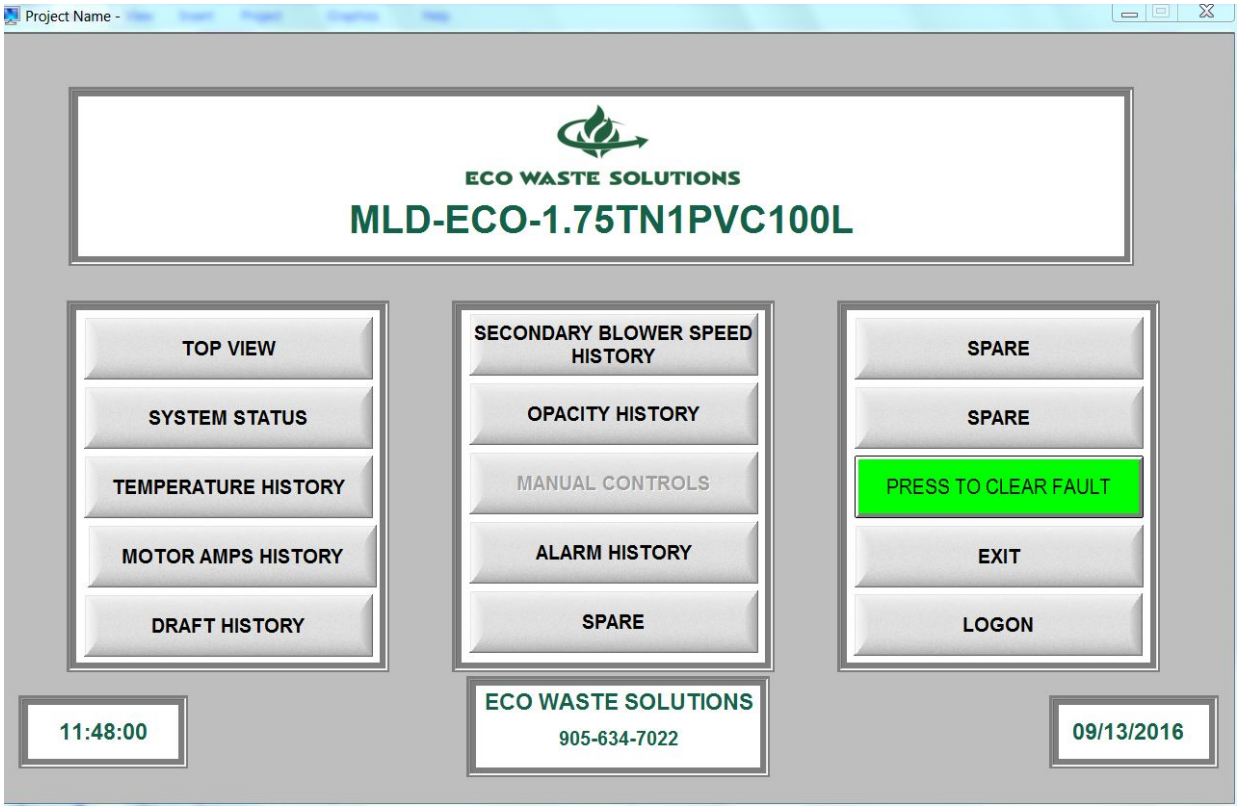
The **Human Machine Interface (HMI)** controls the operation of the incinerator directly from the **Main Control Panel.**

The **Main Menu** screen displays all the available options for viewing the system in operation.

The **Human Machine Interface (HMI)** has a touch-screen and items can be selected by touching them on the screen.

Main Menu

The first screen the operator will view is the **Main Menu** (see below).



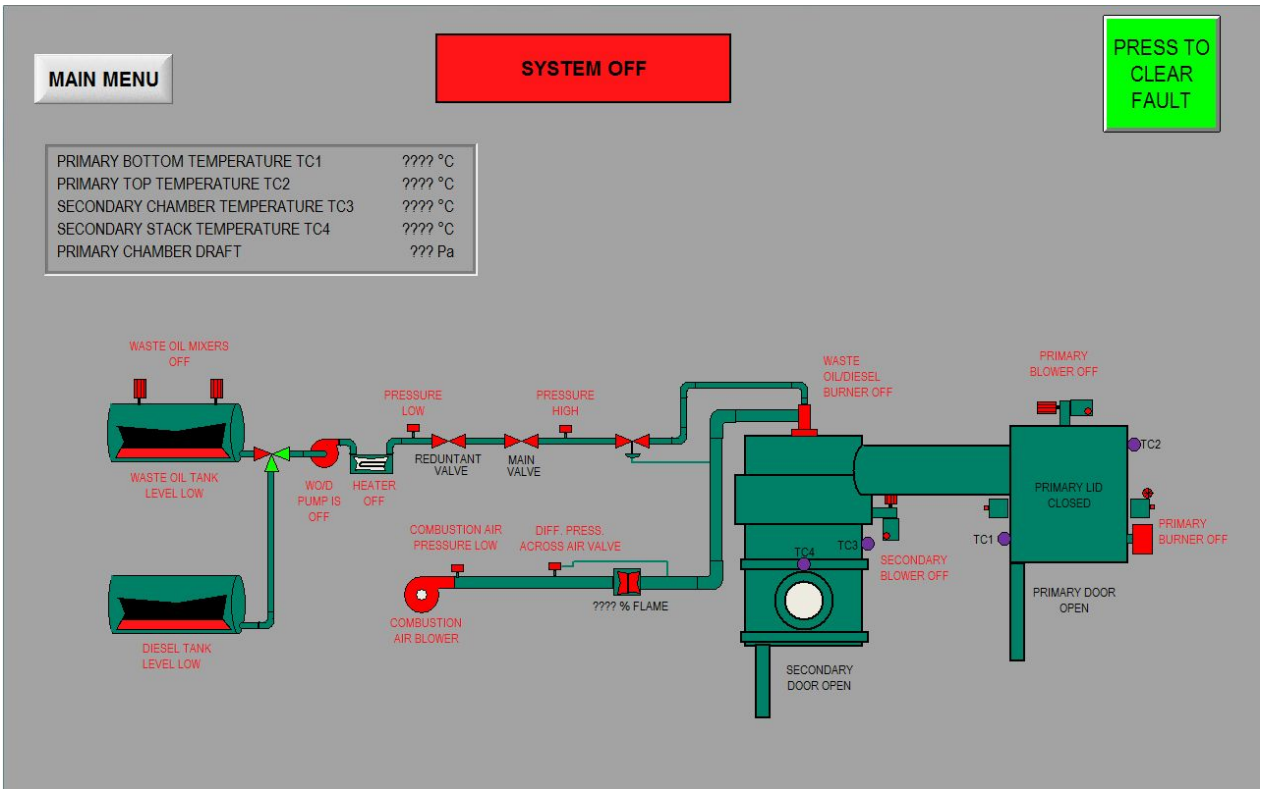
Top View

When the ***Top View*** button is selected, an overview of the incinerator and related components is displayed. This shows key temperatures, flows, and other indicators of what is happening in the process in a real-time basis.

NOTE

The system will not start if there are alarms or faults present. Clear and/or acknowledge faults.

At any time, touch **Main Menu** to go back to the main screen.

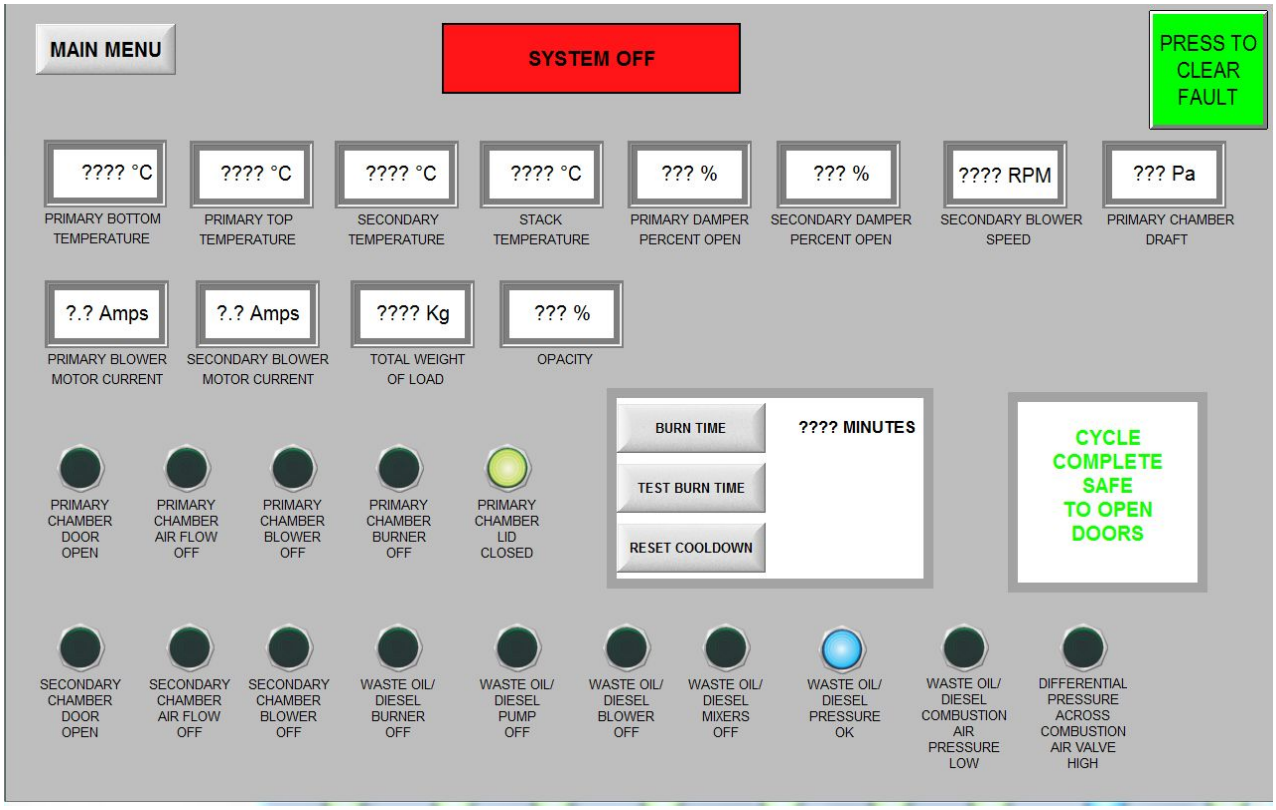


System Status

When the ***System Status*** button is selected from the **Main Menu,** a screen will display the status of all the operating parameters of the incinerator, such as the temperatures and the time remaining in the cycle, as well as displaying other informational items such as status of the door, lid lifter, blowers, etc.

The operator can change the burn time of the cycle by selecting “BURN TIME” and entering a time (in minutes). The operator may do this over time to either prolong the burn time, or decrease the burn time depending on the waste mixture; for example a very wet batch of garbage will take more time to burn than a dryer batch of waste.

At any time, touch **Main Menu** to go back to the main screen.



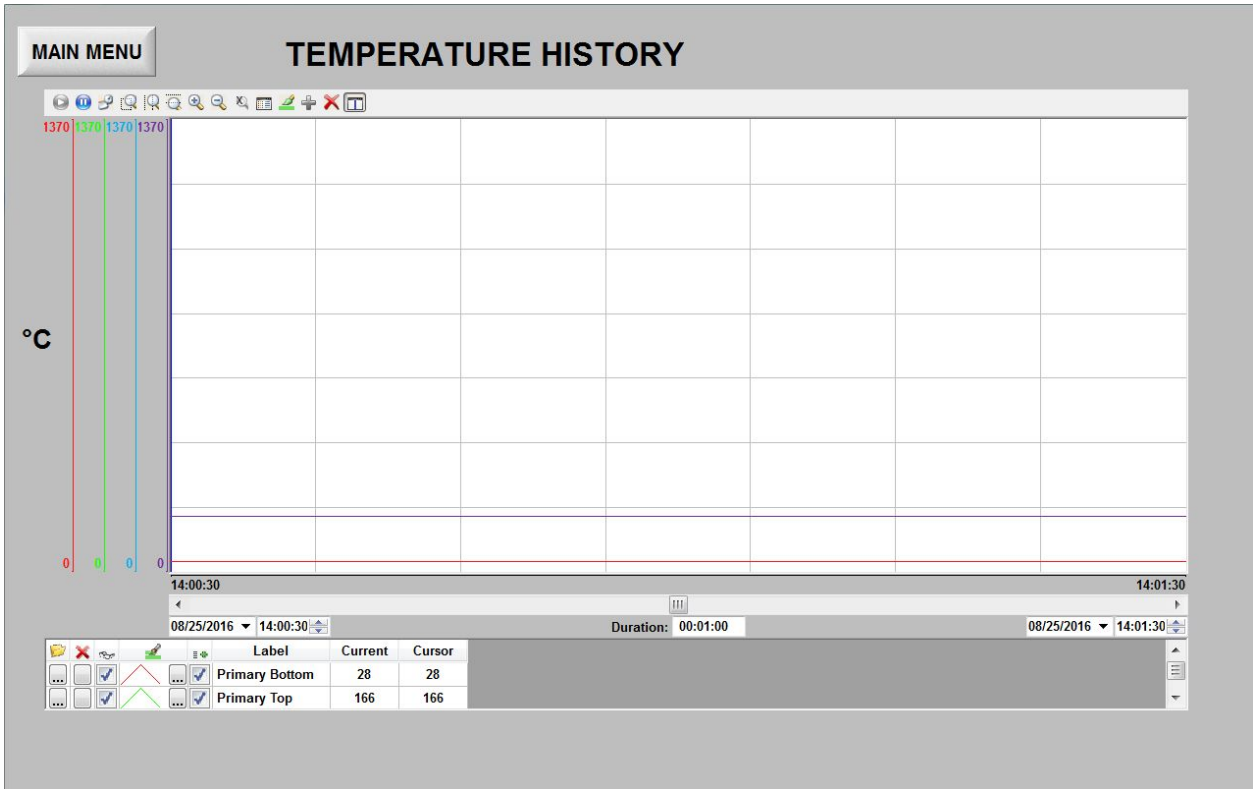
Overview of Historical Charts

The **Human Machine Interface (HMI)** monitors and records (every minute) critical operating parameters of the incinerator system like the temperature, motors, draft, load weights and alarms. Each operating parameter has its own graphic display for the operator to view, at any given time. Each display can easily be selected from the **Main Menu** of the **Human Machine Interface (HMI)**. The display will show the specific data collected from previous burn cycles.

This **Incinerator Data** is important for regulatory purposes and for general operating purposes. Also, the incinerator data is to be downloaded on a weekly basis to USB key for record-keeping purposes.

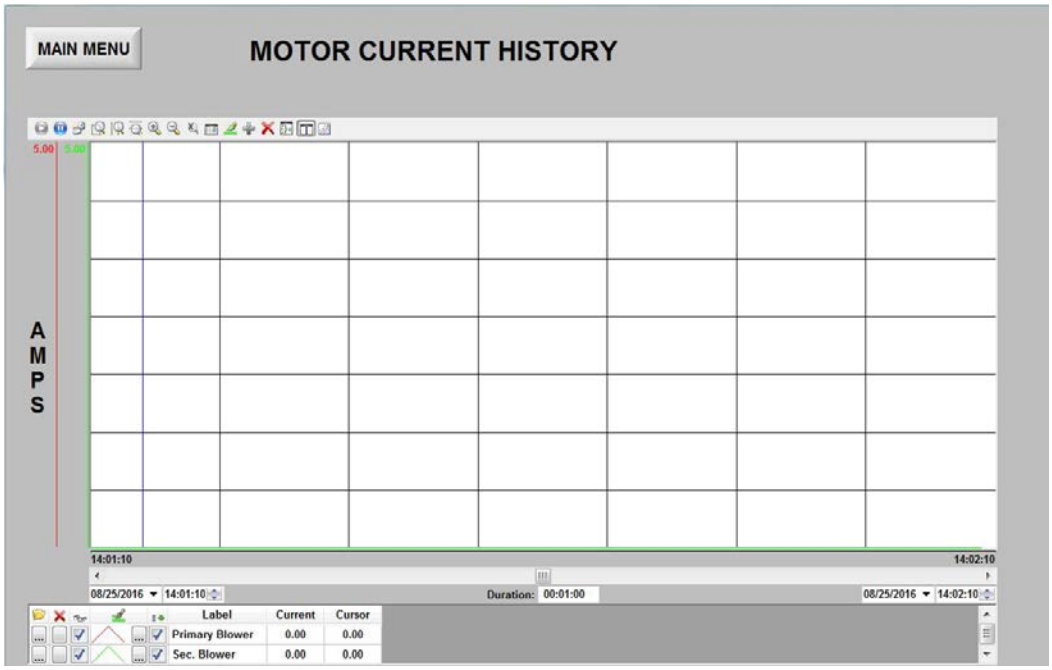
Temperature History

For example, when the ***Temperature History*** button is selected, the screen will display the trend in temperature during the operation of the system, include date & time of occurrence of that specific temperature.



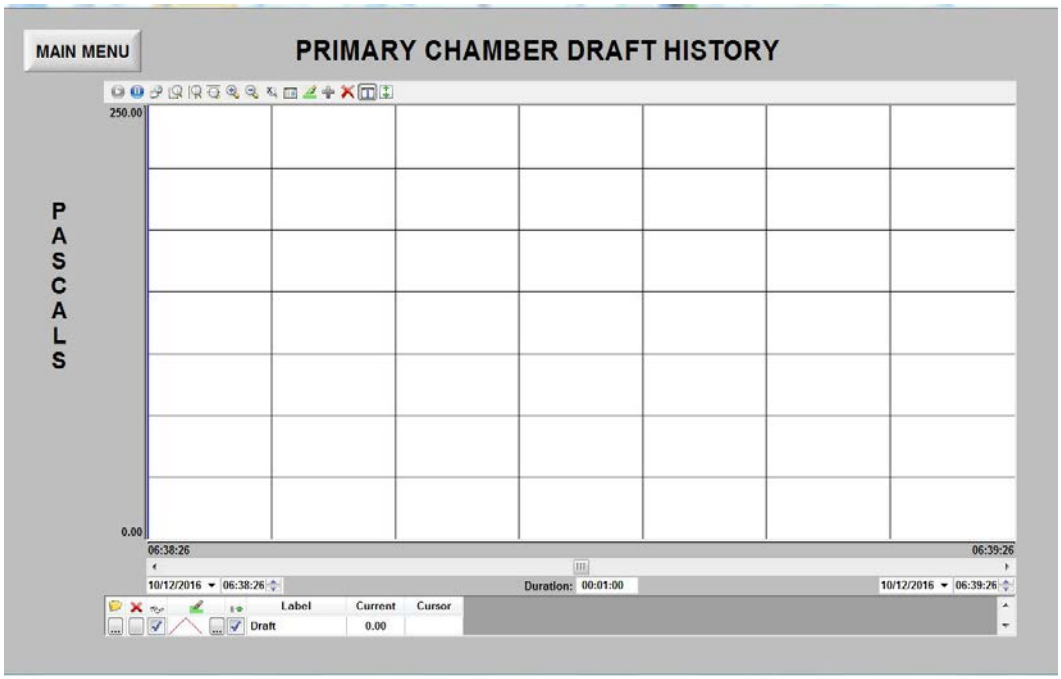
Motor Currents History

When the ***Motor Currents History*** is selected a screen will display the motor currents from the Primary Burner and the Secondary Burner, in AMPS, during the operation of the system, including date & time of occurrence of that specific motor current.



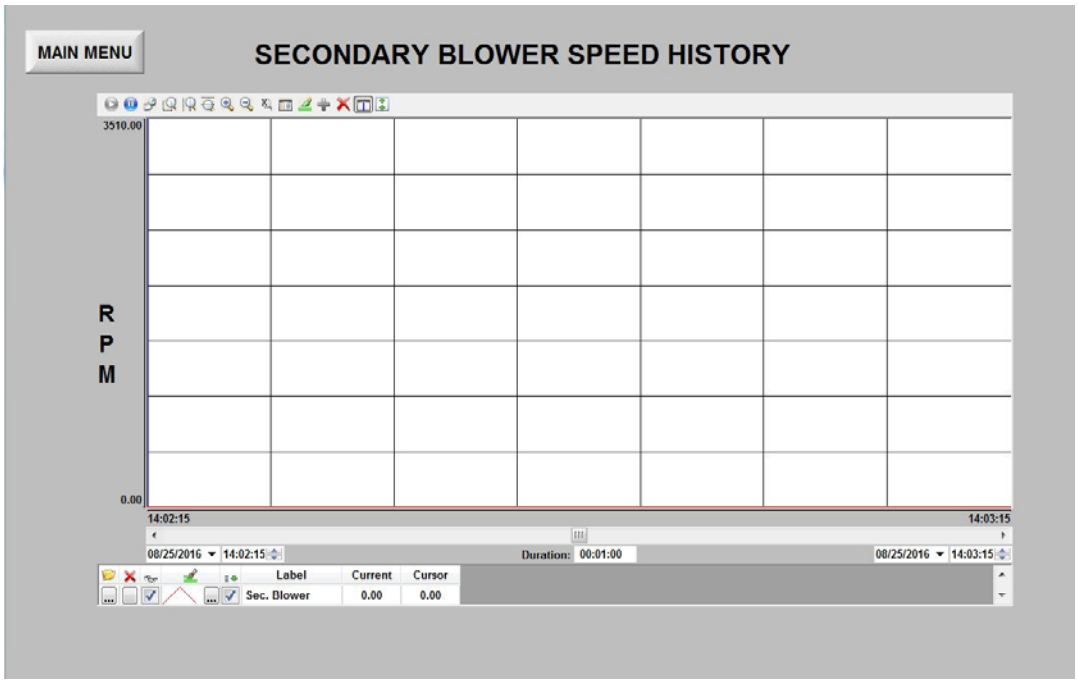
Draft History

When the ***Draft History*** button is selected a screen will display the draft during the operation of the system, include date & time of occurrence of that specific draft trend.



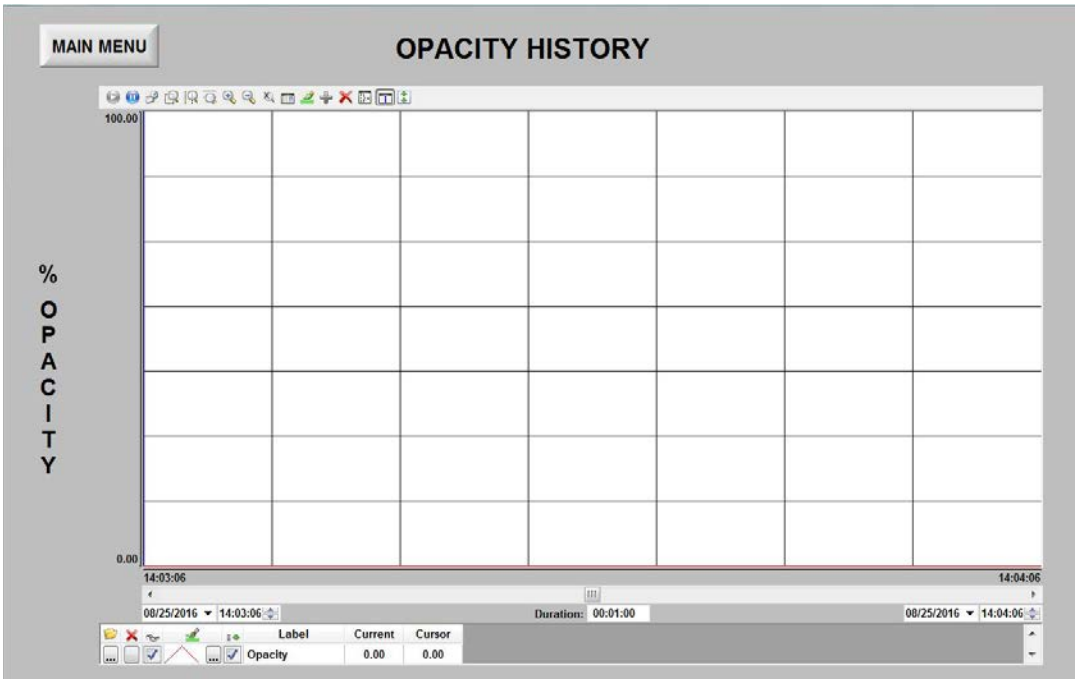
Secondary Blower Speed History

When the ***Secondary Blower Speed History*** button is selected a screen will display the RPM during the operation of the system, include date & time of occurrence of that specific speed.



Opacity History

When the ***Opacity History*** button is selected a screen will display the Opacity during the operation of the system, include date & time of occurrence of that specific reading.

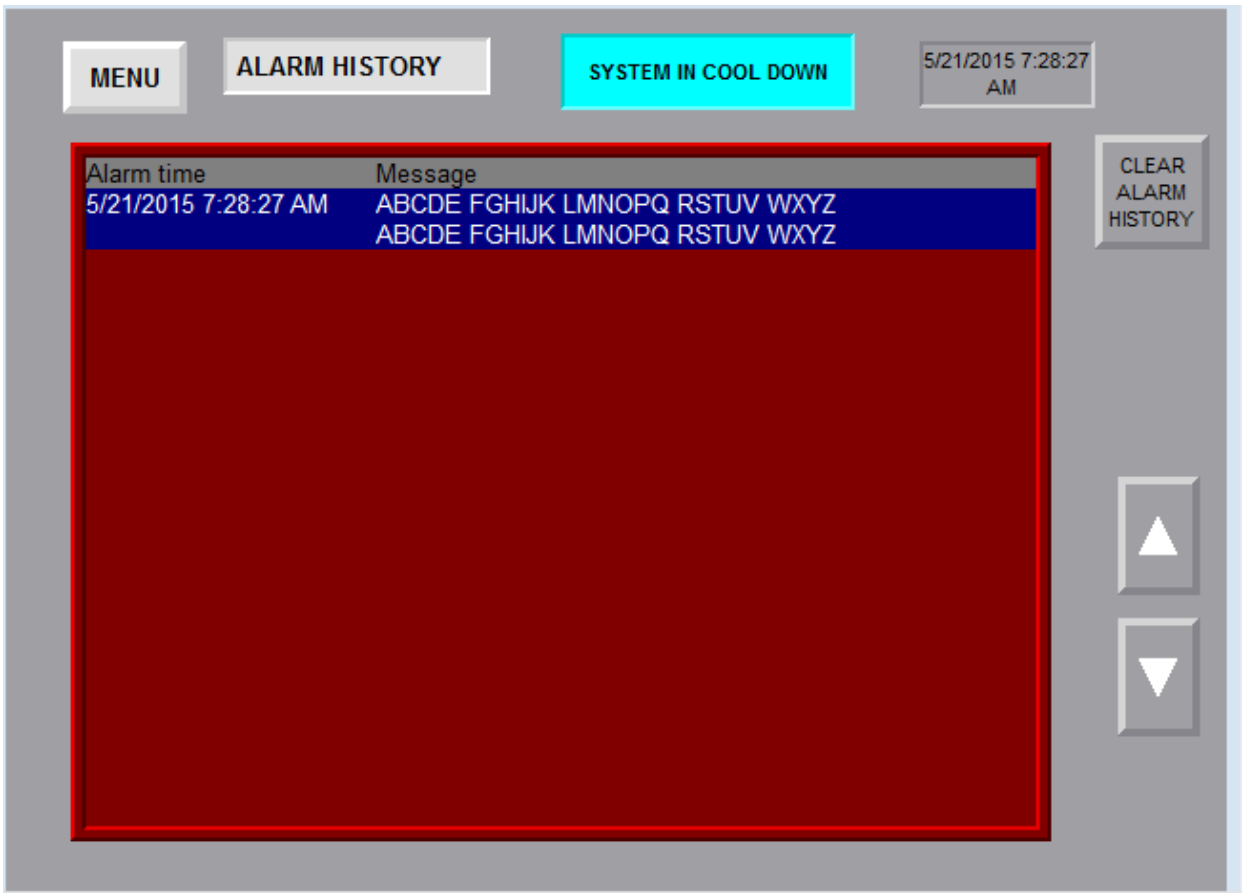


Alarm History

When the ***Alarm History*** button is selected a screen will display the last 128 faults with the date & time of occurrence.

The operator can press the *CLEAR ALARM HISTORY* to clear all of the faults, if they wish to. This does not affect the record-keeping feature of the system.

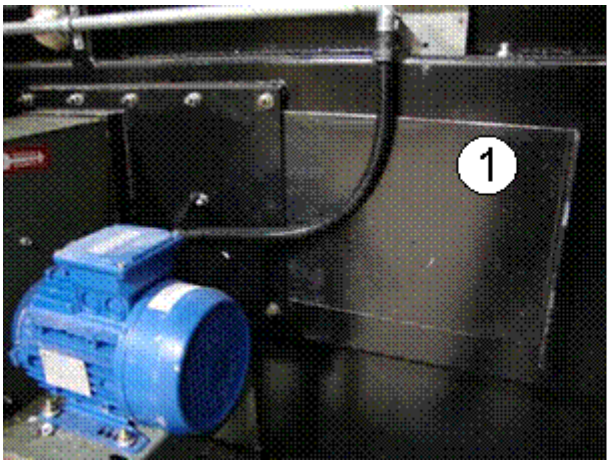
At any time, touch **Main Menu** to go back to the main screen.



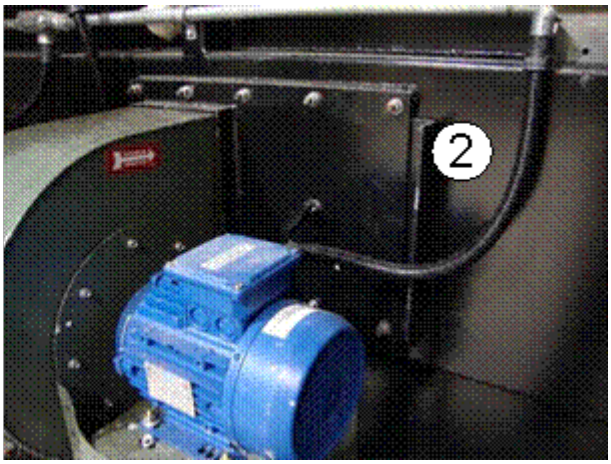
Standard Daily Operating Procedures

Incinerator Daily Start up

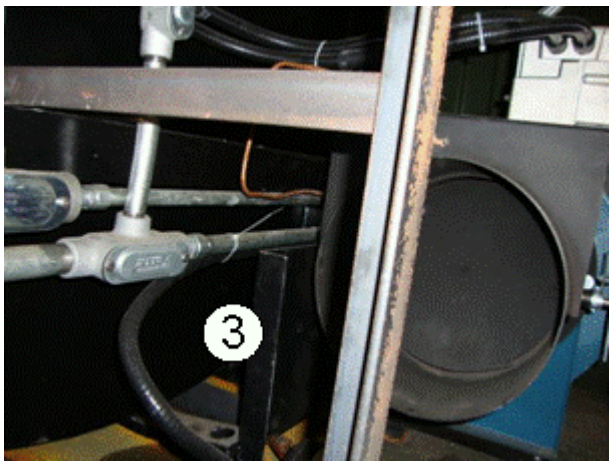
1. Ensure that manual slide gates for each blower are in the open position for free airflow into the **Primary and Secondary Chambers**.



1. **Primary Chamber Blower** Manual Slide Gate Open



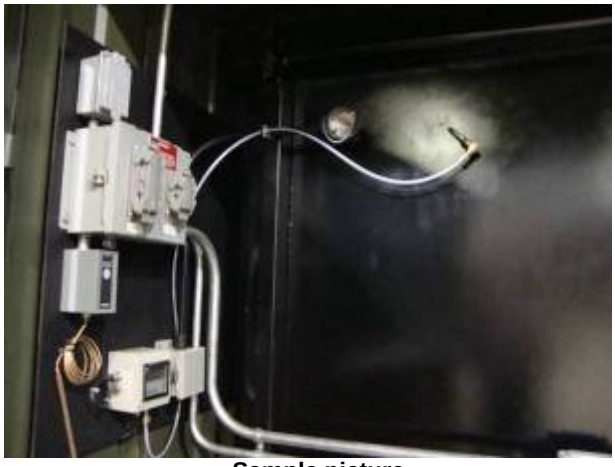
2. **Primary Chamber Blower** Manual Slide Gate Closed



3. **Secondary Chamber Blower** Manual Slide Gate Open

2. Visually inspect the burner hoses to ensure that there are no fuel leaks. Check to see if lines are brittle or cracked, check for any oil spills near the burner, which would indicate a leak.

3. Ensure the draft gauge hose connection is tight and sealed. This is a clear flexible tubing located in the **Primary Chamber** (see photo below).



Sample picture

4. Unlatch all clamps on the **Primary Chamber** door, open and secure in the open position



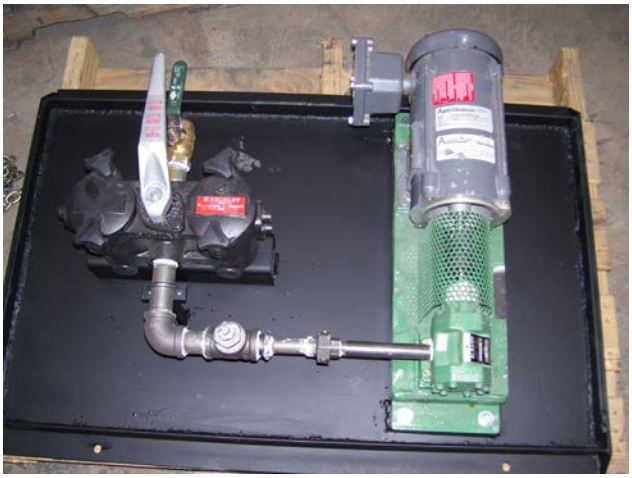


5. Ensure the Primary Chamber floor is cool (less than 90°C). Remove all the ash from the previous burn and store ash is ash bins.
6. Lock the **Primary Chamber** Front Loading Door and ensure all latches are properly engaged.

If the floor is too hot the waste may spontaneously catch on fire during loading.

High Output dual Burner Secondary Chamber Start-up

SYSTEM CHECK



Filter & Pump.(sample image)

Do a walk around the Waste Oil System, ensuring that there are no leaks, all ball valves are in the proper and fully open position for either Diesel or Waste Oil according to the fuel to be used for this specific cycle

Ensure that the correspondent storage tank has enough fuel for the entire cycle.

Using Waste Oil: 800 L minimum of Waste Oil and 300 L minimum of Diesel (the Primary Chamber operated with Diesel only)

Using Diesel Only: 1100 L of Diesel minimum

Both the Waste Oil and Diesel Tanks require at least 150L stored at all time to keep the level sensor closed.

Clean the filter if necessary.

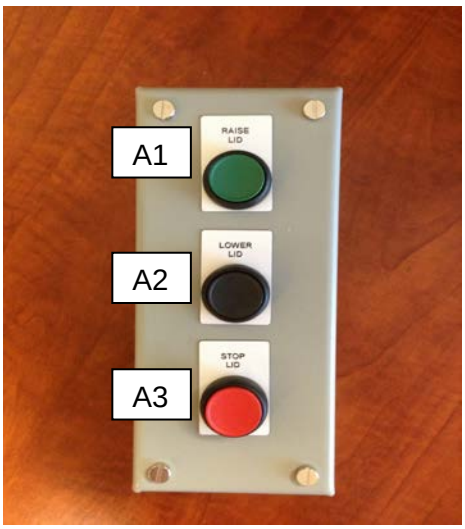
Check that all of the ball valves on the burner fuel oil train are fully open

Check that the Incinerator is not in cool down and the Primary temperature is 90°C or less.

Loading Procedure

Operator Stations for Lid Lifter

The Primary Chamber of the ECO 1.75TN 1PVC100L Waste Incinerator has a lid lifter to allow the roof of the chamber to be opened for quick loading of the waste.



Number	Name	Purpose
A1	**Raise Lid**	Raises the Lid on the Primary Chamber
A2	**Lower Lid**	Lowers the Lid on the Primary Chamber
A3	**Stop Lid**	Stops the lid during raising or lowering.

Once the roof is opened, the chamber can be loaded by the operator with the waste going to the incinerator.

Operating the Integrated Weigh Scale

1. The Operator has two options for managing the waste quantity prior to loading the selected Primary Chamber:

    i. Option 1: The operator will use the hoppers (previously tarred) to load waste onto the weigh scale.

    ii. Option 2: The operator may load waste/garbage (in bags/boxes) on the weigh scale directly.

2. Regardless of the option selected above, once the waste is on the weigh scale the Operator has to push the RECORD WEIGHT (black button) on the Weigh Scale Push-Button Station. By pressing this button, the weight value of that particular load of waste is sent to the PLC and the weight is recorded. At this time, the MAXIMUM WEIGHT (green button) will flash green once to show that the weight has been logged.

3. Then, the operator must take the waste and load it into the Primary Chamber. The hopper is to be raised just past the top edge of the Primary Chamber (using proper lifting equipment by others).

4. Once the hopper clears the edge of the Primary Chamber, the hopper's content can be dumped inside the chamber.

5. The empty hopper can now be pulled from the edge of the chamber and then lowered.

6. The operator returns to the weigh scale with some more waste and repeats Steps 2 to 6. This entire procedure is repeated until the maximum load weight for the Primary Chamber is reached. The PLC will indicate this to the operator when the MAXIMUM WEIGHT (green light) comes on and remains on. This indicates that the maximum weight permitted, in this case, the incinerator is designed for a maximum of 1,750Kg of waste material.

NOTE

No more waste should be loaded into the Primary Chamber after the load has reached the maximum weight.

7. The Primary Chamber is loaded, and the incinerator is ready to start.

Tips for loading: To decrease burn time and allow for more uniform burn.

a. Load the less dense waste first

b. Load dry waste first. Placing wet waste near the top of the Primary Chamber allows moisture to evaporate early in the cycle.

NOTE

Do not load waste greater than 90 Kg using the top loading system. This waste is to be loaded from the front of the unit. Loading waste over 90 Kg from the top will cause refractory floor to fracture.

NOTE

Do not throw the waste towards the sides of the Primary Chamber. Doing so will damage the ceramic blanket refractory.

NOTE

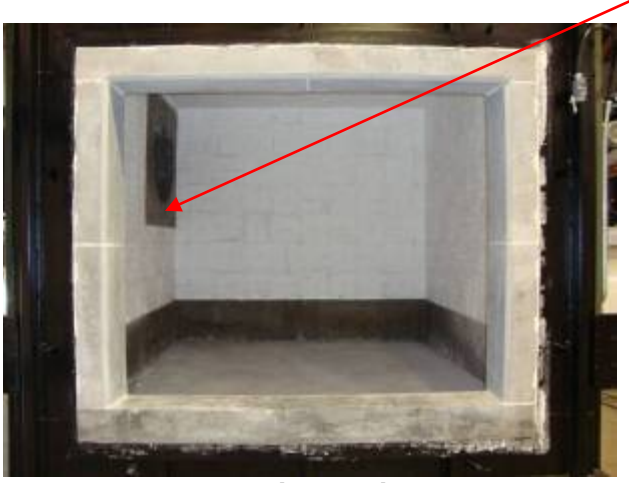
Load only the waste stream that the system has been designed for. DO NOT load a lot of high BTU rated waste for one burn (e.g. do not load more than three (3) gallons of bacon grease, kitchen grease or cooking oil). Doing so will result in excessive temperatures in the system reducing the life of the refractory.

NOTE

Do not load the Primary Chamber above its rated capacity by weight.

NOTE

Do not load the Primary Chamber such that the Breech and Burner section is blocked in any way.



Breech Opening



Burner port

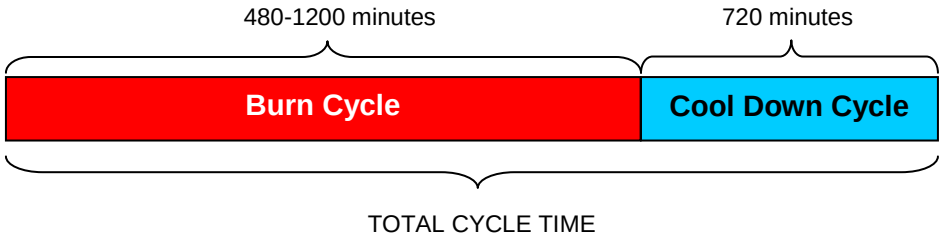
8. Inspect the lid ledge of the Primary Chamber and remove any debris that will prevent a tight seal with the lid.
9. Close the **Primary Chamber** lid by pressing the close button on the Lid Lifter Station. The lid will initially raise, after 0.5 seconds the safety pawls will pull out. Two seconds after sensing that the safety pawls are out the lid will lower.
10. The lid will keep lowering until either the down limit switch is activated or the stop button is pressed.
11. If the stop button was pushed just press the close button to resume lowering. The lid will raise then lower again. When the lid is stopped by either the lower limit switch or the stop button the safety pawls will be released back in.
12. Proceed to the **Main Control Panel.**

NOTE

The burn time will be set to the previous burn, if you wish to change the set time, proceed to the Primary Status screen and click on the BURN TIME button. The minimum number of minutes you can enter is 480 (8 hours). When you have finished, the time will be displayed in minutes beside the BURN TIME button

NOTE

The burn time value (in minutes) determines the length of the burn cycle before cool down cycle starts.



13. Check that the PRIMARY DOOR AND LID are closed on the **Human Machine Interface (HMI)** screens.
14. Check that no alarms are displayed on the **Human Machine Interface (HMI)**
15. Check that the EMERGENCY STOP BUTTON is out.
16. Check the GREEN CONTROL POWER BUTTON is lit up. Press this button to power on the control panel
17. On the **Main Control Panel turn the SELECTOR SWITCH** to the right to start the cycle. The following steps will automatically take place, controlled by the **Main Control Panel**:
    I. The **Primary Blower and Secondary Blower** will purge the system for 2 minutes.
    II. The **Secondary Burner** will purge for safety, and upon completion will ignite.
    III. Once the **Secondary Chamber** temperature reaches 1000°C, the **Primary Burner** on both Primary Chambers will purge for safety and upon completion will ignite.

IV. The burn time will start counting down when the temperature in the **Primary Chamber** reaches 427°C.

NOTE

The Main Control Panel System will maintain proper operating conditions and will provide continuous monitoring capability

After the burn cycle is completed the system will enter the cool-down cycle when the following things will occur:

- Primary Chamber & Secondary Chamber burners OFF
- Secondary Chamber Blower OFF
- Primary Modutrol 100% open
- Primary Blower ON

Once fully cooled and the temperature is below 90°C, proceed to the **Primary Chamber Clean Out Procedures**.

Primary Chamber Clean Out Procedures

Operators responsible for loading and cleaning out incinerators should wear appropriate protective equipment, including eye protection, dust masks, heavy gloves and safety shoes with puncture-proof toes and soles to avoid injury.

Although the ash from the system is considered sterile and will not contain microorganisms, it may contain a quantity of sharp objects, such as broken glass and other sharps which may not be fully destroyed in the burning process, and may thus still pose a hazard to persons who clean out the ash and residues. Also removing the ash does create dust particles in the air. Dust should not be inhaled. The operator must wear dust protection safety gear.

Please follow these steps when the cycle is complete:

1. When the internal temperature of the **Primary Chamber** has cooled to less than 40°C, lock out the power to the system on the **Main Control Panel** by moving the main disconnect to the “OFF” position.
2. Unlock all door latches on the access door to the **Primary Chamber.**
3. While standing in front of the **Primary Chamber** door, slowly open the door to allow clear entry. Secure **Primary Chamber** Door in the OPEN position.
4. With the **Primary Chamber** Door secured in the open position, raise the lid to fully opened
5. Clean the **Primary Chamber** by using ash handling tool(s) and proper safety equipment (not provided).
6. Inspect the interior of the **Primary Chamber** for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure.
7. Check the air inlet holes and remove any obstructions if necessary.

8. Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb.
9. Close the **Primary Chamber** access door by clamping each latch until it is tight.
10. Clean the inspection **View Port** (glass) with a mild soap and water. To clean the view port, unscrew it by hand and re-tighten by hand.

In Case of Emergency



1. Go to manual Slide Gates on the **Primary Chamber**, located just after the blower and close them all the way. This will help to put the fire in the **Primary Chamber** out.
2. Check alarms to see what the problem is.
3. Do not open the door of the **Primary Chamber** unless the temperature inside the chamber is below 90°C.
4. Call a certified technician to fix the problem and/or consult with **Eco Waste Solutions Customer Service Department at 905.634.7022, toll free 1-866-326-2876.**

Start Up After Power Failure

1. Once the power is restored turn breaker (main disconnect) back on.
2. The **Human Machine Interface (HMI)** and PLC will begin a boot up procedure.
3. Wait until the **Human Machine Interface (HMI)** on the **Main Control Panel** has booted up before turning the control power to the panel back on by pressing the Control Power ON button.
4. When the power is restored to the **Main Control Panel**, the button should illuminate.
5. If the system was interrupted during a burn cycle, restart the system by turning the selector switch on the main panel to the right to start the cycle . If the system was interrupted during cool-down cycle, it will resume the cycle where it left off.

Dealing with Warning and Faults

Troubleshooting

The burn cycle will not start if one of the following conditions exists:

1. The system is in the “cool-down” part of the cycle. Wait until the “cool down” cycle is complete.

2. There is a fault in the system as indicated on the **HMI**

3. Loss of power due to any one or more of the following:

    - The main disconnect (see image) is off or there is no electrical power. Turn on the disconnect switch or check why there is no power.



Power is OFF in this position



Power is ON in this position

- An open breaker. Check the breakers and replace any that are defective.

- The EMERGENCY STOP is pushed in. Twist the EMERGENCY STOP button to unlock, and then push the CONTROL POWER ON button. The CONTROL POWER BUTTON should now be illuminated.





4. If on the Main Control Panel HMI the **Primary Chamber** door is not closed, the door has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

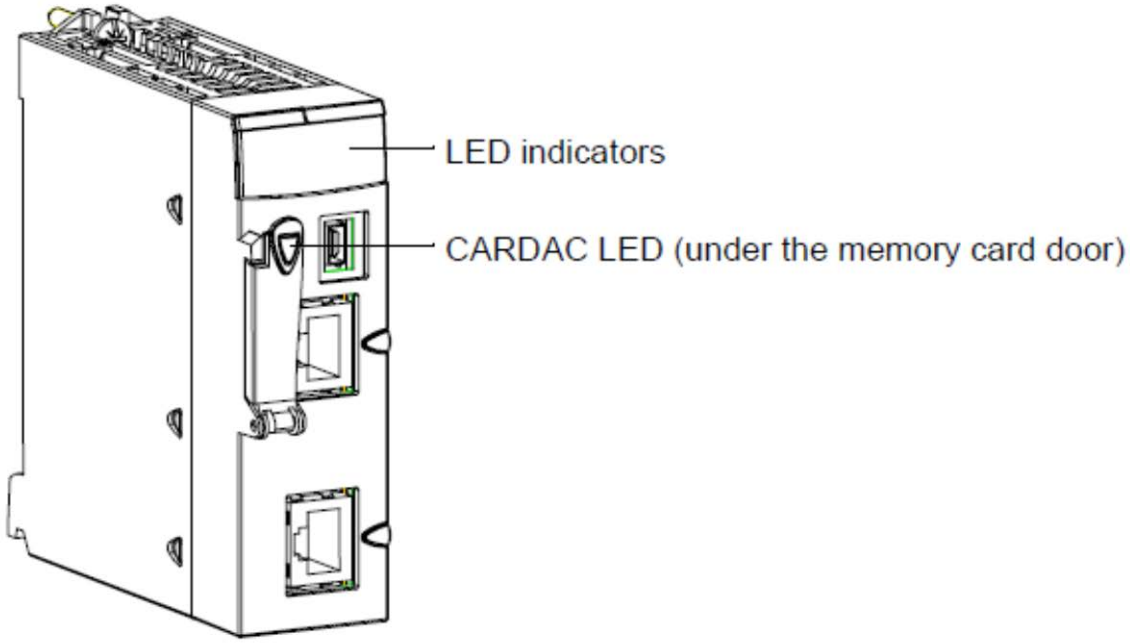
5. If on the Main Control Panel HMI the **Primary Chamber** roof lid is not closed, the lid has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

6. If on the Main Control Panel HMI the **Secondary Chamber** door is not closed, the door has not been shut properly. Adjust the limit switch lever arm, if necessary. Check the limit switch and that the wiring is in working order.

7. If fuel tank is low, system will not start. Tank on the **HMI** will be red, indicating the level is low and needs to be filled.

PLC Processor Problem

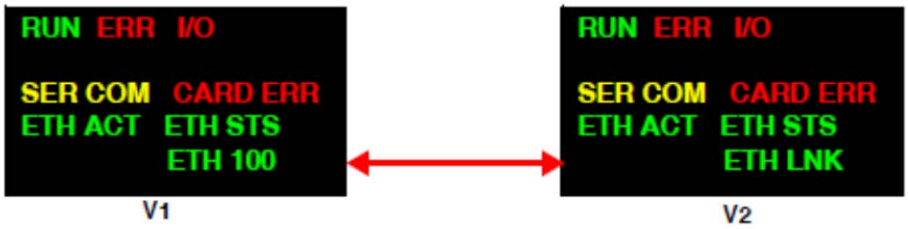
There are several LEDs available on the front panel of each Modicon M340 module or processor, enabling rapid diagnosis of the PLC status:



These LEDs provide information on:
- PLC functioning
- the memory card
- communication with the modules
- serial communication
- communication on the CANopen network
- communication on the Ethernet network

The following diagram shows the diagnostic LEDs on the BMX P34 2020 processor. Note that two displays exist, depending on whether you are using firmware V1 or V2

(or greater) of the processor.



The colors and blink patterns of the LEDs indicate the status and operating conditions of Ethernet communications on the module:

Label	Pattern	Indication
RUN (green): operational state	on	• PLC hardware and PLC program operations are normal. • Module is in RUN state.
	flashing	• PLC is in STOP mode or a blocking error in the application has been detected. • Processor is configured but not in RUN state.
	off	PLC is not configured (application is absent, invalid, or incompatible).
ERR (red): detected error	on	Processor, system, or configuration detected error
	flashing	• PLC is not configured (application is absent, invalid, or incompatible). • PLC is in STOP mode or a blocking error in the application has been detected.
	off	Normal (no detected errors)
ETH STS (green): Ethernet communication status	on	Communication OK
	2 flashes	Invalid MAC address
	3 flashes	Link not connected
	4 flashes	Duplicate IP address
	5 flashes	Waiting for a server IP address
	6 flashes	Secure and safe mode (with default IP address)
	7 flashes	Configuration conflict between rotary switches and internal configuration
CARDERR (red): memory card detected error	on	• Memory card is missing. • Memory card not usable (bad format, unrecognized type). • Memory card content is inconsistent with internal RAM application.
	off	• Memory card is valid and recognized. • Application on card is consistent with the internal RAM application.
I/O (red): input/output status	on	• Error detected on a configured module or CPU channel • Configuration mismatch with the application (module missing...)
	off	Normal (no detected errors)

SER COM (yellow): serial data status	flashing	Data exchange (send/receive) on the serial connection in progress
	off	No data exchange on the serial connection
CAN RUN (green): CANopen operations	on	CANopen network operational
	rapid flashing (note 1)	Automatic detection of data flow or LSS services in progress (alternates with CAN ERR).
	slow flashing (note 2)	CANopen network is pre-operational.
	1 flash	CANopen network is stopped.
	3 flashes	Downloading CANopen firmware.
CAN ERR (red): CANopen detected error	on	CANopen bus is stopped.
	rapid flashing (note 1)	Automatic detection of data flow or LSS services in progress (alternates with CAN RUN).
	slow flashing (note 2)	CANopen configuration is not valid.
	1 flash	At least one error counter has reached or exceeded alert level.
	2 flashes	A guard event (NMT slave or NMT master) or a heartbeat event has occurred.
	3 flashes	The SYNC message was not received before the end of the communication cycle period.
	off	No error detected on CANopen.
CARDAC (green): memory card access **Note:** This LED is located under the memory card door (see *The Module, p. 20*).	on	Access to the card is enabled.
	flashing	Activity on the card: during each access, the card LED is set to OFF, then back to ON.
	off	Access to the card is disabled. You can remove the card after you disable card access by setting system bit %S65 to 0.
Note 1: Rapid flashing is defined as ON for 50 ms and OFF for 50 ms.		

Note 2: Slow flashing is defined as ON for 200 ms and OFF for 200 ms.

The following table describes the meaning of the ETH ACT and ETH 100 LEDs on the front panel for firmware V1 NOE and CPU modules.

Label	**Pattern**	**Indication**
ETH ACT (green): Ethernet communication (transmission/ reception activity)	on	Ethernet link detected: no communications activity.
	off	No Ethernet link detected.
	flashing	Ethernet link detected: receiving or sending packets.
ETH 100 (green): Ethernet transmission speed	on	Ethernet transmission at 100 Mbit/s (Fast Ethernet).
	off	Ethernet transmission at 10 Mbit/s (Ethernet) or no link detected.

The following table describes the meaning of the ETH ACT and ETH LNK LEDs on the front panel for firmware V2 NOE and CPU modules.

Label	Pattern	Indication
ETH ACT (green): Ethernet communication (transmission/ reception) activity	on	Communications activity detected.
	off	No communications activity detected.
ETH LNK (green): Ethernet link status	on	Ethernet link detected.
	off	No Ethernet link detected.

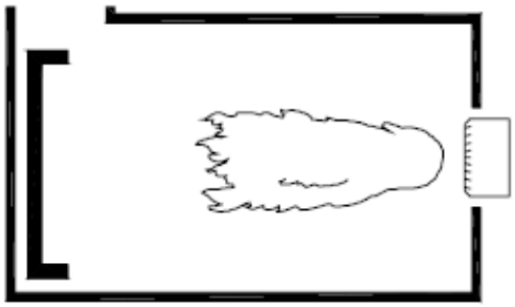
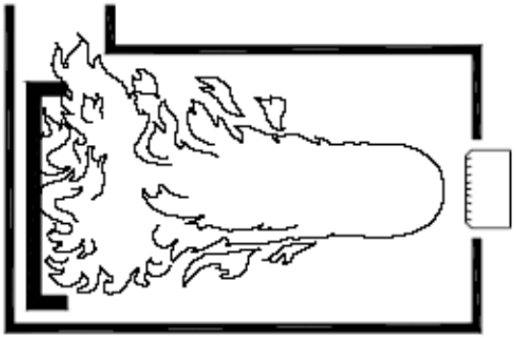
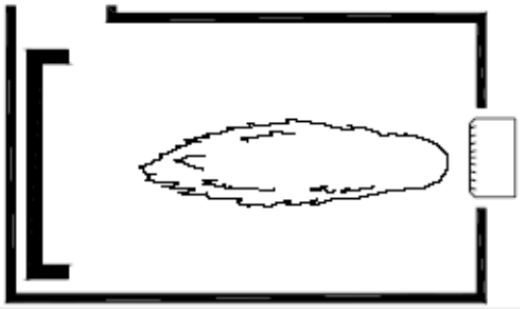
Note:

- Rapid flashing is defined as ON for 50 ms and OFF for 50 ms.
- Slow flashing is defined as ON for 200 ms and OFF for 200 ms.

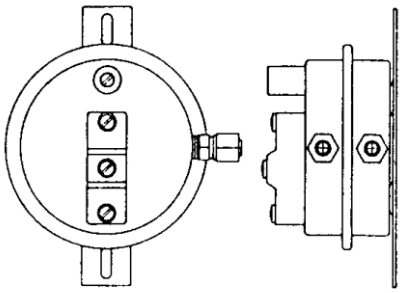
Possible Problems, Causes and Solutions

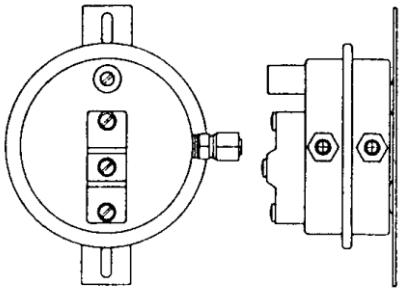
Problem	Causes	Solutions
Blower Fails to start	Over load tripped, blown fuse	Turn power off. Open Panel and reset overload. Check fuse and replace.
	Motor starters or contactor coil is burnt out	Locate contactor for Blower and visually observe if the contactor is pulled in. Use a volt meter to check for voltage across the coil If there is voltage across the coil and the contactor is not pulled in, replace the contactor.
Secondary Burner won't ignite	Bad Electrodes	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 10.
	Fuel Line Leak	Visually inspect the lines for the leak. Tighten any fittings that are near the leak.
	Door Switch not making contact Burner alarm has been tripped	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.
	Bad Thermocouple	Replace thermocouple .
Primary Burner won't ignite	Bad Electrode	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 8.
	Fuel Line Leak	Visually inspect the lines for the leak. Tighten any fittings that are near the leak.
	Door Switch not making contact or broken	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.
	Secondary temperature not at 1000°C	Wait until Secondary temperature is at 1000°C and try again.
	Burner main switch is turned off	Turn switch on.
	Burner alarm has been tripped	Acknowledge burn alarm and then hit the reset button on control panel.

Problem	Causes	Solutions
Persistent Black Smoke	Insufficient air supply to Secondary Chamber to completely consume emissions	Check to ensure combustion air blower/damper assembly is operating properly.
	Secondary Chamber is not hot enough.	Check that the Secondary temperature is operating at required temperature set point.
	Secondary Chamber is not hot enough.	Too much draft, open barometric damper.
	Overloading or loading highly volatile material	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Burner failure	Check burner operation – if no flame or a poor flame is visible through the flame view port adjust air/fuel ratio.
	Operating at a too high Primary Chamber temperature	Check/decrease primary chamber combustion air.
Smoke coming out of Primary	Too much air	Check dampers on primary blower.
	Too much volatile material loaded	Decrease load size on next batch to ensure the waste mix is correct.
	Primary Chamber temperature too high	Waste loaded may not be a good mix of heat value.
	Low draft	Close barometric damper on stack's T-section
Too much fuel usage	Too much secondary combustion air	Check/reduce secondary combustion air.
	Too much air infiltration	Reduce air flow by adjusting the damper.
	Fuel leakage	Check fuel trains and burners for fuel leakage.
	Wet waste	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time.
	Excessive draft	Check/reduce draft – check door seals and other seals for leakage adjust damper.
	Burner setting too high	Check air/fuel mix.

Problem	Causes	Solutions
		Correct Maximum Flame Adjustment (Proper Oil and Air Pressure with correct supply of combustion air)
		Incorrect Flame Adjustment (Not enough Combustion Air)
		Incorrect Flame Adjustment (Air Pressure too high; too much air)
Incomplete burnout/poor ash quality	Build-up around air holes – clogged with ash from previous burn	Check around air holes and clean.
	Poor draft	Draft should be -0.2-0.06 KPa (or 0.8-0.25“ W.C).
	Too much wet waste – overloading system	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time.
	Insufficient burn time	Allow longer burn time period.

Possible Alarms (Faults)

#	ALARM (System Fault)	SOLUTION
1	The Primary Chamber top/bottom thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
2	The Secondary Chamber thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
3	The Secondary Stack Thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
4	The primary burner is faulted	The primary burner has failed to light when it received a signal to start. To reset the burner, press the reset button located on the Burner. If this does not start the burner, refer to Supplier Catalogue (Riello Burner) in Section 8
5	The secondary burner is faulted	The secondary burner has failed to light when it received a signal to start. To reset the burner,
6	The system has shut down due to primary blower low air flow. 	Visually examine the primary blower for any obstructions that may be causing low air flow. Check slide gate located between Primary chamber and blower, ensure it is open. Check damper assembly, ensuring modutrol crank arm is still connected and that butterfly damper is open, allowing air flow. Air proving switch may be defective. Refer to Section 6 of this manual. There are two ports on the air flow switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked. If no air restriction is observed (i.e. blockage in the tube) change the air proving switch. Refer to Section 6 of this manual.
7	The primary blower motor overload is tripped.	Turn power off on Control panel by turning the Main Disconnect to the OFF position. Reset overload.

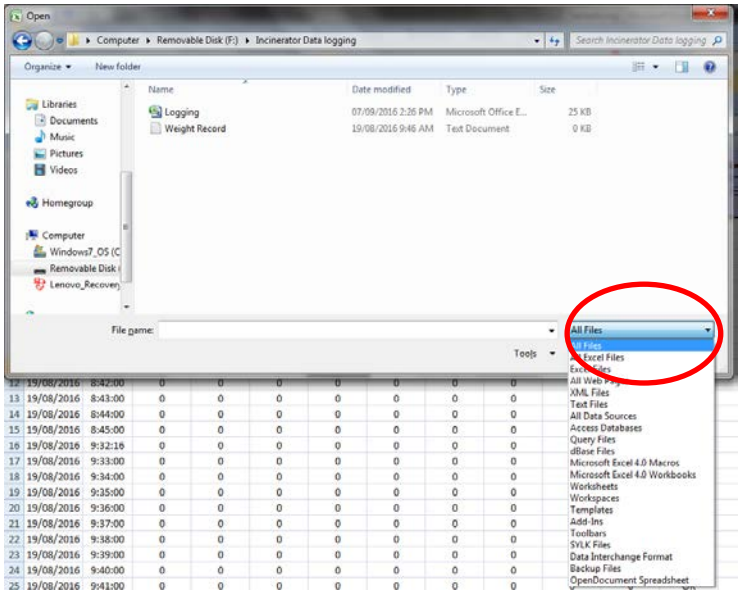
#	ALARM (System Fault)	SOLUTION
8	The system has shut down due to secondary blower low air flow 	Visually examine the Secondary Blower for any obstructions that may be causing low air flow. . Check slide gate located between Secondary chamber and blower, ensure it is open. Check damper assembly, ensuring Modutrol crank arm is still connected and that butterfly damper is open, allowing air flow. Air flow switch may be defective. Refer to Section 6 of this manual. There are two ports on the air flow switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked. If no air restriction is observed (i.e. blockage in the tube) change the air proving switch. Refer to Section 6 of this manual.
9	The Secondary blower variable frequency drive is faulted	Push fault reset button on the HMI If fault persist check the error code on the variable frequency drive and check manual for troubleshooting alarm.
10	The burner fuel level is low.	Add fuel to the fuel tank and the alarm should reset itself. If alarm persists, replace the low level switch.
11	Primary Chamber – lid lifter hydraulic pump overload.	Turn power off on Control panel by turning the Main Disconnect to the OFF position. Reset overload.
12	Primary Chamber – lid lifter stuck while rising.	Check to see if anything is blocking the lifts or roof from raising Check the power pack fluid level to ensure enough hydraulic oil is available Check the limit switch is working

#	ALARM (System Fault)	SOLUTION
13	Primary Chamber - lid lifter stuck while lowering.	Check to see if anything is blocking the lifts or roof from lowering Check the power pack fluid level to ensure enough hydraulic oil is available Check the limit switch is working This can be caused by a burnt out solenoid valve. Check that the control valve is open.
14	Primary Chamber - lid lifter left or right safety pawl failed to retract.	Check the proximity switch that senses that the safety catch is out Check the solenoid valves (located on each column)

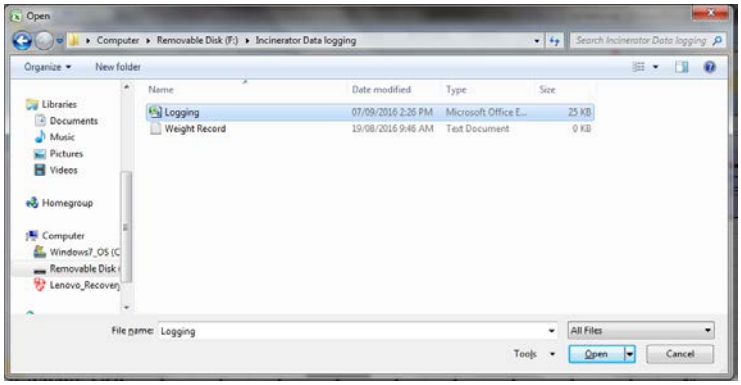
Record Keeping

Accessing Historical Information

1. It is recommended that a dedicated folder be set on the destination computer that is used for storing data from the Incinerator Package (e.g. “Incinerator Data”)
2. Turn power off to the Main Control panel by turning the Main Disconnect to the OFF position.
3. Open the Main Control Panel door and remove the USB from the back of the HMI panel and insert the USB into the destination computer.
4. Open an Excel File, once opened go to File/Open locate the USB on your computer, in the bottom right corner choose “All Files”.

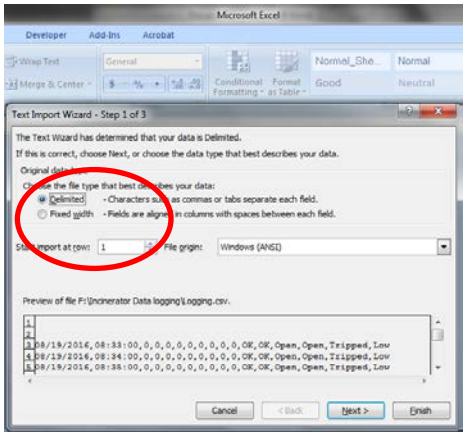


5. Click on the “logging” file and press open.

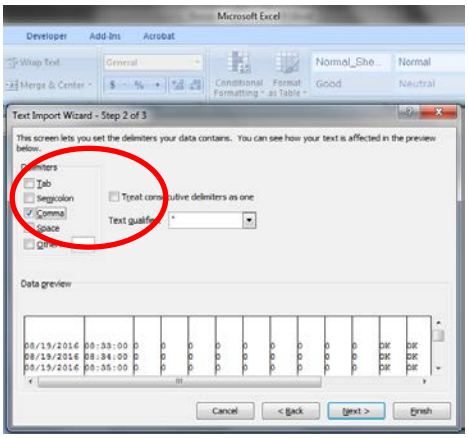


6. Excel will prompt you with a text import wizard, follow the next 3 steps to ensure the log files is displayed properly:

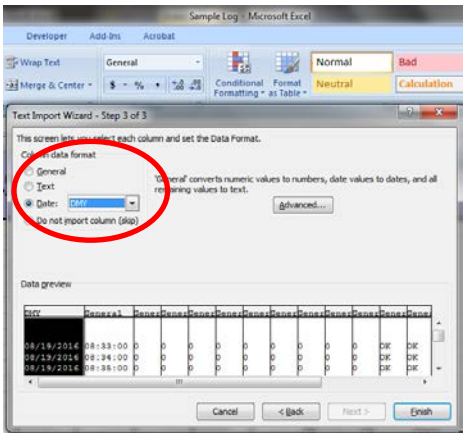
7. Steps 1 of 3 choose delimited – character such as commas or tabs separate each field, and choose Next:



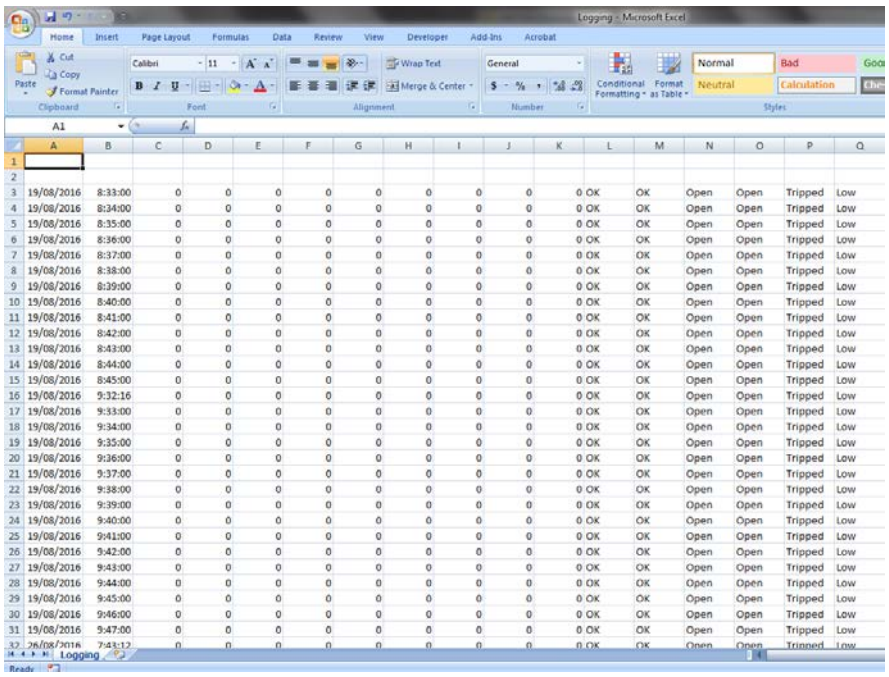
8. Steps 2 of 3 choose Comma as the delimiting item, and choose Next:



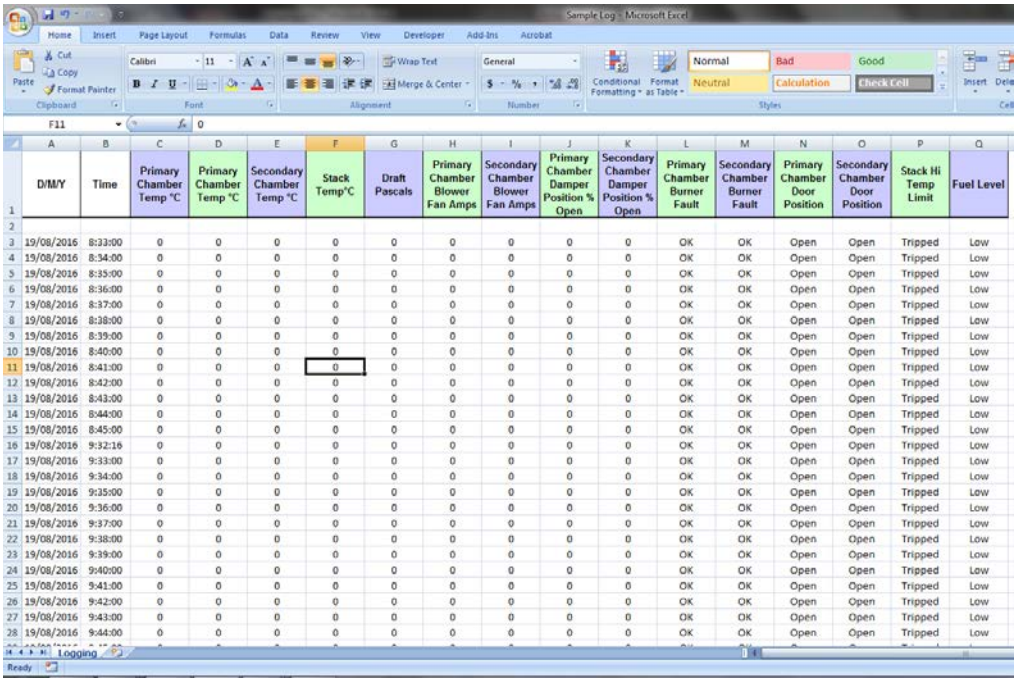
9. Steps 3 of 3 Column data format should be Date with DMY – character such as commas or tabs separate each field, choose Finish.



10. Once the data is open, it will look similar to the following:



11. From the electronic template file located on the USB for the manual copy the first row and paste into your log file:



	D/M/Y	Time	Primary Chamber Temp °C	Primary Chamber Temp °C	Secondary Chamber Temp °C	Stack Temp°C	Draft Pascals	Primary Chamber Blower Fan Amps	Secondary Chamber Blower Fan Amps	Primary Chamber Damper Position % Open	Secondary Chamber Damper Position % Open	Primary Chamber Burner Fault	Secondary Chamber Burner Fault	Primary Chamber Door Position	Secondary Chamber Door Position	Stack Hi Temp Limit	Fuel Level
1																	
2																	
3	19/08/2016	8:33:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
4	19/08/2016	8:34:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
5	19/08/2016	8:35:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
6	19/08/2016	8:36:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
7	19/08/2016	8:37:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
8	19/08/2016	8:38:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
9	19/08/2016	8:39:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
10	19/08/2016	8:40:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
11	19/08/2016	8:41:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
12	19/08/2016	8:42:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
13	19/08/2016	8:43:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
14	19/08/2016	8:44:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
15	19/08/2016	8:45:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
16	19/08/2016	9:32:16	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
17	19/08/2016	9:33:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
18	19/08/2016	9:34:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
19	19/08/2016	9:35:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
20	19/08/2016	9:36:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
21	19/08/2016	9:37:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
22	19/08/2016	9:38:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
23	19/08/2016	9:39:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
24	19/08/2016	9:40:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
25	19/08/2016	9:41:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
26	19/08/2016	9:42:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
27	19/08/2016	9:43:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low
28	19/08/2016	9:44:00	0	0	0	0	0	0	0	0	0	OK	OK	Open	Open	Tripped	Low

12. Save your excel file with the date in the designated folder.

13. Reinstall the USB to the back of the HMI, close the Main Control Panel door and turn power back on to the system.

SECTION 6

MAINTENANCE INSTRUCTIONS

Zero Mechanical State & Lock Out Procedures

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the EWS Incinerator.

NOTE The warranty will become void if proper maintenance is not performed as instructed.

Safety

During maintenance of the EWS mobile incinerator, it is very important to be aware of special hazards. Two safety programs are described in the following sections:

1. Zero Mechanical State
2. Power Lock Out Procedures



Failure to comply with these instructions during maintenance could result in injury or death. The responsibility for implementation of a comprehensive safety program rests with the operating staff and supervision. The safety procedures in this *Manual* should be considered only as a starting point for the safety program at site.



ACCIDENTS CAN BE PREVENTED A CAREFUL WORKER IS THE BEST SAFETY DEVICE

Zero Mechanical State

Zero Mechanical State (ZMS) exists when the possibility of an unexpected mechanical movement has been eliminated. During maintenance, it is absolutely mandatory to totally deactivate the incinerator so that there is no possibility of an unexpected machine movement. Power lock-out, described in the next section, is commonly used for this purpose. Most machines are powered by electrical, hydraulic or pneumatic drives. Energy may be stored in a shutdown machine in various ways: Air pressure in a cylinder, hydraulic pressure fluid stored in pressurized hoses, or machine members whose weight can generate fluid pressure. Therefore, just cutting off the electrical power may not be enough to neutralize all power sources. Certain maintenance procedures at site should require ZMS condition as a matter of course.

Zero Mechanical State (ZMS) Checklist:

1. Every electrical power source to the incinerator must be cut off and locked out (to prevent others who may not be aware of maintenance work from turning the power back on inadvertently).

2. Ensure that the mechanical potential energy of the incinerator is at its lowest practical value so that opening of pipe, tubing, hose or actuation of any valve will not produce an unexpected movement that could cause injury.

3. Check that there is no pressurized fluid (air, oil, gas or other) trapped in the incinerator lines, cylinders or other components. This will ensure that there will be no incinerator motion when a valve is actuated.

4. Secure loose or freely moving parts so that there is no possibility of accidental movement.

Power Lock Out Procedures



Unexpected operation of electrical equipment started by automatic or manual remote control may cause injuries to persons who happen to be nearby. For this reason, when repair work is to be done on motors or other electrical equipment the circuit should be opened at the switch box and the switch pad locked in the OFF position. Tag the switch with a lock out tag indicating who must be contacted before the power is turned back on again.

BECAUSE OF THE SEVERE CONSEQUENCES, INCLUDING DEATH, OF NOT PROPERLY LOCKING OUT ELECTRICITY SUPPLIES DURING MAINTENANCE, THE SUPERVISOR SHOULD ENSURE THAT THERE IS ONLY 1 KEY FOR THE LOCK USED TO LOCK OUT THE POWER SUPPLY.

For identification, locks may be color coded to indicate different crews or shifts.

The Supervisor should maintain the master key and list of key numbers, and should keep an extra key to each lock for his department. The master key should not be loaned out under any circumstances.

No matter what method is used to lock out power to electricity, strict discipline and constant supervision should be employed during any equipment maintenance work.

Power Lock Out Checklist

1. Alert the operator of the equipment.

2. Before starting the work on an engine or motor, line shaft or other power transmission equipment or power-driven machine, make sure it can not be set in motion without your knowledge.

3. Place your own padlock on the control switch, lever, or valve, even if someone has locked the control panel before you. You will not be protected unless you put your own padlock on it. (Another maintenance person could remove their lock and then someone else could start the equipment if they were not aware of maintenance work being done.)

When finished working at the end of your shift remove your own padlock. Never permit someone else to remove it for you. Be sure you are not exposing someone else to danger by removing your padlock

Instruction Classification

Each component is associated with an identification number, see table below:

System Component	Identification number
Primary Blower	01-001
Secondary Blower	02-001
Primary Burner	01-002
Secondary Burner	02-002
Refractory	05-001
Air Compressor	03-001
Thermocouple	05-002
Main Control Panel	03-010
Paint	05-003
Electrical	05-004
Limit Switch	05-005
Lid Lifters	06-001

To differentiate if the instruction is weekly, monthly, quarterly or yearly, the above identification number will be followed by a letter:

Daily: D
Weekly: W
Monthly: M
Quarterly: Q
Yearly: Y

For example**, 01-001.Q.01** Primary blower assembly quarterly instruction number 1.

i. Daily Instructions

Primary Chamber Burner: (01-002.D)

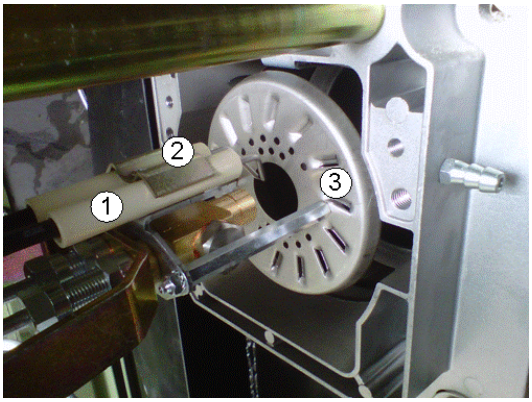
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

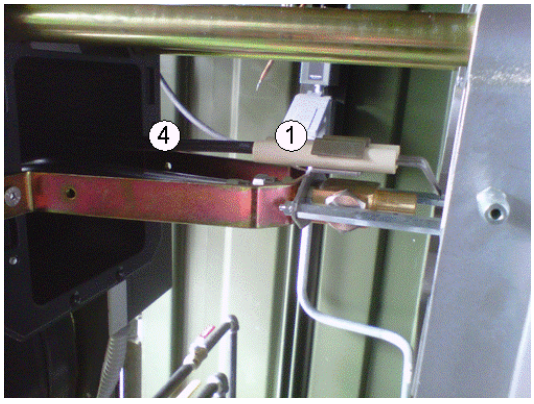
Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01-002.D.01: INSPECTING AND CLEANING ELECTRODES

1. Remove the cover from the Burners as described in 01-002.W.01
2. Inspect the electrodes (PN: 3003796) for any soot build-up.



1. Electrode
2. U-bolt
3. Diffuser Disc

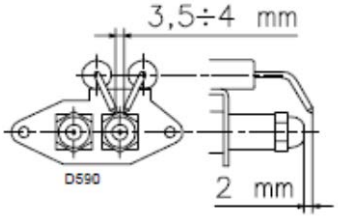


4. HT Leads

3. Clean/wipe down the ignition electrode with a cloth should there be a build-up of soot.

NOTE Do not use sand paper as this will increase the deposit of future soot.

4. If electrodes are damaged remove the screws and u-bolt (see above photo) and install new electrodes. When reinstalling the electrodes make sure that they are positioned as shown below.



Primary Burner

Check the High Temperature (HT) Leads (PN: 3012995) for any heat damage. If HT Leads are severely damaged (ie, you can see the wire beneath the sheathing) then replace. (See *CMI 6.3.3/01-002A)*

INSTRUCTION 01/02-002.D.02: INSPECTING THE FUEL LINES

1. Visually inspect all fuel lines to the Primary and Secondary Burner for any leaks.
2. The Primary Burner have two oil lines, one feed and one return. the Secondary Burner has only a feed line
3. If any leaks are observed tighten or replace the fitting where the leak is occurring

INSTRUCTION 01-002.D.03: INSPECT AND CLEAN BURNER NOZZLES

Primary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the centre retaining bolt.
3. Slide burner out.
4. Check nozzle. If there is carbon, remove the nozzle and clean.
5. Reinstall or replace if necessary (PN: C5222433)

Refractory: (05-001.D)

When working with the refractory make sure you use the proper tools; wear goggles, approved dust mask and gloves

INSTRUCTION 05-001.D.01: INSPECTING THE REFRACTORY

Ensure power is locked out.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

1. Open Primary Chamber door by unlatching all four clamps.

2. Tie-off door to open position to ensure that it will not close unintentionally.

3. Enter Primary Chamber and check the refractory for shrinkage, any gap between the modules greater than 2.5 cm should be patched with the blanket refractory

4. Check for any exposed metal between the modules, if metal is exposed make sure to patch area with blanket material (PN: 1" x 24" 8# 2600) or new module (PN: 6" Mod ZR) (*CMI 6.3.2/05-001A & 6.3.2/05-001B)*

ii. Weekly Instructions

Primary & Secondary Chamber Blowers: (01-001.W & 02-001.W)



Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

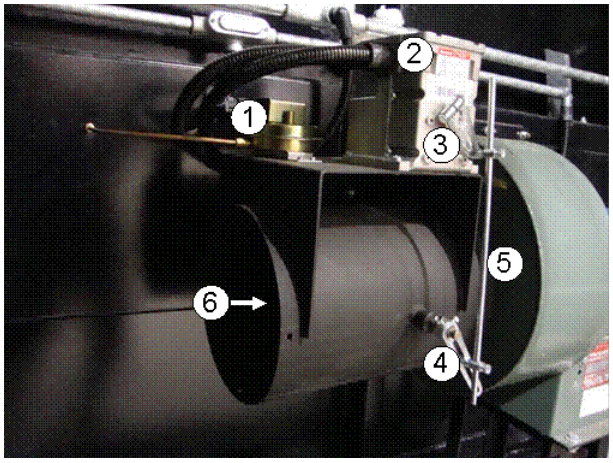
A fan can windmill despite removal of all electrical power therefore, take extra care when working with fans in the system.

The rotating assembly should be blocked securely before attempting maintenance of any kind.

INSTRUCTION 01/02-001.W.01: DAMPER CRANK ARM

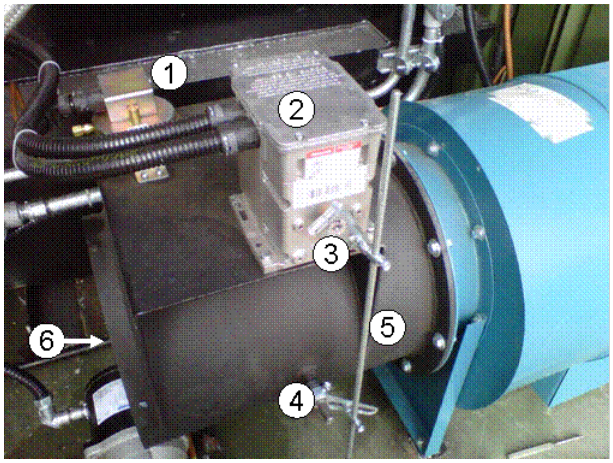
Check to see that the damper crank arm is connected to the damper and the rod.

Ensure mechanical linkage on damper is tight, if loose tighten with wrench.



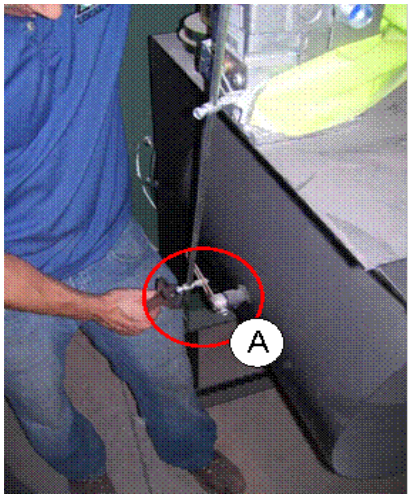
PRIMARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



SECONDARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



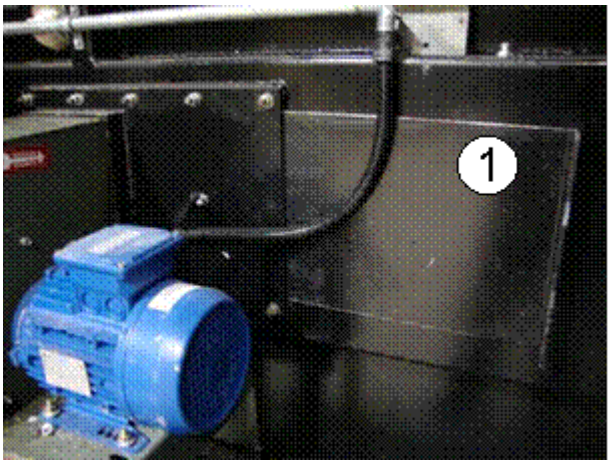
A. Damper Crank arm and connection to Damper and Rod

INSTRUCTION 01/02-001.W.02: SLIDE GATES

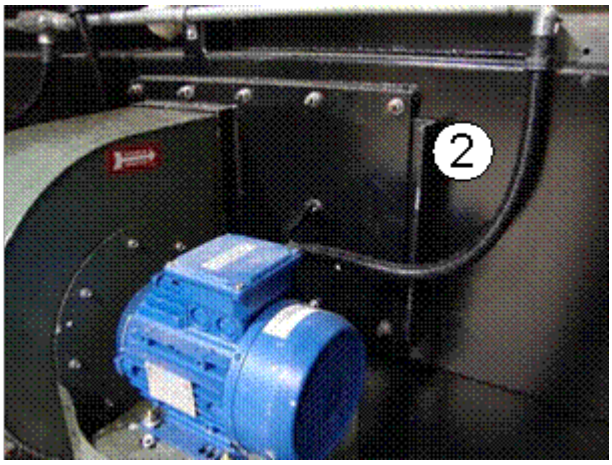
Check to see if slide gates move freely.

1. Move slide gate in and out to ensure free movement. If sticking, use lubricant to loosen. Lubricant should be rated for a high temperature (>150°F) application.

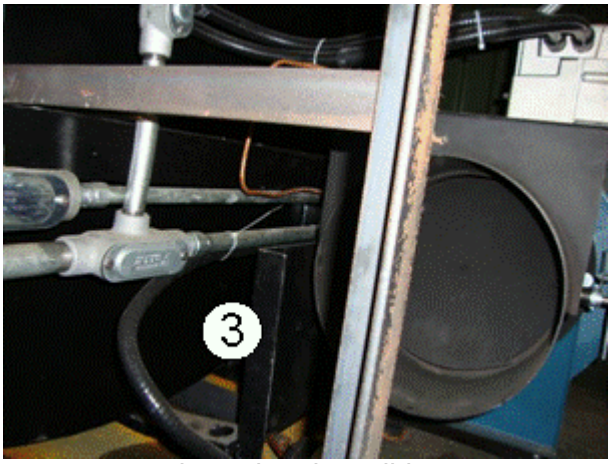
2. Gates must be opened to allow under fire air to enter the chamber. They should only be closed to reduce air in abnormal operating conditions.



1. Primary Chamber Slide Gate Open



2. Primary Chamber Slide Gate Closed



3. Secondary Chamber Slide gate Open

Primary Chamber Burner: (01-002.W)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 01/-002.W.01: REMOVAL OF BURNER COVER

Switch off the electrical power. Please follow all instructions in *Section 6.1 Zero Mechanical State & Lock Out Instructions.* Cover must be removed to perform maintenance on the burner.

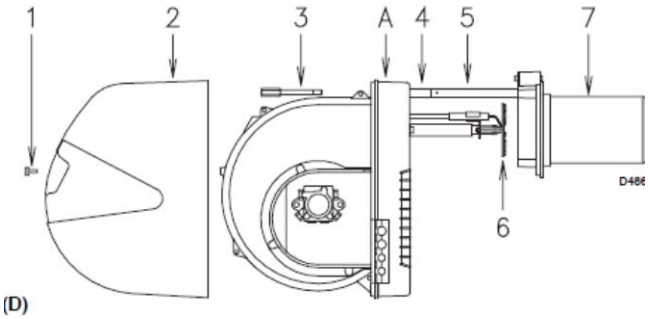
To remove the cover and to pull out the Primary or Secondary Burner, follow instructions below:

1. Loosen screw (Item #1, in the following diagrams) and withdraw the cover (Item #2, in the following diagrams)

2. Primary Burner has one screw to remove the cover. The Secondary Burner has four screws to remove the cover.

3. Remove bolt (Item #3) for the Primary Burner, or screws (Item #3) for the Secondary Burner.

4. Pull (Part A) backwards keeping it slightly raised to avoid damaging the diffuser disk (Item #6).



Primary Burner has 1 screw



INSTRUCTION 01/02-002.W.02: CLEANING THE PHOTO ELECTRIC CELL

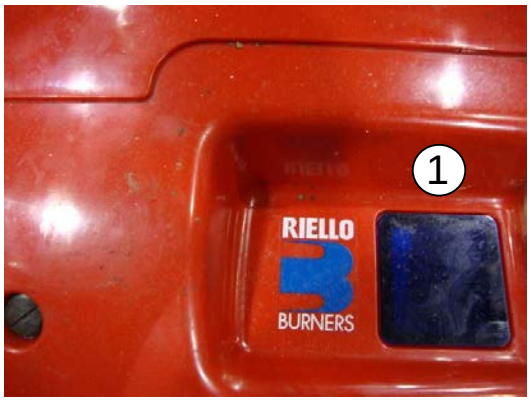
1. Remove the cover from the Burners as described in Instruction 01-002.W.01.
2. Clean Photo Electric (P.E) cell with a wet cloth (Primary Burner PN: 3006216)
3. P.E. cell (Item #1) can be removed by pulling it outward forcefully. Ensure you take note of the position of the eye while removing, this will help when reinstalling.
4. Once cleaned insert P.E. cell back into position ensuring the eye is not facing directly into the chamber (where the flame will be) but on the same angle as before it was removed.
5. Replace burner cover.

Primary Burner PE Cell



INSTRUCTION 01-002.W.03: CLEANING THE INSPECTION WINDOWS

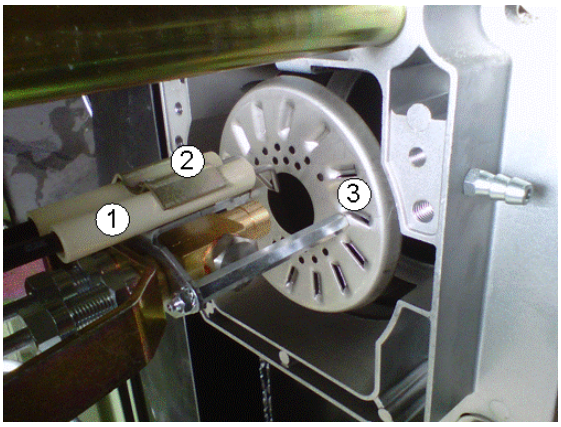
Clean the inspection windows with a wet cloth.



1. Primary Burner Inspection Window

INSTRUCTION 01-002.W.04: INSPECTING THE DIFFUSER DISC ASSEMBLY

1. Remove the cover from the Burners as described in 01-002.W.01.
2. Check the diffuser disc assembly (Primary Burner PN: 3003791) for any heat damage
3. If any heat damage, deformation or excess rust is noted, replace. (*CMI 6.3.8/03-009K)*



1. Electrode
2. U-bolt
3. **Diffuser Disc**

Secondary Chamber High Output Dual Burner: (02-002.W)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

INSTRUCTION 02-002.W.01: SECONDARY BURNER WEEEKLY ROUTINE

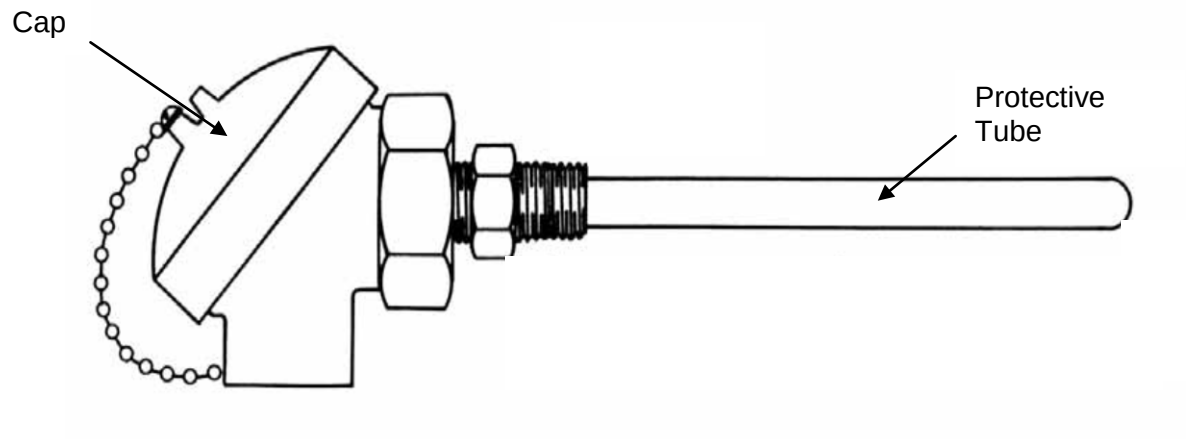
1. Clean flame sensors.
2. Clean the glass on the flame inspection window.
3. Clean spark ignitors.
4. Clean pilot assemblies.
5. Check spark ignitor lead connections.
6. Check turbulator ring.
7. Clean all filters and filter screens.
8. Lubricate all moving parts (i.e. bearings on doors, door latches & hinges, air and fuel valves, proportioning fuel valves, particularly the shafts on both air modulation valves

9. Check all motors for bearing noise, loose fans, etc.

10. Inspect fuel lines for leaks

Thermocouple: (05-002.W)

When working with electrical components ensure lock out instructions are being followed.





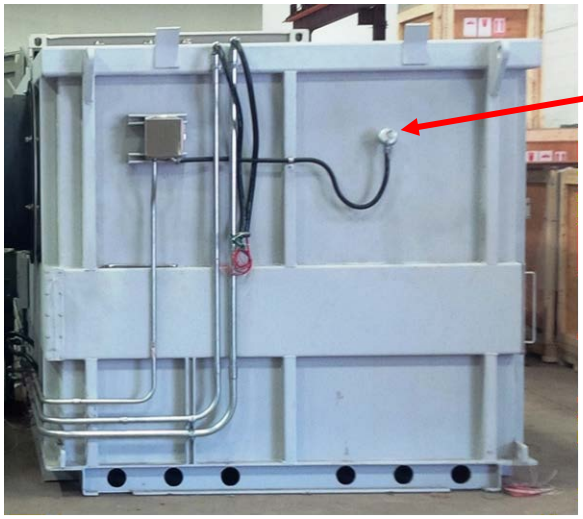
Thermocouple Assembly



Thermocouple Element

INSTRUCTION 05-002.W.01: INSPECT THERMOCOUPLE FOR DAMAGE

Turn main power to the system off - Remove thermocouple and visually inspect for damage. If damaged, see *CMI 6.3.1/05-002A*



1. Primary Chamber #1 Thermocouple



2. Two Secondary Thermocouples on Secondary Chamber body and beside the burner



3. Stack Thermocouple on Stack

i. Monthly Instructions

Primary & Secondary Chamber Blowers: (01-001.M & 02-001.M)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.M.01: CHECK FAN WHEEL



1. Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures, if left in operation.
2. The wheel can be accessed one of two ways.
   a. Remove the blower assembly from the unit and look down the outlet of the blower.
   b. Remove the damper assembly from the inlet of the blower and inspect by looking through the inlet of the blower.
3. Check also for the build-up of material which can cause unbalance resulting in vibration, bearing wear and serious safety hazards.
4. Clean the wheel as required.
5. If replacement is necessary follow these steps:

   a. Remove damper assembly from the unit
   b. Remove the blower assembly
   c. Remove the blower housing around the wheel
   d. Loosen all set screws that are located on the wheel.
   e. A puller may be required if the wheel hasn't been removed for some time.
   f. Ensure the shaft "key" is installed on the shaft before installing the new wheel.
   g. When installing a new wheel, the wheel should be positioned in the housing with the correct spacing between the edge of the inlet cone and the wheel. The wheel to cone clearance on the Primary Blower is 0.3175 cm.
   h. Ensure that the wheel is installed securely before reassembling the blower assembly.
   i. Install the blower assembly
   j. Install the damper assembly

Primary Chamber Burner: (01-002.M)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 01-002.M.01: CHECK FLEXIBLE OIL LINE

1. Check flexible oil lines to make sure that they are still in good condition. This includes frayed, leaking, or worn swivel joints.

2. If any type of damage is observed replace the flexible oil lines see *CMI 6.3.3/01-002F & 6.3.3/02-0002F*



Primary Chamber Burner Flexible lines

INSTRUCTION 01-002.M.02: INSPECT BURNER PUMP DELIVERY PRESSURE

1. Remove the cover from the Burner as described in Instruction 01/02-002.W.01.

2. The pump delivery pressure must be between 180-210 psi, and can be viewed on the gauge shown below.



3. If the pressure is found to be unstable or if the pump is running noisily try the following:
    a. Detach the flexible hose from the line filter (Shown below as #1).
    b. At the tank pour fuel into the supply line.
    c. If there is fuel coming in through the filter it means the filter is not clogged. If no fuel is coming through the filter remove and replace.



Primary Chamber Burner Flexible lines

4. If the pump is found to be responsible:
    a. Loosen the bleed screw.
    b. Turn on the burner
    c. Once all the air has been bled out. Close the bleed screw.

    If the pump is still not working after these steps replace the pump.

5. If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping from a loose fitting or damaged line.

INSTRUCTION 01-002.M.03: CLEAN BURNER OF DUST

1. Remove the cover from the Burners as described in Instruction 01-002.W.01.

2. Check that no dust has accumulated inside the burner fan or on fan blades.

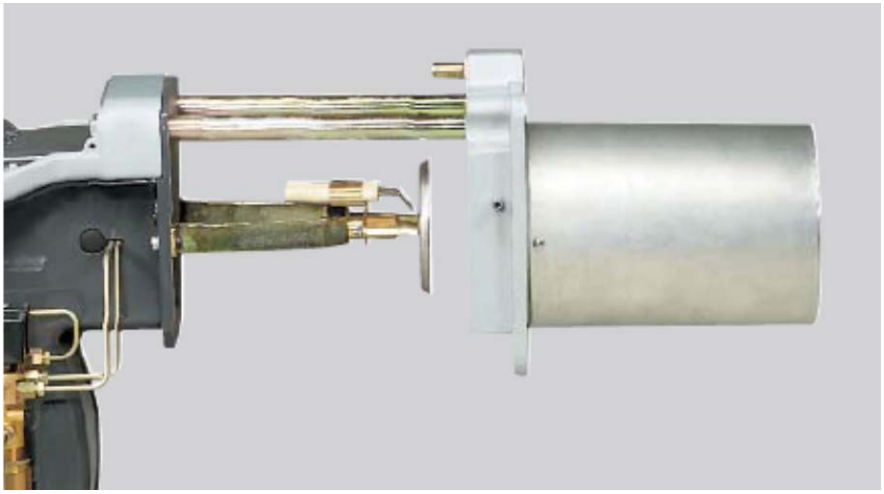
3. If any dust is visible take a clean soft cloth to the fan or the blades and wipe clean.

INSTRUCTION 01-002.M.04: CHECK BURNER COMBUSTION HEAD

1. Remove the cover from the Burners as described in Instruction 01-002.W.01.

2. Check that all parts of the combustion head are in good condition, free of all impurities, and that no deformation has been caused by operation at high temperatures.

(Below is an example of burner in good condition)



If damage is found, please refer to *CMI 6.3.3/01-002D & 6.3.3/02-002D*

Secondary Chamber High Output Dual Burner: (02-002.M)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 02-002.M.01: SECONDARY BURNER IN-LINE HEATER

1. Check all electrical connections.
2. Remove heater element from casing and inspect for build-up. Clean any deposits. When reinstalling always ensure the bundle will be restarted immersed. **NEVER** use the inline oil heater dry.

INSTRUCTION 02-002.M.02: SECONDARY BURNER SOLENOID VALVES

1. Examine solenoid valves for any deposits. Remove if necessary
2. Check electrical connections.

Refractory: (05-001.M)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 05-001.M.01: INSPECT REFRACTORY

1. Ensure power is locked out.
2. Open Secondary Chamber door.
3. Fasten door open, ensuring it will not close by its own weight.
4. Enter Secondary Chamber and check the refractory for shrinkage, any gaps between the modules greater than 2.5 cm should be patched.
5. Fix gaps with supplied blanket by stuffing material into opening. (See *CMI 6.3.2/05-001A)*
6. Check for any exposed metal, if metal is exposed make sure to patch area with blanket material or new module. (See *CMI 6.3.2/05-001A & 6.3.2/05-001B)*
7. Pay special attention to areas where the junction boxes are located, as any excessive heat may melt the wires within the box.
8. From Secondary Chamber interior look up the stack while the cap is in closed position.
9. View the surface of the bottom of the stack cap flap with a flash light
10. Some cracking is normal, however if pieces are missing or have fallen out, (See *CMI 6.3.2/05-001E)*

Lid Lifters: (06-001.M)

 **Controls are normally closed. Do not modify to by-pass or leave the controls open.**

Always remain vigilant and avoid injury.

INSTRUCTION 06-001.M.01: CHECK HYDRAULIC FLUID

Check the level of the hydraulic fluid. Fill if necessary.

1. Always use High temperature hydraulic oil Grade 32 to fill the tank.

ii. Quarterly Instructions

Primary & Secondary Chamber Blowers: (01-001.Q & 02-001.Q)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.Q.01: LUBRICATE BEARINGS

1. Lubricate the bearings, but do not over lubricate.

2. Bearings are completely filled with grease at the factory; they may run at an elevated temperature during initial operation. Surface temperatures may reach 180°F and grease may bleed from the bearing seals. This is normal and no attempt should be made to replace lost grease. Bearing surface temperatures will decrease when the internal grease quantity reaches a normal operating level.

3. Bearings should be lubricated with premium quality lithium-based grease conforming to NLGI Grade 2. Examples are:

   Mobil - Mobilgrease XHP
   Texaco - Premium RB
   Chevron - Amolith #2
   Shell - Alvania #2

4. Add grease to the bearing via the grease nipple while running the fan or rotating the shaft by hand. Be sure all guards are in place if lubrication is performed while the fan is operating. Add just enough grease to cause a slight purging at the seals. Do not over lubricate.

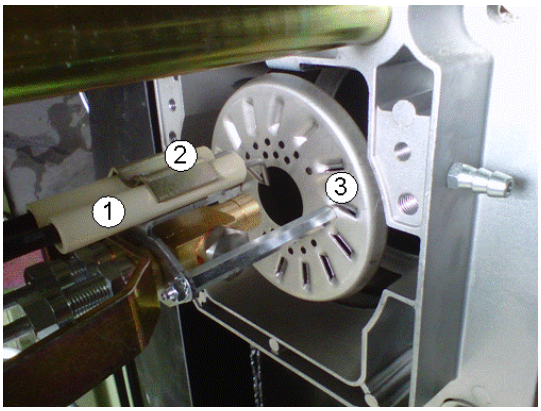


Primary Chamber Burner: (01-002.Q)

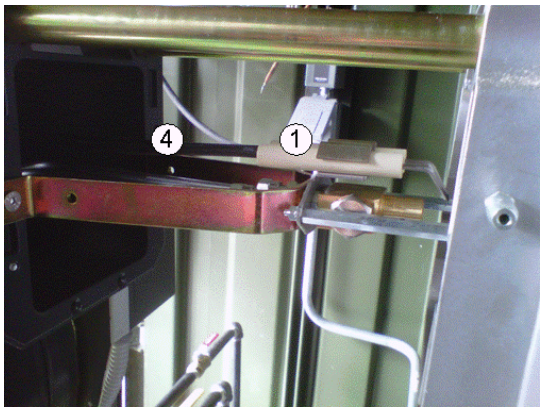
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 01-002.Q.01: INSPECT COMPONENTS FOR HEAT DAMAGE

1. Check all components for heat damage.
2. Look for excessive rust, deformation of all the parts including but not limited to the end cone and the diffuser disc.
3. Check to see that the High Temperature Leads (HT leads) are still intact and have not melted from any excessive heat coming back into the burner. If they are damaged replace with new HT Leads (PN: 3012995 Primary). *See CMI 6.3.3/01.002A.*
    a. The HT leads are attached to the control box and the electrode via a squeeze fitting. Remove the leads from the electrode and control box by simply pulling them out.



1. Electrode
2. U-Bolt
3. Diffuser Disc



4. HT Leads



End cone

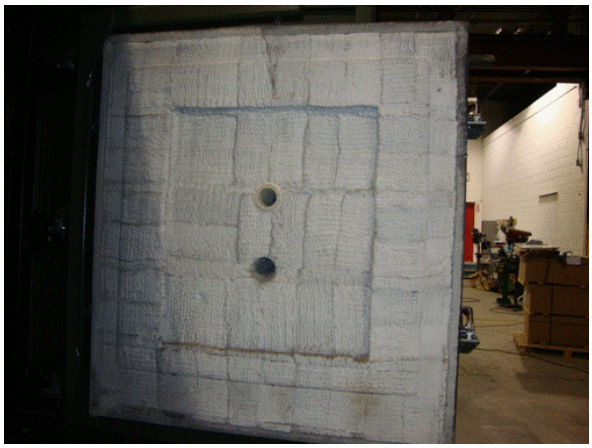
Refractory: (05-001.Q)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 05-001.Q.01: INSPECT DOOR GASKETS

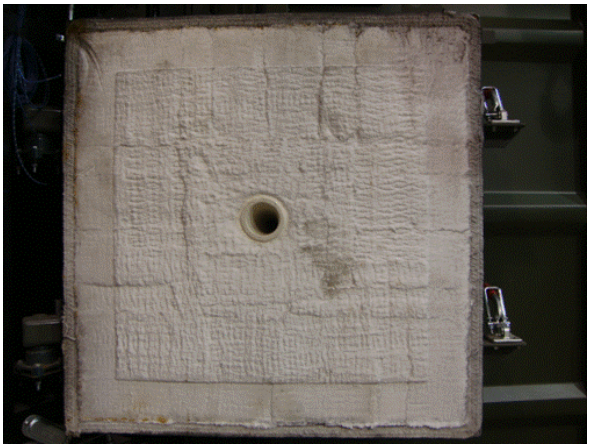
1. Open Primary and Secondary Chamber doors.
2. Fasten doors open, ensuring the door will not close on its own.
3. Inspect door gasket for damage.
4. Replace any damaged segments of door gasket (PN: GSB 1.5") if necessary. Cut out the damaged section and replace with new door gasket. See *CMI 6.3.2/05-001C*.
5. Doors must close tightly and securely, ensuring a good seal.



Primary Door (refractory lined)



1. Primary Door Gasket



Secondary Door (refractory lined)



1. Secondary Door Gasket

INSTRUCTION 05-001.Q.02: INSPECT REFRACTORY FOR SHRINKAGE

1. Ensure power is locked out.
2. Open Primary and Secondary Chamber doors.
3. Fasten doors open, ensuring they will not close on their own.
4. Enter Primary and Secondary Chamber and check the refractory for shrinkage, anything greater than 2.54 cm should be patched.
5. Check to make sure the anchoring of the modules is still strong and intact, if any modules seem loose replace complete module with new module.

A. **REMOVAL:** Remove existing Module (physically pull away existing refractory from underlying Module Anchor).

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell).

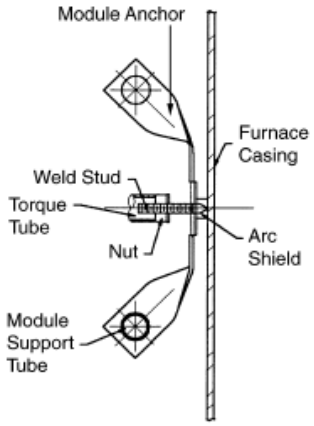


Figure 1: Side view of the Weld Loc Module

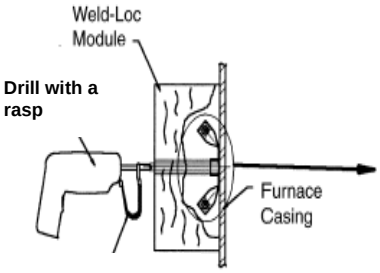


Figure 2: Stud Gun with rasp and Torque Tube.

A. **INSTALLATION**: Once the new module (PN: 433026) is in place take the stud gun (PN: ECO-STUD) with rasp to the Torque Tube and drill into place.

B. Once it has tightened the Torque Tube should come off with the drill.

Paint: (05-003.Q)



Ensure proper ventilation and proper equipment is being used when using any paint product.

INSTRUCTION 05-003.Q.01: INSPECT AND MAINTAIN EXTERIOR PAINT

1. Maintain paint exterior to protect metal from heat and corrosion damage. This includes all components in the system including containers and incinerator components.

2. If discoloration is noted and painting needs to be performed, on areas where paint will be applied, you must do a light sanding before application.

3. Follow paint manufacturer's application instructions which will include surface preparation, priming and painting.

4. If components within the container need to be painted, for example the Primary Chamber or the Secondary Chamber, proceed as above. Use a type of paint that meets the following specifications:

Paint Specifications:

Incinerator Paint: This is the paint coated directly on the incinerator shell. This includes the following components:

1. Primary Chamber
2. Secondary Chamber
3. Breech Section
4. Hot Stack Section (Black)

Finish needs to be able to withstand temperatures in the 650-750°F (340-400°C) range.

Parts: There are no paint specifications for each individual component. This is left up to the discretion of the customer.

iii. Yearly Instructions

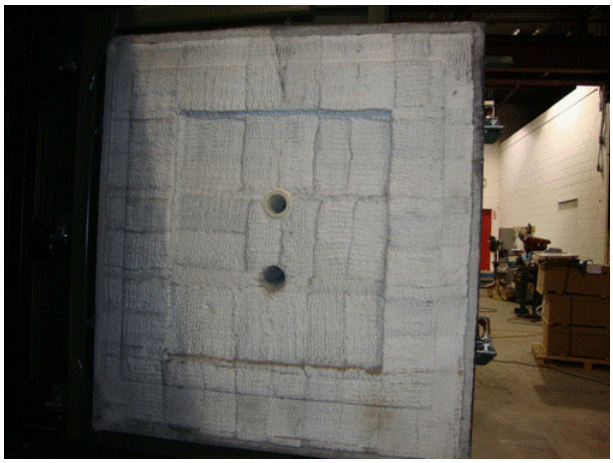
Refractory: (05-001.Y)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

INSTRUCTION 05-001.Y.01:
CHECK DOOR GASKET ALONG PRIMARY & SECONDARY CHAMBER DOORS

1. If required replace the door gasket. The gasket can last over 2 years but will depend on the careful use by the operator when loading and unloading.

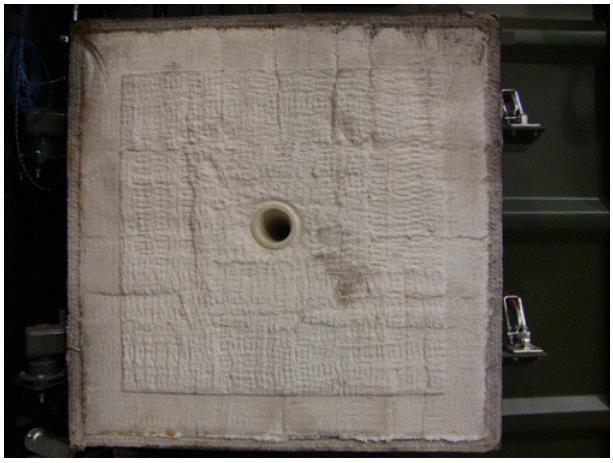
2. Remove the damaged section of door gasket from door and reinstall new gasket (PN: GSB 1.5")



Primary Door (refractory lined)



Primary Door Gasket



Secondary Door (refractory lined)



Secondary Door Gasket

Electrical: (05-004.Y)

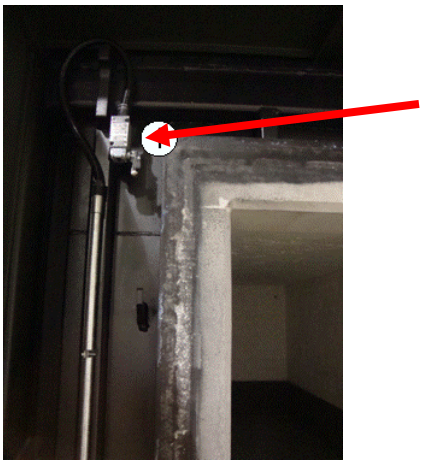
When working with electrical components ensure lock out instructions are being followed

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

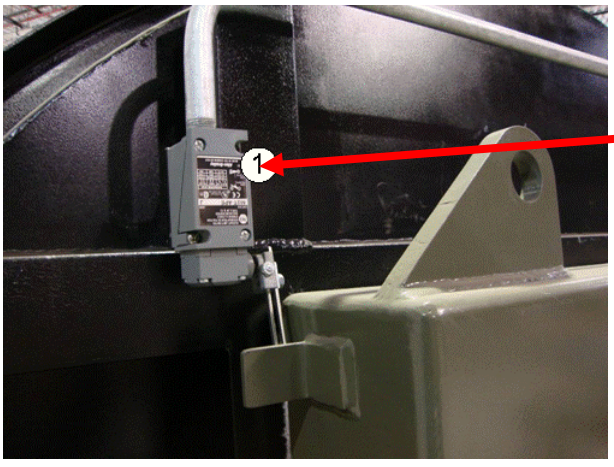
INSTRUCTION 05-004.Y.01: CHECK LIMIT SWITCHES

NOTA System must not be running or in cool down to perform this inspection.

1. Open Primary and Secondary Chamber doors and check top view screen on the HMI to ensure that it indicates door is open.
2. Close Primary and Secondary Chamber doors and check top view screen on the HMI to ensure that it indicates door is open.
3. All limit switches located on the unit are checked this way.
4. Replace limit switches (PN: 802T-APE) if necessary.



Primary Chamber Limit Switch



Secondary Chamber Limit Switch

1. See *CMI 6.3.1/05-005A)*.

2. Check all other limit switches in the system.

    a. Limit Switch located at upper limit of lid lifter Primary Chamber
    b. Limit Switch located at lower limit of lid lifter Primary Chamber

CORRECTIVE MAINTENANCE INSTRUCTIONS (CMI)

The following instructions relate to the replacement or correction (fixing) of components of the EWS Incinerator Package.

These Corrective Instructions are grouped in this section by the following:

6.3.1 General Corrective Maintenance Instructions
6.3.2 Refractory Corrective Maintenance Instructions
6.3.3 Primary & Secondary Burner Corrective Maintenance Instructions
6.3.4 Primary & Secondary Blower Corrective Maintenance Instructions
6.3.5 Waste Oil Burner Corrective Maintenance Instructions
6.3.6 Main Control Panel Corrective Maintenance Instructions

the following table is utilized to identify the components of the system that require corrective maintenance.

System Component		**Identification number**	
Primary Blower		**01-001**	
	Air Proving Switch Replacement		6.3.4/01-001A
	Damper Calibration		6.3.4/01-001B
	Modutrol Resistor Replacement		6.3.4/01-001C
	Damper Crank Arm Replacement		6.3.4/01-001D
	Motor Replacement		6.3.4/01-001E
	Modutrol Motor & Transformer Replacement		6.3.4/01-001F
Secondary Blower		**02-001**	
	Air Proving Switch Replacement		6.3.4/02-001A
	Damper Calibration		6.3.4/02-001B
	Modutrol Resistor Replacement		6.3.4/02-001C
	Damper Crank Arm Replacement		6.3.4/02-001D
	Motor Replacement		6.3.4/02-001E
	Modutrol Motor & Transformer Replacement		6.3.4/02-001F
Primary Burner		**01-002**	
	Replacing Fuel Filter		6.3.1/01-002A
	HT Lead & Electrode Replacement		6.3.3/01-002A
	Diffuser Disc Replacement		6.3.3/01-002B
	Nozzle Replacement		6.3.3/01-002C
	End Cone Replacement		6.3.3/01-002D
	Nozzle Assembly Repair or Replacement		6.3.3/01-002E
	Burner Flexible Oil Line Replacement		6.3.3/01-002F
	Low Level Switch Replacement		6.3.3/01-002G
	Inspection Window Replacement		6.3.3/01-002H
	Fuel Pump Replacement		6.3.3/01-002I
	Control Box Replacement		6.3.3/01-002J
	Oil Tube Replacement		6.3.3/01-002K
	Burner PE Cell & UV Detector Replacement		6.3.3/01-002L
	Burner Fan Motor Replacement		6.3.3/01-002M

Refractory		**05-001**	
	Wall Refractory: Gaps between the Modules		6.3.2/05-001A
	Wall Refractory: Replacement of the Modules		6.3.2/05-001B
	Door Gasket		6.3.2/05-001C
	Castable Refractory		6.3.2/05-001D
	Temporary Repair of Castable		6.3.2/05-001E
Main Control Panel		**03-010**	
	Main Control Panel		6.3.6/03-010A
	Reboot PLC		6.3.6/03-010B
Limit Switch		**05-005**	
	Limit Switch Replacement		6.3.1/05-005A

iv. General Corrective Maintenance Instructions

LIMIT SWITCH REPLACEMENT (6.3.1/05-005A)

1. Loosen the 2 screws holding the limit switch in place.
2. Remove limit switch, replace with a new one (PN: 802T-APE).
3. Take arm off of old body and mount to new.
4. Tighten the 2 screws holding the limit switch body.

REPLACING THERMOCOUPLE (6.3.1/05-002A)

The thermocouple will require routine replacement. The environment inside the incinerator will erode the protection tube to the point of failure. If the element is exposed to this environment it will be destroyed and will need to be replaced.

1. Unscrew thermocouple lid and remove wires.
2. Remove protection tube. To aid with this a vise and a pipe wrench will be needed.
3. Remove element and replace with new element (PN: TK-K08B-0100-S) and protection tube (PN: TA-A427A-K08B-010).









4. Reinstall on incinerator.

5. After installation turn power back on. Observe the temperature reading of the thermocouple you were just working on. If the wires were installed incorrectly the temperature will read the opposite temperature. (ie 20°C would read as -20°C). If this is the case open the thermocouple housing and switch the wires.

REPLACING FUEL FILTER (6.3.1/01-002A AND 02-002A)

The fuel filter will require routine replacement to ensure clean fuel delivery to the Primary and Secondary Chamber burners.

1. Close the ball valve on the supply line.



2. Unscrew the used filter. Use a bucket to catch the surplus fuel when you unscrew the filter.



3. Before installing the filter lubricate the seal on the new filter.

4. Install the new filter, and open the supply line ball valve.

v. Refractory Corrective Maintenance Instructions

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

WALL REFRACTORY: GAPS BETWEEN THE MODULES (6.3.2/05-001A)

The ceramic block refractory will shrink over time exposing the exterior metal shell. These gaps need to be filled in with ceramic refractory blanket.

1. Identify gaps in the chamber that are larger than 1” in width between the modules or if you can see exterior shell.

2. With a Utility knife cut a length of ceramic blanket (PN: 1" x 24" 8# 2600) that will fit in the gap between the modules.

3. Stuff the blanket into the space with a straight edge or ruler.

WALL REFRACTORY: REPLACEMENT OF MODULES (6.3.2/05-001B)

Excessive damage to a section of refractory may necessitate the replacement of modules in the incinerator. Such damage is largely due to mechanical wear. The following diagram walks through the removal and installation of new modules.

A. REMOVAL: Remove existing Module (physically pull away existing refractory from underlying Module Anchor)

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell)

Figure 1: Side view of the Weld Loc Module

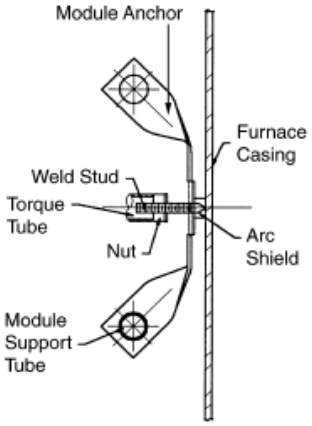
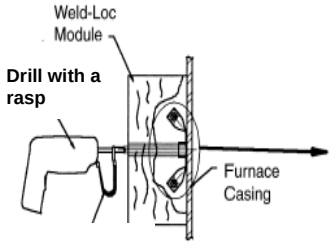


Figure 2: Stud Gun with rasp and Torque Tube (part of module assembly).



C. INSTALLATION: Once the new module is in place take the stud gun (PN: Eco-Stud) with rasp to the Torque Tube and drill into place.

D. Once it has tightened the Torque Tube should come off with the drill.

DOOR GASKET REFRACTORY (6.3.2/05-001C)

The door gasket will degrade over time and will need to be replaced over time. The bottom of the door will see more degradation due to the waste burning in that vicinity.

1. Identify the damaged section of gasket that will need to be removed
2. With a utility knife cut out the section that needs to be replaced.
3. A new piece of gasket (PN: GSB 1.5") will need to be cut the same length as the removed piece.
4. With contact cement coat the gasket on one side and the door section and install.

CASTABLE REFRACTORY (6.3.2/05-001D)

Operators will notice that the castable refractory will show signs of minor cracking. The minor cracking is normal. Large sections of castable should not separate from the rest of the monolithic cast. Such occurrences are largely due to a sudden impact from machinery or dropping of the units themselves. Mortar (PN: SM3000) is supplied to help with a temporary repair while a permanent repair is resolved. Such permanent repairs are a third level repair and have to be considered on a case by case basis.

TEMPORARY REPAIR OF CASTABLE (6.3.2/05-001E)

1. Find the pieces of castable refractory that have separated.

2. Clean both the pieces of refractory and the area where the separation occurred.

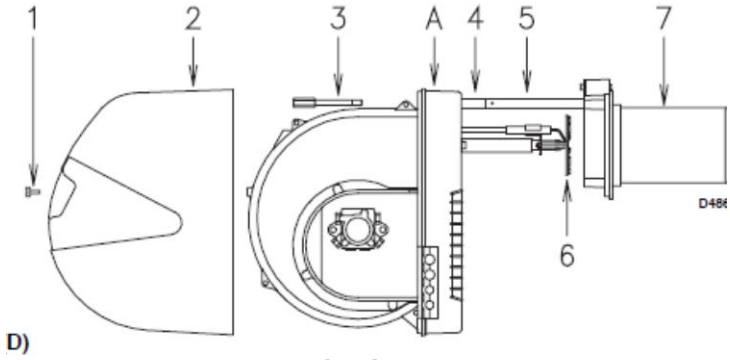
3. Spread an even amount of high temperature mortar on the pieces and the area of separation.

4. Put the pieces back where they originated and support as necessary for a minimum of an hour while the mortar cures.

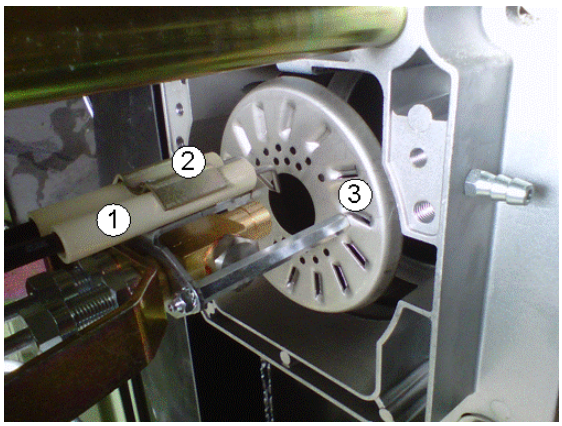
vi. Burner Corrective Maintenance Instructions

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

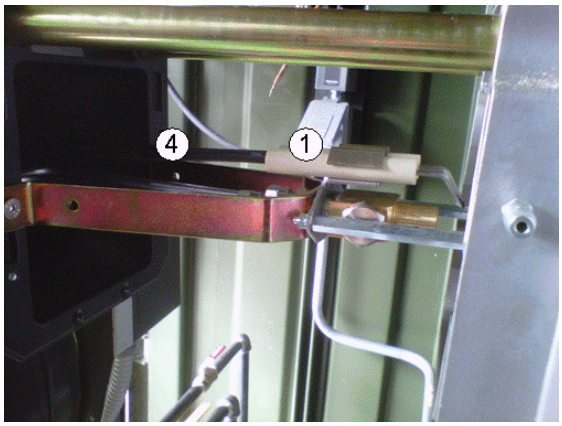
The Burners are pieces of equipment that will require routine corrective and preventive maintenance. Parts within this assembly will need to be repaired or replaced. The most common parts to be repaired or replaced are located at the front end of the burner where the parts are exposed to high temperatures.



Front End Primary Burner



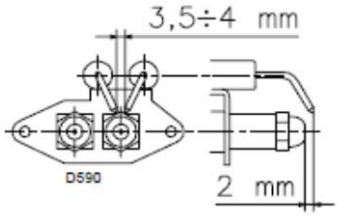
1. Electrode
2. U-bolt
3. Diffuser Disc



4. HT Leads

HT LEAD & ELECTRODE REPLACEMENT (6.3.3/01-002A)

1. In order to change out the HT leads (PN: 3012995) Primary Burner or Electrode (PN: 3003796) the U-Bolt will have to be removed
2. Remove the electrode by pulling the lead out of the white ceramic tube, replace and re-install.
3. To change the Leads the wire will need to be removed from the burner.
4. Pull the wire out of the burner housing through the rubber grommet.
5. The other end is connected to the back of the control box. Pull the wire straight out and the spring fitting will disengage.
6. Replace the lead with a new one reversing the above directions.
7. When reinstalling the electrodes make sure that they are positioned as shown below:



Primary Burner

DIFFUSER DISC REPLACEMENT (6.3.3/01-002B)

1. Identify the diffuser disc in the above pictures.
2. The disc assembly is secured to the nozzle housing by 2 hex nuts.
3. Remove these nuts and remove the assembly from the burner.
4. The disc is attached to the assembly with 2 screws.
5. Remove the screws and replace the disc.
    - Primary Chamber Burner diffuser disc PN: 3003791
6. Reassemble.

NOZZLE REPLACEMENT (6.3.3/01-002C)

1. Identify the nozzle at the very front end of the burner just behind the diffuser disc.

2. Remove the nozzle with a wrench.

3. Install the new nozzle.
    - Primary Chamber Burner nozzle PN: C5222433

END CONE REPLACEMENT (6.3.3/01-002D)

The end cone will need replacement when the flame becomes unstable from too much heat damage.

1. Loosen and remove the 4 hex bolts that hold the burner on the flange.

2. Remove the burner completely from the incinerator. This will require more than one operator because the burner is heavy.

3. There are two screws that hold the end cone on. Remove and save the screws for the new end cone.

4. Install the new End Cone with the old screws.
    - Primary Chamber burner end cone PN: 3003807

5. Reinstall the burner.

NOZZLE ASSEMBLY REPAIR OR REPLACEMENT (6.3.3/01-002E)

The nozzle assembly is subjected to high heat cycling. The heat cycling will eventually cause the seals and assembly to leak. The assembly will have to be replaced when this occurs. First identify the location of the nozzle assembly.

The parts (seals, nozzle assembly) needed for these replacements are all included under one part number.

- Primary Chamber Burner nozzle assembly: PN: 3003814

Remove all connections to the nozzle assembly and replace with the above parts.

BURNER FLEXIBLE OIL LINE REPLACEMENT (6.3.3/01-002F)

1. Turn the inline ball valve to the closed position to isolate the fuel supply from the burner. This valve is located down line from the burner.

2. Remove flexible lines.

3. Replace with new lines.

    - Primary Chamber Burner flexible oil line: PN: C5281160

4. Open ball valve.



Primary Chamber Burner Flexible lines
(Item # 1 Above)

LEVEL SWITCH REPLACEMENT (6.3.3/01-002G & 02-002G)

The level switch is located in the Fuel Tank.

NOTA
Tanks do not have to be emptied to replace.

1. Unplug the level switch.
2. Disconnect the cord and remove the level switch.
3. Replace level switch (PN: FS301-01) and reconnect the cord.
4. Plug in the level switch.

INSPECTION WINDOW REPLACEMENT (6.3.3/01-002H & 02-002H)

To replace the inspection window simply remove the old inspection window and replace with a new one:

- Primary Burner inspection window PN: 3003763

FUEL PUMP REPLACEMENT (6.3.3/01-002I)

Identify the pump on the burner you wish to replace.

Remove all fuel connections to the pump with the appropriate wrench. Unbolt the pump from the main body of the burner and pull the pump away from the burner to remove.

Reinstall the new pump, and reattach all fuel connections.

- Primary Burner: PN: 3013027

CONTROL BOX REPLACEMENT (6.3.3/01-002J & 02-002J)

Identify the control box on the burner you wish to replace:

Ensuring the power is off unscrew the old control box and install the new one.

- Primary Burner: PN: 3012933

OIL TUBE REPLACEMENT (6.3.3/01-002K)

Oil tubes leak due to heat cycling which causes the fittings to fail or a loose fitting.

1. Identify the oil tubes on the Primary Burner and on the Secondary burner.
2. First try tightening the fittings to see if the leak stops. If the leak does not stop:
3. Remove the old oil tubes with a wrench and install the new ones:

- Primary Burner Tubes: PN: 3003821
  PN: 3003822

BURNER PE CELL REPLACEMENT (6.3.3/01-002L)

Primary Burner: If the PE cell has been damaged, then it will need to be replaced. The PE cell while removed needs to be unplugged from the control box. This is accomplished by pulling the connection towards you. With the new PE cell install the control box end first by pushing the connection hard. Reinstall the PE cell in the burner.

BURNER FAN MOTOR REPLACEMET (6.3.3/01-002M)

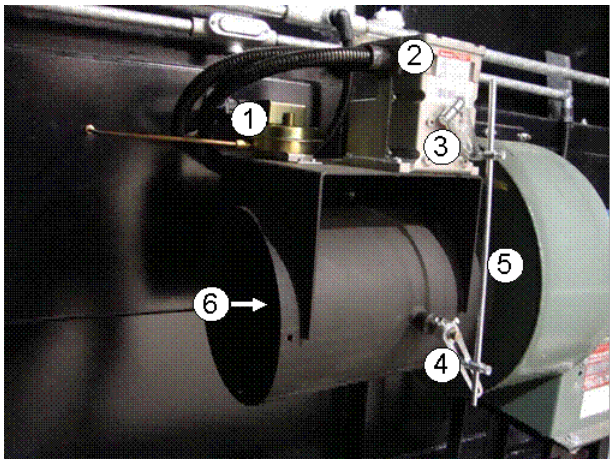
Identify the malfunctioning motor in the affected burner:

Unbolt and remove the malfunctioning motor from the housing. Disconnect all electrical connections. Reinstall the new motor exactly how the old motor was installed.

vii. Primary & Secondary Blower Corrective Maintenance Instructions

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

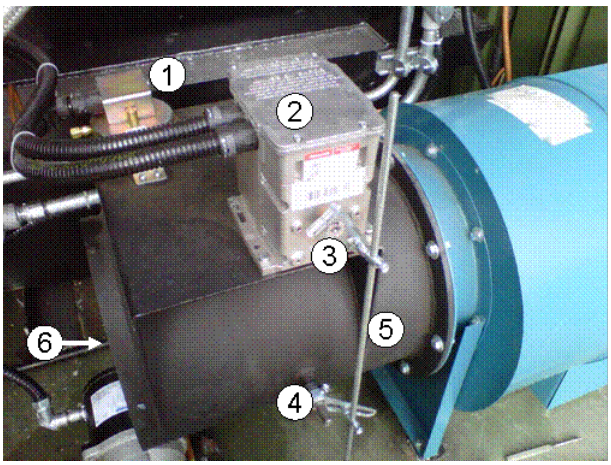
Primary Blower assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



Primary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

Secondary Blower assemblies are not a commonly repaired part on the incinerator. Parts within this assembly will need to be repaired or replaced. They are outlined below.



*Sample picture of a Secondary Blower and its assembly

Secondary Blower

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper

AIR PROVING SWITCH REPLACEMENT (6.3.4/01-001A & 02-001A)

1. Ensure all power is locked out.
2. Remove wiring from switch.
3. Remove tubing from switch.
4. Unscrew screws at the two locations and remove switch.
5. Reinstall new switch (PN: SML8221210034) complete with tubing and wiring and then retighten.
6. Turn power back on.

DAMPER CALIBRATION (6.3.4/01-001B & 02-001B)

Sometimes the damper linkage will slip when the connections become loose (Items 3,4,5 in the Secondary Blower photo) In order to ensure that the linkage is correctly calibrated the operator will need to look at the display screen on the control panel while the unit is in operation

1. Read the % Open value on the control panel operator interface (PanelView) for the Primary Blower.
2. During operation the damper is factory preset to be 0% open, or fully closed.
3. Look inside the damper (Item 6) and ensure that the linkage is completely closed.
4. If it is then this maintenance is complete.
5. Should the damper be open even a small percentage the linkages are to be loosened and the damper adjusted to be completely closed, and then retighten.

MODUTROL RESISTOR REPLACEMENT (6.3.4/01-001C & 02-001C)

The Modutrol resistors are located inside the top lid of the Modutrol motor. Remove the lid to the Modutrol motor by unscrewing the top four (4) screws. The connection between the control panel and the Modutrol is made with a small white connector with 3 terminals. Jumpered between these terminals is the resistors.

Remove and replace the resistors one at a time to ensure the correct resistors are replaced. You identify the correct resistor by examining the color band on the center node of the resistor. Replace like resistors.

DAMPER CRANK ARM REPLACEMENT (6.3.4/01-001D & 02-001D)

The crank arm will only need to be replaced if the arm is damaged due to misuse. Identify the damper crank arm (Item #4 in the picture on the previous page).

Identify the location of the linkage on the rod and the damper arm with a marker, so the new crank arm will be in the same spot when reinstalled. Remove the connections to the crank arm and replace with the new one (PN: 26026G) and ensure it is in the same spot as the old one.

MODUTROL MOTOR & TRANSFORMER REPLACEMENT (6.3.4/01-001F & 02-001F)

To replace the Modutrol motor all power needs to be off to the system as you will need to expose electrical connections. Firstly get the new motor and orientate the motor in the same direction as the old motor. Identify where the conduit is connected on the old motor and punch the connector holes for the new motor.

Removal

1. Remove all electrical terminations and remove the transformer.
2. Install the transformer in the new Modutrol motor.
3. Remove all conduit connections on the motor.
4. Remove the damper arm and linkage from the motor.
5. Unbolt the motor from the damper, and ensure all nuts and bolts are kept for the new motor install

Install

1. Bolt the new motor in the same orientation as the old motor.
2. Install the damper arm and linkage to the motor
3. Install all conduit connections

Terminate all electrical connections the same as the old motor.

REPLACE THE BLOWER CONTACTOR 6.3.4/01-001G

1. Turn the Main Disconnect Switch off.
2. Open Panel.
3. Remove the wires from M1.
4. Pull the retaining clip up.
5. Tilt contactor forward and remove.
6. To reinstall tilt new contactor (PN: 100-C09D10) until it clicks back in.
7. Pull the retaining clip back down to lock.
8. Reinstall wires to M1.
9. Close panel.
10. Turn power back on.

viii. Main Control Panel Corrective Maintenance Instructions

MAIN CONTROL PANEL (6.3.6/03-010A)

All control panel diagnostics are to be completed by certified or trained technicians. Electrical drawings / diagrams are provided to aid electricians with any diagnostics.

REBOOT PLC (6.3.6/03-010B)

Turn Main Disconnect to the off position on the front of the Control Panel. Turn the main disconnect back on.

SECTION 7

PARTS LIST

ECO WASTE SOLUTIONS

ECO 1.75TN 1PV100L Parts List

General Incinerator Components	Quantity		Part #	Supplier
Primary Door Bearings			F4B-E-200R DGE	Canadian Bearings Ltd.
Secondary Door Bearings	5		F4B-E-104R DGE	Canadian Bearings Ltd.
Stack Bearings	2		P2B-SC-100	Canadian Bearings Ltd.
Toggle Clamps US$	6		51335A66	McMaster-Carr
View Ports	5		P1030/8	Pegasus
Thermocouple	4		TA-A427A-K08B-010.0	Thermo-Kinetics Company Ltd.
Metal ash bins 2.5 yds with lid	2		JT-2.5-60-188	JT Fabrication Ltd..
Blower Assemblies	Quantity		Part #	Supplier
Primary Chamber Blower	1		BI10	Canarm
Secondary Chamber Blower w/flanges	1		BI13	Canarm
Modutrol	2		M9184D4009	Yorkland Controls Limited
Air Proving Switch	3		SML 8221210034	Yorkland Controls Limited
Primary Chamber Burner	Quantity		Part #	Supplier
Primary Burner RL 28/2	1		C9511200	Riello
Fuel Tank 4500l	1		6011000	Hassco Industries Inc.
Ktech 37.5" low level switch stainless steel	1		FS301SF-1 28”NC	Ktech Industrial Products Inc.
Diesel filter	1		VF1210	National Energy Equipment Inc.
5 micron pleated paper filter	2	KPP21005B		National Energy Equipment Inc.
High Output Used Oil Burner	Quantity		Part #	Supplier
Special 6514-8-A fireall dual fuel burner complete with refractory tile, standard capacity iron nose	1		6514-8-A/LX/1.0A-X13546	Fives North American Combustion
3/4" Pilot Set	1		4015-0-T	Fives North American Combustion
1/2" std regulator	1		7218-01	Fives North American Combustion
3/8" sensitrol oil valve	1		1813-02-D	Fives North American Combustion
1/2”dia. x 18” AOL; 1/2” mnpt connectors e/e; braided CGA approved and tagged	1		C8777-01/18-CGA	Fives North American Combustion
2" butterfly valve	1		1122-4	Fives North American Combustion
Gauge, 0 - 60" wc and 0 - 35 osi	2		8735-HI	Fives North American Combustion
8" wafer valve	1		1156-9	Fives North American Combustion
Control motor, 310 IN/LBS, 37 second timing,4-20 ma, no feedback signal, 1000 ohm potentiometer, 135 degree travel, 110-120VAC	1		1615-F	Fives North American Combustion
Bracket and Linkage for 1615-A through N, for 1136, 1146, and 1156-9 through -22	1		2-9004-205	Fives North American Combustion
Pressure switch, 12 - 60" wc	1		8757-GAO-A4/4/6	Fives North American Combustion
DIF. PRES. SW 1-20"W.C.AUTO.RST	1		C8757-DG50T-DIF	Fives North American Combustion
1/2" ball valve	4		C1821-01	Fives North American Combustion
1/4" ball valve	5		C1821-03	Fives North American Combustion
Pressure gauge, 2-1/2"; 0-60 psi/400 kPa, dual scale; liquid filled 1/4" bottom; SS case;	2		C8735-M-LF	Fives North American Combustion
1/2" pressure regulator	1		7142-01-25	Fives North American Combustion
1/2" relief valve	1		7177-01-75	Fives North American Combustion

Pressure switch #B424B range=0-100 psi	2	C8757-B424B-100	Fives North American Combustion
1/2" oil solenoid valve, NEMA 3R	1	1483-01	Fives North American Combustion
1/2" automatic reset oil shutoff valve 120/1/60	1	1517-01	Fives North American Combustion
1/4" Oil flow meter nickel-plated brass housing Buna o-ring 0.2-0.9 GPM SS orifice and spring vertical flow up	1	8598B-03-0.9-VU	Fives North American Combustion
1/2" ratiotrol with gauges	1	7052-01-WG	Fives North American Combustion
1/2" expansion chamber	1	C7000-0-HSR	Fives North American Combustion
3/4" regulator	2	C1485-01	Fives North American Combustion
Combution Blower -Chicago Blower	1	D53 E4	Canada Blower
Burner control	1	RM7895C1012	Yorkland Controls Limited
1" three way valve	1	4093T25	McMaster-Carr
1/2" three way valve	1	4093T23	McMaster-Carr
Used Oil Pump	1	03HB1131 code10/13	Albany Pump Company Ltd.
Basket suction strainer with 60 mesh	1	SBS-100	Albany Pump Company Ltd.
Ball Valve, 1” NPT, cUL Listed	1	BAVA-100	Albany Pump Company Ltd.
Relief Valve c/w WS spring (30-100 PSI)	1	FVJ-3R-SS	Albany Pump Company Ltd.
Pressure gauge, 4” Dial; liquid filled, 100 PSI	1	PG100LF-100	Albany Pump Company Ltd.
Compound Gauge;4" Dial; liquid filled; 30-0-30 PSI	1	CG100LF-30/30	Albany Pump Company Ltd.
Watson McDaniel size 3/4” Series ‘B’ pressure reducing valve	1	with Viton disc and diaphragm. 1-50 psig	Albany Pump Company Ltd.
Waste Oil ciculation heater with controller 600v. 3ph, 4687watts	1	CBLS747E13S	Hassco Industries Inc.
Transfer Pump	1	FR450B	National Energy Equipment Inc.
Oil Filter	1	VF1210	National Energy Equipment Inc.
5 micron pleated paper filter	2	KPP21005B	National Energy Equipment Inc.
Waste oil Tank 5000L	1	CUSTOMTANK	Hassco Industries Inc.
Level Switch	1	FS301SF-1 45”NC for 60 dia. tank	Ktech Industrial Products Inc.
Mixer	2	NP HGL-3.3	Metex Corporations
Waste oil totes IBC containment	2	H4435	ULINE CANADA CORPORATION
Waste oil totes IBC	2	H-3886	ULINE CANADA CORPORATION
Salt and/or sand box spillage kit	2	S18304	ULINE CANADA CORPORATION
Top Loading Package	Quantity	Part #	Supplier
Lid lifter HT 3500 Stoke 72"	1	9-LL-3500-72-BE-575	Canada Hydraulique Equipment Inc.
Lid Lifting Link Assembly	4	ECO5TN2PV-06-XX	P.D.S. WELDING LTD
Jaw Only 3/4" - 10 Right Hand Thread 12" max adj	4	3001T23	McMaster-Carr
18-8 Stainless Steel Clevis Pin, 3/4" Dia 2" L	4	92390A521	McMaster-Carr
Opacity Monitor	Quantity	Part #	Supplier
Compliance Opacity Monitoring System (EPA PS-1)	1	PN 80-0290	Akrulogic
Includes:			
Transceiver / Reflector			
Stack Mounting Flanges			
Local Control Panel			
1hp Air Purge Assembly			

-60C Air Purge Hose (2 pcs @ 20')	1	PN 80-3411 (Upgrade)	Akrulogic
Opacity Optic Head Extension Control Cable	1	PN 80-0297	Akrulogic
Scale	Quantity	Part #	Supplier
4 x 4 Scale w/ digital indicator, analog output and weather gland	1		Matrix Scale Service Inc.
Electrical	Quantity	Part #	Supplier
IEC 60 amp 600 volt rotary disconnect	1	GS2GU3N	Graybar
Disconnect operating handle	1	GS2AH420	Graybar
Operating shaft	1	GS2AE81	Graybar
175 amp power distribution block	1	PDB220-3	Graybar
175 amp power distribution block cover	1	CPB162-1	Graybar
Ground lug	1	LAMA2/0-14-QY	Graybar
600 volt 30 amp 3 pole class J fuse block	11	JT60030	Graybar
250 volt 30 amp 1 pole class RK1 fuse block	11	H25030-1CR	Graybar
600 volt 60 amp class J fuse	3	LPJ-60SP	Graybar
600 volt 17 amp class J fuse	3	LPJ-17SP	Graybar
600 volt 10 amp class J fuse	3	LPJ-10SP	Graybar
600 volt 7 amp class J fuse	8	LPJ-7SP	Graybar
600 volt 4 amp class J fuse	9	LPJ-4SP	Graybar
250 volt 30 amp class RK1 fuse	1	LPNRK-30SP	Graybar
250 volt 10 amp class RK1 fuse	1	LPNRK-10SP	Graybar
250 volt 6 amp class RK1 fuse	1	LPNRK-6SP	Graybar
250 volt 5 amp class RK1 fuse	2	LPNRK-5SP	Graybar
250 volt 2 amp class RK1 fuse	2	LPNRK-2SP	Graybar
250 volt 1 amp class RK1 fuse	4	LPNRK-1SP	Graybar
12 amp IEC contactor 120 VAC coil	1	LC1D12G7	Graybar
9 amp IEC contactor 120 VAC coil	6	LC1D9F7	Graybar
4 N.O. top mount auxilary contact	1	LADN40	Graybar
IEC solid state overload relay range 6.4- 32 a	1	LR9D32	Graybar
IEC solid state overload relay range 1.6-8 a	2	LR9D08	Graybar
IEC solid state overload relay range 0.2- 2 a	2	LR9D02	Graybar
16 amp SPDT slim line relay 120 VAC coil	10	RXG15F7	Graybar
Base slim line relay	10	RGZE1S35M	Graybar
8 PIN tube based relay 120VAC coil	10	RUMC23F7	Graybar
DPDT 8 PIN tube based relay base	10	RUZC2M	Graybar
600 to 120 VAC 3000 VA transformer	1	CE3000JA	Graybar
24 VDC 1.3 amp switching power supply	1	PS5R-SC24	SnS
5 port unmanaged ethernet switch US$99	1	SE-SW5U	Automation Direct
Current transducer US$75.5	1	ACT050-42L-F	Automation Direct
10.4" TFT touch panel with Intouch run time	1	TCND1U-10AC-CM2	Wonderware Canada East
600 volt 3 H.P. V.F.D.	1	ACS25-03U-04A1-6	Gerrie
480 volt 8 amp line reactor	1	3PR-004C5H	Graybar
0-1" H2O draft transmitter	1	616KD-00	Furneco
Ethernet PLC programing port	1	P-R2-F3R0	Gerrie

ECO WASTE SOLUTIONS

ECO 1.75TN 1PV100L Parts List

22mm Green illuminated push button operator	2	ZB5AW333	Graybar
22mm Emergency stop push button operator	1	ZB5AS844	Graybar
22mm 3 position return to center selector switch	1	ZB5AD5	Graybar
22mm Green flush push button operator	2	ZB5AA34	Graybar
22mm Black flush push button operator	2	ZB5AA24	Graybar
22mm Red extended push button operator	2	ZB5AL4	Graybar
Green integrated led module	2	ZBVG3	Graybar
N.O. contact block	5	ZBE101	Graybar
N.C. contact block	3	ZBE102	Graybar
Limit switch	4	802T-AP	Gerrie
Limit switch lever	4	802T-W2B	Gerrie
18 mm AC inductive proximity switch US$31	2	VK1-AO-1B	Automation Direct
Pt100 RTD for cold junction compensation	1	TFD	Omega
Unity CPU cw 1 Enet port and 1 serial port	1	BMXP342020	Graybar Canada Inc.
8 Slot Backplane	1	BMXXBP0800	Graybar Canada Inc.
110Vac Power supply	1	BMXCPS2000	Graybar Canada Inc.
16 point 120 vac input module	2	BMXDAI1604	Graybar Canada Inc.
8 channel analog input module	1	BMXAMI0810	Graybar Canada Inc.
4 channel thermocouple input module	1	BMXART0414	Graybar Canada Inc.
16 point relay output module	1	BMXDRA1605	Graybar Canada Inc.
4 Channel analog output module	1	BMXAMO0410	Graybar Canada Inc.
Connectors for all modules except AMI0810 and ART0814	4	BMXFTB2000	Graybar Canada Inc.
Connector for AMI080	1	BMXFTB2800	Graybar Canada Inc.
Connector	1	BMXFCW301S	Graybar Canada Inc.
IEC solid state overload relay range 0.2- 2 a	1	LR9D02	Graybar
1hp VFD ABB	1	ACS250-03U-02A1-6	Gerrie
1hp line reactor	1	REX3PR0002C5H	Graybar Canada Inc.
Type K Thermocouple 20AWG	300	K-20S-TT	Thermo-Kinetics Company Ltd.

APPENDIX B • TECHNICAL SPECIFICATIONS OF WASTE OIL BURNER

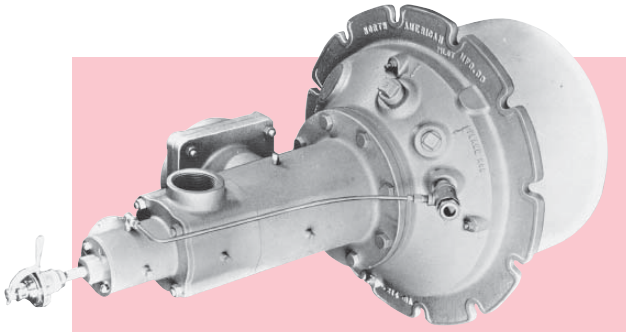
fives north american

FIRE•ALL™ DUAL-FUEL™ BURNERS

Bulletin 6514

February 2011

- **Dual Fuel Burner – gas or oil (light or heavy grade oil)**
- **Conventional forward flame pattern**
- **1.8 to 30 million Btu/hr**
- **Chambers up to 2400F (with alloy nose)**
- **Includes low pressure fuel oil atomizer**



6514 Burner Complete shown with optional (recommended) Sensitrol™ Oil Valve.

6514 FIRE•ALL Dual-Fuel Burners are nozzle mix, sealed-in burners for gas, light oil, or heavy oil. Capable of efficient operation throughout a wide temperature range, these burners are equally at home on low temperature ovens and high temperature forge and melting furnaces.

Ruggedly built for sustained, maintenance-free operation, 6514 Burners also provide for quick change of fuels without disturbing process operations.

Sealed mountings help maintain furnace pressure, controlled atmosphere, and closer air/fuel ratio control--all contributing to better product quality.

Fire•All Burners are a proven workhorse on all types of furnaces.

COMBUSTION CHARACTERISTICS

Oil. Oil viscosity at the burners must not exceed 100 SSU. Oil pressure at air/fuel Ratiotrol™ should be between 25 and 30 psi. Oil pressure at rated capacity is 10 to 15psi at Sensitrol™ and less than 1 psi at burner. Minimum atomizing air pressure at the burners is 14 osi for light oil, 22 osi for heavy oil.

Gas. Atomizing air (4 osi minimum) should be left on to protect the atomizer. Maximum required natural gas pressure at the burner for stoichiometric ratio is less than 4osi.

Air/Fuel Ratio. 6514 Dual-Fuel Burners are stable throughout a wide range from excess fuel to excess air. They can operate with excess fuel without forming carbon, but additional air for complete combustion must be available in the furnace near the burner.

For limits in a specific case, either rich or lean, consult Fives North American.

Turndown. Fire•All Burners can be turned down to atomizing air only (with fuel to match) except when burning residual oils in a cold, tight furnace.

Total air capacities (including main and atomizing air)

Burner designation	16 osi air pressure drop across the burner: Air① scfh	Light oil② gph	Heavy oil③ gph	Gas④ scfh	24 osi air pressure drop across the burner: Air scfh	Light oil gph	Heavy oil gph	Gas scfh	Approx. flame lengths with 16 osi main air (in open furnace)
6514-6	17 900	13	12	1 790	21 900	16	15	2 190	4' - 5'
6514-7	28 400	21	19	2 840	34 800	26	23	3 480	5' - 6'
6514-8-A	48 900	36	33	4 890	60 000	44	40	6 000	8' - 9'
6514-8-B	81 500	60	54	8 150	100 000	74	67	10 000	9' - 12'
6514-9	165 000	122	110	16 500	202 000	150	135	20 200	15' - 18'
6514-10	247 000	183	165	24 700	303 000	224	202	30 300	20'

① For Btu/hr, multiply by 100 ② Light oil at 135 000 Btu/gal. ③ Heavy oil at 150 000 Btu/gal. ④ Natural gas at 1000 Btu/cf.

Burner designation	Main air capacities in scfh: Air pressure drop across the burner in osi 1	5	6	8	12	16	Atomizing air capacities in scfh: Air pressure drop across the burner in osi 14	16	18	20	22	24
6514-6	3 710	8 300	9 100	10 500	12 900	14 900	2 800	3 000	3 180	3 360	3 510	3 660
6514-7	6 100	13 600	15 000	17 200	21 000	24 400	3 770	4 030	4 270	4 500	4 720	4 900
6514-8-A	10 600	23 700	26 000	30 000	36 700	42 400	6 050	6 500	7 000	7 300	7 600	7 850
6514-8-B	17 600	39 200	43 000	49 600	60 500	70 000	10 600	11 300	12 000	12 700	13 200	13 800
6514-9	36 600	82 000	89 500	104 000	127 000	146 000	17 200	18 400	19 600	20 700	21 600	22 500
6514-10	54 500	122 000	135 000	154 000	189 000	218 000	27 200	29 100	30 900	32 600	34 100	35 500

Flame Supervision. An ultraviolet cell‡ will monitor pilot or main flame on gas or oil. For maximum safety, Fives North American urges **interrupted** pilots when flame safeguards are used--pilots should be on only for a preset ignition period (usually 15 seconds), after which flame supervision detects main fire only. Adapters for mounting flame detection devices on 6514 Burners are tabulated on Bulletin 8832.

Tile/Installation. Burner tiles are cast refractory rated for 2800F furnace temperature. They should be supported securely in the furnace wall by castable refractory (not insulation) at least 9" thick all around the tile, extending back to the furnace shell and securely anchored to it. (See Supplement DF-M1.)

Tiles are replaceable in the field except for the 6514-10, whose mounting must be returned to the factory for tile replacement (or purchase a spare mounting plate with a tile cast onto it).

Complete burners include tile, mounting plate, and an observation port into which a small quantity of atomizing air is introduced to keep the glass clear. Order pilot tips and Sensitrol™ Oil Valve separately. See 6514 Dimension Sheet for recommended Sensitrol™ oil valve and premix pilot tip.

Jacketed Tile options are available for applications where the tile is not supported by furnace refractory. Jackets are available in three different metals and have maximum temperature ratings for each. They must be protected with sufficient insulation so as not to exceed rated temperature.The maximum temperature rating depends upon frequency of heat-up/cool-down cycles. As an example, batch annealing furnaces that are heated and cooled every day should use the "intermittent exposure" ratings. Continuous annealing furnaces that remain at the same temperature for months at a time, can use the higher "continuous" rating.

Designation	Jacket Metal	Continuous max.temp.	Intermittent exposure
6514- -LC	carbon steel	700 F	700 F
6514- -L4	304 stainless	1600 F	1500 F
6514- -L9	309 stainless	1900 F	1800 F

‡ Cleaning air must be introduced into the port downstream of the sensor to keep oil and poc's off the lens.

Burner Nose options are available for sizes shown below and can be specified in the product number. The burner nose establishes main combustion air flow and influences flame propagation. Nose material is either cast iron that is suitable for cold air applications up to 1800F, or cast stainless alloy for preheated air (maximum 700F) applications up to 2400F.

Mat'l	Cap'y	-6	-7	-8A	-8B	-9	-10
Cast iron	1.0	√	√	√	√	√	√
Cast Alloy	1.0	√	√	√	√	√	√
Cast iron	1.1		√	√	√	√	√
Cast Alloy	1.1		√	√	√	√	√
Cast iron	1.2			√	√	√	√
Cast Alloy	1.2			√	√	√	√
Cast iron	1.3			√	√	√	√
Cast Alloy	1.3			√	√	√	√

The product designation 1.0 represents standard main air capacity shown on page 1. Use of an extra capacity burner nose will result in either more air at 16 osi or standard air flow at lower pressure. Extending the capacity of the burner by increasing air pressure beyond 16 osi, or using the extra capacity nose, is acceptable for most gas and light oil applications. Specific applications involving either low Btu fuels or heavy oil and extra capacity should be reviewed with Fives North American.

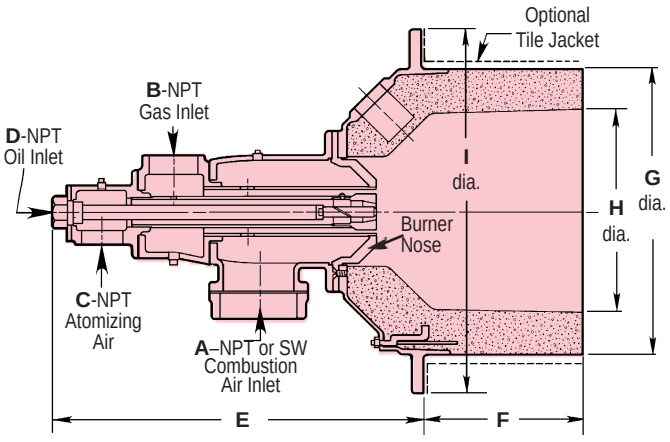
Also, when firing extra capacity, the combustion air flow velocity within the supply piping, and associated pressure loss, can be excessive for some burners. The -8B, -9 and -10 products when operated at 1.2 or 1.3 capacity will develop high pipe velocity based on the burner's air connection size. As an alternative to increasing blower pressure, an oversized air inlet can be purchased separately for these size burners. The connections are SW-type (slip-on sleeve or welded construction) and are one pipe size larger than the standard supply. Nose and oversize air connection part numbers can be found in supplement literature (see Parts List and Burner Options documents).

Options are available for the 6514 burner but require consultation with your Fives North American for application and ordering information. See Sheet 6514-3 for an overview of burner options.

CLEARANCE DIMENSIONS (for details, see Dimensions 6514)

Burner designation	dimensions in inches A†	B	C	D	E	F	G	H	I	Wt. lbs.
6514-6	3	2	1½	⅜	18¾	9	15	10⅜	19½	195
6514-7-	4	2½	2	⅜	20 13/16	8⅞	16	11⅜	20½	225
6514-8-A	6	2½	2½	⅜	27 1/16	10	17¾	12⅜	22¾	335
6514-8-B	6	3	3	⅜	31¼	12⅞	19	13½	24	450
6514-9	8	4	4	½	38⅝	13 7/16	23	16	28	795
6514-10	10	6	6	½	45⅛	13⅝	27½	20½	32½	1035

† SW connection standard for -9 and -10 only.



DIMENSIONS SHOWN ARE SUBJECT TO CHANGE. PLEASE OBTAIN CERTIFIED PRINTS FROM FIVES NORTH AMERICAN COMBUSTION, INC.
IF SPACE LIMITATIONS OR OTHER CONSIDERATIONS MAKE EXACT DIMENSION(S) CRITICAL.

Ordering Information

6514 - _ _ _ / _ _ / _ _ _ _

Product Size
Connection

6 ..... 3"
7 ..... 4"
8-A ..... 6"
8-B ..... 6"
9 ..... 8"
10 .....10"

Tile

BO .. burner only
LX... refractory tile (no jacket)
LC... steel tile jacket
L4 ... 304 stainless jacket
L9 ... 309 stainless jacket

Burner Nose

Capacity	Material
1.0 ... main air capacity	H...cast iron
1.1 ... 1.1 x main air capacity	A...alloy
1.2 ... 1.2 x main air capacity	
1.3 ... 1.3 x main air capacity	

Example 1 6514-8-A/LC/1.2A Fireall gas burner complete with carbon steel jacketed tile and 1.2 capacity alloy nose
Example 2 6514-6/BO/1.0H Fireall gas burner only with standard capacity iron nose
Example 3 6514-9/LX/1.2H Fireall gas burner complete with refractory tile and 1.2 capacity iron nose

Note: See Supplement 6514-6 for cross referencing old product numbers.

WARNING: Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and insurance Underwriters recommendations, and care in operation.

Fives North American Combustion, Inc. - 4455 East 71st Street - Cleveland, OH 44105 USA - Phone 216.271.6000
Fax 216.641.7852 - email: fna.sales@fivesgroup.com - www.fivesgroup.com/fivesna

APPENDIX C • REGISTRATION FORM FROM THE NUNAVUT DEPARTMENT OF ENVIRONMENT: USED OIL AND WASTE FUEL APPLIANCE

REGISTRATION FORM: USED OIL AND WASTE FUEL APPLIANCE

A copy of the Used Oil and Waste Fuel Appliance registration form and user's guide is available by contacting the Nunavut Department of Environment or by downloading the documents at http://env.gov.nu.ca/programareas/environmentprotection. Although registration is voluntary, it enables Nunavut's Department of Environment to better manage used oil and waste fuel by maintaining an up-to-date inventory of certified appliances operating in Nunavut.

Instructions

1. The following information must be provided in order to register a used oil or waste fuel appliance and obtain a registration number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Environmental Protection Division, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying user's guide for further assistance on completing the generator registration form.
5. There is no fee for registering a used oil or waste fuel appliance with the Department of Environment.

Section 1 - Identification

Applicant (Legal Name) Agnico Eagles Mines Limted- Meliadine Project

Mailing Address Suite 879- Rankin Inlet, Nunavut, Canada

Postal Code X0C 0G0

Principle Contact Person Martin Theriault

Title Compliance counselor

Phone 1-819-759-3555; EX: 4608171

Email martin.theriault@agnicoeagle.com

Section 2 – Description of Operation

General Type of Business Mining Industry

Site Location(s) Where the Waste is Generated Meliadine project, Rankin Inlet- Incinerator area

Make, Model and Size of the Appliance 5000L waste oil tank- Hassco- 5000L DW S601

Waste Oil tank level switch- Ketch industrail FS301-01: Mixer- NP HGL 3.3

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person

Date (dd/mm/yy) 2019-01- 16

Print Name of Contact Person Martin Theriault

Title Compliance counselor

Phone 1-819-759-3555; EX: 4608171

Email martin.theriault@agnicoeagle.com

For Department Use Only

Appliance Registration Number NUA# _____ Approved by _____ Date _____

APPENDIX D • CONSULAIR AIR & ENIVIRONMENT GLOBAL MANAGEMENT AIR EMISSIONS REPORT

CONSULAIR
AIR & ENVIRONMENT GLOBAL MANAGEMENT



PROFESSIONNAL SERVICES
STACK TESTING PROGRAM
AIR EMISSIONS QUANTIFICATION
DOMESTIC WASTE INCINERATOR

AGNICO EAGLE

AGNICO EAGLE MINES LTD,
Rankin Inlet (Nunavut)
MELIADINE DIVISION
Kevin Buck
General Supervisor Environment

O/REF: **#18-5528**

consul-air.com

Quebec
2022, Lavoisier Street, Suite 125, Quebec
QC G1N 4L5
PHONE - 418 650.5960
FAX - 418 704.2221
TOLL-FREE - 1 866 6969.AIR (247)

Montreal
600 Leclerc Street, Suite 101, Repentigny
QC J6A 2E5
PHONE - 450 654.8000
FAX - 450 654.6730

AGNICO EAGLE

Revision history

Version name	Date	Detail	Reviewed by
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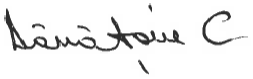
PREPARED BY:



Louis Lawson, project manager

VERIFIED BY:



Cristina Danatoiu, engineer.

Quebec, December 2018

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GLOSSARY

PM: Particulate matter

SVOC (PCDD/F): Dioxins and furans

ME: Metals

O_2: Oxygen

CO_2: Carbon dioxide

CO: Carbone monoxide

NO_X: Nitrogen oxide

ACFM: Actual cubic feet per minute

ECCC: Environment and Climate Change Canada

USEPA: United Stated Environmental Protection Agency

QA/QC: Quality Assurance / Quality Control

ΔP: Differential pressure read at the stack

ΔH: Differential pressure read at the control unit

DL: Detection Limit

SUMMARY

Consulair was mandated by Agnico Eagle Mines, Meliadine Division, to sample the atmospheric emissions at the outlet of an incinerator of its plant located near Rankin Inlet, Nunavut.

The objectives of the characterization of atmospheric emissions were to:

- Evaluate the physical characteristics of the gas flow in the stack;
- Evaluate the concentration and the emission rate of the particulate matter (P), Metals (ME) and Hydrogen chloride (HCl);
- Demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F);
- Ensure that QA/QC of Consulair is respected throughout the stack sampling program.

For this project, the applicable standards are shown below with the tests results. The applicable standards for dioxins and furans (PCDD/F) were met for all tests, as well as the applicable standard for mercury (Hg). The standards come from the "Environmental Guideline for the Burning and Incineration of Solid Waste" emitted by the Department of Environment of the Government of Nunavut base on the Canadian Council of Ministers of the Environment (CCME) Canada - Wide Standards for Dioxins and Furans and Mercury Emissions.

The government of Nunavut presented a guideline document in October 2010, which was revised in January 2012, for the burning and incineration of solid waste. The document presented two criteria for air emissions which are applicable in the current project. A standard for Dioxins and Furans is stated at 80 pg I-TEQ/m^3 and another standard for mercury is stated at 20 µg/Rm^3. The reference conditions are stated at 101.3 kPa and 25°C and both standards are corrected to 11% O_2.

APPLICABLE STANDARDS		
CONTAMINANTS	**TEST RESULTS**	**STANDARDS**
MERCURY (Hg)	0.23 µg / Rm^3 @ 11 % v/v O_2	20 µg / Rm^3 @ 11 % v/v O_2
DIOXINS AND FURANS (PCDD/F)	0.042 ng / Rm^3 @ 11 % v/v O_2	0.08 ng TEQ / Rm^3 @ 11 % v/v O_2

R: Reference conditions 25 °C and 101.3 kPa on a dry basis.

SUMMARY

INORGANIC SAMPLING TRAIN	
STACK GAS PROPERTIES	
TEMPERATURE (°C)	744
MOISTURE (% v/v)	6.0
VELOCITY (m/s)	11.9
VOLUMETRIC FLOW RATE (m^3/h)	22,871
VOLUMETRIC FLOW RATE (Rm^3/h)	6,282
PARTICULATE MATTER	
PARTICULATE MATTER (mg/Rm^3)	26.8
PARTICULATE MATTER (mg/Rm^3) at 7 % O_2	58.3
PARTICULATE MATTER (mg/Rm^3) at 11 % O_2	41.5
PARTICULATE MATTER (kg/h)	0.16
PARTICULATE MATTER (g/s)	0.045
METALS (µg/Rm^3) @ 11% O_2	
CONCENTRATION	7,440
CLASS I (Cu, Pb, V & Zn)	352
CCME GUIDELINE	1,500
CLASS II (As, Cr & Ni)	22
CCME GUIDELINE	500
CLASS III (Cd, Hg & Tl)	2.3
CCME GUIDELINE	150
HCl	
HCl (mg/Rm^3)	25.7
HCl (mg/Rm^3) at 11 % O_2	37.3
HCl (ppm)	17.2
HCl (kg/h)	0.16
ORGANIC SAMPLING TRAIN	
STACK GAS PROPERTIES	
TEMPERATURE (°C)	743
MOISTURE (% v/v)	6.1
VELOCITY (m/s)	12.1
VOLUMETRIC FLOW RATE (m^3/h)	23,252
VOLUMETRIC FLOW RATE (Rm^3/h)	6,386
PCDD/F	
PCDD/F TEQ (ng/Rm^3) at 11 % O_2	0.042
STANDARD (ng/Rm^3) at 11% O_2	0.08
PCDD/F TEQ (µg/h)	0.18
R: Reference conditions 25 °C, 101.3 kPa on a dry basis.	

SUMMARY (Cont'd)

GAS	
OXYGEN (O_2)	
O_2 (% v/v d) - average	14.3
CARBON DIOXIDE (CO_2)	
CO_2 (% v/v d) - average	5.1
CARBON MONOXIDE (CO)	
CO (ppmvd) - average	2.8
CO (mg/Rm^3)	3.3
CO (kg/h)	0.021
NITROGEN OXIDES (NO_X) as NO_2	
NO_X (ppmvd) - average	53
NO_X as equivalent NO_2 (mg/Rm^3)	100
NO_X (kg/h)	0.65
SULPHUR DIOXIDE (SO_2)	
SO_2 (ppmvd) - average	0.2
SO_2 (mg/Rm^3)	0.6
SO_2 (kg/h)	0.004
R: Reference conditions 25 °C, 101.3 kPa on a dry basis.	

The sampling was performed in compliance with the rules of the requirements of the Report No. EPS 3/UP/2, including methods recommended by "Environment and Climate Change Canada" (ECCC) of the Government of Canada inside "Environment Canada, The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology". Report No. EPS 3/UP/2, Ottawa, 1986.

1 INTRODUCTION

Consulair was mandated by Agnico Eagle Mines, Meliadine Division (Nu), to demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F).

1.1 Sampling scope

The objectives of the characterization of atmospheric emissions were to:

- Evaluate the physical characteristics of the gas flow in the stack;
- Evaluate the concentration and the emission rate of particulate matter (P), Metals (ME) and Hydrogen chloride (HCl);
- Demonstrate the performance of the incinerator to meet the standards for mercury (Hg) and dioxins and furans (PCDD/F);
- Ensure that QA/QC of Consulair is respected throughout the stack sampling program.

The study included sources and pollutants referred in the following table.

Table 1-1 – OVERALL TEST MATRIX

SOURCE	POLLUTANTS	SAMPLING METHODS
Incinerator outlet	Particulate matter (PM)	EPS 1/RM/8 EC
	Hydrogen chloride (HCl)	EPS 1/RM/1 EC
	Metals	USEPA 29
	SVOC (PCDD/F)	EPS 1/RM/2 EC

2 SAMPLING TEAM AND PARTICIPANT

The interveners of this testing program are listed in Table 2-1 and 2-2. The analysis laboratory used is defined in Table 2-3.

Table 2-1 – CLIENT CONTACT

CLIENT	CONTACT	FUNCTION
Agnico Eagle Mines Limited Meliadine Division Rankin Inlet, Nunavut, Canada X0C 0G0	Kevin Buck General Supervisor Environment Tel: 819-759-3555 Kevin.buck@agnicoeagle.com	Test program coordination

Table 2-2 – SAMPLING TEAM

STAFF	TITLE	FUNCTION
Louis Lawson	Project Manager	On-site team leader On-site sampling Report writing
Jean-François Guay	Health and Safety Manager	On-site sampling
Cristina Danatoiu	Engineer	Report validation

Table 2-3 – ANALYSIS LABORATORY

LABORATORY	ANALYSIS	FIELD OF ACCREDITATION DR-12-LLA
Consulair	Particulate Matter	400
	Hydrogen chloride (HCl)	---
Maxxam	Metals	404 - 406
Agat	PCDD/F	510

3 SAMPLING

3.1 Process operation

A representative of the Agnico Eagle mines company had the responsibility to monitor the operating conditions to ensure the representativeness of the sampling. In order to perform the sampling program under representative conditions, a tight liaison was maintained with the operators during testing.

Process operating conditions of the incinerator were under Agnico-Eagle's responsibility. The operating conditions were maintained stable throughout each days of the test program.

3.2 Source description

The number of measuring points in the stack was determined in accordance with the requirements of Environment Canada's EPS 1/RM/8 sampling method entitled: "Reference methods for source testing: measurement of releases of particulate from stationary sources".

Stacks characteristics are described in the following table.

Table 3-1 – SAMPLED SITE CHARACTERISTICS

SOURCE	DIMENSION(S) Stack (m)	DIAMETER NUMBER)		NUMBER OF SAMPLING POINTS	
		A_D	B_D	Number of port used and sampling points	Total
Incinerator outlet	0.826	5.0	2.0	2 x 6	12

3.3 Sampling methodology

Sampling methods used in this project are methods approved and recommended by known organisms such as the United States Environmental Protection Agency (US EPA) and Environment Canada (EC).

The following table shows the sampling methods that were used during testing.

Table 3-2 – SAMPLING METHODS

PARAMETERS	METHODS	SAMPLING DURATION (min)
Manual sampling methods		
Temperature	Thermometer or thermocouple	With isokinetic value
Gas flow	SPE 1/RM/8, method B – Environment Canada	With isokinetic value
O_2, CO_2, CO	SPE 1/RM/8, method C – Environment Canada	With isokinetic value
Moisture content	SPE 1/RM/8, method D – Environment Canada	With isokinetic value
Particulate matter (PM)	SPE 1/RM/8, method E – Environment Canada	120 / 170 / 180
HCl	SPE 1/RM/1 – Environment Canada	
Metals	USEPA, CFR 40, Part 60, Method 29	
SVOC (PCDD/F)	SPE 1/RM/2 – Environment Canada	240 / 150 / 180
Instrumental sampling method		
NO_X	USEPA, CFR 40, Part 60, Method 7E	60
SO_2	USEPA, CFR 40, Part 60, Method 6C	60

The distribution of parameters within the sampling train is presented in the following table.

Table 3-3 – DISTRIBUTION OF PARAMETERS FOR EACH SAMPLING SYSTEM

SAMPLING TRAIN	PARAMETERS
Metals & Particulate matter & HCl	PM & Metals & HCl
SVOC	PCDD/F

3.4 Temperature, moisture content and flowrate

Gas temperature, flowrate, velocity and moisture content will be measured at the sampling sites according to "Reference methods for source testing: measurement of releases of particulate from stationary sources". Methods B and D, Environment Canada, December 1993, EPS 1/RM/8.

3.5 Isokinetic sampling

Isokinetic sampling allows to collect particles in the sampling nozzle at the same velocity as the gas stack velocity. In non-isokinetic conditions, if the sampling velocity is inferior than the gas stack velocity, more large particles would be collected resulting in an overestimation of the true mass concentration. On the opposite, if the sampling velocity is superior than the gas stack velocity, less large particles would be collected resulting in underestimation of the true mass concentration. In either case, the sample collected would not be an accurate reflection of the gas stack stream.

The following table presents a test acceptance criteria according to the methods (sampling systems) used.

Table 3-4 – SAMPLING ACEPTANCE CRITERIA

PARAMETERS	METHOD	ACCEPTANCE CRITERIA
Particulate Matter	SPE 1/RM/8	• Isokinetic rate comprised between 90 % and 110 % • Less than 10% of the sampled points out of the 90 % to 110 % range
Metals	Method 29 from USEPA	
SVOC	SPE 1/RM/2	

3.5.1 Particulate matter (PM), metals & HCl

Particulate matter (PM) and metals (Al, Sb, Ag, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Mo, Ni, Pb, K, Se, Na, Ti, V, Zn, Sr, Tl, Si (Silicium soluble), Hg) were sampled in accordance with the requirements of Environment Canada EPS 1/RM/8 sampling method entitled: "Reference methods for source testing: measurement of releases of particulate from stationary sources". This method was combined with USEPA method 29 entitled “Metals emissions from stationary sources" in order to allow for metals sampling (including Hg). HCl was analyzed in the first impinger of that sampling train.

Table 3-5 – MAIN COMPONENTS OF THE PM/HCl/METALS SAMPLING SYSTEM

SAMPLING PROBE	SAMPLING TRAIN	CONTROL UNIT
• Quartz nozzle; • Quartz probe; • S type Pitot tube for the gas velocity attached to the sample probe; • Thermocouple for temperature attached to the sample probe.	• A 0.3 µm porosity pre-weighted quartz filter mounted in a Pyrex filter holder and placed in a heated oven to avoid moisture condensation; • Seven impingers placed in series and containing: ○ # 1: 100 mL H_2O; ○ # 2 and # 3: 100 mL HNO_3 (5%) / H_2O_2 (10%) solution; ○ # 4: empty; ○ # 5 and # 6: 100 mL $KMnO_4$ (4%) / H_2SO_4 (10%) solution; ○ # 7: silica gel; • Impingers placed in an ice bath to condense all the flue gas moisture.	• Sampling cord that connects the train to the sampling console; • Sampling console with oil manometer, a dry gas meter, an orifice, a temperature reader and temperature controllers; • Diaphragm vacuum pump.

3.5.2 Semivolatile organic compounds (SVOC) (PCDD/DF)

Semi Volatile Organic Compounds (SVOC) are defined as organic compounds with boiling points greater than 100 °C. This class of compounds includes PCDD (PolyChlorinated Dibenzo p Dioxins), PCDF (PolyChlorinated DibenzoFurans),

SVOCs (PCDD/F) were sampled in accordance with the requirements of Environment Canada EPS 1/RM/2 sampling method entitled: " Reference Method for Source Testing: Measurement of Releases of Selected Semi-Volatile Organic Compounds from Stationary Sources ". For this project, SVOCs included polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). A minimal volume of at least 3.0 Rm^3 was sampled during each run.

For one series of three SVOC tests, a blank train was taken to the stack sampling site. A volume of ambient air equal to the sum of all leak check volumes during the SVOC test was pumped through the blank train, according to the requirements of reference method EPS 1/RM/2.

The following table shows the various components of the sampling system for PCDD/F.

Table 3-6 – MAIN COMPONENTS OF A SVOC SAMPLING SYSTEM

SAMPLING PROBE	SAMPLING TRAIN	CONTROL UNIT

• Glass nozzle of a precisely measured diameter to allow isokinetic sampling;
• Glass heated probe to avoid moisture condensation;
• Probe is fastened to an "S" type Pitot tube for gas velocity measurement and to a thermocouple for temperature measurement.
	• A 0.3 µm porosity pre-weighted fiber glass filter mounted on an accurate holder and placed in a heated oven to avoid moisture condensation;
	• Condenser;
	• XAD-2 resin cartridge;
	• Condensate trap;
	• Three impingers placed in series and containing:
	  ○ # 1: 100 mL ethylene glycol;
	  ○ # 2: empty;
	  ○ # 3: silica gel;
	• Impingers placed in an ice bath to condense all the flue gas moisture.
		• Sampling cord that connects the train to the sampling console;
		• Sampling console with oil manometer, a dry gas meter, an orifice, a temperature reader and temperature controllers;
		• Diaphragm vaccum pump.

3.6 Gaseous parameters (O_2, CO_2, CO, SO_2 & NO_X)

One CEM (Continuous Emission Monitoring) systems was used to determine the concentration of O_2, CO_2, CO, SO_2 & NO_X. The CEM system includes a gas extraction system, one analyzer and a data acquisition system. The moisture-free gas was analysed for O_2, CO_2, CO, SO_2 & NO_X with an analyzer as described in the following table.

Graphics of continuous measurements of gas are presented in Appendix 2 of the report.

Table 3-7 – GAS ANALYZER

ANALYZER	O_2/CO_2	CO	SO_2	NO_X
Method	USEPA 3A	USEPA 10	USEPA 6C	USEPA 7E
Brand	Horiba	Horiba	Horiba	Horiba
Model	PG250	PG 250	PG 250	PG 250
Detector	Galvanic Cell / Infrared	Infrared	Infrared	Chemiluminescence
Zero gas	Nitrogen			
Working Scale	0 - 30 %v	0 – 100 ppmv	0 – 500 ppmv	0 – 1,000 ppmv

3.7 Testing schedule

Table 3-8 – TESTING SCHEDULE

SOURCE	DATE	TIME	TEST
Outlet of incinerator	2018-09-22	13:44-17:44	GAS & SVOC # 1
	2018-09-28	11:32-14:02	GAS & SVOC # 2
	2018-09-29	16:13-19:13	GAS & SVOC # 3
	2018-09-22	14:45-16:45	PM/Metal/HCl # 1
	2018-09-28	11:33-14:23	PM/Metal/HCl # 2
	2018-09-29	16:14-19:14	PM/Metal/HCl # 3

3.8 LAWS AND REGULATIONS

The government of Nunavut presented a guideline document in October 2010, which was revised in January 2012, for the burning and incineration of solid waste. The following emission standards apply to existing, new or expanding solid waste incinerators operating in Nunavut and have been adopted from the Canadian Council of Ministers of the Environment (CCME) Canada - Wide Standards for Dioxins and Furans and Mercury Emissions. The document presented two criteria for air emission which are applicable in the current project. A standard for Dioxins and Furans is stated at 80 pg I-TEQ/m^3 and another standard for mercury is stated at 20 µg/Rm^3. The R conditions are stated at 101.3 kPa and 25°C. Both standards are corrected to 11% O_2.

4 QUALITY CONTROL PROCEDURES (QA/QC)

The quality insurance program and control at Consulair has several elements to validate the methodologies used during sampling. The main points are detailed within this section.

4.1 QA/QC – PRE-TEST

4.1.1 Equipment, instruments and reagents

The sampling train glassware and sample containers were cleaned and checked according to the applicable reference methods.

The instruments used were subject of regular maintenance and are calibrated for less than a year. The calibration constants of the equipment used are shown in Tables 4-1 to 4-3. Calibration certificates of equipment are presented in Appendix 3 of the report.

The gas standards used for calibration of the analyzer were valid at the time of use considering the retention periods imposed by the supplier. The standard gases are certified to ± 2% by the supplier.

4.1.2 Field forms

The forms that present field data for the target parameters are shown in Appendix 5.

4.2 Sample tracking

A clean room inside the incinerator building was used for the assembly and the different stages of recovery of sampling trains. Recovery of samples was performed according to the procedures recommended by the methods.

The samples were collected in suitable containers as specified by the methods. All samples were kept cool during the sampling period and until the delivery of samples to analytical laboratories. Consulair used an identification system for the samples that allowed tracking the origin easily by a unique code coupled to a lookup table. Each sample number includes the date, test number, the precise location of the sampling, the nature and destination (analysis, archiving). This information is indicated on the chain of custody listing and the information is available on the analysis reports.

4.3 Validation criteria

Consulair ensured that each step of the air emission characterization program (including QA / QC program) will achieve the defined objectives, while respecting the deadline set by the customer.

4.3.1 Analytical laboratory

The particulate samples analysis was done in the laboratory of Consulair. This laboratory is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for particulate matter (domain 400 of the air chemical section). The metals samples were analysed by Maxxam's laboratory, which is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for metallic analysis (domain 404 of the air chemical section). The PCDD/F samples were analysed by AGAT's laboratory, which is accredited by the *Centre d'Expertise en Analyse Environnementale du Québec* (CEAEQ) for PCDD/F analysis (domain 510 of the air chemical section).

The analytical reports have been signed by a chemist and are presented in appendix 4. The laboratory also made available, in its report, the QA/QC program specific to the analysed contaminants.

4.3.2 Validation criteria – Particulate matter / Metals / HCl (PM/ME/HCl)

The following tables show the validation criteria of the methodology used.

Table 4-1 – QA/QC METHODOLOGY – PM/METALS/HCl

SPE 1/RM/8 METHODOLOGICAL INFORMATION				
TEST	ME-1	ME-2	ME-3	**CRITERIA**
CYCLONIC FLOW	0			≤ 15°
REVERSE FLOW	NO			NO
STACK DIAMETER (m)	0.826			≥ 0.3
A_0	2.0			≥ 0.5
B_0	5.0			≥ 2.0
SAMPLING TIME (min)	120	170	180	≥ 120
VOLUME SAMPLED (Rm^3)	2.76	2.83	3.77	≥ 2.8
ISOKINETICITY AVERAGE (%)	102	101	102	90 ≤ ISO ≤ 110
POURCENTAGE OF ISOKINETIC POINTS	100%	100%	100%	≥ 90
SAMPLING VELOCITY	OK	OK	OK	3.0 ≤ V ≤ 30 m/s
PROBE TEMPERATURE	NOT MEASURED			223 ≤ T ≤ 273 °F
FILTER TEMPERATURE	OK	OK	OK	223 ≤ T ≤ 273 °F
OUTLET TEMPERATURE	OK	OK	OK	32 ≤ T ≤ 68 °F
4% D_{MOY} (pi^3/min)	0.03	0.02	0.03	---
FLOW LEAK BEFORE at -15in Hg (ft^3/min)	0.020	0.020	0.020	≤ 0.02 or 4% Dmoy
FLOW LEAK AFTER (ft^3/min)	0.020	0.020	0.020	≤ 0.02 or 4% Dmoy
EQUIPMENT INFORMATION				
SAMPLING MODULE NO.	25	25	25	
METER FACTOR K_C	0.999	0.999	0.999	$0.95 < K_C < 1.05$
ORIFICE FACTOR K_O	0.733	0.733	0.733	
Δh@	2.529	2.529	2.529	
PITOT ID	05-07 5Q-501	05-07 5Q-501	05-07 5Q-501	
PITOT FACTOR	0.774	0.774	0.774	
NOZZLE ID	5Q-502	5Q-434	5Q-434	
NOZZLE DIAMETER (in)	0.4684	0.4366	0.4366	
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.				

The sampling volume for the first test run is slightly lower than the 2.8 m^3 limit of the test method but should not have any impact on the result.

Table 4-2 – QA/QC METHODOLOGY – SVOC

TEST	PCDD/DF-1	PCDD/DF-2	PCDD/DF-3	CRITERIA
EQUIPEMENT INFORMATION				
SAMPLING MODULE NO.	19	19	19	N/A
METER FACTOR K_C	0.997	0.997	0.997	0.95 - 1.05
ORIFICE FACTOR K_O	0.994	0.994	0.994	N/A
PITOT ID	03-06 3Q-371	03-06 3Q-503	03-06 3Q-503	N/A
PITOT FACTOR	0.778	0.781	0.781	N/A
NOZZLE ID	3Q-371	3Q-503	3Q-503	N/A
NOZZLE DIAMETER (in)	0.3741	0.4958	0.4958	N/A
METHODOLOGICAL INFORMATION				
SAMPLING POINTS NUMBER	12	12	12	24
GAS VELOCITY (m/s)	11.7	10.6	13.9	3.0 - 30
SAMPLING TIME (min)	240	150	180	≥ 180
VOLUME SAMPLED (Rm^3)	3.38	3.39	4.99	≥ 3
SAMPLING RATE (pi^3/min)	0.48	0.78	0.95	N/A
ISOKINETICITY AVERAGE (%)	101	101	101	90 - 110
POURCENTAGE OF ISOKINETIC POINTS	100	100	100	≥ 90
PROBE TEMPERATURE (°F)	NOT MEASURED			223 - 273
FILTER TEMPERATURE (°F)	240 - 258	246 – 253	246 - 257	223 - 273
OUTLET TEMPERATURE (°F)	39 - 58	56 - 91	40 - 63	32 - 68
TRAP TEMPERATURE (°F)	46 - 69	38 - 63	41 - 69	33 - 68
FLOW LEAK BEFORE at -15in Hg (ft^3/min)	< 0.020	< 0.020	< 0.020	< 0.02
FLOW LEAK AFTER (ft^3/min)	< 0.020	< 0.020	< 0.020	< 0.02
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.				

The sampling time for the second run of SVOC is under the 180 minutes limit of the method because of a process malfunction and the sampling had to be stopped. However, since the sampling volume for this test run is higher than the 3.0 m^3 limit of the method, this should have no impact on the result.

5 RESULTS

The reference values are reported at a temperature of 25°C and an atmospheric pressure of 101.3 kPa, on a dry basis.

For the inorganic results, a laboratory analysis value preceded of "<" means that the laboratory result is less than the detection limit reported (LDR) and represents a maximum result. In this case, the detection limit reported (LDR) is the value used.

The PCDD / F result tables include all toxic congeners (17) calculated with TEF (Toxic Equivalency Factor). The term "toxic equivalency (TEQ)" is the sum of the 17 toxic congeners calculated according to the TEF and when a congener was not detected by the laboratory analysis, it was replaced by "zero".

Unless otherwise indicated, the averages indicated in the tables below are the average of all tests carried out to the same source for the same operating condition.

Computer compiled data is presented in Appendix 1.

Table 5-1 – STACK GAS PROPERTIES

TESTS SCHEDULE				
TEST	RUN-1	RUN-2	RUN-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
STACK GAS PROPERTIES – METAL SAMPLING TRAIN				
TEMPERATURE (°C)	727	724	782	744
MOISTURE (% v/v)	6.2	5.5	6.3	6.0
VELOCITY (m/s)	12.0	10.2	13.5	11.9
STACK GAS FLOW RATE (m^3/h)	23 080	19 600	25 932	22 871
STACK GAS FLOW RATE (ft^3/min) (ACFM)	6 498	5 503	6 844	6 282
STACK GAS FLOW RATE (Rm^3/h)	13 585	11 536	15 263	13 461
STACK GAS FLOW RATE (Rft^3/min) (SCFM)	3 825	3 239	4 028	3 697
STACK GAS PROPERTIES – SVOC SAMLING TRAIN				
TEMPERATURE (°C)	726	723	780	743
MOISTURE (% v/v)	6.6	5.1	6.6	6.1
VELOCITY (m/s)	11.7	10.6	13.9	12.1
STACK GAS FLOW RATE (m^3/h)	22 509	20 452	26 796	23 252
STACK GAS FLOW RATE (ft^3/min) (ACFM)	13 248	12 038	15 771	13 686
STACK GAS FLOW RATE (Rm^3/h)	6 314	5 774	7 070	6 386
STACK GAS FLOW RATE (Rft^3/min) (SCFM)	3 717	3 398	4 161	3 759
GAS COMPOSITION				
CO_2 (% v/v d)	5.2	4.4	5.6	5.1
O_2 (% v/v d)	14.1	15.1	13.6	14.3
CO (ppmvd)	3	3	3	3
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-2 – RESULTS PM – HCL

TESTS SCHEDULE				
TEST	MEL-ME-1	MEL-ME-2	MEL-ME-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
PARTICULATE MATTER				
PARTICULATE MATTER (mg/Rm^3)	30.9	35.8	13.6	26.8
PARTICULATE MATTER (mg/Rm^3) at 7 % O_2	63.4	85.7	25.9	58.3
PARTICULATE MATTER (mg/Rm^3) at 11 % O_2	45.2	61.0	18.4	41.5
PARTICULATE MATTER (kg/h)	0.20	0.20	0.093	0.16
HCl				
HCl (mg/Rm^3)	32.4	12.0	32.6	25.7
HCl (mg/Rm^3) at 11 % O_2	**47.4**	**20.5**	**44.1**	**37.3**
HCl (ppm)	21.7	8.1	21.8	17.2
HCl (kg/h)	0.210	0.066	0.223	0.167
HCl (g/s)	0.0584	0.0184	0.0619	0.0463
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-3 – METALS CONCENTRATION

SCHEDULE OF TESTS				
TEST	MEL-ME-1	MEL-ME-1	MEL-ME-1	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
METALS (µg/Rm^3) @ 11% O_2				
Aluminium (Al)	307	24	21	118
Antimony(Sb)	129	2.3	78	70
Silver (Ag)	1.5	< 1.6	1.2	1.4
Arsenic (As)	9.2	0.96	11	7.1
Baryum (Ba)	4.1	0.72	0.45	1.7
Beryllium (Be)	< 0.13	< 0.16	< 0.089	< 0.13
Bismuth (Bi)	0.55	0.19	1.8	0.85
Boron (B)	14	8.6	37	20
Cadmium (Cd)	2.0	0.57	3.5	2.0
Calcium (Ca)	1,095	239	142	492
Chromium (Cr)	9.8	3.2	26	13
Cobalt (Co)	0.42	< 0.24	0.18	0.28
Copper (Cu)	48	15	48	37
Tin (Sn)	54	16	68	46
Iron (Fe)	576	331	49	318
Lithium (Li)	5.8	21	13	13
Magnesium (Mg)	167	28	27	74
Manganese (Mn)	36	14	2.1	17
Mercury (Hg)	0.47	0.21	0.018	0.23
Molybdenum (Mo)	3.6	< 1.6	3.9	3.0
Nickel (Ni)	4.6	0.48	0.82	2.0
Lead (Pb)	68	23	160	83
Potassium (K)	5,348	716	3,662	3,242
Selenium (Se)	0.74	0.48	0.36	0.52
Silicium (Si)	409	107	212	243
Sodium (Na)	4,180	520	2,473	2,391
Strontium (Sr)	2.8	0.42	0.25	1.2
Thallium (Tl)	< 0.21	< 0.24	< 0.14	< 0.20
Titanium (Ti)	29	4.2	3.2	12
Vanadium (V)	0.79	< 0.48	0.39	0.55
Zinc (Zn)	274	34	385	231
DETECTED METAL	**12,780**	**2,111**	**7,430**	**7,440**
TOTAL METALS	**12,780**	**2,115**	**7,430**	**7,442**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-4 – METALS EMISSION RATE

SCHEDULE OF TESTS				
TEST	MEL-ME-2	MEL-ME-1	MEL-ME-3	AVERAGE
DATE	2018-09-22	2018-09-28	2018-09-29	(1 to 3)
START HOUR OF THE FIELD TEST	14:45	11:33	16:14	
END HOUR OF THE FIELD TEST	16:45	14:23	19:14	
DURATION OF THE TEST (MINUTES)	120	170	180	
METALS (g/h)				
Aluminium (Al)	1.4	0.078	0.11	0.52
Antimony(Sb)	0.58	0.0076	0.40	0.33
Silver (Ag)	0.0068	< 0.0051	0.0060	0.0060
Arsenic (As)	0.041	0.0031	0.057	0.034
Baryum (Ba)	0.018	0.0023	0.0023	0.0076
Beryllium (Be)	< 0.00059	< 0.00051	< 0.00045	< 0.00052
Bismuth (Bi)	0.0024	0.00062	0.0091	0.0041
Boron (B)	0.063	0.028	0.19	0.093
Cadmium (Cd)	0.0091	0.0018	0.018	0.0096
Calcium (Ca)	4.9	0.78	0.72	2.1
Chromium (Cr)	0.044	0.010	0.13	0.063
Cobalt (Co)	0.0019	< 0.00078	0.00091	0.0012
Copper (Cu)	0.22	0.050	0.24	0.17
Tin (Sn)	0.24	0.051	0.34	0.21
Iron (Fe)	2.6	1.1	0.25	1.3
Lithium (Li)	0.026	0.070	0.064	0.053
Magnesium (Mg)	0.75	0.091	0.14	0.32
Manganese (Mn)	0.16	0.045	0.011	0.072
Mercury (Hg)	0.0021	0.00070	0.000091	0.00096
Molybdenum (Mo)	0.016	< 0.0051	0.020	0.014
Nickel (Ni)	0.020	0.0016	0.0042	0.0087
Lead (Pb)	0.30	0.074	0.81	0.40
Potassium (K)	24	2.3	19	15
Selenium (Se)	0.0033	0.0016	0.0018	0.0022
Silicium (Si)	1.8	0.35	1.1	1.1
Sodium (Na)	19	1.7	13	11
Strontium (Sr)	0.012	0.0014	0.0013	0.0050
Thallium (Tl)	< 0.00094	< 0.00078	< 0.00073	< 0.00082
Titanium (Ti)	0.13	0.014	0.016	0.053
Vanadium (V)	0.0035	< 0.0016	0.0020	0.0024
Zinc (Zn)	1.2	0.11	2.0	1.1
DETECTED METAL	**57**	**6.9**	**38**	**34**
TOTAL METALS	**57**	**6.9**	**38**	**34**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-5 – CONCENTRATION - PCDD/F CONGENERS

SCHEDULE OF TESTS				
SERIAL NUMBER TEST	MEL-COSV-1	MEL-COSV-2	MEL-COSV-3	**AVERAGE**
DATE	2018-09-22	2018-09-28	2018-09-29	**(1 to 3)**
START OF TEST	13:44	11:32	16:13	
END OF TEST	17:44	14:02	19:13	
DURATION OF THE TEST (MINUTES)	240	150	180	
PCDD/DF CONGENERS (ng/Rm^3)				
2,3,7,8 - Tetra CDD	< 0.00030	0.0015	< 0.0014	0.0011
1,2,3,7,8 - Penta CDD	< 0.00089	0.014	0.0046	0.0065
1,2,3,4,7,8 - Hexa CDD	< 0.00089	0.016	0.0056	0.0074
1,2,3,6,7,8 - Hexa CDD	0.00089	0.021	0.013	0.011
1,2,3,7,8,9 - Hexa CDD	< 0.00089	0.024	0.013	0.013
1,2,3,4,6,7,8 - Hepta CDD	0.0050	0.093	0.061	0.053
1,2,3,4,6,7,8,9 - Octa CDD	0.0098	0.047	0.060	0.039
2, 3, 7, 8 - Tetra CDF	0.0044	0.014	0.043	0.021
1,2,3,7,8 - Penta CDF	< 0.0024	0.0062	0.012	0.0070
2,3,4,7,8 - Penta CDF	0.0027	0.013	0.033	0.016
1,2,3,4,7,8 - Hexa CDF	0.0039	0.018	0.065	0.029
1,2,3,6,7,8 - Hexa CDF	0.0027	0.0074	0.024	0.011
2,3,4,6,7,8 - Hexa CDF	0.0024	0.015	0.055	0.024
1,2,3,7,8,9 - Hexa CDF	< 0.0018	< 0.0059	0.0060	0.0046
1,2,3,4,6,7,8 - Hepta CDF	0.0047	0.019	0.095	0.040
1,2,3,4,7,8,9 - Hepta CDF	< 0.0018	0.0024	0.020	0.0081
1,2,3,4,6,7,8,9 - Octa CDF	0.0059	0.0050	0.045	0.019
Total Tetra CDD	0.0027	0.047	0.043	0.031
Total Penta CDD	0.0033	0.13	0.081	0.072
Total Hexa CDD	0.0074	0.27	0.14	0.14
Total Hepta CDD	0.0059	0.099	0.063	0.056
CDD TOTALS	**0.029**	**0.59**	**0.39**	**0.34**
Total Tetra CDF	0.030	0.083	0.23	0.11
Total Penta CDF	0.021	0.12	0.31	0.15
Total Hexa CDF	0.0095	0.051	0.19	0.084
Total Hepta CDF	0.0083	0.036	0.18	0.074
CDF TOTALS	**0.075**	**0.30**	**0.95**	**0.44**
CONGENERS TOTALS TOXIC	**0.051**	**0.32**	**0.56**	**0.31**
TOTAL HOMOLOGUOUS GROUPS	**0.19**	**1.7**	**2.6**	**1.5**
R: Reference conditions at 101.3 kPa and 25°C on a dry basis.				

Table 5-6 – CONCENTRATION - PCDD/F TEQ

SCHEDULE OF TESTS				
SERIAL NUMBER TEST	MEL-COSV-1	MEL-COSV-2	MEL-COSV-3	**AVERAGE**
TEQ - PCDD/F (ng/Rm^3) at 11 % O_2				
2,3,7,8 - Tetra CDD	< LD	0.0025	< LD	0.0016
1,2,3,7,8 - Penta CDD	< LD	0.024	0.0062	0.010
1,2,3,4,7,8 - Hexa CDD	< LD	0.0027	0.00076	0.0012
1,2,3,6,7,8 - Hexa CDD	0.00013	0.0036	0.0017	0.0018
1,2,3,7,8,9 - Hexa CDD	< LD	0.0041	0.0018	0.0020
1,2,3,4,6,7,8 - Hepta CDD	0.000074	0.0016	0.00083	0.00083
1,2,3,4,6,7,8,9 - Octa CDD	0.0000014	0.0000080	0.0000081	0.0000059
2, 3, 7, 8 - Tetra CDF	0.00065	0.0024	0.0059	0.0030
1,2,3,7,8 - Penta CDF	< LD	0.00053	0.00084	0.00051
2,3,4,7,8 - Penta CDF	0.0020	0.011	0.022	0.012
1,2,3,4,7,8 - Hexa CDF	0.00056	0.0031	0.0088	0.0042
1,2,3,6,7,8 - Hexa CDF	0.00039	0.0013	0.0033	0.0016
2,3,4,6,7,8 - Hexa CDF	0.00035	0.0025	0.0074	0.0034
1,2,3,7,8,9 - Hexa CDF	< LD	< LD	0.00081	0.00069
1,2,3,4,6,7,8 - Hepta CDF	0.000069	0.00032	0.0013	0.00056
1,2,3,4,7,8,9 - Hepta CDF	< LD	0.000040	0.00027	0.00011
1,2,3,4,6,7,8,9 - Octa CDF	0.00000087	0.00000085	0.0000062	0.0000026
TOXIC EQUIVALENT TOTAL	**0.0042**	**0.059**	**0.062**	**0.042**
STANDARD (ng/Nm^3) at 11% O_2	**0.08**			
TEQ / % OF THE STANDARD	5.2	73.8	77.8	52.3
TEQ - PCDD/F (µg/h)				
2,3,7,8 - Tetra CDD	< LD	0.0085	< LD	0.0068
1,2,3,7,8 - Penta CDD	< LD	0.080	0.033	0.039
1,2,3,4,7,8 - Hexa CDD	< LD	0.0090	0.0040	0.0045
1,2,3,6,7,8 - Hexa CDD	0.00056	0.012	0.0089	0.0072
1,2,3,7,8,9 - Hexa CDD	< LD	0.014	0.0092	0.0079
1,2,3,4,6,7,8 - Hepta CDD	0.00032	0.0054	0.0043	0.0034
1,2,3,4,6,7,8,9 - Octa CDD	0.0000062	0.000027	0.000042	0.000025
2, 3, 7, 8 - Tetra CDF	0.0028	0.0082	0.031	0.014
1,2,3,7,8 - Penta CDF	< LD	0.0018	0.0044	0.0023
2,3,4,7,8 - Penta CDF	0.0084	0.037	0.12	0.054
1,2,3,4,7,8 - Hexa CDF	0.0024	0.011	0.046	0.020
1,2,3,6,7,8 - Hexa CDF	0.0017	0.0043	0.017	0.0076
2,3,4,6,7,8 - Hexa CDF	0.0015	0.0085	0.039	0.016
1,2,3,7,8,9 - Hexa CDF	< LD	< LD	0.0042	0.0029
1,2,3,4,6,7,8 - Hepta CDF	0.00030	0.0011	0.0067	0.0027
1,2,3,4,7,8,9 - Hepta CDF	< LD	0.00014	0.0014	0.00055
1,2,3,4,6,7,8,9 - Octa CDF	0.0000037	0.0000029	0.000032	0.000013
TOXIC EQUIVALENT	**0.018**	**0.20**	**0.33**	**0.18**
R: Reference conditions at 101.3 kPa and 25°C, and dry basis.				

Table 5-7 – STACK GAS MEASUREMENTS

SCHEDULE OF TESTS			
SERIAL NUMBER TEST	MEL GAZ E1	MEL GAZ E2	MEL GAZ E3
DATE	2018-09-22	2018-09-28	2018-09-29
START OF TEST	13:50	11:35	16:15
END OF TEST	17:40	14:25	19:05
DURATION OF THE TEST (MINUTES)	230	170	170
OXYGEN (O_2)			
O_2 (% v/v d) average	14.1	15.1	13.6
O_2 (% v/v d) minimum	13.0	14.1	12.6
O_2 (% v/v d) maximum	15.4	15.8	14.6
CARBON DIOXIDE (CO_2)			
CO_2 (% v/v d) average	5.2	4.4	5.6
CO_2 (% v/v d) minimum	4.4	4.0	4.9
CO_2 (% v/v d) maximum	6.0	5.0	6.3
CARBON MONOXIDE (CO)			
CO (ppmvd) average	2.6	3.4	2.6
CO (ppmvd) minimum	1.9	2.6	1.3
CO (ppmvd) maximum	3.9	4.4	3.5
CO (mg/Rm^3)	3.0	3.9	3.0
AVERAGE EMISSION (kg/h)	0.019	0.022	0.021
NITROGEN OXIDES (NO_X as NO_2)			
NO_X (ppmvd) average	44	49	66
NO_X (ppmvd) minimum	28	42	56
NO_X (ppmvd) maximum	59	58	77
NO_X equivalent NO_2 (mg/Rm^3)	84	93	124
AVERAGE EMISSION (kg/h)	0.53	0.54	0.87
SULPHUR DIOXIDES (SO_2)			
SO_2 (ppmvd) average	0	0	0.6
SO_2 (ppmvd) minimum	0	0	0
SO_2 (ppmvd) maximum	0	0	3.6
SO_2 equivalent NO_2 (mg/Rm^3)	0	0	1.7
AVERAGE EMISSION (kg/h)	0	0	0.012
R: Reference conditions at 101.3 kPa et 25°C, and dry basis.			

6 CONCLUSION

According to the sampling methods and procedures combined with a rigorous quality control, the results of concentrations and / or emission rates presented in this report are valid and representative of the process operation conditions sampled for period test results.

The final results obtained are valid and representative of the operating conditions during the tests.

The sampling was made in compliance with the rules of the requirements of the Report No. EPS 3/UP/2, including methods recommended by “Environment and Climate Change Canada” (ECCC) of the Government of Canada inside “Environment Canada, The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology”. Report No. EPS 3/UP/2, Ottawa, 1986.

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7 REFERENCES

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APPENDIX 1
COMPUTED DATA



AEM Meliadine
18-5528
Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
DONNEES DES EQUIPEMENTS D'ECHANTILLONNAGE				
PRESSION BAROMÉTRIQUE ("Hg)	30.10	29.73	29.83	29.89
PRESSION STATIQUE ("H2O)	-0.08	-0.05	-0.05	-0.06
PRESSION STATIQUE (kPa)	-0.02	-0.01	-0.01	-0.01
COEFFICIENT DU COMPTEUR (25,25,25,25,	0.999	0.999	0.999	0.999
COEFFICIENT DU PITOT (05-07 5Q-501,05-(	0.774	0.774	0.774	0.774
DIAMÈTRE DE LA BUSE (po) (5Q-502,5Q-43	0.4684	0.4366	0.4366	0.4472
TEMPÉRATURE COMPTEUR (°F)	91	91	92	91
TEMPÉRATURE COMPTEUR (°C)	33	33	33	33
HUMIDITE DES GAZ & VOLUME ECHANTILLONNE				
VOLUME D'EAU (g)	133.3	121.6	186.7	147.2
VOLUME D'EAU (pi³)	6.40	5.84	8.96	7.07
HUMIDITÉ GAZ (BWO)	0.062	0.055	0.063	0.060
HUMIDITÉ GAZ (%v)	6.2	5.5	6.3	6.0
VOLUME GAZ REFERENCE (pi³R)	97.44	100.04	133.02	110.17
VOLUME GAZ REFERENCE (m³R)	**2.759**	**2.833**	**3.767**	**3.120**
CARACTERISTIQUES DU CONDUIT				
DIAMÈTRES AVANT LES TROUS D'ÉCHANT	5.0	5.0	5.0	
DIAMÈTRES APRÈS LES TROUS D'ÉCHANT	2.0	2.0	2.0	
DIAMÈTRE DU CONDUIT (pi)	2.71	2.71	2.71	
DIAMÈTRE DU CONDUIT (m)	0.826	0.826	0.826	
ÉPAISSEUR DU PORT D'ÉCHANTILLONNAC	7.5	7.5	7.5	
LONGUEUR DU CONDUIT (pi)	0.0	0.0	0.0	
LARGEUR DU CONDUIT (pi)	0.0	0.0	0.0	
DIAMÈTRE ÉQUIVALENT (pi)	#VALEUR!	#VALEUR!	#VALEUR!	
DIAMÈTRE ÉQUIVALENT (m)	#VALEUR!	#VALEUR!	#VALEUR!	
PRESSION CONDUIT ("Hg)	30.09	29.73	29.83	29.88
PRESSION COMPTEUR ("Hg)	30.25	29.81	29.95	30.00
SURFACE DU CONDUIT (pi²)	5.8	5.8	5.8	5.8
SURFACE DU CONDUIT (m²)	0.54	0.54	0.54	0.54
CARACTERISTIQUES DES GAZ				
TEMPÉRATURE CHEMINÉE (°F)	1340	1336	1440	1372
TEMPÉRATURE CHEMINÉE (°C)	727	724	782	744
CO_2 (%vs)	5.2	4.4	5.6	5.1
O_2 (%vs)	14.1	15.1	13.6	14.3
O_2 (%vh)	13.3	14.3	12.7	13.4
CO (ppmvs)	3	3	3	3
SO_2 (%vs)	0	0	0	0
N_2 (%vs)	80.6	80.5	80.8	80.6
Ar (%vs)	0.00	0.00	0.00	0.00
POIDS MOLECULAIRE SEC	29.40	29.31	29.44	29.39
POIDS MOLECULAIRE HUMIDE	28.70	28.69	28.72	28.70
VITESSE DES GAZ (pi/s)	39.3	33.4	44.2	38.9
VITESSE DES GAZ (m/s)	12.0	10.2	13.5	11.9
DEBITS GAZ ACTUELS (pi³/h)	815 078	692 166	915 770	807 671
DEBITS GAZ ACTUELS (m³/h)	23 080	19 600	25 932	22 871
DEBITS GAZ ACTUELS (pi³/min)(APCM)	13 585	11 536	15 263	13 461
DEBITS GAZ NORMALISES (pi³R/h)	229 478	194 320	241 695	221 831
DEBITS GAZ NORMALISES (m³R/h)	**6 498**	**5 503**	**6 844**	**6 282**
DEBITS GAZ NORMALISES (pi³R/min) (RPCI	3 825	3 239	4 028	3 697

AEM Meliadine
18-5528
Incinérateur
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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
INFORMATIONS D'ECHANTILLONNAGE				
COEFFICIENT DE L'ORIFICE DU COMPTEU	0.733	0.733	0.733	
VITESSE MAXIMALE (m/s)	12.75	11.35	14.34	
VITESSE MINIMALE (m/s)	10.47	9.17	12.30	
10%Vmax (pi/s)	1.28	1.14	1.43	
Pourcentage >10%Vmax	100%	100%	100%	
NOMBRE POINTS ΔP 20% et + de ΔPmoy	2	3	0	
ISOCINETISME MOYEN (%)	102.2	100.8	101.6	
% PTS RESPECT CRITERE ISO	100%	100%	100%	
DEBIT DE POMPAGE MAX (pi³/min)	0.91	0.65	0.82	
PRESSION DE VIDE MAX DURANT ESSAI (-	-2	-9	-4	
TEMPÉRATURE SONDE MAX (°F)	250	252	250	
TEMPÉRATURE SONDE MIN (°F)	250	243	250	
TEMPÉRATURE FILTRE MAX (°F)	260	261	250	
TEMPÉRATURE FILTRE MIN (°F)	260	246	250	
TEMPÉRATURE SORTIE MAX (°F)	67	67	40	
TEMPÉRATURE SORTIE MIN (°F)	40	67	40	
TEMPÉRATURE TRAPPE MAX (°F)	0	0	0	
TEMPÉRATURE TRAPPE MIN (°F)	0	0	0	
TEMPÉRATURE AUX 3 MAX (°F)	0	0	0	
TEMPÉRATURE AUX 3 MIN (°F)	0	0	0	
TEMPÉRATURE MODULE MAX (°F)	0	0	0	
TEMPÉRATURE MODULE MIN (°F)	0	0	0	
DEBIT DE POMPAGE MOYEN (pi³/min)	0.82	0.61	0.76	
4% DEBIT DE POMPAGE MOYEN (pi³/min)	0.033	0.024	0.030	
TEST DE FUITE AVANT LES ESSAIS À 15 "H	< 0.020	< 0.020	< 0.020	
TEST DE FUITE APRÈS LES ESSAIS (pi³/mi	< 0.020	< 0.020	< 0.020	
PARTICULES FILTRABLES SPE 1/RM/8				
MASSE FILTRE (mg)	48.2	48.4	46.0	47.5
MASSE SONDE (mg)	37.0	53.1	5.3	31.8
MASSE BLANC ACÉTONE (mg)	< 1			
VOLUME BLANC ACÉTONE (mL)	91			
RÉSIDUS ACÉTONE (%)	0.001			
MASSE SONDE (mg)	37.0	53.1	5.30	31.8
MASSE TOTALE (mg)	85.2	101.5	51.3	79.3
CONCENTRATION (mg/m³R)	**30.9**	**35.8**	**13.6**	**26.8**
CONCENTRATION (mg/m³R) à 7% O₂	**63.4**	**85.7**	**25.9**	**58.3**
CONCENTRATION (mg/m³R) à 11% O₂	**45.2**	**61.0**	**18.4**	**41.5**
TAUX D'ÉMISSION (kg/h)	0.20	0.20	0.093	0.16
TAUX D'ÉMISSION (g/s)	0.056	0.055	0.026	0.045
ACIDE CHLORHYDRIQUE (HCl)				
BLANC HCl (mg)	< 0.040			
CHLORURES (mg)	86.87	33.16	119.33	
HCl (mg)	89.34	34.10	122.72	82.1
HCl (mg/m³R)	32.4	12.0	32.6	25.67
HCl (ppmvs)	21.7	8.1	21.8	17.21
HCl (mg/m³R) 11% O₂	47.4	20.5	44.1	37.32
HCl (kg/h)	0.21	0.07	0.22	0.167

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX				
MÉTAUX PARTICULAIRES (µg)				
Aluminium (Al)	570.0	30.0	46.0	215.3
Antimoine (Sb)	245.0	3.60	219.0	155.9
Argent (Ag)	0.90	< 0.60	1.30	0.93
Arsenic (As)	17.2	1.30	30.9	16.5
Baryum (Ba)	7.28	0.65	1.06	3.00
Béryllium (Be)	< 0.050	< 0.060	< 0.050	< 0.053
Bismuth (Bi)	0.84	0.12	4.83	1.93
Bore (B)	4	4	4	4
Cadmium (Cd)	2.47	0.45	9.52	4.15
Calcium (Ca)	1930.0	309.0	243.0	827.3
Chrome (Cr)	18.20	5	73.4	32.2
Cobalt (Co)	0.50	< 0.10	0.20	0.27
Cuivre (Cu)	89.1	24.7	131.0	81.6
Étain (Sn)	77.4	4.00	166.0	82.5
Fer (Fe)	1070.0	33.0	82.0	395.0
Lithium (Li)	8.00	33.0	32.0	24.3
Magnésium (Mg)	216.0	34.0	36.0	95.3
Manganèse (Mn)	16.5	15.7	4.30	12.2
Molybdène (Mo)	4.80	< 0.60	8.90	4.77
Nickel (Ni)	8.10	0.40	2.00	3.50
Phosphore (P)				
Plomb (Pb)	127.0	36.0	444.0	202.3
Potassium (K)	10100.0	1170.0	10200.0	7156.7
Sélénium (Se)	< 0.50	< 0.50	0.50	0.50
Silicium (Si)	717.0	148.0	397.0	420.7
Sodium (Na)	7900.0	851.0	6890.0	5213.7
Strontium (Sr)	5.00	0.40	0.40	1.93
Tellurium (Te)				
Thallium (Tl)	< 0.10	< 0.10	< 0.10	< 0.10
Titane (Ti)	52.0	4.00	6.00	20.7
Uranium (U)				
Vanadium (V)	0.80	< 0.20	0.40	0.47
Zinc (Zn)	509.0	54.0	1070.0	544.3
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**23697.2**	**2762.4**	**20103.4**	**15521.0**
MÉTAUX TOTAUX	**23697.8**	**2764.6**	**20103.6**	**15522.0**
Proportion de métaux versus particules (%	**27.8**	**2.7**	**39.2**	**23.2**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX GAZEUX (µg)				
Aluminium (Al)	12.00	10.00	14.0	12.00
Antimoine (Sb)	< 0.30	< 0.30	< 0.30	< 0.30
Argent (Ag)	< 2.00	< 2.00	< 2.00	< 2.00
Arsenic (As)	< 0.30	< 0.30	< 0.30	< 0.30
Baryum (Ba)	0.45	0.55	0.20	0.40
Béryllium (Be)	< 0.20	< 0.20	< 0.20	< 0.20
Bismuth (Bi)	< 0.20	< 0.20	< 0.20	< 0.20
Bore (B)	22.5	10.40	99.3	44.1
Cadmium (Cd)	1.40	0.5	0.3	0.73
Calcium (Ca)	144.0	92.0	154.0	130.0
Chrome (Cr)	< 0.30	< 0.30	< 0.30	< 0.30
Cobalt (Co)	< 0.30	< 0.30	< 0.30	< 0.30
Cuivre (Cu)	2.60	1.10	2.30	2.00
Étain (Sn)	24.0	22.00	23.0	23.00
Fer (Fe)	21.00	521.0	54.0	198.7
Lithium (Li)	< 3.00	< 3.00	< 3.00	< 3.00
Magnésium (Mg)	101.0	13.00	39.0	51.0
Manganèse (Mn)	51.2	7.50	1.50	20.1
Molybdène (Mo)	< 2.00	< 2.00	< 2.00	< 2.00
Nickel (Ni)	0.60	0.40	0.30	0.43
Phosphore (P)				
Plomb (Pb)	< 2.00	< 2.00	< 2.00	< 2.00
Potassium (K)	34.0	< 30.0	< 30.0	< 31.3
Sélénium (Se)	0.90	0.30	0.50	0.57
Silicium (Si)	58.0	32.0	196.0	95.3
Sodium (Na)	< 20.0	< 20.0	< 20.0	< 20.0
Strontium (Sr)	< 0.30	< 0.30	< 0.30	< 0.30
Tellurium (Te)				
Thallium (Tl)	< 0.30	< 0.30	< 0.30	< 0.30
Titane (Ti)	< 3.00	< 3.00	< 3.00	< 3.00
Uranium (U)				
Vanadium (V)	< 0.70	< 0.60	< 0.70	< 0.67
Zinc (Zn)	9.70	2.60	5.10	5.80
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**483**	**745**	**622**	**617**
MÉTAUX TOTAUX	**518**	**778**	**654**	**650**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (µg)				
Aluminium (Al)	582.0	40.0	60.0	227.3
Antimoine (Sb)	245.3	3.90	219.3	156.2
Argent (Ag)	2.90	< 2.60	3.30	2.93
Arsenic (As)	17.5	1.60	31.2	16.8
Baryum (Ba)	7.73	1.20	1.26	3.40
Béryllium (Be)	< 0.250	< 0.260	< 0.250	< 0.253
Bismuth (Bi)	1.04	0.32	5.03	2.13
Bore (B)	27	14	103	48
Cadmium (Cd)	3.87	0.95	9.82	4.88
Calcium (Ca)	2074.0	401.0	397.0	957.3
Chrome (Cr)	18.50	5	73.7	32.5
Cobalt (Co)	0.80	< 0.40	0.50	0.57
Cuivre (Cu)	91.7	25.8	133.3	83.6
Étain (Sn)	101.4	26.00	189.0	105.5
Fer (Fe)	1091.0	554.0	136.0	593.7
Lithium (Li)	11.00	36.0	35.0	27.3
Magnésium (Mg)	317.0	47.0	75.0	146.3
Manganèse (Mn)	67.7	23.2	5.80	32.2
Molybdène (Mo)	6.80	< 2.60	10.90	6.77
Nickel (Ni)	8.70	0.80	2.30	3.93
Phosphore (P)				
Plomb (Pb)	129.0	38.0	446.0	204.3
Potassium (K)	10134.0	1200.0	10230.0	7188.0
Sélénium (Se)	1.40	0.80	1.00	1.07
Silicium (Si)	775.0	180.0	593.0	516.0
Sodium (Na)	7920.0	871.0	6910.0	5233.7
Strontium (Sr)	5.30	0.70	0.70	2.23
Tellurium (Te)				
Thallium (Tl)	< 0.40	< 0.40	< 0.40	< 0.40
Titane (Ti)	55.0	7.00	9.00	23.7
Uranium (U)				
Vanadium (V)	1.50	< 0.80	1.10	1.13
Zinc (Zn)	518.7	56.6	1075.1	550.1
Mercure (Hg)	0.89	0.36	0.05	0
MÉTAUX DÉTECTÉS	**24 216**	**3 536**	**20 757**	**16 170**
MÉTAUX TOTAUX	**24 217**	**3 543**	**20 758**	**16 173**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX PARTICULAIRE (µg/m^{3}R)				
Aluminium (Al)	207	11	12	76
Antimoine (Sb)	89	1.3	58	49
Argent (Ag)	0.33	< 0.21	0.35	0.29
Arsenic (As)	6.2	0.46	8.2	5.0
Baryum (Ba)	2.6	0.23	0.28	1.0
Béryllium (Be)	< 0.018	< 0.021	< 0.013	< 0.018
Bismuth (Bi)	0.30	0.042	1.3	0.54
Bore (B)	1.5	1.4	0.98	1.3
Cadmium (Cd)	0.90	0.16	2.5	1.2
Calcium (Ca)	699	109	65	291
Chrome (Cr)	6.6	1.8	19	9.3
Cobalt (Co)	0.18	< 0.035	0.053	0.090
Cuivre (Cu)	32	8.7	35	25
Étain (Sn)	28	1.4	44	25
Fer (Fe)	388	12	22	140
Lithium (Li)	2.9	12	8.5	7.7
Magnésium (Mg)	78	12	9.6	33
Manganèse (Mn)	6.0	5.5	1.1	4.2
Molybdène (Mo)	1.7	< 0.21	2.4	1.4
Nickel (Ni)	2.9	0.14	0.53	1.2
Phosphore (P)				
Plomb (Pb)	46	13	118	59
Potassium (K)	3660	413	2708	2260
Sélénium (Se)	< 0.18	< 0.18	0.13	0.16
Silicium (Si)	260	52	105	139
Sodium (Na)	2863	300	1829	1664
Strontium (Sr)	1.8	0.14	0.11	0.69
Tellurium (Te)				
Thallium (Tl)	< 0.036	< 0.035	< 0.027	< 0.033
Titane (Ti)	19	1.4	1.6	7.3
Uranium (U)				
Vanadium (V)	0.29	< 0.071	0.11	0.16
Zinc (Zn)	184	19	284	163
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**8588**	**975**	**5337**	**4967**
MÉTAUX TOTAUX	**8588**	**976**	**5337**	**4967**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX GAZEUX (µg/m^{3}R)				
Aluminium (Al)	4.3	3.5	3.7	3.9
Antimoine (Sb)	< 0.11	< 0.11	< 0.080	< 0.098
Argent (Ag)	< 0.72	< 0.71	< 0.53	< 0.65
Arsenic (As)	< 0.11	< 0.11	< 0.080	< 0.098
Baryum (Ba)	0.16	0.19	0.053	0.14
Béryllium (Be)	< 0.072	< 0.071	< 0.053	< 0.065
Bismuth (Bi)	< 0.072	< 0.071	< 0.053	< 0.065
Bore (B)	8.2	3.7	26	13
Cadmium (Cd)	0.51	0.18	0.080	0.25
Calcium (Ca)	52	32	41	42
Chrome (Cr)	< 0.11	< 0.11	< 0.080	< 0.098
Cobalt (Co)	< 0.11	< 0.11	< 0.080	< 0.098
Cuivre (Cu)	0.94	0.39	0.61	0.65
Étain (Sn)	8.7	7.8	6.1	7.5
Fer (Fe)	7.6	184	14	69
Lithium (Li)	< 1.1	< 1.1	< 0.80	< 0.98
Magnésium (Mg)	37	4.6	10	17
Manganèse (Mn)	19	2.6	0.40	7.2
Molybdène (Mo)	< 0.72	< 0.71	< 0.53	< 0.65
Nickel (Ni)	0.22	0.14	0.080	0.15
Phosphore (P)				
Plomb (Pb)	< 0.72	< 0.71	< 0.53	< 0.65
Potassium (K)	12	< 11	< 8.0	< 10
Sélénium (Se)	0.33	0.11	0.13	0.19
Silicium (Si)	21	11	52	28
Sodium (Na)	< 7.2	< 7.1	< 5.3	< 6.5
Strontium (Sr)	< 0.11	< 0.11	< 0.080	< 0.098
Tellurium (Te)				
Thallium (Tl)	< 0.11	< 0.11	< 0.080	< 0.098
Titane (Ti)	< 1.1	< 1.1	< 0.80	< 0.98
Uranium (U)				
Vanadium (V)	< 0.25	< 0.21	< 0.19	< 0.22
Zinc (Zn)	3.5	0.92	1.4	1.9
Mercure (Hg)				
MÉTAUX DÉTECTÉS	**175**	**263**	**165**	**201**
MÉTAUX TOTAUX	**188**	**275**	**174**	**212**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (µg/m^{3}R)				
Aluminium (Al)	211	14	16	80
Antimoine (Sb)	89	1.4	58	49
Argent (Ag)	1.1	< 0.92	0.88	0.95
Arsenic (As)	6.3	0.56	8.3	5.1
Baryum (Ba)	2.8	0.42	0.33	1.2
Béryllium (Be)	< 0.091	< 0.092	< 0.066	< 0.083
Bismuth (Bi)	0.38	0.11	1.3	0.61
Bore (B)	9.6	5.1	27	14
Cadmium (Cd)	1.4	0.34	2.6	1.4
Calcium (Ca)	752	142	105	333
Chrome (Cr)	6.7	1.9	20	9.4
Cobalt (Co)	0.29	< 0.14	0.13	0.19
Cuivre (Cu)	33	9.1	35	26
Étain (Sn)	37	9.2	50	32
Fer (Fe)	395	196	36	209
Lithium (Li)	4.0	13	9.3	8.7
Magnésium (Mg)	115	17	20	50
Manganèse (Mn)	25	8.2	1.5	11
Molybdène (Mo)	2.5	< 0.92	2.9	2.1
Nickel (Ni)	3.2	0.28	0.61	1.3
Phosphore (P)				
Plomb (Pb)	47	13	118	60
Potassium (K)	3673	424	2716	2271
Sélénium (Se)	0.51	0.28	0.27	0.35
Silicium (Si)	281	64	157	167
Sodium (Na)	2870	307	1834	1671
Strontium (Sr)	1.9	0.25	0.19	0.78
Tellurium (Te)				
Thallium (Tl)	< 0.14	< 0.14	< 0.11	< 0.13
Titane (Ti)	20	2.5	2.4	8.3
Uranium (U)				
Vanadium (V)	0.54	< 0.28	0.29	0.37
Zinc (Zn)	188	20	285	164
Mercure (Hg)	0.32	0.13	0.013	0.15
MÉTAUX DÉTECTÉS	**8776**	**1248**	**5511**	**5178**
MÉTAUX TOTAUX	**8777**	**1251**	**5511**	**5179**

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HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (ug/m^{3}R) À 11 % DE O_2				
Aluminium (Al)	307	24	21	118
Antimoine (Sb)	129	2.3	78	70
Argent (Ag)	1.5	< 1.6	1.2	1.4
Arsenic (As)	9.2	0.96	11	7.1
Baryum (Ba)	4.1	0.72	0.45	1.7
Béryllium (Be)	< 0.13	< 0.16	< 0.089	< 0.13
Bismuth (Bi)	0.55	0.19	1.8	0.85
Bore (B)	14	8.6	37	20
Cadmium (Cd)	2.0	0.57	3.5	2.0
Calcium (Ca)	1095	239	142	492
Chrome (Cr)	9.8	3.2	26	13
Cobalt (Co)	0.42	< 0.24	0.18	0.28
Cuivre (Cu)	48	15	48	37
Étain (Sn)	54	16	68	46
Fer (Fe)	576	331	49	318
Lithium (Li)	5.8	21	13	13
Magnésium (Mg)	167	28	27	74
Manganèse (Mn)	36	14	2.1	17
Molybdène (Mo)	3.6	< 1.6	3.9	3.0
Nickel (Ni)	4.6	0.48	0.82	2.0
Phosphore (P)				
Plomb (Pb)	68	23	160	83
Potassium (K)	5348	716	3662	3242
Sélénium (Se)	0.74	0.48	0.36	0.52
Silicium (Si)	409	107	212	243
Sodium (Na)	4180	520	2473	2391
Strontium (Sr)	2.8	0.42	0.25	1.2
Tellurium (Te)				
Thallium (Tl)	< 0.21	< 0.24	< 0.14	< 0.20
Titane (Ti)	29	4.2	3.2	12
Uranium (U)				
Vanadium (V)	0.79	< 0.48	0.39	0.55
Zinc (Zn)	274	34	385	231
Mercure (Hg)	0.47	0.21	0.018	0.23
MÉTAUX DÉTECTÉS	**12780**	**2111**	**7430**	**7440**
MÉTAUX TOTAUX	**12780**	**2115**	**7430**	**7442**
CLASSE I (Cu, Pb, V & Zn)	**391**	**72**	**593**	**352**
LIGNE DIRECTRICE DU CCME		**1500**		
CLASSE II (As, Cr & Ni)	**24**	**4.7**	**38**	**22**
LIGNE DIRECTRICE DU CCME		**500**		
CLASSE III (Cd, Hg & Tl)	**2.5**	**0.78**	**3.5**	**2.3**
LIGNE DIRECTRICE DU CCME		**150**		
AUTRES MÉTAUX (Al, Ag, Ba, Be, B, Sn, Fe,	**12363**	**2033**	**6795**	**7064**

AEM Meliadine
18-5528
Incinérateur
ME

HORAIRE DES ESSAIS				
ESSAI NUMÉRO	MEL-ME-1	MEL-ME-2	MEL-ME-3	MOYENNE
DATE DE L'ESSAI	2018-09-22	2018-09-28	2018-09-29	(1 à 3)
DÉBUT DE L'ESSAI	14:45	11:33	16:14	
FIN DE L'ESSAI	16:45	14:23	19:14	
DUREE DE L'ESSAI (minutes)	120	170	180	
NOMBRE DE POINTS	24	34	36	
MÉTAUX TOTAUX (g/h)				
Aluminium (Al)	1.4	0.078	0.11	0.52
Antimoine (Sb)	0.58	0.0076	0.40	0.33
Argent (Ag)	0.0068	< 0.0051	0.0060	0.0060
Arsenic (As)	0.041	0.0031	0.057	0.034
Baryum (Ba)	0.018	0.0023	0.0023	0.0076
Béryllium (Be)	< 0.00059	< 0.00051	< 0.00045	< 0.00052
Bismuth (Bi)	0.0024	0.00062	0.0091	0.0041
Bore (B)	0.063	0.028	0.19	0.093
Cadmium (Cd)	0.0091	0.0018	0.018	0.0096
Calcium (Ca)	4.9	0.78	0.72	2.1
Chrome (Cr)	0.044	0.010	0.13	0.063
Cobalt (Co)	0.0019	< 0.00078	0.00091	0.0012
Cuivre (Cu)	0.22	0.050	0.24	0.17
Étain (Sn)	0.24	0.051	0.34	0.21
Fer (Fe)	2.6	1.1	0.25	1.3
Lithium (Li)	0.026	0.070	0.064	0.053
Magnésium (Mg)	0.75	0.091	0.14	0.32
Manganèse (Mn)	0.16	0.045	0.011	0.072
Molybdène (Mo)	0.016	< 0.0051	0.020	0.014
Nickel (Ni)	0.020	0.0016	0.0042	0.0087
Phosphore (P)				
Plomb (Pb)	0.30	0.074	0.81	0.40
Potassium (K)	24	2.3	19	15
Sélénium (Se)	0.0033	0.0016	0.0018	0.0022
Silicium (Si)	1.8	0.35	1.1	1.1
Sodium (Na)	19	1.7	13	11
Strontium (Sr)	0.012	0.0014	0.0013	0.0050
Tellurium (Te)				
Thallium (Tl)	< 0.00094	< 0.00078	< 0.00073	< 0.00082
Titane (Ti)	0.13	0.014	0.016	0.053
Uranium (U)				
Vanadium (V)	0.0035	< 0.0016	0.0020	0.0024
Zinc (Zn)	1.2	0.11	2.0	1.1
Mercure (Hg)	0.0021	0.00070	0.000091	0.00096
MÉTAUX DÉTECTÉS	**57**	**6.9**	**38**	**34**
MÉTAUX TOTAUX	**57**	**6.9**	**38**	**34**

R : Conditions de référence à 101.3 kPa et 25 °C, sur base sèche.

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-1

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
14 h 45	1	1	5	0.15	1.75	1300	79	79	79	534.62	538.31	**3.69**	11.1	98	14.1	5.2	3	-2.0	250	260	40	-	-	-
		1	5	0.15	1.76	1300	82	82	82	538.31	541.93	**3.62**	11.1	96				-2.0	250	260	40	-	-	-
		2	5	0.15	1.77	1300	83	83	83	541.93	545.49	**3.56**	11.1	94				-2.0	250	260	40	-	-	-
		2	5	0.14	1.65	1300	84	84	84	545.49	549.01	**3.52**	10.8	96				-2.0	250	260	40	-	-	-
		3	5	0.18	2.07	1348	84	84	84	549.01	553.11	**4.10**	12.4	100				-2.0	250	260	40	-	-	-
		3	5	0.18	2.07	1349	85	85	85	553.11	557.22	**4.11**	12.4	100				-2.0	250	260	40	-	-	-
		4	5	0.18	2.07	1354	86	86	86	557.22	561.31	**4.09**	12.4	100				-2.0	250	260	40	-	-	-
		4	5	0.18	2.08	1346	88	88	88	561.31	565.42	**4.11**	12.4	100				-2.0	250	260	40	-	-	-
		5	5	0.18	2.08	1348	88	88	88	565.42	569.51	**4.09**	12.4	99				-2.0	250	260	40	-	-	-
		5	5	0.18	2.08	1350	89	89	89	569.51	573.61	**4.10**	12.4	99				-2.0	250	260	40	-	-	-
		6	5	0.18	2.07	1361	89	89	89	573.61	577.68	**4.07**	12.4	99				-2.0	250	260	40	-	-	-
		6	5	0.18	2.07	1362	89	89	89	577.68	581.77	**4.09**	12.4	99				-2.0	250	260	40	-	-	-
	2	6	5	0.19	2.19	1364	92	92	92	581.77	586.08	**4.31**	12.8	102				-2.0	250	260	40	-	-	-
		6	5	0.19	2.21	1352	92	92	92	586.08	590.50	**4.42**	12.7	104				-2.0	250	260	40	-	-	-
		5	5	0.19	2.21	1356	94	94	94	590.50	595.00	**4.50**	12.7	105				-2.0	250	260	40	-	-	-
		5	5	0.19	2.22	1348	94	94	94	595.00	599.50	**4.50**	12.7	105				-2.0	250	260	40	-	-	-
		4	5	0.19	2.22	1352	95	95	95	599.50	604.03	**4.53**	12.7	106				-2.0	250	260	40	-	-	-
		4	5	0.19	2.22	1352	96	96	96	604.03	608.50	**4.47**	12.7	104				-2.0	250	260	40	-	-	-
		3	5	0.18	2.11	1355	97	97	97	608.50	613.00	**4.50**	12.4	108				-2.0	250	260	40	-	-	-
		3	5	0.18	2.11	1355	97	97	97	613.00	617.49	**4.49**	12.4	107				-2.0	250	260	40	-	-	-
		2	5	0.15	1.78	1337	98	98	98	617.49	621.69	**4.20**	11.2	109				-2.0	250	260	67	-	-	-
		2	5	0.15	1.82	1295	98	98	98	621.69	625.82	**4.13**	11.1	106				-2.0	250	260	67	-	-	-
		1	5	0.13	1.54	1337	99	99	99	625.82	629.70	**3.88**	10.5	108				-2.0	250	260	67	-	-	-
		1	5	0.13	1.54	1345	99	99	99	629.70	633.54	**3.84**	10.5	107				-2.0	250	260	67	-	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-2

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O)		Températures (°F)			Orifice	Volume de gaz (pi³)			Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F)					
				ΔP	ΔH	Cheminé	Compteu Entrée	Compteu Sortie		Début	Fin	Total							Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
11 h 33	1	1	5	0.15	1.31	1290	71	71	71	636.82	640.06	3.24	11.2	99	15.1	4.4	3	-7.0	247	250	67	-	-	-
		1	5	0.15	1.28	1341	72	72	72	640.06	643.25	3.19	11.3	99				-7.5	247	256	67	-	-	-
		1	5	0.15	1.27	1349	73	73	73	643.25	646.52	3.27	11.4	101				-8.5	250	252	67	-	-	-
		2	5	0.14	1.19	1352	74	74	74	646.52	649.71	3.19	11.0	102				-8.0	247	255	67	-	-	-
		2	5	0.14	1.19	1354	76	76	76	649.71	652.87	3.16	11.0	101				-7.5	251	252	67	-	-	-
		2	5	0.14	1.20	1354	78	78	78	652.87	656.06	3.19	11.0	102				-7.5	247	253	67	-	-	-
		3	5	0.13	1.12	1344	80	80	80	656.06	659.14	3.08	10.6	101				-7.0	247	252	67	-	-	-
		3	5	0.13	1.13	1340	82	82	82	659.14	662.29	3.15	10.5	103				-7.0	248	249	67	-	-	-
		3	5	0.13	1.13	1348	83	83	83	662.29	665.39	3.10	10.6	101				-9.0	248	250	67	-	-	-
		4	5	0.13	1.13	1347	85	85	85	665.39	668.50	3.11	10.6	101				-9.0	246	250	67	-	-	-
		4	5	0.13	1.13	1345	86	86	86	668.50	671.62	3.12	10.6	101				-6.5	252	253	67	-	-	-
		4	5	0.13	1.14	1348	88	88	88	671.62	674.77	3.15	10.6	102				-6.5	252	253	67	-	-	-
		5	5	0.13	1.15	1334	89	89	89	674.77	677.84	3.07	10.5	99				-9.0	246	249	67	-	-	-
		5	5	0.13	1.15	1330	91	91	91	677.84	680.96	3.12	10.5	100				-9.0	243	249	67	-	-	-
		5	5	0.13	1.15	1337	92	92	92	680.96	684.09	3.13	10.5	100				-9.0	252	252	67	-	-	-
		6	5	0.12	1.07	1334	93	93	93	684.09	687.13	3.04	10.1	101				-9.0	251	255	67	-	-	-
		6	5	0.12	1.07	1335	94	94	94	687.13	690.18	3.05	10.1	101				-9.0	249	251	67	-	-	-
		6	5	0.12	1.07	1340	95	95	95	690.18	693.21	3.03	10.1	101				-9.0	246	255	67	-	-	-
	2	6	5	0.12	1.07	1338	96	96	96	693.21	696.26	3.05	10.1	101				-9.0	248	259	67	-	-	-
		6	5	0.12	1.07	1338	97	97	97	696.26	699.31	3.05	10.1	101				-9.0	246	246	67	-	-	-
		6	5	0.12	1.08	1328	97	97	97	699.31	702.37	3.06	10.1	101				-9.0	251	250	67	-	-	-
		5	5	0.12	1.07	1344	98	98	98	702.37	705.44	3.07	10.1	101				-9.0	251	261	67	-	-	-
		5	5	0.12	1.07	1344	98	98	98	705.44	708.51	3.07	10.1	101				-9.0	249	252	67	-	-	-
		5	5	0.12	1.07	1345	99	99	99	708.51	711.60	3.09	10.1	102				-9.0	249	252	67	-	-	-
		4	5	0.12	1.07	1342	99	99	99	711.60	714.66	3.06	10.1	101				-9.0	249	252	67	-	-	-
		4	5	0.10	0.90	1329	100	100	100	714.66	717.50	2.84	9.2	102				-9.0	249	252	67	-	-	-
		4	5	0.10	0.91	1326	101	101	101	717.50	720.31	2.81	9.2	101				-9.0	249	252	67	-	-	-
		3	5	0.10	0.91	1326	101	101	101	720.31	723.10	2.79	9.2	100				-9.0	249	252	67	-	-	-
		3	5	0.10	0.90	1330	102	102	102	723.10	725.88	2.78	9.2	99				-9.0	249	252	67	-	-	-
		3	5	0.10	0.90	1330	102	102	102	725.88	728.68	2.80	9.2	100				-9.0	249	252	67	-	-	-
		2	5	0.10	0.91	1326	103	103	103	728.68	731.49	2.81	9.2	100				-9.0	249	252	67	-	-	-
		2	5	0.10	0.92	1316	104	104	104	731.49	734.29	2.80	9.2	99				-9.0	249	252	67	-	-	-
		2	5	0.10	0.91	1317	104	104	104	734.29	737.13	2.84	9.2	101				-9.0	249	252	67	-	-	-
		1	5	0.10	0.92	1311	105	105	105	737.13	740.00	2.87	9.2	102				-9.0	249	252	67	-	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - ME - ESSAI# MEL-ME-3

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
16:14	1	1	5	0.20	1.74	1327	78	78	78	747.13	750.85	3.72	13.0	99	13.6	5.6	3	-3.0	250	250	40	-	-	-
		1	5	0.20	1.72	1347	79	79	79	750.85	754.60	3.75	13.1	101				-3.0	250	250	40	-	-	-
		1	5	0.20	1.72	1350	80	80	80	754.60	758.43	3.83	13.1	103				-3.0	250	250	40	-	-	-
		2	5	0.20	1.71	1360	81	81	81	758.43	762.18	3.75	13.1	101				-3.0	250	250	40	-	-	-
		2	5	0.20	1.70	1374	81	81	81	762.18	765.96	3.78	13.2	102				-3.0	250	250	40	-	-	-
		2	5	0.20	1.70	1378	82	82	82	765.96	769.75	3.79	13.2	102				-3.0	250	250	40	-	-	-
		3	5	0.22	1.87	1380	83	83	83	769.75	773.68	3.93	13.8	101				-3.0	250	250	40	-	-	-
		3	5	0.23	1.95	1393	84	84	84	773.68	777.76	4.08	14.2	103				-3.0	250	250	40	-	-	-
		3	5	0.23	1.94	1401	85	85	85	777.76	781.76	4.00	14.2	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.93	1410	85	85	85	781.76	785.75	3.99	14.3	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.92	1420	86	86	86	785.75	789.77	4.02	14.3	101				-3.0	250	250	40	-	-	-
		4	5	0.23	1.93	1423	87	87	87	789.77	793.77	4.00	14.3	101				-3.0	250	250	40	-	-	-
		5	5	0.23	1.92	1431	88	88	88	793.77	797.79	4.02	14.3	101				-3.0	250	250	40	-	-	-
		5	5	0.20	1.68	1418	89	89	89	797.79	801.59	3.80	13.3	102				-3.0	250	250	40	-	-	-
		5	5	0.20	1.68	1430	90	90	90	801.59	805.38	3.79	13.4	102				-3.0	250	250	40	-	-	-
		6	5	0.20	1.69	1418	90	90	90	805.38	809.19	3.81	13.3	102				-3.0	250	250	40	-	-	-
		6	5	0.20	1.67	1440	90	90	90	809.19	813.00	3.81	13.4	103				-3.0	250	250	40	-	-	-
		6	5	0.20	1.67	1445	91	91	91	813.00	816.78	3.78	13.4	102				-4.0	250	250	40	-	-	-
	2	6	5	0.20	1.66	1451	91	91	91	816.78	820.57	3.79	13.4	102				-4.0	250	250	40	-	-	-
		6	5	0.20	1.66	1460	92	92	92	820.57	824.36	3.79	13.5	102				-4.0	250	250	40	-	-	-
		6	5	0.20	1.65	1467	93	93	93	824.36	828.17	3.81	13.5	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1476	94	94	94	828.17	831.88	3.71	13.2	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1479	95	95	95	831.88	835.60	3.72	13.2	103				-4.0	250	250	40	-	-	-
		5	5	0.19	1.57	1481	96	96	96	835.60	839.27	3.67	13.2	101				-4.0	250	250	40	-	-	-
		5	5	0.19	1.55	1502	97	97	97	839.27	842.94	3.67	13.3	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1518	99	99	99	842.94	846.82	3.88	14.0	103				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1518	99	99	99	846.82	850.70	3.88	14.0	103				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1520	100	100	100	850.70	854.57	3.87	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.72	1518	101	101	101	854.57	858.43	3.86	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.21	1.71	1525	102	102	102	858.43	862.27	3.84	14.0	101				-4.0	250	250	40	-	-	-
		5	5	0.21	1.72	1522	103	103	103	862.27	866.14	3.87	14.0	102				-4.0	250	250	40	-	-	-
		5	5	0.17	1.39	1522	104	104	104	866.14	869.62	3.48	12.6	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.44	1460	105	105	105	869.62	873.16	3.54	12.4	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.46	1436	106	106	106	873.16	876.67	3.51	12.3	100				-4.0	250	250	40	-	-	-
		5	5	0.17	1.47	1429	106	106	106	876.67	880.25	3.58	12.3	101				-4.0	250	250	40	-	-	-
		5	5	0.17	1.48	1421	107	107	107	880.25	883.85	3.60	12.3	102				-4.0	250	250	40	-	-	-

AEM Meliadine
18-5528
Incinérateur
COSV

HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DONNÉES DES ÉQUIPEMENTS D'ÉCHANTILLONNAGE									
PRESSION BAROMÉTRIQUE ("Hg)		30.10		29.73		29.83			29.89
PRESSION STATIQUE ("H2O)		-0.08		-0.05		-0.05			-0.06
PRESSION STATIQUE (kPa)		-0.02		-0.01		-0.01			-0.01
COEFFICIENT DU COMPTEUR (19)		0.997		0.997		0.997			0.997
COEFFICIENT DU PITOT (03-06 3Q-371,03-06 3Q-503)		0.778		0.781		0.781			0.780
DIAMÈTRE DE LA BUSE (po) (3Q-371,3Q-503)		0.3741		0.4958		0.4958			0.4552
TEMPÉRATURE COMPTEUR (°F)		60		60		60			60
TEMPÉRATURE COMPTEUR (°C)		16		16		16			16
HUMIDITÉ DES GAZ & VOLUME ÉCHANTILLONNÉ									
MASSE D'EAU (g)		174.8		134.8		259.1			189.6
VOLUME D'EAU (pi^3)		8.39		6.47		12.44			9.10
HUMIDITÉ GAZ (BWO)		0.066		0.051		0.066			0.061
HUMIDITÉ GAZ (% v/v)		6.6		5.1		6.6			6.1
VOLUME GAZ REFERENCE (pi^3R)		119.19		119.67		176.29			138.38
VOLUME GAZ REFERENCE (m^3R)		**3.375**		**3.389**		**4.992**			**3.919**
CARACTERISTIQUES DU CONDUIT									
DIAMÈTRES AVANT LES TROUS D'ÉCHANTILLONNAG		5.0		5.0		5.00			5.0
DIAMÈTRES APRÈS LES TROUS D'ÉCHANTILLONNAG		2.0		2.0		2.00			2.0
DIAMÈTRE DU CONDUIT (pi)		2.71		2.71		2.71			2.71
DIAMÈTRE DU CONDUIT (m)		0.826		0.826		0.826			0.83
ÉPAISSEUR DU PORT D'ÉCHANTILLONNAGE (po)		7.5		7.5		7.5			
LONGUEUR DU CONDUIT (pi)		0.0		0.0		0.0			
LARGEUR DU CONDUIT (pi)		0.0		0.0		0.0			
PRESSION CONDUIT ("Hg)		30.09		29.73		29.83			29.88
PRESSION COMPTEUR ("Hg)		30.13		29.81		29.95			29.96
SURFACE DU CONDUIT (pi^2)		5.8		5.8		5.8			5.8
SURFACE DU CONDUIT (m^2)		0.54		0.54		0.54			0.54
CARACTERISTIQUES DES GAZ									
TEMPÉRATURE CHEMINÉE (°F)		1339		1333		1435			1369
TEMPÉRATURE CHEMINÉE (°C)		726.0		722.8		779.5			742.7
CO_2 (%vs)		5.2		4.4		5.6			5.1
O_2 (%vs)		14.1		15.1		13.6			14.3
O_2 (%vh)		13.2		14.3		12.7			13.4
CO (ppmvs)		3		3		3			3
SO_2 (%vs)		0		0		0			
N_2 (%vs)		80.6		80.5		80.8			81
Ar (%vs)		0.00		0.00		0.00			0.0
POIDS MOLECULAIRE SEC		29.40		29.31		29.44			29.39
POIDS MOLECULAIRE HUMIDE		28.65		28.73		28.69			28.69
VITESSE DES GAZ (pi/s)		38.3		34.8		45.6			39.6
VITESSE DES GAZ (m/s)		11.7		10.6		13.9			12.1
DEBIT GAZ ACTUELS (pi^3/h)		794 892		722 251		946 277			821 140
DEBIT GAZ ACTUELS (m^3/h)		22 509		20 452		26 796			23 252
DEBIT GAZ ACTUELS (pi^3/min)(APCM)		13 248		12 038		15 771			13 686
DEBIT GAZ NORMALISES (pi^3R/h)		222 994		203 892		249 680			225 522
DEBIT GAZ NORMALISES (m^3R/h)		**6 314**		**5 774**		**7 070**			**6 386**
DEBIT GAZ NORMALISES (pi^3R/min) (RPCM)		3 717		3 398		4 161			3 759
INFORMATIONS D'ÉCHANTILLONNAGE									
VITESSE MAXIMALE (m/s)		13.55		11.89		15.22			13.6
VITESSE MINIMALE (m/s)		9.45		9.25		12.42			10.4
10%Vmax (m/s)		1.35		1.19		1.52			1.4
Pourcentage >10%Vmax		75%		100%		100%			92%
NOMBRE POINTS ΔP 20% et + de ΔPmoy		12		5		0			
ISOCINÉTISME MOYEN (%)		101.1		100.9		101.2			101
% PTS RESPECT CRITERE ISO		100%		100%		100%			100%
DEBIT DE POMPAGE MAX (pi^3/min)		≤ 0.54		≤ 0.89		≤ 1.03			0.8
PRESSION DE VIDE MAX DURANT ESSAI (-"Hg)		-2		-6		-5			-4.00
TEMPÉRATURE SONDE MAX (°F)		250		250		254			251.33
TEMPÉRATURE SONDE MIN (°F)		250		235		238			241
TEMPÉRATURE FILTRE MAX (°F)		250		260		262			257
TEMPÉRATURE FILTRE MIN (°F)		250		244		243			246
TEMPÉRATURE SORTIE MAX (°F)		40		68		68			59
TEMPÉRATURE SORTIE MIN (°F)		40		68		66			58
TEMPÉRATURE TRAPPE MAX (°F)		40		58		56			51
TEMPÉRATURE TRAPPE MIN (°F)		40		43		40			41
DEBIT DE POMPAGE MOYEN (pi^3/min)		0.48		0.78		0.95			
4% DEBIT DE POMPAGE MOYEN (pi^3/min)		0.019		0.031		0.038			
TEST DE FUITE AVANT LES ESSAIS À 15 "Hg (pi^3/min)		< 0.020		< 0.020		< 0.020			
TEST DE FUITE APRÈS LES ESSAIS (pi^3/min)		< 0.020		< 0.020		< 0.020			0.020

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES LIMITES DE DETECTION (pg)									
2,3,7,8 - Tetra CDD		1		2		7			3.3
1,2,3,7,8 - Penta CDD		3		9		10			7.3
1,2,3,4,7,8 - Hexa CDD		3		7		10			6.7
1,2,3,6,7,8 - Hexa CDD		3		6		10			6.3
1,2,3,7,8,9 - Hexa CDD		3		7		10			6.7
1,2,3,4,6,7,8 - Hepta CDD		6		10		10			8.7
1,2,3,4,6,7,8,9 - Octa CDD		20		10		20			16.7
2, 3, 7, 8 - Tetra CDF		4		6		9			6.3
1,2,3,7,8 - Penta CDF		8		9		20			12.3
2,3,4,7,8 - Penta CDF		6		7		10			7.7
1,2,3,4,7,8 - Hexa CDF		4		10		10			8.0
1,2,3,6,7,8 - Hexa CDF		4		10		10			8.0
2,3,4,6,7,8 - Hexa CDF		4		10		10			8.0
1,2,3,7,8,9 - Hexa CDF		6		20		20			15.3
1,2,3,4,6,7,8 - Hepta CDF		3		5		20			9.3
1,2,3,4,7,8,9 - Hepta CDF		6		8		20			11.3
1,2,3,4,6,7,8,9 - Octa CDF		9		7		30			15.3
Total Tetra CDD		1		2		7			3.3
Total Penta CDD		3		9		10			7.3
Total Hexa CDD		3		7		10			6.7
Total Hepta CDD		6		10		10			8.7
Sommation des PCDDs		20		10		20			16.7
Total Tetra CDF		4		6		9			6.3
Total Penta CDF		8		9		20			12.3
Total Hexa CDF		6		20		20			15.3
Total Hepta CDF		6		8		20			11.3
Sommation des PCDFs		9		20		30			19.7
DIOXINES ET FURANNES (pg)									
2,3,7,8 - Tetra CDD	**1**	< 1.00	< LD	5.00	5.00	< 7.00	< LD	4.3	4.3
1,2,3,7,8 - Penta CDD	**1**	< 3.00	< LD	47.0	47.0	23.0	23.0	24.3	24.3
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 3.00	< LD	53.0	5.30	28.0	2.80	2.80	28.0
1,2,3,6,7,8 - Hexa CDD	**0.1**	3.0	0.3	71.0	7.10	63.0	6.30	4.57	45.7
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 3.00	< LD	81.0	8.10	65.0	6.50	4.97	49.7
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	17.0	0.17	316.0	3.16	307.0	3.07	2.13	213.3
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	33.0	0.0033	160.0	0.016	300.0	0.030	0.016	164.3
2, 3, 7, 8 - Tetra CDF	**0.1**	15.0	1.50	48.0	4.80	216.0	21.6	9.30	93.0
1,2,3,7,8 - Penta CDF	**0.05**	< 8.00	< LD	21.0	1.05	62.0	3.10	1.52	30.3
2,3,4,7,8 - Penta CDF	**0.5**	9.00	4.50	43.0	21.5	165.0	82.5	36.2	72.3
1,2,3,4,7,8 - Hexa CDF	**0.1**	13.0	1.30	62.0	6.20	326.0	32.6	13.4	133.7
1,2,3,6,7,8 - Hexa CDF	**0.1**	9.00	0.90	25.0	2.50	120.0	12.0	5.13	51.3
2,3,4,6,7,8 - Hexa CDF	**0.1**	8.00	0.80	50.0	5.00	273.0	27.3	11.0	110.3
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 6.00	< LD	< 20.0	< LD	30.0	3.00	1.9	18.7
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	16.0	0.16	64.0	0.64	474.0	4.74	1.85	184.7
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 6.00	< LD	8.0	0.08	100.0	1.00	0.38	38.0
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	20.0	0.0020	17.0	0.0017	227.0	0.023	0.0088	88.0
Total Tetra CDD	**MDDEFP**	9.00		159.0		214.0			127.3
Total Penta CDD		11.0		446.0		406.0			287.7
Total Hexa CDD		25.0		900.0		718.0			547.7
Total Hepta CDD		20.0		334.0		315.0			223.0
Sommation des PCDDs		99.0		2000.0		1950.0			1349.7
Total Tetra CDF		100.0		282.0		1140.0			507.3
Total Penta CDF		72.0		406.0		1540.0			672.7
Total Hexa CDF		32.0		172.0		963.0			389.0
Total Hepta CDF		28.0		123.0		880.0			343.7
Sommation des PCDFs		253.0		1000.0		4750.0			2001.0
ÉQUIVALENCE TOXIQUE TOTALE			**9.64**		**117.4**		**229.6**	**118.9**	
CONGÉNÈRES TOXIQUES TOTAUX		**173.0**		**1091.0**		**2786.0**			**1350.0**
GROUPES HOMOLOGUES TOTAUX		**649.0**		**5822.0**		**12876.0**			**6449.0**

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES (ng/m³R)									
2,3,7,8 - Tetra CDD	**1**	< 0.00030	< LD	0.0015	0.0015	< 0.0014	< LD	0.0011	0.0011
1,2,3,7,8 - Penta CDD	**1**	< 0.00089	< LD	0.014	0.014	0.0046	0.0046	0.0065	0.0065
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.00089	< LD	0.016	0.0016	0.0056	0.00056	0.00074	0.0074
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.00089	0.000089	0.021	0.0021	0.013	0.0013	0.0011	0.011
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.00089	< LD	0.024	0.0024	0.013	0.0013	0.0013	0.013
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.0050	0.000050	0.093	0.00093	0.061	0.00061	0.00053	0.053
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.0098	0.0000010	0.047	0.0000047	0.060	0.0000060	0.0000039	0.039
2, 3, 7, 8 - Tetra CDF	**0.1**	0.0044	0.00044	0.014	0.0014	0.043	0.0043	0.0021	0.021
1,2,3,7,8 - Penta CDF	**0.05**	< 0.0024	< LD	0.0062	0.00031	0.012	0.00062	0.00035	0.0070
2,3,4,7,8 - Penta CDF	**0.5**	0.0027	0.0013	0.013	0.0063	0.033	0.017	0.0081	0.016
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.0039	0.00039	0.018	0.0018	0.065	0.0065	0.0029	0.029
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.0027	0.00027	0.0074	0.00074	0.024	0.0024	0.0011	0.011
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.0024	0.00024	0.015	0.0015	0.055	0.0055	0.0024	0.024
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.0018	< LD	< 0.0059	< LD	0.0060	0.00060	0.00046	0.0046
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.0047	0.000047	0.019	0.00019	0.095	0.00095	0.00040	0.040
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.0018	< LD	0.0024	0.000024	0.020	0.00020	0.000081	0.0081
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.0059	0.00000059	0.0050	0.00000050	0.045	0.0000045	0.0000019	0.019
Total Tetra CDD	**MDDEFP**	0.0027		0.047		0.043			0.031
Total Penta CDD		0.0033		0.13		0.081			0.072
Total Hexa CDD		0.0074		0.27		0.14			0.14
Total Hepta CDD		0.0059		0.099		0.063			0.056
Sommation des PCDDs		0.029		0.59		0.39			0.34
Total Tetra CDF		0.030		0.083		0.23			0.11
Total Penta CDF		0.021		0.12		0.31			0.15
Total Hexa CDF		0.0095		0.051		0.19			0.084
Total Hepta CDF		0.0083		0.036		0.18			0.074
Sommation des PCDFs		0.075		0.30		0.95			0.44
ÉQUIVALENCE TOXIQUE TOTALE			**0.0029**		**0.035**		**0.046**	**0.028**	
CONGÉNÈRES TOXIQUES TOTAUX		**0.051**		**0.32**		**0.56**			**0.31**
GROUPES HOMOLOGUES TOTAUX		**0.19**		**1.72**		**2.58**			**1.50**
DIOXINES ET FURANNES (ng/m³R) 11 % D'OXYGÈNE									
2,3,7,8 - Tetra CDD	**1**	< 0.00043	< LD	0.0025	0.0025	< 0.0019	< LD	0.0016	0.0016
1,2,3,7,8 - Penta CDD	**1**	< 0.0013	< LD	0.024	0.024	0.0062	0.0062	0.010	0.010
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.0013	< LD	0.027	0.0027	0.0076	0.00076	0.0012	0.012
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.0013	0.00013	0.036	0.0036	0.017	0.0017	0.0018	0.018
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.0013	< LD	0.041	0.0041	0.018	0.0018	0.0020	0.020
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.0074	0.000074	0.16	0.0016	0.083	0.00083	0.00083	0.083
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.014	0.0000014	0.080	0.0000080	0.081	0.0000081	0.0000059	0.059
2, 3, 7, 8 - Tetra CDF	**0.1**	0.0065	0.00065	0.024	0.0024	0.059	0.0059	0.0030	0.030
1,2,3,7,8 - Penta CDF	**0.05**	< 0.0035	< LD	0.011	0.00053	0.017	0.00084	0.00051	0.010
2,3,4,7,8 - Penta CDF	**0.5**	0.0039	0.0020	0.022	0.011	0.045	0.022	0.012	0.023
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.0056	0.00056	0.031	0.0031	0.088	0.0088	0.0042	0.042
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.0039	0.00039	0.013	0.0013	0.033	0.0033	0.0016	0.016
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.0035	0.00035	0.025	0.0025	0.074	0.0074	0.0034	0.034
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.0026	< LD	< 0.010	< LD	0.0081	0.00081	0.00069	0.0069
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.0069	0.000069	0.032	0.00032	0.13	0.0013	0.00056	0.056
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.0026	< LD	0.0040	0.000040	0.027	0.00027	0.00011	0.011
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.0087	0.00000087	0.0085	0.00000085	0.062	0.0000062	0.0000026	0.026
Total Tetra CDD	**MDDEFP**	0.0039		0.080		0.058			0.047
Total Penta CDD		0.0048		0.22		0.11			0.11
Total Hexa CDD		0.011		0.45		0.19			0.22
Total Hepta CDD		0.0087		0.17		0.085			0.087
Sommation des PCDDs		0.043		1.01		0.53			0.53
Total Tetra CDF		0.043		0.14		0.31			0.16
Total Penta CDF		0.031		0.20		0.42			0.22
Total Hexa CDF		0.014		0.086		0.26			0.12
Total Hepta CDF		0.012		0.062		0.24			0.10
Sommation des PCDFs		0.11		0.50		1.29			0.63
ÉQUIVALENCE TOXIQUE TOTALE			**0.0042**		**0.059**		**0.062**	**0.042**	
NORME AU PRMRQA	**0.08**								
CONGÉNÈRES TOXIQUES TOTAUX		**0.075**		**0.55**		**0.76**			**0.46**
GROUPES HOMOLOGUES TOTAUX		**0.28**		**2.93**		**3.49**			**2.23**

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HORAIRE DES ESSAIS									
ESSAI NUMÉRO	FACTEUR	MEL-COSV-1	QUANTITÉ	MEL-COSV-2	QUANTITÉ	MEL-COSV-3	QUANTITÉ	**MOYENNE**	**MOYENNE**
DATE DE L'ESSAI	DE TOXICITÉ	2018-09-22	PRÉLEVÉE,	2018-09-28	PRÉLEVÉE,	2018-09-29	PRÉLEVÉE,	**(1 à 3)**	**(1 à 3)**
DÉBUT DE L'ESSAI		13:44	EN	11:32	EN	16:13	EN	**ÉQUIVALENT**	**AVANT**
FIN DE L'ESSAI		17:44	EQUIVALENT	14:02	EQUIVALENT	19:13	EQUIVALENT	**TOTAUX**	**CORRECTION**
DUREE DE L'ESSAI (minutes)		240		150		180			
NOMBRE DE POINTS		48		30		36			
DIOXINES ET FURANNES (µg/h)									
2,3,7,8 - Tetra CDD	**1**	< 0.0019	< LD	0.0085	0.0085	< 0.0099	< LD	0.0068	0.0068
1,2,3,7,8 - Penta CDD	**1**	< 0.0056	< LD	0.080	0.080	0.033	0.033	0.039	0.039
1,2,3,4,7,8 - Hexa CDD	**0.1**	< 0.0056	< LD	0.090	0.0090	0.040	0.0040	0.0045	0.045
1,2,3,6,7,8 - Hexa CDD	**0.1**	0.0056	0.00056	0.12	0.012	0.089	0.0089	0.0072	0.072
1,2,3,7,8,9 - Hexa CDD	**0.1**	< 0.0056	< LD	0.14	0.014	0.092	0.0092	0.0079	0.079
1,2,3,4,6,7,8 - Hepta CDD	**0.01**	0.032	0.00032	0.54	0.0054	0.43	0.0043	0.0034	0.34
1,2,3,4,6,7,8,9 - Octa CDD	**0.0001**	0.062	0.0000062	0.27	0.000027	0.42	0.000042	0.000025	0.25
2, 3, 7, 8 - Tetra CDF	**0.1**	0.028	0.0028	0.082	0.0082	0.31	0.031	0.014	0.14
1,2,3,7,8 - Penta CDF	**0.05**	< 0.015	< LD	0.036	0.0018	0.088	0.0044	0.0023	0.046
2,3,4,7,8 - Penta CDF	**0.5**	0.017	0.0084	0.073	0.037	0.23	0.12	0.054	0.11
1,2,3,4,7,8 - Hexa CDF	**0.1**	0.024	0.0024	0.11	0.011	0.46	0.046	0.020	0.20
1,2,3,6,7,8 - Hexa CDF	**0.1**	0.017	0.0017	0.043	0.0043	0.17	0.017	0.0076	0.076
2,3,4,6,7,8 - Hexa CDF	**0.1**	0.015	0.0015	0.085	0.0085	0.39	0.039	0.016	0.16
1,2,3,7,8,9 - Hexa CDF	**0.1**	< 0.011	< LD	< 0.034	< LD	0.042	0.0042	0.0029	0.029
1,2,3,4,6,7,8 - Hepta CDF	**0.01**	0.030	0.00030	0.11	0.0011	0.67	0.0067	0.0027	0.27
1,2,3,4,7,8,9 - Hepta CDF	**0.01**	< 0.011	< LD	0.014	0.00014	0.14	0.0014	0.00055	0.055
1,2,3,4,6,7,8,9 - Octa CDF	**0.0001**	0.037	0.0000037	0.029	0.0000029	0.32	0.000032	0.000013	0.13
Total Tetra CDD	**MDDELCC**	0.017		0.27		0.30			0.20
Total Penta CDD		0.021		0.76		0.58			0.45
Total Hexa CDD		0.047		1.5		1.0			0.87
Total Hepta CDD		0.037		0.57		0.45			0.35
Sommation des PCDDs		0.19		3.4		2.8			2.1
Total Tetra CDF		0.19		0.48		1.6			0.76
Total Penta CDF		0.13		0.69		2.2			1.0
Total Hexa CDF		0.060		0.29		1.4			0.57
Total Hepta CDF		0.052		0.21		1.2			0.50
Sommation des PCDFs		0.47		1.7		6.7			3.0
ÉQUIVALENCE TOXIQUE TOTALE			**0.018**		**0.20**		**0.33**	**0.18**	
CONGÉNÈRES TOXIQUES TOTAUX		**0.32**		**1.86**		**3.95**			**2.04**
GROUPES HOMOLOGUES TOTAUX		**1.21**		**9.92**		**18.2**			**9.79**

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-1

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
13 h 44	1	1	5	0.18	0.45	1330	60	60	76	483.04	485.51	2.47	12.4	98	14.1	5.2	3	-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	485.51	488.00	2.49	12.1	102				-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	488.00	490.46	2.46	12.1	101				-1.0	250	250	40	40	-	-
		1	5	0.17	0.43	1345	60	60	77	490.46	492.97	2.51	12.1	103				-1.0	250	250	40	40	-	-
		2	5	0.17	0.43	1352	60	60	78	492.97	495.48	2.51	12.1	103				-1.0	250	250	40	40	-	-
		2	5	0.17	0.43	1356	60	60	79	495.48	497.85	2.37	12.1	97				-1.0	250	250	40	40	-	-
		2	5	0.18	0.45	1354	60	60	80	497.85	500.35	2.50	12.5	100				-1.0	250	250	40	40	-	-
		2	5	0.18	0.45	1353	60	60	80	500.35	502.87	2.52	12.4	100				-1.0	250	250	40	40	-	-
		3	5	0.18	0.45	1361	60	60	82	502.87	505.38	2.51	12.5	100				-1.0	250	250	40	40	-	-
		3	5	0.21	0.53	1366	60	60	82	505.38	508.08	2.70	13.5	100				-1.0	250	250	40	40	-	-
		3	5	0.21	0.52	1381	60	60	84	508.08	510.79	2.71	13.5	101				-1.0	250	250	40	40	-	-
		3	5	0.21	0.52	1377	60	60	83	510.79	513.50	2.71	13.5	101				-1.5	250	250	40	40	-	-
		4	5	0.21	0.52	1379	60	60	84	513.50	516.20	2.70	13.5	100				-1.5	250	250	40	40	-	-
		4	5	0.21	0.52	1380	60	60	85	516.20	518.88	2.68	13.5	100				-1.5	250	250	40	40	-	-
		4	5	0.21	0.53	1373	60	60	85	518.88	521.61	2.73	13.5	101				-1.5	250	250	40	40	-	-
		4	5	0.21	0.53	1373	60	60	85	521.61	524.28	2.67	13.5	99				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1347	60	60	87	524.28	526.84	2.56	12.4	102				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1348	60	60	87	526.84	529.27	2.43	12.4	97				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1350	60	60	88	529.27	531.82	2.55	12.4	101				-1.5	250	250	40	40	-	-
		5	5	0.18	0.46	1354	60	60	88	531.82	534.26	2.44	12.5	97				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1355	60	60	88	534.26	536.79	2.53	12.5	101				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1359	60	60	90	536.79	539.34	2.55	12.5	102				-1.5	250	250	40	40	-	-
		6	5	0.18	0.46	1361	60	60	90	539.34	541.87	2.53	12.5	101				-1.5	250	250	40	40	-	-
		6	5	0.17	0.44	1350	60	60	90	541.87	544.36	2.49	12.1	102				-1.5	250	250	40	40	-	-
	2	6	5	0.15	0.38	1357	60	60	93	544.36	546.67	2.31	11.4	101				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1350	60	60	93	546.67	549.00	2.33	11.7	98				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1355	60	60	94	549.00	551.26	2.26	11.7	96				-1.5	250	250	40	40	-	-
		6	5	0.16	0.41	1352	60	60	96	551.26	553.57	2.31	11.7	98				-1.5	250	250	40	40	-	-
		5	5	0.16	0.42	1348	60	60	97	553.57	555.93	2.36	11.7	100				-1.5	250	250	40	40	-	-
		5	5	0.16	0.41	1350	60	60	97	555.93	558.42	2.49	11.7	105				-1.5	250	250	40	40	-	-
		5	5	0.16	0.42	1345	60	60	97	558.42	560.77	2.35	11.7	99				-1.5	250	250	40	40	-	-
		5	5	0.15	0.39	1340	60	60	98	560.77	563.08	2.31	11.3	100				-1.5	250	250	40	40	-	-
		4	5	0.15	0.39	1332	60	60	99	563.08	565.37	2.29	11.3	99				-1.5	250	250	40	40	-	-
		4	5	0.13	0.35	1280	60	60	100	565.37	567.67	2.30	10.4	106				-1.5	250	250	40	40	-	-
		4	5	0.13	0.35	1300	60	60	100	567.67	569.98	2.31	10.4	107				-1.5	250	250	40	40	-	-
		4	5	0.11	0.29	1306	60	60	101	569.98	572.08	2.10	9.6	106				-1.5	250	250	40	40	-	-
		3	5	0.11	0.29	1304	60	60	101	572.08	574.08	2.00	9.6	100				-0.5	250	250	40	40	-	-
		3	5	0.11	0.30	1280	60	60	102	574.08	576.10	2.02	9.5	101				0.5	250	250	40	40	-	-
		3	5	0.11	0.30	1250	60	60	102	576.10	578.09	1.99	9.5	98				1.5	250	250	40	40	-	-
		3	5	0.11	0.30	1266	60	60	103	578.09	580.17	2.08	9.5	103				2.5	250	250	40	40	-	-
		2	5	0.13	0.35	1318	60	60	103	580.17	582.40	2.23	10.5	103				3.5	250	250	40	40	-	-
		2	5	0.13	0.35	1320	60	60	103	582.40	584.62	2.22	10.5	103				4.5	250	250	40	40	-	-
		2	5	0.13	0.35	1324	60	60	103	584.62	586.87	2.25	10.5	105				5.5	250	250	40	40	-	-
		2	5	0.13	0.35	1310	60	60	102	586.87	589.10	2.23	10.5	103				6.5	250	250	40	40	-	-
		1	5	0.13	0.35	1317	60	60	102	589.10	591.32	2.22	10.5	103				7.5	250	250	40	40	-	-
		1	5	0.13	0.35	1317	60	60	102	591.32	593.56	2.24	10.5	104				8.5	250	250	40	40	-	-
		1	5	0.13	0.35	1318	60	60	102	593.56	595.76	2.20	10.5	102				9.5	250	250	40	40	-	-
		1	5	0.13	0.35	1326	60	60	103	595.76	598.00	2.24	10.5	104				10.5	250	250	40	40	-	-

RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-2

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
11 h 32	1	6	5	0.16	1.28	1275	60	60	72	600.12	604.57	4.45	11.6	102	15.1	4.4	3	-5.0	246	253	68	44	-	-
		6	5	0.15	1.15	1353	60	60	73	604.57	608.84	4.27	11.5	104				-5.0	246	247	68	48	-	-
		6	5	0.15	1.15	1360	60	60	73	608.84	612.97	4.13	11.5	101				-5.0	247	253	68	49	-	-
		5	5	0.15	1.15	1362	60	60	74	612.97	617.11	4.14	11.5	101				-5.0	247	246	68	51	-	-
		5	5	0.15	1.15	1369	60	60	75	617.11	621.25	4.14	11.5	101				-5.5	249	251	68	52	-	-
		5	5	0.15	1.16	1362	60	60	77	621.25	625.40	4.15	11.5	101				-5.5	245	253	68	57	-	-
		4	5	0.16	1.23	1369	60	60	77	625.40	629.66	4.26	11.9	101				-5.5	248	250	68	52	-	-
		4	5	0.15	1.16	1371	60	60	79	629.66	633.81	4.15	11.5	101				-5.5	249	256	68	46	-	-
		4	5	0.15	1.16	1372	60	60	80	633.81	637.92	4.11	11.5	100				-5.5	249	255	68	47	-	-
		3	5	0.15	1.16	1369	60	60	81	637.92	642.08	4.16	11.5	102				-5.5	247	254	68	47	-	-
		3	5	0.15	1.17	1370	60	60	83	642.08	646.17	4.09	11.5	100				-5.5	247	247	68	48	-	-
		3	5	0.15	1.17	1373	60	60	84	646.17	650.31	4.14	11.5	101				-5.5	245	251	68	49	-	-
		2	5	0.13	1.05	1315	60	60	86	650.31	654.36	4.05	10.6	105				-5.5	249	249	68	50	-	-
		2	5	0.13	1.04	1320	60	60	86	654.36	658.15	3.79	10.6	98				-5.5	246	250	68	52	-	-
		2	5	0.12	0.97	1316	60	60	88	658.15	661.97	3.82	10.1	103				-5.5	248	251	68	55	-	-
		1	5	0.12	0.97	1314	60	60	89	661.97	665.75	3.78	10.1	102				-5.5	247	246	68	58	-	-
		1	5	0.12	0.97	1318	60	60	90	665.75	669.50	3.75	10.2	101				-5.5	250	251	68	54	-	-
		1	5	0.12	0.97	1318	60	60	91	669.50	673.25	3.75	10.2	101				-5.0	235	253	68	46	-	-
	2	1	5	0.12	0.98	1318	60	60	92	673.25	677.00	3.75	10.2	101				-5.0	250	249	68	43	-	-
		1	5	0.12	0.98	1311	60	60	94	677.00	680.74	3.74	10.1	100				-5.0	249	256	68	43	-	-
		1	5	0.12	0.99	1300	60	60	94	680.74	684.49	3.75	10.1	100				-4.5	249	251	68	44	-	-
		2	5	0.12	0.98	1317	60	60	95	684.49	688.23	3.74	10.1	101				-5.5	250	250	68	46	-	-
		2	5	0.12	0.98	1322	60	60	96	688.23	691.97	3.74	10.2	101				-5.5	246	253	68	48	-	-
		2	5	0.12	0.98	1318	60	60	96	691.97	695.73	3.76	10.2	101				-5.5	247	258	68	50	-	-
		3	5	0.12	0.98	1325	60	60	97	695.73	699.41	3.68	10.2	99				-5.5	250	244	68	52	-	-
		3	5	0.11	0.90	1320	60	60	98	699.41	703.00	3.59	9.7	101				-5.5	249	260	68	56	-	-
		3	5	0.11	0.90	1318	60	60	98	703.00	706.58	3.58	9.7	101				-5.5	249	247	68	58	-	-
		4	5	0.10	0.83	1310	60	60	100	706.58	709.94	3.36	9.2	99				-5.5	248	247	68	52	-	-
		4	5	0.10	0.83	1310	60	60	100	709.94	713.35	3.41	9.2	100				-5.5	249	250	68	45	-	-
		4	5	0.10	0.83	1314	60	60	101	713.35	716.79	3.44	9.3	101				-5.5	248	249	68	44	-	-

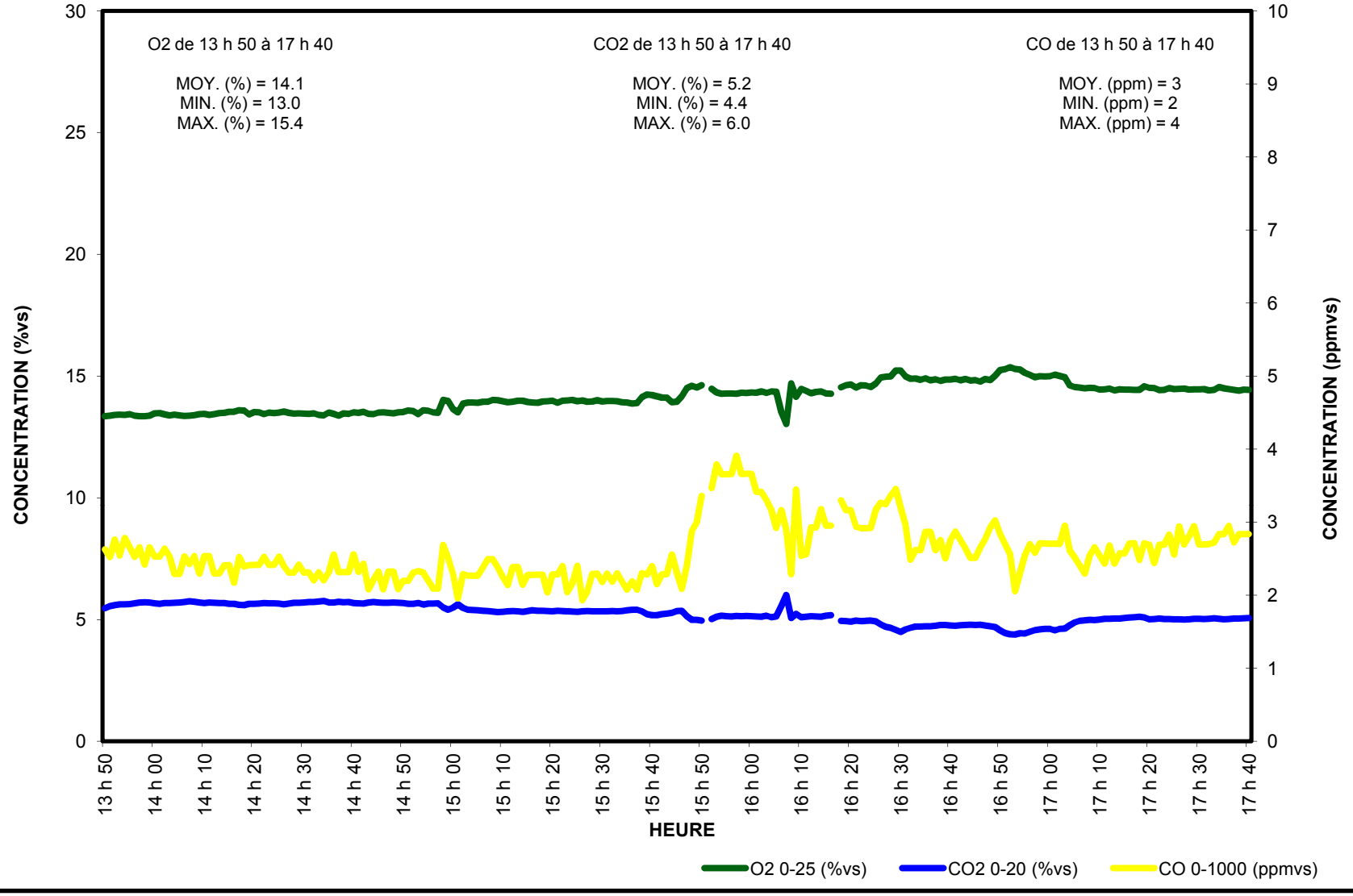
RELEVÉ D'ÉCHANTILLONNAGE: Incinérateur - COSV - ESSAI# MEL-COSV-3

Heure	Trav. #	Point #	Durée de pompage (min)	Différence de pression ("H_2O) ΔP	ΔH	Températures (°F) Cheminé	Compteu Entrée	Compteu Sortie	Orifice	Volume de gaz (pi³) Début	Fin	Total	Vitesse (m/s)	Iso. (%)	O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vacuum (po Hg)	Températures (°F) Sonde	Filtre	Sortie	Trappe F Cond	Aux3	Module
16 h 13	1	6	5	0.24	1.85	1356	60	60	75	729.20	734.29	5.09	14.5	100	13.6	5.6	3	-4.5	250	251	68	52	-	-
		6	5	0.24	1.83	1377	60	60	76	734.29	739.45	5.16	14.6	102				-4.5	244	252	68	42	-	-
		6	5	0.24	1.82	1386	60	60	76	739.45	744.61	5.16	14.6	102				-4.5	247	252	68	40	-	-
		5	5	0.24	1.83	1385	60	60	78	744.61	749.76	5.15	14.6	102				-4.5	253	250	68	40	-	-
		5	5	0.24	1.82	1405	60	60	79	749.76	754.91	5.15	14.7	102				-4.5	247	253	68	40	-	-
		5	5	0.24	1.81	1410	60	60	80	754.91	760.08	5.17	14.7	103				-4.5	245	247	68	41	-	-
		4	5	0.21	1.63	1366	60	60	81	760.08	764.98	4.90	13.6	103				-4.5	240	247	67	41	-	-
		4	5	0.23	1.77	1380	60	60	82	764.98	770.00	5.02	14.3	101				-4.5	252	252	66	42	-	-
		4	5	0.23	1.77	1387	60	60	82	770.00	775.00	5.00	14.3	101				-4.0	252	243	66	42	-	-
		3	5	0.23	1.76	1396	60	60	83	775.00	780.01	5.01	14.3	101				-4.0	251	262	66	42	-	-
		3	5	0.23	1.76	1403	60	60	84	780.01	785.00	4.99	14.4	101				-4.0	249	250	66	43	-	-
		3	5	0.23	1.75	1409	60	60	84	785.00	789.95	4.95	14.4	100				-4.5	254	244	66	44	-	-
		2	5	0.18	1.39	1382	60	60	84	789.95	794.45	4.50	12.6	102				-4.5	244	251	66	44	-	-
		2	5	0.19	1.48	1381	60	60	86	794.45	799.04	4.59	13.0	102				-4.5	249	250	67	45	-	-
		2	5	0.18	1.40	1387	60	60	87	799.04	803.50	4.46	12.7	102				-4.5	250	251	67	48	-	-
		1	5	0.18	1.40	1380	60	60	87	803.50	807.95	4.45	12.6	101				-4.0	253	250	68	50	-	-
		1	5	0.18	1.39	1400	60	60	88	807.95	812.39	4.44	12.7	101				-4.0	238	250	66	41	-	-
		1	5	0.18	1.38	1410	60	60	89	812.39	816.86	4.47	12.7	102				-4.5	252	253	66	40	-	-
	2	1	5	0.18	1.38	1413	60	60	90	816.86	821.26	4.40	12.8	101				-4.5	250	252	68	40	-	-
		1	5	0.18	1.38	1417	60	60	90	821.26	825.67	4.41	12.8	101				-4.5	250	252	68	47	-	-
		1	5	0.17	1.30	1423	60	60	91	825.67	829.97	4.30	12.4	102				-4.5	245	248	68	49	-	-
		2	5	0.17	1.30	1440	60	60	94	829.97	834.30	4.33	12.5	103				-4.0	247	251	68	49	-	-
		2	5	0.17	1.29	1438	60	60	92	834.30	838.54	4.24	12.5	101				-4.0	252	247	68	49	-	-
		2	5	0.17	1.30	1443	60	60	94	838.54	842.77	4.23	12.5	101				-4.0	249	251	68	51	-	-
		3	5	0.17	1.29	1450	60	60	95	842.77	847.00	4.23	12.5	101				-4.0	250	250	68	51	-	-
		3	5	0.24	1.75	1529	60	60	95	847.00	851.90	4.90	15.2	100				-4.0	243	251	68	54	-	-
		3	5	0.24	1.75	1535	60	60	97	851.90	856.84	4.94	15.2	101				-4.0	245	251	68	54	-	-
		4	5	0.24	1.76	1533	60	60	97	856.84	861.77	4.93	15.2	101				-4.0	253	255	68	56	-	-
		4	5	0.24	1.76	1533	60	60	98	861.77	866.72	4.95	15.2	102				-4.0	241	250	68	56	-	-
		4	5	0.24	1.75	1542	60	60	98	866.72	871.64	4.92	15.2	101				-4.0	252	249	68	56	-	-
		5	5	0.24	1.76	1541	60	60	99	871.64	876.54	4.90	15.2	101				-5.0	248	249	68	56	-	-
		5	5	0.23	1.68	1548	60	60	101	876.54	881.29	4.75	14.9	100				-5.0	251	248	68	51	-	-
		5	5	0.22	1.65	1500	60	60	101	881.29	886.00	4.71	14.4	100				-4.0	252	252	68	50	-	-
		6	5	0.22	1.68	1463	60	60	102	886.00	890.71	4.71	14.3	99				-4.0	254	251	68	51	-	-
		6	5	0.22	1.69	1457	60	60	103	890.71	895.49	4.78	14.3	100				-5.0	254	251	68	54	-	-
		6	5	0.22	1.69	1460	60	60	103	895.49	900.26	4.77	14.3	100				-5.0	248	255	68	55	-	-

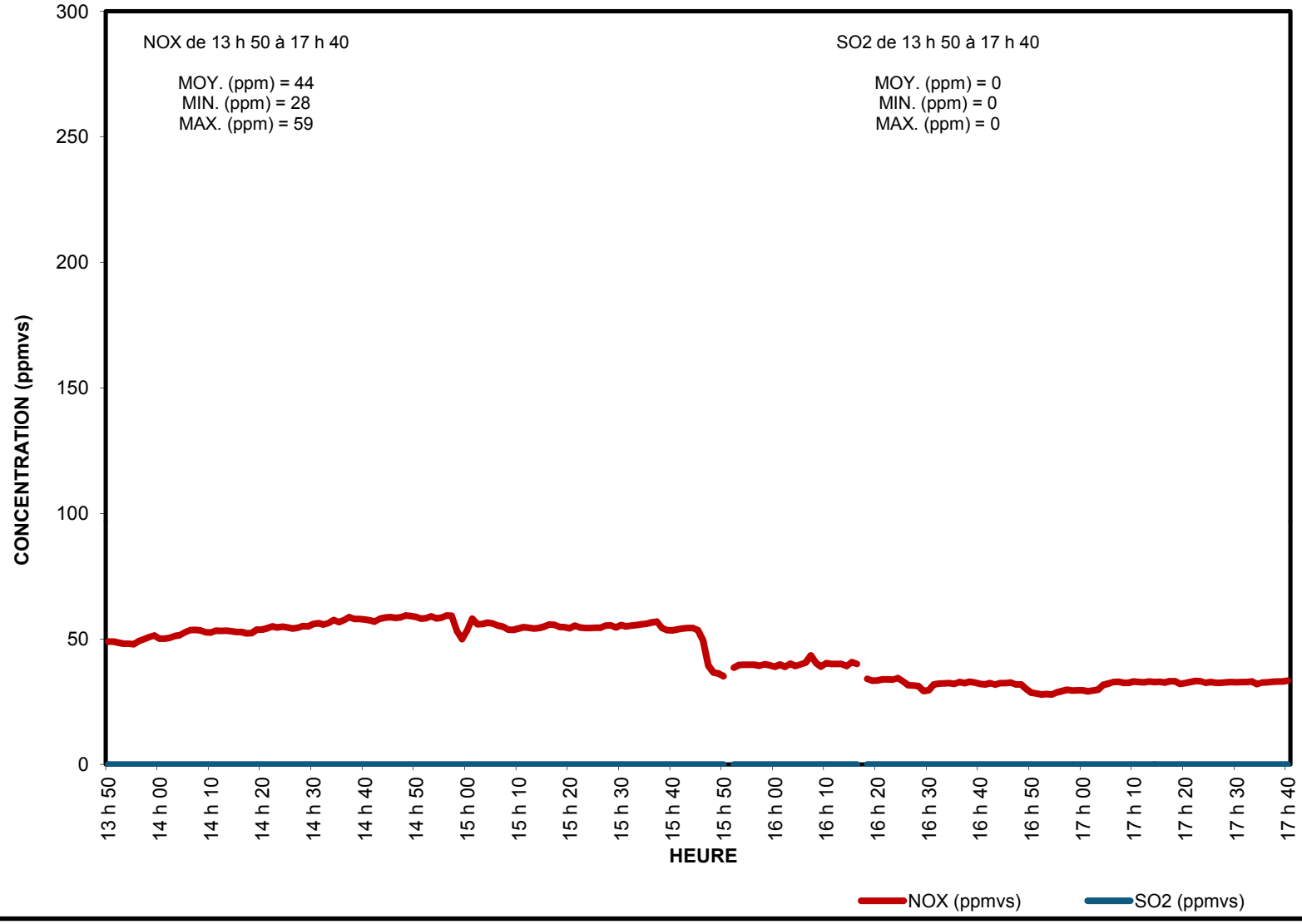
APPENDIX 2
CONTINUOUS MEASUREMENTS OF GAS



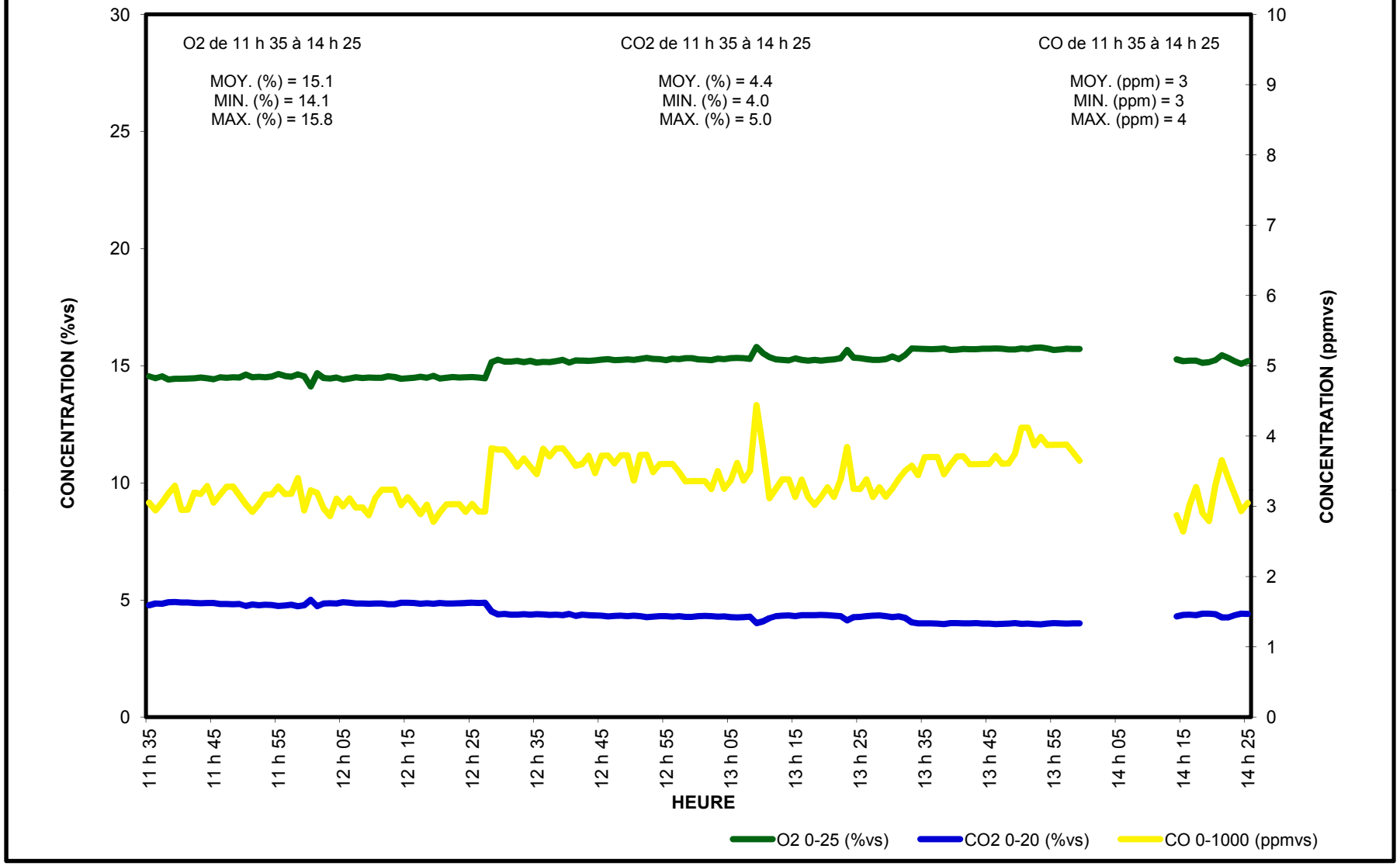
INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 22 SEPTEMBRE 2018 - ESSAI MEL GAZ E1

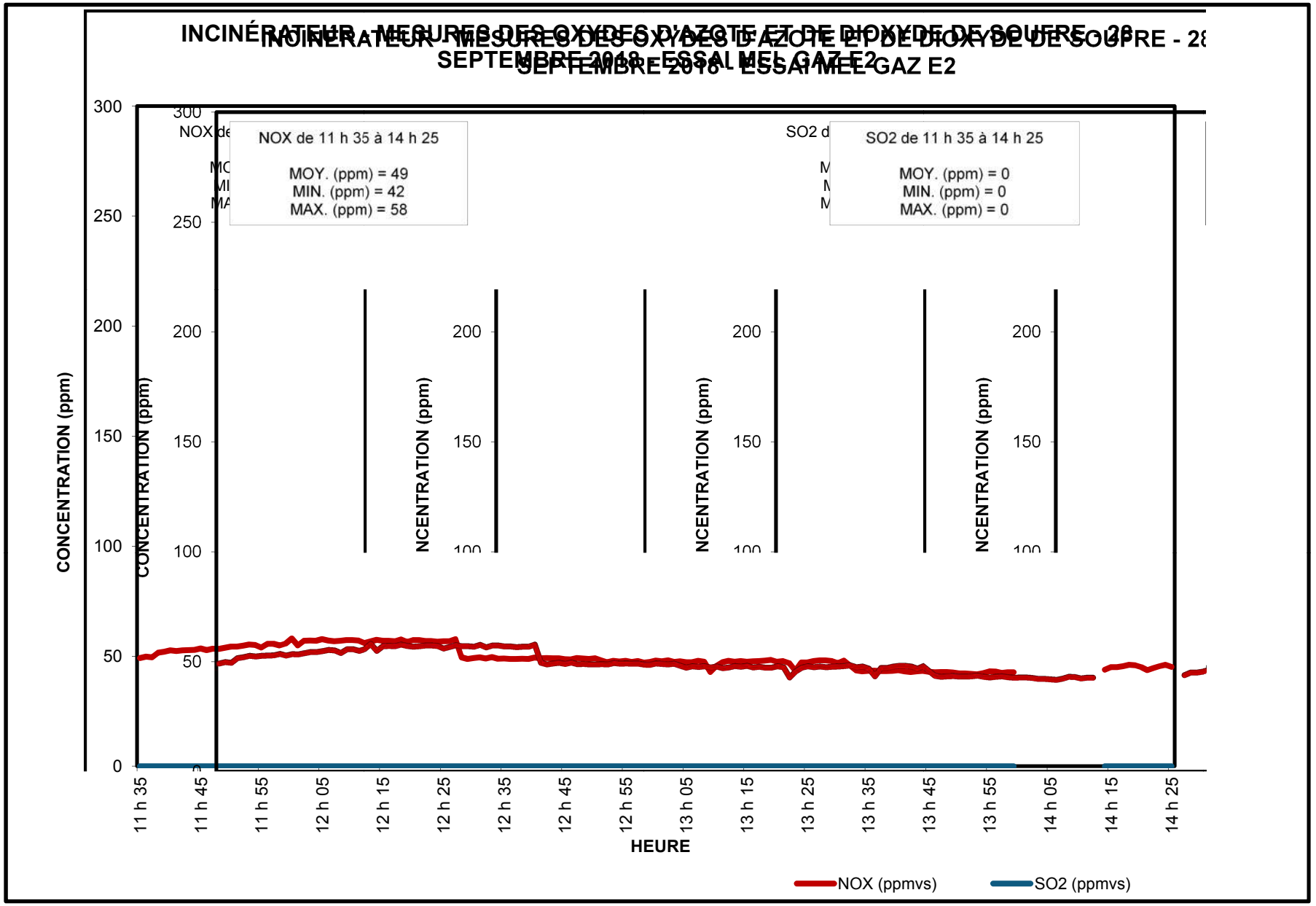


INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 22 SEPTEMBRE 2018 - ESSAI MEL GAZ E1

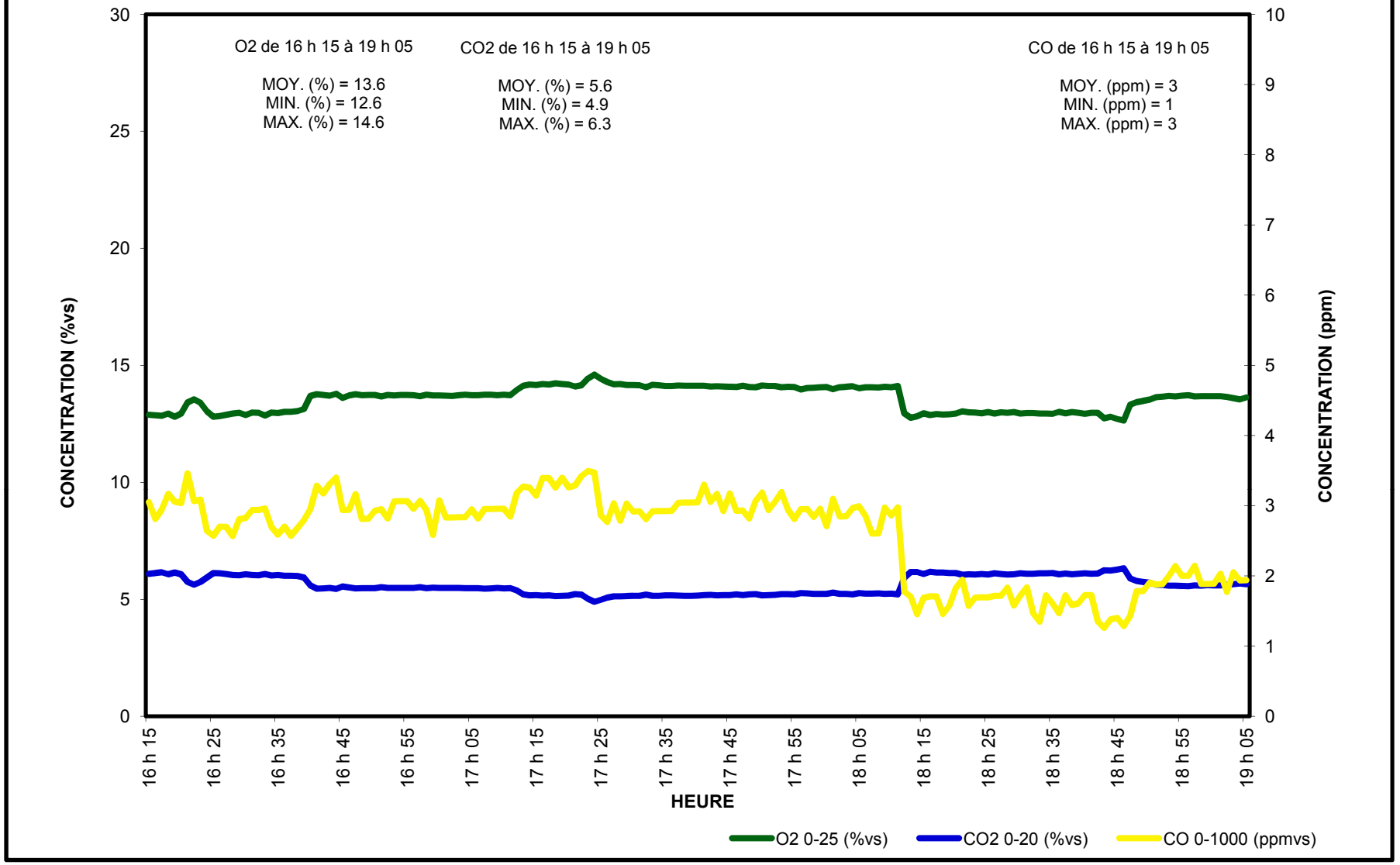


INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 28 SEPTEMBRE 2018 - ESSAI MEL GAZ E2

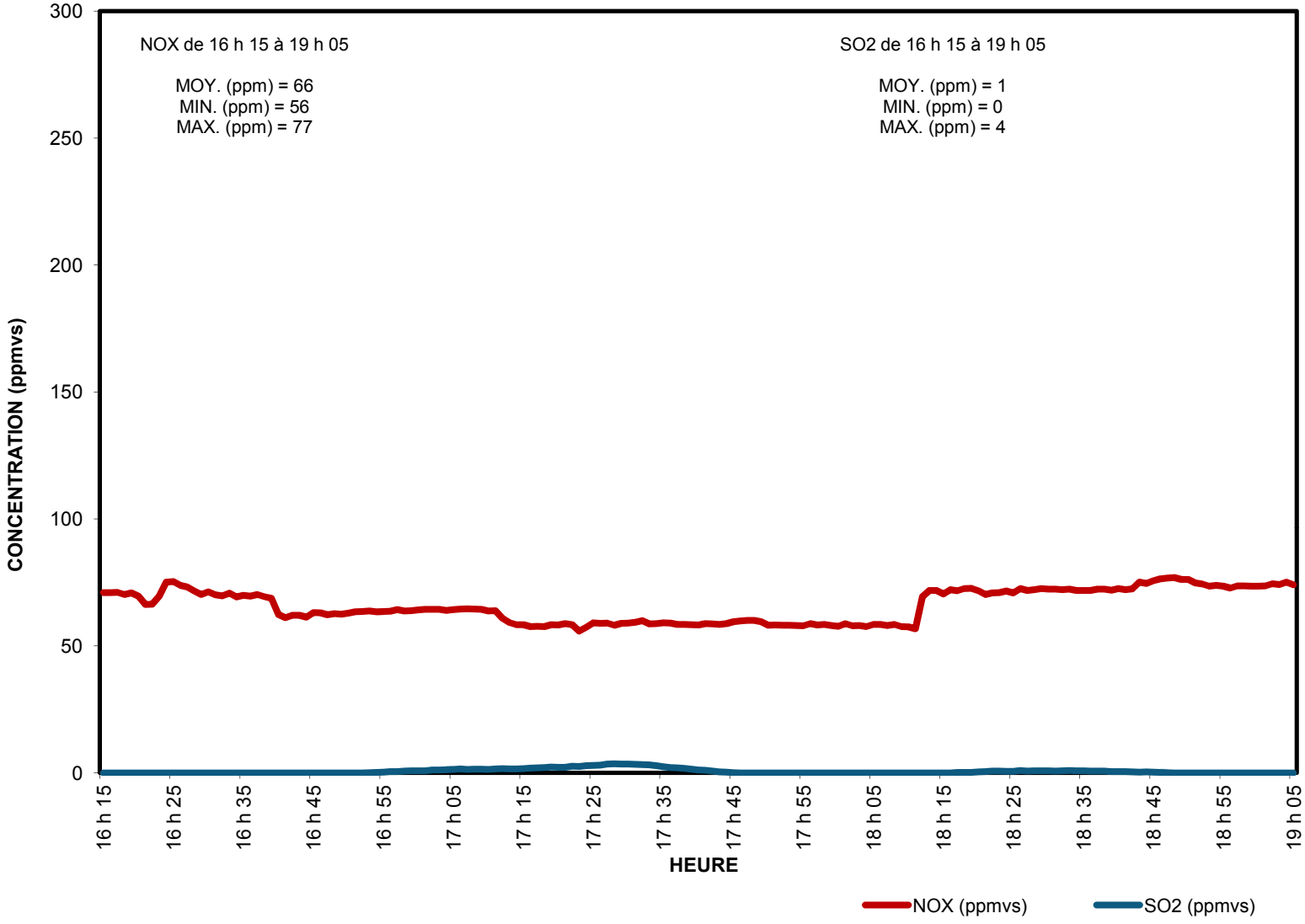



INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 28 SEPTEMBRE 2018 - ESSAI MEL GAZ E2
NOX de 11 h 35 à 14 h 25
MOY. (ppm) = 49
MIN. (ppm) = 42
MAX. (ppm) = 58
SO2 de 11 h 35 à 14 h 25
MOY. (ppm) = 0
MIN. (ppm) = 0
MAX. (ppm) = 0
CONCENTRATION (ppm)
300
250
200
150
100
50
0
11 h 35
11 h 45
11 h 55
12 h 05
12 h 15
12 h 25
12 h 35
12 h 45
12 h 55
13 h 05
13 h 15
13 h 25
13 h 35
13 h 45
13 h 55
14 h 05
14 h 15
14 h 25
HEURE
NOX (ppmvs)
SO2 (ppmvs)

INCINÉRATEUR - MESURES D'OXYGÈNE, DE DIOXYDE DE CARBONE ET DE MONOXYDE DE CARBONE - 29 SEPTEMBRE 2018 - ESSAI MEL GAZ E3



INCINÉRATEUR - MESURES DES OXYDES D'AZOTE ET DE DIOXYDE DE SOUFRE - 29 SEPTEMBRE 2018 - ESSAI MEL GAZ E3



	AQ	AR	AS	AT
1		Graphique		
2	**22 sept. 2018**	**2018-09-22**	**2018-09-28**	**2018-09-29**
3	**ESSAIS**	**MEL GAZ E1**	**MEL GAZ E2**	**MEL GAZ E3**
4	**Début**	13 h 50	11 h 35	16 h 15
5	**Fin**	17 h 40	14 h 25	19 h 05
6	**O2 0-25 (%vs) corrigé**	**#1**	**#2**	**#3**
7	**MOY.**	14.1	15.1	13.6
8	**MIN**	13.0	14.1	12.6
9	**MAX**	15.4	15.8	14.6
10	**CO2 0-20 (%vs) corrigé**	**#1**	**#2**	**#3**
11	**MOY.**	5.2	4.4	5.6
12	**MIN**	4.4	4.0	4.9
13	**MAX**	6.0	5.0	6.3
14	**CO 0-1000 (ppmvs) corrigé**	**#1**	**#2**	**#3**
15	**MOY.**	2.6	3.4	2.6
16	**MIN**	1.9	2.6	1.3
17	**MAX**	3.9	4.4	3.5
18	**SO2 (ppmvs) corrigé**	**#1**	**#2**	**#3**
19	**MOY.**	0.0	0.0	0.6
20	**MIN**	0.0	0.0	0.0
21	**MAX**	0.0	0.0	3.6
22	**NOX (ppmvs) corrigé**	**#1**	**#2**	**#3**
23	**MOY.**	44.5	49.3	65.8
24	**MIN**	27.9	41.8	55.8
25	**MAX**	59.4	58.1	76.9

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
7	22-09-2018 13:50:15	13 h 50	13.4	5.5	2.6	0.0	49.0
8	22-09-2018 13:51:15	13 h 51	13.4	5.6	2.5	0.0	49.0
9	22-09-2018 13:52:15	13 h 52	13.4	5.6	2.8	0.0	48.6
10	22-09-2018 13:53:15	13 h 53	13.4	5.6	2.5	0.0	48.1
11	22-09-2018 13:54:15	13 h 54	13.4	5.6	2.8	0.0	48.2
12	22-09-2018 13:55:15	13 h 55	13.4	5.6	2.7	0.0	47.9
13	22-09-2018 13:56:15	13 h 56	13.4	5.7	2.5	0.0	49.2
14	22-09-2018 13:57:15	13 h 57	13.4	5.7	2.7	0.0	49.9
15	22-09-2018 13:58:15	13 h 58	13.4	5.7	2.4	0.0	50.8
16	22-09-2018 13:59:15	13 h 59	13.4	5.7	2.7	0.0	51.4
17	22-09-2018 14:00:15	14 h 00	13.5	5.7	2.5	0.0	50.1
18	22-09-2018 14:01:15	14 h 01	13.5	5.6	2.5	0.0	50.1
19	22-09-2018 14:02:15	14 h 02	13.4	5.7	2.6	0.0	50.4
20	22-09-2018 14:03:15	14 h 03	13.4	5.7	2.5	0.0	51.1
21	22-09-2018 14:04:15	14 h 04	13.4	5.7	2.3	0.0	51.5
22	22-09-2018 14:05:15	14 h 05	13.4	5.7	2.3	0.0	52.6
23	22-09-2018 14:06:15	14 h 06	13.4	5.7	2.5	0.0	53.5
24	22-09-2018 14:07:15	14 h 07	13.4	5.8	2.4	0.0	53.7
25	22-09-2018 14:08:15	14 h 08	13.4	5.7	2.5	0.0	53.4
26	22-09-2018 14:09:15	14 h 09	13.4	5.7	2.3	0.0	52.7
27	22-09-2018 14:10:15	14 h 10	13.4	5.7	2.5	0.0	52.6
28	22-09-2018 14:11:15	14 h 11	13.4	5.7	2.5	0.0	53.3
29	22-09-2018 14:12:15	14 h 12	13.4	5.7	2.3	0.0	53.2
30	22-09-2018 14:13:15	14 h 13	13.5	5.7	2.3	0.0	53.3
31	22-09-2018 14:14:15	14 h 14	13.5	5.7	2.4	0.0	53.0
32	22-09-2018 14:15:15	14 h 15	13.5	5.7	2.4	0.0	52.8
33	22-09-2018 14:16:15	14 h 16	13.5	5.6	2.2	0.0	52.8
34	22-09-2018 14:17:15	14 h 17	13.6	5.6	2.5	0.0	52.2
35	22-09-2018 14:18:15	14 h 18	13.6	5.6	2.4	0.0	52.4
36	22-09-2018 14:19:15	14 h 19	13.4	5.6	2.4	0.0	53.7
37	22-09-2018 14:20:15	14 h 20	13.5	5.7	2.4	0.0	53.7
38	22-09-2018 14:21:15	14 h 21	13.5	5.7	2.4	0.0	54.3
39	22-09-2018 14:22:15	14 h 22	13.4	5.7	2.5	0.0	55.0
40	22-09-2018 14:23:15	14 h 23	13.5	5.7	2.4	0.0	54.6
41	22-09-2018 14:24:15	14 h 24	13.5	5.7	2.4	0.0	54.9
42	22-09-2018 14:25:15	14 h 25	13.5	5.7	2.5	0.0	54.6
43	22-09-2018 14:26:15	14 h 26	13.5	5.6	2.4	0.0	54.2
44	22-09-2018 14:27:15	14 h 27	13.5	5.7	2.3	0.0	54.5
45	22-09-2018 14:28:15	14 h 28	13.5	5.7	2.3	0.0	55.1
46	22-09-2018 14:29:15	14 h 29	13.5	5.7	2.4	0.0	55.0
47	22-09-2018 14:30:15	14 h 30	13.5	5.7	2.3	0.0	56.0
48	22-09-2018 14:31:15	14 h 31	13.4	5.7	2.3	0.0	56.3
49	22-09-2018 14:32:15	14 h 32	13.5	5.7	2.2	0.0	55.7
50	22-09-2018 14:33:15	14 h 33	13.4	5.7	2.3	0.0	56.3
51	22-09-2018 14:34:15	14 h 34	13.4	5.8	2.2	0.0	57.5
52	22-09-2018 14:35:15	14 h 35	13.5	5.7	2.3	0.0	56.6
53	22-09-2018 14:36:15	14 h 36	13.4	5.7	2.6	0.0	57.5
54	22-09-2018 14:37:15	14 h 37	13.4	5.7	2.3	0.0	58.7
55	22-09-2018 14:38:15	14 h 38	13.5	5.7	2.3	0.0	58.0
56	22-09-2018 14:39:15	14 h 39	13.4	5.7	2.3	0.0	58.0
57	22-09-2018 14:40:15	14 h 40	13.5	5.7	2.6	0.0	57.7
58	22-09-2018 14:41:15	14 h 41	13.5	5.7	2.3	0.0	57.5
59	22-09-2018 14:42:15	14 h 42	13.5	5.7	2.4	0.0	56.9
60	22-09-2018 14:43:15	14 h 43	13.5	5.7	2.1	0.0	58.1
61	22-09-2018 14:44:15	14 h 44	13.4	5.7	2.2	0.0	58.5
62	22-09-2018 14:45:15	14 h 45	13.5	5.7	2.3	0.0	58.7
63	22-09-2018 14:46:15	14 h 46	13.5	5.7	2.1	0.0	58.4
64	22-09-2018 14:47:15	14 h 47	13.5	5.7	2.3	0.0	58.6
65	22-09-2018 14:48:15	14 h 48	13.5	5.7	2.3	0.0	59.4
66	22-09-2018 14:49:15	14 h 49	13.5	5.7	2.1	0.0	59.1
67	22-09-2018 14:50:15	14 h 50	13.5	5.7	2.2	0.0	58.8
68	22-09-2018 14:51:15	14 h 51	13.6	5.7	2.2	0.0	58.1
69	22-09-2018 14:52:15	14 h 52	13.6	5.6	2.3	0.0	58.3
70	22-09-2018 14:53:15	14 h 53	13.4	5.7	2.3	0.0	59.0
71	22-09-2018 14:54:15	14 h 54	13.6	5.6	2.3	0.0	58.2
72	22-09-2018 14:55:15	14 h 55	13.6	5.7	2.2	0.0	58.5
73	22-09-2018 14:56:15	14 h 56	13.5	5.7	2.1	0.0	59.4

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
74	22-09-2018 14:57:15	14 h 57	13.5	5.7	2.1	0.0	59.2
75	22-09-2018 14:58:15	14 h 58	14.0	5.5	2.7	0.0	53.1
76	22-09-2018 14:59:15	14 h 59	14.0	5.4	2.5	0.0	49.9
77	22-09-2018 15:00:15	15 h 00	13.6	5.5	2.3	0.0	53.4
78	22-09-2018 15:01:15	15 h 01	13.5	5.6	2.0	0.0	58.0
79	22-09-2018 15:02:15	15 h 02	13.9	5.5	2.3	0.0	55.8
80	22-09-2018 15:03:15	15 h 03	13.9	5.4	2.3	0.0	56.0
81	22-09-2018 15:04:15	15 h 04	13.9	5.4	2.3	0.0	56.4
82	22-09-2018 15:05:15	15 h 05	13.9	5.4	2.3	0.0	56.2
83	22-09-2018 15:06:15	15 h 06	13.9	5.4	2.4	0.0	55.3
84	22-09-2018 15:07:15	15 h 07	14.0	5.4	2.5	0.0	54.9
85	22-09-2018 15:08:15	15 h 08	14.0	5.3	2.5	0.0	53.8
86	22-09-2018 15:09:15	15 h 09	14.0	5.3	2.4	0.0	53.6
87	22-09-2018 15:10:15	15 h 10	14.0	5.3	2.3	0.0	54.1
88	22-09-2018 15:11:15	15 h 11	13.9	5.3	2.1	0.0	54.7
89	22-09-2018 15:12:15	15 h 12	14.0	5.4	2.4	0.0	54.5
90	22-09-2018 15:13:15	15 h 13	14.0	5.3	2.4	0.0	54.2
91	22-09-2018 15:14:15	15 h 14	14.0	5.3	2.1	0.0	54.4
92	22-09-2018 15:15:15	15 h 15	13.9	5.3	2.3	0.0	54.9
93	22-09-2018 15:16:15	15 h 16	13.9	5.4	2.3	0.0	55.8
94	22-09-2018 15:17:15	15 h 17	13.9	5.4	2.3	0.0	55.6
95	22-09-2018 15:18:15	15 h 18	14.0	5.4	2.3	0.0	54.8
96	22-09-2018 15:19:15	15 h 19	14.0	5.4	2.0	0.0	54.7
97	22-09-2018 15:20:15	15 h 20	14.0	5.3	2.3	0.0	54.2
98	22-09-2018 15:21:15	15 h 21	13.9	5.4	2.3	0.0	55.3
99	22-09-2018 15:22:15	15 h 22	14.0	5.4	2.4	0.0	54.6
100	22-09-2018 15:23:15	15 h 23	14.0	5.3	2.0	0.0	54.3
101	22-09-2018 15:24:15	15 h 24	14.0	5.3	2.2	0.0	54.3
102	22-09-2018 15:25:15	15 h 25	14.0	5.3	2.4	0.0	54.5
103	22-09-2018 15:26:15	15 h 26	14.0	5.3	1.9	0.0	54.5
104	22-09-2018 15:27:15	15 h 27	13.9	5.3	2.0	0.0	55.3
105	22-09-2018 15:28:15	15 h 28	14.0	5.3	2.3	0.0	55.4
106	22-09-2018 15:29:15	15 h 29	14.0	5.3	2.3	0.0	54.6
107	22-09-2018 15:30:15	15 h 30	14.0	5.3	2.2	0.0	55.5
108	22-09-2018 15:31:15	15 h 31	14.0	5.3	2.3	0.0	55.0
109	22-09-2018 15:32:15	15 h 32	14.0	5.3	2.2	0.0	55.3
110	22-09-2018 15:33:15	15 h 33	14.0	5.3	2.3	0.0	55.5
111	22-09-2018 15:34:15	15 h 34	13.9	5.3	2.2	0.0	55.8
112	22-09-2018 15:35:15	15 h 35	13.9	5.4	2.1	0.0	56.1
113	22-09-2018 15:36:15	15 h 36	13.9	5.4	2.2	0.0	56.6
114	22-09-2018 15:37:15	15 h 37	13.9	5.4	2.1	0.0	56.9
115	22-09-2018 15:38:15	15 h 38	14.1	5.3	2.3	0.0	54.4
116	22-09-2018 15:39:15	15 h 39	14.2	5.2	2.3	0.0	53.5
117	22-09-2018 15:40:15	15 h 40	14.2	5.2	2.4	0.0	53.4
118	22-09-2018 15:41:15	15 h 41	14.2	5.2	2.2	0.0	53.9
119	22-09-2018 15:42:15	15 h 42	14.1	5.2	2.3	0.0	54.2
120	22-09-2018 15:43:15	15 h 43	14.1	5.2	2.3	0.0	54.4
121	22-09-2018 15:44:15	15 h 44	13.9	5.3	2.6	0.0	54.4
122	22-09-2018 15:45:15	15 h 45	13.9	5.4	2.3	0.0	53.5
123	22-09-2018 15:46:15	15 h 46	14.2	5.4	2.1	0.0	49.5
124	22-09-2018 15:47:15	15 h 47	14.5	5.1	2.4	0.0	39.5
125	22-09-2018 15:48:15	15 h 48	14.6	5.0	2.9	0.0	36.6
126	22-09-2018 15:49:15	15 h 49	14.5	5.0	3.0	0.0	36.2
127	22-09-2018 15:50:15	15 h 50	14.6	5.0	3.4	0.0	35.2
128	22-09-2018 15:51:15	15 h 51					
129	22-09-2018 15:52:15	15 h 52	14.5	5.0	3.5	0.0	38.6
130	22-09-2018 15:53:15	15 h 53	14.3	5.1	3.8	0.0	39.7
131	22-09-2018 15:54:15	15 h 54	14.3	5.2	3.7	0.0	39.8
132	22-09-2018 15:55:15	15 h 55	14.3	5.1	3.7	0.0	39.8
133	22-09-2018 15:56:15	15 h 56	14.3	5.1	3.7	0.0	39.8
134	22-09-2018 15:57:15	15 h 57	14.3	5.2	3.9	0.0	39.3
135	22-09-2018 15:58:15	15 h 58	14.3	5.1	3.7	0.0	39.9
136	22-09-2018 15:59:15	15 h 59	14.3	5.2	3.7	0.0	39.5
137	22-09-2018 16:00:15	16 h 00	14.3	5.1	3.7	0.0	38.9
138	22-09-2018 16:01:15	16 h 01	14.3	5.1	3.4	0.0	39.8
139	22-09-2018 16:02:15	16 h 02	14.4	5.1	3.4	0.0	38.9
140	22-09-2018 16:03:15	16 h 03	14.3	5.2	3.3	0.0	40.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
141	22-09-2018 16:04:15	16 h 04	14.4	5.1	3.2	0.0	39.2
142	22-09-2018 16:05:15	16 h 05	14.4	5.1	2.9	0.0	39.8
143	22-09-2018 16:06:15	16 h 06	13.5	5.6	3.2	0.0	40.6
144	22-09-2018 16:07:15	16 h 07	13.0	6.0	2.9	0.0	43.4
145	22-09-2018 16:08:15	16 h 08	14.7	5.1	2.3	0.0	40.5
146	22-09-2018 16:09:15	16 h 09	14.1	5.2	3.4	0.0	39.0
147	22-09-2018 16:10:15	16 h 10	14.5	5.1	2.5	0.0	40.3
148	22-09-2018 16:11:15	16 h 11	14.4	5.1	2.6	0.0	40.0
149	22-09-2018 16:12:15	16 h 12	14.3	5.1	2.9	0.0	40.0
150	22-09-2018 16:13:15	16 h 13	14.3	5.1	2.9	0.0	40.1
151	22-09-2018 16:14:15	16 h 14	14.4	5.1	3.2	0.0	39.2
152	22-09-2018 16:15:15	16 h 15	14.3	5.2	3.0	0.0	40.8
153	22-09-2018 16:16:15	16 h 16	14.3	5.2	3.0	0.0	40.1
154	22-09-2018 16:17:15	16 h 17					
155	22-09-2018 16:18:15	16 h 18	14.5	4.9	3.3	0.0	34.2
156	22-09-2018 16:19:15	16 h 19	14.6	4.9	3.2	0.0	33.4
157	22-09-2018 16:20:15	16 h 20	14.7	4.9	3.2	0.0	33.5
158	22-09-2018 16:21:15	16 h 21	14.5	5.0	2.9	0.0	33.9
159	22-09-2018 16:22:15	16 h 22	14.6	4.9	2.9	0.0	33.9
160	22-09-2018 16:23:15	16 h 23	14.6	5.0	2.9	0.0	33.8
161	22-09-2018 16:24:15	16 h 24	14.6	5.0	2.9	0.0	34.4
162	22-09-2018 16:25:15	16 h 25	14.7	4.9	3.2	0.0	33.1
163	22-09-2018 16:26:15	16 h 26	14.9	4.8	3.3	0.0	31.6
164	22-09-2018 16:27:15	16 h 27	15.0	4.7	3.2	0.0	31.5
165	22-09-2018 16:28:15	16 h 28	15.0	4.7	3.4	0.0	31.3
166	22-09-2018 16:29:15	16 h 29	15.2	4.6	3.5	0.0	29.2
167	22-09-2018 16:30:15	16 h 30	15.2	4.5	3.2	0.0	29.6
168	22-09-2018 16:31:15	16 h 31	15.0	4.6	3.0	0.0	31.9
169	22-09-2018 16:32:15	16 h 32	14.9	4.7	2.5	0.0	32.2
170	22-09-2018 16:33:15	16 h 33	14.9	4.7	2.6	0.0	32.3
171	22-09-2018 16:34:15	16 h 34	14.8	4.7	2.6	0.0	32.4
172	22-09-2018 16:35:15	16 h 35	14.9	4.7	2.9	0.0	32.1
173	22-09-2018 16:36:15	16 h 36	14.8	4.7	2.9	0.0	32.9
174	22-09-2018 16:37:15	16 h 37	14.9	4.8	2.6	0.0	32.4
175	22-09-2018 16:38:15	16 h 38	14.8	4.8	2.8	0.0	32.9
176	22-09-2018 16:39:15	16 h 39	14.9	4.8	2.5	0.0	32.6
177	22-09-2018 16:40:15	16 h 40	14.9	4.8	2.8	0.0	32.1
178	22-09-2018 16:41:15	16 h 41	14.9	4.8	2.9	0.0	31.9
179	22-09-2018 16:42:15	16 h 42	14.8	4.8	2.8	0.0	32.4
180	22-09-2018 16:43:15	16 h 43	14.9	4.8	2.6	0.0	31.8
181	22-09-2018 16:44:15	16 h 44	14.8	4.8	2.5	0.0	32.4
182	22-09-2018 16:45:15	16 h 45	14.8	4.8	2.5	0.0	32.4
183	22-09-2018 16:46:15	16 h 46	14.8	4.8	2.7	0.0	32.6
184	22-09-2018 16:47:15	16 h 47	14.9	4.8	2.8	0.0	31.9
185	22-09-2018 16:48:15	16 h 48	14.8	4.7	2.9	0.0	31.9
186	22-09-2018 16:49:15	16 h 49	15.0	4.7	3.0	0.0	30.1
187	22-09-2018 16:50:15	16 h 50	15.2	4.6	2.8	0.0	28.6
188	22-09-2018 16:51:15	16 h 51	15.3	4.5	2.7	0.0	28.3
189	22-09-2018 16:52:15	16 h 52	15.4	4.4	2.6	0.0	27.9
190	22-09-2018 16:53:15	16 h 53	15.3	4.4	2.1	0.0	28.1
191	22-09-2018 16:54:15	16 h 54	15.3	4.4	2.3	0.0	27.9
192	22-09-2018 16:55:15	16 h 55	15.1	4.4	2.5	0.0	28.7
193	22-09-2018 16:56:15	16 h 56	15.1	4.5	2.7	0.0	29.2
194	22-09-2018 16:57:15	16 h 57	14.9	4.6	2.6	0.0	29.8
195	22-09-2018 16:58:15	16 h 58	15.0	4.6	2.7	0.0	29.5
196	22-09-2018 16:59:15	16 h 59	15.0	4.6	2.7	0.0	29.6
197	22-09-2018 17:00:15	17 h 00	15.0	4.6	2.7	0.0	29.6
198	22-09-2018 17:01:15	17 h 01	15.1	4.6	2.7	0.0	29.2
199	22-09-2018 17:02:15	17 h 02	15.0	4.6	2.7	0.0	29.5
200	22-09-2018 17:03:15	17 h 03	15.0	4.6	3.0	0.0	29.8
201	22-09-2018 17:04:15	17 h 04	14.6	4.8	2.6	0.0	31.7
202	22-09-2018 17:05:15	17 h 05	14.5	4.9	2.5	0.0	32.2
203	22-09-2018 17:06:15	17 h 06	14.5	4.9	2.4	0.0	32.8
204	22-09-2018 17:07:15	17 h 07	14.5	5.0	2.3	0.0	33.0
205	22-09-2018 17:08:15	17 h 08	14.5	5.0	2.5	0.0	32.5
206	22-09-2018 17:09:15	17 h 09	14.5	5.0	2.7	0.0	32.6
207	22-09-2018 17:10:15	17 h 10	14.4	5.0	2.5	0.0	33.0

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
208	22-09-2018 17:11:15	17 h 11	14.5	5.0	2.4	0.0	32.9
209	22-09-2018 17:12:15	17 h 12	14.5	5.0	2.7	0.0	32.8
210	22-09-2018 17:13:15	17 h 13	14.4	5.0	2.4	0.0	33.1
211	22-09-2018 17:14:15	17 h 14	14.5	5.0	2.6	0.0	32.8
212	22-09-2018 17:15:15	17 h 15	14.4	5.1	2.6	0.0	33.0
213	22-09-2018 17:16:15	17 h 16	14.4	5.1	2.7	0.0	32.7
214	22-09-2018 17:17:15	17 h 17	14.4	5.1	2.7	0.0	33.1
215	22-09-2018 17:18:15	17 h 18	14.4	5.1	2.5	0.0	33.2
216	22-09-2018 17:19:15	17 h 19	14.6	5.1	2.7	0.0	32.1
217	22-09-2018 17:20:15	17 h 20	14.5	5.0	2.7	0.0	32.4
218	22-09-2018 17:21:15	17 h 21	14.5	5.0	2.4	0.0	32.9
219	22-09-2018 17:22:15	17 h 22	14.4	5.0	2.7	0.0	33.3
220	22-09-2018 17:23:15	17 h 23	14.4	5.0	2.7	0.0	33.2
221	22-09-2018 17:24:15	17 h 24	14.5	5.0	2.8	0.0	32.6
222	22-09-2018 17:25:15	17 h 25	14.5	5.0	2.6	0.0	32.9
223	22-09-2018 17:26:15	17 h 26	14.5	5.0	2.9	0.0	32.6
224	22-09-2018 17:27:15	17 h 27	14.5	5.0	2.7	0.0	32.6
225	22-09-2018 17:28:15	17 h 28	14.4	5.0	2.8	0.0	32.7
226	22-09-2018 17:29:15	17 h 29	14.5	5.0	2.9	0.0	32.9
227	22-09-2018 17:30:15	17 h 30	14.5	5.0	2.7	0.0	32.7
228	22-09-2018 17:31:15	17 h 31	14.5	5.0	2.7	0.0	32.9
229	22-09-2018 17:32:15	17 h 32	14.4	5.0	2.7	0.0	32.9
230	22-09-2018 17:33:15	17 h 33	14.4	5.1	2.7	0.0	33.0
231	22-09-2018 17:34:15	17 h 34	14.6	5.0	2.8	0.0	32.0
232	22-09-2018 17:35:15	17 h 35	14.5	5.0	2.8	0.0	32.6
233	22-09-2018 17:36:15	17 h 36	14.5	5.0	3.0	0.0	32.8
234	22-09-2018 17:37:15	17 h 37	14.4	5.0	2.7	0.0	32.9
235	22-09-2018 17:38:15	17 h 38	14.4	5.0	2.8	0.0	33.1
236	22-09-2018 17:39:15	17 h 39	14.4	5.1	2.8	0.0	33.1
237	22-09-2018 17:40:15	17 h 40	14.4	5.1	2.8	0.0	33.4
238	28-09-2018 11:35:51	11 h 35	14.6	4.8	3.1	0.0	49.2
239	28-09-2018 11:36:51	11 h 36	14.5	4.9	2.9	0.0	49.8
240	28-09-2018 11:37:51	11 h 37	14.6	4.8	3.1	0.0	49.5
241	28-09-2018 11:38:51	11 h 38	14.4	4.9	3.2	0.0	51.6
242	28-09-2018 11:39:51	11 h 39	14.4	4.9	3.3	0.0	52.1
243	28-09-2018 11:40:51	11 h 40	14.4	4.9	3.0	0.0	52.7
244	28-09-2018 11:41:51	11 h 41	14.5	4.9	3.0	0.0	52.3
245	28-09-2018 11:42:51	11 h 42	14.5	4.9	3.2	0.0	52.7
246	28-09-2018 11:43:51	11 h 43	14.5	4.9	3.2	0.0	52.8
247	28-09-2018 11:44:51	11 h 44	14.5	4.9	3.3	0.0	52.8
248	28-09-2018 11:45:51	11 h 45	14.4	4.9	3.1	0.0	53.5
249	28-09-2018 11:46:51	11 h 46	14.5	4.8	3.2	0.0	52.8
250	28-09-2018 11:47:51	11 h 47	14.5	4.8	3.3	0.0	53.4
251	28-09-2018 11:48:51	11 h 48	14.5	4.8	3.3	0.0	53.3
252	28-09-2018 11:49:51	11 h 49	14.5	4.8	3.2	0.0	53.8
253	28-09-2018 11:50:51	11 h 50	14.6	4.8	3.0	0.0	54.3
254	28-09-2018 11:51:51	11 h 51	14.5	4.8	2.9	0.0	54.4
255	28-09-2018 11:52:51	11 h 52	14.5	4.8	3.0	0.0	54.8
256	28-09-2018 11:53:51	11 h 53	14.5	4.8	3.2	0.0	55.3
257	28-09-2018 11:54:51	11 h 54	14.5	4.8	3.2	0.0	55.1
258	28-09-2018 11:55:51	11 h 55	14.6	4.7	3.3	0.0	54.0
259	28-09-2018 11:56:51	11 h 56	14.6	4.8	3.2	0.0	55.6
260	28-09-2018 11:57:51	11 h 57	14.5	4.8	3.2	0.0	55.6
261	28-09-2018 11:58:51	11 h 58	14.6	4.7	3.4	0.0	54.9
262	28-09-2018 11:59:51	11 h 59	14.6	4.8	2.9	0.0	55.7
263	28-09-2018 12:00:51	12 h 00	14.1	5.0	3.2	0.0	58.1
264	28-09-2018 12:01:51	12 h 01	14.7	4.7	3.2	0.0	54.9
265	28-09-2018 12:02:51	12 h 02	14.5	4.8	3.0	0.0	57.0
266	28-09-2018 12:03:51	12 h 03	14.4	4.9	2.9	0.0	57.1
267	28-09-2018 12:04:51	12 h 04	14.5	4.9	3.1	0.0	57.0
268	28-09-2018 12:05:51	12 h 05	14.4	4.9	3.0	0.0	57.8
269	28-09-2018 12:06:51	12 h 06	14.5	4.9	3.1	0.0	57.1
270	28-09-2018 12:07:51	12 h 07	14.5	4.9	3.0	0.0	56.8
271	28-09-2018 12:08:51	12 h 08	14.5	4.9	3.0	0.0	57.0
272	28-09-2018 12:09:51	12 h 09	14.5	4.8	2.9	0.0	57.3
273	28-09-2018 12:10:51	12 h 10	14.5	4.9	3.1	0.0	57.3
274	28-09-2018 12:11:51	12 h 11	14.5	4.9	3.2	0.0	57.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
275	28-09-2018 12:12:51	12 h 12	14.6	4.8	3.2	0.0	55.9
276	28-09-2018 12:13:51	12 h 13	14.5	4.8	3.2	0.0	56.7
277	28-09-2018 12:14:51	12 h 14	14.4	4.9	3.0	0.0	57.5
278	28-09-2018 12:15:51	12 h 15	14.5	4.9	3.1	0.0	57.0
279	28-09-2018 12:16:51	12 h 16	14.5	4.9	3.0	0.0	57.1
280	28-09-2018 12:17:51	12 h 17	14.5	4.8	2.9	0.0	56.8
281	28-09-2018 12:18:51	12 h 18	14.5	4.9	3.0	0.0	57.7
282	28-09-2018 12:19:51	12 h 19	14.6	4.8	2.8	0.0	56.5
283	28-09-2018 12:20:51	12 h 20	14.5	4.9	2.9	0.0	57.3
284	28-09-2018 12:21:51	12 h 21	14.5	4.9	3.0	0.0	57.3
285	28-09-2018 12:22:51	12 h 22	14.5	4.9	3.0	0.0	56.9
286	28-09-2018 12:23:51	12 h 23	14.5	4.9	3.0	0.0	56.9
287	28-09-2018 12:24:51	12 h 24	14.5	4.9	2.9	0.0	56.6
288	28-09-2018 12:25:51	12 h 25	14.5	4.9	3.0	0.0	56.8
289	28-09-2018 12:26:51	12 h 26	14.5	4.9	2.9	0.0	56.8
290	28-09-2018 12:27:51	12 h 27	14.5	4.9	2.9	0.0	57.7
291	28-09-2018 12:28:51	12 h 28	15.1	4.5	3.8	0.0	49.5
292	28-09-2018 12:29:51	12 h 29	15.3	4.4	3.8	0.0	48.8
293	28-09-2018 12:30:51	12 h 30	15.2	4.4	3.8	0.0	49.2
294	28-09-2018 12:31:51	12 h 31	15.2	4.4	3.7	0.0	49.5
295	28-09-2018 12:32:51	12 h 32	15.2	4.4	3.6	0.0	48.9
296	28-09-2018 12:33:51	12 h 33	15.1	4.4	3.7	0.0	49.5
297	28-09-2018 12:34:51	12 h 34	15.2	4.4	3.6	0.0	48.8
298	28-09-2018 12:35:51	12 h 35	15.1	4.4	3.5	0.0	49.0
299	28-09-2018 12:36:51	12 h 36	15.2	4.4	3.8	0.0	48.7
300	28-09-2018 12:37:51	12 h 37	15.2	4.4	3.7	0.0	48.7
301	28-09-2018 12:38:51	12 h 38	15.2	4.4	3.8	0.0	48.9
302	28-09-2018 12:39:51	12 h 39	15.3	4.4	3.8	0.0	48.7
303	28-09-2018 12:40:51	12 h 40	15.1	4.4	3.7	0.0	49.3
304	28-09-2018 12:41:51	12 h 41	15.2	4.3	3.6	0.0	49.1
305	28-09-2018 12:42:51	12 h 42	15.2	4.4	3.6	0.0	49.2
306	28-09-2018 12:43:51	12 h 43	15.2	4.4	3.7	0.0	49.1
307	28-09-2018 12:44:51	12 h 44	15.2	4.3	3.5	0.0	49.1
308	28-09-2018 12:45:51	12 h 45	15.3	4.3	3.7	0.0	48.7
309	28-09-2018 12:46:51	12 h 46	15.3	4.3	3.7	0.0	48.5
310	28-09-2018 12:47:51	12 h 47	15.2	4.3	3.6	0.0	49.1
311	28-09-2018 12:48:51	12 h 48	15.2	4.3	3.7	0.0	49.0
312	28-09-2018 12:49:51	12 h 49	15.3	4.3	3.7	0.0	48.7
313	28-09-2018 12:50:51	12 h 50	15.2	4.3	3.4	0.0	49.0
314	28-09-2018 12:51:51	12 h 51	15.3	4.3	3.7	0.0	48.2
315	28-09-2018 12:52:51	12 h 52	15.3	4.3	3.7	0.0	47.3
316	28-09-2018 12:53:51	12 h 53	15.3	4.3	3.5	0.0	47.9
317	28-09-2018 12:54:51	12 h 54	15.3	4.3	3.6	0.0	47.6
318	28-09-2018 12:55:51	12 h 55	15.2	4.3	3.6	0.0	47.9
319	28-09-2018 12:56:51	12 h 56	15.3	4.3	3.6	0.0	47.3
320	28-09-2018 12:57:51	12 h 57	15.3	4.3	3.5	0.0	47.8
321	28-09-2018 12:58:51	12 h 58	15.3	4.3	3.4	0.0	47.1
322	28-09-2018 12:59:51	12 h 59	15.3	4.3	3.4	0.0	47.4
323	28-09-2018 13:00:51	13 h 00	15.3	4.3	3.4	0.0	48.0
324	28-09-2018 13:01:51	13 h 01	15.3	4.3	3.4	0.0	47.7
325	28-09-2018 13:02:51	13 h 02	15.2	4.3	3.2	0.0	48.1
326	28-09-2018 13:03:51	13 h 03	15.3	4.3	3.5	0.0	47.4
327	28-09-2018 13:04:51	13 h 04	15.3	4.3	3.3	0.0	47.7
328	28-09-2018 13:05:51	13 h 05	15.3	4.3	3.4	0.0	47.3
329	28-09-2018 13:06:51	13 h 06	15.3	4.3	3.6	0.0	47.3
330	28-09-2018 13:07:51	13 h 07	15.3	4.3	3.4	0.0	47.9
331	28-09-2018 13:08:51	13 h 08	15.3	4.3	3.5	0.0	47.4
332	28-09-2018 13:09:51	13 h 09	15.8	4.0	4.4	0.0	42.8
333	28-09-2018 13:10:51	13 h 10	15.5	4.1	3.8	0.0	45.6
334	28-09-2018 13:11:51	13 h 11	15.4	4.2	3.1	0.0	47.3
335	28-09-2018 13:12:51	13 h 12	15.3	4.3	3.3	0.0	47.9
336	28-09-2018 13:13:51	13 h 13	15.2	4.3	3.4	0.0	47.5
337	28-09-2018 13:14:51	13 h 14	15.2	4.3	3.4	0.0	47.8
338	28-09-2018 13:15:51	13 h 15	15.3	4.3	3.1	0.0	47.5
339	28-09-2018 13:16:51	13 h 16	15.2	4.4	3.4	0.0	47.7
340	28-09-2018 13:17:51	13 h 17	15.2	4.4	3.1	0.0	47.8
341	28-09-2018 13:18:51	13 h 18	15.2	4.4	3.0	0.0	48.0

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
342	28-09-2018 13:19:51	13 h 19	15.2	4.4	3.1	0.0	48.3
343	28-09-2018 13:20:51	13 h 20	15.3	4.4	3.3	0.0	47.4
344	28-09-2018 13:21:51	13 h 21	15.3	4.3	3.1	0.0	47.7
345	28-09-2018 13:22:51	13 h 22	15.3	4.3	3.4	0.0	46.9
346	28-09-2018 13:23:51	13 h 23	15.7	4.1	3.8	0.0	43.3
347	28-09-2018 13:24:51	13 h 24	15.3	4.3	3.2	0.0	47.2
348	28-09-2018 13:25:51	13 h 25	15.3	4.3	3.2	0.0	47.2
349	28-09-2018 13:26:51	13 h 26	15.3	4.3	3.4	0.0	47.8
350	28-09-2018 13:27:51	13 h 27	15.2	4.3	3.1	0.0	48.1
351	28-09-2018 13:28:51	13 h 28	15.3	4.3	3.3	0.0	48.1
352	28-09-2018 13:29:51	13 h 29	15.3	4.3	3.1	0.0	47.8
353	28-09-2018 13:30:51	13 h 30	15.4	4.3	3.3	0.0	46.8
354	28-09-2018 13:31:51	13 h 31	15.3	4.3	3.4	0.0	48.0
355	28-09-2018 13:32:51	13 h 32	15.5	4.2	3.5	0.0	45.8
356	28-09-2018 13:33:51	13 h 33	15.7	4.0	3.6	0.0	43.6
357	28-09-2018 13:34:51	13 h 34	15.7	4.0	3.4	0.0	43.2
358	28-09-2018 13:35:51	13 h 35	15.7	4.0	3.7	0.0	43.3
359	28-09-2018 13:36:51	13 h 36	15.7	4.0	3.7	0.0	43.5
360	28-09-2018 13:37:51	13 h 37	15.7	4.0	3.7	0.0	43.2
361	28-09-2018 13:38:51	13 h 38	15.7	4.0	3.5	0.0	43.2
362	28-09-2018 13:39:51	13 h 39	15.7	4.0	3.6	0.0	43.4
363	28-09-2018 13:40:51	13 h 40	15.7	4.0	3.7	0.0	43.7
364	28-09-2018 13:41:51	13 h 41	15.7	4.0	3.7	0.0	43.1
365	28-09-2018 13:42:51	13 h 42	15.7	4.0	3.6	0.0	42.8
366	28-09-2018 13:43:51	13 h 43	15.7	4.0	3.6	0.0	43.2
367	28-09-2018 13:44:51	13 h 44	15.7	4.0	3.6	0.0	43.3
368	28-09-2018 13:45:51	13 h 45	15.7	4.0	3.6	0.0	42.9
369	28-09-2018 13:46:51	13 h 46	15.7	4.0	3.7	0.0	42.8
370	28-09-2018 13:47:51	13 h 47	15.7	4.0	3.6	0.0	42.8
371	28-09-2018 13:48:51	13 h 48	15.7	4.0	3.6	0.0	42.8
372	28-09-2018 13:49:51	13 h 49	15.7	4.0	3.7	0.0	42.6
373	28-09-2018 13:50:51	13 h 50	15.7	4.0	4.1	0.0	42.2
374	28-09-2018 13:51:51	13 h 51	15.7	4.0	4.1	0.0	42.2
375	28-09-2018 13:52:51	13 h 52	15.8	4.0	3.9	0.0	41.9
376	28-09-2018 13:53:51	13 h 53	15.8	4.0	4.0	0.0	41.8
377	28-09-2018 13:54:51	13 h 54	15.7	4.0	3.9	0.0	42.3
378	28-09-2018 13:55:51	13 h 55	15.7	4.0	3.9	0.0	43.2
379	28-09-2018 13:56:51	13 h 56	15.7	4.0	3.9	0.0	43.0
380	28-09-2018 13:57:51	13 h 57	15.7	4.0	3.9	0.0	42.4
381	28-09-2018 13:58:51	13 h 58	15.7	4.0	3.8	0.0	42.7
382	28-09-2018 13:59:51	13 h 59	15.7	4.0	3.6	0.0	42.7
383	28-09-2018 14:00:51	14 h 00					
384	28-09-2018 14:01:51	14 h 01					
385	28-09-2018 14:02:51	14 h 02					
386	28-09-2018 14:03:51	14 h 03					
387	28-09-2018 14:04:51	14 h 04					
388	28-09-2018 14:05:51	14 h 05					
389	28-09-2018 14:06:51	14 h 06					
390	28-09-2018 14:07:51	14 h 07					
391	28-09-2018 14:08:51	14 h 08					
392	28-09-2018 14:09:51	14 h 09					
393	28-09-2018 14:10:51	14 h 10					
394	28-09-2018 14:11:51	14 h 11					
395	28-09-2018 14:12:51	14 h 12					
396	28-09-2018 14:13:51	14 h 13					
397	28-09-2018 14:14:51	14 h 14	15.3	4.3	2.9	0.0	43.9
398	28-09-2018 14:15:51	14 h 15	15.2	4.4	2.6	0.0	45.1
399	28-09-2018 14:16:51	14 h 16	15.2	4.4	3.0	0.0	45.1
400	28-09-2018 14:17:51	14 h 17	15.2	4.4	3.3	0.0	45.5
401	28-09-2018 14:18:51	14 h 18	15.1	4.4	2.9	0.0	46.1
402	28-09-2018 14:19:51	14 h 19	15.1	4.4	2.8	0.0	45.9
403	28-09-2018 14:20:51	14 h 20	15.2	4.4	3.3	0.0	45.0
404	28-09-2018 14:21:51	14 h 21	15.5	4.3	3.7	0.0	43.6
405	28-09-2018 14:22:51	14 h 22	15.3	4.3	3.4	0.0	44.6
406	28-09-2018 14:23:51	14 h 23	15.2	4.4	3.2	0.0	45.5
407	28-09-2018 14:24:51	14 h 24	15.1	4.4	2.9	0.0	46.1
408	28-09-2018 14:25:51	14 h 25	15.2	4.4	3.0	0.0	45.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
409	29-09-2018 16:15:41	16 h 15	12.9	6.1	3.1	-2.7	70.9
410	29-09-2018 16:16:41	16 h 16	12.9	6.1	2.8	-2.9	71.0
411	29-09-2018 16:17:41	16 h 17	12.8	6.2	2.9	-2.8	71.1
412	29-09-2018 16:18:41	16 h 18	12.9	6.1	3.2	-2.8	70.3
413	29-09-2018 16:19:41	16 h 19	12.8	6.1	3.1	-2.8	70.9
414	29-09-2018 16:20:41	16 h 20	12.9	6.1	3.0	-2.8	69.6
415	29-09-2018 16:21:41	16 h 21	13.4	5.7	3.5	-2.6	66.3
416	29-09-2018 16:22:41	16 h 22	13.5	5.6	3.1	-2.4	66.4
417	29-09-2018 16:23:41	16 h 23	13.4	5.7	3.1	-2.4	69.6
418	29-09-2018 16:24:41	16 h 24	13.0	5.9	2.6	-2.5	75.1
419	29-09-2018 16:25:41	16 h 25	12.8	6.1	2.6	-2.3	75.4
420	29-09-2018 16:26:41	16 h 26	12.8	6.1	2.7	-2.1	73.8
421	29-09-2018 16:27:41	16 h 27	12.9	6.1	2.7	-2.1	73.2
422	29-09-2018 16:28:41	16 h 28	12.9	6.0	2.6	-2.1	71.6
423	29-09-2018 16:29:41	16 h 29	13.0	6.0	2.8	-1.8	70.2
424	29-09-2018 16:30:41	16 h 30	12.9	6.1	2.8	-1.8	71.3
425	29-09-2018 16:31:41	16 h 31	13.0	6.0	2.9	-1.5	70.1
426	29-09-2018 16:32:41	16 h 32	13.0	6.0	2.9	-1.6	69.8
427	29-09-2018 16:33:41	16 h 33	12.9	6.1	3.0	-1.4	70.8
428	29-09-2018 16:34:41	16 h 34	13.0	6.0	2.7	-1.3	69.3
429	29-09-2018 16:35:41	16 h 35	13.0	6.0	2.6	-1.3	69.9
430	29-09-2018 16:36:41	16 h 36	13.0	6.0	2.7	-1.3	69.6
431	29-09-2018 16:37:41	16 h 37	13.0	6.0	2.6	-1.1	70.3
432	29-09-2018 16:38:41	16 h 38	13.0	6.0	2.7	-1.1	69.4
433	29-09-2018 16:39:41	16 h 39	13.1	5.9	2.8	-1.1	68.7
434	29-09-2018 16:40:41	16 h 40	13.7	5.6	3.0	-1.0	62.4
435	29-09-2018 16:41:41	16 h 41	13.8	5.5	3.3	-1.0	61.1
436	29-09-2018 16:42:41	16 h 42	13.7	5.5	3.2	-1.0	62.0
437	29-09-2018 16:43:41	16 h 43	13.7	5.5	3.3	-1.1	62.0
438	29-09-2018 16:44:41	16 h 44	13.8	5.4	3.4	-0.9	61.3
439	29-09-2018 16:45:41	16 h 45	13.6	5.6	2.9	-0.8	63.1
440	29-09-2018 16:46:41	16 h 46	13.7	5.5	2.9	-0.6	63.0
441	29-09-2018 16:47:41	16 h 47	13.8	5.5	3.2	-0.7	62.3
442	29-09-2018 16:48:41	16 h 48	13.7	5.5	2.8	-0.6	62.7
443	29-09-2018 16:49:41	16 h 49	13.7	5.5	2.8	-0.5	62.5
444	29-09-2018 16:50:41	16 h 50	13.7	5.5	2.9	-0.3	62.9
445	29-09-2018 16:51:41	16 h 51	13.7	5.5	2.9	-0.2	63.4
446	29-09-2018 16:52:41	16 h 52	13.7	5.5	2.8	-0.2	63.6
447	29-09-2018 16:53:41	16 h 53	13.7	5.5	3.1	0.0	63.7
448	29-09-2018 16:54:41	16 h 54	13.7	5.5	3.1	0.2	63.5
449	29-09-2018 16:55:41	16 h 55	13.7	5.5	3.1	0.3	63.5
450	29-09-2018 16:56:41	16 h 56	13.7	5.5	3.0	0.5	63.7
451	29-09-2018 16:57:41	16 h 57	13.7	5.5	3.1	0.5	64.3
452	29-09-2018 16:58:41	16 h 58	13.7	5.5	2.9	0.7	63.7
453	29-09-2018 16:59:41	16 h 59	13.7	5.5	2.6	0.8	63.9
454	29-09-2018 17:00:41	17 h 00	13.7	5.5	3.1	0.8	64.2
455	29-09-2018 17:01:41	17 h 01	13.7	5.5	2.8	0.9	64.4
456	29-09-2018 17:02:41	17 h 02	13.7	5.5	2.8	1.1	64.4
457	29-09-2018 17:03:41	17 h 03	13.7	5.5	2.8	1.2	64.4
458	29-09-2018 17:04:41	17 h 04	13.7	5.5	2.8	1.3	64.0
459	29-09-2018 17:05:41	17 h 05	13.7	5.5	3.0	1.4	64.3
460	29-09-2018 17:06:41	17 h 06	13.7	5.5	2.8	1.6	64.5
461	29-09-2018 17:07:41	17 h 07	13.7	5.5	3.0	1.4	64.6
462	29-09-2018 17:08:41	17 h 08	13.7	5.5	3.0	1.5	64.5
463	29-09-2018 17:09:41	17 h 09	13.7	5.5	3.0	1.5	64.4
464	29-09-2018 17:10:41	17 h 10	13.7	5.5	3.0	1.4	63.8
465	29-09-2018 17:11:41	17 h 11	13.7	5.5	2.8	1.6	63.8
466	29-09-2018 17:12:41	17 h 12	13.9	5.4	3.2	1.7	60.9
467	29-09-2018 17:13:41	17 h 13	14.1	5.2	3.3	1.6	59.2
468	29-09-2018 17:14:41	17 h 14	14.2	5.2	3.3	1.6	58.3
469	29-09-2018 17:15:41	17 h 15	14.2	5.2	3.1	1.7	58.3
470	29-09-2018 17:16:41	17 h 16	14.2	5.2	3.4	1.9	57.6
471	29-09-2018 17:17:41	17 h 17	14.2	5.2	3.4	2.0	57.8
472	29-09-2018 17:18:41	17 h 18	14.2	5.1	3.3	2.1	57.6
473	29-09-2018 17:19:41	17 h 19	14.2	5.2	3.4	2.3	58.4
474	29-09-2018 17:20:41	17 h 20	14.2	5.2	3.3	2.2	58.3
475	29-09-2018 17:21:41	17 h 21	14.1	5.2	3.3	2.2	58.7

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
476	29-09-2018 17:22:41	17 h 22	14.1	5.2	3.4	2.6	58.3
477	29-09-2018 17:23:41	17 h 23	14.4	5.0	3.5	2.6	55.8
478	29-09-2018 17:24:41	17 h 24	14.6	4.9	3.5	2.8	57.3
479	29-09-2018 17:25:41	17 h 25	14.4	5.0	2.9	3.0	59.1
480	29-09-2018 17:26:41	17 h 26	14.3	5.1	2.8	3.1	58.9
481	29-09-2018 17:27:41	17 h 27	14.2	5.1	3.0	3.4	59.0
482	29-09-2018 17:28:41	17 h 28	14.2	5.1	2.8	3.6	58.1
483	29-09-2018 17:29:41	17 h 29	14.2	5.1	3.0	3.4	58.8
484	29-09-2018 17:30:41	17 h 30	14.2	5.2	2.9	3.4	59.0
485	29-09-2018 17:31:41	17 h 31	14.1	5.1	2.9	3.3	59.3
486	29-09-2018 17:32:41	17 h 32	14.1	5.2	2.8	3.3	60.0
487	29-09-2018 17:33:41	17 h 33	14.2	5.1	2.9	3.1	58.7
488	29-09-2018 17:34:41	17 h 34	14.1	5.1	2.9	2.8	58.7
489	29-09-2018 17:35:41	17 h 35	14.1	5.2	2.9	2.4	59.1
490	29-09-2018 17:36:41	17 h 36	14.1	5.2	2.9	2.1	59.0
491	29-09-2018 17:37:41	17 h 37	14.1	5.2	3.0	1.9	58.4
492	29-09-2018 17:38:41	17 h 38	14.1	5.2	3.0	1.7	58.5
493	29-09-2018 17:39:41	17 h 39	14.1	5.2	3.0	1.4	58.4
494	29-09-2018 17:40:41	17 h 40	14.1	5.2	3.0	1.1	58.3
495	29-09-2018 17:41:41	17 h 41	14.1	5.2	3.3	1.1	58.8
496	29-09-2018 17:42:41	17 h 42	14.1	5.2	3.1	0.7	58.7
497	29-09-2018 17:43:41	17 h 43	14.1	5.2	3.2	0.4	58.4
498	29-09-2018 17:44:41	17 h 44	14.1	5.2	2.9	0.3	58.7
499	29-09-2018 17:45:41	17 h 45	14.1	5.2	3.2	0.1	59.5
500	29-09-2018 17:46:41	17 h 46	14.1	5.2	2.9	-0.1	59.8
501	29-09-2018 17:47:41	17 h 47	14.1	5.2	2.9	-0.3	60.0
502	29-09-2018 17:48:41	17 h 48	14.1	5.2	2.8	-0.3	60.0
503	29-09-2018 17:49:41	17 h 49	14.1	5.2	3.1	-0.4	59.5
504	29-09-2018 17:50:41	17 h 50	14.1	5.2	3.2	-0.5	58.2
505	29-09-2018 17:51:41	17 h 51	14.1	5.2	2.9	-0.5	58.2
506	29-09-2018 17:52:41	17 h 52	14.1	5.2	3.1	-0.6	58.1
507	29-09-2018 17:53:41	17 h 53	14.1	5.2	3.2	-0.7	58.1
508	29-09-2018 17:54:41	17 h 54	14.1	5.2	2.9	-0.7	58.0
509	29-09-2018 17:55:41	17 h 55	14.1	5.2	2.8	-0.6	57.9
510	29-09-2018 17:56:41	17 h 56	14.0	5.3	3.0	-0.7	58.8
511	29-09-2018 17:57:41	17 h 57	14.0	5.3	3.0	-0.8	58.3
512	29-09-2018 17:58:41	17 h 58	14.0	5.2	2.8	-0.8	58.4
513	29-09-2018 17:59:41	17 h 59	14.1	5.2	3.0	-0.7	58.0
514	29-09-2018 18:00:41	18 h 00	14.1	5.2	2.7	-0.8	57.7
515	29-09-2018 18:01:41	18 h 01	14.0	5.3	3.1	-0.7	58.8
516	29-09-2018 18:02:41	18 h 02	14.1	5.2	2.8	-0.7	57.9
517	29-09-2018 18:03:41	18 h 03	14.1	5.2	2.9	-0.8	58.1
518	29-09-2018 18:04:41	18 h 04	14.1	5.2	3.0	-0.6	57.7
519	29-09-2018 18:05:41	18 h 05	14.0	5.3	3.0	-0.6	58.4
520	29-09-2018 18:06:41	18 h 06	14.1	5.2	2.9	-0.6	58.4
521	29-09-2018 18:07:41	18 h 07	14.1	5.3	2.6	-0.7	58.0
522	29-09-2018 18:08:41	18 h 08	14.0	5.3	2.6	-0.8	58.5
523	29-09-2018 18:09:41	18 h 09	14.1	5.2	3.0	-0.8	57.6
524	29-09-2018 18:10:41	18 h 10	14.1	5.2	2.9	-0.6	57.5
525	29-09-2018 18:11:41	18 h 11	14.1	5.2	3.0	-0.5	56.8
526	29-09-2018 18:12:41	18 h 12	13.0	5.9	1.8	-0.4	69.4
527	29-09-2018 18:13:41	18 h 13	12.8	6.2	1.7	-0.3	71.8
528	29-09-2018 18:14:41	18 h 14	12.8	6.2	1.5	-0.3	71.8
529	29-09-2018 18:15:41	18 h 15	12.9	6.1	1.7	-0.3	70.5
530	29-09-2018 18:16:41	18 h 16	12.9	6.2	1.7	-0.1	72.2
531	29-09-2018 18:17:41	18 h 17	12.9	6.1	1.7	0.2	71.7
532	29-09-2018 18:18:41	18 h 18	12.9	6.1	1.5	0.1	72.6
533	29-09-2018 18:19:41	18 h 19	12.9	6.1	1.6	0.2	72.6
534	29-09-2018 18:20:41	18 h 20	12.9	6.1	1.8	0.4	71.7
535	29-09-2018 18:21:41	18 h 21	13.0	6.1	1.9	0.5	70.3
536	29-09-2018 18:22:41	18 h 22	13.0	6.1	1.6	0.7	70.9
537	29-09-2018 18:23:41	18 h 23	13.0	6.1	1.7	0.7	71.0
538	29-09-2018 18:24:41	18 h 24	13.0	6.1	1.7	0.6	71.6
539	29-09-2018 18:25:41	18 h 25	13.0	6.1	1.7	0.7	70.9
540	29-09-2018 18:26:41	18 h 26	12.9	6.1	1.7	0.9	72.6
541	29-09-2018 18:27:41	18 h 27	13.0	6.1	1.7	0.7	71.8
542	29-09-2018 18:28:41	18 h 28	13.0	6.1	1.8	0.8	72.1

	A	B	C	E	G	L	N
6	Date/Heure	Type	O2 0-25 (%vs)	CO2 0-20 (%vs	CO 0-1000 (ppmvs)	SO2 (ppmvs)	NOX (ppmvs)
543	29-09-2018 18:29:41	18 h 29	13.0	6.1	1.6	0.8	72.6
544	29-09-2018 18:30:41	18 h 30	12.9	6.1	1.7	0.8	72.3
545	29-09-2018 18:31:41	18 h 31	13.0	6.1	1.8	0.7	72.3
546	29-09-2018 18:32:41	18 h 32	13.0	6.1	1.5	0.8	72.2
547	29-09-2018 18:33:41	18 h 33	12.9	6.1	1.4	0.9	72.4
548	29-09-2018 18:34:41	18 h 34	12.9	6.1	1.7	0.8	71.8
549	29-09-2018 18:35:41	18 h 35	12.9	6.1	1.6	0.8	71.8
550	29-09-2018 18:36:41	18 h 36	13.0	6.1	1.5	0.7	71.8
551	29-09-2018 18:37:41	18 h 37	12.9	6.1	1.7	0.7	72.3
552	29-09-2018 18:38:41	18 h 38	13.0	6.1	1.6	0.8	72.3
553	29-09-2018 18:39:41	18 h 39	13.0	6.1	1.6	0.5	71.9
554	29-09-2018 18:40:41	18 h 40	12.9	6.1	1.7	0.5	72.5
555	29-09-2018 18:41:41	18 h 41	13.0	6.1	1.7	0.5	72.1
556	29-09-2018 18:42:41	18 h 42	13.0	6.1	1.4	0.4	72.4
557	29-09-2018 18:43:41	18 h 43	12.7	6.2	1.3	0.3	75.2
558	29-09-2018 18:44:41	18 h 44	12.8	6.2	1.4	0.4	74.6
559	29-09-2018 18:45:41	18 h 45	12.7	6.3	1.4	0.3	75.7
560	29-09-2018 18:46:41	18 h 46	12.6	6.3	1.3	0.2	76.4
561	29-09-2018 18:47:41	18 h 47	13.3	5.9	1.4	0.1	76.8
562	29-09-2018 18:48:41	18 h 48	13.4	5.8	1.8	-0.1	76.9
563	29-09-2018 18:49:41	18 h 49	13.5	5.7	1.8	0.0	76.2
564	29-09-2018 18:50:41	18 h 50	13.5	5.7	1.9	-0.2	76.2
565	29-09-2018 18:51:41	18 h 51	13.6	5.6	1.9	-0.4	74.8
566	29-09-2018 18:52:41	18 h 52	13.7	5.6	1.9	-0.3	74.4
567	29-09-2018 18:53:41	18 h 53	13.7	5.6	2.0	-0.5	73.5
568	29-09-2018 18:54:41	18 h 54	13.7	5.6	2.1	-0.4	73.8
569	29-09-2018 18:55:41	18 h 55	13.7	5.6	2.0	-0.7	73.6
570	29-09-2018 18:56:41	18 h 56	13.7	5.6	2.0	-0.5	72.8
571	29-09-2018 18:57:41	18 h 57	13.7	5.6	2.1	-0.8	73.6
572	29-09-2018 18:58:41	18 h 58	13.7	5.6	1.9	-0.7	73.6
573	29-09-2018 18:59:41	18 h 59	13.7	5.6	1.9	-0.8	73.5
574	29-09-2018 19:00:41	19 h 00	13.7	5.6	1.9	-0.8	73.5
575	29-09-2018 19:01:41	19 h 01	13.7	5.6	2.0	-1.0	73.7
576	29-09-2018 19:02:41	19 h 02	13.6	5.6	1.8	-1.1	74.5
577	29-09-2018 19:03:41	19 h 03	13.6	5.7	2.1	-0.8	74.2
578	29-09-2018 19:04:41	19 h 04	13.5	5.7	1.9	-0.9	75.1
579	29-09-2018 19:05:41	19 h 05	13.6	5.6	1.9	-0.9	74.0

APPENDIX 3
CALIBRATION CERTIFICATES



CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

FEUILLE D'ÉTALONNAGE DES MODULES 2018

MODULE	GAMMA (K_c)	ORIFICE (K_o) K_o	ΔH@ moy	DATE ÉTALONNAGE	COMPENSÉ 60 °F
1	1.009	0.999	0.970	13-mars-18	OUI
2	0.999	0.969	1.001	15-mars-18	OUI
3	0.990	0.950	1.188	05-déc-17	NON
4	1.001	0.946	1.040	15-août-18	NON
5	0.996	0.997	0.923	20-mars-18	NON
6	1.004	0.991	1.027	06-sept-18	OUI
7	0.981	0.994	0.928	27-oct-17	NON
8	1.013	1.037	0.958	06-juil-18	OUI
9	0.998	1.012	0.899	14-sept-17	NON
10	1.011	0.993	1.005	20-mars-18	OUI
11	0.989	0.974	1.054	06-sept-18	OUI
12	0.999	0.911	1.208	24-mai-18	NON
13	1.019	0.974	0.921	19-mars-18	NON
14	1.000	1.004	0.975	21-mars-18	OUI
15	1.000	0.982	1.021	13-nov-17	NON
16	1.017	1.027	0.872	15-sept-17	NON
17	0.987	1.050	0.833	15-sept-17	NON
18	1.002	1.013	0.896	07-sept-18	NON
19	0.997	1.000	1.005	06-sept-18	OUI
20	1.005	0.970	1.072	07-sept-18	OUI
21	0.989	1.011	0.984	13-nov-17	OUI
22	0.993	0.996	0.995	04-déc-17	NON
23	1.013	1.029	0.875	15-sept-17	NON
24	1.007	0.995	1.160	04-déc-17	NON
25	0.999	0.733	2.529	24-mai-18	NON

MODULE	GAMMA (K_C)	DATE ÉTALONNAGE
F-1	0.973	27-oct-17
F-2	0.977	05-juil-18
F-3	1.006	13-nov-17
F-4	1.009	17-juil-17
F-5	1.001	26-oct-17
F-6	1.013	22-mars-18

Version: 4
Date: 07-09-2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

FEUILLE D'ÉTALONNAGE DES MODULES 2018

MODULE	GAMMA (K_c)	ORIFICE (K_o) K_o	ΔH@ moy	DATE ÉTALONNAGE	COMPENSÉ 60 °F
1	1.009	0.999	0.970	13-mars-18	OUI
2	0.999	0.969	1.001	15-mars-18	OUI
3	0.990	0.950	1.188	05-déc-17	NON
4	1.001	0.946	1.040	15-août-18	NON
5	0.996	0.997	0.923	20-mars-18	NON
6	1.004	0.991	1.027	06-sept-18	OUI
7	0.981	0.994	0.928	27-oct-17	NON
8	1.013	1.037	0.958	06-juil-18	OUI
9	0.998	1.012	0.899	14-sept-17	NON
10	1.011	0.993	1.005	20-mars-18	OUI
11	0.989	0.974	1.054	06-sept-18	OUI
12	0.999	0.911	1.208	24-mai-18	NON
13	1.019	0.974	0.921	19-mars-18	NON
14	1.000	1.004	0.975	21-mars-18	OUI
15	1.000	0.982	1.021	13-nov-17	NON
16	1.017	1.027	0.872	15-sept-17	NON
17	0.987	1.050	0.833	15-sept-17	NON
18	1.002	1.013	0.896	07-sept-18	NON
19	0.997	1.000	1.005	06-sept-18	OUI
20	1.005	0.970	1.072	07-sept-18	OUI
21	0.989	1.011	0.984	13-nov-17	OUI
22	0.993	0.996	0.995	04-déc-17	NON
23	1.013	1.029	0.875	15-sept-17	NON
24	1.007	0.995	1.160	04-déc-17	NON
25	0.999	0.733	2.529	24-mai-18	NON

MODULE	GAMMA (K_C)	DATE ÉTALONNAGE
F-1	0.973	27-oct-17
F-2	0.977	05-juil-18
F-3	1.006	13-nov-17
F-4	1.009	17-juil-17
F-5	1.001	26-oct-17
F-6	1.013	22-mars-18

Version: 4
Date: 07-09-2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

RÉSUMÉ D'ÉTALONNAGE DES SONDES - S-03 V

Version 1 (02-03-2018)

#	Année	MDF	LV	#	1	2	3	4	5	6	7	8	9	10	11	12	Moy. V	Thermocouple (Validation)	P-T-B	Endroit
				Buse	A-312-1												---			
03-05	2018	O	O	Ct	0.797												0.797	OK	OK	LE-02-W
				E. Rel	0.6												0.6			
				Buse	3Q-371	3Q-431	3Q-503	3Q-682									---			
03-06	2018	N	Q	Ct	0.778	0.779	0.781	0.773									0.778	OK	OK	Atelier
				E. Rel	0.6	0.4	0.6	0.7									0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-07	2018	O	O	Ct	0.779	0.777	0.792	0.790	0.777	0.778	0.782	0.770	0.782	0.781	0.777	0.771	0.780	OK	OK	LE-02-W
				E. Rel	1.0	0.9	0.8	0.8	1.1	1.1	1.0	1.4	1.3	1.1	1.3	1.4	1.1			
				Buse	A-312-3												---			
03-09	2018	O	O	Ct	0.827												0.827	OK	OK	LE-14-B
				E. Rel	0.4												0.4			
				Buse	A-312-3												---			
03-10	2018	O	O	Ct	0.778												0.778	OK	OK	LE-11-V
				E. Rel	1.3												1.3			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-2	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-11	2018	O	O	Ct	0.792	0.795	0.794	0.793	0.796	0.796	0.795	0.798	0.796	0.793	0.793	0.789	0.794	OK	OK	LE-05-O
				E. Rel	1.1	0.8	1.0	1.1	1.1	1.0	1.0	0.6	1.0	1.2	0.9	1.1	1.0			
				Buse	A-312-3												---			
03-12	2018	O	O	Ct	0.791												0.791	OK	OK	LE-14-B
				E. Rel	1.1												1.1			
				Buse	A-312-3												---			
03-13	2018	O	O	Ct	0.772												0.772	OK	OK	LE-11-V
				E. Rel	0.9												0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-14	2018	O	O	Ct	0.801	0.799	0.813	0.811	0.810	0.806	0.808	0.796	0.805	0.802	0.792	0.799	0.804	OK	OK	LE-02-W
				E. Rel	1.2	0.8	1.0	0.7	0.8	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-2	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-15	2018	O	O	Ct	0.808	0.805	0.816	0.811	0.808	0.804	0.800	0.798	0.802	0.800	0.792	0.784	0.802	OK	OK	LE-02-W
				E. Rel	1.2	1.2	1.2	1.0	1.2	1.2	1.3	1.2	1.1	1.3	1.3	1.0	1.2			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-16	2018	O	O	Ct	0.790	0.790	0.794	0.796	0.797	0.794	0.794	0.791	0.800	0.802	0.796	0.793	0.795	OK	OK	LE-02-W
				E. Rel	0.7	1.1	1.3	1.1	1.2	1.3	1.1	1.2	1.4	1.5	1.1	1.1	1.2			
				Buse	A-312-3												---			
03-18	2018	O	O	Ct	0.822												0.822	OK	OK	LE-08-Br
				E. Rel	1.0												1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-19	2018	O	V	Ct	0.765	0.779	0.780	0.772	0.787	0.767	0.774	0.781	0.779	0.781	0.770	0.761	0.775	OK	OK	Atelier Qc
				E. Rel	1.0	0.4	1.0	0.7	0.6	0.0	0.0	0.0	0.0	0.9	1.0	1.0	0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-437-1	A-406-3	A-437-1	A-500-1	A-562-1	---			
03-20	2018	O	V	Ct	0.769	0.779	0.787	0.791	0.795	0.776	0.782	0.788	0.791	0.796	0.785	0.788	0.786	OK	OK	Atelier Qc
				E. Rel	1.3	0.8	1.0	1.1	1.3	1.0	1.1	1.1	1.0	1.1	1.0	1.0	1.1			
				Buse	A-312-3												---			
03-21	2018	O	O	Ct	0.805												0.805	OK	OK	LE-08-Br
				E. Rel	0.4												0.4			
				Buse	A-312-3												---			
03-22	2018	O	N	Ct	0.785												0.785	OK	OK	LE-09-G
				E. Rel	1.1												1.1			
				Buse	A-312-3												---			
03-23	2018	O	O	Ct	0.785												0.785	OK	OK	LE-09-G
				E. Rel	0.0												0.0			

Effectué par: JM / DR / JFG / SA Date: Février 2018

Endroit de la calibration: Université Laval

Vérifié par: Eric Trépanier

Signature:  Date: 2 mars 2018

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

RÉSUMÉ D'ÉTALONNAGE DES SONDES - S-05 V

Version 1 (02-03-2018)

#	Année	MDF	LV	#	1	2	3	4	5	6	7	8	9	10	11	12	Moy. V	Thermocouple (Validation)	P-T-B	Endroit
				Buse	A-312-3												---			
05-03	2018	N	O	Ct	0.769												0.769	OK	OK	LE-09-G
				E. Rel	1.5												1.5			
				Buse	A-312-3												---			
05-05	2018	O	O	Ct	0.800												0.800	OK	OK	LE-14-B
				E. Rel	1.0												1.0			
				Buse	5Q-374	5Q-434	5Q-501	5Q-681									---			
05-07	2018	N	Q	Ct	0.783	0.786	0.774	0.792									0.784	OK	OK	Atelier
				E. Rel	1.3	1.3	1.2	1.5									1.3			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-08	2018	O	O	Ct	0.786	0.786	0.783	0.780	0.783	0.779	0.779	0.781	0.809	0.804	0.798	0.802	0.789	OK	OK	LE-05-O
				E. Rel	0.4	0.8	0.8	1.3	0.9	1.2	1.3	0.8	1.4	1.2	1.3	1.2	1.1			
				Buse	A-312-3												---			
05-09	2018	O	O	Ct	0.796												0.796	OK	OK	LE-14-B
				E. Rel	1.1												1.1			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-10	2018	O	O	Ct	0.792	0.792	0.795	0.794	0.796	0.791	0.793	0.792	0.795	0.798	0.790	0.794	0.794	OK	OK	LE-05-O
				E. Rel	0.7	0.7	0.8	0.4	0.9	0.6	0.7	0.6	0.8	0.0	0.6	0.4	0.6			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-1	A-437-1	A-500-1	A-562-1	---			
05-11	2018	O	O	Ct	0.803	0.798	0.805	0.805	0.802	0.800	0.806	0.801	0.807	0.805	0.803	0.802	0.803	OK	OK	LE-02-W
				E. Rel	0.6	0.9	1.0	1.0	1.0	1.0	0.8	1.2	1.0	1.0	1.0	1.0	1.0			
				Buse	A-312-3												---			
05-12	2018	O	O	Ct	0.783												0.783	OK	OK	LE-15-B
				E. Rel	1.0												1.0			
				Buse	A-312-3												---			
05-13	2018	O	O	Ct	0.808												0.808	OK	OK	LE-11-V
				E. Rel	0.9												0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-14	2018	O	O	Ct	0.828	0.824	0.830	0.830	0.830	0.825	0.813	0.816	0.839	0.836	0.832	0.826	0.827	OK	OK	LE-02-W
				E. Rel	0.7	0.0	0.4	0.0	0.4	0.9	1.0	1.5	1.4	0.8	0.8	0.8	0.7			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-15	2018	O	O	Ct	0.774	0.778	0.785	0.787	0.783	0.783	0.782	0.783	0.787	0.791	0.777	0.775	0.782	OK	OK	LE-02-W
				E. Rel	1.5	1.3	1.0	1.0	1.1	0.7	0.7	0.7	0.9	0.7	0.4	0.7	0.9			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-16	2018	O	O	Ct	0.823	0.819	0.823	0.824	0.818	0.820	0.823	0.820	0.823	0.821	0.816	0.817	0.821	OK	OK	LE-02-W
				E. Rel	0.8	0.9	0.7	0.7	0.0	0.4	0.7	0.9	0.7	0.0	0.0	0.0	0.5			
				Buse	A-312-3												---			
05-18	2018	O	O	Ct	0.767												0.767	OK	OK	LE-08-Br
				E. Rel	0.7												0.7			
				Buse	A-312-3												---			
05-19	2018	O	O	Ct	0.830												0.830	OK	OK	LE-08-Br
				E. Rel	0.7												0.7			
				Buse	A-312-3												---			
05-20	2018	O	O	Ct	0.777												0.777	OK	OK	LE-08-Br
				E. Rel	1.0												1.0			
				Buse	A-125-1	A-180-1	A-218-5	A-250-7	A-280-5	A-312-3	A-343-2	A-375-2	A-406-3	A-437-1	A-500-1	A-562-1	---			
05-21	2018	O	V	Ct	0.812	0.815	0.812	0.808	0.820	0.811	0.820	0.813	0.815	0.817	0.815	0.809	0.814	OK	OK	Atelier Qc
				E. Rel	0.4	0.4	1.0	1.0	0.4	0.0	0.7	0.9	1.0	1.0	1.0	1.0	0.7			
				Buse	A-312-3												---			
05-22	2018	O	O	Ct	0.786												0.786	OK	OK	LE-09-G
				E. Rel	0.7												0.7			

Effectué par: JM / DR / JFG / SA

Date: Février 2018

Endroit de la calibration: Université Laval

Vérifié par: Eric Trépanier

Signature: 

Date: 2 mars 2018

APPENDIX 4
LABORATORY ANALYSIS REPORT



AGAT Laboratoires

9770 ROUTE TRANSCANADIENNE
ST. LAURENT, QUEBEC
CANADA H4S 1V9
TEL (514)337-1000
FAX (514)333-3046
http://www.agatlabs.com

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC
2022 LAVOISIER LOCAL 125
QUEBEC, QC G1N4L5
(418) 650-5960

À L'ATTENTION DE: Eric Trépanier

N° DE PROJET: Agnico Eagle/5528

N° BON DE TRAVAIL: 18M395832

HAUTE RÉSOLUTION VÉRIFIÉ PAR: Anastasia Kazakova, chimiste

DATE DU RAPPORT: 2018-11-01

VERSION*: 1

NOMBRE DE PAGES: 7

Si vous désirez de l'information concernant cette analyse, S.V.P. contacter votre chargé de projets au (514) 337-1000.

*NOTES

Nous disposerons des échantillons dans les 30 jours suivants les analyses. S.V.P. Contactez le laboratoire si vous désirez avoir un délai d'entreposage.

Cette version remplace et annule toute version, le cas échéant. Ce document ne doit pas être reproduit, sinon en entier, sans l'autorisation écrite du laboratoire. Les résultats ne se rapportent qu'aux échantillons soumis pour analyse.

AGAT Laboratoires

9770 ROUTE TRANSCANADIENNE
ST. LAURENT, QUEBEC
CANADA H4S 1V9
TEL (514)337-1000
FAX (514)333-3046
http://www.agatlabs.com

Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

				501 à 506 - Inc.		507 à 512-Inc.-2		513 à 518-Inc.-3		519 à 524-Inc.
IDENTIFICATION DE L'ÉCHANTILLON:				-1						-BL
MATRICE:				Air		Air		Air		Air
DATE D'ÉCHANTILLONNAGE:				2018-09-22		2018-09-22		2018-09-22		2018-09-22
Paramètre	Unités	C / N	LDR	9616643	LDR	9616650	LDR	9616651	LDR	9616652
2,3,7,8-TCDD (pg total)	pg		1	<1	2	5	7	<7	0.8	<0.8
1,2,3,7,8 PeCDD (pg total)	pg		3	<3	9	47	10	23	2	<2
1,2,3,4,7,8 HxCDD (pg total)	pg		3	<3	7	53	10	28	2	<2
1,2,3,6,7,8 HxCDD (pg total)	pg		3	3	6	71	10	63	2	<2
1,2,3,7,8,9 HxCDD (pg total)	pg		3	<3	7	81	10	65	2	<2
1,2,3,4,6,7,8 HpCDD (pg total)	pg		6	17	10	316	10	307	5	<5
OCDD (pg total)	pg		20	33	10	160	20	300	20	<20
2,3,7,8 TCDF (pg total)	pg		4	15	6	48	9	216	2	<2
1,2,3,7,8 PeCDF (pg total)	pg		8	<8	9	21	20	62	2	<2
2,3,4,7,8-PeCDF (pg total)	pg		6	9	7	43	10	165	2	<2
1,2,3,4,7,8 HxCDF (pg total)	pg		4	13	10	62	10	326	2	<2
1,2,3,6,7,8 HxCDF (pg total)	pg		4	9	10	25	10	120	2	<2
2,3,4,6,7,8-HxCDF (pg total)	pg		4	8	10	50	10	273	2	<2
1,2,3,7,8,9 HxCDF (pg total)	pg		6	<6	20	<20	20	30	3	<3
1,2,3,4,6,7,8 HpCDF (pg total)	pg		3	16	5	64	20	474	2	<2
1,2,3,4,7,8,9 HpCDF (pg total)	pg		6	<6	8	8	20	100	3	<3
OCDF (pg total)	pg		9	20	7	17	30	227	7	<7
Sommation des Tétrachlorodibenzodioxines	pg		1	9	2	159	7	214	0.8	3.3
Sommation des Pentachlorodibenzodioxines	pg		3	11	9	446	10	406	2	8
Sommation des Hexachlorodibenzodioxines	pg		3	25	7	900	10	718	2	5
Sommation des Heptachlorodibenzodioxines	pg		6	20	10	334	10	315	5	<5
Sommation des PCDDs	pg		20	99	10	2000	20	1950	20	<20
Sommation des Tétrachlorodibenzofuranes	pg		4	100	6	282	9	1140	2	20

Certifié par:

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AGAT Laboratoires

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FAX (514)333-3046
http://www.agatlabs.com

Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

IDENTIFICATION DE L'ÉCHANTILLON:				501 à 506 - Inc. -1		507 à 512-Inc.-2		513 à 518-Inc.-3		519 à 524-Inc. -BL
MATRICE:				Air		Air		Air		Air
DATE D'ÉCHANTILLONNAGE:				2018-09-22		2018-09-22		2018-09-22		2018-09-22
Paramètre	Unités	C / N	LDR	9616643	LDR	9616650	LDR	9616651	LDR	9616652
Sommation des Pentachlorodibenzofuranes	pg		8	72	9	406	20	1540	2	15
Sommation des Hexachlorodibenzofuranes	pg		6	32	20	172	20	963	3	3
Sommation des Heptachlorodibenzofuranes	pg		6	28	8	123	20	880	3	5
Sommation des PCDFs	pg		9	253	20	1000	30	4750	7	43
2,3,7,8-Tetra CDD (TEF 1.0)	TEQ			0		5.30		0		0
1,2,3,7,8-Penta CDD (TEF 1.0)	TEQ			0		47.2		23.4		0
1,2,3,4,7,8-Hexa CDD (TEF 0.1)	TEQ			0		5.31		2.83		0
1,2,3,6,7,8-Hexa CDD (TEF 0.1)	TEQ			0.296		7.05		6.32		0
1,2,3,7,8,9-Hexa CDD (TEF 0.1)	TEQ			0		8.11		6.46		0
1,2,3,4,6,7,8-Hepta CDD (TEF 0.01)	TEQ			0.171		3.16		3.07		0
Octa CDD (TEF 0.0001)	TEQ			0.00335		0.0160		0.0300		0
2,3,7,8-Tetra CDF (TEF 0.1)	TEQ			1.48		4.84		21.6		0
1,2,3,7,8-Penta CDF (TEF 0.05)	TEQ			0		1.03		3.12		0
2,3,4,7,8-Penta CDF (TEF 0.5)	TEQ			4.36		21.6		82.5		0
1,2,3,4,7,8-Hexa CDF (TEF 0.1)	TEQ			1.30		6.24		32.6		0
1,2,3,6,7,8-Hexa CDF (TEF 0.1)	TEQ			0.926		2.48		12.0		0
2,3,4,6,7,8-Hexa CDF (TEF 0.1)	TEQ			0.818		4.96		27.3		0
1,2,3,7,8,9-Hexa CDF (TEF 0.1)	TEQ			0		0		3.04		0
1,2,3,4,6,7,8-Hepta CDF (TEF 0.01)	TEQ			0.162		0.636		4.74		0
1,2,3,4,7,8,9-Hepta CDF (TEF 0.01)	TEQ			0		0.0830		0.998		0
Octa CDF (TEF 0.0001)	TEQ			0.00201		0.00173		0.0227		0
Sommation des PCDDs et PCDFs (TEQ)				9.51		118		230		0

Certifié par:

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Certificat d'analyse

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)

DATE DE RÉCEPTION: 2018-10-11

DATE DU RAPPORT: 2018-11-01

			501 à 506 - Inc.			519 à 524-Inc.
IDENTIFICATION DE L'ÉCHANTILLON:			-1	507 à 512-Inc.-2	513 à 518-Inc.-3	-BL
MATRICE:			Air	Air	Air	Air
DATE D'ÉCHANTILLONNAGE:			2018-09-22	2018-09-22	2018-09-22	2018-09-22
Étalon de recouvrement	Unités	Limites	9616643	9616650	9616651	9616652
13C-2378-TCDF	%	30-140	56	60	45	54
13C-12378-PeCDF	%	30-140	48	48	38	52
13C-23478-PeCDF	%	30-140	71	60	56	55
13C-123478-HxCDF	%	30-140	84	89	72	73
13C-123678-HxCDF	%	30-140	94	95	68	88
13C-234678-HxCDF	%	30-140	104	109	68	86
13C-123789-HxCDF	%	30-140	94	101	60	72
13C-1234678-HpCDF	%	30-140	70	72	49	64
13C-1234789-HpCDF	%	30-140	57	61	51	55
13C-2378-TCDD	%	30-140	75	73	54	74
13C-12378-PeCDD	%	30-140	65	61	50	60
13C-123478-HxCDD	%	30-140	99	103	72	77
13C-123678-HxCDD	%	30-140	103	117	67	98
13C-1234678-HxCDD	%	30-140	58	62	50	57
13C-OCDD	%	30-140	31	37	33	30

Commentaires: LDR - Limite de détection rapportée; C / N - Critères Normes

9616643-9616652 Le résultat en pg total correspond au composite de chacune des parties du train d'échantillonnage.

Certifié par:

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Contrôle de qualité

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC
N° BON DE TRAVAIL: 18M395832
N° DE PROJET: Agnico Eagle/5528
À L'ATTENTION DE: Eric Trépanier
PRÉLEVÉ PAR:
LIEU DE PRÉLÈVEMENT:

Analyse haute résolution

Date du rapport: 2018-11-01			DUPLICATA			MATÉRIAU DE RÉFÉRENCE				BLANC FORTIFIÉ			ÉCH. FORTIFIÉ		
PARAMÈTRE	Lot	N° éch.	Dup #1	Dup #2	% d'écart	Blanc de méthode	% Récup.	Limites		% Récup.	Limites		% Récup.	Limites	
								Inf.	Sup.		Inf.	Sup.		Inf.	Sup.
Dioxines et furanes - Air (train d'échantillonnage - OMS 1998)															
2,3,7,8-TCDD (pg total)	1	MR	32	30	0.0	< 0.7	80%	70%	130%	NA	70%	130%	74%	70%	130%
1,2,3,7,8 PeCDD (pg total)	1	MR	165	178	0.0	< 2	82%	70%	130%	NA	70%	130%	89%	70%	130%
1,2,3,4,7,8 HxCDD (pg total)	1	MR	179	180	0.0	< 2	89%	70%	130%	NA	70%	130%	90%	70%	130%
1,2,3,6,7,8 HxCDD (pg total)	1	MR	197	183	0.0	< 2	99%	70%	130%	NA	70%	130%	92%	70%	130%
1,2,3,7,8,9 HxCDD (pg total)	1	MR	201	183	0.0	< 2	100%	70%	130%	NA	70%	130%	91%	70%	130%
1,2,3,4,6,7,8 HpCDD (pg total)	1	MR	184	179	0.0	< 2	92%	70%	130%	NA	70%	130%	89%	70%	130%
OCDD (pg total)	1	MR	376	341	0.0	< 4	94%	70%	130%	NA	70%	130%	85%	70%	130%
2,3,7,8 TCDF (pg total)	1	MR	37	39	0.0	< 2	92%	70%	130%	NA	70%	130%	97%	70%	130%
1,2,3,7,8 PeCDF (pg total)	1	MR	208	214	0.0	< 2	104%	70%	130%	NA	70%	130%	107%	70%	130%
2,3,4,7,8-PeCDF (pg total)	1	MR	204	215	0.0	< 1	102%	70%	130%	NA	70%	130%	107%	70%	130%
1,2,3,4,7,8 HxCDF (pg total)	1	MR	197	194	0.0	< 2	98%	70%	130%	NA	70%	130%	97%	70%	130%
1,2,3,6,7,8 HxCDF (pg total)	1	MR	209	209	0.0	< 2	105%	70%	130%	NA	70%	130%	105%	70%	130%
2,3,4,6,7,8-HxCDF (pg total)	1	MR	209	203	0.0	< 2	105%	70%	130%	NA	70%	130%	102%	70%	130%
1,2,3,7,8,9 HxCDF (pg total)	1	MR	196	197	0.0	< 3	98%	70%	130%	NA	70%	130%	98%	70%	130%
1,2,3,4,6,7,8 HpCDF (pg total)	1	MR	195	187	0.0	< 2	97%	70%	130%	NA	70%	130%	94%	70%	130%
1,2,3,4,7,8,9 HpCDF (pg total)	1	MR	197	190	0.0	< 3	99%	70%	130%	NA	70%	130%	95%	70%	130%
OCDF (pg total)	1	MR	427	401	0.0	< 3	107%	70%	130%	NA	70%	130%	100%	70%	130%

Certifié par:

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Sommaire de méthode

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
Analyse haute résolution					
2,3,7,8-TCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8 PeCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9 HxCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8 HpCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
OCDD (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8 TCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8 PeCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,7,8-PeCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,6,7,8-HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9 HxCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8 HpCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8,9 HpCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
OCDF (pg total)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Tétrachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Pentachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Hexachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Heptachlorodibenzodioxines	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDDs	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Tétrachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Pentachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Hexachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des Heptachlorodibenzofuranes	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDFs	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8-Tetra CDD (TEF 1.0)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8-Penta CDD (TEF 1.0)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9-Hexa CDD (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8-Hepta CDD (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Octa CDD (TEF 0.0001)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,7,8-Tetra CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8-Penta CDF (TEF 0.05)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,7,8-Penta CDF (TEF 0.5)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR_151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,6,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
2,3,4,6,7,8-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,7,8,9-Hexa CDF (TEF 0.1)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,6,7,8-Hepta CDF (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
1,2,3,4,7,8,9-Hepta CDF (TEF 0.01)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS

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Sommaire de méthode

NOM DU CLIENT: CONSULAIR GASTON BOULANGER INC

N° BON DE TRAVAIL: 18M395832

N° DE PROJET: Agnico Eagle/5528

À L'ATTENTION DE: Eric Trépanier

PRÉLEVÉ PAR:

LIEU DE PRÉLÈVEMENT:

PARAMÈTRE	PRÉPARÉ LE	ANALYSÉ LE	AGAT P.O.N.	RÉFÉRENCE DE LITTÉRATURE	TECHNIQUE ANALYTIQUE
Octa CDF (TEF 0.0001)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
Sommation des PCDDs et PCDFs (TEQ)	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-2378-TCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-12378-PeCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-23478-PeCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123478-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123678-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-234678-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123789-HxCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234678-HpCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234789-HpCDF	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-2378-TCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-12378-PeCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123478-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-123678-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-1234678-HxCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS
13C-OCDD	2018-10-25	2018-10-31	HR-151-5400	EPA 1613/EPA Method 23	HRMS

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CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

RAPPORT D'ESSAI

Date : 21 novembre 2018

Réf : P2334-1

Client

 # Client : C8

Nom : Trépanier Éric

Téléphone : (418) 650-5960 # 2208

Courriel : eric.trepanier@consul-air.com

Adresse :
CONSULAIR Québec
125-2022,rue Lavoisier
Québec QC
G1N 4L5 Canada

Résumé du projet

Nb. d'objets : 4

 # Projet lab. : P2334

Votre # projet : 18-5528

Chantier : Agnico-Eagle

Résumé des essais

Paramètre(s) non accrédités

ST	Paramètre	Q.	Principe (Méthode)	Matrice
	Chlorures (Cl)	4	Spectrophotométrie	Eau

ST : Paramètre Sous-Traité

Résultats d'essai(s)

ST	Param.	Échantillon (s)		Dates			Résultat(s)		LDR
		# Lab	*# Client*	*Échantillon.*	*Récep.*	*Essai*	*Valeur*	*Unité*	
	Cl	171018-8	**304 - Inc - B1 - 1**	22-09-18	17-10-18	30-10-18	**86.87**	mg	1.76
		171018-9	**312 - Inc - B1 - 2**	28-09-18	17-10-18	30-10-18	**33.16**	mg	0.73
		171018-10	**320 - Inc - B1 - 3**	29-09-18	17-10-18	30-10-18	**119.33**	mg	1.87
		171018-11	**328 - Bl - Eau - Bl**	23-09-18	17-10-18	30-10-18	**< LDR**	mg	0.04

ST : Essai Sous-Traité
LDR : Limite de Détection Rapportée

Commentaire(s)

1.

Contrôle de qualité

ST	Param.	Date	# Réf	Type	Résultat(s)		LDR
					Valeur	***Unité***	
	Cl	30-10-18	BL3010	BL	< LDR	mg/l	0.39
			MR3010	MR	103.4	% Récup.	-
			AD171018-9	AD	103.1	% Récup.	-
			AD171018-11	AD	101.8	% Récup.	-

ST : Contrôle qualité Sous-Traité
 # Réf : Référence du contrôle qualité dans le système de suivi du laboratoire
BL : Blanc
MR : Matériau de Référence
DP : Duplicata
RP : Réplicata
AD : Ajout Dosé
EA : Étalon Analogue
TM: Témoin de l'extraction
LDR : Limite de Détection Rapportée

Signature

Les résultats ne se rapportent qu'aux objets soumis à l'essai
Tout ou partie de ce document ne peut être reproduit sans l'autorisation du laboratoire de CONSULAIR.
Ce rapport d'essai est certifié par la (les) personne(s) mentionnée(s) ci-après.
Pour toute question concernant ce certificat d'analyse, veuillez vous adresser directement à :





Malha Kirèche

Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE
Votre # Bordereau: N/A

Attention: Éric Trépanier

CONSULAIR INC.
2022 Lavoisier
Local 125
Québec, QC
Canada G1N 4L5

Date du rapport: 2018/11/21
Rapport: R2413187
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B847715
Reçu: 2018/10/19, 12:30

Matrice: FILTRE
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles totaux par ICP-MS	4	2018/11/06	2018/11/06	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Matrice: Solution barboteur
Nombre d'échantillons reçus: 16

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Mercure par AAVF	2	2018/10/30	2018/10/31	STL SOP-00042	MA.200–Hg 1.1 R1 m
Mercure par AAVF	2	2018/11/01	2018/11/05	STL SOP-00042	MA.200–Hg 1.1 R1 m
Métaux extractibles	5	2018/11/01	2018/11/05	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Métaux extractibles	3	2018/11/06	2018/11/07	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Métaux extractibles	4	2018/11/14	2018/11/17	STL SOP-00075	MA.200–Mét. 1.2 R5 m
Volume d'échantillon	3	2018/11/02	2018/11/02		

Matrice: SOLVANT
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles	4	2018/11/06	2018/11/07	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Matrice: TRAIN
Nombre d'échantillons reçus: 4

Analyses	Quantité	Date de l' extraction	Date Analysé	Méthode de laboratoire	Référence Primaire
Métaux extractibles	4	2018/11/01	2018/11/08	STL SOP-00075	MA.200–Mét. 1.2 R5 m

Remarques:

Les laboratoires Maxxam sont certifiés ISO/IEC 17025:2005 pour certains paramètres précis des portées d'accréditation. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tels que le CCME, le MDDELCC, l'EPA et l'APHA.

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE
Votre # Bordereau: N/A

Attention: Éric Trépanier

CONSULAIR INC.
2022 Lavoisier
Local 125
Québec, QC
Canada G1N 4L5

Date du rapport: 2018/11/21
Rapport: R2413187
Version: 1 - Finale

CERTIFICAT D'ANALYSES

 # DE DOSSIER MAXXAM: B847715
Reçu: 2018/10/19, 12:30

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliqués par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères de CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire. Le cas échéant, sauf indication contraire, l'incertitude de mesure n'a pas été prise en considération lors de la déclaration de la conformité à la norme de référence.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit. Maxxam ne peut pas garantir l'exactitude des résultats qui dépendent des renseignements fournis par le client ou son représentant.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés. Si l'échantillonnage n'est pas effectué par Maxxam, les résultats se rapportent aux échantillons fournis pour analyse.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.
Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

Note : Les paramètres inclus dans le présent certificat sont accrédités par le MDDELCC, à moins d'indication contraire.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Argyro Frangoulis, Chargée de projets
Courriel: afrangoulis@maxxam.ca
Téléphone (514)448-9001 Ext:7066229

==========

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5271	FX5271			FX5389		
Date d'échantillonnage		2018/09/22	2018/09/22			2018/09/22		
# Bordereau		N/A	N/A			N/A		
	Unités	**305-INC-B2345-1 VT:334ML**	**305-INC-B2345-1 VT:334ML Dup. de Lab.**	**LDR**	**Lot CQ**	**307+308-INC-B67-1 VT:615ML**	**LDR**	**Lot CQ**
MÉTAUX								
Aluminium (Al) †	ug	9	8	3	1949070			
Antimoine (Sb) †	ug	<0.3	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	<2	2	1949070			
Arsenic (As) †	ug	<0.3	<0.3	0.3	1949070			
Baryum (Ba) †	ug	0.2	0.2	0.2	1949070			
Béryllium (Be) †	ug	<0.2	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	<0.2	0.2	1949070			
Bore (B) †	ug	2.6	3.6	0.7	1949070			
Cadmium (Cd) †	ug	1.4	1.4	0.2	1949070			
Calcium (Ca) †	ug	126	123	20	1949070			
Chrome (Cr) †	ug	<0.3	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	2.1	1.9	0.3	1949070			
Etain (Sn) †	ug	24	23	2	1949070			
Fer (Fe) †	ug	21	20	20	1949070			
Lithium (Li) †	ug	<3	<3	3	1949070			
Magnésium (Mg) †	ug	96	93	7	1949070			
Manganèse (Mn) †	ug	49.3	49.4	0.3	1949070			
Mercure (Hg)	ug					0.85	0.31	1949380
Mercure (Hg) †	ug	0.4	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	<2	2	1949070			
Nickel (Ni) †	ug	0.4	0.4	0.3	1949070			
Plomb (Pb) †	ug	<2	<2	2	1949070			
Potassium (K) †	ug	34	41	30	1949070			
Sélénium (Se) †	ug	<0.3	<0.3	0.3	1949070			
Silicium (Si) †	ug	46	49	20	1949070			
Sodium (Na) †	ug	<20	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	<3	3	1949070			
Vanadium (V) †	ug	<0.7	<0.7	0.7	1949070			
Zinc (Zn) †	ug	7.5	7.1	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5496			FX5497		
Date d'échantillonnage		2018/09/28			2018/09/28		
# Bordereau		N/A			N/A		
	Unités	**313-INC-B2345-2 VT:323ML**	**LDR**	**Lot CQ**	**315+316-INC-B67-2 VT:625ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	7	3	1949070			
Antimoine (Sb) †	ug	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	2	1949070			
Arsenic (As) †	ug	<0.3	0.3	1949070			
Baryum (Ba) †	ug	0.4	0.2	1949070			
Béryllium (Be) †	ug	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	0.2	1949070			
Bore (B) †	ug	0.9	0.6	1949070			
Cadmium (Cd) †	ug	0.5	0.2	1949070			
Calcium (Ca) †	ug	60	20	1949070			
Chrome (Cr) †	ug	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	0.4	0.3	1949070			
Etain (Sn) †	ug	22	2	1949070			
Fer (Fe) †	ug	<20	20	1949070			
Lithium (Li) †	ug	<3	3	1949070			
Magnésium (Mg) †	ug	13	6	1949070			
Manganèse (Mn) †	ug	3.1	0.3	1949070			
Mercure (Hg)	ug				0.60	0.31	1949380
Mercure (Hg) †	ug	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	2	1949070			
Nickel (Ni) †	ug	<0.3	0.3	1949070			
Plomb (Pb) †	ug	<2	2	1949070			
Potassium (K) †	ug	<30	30	1949070			
Sélénium (Se) †	ug	<0.3	0.3	1949070			
Silicium (Si) †	ug	21	20	1949070			
Sodium (Na) †	ug	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	3	1949070			
Vanadium (V) †	ug	<0.6	0.6	1949070			
Zinc (Zn) †	ug	1.3	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5498			FX5499		
Date d'échantillonnage		2018/09/29			2018/09/29		
# Bordereau		N/A			N/A		
	Unités	**321-INC-B2345-3 VT:330ML**	**LDR**	**Lot CQ**	**323+324-INC-B67-3 VT:625ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	9	3	1949070			
Antimoine (Sb) †	ug	<0.3	0.3	1949070			
Argent (Ag) †	ug	<2	2	1949070			
Arsenic (As) †	ug	<0.3	0.3	1949070			
Baryum (Ba) †	ug	<0.2	0.2	1949070			
Béryllium (Be) †	ug	<0.2	0.2	1949070			
Bismuth (Bi) †	ug	<0.2	0.2	1949070			
Bore (B) †	ug	6.7	0.7	1949070			
Cadmium (Cd) †	ug	0.3	0.2	1949070			
Calcium (Ca) †	ug	137	20	1949070			
Chrome (Cr) †	ug	<0.3	0.3	1949070			
Cobalt (Co) †	ug	<0.3	0.3	1949070			
Cuivre (Cu) †	ug	2.3	0.3	1949070			
Etain (Sn) †	ug	23	2	1949070			
Fer (Fe) †	ug	54	20	1949070			
Lithium (Li) †	ug	<3	3	1949070			
Magnésium (Mg) †	ug	39	7	1949070			
Manganèse (Mn) †	ug	1.2	0.3	1949070			
Mercure (Hg)	ug				<0.31	0.31	1948181
Mercure (Hg) †	ug	<0.2	0.2	1949070			
Molybdène (Mo) †	ug	<2	2	1949070			
Nickel (Ni) †	ug	0.3	0.3	1949070			
Plomb (Pb) †	ug	<2	2	1949070			
Potassium (K) †	ug	<30	30	1949070			
Sélénium (Se) †	ug	<0.3	0.3	1949070			
Silicium (Si) †	ug	48	20	1949070			
Sodium (Na) †	ug	<20	20	1949070			
Strontium (Sr) †	ug	<0.3	0.3	1949070			
Thallium (Tl) †	ug	<0.3	0.3	1949070			
Titane (Ti) †	ug	<3	3	1949070			
Vanadium (V) †	ug	<0.7	0.7	1949070			
Zinc (Zn) †	ug	4.4	0.3	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

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Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FX5500			FX5502		
Date d'échantillonnage		2018/09/23			2018/09/23		
# Bordereau		N/A			N/A		
	Unités	**329-BL-B123-BL VT:200ML**	**LDR**	**Lot CQ**	**330+331-BL-B56-BL VT:325ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	4	2	1949070			
Antimoine (Sb) †	ug	<0.2	0.2	1949070			
Argent (Ag) †	ug	<1	1	1949070			
Arsenic (As) †	ug	<0.2	0.2	1949070			
Baryum (Ba) †	ug	<0.1	0.1	1949070			
Béryllium (Be) †	ug	<0.1	0.1	1949070			
Bismuth (Bi) †	ug	<0.1	0.1	1949070			
Bore (B) †	ug	0.9	0.4	1949070			
Cadmium (Cd) †	ug	0.8	0.1	1949070			
Calcium (Ca) †	ug	43	10	1949070			
Chrome (Cr) †	ug	0.2	0.2	1949070			
Cobalt (Co) †	ug	<0.2	0.2	1949070			
Cuivre (Cu) †	ug	<0.2	0.2	1949070			
Etain (Sn) †	ug	22	1	1949070			
Fer (Fe) †	ug	19	10	1949070			
Lithium (Li) †	ug	<2	2	1949070			
Magnésium (Mg) †	ug	10	4	1949070			
Manganèse (Mn) †	ug	0.5	0.2	1949070			
Mercure (Hg)	ug				<0.16	0.16	1948181
Mercure (Hg) †	ug	<0.1	0.1	1949070			
Molybdène (Mo) †	ug	<1	1	1949070			
Nickel (Ni) †	ug	<0.2	0.2	1949070			
Plomb (Pb) †	ug	<1	1	1949070			
Potassium (K) †	ug	<20	20	1949070			
Sélénium (Se) †	ug	<0.2	0.2	1949070			
Silicium (Si) †	ug	23	10	1949070			
Sodium (Na) †	ug	<10	10	1949070			
Strontium (Sr) †	ug	<0.2	0.2	1949070			
Thallium (Tl) †	ug	<0.2	0.2	1949070			
Titane (Ti) †	ug	<2	2	1949070			
Vanadium (V) †	ug	<0.4	0.4	1949070			
Zinc (Zn) †	ug	0.5	0.2	1949070			

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
† Accréditation non existante pour ce paramètre

889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FZ0589	FZ0590		FZ0591		
Date d'échantillonnage		2018/09/22	2018/09/28		2018/09/29		
# Bordereau		N/A	N/A		N/A		
	Unités	**304-INC-B1-1 VT:180ML**	**312-INC-B1-2 VT:188ML**	**LDR**	**320-INC-B1-3 VT:240ML**	**LDR**	**Lot CQ**
MÉTAUX							
Aluminium (Al) †	ug	3	3	2	5	2	1952598
Antimoine (Sb) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Argent (Ag) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Arsenic (As) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Baryum (Ba) †	ug	0.25	0.15	0.09	0.2	0.1	1952598
Béryllium (Be) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Bismuth (Bi) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Bore (B) †	ug	19.9	9.5	0.4	92.6	0.5	1952598
Cadmium (Cd) †	ug	<0.09	<0.09	0.09	<0.1	0.1	1952598
Calcium (Ca) †	ug	18	32	9	17	10	1952598
Chrome (Cr) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Cobalt (Co) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Cuivre (Cu) †	ug	0.5	0.7	0.2	<0.2	0.2	1952598
Etain (Sn) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Fer (Fe) †	ug	<9	521	9	<10	10	1952598
Lithium (Li) †	ug	<2	<2	2	<2	2	1952598
Magnésium (Mg) †	ug	5	<4	4	<5	5	1952598
Manganèse (Mn) †	ug	1.9	4.4	0.2	0.3	0.2	1952598
Mercure (Hg) †	ug	<0.09	0.12	0.09	0.1	0.1	1952598
Molybdène (Mo) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Nickel (Ni) †	ug	0.2	0.4	0.2	<0.2	0.2	1952598
Plomb (Pb) †	ug	<0.9	<0.9	0.9	<1	1	1952598
Potassium (K) †	ug	<20	<20	20	<20	20	1952598
Sélénium (Se) †	ug	0.9	0.3	0.2	0.5	0.2	1952598
Silicium (Si) †	ug	12	11	9	148	10	1952598
Sodium (Na) †	ug	<9	<9	9	<10	10	1952598
Strontium (Sr) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Thallium (Tl) †	ug	<0.2	<0.2	0.2	<0.2	0.2	1952598
Titane (Ti) †	ug	<2	<2	2	<2	2	1952598
Vanadium (V) †	ug	<0.4	<0.4	0.4	<0.5	0.5	1952598
Zinc (Zn) †	ug	2.2	1.3	0.2	0.7	0.2	1952598

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Lot CQ = Lot contrôle qualité
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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (SOLUTION BARBOTEUR)

ID Maxxam		FZ0592		
Date d'échantillonnage		2018/09/23		
# Bordereau		N/A		
	Unités	**328-BL-EAU-BL VT:100ML**	**LDR**	**Lot CQ**
MÉTAUX				
Aluminium (Al) †	ug	<1	1	1952598
Antimoine (Sb) †	ug	<0.1	0.1	1952598
Argent (Ag) †	ug	<0.5	0.5	1952598
Arsenic (As) †	ug	<0.1	0.1	1952598
Baryum (Ba) †	ug	0.07	0.05	1952598
Béryllium (Be) †	ug	<0.05	0.05	1952598
Bismuth (Bi) †	ug	<0.05	0.05	1952598
Bore (B) †	ug	0.6	0.2	1952598
Cadmium (Cd) †	ug	<0.05	0.05	1952598
Calcium (Ca) †	ug	<5	5	1952598
Chrome (Cr) †	ug	<0.1	0.1	1952598
Cobalt (Co) †	ug	<0.1	0.1	1952598
Cuivre (Cu) †	ug	<0.1	0.1	1952598
Etain (Sn) †	ug	<0.5	0.5	1952598
Fer (Fe) †	ug	<5	5	1952598
Lithium (Li) †	ug	<1	1	1952598
Magnésium (Mg) †	ug	<2	2	1952598
Manganèse (Mn) †	ug	0.2	0.1	1952598
Mercure (Hg) †	ug	<0.05	0.05	1952598
Molybdène (Mo) †	ug	<0.5	0.5	1952598
Nickel (Ni) †	ug	<0.1	0.1	1952598
Plomb (Pb) †	ug	<0.5	0.5	1952598
Potassium (K) †	ug	<10	10	1952598
Sélénium (Se) †	ug	<0.1	0.1	1952598
Silicium (Si) †	ug	<5	5	1952598
Sodium (Na) †	ug	<5	5	1952598
Strontium (Sr) †	ug	<0.1	0.1	1952598
Thallium (Tl) †	ug	<0.1	0.1	1952598
Titane (Ti) †	ug	<1	1	1952598
Vanadium (V) †	ug	<0.2	0.2	1952598
Zinc (Zn) †	ug	0.3	0.1	1952598

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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

PARAMÈTRES CONVENTIONNELS (SOLUTION BARBOTEUR)

ID Maxxam		FY0848	FY0856	FY0857	
Date d'échantillonnage		2018/09/22	2018/09/28	2018/09/29	
# Bordereau		N/A	N/A	N/A	
	Unités	**302-INC-BS-HNO3-1**	**310-INC-BS-HNO3-2**	**318-INC-BS-HNO3-3**	**Lot CQ**
CONVENTIONNELS					
Volume final †	ml	88	110	66	1949618

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CONSULAIR INC.
Votre # du projet: 18-5528
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MÉTAUX (TRAIN)

ID Maxxam		FY0848		FY0856		FY0857		
Date d'échantillonnage		2018/09/22		2018/09/28		2018/09/29		
# Bordereau		N/A		N/A		N/A		
	Unités	**301+302+303-INC-1**	**LDR**	**309+310+311-INC-2**	**LDR**	**317+318+319-INC-3**	**LDR**	**Lot CQ**
MÉTAUX								
Aluminium (Al) †	ug	570	2	30	2	46	2	1949322
Antimoine (Sb) †	ug	245	0.1	3.6	0.1	219	0.1	1949322
Argent (Ag) †	ug	0.9	0.5	<0.6	0.6	1.3	0.5	1949322
Arsenic (As) †	ug	17.2	0.1	1.3	0.1	30.9	0.1	1949322
Baryum (Ba) †	ug	7.28	0.05	0.65	0.06	1.06	0.05	1949322
Béryllium (Be) †	ug	<0.05	0.05	<0.06	0.06	<0.05	0.05	1949322
Bismuth (Bi) †	ug	0.84	0.05	0.12	0.06	4.83	0.05	1949322
Bore (B) †	ug	4.1	0.5	4.0	0.5	3.7	0.5	1949322
Cadmium (Cd) †	ug	2.47	0.05	0.45	0.06	9.52	0.05	1949322
Calcium (Ca) †	ug	1930	50	309	50	243	50	1949322
Chrome (Cr) †	ug	18.2	0.1	5.1	0.1	73.4	0.1	1949322
Cobalt (Co) †	ug	0.5	0.1	<0.1	0.1	0.2	0.1	1949322
Cuivre (Cu) †	ug	89.1	0.1	24.7	0.1	131	0.1	1949322
Etain (Sn) †	ug	77.4	0.5	4.0	0.6	166	0.5	1949322
Fer (Fe) †	ug	1070	5	33	6	82	5	1949322
Lithium (Li) †	ug	8	1	33	1	32	1	1949322
Magnésium (Mg) †	ug	216	2	34	2	36	2	1949322
Manganèse (Mn) †	ug	16.5	0.1	15.7	0.1	4.3	0.1	1949322
Mercure (Hg)	ug	<0.1	0.1	<0.1	0.1	<0.1	0.1	1949322
Molybdène (Mo) †	ug	4.8	0.5	<0.6	0.6	8.9	0.5	1949322
Nickel (Ni) †	ug	8.1	0.3	0.4	0.3	2.0	0.3	1949322
Plomb (Pb) †	ug	127	0.5	36.0	0.6	444	0.5	1949322
Potassium (K) †	ug	10100	10	1170	10	10200	10	1949322
Sélénium (Se) †	ug	<0.5	0.5	<0.5	0.5	0.5	0.5	1949322
Silicium (Si) †	ug	717	5	148	6	397	5	1949322
Sodium (Na) †	ug	7900	10	851	10	6890	10	1949322
Strontium (Sr) †	ug	5.0	0.1	0.4	0.1	0.4	0.1	1949322
Thallium (Tl) †	ug	<0.1	0.1	<0.1	0.1	<0.1	0.1	1949322
Titane (Ti) †	ug	52	1	4	1	6	1	1949322
Vanadium (V) †	ug	0.8	0.2	<0.2	0.2	0.4	0.2	1949322
Zinc (Zn) †	ug	509	1	54	1	1070	1	1949322

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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

MÉTAUX (TRAIN)

ID Maxxam		FY0858		
Date d'échantillonnage		2018/09/23		
# Bordereau		N/A		
	Unités	**325+326+327-BL-BL**	**LDR**	**Lot CQ**
MÉTAUX				
Aluminium (Al) †	ug	4	3	1949322
Antimoine (Sb) †	ug	<0.3	0.3	1949322
Argent (Ag) †	ug	<2	2	1949322
Arsenic (As) †	ug	<0.3	0.3	1949322
Baryum (Ba) †	ug	0.2	0.2	1949322
Béryllium (Be) †	ug	<0.2	0.2	1949322
Bismuth (Bi) †	ug	<0.2	0.2	1949322
Bore (B) †	ug	4.4	0.6	1949322
Cadmium (Cd) †	ug	<0.2	0.2	1949322
Calcium (Ca) †	ug	<50	50	1949322
Chrome (Cr) †	ug	11.0	0.3	1949322
Cobalt (Co) †	ug	<0.3	0.3	1949322
Cuivre (Cu) †	ug	0.3	0.3	1949322
Etain (Sn) †	ug	<2	2	1949322
Fer (Fe) †	ug	<20	20	1949322
Lithium (Li) †	ug	<3	3	1949322
Magnésium (Mg) †	ug	8	6	1949322
Manganèse (Mn) †	ug	<0.3	0.3	1949322
Mercure (Hg)	ug	<0.2	0.2	1949322
Molybdène (Mo) †	ug	<2	2	1949322
Nickel (Ni) †	ug	<0.3	0.3	1949322
Plomb (Pb) †	ug	<2	2	1949322
Potassium (K) †	ug	<30	30	1949322
Sélénium (Se) †	ug	<0.5	0.5	1949322
Silicium (Si) †	ug	63	20	1949322
Sodium (Na) †	ug	143	20	1949322
Strontium (Sr) †	ug	<0.3	0.3	1949322
Thallium (Tl) †	ug	<0.3	0.3	1949322
Titane (Ti) †	ug	<3	3	1949322
Vanadium (V) †	ug	<0.6	0.6	1949322
Zinc (Zn) †	ug	<1	1	1949322

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REMARQUES GÉNÉRALES

MÉTAUX (SOLUTION BARBOTEUR)

Les limites de détection indiquées sont modifiées en fonction du volume d'échantillon reçu.

MÉTAUX (TRAIN)

Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.
Les limites de détection indiquées sont modifiées en fonction du volume d'échantillon reçu.

Les résultats ne se rapportent qu'aux échantillons soumis pour analyse

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RAPPORT ASSURANCE QUALITÉ

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
1948181	EHA	Blanc fortifié	Mercure (Hg)	2018/10/31		160 (1)	%
1948181	EHA	Blanc de méthode	Mercure (Hg)	2018/10/31	<0.050		ug
1949070	EHA	Blanc fortifié	Aluminium (Al)	2018/11/05		105	%
			Antimoine (Sb)	2018/11/05		110	%
			Argent (Ag)	2018/11/05		102	%
			Arsenic (As)	2018/11/05		110	%
			Baryum (Ba)	2018/11/05		106	%
			Béryllium (Be)	2018/11/05		104	%
			Bismuth (Bi)	2018/11/05		108	%
			Bore (B)	2018/11/05		112	%
			Cadmium (Cd)	2018/11/05		105	%
			Calcium (Ca)	2018/11/05		107	%
			Chrome (Cr)	2018/11/05		105	%
			Cobalt (Co)	2018/11/05		105	%
			Cuivre (Cu)	2018/11/05		106	%
			Etain (Sn)	2018/11/05		112	%
			Fer (Fe)	2018/11/05		107	%
			Lithium (Li)	2018/11/05		106	%
			Magnésium (Mg)	2018/11/05		105	%
			Manganèse (Mn)	2018/11/05		107	%
			Mercure (Hg)	2018/11/05		119	%
			Molybdène (Mo)	2018/11/05		110	%
			Nickel (Ni)	2018/11/05		104	%
			Plomb (Pb)	2018/11/05		109	%
			Potassium (K)	2018/11/05		101	%
			Sélénium (Se)	2018/11/05		109	%
			Silicium (Si)	2018/11/05		99	%
			Sodium (Na)	2018/11/05		107	%
			Strontium (Sr)	2018/11/05		118	%
			Thallium (Tl)	2018/11/05		107	%
			Titane (Ti)	2018/11/05		102	%
			Vanadium (V)	2018/11/05		107	%
			Zinc (Zn)	2018/11/05		103	%
1949070	EHA	Blanc de méthode	Aluminium (Al)	2018/11/05	<1		ug
			Antimoine (Sb)	2018/11/05	<0.1		ug
			Argent (Ag)	2018/11/05	<0.5		ug
			Arsenic (As)	2018/11/05	<0.1		ug
			Baryum (Ba)	2018/11/05	<0.05		ug
			Béryllium (Be)	2018/11/05	<0.05		ug
			Bismuth (Bi)	2018/11/05	<0.05		ug
			Bore (B)	2018/11/05	<0.2		ug
			Cadmium (Cd)	2018/11/05	<0.05		ug
			Calcium (Ca)	2018/11/05	<5		ug
			Chrome (Cr)	2018/11/05	<0.1		ug
			Cobalt (Co)	2018/11/05	<0.1		ug
			Cuivre (Cu)	2018/11/05	<0.1		ug
			Etain (Sn)	2018/11/05	<0.5		ug
			Fer (Fe)	2018/11/05	<5		ug
			Lithium (Li)	2018/11/05	<1		ug
			Magnésium (Mg)	2018/11/05	<2		ug
			Manganèse (Mn)	2018/11/05	<0.1		ug
			Mercure (Hg)	2018/11/05	<0.05		ug

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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
			Molybdène (Mo)	2018/11/05	<0.5		ug
			Nickel (Ni)	2018/11/05	<0.1		ug
			Plomb (Pb)	2018/11/05	<0.5		ug
			Potassium (K)	2018/11/05	<10		ug
			Sélénium (Se)	2018/11/05	<0.1		ug
			Silicium (Si)	2018/11/05	<5		ug
			Sodium (Na)	2018/11/05	<5		ug
			Strontium (Sr)	2018/11/05	<0.1		ug
			Thallium (Tl)	2018/11/05	<0.1		ug
			Titane (Ti)	2018/11/05	<1		ug
			Vanadium (V)	2018/11/05	<0.2		ug
			Zinc (Zn)	2018/11/05	<0.1		ug
1949380	SD2	MRC	Mercure (Hg)	2018/11/05		110	%
1949380	SD2	Blanc fortifié	Mercure (Hg)	2018/11/05		125 (1)	%
1949380	SD2	Blanc de méthode	Mercure (Hg)	2018/11/05	<0.050		ug
1952598	EHA	Blanc fortifié	Aluminium (Al)	2018/11/17		102	%
			Antimoine (Sb)	2018/11/17		100	%
			Argent (Ag)	2018/11/17		115	%
			Arsenic (As)	2018/11/17		104	%
			Baryum (Ba)	2018/11/17		113	%
			Béryllium (Be)	2018/11/17		101	%
			Bismuth (Bi)	2018/11/17		98	%
			Bore (B)	2018/11/17		105	%
			Cadmium (Cd)	2018/11/17		96	%
			Calcium (Ca)	2018/11/17		98	%
			Chrome (Cr)	2018/11/17		102	%
			Cobalt (Co)	2018/11/17		98	%
			Cuivre (Cu)	2018/11/17		100	%
			Etain (Sn)	2018/11/17		106	%
			Fer (Fe)	2018/11/17		98	%
			Lithium (Li)	2018/11/17		100	%
			Magnésium (Mg)	2018/11/17		98	%
			Manganèse (Mn)	2018/11/17		105	%
			Mercure (Hg)	2018/11/17		108	%
			Molybdène (Mo)	2018/11/17		102	%
			Nickel (Ni)	2018/11/17		98	%
			Plomb (Pb)	2018/11/17		101	%
			Potassium (K)	2018/11/17		98	%
			Sélénium (Se)	2018/11/17		103	%
			Silicium (Si)	2018/11/17		98	%
			Sodium (Na)	2018/11/17		104	%
			Strontium (Sr)	2018/11/17		109	%
			Thallium (Tl)	2018/11/17		97	%
			Titane (Ti)	2018/11/17		105	%
			Vanadium (V)	2018/11/17		102	%
			Zinc (Zn)	2018/11/17		111	%
1952598	EHA	Blanc de méthode	Aluminium (Al)	2018/11/17	<1		ug
			Antimoine (Sb)	2018/11/17	<0.1		ug
			Argent (Ag)	2018/11/17	<0.5		ug
			Arsenic (As)	2018/11/17	<0.1		ug
			Baryum (Ba)	2018/11/17	<0.05		ug
			Béryllium (Be)	2018/11/17	<0.05		ug

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CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

RAPPORT ASSURANCE QUALITÉ (SUITE)

Lot AQ/CQ	Init	Type CQ	Groupe	Date Analysé	Valeur	Réc	Unités
			Bismuth (Bi)	2018/11/17	<0.05		ug
			Bore (B)	2018/11/17	0.2, LDR=0.2		ug
			Cadmium (Cd)	2018/11/17	<0.05		ug
			Calcium (Ca)	2018/11/17	<5		ug
			Chrome (Cr)	2018/11/17	<0.1		ug
			Cobalt (Co)	2018/11/17	<0.1		ug
			Cuivre (Cu)	2018/11/17	<0.1		ug
			Etain (Sn)	2018/11/17	<0.5		ug
			Fer (Fe)	2018/11/17	<5		ug
			Lithium (Li)	2018/11/17	<1		ug
			Magnésium (Mg)	2018/11/17	<2		ug
			Manganèse (Mn)	2018/11/17	<0.1		ug
			Mercure (Hg)	2018/11/17	<0.05		ug
			Molybdène (Mo)	2018/11/17	<0.5		ug
			Nickel (Ni)	2018/11/17	<0.1		ug
			Plomb (Pb)	2018/11/17	<0.5		ug
			Potassium (K)	2018/11/17	<10		ug
			Sélénium (Se)	2018/11/17	<0.1		ug
			Silicium (Si)	2018/11/17	<5		ug
			Sodium (Na)	2018/11/17	<5		ug
			Strontium (Sr)	2018/11/17	<0.1		ug
			Thallium (Tl)	2018/11/17	<0.1		ug
			Titane (Ti)	2018/11/17	<1		ug
			Vanadium (V)	2018/11/17	<0.2		ug
			Zinc (Zn)	2018/11/17	<0.1		ug

LDR = Limite de détection rapportée

MRC: Un échantillon de concentration connue préparé dans des conditions rigoureuses par un organisme externe. Utilisé pour vérifier la justesse de la méthode.

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération

(1) La récupération ou l'écart relatif (RPD) pour ce composé est en dehors des limites de contrôle, mais l'ensemble du contrôle qualité rencontre les critères d'acceptabilité pour cette analyse

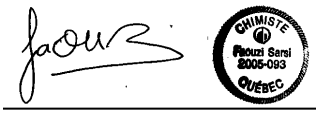
889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B847715
Date du rapport: 2018/11/21

CONSULAIR INC.
Votre # du projet: 18-5528
Adresse du site: AGNICO EAGLE MELIADINE

PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



Faouzi Sarsi, B. Sc. Chimiste



Miryam Assayag, B.Sc. Chimiste

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.

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CONSULAIR
GESTION GLOCALE AIR ET ENVIRONNEMENT

CHAÎNE DE RESPONSABILITÉ

2022-125, rue Lavoiser
Québec (Qc) G1N 4L5
Tél..: (418) 650-5960
Fax : (418) 704-2221
www.consul-air.com

Travaux effectués à : Agnico Eagle Meliadine

Projet #: 18-5528

Chargé de Projet : Eric Trépanier

LABORATOIRE RESPONSABLE DES ANALYSES :
Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
301 - Inc - BS-Acétone - 1	Acétone	BS-Acétone	1	2018-09-22	Métaux, Hg	mg	Combiner les échantillons 301 à 303 pour les métaux particulaires de la source Inc - Essai #1
302 - Inc - BS-HNO3 - 1	HNO3	BS-HNO3	1	2018-09-22	Métaux, Hg	mg	Combiner avec les échantillons 301 et 303 pour les métaux particulaires de la source Inc - Essai #1
303 - Inc - Filtre - 1	Filtre	Poids avant : 0.5266 gr	1	2018-09-22	Métaux, Hg	mg	Combiner les échantillons 301 à 303 pour les métaux particulaires de la source Inc - Essai #1
304 - Inc - B1 - 1	Eau	B1 - Vt: 180 mL	1	2018-09-22	Métaux, Hg	mg	
305 - Inc - B2345 - 1	H2O2 10% / HNO3 5%	B2345 - Vt: 334 mL	1	2018-09-22	Métaux, Hg	mg	
307 - Inc - B67 - 1	KMNO4 4%/H2SO4 10%	B67 - Vt: 390 mL	1	2018-09-22	Hg	mg	Combiner les échantillons 307 et 308 pour le Hg de la source Inc - Essai #1

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19-Oct-18 12:30
Argyro Frangoulis
B847715
AM1

REMIS PAR:	DATE:	HEURE:
REÇU PAR: Vilue Daulos	DATE: 2018/10/19	HEURE: 12:30

Page 1 de 5

DRIVER 7,7,6

ICE : YES
SEAL : NO

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Projet #:

Chargé de Projet :

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Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
308 - Inc - B67-HCl - 1	HCl	B67-HCl - Vt: 225 mL	1	2018-09-22	Hg	mg	Combiner les échantillons 307 et 308 pour le Hg de la source Inc - Essai #1
309 - Inc - BS-Acétone - 2	Acétone	BS-Acétone	1	2018-09-28	Métaux, Hg	mg	Combiner les échantillons 309 à 311 pour les métaux particulaires de la source Inc - Essai #2
310 - Inc - BS-HNO3 - 2	HNO3	BS-HNO3	1	2018-09-28	Métaux, Hg	mg	Combiner avec les échantillons 309 et 311 pour les métaux particulaires de la source Inc - Essai #2
311 - Inc - Filtre - 2	Filtre	Poids avant : 0.5248 gr	1	2018-09-28	Métaux, Hg	mg	Combiner les échantillons 309 à 311 pour les métaux particulaires de la source Inc - Essai #2
312 - Inc - B1 - 2	Eau	B1 - Vt: 188 mL	1	2018-09-28	Métaux, Hg	mg	
313 - Inc - B2345 - 2	H2O2 10% / HNO3 5%	B2345 - Vt: 323 mL	1	2018-09-28	Métaux, Hg	mg	

REMIS PAR:	DATE: 10/10/19	HEURE: 12:30
REÇU PAR: VIURI + DAVID	DATE:	HEURE:

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ICE: YES
SEAL: NO

WT: 533.

DRIVEZ

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GESTION GLOBALE AIR ET ENVIRONNEMENT

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Fax : (418) 704-2221
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Travaux effectués à : Agnico Eagle Meliadine

Projet #:

Chargé de Projet :

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Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
315 - Inc - B67 - 2	KMNO4 4%/H2SO4 10%	B67 - Vt: 400 mL	1	2018-09-28	Hg	mg	Combiner les échantillons 315 et 316 pour le Hg de la source Inc - Essai #2
316 - Inc - B67-HCl - 2	HCl	B67-HCl - Vt: 225 mL	1	2018-09-28	Hg	mg	Combiner les échantillons 315 et 316 pour le Hg de la source Inc - Essai #2
317 - Inc - BS-Acétone - 3	Acétone	BS-Acétone	1	2018-09-29	Métaux, Hg	mg	Combiner les échantillons 317 à 319 pour les métaux particulaires de la source Inc - Essai #3
318 - Inc - BS-HNO3 - 3	HNO3	BS-HNO3	1	2018-09-29	Métaux, Hg	mg	Combiner avec les échantillons 317 et 319 pour les métaux particulaires de la source Inc - Essai #3
319 - Inc - Filtre - 3	Filtre	Poids avant : 0.5182 gr	1	2018-09-29	Métaux, Hg	mg	Combiner les échantillons 317 à 319 pour les métaux particulaires de la source Inc - Essai #3
320 - Inc - B1 - 3	Eau	B1 - Vt: 240 mL	1	2018-09-29	Métaux, Hg	mg	

ICE: YES
SEAL: NO.

REMIS PAR:		DATE: 2018/10/19	HEURE: 12:30
REÇU PAR:	VILLE DAVIDE	DATE:	HEURE:

Page 3 de 5

DRIVER 7,7,6

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Fax : (418) 704-2221
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Travaux effectués à : Agnico Eagle Meliadine

Projet #: _____

Chargé de Projet : _____

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Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
321 - Inc - B2345 - 3	H2O2 10% / HNO3 5%	B2345 - Vt: 330 mL	1	2018-09-29	Métaux, Hg	mg	
323 - Inc - B67 - 3	KMNO4 4%/H2SO4 10%	B67 - Vt: 400 mL	1	2018-09-29	Hg	mg	Combiner les échantillons 323 et 324 pour le Hg de la source Inc - Essai #3
324 - Inc - B67-HCl - 3	HCl	B67-HCl - Vt: 225 mL	1	2018-09-29	Hg	mg	Combiner les échantillons 323 et 324 pour le Hg de la source Inc - Essai #3
325 - Bl - BS-Acétone - Bl	Acétone	BS-Acétone - Vt: 100 mL	1	2018-09-23	Métaux, Hg	mg	Combiner les échantillons 325 à 327 pour les métaux particulaires de la source Blanc - Essai #Bl
326 - Bl - BS-HNO3 - Bl	HNO3	BS-HNO3 - Vt: 300 mL	1	2018-09-23	Métaux, Hg	mg	Combiner avec les échantillons 325 et 327 pour les métaux particulaires de la source Blanc - Essai #Bl
327 - Bl - Filtre - Bl	Filtre	Poids avant : 0.5176 gr	1	2018-09-23	Métaux, Hg	mg	Combiner les échantillons 325 à 327 pour les métaux particulaires de la source Blanc - Essai #Bl

REMIS PAR:		DATE: 2018/10/19	HEURE: 12:30
REÇU PAR: Jules DAVIDS		DATE:	HEURE:

ICE : Yes
SEAL : No.

DAVA 7,7,6

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Québec (Qc) G1N 4L5
Tél.: (418) 650-5960
Fax : (418) 704-2221
www.consul-air.com

Travaux effectués à : Agnico Eagle - Meliadine

Projet #: _____

Chargé de Projet : _____

LABORATOIRE RESPONSABLE DES ANALYSES :
Maxxam
889 Montée de Liesse
Ville St-Laurent (Qc) H4T 1P5
Téléphone : (514) 448-9001
Télécopieur : (514) 448-5922

ÉCHANTILLON	Matrice	Fraction	Qte	Date	Paramètres	Unité	Remarque
328 - BI - Eau - BI	Eau	Eau - Vt: 100 mL	1	2018-09-23	Métaux, Hg	mg	
329 - BI - B123 - BI	H2O2 10% / HNO3 5%	B123 - Vt: 200 mL	1	2018-09-23	Métaux, Hg	mg	
330 - BI - B56 - BI	KMNO4 4%/H2SO4 10%	B56 - Vt: 100 mL	1	2018-09-23	Hg	mg	Combiner les échantillons 330 et 331 pour le Hg de la source Blanc - Essai #BI
331 - BI - B56-HCl - BI	HCl	B56-HCl - Vt: 225 mL	1	2018-09-23	Hg	mg	Combiner les échantillons 330 et 331 pour le Hg de la source Blanc - Essai #BI

REMIS PAR:		**DATE:** 2018/10/19	**HEURE:** 12:30
REÇU PAR:	TROY DAVIS	**DATE:**	**HEURE:**

DRIVER

4,7,6

ICE: YES
SEAL: NO

Page 5 de 5

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Québec, le lundi 15 octobre 2018
Argyro Frangoulis
Maxxam
Ligne Directe: 514.448.9001 #6229
Courriel: AFrangoulis@maxxam.ca

Objet : **Explications de la demande d'analyses pour le projet de Agnico Eagle (Meliadine).**
Notre no de projet : #18-5528

Bonjour Argyro,

Voici la demande d'analyse concernant le dossier mentionné précédemment. Les mesures ont été effectuées du 22 au 29 septembre 2018. Les échantillons se retrouvent dans une glacière. À cela suivra plus tard les échantillons des métaux particulaires et les échantillons d'eau (# 304, 312, 320 et 328).

DEMANDE D'ANALYSES / MÉTAUX

Les fractions filtres et buse-sonde acétone vous seront envoyées un peu plus tard afin de faire l'analyse pour les métaux particulaires. Pour chacun des essais, nous voulons un résultat combiné des 2 fractions Buse-Sonde (Acétone et HNO_3) et le Filtre (donc 3 échantillons à combiner ex. éch.# 301, 302 et 303 – 309, 310 et 311 etc. Aussi, pour le Mercure d'un même essai, les fractions de $KmnO_4$ (BB56) et de HCl 8N (BB56-HCL) doivent être combinées (ex. éch.# 307 et 308). Il est important de respecter ces combinaisons exigées.

Il y a aussi les échantillons d'eau, # 304, 312, 320 et 328 qui vont arriver plus tard. L'analyse des métaux et du Hg sera également à faire.

Les métaux à analyser sont les suivants : Al, Sb, Ag, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Mo, Ni, Pb, K, Se, Na, Ti, V, Zn, Sr, Tl, Si (Silicium soluble), Hg

Il est important de ne pas jeter les échantillons et de nous les retourner après l'analyse.

Pour des renseignements supplémentaires n'hésitez pas à communiquer avec nous.

Envoyer les résultats à eric.trepanier@consul-air.com.

Salutations.

Eric Trépanier

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

Envoi pour analyse à Maxxam
Date: 24/10/2018
Chantier: Agnico Eagle(Meliadine)
Projet: 18-5528
Projet Lab: P2333

# du Labo	# de l'échantillon	# Bécher	Date d'envoi	Retour
171018-1	301 - Inc - BS-Acétone - 1	368	24-10-2018	
171018-2	309 - Inc - BS-Acétone - 2	716	24-10-2018	
171018-3	317 - Inc - BS-Acétone - 3	735	24-10-2018	
171018-4	325 - BI - BS-Acétone - BI	#453	24-10-2018	

Note:Nous retourner SVP les béchers aprés analyse dans leurs boîtes à:

Consulair
Bureau de Repentigny
101-800 Rue Leclerc
Repentigny (Qc), J6A 2E5
Tél: (450) 654-8000 poste 2304
Fax: (450) 654-6730
Courriel: laboratoire@consul-air.com



B847715_COC

to Laurie Dowley
2018/10/24
13:00.
ice-me
seal to
driver.

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT
LABORATOIRE 483

RAPPORT D'ESSAI

Date : 25 octobre 2018

Réf : P2338-1

Client

 # Client : C8

Nom : Trépanier Éric

Téléphone : (418) 650-5960 # 2208

Courriel : eric.trepanier@consul-air.com

Adresse :
CONSULAIR Québec
125-2022,rue Lavoisier
Québec QC
G1N 4L5 Canada

Résumé du projet

Nb. d'objets : 7

 # Projet lab. : P2338

Votre # projet : 18-5517

Chantier : Agnico-Eagle

Résumé des essais

Paramètre(s) accrédités

ST	Paramètre	Q.	Principe (Méthode)	Matrice
	Matières particulaires (MP-A)	4	Gravimétrie (LPT1)	Acétone
	Matières particulaires (MP-F)	3	Gravimétrie (LPT2)	Filtre

ST : paramètre Sous-Traité

Résultats d'essai(s)

ST	Param.	Échantillon (s)		Dates			Résultat(s)		LDR
		# Lab	# Client	Échantillon.	Récep.	Essai	Valeur	Unité	
	MP-A	191018-1	**301 - Inc - BS-Acétone - 1**	05-10-18	19-10-18	19-10-18	**37.0**	mg	1.0
		191018-2	**309 - Inc - BS-Acétone - 2**	06-10-18	19-10-18	19-10-18	**53.1**	mg	1.0
		191018-3	**317 - Inc - BS-Acétone - 3**	07-10-18	19-10-18	19-10-18	**5.3**	mg	1.0
		191018-4	**325 - Bl - BS-Acétone - Bl**	06-10-18	19-10-18	19-10-18	**< LDR**	mg	1.0
	MP-F	191018-5	**303 - Inc - Filtre - 1**	05-10-18	19-10-18	24-10-18	**48.2**	mg	0.1
		191018-6	**311 - Inc - Filtre - 2**	06-10-18	19-10-18	24-10-18	**48.4**	mg	0.1
		191018-7	**319 - Inc - Filtre - 3**	07-10-18	19-10-18	24-10-18	**46.0**	mg	0.1

ST : Essai Sous-Traité
LDR : Limite de Détection Rapportée

Commentaire(s)

1. LPT1 & LPT2: Méthode MA.100-Part 1.0 (Domaine 400 de Chimie de l'air)
2. Le volume de l'échantillon 191018-4 ; V= 110 ml.

Contrôle de qualité

ST	Param.	Date	# Réf	Type	Résultat(s)		LDR
					Valeur	***Unité***	
	MP-A	19-10-18	BL1910	BL	< LDR	mg	1.0
			MR1910	MR	100.7	% Récup.	-
	MP-F	24-10-18	AP- 02 Conforme	-	-	mg	0.1

ST : Contrôle qualité Sous-Traité
 # Réf : Référence du contrôle qualité dans le système de suivi du laboratoire
BL : Blanc
MR : Matériau de Référence
DP : Duplicata
RP : Réplicata
AD : Ajout Dosé
EA : Étalon Analogue
TM: Témoin de l'extraction
LDR : Limite de Détection Rapportée

Signature

Les résultats ne se rapportent qu'aux objets soumis à l'essai
Tout ou partie de ce document ne peut être reproduit sans l'autorisation du laboratoire de CONSULAIR.
Ce rapport d'essai est certifié par la (les) personne(s) mentionnée(s) ci-après.
Pour toute question concernant ce certificat d'analyse, veuillez vous adresser directement à :



Malha Kirèche



APPENDIX 5
RAW FIELD DATA



CONSULAIR

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME. E1

February/2017

Usine : ME. Meljadine	Date : 22.05.2018	P. Bar (po Hg) :	# Cold box : ME-1		
Ville: Rankin Inlet		P. Stat. (po H_2O) :			
ID point d'émission : Incinérateur	Sonde N° : 05.07	Module N° : #25 NC	K' : 30.14		
Diamètre : 32.5	Cp : 0.774	Kc : 0.999			
Distance avant : 5 D	Buse N° : 500-502	Ko : 0.733	Niveau du manomètre: ✓		
Distance après : 2 D	Coef : 0.4684	Distance P-T°-B : ✓	Zéro du manomètre: ✓		

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										534.62								
1445	1	1	5	0.15	1.55	1300	79	79		538.31	13.4	5.7	2	-2.0	—	270		
		1		0.15	1.55	1300	82	82		541.93								
		2		0.15	1.55	1300	83	83		545.49						270		
		2		0.19	1.65	1348	84	84		549.01	14.0	5.4	2					
		3		0.18	2.00	1348	84	84		553.11								
		3		0.18	2.00	1349	85	85		557.22	14.0	5.4	2	-2.0		270		
		4		0.18	2.00	1354	86	86		561.31	14.0	5.3	2					
		4		0.18	2.00	1346	88	88		565.42								
		5		0.18	2.00	1348	88	88		569.51	13.9	5.4						
		5		0.18	2.00	1350	89	89		573.61								
		6		0.18	2.00	1361	89	89		577.68								
		6		0.18	2.00	1362	89	89		581.77								
		1		0.19	2.28	1354	92	92		586.08								
		1		0.19	2.28	1356	92	92		590.50	14.3	5.1				270		
		5		0.19	2.20	1356	94	94		595.00								
		5		0.19	2.20	1348	94	94		599.50	14.2	5.1						
		4		0.19	2.20	1352	95	95		604.03								
		4		0.19	2.20	1352	96	96		608.50								
		3		0.18	2.11	1355	97	97		613.00								
		3		0.18	2.11	1355	97	97		617.49	14.3	5.1						
		2		0.15	1.78	1377	98	98		621.69								
		2		0.15	1.80	1295	98	98		625.82								
		1		0.13	1.54	1377	99	99		629.70								
		1	D	0.13	1.54	1341	99	99		633.54				-2.0				

TDF Initial Débit (pi^3/min): < 0.01	Pression (inhg) : -15" Hg	Volume ini (pi^3):	Volume fin (pi^3): Volume (pi^3):
TDF Final Débit (pi^3/min): < 0.01	Pression (inhg) : -12" Hg	Volume ini (pi^3):	Volume fin (pi^3): Volume (pi^3):

Fuite Pitot (ΔP) : ✓

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

$\Delta P \rightarrow 0.17$ 1340

$\Delta P_x \Rightarrow 0.19$

$\Delta P_N \Rightarrow 0.13$

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI : MRE, E1 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie:	AE - MRGIADNZ	Projet:	5528
Source:	Incinérateur	Essai: MRE1	# Cold Box: MR-1
Échantillonnée le:	22.09.2018	Date de l'assemblage : 21.09.2018	Heure:

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	(NON)

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	(NON)

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	~~VIDE (optionnel)~~ OU CMM H_2O déminéralisée (100 ml)	682.1	599.7	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	722.2	693.0	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	567.3	562.3	
4	Barboteur 4 - GS mod	VIDE ✓	517.1	517.7	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	613.0	613.4	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	791.5	792.2	
7	Contenant de dessicant	GEL DE SILICE	1766.2	1747.8	(33.3)
TOTAL			5659.4	5526.1	

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES
8228.4823		

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ~~ACS~~ Optima	153394
Solution d'acide nitrique (HNO_3) 10%	A.148
Solution d'acide nitrique (HNO_3) 0.1 N	A.148
Solution d'acide sulfurique (H_2SO_4) 10%	A.136
Solution d'acide chlorhydrique (HCl) 8N	A.095
Permanganate de potassium ($KMnO_4$)	A.1017
Solution H_2O_2 10% / HNO_3 5%	A.148 / R-387

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (2/2)

August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération :	23-09-2018	Heure de récupération:	8Lxx
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)	BB 1234	✓	✓	334

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec 123	✓	✓	✓

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	390

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB1 → HCl 180 cc

BB4 → Rincé avec BB 123 parce qu'il était vide après les tests

Blancs :

100 mL Acétone		Pour la demande d'analyse, voici les échantillons:
300 mL 0.1 N HNO_3		1a- Métaux sur contenants 1 + 2 + 3
100 mL H_2O		1b- Hg sur contenants 1 + 2 + 3
200 mL Solution H_2O_2 10% / HNO_3 5%		2a- Métaux sur contenant 4
100 mL KMnO4 4% / H2SO4 10%		2b- Hg sur contenant 4
200 mL H_2O + 25 mL HCL 8N		3a- Hg sur contenant 5
Filtre Quartz (x3)		3b- Hg sur contenant 6
		3c- Hg sur contenant 7

Technicien :

Consulair
Échantillonnage de l'air
Conformité environnementale

Formulaire: F_11_V4 janvier-2014

Laboratoire - Décontamination initiale des ensembles de verrerie - MÉTAUX USEPA 29

Compagnie:	Projet:	# du Cold box : ME-1
Source:	Essai:	# du filtre :
Échantillonnée le:	Date décontamination:	Heure:

Décontamination			Rinçage Eau	Eau + Savon	Eau	Rincer H_2O démin.	Tremper HNO_3 10%	Rincer H_2O démin.	Rincer Acétone
Item (dans l'ordre)		Remarques	1 x	1 x	3 x	3 x	4 hres	3 x	3 x
By pass			✓	✓	✓	✓	✓		
Cyclone (si applicable)									
Erlenmeyer (si applicable)									
Cloche femelle									
Support à filtre en téflon									
Cloche mâle									
Coude (bas cloche - barb.)									
Barboteur 1 x1			✓	✓	✓	✓	✓	✓	✓
Barboteur 2			✓	✓	✓	✓	✓	✓	✓
Barboteur 3			✓	✓	✓	✓	✓	✓	✓
Barboteur 4 (si applicable)			✓	✓	✓	✓	✓	✓	✓
Barboteur 5 (si Hg)			✓	✓	✓	✓	✓	✓	✓
Barboteur 6 (si Hg)			✓	✓	✓	✓	✓	✓	✓
Coudes (5 ou ....)			✓	✓	✓	✓	✓	✓	✓
Liner de verre							Rincer		+ Brosser
Vérification initiale de la verrerie et du liner du train d'échantillonnage et conserver le dernier rinçage à l'acétone si nécessaire.									
Buse de verre									+ Brosser
Vérification initiale de la buse, conserver le dernier rinçage à l'acétone si nécessaire.									
N.B. Joint d'étanchéité en téflon									

Commentaires:

Décontaminé par: ID Date: 04/09/2018 Endroit: QC

Consulair
Échantillonnage de l'air
Conformité environnementale

Formulaire: F_11_V4 **janvier-2014**

Laboratoire - Décontamination initiale des ensembles de verrerie - MÉTAUX USEPA 29

Compagnie:	Projet:	# du Cold box :
Source:	Essai:	# du filtre :
Échantillonnée le:	Date décontamination:	Heure:

Décontamination			Rinçage Eau	Eau + Savon	Eau	Rincer H_2O démin.	Tremper HNO_3 10%	Rincer H_2O démin.	Rincer Acétone
Item (dans l'ordre)		**Remarques**	**1 x**	**1 x**	**3 x**	**3 x**	**4 hres**	**3 x**	**3 x**
By pass			✓	✓	✓	✓	✓	✓	✓
Cyclone (si applicable)									
Erlenmeyer (si applicable)									
Cloche femelle			✓	✓	✓	✓	✓	✓	✓
Support à filtre en téflon			✓	✓	✓	✓	✓	✓	✓
Cloche mâle			✓	✓	✓	✓	✓	✓	✓
Coude (bas cloche - barb.)									
Barboteur 1									
Barboteur 2									
Barboteur 3									
Barboteur 4 (si applicable)									
Barboteur 5 (si Hg)									
Barboteur 6 (si Hg)									
Coudes (5 ou ....)									
Liner de verre							**Rincer**		**+ Brosser**
Vérification initiale de la verrerie et du liner du train d'échantillonnage et conserver le dernier rinçage à l'acétone si nécessaire.									
Buse de verre									**+ Brosser**
Vérification initiale de la buse, conserver le dernier rinçage à l'acétone si nécessaire.									
N.B. Joint d'étanchéité en téflon									

Commentaires:

Décontaminé par: [illegible] Date: 04/09/2015 Endroit: QC

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME-EZ

February/2017

Usine : AE Meliadine	Date : 23-09-2018	P. Bar (po Hg) :	# Cold box : ME-1
Ville: Rankin Inlet		P. Stat. (po H_2O) : — 0.01	
ID point d'émission : Incinérateur	Sonde N° : 05-07 (SQ-501)	Module N° : 25 NC	K' : 28.82
Diamètre : 33 1/2"	Cp : 0.724	Kc : 0.599	
Distance avant : 50	Buse N° : SQ-434	Ko : 0.733	Niveau du manomètre: —
Distance après : 20	Coef : 0.4366	Distance P-T°-B : —	Zéro du manomètre: —

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										636.82								
1434	1	1	5	0.15	1.31	1290	72	71		670.06	14.4	4.9	3	-2.0	/	260	/	40
		1		0.15	1.28	1341	73	72		643.21								
		1		0.15	1.28	1349	73	73		646.52								
		2		0.14	1.19	1352	74	74		649.71								
		2		0.14	1.19	1354	76	76		652.87	14.6	4.7						
		2		0.14	1.19	1354	78	78		656.06					—	272	—	
		3		0.13	1.13	1344	80	80		659.14	14.7	4.7						
		3		0.13	1.13	1340	82	82		662.29								
		3		0.13	1.12	1348	83	83		665.19	14.5	4.9	3					
		4		0.13	1.12	1347	85	85		668.50								
		4		0.13	1.12	1345	86	86		671.62	14.5	4.9						
		4		0.13	1.14	1348	83	83		674.77								
		5		0.13	1.15	1334	85	85		677.84	15.2	4.4						
		5		0.13	1.11	1336	91	91		680.96								
		5		0.13	1.15	1337	92	92		684.09	15.1	4.4	4					
		6		0.12	1.06	1334	93	93		687.13								
		6		0.12	1.06	1335	94	94		690.18	15.3	4.3	4	-3.0	/	270		40
		6	▷	0.12	1.06	1340	95	95	↓	693.21								

TDF Initial Débit (pi^3/min): 0.01	Pression (inhg) : 1" Hg	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : ME-ED

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										693.21								
	2	6	5	0.12	1.07	1358	96	96		696.26	15.3	4.3	4	-30	✓	273	40	✓
		6		0.12	1.07	1338	97	97		699.31								
		6		0.12	1.08	1328	97	97		702.37	15.3	4.3	4					
		5		0.12	1.08	1344	98	98		705.44								
		5		0.12	1.08	1344	98	98		708.51					✓	271	40	✓
		5		0.12	1.08	1341	99	99		711.60	15.3	4.3	4					
		4		0.12	1.08	1342	99	99		714.66								
		4		0.10	0.90	1329	100	100		717.50								
		4		0.10	0.90	1326	100	100		720.31								
		3		0.10	0.90	1326	100	101		723.10								
		3		0.10	0.90	1330	102	102		725.88	15.3	4.0						
		3		0.10	0.90	1330	102	102		728.68								
		3		0.10	0.90	1326	103	103		731.49								
		2		0.10	0.90	1316	104	104		734.29	15.3	4.4						
		2		0.10	0.90	1317	104	104		737.13								
		1		0.10	0.90	1311	105	105		740.0								
		1	▷						▷									

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Arrêt procédé (180 min - 15 min)

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI : ME-2 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AEM - M4		Projet: 18-5528	
Source: incinérateur		Essai: 2	# Cold Box: ME-1
Échantillonnée le: 28-05-2018	Date de l'assemblage : 18-09-26		Heure: 10h30

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	NON

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6		✓	✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	NON

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	~~VIDE (optionnel) OU~~ CMM H_2O déminéralisée (100 ml)	682.6	609.7	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	707.5	684.9	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	573.5	565.5	
4	Barboteur 4 - GS mod	VIDE	520.4	520.8	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	611.7	611.2	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	781.4	783.3	
7	Contenant de dessicant	GEL DE SILICE	1782.6	1761.7	121.6
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS	
Solution d'acide nitrique (HNO_3) 10%	
Solution d'acide nitrique (HNO_3) 0.1 N	
Solution d'acide sulfurique (H_2SO_4) 10%	
Solution d'acide chlorhydrique (HCl) 8N	
Permanganate de potassium ($KMnO_4$)	
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (2/2)

August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération :	29-09-2018	Heure de récupération:	8h00
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3) +4		✓	✓	323

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec BB123			

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB1 → HCl → 188cc

BB4 → N/Pale Rincer Avec BB123

Blancs :

100 mL Acétone	
300 mL 0.1 N HNO_3	
100 mL H_2O	
200 mL Solution H_2O_2 10% / HNO_3 5%	
100 mL KMnO4 4% / H2SO4 10%	
200 mL H_2O + 25 mL HCL 8N	
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

P1

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : ME - E3

février-2017

Usine : AE Meladine	Date : 29-09-2018	P. Bar (po Hg) :	# Cold box : ME.1
Ville: Ranan Inlet		P. Stat. (po H_2O) :	
ID point d'émission : Incinérateur	Sonde N° : 05-07 Q 501	Module N° : 25 NC	K' : 28,82
Diamètre : 32,5"	Cp : 0,774	Kc : 0,999	
Distance avant : 5D	Buse N° : SQ. 434	Ko : 0,733	Niveau du manomètre: ✓
Distance après : 2D	Coef : 0,4366	Distance P-T°-B : ✓	Zéro du manomètre: ✓

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi^3)	Masse molaire O_2 (%v)	CO_2 (%v)	CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										747,13								
16h14	1	1	5	0,20	1,68	1327	78	78		750,81	12,9	6,0	3	-3,0	—	250	50	/
		1		0,20	1,72	1347	79	79		754,60								
		1		0,20	1,77	1350	80	80		758,43	13,0	6,0	3					
		2		0,20	1,71	1360	81	81		762,18								
		2		0,20	1,70	1374	81	81		765,96	12,8	6,1						
		2		0,20	1,70	1378	82	82		769,75								
		3		0,22	1,87	1380	83	83		773,68								
		3		0,23	1,95	1393	84	84		777,76	13,7	5,5				268		
		3		0,23	1,94	1401	85	85		781,76								
		4		0,23	1,94	1410	85	85		785,75								
		4		0,23	1,92	1420	86	86		789,72	13,7	5,5	3					
		4		0,23	1,93	1423	87	87		793,77								
		5		0,23	1,92	1431	88	88		797,79								
		5		0,20	1,68	1418	89	89		801,59								
		5		0,20	1,68	1430	90	90		805,38	14,5	5,2						
		6		0,20	1,69	1418	90	90		809,19	14,2	5,1						
		6		0,20	1,67	1440	90	90		813,00				-4,0		270		
		6	10	0,20	1,67	1445	91	91		816,78								

TDF Initial Débit (pi^3/min): < 0,01	Pression (inhg) :- 15" Hg	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) : ✓

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : ME-E3

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

février-2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										816.78								
	2	6	5	0.20	1.66	145	91	91		820.57	14.1	5.2	3	-3.0	—	220	90	—
		6		0.20	1.66	146	92	92		824.36								
		6		0.20	1.65	146	93	93		828.17								
		5		0.19	1.57	1476	94	94		831.88	14.0	5.3	3					
		5		0.19	1.57	1479	95	95		835.60								
	—	5		0.19	1.57	1481	96	96		839.27								
		4		0.19	1.55	1502	97	97		842.94	12.9	6.2						
		4		0.21	1.72	1518	99	99		846.82								
		4		0.21	1.71	1518	99	99		850.30								
		3		0.21	1.71	1520	100	100		854.57								
		3		0.21	1.72	1518	101	101		858.43								
	—	3		0.21	1.71	1525	101	102		862.07								
		2		0.21	1.71	1522	103	103		866.14								
		2		0.17	1.39	1522	104	104		869.62								
		2		0.17	1.44	1460	105	101		873.16								
		1		0.17	1.46	1436	106	106		876.67								
		1		0.17	1.47	1429	106	106		880.21								
		1	5	0.17	1.48	1421	107	107		883.85								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT | F_12_V9 (1/2) | CODE D'ESSAI: ME-3 | August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AE Méliadine		Projet: 5128	
Source: Incinérateur		Essai: # 3	# Cold Box: ME-1
Échantillonnée le:	Date de l'assemblage : 28-09-2018		Heure: 7h00

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre		✓	✓	✓	✓

Vérification de la buse et sondes d'échantillonnage à conserver : OUI / NON (NON)

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓

Vérification du train d'échantillonnage à conserver : OUI / NON (NON)

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS APRÈS	POIDS AVANT	POIDS TOTAL
1	Barboteur 1 - GS mod	VIDE (optionnel) OU CMM H_2O déminéralisée (100 ml)	740.1	604.4	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)	711.9	684.0	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)	575.8	570.9	
4	Barboteur 4 - GS mod	VIDE	519.6	518.9	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	623.3	624.0	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium	773.1	774.0	
7	Contenant de dessicant	GEL DE SILICE	1801.7	1783.6	18.1
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS	
Solution d'acide nitrique (HNO_3) 10%	
Solution d'acide nitrique (HNO_3) 0.1 N	
Solution d'acide sulfurique (H_2SO_4) 10%	
Solution d'acide chlorhydrique (HCl) 8N	
Permanganate de potassium ($KMnO_4$)	
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT F_12_V9 (2/2) August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération :	30 Q 2018	Heure de récupération:	9h15
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)	230+100	✓		330

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec BB 123			

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques:

BB 1 → HCl → 240 mL

BB4 avec BB 123

Blancs :

100 mL Acétone	
300 mL 0.1 N HNO_3	
100 mL H_2O	
200 mL Solution H_2O_2 10% / HNO_3 5%	
100 mL KMnO4 4% / H2SO4 10%	
200 mL H_2O + 25 mL HCL 8N	
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_12_V9 (1/2) CODE D'ESSAI : ME-BL blanc August/2018

Décontamination avant essai et détermination de l'humidité recueillie - USEPA 29

Compagnie: AER - Mel		Projet: 19-5528	
Source: Incinérateur		Essai: BL	# Cold Box: ME-1
Échantillonnée le: 2018-09-23	Date de l'assemblage : 18-09-23		Heure: 9h00

DÉCONTAMINATION AVANT ESSAI DE LA BUSE ET DE LA SONDE

Item	Remarques	Brosser acétone	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
Buse et liner de verre			✓	✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :				OUI	NON

DÉCONTAMINATION AVANT ESSAI DU TRAIN

Item	Remarques	Brosser acétone (si nécessaire)	Rincer 3x HNO_3 10%	Rincer 3x H_2O démin.	Rincer 3x Acétone
du by-pass au barboteur 6			✓	✓	✓
Vérification du train d'échantillonnage à conserver :				OUI	NON

Remarques :

VOLUME D'EAU RECUEILLI (g)

ITEM #	PIÈCES	CONTENU	POIDS		
			APRÈS	AVANT	TOTAL
1	Barboteur 1 - GS mod	VIDE (optionnel) OU CMM H_2O déminéralisée (100 ml)		603.0	
2	Barboteur 2 - GS mod	HNO_3 5% / H_2O_2 10% (100 ml)		705.1	
3	Barboteur 3 - GS	HNO_3 5% / H_2O_2 10% (100 ml)		560.1	
4	Barboteur 4 - GS mod	VIDE		519.2	
5	Barboteur 5 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium		620.4	
6	Barboteur 6 - GS mod	$KMnO_4$ 4% / H_2SO_4 10% (100 ml) recouvert d'aluminium		764.1	
7	Contenant de dessicant	GEL DE SILICE		766.7	
TOTAL					

PARTICULES TOTALES (g)

# FILTRE QUARTZ	POIDS (g)	REMARQUES

LOTS DES PRODUITS UTILISÉS

Produits	# LOT
Acétone ACS Optima	153 994
Solution d'acide nitrique (HNO_3) 10%	A-148
Solution d'acide nitrique (HNO_3) 0.1 N	A-148
Solution d'acide sulfurique (H_2SO_4) 10%	A-136
Solution d'acide chlorhydrique (HCl) 8N	A-095
Permanganate de potassium ($KMnO_4$)	AZ0F7
Solution H_2O_2 10% / HNO_3 5%	

Remarques:

Technicien :

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT F_12_V9 (2/2) August/2018

Récupération finale du dispositif de prélèvement MÉTAUX USEPA 29

Date de récupération : 24-09-2018		Heure de récupération: 10h00	
Pesée des barboteurs pour l'humidité:	✓	Nettoyage de l'extérieur des différentes pièces :	✓
Conditionnement des contenants de récupération :	✓		

Contenant 1 - Récupération du filtre (Séparateur principal)

Mettre le filtre dans un pétri propre et scellé (pince en polyéthylène ou teflon)	✓

Contenants 2 et 3 - Récupération de la buse et de la sonde

Items	Remarques	Brosser 100 ml Acétone	Rincer 100 ml HNO_3 0,1N	Niveau
de la buse à la partie avant du porte-filtre		✓	✓	✓

Contenant 4 - Récupération de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)

Items	Remarques	Rincer 100 mL HNO_3 0.1N	Niveau	Volume (mL)
de la partie arrière du porte-filtre aux barboteurs métaux (Barb. 1-2 & 3)		✓	✓	≈ 300

Contenant 5 - Récupération barboteurs 4 seul

Items	Remarques	Rincer 100 ml HNO_3 0.1N	Niveau	Volume (mL)
barboteur 4	Avec 123	✓	✓	✓

Contenant 6 - Récupération barboteurs 5 et 6 ($KMnO_4$)

Items	Remarques	Rincer 100 ml $KMnO_4/H_2SO_4$	Rincer 100 ml eau	Niveau	Volume (mL)
du barboteur 5 au barboteur 6 (pot de verre ambré)		✓	✓	✓	400

Contenant 7 - Récupération barboteurs 5 et 6 ($KMnO_4$) avec HCl 8N

Items	Remarques	200 mL H_2O dans bouteille récup. Rincer 25 mL HCl 8N	Niveau	Volume (mL)
du barboteur 5 au barboteur 6		✓	✓	225

Remarques: BB1 - HCl → 100 cc

BB4 - Rincer avec BB 123

Blancs :

100 mL Acétone	✓
300 mL 0.1 N HNO_3	✓
100 mL H_2O	✓
200 mL Solution H_2O_2 10% / HNO_3 5%	✓
100 mL KMnO4 4% / H2SO4 10%	✓
200 mL H_2O + 25 mL HCL 8N	✓
Filtre Quartz (x3)	

Pour la demande d'analyse, voici les échantillons:
1a- Métaux sur contenants 1 + 2 + 3
1b- Hg sur contenants 1 + 2 + 3
2a- Métaux sur contenant 4
2b- Hg sur contenant 4
3a- Hg sur contenant 5
3b- Hg sur contenant 6
3c- Hg sur contenant 7

Technicien :

P1-

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU-E1

February/2017

Usine : AE Methadone	Date : 22-09-2018	P. Bar (po Hg) :		# Cold box : OR-2/U1	
Ville: Rankin Inlet		P. Stat. (po H_2O) :	−0.06		
ID point d'émission : Incinérateur	Sonde N° : 03-06 (371)	Module N° :	19 COMP	K' :	26.18
Diamètre : 32.5	Cp : 0.78	Kc :	0.997		
Distance avant : 5D	Buse N°: 3 371	Ko :	1.000	Niveau du manomètre:	~
Distance après : 2D	Coef : 0.[illegible] (3741)	Distance P-T°-B :	~	Zéro du manomètre:	~

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi³)	Masse molaire O_2 (%v)	Masse molaire CO_2 (%v)	Masse molaire CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Température Filtre (°F)	Température Sortie (°F)	Température Trappe/Filtre (°F)
										483.64								
13h44	1	1	5	0.18	0.45	1330	60	60	76	485.51	13.4	5.3	3	−1.0	~	200	—	37
		1		0.17	0.43	1345			77	488.0								
		1		0.17	0.43	1345			77	490.46	13.4	5.6	3	−1.0				
		1		0.17	0.43	1341			77	493.97	13.4	5.7	3			200		36
		2		0.17	0.43	1352			78	495.48	13.4	5.7	3					
		2		0.17	0.43	1356			79	497.85	13.5	5.7	2					
		2		0.18	0.41	1354			80	500.35	13.5	5.7	2			200		36
		2		0.18	0.41	1353			80	502.87	13.5	5.7	2	−1.0				
		3		0.18	0.41	1361			82	505.38	13.5	5.7	2			200		36
		3		0.21	0.53	1366			82	508.08	13.5	5.7	2	−1.0				
		3		0.21	0.53	1381			84	510.79	13.4	5.8	2					39
		3		0.21	0.53	1377			83	513.50	13.4	5.7	2	−1.5				
14h44	AE	4		0.21	0.53	1379			84	516.20	13.4	5.7	2					
		4		0.21	0.53	1380			85	518.83	13.5	5.7	2					
		4		0.21	0.53	1373			84	521.61	13.7	5.6		−1.5		200		39
		4		0.21	0.53	1373			85	524.28	13.9	5.4						
		5		0.18	0.41	1351			85	526.78	13.9	5.4						39
		5		0.18	0.41	1348			87	529.27	14.0	5.3		−1.5		200		
		5		0.18	0.41	1350			87	531.86	14.0	5.3						
				0.18	0.41	1354			88	534.26	14.0	5.4						
		6		0.18	0.41	1355			88	536.79	14.0	5.3	2					
		6		0.18	0.41	1359			90	539.34	14.0	5.3	2					
		6		0.18	0.41	1361			90	541.87	14.0	5.3	2					
		6	↓	0.17	0.41	1350	↓	↓	90	544.36	14.0	5.3						

TDF Initial Débit (pi³/min): 0.015	Pression (inhg) : ~15"Hg	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	Fuite Pitot (ΔP) : ~
TDF Final Débit (pi³/min):	Pression (inhg) :	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

$\overline{\Delta P} = 0.16$ $\Delta P_{min} = 0.11$

$\Delta P_{max} = 0.21$

TECHNICIEN :

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU-E1

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F) Cheminée	Compteur Entrée	Compteur Sortie	Orifice	Volume Prélevé (pi^3)	Masse molaire O_2 (%v)	Masse molaire CO_2 (%v)	Masse molaire CO (ppmv)	Vaccum po. Hg	Température Sonde (°F)	Température Filtre (°F)	Température Sortie (°F)	Température Trappe/Filtre (°F)
										544.36								
		6	5	0.15	0.38	1357	60	60	93	546.67						250		
		6		0.16	0.41	1350			93	549.00	14.3	5.1						
		6		0.16	0.41	1355			94	551.26								
		6		0.16	0.41	1357			95	553.57	14.3	5.1						
		5		0.16	0.41	1343			97	555.93								
		5		0.16	0.41	1350			97	558.42								
		5		0.16	0.41	1335			97	560.77	14.3	5.1						
		5		0.15	0.37	1340			98	563.08								
		4		0.15	0.39	1332			99	565.37								
		4		0.13	0.35	1280			100	567.67								
		4		0.13	0.35	1300			100	569.98	14.9	4.7						
		4		0.11	0.29	1306			101	572.08								
		3		0.11	0.29	1304			101	574.08	14.8	4.8						38
		3		0.11	0.29	1280			102	576.10								
		3		0.11	0.29	1250			102	578.09								
		3		0.11	0.29	1266			103	580.17	14.9	4.6	3					
		2		0.13	0.31	1318			103	582.40								
		2		0.13	0.35	1320			103	584.62								
		2		0.13	0.35	1324			103	586.87	14.4	5.0						
		2		0.13	0.31	1310			102	589.10								
		1		0.13	0.35	1317			102	591.32	14.5	5.0						
		1		0.13	0.31	1322			102	593.56								
		1		0.13	0.35	1318			102	595.76								
		1		0.13	0.31	1306			102	598.00								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : MEC COSV - E1

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AE Heliantus	Projet: 5528	# Ensemble de verrerie : 28
Source: Incinérateur	Essai: #1	# Hot Box : OR.2 / V1
Date : 22-05-2018		Heure : 17h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	(NON)

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	(NON)

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 #4781	401.1	382.8	
3	Trappe à condensat	VIDE	502.9	365.3	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-~~150~~ mL)	599.7	586.7	
5	Barboteur modifié	VIDE	446.7	446.20	
6	Contenant de dessicant	GEL DE SILICE	1713.9	1708.0	174.8
			3664.3	3488.0 TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	156309
Acétone (grade optima)	153394
Éthylène glycol	142823
Eau HPLC	135150
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 2018-09-23	Heure de récupération:	
Nettoyage de l'extérieur des différentes pièces : ✓	✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :	✓ ✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	
Résine XAD-2 (environ 40g, 1 tube)	
Eau HPLC	
Éthylène Glycol	
Acétone	
Hexane	

Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AE Metadrive		Projet: 5728	
Échantillonné le: 22-05-2018		Récupéré par:	
Source: Incinérateur	Essai: #1	Date: 21-05-2018	Heure:

CAISSE # 28

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass	OR-28-BP	By pass	✓	✓	✓	✓	✓
Cloche femelle	(N/A)	Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon	(N/A)	Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle	(N/A)	Cloche mâle	✓	✓		✓	✓
Réfrigérant	ORC-28-R	Réfrigérant	✓	✓	✓	✓	✓
Trappe de résine		Trappe de résine					
Trappe à condensat verticale	OR-28TC	Trappe à condensat verticale	✓	✓	✓	✓	✓
Long coude		Tuyau MF pour Réfrigérant	✓	✓	✓	✓	✓
	OR-28-LC	Long coudé	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith	(N/A)	Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude	ORC-28-C	Coude	✓	✓	✓	✓	✓
Barbotteur Std	(N/A)	Barbotteur Std	✓	✓	✓	✓	✓
Bouteille de verre ambrée (1)		Bouteille de verre ambrée	✓	✓	✓		✓
Garnitures (Téflon + Aluminium)							
Nombre total de pièces	10	# Unique	1494				

Décontaminé par:	Date: 30/08/2018	Endroit: Québec
Code de décontamination (pot):	JD-30082018-OR28	
# Lot Des Solvants:	Dichlorométhane: 176773	
	Hexane: 175762	
	Acétone: 161822	

Commentaires

Formulaire mis-à-jour le 2018-05-14

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSU. E2

February/2017

Usine : AE McMadine	Date : 28.09.2018	P. Bar (po Hg) :	# Cold box : OR2/U1		
Ville: Rankin Inlet		P. Stat. (po H_2O) : −0.05			
ID point d'émission : Incinerateur	Sonde N° : 03.06 3Q.503	Module N° : 19 COMP	K' : 26.19		
Diamètre : 32 1/2	Cp : 0.781	Kc : 0.997			
Distance avant : 5D	Buse N° : 3Q.503	Ko : 1.000	Niveau du manomètre: ✓		
Distance après : 2D	Coef : 0.4958	Distance P-T°-B : ✓	Zéro du manomètre: ✓		

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi³)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
11:50	1	6	5	0.12	1.08	1375	60	60	72	604.57	14.5	4.6	3	−7.0	—	210		45
		6		0.15	1.26	1353			73	608.84								
		6		0.15	1.15	1360			73	612.97	14.5	4.9	3					
		5		0.15	1.15	1362			74	617.11								
		5		0.15	1.15	1369			75	621.25								
		5		0.15	1.15	1362			77	625.40	14.6	4.7	3	−6.5	—	251		41
		4		0.12	1.23	1369			77	629.66	14.7	4.7	3					
		4		0.15	1.15	1371			79	633.81								
		4		0.15	1.16	1372			80	637.92	14.5	4.9	3					
		3		0.15	1.16	1369			81	642.08								
		3		0.15	1.16	1370			83	646.17	14.5	4.9						
		3		0.15	1.16	1373			84	650.31								
		2		0.13	1.04	1315			86	654.36	15.2	4.4	3					
		2		0.13	1.04	1320			87	658.45								
		2		0.12	0.97	1316			88	661.97	15.1	14.4	4					
		1		0.12	0.97	1314			89	665.75								
		1		0.12	0.97	1318			90	669.50	15.3	4.3	4			210		40
		1	↓	0.12	0.97	1318	↓	↓	91	673.25								

TDF Initial Débit (pi³/min): 20.05	Pression (inhg) : −15"Hg	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	Fuite Pitot (ΔP) :
TDF Final Débit (pi³/min):	Pression (inhg) :	Volume ini (pi³):	Volume fin (pi³):	Volume (pi³):	

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Changement réfrigérant — Cassé à cause du gel

TECHNICIEN :

P2

CONSULAIR

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COJV-E2

February/2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										673,25								
	2	1	5	0,12	0,98	1318	60	60	92	677,00	15,3	4,3	4	-5,5	~	252	~	34
		1		0,12	0,98	1311			94	680,74								
		1		0,12	0,99	1300			94	684,49	15,3	4,3	4					
		2		0,12	0,98	1317			95	688,23								
		2		0,12	0,98	1322			96	691,97					~	252	~	40
		2		0,12	0,98	1318			96	695,73	15,3	4,3						
		3		0,12	0,98	1325			98	699,41								
		3		0,11	0,90	1320			98	703,00								
		3		0,11	0,90	1318			90	706,53								
		4		0,10	0,82	1310			100	709,94								
		4		0,10	0,82	1310			100	713,38	15,3	4,4						
1417		4		0,10	0,83	1314			101	716,79								
		4		0,10	0,83	1300			101									
		5																
		6																
		6																
		6																

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES | O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

Fin bris équipement (réfrigérant) changé de point !

TECHNICIEN :

MEV

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : COSV - 2

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AEM - MV	Projet: 18-5578	# Ensemble de verrerie : 10
Source: Incinérateur	Essai: 2	# Hot Box : OR-2
Date : 28 - 09 - 2018		Heure :

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	NON

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	NON

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2	131.7	125.6	
3	Trappe à condensat	VIDE	375.6	269.5	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	713.9	700.8	
5	Barboteur modifié	VIDE	—	—	
6	Contenant de dessicant	GEL DE SILICE	1723.1	1713.6	134.8
				TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

trappe XAD: 1172

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	
Acétone (grade optima)	
Éthylène glycol	
Eau HPLC	
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération :	28.06.2018	Heure de récupération:	15h00
Nettoyage de l'extérieur des différentes pièces :			
Conditionnement (HA) des contenants **(verre ambré)** de récupération :			

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde				

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine				

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau			

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final			

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite		
Résine XAD-2 (environ 40g, 1 tube)		
Eau HPLC		
Éthylène Glycol		
Acétone		
Hexane		
Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AÉ Meliadine		Projet: 5528	
Échantillonné le: 23-09-2018		Récupéré par: [signature]	
Source: Incinérateur	Essai: ~~[illegible]~~ E-2	Date: 23-09-2018	Heure:

CAISSE # 10

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass		By pass	✓	✓	✓	✓	✓
Cloche femelle		Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon		Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle		Cloche mâle	✓	✓	✓	✓	✓
Réfrigérant		Tuyau MF	✓	✓	✓	✓	✓
		Réfrigérant	✓	✓	✓	✓	✓
		Court MF	✓	✓	✓	✓	✓
Trappe à condensat		Trappe à condensat	✓	✓	✓	✓	✓
Grand L							
		Grand " L"	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith		Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude		Coude	✓	✓	✓	✓	✓
Barbotteur Std		Barbotteur Std	✓	✓	✓	✓	✓
Pot pour le proofing		Pot pour le proofing	✓	✓	✓		✓
Nombre total de pièces		# Unique	988				

Sur le terrain

Verrerie de laboratoire							
Bouteilles de verre ambrée (5)							
Teflon							
Aluminium							
Trappe de résine		Trappe de résine					

Décontaminé par: JD	Date: 24/08/2018	Endroit: Québec
Code de décontamination (pot): JD-24/08/2018-0210		
# Lot Des Solvants:	Dichlorométhane: 162956 Hexane: 182082 Acétone: 181822	

Commentaires

P1

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSV-E3

février-2017

| | | |

P2

CONSULAIR — GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

Code d'essai : COSV - E3

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

février-2017

Usine :	Date :	P. Bar (po Hg) :	# Cold box :
Ville:		P. Stat. (po H_2O) :	
ID point d'émission :	Sonde N° :	Module N° :	K' :
Diamètre :	Cp :	Kc :	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										816.86								
	2	1	5	0.18	1.38	1413	60	60	90	821.26	14.1	5.2	3	-60				
		1		0.18	1.38	1417			90	825.67								
		1		0.17	1.30	1423			91	829.97								
		2		0.17	1.30	1440			94	834.34								
		2		0.17	1.29	1433			92	838.54								
		2		0.17	1.30	1443			94	842.77								
		3		0.17	1.29	1450			95	847.00								
		3		0.24	1.33	1529			91	851.90								
		3		0.24	1.35	1535			97	856.84								
		4		0.24	1.36	1533			97	861.77								
		4		0.24	1.36	1533			98	866.72								
		4		0.24	1.36	1542			99	871.64								
		5		0.24	1.36	1541			99	876.54								
		5		0.23	1.68	1548			101	881.29								
		5		0.22	1.65	1500			101	886.00								
		6		0.22	1.68	1463			102	890.71								
		6		0.22	1.69	1457			103	895.49								
		6	↓	0.22	1.69	1460	↓	↓	103	900.26								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):

Fuite Pitot (ΔP) :

REMARQUES — O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN :

CONSULAIR
SECTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI : MEL- COSU - E3

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: AE Meliadine	Projet: 5528	# Ensemble de verrerie : 1
Source: Imaginatum	Essai: #3	# Hot Box : OR2-V1
Date : 28-09-2018		Heure : 16h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	NON

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	NON

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 1151	121.0	114.1	
3	Trappe à condensat	VIDE	523.10	304.5	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	751.7	729.0	
5	Barboteur modifié	VIDE		—	
6	Contenant de dessicant	GEL DE SILICE	1734.0	1723.1	259.1
				TOTAL	

* : Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT	
Dichlorométhane (grade optima)		
Hexane (grade optima)		
Acétone (grade optima)		
Éthylène glycol		
Eau HPLC		
Résine XAD-2		
Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 30-09-2018		Heure de récupération: 8h20	
Nettoyage de l'extérieur des différentes pièces :		✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :		✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	
Résine XAD-2 (environ 40g, 1 tube)	
Eau HPLC	
Éthylène Glycol	
Acétone	
Hexane	

Récupération par :	Date :	Endroit :

CONSULAIR

Train d'échantillonnage - ORGANIQUE

Compagnie: AE Medicine		Projet: 5528	
Échantillonné le:		Récupéré par:	
Source: Mainstream	Essai: ROSU E3	Date:	Heure:

CAISSE # 1

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass		By pass	✓	—	—	—	—
Cloche femelle		Cloche femelle	✓	✓	—	—	—
Support à filtre en téflon		Support à filtre en téflon	—	—	—	—	—
Cloche mâle		Cloche mâle	—	—	—	—	—
Réfrigérant							
		Réfrigérant	✓	✓	—	—	—
Trappe de résine		Trappe de résine					
Trappe à condensat		Trappe à condensat	✓	—	—	—	—
Grand L		Tige MM	✓	✓	—	—	—
		Tige MF	—	—	—	—	—
		Coude 4 po.	✓	—	—	—	—
Barbotteur Greenberg Smith		Barbotteur Greenberg Smith	—	—	—		
Coude		Coude	—	—	—	—	—
Barbotteur Std		Barbotteur Std	—	—	—	—	—
Pot pour le proofing							
Bouteille de verre ambrée (5)		Bouteille de verre ambrée	—	—	—		—
Garnitures (Téflon + Aluminium)							
Nombre total de pièces		# Unique	495				

Décontaminé par: JD	Date: 28/08/2018	Endroit: Québec
Code de décontamination (pot):	JD-28/08/2018	

Lot des Solvants:
Dichlorométhane: 182968
Hexane: 175762
Acétone: 181822

Commentaires

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

Formulaire: F_09_V5

FEUILLE DE VÉRIFICATIONS ET DE DONNÉES DE PRÉLÈVEMENT MANUEL

Code d'essai : COSV - Blanc

February/2017

Usine : LEM-Mtl	Date :	P. Bar (po Hg) :	# Cold box :
Ville: Montréal		P. Stat. (po H_2O) :	
ID point d'émission : incinérateur	Sonde N° :	Module N° : 25	K' :
Diamètre :	Cp :	Kc : 0.799	
Distance avant :	Buse N° :	Ko :	Niveau du manomètre:
Distance après :	Coef :	Distance P-T°-B :	Zéro du manomètre:

Heure	Trav.	Point	Temps prélèv. (min)	ΔP (po H_2O)	ΔH (po H_2O)	Températures (°F)				Volume Prélevé (pi^3)	Masse molaire			Vaccum po. Hg	Température			
						Cheminée	Compteur Entrée	Compteur Sortie	Orifice		O_2 (%v)	CO_2 (%v)	CO (ppmv)		Sonde (°F)	Filtre (°F)	Sortie (°F)	Trappe/Filtre (°F)
										34.7								
							71	71	71	35.7								

TDF Initial Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	Fuite Pitot (ΔP) :
TDF Final Débit (pi^3/min):	Pression (inhg) :	Volume ini (pi^3):	Volume fin (pi^3):	Volume (pi^3):	

REMARQUES | O_2/CO_2 - Utiliser le formulaire de gaz en continu pour calibration des appareils.

TECHNICIEN : JFC

CONSULAIR GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (1/2) Avril 2018

CODE DE L'ESSAI: MEV COSV-2 blanc

Vérification avant essai et montage du dispositif de prélèvement - COSV (SPE 1/RM/2)

Compagnie: NE Meliadine	Projet: 5078	# Ensemble de verrerie : 22
Source: Incinérateur	Essai: #2	# Hot Box : OR2-V1
Date : 22-09-2018		Heure : 10h00

1 - DÉCONTAMINATION & VÉRIFICATION AVANT ESSAI - BUSE ET SONDE

Item	Remarques	Brosse - DHA	HA
		3x Ch.	3x Ch.
Buse et sonde		✓	✓
Vérification de la buse et sondes d'échantillonnage à conserver :		OUI	(NON)

2 - VÉRIFICATION AVANT ESSAI - TRAIN

Item	Remarques	HA	
		3x Ch.	
Train		✓	
Vérification de la verrerie du train d'échantillonnage à conserver :		OUI	(NON)

3 - VOLUME D'EAU RECUEILLIE

ITEM #	PIÈCE	CONTENU	POIDS (g)		
			APRÈS	AVANT	TOTAL
1	Condenseur (réfrigérant)	VIDE			
2	Trappe de résine *	XAD-2 lisr	123.4	123.3	
3	Trappe à condensat	VIDE	371.8	371.8	
4	Barboteur Greenburg-Smith	ÉTHYLÈNE GLYCOL (100-150 mL)	686.2	687.0	
5	Barboteur modifié	VIDE	—	—	
6	Contenant de dessicant	GEL DE SILICE	1730	1730	
				TOTAL	0

*: Recouvrir de papier d'aluminium après la pré-pesée, et retirer avant la pesée après essai.

REMARQUES :

4 - LOTS DES SOLVANTS UTILISÉS

SOLVANTS	# LOT
Dichlorométhane (grade optima)	
Hexane (grade optima)	156309
Acétone (grade optima)	153394
Éthylène glycol	142823
Eau HPLC	135150
Résine XAD-2	

Vérifié par:	Date:	Endroit:

CONSULAIR
GESTION GLOBALE AIR ET ENVIRONNEMENT

F_07_V5 (2/2)
Avril 2018

Récupération finale du dispositif de prélèvement - COSV (SPE 1/RM/2)

Date de récupération : 24.09.2018	Heure de récupération: 15h00	
Nettoyage de l'extérieur des différentes pièces : ✓	✓	
Conditionnement (HA) des contenants **(verre ambré)** de récupération :	✓	

Contenant 1 - Buse-Sonde

Item	Remarques	Brosse HA	HA 3x Ch.	Niveau
Buse et Sonde		✓	✓	✓

Contenant 2 - Filtre

Filtre	Pétri scellé avec ruban de teflon - dans le papier d'aluminium	✓

Contenant 3 - Récupération de la partie arrière du Porte-filtre au Condenseur (avant trappe)

Item	Remarques	Tremp. H-A 5 min. Ch.	HA 3x Ch.	Niveau
Avant trappe résine		✓	✓	✓

Contenant 4 - Récupération de la Trappe de résine XAD-2

Trappe de résine XAD-2	Sceller avec ruban de teflon - enveloppé papier d'aluminium	✓

Contenant 5 - Récupération de la Trappe à condensat au 1er Barboteur (eau)

Item (dans l'ordre)	Remarques	H_2O HPLC 3x	Niveau
Eau		✓	✓

Contenant 6 - Rinçage final de la partie arrière du Porte-filtre au dernier Barboteur

Item	Remarques	HA 3x Ch.	Niveau
Rinçage final		✓	✓

Les pots doivent être en verre ambré.

Remarques

Blancs:

Blanc de terrain (1x pour chaque 3 essais) - Faire aspirer volume d'air équivalent à tous les tests de fuite	✓
Résine XAD-2 (environ 40g, 1 tube)	✓
Eau HPLC	✓
Éthylène Glycol	
Acétone	✓
Hexane	✓

Récupération par : fm	Date : 15-09-20	Endroit : MEL

CONSULAIR

Train d'échantillonnage - ORGANIQUES

Compagnie: AE Meliadine		Projet: 5528	
Échantillonné le: 23-09-2018		Récupéré par:	
Source: Incinérateur	Essai: [illegible] BL	Date: 23-09-2018	Heure: 10h00

CAISSE # 22

Décontamination			Sol. RBS	Eau + Savon	Eau démin.	DHA	HA
Item (dans l'ordre)	#	Nom de la pièce	Ok				
By pass 125 mm	(N/A)	By pass 125 mm	✓	✓	✓	✓	✓
Cloche femelle	(N/A)	Cloche femelle	✓	✓	✓	✓	✓
Support à filtre en téflon	(N/A)	Support à filtre en téflon	✓	✓	✓	✓	✓
Cloche mâle	B	Cloche mâle	✓	✓	✓	✓	✓
Réfrigérant	OR-13-R1	Réfrigérant	✓	✓	✓	✓	✓
	OR-13-R2	Rallonge de réfrigérant	✓	✓	✓	✓	✓
	(N/A)	~~Coude réfrigérant~~ Tuyau MFo	✓	✓	✓	✓	✓
Trappe de résine	[redacted]	Trappe de résine					
Trappe à condensat verticale	OR-22-TC	Trappe à condensat verticale	✓	✓	✓	✓	✓
Coude	(N/A)	Coude	✓	✓	✓	✓	✓
Barbotteur Greenberg Smith	(N/A)	Barbotteur Greenberg Smith	✓	✓	✓	✓	✓
Coude	(N/A)	Coude	✓	✓	✓	✓	✓
Barbotteur Std	(N/A)	Barbotteur Std	✓	✓	✓	✓	✓
Bouteille de verre ambrée (1)	[redacted]	[redacted]mbrée	✓	✓	✓	[redacted]	✓
Garnitures (Téflon + Aluminium)	[redacted]						
Nombre total de pièces	12	[redacted]	1000				

Bouteille de verre a[illegible]

Décontaminé par: JD	[illegible]018	Endroit: QC
Code de décontamination (pot):	[illegible]: 3[illegible] 08/2018-OR22	
# Lot Des Solvants:	Dichlorométhane: 176773 Hexane: 175762 Acétone: 181822	

Commentaires

Formulaire mis-à-jour le 2018-05-14



AGNICO EAGLE

MELIADINE GOLD PROJECT

Quality Assurance/Quality Control Plan

MARCH 2019
VERSION 3
6513-QQY-01

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ᑎᑎᖅᑲᖅ ᐱᓕᐊᑎᖅᑐᖅ ᑕᓯᖏᐊᖏᑦᑕ ᐅᓴᖏᑕᒪᐊᖅ ᖃᓄᐃᐅᓂᓂᓚᓄᑦ ᓇᓗᓇᐃᖅᓯᓂᖅ / ᖃᓄᐃᐅᓂᓂᓚᓂᒃ ᐊᐅᓪᓚᑦᑎᓂᖅ (QA/QC) <ᖏᓇᐅᑎᒥᑦ, ᐱᓴᓇᐊᖃᖅᑐᖅ ᑕᓯᖏᐊᖏᓪᓕᑦ Type A ᐃᒪᖏᓕᑦ ᓪᐃᓴᓕᓯ ᓭᓴᐅᑎ 2AM-MEL1631-ᒥᑦ, ᐅᖃᖅᓯᒪᔪᖅ ᐊᐃᓵᑐᖅᓯᒪᔪᖅ I, ᖃᓄᐃᓕᓴᓇᓇᐊᖃᖏᓂᖅ 16-ᒥᑦ:

> *ᓪᐃᓴᖃᖅᑐᖅ ᒪᒪᓂᐊᖅᐸᓕᒍ ᖃᓄᐃᐅᓂᓂᓚᑦᓇᓗᓇᐃᖅᓯᓂᖅ / ᖃᓄᐃᐅᓂᓂᓚᓂᒃ ᐊᐅᓪᓚᑦᑎᓂᖅ (QA/QC) <ᖏᓇᐅᑎᒥᑦ, ᓭᓚᒋᔭᐅᔪᖅ ᑲᑎᒪᔨᓄᑦ ᐃᓪᓕᐅᑐᑎᒃ ᐱᔭᕆᐊᖃᖏᓂᐅᔪᓂ ᐃᓕᓴᐅᔪᓂ ᐅᓂᒃᑐᔾᔨᓂᖅᑐᑎᒃ ᐊᓚᓪᓕ ᖃᐅᔨᓴᐃᓂᖃᖅᓯᒃᑎᓂᒃ. QA/QC <ᖏᓇᐅᑎ ᐱᓪᓗᐊᖅᓯᐊᖅᐳᑦ ᐊᓚᓪᓕ ᐅᐸᒥᒍᓪᓂᖅᑕᐅᓂᓂ ᐱᔭᕆᐊᖃᖏᓂᒃᑯᑦ ᓪᓚᕐᓂᑦ ᐊᓚᓪᓕ ᐅᖃᖅᑎᑦᓯᐅᑦᑯᓚᐅᑦᑎᐊᓪᓚᑦ ᖃᐅᔨᓴᐃᓂᖃᖅᓯᒃᑎᓂᒃᑯᑦ. <ᖏᓇᐅᑎᒥᑦ ᐃᓚᐅᓂᐊᖅᐳᑦ ᑎᑎᖅᑲᖅ ᐃᓪᓕᑕᒪᔭᐅᓚᓪᓚᑦ ᖃᐅᔨᓴᐃᖅᑲᓚᑦ ᓇᓗᓇᐃᖅᓯᓂᐅᔪᓂ ᐅᓂᒃᑐᔾᔨᓂᖅᑐᑎᒃ <ᖏᓇᐅᑎ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᓕᓂᐅ ᓪᓚᕐᓂᒍ ᓭᓴᐅᑎ. ᑕᑦᓚ <ᖏᓇᐅᑎ ᐱᓪᓗᐊᖅᓯᐊᖅᐳᑦ ᓪᓚᕐᓂᑦ ᒧᐊᐅᓚᓂᖅ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐋᖅᑭᐅᓚᑦᑕ 1996-ᒥᑦ ᖃᓄᐃᐅᓂᓂᓚᓂᒃ ᓇᓗᓇᐃᖅᓯᓂᖅ (QA) ᖃᓄᐃᐅᓂᓂᓚᓄᑦ ᐊᐅᓪᓚᑦᑎᓂᖅ (QC)-ᓄᑦ ᓪᓚᕆᑕᐅᔨᕐᓴᐃᑦ ᐊᑐᖅᑕᐅᓂᐊᓕᓂᐅ ᐃᓂᐅᓄᑦ "A" (INAC).*

EXECUTIVE SUMMARY

This document presents the Meliadine Mine Quality Assurance / Quality Control (QA/QC) Plan, a requirement of the Meliadine Type A Water License No. 2AM-MEL1631, specified under Part I, Condition 16:

> *The Licensee shall maintain a Quality Assurance / Quality Control Plan, accepted by the Board that includes requirements for independent third party sampling and analysis. The QA/QC Plan shall be prepared and updated as needed in accordance with and in consultation with the accredited laboratory conducting the analyses. The Plan shall include a cover letter from the accredited laboratory confirming approval of the Plan for analyses to be performed under this Licence. This Plan shall be developed in accordance with current Standard Methods and the 1996 Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A" (INAC).*

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TABLES AND FIGURES

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			This is the first version of this Plan, developed for the Type A Water Licence Application	Golder Associates Ltd.
2	March 2018	All	All	-Updated revision date	Meliadine Environment Department
		2.1	3	-Changed Hanna multi-meter to Eureka Manta II	
		2.2.4	6	-Laboratory name change: MultiLab to H2Lab	
		Table A-2	Appendix 12	-Updated table of analytical parameters (removed Group listing)	
		Figure A-2		-Removed figure heading for site sampling location – no figure was included with the heading	
		Figure A-1	Appendix 16	-Added General Site Plan figure to existing heading	
3	March 2019			Reviewed internally (added changes that the construction phase brought and review of the grammatical tense)	Meliadine Environment Department
		Executive Summary	Ii	Additional INAC information added to executive summary	
		Table A-1	A-2, A-3	Updated GPS Coordinates	
		Figure A-1	A-5	Updated Site Map	

ACRONYMS

CIRNAC	Crown-Indigenous Relations and Northern Affairs
Agnico Eagle	Agnico Eagle Mines Limited
AEMP	Aquatic Effects Monitoring Program
Mine	Proposed Meliadine Gold Mine
MDMER	Metal and Diamond Mining Effluent Regulations
NWB	Nunavut Water Board
Project	Meliadine Gold Project
QA/QC	Quality Assurance and Quality Control
SNP	Surveillance Network Program
CALA	Canadian Laboratory Accreditation

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) developed the Meliadine Gold mine site approximately 25 kilometres north from Rankin Inlet, and 80 kilometres southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson's Bay, the Meliadine site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°01'23.8"N, 92°13'6.42"W), on Inuit Owned Land.

This report presents the Quality Assurance/Quality Control (QA/QC) Plan for the Project. The Plan was prepared in accordance with the requirements of Type A Water Licence Application and the Supplementary Information Guidelines for Mining and Water Works, issued by Nunavut Water Board (NWB 2010a, b, c). It has been developed in accordance with the Aboriginal Affairs and Northern Development Canada (AANDC) 1996 '*Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan*', which includes the following definitions:

- Quality Assurance: the system of activities designed to better ensure that quality control is done effectively; and
- Quality Control: the use of established procedures to achieve standards of measurement for the three principal components of quality – precision, accuracy and reliability.

The mine will have an open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.1 Mt of overburden waste, and 14.9 Mt of tailings. There are four phases to the development of Tiriganiaq: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

A general location plan of the Mine is shown in Figure A-1.

This Plan, which is part of the Environmental Management System for the Mine, is divided into the following components:

- Procedures for field sample collection (Section 2);
- External and internal laboratory requirements (Section 3); and
- Data verification procedures and regulatory reporting requirements (Section 4).

The objective of the QA/QC program is to assure that the chemical data collected are representative of the material being sampled, are of known quality, are properly documented, and are scientifically defensible. Data quality is assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of accredited laboratories, and by staffing the program with experienced technicians.

This QA/QC Plan sets out standard procedures for sample and data collection with respect to surface water and groundwater sampling in support of monitoring programs outlined in the Water Management Plan, Groundwater Management Plan, and the Aquatic Effects Monitoring Program (AEMP) Design Plan.

SECTION 2 • FIELD SAMPLING

Water quality monitoring was initiated at the pre-development stage and will continue during construction, operations, and closure. Sampling stations, frequency, and parameters are listed in Appendix A, Table A-1. Table A-2 provides supporting definitions. The stations and their requirements may be adjusted based on the requirements of the Type A Water Licence and/or any updates to the Mine management plans over the life of the Mine. Sampling stations are shown in Appendix A, Figure A-2.

There are three categories of aquatic monitoring at Meliadine:

- **Regulated monitoring** occurs at monitoring points specified in licences or regulations. It includes discharge limits that must be achieved to maintain compliance with an authorization (i.e., water licence) or regulation (i.e., Metal and Diamond Mining Effluent Regulations). Enforcement action may be taken if discharge limits are exceeded for a parameter.
- **Verification monitoring** is carried out for operational and management purposes by Agnico Eagle. This type of monitoring provides data for decision making and builds confidence in the success of processes being used. There is no obligation to report verification monitoring results, although some monitoring locations and these results can be mentioned in environmental management plans (i.e., sampling to verify soil remediation in the landfarm).
- **General monitoring** is commonly included in a water licence specifying what is to be monitored according to a schedule. It covers all types of monitoring (i.e., geotechnical, lake levels, etc.). This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included QA/QC provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the Water Board.

All sampling stations are clearly identified; their GPS coordinates collected and stored. All sampling is conducted by qualified personnel, at the same location, using the same techniques to reduce operational error. The following sections outline the standard procedures for collection and handling of all surface water and groundwater samples.

2.1 Sampling Equipment

New laboratory supplied containers are used for sample collection. The bottles are either polyethylene plastic or glass, dependent on the specific parameter being analyzed.

Equipment, such as the HACH test kit – 2100 Q Portal Turbidimeter (turbidity), Oakton PCS35 Meter (pH and conductivity), and Eureka Manta II (pH, dissolved oxygen and conductivity) are handheld instruments that are used to collect, as required, field parameters. The instruments are calibrated before each sample event to ensure optimal performance and record of the calibration are kept in a

Calibration log, and maintenance procedures will be followed as set out by the supplier's operation manual. Equipment and bottles are selected so that they do not contaminate or alter the concentrations of parameters of interest according to laboratory standards.

To collect water samples at depth from the surrounding lake receiving environments, a pump with tubing is used. Low Density Polyethylene tubing, filter apparatus, manual or electric pump, and ashless filter paper are used to filter water for specific analyses (e.g., dissolved metals, chlorophyll *a*) and/or for depth integrated sampling (e.g., chlorophyll *a*, phytoplankton, or biological oxygen demand).

2.2 Sampling Methods and Handling

2.2.1 Sampling Identification

All samples have a unique sample identification name based on a station identifier, date, and time of collection. For duplicates and field blanks, the sample identification follows the naming convention *year* and *sampling number* by following the Environment QAQC table (e.g. 2018-0001)

All sample bottles are identified with the sample identification and date of collection. This information is marked on a label with a water resistant pen or using a label printer and affixed to the sample bottle. Additional information (time of sampling and parameters to analyze) is included in the analysis request (Chain of Custody) that is sent to the Canadian Laboratory Accredited laboratory (CALA).

2.2.2 Surface Water Sampling

Bottles are pre-labeled with the required sample identification before going to the field. Surface grab samples are collected by submerging the sample bottle to half depth of the stream. For sumps, diversion ditches and piped discharge points, samples are collected below the surface of the water.

Samples bottles are provided by the accredited laboratory. All bottles from the lab are pre-rinsed and pre-preserved or pre-rinsed with vials of preservative to that are added in the field by qualified technicians; in the case that bottles are not pre-preserved; bottles are rinsed three times with sample water before filling. When the sampling bottles contains preservative, the bottles are filled by using another clean bottle to avoid any release of preservative. Sometimes, a preservative is added after filling as directed by the laboratory; see Section 2.2.4 for more details on preservation. The bottles are filled properly to allow mixing, preservative addition, and thermal expansion.

Samples analyzed for dissolved metals and chlorophyll *a* are filtered through ash less filter paper at the time of collection when the delay before analyses is long. However, when the delay before analyses is short, the accredited laboratory filters the sample before analyses. In some cases, when the analysis delay is long, the sample will be frozen to prevent parameter degradation.

2.2.3 Groundwater Sampling

Water samples taken from sumps within the underground mine follow the procedures outlined in Section 2.2.2.

Samples representing non-contact groundwater are collected via Diamond Drill Holes (DDHs) intersecting the fracture network. In order to ensure samples are unaffected by substances and materials used during the drilling process, DDHs are flushed thoroughly prior to collecting. The duration of a flush is based on the length of the DDH and rate of groundwater flow measured at its collar. These values are matched to flush-duration curves provided by Golder Associates.

Groundwater samples are collected in clean 4L and 1L containers. In order to minimize the impact of potential contamination from the atmospheric conditions in the underground mine, the 4L sample is transferred to bottles of smaller volume any additional parameters to be analyzed once brought to surface. This is done in a clean laboratory environment where the risk of sample contamination is greatly decreased. Samples are processed and preserved in an appropriate timeframe after collection.

2.2.4 Preservation

Preservatives, if required, are added to sample bottles by the laboratory or added by the technician after filling, as directed by the analytical laboratory. Table A-3 summarizes the minimum sample volumes, preservation, and holding times for select parameters. This information was provided by the CALA certified laboratory H2Lab (formerly MultiLab) for the Meadowbank Mine; however, they are also applicable to the Project.

Table 0-1: Summary of Sampling Requirements

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Microbiology							
Escherichia coli, total coliforms, A.A.H.B	48h	48h	48h	48h	PPS	TS, E	250ml
Enterococcus	48h	48h	48h	48h	PPS	TS, E	250ml
Thermo tolerant coliforms (fecal)	48h	48h	48h	48h	PPS	TS, E	250ml
Inorganic Chemistry							
Absorbance UV, Transmittance UV				24h	P. T. V	N	125ml
Alkalinity, Acidity, Bicarbonates, Carbonates	14d	14d	14d	14d	P, T, V	N	250ml
Ammonia nitrogen (NH_3-NH_4)	28d	28d	28d	28d	P, T, V	AS	125ml
Kjeldahl ammonia (NTK)		28d	28d	28d	P, T, V	AS	125ml
Anions (Cl, F,SO_4)	28d	28d	28d	28d	P, T, V	N	250ml
Color, Free & total Chlorine	48h	48h	48h	48h	P, T, V	N	125ml
Conductivity	28d	28d	28d	28d	P, T, V	N	250ml
Cyanides total/available, Cyanides	14d	14d	14d	14d	P, T, V	NaOH	250ml
BOD_5/Carbonated BOD_5 (2)		48h/4°	48h/4°		P, T, V	N	250ml
COD (chemical oxygen demand)		28d	28d		P, T, V	AS	125ml
Mercury (Hg)	28d	28d	28d	28d	P, T, V	AN	250ml
Total/dissolved metals (filtered on field)	180d	180d	180d	180d	P, T, V	AN	250ml
Dissolved Metals (filtered in the laboratory)	24h	24h	24h	24h	P, T, V	N	250ml
Total suspended solids & Volatile TSS		7d	7d	7d	P. T. V	N	500ml
NH_3 or NH_4		24h	24h	24h	P.T.V	N+AS	2/125ml

Nitrites (NO_2), Nitrates (NO_3), Turbidity	48h	48h	48h	48h	P, T, V	N	250ml
Nitrites-Nitrates (NO_2-NO_3)	28d	28d	28d	28d	P, T, V	AS	250ml
O-Phosphates (O-PO_4)	48h	48h	48h	48h	P, T, V	N	500ml
pH	24h	24h	24h	24h	P, T, V	N	125ml
Total Phosphorus (P-tot)	28d	28d	28d	28d	P, T, V	AS	125ml
Dissolved solids (TDS)		7d	7d	7d	P. T. V	N	250ml
Total solids		7d	7d	7d	P. T. V	N	250ml
Sulphides (H_2S) (3)	28d	28d	28d	28d	P. T. V	AcZn + NaOH	125ml
Thiosulfates	48h	48h	48h	48h	P. T. V	N	125ml
Radioactive & Organic Chemistry							
Fatty resin acids (S-T)	--	28d	28d	--	VA, VT	AS	1L
Congeners PCB (S-T)	28d	28d	28d	28d	VA, VT	N	1L
Chlorobenzene	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml
Total Organic Carbon (TOC)	28d	28d	28d	28d	P, T, V (B)	AC	100ml
Dissolved Organic Carbon (DOC)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Total Inorganic Carbon (CIT)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Phenolic compound (GC-MS)	28d	28d	28d	28d	VA, VT	AS	1L
Glyphosate (S-T)	14d	14d	14d	14d	P.T	N	500ml
PAH	28d	28d	28d	28d	VB	AS	1L
Oil & Greases (total and non-polar)	28d	28d	28d	28d	VA, VT	AS	1L
C10-C50 HP and/or Petroleum Product Identification	28d	28d	28d	28d	VA, VT	AS	1L
Phenol index	28d	28d	28d	28d	VA, VT	AS	500ml
Radium-226	180d	180d	180d	180d	P, T. V	AN	1L
VOC (MAH, CAH, THM, BTEX) (3)	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml

Type of bottle:
P.S.V.T.: plastic bottle, bag or glass bottle with Teflon cap
P, T: Plastic bottle or plastic bottle with Teflon cap
P.T.V.: Plastic bottle or glass bottle with plastic or Teflon cap
PPS: Sterile propyl ethylene bottle
VA: Clear or amber glass with aluminium or Teflon seal
VB: Amber glass (or clear glass covered with aluminium paper) aluminium seal of Teflon
VT: Clear or amber glass bottle with Teflon seal
Preservative:
AC: 0.1ml (100µl) of HCl per 100ml of sample
AcZn: 0.2ml zinc acetate 2N per 100ml of sample and NaOH 10N to pH >9
AN: HNO3 to pH <2
AS: H2SO4 to pH <2
E: 2.5ml EDTA 1.5% (p/v) per 100ml of sample if heavy metals are suspected
ED: 0.1ml diamine ethylene 45 mg/l per 100 ml of sample
EDTA: 1ml EDTA 0.25M per 100ml of sample
N: No preservative
NaOH: NaOH 10N to >12
TS: Sodium thiosulfate final concentration in the sample of 0.1% (p/v)

2.2.5 Field Duplicates and Blanks

One field duplicate and one field blank are collected for approximately every 10 samples as shown in Table 2.2. Field duplicates are collected and handled in the same manner as the other samples in the field. Field blanks are samples of deionized water handled concurrently and in the same manner as the other samples in the field.

Table 0-2: Quality Control Sample Frequency

Sampling Site	QA/QC Sampling Frequency
Compliance Monitoring Program	
Regulated Monitoring	1 field duplicate and 1 field blank per 10 samples
Verification Monitoring	1 field duplicate and 1 field blank per 10 samples
–General Aquatic Monitoring	1 field duplicate and 1 field blank per 10 samples
Event Monitoring Program	
Each event	1 field duplicate and 1 field blank per 10 samples

2.2.6 Sample Transport

All water samples are stored upright in coolers with ice packs and preserved as specified by the laboratory. Samples are to be shipped to the external laboratory as soon as possible via Nolinor Charter flight and dedicated ground transportation to ensure arrival in a safe and timely manner. If the sample (sediments, soil and water) cannot be shipped the same day, they are to be stored in a refrigerator at approximately 4°C until shipping.

A Chain of Custody form with the following information is completed for every shipment of samples:

- Company name and sampler's name;
- Sample identification name;
- Time and date of sampling;
- Presence and type of preservative and whether the sample was filtered or not;
- Requested analytical parameters for each bottle;
- Time and date of shipping; and
- Analytical laboratory address and contact person.

One electronic or PDF copy will be sent by email to the laboratory; an electronic copy will be kept at the Mine site for reference.

SECTION 3 • LABORATORY ANALYSIS

3.1 External Laboratory

All analytical chemistry analyses are performed by a CALA accredited laboratory.

In most cases, these analyses are performed by Maxxam, an accredited facility (see Appendix B) located in Ottawa, Ontario. All data from Maxxam undergoes a rigorous internal QA/QC process, including the use of spiked samples and duplicate samples. Toxicity tests will be performed by Aquatox in Nova Scotia. Testing will be conducted as stipulated by Environment Canada's Biological Test Methods.

Agnico Eagle may also require the services of laboratory, such as Maxxam in Edmonton, AB, SGS in Lakefield, ON and H2Lab in Val d'Or, QC. Agnico Eagle may also use the services of ALS Global for some of the AEMP water quality analysis.

3.2 Internal Laboratory

The assay lab at the Mine site is not an accredited laboratory but will be used periodically for "real-time" results for some parameters like pH, total suspended solids, and Weak Acid Dissociable Cyanide. These results are for observational purposes and do not meet the standards of an accredited laboratory.

SECTION 4 • DATA REQUIREMENTS

4.1 Data Collection

A database of all water sampling data is maintained at the Mine site. The database is designed based on the various discharge limits designated in the Water License and the MDMER. The database functionality includes event scheduling, trend analysis, and flagging out-of-compliance samples, all to enhance the effectiveness of the QA/QC program. The database information is presented to regulators in the annual report.

The following data is collected for each sample in the field and is entered into the database by the sampler for the corresponding sampling station:

- Sample identification name;
- Name of sampler;
- Date and time of sampling or measurement; and
- Physical characteristics (pH, temperature, etc.), if required.

The sample results from the laboratory are input into the database and matched to the sample identification name. The analysis certificate for each sample from the accredited laboratory includes but is not limited to:

- Analytical methods or techniques used;
- Date of analysis;
- Detection limit
- Name of the person(s) / laboratory that approved the certificate; and
- Results of any analysis.

4.2 Data Verification

Upon receipt of analytical results, the field blank and duplicate analyses are verified for potential contamination and accuracy, respectively. Results are interpreted and recommended actions are taken if necessary.

4.3 Exceedance Reporting

Any measured concentration at a sample station exceeding a regulated discharge criterion stipulated in the Water License or the MDMER are reported to the Nunavut Water Board, Environment Canada and Climate Change, and AANDC water inspector within 30 days of the receipt of the analysis. In addition, results of the action plan, where required, is reported and, where necessary, mitigation options identified within 90 days after receipt of the analyses.

SECTION 5 • REFERENCES

AANDC (Aboriginal Affairs and Northern Development Canada). 1996. Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan.

NWB (Nunavut Water Board). 2010a. Guide 4: Completing and Submitting a Water Licence Application for a New Licence. April 2010.

NWB. 2010b. Supplemental Information Guideline (SIG) for General Water Works (M1). Issued February 2010.

NWB. 2010c. Supplemental Information Guideline (SIG) for Mine Development (MM3). Issued February 2010.

APPENDIX A • TABLES AND FIGURES

Table A-1: Proposed Water Quality Regulated, General Aquatic, and Verification Monitoring for the Project during Construction, Operations, and Closure A-2

Table A-2: List of Analytical Parameters A-4

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Figure A-2: Maxxam Ottawa Lab Accreditation A-6

Table A-1: Proposed Water Quality Regulated, General Aquatic, and Verification Monitoring for the Project during Construction, Operations, and Closure

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	UTM Zone 11		Sampling Depth	Sample Type	Number of Samples per Station
					Easting	Northing			
Regulated	Construction	MEL-D-1 to TBD	Dewatering: Water transferred from lakes to Meliadine Lake during dewatering of lakes	Quality of intake water	TBD	TBD	Shoreline	Grab	1
Regulated	Construction, and Operations	MEL-SR-1-TBD	Surface Runoff – runoff downstream of Construction areas at Meliadine Site and Itivia Site, Seeps in contact with the roads, earthworks and any Runoff and/or discharge from borrow pits and quarries	Confirm no adverse effects from leakage/runoff	Sample Dependant	Sample Dependant	Surface water runoff (if present)	Grab	1
Aquatic	Construction, and Operations	MEL-11	Water intake from Meliadine Lake	Test quality of final effluent before release	539439	6990637	From pipe	Grab	1
Verification	Construction (prior to release), Operations, and Closure	MEL-12	Water treatment plant (pre-treatment) coming from CP1, off the pipe and not in the pond	Test quality of water before treatment (required to evaluate treatment efficiency)	539636	6989909	From pipe	Grab	1
Aquatic	Construction (prior to release), Operations, and Closure	MEL-13	Mixing zone in Meliadine Lake, Station 1; and MMER exposure stations for final discharge point	Test mixing of effluent in the receiving environment; sample at varied distances and directions from pipe; MMER exposure for final discharge point	542805.78	689105.05	Depends on presence of a vertical conductivity gradient	Discrete	1 (depth of maximum conductivity, or mid-depth if no conductivity gradient is present)
Regulated	Construction (upon effluent release), Operations, and Closure	MEL-14	Water treatment plant from CP-1 (post-treatment), end of pipe (before offsite release) in the plant before release.	Quality of intake water	539642.3	6989897.9	Depth Integrated or from Intake Pipe	Grab	1
Verification	Construction, and Operations	MEL-15	Local Lake E-3	Confirm no leakage/runoff from Emulsion Plant	537019	6990676	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-16	Local Lake G2	Possible seepage or dust loadings from site infrastructure	538444	6990917	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-17	Local Pond H1		540728	6989568	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-18	Local Lake B5		537306	6988841	Shoreline	Grab	1
Verification	Construction, Operations, and Closure	MEL-19	CP-2 Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	539575.88	6989757.49	Surface water runoff (if present)	Grab	1
Verification	Construction, and Operations	MEL-20	CP-3 Collection of drainage from dry stacked tailings	Collection of drainage from dry stacked tailings	538207.30	698723.66	TBD	Grab	1
Verification	Construction, and Operations	MEL-21	CP-4 Collection of drainage from WRSF1	Collection of drainage from WRSF1	538991.12	6988841.31	TBD	Grab	1
Verification	Construction, Operations, and Closure	MEL-22	CP-5 Collection of drainage from WRSF1 and WRSF2	Collection of drainage from WRSF1 and WRSF2	540257	6988627.4	TBD	Grab	1

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	UTM Zone 11		Sampling Depth	Sample Type	Number of Samples per Station
					Easting	Northing			
Verification	Construction, Operations, and Closure	MEL-23	CP-6 Collection of drainage from WRSF3	Collection of drainage from WRSF3	TBD	TBD	TBD	Grab	1
Verification	Construction, Operations, and Closure	MEL-24	Seepage from the Landfill between the landfill and Pond H3	Located between the landfill and Pond H3 to monitor seepage from the landfill	539085.44	6989561.54	Pooling Water (if present)	Grab	1
Regulated	Construction, Operations, and Closure	MEL-25	Secondary containment area at the Itivia Site Fuel Storage and Containment Facility	Located in the secondary containment area of the tankfarm at Itivia to monitor water quality prior to discharge to land	545939.8	6963675.3	Pooling Water (if present)	Grab	1

Notes: as per Metal Mining Effluent Regulations (MMER), samples for effluent characterization and receiving environment must be collected quarterly, or at least one month apart while effluent is being deposited.

Grey shading indicates that verification monitoring parameters and locations are internal for Agnico Eagle. A systematic approach will be used in communicating inspections results, likely on an annual basis. This will allow Agnico Eagle to inform government, Inuit associations, and the public of inspection outcomes.

CP = collection pond; WRSF = waste rock storage facility; TBD = to be determined

Table A-2: List of Analytical Parameters

	Parameters
Total/Dissolved Metals	Aluminum, antimony, arsenic, barium, beryllium, boron cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, zinc and mercury
Nutrients	Ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, ortho-phosphate, total phosphorus, total organic carbon, dissolved organic carbon
MDMER	Total cyanide, arsenic, copper, lead, nickel, zinc, radium-226, TSS, pH, sulphate, turbidity, and aluminum. Effluent volumes and flow rate of discharge, acute toxicity (Rainbow Trout and *Daphnia magna*) and environmental effects monitoring (EEM).
Conventional Parameters	Bicarbonate alkalinity, carbonate alkalinity, turbidity, conductivity, hardness, pH, total alkalinity, TDS, TSS, turbidity
Cyanide	Free and total cyanide
Major Ions	Calcium, magnesium, potassium, sodium, chloride and sulphate
Petroleum Hydrocarbons	F1, F2-F4 and BTEX
Other	Reactive silica, radium-226, oil & grease
Flow	Flow datalogger/meter
Field measurements	Field pH, specific conductivity, dissolved oxygen, and temperature.

MDMER = Metal and Diamond Mining Effluent Regulations.

Figure A-1: General Site Plan

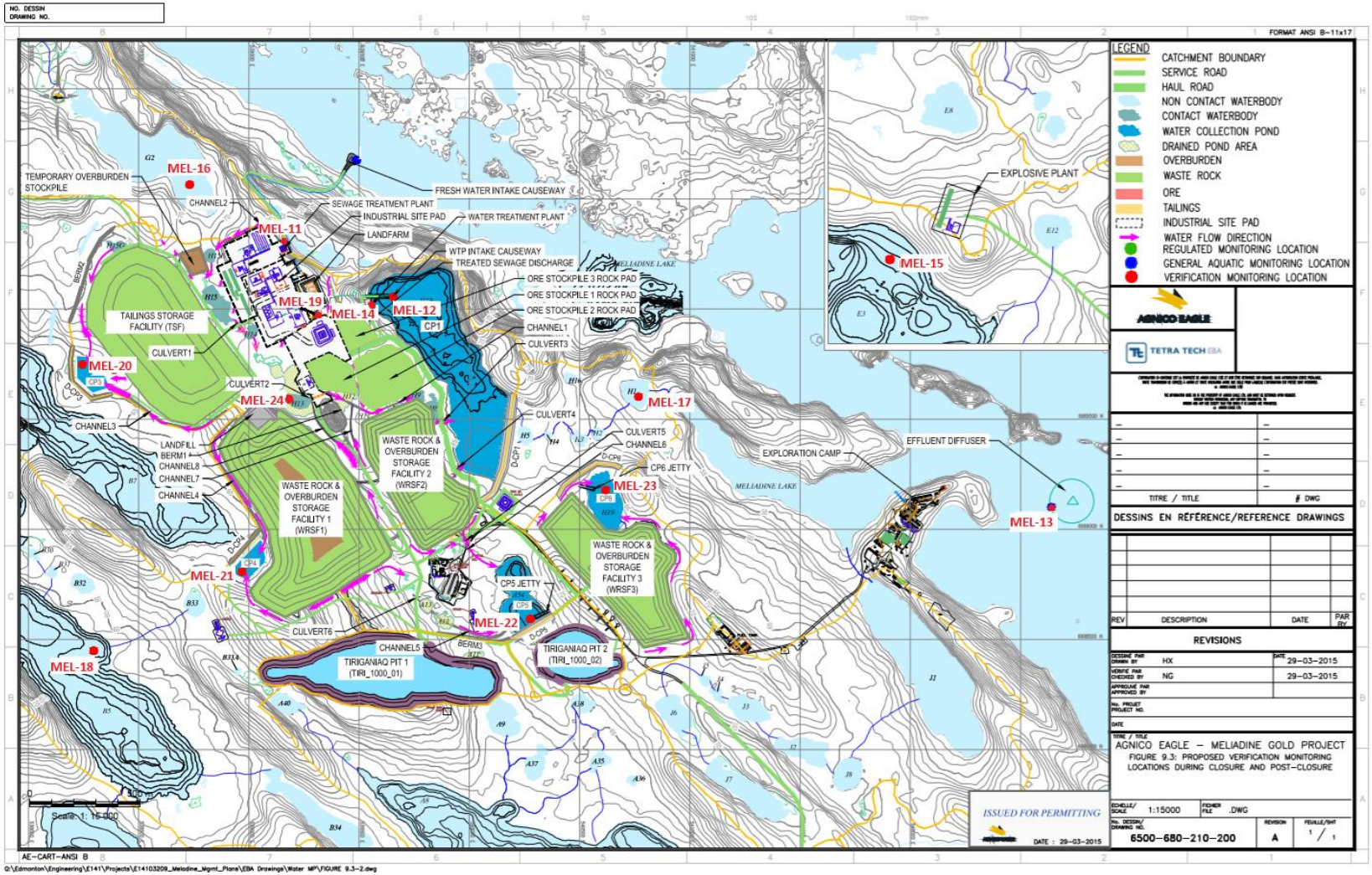

Figure A-2: Maxxam Ottawa Lab Accreditation



CERTIFICATE OF ACCREDITATION

Standards Council of Canada
Conseil canadien des normes

CERTIFICAT D'ACCRÉDITATION

Maxxam Analytics International Corporation
32 Colonnade Road North, Unit 1000, Nepean, ON K2E 7J6

having been assessed by the Standards Council of Canada (SCC) and found to conform with the requirements of ISO/IEC 17025:2005 and the conditions for accreditation established by SCC is hereby recognized as an

ayant fait l'objet d'une évaluation du Conseil canadien des normes (CCN), et ayant été trouvé conforme aux exigences énoncées dans ISO/IEC 17025:2005 et aux conditions d'accréditation établies par le CCN, est de ce fait reconnu comme étant un

ACCREDITED TESTING LABORATORY

LABORATOIRE D'ESSAIS ACCRÉDITÉ

for the specific tests or types of tests listed in the scope of accreditation approved by SCC and found on the SCC website at www.scc.ca.

pour les essais ou types d'essais énumérés dans la portée d'accréditation approuvée par le CCN et figurant dans le site Web du CCN au www.ccn.ca.

Accredited laboratory number: / Numéro de laboratoire accrédité : 814

SCC file number: / Dossier du CCN n° : 151024

Initial accreditation date: / Date de la première accréditation : 2015-10-14

Vice-President – Accreditation Services / Vice-présidente – Services d'accréditation

Issued on: / Délivré le : 2018-01-24

The validity of this certificate, including the date of last re-accreditation and its expiry can be confirmed by the accompanying Scope of Accreditation document in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. The accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF communiqué dated April 2017).

Pour vérifier la validité du présent certificat, y compris la date de la dernière réaccréditation et la date d'expiration du certificat, consulter la portée d'accréditation qui se trouve dans le répertoire des laboratoires accrédités dans le site Web du CCN au www.ccn.ca.

Ce laboratoire est accrédité conformément à la Norme internationale reconnue ISO/IEC 17025:2005. Cette accréditation démontre la compétence technique d'un organisme pour une portée définie et l'exploitation d'un système de management de la qualité de laboratoire (cf. communiqué conjoint ISO-ILAC-IAF date de avril 2017).

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MELIADINE GOLD PROJECT

Environmental Management and Protection Plan (EMPP)

MARCH 2019
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6513-MPS-07

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ᐊᓂᐊᓕᕆᓂᖅᑎᑦ ᐊᐅᓪᓚᕐᑎᓂᖓᓪᓗᒍ ᐊᓛᓪᓗ ᒥᐊᓂᕐᓴᕐᓂᖓᓪᓗᒍ ᐸᖅᓇᐅᑎᒍ ᑕᑯᐸᐅᑎᑕᑎᔪᖅ ᖃᓄᐃᓪᓕᖅᓯᓂᐅᔪᓂᖅ ᐊᓂᐊᓕᕆᓂᖓᓪᓗᒍ ᐊᓛᓪᓗᒍ ᐃᓇᐃᑦ-ᐱᑭᐅᓪᓕᐊᓂᖓᓪᓗᒍ ᐊᐅᓪᓚᕐᑎᓂᖓᓪᓕᖅᑎᑦ ᐊᓚᐅᑯᑯᑦ ᑕᓯᔪᐊᖅᑕᑦ ᔪᓕᓗᒍ ᐱᓕᕆᖓᓂᖅᓴᖅ (ᐱᓕᕆᐊᖅ). ᐃᑲᔪᖅᑕᐅᔪᖅ ᑲᑎᒪᔪᓂ ᐱᓕᕆᐊᖓᔪᖓᓕᖅᓴᖅ ᐊᓐᓯᓗᓐᓯᑎᐊᖅᑎᑕᑎᓂᖓᓪᓕᖅᑎᑦ, ᖃᐅᔨᓕᐊᖃᖅᑕᑕᓂᖓᓪᓕᖅᑎᑦ, ᐊᓚᓗᓗ/ᐅᐸᓂᔫᓂ ᐊᐅᓚᕐᑎᓂᖓᓪᓕᖅᑎᑦ ᐸᖅᓇᐅᑎᓄᑦ ᐅᖃᖅᓯᒪᔪᓂ ᐱᓕᕆᖓᓪᓗᒍ ᐊᐅᓪᓚᕐᑎᓂᖓᓪᓗᒍ ᐊᓛᓪᓗ ᐃᓇᐃᑦ-ᐱᑭᐅᓪᓕᐊᓂᖓᓪᓗᒍ ᐊᐅᓚᕐᑎᓂᖓᓪᓕᖅᑎᑦ. ᐊᖏᔪᓂᔪᓂ ᐊᐅᓚᓐᓂᐊᖅᑕᓐᓂᑦ ᖃᓄᐃᓐᓇᕆᐊᖃᖅᓯᐅᑦᓂᐅᔪᓂ ᐱᓕᕆᖓᓪᓗᒍ ᓇᓗᓇᐃᔪᓂᕐᒥᑦᑐᑐᒍ, Type A ᐃᒪᖅᓗᒍ ᓚᐃᓴᓪᓗ (2AM-MEL1631)-ᒥᑦ, ᐊᓯᖏᑦ ᐱᒋᐊᕐᓇᖅᑎᑕᑎᓂᓚᓂ, ᐊᓛᓪᓗ ᐱᓕᕆᖃᖅᓴᖅᑐᒍ ᐱᓐᔨᐸᖃᖅᓴᖅᑐᒍ ᑕᑦᓯᔪᓂᖓᓪᓗᒍ ᐊᓛᓪᓗ ᒪᓕᑕᒫᓂᖓᓪᓗᒍ ᐊᓛᓪᓗ ᐃᓇᐃᑦ-ᐱᑭᐅᓪᓕᐊᓂᖓᓪᓗᒍ ᐊᐅᓚᕐᑎᓂᖓᓪᓗᒍ. ᐊᖏᔪᓂᔪᓂ ᐊᐅᓚᓐᓂᐊᓕᖅᑕᖏᑦ ᖃᓄᐃᓐᓇᕆᐊᖃᖅᓯᐅᑦᓂᐅᔪᓂ ᐱᓕᕆᐊᖓᔪᖓᓕᖅᓴᖅ ᓇᓗᓇᐃᓐᓇᓕᓕᒫᑦᑐᑦᑐᒍ, Type A ᐃᒪᖅᓗᒍ ᓚᐃᓴᓪᓗ (2AM-MEL1631)-ᒥᑦ, ᐊᓯᖏᑦ ᐱᑭᐊᑭᓐᓇᖅᑎᑕᑎᓂᓕᓂ, ᐊᓛᓪᓗ ᐱᓕᕆᖃᖅᓴᖅ ᐱᓐᔨᐸᖃᖅᓴᖅ ᑕᓐᓇᐅᑎᓄᑦ ᐱᓕᕆᖓᓪᓗᒍ ᓚᓐᓇᕐᓂᖓᓪᓗᒍ ᐊᓛᓪᓗ ᓚᓐᓇᕐᓂᖓᓪᓗᒍ ᐊᐅᓚᕐᑎᓂᖓᓪᓕᖅᑎᑦ. ᐊᖏᔪᓂᔪᓂ ᐊᑲᐅᕐᓱᓂᐊᖅᑕᓐᓂᑦ ᐊᐅᓚᕐᑎᓂᖓᓪᓗᒍ ᐊᓛᓪᓗ ᐃᓇᐃᑦ-ᐱᑭᐅᓪᓕᐊᓂᖓᓪᓗᒍ ᐊᐅᓚᕐᑎᓂᖓᓪᓗᒍ ᐊᓛᓪᓗ ᒥᐊᓂᕐᓴᕐᓂᖓᓪᓗᒍ ᐱᓕᕆ

ᖃᓄᐃᖓᓂᐅᔪᑦ ᐃᓕᓴᐅᑎᓂᐊᖏᓚᐅᖅᑎᑦ ᐱᓕᕆᐊᖏᑦ ᖃᐅᔨᒪᓕᖅᑎᑎᑲᓂᔪᓂᑦ ᐊᐱᒪᓗ ᐱᐅᓯᐊᖅᓯᐅᔪᓐᓇᖅᑐᓂᒃ ᐊᑐᓕᖅᑎᑎᓂᔪᓂᑦ ᐊᔨᔨᒋᑦᑐᓂᒃ ᐃᓕᑎᕐᐅᔪᓂᒃ ᐱᓕᕆᐊᖏᑦ.

ᐊᑦᖁᐅᒪᓂᕆᕐᓂᑦ ᖃᐅᔨᑎᐊᖃᑦᑕᑦᓂᔪᑦ ᐊᐱᒪᓗ ᐊᐅᓪᓕᑎᓂᔪᑦ <ᖏᓇᐅᑦ, ᓇᓴᐅᑎᓂᒃ/ᑎᑎᖃᓂᒃ ᖃᐅᔨᓴᐃᓂᓪᑦ, ᐅᓂᐸᒃᓕᐅᕆᓂᖅ, ᐊᐱᒪᓗ ᐃᓕᓴᐅᑎᓂᖅ ᖃᓄᐃᖓᓂᐅᔪᑦ ᐊᐅᓪᓚᖃᑎᑦᑎᓂᔪᑦ ᒪᓕᒃᑕᐅᔪᓴᓇᓂᑦ ᐱᓕᕆᐊᖓᓂᐊᖃᖅᑐᓂᖅ ᐊᓱᒃᓂᔪᓂᓇᓂᖅ. ᐅᖃᖅᑎᑎᖃᖅᑦᑕᑦᓂᖅ ᑕᐸᔪᓇᖅᓱᒃ ᐊᓯᐊᖏᖅᓯᓂᖃᑐᐃᓐᓇᕆᐊᖃᖅᑐᖅᑐᖅ ᒪᓕᒃᓂᐊᓕᕆᓂᑦ ᐱᓴᐅᔨᒪᔨᓇᓂᑦ ᐊᐱᒪᓗ ᐃᓯᒧᓕᑕᐅᔨᓇᓂᑦ ᐊᓯᖏᓐᓂᓇᓂᑦ ᑲᑐᔨᖃᑎᒋᓇᓂᑦ. ᐊᓱᒃᓂᔪᓂᔪᓂᑦ ᐅᔪᓂᖏᓱᒃ ᐃᓕᓴᐅᑎᓂᐅᔨᒪᓕᖅᑎᑎᓂᔪᑦ ᓴᓐᓂᔪᓂᑦ:

- ᐱᓕᕆᐊᖏᔨᔨᑦ, ᐊᑐᖅᑐᑦ ᒪᓕᑦᑐᐃᑦ, ᐊᐱᒪᓗ ᒪᓕᑦᑐᕋᓯᑦ;
- ᐃᒃᐱᕈᓂᖅᓴᐅᔨᑦ ᐅᒪᖃᑎᑎᓯᓂᖅᖅᑐᓂᓇᑦ ᐃᓕᓴᐅᔨᔨᓂᒃ (VECs) ᐊᐱᒪᓗ ᐃᒃᐱᕈᓂᖅᓴᐅᔨᑦ ᐃᓇᐃᑦ-ᐱᑭᖅᐸᓪᓕᐊᓂᖏᓇᓂᑦ ᐃᓕᓴᐅᔨᔨᓂᒃ (VSECs) ᖃᐅᔨᕈᐊᖅᑕᐅᖃᑦᑕᑦᓂᓕᕆᓪᓗᑎᒃ;
- ᐃᓇᐃᑦ ᖃᐅᔨᒪᔭᑐᖅᖏᓂᒃ ᓇᓂᔨᐅᔨᔨᑦ;
- ᖃᐅᔫᒃᑯᖃᑦᑕᑦᓂᖏᓂᑦ, ᖃᓇᑎᒋᐅᓂᖏᓂᑦ, ᐊᐱᒪᓗ ᓇᓇᐅᐸ ᐃᓂᖏᑕ ᐊᖏᓂᖏᓚᓇᑦ ᑎᑭᐅᑎᓂᕐᒃ ᖃᐅᔨᕈᐊᖃᑦᑕᑦᓂᖅ;
- ᑐᒃᓯᕿᐅᑕᐅᔨᑦ ᖃᓇᐃᓓᕆᐅᓴᕆᓂᔪᑦ <ᖏᓇᐅᑎᑦ ᐊᐱᒪᓗ ᐅᓂᐸᒃᓕᐅᕆᓂᔪᑦ ᒪᓕᒃᑕᐅᔨᔨᓴᐃᑦ; ᐊᐱᒪᓗ
- ᖃᓇᐃᖏᓐᓂᔪᑦ ᓇᓗᓇᐃᖅᓯᓂᖅ ᐊᐱᒪᓗ ᖃᓇᐃᖏᓐᓂᔪᑦ ᐊᐅᓪᓚᖃᑎᑦᑎᓂᔪᑦ <ᖏᓇᐅᑎᑦ, ᑕᒪᒃᑯᐊᕆᓗᐃᑦ.

ᐱᔨᑌᐊᖃᖅᑦᓴᓚᑦ, ᖃᐅᔨᕈᐊᖃᑦᑕᑦᓂᔪᑦ ᑐᑦᓴᓚᔨᑦ ᐁᖁᑭᒃᑕᐅᓂᐊᖅᑐᑦ ᖃᓇᐃᖏᓂᐅᔨᑦ ᐱᓕᕆᐊᖏᔨᓐᓇᕐᓂᐊᖅᑕᒪᑦ ᐱᓕᕆᐊᖏᐃᓐᓇᖅᑐᖅ ᐅᑭᐅᖅᑕᖅᑐᑎᑦ ᐊᐃᔅᑐᖅᓯᒪᔨᑦ ᐱᓕᕆᐊᒃᓴᖅᓂᒃ ᐅᖁᔨᓴᓂᓂᑦ ᑐᑦᓴᓚᔨᓇᑦ ᐱᔨᓇᖅᑎᑦᑎᓂᒃ ᓴᖅᓯᒪᓂᖅᓇᓂᑦ ᑲᑎᒪᔨᖃᑎᒌᓂᑦ ᐅᖁᔨᓴᓂᓂᑦ ᐅᑭᐅᖅᑕᖅᑐᑎᑦ ᐊᐃᔅᑐᖅᓯᒪᔨᑦ ᐱᔨᓇᖅᑎᑦᑎᓂᒃ.

EXECUTIVE SUMMARY

The Environmental Management and Protection Plan (EMPP) describes the overall intent and direction for environmental management at Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Project (Project). This document outlines and describes project-specific management plans, mitigation measures, adaptive management and other standards and requirements for specific areas of environmental management. It is Agnico Eagle's intent to comply with and manage the conditions of the Nunavut Impact Review Board Project Certificate (#006), the Nunavut Water Board Type A Water Licence (2AM-MEL1631), and requirements pertaining to relevant laws and regulations. Agnico Eagle has also developed standard operating and inspection procedures that take into account licenses, permits and legal requirements pertaining to the Project.

A cyclical feedback loop will be employed where operations are planned and implemented, monitoring data collected and analyzed, and practices adjusted to promptly reduce or eliminate any observed negative impacts throughout the life of the Project. Continual use of this feedback loop will allow adaptive management decisions to be made, and shall lead to improvements to the environmental management systems as necessary over time.

The EMPP allows flexibility to respond to changes, for example, in the mining development plan, the regulatory regime, the biophysical environment, technology, research results, and the understanding of Inuit Qaugimajatuqangit (IQ). Thresholds and indicators to trigger management actions are provided, where applicable, in the management plans associated with licenses and permits, along with a system of accountability.

Monitoring and adaptive management are essential tools for ensuring that a project progresses as planned, that mitigation measures are successful, that the procedures and practices are effective and that potential adverse impacts are avoided or minimized. Management Plans and relevant Standard Operating Procedures outline mechanisms such as monitoring, which will be used to refine and modify any mitigation measures.

The design of monitoring and management plans, data analysis, reporting, and integration of results into operational procedures will be carried out by Agnico Eagle. Consultation on the same may lead to changes to meet the needs and concerns of other stakeholders. Agnico Eagle has incorporated the following

- objectives, applicable laws, and regulations;
- the Valued Ecosystem Components (VECs) and Valued Socio-economic Components (VSECs) to be monitored;
- IQ findings;
- frequency, duration, and geographic extent of monitoring;
- proposed action plans and reporting procedures; and

- quality assurance and quality control programs.

When applicable, monitoring programs will be designed so that the results can be coordinated with ongoing regional initiatives or programs with the relevant government organizations or regional authorities.

As a function of Agnico Eagle's adaptive management several management plans have been revised and/or updated, including, but not limited to, the following:

- Environmental Management and Protection Plan Version 8 - Jan, 2019
- Water Management Plan Version 3 - Jan, 2019
- Incinerator Management Plan Version 5 – Dec, 2018
- Landfill Management Plan Version 7 Dec - 2018
- Quality Assurance/Quality Control Plan – Version 3, Dec, 2018
- Aquatic Effects Monitoring Plan – Version 2 - Oct, 2018
- Mine Waste Management Plan – Version 4 - Dec, 2018

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	November 2012			First draft of the Environmental Management and Protection Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013	1.2	2-4	Add Project phases to Table 1-1 and details on adaptive management	John Witteman, Env. Consultant, Agnico Eagle
		3.2	11-13	Add details on adaptive management in design of plans	
		4.5	20-21	Independent audits and reviews	
3	April 2014	1.2	5	Monitoring and mitigation plans vs licensing process	John Witteman, Env. Consultant, Agnico Eagle
		1.3	5	Revision throughout life-of-mine	
		1.3	7	Added Table 1-3	
		2.1	8	Updated Sustainable Development Policy	
		4	16 and 18	Added design, practices and procedures; link with VECs and VSECs	
4	April 2015			Update of entire document for Water Licence Application	John Witteman, Env. Consultant, Agnico Eagle
		4.2.2	24	New section on Traditional Knowledge (IQ)	
		4.2.3	25	New section on Inspections	
5	June 2016	Executive Summary		Revised Section to reflect receipt of Water Licence	Golder Associates, Ltd.
		1		Revised Introduction	
		4.2.1		Revised Environmental Monitoring to meet Water Licence	
		4.2.3		Revised Inspections	
		4.4		Revised Table 4-4 to meet Water Licence	
6	March 2017	Table 4-1 Figure 4-2		Revised Table as per approved new sampling location nomenclature	Manon Turmel, Agnico Eagle Mines Ltd.

7	February 2018	All	Revised to reflect current conditions at Site and reduce repetition	Alex Gauthier and Jennifer Brown, Agnico Eagle Mines Ltd.
8	December 2018	All	Revision required by part I Item 2 of the NWB water Licence 2AM MEL1631, Update relevant Management Plan Version and Date	Dan Gorton, Kevin Buck, Martin Theriault
9	March 2019		Addition of the tables 4.1, 4.2 and 4.3 (monitoring programs and list of constituents in each parameter group) Introduction to reflect the actual mine plan Change references to Appendix B	

ACRONYMS

CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
AEMP	Aquatic Effects Monitoring Program
Agnico Eagle	Agnico Eagle Mines Limited
DFO	Fisheries and Oceans Canada
DOE	Department of Environment
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EMPP	Environmental Management and Protection Plan
FEIS	Final Environmental Impact Statement
GN	Government of Nunavut
HTO	Hunting Trapping Organization
IP	Inspection Plan
IQ	Inuit Qaugimajatuqangit
KIA	Kivalliq Inuit Association
NIRB	Nunavut Impact Review Board
NPC	Nunavut Planning Commission
NWB	Nunavut Water Board
PDCA	Plan, Do, Check, Adjust
QA/QC	Quality Assurance and Quality Control
RMMS	Responsible Mining Management System
TC	Transport Canada
VEC	Valued Ecosystem Component
VSEC	Valued Socio-Economic Component

SECTION 1 • INTRODUCTION

1.1 Purpose and Scope

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1’23.8’’ N, 92°13’6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. There are four phases to the development of Tiriganiaq: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forward). Approximately 14.9 million tonnes (Mt) of ore will be produced. The produced ore will be milled over approximately 8 years of mine life at a rate of approximately 3,000 tonnes per day (tpd) in Year 1 to Year 3 and 5,000 tpd in Year 4 to Year 8.Mining facilities include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), a water management system that includes collection ponds, water diversion channels, and retention dikes/berms, and a Water Treatment Plant (WTP)

The Environmental Management and Protection Plan (EMPP) provides Agnico Eagle with direction to measure and manage environmental effects of the Project throughout the life of mine. It is a site-specific plan that describes the systematic means by which Agnico Eagle will consistently manage and control potentially adverse impacts, and enhance potential project benefits identified through the Environmental Assessment (EA) process and the subsequent licensing and permitting of the Project.

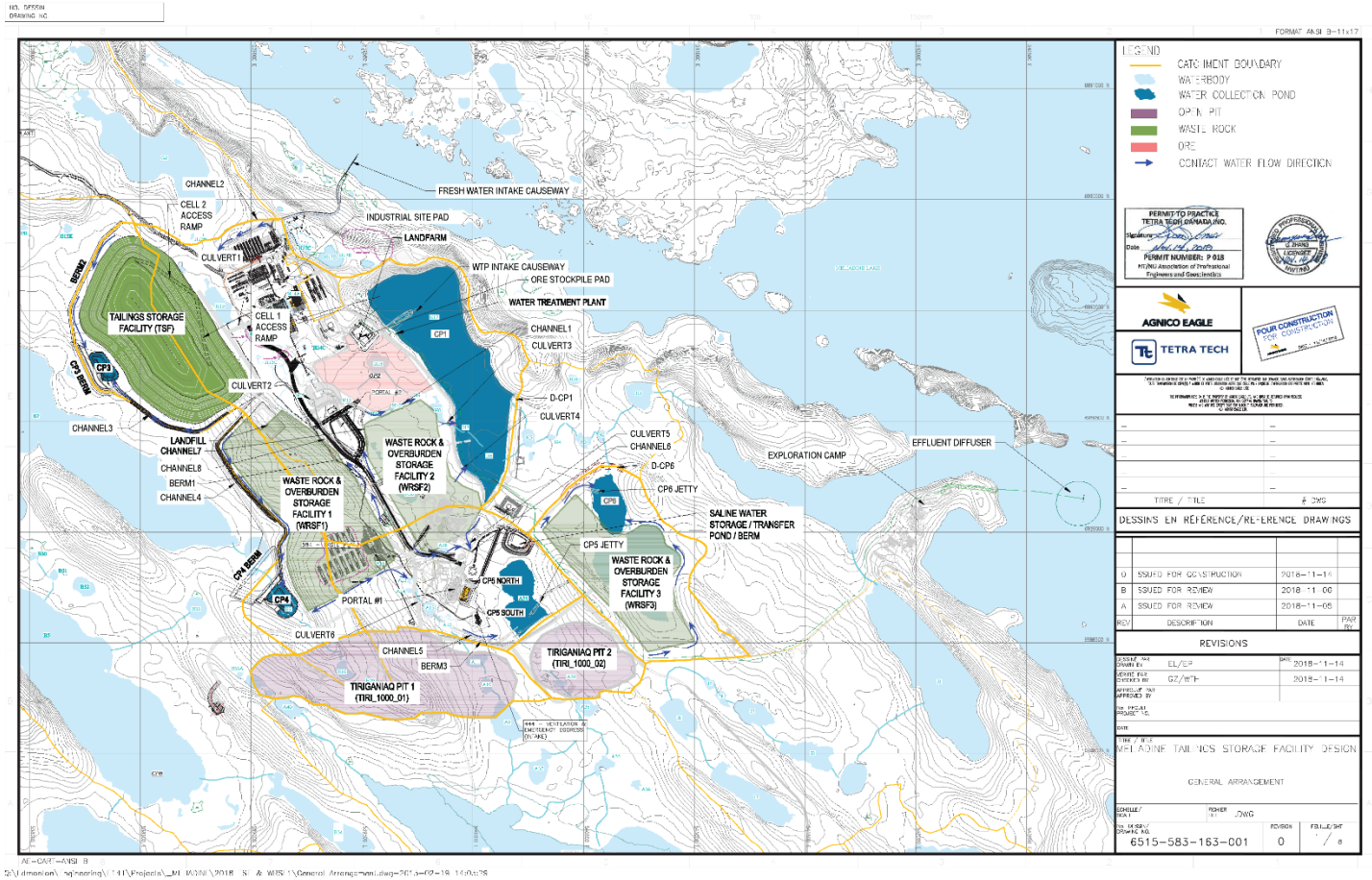
The goal of the activities related to the EMPP is to ensure that Agnico Eagle complies with laws, regulations, and authorizations, and to enable the achievement of goals set out in Agnico Eagle’s Sustainable Development Policy. This plan applies to the pre-development, construction, operations, and closure phases for the Project.

The EMPP defines the sequence of policy, planning, implementation, monitoring, and review processes that will ensure that the Project complies with commitments made throughout the EA process, applicable regulated standards and Agnico Eagle’s environmental standards. The Plan also contemplates implementation of adaptive management activities for ongoing improvement.

The EMPP encompasses a suite of project specific management plans that set out the Project’s standards and requirements for different areas of environmental management. Many of the plans are required by law or by conditions of the NIRB Project Certificate, and the NWB Type A Water Licence

2AM-MEL1631 issued for the Project. The plans and measures are specific to activities and phases of the Project

Figure 1-1 General Site Plan



1.2 Environmental Management Documentation

The structure of the Project's environmental management documentation is shown in Table 1-1. Socio-economic plans are also included. For specific details, please consult the individual plans.

Table 1-1 Environmental and Socio-Economic Monitoring, Mitigation, and Management Plans

Environmental Management System							
				Project Phase			
Plan			Purpose	Construction	Operation	Closure	Post-Closure
6513-MPS-01	Incineration Management Plan	Version 5, Dec 2018	To outline the operation of an incinerator located at the site.	√	√	√	
6513-MPS-03	Roads Management Plan	Version 5, Mar 2018	To manage access, service, and haul roads proposed in the Project areas, covering construction, operations, and final closure (the Plan also covers temporary closure).	√	√	√	
6513-MPS-04	Borrow Pits and Quarries Management Plan	Version 6, Mar 2018	To outline environmental aspects of developing, using, and closing the borrow pits and quarries necessary for the overall Project. May be used throughout the Project's life as necessary (when quarries and borrow pits will be required).	√	√	√	
6513-MPS-05	Spill Contingency Plan	Version 7, Mar 2018	To ensure the efficient cleanup of spills related to the Project and to promote prevention, safety and environmental awareness on and off site..	√	√	√	√
6513-MPS-06	Landfill and Waste Management Plan	Version 7, Dec 2018	To describe how non-combustible, non-hazardous, solid industrial wastes will be managed using a landfill, and how remaining non-hazardous waste will be managed.	√	√	√	
6513-MPS-07	Environmental Management and Protection Plan	Version 8, Dec 2018	To provide overarching direction for environmental and socio-economic management for the Project.	√	√	√	√
6513-MPS-08	Ore Storage Management Plan	Version 1, Apr 2015	To address the management of ore mined at the Project.		√		
6513-MPS-09	Mine Waste Management Plan	Version 3, Mar 2018	To address the management of all waste rock and overburden generated through all phases of the Project, and all tailings generated during the operational phase of the Project.	√	√	√	√
6513-MPS-10	Mine Plan	Version 1, Apr 2015	Provide a summary of consolidated information on the design, operation, production and environment management of the mining and milling facilities.	√	√	√	
6513-MPS-11	Water Management Plan (includes	Version 3, Dec 2018	To provide a consolidated source of information on the strategies that will be applied to intercept, collect, contain, conserve, and monitor water in	√	√	√	√

Table 1-1 Environmental and Socio-Economic Monitoring, Mitigation, and Management Plans

Environmental Management System							
				Project Phase			
Plan			Purpose	Construction	Operation	Closure	Post-Closure
	Freshet Action Plan)		the Project's area, thus preventing potential adverse impacts on water.				
6513-MPS-12	Hazardous Materials Management Plan	Version 6, Dec 2018	To describe how solid and liquid hazardous materials, including hazardous waste, will be managed and. Includes the Fuel Management Plan.	√	√	√	
6513-MPS-14	Explosive Management Plan	Version 5, Mar 2018	To provide information on explosives transport, storage, manufacture, and handling at the Project.	√	√		
6513-MPS-15	Landfarm Management Plan	Version 3, Dec 2018	To outline the storage and remediation of petroleum hydrocarbon contaminated soil, snow, and ice that may be generated at the Project.	√	√	√	
6513-RMM-01	Risk Management and Emergency Response Plan	Version 4, Apr 2015	An assessment of the potential risks from natural hazards, in both aquatic and terrestrial environments, plus a response plan to emergencies. Includes risk assessment and management if incidents and mechanical and procedural malfunctions emergency response plan.	√	√	√	√
6513-CRP-01	Preliminary Closure and Reclamation Plan	Version 1, Apr 2015	To develop a conceptual plan which outlines how the various mine components will be decommissioned, reclaimed and/or closed following temporary closure or final mine closure. Includes care and maintenance.			√	√
6513-QQY-01	Quality Assurance/Quality Control	Version 3, Dec 2018	Provides consolidated information on the quality assurance and quality control measures for the Project.	√	√	√	
6513-REP-03	Aquatic Effects Monitoring Program (AEMP) Design Plan	Version 2, Oct 2018	To provide information on monitoring the aquatic environment and on mitigation measures to protect and minimize potential impacts on the aquatic environment.	√	√	√	√
	Greenhouse Gas Emissions Reduction Plan	Version 1, Dec 2018	To discuss monitoring, mitigation and adaptive management strategies for the reduction of greenhouse gas emissions over the life of the project.	√	√	√	√
	Conceptual Fisheries		To discuss measures to be implemented to offset the loss of fish habitat resulting from Project	√	√	√	√

Table 1-1 Environmental and Socio-Economic Monitoring, Mitigation, and Management Plans

Environmental Management System						
			Project Phase			
Plan		Purpose	Construction	Operation	Closure	Post-Closure
Protection and Offsetting Plan		activities and components. Not applicable at this time.				
Air Quality Monitoring Plan	Version 1, Nov 2015	To present air quality monitoring and management, and emissions and dust reduction/control strategies.	√	√	√	
Noise Monitoring Plan	Version 2, Mar 2017	To provide information on monitoring and mitigation of noise.	√	√	√	
Terrestrial Environment Management and Monitoring Plan (TEMMP)	Version 1, Nov 15	To include appropriate mitigation and monitoring for selected terrestrial species.	√	√	√	√
Shipping Management Plan	Version 7, Mar 2018	To present all Project-related shipping of dry cargo and fuel to Rankin Inlet.	√	√	√	
Oil Pollution Prevention Plan	Version 1.3, Feb 2018	To present the requirements for emergency procedures, equipment, and resources specific to the Rankin Inlet Oil Handling Facility (Itivia) tank farm), as well as preventive measures.	√	√	√	

The EMPP is not a static document; it should be updated periodically as site and external conditions change and as knowledge is gained. Requirements to refine the EMPP may result from changes in operations, technologies employed, the phase of the Project, the result of research findings commissioned by Agnico Eagle, improvements in safety procedures, and/or greater understanding of traditional knowledge (IQ). Changes to laws and regulations, environmental conditions, and other external factors can also have a bearing on the EMPP.

SECTION 2 • BACKGROUND

2.1 Sustainable Development Policy

The Sustainable Development Policy is Agnico Eagle's commitment to operate in a safe social and environmentally responsible manner. It forms the basis of the EMPP and defines the framework within which Agnico Eagle operates. Environmental commitments from the Policy are listed below.

PROTECT THE ENVIRONMENT

We aim to minimize the effects of our operations on the environment and maintain its viability and its diversity. To achieve this, we:

- *Minimize the generation of waste and ensure its proper disposal;*
- *Manage tailings, waste rock and overburden to ensure environmental protection;*
- *Implement measures to conserve natural resources such as energy and water;*
- *Implement measures to reduce emissions to air, water and land, and to minimize our footprint;*
- *Implement measures to reduce our greenhouse gas emissions and address climate change;*
- *Integrate biodiversity conservation and land use planning considerations through all stages of business and production activities;*
- *Rehabilitate sites to ensure physical and chemical stability and in consultation with the communities in a timely manner.*

2.2 Regulatory Setting

Appendix A provides a listing of the various territorial and federal laws, regulation, and guidelines applicable to the Project.

The main authorizing agencies that participated in the review of the Project's Type A Water License (Nunavut Water Board) and the authorizing Project Certificate (Nunavut Impact Review Board) are the following:

- Nunavut Impact Review Board (NIRB);
- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC);
- Nunavut Planning Commission (NPC);
- Nunavut Water Board (NWB);
- Kivalliq Inuit Association (KIA);
- Fisheries and Oceans Canada (DFO);
- Environment and Climate Change Canada (ECCC);
- Rankin Inlet Hunting Trapping Organization (HTO)
- Transport Canada (TC);
- Nunavut Research Institute;

- Department of Environment (DOE), Government of Nunavut (GN);
- Department of Culture and Heritage, (CH)[1], GN;
- Community and Government Services (CGS), GN; and
- Hamlet of Rankin Inlet.

2.3 Environmental Management and Protection Plan Effectiveness

It is Agnico Eagle's intent to ensure the effectiveness of the EMPP by:

- applying best management practices and using best available information throughout the life of the Project;
- employing adaptive management to address any concerns that may be raised through monitoring;
- seeking continual improvements in environmental and socio-economic management;
- implementing procedures to comply with the conditions imposed by the NIRB Project Certificate and the NWB issued Type A Water Licence;
- consulting with Kivalliq communities and Inuit organizations to understand and address their concerns and to develop guidance for environmental and socio-economic management;
- consideration for incorporating Inuit Qaujimajatuqangit (IQ) into management decisions;
- complying with laws, regulations, and authorizations,
- managing environmental risks associated with the Project through the use of the Precautionary Principle[2] to prevent risks of serious or irreversible harm to the environment;
- assigning roles and responsibilities in making decisions and responding to environmental and impacts that may occur; and
- Reducing or eliminating potentially adverse impacts while maximizing beneficial effects.

2.4 Flexibility in the Environmental Management and Protection Plan

Adaptive management can improve long-term management outcomes. This is possible due to flexibility of this Plan and all other Management Plans developed by Agnico Eagle. Decision-making will meet management objectives and accrue information needed to improve future environmental management (Holling 1978). Flexibility allows for adjustments to operating procedures and refinement of mitigation measures based on what has been learned through experience, monitoring, and research.

[1] Formerly Department of Culture, Language, Elders and Youth (CLEY)

[2] The *Canadian Environmental Protection Act* (1999) defines the Precautionary Principle as follows: "*…where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."*

SECTION 3 • ENVIRONMENTAL MANAGEMENT SYSTEM

3.1 Responsibilities and Resource Allocation

The Responsible Mining Management System (RMMS), developed by Agnico Eagle, is expected to provide information related to two key questions:

1. *Does the RMMS effectively conserve and protect the environment in which the mine operates and allow traditional pursuits to continue unimpeded?*

2. *Does the RMMS achieve the goals found in Agnico Eagle's Sustainable Development Policy?*

The RMMS is designed to provide a framework to ensure adequate protection of the environment. It includes the flexibility for continual improvement over time. RMMS verifies that the assignment of environmental management responsibilities and resource allocation to environmental management, monitoring, and mitigation has been considered.

The use of adaptive environmental management allows scenarios to be tested and mitigation measures to be planned and developed beforehand. This allows for a rapid response to adverse effects and reduces the length of time land and water potential impacts could persist. In the event inadequacies are detected in the RMMS, the flexibility afforded by adaptive management allows these to be addressed quickly and in a comprehensive manner.

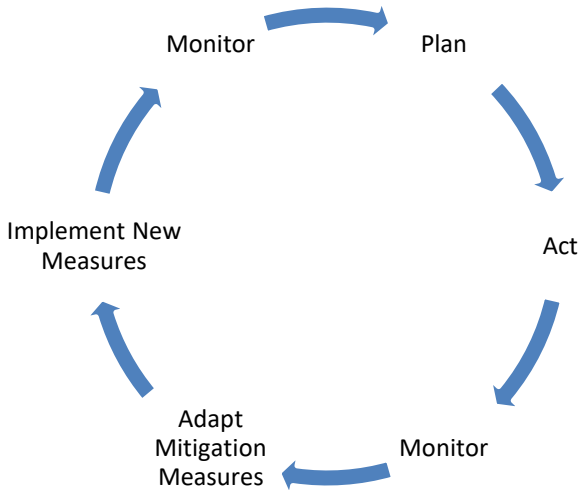
Responsibility for decision-making and providing the resources for the implementation, maintenance, and improvements to the EMPP rests with mine management with input from Agnico Eagle's corporate office. Management responses to potential adverse effects will be based on the analysis of monitoring results and an understanding of the cause and effect, the severity and duration of the adverse effect, and the impact on traditional pursuits. Decisions made using an adaptive management process will improve the EMPP's effectiveness in addressing environmental effects while maintaining the economic viability of the mine. The Environment Superintendent, as a member of the mine senior management team, will have input to collective decisions.

The response initiated and resources provided would be commensurate with the gravity and duration of the observed effect. The goal is to remove the cause of the adverse effect or reduce the observed effect to an acceptable level. This could include administrative actions, such as adjustments to standard operating procedures, especially if negative effects persist.

3.2 Design of Mitigation and Monitoring Plans

Environmental mitigation and monitoring plans outline specific procedures and actions considered essential in accomplishing defined tasks required by the Project. These plans (e.g., Water Management Plan [Agnico Eagle 2018], Terrestrial Environment Management and Monitoring Plan [Agnico Eagle 2017], Borrow Pits and Quarries Management Plan [Agnico Eagle 2018], etc.) include various responses, mitigation measures and strategies designed to be corresponding to the potential

adverse effects. The Plans also include monitoring provisions and programs designed with the objective of assessing effectiveness of the planned mitigation measures after such measures have been implemented. These Plans will assist Agnico Eagle in modifying its work activities and in making improvements to its mitigation measures during all phases of the Project. Adaptive management is a cycle that is applicable to all activities under the RMMS.



In this way, Agnico Eagle can continue to monitor the effectiveness of its mitigation measures, both against regulatory requirements and against the outcomes predicted through the FEIS and permitting processes, and then to adaptively adjust its mitigation measures until the effectiveness of such mitigation measures meet the expected or required outcomes. Agnico Eagle has incorporated initial trigger or threshold levels/points, for example, in the Aquatic Effects Monitoring Plan (AEMP) that, when reached or exceeded, would allow Agnico Eagle to initiate further mitigation measures or adaptively adjust its activity to reverse or stop unwanted outcomes. These initial threshold points will be the subject of continued assessment and would be reviewed and, where appropriate, revised in subsequent updates to the site AEMP.

In the instance of economic hardship (be it internal project economic hardship or external economic hardship recession or collapse in the price of gold]), Agnico Eagle will adjust its operational plans to the prevailing economic condition but it will not sacrifice its commitment to operate in accordance with statutory requirements or compromise its internal mandate to operate in a safe, responsible and sustainable manner. It is understood that Agnico Eagle will consult the NIRB and the NWB to determine whether any potential change to the Project would result in a change to the scope of the Project and potentially require an additional environmental review.

In the event of a transfer of ownership, Agnico Eagle expects that, as a precedent condition to such a sale or transfer, the new owner would be obligated to continue to meet all of the same requirements under the NIRB Project Certificate/NWB Water Licence/or other authorizations, and to continue to operate in a safe, responsible, sustainable manner under the Project's RMMS/EMPP.

In developing the monitoring and management plans for the Project, Agnico Eagle has included the following elements, where applicable:

- objectives of the monitoring program, applicable laws, and regulations;
- discussion of actions to be taken in case of non-compliance with the law or regulations;
- the Valued Ecosystem Component (VEC) to be monitored, and applicable criteria/thresholds and regulations, including, if relevant, the obligations imposed on contractors by the environmental provisions of their contracts;
- description of how the efficiency of mitigation measures will be evaluated;
- description of the frequency, duration, and geographic extent of monitoring with justification for each, and identification of personnel who will conduct the collection, analyse and interpretation of data;
- proposed actions in the event that observed results or impacts differ from those predicted;
- proposed reporting scheme for monitoring results, including format, reporting intervals, and responsible territorial and federal authorities;
- identification of organizations to which to communicate results of monitoring efforts: Inuit organizations, institutes of public government, territorial, and federal authorities, etc.;
- plans for integration of monitoring results with other aspects of the Project, including adjustments of procedures and refinement of mitigation measures;
- procedures/mechanisms to assess the effectiveness of monitoring and adaptive management programs; and
- quality assurance and quality control (QA/QC) measures to be applied to monitoring and management programs.

The initial design of monitoring and management plans, data analysis, reporting, and integration of results into operational procedures will be carried out by Agnico Eagle. Consultation on the same may lead to changes to meet the needs and concerns of other organizations.

Monitoring will use a hierarchical sequence of responses when criteria levels or compliance limits are exceeded, thereby triggering corrective actions.

Mitigation measures as well as corrective and preventative actions will be implemented by applicable mine departments or contractors with support from the Meliadine Environmental Department. This could include the evaluation of mitigation measures in place and updates to operational procedures. Communication will be maintained with Inuit organizations, authorizing agencies and the public in describing any adverse effect observed and what corrective action is being used to mitigate it.

3.3 Mitigation of Adverse Environmental Effects

Mitigation is a means of eliminating, reducing, or controlling a potential adverse environmental effect at the Project, including restitution for any damage to the environment caused by such effects through

replacement, restoration, compensation, or other means (JRP 2010). The ranking of mitigation options is as follows:

- **Avoidance** – using an alternate site or technology to avoid the adverse effect all together. This is the most desirable.
- **Minimization** – taking actions to minimize and/or contain effects to the maximum extent possible during engineering design, construction, operation and closure.
- **Rectification** – taking actions to rehabilitate or restore the affected environment after the fact.
- **Compensation** – this is used as a last resort to offset adverse environmental effects. This is the least desirable.

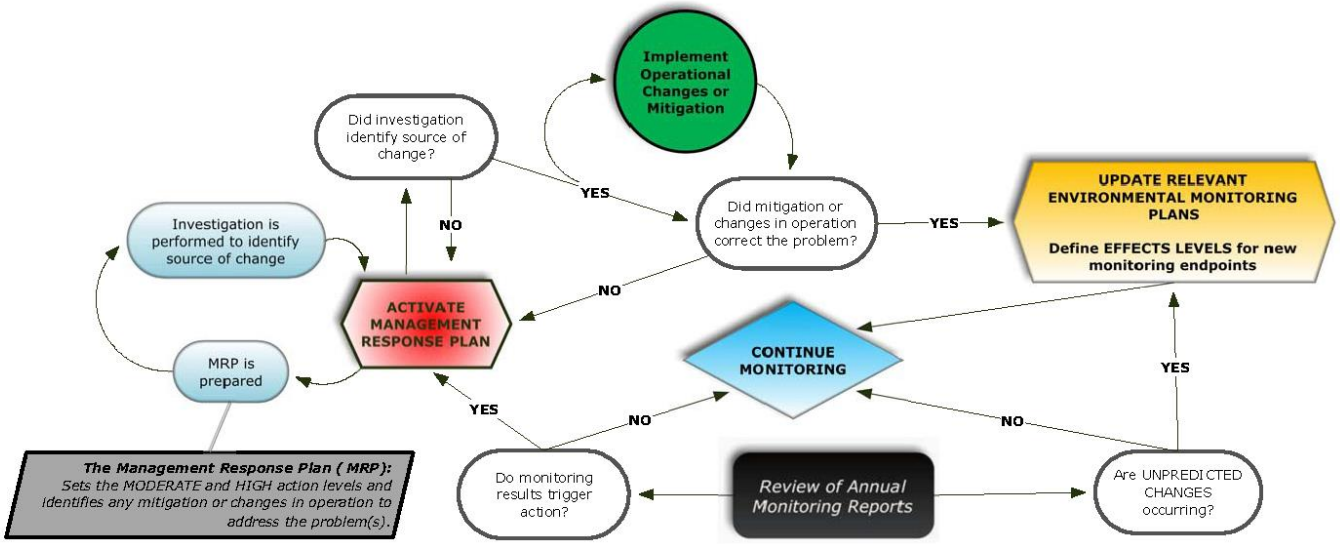
Environmental effects monitoring programs will monitor the effectiveness of mitigation measures. These programs will include a reporting and response system; through adaptive management, strategies (see Section 4).

SECTION 4 • FOLLOW-UP AND ADAPTIVE MANAGEMENT PLAN

Each of the management plans developed for the Project include an intrinsic process of continuous improvement that is aimed at evaluating the effectiveness of the design features, mitigation measures, operating practices, and procedures put in place.

Making use of adaptive management requires the recognition that it is a structured, iterative approach to environmental management decision-making (CPR 2011). Many VECs applicable to the Project are part of dynamic natural systems where uncertainty can be a significant factor. The goal is to reduce uncertainty over time by incorporating learnings from design, monitoring, mitigation, and changes in operations into environmental management at the proposed mine site. Where applicable, an adaptive management strategy or approach will be used for those VECs that will be monitored by Agnico Eagle. The adaptive management process is shown in Figure 4-1.

Trends will be documented and compared to the pre-established goals/thresholds. Any corrective action plan will also be documented through the RMMS.



Adaptive Management Plan triggered when EFFECT(S) LEVELS exceed pre-determined LOW ACTION LEVELS or UNPREDICTED CHANGES are occuring (i.e., conclusions of monitoring response framework).

Outcome may include engineering/mitigation, changes to Effluent Quality Criteria (EQC), and updated monitoring programs.

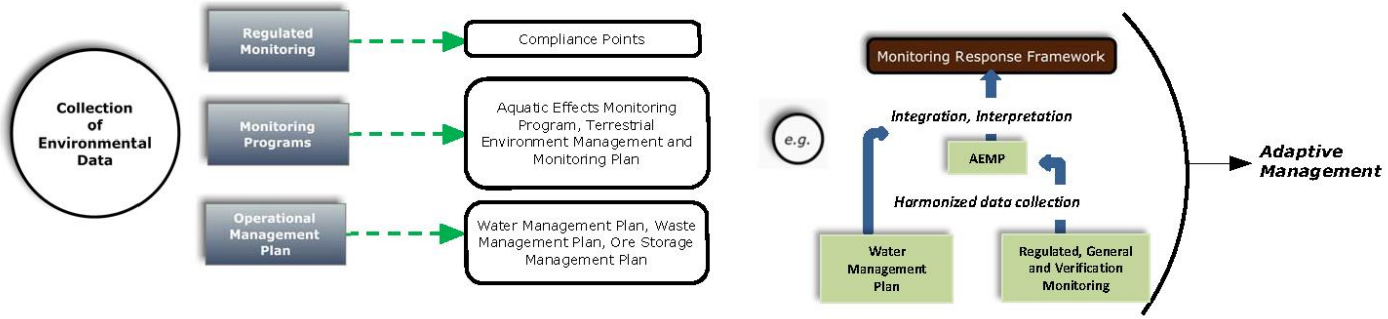


Figure 4-1 Adaptive Management Process

4.1 Adaptive Management and Precautionary Principle

It is through monitoring that any unanticipated adverse environmental impacts can be discovered. Adaptive management is particularly useful in implementing the appropriate remedial measures in these instances. Additionally, the objectives of monitoring and adaptive management are to verify that:

- commitments are fulfilled;
- regulatory and other requirements are met;
- adverse effects are avoided or minimized; and
- benefits are enhanced.

The precautionary principle, in conjunction with adaptive management, will be used in decision-making. In the face of uncertainty, conservative approaches will be used with an aim to reducing uncertainty over time via monitoring and mitigation.

Inspection precedes maintenance. Inspections, combined with monitoring, will signal when adaptive management must be used to mitigate possible negative effects (see Section 4.2.3 Inspections).

4.2 Performance Measurement and Monitoring

To effectively communicate performance, it is important to select the appropriate indicators. As part of the Mining Association of Canada, Agnico Eagle reports its global performance through its annual Corporate Social Responsibility report. This report includes, notably, the indicators of the Global Reporting Initiative and Towards Sustainable Mining Initiative. Those will be incorporated into the Meliadine RMMS. Indicators to follow will be selected by taking into account:

- the compliance with relevant regulatory requirements and permitting targets;
- activities trends; and
- the progress towards achieving targets.

The RMMS will link the compliance thresholds to appropriate corrective actions and establish accountability.

The performance of the management plans will be monitored and the results communicated. Independent researchers or consultants may be engaged to review performance where necessary. The accuracy of the environmental impact predictions and the effectiveness of the mitigation measures will be verified through that process. If unusual or unforeseen adverse environmental impacts are noticed, corrective action will be put in place. Through the adaptive management process, the existing mitigation measures will be adjusted or new mitigation measures implemented if necessary. External reporting will be completed, as required. As a result, site Management Plans may be revised or modified as required.

A follow-up program will verify the effectiveness of any mitigation measures taken in response to expected and unexpected adverse environmental effects. An environmental effects monitoring

program, will monitor the effectiveness of all mitigation measures. This program will include a reporting and response system.

4.2.1 Environmental Monitoring

Environmental monitoring, for the purposes of the EMPP, consists of the following:

- Regulated discharge monitoring occurs at monitoring points specified in the Type A Water License, other licenses, or regulations. It includes discharge limits that must be achieved to maintain compliance with an authorization (e.g., water license) or regulation (e.g., Metal and Diamond Mining Effluent Regulations). Enforcement action occur if discharge limits are exceeded for a parameter.
- Verification monitoring is carried out for operational and management purposes by Agnico Eagle. This type of monitoring provides data for decision-making and builds confidence in the success of processes being used. There is no obligation to report verification monitoring results, although some monitoring locations and these results can be mentioned in environmental management plans (e.g., sampling to verify soil remediation in the landfarm) or the Annual Reports required by regulators.
- General monitoring is commonly included in a water license specifying what is to be monitored according to a schedule[3]. It covers all types of monitoring (e.g., geotechnical, lake levels, etc.). This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, including quality assurance/quality control provisions, and addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB or the NIRB.

All three types of monitoring will be used at the Project. A summary of Water Quality Regulated, General Aquatic, and Verification Monitoring for the Project during Construction, Operations, and Closure is included in the Aquatic Effects Monitoring Program Design Plan (AEMP) (Golder 2018) and the list of parameters for sample analysis is included in the Type A Water Licence.

[3] Referred to in NWT and old NWB licenses as the Surveillance Network Program.

Table 4.1 Water Quality Regulated, General Aquatic, and Verification Monitoring for the Project during Construction, Operations, and Closure

Station	Type of monitoring	Description	Phase	Monitoring Parameters	Frequency
Mine Site					
MEL-D-1 to TBD	Regulated Monitoring	Dewatering: Water transferred from lakes to Meliadine Lake during dewatering of lakes	Construction	As defined in the Water Management Plan referred to in Part D, Item 12	Prior to discharge and Weekly during discharge
				Volume (m3)	Daily during periods of discharge
MEL-SR-1 to TBD	Regulated Monitoring	Surface Runoff – runoff downstream of Construction areas at Meliadine Site and Itivia Site, Seeps in contact with the roads, earthworks and any Runoff and/or discharge from borrow pits and quarries	Construction, and Operation	As defined in the Water Management Plan referred to in Part D, Item 18 and Part I, Item 11	Prior to Construction, Weekly during Construction
				Group 1	Monthly during open water or when water is present upon completion
MEL-11	General Aquatic monitoring	Water Intake from Meliadine Lake	Construction, Operation, and Closure	Full Suite	Monthly during periods of intake
				Volume (m3)	Daily during periods of intake
MEL-12	Verification monitoring	Water treatment plant (pre-treatment) coming from CP1, off the pipe and not in the pond	Construction (prior to release), Operations, and Closure	Group 1	Monthly during periods of discharge
MEL-03-01 (and AEMP Stations)	General Aquatic monitoring	Mixing zone in Meliadine Lake, Station 1; and MMER exposure stations for final discharge point within mixing zone	Construction (prior to release), Operations, and Closure	Full Suite, Group 3 (MMER)	Monthly during periods of discharge

MEL-14	Regulated Monitoring	Water treatment plant from CP-1 (post-treatment), end of pipe (before offsite release) in the plant before release.	Construction (upon effluent release), Operations, and Closure	Full Suite, Group 3	Prior to discharge and Weekly during discharge
				Volume (m3)	Daily during periods of discharge Once prior to discharge and Monthly thereafter
				Acute Lethality	Once prior to discharge and Monthly thereafter
MEl-15	Verification monitoring	Local lake E-3	Operations, and Closure	Group 2	Bi-annually during open water
MEL-16	Verification monitoring	Local Lake G2	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-17	Verification monitoring	Local Pond H1	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-18	Verification monitoring	Local Lake B5	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-19	Verification monitoring	CP-2 Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-20	Verification monitoring	CP-3 Collection of drainage from dry stacked tailings	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-21	Verification monitoring	CP-4 Collection of drainage from WRSF1	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-22	Verification monitoring	CP-5 Collection of drainage from WRSF1 and WRSF2	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present

MEL-23	Verification monitoring	CP-6 Collection of drainage from WRSF3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-24	Verification monitoring	Seepage from the Landfill between the landfill and Pond H3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-25	Regulated Monitoring	Secondary containment area at the Itivia Site Fuel Storage and Containment Facility	Construction, Operation, Closure	Group 4, Volume (m3)	Prior to discharge or transfer of Effluent

Table 4-2 List of Constituents in Each Parameter Group

Parameter Group	Parameters
1	pH, turbidity, hardness, alkalinity, chloride, fluoride, sulphate, total dissolved solids (TDS), total suspended solids (TSS), total cyanide, ammonia nitrogen, nitrate, nitrite, phosphorus, ortho-phosphate, total metals (aluminum, arsenic; barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, and zinc).
2	**Total and dissolved metals**: aluminum, antimony, arsenic, barium, beryllium, boron cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc. **Nutrients**: ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, ortho-phosphate, total phosphorus, total organic carbon, dissolved organic carbon, and reactive silica. **Conventional Parameters**: bicarbonate alkalinity, chloride, carbonate alkalinity, turbidity, conductivity, hardness, calcium, potassium, magnesium, sodium, sulphate, pH, total alkalinity, TDS, TSS, total cyanide, free cyanide, and weak acid dissociable (WAD) cyanide.
3	**MDMER parameters**: total cyanide, arsenic, copper, lead, nickel, zinc, radium-226, TSS, pH, sulphate, turbidity, and aluminum. **MDMER additional requirements:** Effluent volumes and flow rate of discharge, Acutely Lethality tests (Rainbow Trout and *Daphnia magna*) and environmental effects monitoring (EEM).
4	Total arsenic, total copper, total lead, total nickel, TSS, ammonia, benzene, toluene, ethylbenzene, xylene, total petroleum hydrocarbons (TPH), and pH.
Full Suite	Group 2, TPH, and turbidity.
Flow	Flow datalogger
Field measurements	Field pH, specific conductivity, dissolved oxygen, and temperature.

MDMER = Metal and Diamonds Mining Effluent Regulations; P = phosphorus; N = nitrogen

Table 4-3 Summary of Aquatic Effects Monitoring Program Study Design

Area	Core (or Target Study)	Number of Stations per Area	No. of Samples per Station	Parameters	Sample Type	Collection Frequency within Program	Program Frequency
Exposure Area (near-field and mid-field)[a]	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	once during under-ice; monthly during discharge period	annual
		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated	monthly during discharge period	
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	once per year	every 3 years
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	once per year	every 3 years
	Plankton[b]	5	1	phytoplankton taxonomy	composite; depth-integrated	monthly during open-water period	TBD
		5	1	zooplankton taxonomy	composite; vertical tow of water column		
	Fish Health[c]	n/a	60[d]	lengths, weights, sex, fecundity, age, external and internal health	individual fish	once per year	every 3 years
	Fish Tissue Chemistry[c]	n/a	40[d]	metals	carcass (adults only), muscle, liver, kidney	once per year	every 3 years
Reference Area 1	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	monthly during open-water period	annual

Area	Core (or Target Study)	Number of Stations per Area	No. of Samples per Station	Parameters	Sample Type	Collection Frequency within Program	Program Frequency
(northeast bay)		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated		
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	once per year	every 3 years
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	once per year	every 3 years
	Plankton[(b)]	5	1	phytoplankton taxonomy	composite; depth-integrated	monthly during open-water period	TBD
		5	1	zooplankton taxonomy	composite; vertical tow of water column		
	Fish Health[(c,e)]	n/a	60 [(d)]	lengths, weights, sex, fecundity, age, external and internal health	individual fish	once per year	every 3 years
	Fish Chemistry[(c,e)]	n/a	40 [(d)]	metals	carcass (adults only)	once per year	every 3 years
Reference Area 2 (northwest bay	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	once per year	annual
		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated	once per year	annual

Area	Core (or Target Study)	Number of Stations per Area	No. of Samples per Station	Parameters	Sample Type	Collection Frequency within Program	Program Frequency
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	as required[(f)]	as required[(f)]
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	as required[(f)]	as required[(f)]
	Plankton[(b)]	5	1	phytoplankton taxonomy	composite; depth-integrated	as required[(f)]	as required[(f)]
		5	1	zooplankton taxonomy	composite; vertical tow of water column	as required[(f)]	as required[(f)]
	Fish Health[(c,e)]	n/a	60 [(d)]	lengths, weights, sex, fecundity, age, external and internal health	individual fish	once per year	every 3 years
	Fish Chemistry[(c,e)]	n/a	40 [(d)]	metals	carcass (adults only)	once per year	every 3 years
Reference Area 3 (southwest bay)	Water Quality	5	1	major ions, nutrients, metals	composite; from specific depth	once per year	annual
		5	1	chlorophyll *a*	composite; from specific depth or depth-integrated	once per year	annual
	Benthic Invertebrates	5	5	benthic invertebrate taxonomy	composite from 5 grabs	as required[(f)]	as required[(f)]

Area	Core (or Target Study)	Number of Stations per Area	No. of Samples per Station	Parameters	Sample Type	Collection Frequency within Program	Program Frequency
	Sediment Quality	5	5	particle size, total organic carbon, nutrients, metals	composite grab	as required[(f)]	as required[(f)]
	Plankton[(b)]	5	1	phytoplankton taxonomy	composite; depth-integrated	as required[(f)]	as required[(f)]
		5	1	zooplankton taxonomy	composite; vertical tow of water column	as required[(f)]	as required[(f)]
Peninsula Lakes	Water Quality	3	1	major ions, nutrients, metals	composite; from specific depth	Twice during open water season	annual

Notes:
(a) Only the Near-field area, and Reference Areas 1 and 2 are planned for sampling fish health and fish tissue chemistry.
(b) Plankton monitoring is not a core component of the AEMP but was planned as a targeted study to evaluate the usefulness of plankton monitoring for future monitoring.
(c) Fish health and tissue chemistry sampling for the AEMP is currently scheduled for 2021.
(d) Sample size is for Threespine Stickleback; Lake Trout sample sizes will be determined prior to next AEMP Fish Health/Tissue Chemistry program.
(e) Lake Trout will not be collected from the Reference Areas.
(f) Reference Area 2 was sampled to provide additional baseline data; further sampling will depend on triggering by water quality results from the Mid-field area or Reference Area 1.

"Metals" include non-metals (e.g. selenium) and metalloids (e.g., arseni

4.2.2 Use of Inuit Qaugimajatuqangit in Environmental Management and Monitoring

IQ consists of Inuit values, preferences and traditional knowledge; it is about the relationships between humans, animals, and the environment. It is location specific and reflects the particular conditions in specific geographic locations. IQ, although normally undocumented, is shared information within the community, and maintains the means and knowledge of living off the land, continues traditional land use activities, and promotes a cultural life style, all of which sustained Inuit for generations.

IQ is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. As such, IQ represents a valid and essential source of information in the design and implementation of environmental management and monitoring programs. Improvements have been incorporated based on stakeholder review, and through the inclusion of traditional knowledge from communities and Inuit organizations throughout the Kivalliq region. Agnico Eagle expects to continue active engagement with communities and Inuit organizations, which should lead to further inclusion of traditional knowledge in periodic updates to the design and implementation of environmental programs. Agnico Eagle has and will continue to engage with the KIA to advance the use of IQ. This will ensure that the combination of science and IQ leads to environmental management and monitoring that meets the expectations of government, communities, and Inuit organizations.

4.2.3 Inspections

Agnico Eagle is responsible for inspection and maintenance of all mine components, and the inspection and monitoring of mine activities. A regular inspection program will lead to the early identification of areas where improvements are needed. The early resolution of any deficiencies will result in less ongoing maintenance and repair of mine components, and a reduction in the risk of adverse environmental effects.

Inspections ensure that Project mine components are constructed, operated, maintained, managed, and closed in an environmentally sound, safe, and efficient manner. Further, inspections assist in obtaining better environmental outcomes for all activities and more timely maintenance of mine components throughout the mine life.

For the most part mine environmental personnel having knowledge and experience with the mine components and activities carry out the inspections. Training is provided by Agnico Eagle to effectively and efficiently complete inspections. Inspections result in month-end summary reports that are distributed to mine management and regulators. This allows action to be taken to address any deficiencies in components or activities. Inspection reports are retained on site by the respective inspecting departments.

4.2.3.1 Scope of Inspection Program

The Inspection Program (IP) is relevant to all phases of the mine life, including pre-development, construction, operation, closure, and any periods of care and maintenance. Inspections are conducted throughout the entire mine site and associated components. Inspections are also carried out at the Itivia site in Rankin Inlet. This includes, but is not limited to, mine components such as, open pits, quarries, borrow pits, roads, storage pads, waste rock storage facilities, diversion channels, dikes, sumps, berms, tailings storage facility, landfill, incinerator, landfarm, explosives plant, and pipelines. It includes such activities as the pumping of water and waste, discharge to the receiving environment, spill cleanup, and fuel transport on Agnico Eagle's roads.

4.2.3.2 Inspection Priority and Risk Analysis

Inspection priorities are based on analyzing all mine components / activities and their respective risks. Installations and activities are qualitatively[4] ranked as "high risk", "medium risk" and "low risk" with those posing a "high risk" receiving inspections that are more frequent[5]. If needed, the inspection schedule will be adjusted to accommodate an increased inspection frequency of mine components and/or activities requiring more attention.

The criteria used in determining risk arising from the use of water or discharging to water include the following:

- potential effect on the environment (e.g., due to the location of mine components and sensitivity of the nearby receiving environment);
- potential effect on public health (e.g., potable water treatment or sewage treatment);
- safety risks (e.g., the integrity of roads throughout freshet or following a major rain event);
- potential social impacts (e.g., dust from Agnico Eagle's roads); and,
- potential financial or economic impact resulting from an accident, malfunction, or spill (e.g., tanker truck leaving the all–weather access road, spilling fuel, and requiring significant resources for the cleanup).

4.2.3.3 Routine and Non-routine Inspections

Routine inspections are planned and scheduled on a reoccurring basis and cover the following:

- inspections required under authorizations;
- inspections of mine components where the management of water and waste takes place; and,

[4] If there is a disagreement on the level of risk based on a qualitative determination, a quantitative determination will be undertaken using accepted methods found in the literature (IMPEL 2012).

[5] Agnico Eagle has the capacity to carry out an inspection program. All activities and mine components identified in this inspection program affecting the use of water or the discharge of waste to water will be inspected, irrespective of the level of risk.

- activities that could affect water and waste management.

Non-routine, event, or unplanned inspections cover the following:

- environmental complaints or concerns raised by the public;
- accidents, malfunctions and spills;
- after major rain events;
- instances when the quality or quantity of water on the mine site is not meeting expectations; and
- instances where discharge criteria to the receiving environment approach, but do not exceed, Water License limits or the Metal Mining Effluent Regulations.

Inspections will have a strong seasonal component with some inspections suspended over the winter and others reduced. Agnico Eagle foresees a high frequency of inspections of engineered structures occurring just before and during freshet, followed by less frequent inspections over the remainder of the open water season. For example, inspections of culverts, bridges, ditches, and sumps will be suspended over the winter, and would resume before freshet and continue over the summer until freeze-up. Increased inspections during freshet will ensure mitigation measures employed to manage the higher spring flows prove effective, and that the integrity of bridges and culverts are not compromised.

Year-round inspections at a set frequency will occur for mine components such as the potable water treatment plant, the sewage treatment plant and the landfill. These are not directly influenced by the changing weather experienced at the mine site over the year.

Table 4-1 below provides a summary of proposed inspections of mine components and mine activities; this includes some unrelated to the use or water or the discharge of waste to water. Specific details are included in the respective management plans and/or procedures and indicate inspection methods or procedures, and frequency. It also identifies the department responsible for the inspection. Ultimately, the environmental department at Agnico Eagle will be responsible for ensuring that all monitoring and inspections are completed.

Table 4-4 Summary of Proposed Inspections

Mine Components / Activities Inspected	Inspection Methods/Procedures/ Department Responsible	Qualitative Risk Level - High, Medium, or Low	Department Responsible	Frequency
Dikes	Visual inspection for erosion of or seepage through or under the dikes, including movement of crests and slopes. The environment department would collect samples of any seepage.	High. Failure of a dike could have significant adverse effects on the downstream environment	Engineering	Weekly prior to freshet when the dikes are clear of snow, and weekly over the open water season. Monthly during the winter to check for seepage
Open Pits	Visual inspection for seepage and collection of samples, if it safe to do so	Low. Water seeping into open pits will be controlled and directed to CP1	Open Pits Mining Environment Engineering	Weekly at freshet and monthly thereafter over the open water season
Waste Rock Storage Facilities	Visual Inspection for seepage and collection of samples, if it safe to do so. Thermistor Installation	Low. Ditches will intercept any seepage from the waste rock and direct the water to CP1. Thermistors monitor the rate of freeze back and permafrost development progress	Open Pits Mining Engineering Environment	Visual inspection, monthly over the open water season and thermistors monitored four times per year.
Ore Stockpiles	Visual Inspection for seepage and collection of samples, if it safe to do so.	Low. Ditches will intercept any seepage from the ore stockpiles and direct the water to CP1.	Engineering	Visual inspection, monthly over the open water season
Tailings Storage Facility	Thermistor Installation	Low. Thermistor cables will be installed in the TSF to monitor the permafrost development progress within the facility during the operations stage	Engineering Environment	Four times per year
Berms	Visual inspection for erosion of or seepage through or under the berms, including movement of crests and slopes.	High. Failure of berms upstream from pits could pose a safety hazard.	Engineering	Weekly inspection just before, during and just after freshet; Monthly after freshet is over in the open water season
Culverts	Visual inspection for snow and/or debris blockage of culverts.	Medium. Snow can be removed from the front and back of the culverts before freshet	Energy and Infrastructure Environment Engineering	Just prior to freshet and daily during the first days of freshet; also following major rain events. Weekly during period of flow. Monthly after freshet is over in the open water season

Table 4-4 Summary of Proposed Inspections (continued)

Roads	Visual inspection for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment	Low. Affected area will be repaired using granular material and/or crushed rock.	Energy and Infrastructure	Weekly over the summer (approximately mid-May , from the start of the freshet period to October, prior to the fall freeze-up)
Water ponding against roads	Visual inspection of roads after freshet and major rain events.	Low. Ponding can be dealt with by pumping the water or by installing a culvert in the road where water is ponding.	Energy and Infrastructure Environment	Weekly over the open water season and following freshet and major rain events
Bridges	Visual inspection for snow dams prior to freshet	High. Snow dams could lead to the bridge being overwhelmed at freshet with resultant damage. Snow dams may also result in flooding upstream from the bridge, potentially impacting existing heritage resources.	Energy and Infrastructure	Prior to freshet to allow time for any snow dams to be removed and weekly during freshet to confirm that snow dams were breeched.
Snow removal from roads	Visual inspections to ensure skidoo trails are not being blocked by snow removed from the roads	Low. Pushing snow onto skidoos trails that cross Agnico Eagle's roads will make it difficult for trail users to cross the roads.	Energy and Infrastructure Environment	Following each major winter storm and clearing of snow off the roads.
Road dust	Visual inspection of the road for excessive dust generation and deposition.	High. Dust can impact on the environment along the roads, and be a safety risk due to limited visibility.	Energy and Infrastructure Environment	Weekly when roads are very dry and/or when road traffic is heavy. Inspections will be suspended during rainy days and over the winter.
Caribou near or on roads	Visual inspection of hunting activities along the road when large numbers of caribou are near-by.	High. Hunters should observe the 1 km no shooting zone along the road	Environment	Weekly, year round, and more frequently when during caribou migration periods.
Watercourses and watercourse crossings	Visual inspection of infrastructure to identify defects, cracks or any other risks to structural integrity, sediment or other debris accumulation, or bed erosion or scour	Low. Infrastructure will be repaired after deficiencies are noted, when it is safe to do so.	Energy and Infrastructure Engineering Environment	Weekly during the open water, during the freshet period, and unscheduled inspections following a major rain event.

Table 4-4 Summary of Proposed Inspections (continued)

Sumps	Visual inspection of sumps and the measurement of freeboard.	Medium. Sumps need to be pumped down prior to freeze-up to accommodate the coming year's freshet.	Engineering	One inspection before freeze-up to ensure the water level in the sumps is low to allow for inflow during freshet. Weekly during freshet, immediately after a major rain event and weekly otherwise over the open water season. Monthly after freshet is over in the open water season
Collection Ponds	Visual inspection and measurement of freeboard in contact ponds	Medium. The storage capacity of the pond needs to be increased before freeze-up to accommodate next year's freshet.	Engineering	One inspection before freeze-up to ensure the water level in the sumps is low to allow for inflow during freshet. Weekly during freshet, immediately after a major rain event and weekly otherwise over the open water season; Monthly after freshet is over in the open water season
Diversion Channels	Visual inspection of the channel for permafrost degradation and excess snow and ice accumulation leading to potential blockages.	Medium. Permafrost degradation may result in bank slumping and channel instability. Diversion channels need to be clear of snow prior to freshet to allow for water flow.	Engineering	(1) Prior to and at freshet; (2) Immediately after a major rain event; and (3) Weekly for the remainder of the ice-free season
Potable Water Treatment Plant	Visual inspection for cleanliness and that the plant is operating as required. Water samples for testing will be collected.	High. Plant provides potable water to the camp and its proper operation is necessary for human health.	Energy and Infrastructure	Ongoing as prescribed by the Dep't of Health or Public Health Authorities. Daily inspections are expected
Sewage Treatment Plant	Visual inspection for cleanliness and collection of samples for testing	Medium. The sewage treatment plant discharges to CP1, which has a dike to control flow to Meliadine Lake. The water in CP1 is reclaimed for use in processing ore, or receives additional	Energy and Infrastructure Environment	Weekly

Table 4-4 Summary of Proposed Inspections (continued)

		treatment if necessary before release to Meliadine Lake.		
Tank farms at the mine site and at Itivia	Visual inspection of water level within the secondary containment structure, and evidence of any spills or leaks. A geotechnical consultant performs a geotechnical inspection annually (between the months of July and September) of the bulk fuel secondary containment structures.	Low. Due to snow accumulation, melting and precipitation, contact water will unavoidably collect inside the secondary containment area. This water will be sampled and tested before discharge to CP1 Water from the Itivia tank farm will be returned to site, if necessary Spills and leaks will be cleaned up.	Energy and Infrastructure Environment	Weekly by Energy and Infrastructure Supervisor Weekly manual or electronic dip tests are conducted for inventory reconciliation of fuel in the tanks by sites services The geotechnical consultant inspects the tank farms annually.
Diesel Power Generating Plant	Visual inspection. Locate leak(s) and report promptly.	Low. All spills in Generating Plant will be held within the building.	Energy and Infrastructure	Weekly by powerhouse operator
Other Fueling Stations	Visual Inspection for leaks or spills and keep a written log of inspections to be made available to an Inspector upon request	Low. Fueling stations will have an impermeable liner to capture spills or leaks	Energy and Infrastructure Environment	Weekly by Energy and Infrastructure Supervisor
Hazardous Material Storage Areas	Visual inspection for proper storage of hazardous wastes	Low. Hazardous waste will be stored in areas having containment or in sea cans	Energy and Infrastructure Environment	Weekly by Energy and Infrastructure Supervisor
Waste Shipments	Inspect shipping forms to ensure they meet regulatory requirements	Low. Employees or contractor preparing waste for transport will be trained in the transportation of dangerous goods.	Warehouse/ Logistics Environment	Waste will be shipped south during the latter part of the shipping season. The shipping forms will be inspected monthly year round for sea cans that are full and have been sealed for shipment.
Landfarm	Visual inspection for water ponding outside the perimeter berm and water accumulating within the landfarm.	Low. The landfarm will have an impermeable liner and an oil: water separator will be used to remove excess water from the landfarm.	Energy and Infrastructure Environment	At freshet and weekly for the remainder of the summer.
Landfill	Visual inspection for orderly use of the landfill, absence of blowing debris, and	Low. The landfill has a berm to reduce blowing debris, and a ditch will	Energy and Infrastructure	Weekly over the entire year for the orderly use of the landfill and

Table 4-4 Summary of Proposed Inspections (continued)

	leachate at the base of the landfill during the summer.	intercept any leachate coming from the landfill.	Environment	for evidence of blowing debris. Inspections for leachate following freshet and weekly thereafter over the open water season.
Incinerator	Visual inspection for cleanliness and the proper management of all waste delivered to the facility.	Low. All waste delivered to the facility will either be incinerated or managed for future off site recycling or disposal.	Energy and Infrastructure Environment	Weekly to ensure wastes generated at the mine are being properly managed.
Emulsion Plant	Visual inspection for spillage of NH_4NO_3 outside the explosives factory and at storage locations. All Plant components inspected as per regulations	High. If NH_4NO_3 gets into water, it can negatively affect fish.	Emulsion Plant Manager	Weekly, year round, or at a frequency required by regulation.
Quarries / Borrow Pits	Visual inspection for slumping and seepage from the quarries/borrow pits.	Low. Loose rock will be pulled down from the quarry face. Seepage sampled.	Energy and Infrastructure Environment	Weekly at freshet and monthly thereafter over the open water period. Also, after major rain events.
Freshwater Jetty	Visual inspection for erosion and settlement of the jetty	Low. If there is settlement of the jetty, additional clean waste rock will be added.	Engineering	Annually following Meliadine Lake becoming ice free
Pipelines	Visual inspection for leakage or damage to the pipeline	Low. If the freshwater pipeline were to fail, the pumps in Meliadine Lake can be remotely turned off. Other pipelines discharge to or from CP1.	Energy and Infrastructure	Weekly, year round
Spills	Document the recovery of spilled material and clean-up of any remaining residuals	This could range from low to high risk depending on what was spilled, where it occurred, and success of spill recovery efforts.	All departments; Environment to follow-up	Inspections begin when a spill is reported and continues on a regular basis until the spill is cleaned up. The frequency of inspections will be dependent on what was spilled, where it occurred, and success of spill recovery efforts.
Spill Kits	Inventory of spills response equipment and materials in each spill kit	Low. Spills kits will be restocked after use.	All departments; Environment to follow-up	Quarterly by Environment Technician

Table 4-4 Summary of Proposed Inspections (continued)

Archaeological Sites	Inspect archaeological sites and report annually	Low	Environment	The location of archaeological sites has been identified and Agnico Eagle will take photos of the sites inspected and when new construction is planned in these locations.

4.2.3.4 Periodic Revisions of the Inspection Program

Periodic Revisions of the Inspection Program. The effectiveness of the inspection program will be evaluated annually to determine the extent to which it achieved the desired environmental and maintenance outcomes. Updates to the program may be prompted by changes in policies or legislation, changes in operations and/or technology at the mine, or as part of corrective action.

4.3 Incident Investigations and Corrective Actions

One of the most important aspects in investigating incidents, accidents, and non-conformities is to analyse situations and try to find root cause(s). Through this process, actions taken to address those incidents, accidents, and non-conformity should result in permanent and positive changes to the RMMS as well as on site Plans and affirm continuous improvement. It is important that employees with responsibilities with regard to a situation under investigation be part of the process in identifying and assessing causes.

The following standard steps will be followed when conducting an investigation:

- identify the cause(s);
- prepare a report on the findings;
- develop a plan for corrective, mitigation, and preventive action(s)[6];
- implement the plan;
- evaluate the appropriateness and effectiveness of the corrective action(s);
- incorporate changes for continuous improvement; and,
- record and communicate changes arising from the continuous improvement.

Additional detail is provided in the Risk Management and Emergency Response Plan.

4.4 Communication and Reporting

The sharing and communication of information is an important part of the EMPP. Internal communications will be recorded and distributed to managers before being filed for future reference. Agnico Eagle will maintain and preserve internal and external records.

External reporting will detail the activities at the mine site (including accidents and incidents), the monitoring being carried out, how it complies with authorizations and meets environmental goals. Communications shall utilize available modern means of presenting information on environmental performance to interested parties through community liaison meetings, Agnico Eagle Nunavut website (http://www.aemnunavut.ca/), training initiatives, public notices, compliance reports, annual reports, community presentations, formal correspondence, updates to management and mitigation plans, radio announcements, etc. All efforts will be made to keep Inuit organizations, communities, authorizing agencies, the business community, and the public informed of environmental

[6] In the case of spills this would include the verification of its cleanup through inspections and, if necessary, the collection of samples.

performance of the Project. As a member of the Mining Association of Canada, Agnico Eagle is committed to "Towards Sustainable Mining (TSM)" Guiding Principles, one of which is to be "proactively seeking, engaging, and supporting dialogue regarding our operations." The "Towards Sustainable Mining" Guiding Principles are part of Agnico Eagle's RMMS. Agnico Eagle communication initiatives support this guiding principle.

Table 4-5 Internal and External Record Keeping

Record Type	Responsible Department
training records	Human Resources; Training Department
standard operating procedures	All departments*
inspection reports	Engineering and Environment
consultation records	Community Affairs
construction records	Engineering
tailgate/toolbox meetings records	Environment
spill, accident, incident, and non-conformity investigation reports, including follow-up, preventive and adaptive action plans and reports	Environment
medical test reports	Health and Safety
health surveillance reports	Health and Safety
health and safety claims files	Health and Safety
audits and assurances	All departments*
management reviews	Management
management meetings	Management
environmental audits	Environment
monitoring data and reports	Environment
exposure measurement records	Health and Safety
hazard identification, risk assessment, and risk control records	All departments*
site visits by local community members	Human Resource and Community Affairs
tours by of government officials	Environment
government reports	Environment
waste backhauled/ confirmation of proper disposal	Environment
watercourse crossings digital photographic	Environment

photographic records of site conditions before and after completion of operations	Environment
photographic records before, during and after construction;	Environment

4.5 Audit, Review, and Update

It is expected that regulatory agencies will inspect the Project over its life for compliance with permits, regulations, and licences. Audits will also be conducted internally; however, independent researchers or consultants may also be engaged to complete the audits. Management reviews will also be conducted to determine the continued suitability, adequacy and effectiveness of the RMMS. The internal inspection process described previously can also be considered as an audit procedure. Outputs of the audits and management reviews could include:

- recommendations to revise the Environmental, Health, and Safety Policies and Management Plans;
- revision to established objectives and targets; and,
- specifications for corrective actions for individual management plans.

SECTION 5 • WATER LICENCE 2AM-MEL1631 PART I, ITEM 2

As requested in the Nunavut Water Board Water Licence No: 2AM-MEL1631 Part I, Item 2

The Licensee shall update the Environmental Management and Protection Plan for submission to the Board for approval in writing, at least ninety (90) days prior to Operations. The updates are to take into account commitments made with respect to submissions received during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable.

a. Comprehensive Receiving Environment monitoring to identify changes to the aquatic environment associated with mine activities;
b. Linkage between monitoring results and adaptive management response;
c. Sampling and analysis plans;
d. Thresholds for contaminant levels in CP1 and triggers for mitigation measures; and
e. Monitoring under Fisheries Authorizations, NWB Licence Compliance Monitoring, Metal Mining Effluent Regulations (MMER) Environmental Effects Monitoring, and Groundwater Monitoring

a. Comprehensive Receiving Environment monitoring to identify changes to the aquatic environment associated with mine activities;

Since the Water License was issued, Agnico Eagle has submitted an Aquatic Effects Monitoring Program (AEMP) report. Agnico has addressed comments received from the NWB which were implemented in the 2018 AEMP Program. The AEMP is a comprehensive study that considers Water Quality sampling, Sediment Quality sampling, an assessment of the benthic community and an assessment of plankton abundance. The study considers both the proximity of near field sampling stations as well as far field stations. As mine operations are set to begin in the first half of 2019 it is especially important to have this initial pre-operation information which future monitoring results can be compared to. The 2019 AEMP will contain trigger levels which can initiate adaptive management/mitigation measures prior to any detrimental environmental impacts.

In addition, the study design for Agnico Eagle's Environmental Effects Monitoring Program (EEM) was approved by Environment Canada. In Dec, 2018 Environment Canada also approved Agnico Eagle's request to submit the results of the EEM as part of the AEMP as requirements for both programs have met the NWB and Environment Canada's criteria to conduct the program.

b. Linkage between monitoring results and adaptive management response

It is noted in Table 1 that most individual, site specific environmental management plans have been revised since the NIRB Project Certificate and NWB Type A Water License were issued. Many of the Plans are 2018 versions. The Mine Plan, Ore Storage Plan and the Closure and Reclamation Plan are the only plans that have not been revised since the issuance of permits; mainly because they are

reflective of the Operations phase of the mine (which has not commenced) The Water Management and Mine Waste Management Plan will be revised on a yearly basis moving forward. The reason for this is that these Plans encompass major components of mine operation and there are many changes that can occur. Thus as an adaptive strategy the plans are revised to ensure we comply with our permits and prevent adverse environmental impacts.

In addition, through a comprehensive site wide inspection program whereby Agnico Eagle monitors different departments for compliance with our permits and management plans any non-conformity or observed deficiency can lead to corrective actions being taken and/or modifications of individual management plans.

To summarize, Agnico Eagle has revised or modified most of the environmental management plans approved for the project since the Water License was issued. This was in response to legal requirements or observations (inspections) on site where there have been changes or modifications to existing management plan requirements. Therefore, Agnico Eagle has demonstrated adaptive management as a strategy to prevent or mitigate any adverse environmental impact. Any revisions or modifications (along with the reasons) are referred to in the Document Control Section of the specific management plans.

c. Sampling and analysis plans;

Agnico Eagle has developed comprehensive sample and monitoring plans. These include the Air Monitoring Program (includes noise monitoring and particulate from site operations), Roads Management Plan (dustfall sampling), Freshet Action Plan (TSS sampling at critical areas during spring freshet), Compliance sampling at CP1 to name a few.
As mentioned in the previous section many individual environmental management plans have been revised to reflect sample monitoring programs (ie., Freshet Mgt Plan). Individual Plans should be consulted for specific details regarding sampling and analysis.

d. Thresholds for contaminant levels in CP1 and triggers for mitigation measures;

Thresholds for contaminant levels in CP1 are linked with the NWB Licence Compliance Monitoring and Metal and Diamond Mining Effluent Regulations (MDMER) regulations. Sampling is completed as per the requirements of the Water License and MDMER in CP1 during discharge events to ensure water discharge criteria are met.

With respect to TSS monitoring during CP1 discharge events Agnico has developed triggers for mitigation. Rating curves predicting TSS concentration as a function of turbidity and TDS as a function of conductivity were developed with simple linear regressions. The regressions applied *in situ* conductivity and turbidity readings and MEL-14 sample results. Rating curves are applied to continuous conductivity and turbidity readings taken from internal probes within the EWTP to predict TDS and TSS, respectively. Regarding conductivity, a trigger limit has been set to 1900 µS/cm which corresponds to 1,244 mg/L TDS (Appendix B). When this trigger is reached, discharge to Meliadine

Lake will be stopped. The correlation strength pertaining to the TDS-conductivity rating curve is R^2 = 0.85. Thus, the trigger limit was set below the maximum allowable concentration (1400 mg/l - TDS limit) to allow for uncertainty associated with the correlation.

Regarding turbidity, two trigger limits have been set. The first is set to 1.2 NTU which corresponds to app 15 mg/L TSS (Appendix B). When this first trigger is reached, sample frequency will be increased to twice per week for TSS at an accredited lab. The second trigger limit is set to 2.3 NTU which corresponds to app. 25 mg/L TSS (Appendix B). When this second trigger is reached, discharge to Meliadine Lake will be stopped. The correlation strength pertaining to the TSS-turbidity rating curve is R^2 = 0.79. Thus, the trigger limit was set below the maximum allowable concentration (15mg/l – TSS Max Ave Concentration and 30 mg/l - TSS Max Grab Concentration) to allow for associated uncertainty the correlation.

e. Monitoring NWB Licence Compliance Monitoring, Metal Mining Effluent Regulations (MMER) Environmental Effects Monitoring, and Groundwater Monitoring

As stated in section 4.2.1, regulated discharge monitoring occurs at monitoring points specified in the Type A Water License, other licenses, or regulations. It includes discharge limits that must be achieved to maintain compliance with an authorization (e.g., water license) or regulation (e.g., Metal and Diamond Mining Effluent Regulations). Groundwater quality and quantity metrics are monitored at points and frequencies identified in the Groundwater Management Plan with the purpose of monitoring inflows and outflows of mine water and associated water quality.

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APPENDIX A • FEDERAL AND TERRITORIES LAWS, REGULATIONS AND GUIDELINES

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197) *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301) *Release and Environmental Emergency Notification Regulations* (SOR/2011-90)	Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Migratory Birds Convention Act (1994 c.22)	*Migratory Birds Regulations* (C.R.C., c. 1035)	
Canada Water Act (1985 c.11)		
Oceans Act (S.C. 1996, c. 31)		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	*Arctic Waters Pollution Prevention Regulations* (C.R.C., c. 354) *Arctic Shipping Pollution Prevention Regulations* (C.R.C., c. 353)	
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Canada Shipping Act, 2001 (S.C. 2001, c. 26)	*Response Organizations and Oil Handling Facilities Regulations* (SOR/95-405) *Pollutant Discharge Reporting Regulations*, 1995 (SOR/95-351) *Environmental Response Arrangements Regulations* (SOR/2008-275) *Ballast Water Control and Management Regulations* (SOR/2006-129) *Vessel Pollution and Dangerous Chemicals Regulations* (SOR/2012-69)	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP 12401E 1995

Acts	Regulations	Guidelines
		Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)
Navigation Protection Act		
Marine Liability Act (A.C. 2001, c.6)	*Marine Liability Regulations* (SOR/2002-307)	
Fisheries Act (R.S.C. c. F-14)	*Metal Mining Effluent Regulations* (SOR/ 2002-2222) *Marine Mammal Regulations* (SOR/93-56)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Transport of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Explosives Act (1985 c.E-17)	*Explosives Regulations* (C.R.C., c. 599) *Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	
National Fire Code of Canada (2010)		
Nuclear Safety and Control Act (s.c. 1997, c.9)	*General Nuclear Safety and Control Regulations* (SOR/2000-202)	
Canadian Human Rights Act (R.S.C., 1985, c. H-6)	Canadian Charter of Rights and Freedom	
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986) *Canada Occupational Health and Safety Regulations* (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516) *Territorial Land Use Regulations* (C.R.C. 1524) *Territorial Quarrying Regulations* (C.R.C. c. 1527)	

Acts	Regulations	Guidelines
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c. 10)	*Northwest Territories Waters Regulations* (SOR/93/303)	
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nunavut Land Claims Agreement Act (1993, c. 29)		
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) *Used Oil and Waste Fuel Management Regulations* (NWT Reg 064-2003) [The removal of hazardous materials requires the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport. The Meliadine Project and the Meadowbank Mine are registered under a single permit for Agnico Eagle Mines Limited - Waste Generator Number - NUG100031]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's Land Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Scientists Act (RSNWT (Nu) 1988, c S-4)	*Scientists Act Administration Regulations* (NWT Reg (Nu) 174-96)	
Historical Resources Act (RSNWT (Nu) 1988, c H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92)	

Acts	Regulations	Guidelines
	Wildlife Licences and Permits Regulations (NWT Reg (Nu) 027-92)	
	Wildlife Management Barren-Ground Caribou Areas Regulations (NWT Reg (Nu) 099-98)	
	Wildlife Management Grizzly Bear Areas Regulations (NWT Reg (Nu) 155-96)	
	Wildlife Management Zones Regulations (RRNWT (Nu) 1990 c W-17)	
	Wildlife Regions Regulations (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Airport Lands Regulations* (NWT Reg (Nu) 067-97)	
	Commissioner's Land Regulations (RRNWT 1990, c C-13)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1)	
	Work Site Hazardous Materials Information System Regulations (RSNWT 1988, C 81 (Supp))	
Mine Health and Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health and Safety Regulations* (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	*Workers' Compensation General Regulations* (Nu Reg 017-2010)	
Apprenticeship, Trade and Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	*Apprenticeship, Trade and Occupations Certification Regulations* (RRNWT (Nu) 1990 c A-8)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	*Annual Vacations Regulations* (RRNWT 1990, c.L-1)	
	Educational Work Experience Regulations (RRNWT 1990, c.L-2)	
	Employment of Young Persons Regulations (RRNWT 1990, c.L-3)	
	Labour Standards Meal Regulations (RRNWT 1990, c.L-4)	
	Notice of Termination Exemption Regulations (RRNWT 1990 c.L-5)	

Acts	Regulations	Guidelines
	Pregnancy and Parental Leave Regulations (RRNWT 1990, c.8(Supp.))	
	Reciprocating Jurisdiction Order (RRNWT 1990, c.L-6)	
	Wages Regulations (RRNWT 1990, c.L-7)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	*Electrical Protection Regulations* (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	*Petroleum Products Tax Regulations* (RRNWT (Nu) 1990 c P-3)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Hospital Insurance and Health and Social Services Administration Act (RSNWT 1988, c T-3)	*Territorial Hospital Insurance Services Regulations* (RRNWT (Nu) 1990 c T-12)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	*Camp Sanitation Regulations* (RRNWT (Nu) 1990 c P-12)	
	General Sanitation Regulations (RRNWT (Nu) 1990 c P-16)	
All-terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	*All-terrain Vehicles Regulations* (RRNWT (Nu) 1990 c A-1)	
Motor Vehicles Act (RSNWT (Nu) 1988, c M-16)	*Large Vehicle Control Regulations* (RRNWT (Nu) 1990 c M-30)	
	Motor Vehicle Registration and Licence Plate Regulations (NWT Reg (Nu) 054-94)	
Public Highways Act (RSNWT (Nu) 1988, c P-13)	*Highway Designation and Classification Regulations* (NWT Reg (Nu) 047-92)	
Transportation of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	*Transportation of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

APPENDIX B • RATING CURVES PREDICTING TSS AND TDS CONCENTRATION

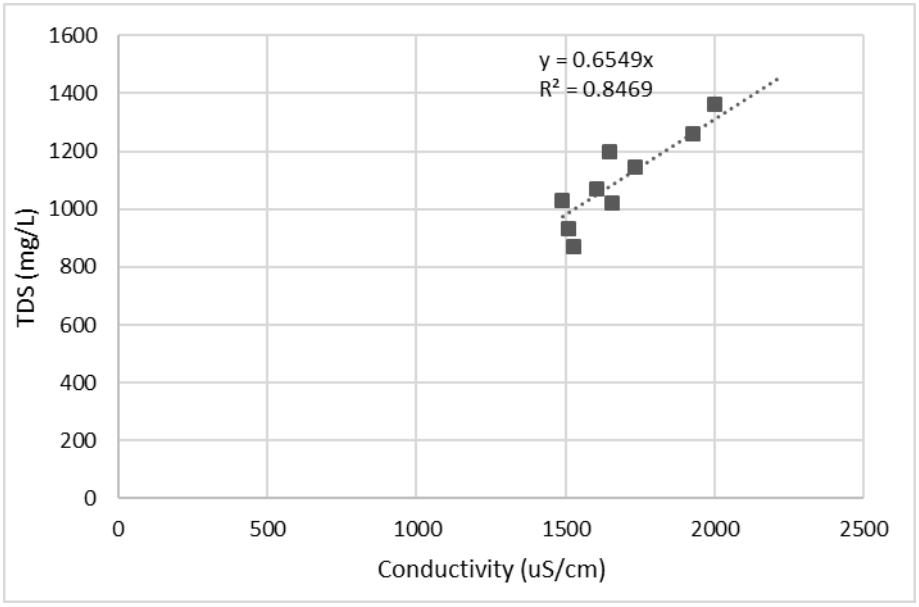

Figure 1: Rating curve relating conductivity to TDS.

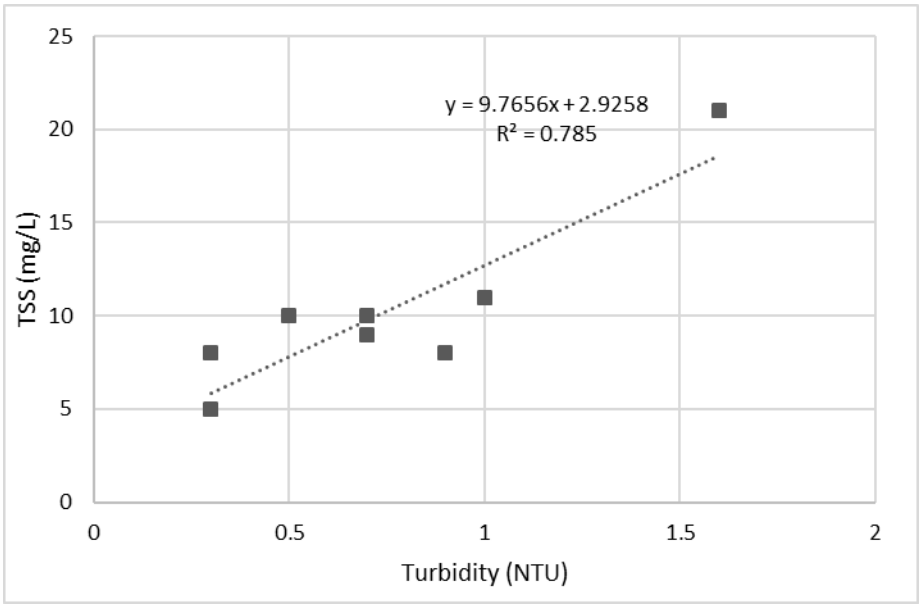

Figure 2: Rating curve relating turbidity to TSS.

AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfill and Waste Management Plan

MARCH 2019
VERSION 7
6513-MPS-06

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ᐊᒃᓗᓄ ᐃᐃᒍ ᐅᓴᖅᑕᕆᐊᓕᓚᕕᓴᒃᓄᑦ (ᐊᒃᓗᓄᒃᓄᑦ) ᐱᓱᓪᓕᐊᔪᑦ ᑕᓯᔪᐊᐊᖏᑦ ᒍᓗᒍᑦ ᐱᓕᕆᐊᖏᑦ (ᐱᓕᕆᐊᖅ), ᐃᓂᐅᔪᒋᑦᑐᖅ 25 ᑭᓪᒥᑦᑐᓗᓂᒃ ᐅᖃᓕᒫᓂᖅᐸᖅ ᐅᐊᖃᓇᖃᓂᑦ ᑲᖏᖅᓯᓂᐅᑦ, ᐊᒻᒪᓗ 80 ᑭᓪᒥᑦᑕᓂᒃ ᐅᖃᓕᒫᓂᕕᑦᑐᓂ ᓂᕆᖅᑭᔪᐊᓂᑦ ᐅᐊᖃᓇᖅᑭᔪᐊᓂᑦ ᐃᒡᓗᓪᓚᖁᔨᑦ ᑭᐸᓪᓕᖏᑦ. ᐅᓴᖅᑕᕆᐊᖅ ᒪᕐᒋᖃᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖃᒪᔨᓂᒃ (ᑎᓚᓂᐊᖅ ᓄᓇᒥᑦ ᐃᓗᑦᑐᖅᓯᒪᔪᖅ 1 ᐊᒻᒪᓗ ᑎᓚᓂᐊᖅ ᓄᓇᒥᑦ ᐃᓗᑦᑐᖅᓯᒪᔪᖅ 2 ᐊᒻᒪᓗ ᐃᓐᓇᐅᔪᖅ ᐊᐅᓪᓚᖅᑎᑎᔪᑦ ᓄᓇᐅᑦ ᐃᓗᐊᓂᑦ ᑎᓚᓂᐊᖅ ᔪᓚᑕᓪᓕᒧᑦ). ᑎᑎᖅᑲᖅ ᐱᔨᔪᖅᖄᑐᖅ ᐊᑕᐊᓂᓂᒃ ᐊᐅᓪᓚᖅᑎᑎᔪᑦ ᐸᖁᓇᐅᑎᒃ (ᐸᖁᓇᐅᑎ) ᐱᓕᕆᖁᒧᑦ ᐊᒻᒪᓗ ᐃᓕᓴᔪᖅ ᑎᑎᖅᑲᓇᑦ ᐱᔨᔪᑎᓕᓂᒃ Type A ᐃᒪᖁᒧᑦ ᓕᐃᖁᓴᒧᑦ ᑐᐱᔪᑐᒧᑦ ᐸᖁᓇᐅᑎ ᐅᓴᖅᑕᕆᐊᓕᓚᕕᓴᒃᓄᑦ (ᐊᒃᓗᓄᒃᓄᑦ) ᖃᓄᖅᑐᑭᑎᖅᓴᓂᒃ ᐊᒃᑕᓯᓂᒃ ᐊᐅᓪᓚᖅᑎᑎᔪᑦ ᑕᓯᔪᐊᐊᖏᑦ ᒍᓗᒍᑦ ᐱᓕᕆᐊᖏᑦ (ᐱᓕᕆᐊᖅ).

ᒥᐅᓕᐊᖅᓴᓂᖅ, ᐊᑐᐅᒃᓴᓂᔪᐊᖅᑐᓂᒃ, ᐊᒻᒪᓗ ᐱᓕᐅᖅᑕᐅᒃᓴᓂᔪᐊᖅᑐᓄᑦ ᐱᓕᕆᐊᒃᓴᐃᑦ ᐱᓕᕆᐊᖏᔪᐅᖅᑐᑦ ᐊᒥᓲᖏᓪᓂᖅᓴᐅᑎᓴᓂᔪᓐᓇᑦ ᐊᒃᑕᑯᓕᐅᖅᑕᐅᔪᑦ. ᐊᒃᑕᑯᓂᒃ ᐊᑦᑎᕆᓂᖅ ᐊᑐᖅᑕᐅᖅᑕᒃᑕᖅᑐᑦ ᐊᒃᑕᑯᓂᒃ ᐊᑐᖅᑕᐅᒃᓴᓂᔪᓐᓇᖅᑐᓂᒃ ᐅᕐᓂᓚᐅᓂ, ᐱᓕᕆᐊᖅᑐᓂ ᐱᓕᕆᐊᖏᔪᐅᖅᑐᓂᒃ ᐱᓂᐊᑦᓗᓂ, ᐊᑕᐅᑦᑎᒃᑯᑦ ᐁᓐᓂᖅᑕᑕᐅᔪᓐᓇᖅᑐᑦ ᐊᒃᑕᑯᐃᐅᑦ ᐊᐅᓪᓚᖅᑕᑎᐊᖅᓯᓗᓕᖅᑐᓕ.

ᐊᒃᑕᑯᓯᖏᓐᓇᒃ ᐱᓴᓕᐊᖅᑲᖅᑐᖅ ᐊᒃᑕᑯᓯᑦᓂᐊᓕᑦᓯᓕᒫᑦ ᐅᑎᖅᑎᑕᐅᓂᖅ ᐊᔪᖅ, ᐁᓐᓂᖅᑕᐅᔪᖏᓐᓇᓕᖅᑐᑦᑐᑦ, ᐃᒍᓇᔨᑲᖅᑐᓂᒃᓴᓇᓕᖅᑐᑦ ᐱᓕᕆᐊᖅ. ᐱᓕᕆᐊᖅ ᐃᓕᓴᒃᓯᖏᓐᓇᕆᐊᖅᑐᖅ ᐅᓯᓂᖅᑐᓂᒃ, ᐊᒻᒪᓗ ᐊᑐᖅᑕᒡᓕᕐᓂᑦᑐᓂ, ᓄᓇᓕᖅᑐᑦ ᐱᓴᓯᐅᑦ ᐅᖃᓪᓚᖅᑐᓂᒃ ᐊᑐᖅᑕᐅᓂᖅᑐᑦ ᐊᐅᓪᓚᖅᑎᑎᔪᑦ.

ᐊᒃᑕᑯᓯᖏᓐᓇᒃ ᐊᒃᑕᑯᓯᖅᑕᐅᔪᓂᒃ ᐅᑲᖅᑲᓂᒃ ᑐᖅᓯᓯᓯᖏᓐᓇᓕᕐᓂᖅᑐᑦ 1 (WRSF1) ᐃᓂᐅᔪᒋᑦ ᓂᕆᖅᑭᔪᐊᓂᑦ ᐱᖓᓱᓇᖅᑭᔪᐊᓂᑦ ᐅᑲᖅᑕᕆᐊᖃᑦ ᐱᓴᓕᐊᖅᑲᖅᑐᖅᑐᓂᒃ. ᐊᒃᑕᑯᓯᖏᓐᓇᒃ ᐃᖅᑲᑕᒪᐃᓐᓇᐅᑎᖅᑕᖅᑐᑦ ᐊᒻᒪᓗ ᐊᖅᑭᐅᐅᒪᔨᓕᒃᑯᑦ. "ᐃᓂᐅᔪᒋᑦ ᐊᖅᑭᐅᐅᒪᔨᖅ" ᐃᖅᑲᑕᒪᐃᓂᒋᑦ ᐊᑐᖅᑕᐅᑎᖅᑕᖅᑐᑦ ᐊᑐᖅᑕᐅᓂᓯᐃᑦ ᐃᒋᑕᐅᔪᓂᒃ ᑐᑭᓯᓴᓐᓂᒃ ᐊᒻᒪᓗ ᖃᓪᓗᖅᑕᐅᑎᖅᑕᖅᑐᓂᒃ. ᐊᒃᑕᑯᓯᐃᑦ ᐃᒋᑕᐅᖃᖅᑕᖅᑐᑦ ᐊᒃᑕᑯᓯᖏᓐᓇᐅᔪᒃ ᓇᑎᐊᓇᑦ ᐊᒻᒪᓗ ᒥᐅᑎᖅᑕᐅᔪᒃᑯᓂᒃ ᓄᓇᓯᓯᑎᐊᓇᑦ ᐊᓯᓗᑦ ᐅᐸᓴᓐᓂᒃ ᐃᒪᓐᓇᐅᑎᓯᒪᔪᓂᒃ ᐅᐸᓴᓐᓂᒃ ᐊᒃᑕᑯᓯᖏᓐᓇᒃ ᐃᒋᑕᐅᖃᖅᑕᖅᑐᑦ ᐊᐅᓪᓚᖅᑎᑎᔪᑦ.

ᓄᓇᓂᖅ ᐊᒃᑕᑯᓯᖏᓐᓇᖅᑎᑦ ᓂᓚᐅᒥᔨᐅᔪᖅ ᓴᖅᑭᑦᑖᓂᓴᓇᓂᑦ ᐊᐅᓕᑎᓂᖅᑕᖅᑐᖅᓯᒪᔪᖅ ᐱᔨᔪᑎᓕᓚᕕᓴᒃᓄᑦ ᐊᑐᖅᑕᐅᓂᓯᐃᓕᓂᒃ ᓅᓴᒥᑦ WRSF-ᑎᑦ ᒥᐅᔪᖅ ᐱᑕᖃᓂᑕᒧᑦᓴᓇᓂᒃᓴᓂᖅ ᐃᒪᒥᖅᓯᓪᓗᑎᒃᓴᓂᖅ ᐱᓯᓂᐅᑦᑎᐊᖅᑯᓂᒃ ᖃᓄᖅᑐᐃᓂᖅᑐᑦ ᐱᓯᓂᐅᑦᑎᐊᖅᑯᓂᒃ WRSF. ᐊᑦᕿᔪᑕᒪᓴᖅ ᐊᒃᑕᑯᓯᖏᓐᓇᕆᓂᖅᑐᑦ ᐃᓕᐅᖃᓚᖅᑕᖅᑐᖅ ᐅᑕᐅᐃᔨᐃᓂᖅ ᐅᐱᑦᓰᑲᓚᖅᑐᑦ ᐊᐅᖅᑲᖅᑎᑦᑐᖅᓴᓇᓂᒃ. ᐅᓪᓗᓂ, ᐊᐃᓂᖅᑕᖅᑐᕆᔨᖅᑲᖅᑲᓂᑦ ᐊᒃᑕᑯᓯᖏᓐᓇᕆᓂᖅᑐᑦ ᒪᑦᓂᖃᑦᓂᖅ ᐱᔨᔪᑎᓕᓚᕕᓴᒃᓄᑦ ᐊᐅᒃᑲᓕᑦᑐᖅᓴᓇᓂᒃ, ᐊᐃᓂᑦ ᑲᑎᑕᐅᓂᖅᑐᑦ, ᑲᒪᕐᔨᐅᓪᓗ ᐊᒻᒪᓗ ᐱᓕᕆᐊᖏᔪᐅᖅᑐᓂᒃ, ᐊᑦᑎᕆᓂᖅᑲᖅᑲᓂᑦ ᐃᓕᓴᒃᓯᖏᓐᓇᕆᐊᖅᑐᖅᑐᓂᒃ ᐊᐅᓪᓚᖅᑎᑎᔪᑦ.

AGNICO EAGLE

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2 and is currently operating the underground Tiriganiaq gold deposit. This document presents the Landfill and Waste Management Plan (Plan) for the Project and forms a component of the documentation series produced for the Type A Water Licence Application. The Plan describes Agnico Eagle Mines Limited's (Agnico Eagle) strategies regarding waste management for the Meliadine Gold Project (Project).

Reduce, reuse, and recycle initiatives have been developed at the Project to minimize the quantity of waste generated. Waste segregation is being used to capture wastes suitable for reuse or recycling, while at the same time ensuring that hazardous waste is managed appropriately.

A landfill is required for the disposal of non-salvageable, non-hazardous, non-putrescible solid wastes from the construction, operation, and closure of the Project. The Project is totally independent of, and do not use, municipal facilities or services for waste management.

The landfill is located within the Waste Rock Storage Facility 1 (WRSF 1) which is located to the southwest of the main mine infrastructure. The landfill is being filled progressively and in an orderly manner. An "area method" of dumping is being used such that materials are dumped in rows and covered as required. Wastes are disposed directly on the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier. Controlling the materials that can be placed in the landfill is a strategy aimed to reduce the concentration of constituents in potential leachate and to minimize the attraction of wildlife to the landfill. Landfill operation will also conform to best management practices to reduce the potential for windblown debris.

Leachate from the landfill is anticipated to be weak due to the controls placed on materials acceptable for landfilling. Moreover, drainage from the landfill is largely expected to freeze within the WRSF with little to none migrating to the water collection infrastructure placed around the WRSF. Annual landfill operation will also involve clearing of snow prior to spring melt. However, in the event there is leachate from the landfill due to periods of heavy rainfall or spring freshet, the runoff will be collected, controlled and treated, if necessary.

The landfill will be covered with a minimum of 3.7 m of waste rock to isolate it from the environment and physically stabilize it during closure.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	November 2012			First draft of the Landfill and Waste Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			Draft Environment Impact Statement re-submission; rebranding	
3	April 2014	1.3 1.4 4.3.1 4.5 5 6 7	2-3 3 11 13-14 16-17 18 19	Addressed commitments made during review of Draft Environmental Impact Statement: - Leachate management - Landfill schedule - Asbestos management - Records and reports - More details on Standard Operation Procedures - More details on best practices and training	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			Complete update to correspond with the Mine Plan	John Witteman, Env. Consultant, Agnico Eagle
5	February 2017	- 1.1 4.1 4.4.1 - - -	All Pages 1 9 12 Title Page 3 4	- Changed effective date from April 2015 to March 2017 - Added statement “Plan will have to be updated and submitted 90 days prior to landfill construction” - Removed statement “paper lunch bags will be replaced by sturdy metal or plastic lunch boxes” - Added ultraviolet lamp tubes to the section on fluorescent lamp tube disposal, as both contain mercury and will be disposed of in the same way - Changed April 2015 to March 2017 - Landfill Site Location diagram added - Typical Sections for Landfill Closure diagrams added	Justin MacMillan, Environmental Technician, Agnico Eagle
6	March 2018		All Pages	General document update	Environment Department

7	March 2019	All Pages	Updated document to include mining the underground deposit and current operating conditions.	Randy Schwandt, Terry Ternes,
		1	Removed unnecessary paragraph about ore and waste rock tonnage from the Mine Plan.	
		Figure 2.1	Figure updated to show present Project status.	
		Figure 5.2	Figure shows extension of phase 1.	

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ARD/ML	Acid-Rock Drainage/Metal Leaching
CP1	Collection Pond 1
GN	Government of Nunavut
INAC	Indian and Northern Affairs Canada
NIRB	Nunavut Impact Review Board
Project	Meliadine Gold Project
WHMIS	Workplace Hazardous Materials Information System
WRSF	Waste Rock Storage Facility

UNITS

km	kilometre
m	metre
t	metric tonnes

SECTION 1 • INTRODUCTION

1.1 Purpose and Scope of the Plan

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The Landfill and Waste Management Plan (Plan) outlines the design, operation, and closure of a solid waste landfill as part of Agnico Eagle's Project. It also highlights the waste segregation strategies that are implemented to minimize the quantity of waste to be placed in the landfill or incinerated. The Plan was updated and submitted 90 days prior to permanent landfill construction.

The objectives of this Plan are summarized as follows:

1. To define the location, design, and operating procedures to be used in the landfill disposal of non-salvageable, non-hazardous, non-putrescible solid waste generated at the mine.
2. To define acceptable/non-acceptable types of solid waste to be placed in the landfill.
3. To describe plans to reduce/reuse/recycle Project wastes.
4. To define monitoring requirements for the landfill.

A landfill is required for the disposal of non-salvageable, non-hazardous, non-putrescible solid industrial wastes that cannot be incinerated and that result from construction, operations, and closure of the Project. The Project is operated totally independent of, and do not use, any municipal facilities or services for waste management.

Hazardous wastes will not be placed in the landfill. All hazardous materials will be packaged for shipment to a certified waste management company for treatment, recycling, and/or disposal. The Project also includes a landfarm to treat soils and rocks contaminated with hydrocarbons. The landfarm is described in the Landfarm Management Plan.

1.2 Location of the Landfill

The landfill is situated within the Waste Rock Storage Facility 1 (WRSF 1), which is located close to, and northeast of, the main mine infrastructure. The following criteria were considered in determining its location:

- Drainage – sites that will drain into areas where water will be collected and monitored as part of the overall site plan were preferred;

- Disturbed areas – sites within or near areas that will be disturbed as part of the future overall mine plan were preferred to minimise the environmental footprint of the Project;
- Access – sites located close to existing service or haul roads were preferred; and
- The landfill site had to be large enough to accommodate non-salvageable, non-hazardous, non-putrescible solid industrial wastes for the life of the Project, including the development of the other pits.

The first three criteria are recommendations from the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

1.3 Landfill Design

The landfill is not a conventional landfill; it is a controlled landfill where:

- Wastes is segregated with liquids, hazardous and putrescible waste all being diverted away from the landfill (Section 4.3 and 4.4). The segregation of waste involves a major commitment by Agnico Eagle to educating all its employees and contractors in directing wastes to the proper waste collection bins;
- Waste management includes an incinerator where all organic, office waste, and any waste coming in contact with food is incinerated. Ash from the incineration process is disposed of in the landfill (Section 4.6); and
- Waste in the landfill is not scattered all over the floor of the landfill, but placed daily at the active working face where the waste can be leveled, compacted, and covered (Section 5).

The landfill is located within the WRSF 1 as shown on Figure 1-1 and the extension of the landfill is shown in Figure 5-2. The active WRSF 1 sets the bounds of the landfill on its south and west sides, while berms were constructed on the north and east sides of the landfill (see Figure 1-2). The purpose of the berms is to confine the area for waste disposal and to act as a wind shield to reduce windblown debris. The landfill is a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste will be protected from the wind by the berm. In August 2018 stage 1 cell was extended to the South East to allow for additional waste material to be placed in the cell.

Figure 1-1 Landfill Location for Meliadine Gold Project

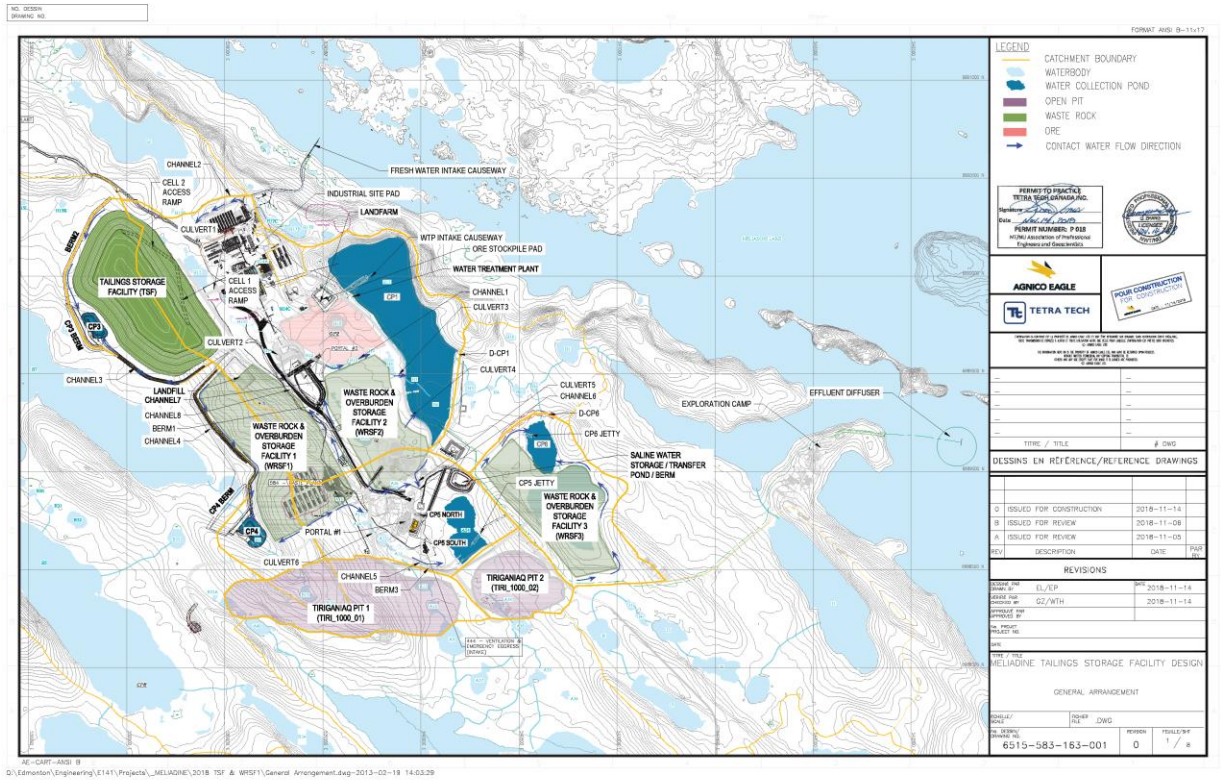
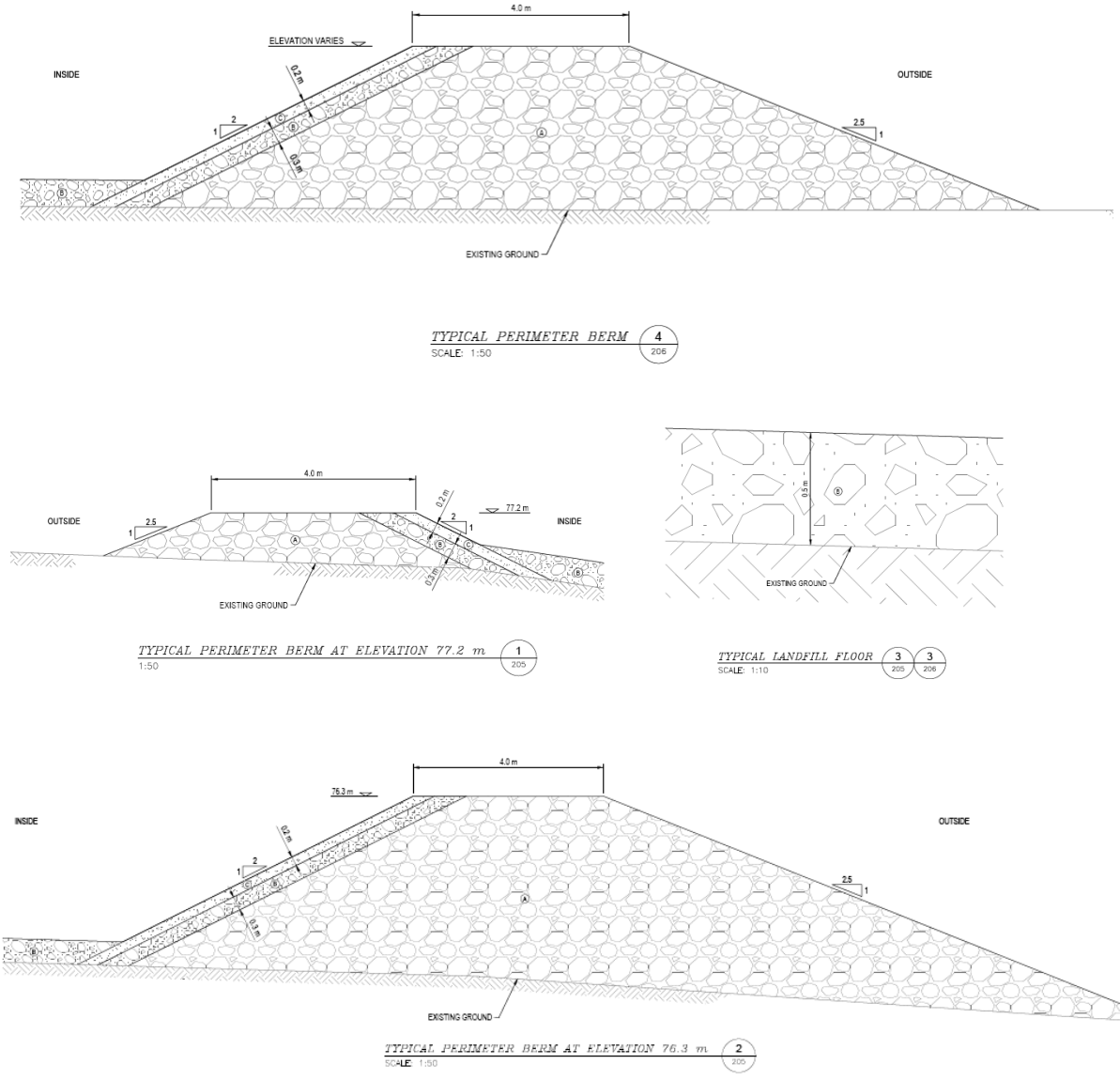


Figure 1-2 Typical Sections for Landfill Closure



AGNICO EAGLE

Both the floor and the berm of the landfill were constructed with material (rockfill and/or waste rock) sourced from waste rock from the underground development. The landfill floor is approximately 1.2 m thick. The design of the berms will not assume that they will be in a frozen state or permanently impermeable to leakage. The final design will take into account berm and subgrade stability.

Due to the restriction on wastes that can be landfilled (see Section 4.3), and since the landfill is located within the WRSF 1, the quantity of leachate is expected to be minimal (if any), and of low ionic strength. The landfill will nonetheless receive precipitation during the summer period, which could infiltrate the landfill before it can evaporate. In the event that leachate migrates from the landfill, it will be collected, monitored, and, if necessary, treated before being released to the receiving environment.

Closure design for the landfill is described in Section 7 and illustrated in Figure 1-2. Based on the design strategy for the landfill, and the management and operating procedures listed above, a liner is not considered necessary for the landfill.

1.4 Landfill Schedule

The landfill will be used for the construction, operations, and closure phases. It will not be required for post-closure. The exploration landfill approved under water licence 2BB-MEL0914[1] was used during the pre-development phase until the landfill for the mine had been constructed and became operational.

The schedule for the landfill is as follows:

- Years -3 to -1: Construction of the landfill will occur directly after the placement of minimum 1.2 m of waste rock or rockfill to serve as a base or foundation. This will occur during the first year of construction, with commissioning of the landfill directly thereafter. This will allow non-salvageable, non-hazardous, non-putrescible solid construction waste to be placed in the landfill;
- Years 1 to 8: The landfill will be used continuously during operations;
- Years 9 to 11: The landfill will be one of the last parts of mine infrastructure to close. It is expected to be extensively used during closure for demolition waste and will remain operational until it is no longer needed.[2]

[1] Although approved by the Nunavut Water Board, this landfill has not been built as of March 2015.
[2] The incinerator will close before the landfill.

SECTION 2 • RELATED DOCUMENTS

Related documents include the following:

- Risk Management and Emergency Response Plan;
- Hazardous Materials Management Plan;
- Incineration Management Plan;
- Environmental Management and Protection Plan;
- Preliminary Closure and Reclamation Plan; and
- Occupational Health and Safety Plan (Agnico Eagle 2014).

The Landfill and Waste Management Plan is part of the Environmental Management and Protection Plan, which provides overarching environmental direction for the Project.

SECTION 3 • REGULATORY SETTING

Waste management in Nunavut is regulated under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act*, the federal *Environmental Protection Act,* and the federal *Transport of Dangerous Goods Act*. Agnico Eagle is also be bound by the terms and conditions of its commercial lease with the Kivalliq Inuit Association and its water licence from the Nunavut Water Board.

In addition to mandatory requirements, a number of waste management guidelines are commonly used in the Northwest Territories and Nunavut. The most recent of these was developed for municipal solid waste and is titled: "*Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT*" (Ferguson Simek Clark 2003). *Environmental Guideline for Industrial Waste Discharge into Municipal Solid Waste and Sewage Treatment Facilities* (GN 2011c) were also used (Appendix D). While not all of the recommendations provided in these guidelines are appropriate for the management of industrial waste expected at the Project, principles considered applicable have been adopted in this Plan.

In addition, the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007) were followed regarding specific landfill design and mitigation for potential impacts pertaining to waste.

SECTION 4 • WASTE MANAGEMENT APPROACH

Waste[3] at the Project is divided into the following categories:

1. Domestic waste: general waste materials coming from the kitchen, cafeteria, lunch rooms, dormitories, and offices. Bins are located in high traffic areas for segregating wastes destined for incineration, landfilling, or recycling.

2. Medical waste: medical waste generated in the first aid/health room will require special handling and are placed in easily identifiable single use medical waste containers. Both the containers and its contents are incinerated.

3. Industrial waste: waste arising from operations in the truck shops, process plant, emulsion plant, paste plant, and warehouses. Each work area has specially marked bins for segregating waste for incineration, recycling, or disposal. Special bins or areas are set aside for hazardous waste. Large bulky items that cannot be incinerated will be prepared for shipment south for recycling, or be cleaned of any hydrocarbon contamination and have the electronics removed before disposal in the landfill.

4. Sewage: wastewater from the accommodation complex is treated in the Sewage Treatment Plant before being directed to Collection Pond 1 (CP1). Sewage sludge removed from the Sewage Treatment Plant will be added to the landfarm as nutrient amendment on an as needed basis. Excess sludge is either disposed of in the tailings storage facility, or stored in drums/totes to be shipped off site as hazmat.

5. Used oil and waste fuels: used engine oil, hydraulic fluids, and fuels that do not meet specifications for designated use. This does not include solvents or paints. Used oil and waste fuels are burned in waste oil burners if it is found acceptable. For more details on the used oil and waste fuels, refer to the Incineration Management Plan.

6. Incinerator ash: ash testing protocol developed by the Government of Nunavut in accordance with the *Nunavut Environmental Guideline for Industrial Waste Discharges* is implemented to ensure that the incinerator ash is suitable for disposal in the landfill (GN 2012). Ash not meeting the guidelines will be packaged in drums to be sent to a certified waste management facility for appropriate treatment, recycling, and/or disposal, or will be buried within the dry stacked tailings.

[3] Tailings, waste rock, and overburden are also considered waste materials. The Mine Waste Management Plan provides details on these wastes.

7. Hazardous waste: refer to the Hazardous Materials Management Plan for details on how hazardous waste will be managed.

4.1 Reduce/Recycle/Reuse Initiatives

Waste management begins by keeping all materials that can be economically recycled out of the waste stream destined for the landfill or incineration. The three R's of waste management - reduce, reuse, and recycle - is encouraged within the waste management program.

Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste incinerated or directed to the landfill. To support this initiative, operating procedures will be developed to maximize the volume of materials that are recycled and/or reused. This will include eliminating the use of disposable materials where possible, and segregating waste destined for reuse, and recycle alternatives.

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created (Environment Canada 2003). Waste management for the Project will include efforts directed at eliminating, where practicable, the use of disposable materials in everyday use, such as disposable cups, plates, and table ware. Workers will be encouraged to use ceramic mugs and stainless steel cutlery in the cafeteria or lunch rooms, and to carry personal drink containers or thermoses. If it is deemed to not affect the mill process, water will be recycled from CP1 for use in the mill with fresh water from Meliadine Lake only being used as makeup water. A tailings pond was not constructed; instead, Dry Stack Tailings technology is employed whereby tailings water will be reclaimed within the mill before the tailings are trucked for disposal. This will increase the volume of water available for recycling to the process. Low flush toilets and water saving showers heads are also used throughout the facility to conserve water.

Disposal bins are located in high traffic areas for small waste items such as alkaline and rechargeable batteries, obsolete computer equipment and supplies, and fluorescent light bulbs. Scrap metal will be collected on-site. These wastes will be packed for shipment off-site to licensed recycling depots.

All hazardous materials collected on-site are sent off-site to a licensed hazardous waste management company. Many of these materials end up being compatible with recycling after treatment. Examples include lead recovered from lead-acid batteries and oil filters becoming scrap metal after cleaning.

4.2 Collection and Handling of Waste

The strategy for the management of solid waste at the Project is to first identify and segregate acceptable disposal items from non-acceptable items. Within the acceptable disposal items, the second step is to segregate those items that can be economically recycled from those that cannot.

This segregation is done at the source by locating bins throughout the facilities for the collection of items suitable for recycling.

Waste is generated and segregated in all buildings and needs to be collected and transported to the incinerator (waste management) building for final disposal or incineration. The Site Services Department is responsible for the collection and transport of waste to the incinerator building.

All solid wastes that may contain medical waste from the Health Centre, food waste, food packaging waste, or other organic waste that could attract wildlife are incinerated in the on-site incinerator. This includes all garbage from the accommodation complex, kitchen, lunchrooms, and offices. These receive priority in being incinerated. Food wastes and wastes associated with food are collected daily, at a minimum, and immediately transported to the incinerator building. This waste is not allowed to remain unattended in vehicles at any time. The ash from the incinerator is disposed of in the landfill. Quaterly leachate samples of the ash are taken to confirm that the ash conforms to regulatory requirements.

The development of the landfill will minimize the area required for waste storage and re-handling of waste. Acceptable items that are disposed of in the landfill are those that are solid, non-salvageable, non-hazardous, inert, and non-putrescible with a low leachate and low heat generation potential. Controlling the materials that can be placed in the landfill is a strategy aiming at reducing the concentration of constituents in potential leachate. The landfill conforms to best management practices allowing for orderly landfill development, which reduces the potential for windblown debris.

Hazardous waste and materials that can be recycled are appropriately packaged (as per regulations under the *Transport of Dangerous Goods Act)* to be sent off-site to a licensed hazardous waste management facility or recycling facility, respectively. Management of hazardous materials is covered in detail in the Hazardous Materials Management Plan.

4.3 Waste Acceptable for Placement in Landfill

The following materials are acceptable for disposal in the landfill:

- Plastic (except expanded polystyrene);
- Steel, copper, aluminum, iron;
- White goods;
- Wire;
- Wood;
- Fiberglass insulation;
- Fiberglass;
- Roofing;
- Asphalt;
- Concrete;

- Carpet;
- Bricks;
- Ceramics;
- Rubber;
- Empty caulking tubes;
- Hardened caulk;
- Clothing;
- Air filters;
- Glass, including light bulbs (fluorescent bulbs will require special handling, see below for more details);
- Waste Asbestos (see below for more details);
- Small appliances (with batteries removed);
- Gyproc;
- Ash, provided it has cooled to 60 degrees Celsius or less;
- Vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed; and
- Treated soils from landfarm.

4.3.1 Waste Asbestos[4]

Waste asbestos includes any type of material with greater than 1 % asbestos by weight (GN 2011a). Asbestos that has been immersed or fixed in a natural or artificial binder or included in a manufactured product is not considered waste asbestos; it is considered a hazardous waste and will be disposed of accordingly. Waste asbestos can either be backhauled off-site for disposal in an approved facility or it can be landfilled. The following are guidelines for landfilling waste asbestos:

- Immediate burial and cover with 0.5 m of cover material;
- Burial where it will not be disturbed; and
- Maintenance of the location on a map or diagram for future reference.

In addition to following the *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a), Agnico Eagle will adhere to the Government of Nunavut's (GN) *Environmental Guideline for Waste Asbestos* (GN 2011a). Before landfilling waste asbestos, Agnico Eagle will review the steps in this guideline with the GN.

The complete *Environmental Guideline for Waste Asbestos* (GN 2011a) and *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a) can be found in Appendix A and the Hazardous Materials Management Plan, respectively. All Government of Nunavut environmental guidelines can be accessed online at http://env.gov.nu.ca/programareas/environmentprotection/legislation.

[4] It is unlikely that asbestos waste will result from mine operations. Agnico Eagle will avoid using asbestos wherever possible.

4.4 Waste Unacceptable for Placement in Landfill

Materials not listed in the previous section are unacceptable for placement in the landfill, unless approved in writing by the Meliadine Environment Department. These materials include the following:

- Organic matter, including food, sludge from the Sewage Treatment Plant, dead animals, paper, cardboard;
- Food containers and wrappings, unless cleaned;
- Hazardous wastes including mercury, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- Electronics;
- Materials that can be recycled economically;
- Petroleum products, including materials contaminated with petroleum products; and
- Expanded polystyrene.

In particular, organic matter is not accepted in the landfill, thus eliminating the attraction of small mammals, carnivores, and/or raptors. This is accomplished by requiring all personnel to dispose of domestic waste in designated receptacles and by sending all collected domestic waste (e.g., from kitchen, offices, and living quarters) to the on-site incinerator. Regular inspections and toolbox meeting are held to raise the awareness and lower the risk of having organic matters in the landfill.

4.4.1 Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphorus powder and traces of lead and cadmium are considered environmental contaminants under the Nunavut *Environmental Protection Act* (GN 2010b). The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal facility (GN 2003). Government of Nunavut guidelines on *Mercury-Containing Products and Waste Mercury* (GN 2010b) and E*nvironmental Guideline for the General Management of Hazardous Waste* (GN 2010a) are included in Appendix B and the Hazardous Materials Management Plan, respectively. These guidelines are followed and wastes having mercury are sent to a certified waste management company for treatment, recycling, and/or disposal.

Ultraviolet (UV) lamp tubes used in the wastewater and potable water treatment systems are disposed of in the same way as fluorescent lamp tubes, as they also contain mercury (vapour).

4.4.2 Ozone Depleting Substances

Ozone depleting substances include chlorofluorocarbons or halons. Common sources include refrigeration equipment, air conditioning equipment, motor vehicle air conditioners, and fire extinguishing equipment (GN 2011b). These materials are hazardous in nature; consequently, all disposal of ozone depleting substances takes place at an approved facility.

Any non-salvageable equipment containing ozone depleting substances will have the ozone depleting substances removed by a certified technician prior to disposal in the landfill. The *Environmental Guideline for Ozone Depleting Substances* is included in Appendix C.

4.5 Total Volume of Waste

The number of people working on-site, and the activities occurring at the time, will have a direct bearing on the volume of waste destined for the landfill, the incinerator, and the amount of materials removed from the waste stream for reuse and recycling. Also, purchasing policies that focus on reduced packaging will have a bearing on the volume of waste.

An estimate of waste volume is required to determine the appropriate size of the landfill. However, an exact waste volume is not a critical parameter in the design because of the flexibility of the design to accommodate extensions (larger to accept more waste) or contractions (smaller to accept less waste) within WRSF 1.

Table 4-1 indicates the estimated mass of waste destined for the landfill each year and cumulatively for the life of the Project. As mentioned earlier, the flexibility in the landfill design allows for greater flexibility in the landfill design and allows for increased volume in case more waste than estimated is generated. This ensures there will be enough room for all landfill waste for the life of the Project.

Table 4-1 Estimated Waste in Landfill

Project Phase	Waste Not Incinerated (t/year)	Ash From Incinerator (t/year)	Estimated Volume of Non-Hazardous Waste and Ash Produced (m^3/year)	Approximate Treated Soil From Landfarm (m^3/year)	Maximum Accumulated Waste Material in Landfill (m^3)
Construction	100	30	260	0	1,040
Operations	340	102	884	446	37,043
Closure	25	7.5	65	525	25,226
Total					**63,309**

As part of the larger waste management system, records are kept of the quantity of waste landfilled, the quantity of waste incinerated, type and quantity of materials recycled, and any analytical results. All this information will be submitted to regulators in an annual report.

4.6 Incinerator Ash Testing Protocol

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials, then ash from the incineration process should be non-hazardous. An ash testing protocol, as described in Section 8.3 of the Incineration Management Plan, is implemented to ensure that the incinerator ash is suitable for disposal in the landfill.

SECTION 5 • LANDFILL MANAGEMENT

5.1 Site Development and Landfilling Method

The site for the landfill was prepared by first placing a foundation (or base) of 1.2 m of waste rock or and/or rockfill material directly on top of the natural ground to form a floor. A service road, accessible only to mine staff and Agnico Eagle's contractors, connects the landfill to other mine infrastructure. Berms surrounding the facility on three sides are built of waste rock and/or rockfill material. The design of the berms does not assume that they will be in a frozen state, or permanently impermeable to leakage. The berms will serve to confine the area for waste disposal and act as a wind shield to reduce windblown debris (Figure 5.1). In August 2018 the mine extended stage 1 of the landfill to the SE to accommodate additional waste (Figure 5.2).

Figure 5-1 Landfill Stage 1

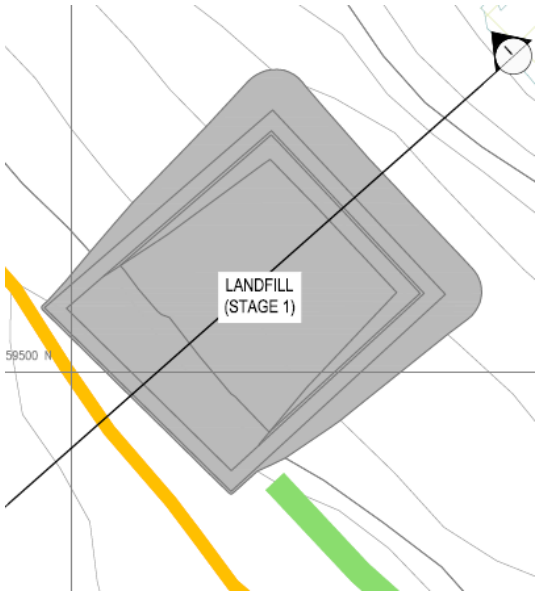
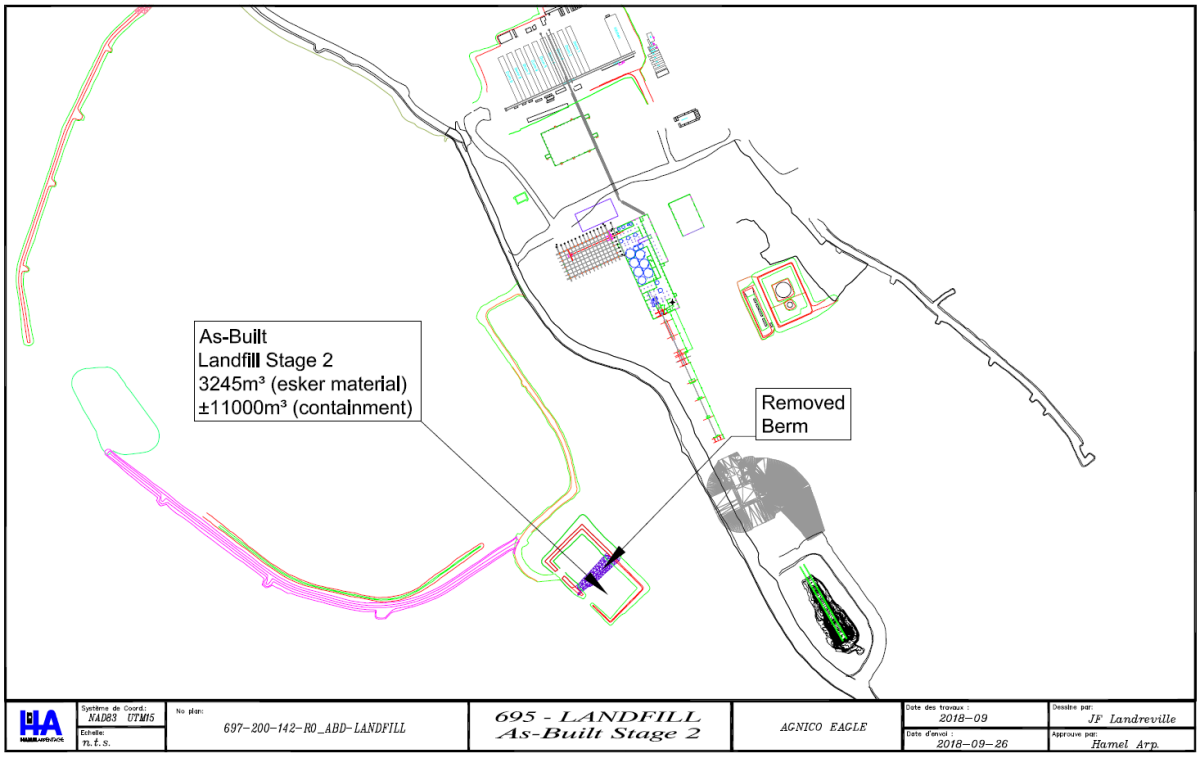


Figure 5-2 Landfill Stage 1 Extension



The Project's Site Services Department is responsible for the operation and maintenance of the landfill and will develop standard operating procedures for the facility. The landfill will progressively be filled in an orderly manner. Specifically, waste will be placed to full height at one end of the landfill and then the active waste area will progressively advance. An "area method" of dumping is used such that materials is dumped in rows and covered as required. Wastes is deposited directly onto the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier.

Areas where the waste has been placed to full height, compacted and levelled is progressively covered by placement of a minimum of 0.3 m thick of rock fill on top of the waste to reduce windblown debris.

Owing to its placement within the WRSF 1, the landfill will become encapsulated within waste rock. Agnico Eagle plans to use waste rock to surround and cover the landfill. Upon closure, the entire landfill will be covered with 3.7 m of waste rock.

5.2 Staffing and Equipment

The Project's Site Services Department collects waste throughout the mine site using trucks. Waste is segregated at the source with different waste streams following different paths. Trucks hauls waste destined for the landfill and dumps it at the working face where a dozer is used to spread, level, and compact the waste.

When activities such as capping and topping are conducted, visual monitoring of the dust will be completed. If dust is considered to be an issue, appropriate suppression methods will be employed. If dust is not observed to be an issue in the surrounding environment, the use of water as a dust suppression will be avoided to minimize ponding and leaching.

Landfill operation does not require a full-time attendant as waste will only be delivered to the landfill for short periods each day.

5.3 Leachate Management

The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill, and, as a result, site-specific landfill leachate management is not considered necessary.

In the event there is leachate from the landfill during periods of heavy rainfall or spring freshet, the runoff will be collected and directed to CP1[5], where it will be controlled and, if necessary, treated before release to the receiving environment. During operations, wastewater in CP1 could also be recycled and sent to the mill for use in the process.

In the event that greater volumes of leachate, or leachate with high ionic strength, is found coming from the landfill, an investigation would immediately be undertaken to determine the cause. This could lead to changes in the configuration and/or management of the landfill to further limit water coming in contact with landfill materials and/or modify the water management strategy in this area.

The toe of WRSF 1 is visually inspected monthly during the open water season and, if required, samples of water found ponding on the natural ground below the landfill will be collected and analysed. The collection of samples, their analysis and reporting of results are part of the Water Licence for the mine.

Because the landfill will be located in an area with underlying permafrost (see Permafrost Thermal Regime Baseline Studies in Agnico Eagle 2014), deep groundwater contamination from potential landfill leachate is not anticipated.

[5] Collection Pond 1 collects contact water runoff from a number of mine areas. For more details on CP1, refer to Water Management Plan.

5.4 Surface Water and Erosion Control

The perimeter berms of the landfill are constructed of rock material which has been compacted and is sloped on both sides. These berms are not subject to erosion, and are inspected visually during regular environmental inspections of the landfill. After periods of rainfall and snowmelt seepage from the landfill is monitored. When seepage is observed. Water samples are collected from an established downslope sampling location (MEL-24).

5.5 Operational Inspections

The Project's Environment Department undertakes periodic inspections of the landfill operations to verify compliance with applicable plans, including the condition of landfill works, evidence of erosion, excessive ponding or unusual landfill settlement, and adequacy of safety measures. The Environment Department also visually inspects the toe of the WRSF 1 monthly during the open water season for leachate from the landfill and, if present, collect samples for analysis.

SECTION 6 • TRAINING

All Agnico Eagle personnel and contractors working at the Project site are trained in waste management. This is included in the site orientation upon arrival, which includes the identification of waste bins and dumpsters for the different categories of waste, where these are located, and the signage associated with each. Stewardship of the environment is emphasized in that it is everybody's responsibility to properly dispose of waste, including wastes that can be recycled. This extends to ensuring wildlife does not have access to food or food wastes.

The success of the waste management system at the mine site will be dependent on the proper disposal of all waste by all employees and contractors. Waste management training beyond the initial orientation will occur in each department. Environment department staff will reinforce proper waste segregation and disposal at various departmental meetings.

The Project's Site Services Department will have enhanced on-the-job waste management training as they will be collecting and processing all mine site waste. They will be trained in identifying misdirected waste, identifying where to dispose of it and in recommending where further waste management training is required on-site.

All maintenance staff must successfully complete equipment training before they can operate machinery and vehicles related to waste management on-site. Additionally, crews handling waste will be fully trained in safe work procedures. Training programs will include Workplace Hazardous Materials Information System (WHMIS) and Transportation of Dangerous Goods (TDG). Training completion and retraining will be documented and tracked by the Project's Human Resources Department.

SECTION 7 • CLOSURE PLAN

The landfill is located within the WRSF 1. This location serves to minimize the area of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use that is chemically and physically stable, and consistent with past traditional pursuits and wildlife habitat. While waste rock will be disposed on land and in a manner that encourages total freezing. The design, operation, and/or closure of the WRSFs and landfill do not rely on total freezing. Any unacceptable leachate that is generated following closure of these facilities will be contained, collected, and/or treated, if necessary.

The following is a plan for closing the landfill; more information is available in the Mine Preliminary Closure and Reclamation Plan:

a) Estimate of Total Waste Volume at Closure

Upon closure, it is estimated that the landfill will have a volume of approximately 63,000 m^3 of waste.

b) Final Cover Design

The landfill will be covered with a minimum of 3.7 m of waste rock, and should thereafter be stable. When finalizing the design for the cover, the need for thermistors to be installed will be evaluated. The cover surface will be left irregular so as to capture snow, windblown sediment, and collect seeds.

c) Water Management

Contact water from the landfill at its closure will continue to be managed using best management practices in accordance with the Project's closure and reclamation plan.

SECTION 8 • PLAN REVIEW AND UPDATE

The Landfill and Waste Management Plan will be reviewed annually by the Meliadine Environment Department. This plan will be reviewed and updated on an annual basis, as required, to reflect changes in operations and/or technology. Improvements suggested through these reviews would be implemented in consultation with the Nunavut Water Board and Kivalliq Inuit Association.

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APPENDIX A • ENVIRONMENTAL GUIDELINE FOR WASTE ASBESTOS

Environmental Guideline for

Waste Asbestos









Department of Environment
Government of Nunavut

GUIDELINE: WASTE ASBESTOS

Original: January 2002
Revised: January 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with waste asbestos. This Guideline does not replace the need for the owner or person in charge, management or control of the waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of waste asbestos.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Centre – Public Domain
Right – Arun District Council, United Kingdom

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Introduction

Asbestos is the commercial term given to a group of silicate minerals that occur naturally in the environment. These minerals have separable long fibers that are heat resistant, strong and flexible enough to be woven or spun. Because of these characteristics, asbestos has been used in a wide range of manufactured products, mostly in building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), friction products (i.e. automobile clutch, brake and transmission parts) and heat resistant insulation, fabrics, packaging, gaskets and coatings. Loose-fill vermiculite insulation may also contain small amounts of asbestos.

During the 1980s the health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. Asbestos products may still be found when buildings are being renovated or demolished, or when carrying out repairs on older vehicles and electrical appliances.

Although asbestos is typically considered to be a human health hazard, the route of exposure is through breathing air and drinking water that contain the very small asbestos fibres. The *Environmental Guideline for Waste Asbestos* (the Guideline) provides information on the characteristics and potential environmental and human health effects of waste asbestos and guidance on its proper storage, handling and removal, transportation and disposal. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of waste asbestos is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of waste asbestos.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Asbestos	A commercial term given to naturally occurring fibrous silicate minerals including crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite and mysorite.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.

Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Friable Waste Asbestos	Waste asbestos which can be crumbled by hand pressure when it is dry.
Minister	The Minister of Environment of the Government of Nunavut.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
Responsible Party	The owner or person in charge, management or control of the waste.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations and Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).
Waste Asbestos	A substance containing asbestos in a concentration greater than 1% by weight that is no longer wanted or is unusable for its intended purpose and is intended for storage or disposal. Waste asbestos does not include asbestos that is immersed or fixed in a natural or artificial binder.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key environmental agency responsible for ensuring parties properly manage waste asbestos and will provide advice and guidance on its management. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be

obtained by contacting the Department of Environment or by visiting the web site at http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Generators of Waste Asbestos

The owner or person in charge, management or control of waste asbestos is known as the responsible party. In general, the responsible party must ensure asbestos is properly and safely managed from the time it is produced to its final disposal. This is referred to as managing the waste from cradle-to-grave. Information on the general management of hazardous waste in Nunavut, including generator, carrier and receiver responsibilities, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste*.

Contractors may manage unwanted or waste asbestos on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of waste asbestos as there may be other environmental or public and worker health and safety issues to consider.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers. The *Asbestos Safety Regulations* provide specific requirements for the safe handling of asbestos in the workplace and for medical surveillance of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the handling and management of waste asbestos may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division of the Department of Economic Development and Transportation is responsible for the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* (CEPA)[1] and for regulating the interprovincial and international movement of hazardous waste, including waste asbestos, under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters, including the impact waste asbestos may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of waste asbestos. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites and sewage lagoons only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue involving asbestos is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of waste asbestos may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

[1] Asbestos is listed in Schedule 1 of the *Canadian Environmental Protection Act* as being a 'Toxic Substance"

Characteristics and Potential Effects of Asbestos

2.1 Characteristics

Asbestos is a naturally occurring silicate mineral with several unusual properties. Its long flexible silky fibres are strong enough to be spun or woven into a variety of blanket-like products. It is resistant to high temperatures, chemical corrosion and wear. A poor conductor of electricity, asbestos also insulates well against heat and electricity. This combination of properties gives asbestos performance characteristics that are difficult to match and, as a result, it has been used in a wide range of manufactured products over the years including building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), various automotive friction products (i.e. clutch, brake and transmission parts) as well as heat resistant insulation, fabrics, packaging, gaskets and coatings. Although asbestos use was either banned or largely phased out in North America starting in the mid 1980s, it can still be found in many older buildings, vehicles and appliances. Appendix 3 provides a listing of products that have been manufactured in the past using asbestos.



Figure 1 - Anthophyllite Asbestos Fibres
Source: Public Domain

2.2 Potential Effects on Environment and Human Health

Asbestos fibres are stable and do not break down into other compounds in soil, evaporate into air or dissolve in water. In other words, the basic silicate structure of the flbre remains largely intact in the environment. Small diameter fibres may remain suspended in air and water and be carried long distances while larger fibres tend to be deposited more quickly. Asbestos fibres are not able to move through soil.

Human exposure to asbestos occurs when the asbestos-containing material is disturbed in some way so as to release fibres into the air and water. Small amounts can also be released to the environment through the breakdown of natural deposits. Health risks occur when fibres are present in drinking water and in the air that people breathe. When inhaled, asbestos fibres can cause asbestosis (a scarring of the lungs which makes breathing difficult), lung cancer and mesothelioma (a rare cancer of the lining of the chest or abdominal cavity). The risk of contracting an asbestos related disease is greatest when fibre concentrations in the air are high and the exposure period is long, such as in the workplace. Smoking combined with asbestos inhalation also greatly increases the risk of lung cancer.

Waste Management

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.[2]

3.1 Pollution Prevention

Pollution prevention is a term used to describe methods and practices that minimize or eliminate the generation of waste. If asbestos is known to be present, removal of the asbestos material should only be undertaken by a qualified person and only when the material is beyond repair or, if it is in a building, when the building is undergoing renovation or demolition. Asbestos that is not disturbed or deteriorated does not, in general, pose a risk to human health and can be left alone.

Other pollution prevention opportunities for waste asbestos include:

Reduce

- Replace asbestos-containing materials with less hazardous materials. A number of materials have been developed as replacements for asbestos in manufactured products including fiberglass, carbon and graphite fibres and PTFE (polytetra fluroethylene).

Reuse

- Encapsulate existing asbestos material by sealing with paint or an epoxy product or cover the material with paneling or other non-asbestos product. The Workers' Safety and Compensation Commission, Chief Medical Officer of Health and your Regional Environmental Health Officer must be consulted prior to encapsulating or sealing existing asbestos material.
- Friable asbestos materials should never be reused for any purpose once it has been removed. Non-friable asbestos materials (i.e. asbestos cementous board) can only be re-used if it remains intact and unbroken. This will extend the life of the product and reduce replacement costs.

Public and commercial building and home owners should keep an inventory of asbestos material so as to inform users, contractors and regulatory and municipal authorities in the event of renovation or demolition activities or an emergency (i.e. fire).

3.2 Handling and Removal

The safe handling and removal of asbestos requires a thorough understanding of the potential risks and knowledge of abatement measures. As long as the asbestos fibres remain enclosed or tightly bound in the material, the fibres will not be released to the air and there is no significant health risk. However, asbestos materials that are disturbed, broken or removed can result in the release of fibres if adequate safety measures are not in place. Unfortunately, simply looking at the material may not confirm whether asbestos is present. If in doubt, have the material analyzed by a qualified person.

Homeowners should contact the Chief Medical Health Officer or Regional Environmental Health Officer before handling material that contains asbestos. Check the material regularly for any sign of damage or wear and have renovations or asbestos removal carried out by a trained and qualified person.

[2] Source – Canadian Council of Ministers of the Environment.

The *Asbestos Safety Regulations* provide employers with specific requirements for the safe handling of asbestos in the workplace. The *Regulations* require that employers:

- Provide workers with protective respiratory equipment, clothing and eye protection.
- Enclose the work area and ventilate the air using filtering equipment.
- Post warning signs and notices.
- Soak the asbestos material through its entire thickness with water during its removal to minimize release of asbestos fibres.
- Thoroughly clean the work area each day.
- Place all asbestos material and debris in clearly labeled, sealed and airtight containers.
- Provide training to workers in the use of protective equipment, the safe handling and disposal of asbestos waste and health information on the potential effects of asbestos exposure.
- Pay and arrange for a medical examination upon the written request of a worker involved in handling and disposing of asbestos materials and waste.

Employers should consult the *Asbestos Safety Regulations* in order to obtain a complete description of the regulatory requirements. A consolidated copy of the current *Regulations* is provided in Appendix 2. The authoritative text can be obtained by contacting the Workers' Safety and Compensation Commission or by downloading a copy from the Department of Justice web site at http://www.justice.gov.nu.ca/apps/search/docSearch.aspx.

The handling and removal of asbestos should only be undertaken by trained and qualified persons. The names of qualified asbestos abatement companies can be obtained by contacting the Workers' Safety and Compensation Commission or the waste management exchanges and associations listed in Appendix 10 of the *Environmental Guideline for the General Management of Hazardous Waste.*

3.3 Storage

Storage refers to the maintenance of waste asbestos while awaiting its transport and disposal. Storage is not acceptable for the long-term management of waste asbestos except under extraordinary circumstances and should be considered as a temporary measure only.

Waste asbestos should be stored in the following manner:

- Store wet waste asbestos in airtight, non-leaking plastic or 16 gauge steel drums. Dry asbestos can be stored in 6 mil plastic bags sealed within non-reusable drums or a second 6 mil plastic bag. Containers should be tightly sealed when not in use to prevent release of asbestos fibres.
- Each container must be clearly labeled "ASBESTOS" in accordance with the *Asbestos Safety Regulations.* If waste asbestos is being stored in an institutional, commercial or industrial location or if the asbestos is being stored for transport, the containers must also be labeled in accordance with the *Workplace Hazardous Materials Information System* (WHMIS) and relevant Transport Authority.
- Place all labeled containers in a secure and clearly marked area.
- Containers should be located so as to be protected from the sun, weather and physical damage.
- Workers must be trained in the safe handling and shipping for waste asbestos, have access to material safety data sheets and be provided with personal protective equipment. Only trained personnel should have access to the designated storage area.

If a commercial facility is used to store hazardous waste for periods of 180 days or more or the quantity of asbestos and other waste on-site at any one time exceeds the criteria set out in the *Environmental Guideline for the General Management of Hazardous Waste*[3], the facility must be registered with the Department of Environment as a hazardous waste management facility. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

3.4 Transportation

Friable waste asbestos should never be transported in bulk, but in storage containers as described in section 3.3 of the Guideline. The waste should be properly secured and transported within an enclosed vehicle or covered with a tarpaulin or net if transported in a vehicle that is not enclosed. A compaction type waste haulage vehicle must never be used to transport friable asbestos waste. Asbestos waste that is non-friable (i.e. asbestos that is immersed or fixed in a natural or artificial binder) does not need to be specially packaged for transport and disposal.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations,* no person may transport hazardous waste in Canada for the purpose of disposal or recycling in a quantity greater than five litres or five kilograms unless it is accompanied by a completed manifest. Manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

Friable waste asbestos is classified as a Class 9 Miscellaneous Waste by the *Transportation of Dangerous Goods Act*. The classification, packaging, labeling and placarding of this waste must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations*. Schedule I of the *Regulations* classifies waste asbestos as follows:

Shipping Name: WASTE Asbestos Blue (crocidolite)
Classification: 9
Product Identification Number: UN2212
Packing Group: II

Shipping Name: WASTE Asbestos Brown (amosite, mysorite)
Classification: 9
Product Identification Number: UN2212
Packing Group: II

Shipping Name: WASTE Asbestos White (chrysotile, actinolite, anthophyllite, tremolite)
Classification: 9
Product Identification Number: UN2590
Packing Group: III

[3] The criterion for Class 9 Miscellaneous Waste is 1000 kilograms or litres and the total aggregate quantity is 5000 kilograms or litres.

Non-friable asbestos is not a hazardous waste and does not need to be accompanied by a manifest.

The transport of waste asbestos by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these materials can be obtained by contacting Transport Canada or by referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Disposal

Friable waste asbestos may be disposed of at a municipal landfill site in Nunavut provided that authorization and approval has first been obtained from the local municipal government. The local municipal government must be registered with Nunavut's Department of Environment as a hazardous waste receiver before accepting the waste.

Upon arrival at the landfill site, the waste asbestos should immediately be buried and covered with at least 30 centimetres (one foot) of soil to ensure further direct contact with people and heavy equipment is avoided. Care should be taken to ensure the asbestos containment (i.e. plastics bags) is not broken or ruptured while being covered. A final cover of at least 60 centimetres (two feet) of soil should be placed over the waste asbestos within 24 hours. The excavation site should be separate from other disposal or burning activities and a sign erected so the asbestos is never disturbed. A detailed map or drawing of the excavation site location should also be maintained by the local municipal government for future reference.

Where friable asbestos is being unloaded for the purpose of disposal, the unloading must be carried out so that no loose asbestos waste or punctured, broken or leaking containers are landfilled. Any friable asbestos that is in a punctured, broken or leaking container must be repackaged in drums or two 6 mil plastic bags prior to its disposal.

Where local disposal of friable waste asbestos is not available, the asbestos should be transported for disposal by a registered hazardous waste carrier to a receiver or management facility that is registered to operate in Nunavut. A listing of hazardous waste carriers, receivers and management facilities is available by contacting Nunavut's Department of Environment. A listing of receivers and management facilities authorized to accept waste asbestos in other territories and provinces can be obtained by contacting the environment department in that jurisdiction or the Canadian waste exchanges and associations found in Schedule 10 of the *Environmental Guideline for the General Management of Hazardous Waste.*

Conclusion

Asbestos is a commercial term given to a group of fibrous silicate minerals that occur naturally in the environment. Because of its unique and unusual properties, asbestos has been used over the years in the manufacture of a wide range of products. These products include building materials, friction products, heat resistant insulation, fabrics, packaging, gaskets and various coatings. During the 1980s the human health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. However, a variety of asbestos products may still be found when older buildings are being renovated or demolished, or when repairs are being carried out on older vehicles and electrical appliances. The *Environmental Guideline for Waste Asbestos* is an introduction to the management of asbestos. It provides information on the characteristics of asbestos, its possible effects on the environment and human health and guidance on its proper storage, handling and removal, transportation and disposal.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of waste asbestos to comply with all applicable federal and territorial legislation and municipal by-laws. The management of waste asbestos may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of waste asbestos, or to obtain a listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

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APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – *SAFETY ACT: ASBESTOS SAFETY REGULATIONS*

This consolidation is not an official statement of the *Asbestos Safety Regulations*. It is a current consolidation prepared for convenience of reference only. The authoritative text of the *Regulations* should be obtained from the Northwest Territories and Nunavut Workers' Safety and Compensation Commission.

1. In these regulations,

"Asbestos" means crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite or any mixture containing any of these minerals;
"Asbestos dust" means dust consisting of or containing asbestos fibres;
"Asbestos process" means the handling of materials containing asbestos and includes:
(a) sawing, cutting, sanding or spraying materials,
(b) repair or maintenance of materials,
(c) cleaning or disposal of materials,
(d) mixing or applying asbestos shorts, cements, grouts, putties or similar compounds,
(e) storage or conveyance of materials.

2. These regulations apply to every establishment.

3. No person shall use crocidolite in any asbestos process.

4. No person shall apply, by spraying, insulation materials containing asbestos.

5. (1) An employer conducting an asbestos process shall:
(a) provide each worker who may be exposed to asbestos with respiratory equipment designed for use in asbestos processes and that has been approved by the Canadian Standards Association;
(b) provide each worker who may be exposed to asbestos with dustproof coveralls, gauntlets, eye protection and headgear;
(c) ensure that, at all times during the asbestos process, ventilation and air filtering equipment is in operation and removing asbestos dust from the air;
(d) enclose the work area to prevent the escape of asbestos dust;
(e) post warning notices in prominent places indicating that an asbestos process is in progress;
(f) ensure that, prior to disturbing any asbestos surface, the asbestos is soaked with water through its entire thickness;
(g) where a safety officer is of the opinion that it is not practicable to comply with the requirements in paragraph (d), ensure that any asbestos surface is kept wet as it is being disturbed;
(h) clean the work area surrounding an asbestos process thoroughly each day by vacuum equipment or a wet cleaning method approved by a safety officer; and
(i) ensure that all asbestos materials, debris and dust are placed in sealed, airtight containers and clearly labeled "ASBESTOS".

(2) A safety officer may, in writing, exempt an employer from the requirements of paragraph 1(a) where the safety officer is of the opinion that the nature of the asbestos process is such that the employer cannot, practically, comply with the requirements.

(3) An employer providing equipment under subsection (1) shall dispose of the equipment after use or shall remove all traces of asbestos dust and shall store the equipment in an airtight container.

6. An employer conducting an asbestos process shall provide the following training to any worker who is likely to come in contact with asbestos:
   (a) demonstration and instruction in the use of all protective equipment;
   (b) the safe handling and proper disposal of waste asbestos;
   (c) health education including information relating to pneumoconiosis, lung cancer, mesothelioma and the effects of smoking; and
   (d) any other information a safety officer considers necessary.

7. (1) Where an employer uses ventilation and air filtering equipment, the employer shall inspect and clean the equipment weekly.

   (2) A safety officer may designate a person in the workplace to inspect any ventilation and air filtering equipment yearly to report to the employer on the condition of the equipment and the need for repair.

   (3) An employer receiving a report recommending repair under subsection (2) shall complete the recommended repairs within 30 days of receipt of the report.

8. No person shall employ a minor where an asbestos process is being conducted unless
   (a) the process is conducted under constant supervision; and
   (b) the process has been inspected and approved by a safety officer.

9. (1) Within 30 days of receipt of a written request for a medical examination by a worker involved in an asbestos process, an employer shall arrange and pay the full cost of an examination by a physician.

   (2) The employer shall make arrangements for a medical examination that includes:
   (a) a complete physical examination with special attention to the respiratory system;
   (b) lung function tests including forced vital capacity and forced expiratory volume at one second; and
   (c) any medical procedures considered necessary by the examining physician for the diagnosis of asbestos related illness.

   (3) Upon written request by the Minister, a physician who has conducted an examination under subsection (2) shall provide the Minister with a report containing all information resulting from the examination.

   (4) Every report provided under subsection (3) is a privileged communication of the person making it.

APPENDIX 3 – ASBESTOS CONTAINING MATERIALS

The following products have in the past been manufactured using asbestos. If in doubt, confirm with the product's manufacturer as to whether it is asbestos-free.

- Acoustical Plaster
- Base Flashing
- Breaching Insulation
- Cement Pipes
- Chalkboards
- Ductwork
- Electrical Panel Partitions
- Fire Blankets
- Fireproofing Materials
- Heating and Electrical Ducts
- Joint Compounds
- Packing Materials
- Roofing Shingles
- Taping Compounds (thermal)
- Wallboard
- Vinyl Floor Tile
- Adhesives
- Blown-in Insulation
- Caulking and Putties
- Cement Siding
- Construction Mastics and Adhesives
- Electrical Wiring Insulation
- Elevator Brake Shoes
- Fire Curtains
- Flexible Fabric Connections
- High Temperature Gaskets
- Laboratory Gloves
- Pipe Insulation
- Spackling Compounds
- Textured Paints and Coatings
- Vinyl Sheet Flooring
- Cooling Towers
- Asphalt Floor Tile
- Boiler Insulation
- Ceiling Tiles
- Cement Wallboard
- Decorative Plaster
- Electrical Cloth
- Elevator Equipment Panels
- Fire Doors
- Flooring Backing
- HVAC Duct Insulation
- Laboratory Hoods and Table Tops
- Roofing Felt
- Spray-Applied Insulation
- Thermal Paper Products
- Vinyl Wall Coverings

Source - Krytiuk Specialty Contracting Inc.

APPENDIX 4 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Industry

National Demolition Association
16 N. Franklin Street, Suite 203
Doylestown, Pennsylvania USA 18901-3536
Telephone: (215) 348-4949 Fax (215) 348-8422
Website: http://www.demolitionassociation.com

APPENDIX B • ENVIRONMENTAL GUIDELINE FOR MERCURY-CONTAINING PRODUCTS AND WASTE MERCURY

Environmental Guideline for

Mercury-Containing Products and Waste Mercury













Department of Environment
Government of Nunavut

GUIDELINE: MERCURY-CONTAINING PRODUCTS AND WASTE MERCURY

Original: November 2010

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with common mercury-containing products and waste mercury. This Guideline does not replace the need for the owner or person in charge, management or control of the product or waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of mercury.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Top Right - California Department of Toxic Substances Control
Bottom Left - E. Paquin

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Introduction

Mercury is a naturally-occurring element that is found in soil, air and water around the world. It is constantly being released from natural sources such as volcanic eruptions and the weathering of soil and rock. It can exist as a gas or in a range of organic and inorganic forms that vary in toxicity and can cycle between the earth's land, water and air. Mercury is a persistent substance. If released into the atmosphere, it can remain airborne for long periods of time and be deposited in soil and water in the Canadian Arctic, an area with no significant local industrial sources of mercury. Almost all forms of mercury are toxic to some degree or can be converted through biological activity into the highly toxic organic form called methylmercury. Mercury may also build up, or bioaccumulate[1] and biomagnify[2], in living organisms. This results in animals such as predatory fish, fish-eating birds and mammals being at a higher risk of harm from mercury than those species which do not prey upon other organisms.

Mercury has been used for many years in a variety of consumer and industrial products because it is an excellent conductor of electricity and reacts predictably to changes in temperature and pressure. Common consumer and industrial products that can contain mercury include fluorescent lamps, thermometers and thermostats, batteries, dental amalgam, medical and other measuring devices, and electrical switches and relays. Although the use of mercury in these products has declined significantly over the past several decades, stockpiles of older mercury-containing products and the current technical requirements of products such as fluorescent lamps and specialized batteries suggests that the elimination of mercury use is not expected soon. For this reason, mercury-containing products must continue to be actively managed.

The Guideline for Mercury-Containing Products and Waste Mercury (the Guideline) provides information on the risks, hazards and best management practices associated with various mercury-containing products commonly used in Nunavut. It examines the characteristics and effects of mercury on the environment and human health, identifies non-mercury alternatives for common products and provides guidance on the proper cleanup, storage, transportation and disposal of unwanted mercury.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of a mercury-containing product or waste mercury is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of mercury.

1.1 Definitions

Commissioner's Land — Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.

[1] The accumulation over time of metals and other persistent substances within an organism from both biotic (i.e. other organisms) or abiotic (i.e. land, air and water) sources.

[2] The progressive buildup of metals or other persistent substances through successive trophic levels – meaning that it relates to the concentration ratio in the tissue of a predator as compared to that in its prey.

Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the Transportation of Dangerous Goods Regulations in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Hazardous Waste	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal.
Mercury-Containing Product	A manufactured device or part of a device that contains elemental mercury which is integral to its function.
Minister	The Minister of Environment of the Government of Nunavut.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
Responsible Party	The owner or person in charge, management or control of the waste.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations* (CEPA) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (CEPA). (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).
Waste Mercury	Mercury that is no longer wanted or is unusable for its intended purpose and is intended for storage, recycling, treatment or disposal.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Department of Environment is the key environmental agency responsible for ensuring responsible parties properly manage unwanted mercury-containing products and waste mercury and will provide advice and guidance on its management, including proper disposal. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Generators of Unwanted Mercury-Containing Products and Waste Mercury

The owner or person in charge, management or control of the unwanted mercury-containing product or waste mercury is known as the responsible party. In general, the responsible party must ensure the unwanted product and waste mercury is properly and safely managed from the time it is produced to its final disposal. This is referred to as managing the product and waste from cradle-to-grave. Information on the general management of hazardous waste in Nunavut, including generators, carriers and receivers, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste*.

Contractors may manage unwanted mercury-containing products and waste mercury on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of unwanted mercury-containing products and waste mercury as there may be other environmental or public and worker health and safety issues to consider.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and the *Safety Act,* both of which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the management of unwanted mercury-containing products and waste mercury may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* (CEPA). Mercury is listed as a Toxic Substance in Schedule I of CEPA and notices have been published in the Canada Gazette requiring the preparation and implementation of pollution prevention plans in regard to mercury releases from switches in end-of-life vehicles and dental amalgam waste. Environment Canada is also responsible for regulating international and interprovincial movement of hazardous waste, including unwanted mercury-containing products and waste mercury, under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact waste mercury may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of unwanted mercury-containing products and waste mercury. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites and sewage lagoons only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of unwanted mercury-containing products and waste mercury may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Characteristics and Effects of Mercury

Mercury is a naturally occurring element that can be released to the environment from natural sources or through human activities. Natural sources include the release of mercury from the Earth's crust through volcanic activity and the weathering of soil and rock. Human activities contribute to mercury levels in the environment primarily through the burning of coal and the burning and landfilling of products or waste that contain mercury.

Elemental mercury is a shiny, silver-white metal that is liquid at room temperature. It is a persistent element that can cycle between the earth's land, water and air for long periods of time. Through a process known as 'atmospheric mercury depletion events'[3] relatively high concentrations of mercury are now being found in the Canadian Arctic, a region with no significant industrial sources of the metal.

Several forms of mercury occur naturally in the environment with microorganisms and natural processes being able to change the mercury from one form to another. The most common natural forms of mercury found in the environment are metallic mercury, mercuric sulphide, mercuric chloride, and the organic form methylmercury. Being an element, mercury cannot be broken down or degraded further into harmless substances.

2.1 Effects on the Environment

All forms of mercury can accumulate in organisms to some degree. Of most importance is methylmercury, which is a fat soluble compound that readily bioaccumulates in living organisms and biomagnifies up the food chain. This can result in methylmercury levels in edible freshwater and saltwater fish, aquatic mammals and predatory birds that are thousands of times greater than levels in the surrounding water. Wildlife exposed to these high levels of methylmercury is at risk of harm. Depending upon the species and level of exposure, harmful effects can include slower growth, reproductive failure, death and the development of abnormal behaviors that can affect survival rates.

As little as 25 milligrams (or 25 thousandths of a gram) of mercury, the amount contained in many common consumer products, can contaminate as much as one hundred thousand litres of water beyond the safe limits for the protection of aquatic life[4].

2.2 Effects on Human Health

Mercury is a neurotoxin that can cause damage to the brain, central nervous system, kidney and lungs in humans. The severity of the toxic effect depends on the form and concentration of mercury and its route of exposure. Methylmercury readily enters the brain and can lead to health effects including personality changes, tremors, changes in vision, deafness, loss of muscle coordination and sensation, memory loss, intellectual impairment, and in extreme cases, death. Mercury can also cross the placental barrier of pregnant mothers affecting the fetus while in the womb. Affected children may exhibit reduced coordination and growth, lower intelligence and seizures.

[3] 'Atmospheric mercury depletion events' occur when a series of photochemical reactions involving halogens convert gaseous elemental mercury to a more reactive form. This new form of mercury then adheres to dust and other particles in the atmosphere and is deposited in the Arctic, sub-Arctic and Antarctic regions.

[4] The Canadian Council of Ministers of the Environment (CCME) has established 0.026 micrograms of inorganic mercury per litre of water as the water quality guideline for the protection of aquatic life.

Waste Management

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.[5]

Responsible waste management involves adopting methods and techniques that have been shown to prevent or reduce pollution. These policies, prohibitions of practices, maintenance and monitoring procedures can include reducing the amount of waste generated, reusing the waste for a different purpose or recycling the waste to produce a new product. Implementing these management practices is an effective way of reducing a person's costs, reducing pollution and reducing legal liabilities.

3.1 Pollution Prevention - Mercury-Containing Products and Non-Mercury Alternatives

Pollution prevention methods reduce or eliminate the creation of waste mercury. Scientific and technical advances in product manufacture and design have enabled the amount of mercury in many consumer, institutional, commercial and industrial products to be reduced or eliminated. In many cases, these non-mercury or low-mercury alternatives have the same performance characteristics and cost less to operate than the original mercury-containing product. The following sections introduce the common mercury-containing products used in Canada and their non-mercury alternatives.

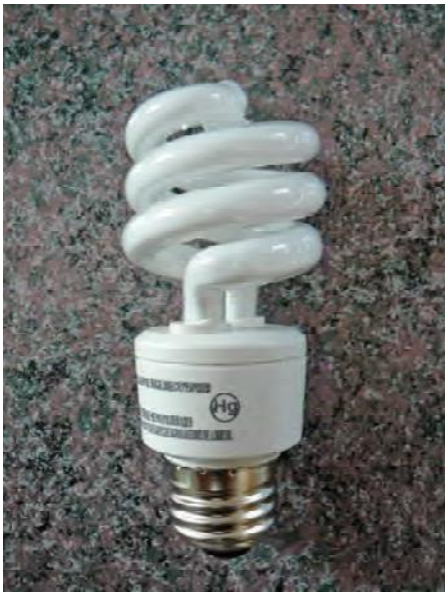

Figure 1 - Compact Fluorescent Lamp Tube
Source – E. Paquin

3.1.1 Fluorescent and Other Lamps

Mercury is an essential element needed for the operation of most fluorescent, high intensity discharge and neon lamps. Light is produced when electricity passes through the lamp and excites the contained mercury vapour. The quantity of mercury in these lamps varies according to the type and size of the lamp. Table 1 describes the common types of mercury-containing lamps and their mercury content.

In recent years, industry has been able to reduce the amount of mercury in these lamps but, because it remains an essential element for the lamp's operation, small amounts of mercury continue to be used in their manufacture.



Figure 2 - Linear Fluorescent Lamp Tube

When fluorescent and other mercury-containing lamps burn out, much of the mercury tends to be absorbed by other lamp materials such as phosphorous and glass. However, a small amount of mercury still remains in vapour form, which can result in an inhalation hazard if the lamp is broken or crushed. Over 75% of the mercury used in lamps in Canada currently ends up in landfill sites.

[5] Source – Canadian Council of Ministers of the Environment.

Table 1. Mercury-Containing Lamps

Lamp Type	Description and Use	Mercury Content[6]
Linear Fluorescent	Linear fluorescent lamps are sealed glass tubes that are between 2 and 8 feet in length and contain small amounts of mercury, an inert gas and phosphor powder coating the inside of the tube. The lamps are commonly used in offices, stores, warehouses and homes.	3 to 50 milligrams
Compact Fluorescent	Compact fluorescent lamps (CFL's) have the same characteristics as linear fluorescent lamps except the glass tube has been replaced with a compact coil. CFL's are designed to replace the traditional incandescent lamp and are becoming increasingly common in homes and offices.	1 to 25 milligrams
Mercury Vapour Discharge	Mercury vapour lamps consist of a glass envelope with a pinched quartz glass tube and several electrodes within. Mercury vapour is contained within the glass tube. The lamps are used for street and floodlighting applications. The emitted light has a bluish glow.	25 to 225 milligrams
High Pressure Sodium Vapour Discharge	High pressure sodium vapour lamps (70 to 1000 watts) have the same physical characteristics as mercury vapour discharge lamps except they contain solid sodium, mercury and a small amount of neon and argon gas. Low pressure sodium vapour lamps (35 to 180 watts) do not contain mercury. Both are high intensity discharge lamps used for street and floodlighting applications. The emitted light has a yellowish glow.	20 to 145 milligrams
Metal Halide	Metal halide lamps have the same physical characteristics as mercury and sodium vapour discharge lamps except they contain metal halides, mercury and argon gas. Sodium iodide and scandium iodide are commonly used as the metal halide. These lamps are used to light sporting facilities where a very bright light is required.	25 to 225 milligrams
Neon	Neon lamps are similar to florescent lamps except that the colour emitted depends on the mixture of gases and the colour of the glass. Although the term refers to all gas discharge bulbs using noble gases, only the red lamps use neon. Red neon lamps do not contain mercury. Other neon lamps use argon, mercury and phosphor to produce additional colours.	Varies by colour and size

Non-Mercury Alternatives

Fluorescent and high intensity discharge lamps are currently the most energy-efficient lamps available for their specific applications and similar energy-efficient alternatives are currently not commonly available. Using these lamps in place of incandescent bulbs reduces the overall amount of greenhouse gases and other contaminants emitted from electrical generating stations powered by fossil fuels because of the lamp's energy efficiency. High-efficiency, low-mercury content lamps should be

[6] To assist in putting mercury content into the proper context, one Canadian penny weighs approximately 2300 milligrams.

purchased whenever possible. In some cases, light emitting diode (LED) lamps can be used to replace neon and other mercury-containing lamps, although LED lamps can be more costly and cannot be used in all applications.



Figure 3 – High Pressure Sodium Discharge Lamp

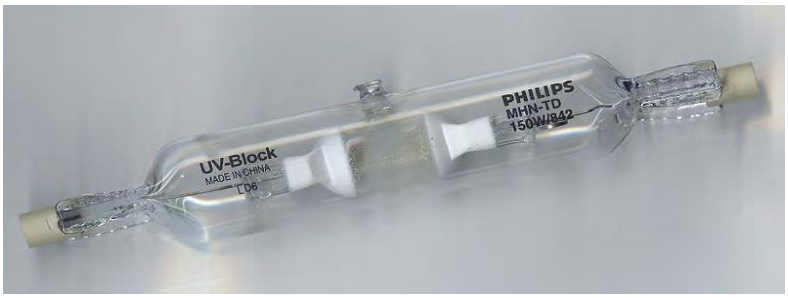

Figure 4 – Metal Halide Lamp



Figure 5 – Mercury Vapour Lamp

3.1.2 Thermometers and Other Measuring Devices

Mercury has been used in a variety of measuring devices because the liquid reacts predictably to changes in temperature and pressure. Table 2 describes various mercury-containing measuring devices that can be found in Nunavut. These devices can be found in homes, schools, laboratories, hospitals, nursing stations, as well as commercial and industrial facilities.



Figure 6 – Clinical Mercury Thermometer

Non-Mercury Alternatives

Various digital, mechanical and non-mercury liquid alternatives have been developed. Table 2 provides a list of several non-mercury alternatives for thermometers and other measuring devices. Availability, product effectiveness and relative cost should be considered when switching to a non-mercury alternative.



Figure 7 - Electronic Clinical Thermometers

Table 2. Mercury-Containing Measuring Devices

Device Type	Description and Use	Alternatives
Thermometer	Thermometers measure temperature. Held within a bulb at the base of the instrument, heat and cold causes the mercury to move up and down a thin tube where its position indicates the temperature. Various types of thermometers exist and can be found in homes, laboratories, schools and industries.	Digital, alcohol or spirit-filled thermometer
Barometer and Manometer	Barometers measure air pressure while manometers measure pressure differences. They consist of long tubes filled with mercury where air pressure causes the mercury to move up or down the tube. These devices are commonly used at airports and other weather stations.	Digital or aneroid barometer, digital manometer or needle bourdon gauge
Flowmeter	Flowmeters measure the rate of flow of gas, water and air streams. Although no longer manufactured, mercury-containing flowmeters are still used in water and sewage treatment plants, power stations and other industrial applications.	Digital or ball-actuated flowmeter
Hydrometer	Hydrometers measure the specific gravity and density of a liquid. They look similar to a thermometer except the bulb at the bottom is wider and weighted to keep the hydrometer upright when placed in a liquid. Hydrometers are commonly used in laboratories and in the production of alcohol.	Spirit filled hydrometer
Hygrometer	Hygrometers measure the moisture content of air. The most common type, the psychrometer, looks like a dual thermometer, one with a wet base and the other with a dry base. Hygrometers are used for weather forecasting.	Digital or spirit-filled psychometer
Medical Devices	Examples of medical devices that contain mercury include: sphygmomanometers (measure blood pressure), esophageal dilators (open the patient's throat during surgery), and gastrointestinal tubes (removal of intestinal obstructions).	Aneroid or digital sphygmomanometer

3.1.3 Thermostats

Mercury-containing thermostats are used to control residential, commercial and institutional heating and cooling systems. These thermostats contain small glass containers, or ampoules, of mercury which act as temperature-sensitive tilt switches to automatically control the furnace or other device. Each ampoule generally contains three grams of mercury, with each thermostat having up to six ampoules depending upon its application.



Figure 8 - Home Thermostat

Thermostats that contain mercury can be identified by removing the front cover of the device and visually inspecting its contents. If there are glass ampoules inside that contain a shiny silver-white liquid, it is most likely mercury.



Figure 9 - Touch Screen Digital Thermostat

Non-Mercury Alternatives

Mercury-containing thermostats can be replaced using relatively inexpensive digital thermostats. Most modern digital thermostats are programmable, which enables temperature in a building to be automatically adjusted according to a predetermined schedule. This results in energy and cost savings.

3.1.4 Batteries

Since the late 1990's North American battery manufacturers have eliminated or significantly reduced the mercury found in batteries. The use of mercury in the common alkaline battery has been eliminated while small amounts of mercury – anywhere from 5 to 25 milligrams - continue to be used in the manufacture of several types of button-cell batteries[7]. Button-cell batteries are small, thin energy cells that are not rechargeable. They continue to be used in a wide variety of electronic advices because of their small size and steady voltage output. Table 3 describes the common button-cell batteries in use today.



Examples of various sized button cell batteries.

Figure 10
Source – Vermont Department of Environmental Conservation

Table 3. Mercury-Containing Button-Cell Batteries

Battery Type	Common Uses
Zinc Air Miniature Batteries	Mostly used in hearing aids because of their high energy concentration and ability to continuously discharge energy. May also be used in small devices such as wristwatch pagers and ear speech processors.
Silver Oxide Button-Cell Batteries	Used in various devices such as hearing aids, watches, cameras and clocks. Silver oxide batteries may come in a large size as well as button-cell however, their manufacture is limited due to the price of silver.
Alkaline Manganese Oxide Button-Cell Batteries	Used in toys, calculators, remote control devices and cameras.

[7] Gas can form in button-cell batteries because of the corrosion of zinc causing the battery to leak. Mercury suppresses this corrosion. Button-cell batteries can contain up to 0.005 grams of mercury in the insulating paper surrounding the battery, or mercury can be mixed in the battery anode itself.

Mercuric oxide batteries contain mercury as the electrode and are useful in applications that require a high energy density and steady voltage output. Although North American battery manufacturers discontinued production of these batteries in 1996, larger mercuric oxide batteries may still be used in applications such as military, medical and industrial equipment.

Non-Mercury Alternatives

Few mercury-free alternatives currently exist for button-cell batteries and those that do exist are generally considered to have reduced performance and a higher cost. Observing battery packaging and labeling is the best method for identifying mercury-free or mercury-reduced button-cell batteries. Electrical devices that can operate on standard 110 volt power supplies (i.e. smoke and carbon dioxide detectors) should be purchased where practical rather than battery-powered devices. The use of rechargeable batteries is also a good alternative to non-rechargeable batteries where the replacements are compatible with the device.

3.1.5 Switches and Relays



Figure 11 - Mercury-Containing Switches
Source – California Department of Toxic Substances Control

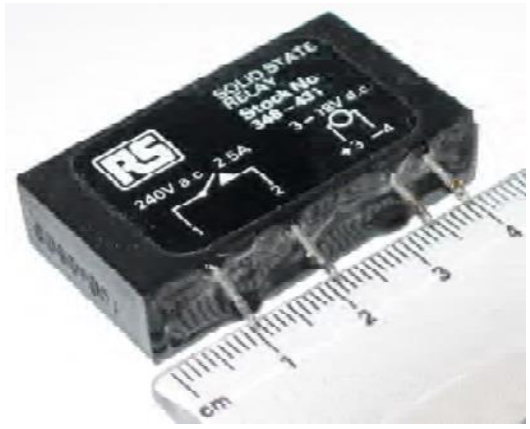

Figure 12 – Solid State Relay Switch

Switches are products that open or close an electrical circuit. When open, switches allow the electrical current to flow and when closed the circuit is broken and flow of current is stopped. Many older switches contain mercury because of the metallic liquid's excellent ability to conduct electricity. The most common consumer applications have been in tilt switches (i.e. older-model thermostats, hood and trunk lights on older-model vehicles) and float switches (i.e. boat bilge pumps).

Relays are products that open or close electrical contacts to control the operation of other electrical devices. They enable large electrical loads to be turned on or off by supplying relatively small currents to a control circuit.

Table 4 describes various mercury-containing switches and relays used in Canada and their available non-mercury alternatives.

Non-Mercury Alternatives

Mechanical and digital switches are widely available to replace mercury switches for all common applications. These vary in price depending on use and design. Not all non-mercury alternatives may be suitable for any one application without retrofit as electrical requirements must be strictly adhered to. If in doubt, the manufacturers or distributors of the specific equipment should be consulted.

Displacement and contactor relays are very specific for

their applications and non-mercury alternatives have generally not provided equal performance and reliability. Mercury wetted relays can be replaced by dry magnetic reed relays for most applications.

Table 4. Mercury-Containing Switches and Relays

Device Type	Description and Use	Alternatives
Float Switch	Float switches monitor liquid levels and are most commonly used in sump pumps. They are also used in boat bilge pumps, boilers, sewage treatment plants and pumping stations. The mercury is normally contained inside a sealed ampoule within a cylindrical outer casing.	Mechanical, optical, metallic ball, sonic or ultrasonic, pressure transmitter, alloy, thermal or capacitance float switches
Tilt Switch	Tilt switches are activated by a change in the switch position. They have been commonly used in older-model thermostats as well as applications that activate upon opening such as hood and trunk lights in older-model vehicles and chest freezers. Mercury tilt switches are typically small glass tubes with two electrical contacts at one end.	Metallic ball, electrolytic, mechanical, digital or capacitance tilt switches
Pressure Switch	Pressure switches are activated by a change in pressure. These switches have been used in HVAC systems, medical devices, automobiles (ABS brakes), appliances and other applications. Pressure switches are comprised of a diaphragm, piston or other pressure-response device coupled with a mercury ampoule.	Mechanical or digital switches
Temperature Switch	Temperature switches are activated by a change in temperature. These switches are used in a wide variety of applications including food warming trays, hot water boilers, ovens, sterilizers and heat exchangers. The switch is similar to a tilt switch and is usually attached to a temperature sensing device such as a bi-metallic strip.	Mechanical or digital switches
Relays	Relays are devices that open or close electrical control circuits to operate other devices in the same or different electrical circuit. They include displacement, contactor and wetted reed relays. Relays are commonly used in electronic circuit boards, commercial and industrial electric ranges and other cooking equipment.	Dry magnetic reed relays

3.1.6 Dental Amalgam

Dental amalgam is a mixture of metals that has been used for over 150 years to restore teeth. The metal mixture, commonly referred to as ‘silver fillings’, can consist of up to 50% mercury. Despite its use for many years, there is currently no evidence to suggest that mercury in dental amalgam is a risk to human health in the general population.

Mercury amalgam continues to be used for tooth restorations because of its durability, ease of use and low cost[8]. In the past, dentists mixed the amalgam on site using bulk mercury and metal powders. This practice resulted in a health risk to workers through physical contact with the elemental mercury and to the environment through spillage. Today, dental amalgam is purchased in pre-dosed amalgam capsules that come in different sizes.

In 2001, federal, provincial and territorial governments endorsed the *Canada-Wide Standard on Mercury for Dental Amalgam Waste* through the Canadian Council of Ministers of the Environment (CCME). The Standard called for dentists to apply 'best management practices' to achieve a 95% national reduction in mercury releases from dental amalgam by 2005. These practices include the installation, use and maintenance of International Organization for Standardization (ISO) certified amalgam separators, traps and filters to remove waste mercury from dental office wastewater. A report released in 2007 indicates that 70% of dentists operating in Canada were employing ISO certified amalgam separators (Environment Canada, 2007).

Non-Mercury Alternatives

There are several resin and composite materials that are substitutes for mercury amalgam. These include cast gold, bonded amalgam and dental ceramics. These alternatives are usually more costly than mercury amalgam fillings and may not be suitable for all procedures. Composite resins are tooth-coloured plastic materials often used to restore front teeth where a natural appearance is important. These resins can also be used as fillings on back teeth depending on the location and extent of tooth decay.

3.2 What to do if a Spill of Mercury Occurs

Cleanup actions must be started as soon as possible following a spill of mercury so workers and family members are not exposed to its hazards. When a thermometer or other liquid mercury-containing product is broken, the mercury will quickly form beads that accumulate in small pools and in the tiniest of spaces, making cleanup difficult. When a fluorescent or other mercury-containing lamp is broken or if mercury remains trapped (i.e. in tiny spaces, drains or soft surfaces such as carpet and furniture), mercury vapour is released directly to the air. Although mercury evaporates slowly at normal room temperature, dangerous levels of mercury vapour can build up in indoor air.

The following should be considered when cleaning up a spill of mercury:

- It can be very dangerous to touch liquid mercury directly or breathe mercury vapour. Immediately isolate the spill area by keeping people and pets away, closing all interior doors that lead to other rooms in the building and turning off heaters. Ventilate the area by turning on fans that vent directly to the outdoors and opening windows and exterior doors.
- Protect yourself by changing into old clothing and shoes that can be thrown away after clean up has been completed, removing all jewelry as mercury can adhere to metal and putting on gloves, preferably made of rubber, nitrile or latex.
- On a hard surface (i.e. linoleum, tile or concrete), push the mercury beads together using razor blades, stiff paper or cardboard, pick up the beads using a dustpan or stiff paper and carefully transfer the mercury into a wide-mouth container or plastic bag. Any remaining beads of

[8] Approximately 1.3 tonnes of mercury in new filling material is placed each year in the mouths of Canadians (CCME, 2001).

mercury can be picked up using tape, cotton balls or a moist paper towel. All debris should be placed inside the container or bag and the lid sealed tightly with tape.

- On a soft surface (i.e. carpet, couch or clothing), it is best to cut out the contaminated materials and place them into a sealable container or plastic bag. If you're not willing to cut out the materials, use cotton balls, moist paper towel or an eye dropper to pick up the spilled mercury and place it, along with any debris, into the container or bag.
- When a fluorescent or other mercury-containing lamp is broken, quickly ventilate the area by turning on fans that vent to the outdoors and opening all windows and exterior doors. Leave the area for at least 30 minutes and then follow the instructions for the type of surface to be cleaned.
- In every case, place the sealed container or plastic bag containing the mercury and debris into another container or bag for additional protection against breakage and leakage.
- Wash your hands thoroughly and take a shower immediately after the cleanup.

Never allow people who are wearing clothing or shoes contaminated with mercury to walk around the building, never use a broom or ordinary vacuum cleaner to clean up mercury, never pour mercury down a drain and never launder mercury-contaminated clothing in a washing machine.

Mercury spill kits are commercially available from safety supply companies to assist in the cleanup of spilled mercury. Although convenient, these kits may be expensive and are not absolutely necessary to clean up a small contained spill of mercury, such as from a mercury switch or thermometer. The following are some commonly available items that can be used to construct a mercury spill kit: rubber gloves, goggles or other eye protection, flashlight, sponge or cotton balls, wide duct or masking tape, eye dropper or syringe without needle, stiff index cards, plastic containers with tight-fitting lids and plastic bags with zipper seals.

All spills of mercury must immediately be reported to the NWT/Nunavut 24-Hour Spill Report Line at (867) 920-8130 (toll free) or e-mailed to: spills@gov.nt.ca . Spill reporting forms are available on the Department of Environment's website: http://env.gov.nu.ca/programareas/environmentprotection

The local nursing station or health authority should also immediately be notified.

3.3 Storage

Storage refers to keeping unwanted material while awaiting its transport, recycling or disposal. Except under extraordinary circumstances, storage is not acceptable for the long-term management of unwanted mercury-containing products and waste mercury and should be considered as a temporary measure only.

Unwanted mercury-containing products and waste mercury should be stored in the following manner:

- If the packaging that was used to originally ship the product is available and the product is unbroken, place it in the packaging and seal the package securely with tape.
- If the original packaging is not available or if the mercury is from a spill, place the product or container containing the mercury and any cleanup materials and debris inside a larger metal or plastic container. Place kitty litter or other oil absorbent packing material around the product or

small container to protect it from breaking or sudden shock. Secure the larger container with a tight fitting lid or tape.

- Clearly label all storage containers as containing mercury according to the requirements of the *Workplace Hazardous Materials Information System* (WHMIS) and relevant Transport Authority.
- Place all labeled storage containers in a clearly marked designated area which is separate from other waste to prevent its disposal with normal garbage.
- If mercury-containing lamps are being stored, do not crush the lamps as crushing will release vapours that may pose health and environmental hazards. Broken lamps are a hazardous waste.

If the storage facility is used for commercial purposes to store hazardous waste for periods of 180 days or more or the quantity of waste stored on-site exceeds the criteria set out in the *Environmental Guideline for the General Management of Hazardous Waste*, the facility must be registered with the Department of Environment as a hazardous waste management facility[9]. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the GN *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

3.4 Transportation

Unwanted mercury-containing products and waste mercury may be classified as a hazardous waste for the purposes of transportation depending upon the quantity of waste being transported for recycling or disposal. Under the federal *Interprovincial Movement of Hazardous Waste Regulations*, no person may transport waste mercury in Canada in a quantity greater than five kilograms or five litres unless it is accompanied by a completed manifest[10]. Manifesting requirements for the international transport of waste are controlled under the federal *Export and Import of Hazardous Waste and Recyclable Material Regulations*. Manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to Environment Canada's *User's Guide for the Hazardous Waste Manifest* or the *Environmental Guideline for the General Management of Hazardous Waste*.

The classification, packaging, labeling and placarding of mercury-containing products and waste mercury while being transported must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations*. Schedule I of the *Regulations* classify waste mercury as follows[11]:

Shipping Name: WASTE Mercury
Classification: 8
Product Identification Number: UN2809
Packing Group: III

[9] The criterion for Class 8 Corrosives is 1000 kilograms and the criterion for the aggregate quantity of hazardous waste is 5000 kilograms.
[10] In response to the 2007 federal government direction on streamlining regulation in Canada, the alignment of definitions in the *Interprovincial Movement of Hazardous Waste Regulations* (IMHWR) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (EIHWHRMR) is being undertaken by Environment Canada. Under the current proposal, the quantity of waste mercury requiring a manifest while being transported in Canada would be revised to less than 50 milliliters (ml) per shipment, which is the same as is currently required for international transport under the EIHWRHMR (Environment Canada, 2010).
[11] A wide variety of mercury-containing chemicals and compounds in addition to elemental mercury are available for use in Canada. Refer to Schedule I of the *Transportation of Dangerous Goods Regulations* for the specific classification, product identification number and packing group of these chemicals and compounds.

The transport of mercury-containing products and waste mercury by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these materials can be obtained by contacting Transport Canada or the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and hazardous waste management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Disposal

Municipal landfill sites and sewage lagoons in Canada have over the years become a major source of mercury to the environment. Unwanted mercury-containing products and waste mercury must never be thrown in the garbage and liquid mercury must never be poured down the drain[12].

Recycling and disposal options for unwanted mercury-containing products and waste mercury in Nunavut are limited. The majority of these materials are used in government, commercial, industrial and institutional facilities and any unwanted or end-of-life products should be safely stored until they can be transported to a registered hazardous waste receiver that is licensed to recycle or dispose of mercury. Names of Canadian recyclers and disposal companies are available by contacting the waste management exchanges and associations listed in Appendix 10 of the *Environmental Guideline for the General Management of Hazardous Waste.* Additional information on commercial processors of mercury-containing waste can be obtained through the following web site links:

- lamprecycle.org/ - The lamprecycle.org web site is an American resource of information on mercury-containing lamp recycling and lists several lamp recycling companies in Canada.
- www.almr.org/ - The Association of Lighting and Mercury Recyclers represents the majority of commercial processors of mercury-containing waste in the United States, some of which also operate in Canada.

Some Municipalities in Nunavut are starting to implementing programs aimed at collecting and safely storing unwanted or end-of-life fluorescent lamps and other mercury-containing products as part of their household garbage collection programs. Homeowners wishing to dispose of these wastes should contact their municipality for local disposal information.

[12] The *Guideline for Industrial Waste Discharges* prohibits the disposal of mercury in sewage lagoons and landfills if mercury is present in excess of 0.1 milligrams per litre (parts per million) based on leachate quality test results.

Conclusion

Mercury is a naturally occurring element that is found in soil, air and water around the world and which can take many different forms, some of which are harmful to humans and wildlife. Mercury has also been used for many years in a variety of consumer and industrial products because of its ability to conduct electricity and react predictably to changes in temperature and pressure. The Guideline is an introduction to the risks, hazards and best management practices associated with various mercury-containing products and waste mercury. It examines the characteristics and effects of mercury on the environment and human health, identifies non-mercury alternatives for common products and provides guidance on the proper cleanup of spilled mercury and the storage, transportation and disposal of unwanted products.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of mercury-containing products and waste mercury to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these materials may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of mercury-containing products and waste mercury, or to obtain a complete listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

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United States Environmental Protection Agency (USEPA). Mercury Releases and Spills Website – http://www.epa.gov/mercury/spills.

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free) Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

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APPENDIX C • ENVIRONMENTAL GUIDELINE FOR OZONE DEPLETING SUBSTANCES

Environmental Guideline for

Ozone Depleting Substances









Department of Environment
Government of Nunavut

GUIDELINE: OZONE DEPLETING SUBSTANCES

Original: January 2002
Revised: April 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with ozone depleting substances. This Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of these substances.

Copies of this Guideline are available upon request from:

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Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Introduction

A layer of colourless gas known as "ozone" surrounding the earth helps to filter the sun's harmful ultraviolet radiation from reaching the planet's surface. This layer is located in the stratosphere eight to ten kilometres above the earth. Scientific evidence shows that this ozone is being destroyed, and therefore this protective layer is becoming thinner, because of manufactured chlorofluorocarbons, halons and other similar substances being released into the air. These substances are commonly referred to as 'ozone depleting substances'.

As one of the early signatories to the *Montreal Protocol on Substances that Deplete the Ozone Layer*, Canada is committed to protecting the earth's ozone layer from further deterioration. The Protocol, developed in 1989 under the auspices of the United Nations Environmental Programme, provides a coordinated international response to the global problem of ozone depletion.

Canada's *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* was initially endorsed in 1998 through the Canadian Council of Ministers of the Environment (CCME) in response to Canada's commitments under the Montreal Protocol. The Action Plan is a national framework under which federal, provincial and territorial governments commit to implementing an ozone layer protection program focused on chlorofluorocarbons. The Action Plan was updated in 2001 to include all ozone depleting substances.

The original *Environmental Guideline for Ozone Depleting Substances*, which was approved by the Government of the Northwest Territories in 1999 and subsequently adopted by the Government of Nunavut in 2002, represented the Government's initial response to the National Action Plan. This version of the *Environmental Guideline for Ozone Depleting Substances* (the Guideline) provides updated information on the most common ozone depleting substances and their replacements, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances. It focuses on the refrigeration, air conditioning and fire protection sectors, although ozone depleting substances have been used by many other sectors in Canada. The Guideline does not address the production, import or export of new or recovered ozone depleting substances as these activities are controlled under regulations administered by Environment Canada. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of an ozone depleting substance is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of these substances.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Air Conditioning and Refrigeration Equipment	Equipment used to remove heat from one medium or another using an inert gas (i.e. ozone depleting substance). The Equipment may be stationary (i.e. building air conditioner, commercial or household refrigerator) or mobile (i.e. vehicle air conditioner).

Certified Service Technician	A person who is qualified to service air conditioning, refrigeration or fire extinguishing equipment through the successful completion of an environmental awareness course for ozone depleting substances approved by Environment Canada.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Fire Extinguishing Equipment	A handheld, wheeled or fixed unit or system that is designed to control or extinguish a fire.
Minister	The Minister of Environment of the Government of Nunavut.
Motor Vehicle Air Conditioner	A mechanical vapour compression refrigerant system on a motor vehicle that is designed to provide cooling for the passenger compartment.
Ozone	A colourless gas containing three atoms of oxygen (O^3). In the upper atmosphere, ozone absorbs ultraviolet radiation thereby preventing the radiation from reaching the surface of the earth. In the lower atmosphere (i.e. near the surface of the earth), ozone is one of the detrimental component of urban smog.
Ozone Depleting Substance	A chlorofluorocarbon, hydrochlorofluorocarbon, halon or other substance that is sufficiently stable to reach the stratosphere and has the potential of reacting with and destroying ozone.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.

Reclamation	The cleaning of recovered ozone depleting substances by filtering, drying, distillation or chemical treatment to meet or exceed industry-accepted reuse standards.
Recovery	The transfer of an ozone depleting substance into a container that is not part of the system from which the substance is transferred.
Recycle	The reuse of recovered ozone depletion substances by transferring the substance back into similar equipment after servicing.
Refillable Container	A container that meets the requirements of Transport Canada and is approved for multiple use.
Responsible Party	The owner, vendor or service technician in charge, management or control of the ozone depleting substance.
Servicing	Repairing, maintaining or adjusting a component of air conditioning, refrigeration or fire extinguishing equipment.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key territorial government agency responsible for ensuring parties properly manage ozone depleting substances. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Owners, Wholesalers, Retailers and Service Technicians

Owners, wholesalers, retailers and service technicians in charge, management or control of an ozone depleting substance are considered to be the responsible party. The responsible party must ensure the substance is properly and safely managed from the time it is purchased to its final destruction so as to prevent its release to the environment.

Building, equipment and vehicle owners need to be aware of the presence of ozone depleting substances in their air conditioning, refrigeration and fire extinguishing equipment. Equipment that may be leaking or discharging these substances into the air must immediately be taken out of service, the leak stopped and the discharge reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130 (refer to table 3 on page 11 of the Guideline). Owners may also be affected by the phase-out of ozone depleting substances in Canada and should develop a plan for replacing the ozone depleting substance with an acceptable alternative.

Wholesalers and retailers of ozone depleting substances, other than where the substance is an integral part of the equipment, should sell replacement substances only to companies that employ certified service technicians.

A service technician may become certified by successfully completing an environmental awareness course for ozone depleting substances that is approved by Environment Canada. Only certified service technicians should maintain and repair air conditioning, refrigeration and fire extinguishing equipment that contain ozone depleting substances. Technicians should immediately advise the owner when they become aware of leaking equipment and the equipment must not be refilled or put back into service until the necessary repairs are completed.

Contractors may manage ozone depleting substances on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the ozone depleting substance, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of ozone depleting substances as there may be other environmental or public and worker health and safety issues to consider.

Environment Canada

Environment Canada is responsible for controlling the import, manufacture, use in some cases, sale and export of ozone depleting substances through the federal *Ozone-depleting Substances Regulations* and *Federal Halocarbon Regulations* which have been adopted under the *Canadian Environmental Protection Act.* Environment Canada is also responsible for regulating the international and interprovincial movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

Department of Community and Government Services

The Office of the Fire Marshal in the Department of Community and Government Services is responsible under the *Fire Prevention Act*, National Fire Code and National Building Code for ensuring adequate fire prevention and response measures are in place. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Health and Social Services

Activities related to the management of ozone depleting substances may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of unwanted ozone depleting substances and equipment and vehicles that contain these substances. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of ozone depleting substances may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Characteristics and Impacts of Ozone Depleting Substances

2.1 Characteristics

Ozone depleting substances generally contain a combination of chlorine, fluorine, bromine, carbon and hydrogen and are often referred to by the general term 'halocarbons'. Although each has its own unique chemical characteristics, ozone depleting substances are described as having low toxicity, low boiling points and low flammability. These characteristics have resulted in their wide use as refrigerants, fire extinguishing agents, blowing agents in manufacturing foam, propellants in aerosols and medical applications, and degreasing solvents.

Many halocarbons are highly effective in breaking down ozone. Unlike many other substances that are released into the atmosphere, ozone depleting substances are not 'washed' back to Earth by precipitation or destroyed by other chemicals but can remain in the atmosphere for several decades or more. This enables the substances to drift upward into the stratosphere where ultraviolet radiation from the sun releases the chlorine or bromine atoms which, in turn, destroy stratospheric ozone. Many ozone depleting substances are also powerful greenhouse gases with a much higher potential to enhance the greenhouse effect than carbon dioxide and methane.

Table 1 describes the characteristics of many common ozone depleting substances.

Ozone depleting substances are broadly grouped into the following categories, depending upon their molecular structures.

Chlorofluorocarbons — Chlorofluorocarbons, or CFCs, contain chlorine, fluorine and carbon atoms. First developed in the 1920s, they began to replace ammonia as a refrigerant gas in the 1930s and as an aerosol propellant in the 1940s. By the 1980s they were widely used as coolants in refrigerators and air conditioners, solvents in degreasers and cleaners, and as blowing agents in the production of foam.

Halons — Halons contain bromine, chlorine, fluorine and carbon atoms. The characteristics of halons make them very effective for extinguishing fires and are suitable for all types of fire extinguishing equipment ranging from industrial total flooding equipment to hand-held fire extinguishers popular for home or office use.

Hydrochlorofluorocarbons — Hydrochlorofluorocarbons, or HCFCs, contain chlorine, fluorine, hydrogen and carbon atoms. HCFCs have been developed for use as transitional or temporary replacements for CFCs because the hydrogen atom makes them less stable and therefore less damaging to the ozone layer. HCFCs are used mainly for foam blowing, refrigeration and air conditioning, solvent cleaning and, to a lesser extent, aerosols and fire protection.

Table 1.		Classification under Transportation of Dangerous Goods Regulations	ODP[a]	GWP[b]	Life Time[c]
Chlorofluorocarbons (CFC's)					
CFC-11	Trichlorofluoromethane	Not restricted under TDG	1.0	4600	45
CFC -12	Dichlorofluoromethane	UN 1029 Class 2.2 Non-flammable Gas	1.0	10600	100
CFC-113	Trichlorofluoroethane	Not restricted under TDG	0.8	6000	85
CFC-114	Dichlorotetrafluoroethane	Not restricted under TDG	1.0	9800	300
CFC-115	Chloropentafluoroethane	UN 1020 Class 2.2 Non-flammable Gas	0.6	7200	1700
All other chlorofluorocarbons		Consult TDGA for classification			
Halons (Bromofluorocarbons)					
Halon 1011	Bromochloromethane	Un 1887 Class 6.1 Toxic Substance	0.12	-	-
Halon 1211	Bromochlorodifluoromethane	Not restricted under TDG	3.0	1300	11
Halon 1301	Bromotrifluoromethane	Un 1009 Class 2.2 Non-flammable Gas	10.0	6900	65
Halon 2402	Dibromotetrafluoroethane	Not restricted under TDG	6.0	-	-
All other halons		Consult TDGA for classification			
Hydrochlorofluorocarbons (HCFC's)					
HCFC-22	Chlorodifluoromethane	Un 1018 Class 2.2 Non-flammable Gas	0.055	1700	11
HCFC-123	Dichlorotrifluoroethane	Not restricted under TDG	0.02	-	1
HCFC-124	Chlorotetrafluoroethane	UN 3297 Class 2.2 Non-flammable Gas	0.022	620	6
HCFC-141b	Dichlorofluoroethane	Not restricted under TDG	0.11	700	9
HCFC-142b	Chlorodifluoroethane	Not restricted under TDG	0.065	2400	18
HCFC-225ca	Dichloropentafluoropropane	Not restricted under TDG	0.025	-	2
HCFC-225cb	Dichloropentafluoropropane	Not restricted under TDG	0.033	-	6
All other hydrochlorofluorcarbons		Consult TDGA for classification			

a. 'Ozone Depleting Potential' is a measure of the capability of a chemical to destroy ozone. It is measured against CFC-11 which has an ozone depleting potential of one (1.0). As an example, one molecule of Halon 1301 has the potential to destroy ten times more ozone than one molecule of CFC-11.
b. 'Global Warming Potential' is a measure of the warming effect that the emission of a gas has on the atmosphere. It is measured as a factor relative to carbon dioxide (CO^2) which has a global warming potential of one (1.0). As an example, one molecule of CFC-11 has the potential to warm the atmosphere 4600 times more than one molecule of carbon dioxide.
c. 'Life time' is the number of years it takes for the substance to break down in the lower atmosphere.

2.2 Impacts

Ozone is very effective in absorbing ultraviolet radiation in the stratosphere. Its depletion, or thinning, allows more of this high-energy radiation to reach the Earth's surface. Releases of halocarbons, particularly chlorofluorocarbons and halons, enable photochemical reactions[1] to take place in the stratosphere that destroy the ultraviolet radiation-shielding layer of ozone.

Increased exposure to ultraviolet radiation by humans can lead to an increase in sunburn, skin cancer, eye cataracts, weakening of the immune system and aging of the skin (i.e. the skin becomes drier and

[1] The most important reaction is the photo-induced breaking of the carbon-chlorine or carbon-bromine bond. Once released, the radical chlorine and bromine atoms catalyze the conversion of ozone (O^3) into oxygen (O^2).

looses elasticity). Ecosystem impacts can also occur. This begins at the bottom of the food chain where plankton populations in the ocean have been reduced by increased ultraviolet radiation. Damage and impacts to vegetation, food crops, wildlife and domestic animals can also occur.

The atmospheric impact of ozone depleting substances is not limited solely to the reduction of ozone. Many of these substances are also powerful greenhouse gases with much higher 'global warming potentials' than carbon dioxide and methane.

The Management of Ozone Depleting Substances

> *Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.*[2]

In the past, the refrigeration, air conditioning and fire protection sectors have incorporated ozone depleting substances as critical components in their equipment and processes. Although a large portion of Canada's ozone depleting substances consumption has been eliminated in recent years, a significant quantity remains in use or storage. Many of the same ozone depleting substances used by the commercial, industrial and institutional sectors were also used in domestic applications (i.e. household refrigerators, freezers, vehicle air conditioners). An inventory completed for the Government of the Northwest Territories in 1992 confirmed that approximately three-quarters of the ozone depleting substances in use in the Northwest Territories and Nunavut at that time were accounted for by the commercial, industrial and institutional sectors. As a result, this section focuses on the use of ozone depleting substances by the commercial, industrial and institutional refrigeration, air conditioning and fire extinguishing sectors in Nunavut. References are made to domestic sector use where appropriate.

3.1 Phase-out Objectives and Approaches

The overall strategy in Canada has been to eliminate the manufacture, import and export of ozone depleting substances and to phase-out their sale and use as suitable replacements become available. Several substances have been identified as being suitable replacements for chlorofluorocarbons in refrigeration and air conditioning equipment including hydrochlorofluorocarbons and hydrofluorocarbons. Unfortunately, these replacements are not totally benign (i.e. some are very powerful greenhouse gases) and an active approach to controlling their sale and use continues to be necessary.

Under the federal *Ozone-depleting Substances Regulations,* no person may use, sell or offer for sale halons in Canada. The Nunavut Office of the Fire Marshal should be consulted on suitable replacements for halon systems when the servicing, recharging or replacement of existing equipment is being considered[3].

Table 2 describes the phase-out objectives and approaches that apply to these ozone depleting substances in refrigeration, air conditioning and fire extinguishing equipment in Nunavut along with their primary replacement, hydrochlorofluorocarbons,. The phase-out objectives and approaches described in the table are consistent with those outlined in *Canada's Strategy to Accelerate the Phase-Out of CFC and Halon Uses and to Dispose of Surplus Stocks 2001* and the federal *Ozone-depleting Substances Regulations*.

[2] Source – Canadian Council of Ministers of the Environment.

[3] The United States Environmental Protection Agency periodically updates a list of acceptable alternatives to halons and other ozone depleting substances. The listing can be downloaded at http://www.epa.gov/ozone/snap/lists/index.html#halons.

Table 2. Phase-out Objectives

Objective	Phase-Out Date
Refilling or replacement of chlorofluorocarbon-containing small (< 5 horsepower), medium, (5-30 horsepower) and large (>30 horsepower) commercial, industrial or institutional refrigeration and air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile commercial and industrial refrigeration and chiller equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of halon-containing handheld or wheeled fire extinguishing equipment with a suitable alternative, except for critical uses[a].	September 2011 or next service
Refilling or replacement of halon-containing fixed fire extinguishing equipment with a suitable alternative, except for critical uses[a].	September 2011 or next service
Use and sale of hydrochlorofluorocarbons, except dichlorotrifluoroethane (HCFC-123).	January 2020
Use and sale of dichlorotrifluoroethane (HCFC-123).	January 2030

a. 'Critical use' for halons only include fire extinguishing equipment in military equipment.

3.2 Releases to the Environment

Ozone depleting substances must not be released to the environment. Equipment owners, managers and service technicians should be made aware of the environmental and human health impacts of ozone depleting substance emissions and the use of alternatives. To prevent releases from occurring, compressors, condensers, evaporators, piping and all associated equipment fitted to them need to be thoroughly inspected according to manufacturers' specifications, or at least twice each year if no specifications exist. These inspections should be incorporated into the facilities' regular maintenance plan.

Leaking equipment must not be 'recharged' with an ozone depleting substance until all necessary repairs have been completed by a certified service technician.

Spills or releases of ozone depleting substances must be immediately reported to the Nunavut/NWT 24-Hour Spill Report Line by phoning (867) 920-8130 in accordance with Schedule B of the *Spill Contingency Planning and Reporting Regulations.* Table 3 describes the minimum reportable quantities for ozone depleting substances as described in Schedule B.

Table 3. Minimum Reportable Quantities Following a Release

Ozone Depleting Substance	Minimum Reportable Quantity
CFC-12, CFC-15, HCFC-22, HCFC-124, Halon 1301[a]	Any release from a container with a capacity greater than one hundred (100) litres
Halon 1011[b]	5 litres or 5 kilograms
All other ozone depleting substances	100 litres or 100 kilograms

a. Transportation of Dangerous Goods Class 2.2 Non-flammable Gas
b. Transportation of Dangerous Goods Class 6.1 Toxic Substance

3.3 Recovery, Reclamation and Disposal

Table 2 describes the phase-out objectives of ozone depleting substances currently in use in Nunavut. Owners of fire extinguishing equipment and commercial, industrial or institutional mobile and stationary refrigeration and air conditioning equipment should either replace existing chlorofluorocarbons and halons with acceptable alternatives by September 2011 or during the next scheduled equipment service, or provide the Department of Environment with a suitable phase-out plan for the substance.

3.3.1 Stationary Refrigeration and Air Conditioning Systems

All compressor rooms housing stationary refrigeration and air conditioning systems should have refrigerant detectors and alarms installed in accordance with the Canadian Standards Association publication *B-52 – Mechanical Refrigeration Code* to detect refrigerant leaks and emissions. A refrigerant level greater than 10 parts per million in the compressor room is an indication that one or more of the systems is leaking. While refrigerant alarms are important, they are not substitutes for the physical leak testing of the system itself, which should take place a minimum of one time each year. Leak testing should also immediately be undertaken upon finding that a refrigeration or air conditioning system appears to be short of refrigerant. Any leak must be repaired prior to the system being recharged with refrigerant or put back into service. Chlorofluorocarbons must not be used to 'top up' a system. Recommendations on acceptable alternative refrigerants should be sought from the equipment's manufacturer.

Refrigerant must be recovered during the servicing of equipment to avoid its venting or release to the atmosphere. All recovery equipment should meet the Air-Conditioning, Heating and Refrigeration Institute (AHRI) *Standard 740 – Refrigerant Recovery/Recycling Equipment* or the Underwriters' of Canada (ULC) *Standard C1058.5-2004 - Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment*.

Only refillable containers may be used to store recovered refrigerants. These containers are less likely to leak and their use eliminates emissions caused by the disposal of throwaway or recyclable containers. All containers must meet the specifications listed in the *Transportation of Dangerous Goods Act* and be labeled in accordance with the *Workplace Hazardous Materials Information System* (WHMIS).

The venting or release of refrigerants to the atmosphere for the purposes of disposal is unacceptable. Chlorofluorocarbons that are recovered from equipment must be returned to the original supplier, an independent reclaimer or licensed disposal facility for destruction. Contact Refrigerant Management Canada[4] (RMC) by telephone at 1-866-622-0209 or by email at rmc@hrai.ca for information on the nearest reclaimer or licensed disposal facility. Only hydrochlorofluorcarbons and hydrofluorocarbons may be reclaimed to their original properties and used to 'top up' or recharge refrigeration and air conditioning equipment.

Unwanted refrigeration and air conditioning equipment must be completely emptied of refrigerant by a certified service technician prior to its disposal. A weatherproof notice should be permanently attached to the equipment stating the date of servicing, name of the certified technician and servicing company, and a statement confirming the equipment no longer contains refrigerant. Household refrigeration and air conditioning equipment is exempt from this requirement as long as it is disposed of in a separate area of the landfill specifically set aside for the disposal of 'white goods'. Local municipal governments are encouraged to use certified service technicians to recover the refrigerant from stored 'white goods' when quantities warrant.

Additional design and service practices are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*

3.3.2 Mobile Air Conditioning Systems and Chillers

The basic principles outlined in section 3.3.1 also apply to mobile air conditioners and chillers containing chlorofluorocarbons – recovery of the refrigerant during the installation, operation and servicing of equipment; avoiding the venting of refrigerants to the atmosphere; use of refillable containers to store recovered refrigerants; and servicing by certified service technicians.

Newer-model vehicle air conditioners and chillers already contain alternative non-chlorofluorocarbon refrigerants while older vehicles are likely to still contain CFC-12. The servicing of a motor vehicle air conditioner should be undertaken by a certified service technician in accordance with the Society of Automotive Engineers publication *SAE J1661 – Procedures for Retrofitting CFC-12 (R-12) Mobile Air-Conditioning Systems to HFC-134a (R-134a)* and *SAE J1989 - Recommended Service Procedure for the Containment of CFC-12 (R-12).* Owners and service technicians should refer to the manufacturers' specifications when choosing a replacement refrigerant.

All motor vehicle air conditioning systems and chiller refrigerant must be recovered before the vehicle is wrecked or scrapped. A certified service technician who is trained in the safe handling of refrigerants should remove the refrigerant, transfer it to a suitable refillable and labeled container, and arrange to have it transported to the original supplier, an independent reclaimer or licensed disposal facility for destruction. A personal motor vehicle delivered to a landfill by its owner is exempt from this requirement as long as the vehicle is disposed of in a separate area of the landfill specifically set aside for this purpose. Local municipal governments are encouraged to use certified service technicians to recover refrigerants from discarded vehicles when quantities warrant.

[4] RMC is a not-for-profit corporation established by the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) to ensure the responsible disposal of surplus ozone depleting substances from refrigeration and air conditioning equipment. The program is an EcoLogo™ certified program.

Additional design and service practices for mobile air conditioners and chillers are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*

3.3.3 Fire Extinguishing Equipment

The basic principles outlined in section 3.3.1 also apply to halon fire extinguishing equipment - recovery of the extinguishant during servicing and decommissioning; avoiding release of halons during training and equipment testing; use of refillable containers to store recovered halons; and servicing by certified service technicians.

Owners of fire extinguishing equipment that contain halons should develop a management plan in accordance with the phase-out objectives described in Table 2. Fire extinguishing equipment may not be recharged with halons in Canada except for use in military applications. Owners should contact the Underwriters' Laboratories of Canada (ULC) for information on the nearest reclaimer or licensed disposal facility. The Office of the Fire Marshal should also be consulted on suitable replacement fire extinguishing equipment when decommissioning halon systems.

Existing halon equipment must be properly maintained for as long it remains in service in order to avoid releases to the environment and to ensure the facility or asset is not without adequate fire protection. The training of personnel and testing of equipment must not result in any release of halons. Alternative procedures, such as video demonstrations and the use of halon stimulants, should be used to achieve the same testing and training objectives.

The servicing and decommissioning of halon fire extinguishing equipment must only be undertaken by a certified service technician. All equipment and servicing procedures must comply with Underwriters' Laboratories of Canada *Standard ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment* and the *Standard ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems*.

The venting or release of halons to the atmosphere for the purposes of disposal is unacceptable and must be avoided. Should a release occur, it must immediately be reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130.

Additional design and service practices for fire extinguishing equipment containing halons are described in Environment Canada's *Environmental Code of Practice on Halons.*

3.4 Transportation

Under the federal *Ozone-depleting Substances Regulations,* any person wishing to import or export a controlled ozone depleting substance must first obtain a permit from Environment Canada. In addition, several ozone depleting substances are classified as either Class 2.2 or 6.1 dangerous goods under the *Transportation of Dangerous Goods Act* and must be transported in accordance to this Section.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations,* no person may transport waste dangerous goods in Canada for the purpose of disposal or recycling in a quantity greater than five kilograms or five litres unless it is accompanied by a completed manifest. Manifest forms are available

from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

The classification, packaging, labeling and placarding of several ozone depleting substances must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations* while the substances are being transported. Schedule I of the *Regulations* classify these substances as follows:

Shipping Name:	WASTE Bromotrifluoromethane; or Refrigerant Gas R-13b1 Classification: 2.2 Product Identification Number: UN1009
Shipping Name:	WASTE Chlorodifluoromethane; or Refrigerant Gas R-22 Classification: 2.2 Product Identification Number: UN1018
Shipping Name:	WASTE Chloropentafluoroethane; or Refrigerant Gas R-115 Classification: 2.2 Product Identification Number: UN1020
Shipping Name:	WASTE Dichlorofluoromethane; or Refrigerant Gas R-21 Classification: 2.2 Product Identification Number: UN1029
Shipping Name:	WASTE Bromochloromethane Classification: 6.1 Product Identification Number: UN1887 Packing Group: III
Shipping Name:	WASTE Ethylene Oxide and Chlorotetrafluoroethane Mixture Classification: 2.2 Product Identification Number: UN3297

The transport of ozone depleting substances by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these substances can be obtained by contacting Transport Canada or referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Certification and Awareness Training

Only certified service technicians may service refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance. To achieve certification, a technician must successfully complete an environmental awareness training course approved by Environment Canada. A card indicating completion of training should be carried by the certified service technician at all times. Completion of training only enables the person to handle ozone depleting substances as provided in the Guideline and is not evidence of qualifications to otherwise service refrigeration, air conditioning or fire extinguishing equipment.

Only certified service technicians may purchase or possess an ozone depleting substance for the purpose of servicing equipment that already contains an ozone depleting substance. Companies employing certified service technicians must maintain records indicating the name, training date and qualifications of employees who are certified to service ozone depleting substance-containing equipment.

3.6 Labeling and Record Keeping

Each piece of refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance must be permanently labeled with the quantity and type of ozone depleting substance contained within that equipment. The label must be amended if the equipment has been 'evacuated' of ozone depleting substances or if the equipment is recharged with a different refrigerant or extinguishant.

An up-to-date service record should be maintained in close proximity to equipment containing ozone depleting substances, or with the owner of the facility. The record should include servicing dates, name of servicing company and certified technician, details on leak testing and detection, quantities of substances recovered or re-charged, and any other information pertinent to the servicing, operation and maintenance of the equipment. The record must be retained for the operating life of the equipment and be made available for inspection upon the request of an Inspector appointed under the *Environmental Protection Act.*

3.7 Sales Records

Any person who sells an ozone depleting substance, except where the substance is a component of another product, should maintain a sales record indicating the type of ozone depleting substance sold, the date of sale, the name of the person who purchased the substance and the name of that person's business. Only persons who are certified service technicians should purchase ozone depleting substances, except where the substance is a component of another product.

Conclusion

The *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* commits federal, provincial and territorial governments to implement an ozone layer protection program focused on all ozone depleting substances. The *Environmental Guideline for Ozone Depleting Substances* represents the Government of Nunavut's updated response to the National Action Plan. The Guideline focuses on the industrial, commercial and institutional refrigeration, air conditioning and fire protection sectors, although it is recognized that ozone depleting substances can still be found in older-model household refrigerators and freezers and older-model vehicle air conditioners and chillers. The Guideline provides information on the most common ozone depleting substances and their replacement, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these substances may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of ozone depleting substances, or to obtain a complete listing of guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

References

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Society of Automotive Engineers (SAE). J1989: Recommended Service Procedure for the Containment of CFC-12 (R-12). 1998. Available for purchase online. http://standards.sae.org/j1989_199811

Underwriters' Laboratories of Canada. ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems. Available for purchase online.

Underwriters' Laboratories of Canada. ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment. Available for purchase online.

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Industry

The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI)
2800 Skymark Avenue, Building 1, Suite 201
Mississauga, Ontario L4W 5A6
Telephone: 1-800-267-2231 (toll free)
http://www.hrai.ca

Refrigerant Management Canada (RMC)
http://www.refrigerantmanagement.ca

Underwriters' Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (866) 937-3852) Fax: (416) 757-8727
Email: customerservice@ulc.ca

APPENDIX D • ENVIRONMENTAL GUIDELINE FOR INDUSTRIAL WASTE DISCHARGES INTO MUNICIPAL SOLID WASTE AND SEWAGE TREATMENT FACILITIES

Environmental Guideline for

Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities







Department of Environment
Government of Nunavut

GUIDELINE: INDUSTRIAL WASTE DISCHARGES

Original: January 2002
Revised: April 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with industrial waste. This Guideline does not replace the need for the owner or person in charge, management or control of industrial waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of this waste.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

Cover Photos: Top – Indian and Northern Affairs Canada
Bottom – John Tyman. "Inuit: People of the Arctic"

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Introduction

Waste is produced by a wide variety of industrial, commercial and institutional operations in Nunavut. Much of this waste can be safely disposed of in landfills (i.e. food and packaging waste) and sewage treatment facilities (i.e. toilet waste) operated and maintained by local municipal governments. These municipal facilities may not however, accept all types of waste because of their design (i.e. the absence of groundwater collection and treatment at landfills) or because the introduction of contaminants may be harmful to bacteria that decompose the waste. The disposal of hazardous waste may also make it difficult for municipalities to comply with the terms and conditions contained in water licenses issued to them by the Nunavut Water Board.

The *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* (the Guideline) provides guidance on the local management and disposal of waste from industrial, commercial and institutional operations. Specifically, it establishes limits on the type of waste that can be disposed of into municipal waste management facilities. It does not establish limits on discharges from facilities licensed through the Nunavut Water Board. The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of industrial waste is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of waste.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Commissioner's Land — Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.

Composite Sample — A collection of three or more individual samples of equal volume, equal weight or sized proportionally to the flow of the liquid being sampled that are taken at regular intervals over a period of time.

Contaminant — Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,

(a) endangers the health, safety or welfare of persons,
(b) interferes or is likely to interfere with normal enjoyment of life or property,
(c) endangers the health of animal life, or
(d) causes or is likely to cause damage to plant life or to property.

Dangerous Good — Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the Schedule provided in the *Transportation of Dangerous Goods Act*.

Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Hazardous Waste	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal.
Industrial Operation	An operation involved in the manufacturing, processing or provision of goods and services, including commercial and institutional operations.
Landfilling	The intentional depositing or placement of waste in or on land for the purposes of disposal.
Leachate	Effluent containing contaminants that is produced by water or other liquids flowing or percolating through a waste.
Minister	The Minister of Environment of the Government of Nunavut.
Non-Point Source Discharge	A non-specific or diffuse source of effluent entering the environment including run-off from an industrial compound or storage yard.
Process Effluent	Water mixed with treated or untreated waste that is discharged from an industrial operation.
Process Residuals	Solid, semi-solid or sludge waste resulting from an industrial operation.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
Responsible Party	The owner or person in charge, management or control of the waste.
Sewage Treatment System	A system for the collecting, conveying, pumping, treating and disposing of blackwater (water containing fecal matter and urine waste) and greywater (water drained from sinks, showers, kitchens and laundry facilities).
Solid Waste	Unwanted solid materials discarded from a household (i.e. single or multiple residential dwellings, other similar permanent or temporary dwellings), institutional (i.e. schools, government facilities, hospitals and health centres), commercial (i.e. stores, restaurants) or industrial (i.e. mineral, oil and gas exploration and development) facility. For clarity, solid waste does not include biomedical waste, hazardous waste or sewage sludge.

Standard Methods	A procedure set out in *Standard Methods for the Examination of Water and Wastewater* published jointly by the American Public Health Association, American Water Works Association and Water Pollution Control Federation, current at the date of testing.
Toxicity Characteristic Leaching Procedure	A testing procedure designed to determine the mobility of both organic and inorganic parameters in solid, semi-solid and sludge waste. The procedure is determined by United States Environmental Protection Agency (USEPA) Test Method 1311 and is intended to simulate the characteristics a waste may exhibit when disposed of in a landfill.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key environmental agency responsible for ensuring parties properly manage industrial waste and will provide advice and guidance on its management. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Generators of Industrial Waste

Industrial waste must be properly and safely managed from the time it is produced to its final disposal – or in other words from cradle to grave. The owner or person in charge, management or control of the industrial waste is known as the responsible party. The responsible party must determine the nature of the waste, including whether it is hazardous or non-hazardous, before the waste can be disposed of in a municipal solid waste landfill or sewage treatment facility. If the waste exceeds the criteria established in the Guideline, the waste must be managed as a hazardous waste. Further information on the management of hazardous waste in Nunavut, including generator, carrier and receiver responsibilities, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or specific guidelines that have been developed for the major types of waste.

Contractors may manage industrial waste on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of industrial waste as other environmental or public and worker health and safety issues may also need to be considered.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste landfills and sewage treatment facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the management of industrial waste may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* and for regulating the interprovincial and international movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact industrial waste may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of industrial waste. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal solid waste and sewage treatment facilities. Unwanted waste may be deposited into municipal waste facilities only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

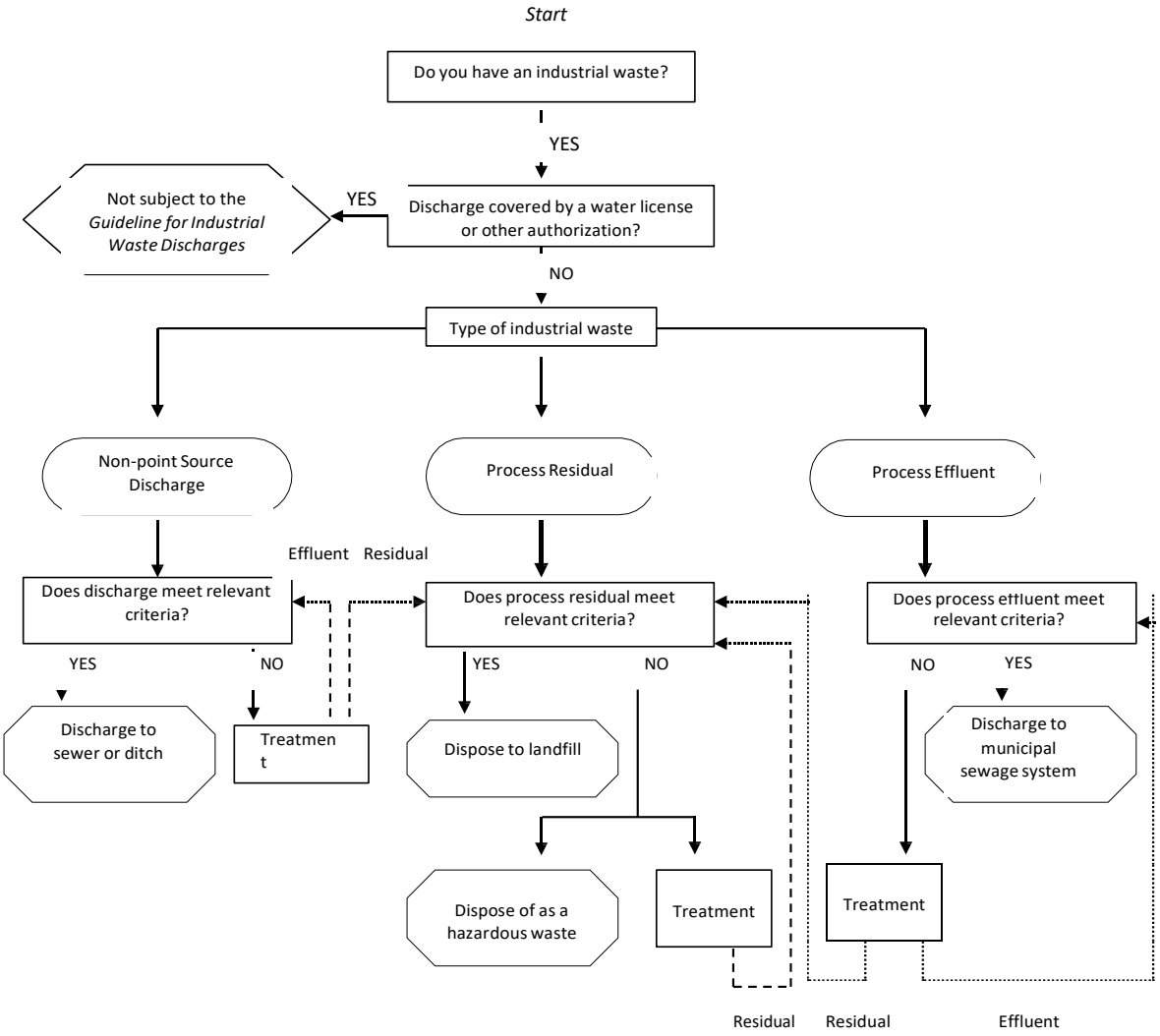
Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of industrial waste may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Waste Management

Proper waste management simply makes good sense. Minimizing or eliminating the generation of hazardous and other industrial waste helps to reduce the hazards and costs associated with its handling, storage, transport, recycling, treatment and disposal. It also reduces the impacts waste could have on the environment, human and worker health and safety and reduces the global emission of greenhouse gases by minimizing the use of raw materials.

Once an industrial waste is created, the generator is responsible for its safe management from cradle- to-grave. Waste generators can prevent pollution and reduce costs by implementing proper waste reduction, reuse and recycling programs through changes to operational procedures, maintenance practices and raw material use. Treating and disposing of waste should be considered only when reuse and recycling options are not available or practical.

The following flowchart illustrates the decision process for managing industrial waste for treatment and disposal.



Sections 2.1, 2.2 and 2.3 do not apply to industrial wastes where a regulation or guideline governing that waste already exists, or where the waste is subject to an existing water license, land use permit, land lease or other authorization. A complete listing of guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

http://env.gov.nu.ca/programareas/environmentprotection.

Should a generator request a variance to any of the requirements established below, an assessment describing the anticipated effects of disposing the waste into a municipal sewage treatment system or landfill must be provided to the Nunavut Department of Environment and local municipal government. The assessment must indicate that a level of environmental protection equivalent to complying with the Guideline is being provided.

2.1 Process Effluent

Process effluent is water mixed with treated or untreated waste discharged from an industrial operation. For the purpose of the Guideline, process effluent does not include toilet waste and liquid from showers, baths, sinks and kitchens unless the liquid contains a contaminant that is not usually associated with that source (i.e. used antifreeze poured down a drain).

Process effluent that meets all the criteria established in Column 1 of Table 1 may be discharged to a municipal sewage treatment system with the consent of the local municipal government. Effluent that exceeds one or more of the criteria is a hazardous waste and either requires treatment to comply with the criteria or must be managed in accordance with the *Environmental Guideline for the General Management of Hazardous Waste*. Any residuals or sludge from the treatment of process effluent is subject to the standards established for process residuals – refer to Section 2.2.

All sampling, sample handling and chemical testing of process effluent must be consistent with accepted practices. Where a sample is required to determine the characteristics of the effluent, the sample must be a composite sample. Composite samples are obtained by combining three or more individual grab samples of equal volume, equal weight or sized proportionally to the flow of the liquid being sampled taken at regular intervals over a period of time, normally 24 hours. This ensures the collected liquid is representative of the process effluent. Chemical testing should be conducted by laboratories that have been formally recognized as competent to perform the specified tests by the Canadian Association of Environmental Analytical Laboratories (CAEAL)[1]. Chemical parameters should be tested using the appropriate analytical method as contained in the most recent edition of *Standard Methods for the Examination of Water and Wastewater* or other recognized testing methods (i.e. Canadian General Standards Board). Generators may use their knowledge of the effluent to reduce the number of parameters tested.

Generators wanting to discharge process effluent on commissioner's Land other than to a municipal sewage treatment system must first contact the Nunavut Department of Environment and local municipal government.

[1] CAEAL is a non-profit organization dedicated to raising the level of competency, consistency, capability and communication within environmental testing laboratories in Canada. Members of CAEAL voluntarily participate in programs of proficiency testing and accreditation.

Table 1. Criteria for Process Effluents, Process Residuals and Non-Point Source Discharges

Substance	Criteria (mg/L)		
	Column 1 Process Effluent	Column 2 Process Residuals[a]	Column 3 Non-Point Source Discharge
Aluminum	50	NC	1
Ammonia	NC	NC	10
Arsenic	1	2.5	1
Barium	5	100	1
Biochemical Oxygen Demand (BCOD)	500	NC	15
Cadmium	2	0.5	0.1
Carbon Tetrachloride (tetrachloromethane)	NC	0.5	NC
Chlorides	1500	NC	NC
Chlorine	NC	NC	1
Chromium	5	5	0.1
Copper	5	NC	1
Cyanide	2	NC	0.1
Fluoride	10	NC	2
Iron	50	NC	1
Lead	5	5	0.05
Mercury	0.1	0.1	0.0006
Methyl Ethyl Ketone	NC	200	NC
Nickel	5	NC	1
Non-aqueous Phase Liquids	NC	NC	Non-Visible Sheen
Oil and Grease	150	NC	15
pH Range	6.5 to 10.5	NC	6.0 to 10.5
Phenolic Compounds	1	NC	0.02
Phosphorous	100	NC	1
Polychlorinated Biphenyls (PCBs)	NC	50[b]	NC
Polychlorinated Dibenzo Dioxins and Furans	NC	0.0000015 I-TEQ[c]	NC
Selenium	NC	1	NC
Silver	5	5	0.1
Sulphates	1500	NC	NC
Sulphides	2	NC	NC
Suspended Solids	600	NC	15
Tetrachloroethylene	NC	3	NC
Tin	5	NC	1
Trihalomethanes (Total)	NC	10	NC
Uranium	NC	10	NC
Vinyl Chloride	NC	0.2	NC
Zinc	5	500	0.5

NC No criteria has been adopted for this substance

a. Refer to the *Canadian Environmental Protection Act (CEPA) Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations - Schedule 6* for criteria regulating other process residuals.

b. Based on concentration by mass.

c. International Toxicity Equivalents.

2.2 Process Residuals

A process residual is any solid, semi-solid or sludge waste produced from an operation that is involved in the manufacturing, processing or provision of goods and services, including commercial and institutional operations.

Process residuals that meet the criteria established in Column 2 of Table 1 may be disposed of in a municipal landfill with the consent of the local municipal government. Process residuals that exceed one or more of the criteria are considered to be a hazardous waste and either requires treatment or management in accordance with the *Environmental Guideline for the General Management of Hazardous Waste*. The treatment of process residuals may result in a significantly different waste. Any liquid or solid waste resulting from the treatment of a process residual is subject to the criteria established in Column 1 and 2 of Table 1 to determine whether it is suitable for disposal in the local sewage treatment facility or landfill.

The recommended leachate testing procedure for process residuals is Method 1311 Toxicity Characteristic Leaching Procedure (TCLP) as described in the United States Environmental Protection Agency Regulation 40CFR261. This testing method is designed to determine the acceptability of landfilling process residuals by simulating leaching characteristics the waste may exhibit when disposed of. Any leachate extract collected must then be tested using the appropriate analytical method contained in the most recent edition of *Standard Methods for the Examination of Water and Wastewater.* All testing procedures should be undertaken by a CAEAL recognized laboratory. Knowledge of the industrial process may reduce the number of parameters needed to be tested.

Nunavut's Department of Environment should be contacted by the generator if an alternative leaching procedure or chemical test is proposed.

2.3 Non-Point Source Discharges

A non-point source discharge is the release of wastewater from a diffuse source, such as run-off from an industrial compound or storage yard to an adjacent property, drainage ditch, stream or waterbody. Where a non-point source discharge is already covered by a water license issued by the Nunavut Water Board, the effluent criteria established through the license are to be complied with. The criteria established in Column 3 of Table 1 apply only where no license, permit or authorization has previously been issued for the discharge.

A non-point source discharge that meets the criteria established in Column 3 of Table 1 may be discharged directly to the environment with the consent of the local municipal government. Where one or more of the criteria are exceeded, the discharge must immediately be stopped, the discharge reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130, and the run-off contained for treatment and disposal. Any collected run-off may be disposed of in the local sewage treatment system where the criteria established in Column 1 of Table 1 are met, and with the consent of the local municipal government.

All sampling, handling and chemical testing of run-off must be consistent with accepted practices. Composite samples should be obtained where possible and chemical testing procedures undertaken by a CAEAL recognized laboratory.

Conclusion

Industrial, commercial and institutional operations in Nunavut produce a wide variety of wastes that require disposal. Much of this waste can be safely disposed of in landfills (i.e. food and packaging waste) and sewage treatment facilities (i.e. toilet waste) while others are hazardous and require treatment prior to disposal. The *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* establishes limits on industrial waste that can be disposed of into municipal waste facilities in Nunavut.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of an industrial waste to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these wastes may also be controlled through permits and licenses issued by Nunavut's co-management boards, the Nunavut Water Board, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of industrial waste, or to obtain a listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

References

American Public Health Association, American Water Works Association and Water Environment Federation. Standard Methods for the Examination of Water and Wastewater. Latest Edition.
http://www.standardmethods.org/

Government of Alberta, Department of Environment. Alberta User Guide for Waste Managers.
http://www.environment.gov.ab.ca/info/library/7423.pdf

Government of Canada, Department of Justice. *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations.*
http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=84

Government of Nunavut, Department of Environment. Environmental Guideline for the General Management of Hazardous Waste. 2010.
http://env.gov.nu.ca/node/82#Guideline Documents

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Waste Discharge in Nunavut. 2002.

Government of the Northwest Territories, Department of Municipal and Community Affairs. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories. 2003.
http://www.enr.gov.nt.ca/_live/documents/content/solidwaste_guidelines.pdf

United States Environmental Protection Agency. Method 1311 – Toxicity Characteristic Leaching Procedure.
http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/1311.pdf

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;
   (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;

(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT AND OTHER CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Other Contacts

Nunavut Water Board
P.O. Box 110
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-6338 Fax: (867) 360-6369

Canadian Association for Environmental Analytical Laboratories
300-265 Carling Avenue
Ottawa, Ontario K1S 2E1
Telephone: (613) 233-5300 Fax: (613) 233-5500



AGNICO EAGLE

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ᐊᑦᓯᔪᑎᓂᑦ ᐊᐅᓪᓚᑕᑎᓂᖅ

ᐸᑦᓇᐅᑎᒥᑦ ᐃᓪᒥᐅᔪᓂ ᐱᔪᐅᔪᖓᓇᖅᓂᖏᑦ, ᐱᔨᑎᑎᕆᐃᓂᖅ, ᐊᑦᒪᓗᓂ ᐅᓯᒃᑕᖓᓂᒧᑦ ᐊᑦᓯᔪᑎᓂᑦ ᐱᓪᓚᑕᐊᖏᑦ, ᐊᑦᒪᓗᓂ ᐱᔭᐸᑎᖅᑐᖅᑐᖅ ᓴᓇᐅᑎᓂᖅᑐᑦ, ᐊᐅᓪᓚᑎᓂᖅ, ᐅᑦᔪᓂᖅᑎᑦᑎᓂᖅ ᐊᑦᒪᓗᓂ ᐅᑦᔪᓂᖅᓯᒪᓪᓕᔭᒍ ᐱᓪᓚᑕᖅ. ᑕᑦᓇ ᐸᑦᓇᐅᑎ ᐊᑦᑐᐊᓂᖅᑐᖅᑐᖅ ᔪᐃᔨᖅᑲᖅᐸᑦ ᓂᓚᐅᓇᖖᑦᑐᐃᓂᒃ ᐸᑦᓇᐅᑎᒍᑦ ᐊᑦᒪᓗᓂ ᓄᓇᐅᑦ ᐊᐊᖏᓐᓄᑦᑐ ᐊᐅᓪᓚᑎᓂᖅ ᐊᑦᒪᓗᓂ ᖃᐅᔨᓴᖅᑐᐅᔪᑦ ᑎᑎᖅᑲᖅᑐᑦᑐᐅᔪᑦ ᐅᖅᓱᑕᕆᐊᖅᓯᒪᑦ (ᐊᑦᓂᓂᔪᑦ 2014a). ᐊᑦᓯᔪᑎᓂᑦ ᐊᐃᓐᖅᑕᐅᖅᑕᖅᑕᑦ ᐊᑦᓂᓂᔪᑦᔨᓄᑦ ᑭᔪᐊᓂ ᑭᓪᓕᖅᑐᑦᔪᑦ ᐊᐃᓐᖅᑕᐅᑎᓂᑎᖅᑕᖅᑕᕐᓯᑦ ᐃᓄᓗᐊᓇᓕᒫᑦᐸᓂᑦ, ᐅᓗᓚᐊᓇᓕᒫᑦᐸᑦᓂᓗᓄ. ᐊᑦᓯᔪᑎᓂᑦ ᐅᖅᓱᑕᕆᐊᑦ ᔪᓯᒃᑕᑎᓂᒃ ᐊᐃᓐᖅᑕᐅᖅᑕᖅᑕᑦ ᐊᑦᓂᓂᔪᑦ ᓄᓇᕗᒻᒥᐅᑦ ᐊᐃᓐᖅᑕᐅᑎᓂᑎᖅᑕᖅᑕᕐᓯᑦ ᐃᓄᓗᐊᓇᓕᒫᑦᐸᓂᑦ ᐊᐃᓐᖅᑕᐅᑎᓂᑎᖅᑕᖅᑕᕐᓯᑦ ᐃᓄᓗᐊᓇᓕᒫᑦᐸᓂᑦ ᑕᐃᒪᐃᓐᓇᖅᑐᑦ ᐊᑦᓂᓂᔪᑦ ᐊᐃᓐᖅᑕᐅᑎᓂᑎᖅᑕᖅᑕᕐᓯᑦ ᐃᓄᓗᐊᓇᓕᒫᑦᐸᓂᑦ ᐊᑦᓯᔪᑎᓂᑦ ᐊᐃᓐᖅᑕᐅᖅᑕᖅᑕ

ᐱᓕᕆᐊᖅᐳᓂᖏᑦᓄᓕᑦ ᐊᑦᕋᓀᑦ ᐃᓕᐅᑦᓗᑎᒃ ᓴᐸᖃᑦᖠᓗᖅᑕᐃᓕᓚᐸᓀᑦ ᐊᑐᖅᑕᐅᖅᖃᑦᑕᖅᑐᑦ, ᐊᐳᑕᐃᓕᐅᑦ, ᐸᐸᓗᓂᑦ ᐊᐅᓚᐸᓂᑦ ᐊᐳᑎᒥᒃ ᐊᐅᓚᑦᑎᓂᖅᑎᒃ, ᐊᓪᓚᓗ ᐊᐳᑎᒥᒃ ᐊᐅᓚᑦᑎᓂᖅ ᐃᑲᔪᑎᓂᑦ ᐊᓪᓚᓗ ᓯᑦᓗᓂᑦ.

ᐊᑐᖅᑕᐅᔨᕐᓴᐃᑦ ᐱᓂᑦᓗᐊᖏᓂᐅᔨᓄᑦ ᐊᓪᓚᓗ ᐊᑐᖅᑕᐅᐅᓚᐊᖅᖅᓯᑕ ᓴᐳᖅᑕᓭᑦ ᑕᐃᒪᐅᔨᑦ ᐊᕐᕕᐃᑐᖅᓯᔨᓂᑦ ᐊᑕᓂᓂ. ᐊᓚᓂᔪᔪᑦ ᐊᖅᑭᔪᓯᒪᔨᑦ ᒪᓕᓚᑕᐅᔨᕐᓴᕐᓂᒃ ᐊᓪᓚᓗ ᐱᕐᕕᐃᓕᖅᑕᖅᑐᑦ ᖃᓂᑎᓂᓂᐊᖅᑕᖅᑐᑦ ᐅᓯᓗᐃᑦᑐᖅᑕᖅᑐᑦ ᐅᓴᓗᐊᖅᖅᓯᑕ ᑐᓴᓚᐊᖅᖅᑐᓗᓂᑦ ᐊᓪᓚᓗ ᐅᓴᓗᐊᖅᖅᑐᑦ ᖃᓄᐃᓕᓚᐸᓀᑦ ᐊᑐᖅᑕᐅᖅᖃᑦᑕᖅᑐᑦ ᐅᓴᓗᐊᖅᖅᑐᑦ ᐅᓴᓗᐊᔨᐅᖅᑐᑦ ᖃᓄᐃᓕᓚᐸᓀᑦ ᐅᓴᓗᐊᖅᖅᑐᑦ ᖃᓄᐃᓕᓚᐸᓀᑦ ᑐᓴᓚᐊᖅᖅᑐᑦ ᐅᓴᓗᐊᖅᖅᑐᑦ ᐅᓴᓗᐊᖅᖅᑐᑦ ᐅᓴᓗ

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine is located on Inuit Owned Lands and, as such, land and environmental management are generally governed by the provisions of the Nunavut Land Claims Agreement. This document presents the Roads Management Plan (the Plan) for the mine and forms a component of the documentation series produced for the Type A Water Licence Application. A list of permits, licenses, agreements, authorizations, and approvals applicable to this Plan are provided.

Roads Management

The Plan includes access, service, and haul roads within the Project area, and covers construction, operations, closure and post-closure phases of the Project. This Plan is linked to the Spill Contingency Plan and the Terrestrial Environment Management and Monitoring Plan (Agnico Eagle 2014a). Access roads are used by Agnico Eagle but they also provide unrestricted access to the public, if it is safe to do so. Roads outside the mine area include:

1. A 30 km All-weather Access Road (AWAR) from Rankin Inlet to the mine site. The AWAR is used to transport the building materials, construction/mining equipment, fuel, reagents, supplies, workers, and contractors to the mine site. The road is also used to transport saline water from the mine site to Itivia where it is discharged into Melvin Bay. This road has unrestricted public access providing rules of the road are observed.
2. A 5.9 km bypass road around the Hamlet of Rankin Inlet from the Rankin Inlet Itivia land-based facilities (Itivia) to the AWAR. This road is closed to public use.

A manned gate is located on the south side of the AWAR at km 7 to prevent public access to the mine site. There is also an unmanned gate at Meliadine Camp's entrance, kilometer 30 of the AWAR. The road is closed during periods of bad weather, in the event of a road accident, during periods of major road maintenance, and, during caribou migration.

A sign is installed near Rankin Inlet giving the daily status of the AWAR, stating whether it is open or closed to the public that day. Monitoring the average daily traffic on the AWAR including the type and numbers of vehicles depending on the season, is included in the Plan.

This Plan presents mitigation measures and protocols to be implemented during operations to preserve wildlife, to prevent permafrost degradation, to control surface runoff and sedimentation, and to mitigate dust. Agnico Eagle has put in place operational procedures for daily operation and maintenance of the roads including dust suppression methods, snow removal, de-icing and snow drifts/banks management, and snow management at bridges and culverts.

Protocols for accidents and anticipated use of police services are presented in the sections below. Agnico Eagle has procedures in place and will keep resources close-at-hand to respond to emergencies on the roads in a timely manner. Agnico Eagle also reports all reportable incidents to the appropriate Government authorities.

Reclamation of the access, service and haul roads will follow the completion of all mining. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowner (the Kivalliq Inuit Association and/or the Hamlet) and then complete its own environmental assessment and permitting process covering future use.

Dust Management

Agnico Eagle uses best management practices to minimize dust generation from becoming airborne at the mine site, Itivia, AWAR, Bypass road, service roads, and haul roads. This includes identification of major sources of dust, implementation of dust mitigation measures, inspections for unacceptable levels of dust, and recording dust monitoring data to document Agnico Eagle's success in controlling and reducing dust at the Project. The Dust Management Plan focuses primarily on dust generated from roads, with some reference to other mining activities such as the tailings storage facility which are addressed in other plans, including the Mine Waste Management Plan.

Dust could potentially be generated by such activities as road use, drilling, blasting, crushing, conveying, loading, hauling, unloading, stockpiling, and by wind erosion of dry, exposed mine areas. Dust emissions are prevalent during late spring and summer, while being much reduced in fall and winter.

Mitigation measures to control dust include mine design and operational procedures. Operational practices, such as speed limits and road maintenance, assist in reducing dust. Water and the addition of Calcium Chloride ($CaCl_2$) is used to control and reduce dust on roads and other mine areas when airborne dust becomes a safety hazard or impacts sensitive natural areas.

Dust suppression measures are in place during operations and closure.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	September 2012			First draft of the Roads Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	March 2013			Additions made throughout the Plan	John Witteman, Env. Consultant, Agnico Eagle
		6.4	17	Addition of Section 6.4	
3	April 2014	1.2.1	4	Added IQ box	Larry Connell, Corp. Dir. Reg. Affairs, Agnico Eagle
		1.2.5	6-7	Details on snowmobile trails	
			8	Added new Figure 1-2 (Itivia)	
		2.2	12-14	Update including *Navigation Protection Act*	
		4	17	Added details on consultation wrt road mgmt. and use	
		6.1	20	Details on emergency reporting	
		6.5	23	Territorial Park	
		6.6	24	Periodic survey of road use	
		7.1	25-26	Section on sedimentation control	
		7.2.1	28	Protection of archaeological sites	
		7.3	29	Meadowbank experience wrt winter maintenance	
		8.2	34	Role of the Royal Canadian Mounted Police (RCMP)	
		App. C		New Appendix: Dust Management Plan	John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			Complete plan update based on Feasibility Study and NIRB Conditions for the Water Licence Application	John Witteman, Env. Consultant, Agnico Eagle
5	March 2017			General review of the plan	Environment Department, Agnico Eagle Mines
6	March 2018			Update plan based on NIRB requests	Environment and E&I Departments, Agnico Eagle Mines

7	March 2019			-General review/update of the plan reflecting production phase. -Updated Appendix A	Terry Ternes, Sean Arruda, Bethany Hodgins, Environment Department, Agnico Eagle Mines
		1.2.3, 6.4	3 23, 24	-Added information about trucking of treated saline water to Itivia.	
		6.1	20,21	Traffic Management update	
		10	42	Updated information on bypass road	
		1.1	1	Removed mine plan from introduction as it is non-essential to the Roads Management Plan	
		10.1	39-40	Updated with AWAR closure during Caribou migration	

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ARD/ML	Acid Rock Drainage/Metal Leaching
ATV	All-Terrain Vehicle
AWAR	All-weather Access Road
CGS	Department of Community and Government Services, Government of Nunavut
DFO	Department of Fisheries and Oceans Canada
ERT	Emergency Response Team
GN	Government of Nunavut
HTO	Hunters and Trappers' Organization
INAC	Indigenous and Northern Affairs Canada
IOL	Inuit Owned Lands
IQ	Inuit Qaujimajatuqangit
KIA	Kivalliq Inuit Association
MDAG	Multidisciplinary Advisory Group
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NTI	Nunavut Tunngavik Incorporated
NU	Nunavut
NWB	Nunavut Water Board
RCMP	Royal Canadian Mounted Police

UNITS

km	kilometre
m	metre

SECTION 1 • INTRODUCTION

1.1 Project Description

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands (IOL). The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

Figure 1-1 provides an overview of the Project access road network. There is presently a controlled access, Phase 1 All-weather Access Road (AWAR) between the mine site and Rankin Inlet[1] (constructed in 2013/2014). A bypass road that was built around the Itivia site and links to the AWAR outside of Rankin Inlet. The remote location of the Project necessitates that access, service, and haul roads be built to support the development of the mine.

The following structures and facilities located near the Tiriganiaq gold deposit include:

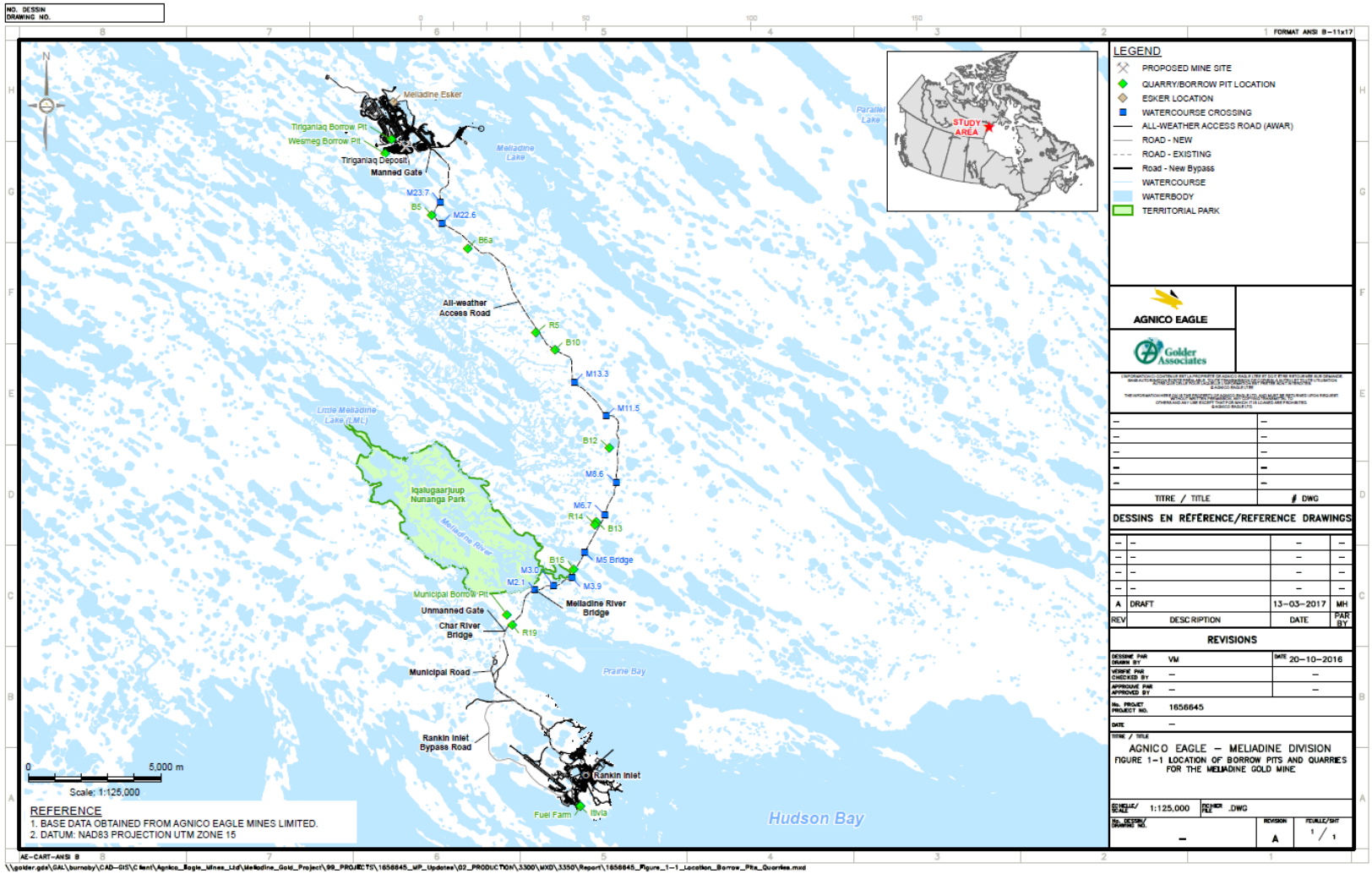
- Two open pits for the Tiriganiaq gold deposit and ancillary facilities;
- Underground and ancillary facilities;
- Tailings storage facility consisting of dry stack tailings;
- Overburden/waste rock/ore storage facilities;
- Plant site and ancillary facilities;
- Storage areas;
- Fuel tanks holding up to 9 million litres;
- Quarries and granular borrow pits;
- Water management facilities;
- All-weather access, bypass, service and haul roads;
- Incinerator building;
- Landfarm for petroleum hydrocarbon contaminated soils and snow/ice; and
- Industrial waste landfill.

The following structures and facilities located in Rankin Inlet include:

[1] The Meliadine Phase 1 AWAR was authorized under a separate process (Golder Associates 2010, 2011a, 2011b) and subject to separate monitoring and management plans (Agnico Eagle 2011, 2012). The concepts and monitoring and management plans are being merged with the current Project.

- Spud barge located at Itivia and serving as a dock;
- Oil Handling Facility at Itivia holding up to 38 million litres of diesel;
- Laydown yard at Itivia;
- 5.9 km bypass road around the community;
- Two kilometres of the AWAR located on municipal land;
- Bridges over the Char and Meliadine Rivers on municipal land; and
- Reclaimed rock quarry (R19) on unicipal land.

Figure 1-1 Meliadine Access Road Network with Quarries and Drainage



AGNICO EAGLE

1.2 Access Roads, Service Roads, and Haul Roads

What is the difference between access roads, service roads and haul roads?

Access Roads have public access. The public can use small vehicles such as All-Terrain Vehicle (ATVs), skidoos, and pick-up trucks on these roads, providing the use is in a safe manner. Small mine and contractor vehicles frequently use access roads. Large vehicles such as fuel tankers, buses, transport trucks, graders, and snow plows can also be expected. If oversized vehicles were to use an access road, they are be accompanied by escort vehicles. Access roads have two-way traffic, are 6.5 metres (m) wide with pull offs approximately every 400 ± 50 m.

Service Roads do not have public access. These roads are restricted to mine and Agnico Eagle contractor vehicles. All mine and contractor drivers using service roads are trained to do so. Large equipment occasionally makes use of service roads but normally use haul roads. Service roads have two-way traffic and are 6.5 m wide.

Haul Roads do not have public access. All mine and contractor drivers using haul roads are trained to do so. Haul roads are essentially reserved for haul trucks transporting waste rock and ore from open pits. Haul roads are approximatively 17 m wide, and have safety berms where required.

Access, service, and haul roads are needed in the operation of the Project. Access roads are used by Agnico Eagle but also have unrestricted access by the public, if it is safe to do so. The only access road is the 30 kilometer AWAR between Rankin Inlet and the mine site as shown on Figure 1-1. The bypass road around Rankin Inlet is closed to public use. It is used by Agnico Eagle and its contractors to transport fuel, supplies, and reagents from Itivia to the AWAR. The AWAR and the Bypass road is also used to carry saline water from the mine site to Itivia for discharge to Melvin Bay.

A gate is installed on the AWAR near the mine site to prevent public entry. There is a manned gate at km 7 at the south end of the AWAR. The road is closed during periods of bad weather, in the event of a serious road accident, during periods of major road maintenance, and during migration. A chronological record of consultation on the AWAR to date is provided in Appendix A.

Service roads are exclusively for Agnico Eagle and its contractors use; the public does not have right of entry to these roads that service mine areas. They are found in and around open pits, leading to waste rock storage facilities, around the mill site, to the landfill and Emulsion Plant to mention a few. Service vehicles, trucks carrying explosives, and small trucks with mine personnel use the service roads. All Agnico Eagle workers and its contractors using service roads receive training before doing so.

Haul roads are primarily restricted to haul trucks, loaders, and other heavy machinery. Small vehicles operated by Agnico Eagle and its contractors can also use haul roads, but only after driver training and when it is safe to do so.

The Plan applies equally to access, service, and haul roads. Operations and maintenance of all types of roads will largely be the same. While public safety is emphasized in the use of the access roads, the safety of its workers and contractors is of no less importance to Agnico Eagle in their use of all roads.

1.2.1 Road Routes

The routing of the AWAR and service roads were selected to minimize possible effects of construction and operation on the environment, and to facilitate maintenance of the road, particularly during winter. Prior to future road construction, Agnico Eagle conducts a survey along road routes to verify that dens of foxes, bears or wolverines are not destroyed or damaged. Other considerations include the overall length of the road, the route's proximity to satellite ore bodies, the number of stream crossings, the availability of quarries along the route, acid rock drainage/metal leaching (ARD/ML) potential of borrow materials, geomorphology, avoidance of archaeological resources, avoidance of the Iqalugaarjuup Nunanga Territorial Park, Inuit Qaujimajatuqangit (IQ), and avoidance of raptor nesting sites. An additional design consideration for roads is to remain on the height of land as much as possible to allow for drainage in the summer and for wind to assist in clearing snow in the winter.

> The location of the Meliadine Bridge was in part determined by IQ. Inuit Elders spoke of graves on an esker downstream of the present bridge location, which ruled out crossing at this location.
>
> The elevation of the bridge above the Meliadine River was based on IQ as Elders spoke of significant overflow at the selected location, which could impinge on the bridge. This caused Agnico Eagle to raise the elevation of the bridge more than first described in the engineering design.

Wildlife concerns also factor into road routes. Their design takes into account measures that roads do not prevent or unduly limit the movement of wildlife. This includes limiting the height of the road above the surrounding topography and limiting safety berms on haul roads where possible. Ore from the underground mine is transported by conveyor underground to the primary crusher. This design feature eliminates the surface transport of underground ore and mitigates possible interactions with wildlife.

Haul roads will be proximal to open pits and used year round; they connect open pits to Waste Rock Storage Facilities, ore storage pads and the primary crusher. Haul roads will be kept as short as possible and, where feasible, follow routes that limit the need for safety berms, which can block the movement of wildlife.

The routing of the bypass road, as shown on Figure 1-1, avoids the built-up part of the Hamlet thereby ensuring homes, businesses, recreation centres, schools, and healing centre are not disturbed by mine traffic. It does not interfere with the operation of the airport, potential runway expansion, community's water intake source (i.e. Nipissar Lake) or the new Hamlet landfill, and joins the municipal road leading to the AWAR, Iqalugaarjuup Nunanga Territorial Park, and a community borrow pit.

1.2.2 All-weather Access Road

The AWAR, as shown on Figure 1-1, connects Rankin Inlet to the mine site. The route was selected following consultation with the Inuit. The AWAR is a 30 km private road built with a 6.5 m running surface between the Char River bridge turn-off and the mine site, and has passing turnouts approximately every 400 ± 50 m (9.5 m total road width at passing turnouts[2]).

There is controlled access to the mine area by a seasonally manned gate located on the AWAR just south of the mine area (kilometer 30). There is also a year-round manned gate at kilometer 7 at the south end of the AWAR. The road is closed during periods of bad weather, in the event of a road accident, during periods of major road maintenance and, during caribou migration. Finally, a sign will be installed near Rankin Inlet giving the daily status of the AWAR stating whether it is open or closed to the public.

1.2.3 Hamlet Bypass Road

A bypass road was completed in 2018 and is built around the south of the airstrip to Itivia as shown on Figure 1-1. Its design and width is identical to the AWAR (6.5 m). The bypass road is approximately 5.9 km long and allows traffic from Itivia to bypass the Hamlet in delivering materials and fuel to the

Why a bypass road is preferable to using existing roads in the Hamlet?

Thirty million litres of fuel are required annually for mine operations and it is stored in the Itivia tank farm. All this fuel needs to be transported to the mine site where two tank farms, each having 2 tanks are located. The total fuel that can be stored on site is approximately 9 million litres. If each fuel tanker carries 45,000 litres, it results in a total of approximately 667 trips annually or, on average, 1.8 trips per day. Added to this would be moving 20,000 to 40,000 tonnes of dry cargo from Itivia to the site annually, and up to 350 workers to and from the airport for each two-week work rotation. It is estimated that approximately 1,800 trips per year will occur when the mine hauls saline water to Itivia for discharge to the sea.

[2] Passing turnouts allow vehicles to pass each other when travelling in opposite directions.

mine site or saline water to Itivia from the mine. By building the bypass road, use of municipal roads by Agnico Eagle is kept to a minimum. The bypass road is closed to the public.

A small amount of material is also transported from the mine site to Itivia for transport south by sea, including hazardous materials and other wastes that require shipment to the south.

In 2019 Agnico Eagle will begin transporting treated saline water from the underground mine, to the Itivia area for discharge to sea. This will result in an increased amount of traffic on both the AWAR and the Bypass road. It is estimated that approximately 1,800 trips per year will be made from the mine to Itivia for the discharge of saline water.

1.2.4 Traditional ATV and Snowmobile Trails

The building of roads and the infrastructure at Itivia impacts existing ATV and snowmobile trails. Where these trails cross a road, a ramp has been constructed to ease road crossing, and signage is in place to alert road users of the crossing. Similarly, there are signs alerting ATVs and snowmobiles when approaching a road. Maintenance of the roads would ensure the snowmobile crossings are kept clear of snow.

Rankin Inlet residents, the Rankin Inlet and Kangiqliniq Hunters' and Trappers' Organization (HTO) have identified that there is an existing snowmobile trail in the area of the Itivia laydown yard that local residents use in winter months to access the sea ice at Melvin Bay. Agnico Eagle is aware of this trail and has accommodated the trail to allow continued unfettered snowmobile access along the east side of the laydown yard to the sea ice at Melvin Bay. The location of this trail in relation to the laydown yard is shown in Figure 1-2.

While the laydown area is fenced, this snowmobile trail is not hampered or blocked by any fencing.

1.2.5 Haul Roads

The building of additional haul roads will be governed by the sequence of the two open pits to be mined, Tiriganiaq 1 and 2, and their width determined by the size of the haul trucks and other equipment using the roads. Haul roads are kept separate from access and service roads to ensure road safety. The layout of haul roads in the vicinity of the mine site is presented in Figure 1-3.

Haul roads outside the open pits are 26 m wide to allow for two way traffic, or 17 m for single lane traffic with passing zones spaced accordingly. A two-lane 17 m wide haul road designed for 70-t trucks in dual lanes is required for access to the TSF and Paste Plant. Safety berms are installed where necessary along the haul roads.

The ramps and haul roads were designed for the largest equipment (70 payload tonne class haul trucks), with an operational width not exceeding 5.7 m, in accordance with Nunavut mine regulations. For double lane traffic, the ramp width will be 21.5 m decreasing to 15.8 m for single

lane traffic at the pit bottom (last three benches) to reduce waste stripping. The ramp's width will include a protection berm and a drainage ditch. The safety berm on the outside edge will be constructed of crushed rock to a height equal to 3/4 of the rolling radius of the largest tire using the ramp. To facilitate drainage, ramp gradients will be established at 10% and will increase to 12% for the last three benches at the bottom of the open pit.

Figure 1-2 Itivia General Arrangement and Access

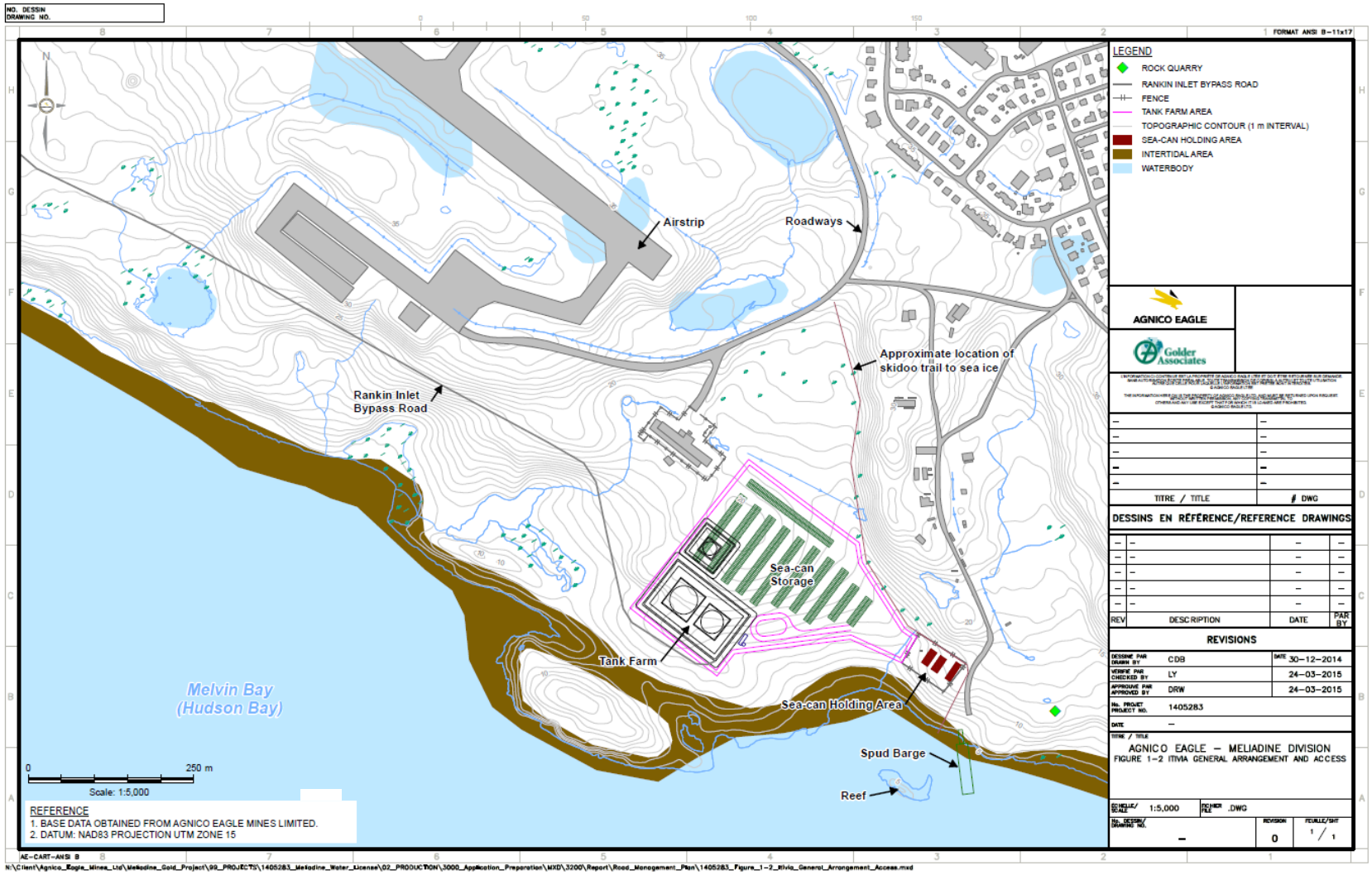
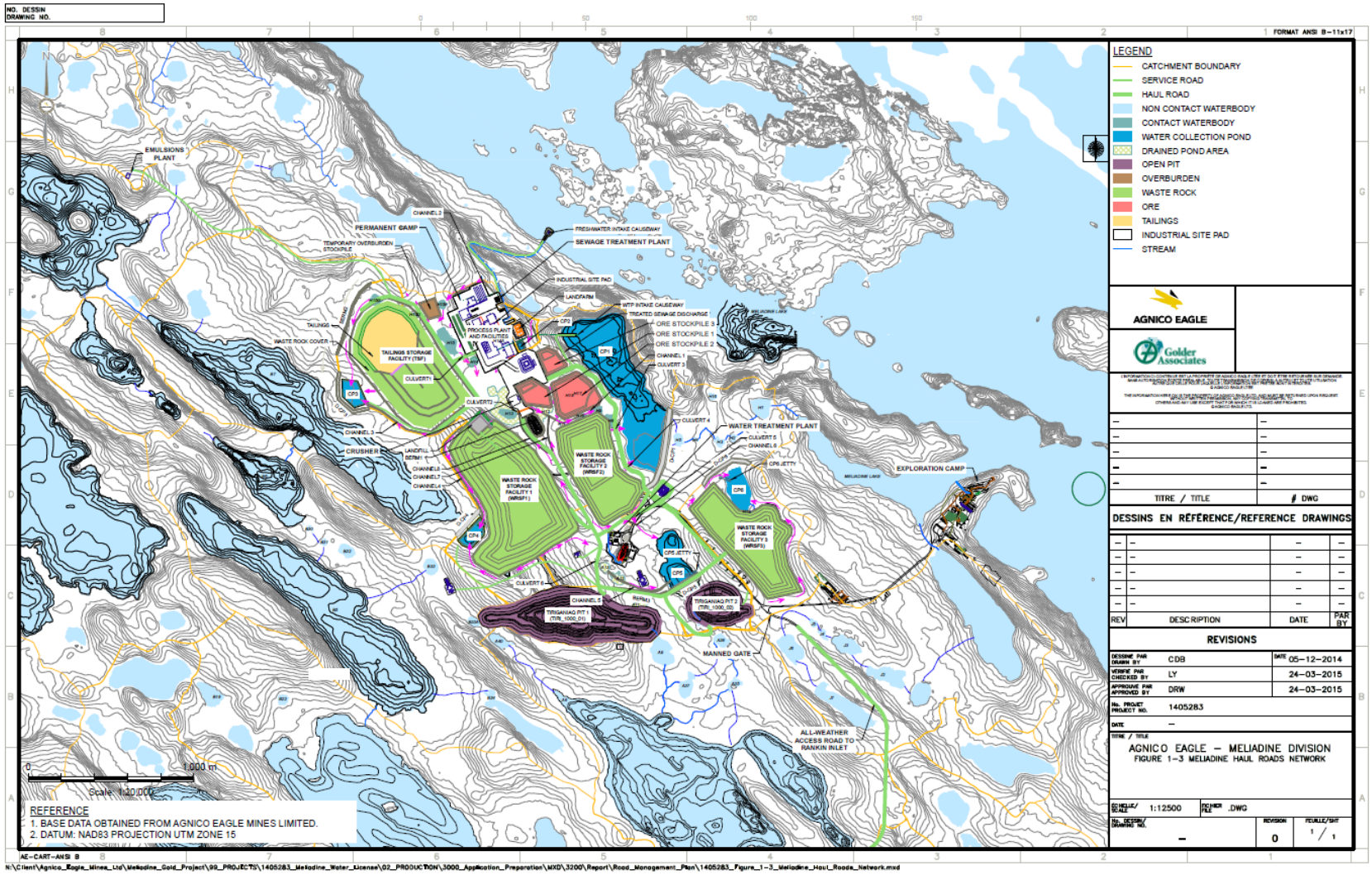


Figure 1-3 Meliadine Haul Roads Network



SECTION 2 • REGULATORY SETTING

2.1 Land Tenure

The majority of all access, service and haul roads are located on IOL administered by the Kivalliq Inuit Association (KIA). The surface ownership of the land encompassing the roads right-of-ways was transferred to the KIA when the Nunavut Land Claims Agreement came into effect. Land and environmental management in this area are generally governed by the provisions of the Nunavut Land Claims Agreement.

Closer to Rankin Inlet, 2.3 km of the AWAR and the complete bypass road are on Commissioner's land held by the Department of Community and Government Services (CGS) for the benefit of the Hamlet of Rankin Inlet.

The Phase 1 AWAR was constructed under land use permits issued by CGS on municipal land, and the KIA on IOL. Leases followed the completion of construction and a legal survey of the road right-of-way. The width of the land leases is 20 m for the length of the roads, wide enough to accommodate their 6.5 m width.

Service and haul roads will exclusively be constructed on IOL under the mine lease(s) issued by the KIA.

2.2 Permitting Regime

Federal, territorial, and municipal laws and regulations that apply to the construction, operation and closure of all access, service, and haul roads are itemized in Appendix B. No land use permit, operating permit, authorization, or license can be issued by any regulatory agency that would allow Agnico Eagle to undertake construction on any other road until the Nunavut Impact Review Board (NIRB) has completed its environmental assessment and issued a Project Certificate Amendment of No. 006.

Table 2-1 outlines the current licences and permits held by Agnico Eagle in relation to the Phase 1 AWAR and for advanced exploration. Most winter roads right-of-way permits are being allowed to expire because the AWAR is complete, but are included for sake of completeness. After receiving a Project Certificate and all necessary authorizations, land use permits were issued by CGS on behalf of the Hamlet for the construction of the bypass road. This permit has subsequently been taken to lease.

A list of anticipated permits, licenses, agreements, authorizations, and approvals for all roads is presented in Table 2-2.

Table 2-1 Licenses and Permits held by Agnico Eagle – Roads

License Number	Explanation	Issued By	NIRB File	Remarks
KVL100B195	Meliadine Prospecting – Land Use	KIA		general land use permit applying to exploration and drilling
KVL302C268	NTI RI-01 Parcel Drilling	KIA		drilling on RI-01 Inuit Owned Lands
KVL308C07	Mel E Exploration RI-01	KIA		drilling on RI-01 Inuit Owned Lands
N2010C0002	PB1, Drilling Permit	INAC	10EN006	
N2013-C002	Exploration, drilling claims CWM	AANDC		
KVCL102J168	Commercial Lease	KIA	07EN044	commercial lease for exploration and underground activities
KVRW98F149	Meliadine Right-of-Way	KIA		amended to allow access to old Discovery camp (renewed annually)
KVRW07F02	Overland Right-of-Way	KIA	07AN063	winter road along all-weather road route(will be allowed to expire)
KVRW11F02	Permanent Road Right-of-Way	KIA	11RN017	
KVCA07Q08	Mainland Esker Quarry Permit	KIA		Tiriganiaq Esker quarry
KVCA11Q01	Permanent Road Quarries	KIA	11RN017	
	WCB Program Authorization	WCB		annual renewal
2BB-MEL1424	Bulk Sampling - Water License	NWB	07EN044, 11RN017	
2BE-MEP1318	Exploration – Water License	NWB	08EN043	
2AM-MEL1631	Meliadine Mine	NWB	11MN034	

Table 2-2 Approvals and Authorizations for All Roads

Authorization	Authority	Basis
Conformity determination with Keewatin Regional Land Use Plan	Nunavut Planning Commission	allows Project to proceed to screening
Article 12, Part 5 Environmental Assessment	Nunavut Impact Review Board	allows Project to proceed to authorizations to build and operate roads
Type A Water License	Nunavut Water Board	allows for construction of the mine and related roads
Navigation Protection Act evaluation	Transport Canada	Agnico Eagle provided a list of water crossings for the Phase 1 AWAR and requested a navigability determination for each from Transport Canada. Subsequently, a navigation evaluation was prepared for small streams, lakes, and ponds impacted by the Project
Inuit Impact and Benefits Agreement	Kivalliq Inuit Association	impacts are compensated and benefits provided to Inuit
Water Compensation Agreement	Kivalliq Inuit Association	compensation for Inuit Water Rights under NLCA Section 20
Right-of-way Lease	Kivalliq Inuit Association	allows right-of-way for AWAR across Inuit lands
Land Use Permit	Rankin Inlet and Community and Government Services	allows construction of the bypass road on municipal land
Right-of-way Lease	Rankin Inlet and Community and Government Services	allows right-of-way for AWAR and bypass road located on municipal lands
Quarry License	Kivalliq Inuit Association	various quarry and borrow pit sites on Inuit Owned Land along the right-of-way for building the road to the mine site and infrastructure pad.
Explosive Magazine Permit Renewal	Workers' Safety and Compensation Commission	permits an explosive magazine on-site and at other approved locations
Class 2 Permit for Heritage Sites (obtained by qualified professional archaeologist)	Department of Culture, Language, Elders and Youth	unavoidable impacts of roads on heritage sites have been mitigated

Amendments to the *Navigable Waters Protection Act* came into force in April 2014 as part of the Federal Government's 2012 Bill C-45. In part, these amendments:

- Changes the name of the *Navigable Waters Protection Act* to the *Navigation Protection Act*;
- Includes a schedule, which clearly lists the major waterways for which regulatory approval is required prior to the placement or construction of work;
- Allows proponents of works in non-scheduled waters to opt-in and seek approval of their proposed work to give them additional legal certainty; and
- Expands the list of low risk works (e.g., minor repairs on bridges) that can be pre-approved because they pose very little impact on safe navigation.

Schedules listing major waterbodies requiring regulatory approval include Schedule 2 Part 1 – Oceans and Lakes, and Schedule 2 Part 2 – Rivers and Riverines. Schedule 2, Parts 1 and 2 do not include any waterbodies found within the Project's footprint. As such, all are non-scheduled waterbodies and Agnico Eagle undertook an assessment to determine navigability.

Using the *Navigation Protection Act*, Agnico Eagle assessed the navigability of the small lakes, ponds and streams within the Project's footprint through the following questions[3]:

- Are the waterbodies within the Project's footprint capable of being navigated by floating vessels for the purpose of transportation/recreational use?
    - If the answer is "no" to this question, the waterbodies are not navigable.
    - If the answer is "yes", then additional questions were asked.

- Is there a public right to travel?
- Is there any historical use of the waterbodies for navigation?
- Is there any proposed future use of the waterbodies for navigation?
- Is the waterbody part of a navigational network or transit route to other waterbodies?
- Is the waterbody a self-contained route for fishing or recreation?
- Will Agnico Eagle's roads offer access to waterbodies within the Project's footprint?

Based on these questions, Agnico Eagle determined that:

- Navigation of streams found within the Project's footprint is not feasible;
- Navigation to and between waterbodies is not feasible;

[3] The questions being asked are in part based on the *Draft Working Framework for determining a Navigable Water under the Navigation Protection Act* prepared by Transport Canada.

- The waterbodies within the Project's footprint do not form part of a navigational network or transit route;
- There is no evidence of historical use of the waterbodies for navigation or recreation; and
- There is no anticipated future use of the waterbodies for navigation.

At this time, Agnico Eagle does not believe that the small lakes, ponds, and streams within the Project's footprint are navigable waterbodies. Agnico Eagle does recognize that Meliadine Lake, Meliadine River, and Melvin Bay[4] as navigable waterbodies.

[4] The port of Itivia is located in Rankin Inlet at Melvin Bay, which is part of Hudson Bay.

SECTION 3 • RELATED DOCUMENTS

Final Environmental Impact Statement documents and documents submitted in support of the Water Licence Application that provided input to the Roads Management Plan include the following:

- Terrestrial Environment Management and Monitoring Plan (Golder 2015);
- Spill Contingency Plan;
- Preliminary Closure and Reclamation Plan;
- Borrow Pits and Quarries Management Plan; and
- Dust Management Plan.

The Plan is part of the Environmental Management and Protection Plan for the Project and will be in effect during the operation and closure of the Project.

SECTION 4 • CONSULTATION

Consultations on the road route with the community of Rankin Inlet, Inuit Elders, Kangiqliniq HTO and KIA were ongoing from as early as 2004. A chronological record of consultation on the AWAR is provided in Appendix A. Extensive details on all consultation for the Project can be found in the Public Engagement and Consultation Baseline Report. In Agnico Eagle's June and August 2014 Kivalliq community consultations, concerns with the AWAR or the bypass road were not raised.

On several occasions in 2013, Agnico Eagle met with the KIA and with the Rankin Inlet HTO to discuss how the Phase 1 AWAR should be managed and to develop a plan on how limited public access would be provided. The HTO told Agnico Eagle that they believe the AWAR should be open to unlimited public access but acknowledged that for Phase 1, the AWAR must be operated with controlled, limited public access until NIRB has the time and opportunity to assess the impact of such open public access. In the interim closure, Agnico Eagle and the HTO discussed how to control and manage limited public access on the Phase 1 AWAR beginning in the summer of 2014. It was agreed that access be limited to ATVs only unless otherwise permitted and be via a pass system where the HTO has involvement over who is granted a pass. Agnico Eagle and the HTO have also been discussing a program that would see the HTO provide wildlife monitoring services for Agnico Eagle along the Phase 1 AWAR. In 2016, 3 meetings were attended by Agnico Eagle personnel at the KHTO meetings. Agnico provided the KHTO with offers and opportunities to assist in the AWAR road surveys. Agreement on this program still remains to be concluded with KTHO. In 2017 and 2018, Agnico continued communicating with KTHO to engage the organization in assisting in these programs. Further meetings are scheduled in 2019 to discuss these items.

Agnico Eagle presented its proposed management procedures for the AWAR, along with options for the development of the Rankin Inlet by-pass road at public meetings held in Rankin Inlet in 2012 (mid-October) and 2013 (mid-February).

There were some elders who would have preferred the AWAR be built using a different alignment that ran west of the Iqalugaarjuup Nunanga Territorial Park and then cut north towards the Project. This would have given them better access to the Diana River and traditional hunting and fishing area to the northwest. Agnico Eagle explained that this was a much longer route as it moved away from the site (i.e. was not a straight line to the Project site) and involved more water crossings and was thus not an acceptable route from Agnico Eagle's needs and perspectives. The community spoke to its preference to the Rankin Inlet by-pass route going along the southwest side of the Rankin Inlet airport and not along the northeast side as proposed in one option by Agnico Eagle. This option placed the by-pass road in conflict with the entry to the airport terminal and future housing development areas.

At the NIRB's technical meeting and pre-hearing conference in early December 2013, road issues were raised by various Kivalliq communities. Unrestricted road accessibility to Inuit, road interactions with

caribou, peregrine nests, dust control, what happens to the roads upon closure, and fuel transport were all raised as concerns.

4.1 Upcoming Consultations Prior to Opening the All-weather Access Road to Public Use

Agnico Eagle wants to meet the expectation of Rankin Inlet residents in opening the AWAR to public use. However, Agnico Eagle shares the concerns of others that all AWAR users need to abide by 'rules of the road' to protect their own safety and that of others. While Agnico Eagle will maintain the AWAR in good operating condition and close it when poor driving conditions prevail, it will be incumbent on all organizations and the public to share in the responsibility in educating AWAR users in safe and responsible road use. This could be as simple as leading by example to participating in developing and endorsing the rules of the road.

Prior to the opening of the All-weather Access Road to public use, Agnico Eagle will:

- Undertake extension consultation with the KIA, HTO, residents of Rankin Inlet, and the Hamlets of Rankin Inlet and Chesterfield Inlet with the purpose of developing rules of the road and safety requirements for public use of the AWAR;
- Update this Plan, with particular emphasis on public safety, and submit it to the Nunavut Impact Review Board, KIA, HTO, the Government of Nunavut (GN), Nunavut Water Board (NWB), Hamlet of Rankin Inlet and authorizing agencies;
- Prior to opening the AWAR to the public, hold community meetings to go over the rules of the road and impress on all potential AWAR users their responsibility for their own safety and that of others in using the AWAR safely; and
- Place signs emphasising safe use of the AWAR at strategic locations along the AWAR.

The rules of the road will be posted on community bulletin boards; and on a quarterly basis, read over the community radio and placed on the local television station. Agnico Eagle will also post them on its Nunavut web site.

4.2 Road Use by Nunavummiut and Other Developers

The AWAR partly covers existing ATV and snowmobile trails, which were used as access to traditional areas for hunting, fishing, and recreation in the Meliadine Lake, Machum Lake, and Twin Lakes areas. Agnico Eagle is unaware of any possible future developments near the Project that could make use of the access and/or service roads.

It is Agnico Eagle's responsibility to decommission and reclaim the roads once its activities in the area are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Hamlet) and then complete its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim

all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads.

4.3 Use of Inuit Qaujimajatuqangit in the Planning of the Roads Management Plan

Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected through IQ can contribute to mine design and planning, as well as monitoring activities. Agnico Eagle is committed to including IQ and public concerns raised through IQ, where practical, in the design of management and monitoring plans for the Project. Agnico Eagle continues active engagement with communities and Inuit organizations as the Project proceeds through permitting, operations, and closure. Additional IQ collected through consultation and engagement will be included in updates to the design and implementation of environmental programs.

The Road Management Plan considered IQ (including TEK, TLU) and concerns regarding Project effects on traditional resources and traditional land use sites through the following Project design and mitigation measures:

- In allowing public access on the AWAR, Agnico Eagle took into consideration that the area in the vicinity of the Project will continue to be used for traditional purposes during the construction, operation, and closure phases of the Project.

- Access to traditional use sites are being mitigated by constructing ramps and installing signage along Project roads to facilitate road crossings for existing ATV and snowmobile trails. Snow clearing takes into consideration the location of snowmobile trails such that they are not blocked, and snowmobile crossings are identified with signs identifying the location of the trail prior to snow removal.

- The Itivia laydown yard was designed to avoid impacting the existing snowmobile trail so that local residents can continue to access the sea ice at Melvin Bay.

- Elders expressed the greatest concern regarding potential effects of the Project on caribou including road construction and motorized vehicles potentially limiting or altering their movement patterns, and the potential for overhunting to occur as a result of increased access to caribou migration routes and calving grounds. Agnico Eagle consulted with the Government of Nunavut, the KIA, the Kivalliq Wildlife Board, local HTOs, and the public in developing appropriate monitoring and mitigation measures related to the ease of harvesting of caribou afforded by the AWAR. The result of these consultations was a Road Access Management Agreement (see Section 10.2).

- IQ indicated that land mammals including Arctic fox, wolverine, and wolf are important traditional resources for harvesting, and community concerns were raised regarding the potential effects of snowmobiles, and the potential of road construction creating barriers to

wildlife movement. The routing and design of the AWAR and service roads were selected to minimize potential Project effects on the environment, including wildlife movement. Potential adverse effects to wildlife abundance or movement were considered in setting the rules of the road, including setting maximum speed limits and ensuring wildlife has right-of-way on the roads, wildlife will not be harassed and hunting is prohibited within 1 km of the AWAR. Furthermore, locations of large aggregations of animals is reported and all incidents between vehicles and wildlife will be reported and investigated. Finally, a wildlife monitoring program will be implemented with input from the local stakeholders to record the species, numbers and location of wildlife observed along the roads, with particular focus on caribou, muskoxen, bears, wolves, migratory birds and raptors.

- Community concerns were also raised regarding the potential for the Project to change the land and water, subsequently impacting the diet of land animals. There was also concern that road construction could affect environmental stability and contaminate water. IQ also indicated that berry harvesting is an important activity in the area, and community members expressed concerns over dust that could impact the health of both water and vegetation. These concerns were considered in proposing the following mitigation measures and protocols to be implemented during construction and operations to preserve wildlife, prevent permafrost degradation, control surface runoff and sedimentation, and mitigate dust:
    - Sedimentation and erosion control measures were implemented prior to the start of work and maintained until after all disturbed areas have been stabilized; and
    - Regular inspection of the roads are conducted to identify areas of ponding, erosion or sedimentation.

- IQ indicated that the rivers and Meliadine Lake are considered important fish harvesting sites, and community concerns were raised regarding potential contamination of waterbodies in the entire Meliadine watershed, and for potential adverse effects to fish and other traditional resources. Accordingly, to protect fish spawning and nursery periods of local fish populations, no in-water work was taken place from May 1st to July 15th. In addition, areas where dust deposition could impact fish habitat and/or water quality, mitigation measures were implemented, including grading of the road surface, placement of new coarser topping, and/or watering/addition of $CaCl_2$ on the road surface.

- IQ has indicated that the entire Meliadine valley, including Iqalugaarjuup Nunanga Territorial Park, has a long history of traditional use and many important cultural sites. To mitigate the potential for disturbance to cultural sites, all employees or contractors are not allowed to construct any side roads/trails off the west side of the AWAR between Km 1 and Km 8, and regular road inspections occur to ensure that no unauthorized trails or access routes leading from the AWAR into the Park are being created. In addition, Agnico Eagle and GN-DoE Park staff will work together to discuss what other measures can be taken to prevent unauthorized

access into the park, including potential signage, public education and the placement of barriers.

- To prevent potential ice buildup at the lower Meliadine River crossing bridge resulting in flooding of important cultural sites upstream from the bridge, regular inspections and monitoring occurs so that potential risks to cultural sites can be mitigated.

SECTION 5 • MEASURES TO PREVENT PERMAFROST DEGRADATION

Roads have been designed with a minimum fill thickness to maintain permafrost conditions within the subgrade soils. The thermal modelling indicated a minimum road fill thickness of 1 m is required above ice poor subgrade soils to maintain the soil in a frozen condition year round. Similarly, a minimum road fill thickness of at least 1.3 m is required above ice rich subgrade soils.

To the greatest extent possible, roads are constructed in the winter when the subgrade soils are frozen to prevent insulation of thawed subgrade soils. A rough base is advanced at the full road width so that the base of the roads is laid down in winter frozen ground conditions. The stream crossing culverts are also installed in the winter. Once the rough base and stream culverts were installed, the remainder of the construction was completed by building up the rough base primarily under winter conditions, and placing the final topping materials during the spring and early summer.

Mitigation and environmental design features to reduce the potential for permafrost degradation are as follows:

- Road alignments avoid, where possible, fine-grained, poorly drained, ice-rich, frost susceptible soil conditions as noted by geomorphologic mapping, due to their susceptibility to thaw related settlement;
- Regions of high ground relief (higher elevations) are sought to provide better drainage conditions, to minimize the potential for snow drifting on the road and to avoid organic depressions and/or other poor ground conditions, which are more abundant in the low lying areas;
- Road fill material was placed directly over the existing soil layer without cutting, stripping, or grubbing to avoid disturbing the subgrade soils;
- Thick drifted snow was removed before road fills were placed;
- The road fill thickness was a minimum of 1 m in thaw-stable soils, and 1.3 m in thaw-sensitive soils; and
- Construct access, service, and haul roads in the winter when the subgrade soils are frozen to prevent insulation of thawed subgrade soils, to the greatest extent possible.

The road and its shoulders is inspected weekly (at a minimum) during the summer period (June to August) for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment. Such movements are expected and may lead to longitudinal cracking and thaw settlement especially for portions of the road founded on thaw susceptible (ice rich) soils. When such areas are discovered, the affected area is repaired using granular material and/or crushed rock. Agnico Eagle will maintain stockpiles of such material in select borrow/quarry areas along the road.

SECTION 6 • TRAFFIC MANAGEMENT ON ACCESS ROADS

6.1 Management of Agnico Eagle Traffic on the Access Roads

All of the required fuel, supplies, and equipment for the mine will be transported to the mine via the bypass road and AWAR. Saline water delivery from the mine to Itivia occurs on the bypass road and AWAR. All drivers transporting these materials and personnel will either be Agnico Eagle employees or employees of contractors directly hired by Agnico Eagle. They must possess a valid driver's license from a Canadian province or territory, for the appropriate class of vehicle, for them to be allowed to operate vehicles on access roads. Agnico Eagle educates all of its employees and all of its contractor's employees on road safety rules during the safety introduction training that occurs when first starting work at the mine site.

All Agnico Eagle vehicles that routinely travel on the access roads are equipped with a radio set to the requisite road frequency. Similarly, contractor's vehicles that routinely travel on the access roads are also equipped with a radio set to the requisite road frequency. Consequently, Agnico Eagle and contractor traffic on the road always have radio contact with the northern gatehouse, security, Agnico Eagle and contractor traffic. This system is used to report any unusual conditions along the roads such as: location of other vehicles, presence of wildlife on or near the roadway, presence of non-Agnico Eagle traffic such as ATVs, snowmobiles or other vehicles on the access roads, special road conditions, and special weather conditions. All Agnico Eagle drivers and contractors using the road are required to monitor and report to the northern gatehouse by radio any observed unauthorized or unsafe use of the road.

The AWAR is open to restricted public access and as such when there is a scheduled shut down of the road due to weather or special shipments of restricted products Agnico Eagle will notify the Hamlet. It is proposed in the future that Agnico Eagle may be able to establish full cell phone service along the full length of the AWAR during the operation of the mine. When this occurs the prime mechanism for contacting Agnico Eagle in the event of an emergency will be by cell phone. Once such service capability is in place, Agnico Eagle will take the following action to communicate how the public can contact Agnico Eagle to report an emergency on the AWAR. The following guidelines are presently being used to notify the public:

- Signage at the Rankin Inlet end of the road and at the mid-point Emergency Spill Response station(at a minimum) will provide the public with the Agnico Eagle phone contact number (site security) to which the public can report an emergency along the AWAR.
- Signage near Rankin Inlet will provide the current status of the AWAR, stating whether it is open or closed to public use that day.
- Include this information on periodic public information sessions on the rules of the road and road safety procedures delivered in Rankin Inlet.
- Include this information in periodic community radio and TV announcements.

- Information is provided on Agnico Eagle's Nunavut web page.
- AEM webpage indicates road closures and information.
- The gatehouse at the 7 km marked will be closed and the gate house attendant can discuss the closure with interested parties.

6.2 Management of Non-Agnico Eagle Traffic on the All-weather Access Road

Agnico Eagle works with the KIA, HTO, the Government of Nunavut, and the Hamlet of Rankin Inlet to devise a system for unrestricted public access to the AWAR at a future date. Until this system is in place, traffic on the AWAR is controlled by Agnico Eagle through an unmanned gate at its southern end and a manned gatehouse at its northern end.

The rules of the road[5] developed for the roads apply to all users of the road, including Agnico Eagle employees, Agnico Eagle contractor employees, and the public. Agnico Eagle holdsd public information sessions in Rankin Inlet for AWAR users, on a regular basis (minimum of twice per year). The Government of Nunavut will also be consulted prior to opening the AWAR to unrestricted traffic. A copy of the rules of the road, which will have a strong emphasis on road safety, will be presented at these sessions.

Agnico Eagle will also holds public information sessions in Chesterfield Inlet for AWAR users on a regular basis (minimum of once per year). A copy of the rules of the road will be presented at these sessions. This is required because Chesterfield Inlet has now built approximately 17 km of trail/road south from their community towards Rankin Inlet and occasionally drive their ATVs/snowmobiles to Rankin Inlet.

Agnico Eagle will also use other communication tools to get the road access procedures and road safety rules out to the public in Rankin Inlet. These will include community radio, community TV[6], Facebook page, postings around town, through the Project office in Rankin Inlet, and via an Agnico Eagle Project website. The communication will be in both English and Inuktitut. All non-Agnico Eagle road users will also be encouraged to monitor and report any observed unsafe use of the roads to Agnico Eagle.

6.3 Other Access Control Procedures

There will be occasions when access to the AWAR will be restricted for short time periods for special reasons. This includes bad weather, unsafe road conditions, maintenance activity on the roads, heavy project related truck traffic, movement of oversized loads, and/or presence of large numbers of

[5] See Section 8 for complete details on rules of the road measures proposed for the AWAR.

[6] Notices on rules of the road will be placed on community radio and television a minimum of 4 times a year.

caribou on or adjacent to the road. The AWAR could also be temporarily closed in the event of an incident, accident or other event requiring mitigation or response. These short-term closures will be required to ensure safety.

In communicating such short-term closures, Agnico Eagle will take the following actions:

- Agnico Eagle will issue a daily road condition bulletin by means of email to a subscriber list, through an Agnico Eagle website, and through community radio. The bulletin will provide information on current road and weather conditions and on special activity planned for that day on the AWAR.
- Agnico Eagle (with the consent of the Hamlet of Rankin Inlet) will set up and maintain a sign in English and in Inuktitut to be located close to Rankin Inlet on the existing municipal road out to the Char River and the Territorial Park that indicates whether the AWAR is “open” or “closed” at that specific point in time.
- Agnico Eagle will limit access and, in certain conditions, close the roads to all traffic during bad winter weather (blizzard or white out conditions). In the worst weather, the southern gate on the AWAR near the Char River will be closed and signed accordingly;
- Agnico Eagle will limit access to the AWAR when it is not safe as a result of an accident or a road maintenance problem.
- Agnico Eagle will limit access to the AWAR when large numbers of caribou are near to or crossing the road. This will occur in consultation with the Kangiqliniq HTO.
- Agnico Eagle will work with the GN, KIA, and HTO to establish a one kilometre no shooting zone on both sides of the AWAR to ensure that project workers and all other road users are not inadvertently exposed to the risk of accidental shooting.
- Agnico Eagle reserves the right to refuse access to individuals who do not respect the rules of the road on safety, speed and the no shooting zone when using the AWAR.

The GN Department of Environment (GN-DoE) has expressed a valid concern that there is potential for unauthorized trails/access routes to be created from the AWAR into a designated preservation zone within the Iqalugaarjuup Nunanga Territorial Park at an area to the northeast of the Meliadine River just north of the new Meliadine River Bridge. The AWAR is in close proximity to the park boundary in this location. The GN-DoE have pointed out that such an unauthorized use of this designated preservation zone could cause irreparable damage to the natural and cultural features meant to be protected within this territorial park. Agnico Eagle acknowledges this concern and commits to work with the GN-DoE to reduce/prevent this potential unauthorized access from the AWAR to this part of the Iqalugaarjuup Nunanga Territorial Park.

In this respect, Agnico Eagle will take the following actions:

- Agnico Eagle commits that it will not allow any of its employees or contractors to construct any side roads/trails off the west side of the AWAR between Km 1 and Km 7. Agnico Eagle has no intention of constructing any side roads and/or trails off the designated AWAR corridor at

any point along its length, and if so, additional regulatory approval would be needed under the Terms of the Road Use Lease with the KIA and/or Community & Government Services before any side road/trail could be constructed;

- Agnico Eagle will task its Road Supervisor with keeping an eye on this critical section of the AWAR as part of its regular road inspections (as outlined in Section 7 of this Roads Management Plan) with the objective of identifying any signs of unauthorized trails/access routes leading from the AWAR into this area of the Park. If any evidence of unauthorized access trails is discovered, the Road Supervisor will contact GN-DoE Park Staff in Rankin Inlet to inform the GN-DoE Park staff of the discovery and to jointly work on a plan to prevent any further use of such access points. Agnico Eagle would then take the agreed upon measures to implement the plan provided that such measures are reasonable; and
- Agnico Eagle will meet with GN-DoE Park staff to jointly discuss what other measures can be taken to dissuade/prevent such potential unauthorized access into this area of the Park (e.g. possibly signage, public educational measures, placement of barriers, etc.). Agnico Eagle will then implement the agreed upon measures. Agnico Eagle will continue to periodically meet with GN-DoE park staff (at least annually, but more frequently if required) to discuss protection of this designated preservation zone within the Park.

6.4 Projected All-weather Access Road Traffic between Itivia and the Mine

Agnico Eagle and contractor traffic on the AWAR between Itivia and the mine site is not expected to vary as much as public traffic between summer and winter. Table 6-1 provides the projected traffic for the bypass road and AWAR.

Agnico Eagle and contractor vehicles which use the road include, but are not limited to: pick-up trucks, cube vans, buses, fuel trucks, tractor-trailers, snowplows and graders. However, the amount of traffic will be highly dependent on the level of activity on site and the time of year, such as when supplies and materials arrive by sea, as well as on the weather and the traffic as a result of transporting saline water from the mine to Itivia. Also, should flights not be able to get into Rankin Inlet, passenger vans/buses would only transport local employees to the mine site, which would reduce the number of vans/buses by half.

Summer traffic is expected to be moderately higher than winter traffic as more contractual work can be expected over the summer. Fuel deliveries and passenger van/bus traffic are not expected to vary a great deal between winter and summer.

In the summer of 2019 Agnico Eagle will begin trucking treated saline water from the underground mine, to Itivia, where it will be discharged to sea. This process will result in increased traffic along the AWAR and Bypass road.

Table 6-1 Estimated Average Daily Traffic on the All-weather Access Road

Type of vehicle	Winter		Summer	
# of vehicles	Week Days	Weekends	Week Days	Weekends
Mine-Related Traffic				
Pick-up trucks	10-12	4-8	12-14	6-10
Cube vans	4	1	4	1
Passenger vans/buses	2	1	2	1
Fuel trucks[(a)]	2	2	2	2
Transport trucks[(b)]	1	1	6-14	6-14
Saline Trucks[(c)]	0	0	16-20	16-20
Public Road Use				
Pick-up trucks	4-6	2-4	6-8	12-16
ATVs/snowmobiles	4-8	4-10	10-16	10-20

[(a)] Transport of fuel is continuous, year round. A fuel truck carries on average 45,000 litres.

[(b)] Transport of dry goods from Itivia largely takes place over a 4-month period, from August to November.

[(c)] Transport of treated saline water from mine to Itivia is estimated at 800 m3/day over approximately 3-month period (July 1 to October 1)

Projected public traffic on the access roads has greater uncertainty as it will be weather dependent. Agnico Eagle estimates that 25-50% of the anticipated trips will be incremental to current access, which is by ATVs and snowmobiles. During periods of mild weather, more traffic can be expected as those living in Rankin Inlet may travel up the AWAR for a day of fishing, hunting, berry picking, or other leisure activities. During poor weather conditions, public traffic on the road can be expected to drop significantly and it is likely that no public access will occur during such conditions.

During the Phase 1 operation of the AWAR, Agnico Eagle will collect information on traffic volume on the road on a daily basis. The survey information will record the number and types of mine vehicles, and the number and types of public vehicles using the AWAR over a 12-hour period, typically from 8:00 AM to 8:00 PM. The surveys will gauge the accuracy of the predictions contained within Table 6-1. The survey results will form part of Agnico Eagle's annual report.

SECTION 7 • INSPECTION AND MAINTENANCE OF ACCESS, SERVICE, AND HAUL ROADS

Agnico Eagle recognizes that inspection precedes maintenance, and believes that a thorough inspection program leads to the early identification of areas of the roads where improvements are necessary. The early resolution of any deficiencies results in less ongoing maintenance and repair of the driving surface and water crossings.

Agnico Eagle has the sole responsibility for the ongoing inspection and maintenance of all of the components of the access, service, and haul roads, including road beds, bridges, culverts, and borrow/quarry sites used in the construction and maintenance of the roads. Agnico Eagle applies the experience that it has gained from the ongoing operation of the Meadowbank All-Weather Road, which has now been in operation for eight years. This experience is applied in the planning of day-to-day operation, inspection, and maintenance of the Project roads. Agnico Eagle has a road supervisor who is responsible for the ongoing road inspection and maintenance of the access, service and haul roads. The operation and maintenance of all roads applies the same principles.

The road supervisor conducts periodic inspections (minimally on a weekly basis) of the roads to ensure that the roads are maintained for safe travel of personnel, equipment, and supplies. These inspections are recorded, including deficiencies which are followed up by a corrective plan. These periodic inspections include an inspection of the bridge abutments and a visual observation of the road surfaces to assess the status of road foundation.

During the summer period (June to August), the road surface is maintained with fresh gravel being spread as required and regular grading of the road. By September, the road starts to freeze; therefore, gravel is added for safety reasons. Snow clearing and road sanding along the road are done to operate vehicles on the roads safely. The manner in which the snow is cleared will also take into account the road configuration to avoid snow accumulation that could cause problems during the freshet or block snowmobile trails.

All roads are inspected for signs of accumulation of ponded water either on the road surface or along the sides of the road. Where noticed, the Agnico Eagle road supervisor evaluates and monitors the accumulation to determine why water is accumulating in these areas. Based on these evaluations, the road supervisor takes remedial action where and when necessary to correct the cause of such ponding, such as grading of the road surface to remove areas of ponding or installation of additional culverts if the road is causing excessive water ponding.

7.1 Sedimentation Control

7.1.1 Construction

Various mitigations and best practices that were followed during the bypass road construction to control sedimentation and these are as follows:

- No in-water works took place from May 1st to July 15th, to protect fish spawning and nursery periods of local fish populations; this would apply to all stream crossings;
- Sediment and erosion control measures were implemented prior to the start of work and maintained during the work phase to prevent entry of sediment into water or the movement of re-suspended sediment into the stream crossings;
- Sediment and erosion control measures were left in place until all disturbed areas were stabilized;
- All disturbed areas were physically stabilized as soon as possible following construction using rock and/or vegetation;
- Machinery used near stream crossings or working within the drainage of Nipissar Lake arrived on-site in a clean condition and be maintained free of fluid leaks to keep contaminants out of the drainage basin;
- The equipment was re-fueled, serviced, and washed away from the stream crossings to prevent deleterious substances from entering the water. Fuel, lubricants, hydraulic fluids, etc., were not stored within 31 m of the high water mark of any waterbody, and were kept in an area where spillage can be contained, and in a manner inaccessible to all wildlife; and
- An emergency spill kit was kept at the work site in case of fluid leaks or spills from machinery.

In addition to those listed above, the following mitigation measures will be used to minimize potential effects on water resources should road construction activities occur in non-winter months:

- Regular inspection of the road to identify areas of ponding, erosion, or sedimentation, will be conducted;
- Construction runoff will be captured and managed to minimize suspended solids in the watercourses, where applicable; and
- In-stream construction work will be avoided, or limited, to the minimum extent possible.

7.1.2 Operation

During the operational phase, routine periodic inspections of the AWAR and bypass road continue to be conducted as discussed previously in this Section. These inspections will include looking to identify areas of ponding, erosion, or sedimentation. If identified, any such areas will be addressed using the same mitigation measures described in this section for the construction phase.

7.2 Watercourse Crossings Inspections and Maintenance

The watercourse crossing inspection and maintenance program has three main components:

- A regular inspection program to identify issues relating to watercourse crossings, such as structural integrity and hydraulic function;

- An inspection program to track the impacts of large storm events on watercourse crossings, such as structural integrity and hydraulic function; and
- A culvert location inspection program to ensure that culverts have been installed in the right locations with respect to the watercourse and that culvert capacity is adequate to ensure that the culvert(s) pass the water under all hydraulic conditions. In most cases there will be multiple culverts installed at different elevations at each stream crossing to ensure that these culverts can adequately pass normal summer flows as well as spring freshet and heavy rainfall flows.

7.2.1 Regular Crossing Inspection and Maintenance

Just prior to spring freshet, all culverts and stream crossings (including the bridge crossings at the Char River, lower Meliadine River and at the M5 Bridge (see Figure 1-1) will be inspected to confirm that they are in a state that will allow them to accommodate the rapid spring thaw that is seen in the north. During the freshet period, crossings inspections will be performed twice a week (mid-May through June) and weekly during the remainder of the ice-free period prior to fall freeze-up (July through October).

These inspection activities for each watercourse crossing will consist of:

- Visual inspection of its infrastructure to identify defects, cracks or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required;
- Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damages as soon as possible; and
- Visual inspection of upstream and downstream channel to identify bed erosion or scour around the watercourse crossing structure. Particular attention will be paid to bridge abutments and abutment foundations as they will be vulnerable to scouring and erosion during flood events. Particular attention will also be paid to potential sources of sediment transport at the crossing.

Inspection results will be recorded by Agnico Eagle to help track changes in conditions over time. Maintenance operations will consist of undertaking remediation of any detected problems and repairing damage as soon as possible.

7.2.2 Archaeological Sites and Ice Buildup

Agnico Eagle acknowledges that the GN Territorial Archaeologist has concerns that potential ice buildup at the site of the lower Meliadine River bridge crossing can cause water to back up and flood important archaeological sites upstream from the bridge in the Iqalugaarjuup Nunanga Territorial Park. Agnico Eagle has committed to work with the GN to inspect and mitigate where possible such

risks. To this effect, Agnico Eagle has committed to provide copies of its twice weekly inspections at the lower Meliadine River Bridge to the GN Territorial Archaeologist in the spring/early summer freshet period via email or fax. The intention is to allow both Agnico Eagle and the GN Territorial archaeologist to monitor for this potential risk, specifically for the purpose of taking appropriate action in a timely manner should ice buildup reach the point where these sites are at risk of flooding. The intent is for action to be taken prior to harm being done. The action plan would be developed and implemented by Agnico Eagle in consultation with the GN.

Agnico Eagle has agreed to work with the GN to develop other protective measures to protect important archaeological sites upstream of the Meliadine River Bridge within the Iqalugaarjuup Nunanga Territorial Park if it is shown that these sites continue to be damaged by flooding caused by ice and snow accumulation at the bridge.

7.2.3 Event Crossing Inspection and Maintenance

Inspection frequency will increase just after heavy or prolonged rainfall storm events. Visual inspection of each watercourse crossing will be completed to identify potential risks to the crossing's structural integrity, debris accumulation, and whether erosion and scouring have occurred. Water accumulation along the road will also be monitored. Results will be recorded by Agnico Eagle to help track changes in condition over time. The remediation of any detected problem and any necessary damage repairs will be undertaken as soon as possible, under the direction of Agnico Eagle's road supervisor.

7.2.4 Culvert Location Inspection

Following their installation, the culvert crossings were visually inspected to confirm they have been properly executed and installed. These culverts were installed during winter conditions and thus it is possible that a culvert will not be sited correctly to pass all ponding of water through the road. The road supervisor or designate checks for such conditions during the first snow melt and after rain events so that adjustments can be made accordingly. Additional culverts will be installed, if necessary, should the inspection indicate that the culverts were installed in a location that does not optimally route water flows.

7.3 Snow Removal and Snow Management – Winter Maintenance

Sections of the Meliadine roads are expected to experience snow drifts because of strong winds over the winter period[7]. As much as possible, this snow will be cleared to the downwind side of the road

[7] This has been the experience along the AWAR where significant snow accumulation occurs at one location on municipal land known as Apache Pass.

to limit the wind re-depositing the same snow on the cleared road. Routine spring snow management will include the removal of any snow that accumulates at bridges and culverts so that water at freshet can move freely through the culverts and under bridges. In the case of culverts, snow will be removed from both ends but not from the inside.

Where snowmobile trails cross the road, snow clearing will be mindful of not placing snow on the trails thereby making crossing the roads easy.

The report, "Preliminary Snow Drift Assessment of the Meliadine All-Weather Road from Rankin Inlet to the mine site, Nunavut" (Golder Associates 2011c) provides an assessment where snow drifts can be expected. It states:

> *"Observations seem to indicate that snow drifts can be expected on the lee of short, steep slopes and along lake shores."* and
>
> *"Maintenance will be required during operations to manage snow accumulation along the road alignment; however, most of the alignment appears to be located along the windward slopes and ridge crests where there should be a limited tendency for snow to build up."*

The design of the AWAR between the mine site and Rankin Inlet factored in snow accumulation and this is one of the reasons the road is located along the height of land as much as possible and has a northerly alignment.

Dangerous ice formation on road surfaces, including the AWAR, is expected to occur periodically leading to their temporary closure until the roads can be graded and/or sanded. These procedures are employed at Meadowbank and were adopted for the Project. Road sanding and grading equipment is available at Meliadine to address icy road conditions.

7.4 Dust Suppression

The Dust Management Plan addresses in detail the actions that Agnico Eagle takes to suppress dust generated by road traffic during the non-winter months when dust becomes an issue. Particular attention is paid to the dryness of the bypass road surface, the number of vehicles, weight and speed, and maintenance road near Nipissar Lake where dust suppression is a priority.

In general, the amount of dust generated along a road is dependent on the driving surface. Regular grading of the roads combined with the addition of granular material to the driving surface is needed. This improves road safety and reduces the amount of dust generated. Dust is also mitigated by maintaining posted speed limits.

In areas or times identified by the Agnico Eagle road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition could impact fish habitat and/or water quality, the road supervisor arranges mitigation measures as appropriate. This could

involve actions such as grading of the road surface, placement of new coarser topping, and/or watering of the road surface. Use of chemical dust suppressants, such as Calcium Chloride,is only used as a last resort and only in accordance with the Guideline for Dust Suppression on Unpaved Roads published by the Government of Nunavut Department of Environment (GN 2014).

Dust control measures along the AWAR, service and haul roads, and travel surfaces such as yards at the mine site have been identified by the community of Rankin Inlet as an important health concern important health concern[8].

[8] Following the technical review and community roundtable sessions held by the NIRB on the Draft EIS, NIRB directed Agnico Eagle to prepare a Dust Management Plan for inclusion with the Final EIS. This plan was prepared and was updated following receipt of Final Hearing Report.

SECTION 8 • ROAD SAFETY

Agnico Eagle security personnel along with Agnico Eagle's road supervisor monitor activity on all roads through radio contact with both staff at the gatehouse and drivers on the roads, and through periodic patrols of the roads. All Agnico Eagle and contractor vehicles that routinely travel on the roads are equipped with a radio set to the requisite road frequency (Section 6). This radio system is used to report any unusual conditions along the roads such as:

- Location of other Agnico Eagle vehicles;
- Presence of wildlife on the roadway;
- Presence of non-Agnico Eagle traffic such as ATVs, snowmobiles, or other vehicles;
- Non-Agnico Eagle vehicles broken down on the roads;
- Any unsafe practices noticed;
- Any special road conditions; and
- Any special weather conditions; etc.

Agnico Eagle works to develop partnerships with the residents of Rankin Inlet, community organizations, and government departments in developing rules of the road, and educating the non-Project related users on road safety, on good driving practices, and on influencing people's behaviour on the roads. Emphasis is directed to the use of helmets, seat belts, observing the posted speed limits, improving one's visibility by wearing reflective clothing when on a snowmobile or ATV, not drinking and driving, dealing with driver inexperience, etc.

These are the same safety rules that apply to all users of the roads, including Agnico Eagle employees, Agnico Eagle contractor employees, and public users of the roads. The rules of the road include but not limited to the following:

- Maximum speed limits:
    - on AWAR: 50 km/h;
    - on the bypass road: 30 km/h;
- Use of seat belts by all drivers and passengers is mandatory;
- Driving under the influence of alcohol or intoxicating drugs is prohibited;
- Wildlife has right-of-way on the roads, and no harassment of wildlife is allowed;
- All hunting activity must avoid shooting across the road and should respect a safe shooting distance from the road (suggested at 1 km);
- Hunting is prohibited within 1 km of the AWAR and the Project;
- Vehicles are not to park on the travelling surface of the roads but pull off the road at a safe location such as passing turnouts to prevent accidents (passing turnouts are spaced approximately every 400 ± 50 m along AWAR length); and

- No public traffic is allowed within mining areas; these are industrial work sites and, thus, non-Project related vehicles are stopped at the gate when in operation. Signs are posted warning of an upcoming gate[9].

Agnico Eagle holds public information sessions in Rankin Inlet for users of the roads prior to the roads opening and on a regular basis thereafter (minimum of twice per year). The rules of the road and safety considerations are presented at these sessions, and modified if necessary based on broad and frequent consultation.

Agnico Eagle also uses other communication tools to get the road access procedures and rules of the road and safety considerations out to the public in Rankin Inlet. These include community radio, community TV, Facebook/Internet, postings around town, signage near Rankin Inlet indicating whether the AWAR is open, through the Project office in Rankin Inlet and via the Agnico Eagle Project website. The communication is in English, Inuktitut, and French.

Agnico Eagle has placed an emergency spill response sea can at km 7 and km 18 along the AWAR. The station has the necessary spill response supplies to address any spills that occur along the road in an emergency situation.

8.1 Road Signage

Agnico Eagle has posted appropriate road signs along the roads in both English and Inuktitut. Typically, signs advise drivers of the posted speed limit, of approaching bridges, of approaching curves, and/or areas of lower visibility (blind hills or obstructed curves).

English and Inuktitut signs are posted at the southern and northern ends of the AWAR, and at an appropriate mid-point to advise any public travelling by snowmobile or ATV that they are entering an area that may be potentially hazardous due to the presence of heavy vehicle traffic. This recognizes that snowmobiles and ATVs can enter and leave the road from any point along the roads. Signs are also posted to advise the public that they are approaching the gate at the northern end of the AWAR where public access is not allowed. This is just before entering the mine site, where heavy industrial activity and large vehicles can be expected. Both ends of the bypass road have automatic manually operated gate with signs indicating it is not open to public access.

Signs are also located at the bypass road, where it enters the AWAR, indicating that the bypass road is a private and restricted road for Agnico Eagle employees and contractors only. A sign also occurs at the start of the bypass road located at Itivia indicating that the bypass road is a private road.

[9] A gate was installed on the AWAR near the mine site.

Speed limit signs are posted at intervals of approximately every 5 km along the roads. Reflective flags are installed along one side of the roads to help drivers identify the road shoulder during blizzard, white-out conditions or dense fog. Typically, these flags are black in colour to help them stand out in white-out conditions, and are nominally set at intervals of 100 to 200 m apart. Kilometer markers are posted at intervals of at least 1 km along the roads.

A list of road signage on roads is presented in Table 8-1.

Table 8-1 Road Signage

Element	Location
Safety precautions and users advice	at the southern and northern ends of the AWAR, and at an appropriate mid-point
Stop signs	where required at road junctions
Give way	at haul and service road junctions
Blind hill	200 m ahead of the beginning of a blind hill
Speed limit	nominally at 5 km intervals
Curve	200 m ahead of a curve
Bridge announcement	200 m ahead of a bridge
Bridge side sign	On each side of the bridge
Flexible delineators (flags)	nominally at 100 to 200 m intervals
Kilometres markers	nominally at 1 km intervals
Private Road	Bypass road at Itivia and where the bypass road intersects AWAR

8.2 Policing of Rules of the Road

For privately operated roads, responsibility for “policing” will not fall to the RCMP. Responsibility for all operating and maintenance activity on roads rests solely with Agnico Eagle. For the access roads, Agnico Eagle concentrates on raising public awareness and commitment to road safety, and improving communication, cooperation and collaboration among all stakeholders on the safe use of the roads. For all roads, all Agnico Eagle employees and its contractors who use the roads are required to take road safety training before being allowed to access the roads.

Agnico Eagle uses its road supervisor and site security to monitor what is occurring on the roads. They monitor activity on the roads through radio contact with the staff at the gatehouse, through periodic patrols of the roads, and in conversation with drivers on the roads at the time. Agnico Eagle monitors speed limit infractions by direct observation of drivers seen driving too fast and by recording the time taken to drive between the Project and the Hamlet. Agnico Eagle also relies on radio contact with all Agnico Eagle and Agnico Eagle contractor vehicles on the roads to monitor unsafe conditions or

activity. Agnico Eagle records unsafe practices, warns the person causing the infraction, and in severe or repeated cases of violation, removes all privileges for future access to the roads by an offending driver. In the case when Agnico Eagle is aware of unsafe or illegal activity on the road, the RCMP will be informed.

Regulatory inspectors can inspect the roads and any associated infrastructure at will. Agnico Eagle abides with the recommendations and directives provided by the inspectors.

However, the *Criminal Code* of Canada applies to private roads. For example, if an accident were to occur on a road and alcohol was involved, that person could be charged by the RCMP. Under their current mandate, while the RCMP is not responsible for policing of the AWAR as it is a privately operated road, the RCMP will have the right to access the AWAR at any time to investigate any accident or incident where they believe there is a need.

8.3 Public Use of Private Roads in Other Jurisdictions

The AWAR is a private road constructed, operated, and maintained by Agnico Eagle. The AWAR covers traditional trails that were openly and continuously used by Inuit for many years. As well, most of the AWAR is on Inuit Owned Land. Agnico Eagle had to obtain land use permits from the KIA. After completion of the AWAR, these land use permits were taken to lease. Agnico Eagle is subject to the terms and conditions of the leases.

Before the construction of the bypass road was completed, Agnico Eagle met with all regulatory agencies and the public to finalize the rules of the road and this Plan.

SECTION 9 • ACCIDENTS, SPILLS, MALFUNCTIONS, AND EMERGENCY RESPONSE

Emergency response is reactive whereas prevention lowers the frequency of incidents occurring requiring emergency response. Agnico Eagle's emphasis will be on the latter, while at the same time keeping resources nearby to respond to emergencies on the roads in a timely manner.

Three possible causes of road emergencies are the road, vehicle, and people. It is the interplay of these three elements that lead to either safe use of the roads or emergency response. Agnico Eagle is fully responsible for the design, construction, and maintenance of the roads for Project related use, and public use of the access roads. This includes regular inspection and maintenance of transportation infrastructure, including access roads, service roads, haul roads, road crossings, water crossings, signage and the two emergency spill response stations.

Agnico Eagle verifies its vehicles are in good working order prior to use. Agnico Eagle, however, has little influence on the condition of the non-Agnico Eagle owned vehicles that will use the AWAR. Vehicles could be poorly maintained and individuals could also make poor decisions such as using an ATV in winter when a snowmobile would be more appropriate. Nonetheless, Agnico Eagle will provide emergency assistance where the health or safety of people is at risk when travelling on the AWAR or on the land near Project facilities. Additionally, Agnico Eagle trains its employees and contractors on road safety and emergency response (first aid, firefighting, spill response, etc.). By educating and protecting its workers, they lead by example in road safety.

While Agnico Eagle feels it can successfully manage the condition of the AWAR and influence what vehicles use it, shaping an individual's responsible driving habits and attitudes to safety could prove more difficult. As a result, Agnico Eagle, in cooperation with Inuit organizations, authorizing agencies and others, will, to the best of its ability, implement all such measures necessary to protect public and mine traffic on all roads open to unrestricted public use. Responsibility and risk comes with driving on the AWAR and Agnico Eagle will:

- Impress on AWAR users that they should always remain aware of what is happening around them as they drive and make responsible decisions about hazards and problems;
- Highlight the environmental and human costs of irresponsible driving habits, and a driver's accountability for his/her decisions; and
- Repeatedly inform AWAR users of the rules of the road.

In 2018, Agnico Eagle educated the public on road safety, shaping good driving practices and influencing people's behaviour on the roads. Emphasis was directed to the use of helmets, seat belts, observing the posted speed limits, improving one's visibility by wearing reflective clothing when on a snowmobile or ATV, not drinking and driving, dealing with driver inexperience, etc. This also included encouraging all drivers to abide by the rules of the road to control speeds and advance considerate

driving. Vests and buggy whips will be available for borrow at the gatehouse (km 7) when accessing the AWAR.

An Agnico Eagle trained site-based emergency response and spill clean-up team[10] are available on site with appropriate equipment to respond to all spills and road accidents. The Emergency Response Team (ERT) are trained in emergency response (firefighting, first aid, mine rescue, spill response, vehicle accidents, etc.). In addition, emergency response equipment and spill kits are carried in all Agnico Eagle vehicles using the roads to improve response in the event of an incident or accident. This equipment includes emergency first aid equipment, and initial spill response equipment. Spill response is implemented by environmental staff who advise, document, and report on initial response and clean-up actions. The Spill Contingency Plan is activated in responding to a major spill. Minor spills are handled safely without the assistance of the ERT using initial spill response equipment carried in the vehicle. Major spills[11] require the ERT, who use spill response equipment and supplies maintained by Agnico Eagle at the mine site or from the two emergency spill response stations on the AWAR and/or at Itivia.

In urgent circumstances, where appropriate, Agnico Eagle may request assistance from other parties in Rankin Inlet. However, based on Agnico Eagle's experience with the Meadowbank access, service, and haul roads, Agnico Eagle does not believe that its Project roads will result in any increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Rankin Inlet.

9.1 Accidents and Malfunctions

Agnico Eagle understands that accidents can occur, but the prevention and mitigation measures along the roads, emergency response planning, training, and preparation will substantially reduce the risk, frequency, and severity of such incidents. Agnico Eagle emergency response personnel are tasked with responding to any vehicle accident resulting in personal injury or spillage of harmful material. Agnico Eagle will initiate response and transport to medical assistance at the mine's health centre or Rankin Inlet's medical center. Agnico Eagle staff will follow the procedures in place in Risk Management and Emergency Response Plan. The types of accidents and malfunctions that may occur are as follows:

[10] For more details on emergency and spill response, please refer to the Risk Management and Emergency Response Plan and the Spill Contingency Plan, respectively.

[11] A major spill is defined as an event that cannot be handled safely without the assistance of Emergency Response Team, including all events where a person is injured or contaminated.

- Vehicle collisions that may result in personal injury and spillage of potentially harmful materials such as fuel, lubricating fluids, saline water, and antifreeze;
- Contact between vehicles and wildlife that may result in harm to wildlife, personal injury and spillage of potentially harmful materials;
- Single vehicle accidents that may result in personal injury and spillage of potentially harmful materials;
- Risk of people getting stuck on the roads in bad weather such as in blizzard, white out or dense fog conditions, or due to mechanical breakdown;
- Risk of accident due to an intoxicated or impaired driver on the roads; and
- Spills of harmful materials onto the land or into water through a vehicle rollover or tipping over.

Agnico Eagle reports all reportable incidents to the appropriate Government authority (e.g., Mines Inspector, RCMP, NWB, NU Spill Line, Environment Canada, GN Department of Environment, Fisheries and Oceans Canada (DFO), KIA, and Hamlet of Rankin Inlet).

The following actions are to be taken in the event of an accident on the roads involving other vehicles (including ATVs), or in the event of an accident involving contact with wildlife such as caribou, muskox, bear, and wolf, the ERT will:

- Check the condition of people involved in the accident and provide immediate first aid if appropriate;
- Call the Meliadine road dispatch by radio and report the location and nature of the accident and indicate the type of assistance required (medical help, environmental cleanup, fire and/or mechanical help);
- Secure the accident site so that the vehicles do not continue to present a hazard to others. This may involve moving the vehicles to the nearest pull off in the event of a minor accident, or blocking off the road in both directions in the event of a more serious accident; and
- If safe to do so, secure the site to prevent continued spill or leakage of contaminants into the surrounding environment.

Upon receiving the accident call, the road dispatch will initiate the emergency response procedure passing along the information to the emergency response coordinator. The emergency response coordinator will then call out the required emergency response personnel to assist at the accident site.

Once the accident site is secured and all people requiring assistance have been removed to medical care, the emergency coordinator will turn the scene over to the mine's safety personnel so that an appropriate accident investigation can be initiated.

In the event of an incident involving contact with wildlife, the road dispatch will notify the site security personnel and the environmental representatives. Security and the site environmental team will then

initiate an appropriate accident investigation. The Environmental Department will ensure that appropriate reporting of such incidents is done in a timely manner to the KIA, the Rankin Inlet HTO, and the GN Conservation Officer in Rankin Inlet.

In the event of a serious accident, the RCMP will be contacted and advised of the incident. The RCMP will then decide on whether they will become involved or take the lead on any subsequent accident investigation.

SECTION 10 • WILDLIFE MANAGEMENT

Wildlife is occasionally expected to be observed on or near the AWAR, service, and haul roads. Caribou and other wildlife will have the right-of-way at all times. In case of problems (e.g., aggregations of caribou), the environmental personnel on-site will be in charge of managing the situation and, with the collaboration of the security department, will advise road users by patrolling the roads. The Project personnel will be notified by dispatch radio if any wildlife is observed on the roads.

The following protocol is implemented on the roads for the protection of wildlife:

- Vehicle traffic speeds on the access, service and haul roads will be limited to 50 km/h and 30 km/hr on the bypass road;
- Where small to moderate aggregations of caribou (i.e., 1 to 50 animals) are observed within 100 m of a road, travel speeds are reduced to 30 km/h;
- Where large aggregations of caribou (i.e., 50 or more) are observed within 100 m of a road, the protocol outlined in section 10.2 is followed;
- Caribou and all wildlife are given right-of-way on the road: vehicles must stop until the animal is off the road;
- Locations of large aggregations of animals are reported to the road supervisor who will inform all potentially affected employees and the environmental representative, and put the protocol in Section 10.2 into effect. Agnico Eagle's environmental coordinator will then inform the KIA, the Hamlet, HTO, and the GN Conservation Officer in Rankin Inlet;
- All incidents between vehicles and wildlife are reported to the Agnico Eagle road supervisor and the environmental representative whether they are:
    - Near-miss;
    - Collision with injury to the wildlife; or
    - Accidental death.
- Each incident is investigated by the road supervisor and the Environment Department, and measures taken to avoid re-occurrence are put in place. Disciplinary measures will be taken against any employee if the investigation concludes that the accident is the result of negligence; and
- In the case of accidental death of an animal, the Environmental Coordinator will contact the GN Conservation Officer in Rankin Inlet. The carcass will be removed from the road and incinerated to avoid attracting scavengers such as Arctic foxes, wolves, grizzly bears, and/or wolverines.

10.1 Wildlife Monitoring Program

Agnico Eagle has implemented a monitoring program to record on a systematic basis the prevalence of wildlife seen along the roads. This program will be developed further with the input of the local

HTO and the KIA as needs change. The program will focus on caribou, muskoxen, bears, wolves, migratory birds, and raptors. Agnico Eagle and the HTO have also been discussing a program that would see the HTO provide wildlife monitoring services.

The current program consists of year-round weekly ground surveys of wildlife observed along the roads. The survey is logged and includes type of wildlife observed, estimate of numbers, and nearest kilometre marking along the roads. The data is aggregated and presented in the annual report for the mine. Complete details on wildlife monitoring can be found in the Terrestrial Environment Management and Monitoring Plan (TEMPP) (Golder 2015).

During caribou migration daily AWAR surveys are completed. If more than 50 caribou are detected within 100 m of the AWAR the Road Utilisation Work Suspension Protocol as per the TEMMP (Golder 2015) is implemented.

10.2 Road Management Agreement

Agnico Eagle has consulted with the Government of Nunavut, the KIA, the Kivalliq Wildlife Board, local HTOs, and the public in developing appropriate monitoring and mitigation measures related to the ease in harvesting of caribou afforded by the AWAR. The result of these consultations are known as the Road Access Management Agreement that endorses the following measures:

- During periods when large aggregations of caribou (greater than 50 individuals) are detected within 1 km of the AWAR, the southern gate is closed to public cars and trucks. Public access using ATVs will still be allowed.
- In consultation with the Kivalliq Wildlife Board (KWB), as required under the Nunavut Wildlife Act, Agnico Eagle will seek the establishment of a no-shooting zone (1 km wide) on either side of the road. If the KWB, other agencies and the public are in agreement, AWAR use by hunters will be conditional on observing the 1 km no-shooting zone.
- Dedicated ‘road monitors’ patrol the road to ensure compliance relating to public safety and wildlife. Monitoring is increased during periods of road closure when large aggregations of caribou are present;
- All incidents of hunting involving shooting along or across the AWAR are reported by the Agnico Eagle to the GN.
- During periods when large aggregations of caribou are detected near the Project, harvest monitoring intensity is increased to properly document harvesting levels of caribou.

The roads supervisor, in consultation with the environment coordinator, or designate is responsible for ordering the southern gate shut and preventing the use of bridges by ATVs while large numbers of caribou remain on or near the AWAR. Similarly, the roads supervisor, in consultation with the environment coordinator, would open the southern gate and bridges to all traffic once the caribou have moved on.

SECTION 11 • RECLAMATION

Reclamation of the access, service, and haul roads will follow the completion of all mining. Progressive reclamation will, in some instances, lead to roads being reclaimed after they are no longer needed. As described in the Preliminary Closure and Reclamation Plan, the access roads should be one of the last mining components to be reclaimed.

In most circumstances, the AWAR will continue to be open to public access during any temporary closure of the mine. The status of the road during such periods would be assessed by Agnico Eagle on a case-by-case basis. For short duration temporary shutdowns (short-term temporary closure), the AWAR would remain open and be maintained in the same manner as proposed during the operational phase. While each case would be assessed separately, temporary shutdowns of less than 6 months duration would not change the way the access road is operated or maintained. For temporary shutdowns of greater than six months and less than 12 months in duration, and/or for indefinite shutdowns (period of time greater than one year: long-term temporary closure), Agnico Eagle would have to change the way it operates and maintains the road. In such an instance, Agnico Eagle would evaluate what level of activity was expected to continue at the site during the shutdown period and adjust its care and maintenance of the access road accordingly. For example, here are two possible scenarios:

Case 1: Long-term Temporary Closure of the Mine due to a low Gold Price

Under an indefinite shutdown of the mine due to a low gold price, in this case the duration of the event would be unknown and beyond the control of Agnico Eagle. Agnico Eagle would likely shutdown all mining and milling operations in a progressive manner and put the facilities into a care and maintenance mode with a minimal site presence to protect the integrity of the facilities at the site. In this event, Agnico Eagle would likely suspend winter snow clearing along the AWAR and would significantly reduce summer maintenance. Winter use of the AWAR by public would stop; summer access would still be open but likely limited to ATVs as the road would no longer be maintained to its normal standard.

Case 2: Short-term Temporary Closure of the Mine

Short-term Temporary Closure is defined as the shutdown of the mine with a defined timeline, less than 1 year mill shutdown. The duration of the event would be known and would be within the control of Agnico Eagle. Agnico Eagle would reduce activity at the site while the mill is rebuilt and/or repaired. In this case, there would be a continued presence on site and thus regular road access would still be required. In this event, Agnico Eagle would likely maintain the road in the same manner as during normal operations with potential extended shut downs during the worst winter conditions. In this event, continued public access to the road would continue as normal except for periods when the road is closed due to severe winter conditions or some other eventuality.

There are a number of scenarios that could fall between those presented above and each would be considered on a case-by-case basis. In general, if during the short-term or long-term shutdown period there is ongoing activity planned at the site, the AWAR would for the most part remain open to public access. However, if during the shutdown period there is no ongoing activity planned at the site, the road would not be maintained, thereby limiting public access to snowmobiles or tracked vehicles during winter and to ATVs during summer months.

The question as to how public use of the AWAR will be monitored and how road use rules and procedures will continue to be enforced during any short-term or long-term temporary closure of the mine has been raised as a valid concern.

- For short-term temporary closures (up to 12 months in duration), the AWAR would continue to be monitored, maintained and operated (enforcement of rules and procedures) in the same manner as those laid out in Sections 6 through 10 of this Plan for normal operations; and

- For long-term temporary closures or for indefinite shutdowns (greater than 12 months in duration) where further site activity is being curtailed and the intention is that the mine will resume operations as soon as possible after the cause for the indefinite shutdown has been addressed, then AWAR monitoring, maintenance and enforcement activities would be significantly reduced. A decision on the estimated length of the indefinite shutdown would be made after the initial one year period. Decisions on possible extensions to the indefinite shutdown would be made every 6 months thereafter and would be based on the conditions at that time. At present, the maximum length of time or number of extensions for interim shutdown before moving to final closure has not been defined.

When further site activity is curtailed, a physical barrier would be established on the AWAR before the Meliadine River Bridge that prevents open public access by cars, trucks or other motorized vehicles larger than an ATV. This would likely be a rockfill barrier with appropriate signage. During winter months, the road would not be kept open thus curtailing travel other than by snowmobile or tracked snow vehicle. In summer months, Agnico Eagle would continue to carry out environmental monitoring both along the AWAR and at the mine site but at a reduced frequency in accordance with its license/permit requirements. During these inspections, Agnico Eagle personnel would continue to monitor for inappropriate use of the AWAR and for conditions along the AWAR that could result in risk to public safety or to the environment (e.g., wash outs, erosion, plugged culverts, etc.). This would include monitoring and addressing any unauthorized trails/access into the designated preservation zone of the Iqalugaarjuup Nunanga Territorial Park as discussed in Section 6.3 of this Plan.

For the permanent closure scenario and as outlined in the Preliminary Closure and Reclamation Plan, the AWAR will remain available for use during closure as access to the mining areas is required until post-closure and reclamation activities have been completed. The road surface will at this point

be rehabilitated to promote natural re-vegetation, water crossings removed, and natural drainages re-established.

Agnico Eagle would like to emphasis that it has the responsibility of decommissioning and reclaiming all roads once construction, operations, closure, and post-closure activities are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Hamlet) and then complete its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads.

Decommissioning of the roads will be accomplished by loosening compacted surfaces, flattening side slopes, and removing all culverts, bridges (not including the Char River bridge as this would become the property of the Hamlet of Rankin Inlet), and other potential obstructions to drainage paths. The objective will be to make the road surface impassable by vehicle traffic by ripping the entire road bed and removing all bridges and culverts along the route.

The loosening of compacted surfaces will be accomplished by ripping of the road bed using a dozer with a “ripper” attachment on the back. Successive passes with the dozer longitudinally along the road bed will eliminate the level road surface and make travel difficult (Figure 11-1). It is anticipated that, in this way, the abandoned roads will not be useable by wheeled vehicles (i.e., cars, trucks, and pick-up trucks). The road bed would still be useable by ATV or snowmobile and, thus, even after final reclamation, the reclaimed roadbed would offer similar passage to the existing set of trails that currently exist and are used by the residents of Rankin Inlet for traditional use purposes.

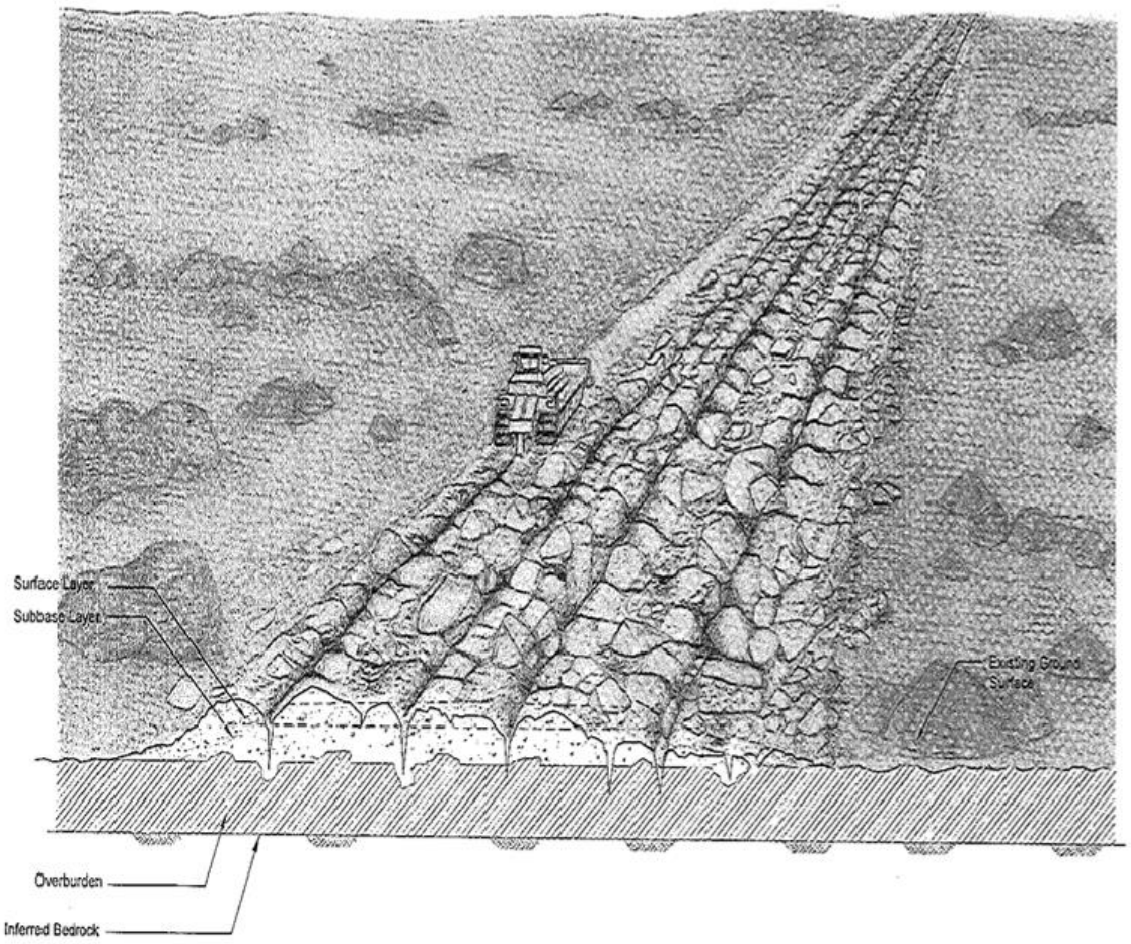


Figure 11-1 Schematic Showing the Ripping of the Road upon Closure

The road deactivation works will be carried out as necessary to stabilize any slopes where potential for slope erosion may exist. Stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened out slopes using non-acid generating material.

These measures would also be applicable to borrow pits/quarries that remained open following construction and are located adjacent to the roadway. As much as practical, deactivated surfaces will be graded to blend with the existing topography.

To the extent practical, the reclamation would also restore the natural pre-road hydrology. Natural drainage courses would be restored primarily through the removal of all culverts and bridges (excluding the Char River bridge, which will belong to the Hamlet of Rankin Inlet), and through rehabilitation of channels and banks at the crossing sites. Cross-drain structures (cross-ditches) will also be installed where necessary between culvert sites. Where armouring rock (rip-rap) is required, this rock will be non ARD/ML for the protection of aquatic life. Where affected watercourses are fish

bearing, the timing of work will have to be restricted to within the designated DFO fisheries work window (July 16th to April 30th). For these sites, appropriate fish exclusion measures will be undertaken prior to the in-stream works. All in-stream works will be carried out using best management practices for erosion and sediment control.

Decommissioning of the roads will start from the Project site and progress south towards Rankin Inlet and will include reclamation of the bypass road. Stream crossings will be rehabilitated as they are encountered during the progression of the work. The culverts and bridges, as previously mentioned, will be removed from the crossings using a backhoe and crane, and then removed materials (i.e., culvert steel, bridge decks, abutment steel, etc.) will be transported to Rankin Inlet using a semi-tractor and a low-boy trailer, for disposal and salvage.

11.1 Reclamation of Quarries and Borrow Pits Sites

All quarry sites and borrow sources developed during the construction of the roads have been selected to generate only non-acid generating/low metal leaching materials (see Borrow Pits and Quarries Management Plan). Water quality monitoring and testing will be undertaken periodically during the construction and operational period of the roads to measure the quality of water draining from the open quarry/borrow sites and from the road base materials.

The quarries and borrow pits have gently sloping walls and are designed for positive drainage wherever possible. Reclamation and closure of quarries and borrow pits will depend on the individual site conditions. With a conservative initial design, the quarries should require little reclamation following completion of the roads. Loose rock will be pulled to the floor of the quarry and the entrance blocked with large boulders. Reclamation should lead to natural re-vegetation establishing on disturbed areas.

During reclamation of the roads, should acid-generating bedrock be exposed along the roadway or in borrow pit/quarries, these areas will be covered with a minimum 2m thick layer of non-acid generating soil or rock to direct water away from the surface.

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APPENDIX A • AGNICO EAGLE CONSULTATION ON THE ALL-WEATHER ACCESS ROAD

A chronological record is provided of the consultation undertaken on the routing of the AWAR between Rankin Inlet and the mine site.

Date	Location	Parties involved and purpose of meeting
2004/10/21	Rankin inlet	Presentation on Project status to KIA Board of Directors with a request for a proposal of motion to support a future road from Rankin Inlet to the site.
2007/03/26	Chesterfield Inlet	Presentation to the KIA Board of Directors on the proposed underground Program and 2007 Meliadine West exploration plans. Verbal Motion of Support from the Board
2007/03/27	Rankin Inlet	Presentation of the proposed 2007 Meliadine West exploration program to the Rankin Inlet Community Lands and Resources Committee.
2007/03/28	Rankin Inlet	Presentation of the proposed 2007 Meliadine West exploration program to the Kivalliq Chamber of Commerce.
2007/03/28	Rankin Inlet	Town hall meeting - presentation of the proposed 2007 Meliadine West exploration program.
2007/07/04	Rankin Inlet	Briefing on Project status to Hamlet Council with specific discussions on road alignment and overwinter fuel storage in barge.
2007/07/04	Rankin Inlet	Elders Luncheon at Nunavut Arctic College. Project overview and immediate project plans for underground exploration was presented by Mark Balog with a slide show. Issues that were raised: – employment opportunities for young people; – all-season road location and utility for other projects; – Soapstone from Newfoundland. Attendees: Hamlet Elders including Mr/Mrs Tatty, Mr/Mrs. Itinuar, Mr/Mrs Kabvitok, Mrs. Pissuk, others: Comaplex Minerals: Mark Balog, Ben Hubert. Arranged by John Hickes.
2009/05/06-08	Rankin Inlet	Multidisciplinary Advisory Group (MDAG), chaired by Bernie MacIssac, INAC: all regulatory groups in attendance. Presented the Project and All- weather Road to regulators. Met regulators who will work on Project, including Jackson Lindell and Stephen Hartman, KIA, and Keith Morrison and Jorgan Aitaok, NTI.
2009/06/17	Rankin Inlet	Meeting with Manager CED (Robert Connelly) and Nunavut Transport (Alan Johnson) regarding proposal to access federal infrastructure money

		for the Meliadine River bridge and Comaplex fund the road. Visit to the bridge site.
2009/06/18	Rankin Inlet	Discussion with Rankin Inlet Mayor John Hickes, the SAO, and several council members. Project update and proposed application for road and bridge funding.
2010/06/01	Chesterfield Inlet	Mark Balog and John Witteman, Comaplex sponsored a town hall meeting providing an update on the Project and the building of an All-weather Road. The road would link to the planned road to Chesterfield Inlet.
2010/06/02	Rankin Inlet	Mark Balog and John Witteman, Comaplex sponsored a town hall meeting providing an update on the Project and the building of an All-weather Road. The meeting was particularly well attended and there were no objections to the routing to the All-weather Road. There were no objections to the proposed road alignment.
2010/01/09	Meliadine site	John Witteman and Jacek Patalas (Golder Associates) met with Gary Cooper and Nicola Johnson of DFO to discuss fisheries habitat and compensation issues relating to the development of the Meliadine Gold Project. Discussions regarding compensation for road crossings were also discussed.
2011/01/06	Cambridge Bay	Eric Lamontange, Denis Gourde and John Witteman met with Ryan Barry, Kelli Gillard and one more staff member, NIRB, to describe the status of the Project and in particular the AWAR. Agnico Eagle described what had been done in regards to gathering baseline information for the road, regulatory permits required and use of the road (having it open access).
2011/02/07-09	Rankin Inlet	Larry Connell and John Witteman met with the Lands Division of KIA to discuss the road and other matters. A meeting with the HTO was cancelled due to a blizzard.
2011/03/01	Rankin Inlet	John Witteman, Bertho Caron and Selma Eccles of Agnico Eagle attended a meeting with the HTO, Rankin Inlet. The HTO raised a number of concerns with the route of the road, bridge location over the Meliadine River, wildlife monitoring along the road, plans for the Itivia port area, fish concerns with the bridge. Agnico Eagle talked to each of the concerns raised and were subsequently informed that the HTO Board was satisfied with the responses received
2011/03/23	Rankin Inlet	Denis Gourde, Eric Lamontagne, Larry Connell, Selma Eccles, John Witteman met with the Hamlet Council to describe the AWAR and ongoing activities at the Meliadine site. The Hamlet Council supports the All- weather Access Road and a letter of support can be expected. The

		underground program was explained and what is hoped to be gained from carrying out this work - getting needed information on the deep ore. The question of dust control was raised and lands available in town for development. The underground development was discussed.
2011/03/23	Rankin Inlet	Denis Gourde, Eric Lamontagne, Larry Connell, Selma Eccles, John Witteman hosted a town hall meeting with the community to discuss the All-weather Access Road and the proposed mine. A PowerPoint presentation in English and Inuktitut was presented. The meeting was well attended with over 100 persons present. The road is widely supported by the community as it offers access to Meliadine Lake and also is expected to lead to more economic activity. The question of jobs and careers was frequently raised and what must be done to get jobs such as supervisors and managers. Education was emphasized by Agnico Eagle as well as on-the-job training. Support was voiced for the road and the proposed mine.
2011/04/07	Iqaluit	Meeting with NIRB and NWB in Iqaluit during the Nunavut Mining Symposium. PowerPoint presentation was made on the proposed Meliadine AWAR and our application to amend our Type B water license to allow for construction of this road. Good exchange with NIRB an NWB pointing out omissions in what was presented.
2011/05/06	Geovector, consultant to KIA	AWAR – quarry locations and need to check for ground ice, geochemistry of the waste rock and potential quarries, snow drifting along road, design of culverts, lessons learned from Meadowbank.
2011/06/06	Cambridge Bay, Gjoa Haven Iqaluit	Presentation to NIRB, NWB, Regulatory Agencies in Iqaluit. Discussions on next steps in EA process, possible predevelopment activities, class A water licence, Agnico Eagle's use of municipal infrastructure, need to submit a land use permit for crown land to be crossed by the AWAR, quarries along road.
2011/06/14	KIA, Mayor of Rankin Inlet	Possible predevelopment, Hamlet motion to approve AWAR, build only 1 lane at this time.
2011/10/31	Rankin Inlet	Larry Connell and John Witteman met with the HTO. A PowerPoint presentation was made on the All-weather Access Road and developments at the Meliadine site. The HTO wanted to discuss the alignment of the AWAR to the Meliadine site and the arrangement of Agnico Eagle facilities at Itivia. A more southerly route was proposed by the HTO but Agnico Eagle indicated it was too long and had too many water crossings. The HTO want a role and contract in monitoring wildlife along the AWAR. The arrangement at Itivia was raised but Agnico Eagle did not have maps of the area. Discussion was deferred to the next meeting when Agnico Eagle would bring maps of Itivia and

		surrounding area. Agreement was reached on a ski-doo trail along the east side of the laydown area.
2012/02/29	Rankin Inlet	A public meeting with the community. The meeting covered the status of the Meliadine Project with emphasis on the planned construction of the Phase 1 AWAR between Rankin Inlet and the Meliadine Project site. Options for a bypass road around the Hamlet were presented with support for keeping Agnico Eagle traffic outside the community. Other topics touched on the fate of the existing Char River Bridge, the formation of a Liaison Committee for Rankin Inlet, plans for the Itivia area and employment opportunities in the building of the road.
2012/04/18	Iqaluit	Presentation made to the NIRB and the NWB on the proposed Meliadine All-weather Access Road and update on the exploration project.
2012/08/16	Rankin Inlet	Site visit of the Phase 1 AWAR by two representatives of the Hunters and Trappers' Organization. Progress on the bridges and road was viewed.
2012/09/11	Rankin Inlet	Site visit of the Phase 1 AWAR by KIA and CLARC representatives. Progress on the bridges and road was viewed.
2013/06/21	Rankin Inlet	Meeting was held with the hamlet and Government Services (GN) concerning the removal of the Char River Bridge, the Apache Pass, and the airport by-pass road.
2013/06/27	Rankin Inlet	Presentation on Agnico Eagle exploration activities, Phase 1 AWAR and road access made to town council, community, Land and Resources, Hunters and Trappers' Organization, Kivalliq Inuit Association, NTI.
2013/07/10	Rankin Inlet	Discussions were held with the Airport Manager and Government Services (GN) concerning the airport by-pass road.
2013/08/08	Rankin Inlet	Meeting with town council, community, Land and Resources, Hunters and Trappers' Organization, Kivalliq Inuit Association, NTI on the Phase 1 AWAR and Road Access Policy – minutes are available.
2013/11/06	Rankin Inlet	Meeting with HTO Board explaining the status of the Project, Phase 1 All-weather Access Road, caribou migration, sewage treatment – minutes available.
2014/05/29	Rankin Inlet	Rankin Inlet Public consultation on the road access by ATV.
2016/05/05	Rankin Inlet	Meeting with the KHTO to discuss the proposed joint Wildlife Monitoring Program to be conducted along the AWAR.

2016/06/09	Rankin Inlet	Meeting with Nunavut Airports, Government Services (GN) and the Hamlet to present the updated road route for the bypass road. The permitting process was also discussed.
2016/07/07	Rankin Inlet	Meeting with the KHTO to discuss the proposed joint Wildlife Monitoring Program to be conducted along the AWAR.
2016/08/25	Rankin Inlet	Meeting with Nunavut Airports, Government Services (GN) and the Hamlet to provide an update on the bypass road design process and hear concerns. The permitting process was also discussed.
2016/09/20	Rankin Inlet	Meeting with KHTO to discuss signage erected on AWAR.
2016/11/28	Rankin Inlet	Pre-Hamlet Council meeting with Nunavut Airports, Government Services (GN) and the Hamlet to discuss the bypass road project. Pre-Council concerns were also shared by all parties.
2016/11/28	Rankin Inlet	Hamlet Council Meeting. Bypass road project presented to request support for the project by the Hamlet.
2016/12/13	Rankin Inlet	Hamlet Council Meeting. Bypass road project receives support from the Hamlet.
2017/02/27	Rankin Inlet	Hamlet Council Meeting. Bypass road project application for lease presented for approval by Council. Outstanding concerns discussed. Vote postponed.
2017/03/13	Rankin Inlet	Hamlet Council Meeting. Bypass road project application for lease discussed. Agnico Eagle is requested to provide design for road extension.
2017/07/17	Rankin Inlet	Meeting with SAO on dust control measures.
2017/07/18	Rankin Inlet	Public meeting on Itivia, including bypass road.
2017/07/27	Rankin Inlet	Information and consultation on Itivia Boat Launch and Johnson's Cove Boat Launch, dust control, road maintenance, bypass road, snowmobile trail, shooting range relocation, caribou migration and gravel pits.
2017/11/24	Rankin Inlet	Visit of bypass road area with HTO and Elder representative. Discussed access for ski-doos and hunters.
2018/06/05	Rankin Inlet	Meeting regarding Cyanide attended by: Rankin Inlet Emergency Services, HTO, Health Centre, RCMP and Gun Club, Nunavut Parks, Airports and Government. Topics covered included: International Cyanide Management Code, Cyanide transportation to Meliadine, Health and

		Safety regarding Cyanide storage and community sharing of the draft Emergency Response Plan. Main outcomes: Department of defence will restrict access to their site during transportation, Agnico Eagle will provide shipping window and mock drill dates and Agnico Eagle will reach out to other Stakeholders.
2018/06/13	Rankin Inlet	Public meeting on Meliadine and Itivia project update, AWAR health and safety procedures and Caribou Management on the AWAR.
2019/07/31	Rankin Inlet	Rankin Inlet Emergency Services, HTO and Government meeting regarding cyanide. Topics covered included: International Cyanide Management Code, Cyanide transportation to Meliadine, Health and Safety regarding Cyanide storage and community sharing of the draft Emergency Response Plan.
2019/08/18	Rankin Inlet	Rankin Inlet Public meeting regarding cyanide. Topics covered included: International Cyanide Management Code, Cyanide transportation to Meliadine, Health and Safety regarding Cyanide storage and community sharing of the draft Emergency Response Plan.

APPENDIX B • APPLICABLE ACTS, REGULATIONS, AND GUIDELINES FOR THE ACCESS, SERVICE AND HAUL ROADS

Applicable Acts, Regulations, and Guidelines for the Access, Service and Haul Roads

Act	Regulation	Guideline
Federal		
Canadian Environmental Protection Act (1999 c.33)	Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197) Environmental Emergency Regulations (SOR/2003-307) Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301) Release and Environmental Emergency Notification Regulations (SOR/2011-90)	CCME - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory (threshold for hydrochloric acid 6.8 tonnes) Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Migratory Birds Convention Act (1994 c.22)	Migratory Birds Regulations (C.R.C., c. 1035)	
Canada Water Act (1985 c.11)		
Oceans Act (S.C. 1996, c. 31)		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	Arctic Waters Pollution Prevention Regulations (C.R.C., c. 354) Arctic Shipping Pollution Prevention Regulations (C.R.C., c. 353)	
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	Transportation Safety Board Regulations (SOR/92-446)	
Canada Shipping Act, 2001 (S.C. 2001, c. 26)	Response Organizations and Oil Handling Facilities Regulations (SOR/95-405) Pollutant Discharge Reporting Regulations, 1995 (SOR/95-351) Environmental Response Arrangements Regulations (SOR/2008-275) Ballast Water Control and Management Regulations (SOR/2006-129) Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69)	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP 12401E 1995 Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)

Act	Regulation	Guideline
Navigation Protection Act		
Marine Liability Act (A.C. 2001, c.6)	Marine Liability Regulations (SOR/2002-307)	
Fisheries Act (1985, c. F-14)	Metal Mining Effluent Regulations (SOR/2002-2222) Marine Mammal Regulations (SOR/93-56)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Transport of Dangerous Goods Act (1992, c. 34)	Transportation of Dangerous Goods Regulations (SOR/2001-286)	
Explosives Act (1985 c.E-17)	Explosives Regulations (C.R.C., c. 599) Ammonium Nitrate and Fuel Oil Order (C.R.C., c. 598)	
National Fire Code of Canada (2010)		
Nuclear Safety and Control Act (s.c. 1997, c.9)	General Nuclear Safety and Control Regulations (SOR/2000-202)	
Canadian Human Rights Act (R.S.C., 1985, c. H-6)	Canadian Charter of Rights and Freedom	
Canada Labour Code (R.S.C., 1985, c. L-2)	Canada Labour Standards Regulations (C.R.C., c. 986) Canada Occupational Health and Safety Regulations (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	Northwest Territories and Nunavut Mining Regulations (C.R.C., c. 1516) Territorial Land Use Regulations (C.R.C. 1524) Territorial Quarrying Regulations (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c.10)	Northwest Territories Waters Regulations (SOR/93/303)	
Nunavut Act (1993 c.28)	Nunavut Archaeological and Paleontological Sites Regulations (SOR/2001-220)	

Act	Regulation	Guideline
*Nunavut Land Claims Agreement Ac*t (1993, c.29)		
Territorial - Nunavut		
Environmental Protection Act (RSNWT (nu) 1988, c E-7)	Spill Contingency Planning and Reporting Regulations (NWT Reg (Nu) 068-93) Used Oil and Waste Fuel Management Regulations (NWT Reg 064-2003) [The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport.]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guidelines on Mercury-Containing Products and Waste Mercury Environmental Guideline for Waste Asbestos Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's land Environmental Guideline for Ozone Depleting Substances
Scientists Act (RSNWT (Nu) 1988, c S-4)	Scientists Act Administration Regulations (NWT Reg (Nu) 174-96)	
Historical Resources Act (RSNWT (Nu) 1988, c. H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	Territorial Parks Regulations (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	Wildlife General Regulations (NWT Reg (Nu) 026-92) Wildlife Licences And Permits Regulations (NWT Reg (Nu) 027-92) Wildlife Management Barren-Ground Caribou Areas Regulations (NWT Reg (Nu) 099-98) Wildlife Management Grizzly Bear Areas Regulations (NWT Reg (Nu) 155-96)	

Act	Regulation	Guideline
	Wildlife Management Zones Regulations (RRNWT (Nu) 1990 c W-17)	
	Wildlife Regions Regulations (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	Commissioner's Airport Lands Regulations (NWT Reg (Nu) 067-97)	
	Commissioner's Land Regulations (RRNWT 1990, c C-13)	
Safety Act (RSNWT 1988, c.S-1)	General Safety Regulations (RRNWT (Nu) 1990 c S-1)	
	Work Site Hazardous Materials Information System Regulations (RSNWT 1988, C 81 (Supp))	
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	Mine Health And Safety Regulations (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	Workers' Compensation General Regulations (Nu Reg 017-2010)	
Apprenticeship, Trade And Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	Apprenticeship, Trade And Occupations Certification Regulations (RRNWT (Nu) 1990 c A-8)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	Annual Vacations Regulations (RRNWT 1990, c.L-1)	
	Educational Work Experience Regulations (RRNWT 1990, c.L-2)	
	Employment of Young Persons Regulations (RRNWT 1990, c.L-3)	
	Labour Standards Meal Regulations (RRNWT 1990, c.L-4)	
	Notice of Termination Exemption Regulations (RRNWT 1990 c.L-5)	
	Pregnancy and Parental Leave Regulations (RRNWT 1990, c.8(Supp.))	
	Reciprocating Jurisdiction Order (RRNWT 1990, c.L-6)	
	Wages Regulations (RRNWT 1990, c.L-7)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	Electrical Protection Regulations (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	Explosives Regulations (RRNWT (Nu) 1990 c E-27)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	Petroleum Products Tax Regulations (RRNWT (Nu) 1990 c P-3)	

Act	Regulation	Guideline
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	Fire Prevention Regulations (RRNWT (Nu) 1990 c F-12)	
Hospital Insurance And Health And Social Services Administration Act (RSNWT 1988, c T-3)	Territorial Hospital Insurance Services Regulations (RRNWT (Nu) 1990 c T-12)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	Camp Sanitation Regulations (RRNWT (Nu) 1990 c P-12) General Sanitation Regulations (RRNWT (Nu) 1990 c P-16)	
All-Terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	All-Terrain Vehicles Regulations (RRNWT (Nu) 1990 c A-1)	
Motor Vehicles Act (RSNWT (Nu) 1988, c M-16)	Large Vehicle Control Regulations (RRNWT (Nu) 1990 c M-30) Motor Vehicle Registration And Licence Plate Regulations (RWT Reg (Nu) 054-94)	
Public Highways Act (RSNWT (Nu) 1988, c P-13)	Highway Designation And Classification Regulations (NWT Reg (Nu) 047-92)	
Transportation of Dangerous Goods Act (1990. RSNWT (Nu) 1988, c 81 (Supp))	Transportation Of Dangerous Goods Regulations (1991, NWT Reg (Nu) 095-91)	



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MELIADINE PROJECT

PROJECT CERTIFICATE NO. 006

Analysis of the Risk of Temporary Mine Closure

February 1, 2019

Presented to: Nunavut Impact Review Board

AGNICO EAGLE

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1. Introduction

As part of the Meliadine Project Certificate No. 006, term and condition No. 90, Agnico Eagle has been asked to "*identify risks and potential effects of temporary mine closures on communities and to develop appropriate offsetting measures*" (Nunavut Impact Review Board, 2015). More specifically:

> *"Prior to the commencement of operations, the Proponent is required to undertake an analysis of the risk of temporary mine closure, giving consideration to how communities in the Kivalliq region may be affected by temporary and permanent closure of the mine, including economic, social and cultural effects. The results of this analysis are to be provided to the NIRB upon completion."* (Nunavut Impact Review Board, 2015).

2. Temporary Closure

A temporary closure occurs when Agnico Eagle ceases to operate the Meliadine Project with the intent to resume mining activities in the future, and maintains activities relating to the facilities necessary to protect humans, wildlife and the environment. Temporary closure could last for a period depending on economic, environmental and social factors (Agnico Eagle Mines Ltd and Kivalliq Inuit Association, 2017, p. 28).

The Meliadine Operation is planned to be continuous for the entire proposed operating period, however, temporary closure could occur if, for any reason, the Project became uneconomic and was expected to remain so for an extended period of time (Agnico Eagle Mines Ltd, 2014, p. 20). Examples of situations that could contribute to the Project becoming uneconomic include labour disputes, unfavorable gold prices, critical breakdowns, or shipping delays.

Notification of temporary closure would be presented to the staff and the local population with at least 30 days' notice; a longer notice period will be provided where possible. The staff maintained at site would be sufficient in number and expertise to successfully carry out care, maintenance and monitoring duties, and to address and remediate any potential problems that may arise (Agnico Eagle Mines Ltd, 2015, p. 142).

As per the Meliadine Inuit Impact and Benefit Agreement (IIBA), written notice of a temporary closure decision would be given immediately to the Kivalliq Inuit Association (KIA) and the Parties would "*enter into good faith negotiations and use commercially reasonable efforts to conclude an agreement on appropriate implementation measures which shall be in keeping with the purpose and the objectives of"* the IIBA (Agnico Eagle Mines Ltd and Kivalliq Inuit Association, 2017, p. 17).

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3. Effects of Temporary Closure on Kivalliq Communities

Any potential temporary closure scenario would likely be unplanned and therefore would have more potential for negative effects (Agnico Eagle Mines Ltd, 2014, p. 20). However, if a temporary closure were to occur early in the Project's life cycle, many of the anticipated socio-economic impacts described in the Meliadine Project Final Environmental Impact Statement (FEIS) may not have fully developed (Golder Associates, 2014, p. 186) and may thus attenuate any negative impacts of a temporary closure.

The extent to which mine closure affects Kivalliq communities will vary depending on the size of the Agnico Eagle and contractor labour force from each community that is employed at the Meliadine Project. The impacts will likely be higher in the community of Rankin Inlet as this community currently provides over 60% of Agnico Eagle's Inuit labour force (Aglu Consulting and Training Inc and Stratos Inc, 2018, p. 17).

3.1 Anticipated Socio-Economic Impacts

Anticipated socio-economic impacts of the Meliadine project have been detailed in Volume 9 – Social Environment of the FEIS through pathway and effects analysis. A primary pathway is likely to result in a measurable environmental change that could contribute to residual effects on a VSEC relative to baseline values (Golder Associates, 2014, p. 12) The table below summarizes the primary pathways by valued socio-economic components (VSEC):

Valued Component	Primary Pathway topics
Population Demographics	• Population stability
Traditional Activity and Knowledge	• Traditional and commercial harvesting • Land use and mobility • Food security
Economic Development and Opportunities	• Employment • GDP and Economic Growth • Inflation and Consumer Price Index • Trade Balance • Investment • Government Fiscal Situation • Business Opportunities and Contracting • Economic Development • Income

Education and Training	• Education achievement, dropout rates, school attendance • Available training in existing education system • Capacities of existing education system • Funding of existing education system • Education and skill levels of local labour force
Individual, family and community wellbeing	• Physical and Mental Health • Safety • Savings
Community infrastructure and Public Services	• Population stability (effects of migration on housing, police, and health/social services, financial services, communication services, school services and community/infrastructure services) • Local and regional transportation
Governance and Leadership	• Fiscal performance of government • Operational capacity of government • Regulatory and monitoring capacity of government
Non-Traditional Land Use and Resource Use	• Hunting and fishing • Tourism, recreation, parks and protected areas
Worker and Public Health and Safety	• Health and safety performance for the Project (Project Activities) • General Public, Workers
Cultural, Archaeological and Paleontological Resources	• Site specific

Table 1: Summary of VSECs with primary pathway analysis 9.2-9.10 (Golder Associates, 2014)

Of the identified impacts with primary pathway analysis in the FEIS, those that would be most affected by a temporary closure are listed below:

- **Employment:** Temporary closure would have a significant impact on employment. As per the FEIS, during operations, the Meliadine project is expected to directly employ 700 people per year (Golder Associates, 2014, p. 182). Although the Meliadine Project FEIS makes no specific predictions regarding Kivalliq community's resident employment rates, Agnico Eagle is committed to maximizing employment opportunities for the greatest number of Inuit (Agnico Eagle Mines Ltd and Kivalliq Inuit Association, 2017, pp. 7,56).

- **Income:** Employment income paid by Agnico Eagle at the Meliadine Project will result in competitive wages for people working on the Project, including for unspecialized workers (Golder Associates, 2014, p. 185). In the event of a temporary closure, incomes may be negatively affected as employees shift to employment insurance (in the case of a layoff) or work reduced hours in the case of work sharing or other mitigation measures that Agnico may implement.
- **Business Development:** A temporary closure will have direct impacts on project expenditures, GDP, government revenues including IIBA-related royalties and business development as Agnico spending is reduced. The most significant anticipated impact would be on Kivalliq businesses, particularly in Rankin Inlet and Baker Lake, where 70% of the Kivalliq's NTI-registered businesses are located (Golder Associates, 2014, p. 118).

It is not expected that a temporary closure would greatly impact workforce training and community education. As per the Meliadine Inuit Impact and Benefit agreement, Agnico Eagle is required to maintain Inuit training expenditures at around $3.6 million in addition to spending an additional $1 million (half of which is spent by Agnico and half is paid to the KIA) on initiatives that serve to assist in obtaining at least 50% Inuit employment for all Nunavut Projects (Agnico Eagle Mines Ltd and Kivalliq Inuit Association, 2017, p. 66).

While IIBA provisions may be suspended during a temporary closure, if other Agnico projects are still operating normally in Nunavut (e.g. Whale Tail), then these general requirements would likely still be in effect. Given this, while the types of workforce training and community education may shift in order to attenuate employment effects of a temporary closure, the overall dollar amount spent would likely not be affected unless temporary closure occurred at all Agnico sites in Nunavut. In the case of a temporary closure at all Agnico sites in Nunavut, training expenditures would be impacted, however these impacts cannot be assessed since changes to IIBA provisions would need to be negotiated with the KIA.

3.2 Mitigation Measures

3.2.1 Building Capacity

Agnico Eagle is committed to not only enhancing access to economic opportunities during the Meliadine Project's life, but to also give consideration to an eventual final closure. It is Agnico's intent to, by Project final closure, have increased the capacity of Kivalliq labour and business to engage in economic activities independent of the Project. The principles below contribute to achieving this goal and could help mitigate effects of a temporary closure (Agnico Eagle Mines Ltd, 2014, pp. 19-20):

- **Employment**: Preferential employment, training and culturally sensitive employment practices that contribute to job performance, satisfaction, retention and advancement for people in the Kivalliq Region.
    - This, and the inclusion of targeted Inuit employment as a criterion for evaluating bids from contractors, will build the capacity of Inuit employees to participate in a

wage economy. These measures will provide the work experience that will give people a competitive edge in competing for jobs elsewhere in the economy.

- **Education and training**: Programs that emphasize not only preparation of adults for work at the Project (e.g. work readiness training), but that encourage youth to value education with a view to either Agnico Eagle employment or other participation in the formal wage economy has implications for long-term employability. In addition, the expectation is that such programs will provide motivation to higher education in areas such as health, education, public security, and business administration.
- **Contracting**: Preferential contracting, assistance with the development of business expertise and including the use of Kivalliq region businesses as a criterion for evaluation of bids from businesses supplying to the Project, will contribute to building experience and capacity in the Kivalliq. In addition, Agnico Eagle will support local suppliers to enhance their service offering with a view to diversify their client base and be less dependent on Agnico as a primary client.
- **Support of traditional culture**: The consideration and support for individual decisions to combine formal wage employment with traditional activities and practices in employment and education and training programs contributes to resilience in face of economic dislocation.
- **IIBA and community contributions**: Continued implementation of the IIBA will contribute to economic growth, but also to the social and cultural wellbeing that underlies the ability of people to create and take up life opportunities.

3.2.1 Workforce and Contract Transition Plan

As per the Meliadine IIBA, Agnico "*will use its Best Efforts to ensure that Inuit workers shall be the last to be laid off, with preference given to Inuit of the Affected Communities*" (Rankin Inlet and Chesterfield Inlet) (Agnico Eagle Mines Ltd and Kivalliq Inuit Association, 2017, p. 59). This provision as well as the hiring priority outlined in the IIBA are the main drivers behind the workforce transition plan.

One of Agnico Eagle's guiding principles in a temporary closure scenario is the minimize layoffs and job losses, however, depending on the nature and duration of the temporary closure, impacts would likely still be felt by Kivalliq communities.

Agnico Eagle intends to work with communities and government to agree on appropriate measures, including schedules, to ensure that effects of any temporary closure are managed as best as possible (Agnico Eagle Mines Ltd, 2014).

In the event of a temporary closure of the Meliadine Project, specific mitigation measures have been considered to reduce potential negative effects on Kivalliq communities (Agnico Eagle Mines Ltd, 2016, pp. 4-5):

- Secure full time jobs and income and whenever possible, minimize the length of the transition for employees affected.
- Encourage the use of vacations to cover lack of work period.
- Promote opportunities for Agnico Eagle employees to transfer to other Agnico mine site locations, including temporary assignments.
- Explore opportunities to progress projects or maintenance programs in order to maintain jobs and income.
- Offer training to employees to acquire the necessary skills to be able to take advantage of mitigation measures (e.g. transfers, maintenance programs). Training offered will be focused on enhancing acquired skills in same or equivalent position based on current and future operational needs.
- Introduce temporary unpaid leave of absence for those who would like to pursue other training or personal opportunities during a temporary closure.
- Exploring opportunities for Work-Sharing. Work-Sharing is an adjustment program with Services Canada designed to help employers and employees avoid layoffs when there is a temporary reduction in the normal level of business activity that is beyond the control of the employer. The measure provides income support to employees eligible for Employment Insurance benefits who work a temporarily reduced work week while their employer recovers. Employees on a Work-Sharing agreement agree to a reduced schedule of work and to share the available work over a specified period of time.
- Promote early retirement options for those who are eligible.
- Provide counselling to employees that are being laid-off to help them prepare for the effects of losing their jobs by reviewing their options and plan their next steps.
- Provide financial information and counselling to employees (such as any lay-off packages, RRSP management, stocks management, budgeting, information on government employment benefit programs, etc.)
- Maintain access to Agnico's Employee Family Assistance Program by laid-off employees during temporary mine closure.
- Meet with Inuit business contractors to discuss impacts of temporary closure to contracts and opportunities for care and maintenance contracts. Agnico Eagle will place emphasis on such opportunities for Rankin Inlet-based contractors.

It is noted that the economic effects of a temporary closure will to a large extent depend on whether or not there are economic alternatives available at the time of closure to replace the

Project. This in turn is expected to largely depend on progress in developing the mining sector in the Kivalliq Region, and Nunavut more generally (Agnico Eagle Mines Ltd, 2014, p. 20).

4. Conclusion

Ultimately, the depth of the effects of a temporary closure on Kivalliq communities will depend on the duration and scope of the closure. The capacity building integrated into the overall Project as well as the workforce and contract transition plan have been designed to minimize and mitigate any potential effects.

In the event of premature (temporary or final) closure of the Project, Agnico will consult with the Socio-Economic Monitoring Working Group and the Kivalliq Socio-Economic Monitoring Committee to update the Socio-Economic Management Plan (Agnico Eagle Mines Limited, Government of Nunavut, Government of Canada, 2017). Additionally, this analysis will be updated as necessary to reflect significant changes to the Project or the socio-economic conditions in the region that may increase the risks and potential effects of temporary mine closures (Nunavut Impact Review Board, 2015). Updates will be submitted to the Nunavut Impact Review Board.

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MELIADINE GOLD PROJECT

Dust Management Plan

MARCH 2019

VERSION 5

Executive Summary

Agnico Eagle Mines Limited (Agnico Eagle) will use best management practices to minimise dust generation from becoming airborne at the mine site, Itivia, and all access, service, and haul roads. This includes identification of major sources of dust, implementation of dust mitigation measures, inspections for unacceptable levels of dust, and recording dust monitoring data to document Agnico Eagle's success in controlling and reducing dust at the Meliadine Project. The Dust Management Plan focuses primarily on dust generated from roads, with some reference to other mining activities. Dust generated from other mining activities, such as the Tailings Storage Facility (TSF), are addressed in other plans, including the Mine Waste Management Plan and the Tailings Storage Facility Deposition Plan .

Dust could potentially be generated by such activities as road use, drilling, blasting, crushing, conveying, loading, hauling, unloading, stockpiling, and by wind erosion of dry, exposed mine areas. Dust emissions will be prevalent during late spring and summer, while being much reduced in fall and winter.

Mitigation measures to control dust include mine design and operational procedures. Operational practices, such as speed limits and road maintenance, will assist in reducing dust. Water and, if necessary, chemical dust suppressants such as calcium chloride, or another acceptable chemical, will be used to control and reduce dust on roads and other mine areas when airborne dust becomes a safety hazard or impacts on sensitive natural areas. The Itivia bypass road will not have any chemical dust suppressants applied. Only water will be applied on this portion of the road for dust suppression. Dust suppression measures will be in place during construction, operations, and closure.

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Document Control

Version	Date	Section	Page	Revision	Author
1	April 2014			Version 1 of the Dust Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	April 2015	7.2	11	Update plan for Water Licence application - Added EK-35 and DUST-STOP to chemical dust suppressants approved for use in Nunavut	John Witteman, Env. Consultant, Agnico Eagle
3	April 2017			General review of the plan	Environment Department, Agnico Eagle Mines
4	March 2018			Minor modifications	Environment Department, Agnico Eagle Mines
5	March 2019			General update of the document to reflect going into production	Terry Ternes, Sean Arruda, Environment Department, Agnico Eagle Mines
		5	7	Saline water trucked to Itivia	
		6.2	8	Removed sentence indicating transport on bypass road would be maximized in late summer and fall.	
		7	9-14	Calcium Chloride as dust suppressant	

1. Introduction

The Dust Management Plan (the Plan) is a framework for the management and control of dust[1] (airborne particulate matter) arising from traffic related to mine activities. Best management practices are identified to minimize and reduce the impact of dust on the natural and human environment.

The Plan identifies the sources of dust along with measures for their control during operation and closure.

2. Climate

The Meliadine Gold Project (Project) is located in the low Arctic eco-climate characterized by long cold winters and short cool summers. The frost-free period can be as short as 90 days and have prolonged periods with no precipitation. The 30-year climate normals for Rankin Inlet (1971 to 2000) indicate that wind speeds are relatively high, averaging more than 19 km/h every month.

Dust can be a problem at certain times of the year. During the winter and early spring, dust does not pose a significant problem as snow and ice cover most surfaces. However, surfaces that are exposed to the wind can result in dust, especially if ice resulting from fall rains is not present to bond fine particles together. However, in the late spring and summer, and under the right conditions, dust generation could present an issue at the mine site and along its roads. In late spring when temperatures remain below freezing, sublimation tends to cause mine surfaces, including roads, to be dry leading to a potential for dust generation. In summer, when evaporation is high and with little rain, mine surfaces and roads can be dry. The combination of low precipitation and drying winds promote dust generation from developed areas where work is underway and where vehicle traffic is present, especially if mitigation measures are not employed. High winds by themselves can also erode dust from exposed mine surfaces.

3. Related Documents

3.1 Environment Management and Protection Plan

The Environmental Management and Protection Plan (EMPP) provides Agnico Eagle with overarching direction to environmental and socio-economic management for the Project throughout its life (i.e., across all Project phases). It is a site-specific plan that describes the systematic means by which Agnico Eagle will consistently manage and control potentially adverse impacts, and enhance potential project benefits identified through the Environmental Assessment process and the subsequent licensing and permitting of the Project.

The EMPP offers enough flexibility to respond to changes, for example, in the mining development plan, the regulatory regime, the biophysical and socio-economic environments, technology, research results, best management practices, and the understanding of traditional knowledge. Thresholds and indicators

to trigger management actions are provided in the sub plans embedded in the EMPP, along with a system of accountability.

3.2 Air Quality Monitoring Plan

In the Air Quality Monitoring Plan (Agnico Eagle 2015), dust monitoring is expected to occur throughout all phases of the mine, during all seasons, at various locations on the mine site, along the All-weather Access Road (AWAR), the bypass road, and at the Rankin Inlet Itivia land-based facilities area (Itivia). The principle monitoring means are to be particulate fallout measurements.

The Air Quality Monitoring Plan outlines how dust monitoring data helps in verifying if the actual effects from air emissions are less than those predicted in the Final Environmental Impact Statement (FEIS). The data collected provides feedback for continuous improvement in dust mitigation measures. If the dust monitored indicates more dust than expected, adaptive management will be used to understand the reason for the elevated levels and recommend mitigation measures to reduce it.

4. Environmental, Safety and Operational Effects of Dust

The Project is anticipated to generate dust representative of local overburden and rock type. There should not be enrichment of any metal in the dust. Agnico Eagle will use all reasonable and practicable measures to minimise dust generated from the Project.

4.1 Environmental Concern

Physical and chemical stresses on the tundra environment are commonly associated with unpaved roads. Dust generated by vehicle traffic along the roads is carried by the prevailing wind onto the surrounding tundra where it is deposited onto the vegetation and waterbodies.

Chemically inert dust can have negative effects on sensitive receptors such as vegetation. It can accumulate on leaf surfaces and negatively affect leaf physiology. Dust has a shading effect, which reduces the amount of photosynthesis and increases the leaf temperature through incident solar radiation being absorbed by the dust, thus increasing the transpiration rate (Agnico Eagle 2008). Adverse impacts might occur on the wildlife that depend upon the vegetation as a food source. Dust carried off the roads can eventually wash into the local waterbodies adding suspended solids to the water, which can adversely affect water quality and possibly the health of aquatic species.

4.2 Safety Concern

Dust generated by vehicle traffic along roads and other mine surfaces is typically fine, inorganic particulate matter. It reduces visibility along roads, thereby increasing the risk of vehicle accidents. Inhalation of fine particulate matter can potentially cause adverse health effects, especially in persons with pre-existing respiratory problems.

4.3 Operational Cost Concern

Excessive dust when drawn into a vehicle's engine can result in rapid clogging of vehicle air filters, diminishing engine performance and increasing maintenance costs. While the engines are equipped with air filters, the finer sized particulate matter can pass through these filters, getting into the engine where it can cause premature scouring and wear on the pistons and other moving components, thereby leading to a need for more frequent maintenance and shortening the life of the engine.

5. Sources of Dust

The greatest source of dust at mine sites is vehicle traffic on unpaved roads (Thompson and Visser 2001). Dust emissions will vary by the time of week, as well as the time of year. Dust will be more prevalent during the late spring and summer than during winter. Dust emissions are anticipated to be greatest during the operation of the AWAR, when traffic along the road will be at its peak (e.g., on days when additional road traffic is required due to barge unloading, saline water transport to Itivia, and transport to the mine site).

The most significant sources of dust during operations, and closure include the following:

- Preparation of ground surface for construction through stripping, excavating, covering, and/or stockpiling;
- Wind erosion of exposed mine surfaces – e.g., roads, ore stockpiles, waste rock storage facilities, and dry stack tailings;
- Vehicle traffic on unpaved roads and other mine surfaces – haul, service and access roads, pit ramps, other vehicle travel areas (e.g. waste rock storage facilities, storage pads, laydown pads, parking lots);
- Material handling and transfer – loading, hauling, unloading, crushing, conveying;
- Open pit mining activities – drilling, blasting; and
- Closure activities such as covering the tailings, decommissioning of other mine areas, and scarification of roads.

Dust from buildings where people are working such as the mill, maintenance shop and warehouse is expected to be minimal due to the use of bag houses or equivalent means to control dust.

6. Dust Suppression

Dust suppression measures, which are considered to be typical of current mine practices and consistent with best management practices, are expected to achieve desired results through design, operations, and closure.

6.1 Design-Based Dust Suppression Measures

In assessing dust emissions associated with the Project, consideration was given to those mitigation measures that were considered integral in the mine design. Design-based means of dust suppression include:

- The mine site is compact thereby reducing the area where dust generation can occur;
- Dry stack tailings were selected as the preferred form of tailings. These will be trucked from the mill to a tailings storage area northwest of the mill[2];
- Roads were designed as narrow and short as possible while maintaining safe construction and operation practices. This reduces the surface area of roads and the potential to generate dust;
- To minimize dust during construction and operations, coarse sized rock is be used as much as possible in building roads, pads, and laydown areas;
- If possible, road construction will largely occur during the winter when the generation of dust is at its lowest;
- Sheds, enclosures, covers, and/or bag houses will be used on most crushing and processing equipment to limit dust emissions; and
- Most outside conveyer belts will have covers.

6.2 Operation-Based Dust Suppression Measures

Best management practices will be used to control and suppress dust emissions from the Project. Dust suppression during operations include:

- Overburden stripped in opening the open pits is anticipated to be prone to wind erosion, and will be stored within the core of the waste rock storage facilities;
- During landfill activities such as topping and capping, visual monitoring will occur and if necessary, water will be applied
- Roads will be regularly graded to mix excessive silt found on the road surface with the coarser materials located deeper in the roadbed. This will reduce the percentage of silt in the road surface with the benefit of reducing related dust;
- As needed, roads and travel areas will be topped with aggregate and stabilized, which will minimize erosion and dust emissions;
- Where appropriate, larger sized aggregate will be used on the road surface to replace material lost due to wind and water erosion;
- Water, Calcium Chloride, or an equivalent approved dust suppressant, will be applied as needed to reduce airborne dust and improve visibility on access, service, haul roads, pit ramps and other travel areas. This will remove a safety hazard;
- Communication with Rankin hamlet will occur every year to ensure the entire length of the AWAR is treated with dust suppression;
- The Itivia bypass road will not have any chemical dust suppressants applied. Only water will be applied on this portion of the road for dust suppression;
- Dust aprons will be used on open pit, production drills, where practical during all open pit drilling to control dust emissions;
- Should further rock crushing occur in the quarries along the access roads, the crushers location will be best shielded from the prevailing wind, preferably behind a high wall in the quarry so as to

[2] Details on the use of dry stack tailings and how dust arising from them will be mitigated can be found in Mine Waste Management Plan

reduce the quantity of wind-blown dust, and to have as much dust as possible fall within the bounds of the quarry;
- The maximum speed limit on the AWAR will be 50 km/hr but will be lower where required for safety reasons (e.g., approaches to bridges, intersections, etc.);
- The number of mine vehicles on the AWAR will be kept to a minimum (e.g., vans and buses are to be used to transport employees to and from the Rankin Inlet airport);
- Maximize the transport of materials from Itivia to the mine site in late summer when rain events are more common, and in the fall when the road surface is frozen and less susceptible to dust generation;
- Regularly inspect the road and undertake timely repairs to minimize the silt loading on the road surface;
- Avoid multiple handling of materials that have the potential to generate dust, where possible;
- Conveyor loads will be kept within designated load limits, and conveyor covers used, where practical;
- Stockpiles will be of a suitable height, width and slope to minimise wind effects;
- Employees and contractors will be encouraged to report excessive dust to their supervisor; and
- Contractors for activities that have the highest potential for dust generation are required to submit detailed work plans that indicate dust mitigating practices and procedures. This may include the modification of activities to reduce the dust created by their activities.

6.3 Closure-Based Dust Suppression Measures

Closure will include the following dust suppression measures:

- The tailings storage facility will be covered progressively, with an engineered cover, thereby isolating it from the environment and preventing dust generation;
- Other exposed mine areas subject to wind erosion will also be covered with waste rock;
- Open pits will be flooded;
- All roads will be scarified and bridges and culverts removed thereby making the roads impassable to large vehicles and associated dust generation. Scarification will also allow plants to establish on the former roads and, in doing so, prevent wind and water erosion; and
- During operations, obsolete roads will be closed and scarified.

7. Access, Service and Haul Roads

For the Phase 1 AWAR, Agnico Eagle committed to apply active controls on the road surfaces to reduce dust. These controls could include actions such as using water or applying chemical dust suppressants such as Calcium Chloride. Although literature does not provide a control efficiency for regular maintenance of the road surfaces, the commitment by Agnico Eagle to maintain the road surface is expected to have benefits with respect to the amount of dust generated (Agnico Eagle 2011b).

The nature of the road surface and the size distribution of the material, in particular the percentage content of silt and fine sand (2 µm to 75 µm), directly influences the potential to generate dust (Thompson

and Visser 2001). The greatest sources of dust on a mine site are the disturbance of granular surfaces, and this normally occurs when materials are handled or when vehicles pass over an unpaved surface[3]. Of the two, by far the largest source of dust is vehicle traffic on unpaved roads; this has been estimated to reach 70 percent in some instances (*Cecala 2012*). The mechanical grinding of surface materials on the road and their breakdown under the weight of vehicle wheels creates dust, while the air turbulence created by the vehicle causes dust to become airborne. The amount of dust generated along a road is dependent on the dryness of the road surface, the percentage of silt on the road surface, the number of vehicles, weight and vehicle speed, weather conditions[4], and maintenance of the driving surface.

The composition of the road surface will be analysed to determine what dust suppression measures will work best. Different types of road surfaces dictate different approaches to dust control. Kissel (*2003*) makes the following recommendations based on the particle size distribution of material on the road surface:

- *Gravel with few fines.* In gravel road surfaces with not enough fines, only watering will be effective. Chemical dust suppressants can neither compact the surface (because of the poor size gradation) nor form a new surface, and water soluble suppressants will thus leach.
- *Sand.* In compact sandy soils, bitumens, which are not water-soluble, are the most effective dust suppressant. Water-soluble suppressants such as salts, lignins, and acrylics will leach from the upper road surface. However, in loose, medium, and fine sands, bearing capacity will not be adequate for the bitumen to maintain a new surface.
- *Good size gradation.* In road surfaces with a good surface particle gradation, all chemical suppressant types offer potential for equally effective control.
- *Silt.* In road surfaces with too much silt (greater than about 20 to 25%), no dust suppression program is effective, and the road should be rebuilt. In high-silt locations, chemical suppressants can make the road slippery, and there is an inability to compact the surface or maintain a new road surface because of poor bearing capacity. Further, rutting under wet conditions requires that the road be graded, which destroys chemical dust suppressant effectiveness. If the road cannot be rebuilt, watering is the best option.

Optimally designed and maintained roads offer the best means of controlling dust but it does not remove the potential for dust generation completely. The potential for dust generation decreases significantly when road design and maintenance are combined with the application of water and/or chemical dust suppressants such as Calcium Chloride.

[3] Volume 5 of the Final Environmental Impact Statement Atmospheric, Environment and Impact Assessment, section 1.4 Emissions Estimation provides details on how dust emissions can be calculated for various mine sources (*Golder Associate 2013*).

[4]Humidity, frequency of days with rain, mean daily evaporation rates, and the prevailing wind speed and direction. Wind erosion contributes to road dust emissions, especially when strong winds combined with vehicle traffic moves the dust generated far afield.

7.1 Dust Suppression Using Water

Water remains the most readily available means of controlling dust in Nunavut. It is common at mine sites worldwide to apply water through fantail sprayers or spray bars attached to a haul truck or equivalent fitted with a large tank. Agnico Eagle recognises that water is only a temporary measure, and reapplications could be necessary to achieve the desired dust control efficiency[5]. The control efficiency of water applications is dependent on the amount of water applied, the time between re-applications, penetration depth of the water into the road surface, the traffic volume, prevailing weather conditions, and the state of the road surface (e.g., excessive fines over coarse material). All these variables need to be considered before selecting water to control dust from roads and other mine areas. If water is selected to suppress dust, Agnico Eagle will use it with a greater frequency near critical areas along the roads.

Watering the roads is only possible during frost-free days. In late spring, significant sublimation can be expected when the temperatures remain below freezing, which can lead to dry roads and significant dust potential. If water is applied while the temperature is below freezing, it will turn to ice on the road and pose a safety hazard for travel. Dust suppression using water or chemicals will not be possible at this time of the year.

7.2 Chemical Dust Suppression

Chemical dust suppressants offer advantages over water under the right conditions. They tend to have the benefit of a reduced treatment frequency over water. However, use of chemical suppressants under all conditions does not necessarily lead to improved dust suppression over that of water. Presently, only fresh water, seawater, DL10, calcium chloride, EK-35 and DUST-STOP are approved for use in Nunavut. Other chemical dust suppressants can be approved for use in Nunavut following their assessment by the Government of Nunavut's Environmental Protection Service.

Numerous types of chemical suppressants are available; broad categories that encompass those approved for use in Nunavut are as follows:

- Wetting agents are designed to increase the ability of water to adhere to and spread over the dust particle. This increases the bulk density of the particle and leads to agglomeration. Calcium chloride ($CaCl_2$) is one such wetting agent.
- Binders hold particulates together and can provide long-term dust suppression on roads. DL10, EK-35, and DUST-STOP are examples of binders approved for use in Nunavut (*GN 2014*).
- Crusting agents work best on inactive storage piles. They are reasonably long lasting, rain resistant, and wind proof. None are approved for use in Nunavut.

[5] Regular light watering is more effective than infrequent heavy watering (Thompson and Visser 2007).

Table C.1 provides a comparison of the advantages and disadvantages of using water, wetting agents, and binders for dust suppression.

Analysis of the road surface is considered when the decision on whether to use chemical dust suppressants , such as Calcium Chloride, is made. Agnico Eagle usage of calcium chloride is kept to a minimum to prevent damage to vegetation adjacent to the road and to mitigate the risk of creating an attractant to wildlife (salt lick effect). It is used selectively where it's more effective than water alone, and where it doesn't adversely affect the environment immediately next to the road. As calcium chloride is susceptible to leaching, Agnico Eagle is not using it within 30 metres of waterbodies or sensitive plant communities.

Table C.1. Comparison of Dust Suppressants

Dust Suppressant	Advantages	Disadvantages
Water	- no environmental impacts - readily available	- short term dust suppression, requires frequent re-application - works better than chemical dust suppressants on roads having greater than 20 – 25 % silt on the driving service or having a majority of sand - can cause water erosion if too much is applied
Calcium chloride	-effective in climatic areas when relative humidity greater than 30% -less frequent applications required than water	- possible impact on water and aquatic species when washed from the road and into the environment - soil salinization and impact on plant life; attractant for wildlife - not effective when road surface has greater than 20 – 25 % silt or has a majority of sand on the driving surface
Oil based binders (DL10)	- effective and long lasting	- may have adverse impacts on vegetation, soil, water and aquatic life
Organic binders (EK-35, DUST-STOP)	- effective and applied directly to road surfaces- Less frequent applications than water	- significantly more expensive to use than water - limited effectiveness if road has greater than 20 to 25 % silt on the driving surface, it is better to use water under this condition -Requires specialize equipment

Adapted from Alberta Environment 2012

As part of its Meliadine Update Technical Study Phase 2, 2015 Agnico Eagle plans to use saline groundwater as dust suppressant (Agnico Eagle 2015) beginning in summer of 2019. If this proves not to be sufficiently efficient, Agnico Eagle will continue to use calcium chloride as the product is considered to work best at the Project. If another non-approved product is considered, AEM will request that the Department of Environment carry out an assessment.

7.3 Planned Dust Suppression

During the peak season where dust suppression is required, Agnico Eagle will complete daily inspections of the road and, on an as-needed basis, will apply water and a mix of $CaCl_2$ and water along the entire length of the AWAR. At the present time only water can be used on the Bypass Road.

Another chemical suppressant (Dust Stop) was tested to evaluate the performance in terms of dust suppression but it did not show to be as effective as calcium chloride. It is Agnico Eagle's intention to use best management practices concerning dust suppression along all of its roads.

7.4 Maintenance of the Road Surface for Dust Suppression

Agnico Eagle recognizes that inspection precedes maintenance and a good inspection program will lead to the early identification of areas of the roads where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface (Agnico Eagle 2011a). It will also lead to less dust generation.

The amount of dust generated is a function of the composition of the road surface. If there is a significant percentage of silt size particles on the road surface, one can expect greater dust generation. Likewise, any reduction in the percentage of silt on the road surface leads to an equivalent reduction in dust. Grading roads provides relief from excessive dust by mixing silt sized material on the road surface with coarser road materials found deeper in the roadbed.

Unpaved roads and travel areas are topped with new aggregate and graded on an ongoing basis, with the goal of improving safety, minimizing erosion, and reducing dust emissions. This is required as unpaved road constantly lose surface material through wind and water erosion, and from vehicles throwing material off the road.

8. Thresholds for Initiating Dust Suppression

Table C.2 outlines the thresholds Agnico Eagle uses at the Project to initiate mitigation measures.

Dustfall measurements are regularly collected along the roads and other parts of the mine site using passive sampling methods to record the quantity of dust collected over time, and to allow the success of mitigation measures to be quantified. The monitoring data is used to adjust mitigation measures to improve dust management strategy

Table C.2. Thresholds and Mitigation Measures

Location	Frequency	Indicator	Threshold	Mitigation Measure
Itivia laydown and Oil Handling Facility	routine inspection by Itivia supervisor during summer period.	- measured dustfall. - deterioration of visibility along road.	- deterioration of visibility. - safety concern. - dust reaching Hamlet.	- use water and/or calcium chloride to control the dust.
AWAR and bypass road	regular weekly or more frequent inspection by road supervisor during the late spring and summer periods.	- measured dustfall. - deterioration of visibility along road.	- deterioration of visibility. - safety concern. - high dust levels evident near significant waterbodies.	- use water and/or calcium chloride (AWAR road only) in areas requiring attention. - grade the road surface. - add new granular material to the road surface.
Mine site, including travel areas, haul and service roads	regular weekly or more frequent inspection by site services supervisor during the late spring and summer periods.	- measured dustfall.	- deterioration of visibility. - safety concern. - dust reaching Meliadine Lake.	- use water and/or dust suppressant on exposed surfaces such as parking areas, pads, haul, access and service roads, dry stack tailings. - review mitigation measures in place. - add new granular material to surface, - if applicable, grade the surface. - temporarily lower speed limit on site.
Ramps in the open pits	regular inspection by pit supervisor during summer period.	- deterioration of visibility.	- deterioration of visibility. - safety concern.	- use water as a dust suppressant.

Table adapted from Baffinlands 2010

8.1 The Role of the Road Supervisor

The road supervisor[6] conducts periodic inspections (minimum weekly) of roads to ensure that they are maintained for safe travel of personnel, equipment, and supplies. These inspections are recorded and any deficiency recorded and followed up by a corrective plan.

In areas or times identified by the Agnico Eagle road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition could impact waterbodies or the Hamlet, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, addition of aggregate to the road surface, watering of the road surface and/or using calcium chloride. The bypass road will receive special attention and extra dust suppression measures may be taken to avoid dust impinging on Nipissar Lake.

Adaptive management will be used when inspections or monitoring shows the generation of dust to be greater than anticipated and that additional mitigation measures are required. As well, if dust is unexpectedly generated where it was not anticipated, adaptive management will be used to understand the source and find ways to reduce or eliminate the same.

9. Dust Management Plan Update

The Plan will be reviewed annually and updated if there are changes in operations and/or technology.

[6] The open pit supervisor will do the same for the open pit ramps.

10. References

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OIL HANDLING FACILITY

OIL POLLUTION EMERGENCY PLAN

For
Meliadine Mine Fuel Farm in Rankin Inlet

JANUARY 2019
Version 2

EXECUTIVE SUMMARY

This document presents the Oil Pollution Emergency Plan for Agnico Eagle Mines Limited (Agnico) Meliadine Division. This plan is pursuant to the Canada Shipping Act 2001; and all the subtending regulations.

Oil Pollution Emergency Plan (OPEP) designates lines of authority, responsibility, establishes proper reporting and details plans of action in the event of a spill. This plan applies to the operational phase of the fuel transfer which takes place at Agnico Eagle Ltd.'s Itivia Site Fuel Storage and Containment Facilities and Oil Handling Facility located at latitude 62°48'16.66" N and longitude 92°05'5.32" W.

A hard copy of the OPEP is available at the Rankin Inlet Marshalling facility during the transfer operations.

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ᐅᖅᓴᒥᐅ ᑐᐊᕆᓇᖅᑐᑕᓂᔪᓐᓇᑦ ᕿᓂᓇᐅᑎ (OPEP) ᐱᓕᒃᓴᖅᑎᑦᑎᔨᖅ ᐱᔨᓐᓇᖅᑎᑦᑎᔨᓂᒃ, ᐱᓕᒃᓴᐅᑎᑕᓐᓂᒃ, ᓴᖅᑭᑦᑎᕿᓗᓂ ᐅᓂᕿᑲᑕᐅᓇᓂᕐᒥᒃ ᐊᒻᒪᓗ ᓇᓗᓇᐃᓕᖅᓴᓪᓚᔨᑕᐅᖅᓱᓂ ᕿᓂᓇᐅᑎᓂᒃ ᖃᓄᐃᑕᐅᔨᓂᐊᓂᓂᔪᓐᓇᑦ ძᐃᔨᖃᖅᕿᑦ. ᕿᓂᓇᐅᑎ ᐊᑐᖅᑐᖅ ᐊᐅᓪᓚᑦᑎᑎᓂᓂᓂᔫᓂᕐᒥᒃ ᐅᖅᓴᓪᓚᑐᓂᒃ ᐃᓕᑎᓂᓂᔪᓐᓇᑦ ᐊᒻᒪᓗ ᐃᓕᑦᑎᓂᒃ ᐃᓂᓐᓇᑎᑦᑎᓂ ᐃᓂᐅᓴᖅᑎᓂ ᐅᖅᓴᓪᓚᒋᔨᖃᐃᓐᓇᓂᑦ ᐊᒻᒪᓗ ᐅᖅᓴᓪᓕᓇᖅᑎᑦᑎᓂᒃ latitude 62°48’16.66” N ᐊᒻᒪᓗ longitude 92°05’5.32” W.

ᐊᓕᓚᔨᓪᓚᓂᓂ ᐊᐱᔨᖓ OPEP ᒪᓂᒪᔨᖅ ᑲᖏᖅᓯᓂᓕᖅᑎᑦ ᐅᓪᓚᖅᑐᐃᐧᕆᔨᑎᑦ ᓄᓇᑎᓂᖅᑐᑦ ᐊᐅᓪᓚᖅᑎᑎᓂᖅᑐᑦᑎᓪᓗᑎᑦ.

ACRONYMS

Agnico	Agnico Eagle Mines Limited
DFO	Department of Fisheries and Oceans Canada
ECC	Emergency Control Center
ECCC	Environment and Climate Change Canada
ERT	Emergency Response Team
ERP	Emergency Response Plan
Fuel	P50 Arctic Grade diesel fuel
IMO	International Maritime Organization
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
KIA	Kivalliq Inuit Association
MARPOL	*The International Convention for the Prevention of Pollution from Ships,* 1973, and
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
PPE	Personal Protective Equipment
SCP	Spill Contingency Plan
SOPEP	Ship Oil Pollution Emergency Plan
SMP	Spill Management Plan
TC	Transport Canada
TCMSS	Transport Canada Marine Safety & Security
TEU	Twenty-foot equivalent unit

DISTRIBUTION LIST

Agnico - Environmental Superintendent

Agnico – General Mine Manager

Agnico – Health and Safety Superintendent

Agnico – Energy and Infrastructures Superintendent

Agnico – General Services Superintendent

Agnico – ERT Emergency Measures Councilor

Rankin Inlet – Rankin Inlet Hamlet Office

Rankin Inlet – Fire Department

Coastal Shipping Limited – General Manager

Transport Canada – Marine Pollution Officer

Canadian Coast Guard Environmental Response

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
0	17/07/17	All	All	Comprehensive plan for Agnico's Rankin Inlet Fuel Farm Facilities
1.1	18/09/17	5.3, 10.2, Appendix H	11, 33, 217	Additions and revisions in response to the comments by Transport Canada officer
1.2	18/02/07	All Document control 3.2.1 4.2.1 5.4 Figure 3 Table 5	All 5 4 8 12 13 24	-Version and date updated, general review and revision -Environment general supervisor updated -Added reference to spill response seacans located along the AWAR -Removed "A fuel dispensing pad area completed with a dispensing unit will be located in a lined facility with a provision to capture any and all spills at the fueling area and direct them to a containment area provided at the tank farm." – to be implemented through future planning -Added "or equivalent, ie. Plastic tote" to options for spill containment at OHF manifold -Added environment department to list of security contacts -Updated Agnico contact list
1.3	18/07/20	All	All	Fuel Handler
2	19/01/03	All Appendix I	All	-Version and date updated, general review and revision -added mock spill training in the summer of 2018

Prepared By: Agnico Eagle Mines Limited - Meliadine Division

Approved By: 

Kevin Buck
Environment General Supervisor

AGNICO EAGLE

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SECTION 1. OIL HANDLING FACILITY DECLARATION

Pursuant to paragraph 168(1) (b) (i) of the Canada Shipping Act 2001, Agnico Eagle Mines Ltd. (Agnico) has signed an Oil Handling Facility Declaration. This Declaration can be found posted at the Oil Handling Facility (OHF).

SECTION 2. GENERAL INTRODUCTION

The Oil Pollution Emergency Plan (OPEP) outlines the necessary actions to stop or minimize the potential loss of fuel at Agnico Eagle Mines Limited's Itivia Site Fuel Storage and Containment Facility located in Rankin Inlet, Nunavut during the ship-to-shore fuel transfer. Additionally, it provides direction to Agnico personnel and/or contractors at the laydown and tank farm areas, and to Agnico's Emergency Response Team (ERT) for emergency spill response situations, describes oil pollution scenarios, defines the roles and responsibilities of management and responders; and outlines the measures taken to prevent spills. The purpose of the OPEP is to minimize potential health and safety hazards, environmental damage and cleanup costs.

2.1 Fundamental Principles

The following OPEP is submitted to comply with the Canada Shipping Act 2001 and all the subtending regulations and to outline the appropriate spill response protocol during fuel transfer operations at the Rankin Inlet OHF. A hard copy of the OPEP is located on site for reference and review during transfer operations. This OPEP is reviewed annually and updates are provided to Transport Canada Marine Safety & Security (TCMSS) for compliance prior to every shipping season. The following priorities shall be taken into account when responding to an oil pollution incident and in the following order:

1. Safety of the workers;
2. Safety of the OHF;
3. Safety of the community of Rankin Inlet;
4. Prevention of fire and explosion;
5. Minimize of the oil spill;
6. Notify and report the oil pollution incident to associated Governing bodies;
7. Minimize the environmental impact of the spill;
8. Complete clean-up from the oil pollution incident.

2.2 Legislative Requirements

This plan was prepared in accordance with federal legislation listed below, which lists legislative instruments applicable to Agnico's Itivia Site Fuel Storage and Containment Facility. All requirements found in the Canada *Shipping Act*, *2001*, ss. 168 are laid out in the Meliadine Mine site OHF Concordance Table which will be submitted to Transport Canada (TC) as a stand-alone document.

The OPEP complies with the requirements for procedures, equipment and resources as set out in the *Canada Shipping Act* (s.s. 660.2(4)) specific to a fuel handling facility - the bulk incoming transfer of fuel from ship-to-shore and spill scenarios directly relating to this operation.

The following standards and regulatory requirements have been reviewed in preparation of this document:

- Canada Shipping Act;
- Response Organizations and OHFs Regulations;
- Vessel Pollution and Dangerous Chemical Regulation;
- Environmental Response Arrangements Regulations;
- OHFs Standards (TP 12402E);

- Response Organization Standards (TP 12401);
- Arctic Waters Oil Transfer Guidelines (TP 10783);
- Environmental Prevention and Response National Preparedness Plan (TP 13585);
- Release and Environmental Emergency Notification Regulations;
- Guidelines for reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants;
- Requirements of the Central & Arctic Regional Response Plan; and
- Storage tank System Regulations

2.3 Related Documents

Management and monitoring plans for the Meliadine Project and that provided input to the Oil Pollution Emergency Plan include the following:

1. Spill Contingency Plan;
2. Emergency Response Plan; and
3. Shipboard Oil Pollution Emergency Plan[1].
4. Shipping Management Plan

The cornerstones of contingency planning for Agnico are the Spill Contingency Plan and the Oil Pollution Emergency Plan. These, coupled with the Emergency Response Plan and the Shipping Management Plan, describe the processes to be followed in responding to a spill. The OPEP on its own provides the necessary information in the event of a mishap where fuel is lost during the transfer of fuel from a tanker vessel to the Fuel Tank Facility.

The OPEP complements the Spill Contingency Plan and it should not be construed as superseding it. The Spill Contingency Plan addresses a wider scope of operations stretching 35 kilometers from the Meliadine mine site in the north to the infrastructure at the Itivia Site Fuel Storage and Containment Facilities. The OPEP strictly covers the transfers of fuel from ship to OHF.

2.4 Meliadine Mine Oil Pollution Emergency Plan

This Plan is a working document that will be reviewed annually and updates will be provided to TCMSS for compliance prior to every shipping season.

This plan specifically centers on the activities in ship-to-shore transfer of fuel from a small tanker delivering fuel to Agnico's Itivia Site Fuel Storage and Containment Facility constructed in Rankin Inlet. On site personnel at the Facility are expected to respond to spill incidents (generally smaller than 1 m^3) that can be contained and cleaned up without assistance, while the Emergency Response Team will respond to larger spills.

Fuel is being delivered to Agnico's Itivia Site Fuel Storage and Containment Facility by Coastal Shipping Limited, a Division of the Desgagnes Group. Fuel is stored within the existing tank farm owned and operated by Agnico. The Shipboard Oil Pollution Emergency Plan (SOPEP) is the responsibility of the shipping company. The outline of the SOPEP prepared by Coastal Shipping Limited can be found in Appendix A – 1.1.

[1] *The Shipboard Oil Pollution Emergency Plan (SOPEP) contains all information and operational instructions as required by the "Guidelines for the development of the Shipboard Marine Pollution Emergency Plan" as developed by*

the International Marine Organization. Desgagnes, the shipping company, is responsible for this Plan.

SECTION 3. PLANNING STANDARDS

3.1 Facility Category

OHFs are categorized according to their maximum oil transfer rate in cubic meters per hour, in respect of the oil product loaded or unloaded to or from a ship, as follows (Table 1):

Table 1 - Category of OHF

Category of OHF	Maximum Oil Transfer Rate (cubic meters/hour)
Level 1	150
Level 2	750
Level 3	2 000
Level 4	More than 2 000

The product transfer rate (Diesel) for the Agnico's Itivia Site Fuel Storage and Containment Facility OHF at Rankin Inlet is 400 m^3/hr. As indicated in the OHF Standards TP 12402, this flow rate requires the onsite spill response capacity to meet a Level 2. To do this, the OHF will have the equipment and resources to respond to a 5 m^3 spill within the required timelines specified in the Response Organization and OHF Regulations:

1. Contain and control in one hour of spill detection; and
2. Commence cleanup within six hours after spill detection.

3.2 General Planning Guidelines

3.2.1 Response Time Standards

Agnico and contractor personnel at Itivia Site Fuel Storage and Containment Facility have appropriate training to respond to spills, if it is safe to do so (see Table 8). The material onsite can be deployed within one hour to contain a spill of 5 m^3 or less, unless deployment within one hour will be unsafe. Generally, for a spill greater than 1 m^3, the OPEP and the Emergency Response Plan (ERP) will be activated and the Emergency Response Team (ERT) located at Meliadine Mine site will come in Rankin Inlet to help. Realistically, the ERT can be on site within 60 minutes (or less) ready to help for the clean-up activity. If the spill is greater than 5 m^3, material from the spill response seacans along the AWAR (km 7 and 18) and the Meliadine Mine site will be required and will be brought to the Itivia OHF within 60 minutes to finalize the containment (if not complete) and recovery of the oil pollution incident.

3.2.2 On-Water Recovery

Agnico has a boat in a sea can at the Itivia Site Fuel Storage and Containment Facility that is ready to be deployed in case of an emergency situation.. All personnel involved in a response situation need to have or complete the pleasure craft operator's certification.

If additional water crafts are required to help with the containment of a spill from the OHF local resources

such as Sarliaq Holdings Ltd and Inuksuk Contracting. Contact info for these companies can be found in Table 6.

3.2.3 Dedicated Facility Spill Response Equipment

Agnico has a sea can with spill response equipment at the Rankin Inlet shore within Agnico's Marshalling area and includes booms that can rapidly be deployed to limit the spread of any spill on water. The list of equipment can be found in Table 2. The spill supplies and resources are in place to respond to a 5 m^3 spill within the required timelines as specified in the Response Organizations and OHF Regulations. These sea cans are inspected before each transfer season to ensure that all the spill response material and PPE are there and stored in a manner that is organized and accessible in order to comply with regulatory requirements and allow an efficient spill response.

3.2.4 Transfer Conduit

The transfer conduit or hose that is used to transfer fuel from Coastal Shipping Vessels to the Agnico Rankin Inlet Fuel Farm OHF are pressure tested annually by Coastal Shipping according to the regulation prior to it being placed into service. A copy of the annual pressure tests conducted can be found in Appendix B. The transfer conduit will always have a bursting pressure of at least 4 times its maximum design pressure and the design pressure will be clearly marked on the conduit.

3.2.5 MEL-ENV-0029: OHF / Ship to Shore Fuel Discharge Procedure

Agnico has created an internal procedure to ensure all planning and precautions are in place prior to the transfer of any fuel from the vessels to the OHF. This procedure can be found in Appendix C along with the Pre-discharge and Spill Response Sea Can checklist.

SECTION 4. RANKIN INLET MARSHALLING AREA AND FUEL STORAGE FACILITY

4.1 General Overview and Site Description

Agnico Eagle's proposed tank farm and laydown area is located at Itivia in Rankin Inlet on Melvin Bay at latitude 62°48'16.66" N and longitude 92°05'5.32" W, map sheet 055/K16. Its location is shown on Figure 1-1. Two (2) fuel storage tanks are installed at the Rankin Inlet Itivia fuel farm. The site location of the 20 million and 13.5 million liter tanks (tank #1 and #2 respectively) is shown on Figure 2 below. Tank #1 was completed in 2018; Tank #2 was erected in 2017.

Figure 1 - Location of the Community of Rankin Inlet

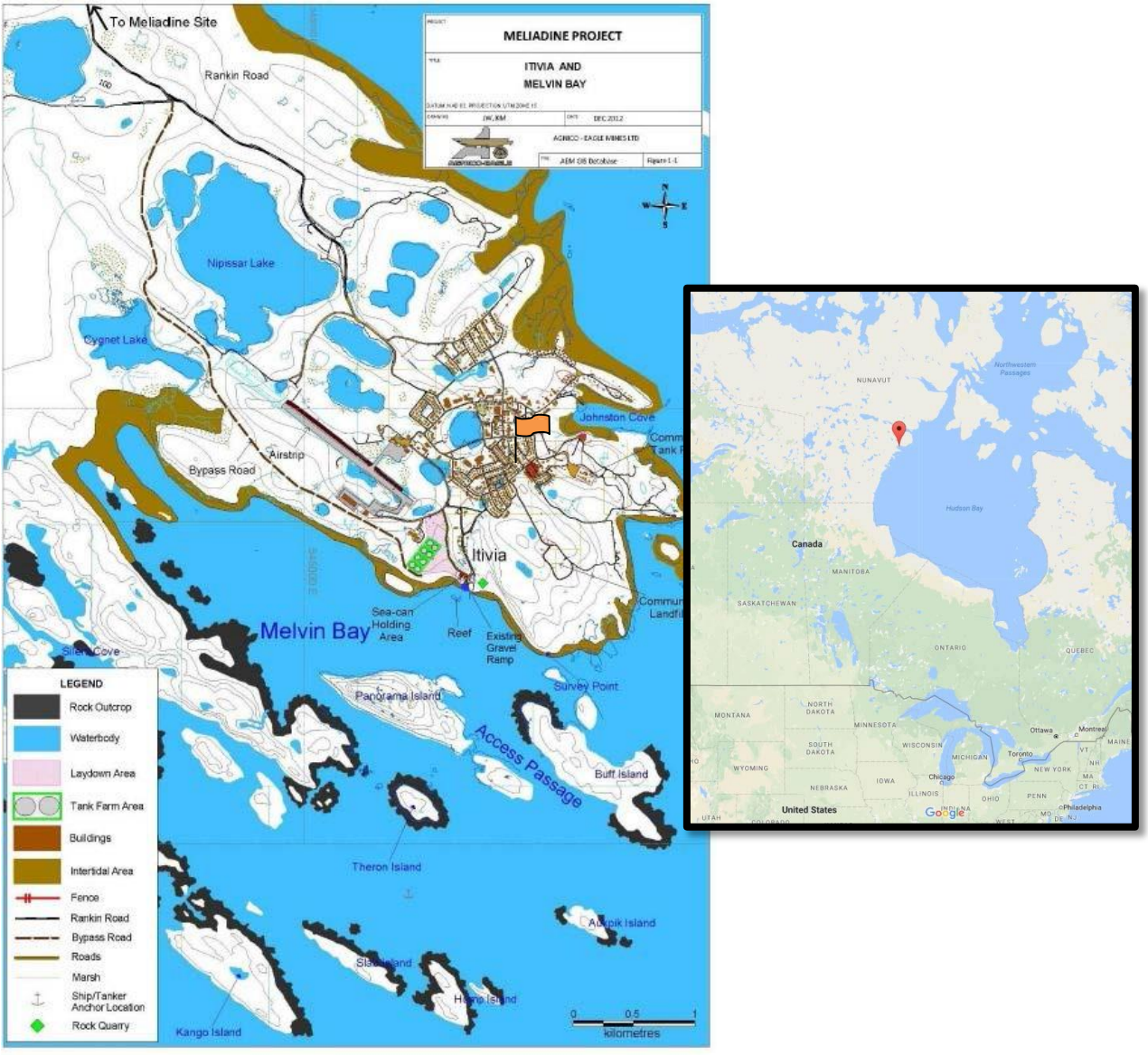
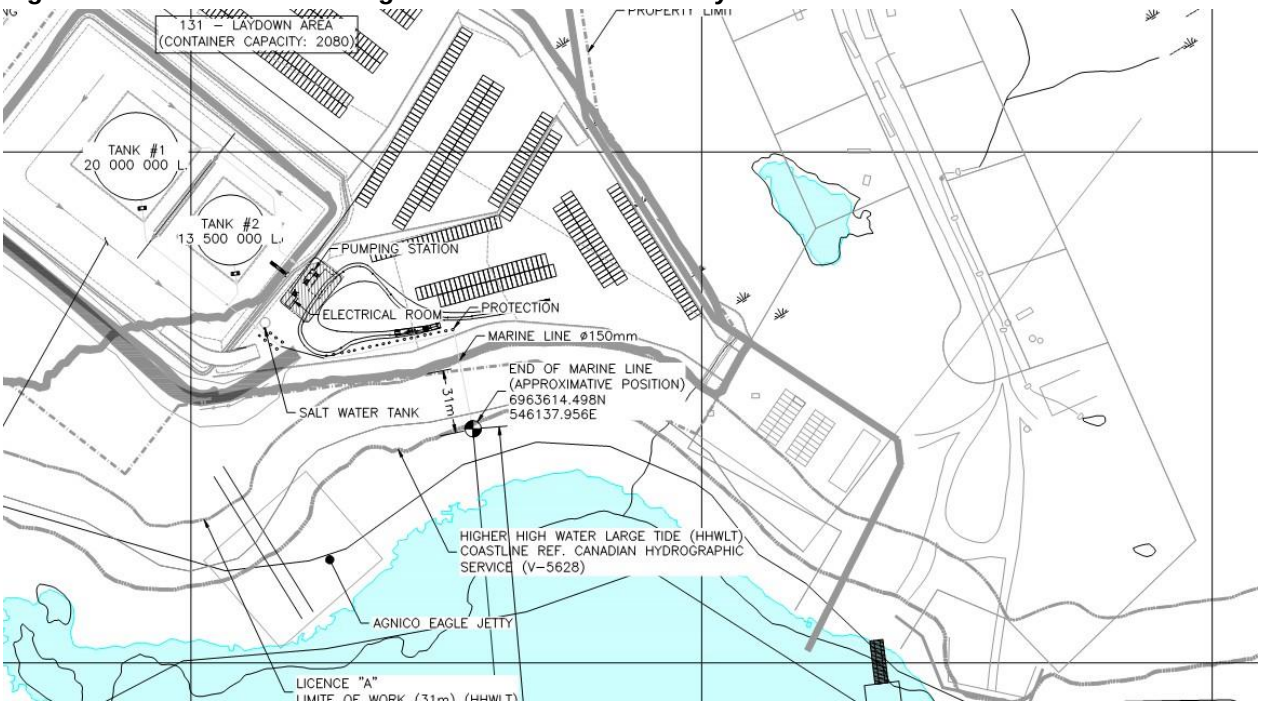


Figure 2 - Itivia Site Fuel Storage and Containment Facility



4.2 Fuel Storage Facilities Infrastructure

4.2.1 P-50 Fuel Tanks

The diesel fuel tanks are contained within an impermeable lined and bermed area. The steel fuel tanks were field-erected and built to API-650 standards. The bermed area is capable of containing 110% of the volume of the largest storage tank. The impermeable lined and bermed cell has the following:

- A granular base for the tank completed with an impermeable LLDPE liner system and granular dikes;
- A tank complete with the required appurtenances such as stairs, base manholes, water draw offs, re-supply nozzle, suction nozzle, tank lighting, tank level monitoring, roof manhole, manual gauge hatch, tank temperature and P/V vent;
- Piping for unloading and loading; and
- Site lighting via fixtures mounted from the dispensing building.

The Tank Farm Facility is designed to meet the following standards:

- National Fire Code 2010;
- *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* – 2008; and
- Canadian Council of Ministers of the Environment, "*Environmental Code of Practice of Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied*

Petroleum Products – 2003 (Updated in 2013) (PN1326)".

The OHF is constructed and operated in accordance with TC Arctic Waters Oil Transfer Guidelines (TP 10783E) and OHF Guidelines (TP 12402E).

4.3 Rankin Inlet Shoreline and Marine Characteristics

The following Rankin Inlet Shoreline and Marine Characteristics were gathered during the Environmental Impact Assessment that was performed prior to construction of the Rankin Inlet Marshalling facility and Tank Farm.

4.3.1 Topography

The bulk fuel storage area is located south of the residential area of Rankin Inlet, and within the industrial area of the community of Rankin Inlet, south of the Rankin Inlet Regional Airport. The OHF sits on a terrace parallel with the shoreline of the coast of Hudson's Bay, the bay in which Rankin Inlet is located is known as Melvin Bay. There is a gradual slope (5 to 10% grade) toward Melvin Bay with an approximate elevation change of 3-5 m from the OHF to the coastal shoreline. The Melvin Bay shoreline is gently sloping, well-drained, very rocky, comprised of boulders and rock.

4.3.2 Flora and Fauna

There are no trees and few shrubs in the area surrounding the bulk fuel storage facility. The site is covered by low-lying vegetation; predominated by grassy hummocks, dwarf willow, sedge, green moss and lichen.

Arctic ground squirrels, ptarmigans and songbirds inhabitthe area surrounding the bulk fuel storage facility. Lake cisco, lake trout, arctic char, lake whitefish, round whitefish, slimy sculpin and stickleback are predominant species found in Hudson Bay in the vicinity of Rankin Inlet.

4.3.3 Tides and Currents that Prevail at the Facility

There is a general cyclonic (counter clockwise) current in Hudson Bay with mean monthly residual currents of approximately 4 to 6 cm/sec. In Hudson Bay, stronger currents occur in summer than in winter and more variability occurs at the surface than at depth. Based on the navigation charts prepared by Canadian Hydrographic Service, flow through the Access Passage into Melvin Bay can reach approximately 26 cm/s (0.5 knot; CHS 1997). Tidal range is about 4.6 metres at Panorama Island in Melvin Bay.

4.3.4 Meteorological Conditions Prevailing at the Facility

Monthly meteorological data has been collected from 1981 to 2009 at the Rankin Inlet A climate station, which is a Meteorological Service of Canada climate station. Snow and rain are combined to give monthly average precipitation. The prevailing winds for the area are generally from the north to north-west and average 23 km/h.

4.3.5 Surrounding Area Environmental Sensitivities

The hamlet of Rankin Inlet is situated on the Kudlulik Peninsula which protrudes into Rankin Inlet of Hudson Bay. Rankin Inlet itself has three (3) main rivers entering it: the Diane River in its northwest, and the Meliadine River and Char River in the northeast. Melvin Bay is fringed with drying flats on the north side and encumbered by islands, islets, reefs and shoal water. The access passage is mostly bedrock.
Itivia is situated on the northeast shore of Melvin Bay as shown in Figure 1. Itivia has an intertidal zone of up to 56 metres with the substrate predominately comprised of 70% gravel/cobble, 20% fines and 10%

boulders. The substrate at this location was strongly influenced by the addition of gravel to develop the harbour's boat launch. In the open water season, Itivia provides a place for residents to moor and launch their boats. A few cabins are situated across Melvin Bay from Itivia but otherwise there are no buildings on the shore. Itivia is used for the loading and unloading of community supply vessels. In the winter, it is used by residents for snowmobile access to the sea ice in Melvin Bay and beyond.

Melvin Bay has a typical biological assemblage of macrophytes, plankton, zooplankton, benthic invertebrate and fish found elsewhere in this area of Hudson Bay. Near shore macrophyte coverage around Melvin Bay is sparse and is predominately rockweed (Fucus spp.) and kelp (Laminaria spp.). Phytoplankton are predominately dinoflagellates while the zooplankton community is more variable. Incidental invertebrate species are observed and include amphipods, barnacles, unidentified bivalves (e.g., mussels, clams), winkles (Littorina sitkana), ascidians (sea squirts), and unidentified crab species. Arctic char were not captured in Melvin Bay during the baseline survey. The predominate fish was Greenland cod followed by slender eelblenny and fourhorn sculpin.

SECTION 5. SITE ACTIVITIES

5.1 Nature of the Oil Product

The main fuel stored at the Agnico's Rankin Inlet Fuel Farm is P50 diesel. Appendix D includes the MSDS for Diesel. All other fuels such as gasoline, Jet-A and possibly other grades of diesel are purchased in drums or 1 m^3 totes and brought to the mine site for storage at the Itivia Site Fuel Storage and Containment Facility, or purchased and brought to site from a supplier or contractor in Rankin Inlet.

5.2 Bulk Transfer

The tankers delivering diesel fuel are anchored within Melvin Bay. From there, transfer hoses (Conduit) are connected to a shore based pipeline for transfer of P-50 diesel fuel to the diesel tank farm.

Ballast are not required for the inward voyage as the tanker arrives at Rankin Inlet loaded with diesel fuel. After transferring the fuel to the tank farm, the tanker takes on ballast in its segregated ballast compartments before sailing out.

Due consideration is given to prevailing and expected wind, weather and tide conditions when undertaking ship-to-shore fuel transfers.

The tanker is discharging at a rate of 400 m^3/hr. Communications between the shore and the tanker is maintained throughout to ensure the safe transfer of the fuel and to avoid the overfilling of the tanks. The ship-to-shore transfer procedure being use is similar to the one used at communities throughout Nunavut.

5.3 Measures to Minimize a Diesel Pollution Incident

The small tanker is anchored offshore in water of sufficient depth to allow for draught and tidal changes during transfer.

The transfer of the fuels uses sound, well-rehearsed practices, including an adequate number of trained and alert personnel, have sufficient materials, and use well maintained, thoroughly tested equipment. A team of trained personnel on the tanker is in charge of the tanker fuel transfer equipment, while an onshore team is in charge of the land based transfer equipment. Agnico has at least 2 trained personnel on the land to observe for any leak detection: a third party contractor (Intertek) and the Rankin Inlet Supervisor. The role of the third party contractor is to apply procedure and oversee operation during the fuel transfer. To do this, the third party contractor needs to come on site at least one (1) day before the first day of transfer to receive the appropriate training given by the Environmental Department. Fire-fighting, spill response equipment, and supplies are located on the tanker and onshore near the transfer point as required by TC. This includes readily available absorbent material (including absorbent pads) at the flexible hose connections on deck and onshore to quickly address minor spills at predictable minor spill locations. Additionally, Agnico placed a sea can with spill response supplies (including boat) and equipment at the Itivia Site Fuel Storage and Containment Facility area where it can quickly be accessed in the event of a spill.

Four-inch (10 cm) steel piping able to accommodate a flow rate of approximately 400 m^3/hr leads down to the shore from the diesel tank farm. Conduit from ship-to-shore are connected to the fuel-receiving manifold located onshore using a dry-break coupling(s).

- Complete checklist before / during transfer for the on-land responsible (See Appendix E);
- Complete checklist, provide by Desgagnes, with vessel captain before transfer begin (Appendix E);
- Complete inspection / inventory of spill response sea can before transfer;
- During the transfer, regular monitoring are undertaken for detection of incipient spills and leaks between the tanker and the tank farm;
- Radio test before transfer and at hour intervals during transfer between the personnel on land and the captain of the vessel
- Transfer operations will be suspended should any leak be detected or filling alarm are activated;
- The onshore area and ship deck are well-lit as fuel transfers could continue around the clock;
- Have a good knowledge of the OPEP requirement and protocol to follow in case of a spill by receiving a training / review each year before the transfer season; and
- The regular update of the OPEP.

During the ship-to-shore transfer, Agnico has competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew. Should problems arise, the ship can be called to shut down the transfer and onshore piping will be closed down. In the event of a spill that escapes the containment boom, diversion booming will be deployed to minimize migration of a spill throughout Melvin Bay. Adequate lighting is in place during all transfers, to allow for proper inspections of transfer locations around the clock. The lighting system intensity is not less than 54 lx at each transfer connection point of the vessel and OHF and a lighting intensity not less than 11 lx at each transfer operation work area around each transfer connection point of the vessel and OHF.

For more information, please refer to Appendix C: MEL-ENV-0029: OHF / Ship to Shore Fuel Discharge Procedure.

5.4 Permanent Containment Structure

At the connection of the ship's conduit to the OHF manifold, a permanent containment structure was erected for the transfer of product. This structure is capable of holding ~400 L of liquid in the case that there is a leak at the flange or residual drips out of the conduit or hard wall pipe.

Spill "pop-up" pools/secondary containment berms will be in place under each joint for the conduit used to fill the Fuel tanks during fuel transfer. These pop-up pools/berms are only capable of holding 20-50 L of fuel and are in place to catch residual and be a first line of defense in the case of a leak.

SECTION 6. MELIADINE RESPONSE TO EMERGENCIES

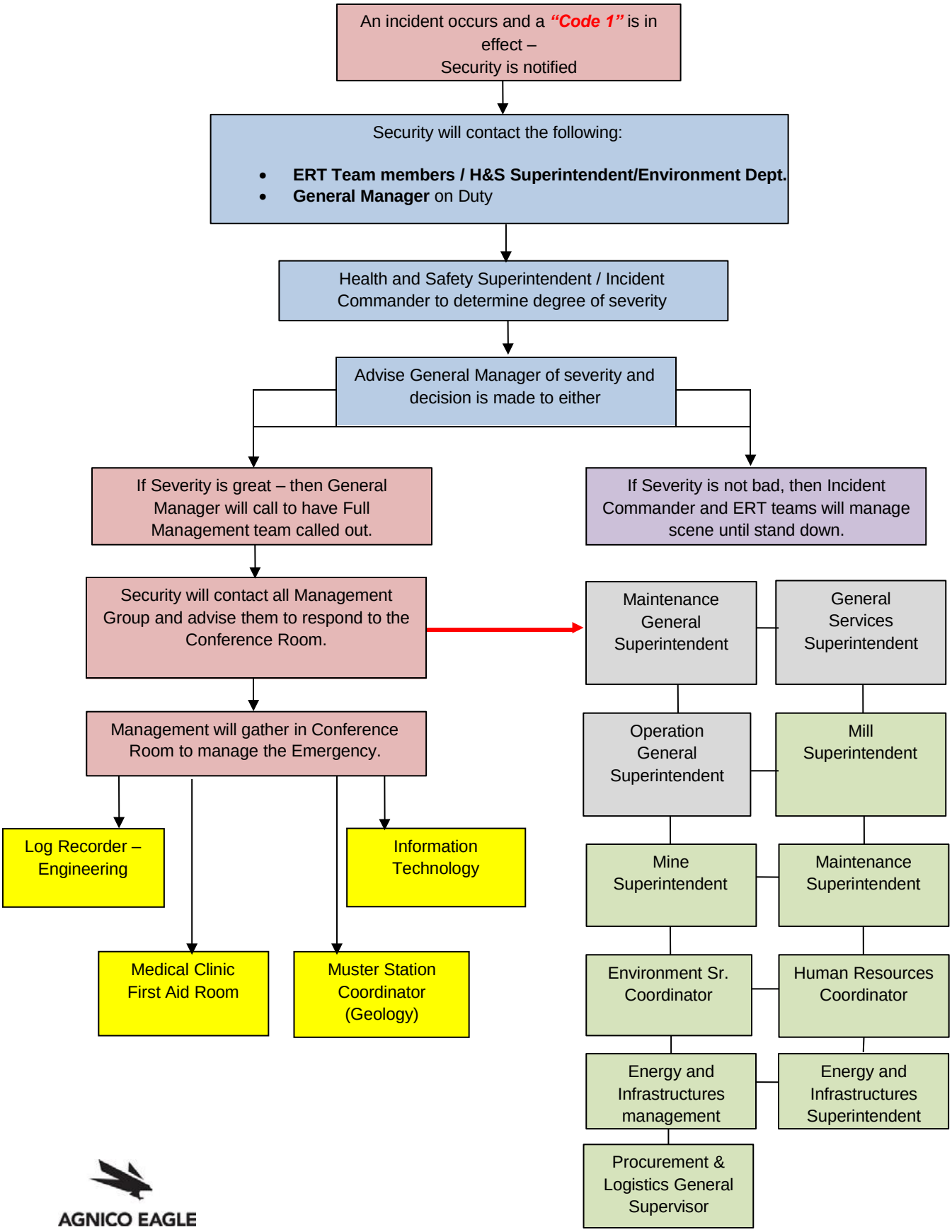
The Itivia Site Fuel Storage and Containment Facility OHF is considered Level 2 Handling facility as indicated in the OHF Standards TP 12402. With a transfer rate of ~400 m^3/hr, Agnico's OHF must have the spill response capacity to respond to a minimum of a 5 m^3 spill.

6.1 Response Management Structure

Agnico has an Emergency Response Team (ERT) at the Meliadine site trained and responsible for controlling Level 2 or greater spills at the Itivia Site Fuel Storage and Containment Facility, and for assisting with medical and other emergencies that may occur at the mine site or the OHF.

Figure 3 depicts the Response Management System.

Figure 3. Response Management System



6.2 Logistics and Planning

The Emergency Measures Counsellor (EMC) ensures that site drawings and equipment lists are posted in key locations throughout the site so that important information is always readily available. This includes the following:

- Location and isolation points of energy sources;
- Location of emergency equipment (e.g., fire water pumps, fire extinguishers, monitors, self-contained breathing apparatus);
- Emergency procedures outlines, such as specialist firefighting, chemical neutralization;
- Location of equipment for combating pollution (e.g., booms, pumps, absorbents, dispersants);
- Availability of internal and external emergency medical support (e.g., hospitals, clinics, ambulances, medical supplies, personnel with medical or first aid training);
- Location of toxicity testing facilities (e.g., gas and water);
- Location of wind direction / speed indicators;
- Directions on how to contact the local or regional weather forecasting service;
- Location of personal protective equipment (PPE) and directions on its proper use; and
- Location of first aid stations and muster areas.

The Incident Commander, EMC, and Health and Safety Superintendent know where, throughout the project site, all of this information is posted and where emergency equipment is stored. These individuals are also trained in the proper use of emergency equipment.

SECTION 7. EQUIPMENT AND PPE

The following sections describe the items that are available in the case of a spill at the Agnico Eagle Mines Limited's Rankin Inlet Fuel Farm OHF. Equipment has been classified into items available for spill sizes either up to or greater than 5 m^3. However, any and all means will always be used to respond to a spill in a timely manner and ensure a prompt clean-up of any spill.

7.1 OHF Response Equipment for spills up to ~5 m^3

The following equipment (Table 2) is available right at the OHF during open water season in a sea can designated for ***Environmental Emergency*** and can be deployed on scene within one hour, if it is safe to do, to contain and control the spill.

Table 2 - Material available in the Spill Response Sea Can at Agnico's OHF

Agnico Eagle Boom Sea Container		
Line #	**Description**	**QTY**
1	Anchor Set; 25kg anchor, 50' x 1/2" chain ballast, 50' rode line and 21" marker buoy	6
2	Tow bridles with bullet float	4
3	8" float x 12" skirt OptiMax II Boom - 25' sections	32
4	Mini Max Hydraulic Skimmer with pump, Power pack	1
5	14' aluminum boat with 15 hp outboard prop motor	1
6	1/2" Polyester Yacht Braid rope (600' rolls)	10
7	Drive pin anchors	5
8	Slater anchors	5
9	Wing anchors	5
10	Sorbent Boom, 5" X 4 per bag	30
11	Mustang Floater Suit	4
12	Personal Floatation Devices (PFD)	8
13	Oil resistant gloves	12
14	Leather gloves	12
15	Sledge Hammer with Fibreglass Handle	2
16	Spade - Long Handle	2
17	Fire Extinguisher - 20lb ABC with brackets	2
18	Tyvex Suit XL	20
19	Alberta Standard #3 First Aid Kit	1
20	Storage Totes for Small Items	4
21	Quick Tank (500 gallon / 1893 ltrs.)	1

7.2 Additional Response Equipment or for Spills >5m^3

All equipment previously mentioned is available for use during any emergency situation for a spill greater than 5 m^3. The following equipment would take time to get to the spill site, time would vary depending on distance from the spill. All these equipment and resources can be deployed on scene in <6 hours for the recovery and clean-up of the spill.

7.2.1 General Equipment

This section addresses the emergency response machinery, equipment, tools and other resources that can be made available on-site for spill counter measures.

7.2.1.1 Mobile Equipment

Mobile equipment available to Agnico, that will be used for spill contingency include:

- Graders-1
- Cranes-3
- Snowmobiles-3
- Vacuum Truck-1
- Loaders-6
- Backhoe-3
- Bulldozer-1
- Forklift & Hysters-4
- Water Trucks-6
- Winch Trucks-2
- Pickup Trucks-40
- Generator Sets/Light tower-26
- Fire Truck-1
- Boats-4
- Fuel Trucks-1
- Bobcat-4
- Haul Trucks-13
- Snow Cat-1

All the previous listed equipment can be found on the Meliadine Project site. Wheeled equipment can be at the OHF in Rankin Inlet in 3-6 hours. Tracked equipment would have to be loaded and transported which would take 5-6 hours.

7.2.1.2 Emergency Transportation

Emergency transportation that will be used under an emergency situation are:

- Seasonal Aircraft (fixed wing or helicopter)
- 4-wheel drive vehicles >70
- Snowmobiles x 9
- Boats and motor x 4

7.2.2 Spill Response Kits and Containers

7.2.2.1 Kits

Spill response kits are strategically located where required. Each department and work area is responsible for providing sufficient spill response kits in their respective work areas. The kits are kept in marked and accessible locations. The locations include all fuel storage areas, chemical storage areas and so on.

All of the mobile equipment for the Meliadine project (including heavy equipment) contains an emergency spill kit. Regular audits are completed to ensure these are in place.

7.2.2.2 Emergency Trailer

Agnico also have an Environmental Emergency Trailer which is easily accessible and mobile. The trailer is located at the Meliadine Project Site east of the Environmental Office. This trailer contains the following items:

2018-Emergency spill trailer equipment	
Items	**Quantity**
Evac system	2
Leak control kit	1
Drum opener	1
Westcott	2
Hammer	2
Scew driver	3
Plier	1
Empty drum	4
Berms 4x4	2
Tarp	2
Spill pad-Universal (bags)	2
Spill roll-Univesal	2
Booms (5x10)-Univesal (bag of 4)	2
Booms (8x10)-Universal (bag of 4)	2
Absorbent (gator)-(Bag)	3
Absorbent (pellet)-(bag)	2
Quatrex-bags	5
Milk crate	1
ty-wrap	Pack
Yellow liner roll	1
Anti-spark Gaz pump	1
Pump Hose	200ft
Shovel 4ft round tip	3
Re-bar 3-4-5ft	14
Sledge hammer	2
Jerry can (full gaz)	2
Crow bar 4 ft	2
Pig tale (3 balls)	1
Pin for pig tale	1

7.2.2.3 AWAR Sea cans

Along the AWAR there are 2 Environmental Emergency sea cans. These sea cans are strategically

placed along the road at water crossings. Each Environmental Emergency sea can contain the following material:

2018-AWAR SPILL SEACAN (KM 7)

Seacan	Items	Quantity
271029-0	Empty drums (Sealed) 45 gal.	10
	Quatrex Bags	10
	Yellow liner (Q-bag liner) Roll	1+1/4
	Mini Berm 3'x3'	2
	Mini berm 2'x3'	4
	Spill Kit (blue drum)	1
	Tarp 8'x10'	3
	Tarp 20'x30'	0
	Tarp 30'x50'	1
	Universal boom 5"x10'	20
	Universal boom 8"x10'	20
	Oil only booms 5"x10'	20
	Maritime barrier (Baffle)	3
	ABS pipe : 10' (4")	0
	Absorbent Sheet (bags)-Universal	10
	Absorbent Roll-Universal	10
	Absorbent pellet (bag)	7
	Oil gator absorbant (bag)	10
	Plug pattie	0
	Fork lift crate (pallets)	6
	Long handle round and sqaure point shovel	6
	Chisel point crow bar 16 lbs 57"	2
	Ice braker chisel	1
	Sledge hammer 12 lbs 36''	3
	Steel Rod bar (4')	16
	Steel Rod bar (6')	10
	stream skimmer	0
	temporary storing device (old bladders, pipes and fitting)	0
	CI agent granules (100lbs)	0
	Oil spill kit (pail)	1
	Yellow Nylon rope (bags)	2
	Mini-Sledge Hammer	1
	Ty-wrap (pack)	1
	26' Tape	1
	Multi-purpose shears	1
	Crescent wrench	1
	Hook knife	1
	Mechanics wire roll	1
	Side cutters	1

2018-AWAR SPILL SEACAN (KM 18)

Seacan	Items	Quantity
278737-1 (KM 18)	Empty drums (Sealed) 45 gal.	10
	Universal boom 5"x10'	12
	Universal boom 8"x10'	12
	Oil only booms 5"x10'	12
	Maritime barrier (Baffle)	3
	Absorbent Sheet (bags)-Universal	10
	Absorbent Roll-Universal	10
	Absorbent pellet (pail)	10
	Fork lift crate (pallets)	6
	Yellow Spill Kit	1
	Evac System	2
	Silt Bags	2
	Silt Fence	2
	Yellow Liner Roll	1
	Q-Bags	10
	Rebar 3''	4
	Rebar4''	10
	Sledge Hammer	1
	Mini Sledge Hammer	1
	Nylon rope roll	1/2
	'Pingouin''	1
	Tarp	4
	Bolt cutter	1
	Side cutters	1
	Knife	1
	Mechanic wire roll	1
	Yellow and red ruban	1 roll each
	Ty-wrap (pack)	1
	Pipe wrenck	1
	Westcott	2
	Crow bar	1

7.3 PPE

7.3.1 PPE at OHF for Spills <5 m^3

The following PPE (Table 3) can be found in the Emergency Trailer and also in sea can at the OHF:

Table 3 - PPE available at OHF

Quantity	Equipment/tool name
3	Rain gear -- Pants and Top (L & 2-XL)
3	Rubber boots (size 8,10,12)
6	Rubber gloves
3	Goggles
3	Tyvex suits (L & 2 XL)
3	Safety glasses
3	Leather gloves

This is adequate PPE intended for 3 persons. Additional PPE will be available from the Meliadine Project site.

7.3.2 PPE for Spills >5 m^3

PPE is stored in bulk quantities at the Meliadine Warehouse. Quantities of each can be found on site using the JD Edwards system. In addition, the community of Rankin Inlet has certain PPE that can be purchased through Agnico Eagle after consulting the Agnico Eagle Procurement and Logistics department; however quantities of this PPE cannot be relied on within Rankin Inlet.

SECTION 8. COMMUNICATION

The primary basis for communication is the phone system; back-up communication is also available via radios or satellite phone. For on-site communication, hand-held radios is mandatory for all employees working or travelling in remote areas from the OHF. Cell phones can be used as an additional means of communication however only CDMA service is available at the OHF. Back-up power sources and replacement batteries for communications equipment is available to provide continuous, uninterrupted operation either at fixed facilities or at emergency sites.

Key site personnel are accessible at all times by either portable radios, radios in vehicles, or office radios. The Health Care Professional carries a hand-held radio and is available at all times. Security personnel monitor the emergency channel twenty-four hours per day. Senior management personnel will rotate as "On-Call Managers" for after-hour emergencies. An accommodations list that highlights key personnel will be posted and updated as required.

In the event of a major emergency, all external communications for the project site and associated areas will be cut and all external contact will take place solely through the Emergency Control Center at the Meliadine Site.

During fuel transfer operation, the vessel master and the operator of the OHF always have a two-way communication on a continuing basis. This two-way communication is the direct communication by radio and the use of the cell phone.

8.1.1 Communication with the Public

Communication with public bodies during the state of emergency is the responsibility of the General Mine Manager or the Communications & Public Affairs Corporate Director.

In the case that the community of Rankin Inlet should need to be evacuated on short notice, the Emergency Response Team will immediately assist in the evacuation of the community. The General Mine Manager will immediately contact the Mayor of the Hamlet to inform regarding the situation. In addition, if safe to do so, a radio notification should be immediately broadcasted on the Rankin Inlet Radio station.

8.1.2 Hand Held Radio Communication

The channels used for hand held radio communication on the Meliadine Project site, the All Weather Access Road, OHF, and associated facilities are as follows in Table 4:

Table 4 - Meliadine Radio Channels

CAMP
CONSTRUCTION
EXPLORATION
ROAD
UG OPERATION
DRILL & BLAST
WAREHOUSE
MAINTENANCE

**Grey represents channels used at Itivia

8.1.3 Contacts

Internal contact information is contained in Table 5 for all Agnico personnel involved in spill recovery. Table 6 contains contact information for contractor contacts which can be called for assistance with spill recovery. Table 7 is a list of government officials and external contacts to notify and provide subsequent reporting.

Table 5 - Agnico Contact

Title	Name	Telephone No.
Sr. Vice President, Environment and Sustainable Development	Louise Grondin	416.847.8656 Cell: 819.724.2020
Vice President of Environment and Sustainable Development	Michel Julien	416-947-1212 ext. 3738 Cell: 514.244.5876
Corporate director, Communications & Public Affairs	Dale Coffin	416.847.8669 Cell: 647.274.4154
Director Shared Services	Jason Allaire	819.759.3555 ext. 4608004 Cell: 819.355.2608
Meliadine General Mine Manager	Martin Plante	819-759-3555 ext 4608058 Cell: 819.856.1873
H&S Superintendent	Dominic Richard	819.759.3555 ext.4603076 Cell: 819.856-4104
H&S General Supervisor	Nathalie Ledoux	819.759.3555 Ext 4603968
Emergency Measure Counsellor	Dave Loder Darren Wilcox	819.759.3555 ext.4603113
Environmental Superintendent	Nancy Duquet Harvey	819.759.3555 ext.4603175 Cell: 819.856.4385
Environmental General Supervisor	Kevin Buck	819.759.3555 ext.Cell: 819.860.4515
SR. Environmental Coordinator	Jennifer Brown Daniel Gorton	819.759.3555 ext.4603996
Environmental Department	Environmental Technicians	819.759.3555 ext.4603903 & 4603925

On-site Nurses		819.759.3555 ext.4603011

Table 6 - Contractors / Local Contacts

Title	Telephone No.	Contact in Emergency for:
Nolinor Aviation Services	Protocol Agent (819).759.3555 ext. 8008 Emergency (450) 476.0018 (888) 505.7025	Flight services for additional crew, or additional supplies
Calm Air	(867) 645.2746 Emergency (204) 677.5013 (204) 677.5019	Flight services for additional crew, or additional supplies
Dyno Nobel Explosives Ltd.	(867) 793-4610 ext. 3926	Heavy Equipment, Man power, Emergency Blasting
Desgagnes Group (Shipping)	(867) 979-3799	Fuel Hauler
Sarliaq Holdings Ltd.	Richard- Office 867.645.2653 Cell 867.645.1281 Silu - Office 867.645.2651 Cell 867.645.7645 James - Office 867.645.2759 Cell 867.645.6718 Kilabak - Office 867.645.2759 Cell 867.645.7851 Marvin - Cell 867.645.6799 Shop - 867.645.2753	Equipment, man power, Ground transportation services
M & T Enterprises	Sean Sykes – 250.505.6105 Raymond Boisvert – 250.551.2894	Equipment, man power, Ground transportation services
Inuksuk Construction	John Winter – 902.483.0398 Tony King – 902.478.4700 Inukshuk Construction – 867.645.4032	Man power, equipment, trades personnel i.e. pipefitter, plumber, electrical

Table 7 - External Contacts

All phone numbers will be reviewed each year at the beginning of July and updated.

Organization/Authority	Telephone Number	Fax Number
NT-NU 24-Hour Spill spills@gov.nt.ca	(867) 920-8130	(867) 873-6924
Workers' Safety & Compensation Commission	(867) 979-8500	(867) 979-8501
Kivalliq Inuit Association (KIA)	(867) 645-5725	(867) 645-2348
Nunavut Water Board (NWB)	(867) 360-6338	(867) 360-6369
CIRNAC Inspector (Tim Morton Nunavut Regional Office (NRO) – Indigenous and Northern Affairs Canada (INAC) – Iqaluit	(867) 669-2442 (867) 975-4500	(867) 669-2871 (867) 975-4560
Department of Fisheries and Ocean (DFO) – Nunavut Regional Office - Iqaluit	(867) 979-8000	(867) 979-8039
Manager, Environmental Protection, Government of Nunavut – Kristi Lowe	(867) 975-7748	(867) 975-6099
Kivalliq Health Services – Rankin Inlet Emergency on call Nurse	(867) 645-8300 (867) 645-6700	(867) 645-8304
Rankin Hamlet Office	(867) 645-2895	(867) 645-2146
Rankin Ambulance or Fire Emergency	(867) 645-2525	
RCMP 24 Hour Emergency Number	(867) 645-0123	
Canadian Coast Guard (in the event of a spill to the marine environment 24 hours) Superintendent, Environmental Response Coast guard e-mail for notification iqanordreg@innav.gc.ca	(800) 265-0237 (519) 383-1954 (867)-979-5724	 (519) 337-2498
Transport Canada – Marine Safety Jaideep Johar Ian Salisbury Philip Levesque - Marine Safety Inspector	(204) 880-0754 or (204) 984-8618 (204) 984-2254 (780) 495-8360 (250) 754-0290 (204).984.5786 204.801.6951(cell)	 (780) 495-8607

SECTION 9. ROLES AND RESPONSIBILITIES

9.1.1 First Responder (Third Party Contractor (Intertek Personnel) and Spud Barge Supervisor)

The person who has caused a spill or is the first to observe the spill is the first responder.

The responsibilities of the First Responder are as follows:

- Oversee the fuel transfer operation;
- Follow procedure set-up in the OPEP to prevent and minimize spill (See Section 5.3)
- In case of spill to land, ice or water, contact the Rankin Inlet Gatehouse to report the incident;
- Identify and contain the spill, IF SAFE TO DO SO; commence preparing spill response equipment, and
- Participate in spill response as a member of the clean-up crew.

9.1.2 Supervisor Fuel Discharge

The responsibilities of the Supervisor are as follows:

- Contact the Rankin Inlet Gatehouse; contact the Environment Department;
- Gather facts about the spill; and
- Participate in spill response.

9.2 Roles & Responsibilities of the Emergency Control Group

Below are the roles and responsibilities of the Emergency control group.

9.2.1 Official In-Charge

The Official In-Charge (General Manager or designate) will take charge for overseeing and approving the overall emergency strategy.

Immediate duties of the Official In-Charge include:

- Consult with the Incident Commander the status of emergency;
- Appoint an Emergency Log Recorder to maintain a written record of the time and events, including all discussions, instructions and decisions made by the Emergency Control Team;
- Issues specific tasks to the members of the Management Team as they arrive at the Control Room, as per this guideline;
- Brief the Emergency Control Team;
- Ensure that the safety of personnel is maintained, throughout the operation;
- Ensure procedures are in place for prompt dispatch of requested personnel, materials and

equipment to the emergency area;

- Arrange for all reports to be presented at specific intervals to the Emergency Control Team;

- Finalize the recommendations of the Incident Commander for rescue and recovery operations;

- The Official In-Charge is the only person authorized to release information to Government Agencies, Corporate Office or the Local Communities. He may delegate this activity to other members of the Emergency Control Team;

    - Verify all information you release;
    - Keep a record of all inquiries (media and non-media);
    - Do not speculate on causes;
    - Do not speculate on resumption of normal operations or when the problem will be solved; and
    - Advise that further updates will be forth coming.

- Notify the corporate management, if the following appear probable:

    - Fatalities;
    - Injuries that could probably become items of local, regional or national media interest;
    - There is a public health or environmental risk;
    - An incident involving chemicals where there is a large volume or the potential for over reaction (e.g., cyanide);
    - A spill of effluent or contaminated water or chemical substance to an area that lies outside the area of drainage control of the mine site (i.e., an external spill);
    - Mine operations may be stopped for more than two (2) days; and
    - Government authorities will become involved.

- Ensure all response teams, regulatory agencies and any other agency on emergency alert notice are advised when the emergency has ended;

- Ensure all documentation (i.e., notes, log sheets, written instructions, etc.) is gathered for the creation of the final report; and

- Participate in debriefing.

9.2.2 General Superintendents

- Energy & Infrastructure, Operations and Maintenance will report to the Emergency Control Room and support the General manager/Designate in whatever capacity required;

- They will also ensure that the Superintendent/Designate in each of their respective Department's is aware of the emergency; and

- They will assist with the investigation and write up of the final report.

9.2.3 Incident Commander: A Trained Staff Member (ERT Coordinators or Supt.)

The responsibilities of the Incident Commander include:

- Ensure Security has been notified of emergency;
- Ensure the evacuation procedures have been activated, if required;
- Ensure that there are sufficient ERT members available to respond to the emergency;
- Ensure that the ERT has back-up support, a standby Team;
- Ensure that ERT Team has refreshments and nourishment (if the emergency requires several hours to resolve);
- Assess the size and severity of the emergency and the likely consequences. Establish response priorities; as well coordinate prevention of fire or explosion;
- Maintain communication with the ERT Captain;
- Advise the Official In-Charge of the ERT Team's activities, regarding the rescue and recovery operations;
- Appoint sufficient personnel, equipment and outside services are available. Utilize the members of the Emergency Control Team to organize these resources;
- Advise Official In-Charge when the emergency situation is under control and give the "All Clear";
- Participate in emergency investigation;
- Coordinate an orderly return to normal operating conditions;
- Arrange for a debriefing session, and utilize the services of all involved in resolving the emergency; and
- Assist to write the final report.

9.2.4 Emergency Response Team (ERT Team) Duties:

- The ERT Team Members must report to the Fire Hall, when paged for a "Code One" emergency;
- ERT Team Members will be given instructions on the emergency by the Incident Commander;
- ERT Team Members will follow instructions from the Incident Commander and will not put the Team at risk; and
- The ERT Team Captain will maintain radio contact with the Incident Commander throughout the emergency.

9.2.5 Environmental Superintendent /Designate Duties:

The following are the responsibilities of the Environmental Superintendent/Designate;

- Provide technical advice on probable environmental effects resulting from a spill and how to minimize them;
- Provide advice to the Official-in-Charge for appropriate spill response procedures;
- Ensure that Environmental Staff are available to direct the spill response action plan; and
- Assist with restoring of the Operations back to normal operating standards.

9.2.6 Health and Safety Superintendent/Designate Duties:

The Health and Safety Superintendent/Designate will be responsible for:

- Ensure that an Incident Commander is in place to oversee the ERT Teams;
- Ensure that all Management respond to the emergency and meet in the emergency control room;
- Oversee all activities that require Security or Nursing and arrange for Medevac transport, if required;
- Assist with getting a “head count” for the Official in-charge; and
- Assist with obtaining outside help if required.

9.2.7 Energy & Infrastructure Superintendent/Designate Duties:

The following are the responsibilities of the Energy & Infrastructure Superintendent/Designate;

- Ensure that all employees are accounted for;
- Ensure that all ERT Crew Members respond to the “ Code One” emergency;
- If the “ Emergency” involves the site facilities, assist the Official-in-Charge with the action plan to deal with the emergency;
- Assist as required by supplying equipment and/or manpower; and
- Assist with restoring of the Operations back to normal operating standards.

9.2.8 Human Resources Coordinator/Designate Duties:

The following are the responsibilities of the Human Resources (HR) Superintendent/Designate:

- Ensure that all HR employees are accounted for; and

- Provide assistance to the Official-in-Charge if there are employee issues, such as injuries, transportation requirements, etc.

9.2.9 Health Care Professional (Nurse/Medic):

The on-site health professionals are responsible for the following:

- Providing on-site first aid and other medical support;
- Establish a triage location if there are multiple casualties;
- Arrange for medevac transportation, if required; and
- Ensuring that the first aid room is maintained at all times, by using First Responders as support.

9.2.10 Security (Sarliaq Holdings Ltd.):

The on-site Security Supervisor is responsible for the following:

- Ensuring that the Security officer has activated the appropriate level of emergency notification;
- Ensure that access points to the emergency are properly guarded;
- Notify the Rankin Inlet Gatehouse if the emergency involves the all-weather private road (AWPR); and
- Assist with other duties as requested by the Emergency Control Group.

9.3 Debriefing

After an incident has taken place and the location is brought back to normal operating standards a debriefing session will occur between ECG, Field Supervisors for the incident, ERT Captain(s), and the supervisor of the department involved with the spill.

The point of this debriefing session to determine the *who, what, where, when, why, and how* the incident occurred. It will also be the time to reflect on the steps that were taken to carry out the response and to determine what was done right and what corrective measures need to be put in place to better the response if needed in the future.

SECTION 10. GENERAL SPILL PROCEDURES

SPILL RESPONSE PRIORITIES

1. **Safety of the personnel working at or around the OHF**
   a. Contact all personnel working around the spud barge area and make them aware
   b. Make contact with the vessels Captain to make aware the ship and stop the transfer of the product
   c. Wear appropriate PPE
   d. STOP the spill
2. **Make safe the facility**
   a. Create a no entry perimeter to ensure unaware persons do not enter the area in which the incident took place.
   b. Barricade entrances to the facility with red danger tape
   c. Have a person designated to watch entrances to ensure no community persons come on to site.
3. **Make the community of Rankin Inlet aware of the Spill to ensure measures can be taken to ensure safety of the community**
   a. Contact Mayor / Hamlet counsel
   b. Fire department
   c. RCMP
4. **Prevent fires or explosions / Stop all ignition sources**
   a. Disconnect power supplies
   b. Do not contain diesel fuel if vapors might ignite
   c. Allow fuel vapors to evaporate before intervention
5. **Minimize the Spill**
   a. When safe to proceed stop the spread of the product
   b. Use spill response equipment in emergency sea cans and ask for additional material if the spill is greater than 5 m^3
6. **Notice and Report the Spill**
   a. Spill needs to be reported to Transport Canada, Coast Guard, Environment and Climate Change Canada and Government of Nunavut immediately
   b. Other governing bodies will also be notified (see section 10.2)
7. **Environmental Impact**
   a. Deter wildlife from entering spill area. Keep track of any wildlife mortalities
   b. Determine what impacts the spill will have on the Environment
8. **Clean-up**
   Commence clean-up of the spill

10.1 Coordination with Government Agencies

10.1.1 Coordination with TC Technical Service Environmental Response

In the event of a marine spill TC Technical Service Environmental Response (TC) will be contacted immediately regarding the incident. Agnico will adhere to further recommendations from TC in response to the spill.

TC will also be contacted annually prior to the deposition of fuel at the OHF. As well, annual approval of this OPEP will be required by TC Pollution Prevention Officer.

10.1.2 Coordination with Canadian Coast Guard

In the event of a marine spill, the coordination with Canadian Coast Guard (CCG)[2] is required and they will be contacted to report the incident. A description of the event will be provided to the CCG Environmental Response. Agnico will adhere to further recommendations from CCG in response to the spill.

On an annual basis prior to the shipment of fuels to the OHF commencing, Agnico will contact the CCG and make them aware that the shipping season will be starting so they are aware that fuels will be travelling to Agnico's Rankin Inlet Fuel Tank Facility constructed in Rankin Inlet.[3] Also Agnico will inquire if there are any updates to "*The Central and Arctic Regional Response Plan (2008).*"

Agnico's Environmental Group will annually, prior to fuel transfer, review "*The Central and Arctic Regional Response Plan (2008).*" A copy of this plan can be found in Appendix F for reference. The plan will be reviewed to ensure that the OPEP and the actions of Agnico's OHF meet all requirements listed for an OHF.

10.1.3 Other Government Agencies

Agnico will contact all government agencies associated with the Meliadine Gold Project as is the norm for any reportable spill. These groups include: Government of Nunavut (GN) via 24 hour spill reporting line, Crown - Indigenous Relations and Northern Affairs Canada (CIRNAC), Department of Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC), Nunavut Water Board (NWB), and Kivalliq Inuit Association (KIA).

10.2 Reporting Requirements

As per the Canada Shipping Act. spills to the marine environment will be reported to the TC Technical Service Environmental Response and Canadian Coast Guard (contact numbers in Table 7). Marine spills will be reported in accordance with TC Guideline TP- 9834E, *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants*. Others to receive the spill report include the KIA, Hamlet of Rankin Inlet, DFO, ECCC, Canadian Coast Guard and INAC. Incidents that require media communications will be the responsibility of Agnico General Mine Manager or Public Affairs Corporate Director. The copy of NT-NU spill report form is provided in Appendix H.

To ensure compliance with Section 36(3) of the *Fisheries Act*, all spills of fuel or hazardous materials, regardless of quantity, into a water body or onto ice will be reported immediately to the NT-NU 24-HOUR SPILL REPORT LINE (phone: (867) 920-8130, fax: (867) 873-6924, spills@gov.nt.ca).

[2] CCG: 1-800-265-0237, Superintendent Environmental Response Phone: 519-383-1954 Cellphone :519-381-6186

[3] *JJ Brickett with CCG was contacted on July 7, 2015*

Agnico possess a thorough internal spill reporting system that documents all spills for internal tracking. A copy of this Agnico internal spill report can be found in Appendix G, this is this spill report that the first responder will have to complete. Regardless of the volume, these spills are all reported to the Environment Department and if the NT-NU spill limits are exceeded or if the spill occurs in a water body, the Environmental Department reviews the incident, produces the NT-NU spill report and submits the NT-NU spill report to the regulator listed above. Investigation of all reportable spills is completed by the Meliadine Environment Department.

10.3 Treatment and Disposal

All diesel recovered through the spill response and any contaminated material will be taken to the Meliadine Project site for recovery and, if applicable, incineration. It could also be packaged for disposal/recycling by a certified hazardous waste management company in southern Canada.

10.4 Resuming Unloading

The unloading of fuel from the tanker to the OHF will not resume if it hinders the response to the spill in any way. Unloading will resume once all problems are corrected, thus ensuring that the spill will not continue.

SECTION 11. SPILL SCENARIOS AND RESPONSE STRATEGIES

Agnico will strive to prevent any accidental spills and take all reasonable steps to minimize the risk of spill incidents and their impact on the environment. A mock spill exercise is conducted this year and the summary is provided in Appendix I.

11.1 Product Properties and Response Strategy

P50 Diesel is a bright oily substance that has a low viscosity. It spreads rapidly on the water, has a low solubility in salt water (60 mg/L), and a high evaporation rate as described in the text box below.

At Itivia, the wind is largely from the NW to N and the current in the access passage is 0.93 km/h to the south.

Predicted Evaporation Rate of Spilled Diesel

Weight percent Evaporation = (5.8 + 0.045T) in(t)
Where T = water temperature
t = time in minutes

After a time span of 60 minutes at a surface temperature of 5°C, up to 25% weight of the spilled diesel would have evaporated.

After 240 minutes, or 4 hours, the weight percent of the diesel that would have evaporated would be 33%.

Source: *Environment Canada, Emergencies Science and Technology Division*

As a result of the properties of diesel and the environmental conditions that predominate at Itivia, the spill response will aim to stop the spilled product from spreading across Melvin Bay to the south shore and into the access passage. This could include activating the Shipboard Oil Pollution Emergency Plan. The tanker has response equipment on board and a fully trained crew in spill response. This, coupled with a shore-based response under the OPEP, ensures sufficient resources are available to control and recover as much diesel fuel as feasibly possible.

11.2 Pipeline safeguards

There are a number of safeguards in operating the ship-to-shore pipeline; these include:

- Save-all trays to capture any minor spills at the ends of the floating pipeline;
- Dry-break couplings at both ends of the floating pipeline;
- A pressure test is performed before the diesel transfer to confirm the system is free of leaks; and

- Both the crew on the tanker and Agnico's shore based personnel are fully trained in spill response and spill recovery.

11.3 Wildlife

During a spill event, Agnico will take care to deter any animal that will be near the spill area to minimize the risk to wildlife. In a case of mortalities, Agnico will track any mortality and report these numbers to the GN and ECCC.

11.4 Scenarios

Three scenarios are considered, these being:

1. A spill between the ship and the flange of the OHF, the floating pipeline, resulting in a spill smaller than 1000 L of diesel fuel;

2. A major failure between the ship and the flange of the OHF, the floating pipeline, resulting in a spill greater than 1000 L but smaller than 5000 L of diesel fuel; and

3. Spill greater than 5000 litres.

In most instances Agnico personnel and/or contractors will be able to respond to the spill but if necessary, backup can be requested by calling for the assistance of the Agnico Emergency Response Team that is stationed at the Meliadine site located 35 kilometers away. The ERT can be at Rankin Inlet within 60 minutes to take charge of the spill response. Agnico will make every effort to have its equipment and resources deployed within 6 hours of an incident.

Scenario 1: **Loss between the ship and the flange of the OHF, the floating pipeline, resulting in spill smaller than 1000 L of diesel fuel.**

Appropriate Actions	Resources
1. Communicate with vessel and immediately stop the ship-to-shore transfer of fuel, if it's safe to do. The transfer should not restart in a manner that would interfere with the immediate, effective and sustained response to the oil pollution. 2. Make sure that the environment is safe for the facility and vessel personnel, the facility and Rankin Inlet community. 3. Make sure that risk of fire or explosion are minimize. 4. Contact person found on OHF Declaration to initiate the OPEP. 5. Minimize the oil pollution incident by containing the spilled fuel to spreading within the marine environment, if it's safe to do. 6. Notify CCG, local and regulatory authorities. 7. Containment boom is manned to prevent the escape of fuel outside the boom. 8. If necessary, place a diversion boom outside the containment boom to stop the diesel from getting onto the beach. 9. Spread absorbent material on the spill to capture it. 10. Monitor any fuel that could not be recovered and collect water samples near the spill site and in the access passage for analysis. Repeat as necessary. 11. If diesel reaches the beach, excavate the contaminated beach material and take it to the Landfarm area at the Meliadine site.	a. Crew on the tanker trained in spill response. b. Agnico's shore based personnel trained in spill response and recovery. c. Emergency Response Team to take control of the spill response and recovery. d. Spill response equipment and supplies maintained on board the tanker and also in the sea can located on shore of Itivia Site Fuel Storage and Containment Facility. e. Save-alls (Pop-up pools/plastic totes) placed under the pipeline manifolds to collect minor spills. f. Shore-based boat to position booms. g. Absorbent booms to recover spilled diesel on sea water. h. Heavy equipment such as excavators, back hoes, vacuum trucks, and dump trucks available if beach is contaminated.

Scenario 2: **Loss between the ship and the flange of the OHF, the floating pipeline, resulting in spill greater than 1000 L but smaller than 5000 L of diesel fuel.**

Appropriate Actions	Resources
1. Communicate with vessel and immediately stop the ship-to-shore transfer of fuel, if it's safe to do. The transfer should not restart in a manner that would interfere with the immediate, effective and sustained response to the oil pollution. 2. Make sure that the environment is safe for the facility personnel, the facility and Rankin Inlet community. 3. Make sure that risk of fire or explosion are minimized. 4. Contact person found on OHF Declaration to initiate the OPEP. 5. Minimize the oil pollution incident by containing the spilled fuel to spreading within the marine environment, if it's safe to do. 6. Notify CCG, local and regulatory authorities. 7. Containment boom is manned to prevent the escape of fuel outside the boom. 8. If necessary, place a diversion boom outside the containment boom to stop the diesel from getting onto the beach 9. Spread absorbent material on the spill to capture it 10. For larger amounts of spilled materials on water, use absorbent booms to collect the spilled diesel 11. Monitor any fuel that could not be recovered and collect water samples near the spill site and in the access passage for analysis. Repeat as necessary. 12. If diesel reaches the beach, excavate the contaminated beach material and take it to the Landfarm area at the Meliadine site.	a. Crew on the small tanker trained in marine spill response. b. Crew from the large tanker anchored outside the access passage. c. Agnico's shore based personnel trained in near shore spill response and recovery. d. Emergency Response Team trained for near shore spill response. e. Shore-based boat to position booms and spread absorbent material. f. Spill response equipment and supplies maintained on board the tanker, in Agnico sea can locate at Itivia Site Fuel Storage and Containment Facility. g. Additional booms to place outside the containment boom. h. Additional boats can be transported from the Meliadine site as well local boats can be rented from local contracting companies i Heavy equipment such as excavators, back hoes, vacuum trucks, and dump trucks for waste materials. j. in the case of larger spills an Incident Command System will be set up at the Meliadine site as laid out in the Meliadine Emergency Response Plan.

Scenario 3: **A spill >5,000 litres**

In the case of an ***Extreme*** spill, Agnico will follow the actions listed in Scenario 2 to complete the best clean up possible. Between the spill response equipment that the tanker delivering fuel has on board and the spill response supplies at the OHF, a spill up to the size of 5, 000 - 10, 000L will be able to be controlled and cleaned up. However if the spill is greater than 10, 000L, at this point Agnico will require external assistance with the clean-up.

The Canadian Coast Guard (CCG) and Transport Canada are made aware each year prior the fuel transfer, there is a possibility that under direction of CCG that their spill depot supplies located in Rankin Inlet may be used.

SECTION 12. PREVENTIVE MEASURES

Agnico recognises that spill prevention is more desirable than any modern efficient cleanup measures after the fact. Preventive measures have been adopted in relation to any transport, transfer, use and storage of diesel fuel. The tankers carry a Ship Oil Pollution Emergency Plan (SOPEP) (Appendix A) as per the MARPOL 73/78 requirement under Annex I. All ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by the International Maritime Organization (IMO).

A SOPEP contains the following things:

- The action plan contains duty of each crew member at the time of spill, including emergency muster and actions;
- General information about the ship and the owner of the ship etc.;
- Steps and procedure to contain the discharge of oil into the sea using SOPEP equipment;
- On-board Reporting procedure and requirement in case of oil spill;
- List of authorities to contact and reporting requirements in case of oil spill. Authorities like port state control, oil clean up team etc. are to be notified;
- Drawing of various fuel lines, along with other oil lines on board vessel with positioning of vents, save-all trays, etc.;
- General arrangement of ship, which includes location of all the oil tanks with capacity, content, etc.; and
- The location of the SOPEP locker and contents of the locker with a list of inventory (Marine Insight 2012).

The Spill Contingency Plan, Emergency Response Plan and the Oil Pollution Emergency Plan identify potential causes of emergencies and provides for the development and implementation of strategies to minimize the likelihood of the same.

As described in the Spill Contingency Plan, exercises are part of training for the Emergency Response Team. This includes comprehensive spill response exercise to practice the use of spill response equipment, including the use of booms and oil water separator.

The OPEP is updated annually based on the results of spill exercises, changes to the infrastructure at Agnico's Fuel Handling Facilities, changes to procedures and other variables. The updated OPEP is distributed to the Agnico Emergency Response Team, TC, the Kivalliq Inuit Association, the Municipality of Rankin Inlet and other agencies as appropriate.

12.1 Training

The environmental department and ERT team received training from a response organization and as a result will be able to respond to or assist with incidents that may occur at the OHF.

12.1.1 Meliadine site Personnel

A designated Emergency Response Team consisting of on-site personnel is established at Agnico's Meliadine Project site. Agnico ensures that the ERT is trained and staffed in sufficient number so that

the ERT is present at all times. All members of the team are trained and familiar with emergency and spill response resources, including their location and access, the Spill Contingency Plan, the Oil Pollution Emergency Plan and appropriate emergency spill response methodologies. The ERT have up to 20 members, each of whom will be trained.

The training includes the following:

- Worker health and safety during emergency interventions;
- A review of the spill response plan and responsibilities of the ERT members;
- The nature, status, and location of fuel and chemical storage facilities;
- The on-site and off-site spill response equipment and how to use it;
- Emergency contact lists;
- Communication methods and signals;
- Desktop exercises of “worst case” scenarios;
- Emergency evacuation;
- Fires or explosions;
- Emergency equipment and use;
- PPE and clothing;
- Marine shoreline recovery operations; and
- The likely causes and possible effects of spills.

The Environmental Department regularly provides tool-box sessions to give information on spill response and reporting procedures.

Basic spill response training is completed by all Agnico employees and contractors working on the Meliadine project as part of the mandatory induction for all personnel arriving on site. ERT members receive more extensive spill response training and learn how to respond while wearing personal protective clothing, use of specific spill response gear, proper deployment of absorbents and maritime boom.

12.1.2 OHF Personnel Training

Prior to the first discharge of fuel from the vessel to the OHF, a mandatory training takes place. This is a review with all the personnel responsible for the shore based portion of the fuel transfer, including the third party contractor and the Rankin Inlet supervisor, the current OPEP and make them aware of the procedures to follow in case of a spill before the first fuel barge arrives. A copy of the 2018 log sheet is provided in Appendix I.

A mock spill training is planned for the summer of 2019 to practice the response of all involved personnel to a hypothetical spill situation.

12.1.3 Boat Operators

All people involved in the supervision during operation and / or on the spill response has complete the training course for the pleasure craft operator. Records of pleasure craft operator certification is retained by the Meliadine Training department.

All concerned persons working for Agnico Eagle Mines Ltd. must possess a pleasure craft operator card and provide proof of this certification prior to operating any boat relating to the Meliadine project which includes the Rankin Inlet Marshalling facility. This includes emergency responders.

SECTION 13. COASTAL SHIPPING

13.1.1 Coastal Shipping

Please refer to Appendix A - 1.2 for the 2018 contact information for Coastal Shipping during the barge season. This is reviewed with Coastal Shipping on an annual basis.

SECTION 14. REFERENCES

Transport Canada *Oil Handling Facilities Standards*, TP12402E.

Canadian Coast Guard, Central & Arctic Region, 2008. *Regional Response Plan.*

Marine Insight, 2012. What is Ship Oil Pollution Emergency Plan (SOPEP)?
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Transport Canada, TP-13585, 2008. *Environmental Prevention and Response National Preparedness Plan.*

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Journal of Petroleum Science Research (JPSR) Volume 2 Issue 3, July 2013 - Modeling Oil and Petroleum Evaporation by Merv F. Fingas

APPENDICES

APPENDIX A – SOPEP and Contact info – Desgagnes Group

Transport Desgagnés Inc.

21, rue du Marché-Champlain
Québec (Québec) G1K 8Z8
Canada

Téléphone : (418) 692-1000
Télécopieur : (418) 692-6004
info@desgagnes.com

M/T *Dara Desgagnés*

Shipboard Marine Pollution Emergency Plan

For Oil and Noxious Liquid Substances

As defined by MARPOL 73/78, Annex I, Regulation 37 and annex II, Regulation 1

Prepared by Transport Desgagnés In

October 31, 201



Distribution List

M/T Dara Desgagnés (1)
M/T Esta Desgagnés (1)
M/T Jana Desgagnés (1)
Transport Desgagnés Inc. Emergency Room (1)
Transport Canada, Marine Safety (1)

SHIPBOARD MARINE POLLUTION EMERGENCY PLAN

In accordance with Regulation 37 of Annex I and Regulation 17 of Annex II of MARPOL 73/ 78

SHIP'S IDENTIFICATION

GL-Register-Number	33862
Name of Ship	DARA DESGAGNES
Distinctive Number or Letters (Call Sign)	VCBW
IMO-Number	9040089
Type of Ship	Chemical Tanker
Port of Registry	Quebec
Gross Tonnage	6262
Flag	CANADA

Owner / Managers: see „Ship Interest Contacts“

GL **Approved**

as being in compliance with
MARPOL 73/78 Annex II Reg. 17 and Annex I Reg. 37
(former Reg.16 and Reg. 26)
authorised by the Government of Canada

EdM

Hamburg **2013-01-07** **Ref.-No. 13-001410**

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Foreword

1. This Plan is available to assist the ship's personnel in dealing with an unexpected discharge of oil or noxious liquid substances. Its primary purpose is to set in motion the necessary actions to stop or minimize the discharge of those substances and to mitigate its effects.

1.2 Effective planning ensures that the necessary actions are taken in a structured, logical and timely manner.

1.3 The primary objectives of this Plan are to :

- prevent pollution;
- stop or minimize outflow when a damage to the ship or its requirements occurs;
- stop or minimize outflow when a operational spill occurs in excess of the quantity or instantaneous rate permitted under the present Convention.

1.4 Further, the purpose of the Plan is to provide the Master, officers and certain crew members with a practical guide to the prevention of marine spills and in carrying out the responsibilities associated with regulation 37 of Annex I and Reg. 17 of Annex II of MARPOL 73/ 78:

- procedures to report an oil / marine pollution incident;
- Coastal State contacts (Focal Points) and Port Contact Lists to be contacted in the event of any pollution incident;
- response actions to reduce or control the discharge of substances following an incident;
- co-ordination with national and local Authorities in combating a pollution.

1.5 In summary, the Plan will serve to promote a practised response when the ship's personnel is faced with a spill.

1.6 Although the Plan is designed as a ship-specific tool it must also be considered as an additional instrument and as a link to shore-based plans. With this the Plans allows an efficient co-ordination between the ship and shore-based Authorities/ Organizations in mitigating the effects of any pollution incident.

1.7 The Plan includes a summary flowchart (see under iii) to guide the Master through reporting and acting procedures required during an oil pollution incident response.

1.8 The Plan is likely to be a document used on board by the Master and officers of the ship and must therefore be available in the working language used by them.

Summary Flowchart

Discharge of Oil
Probable or Actual

⇩

Assessment of the Nature of Incident

⇩

Actions required

Alert crew members
Identify spill source
Personell Protection
Spill Assessment
Vapour Monitoring
Evacuation

REPORTING	**ACTION TO CONTROL DISCHARGE**	
By Master and/ or designated crew member	**Measures to minimize the escape of oil and threat to the marine environment**	
When to report All probable and actual spills How to report - By quickest means to coastal radio station - Designated ship movement reporting station or - Rescue Co-ordination Centre (at sea) - By quickest available means to local autho-rities Who to report - Nearest Coastal State Harbour and termi-nal operators (in port) - Shipowner´s manager; P & I insurer - Head Charterer; Cargo owner - Refer to contact lists What to report - Initial report (Res. A.851(20)) - Follow-up reports - Characteristics of material spilled - Cargo/ ballast/ bunker dispositions - Weather and sea conditions - Slick movement - Assistance required • Salvage • Lightening capacity • Mechanical equipment • External strike team • Chemical dispersant/ degreasant	NAVIGATION MEASURES - Alter course/ position and/ or speed - Change of list and/ or trim - Anchoring - Setting aground - Inititate towage - Assess safe haven require-ments - Weather/ tide/ swell fore-casting - Slick monitoring - Record of events and commu-nications taken	SEAMANSHIP MEASURES - Safety assessment and pre-caution - Measures for safety of crew - Advice on priority countermea-sures/ preventive measures - Get vapours off deck - Damage stability and stress consideration - Ballasting/ deballasting - Internal cargo transfer opera-tions - Emergency ship-to-ship trans-fers of cargo and/ or bunker - Set up shipboard response for: • Leak sealing • Fire fighting • Handling of ship-board response equipment (if available)

⇩

STEPS TO INITIATE EXTERNAL RESPONSE

- Refer to Costal Port State listings for local assistance
- Refer to ship interest contact list
- External clean-up resources required
- Continued monitoring of activities

⇩

Introduction

1. This Plan is written in accordance with the requirements of the Canadian Regulations for the Prevention of Pollution from ships and for Dangerous Chemicals SOR/2012-69, regulation 37 of Annex I and regulation 17 of Annex II of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto. As recommended by IMO this plan is a combination of a SOPEP and a Shipboard Marine Pollution Emergency Plan for noxious liquid substances.

2. The purpose of the Plan is to provide guidance to the master and officers on board the ship with respect to the steps to be taken when an oil and/or noxious liquid substance pollution incident has occurred or is likely to occur.

3. The Plan contains all information and operational instructions required by the Guidelines. The appendices contain names, telephone, telex numbers, etc., of all contacts referenced in the Plan, as well as other reference material.

4. This plan has been approved by the Classification Society for the Administration and, except as provided below, no alteration or revision shall be make to any part of it without the prior approval of the Classification Society for the Administration.

5. Changes to Section 5 and the appendices will not be required to be approved by the Classification Society for the Administration. The appendices will be maintained up to date by TRANSPORT DESGAGNÉS INC.

Regulatory Requirements

The Canadian Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals SOR/2012-69 and Regulation of Annex I of MARPOL 73/78 require every oil tanker of 150 gross tons and above, and every vessel other than an oil tanker of 400 gross tons and above, to have a shipboard emergency plan with four elements:

1) Procedures for reporting oil pollution incidents;
2) A listing of authorities to be notified;
3) A detailed description of actions to be taken by a vessel's crew to reduce or control an oil discharge; and
4) Procedures for co-ordinating onboard activities with national and local authorities.

This Shipboard Marine Pollution Emergency Plan meets the MARPOL requirements.

The plan required by Regulation 37 of Annex I and Regulation 17 of Annex II of MARPOL 73/78 will **not** fully meet the US regulations under the Oil Pollution Act of 1990 (OPA 90). However, OPA 90 regulations only pertain to tankers and other vessels that carry oil either as primary or secondary cargo.
They do not apply to dry cargo vessels such as freighters, containerships, Ro/Ro, etc. While there is no requirement to do so, operators of these vessels are encouraged to develop Vessel Response Plans (VRP) in the unlikely event of a pollution incident as the result of bunker transfer operations or other incidents involving fuel. The OPA 90 VRP for this vessel meets the intent of OPA 90 for operations in US navigable waters.

Under OPA 90 each state is allowed to develop more stringent regulations for spill prevention and spill response activities. As such, some states also require owners and operators of dry bulk vessels to develop and maintain Vessel Response Plans. One state also requires owners and operators of tank and dry cargo vessels to develop and maintain Spill Prevention Plans.

US WATERS NAVIGATION
Then In case of navigation in US waters Masters and Officers must refer to the US VRP Prepared by Hudson Marine for the company and follow the instructions available in case of an emergency situation in US waters.

Safety and Environmental Policy

POLICY STATEMENT

It is the policy of the Company to provide healthy and safe working conditions, and to maintain a safe pollution-free operating practice that complies with national and international regulations and relevant standards and guidelines.

Company objectives are to:

- provide for safe practices in ship operation and a safe working environment;
- establish safeguards against all identified risks; and
- Continuously improve the safety management skills of personnel ashore and aboard ship, including preparing for emergencies related both to safety and environmental protection.

The objectives will be achieved by:

- maintaining high standards of safety consciousness, personal discipline and individual accountability by adherence to a comprehensive and documented system of training;
- actively promoting employee participation in measures aimed at improving safety and protecting the environment;
- keeping all personnel fully informed of any known or potential hazards that may affect themselves, their colleagues, the ship or the environment by transmittal of pertinent documentation;
- ensuring adherence at all times to the documented operating procedures by a system of internal verification of procedures and activities; and
- continuously reviewing all mandatory rules, regulations industry codes and guidelines that are relevant to specific vessel types and trades.

All employees are expected to comply with Safety and Pollution Prevention Regulations and Procedures at all times, and to take the necessary precautions to protect themselves, their colleagues, the ship, its cargo and the environment.

Plan Approval
M/T *Dara Desgagnés*

Original Plan Approved by:	Date:	Document No.
Official Stamps:		

Revised Plan Approved by:	Date:	Revision No.
Official Stamps:		

Revised Plan Approved by:	Date:	Revision No.
Official Stamps:		

Revised Plan Approved by:	Date:	Revision No.
Official Stamps:		

Record of Changes

Revision Number	Date of revision	Section revised	Initials	Remarks
0	25-10-2012	New Manual	DC	All Sections revised

Section 1 — Generalities

This Shipboard Marine Pollution Emergency Plan should be used for response to oil/noxious liquid substances (NLS) spill incidents and other vessel casualties that occur in any part of the world that is located *outside* of the navigable waters of the United States, including the Exclusive Economic Zone (EEZ, or 200 Mile Limit).

While within the navigable waters of the United States, including the Exclusive Economic Zone (EEZ, or 200 Mile Limit), use the OPA 90 Vessel Response Plan (VRP) , which is prepared in accordance with the Oil Pollution Act of 1990 (OPA 90), the requirements of Title 33 Code of Federal Regulations (CFR) Part 155, and the requirements of each state, and approved by the U.S. Coast Guard.

1.1. CONCEPT OF PLAN

This Shipboard Marine Pollution Emergency Plan is intended to provide the Master and his crew, as well as shore-based personnel, with the necessary information on how to deal with oil/NLS spills and threats of oil/NLS spills, and other vessel casualties, anywhere in the world, except in the navigable waters of the United States. *(See OPA 90 Vessel Response Plan (VRP) for similar information while in U.S. waters.)* It is also intended to guide personnel in taking the necessary actions to stop or minimise the discharge through:

- Response procedures;
- Reporting procedures;
- Contact points;
- Co-ordination with national authorities; and
- Training and drills.

Where possible, this Plan makes use of flow charts and checklists to guide the Master through the various actions and decisions that will be required in an incident response. Flow charts and checklists provide a visible, and logically sequenced, form of information, thus reducing the chance of oversight or error during the early stages of dealing with an emergency situation.

Personnel with key functions on board and ashore must be familiar with the plan. For any plan to be effective, it has to be reviewed and updated regularly, and it has to be tested in drills and regular practices. Exercises in implementation of the plan as part of the shipboard mitigation procedures must be held at regular intervals. In the same way, exercises in the communications procedures are necessary in order to verify that the shore-side plans are also working properly.

It is recognised that no plan can foresee the many circumstances and combinations of events that may arise with respect to a particular incident. It is accepted that the Master and officers of the vessel will exercise prudent judgement, assess risk factors, and make decisions under emergency conditions on the basis of incomplete information. The guidance contained herein is always subject to events beyond the control of the parties named.

1.2. COMPANY POLICY

Quality is an integrated part of the Transport Desgagnés Inc.'s business idea and operating philosophy. Quality reflects the approach to all aspects of conduct and policy in ship owning, ship operation, and ship management. Quality means Safety, Punctuality, and Efficiency in securing the requirements of our customers. The final measure of quality is customer satisfaction.

In pursuing the objectives, Transport Desgagnés Inc. has outlined the following main policies to be known and observed by all personnel:

- Maximum safety for personnel, environment, ship and cargo in all operational activities shall always be the overriding consideration;
- Strict observation of relevant regulations shall always be the rule;
- Maximum emphasis shall be put on proper and careful planning of operations as insufficient planning and preparation is the most frequent reason for operational irregularities; and
- Transport Desgagnés Inc.'s management expertise and market knowledge shall be fully utilized in the structuring and management of vessel operations and crew training.

Transport Desgagnés Inc.'s Quality and Safety Management System has been established to enable the company's management to implement the above objectives in a consistent manner. In this context, Quality and Safety Management becomes an important means of achieving the objectives.

All Company personnel will adhere to this policy and will correct, or identify to appropriate supervisory levels, situations that will run counter to this policy.

This Shipboard Marine Pollution Emergency Plan is describing in details the procedures to be followed in any oil/NLS spill incident or threats of spills.

1.3. ADMINISTRATION AND UPDATING

This Shipboard Marine Pollution Emergency Plan should be reviewed by the company annually, and as needed in light of changes in local law or regulation, contact names and numbers, and company policy. In addition, this Plan should be reviewed and evaluated after every drill, exercise, and spill, and where lessons learned requires changes.

The Quality, Safety, Security and Environment Department is responsible for revising the Plan.

The Master should submit to the company any additional or updated information involving the vessel, the shipboard personnel, and on-board equipment. In addition, the Master and his officers are encouraged to submit proposals for changes to the Plan.

1.4. DISTRIBUTION LIST

The Shipboard Marine Pollution Emergency Plan is distributed as follows:

RECIPIENTS	NUMBER OF COPIES	LOCATION
M/T *Dara Desgagnés*	1	Master's office
M/T *Esta Desgagnés*	1	Master's office
M/T *Jana Desgagnés*	1	Master's office
Transport Desgagnés Inc.	1	Transport Desgagnés Emergency Room
Flag State Administration	1	Transports Canada, Marine Safety

Shipboard Marine Pollution Emergency Plan

Section 2 — Reporting Requirements

GENERAL

A. The Canadian "Pollutant Discharge Reporting Regulations", SOR 95-351 and, Article 8 and Protocol I of MARPOL 73/78, require that the nearest coastal state should be notified of actual or probable discharges of oil/NLS to the sea. The intent of the requirement is to ensure that coastal states are informed without delay of any incident giving rise to pollution, of the marine environment, as well as the need for assistance and salvage measures, so that appropriate action may be taken.

B. The reporting requirements of this section comply with those of regulation 37 Annex I and 17 Annex II of MARPOL 73/ 78.

C. When the ship is involved in an incident which results in the discharge of oil or NLS, the Master is obliged under the terms of MARPOL 73/ 78 to report details of the incident, without delay, to the nearest Coastal State by means of the fastest telecommunication channels available. Transport Canada's Publication – *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful substances, and Marine Pollutants* (TP 9834) gives detailed reporting procedures when the incident occurs in Canadian waters or fishing zones.

D. The intent of these requirements are to ensure that Coastal States are informed, without delay, of any incident giving rise to pollution, or threat of pollution of the marine environment, as well as of assistance and salvage measures, so that appropriate action may be taken.

E. Without interfering with shipowners' liability, some coastal states consider that it is their responsibility to define techniques and means to be taken against a marine pollution incident and approve such operations which might cause further pollution, i.e. lightening. States are in general entitled to do so under the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 and the Protocol relating to Intervention on the High Seas in Case of Pollution by Substances other than Oil, 1973.

2.1 WHEN TO REPORT

All oil/NLS discharge in excess of the quantity permitted by laws and regulations must be reported.

2.1.1 ACTUAL DISCHARGE

The Master is obliged to report to the nearest Coastal State whenever there is a discharge of oil resulting

- from damage to the vessel.
- from damage to the vessel's equipment.
- for the purpose of securing the safety of a ship or saving life at sea.
- during the operation of the vessel in excess of the quantity or instantaneous rate permitted under the present Convention.
- During the operation of the ship, a discharge of oil/NLS in excess of the quantities permitted by the Canadian Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals SOR/2007-86, and the Arctic Shipping Pollution Prevention Regulations, e.g.:

    - 0 PPM Arctic waters
    - 5 PPM Inland waters
    - 15 PPM Outside inland waters

Reports to coastal states should be in the style given in Section 2.2.

2.1.2 PROBABLE DISCHARGE

The Master is obliged to report even when no actual discharge of oil or NLS has occurred but there is a probability that one could.

However, as it is not practicable to lay down precise definitions of all types of situations involving probable discharge of oil/NLS which would warrant an obligation to report the Master is obliged to judge by himself whether there is such a probability and whether a report should be made.

Therefore, it is recommended that, at least, the following events

- Damage, failure or breakdown which affects the safety of the ship (e.g. collision, grounding, fire, explosion, structural failure, flooding, cargo, cargo shifting etc.)

or

- Failure or breakdown of machinery or equipment which results in impairment of the safety of navigation (e.g. failure or breakdown of steering gear, propulsion, electrical generating system, essential shipborne navigation aids etc.)

are carefully considered by the Master – taking into account the nature of the damage failure or break- down of the ship, machinery or equipment as well as the ship's location, proximity to land, weather, state of the sea and traffic density – as cases in which a probable discharge is most likely.

If in doubt, the Master should always make a report in cases aforementioned.

In all cases the Authorities should be kept informed by the Master as how the situation progress and be advised when all threat of pollution has passed.

2.1.3 FOLLOW UP REPORTS

Once the vessel has transmitted an initial report, further reports should be sent at regular intervals to keep those concerned informed of developments.

Follow up reports to coastal states should always be in the style given in Section 2.2, and should include information about every significant change in the vessel's condition, the rate of the release and spread of oil/NLS, weather conditions, and details of agencies notified and clean-up activities.

2.2 INFORMATION REQUIRED

As required in article 8 and Protocol I of MARPOL 73/ 78 Convention the Master or other persons having charge of the ship should report the particulars of any pollution incident. In this context the International Maritime Organization (IMO), in 1997, adopted Resolution A. 851 (20) "General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents involving Dangerous Goods, Harmful Substances and/ or Marine Pollutants".

The intent of the Resolution aforementioned is to enable Coastal States and other interested parties to be informed, without delay, of any incident giving rise to pollution, or threat of pollution of the marine environment, as well as of assistance and salvage measures, so that appropriate action may be taken.

Nothing in this chapter relieves the Master in using sound judgement to make sure that any incident or probable discharge is reported as quickly as possible in the prevailing situation.

When transmitting initial reports to the authorities of the nearest Coastal State the Master or other persons dealing with such a transmission should take note of Resolution A. 851 (20).

Especially, the format of the initial report as well as supplementary of follow-up reports should conform to the guidance contained in Res. A. 851 (20).

All reporting whether initial or follow-up, should follow IMO´s reporting format as outlined below and should contain the following information

LABEL	FUNCTION	EXPLANATION
A	Ship	Name, call sign and nationality
B	Date and time (UTC) of event	A 6-digit group giving day of month (first two digits), hours & minutes (last four digits)
C or:	Position	A 4-digit group giving latitude in degrees and minutes suffixed with N or S, and a 5-digit group giving longitude in degrees and minutes suffixed with E or W
D	Position	True bearing (first 3 digits) and distance (state distance) in nautical miles from clearly identified landmark (state landmark)
E	True course	A 3-digit group
F	Speed at time of incident	In knots and tenths of knots as a 3-digit group
L	Route information	Details of intended track
M	Radio communications	Full details of radio stations (names) and frequencies being guarded
N	Time (UTC) of next report	A 6-digit group as under BB above
P	Cargo on board: can be included in "RR" as relevant	Type(s) and quantity(ies) of cargo/ bunker on board and brief details of any harmful substances and gases that could endanger persons or the environment, pollution category, manufacturer, etc.
Q	Defects, damage or deficiencies or other limitations	Brief details of conditions of the ship as relevant; ability to transfer cargo/ ballast/ bunker fuel
R	Description of pollution or possible overboard discharge	Brief details of pollution; this should include the type(s) of oil or NLS, an estimate of the quantity discharged, whether the discharge is continuing, the cause of the discharge and, if possible, an estimate of the surface area of the spill and the movement and area

S	Weather conditions	Brief details of weather and sea conditions prevailing including wind force and direction and relevant swell details
T	Ship's representative and/ or owner	Name, address, telex and telephone number of the ship's owner and representative (charterer, manager or operator of the ship or their agents)
U	Ship's size and type	Details of length, breadth and type of ship as well as draught
X	Miscellaneous and additional information	Any other information including relevant details such as brief details of incident, need for outside assistance, action being taken to limit further discharge; details of any personnel injuries sustained, details of P & I Club and local correspondent.

Note: See blank form at the end of this section.

All follow-up reports by the Master should include information relevant to the Coastal State Authorities to keep them informed as the incident develops.

Follow-up reports should include information on any significant changes in the ship's condition, the rate of release and spread of the substances, weather and sea conditions and clean-up activities underway.

In this context details of bunker and cargo disposition, condition of any empty tanks and nature of any ballast carried are information needed by those involved in order to assess the threat posed by an actual or probable discharge from the damaged ship.

The following additional information should be sent to TRANSPORT DESGAGNÉS INC. either at the same time as the initial report or as soon as possible thereafter:

- Number of casualties;
- Further details of damage is still sustained;
- Whether damage is still sustained;
- Assessment of fire risk and precautions taken;
- Damage to other ships or property;
- Disposition of cargo on board and quantities involved;
- Time (UTC) assistance was requested and time (UTC) assistance expected to start;
- Name of salvor and type of salvage agreement;
- Whether further assistance is required;

- Priority requirements for spare parts and other materials;
- Details of outside parties advised or aware of the incident;
- Any other important information.

After transmission of the information contained in an initial report, as much as possible of the information essential for the safeguarding of life and the protection of the ship and the marine environment should be reported to the coastal state, owner and/or operator, in order to keep them informed of the situation as the incident develops. This information should include items P, Q, R, S and W, as appropriate.

Blank forms are available at the end of section as well as in the Master's office.

2.3 WHOM TO CONTACT

The Master is responsible for reporting any incident involving an actual or probable discharge of oil or NLS.

Nothing in this chapter relieves the Master from using sound judgement to make sure that any incident is reported as quickly as possible in the prevailing situation.

2.3.1 COASTAL STATE CONTACTS

In order to expedite response and minimize damage from a pollution incident, it is essential that appropriate coastal states are notified without delay. This process is begun with the Initial Report. Guidelines for compiling reports are provided in Section 2.2.

The report should be transmitted in one of the following manner:

1. If the incident occurs in Canadian waters or fishing zone, the report shall be made with the highest possible priority and using the quickest means available, to a pollution prevention officer.

2. If the vessel is in area governed by Vessel Traffic Services (VTS) Standards, the report should, where expedient, be routed through that system. If area not covered by VTS but covered by Coast Guard radio station system, the report should, where expedient, be routed through the latter system.

3. If the incident occurs outside Canadian waters and fishing zones, the report should be made to the nearest coastal state through an appropriate coast station, preceded by the safety signal (if the incident affects the safety of the navigation), or by the urgency signal (if the incident affects the safety of the ship or persons);

4. On appropriate frequencies in the band 405-525 kHz, 1605-2850 kHz or 156-174 MHz;

5. If the ship is not within reach of an MF or VHF coast radio station, to the most appropriate HF coast radio station or on the maritime satellite communication system.

6. When the ship is within or near an area where a ship movement reporting system has been established, to the designated radio station of that system.

This Plan includes, in APPENDIX 1, a list of agencies or officials of administration responsible for the receipt, transmission and processing of urgent reports of incidents involving harmful substances including oil or noxious liquid, E.G., ships to coastal state.

2.3.2 PORT CONTACTS

Notification of local agencies will speed response. However, the variety of trades in which ships engage may make it impractical to list local agencies in the Plan. Where this is feasible, the Master should obtain details concerning local reporting procedures upon arriving in port.

Nevertheless, a list of Coastal State Contacts is available in Appendix 1 as required by article 8 of MARPOL 73/78 and a list of National Operational Contacts is available in Appendix 2.

If an oil/NLS spill occurs, whatever the cause, it is the Master's duty to immediately activate the vessel's Oil/NLS Pollution Team, and report the incident. Precise details of whom to notify locally should be obtained on arrival, but the following is a guide:

a) Local Authority (Coast Guard/Government);
b) Owners/Owners' Managers;
c) Owners Local Representatives / Spill Manager;
d) Terminal / Loading Master;
e) Local State (Environmental) Authority and, if time permits;
f) Local Fire Department (in case of explosion and/or fire);
g) Agent;
h) Port Authority;
i) The vessel's local P&I representative (P&I Club List of Correspondents is filed in the Master's office);
j) Charterer; and
k) Clean-up Contractor.

If a change in the ship's range of trade or a change in the addresses of persons/ Authorities of the ports/ terminals served regularly takes place the Master or any other person aboard delegated by the Master is required to issue a new list.

2.3.3 SHIP INTEREST CONTACTS

The Plan provides details of all those parties with an interest in the ship who should be advised in the event of an incident. While reporting an incident to other interests, it should be remembered that in the event of a serious incident, the ship's personnel may be fully engaged in saving life and taking steps to control and minimise the effects of the casualty. They should therefore not be hampered by having non-essential communications requirements imposed upon them. Thus, Transport Desgagnés Inc. officials should ensure these communications are made.

The Plan clearly specifies who will be responsible for informing the various interested parties such as cargo owns insurers and salvage interests. It is also essential that both the ship's plan and the company's corporate plan are coordinate d to guarantee that all parties having an interest are advised and that duplication of reports is avoided.

A list of ship interest contacts is detailed in Appendix 3, which also indicates the order of priority for notifying those concerned. Out-of-hours contacts are included.

Precise details of whom to notify will vary from company to company, but the following is a guide:

- Head Office;
- Charterer;
- Classification Society; and
- P & I Club.

All further reports and copies of messages sent to coastal states and/or port authorities should be sent to the company. If required, the company's office will be staffed as soon as possible after receipt of an initial report.

Once the initial report has been made, the company's corporate plan (Office Contingency Plan) will ensure that other interests such as Flag State authorities, P & I Club, Classification Society, and others, are notified and kept up to date on the incident.

These updating reports are a vital necessity to ensure appropriate measures are being taken whilst unnecessary risks and expenses are avoided.

The master or owner of a ship must report, without delay, any discharge or anticipated discharge of a pollutant to a Pollution Prevention Officer (PPO). These initial reports should be made to any Marine Communications and Traffic Services (MCTS) on the frequencies listed in the publication, Radio Aids to Marine Navigation (RAMN) - DFO 5470 (Great Lakes and Atlantic) and DFO 5471 (Pacific).

In addition to the above process for reporting spills from a ship to PPO's through the Marine Communications and Traffic Services (MCTS), the Coast Guard maintains a 24-hour Duty Manager alerting process which can be contacted at the numbers listed below.

Canadian Coast Guard
Safety & Rescue Environmental Response Systems Marine Programs
Department of Fisheries and Oceans
200 Kent Street,
Ottawa, Ontario, K1A 0E6
Pager: +1 613 751 0605 (24 hours)
Fax: +1 613 998 0434 Note: This number is operational on a 24-hr basis but is only monitored during business hours.
E-mail: erhqsr@dfo-mpo.gc.ca
Languages understood: ENGLISH/FRENCH

Enquiries regarding pollution preparedness and response should be directed to:

Manager, Environmental Response
Canadian Coast Guard
Safety & Rescue Environmental Response Systems Marine Programs
Department of Fisheries and Oceans
200 Kent Street, 5th Floor
Ottawa, Ontario K1A 0E6

Phone: +1 613 990 7011
Fax: +1 613 996 8902
E-mail: melhuish@dfo-mpo.gc.ca
Languages understood: ENGLISH/FRENCH

Within Canada administrative enquiries related to pollution prevention, vessel regulations, design and construction should be directed to:

Director, Ships & Operations Standards
Transport Canada

Tower C, Place de Ville
330 Sparks Street, 11th floor
Ottawa, Ontario K1A 0N8

Phone: +1 613 991 3131
Fax: +1 613 993 8196
E-mail: dayrh@tc.gc.ca
Languages understood: ENGLISH/FRENCH

SHIPBOARD MARINE POLLUTION EMERGENCY PLAN
Initial Notification

A	(Ship name, call sign, flag)
B	(Date and time of event, UTC) _____ _____ _____ D D H H M M
C D	(Position: Lat, Long.) or (Bearing x dist Landmark) (dd mm) _____N/S _____ (ddd mm) _____E/W ddd N miles
E F	(Course) (Speed) _____ _____ d d d kn kn 1/10 kn
L	(Intended track)
M	(Radio station guarded)
N	(Date and time of next report, UTC) _____ _____ _____ D D H H M M
O P	(Type and quantity of cargo / bunker on board) Draught _____fwd _____ aft
Q	(Brief details of defects / deficiencies / damage)
R	(Brief details of pollution, including estimate of quantity lost)
S	Wind dir._____(ddd) Swell dir. _____(ddd) Speed _____(beaufort) Height _____(m)
T	(Contact details of ship's owner operator, agents) Transport Desgagnés Inc. Tel: (418) 692-1000 21 Marché-Champlain Street Fax: (418) 692-6044 Québec, Québec G1K 8Z8 E-Mail: info@desgagnes.com Agent: _____
U	(Ship size and type) Length: Breadth: Tonnage:
V W	(Add'l information) Details of incident: _____ _____ Need for outside assistance: _____ Action to be taken: _____ Number of crew and details of injury: _____ Details of P & I club and correspondent: _____ _____ Others: _____

The alphabetical reference letters in the above format are from the guidelines for reporting incidents involving dangerous goods, harmful substances and /or marine pollutants. The letters do not follow the complete alphabetical sequence as certain letters are used to designate information required for other standard reporting formats, e.g., those used to transmit route information.

Section 3 — Steps to Control Discharge

Whenever an oil/NLS spill occurs, it is the duty of the person finding the spill to inform immediately the Master of responsible officer, who should call out the vessel's Oil/NLS Pollution prevention team (see Appendix 4). Remember that an oil/NLS spill may create a fire or explosion hazard, requiring safety precautions to be observed.

Ship personnel will most probably be in the best position to take quick action to mitigate or control the discharge of oil or noxious liquid substances from their ship.

Therefore, this Plan provides the Master with clear guidance on how to accomplish this mitigation for a variety of situations.

It is the Master's responsibility to initiate a response in the event of a discharge of oil/NLS or substantial threat of discharge – actual or probable – into the waters.

In no case action should be taken that in any way could jeopardize the safety of personnel either onboard or ashore.

In cases of a discharge of noxious liquid substances the Master has to refer to the "Characteristics of Liquid Chemicals Proposed for Marine Transport in Bulk" (Data Sheets) provided onboard for any NLS cargo. Considerations have to be made to any danger resulting from discharge of such substances, i.e. mixing with water, air and other materials/substances.

Special consideration is to be taken in case of the necessity to transfer cargo into another compartment onboard the compatibility of the material to be transferred and the material of pipes and tanks to be used for such action.

The following enumeration specifies different kinds of possible operational spills with regard to reactions to be taken.

3.1 OPERATIONAL SPILLS

3.1.1 OPERATIONAL SPILL PREVENTION

Crew members shall maintain a close watch for the escape of oil or NLS during bunker or cargo operations.

Prior to bunker or cargo transfer the competent crew members should mobilize the spill equipment, as far as available on board, and place it close to the planned operation, e.g. along the railing on the side at which bunker operation takes place.

Before bunker or cargo handling commences, all deck scuppers and open drains must be effectively plugged. Accumulations of water should be drained periodically and scupper plugs replaced immediately after the water has run off. Any free floating substances should be removed prior to draining.

Bunker or cargo tanks which have been topped up should be checked frequently during the remaining operations to avoid an overflow.

Unless there are permanent means for retention of any slight leakage at ship/ shore connections for bunker or cargo transfer, it is essential that a drip tray is in place to catch any leaking substance.

3.1.2 PIPELINE LEAKAGE DURING CARGO AND BUNKER TRANSFER

Measures to implement immediately:

- Stop all cargo and bunkering operations and close manifold valve;
- Sound general alarm bell; notify situation by public address system;
- Initiate emergency response procedures;
- Inform terminal/bunkering personnel of incident

Further measures:

If a leakage occurs from a pipeline, valve, hose or metal arm, operations through that connection should be stopped immediately until the cause has been as contained and the defect remedied.

The defective pipe section should be isolated. Affected sections should be drained down to an available empty or slack tank.

If there is any possibility of released vapours entering an engine room or the accommodation intake, appropriate preventive steps must be taken quickly.

If a leakage occurs from a hydraulic pipeline, operations should be stopped immediately.

Initiate clean-up procedures.

The removed substances and the used clean-up material should be retained on board until it can be discharged to a reception facility.

Inform in line with Section 2 all parties interested about Pipeline Leakage and the actions taken so far.

Refer to checklist in Appendix 5.

3.1.3 TANK OVERFLOW DURING LOADING OR BUNKERING

If there is a tank overflow all bunker/cargo operations should be stopped immediately and should not be restarted until the fault has been rectified and all hazards from the released substances have been eliminated.

If there is any possibility of released vapours entering an engine room or the accommodation intake, appropriate preventive steps must be taken quickly.

As far as the substance permits in view of the material compatibility of tanks/pipes, shift liquid from the tank overflowed to an available empty or slack tank or prepare pump(s) or transfer the excess ashore.

Initiate clean-up procedures.

The removed substances and the used clean-up material should be retained on board until it can be discharged to a reception facility.

Inform in line with Section 2 all parties interested about Tank Overflow and actions taken so far.

AFTER DEALING WITH AN OIL/NLS SPILL, ONCE CLEANUP OPERATIONS ARE COMPLETED, REQUEST PERMISSION TO RESUME OPERATIONS FROM PROPER AUTHORITIES.

Refer to checklist in Appendix 5.

3.1.4 HULL LEAKAGE

Signs leading to the suspicion of hull fractures:

- Excessive list;
- Oil/NLS in water around the vessel.

Measures to implement:

- Stop all cargo and bunkering operations and close manifold valve;
- Sound general alarm bell; notify situation by public address system;
- Initiate emergency response procedures;
- Inform terminal/bunkering personnel of incident

Further measures:

- Use the Oil/NLS Pollution Prevention team in an attempt to locate the source of leakage;
- Consider whether to stop air intake into accommodation and non-essential air intake in engine room.

When the source of leakage is identified:

- Reduce the hydrostatic head of leaking cargo/bunker tank by transferring in an empty or slack tank;
- Consider changing trim/list condition to use seawater as equalising or exceeding bunker tank hydrostatic pressure;
- Consider possibility of pumping water in ballast tank to change effect of hydrostatic pressure;
- Consider possibility of pumping water into leaking cargo/bunker tank to create a water cushion to prevent further oil/NLS loss;

- If the leakage is located below the waterline, call in divers for further investigation.

If it is not possible specifically to identify the tank:

- The level of oil/NLS in the vicinity of the suspected area should be lowered. Remember to consider the effect of hull stresses and stability of the vessel.

AFTER DEALING WITH AN OIL/NLS SPILL, ONCE CLEANUP OPERATIONS ARE COMPLETED, REQUEST PERMISSION TO RESUME OPERATIONS FROM PROPER AUTHORITIES.

Refer to checklist in Appendix 5.

3.1.5 SPILLS CAUSED BY EQUIPMENT IN MACHINERY SPACES

If operational spills are caused by a failure of equipment in machinery spaces any further operations of this equipment should be stopped immediately or measures are to be taken to avoid a spill.

Such equipment may be:

- Oily-water separating equipment or oil filtering equipment to oil bilge water from the engine room bilges
- Valves in pipes connecting ballast/ bilge/cargo systems
- Cooling pipes in cooler systems
- Gearing of bow thrusters
- Stern tubes

3.2 SPILL RESULTING FROM CASUALTIES

Priority actions

In responding to a casualty, the master's priority will be to ensure the safety of personnel and the ship and to take action to prevent escalation of the incident. In casualties involving spills, immediate consideration should be given to measures aimed at preventing fire, personnel exposure to toxic vapours, and explosion, such as altering course so that the ship is upwind of the spilled cargo, shutting down non-essential air intakes, etc. If the ship is aground, and cannot therefore manoeuvre, all possible sources of ignition should be eliminated and action should be taken to prevent toxic vapours or flammable vapours entering accommodation and engine-room spaces. When it is possible to manoeuvre, the master, in conjunction with the appropriate shore authorities, may consider moving his ship to a more suitable location in order, for example, to facilitate emergency repair work

or lightening operations, or to reduce the threat posed to any particularly sensitive shoreline areas. Such manoeuvring may be subject to coastal State jurisdiction
Prior to considering remedial action, the master will need to obtain detailed information on the damage sustained by his ship. A visual inspection should be carried out and all cargo tanks, bunker tanks, and other compartments should be sounded. Due regard should be paid to the indiscriminate opening of ullage plugs or sighting ports, especially when the ship is aground, as loss of buoyancy could result.

Having assessed the damage sustained by the ship, the master will be in a position to decide what action should be taken to prevent or minimize further discharge. When bottom damage is sustained, hydrostatic balance will be achieved (depending on physical properties) fairly rapidly, especially if the damage is severe, in which case the time available for preventive action will often be limited. When significant side damage is sustained in the way of fuel/lubrication and/or cargo tanks, bunkers or cargo will be released fairly rapidly until hydrostatic balance is achieved and the rate of release will then reduce and be governed by the rate at which bunkers or cargo is displaced by water flowing in under the bunkers or cargo. When the damage is fairly limited and restricted, for example, to one or two compartments, consideration may be given to transferring the substance involved internally from damaged to intact tanks. When considering the transfer of oil or noxious liquid substances from a damaged tank to an intact tank, the master should consider:

1. the extent of the damage;
2. hydrostatic balance;
3. the ship's ability to transfer cargo; and
4. the physical properties of the substance(s) (for ships certified to carry NLSs) involved such as:
    - solubility;
    - density;
    - water reactivity
    - solidification; and
    - compatibility.

Great care in casualty response must be taken to consider stability and strength when taking actions to mitigate the spillage of oil or noxious liquid substance or to free the ship if aground. The Plan provides the master with detailed guidance to ensure that these aspects are properly considered. Nothing in this section shall be construed as creating a requirement for damage stability plans or calculations beyond those required by relevant international conventions.

Internal transfers should be undertaken only with a full appreciation of the likely impact on the ship's overall longitudinal strength and stability. When the damage sustained is

extensive, the impact of internal transfers on stress and stability may be impossible for the ship to assess. Contact may have to be made with the owner or operator or other entity in order that information can be provided so that damage stability and damage longitudinal strength assessments may be made. These could be made within the head office technical departments. In other cases, classification societies or independent organizations may need to be contacted. Additionally, in the case of ships certified to carry NLSs, consideration as to the compatibility of all substances involved such as cargoes, bunkers, tanks, coatings, piping, etc., must also be considered before such an operation is undertaken.

Mitigating Activities

If safety of both the ship and the personnel has been addressed the Master shall care for following issues:

- Assessment of the situation and monitoring of all activities as documented evidence
- Care for further protection of the personnel, use of protection gear, assessment of further risk for health and safety
- Containment of the spilled material by absorption and proper and safe disposal of all material onboard until proper delivery ashore under close guidance of the safety information given by the Product Data Sheet
- Decontamination of personnel after finishing the cleanup process

3.2.1 LIGHTERING / SHIP-T0-SHIP TRANSFER

If a ship becomes disabled or stranded, it may be necessary to transfer all or part or her cargo/bunker to another ship. In the case of tankers, reference should be made, to the *Ship-to-Ship Transfer Manual* available onboard and approved by the Classification Society.

In Ship-to-Ship transfer operations involving a specialized ship, the Master of that ship will normally be in overall charge.
In the case of non-specialized ships, the Master or other person in overall charge of the operation should be mutually agreed and clearly established by the Masters concerned prior to the start of operations. In all cases each master remains responsible for the safety of his own ship, its crew, cargo/bunker and equipment and should not permit their safety to be jeopardized by the action of the other Master, his owner, regulatory officials or others.

The Ship-to-Ship transfer operations should be coordinated with the appropriate responsible local Authority. In addition, the Master should take note of supplemented instructions issued by the Company.

The operation will be greatly expedited if the ship to be lightened makes the following preparations where possible:

a) Establish contact with the lightening ship and makes a detailed plan of the proposed operation including the designation of a communication channel. Fixed or portable hand-held radio telephones may be usefully employed;

b) Lay out mooring lines, heaving lines, messengers, stoppers, fenders, etc. If no large fenders are available, mooring ropes and any other soft material should be strung over the ship's side in strategic positions;

c) Prepare the cargo manifold and have reducers ready available to facilitate the connection of a wide range of hoses (from 200mm to 400mm) on both sides of the ship. In most cases the lightening ship will prefer to berth with her port side to the disabled ship's starboard side, if this is practicable;

d) Top-up derricks or cranes to assist in hose connection. Also have messenger ropes, lifting tackles, etc. available;

e) Have the anchors cleared ready for use, if in waters where use may be possible;

f) Brief the officers and crew on the operation, with particular reference to the safety aspects and complete the appropriate safety check list if possible.

Cargo transfer:

If the disabled ship has power and its cargo piping system is intact, transfer should be made in the usual way.

If the ship's pipelines are not intact, approved portable submersible pumps with power packs should be obtained. The power for submersible pumps may be electric, air or hydraulic. When using submersible pumps, the tanks being emptied of cargo may be counter-flooded with water in order to reduce the head. This may also assist in preventing pollution.

3.2.2 GROUNDING OR STRANDING

The GENERAL ALARM must be sounded immediately for the personnel to muster at their designated positions.

If the vessel is aground and therefore cannot manoeuvre, all possible sources of ignition must be eliminated and action taken to prevent flammable vapours from entering the engine room spaces or the accommodation.

The Master's next priority should be to ensure that he as soon as possible receives detailed information on the damage that the vessel has sustained, in order to find out what remedial action needs to be taken to ensure the safety of the vessel and its crew.

- A visual inspection should be carried out.
- All cargo and bunker tanks to be sounded (ullage)
- All other compartments which have contact with the sea should be sounded to ensure that they are intact.
- Soundings of cargo tanks are to be compared with last soundings to check for possible leaks.
- Any list shall be noted and included in the report for assistance.

Also consider:

- Danger to the vessel's complement if the vessel should slide off grounding site.
- Danger of vessel being broken down by heavy seas or swells.
- Health hazards to the vessel's complement and surrounding population due to release of hazardous substances is dangerous concentrations.
- That fire may start due to released flammable substances due to uncontrolled ignition sources.
- Furthermore, the vessel's Master must take into account the following considerations:
- Is the vessel constantly being struck in the seaway?
- Is the vessel exposed to torsion?
- Sounding to be taken around the vessel to establish the vessel's position on the bottom.
- Are there strong tidal currents in the grounding area?

- May the vessel drift further up on the shore, due to high tides, wind and waves?

3.2.2.1 PREVENTION OF FIRE AND EXPLOSION

If the ship is aground and therefore cannot manoeuvre, all possible sources of ignition should be eliminated and action taken to prevent flammable vapours from entering the machinery spaces or the accommodation.

3.2.2.2 EXTENSION OF HULL DAMAGE

First, a visual inspection should be carried out.

Check for visible oil along hull or in wake of the ship during day time. At night a stick with white cloth (or sheet of sorbent) around it may be lowered into the water alongside the ship to check for oil leakages.

All ballast/ bunker tanks to be sounded (ullage).
All other compartments which may have contact with the sea should be sounded to ensure that they are intact.

Soundings of ballast/cargo/bunkers tanks are to be compared with last soundings to check for possible leaks.

Sounding to be taken around the ship establish the ship's position on the grounding area.

When the ship is aground, due regards should be given to the indiscriminate opening of ullage plugs, sighting ports etc. as loss of buoyancy could be the result of such actions.

Any list of the ship shall be noted and included in the report for assistance.

3.2.2.3 PROCEDURES TO REDUCE OR STOP OUTFLOW OF OIL OR NLS

The Master should assess the possibility of damage to the environment and whatever action can be taken to reduce further damage from any release, such as:

- Transfer of bunkers/cargo internally, provided shipboard piping system is in an operational condition and in careful view of the compatibility of the substance and the tanks/pipes used for transfer, and taking into account the impact on the ship's overall stress and stability
- Isolate damaged/ penetrated tank(s) hermetically to ensure that hydrostatic pressure in tanks remains intact during tidal changes

- Evaluate the necessity of transferring bunkers/cargo to barges or other ships and request such assistance accordingly
- Evaluate the possibility of additional release of oil or NLS in close co-operation with coastal states.

In case of large differences between the tide levels, the Master should try to isolate the damaged tank(s) to reduce additional loss of substances.

3.2.2.4 REFLOATING BY OWN MEANS

The Master should also evaluate the question of refloating the vessel by own means. Before such an attempt is made, it must be determined:

- whether the ship is damaged in such a way that it may sink, break up or capsize after getting off
- whether the ship after getting off may have manoeuvring problems upon leaving the dangerous area by own means
- whether machinery, rudder or propeller are damaged due to grounding or may be damaged by trying to get off ground by own means
- whether the ship may be trimmed or lightened sufficiently to avoid damage to other tanks in order to reduce additional pollution
- weather evaluation: whether there is time/ reason to await improvements in weather or tide.

3.2.2.5 SECURING THE SHIP

The risk of further damage to the ship is greater in an attempt to refloat the ship by own means, than in remaining aground until professional assistance has been obtained, the ship's Master should try to secure the ship as much as possible by:

- Trying to prevent the ship from moving from is present position
- By dropping anchors (adequate water depth and anchor ground provided)
- By taking ballast into empty tanks, if possible
- Trying to reduce longitudinal strain on hull by transferring ballast or bunkers internally
- Reducing fire risk by removing all sources of ignition.

Inform in line with Section 2 all parties interested about the Grounding and the actions taken so far.

3.2.3 TOUCHING BOTTOM

Should the vessel experience unusual shaking or vibrations of the hull, unexplained movements or changes in engine revolutions, it may be suspected that the vessel has touched bottom. Procedures should be initiated to ensure that vessel is intact and that there is no oil/NLS leakage.

- If vessel has pilot on board, ask for possible explanation.
- Stop engine immediately, and observe any unexpected speed reduction.
- Consult vessel's charts for area and check depth information.
- Observe accurate position by bearings of fixed points.
- Check for visible oil/NLS along hull or in wake of vessel during day time. At night a stick with white cloth (or sheet of sorbent) around it may be lowered into the water alongside the vessel to check for oil/NLS leakage.
- Take soundings of all tanks, cargo/bunkers and other compartments (ballast tanks etc) to ensure that the vessel has not sustained any damage.
- Isolate penetrated tank by closing the tank hermetically. Very important when large differences in tides occur.

If the vessel is aground, follow instructions provided in 3.2.2

3.2.4 COLLISION

Should the ship be involved in a collision with another ship, the Master should as soon as possible identify the extent of damage to his own vessel.

When a collision occurs, the GENERAL ALARM should be sounded immediately for the personnel to muster at their designated Muster Stations.

The following check list should assist the Master in assessing the situation:

- Are any tanks penetrated above or below the waterline?
- If ships are dead in the water and interlocked, what is most prudent, to stay interlocked or separate?

- Is there any spill at present – small or large? Will a separation of the interlocked ships create a larger spill than if the ships stay interlocked?
- If there is a spill, will the separation of the ships cause sparks that can ignite the spilled material or other flammable substances leaked out from the ships?
- Are the ships creating a greater danger to other traffic in the area if the are interlocked than if separated?
- Is there a danger to either ship of sinking after being separated?
- If the ships are separated, how is the manoeuvrability of the own ship?

Shut down all none essential air intakes.

Isolate damaged/ penetrated tank(s) by hermetically closing the tank(s), if possible.

When it is possible to manoeuvre, the Master, in conjunction with the appropriate shore authorities, should consider moving his ship to a more suitable location in order to facilitate emergency repair work or lightening operations, or to reduce the threat posed to any sensitive shoreline areas.

Inform in line with Section 2 all parties interested about the collision and the actions taken so far.

3.2.5 FIRE AND EXPLOSION

When a fire and/or explosion occur, the FIRE ALARM must be sounded immediately for the personnel to muster at their designated positions.

Chemical fires produce additional hazards and great care is necessary when fighting them. The data sheets of all chemical cargoes must be carefully studied before and during carriage, so that all personnel are familiar with their properties.

- Water may react with some chemicals with the following results:
  - Productions of flammable solutions;
  - Production of toxic vapours;
  - Re-ignition due to low auto-ignition temperature;
  - Production of heat and increased amounts of flammable gases.
- Chemicals soluble in water will destroy normal foam.
- Some chemicals produce toxic vapours when heated. While burning a chemical transformation may produce highly toxic vapours of a different chemical composition.
- Some chemicals that are heavier than water can be blanketed with water if the jet stream is applied slowly and carefully.
- All personnel are to wear breathing apparatus ready for immediate use should toxic vapours or fumes be produced.
- The Emergency Team should always wear breathing apparatus at fire practices.
- The Emergency Team should supplement any fixed fire fighting system with foam or water sprays, if appropriate.
- Small fires in scuppers or around decks should be fought with appropriate portable extinguishers.
- Any sealed space in which a fixed fire fighting system has been used should be entered only after thorough ventilation and testing of the atmosphere.

Should an explosion and a fire occur on board; the vessel's Emergency Teams will under the leadership of the Chief Officer initiate the necessary steps to bring the situation under control.

Such steps shall be:

- Find out immediately where the fire/explosion has taken place.
- Try to determine the extent of damage, and if anyone of the compliment is injured or dead.
- Deploy the members of the vessel's Emergency Teams to the positions deemed best for fighting the fire.
- Use all available means to fight the fire such as:
- Water w/spray nozzles
- Water cannons (monitors)
- Foam cannons (monitors)
- CO2
- Try to contain the fire and prevent it from spreading to other parts of the vessel.

The occurrence shall be reported to the local authorities, informing them about the situation and if the fire cannot be controlled by the complement, request outside assistance as per section 4.

In case of fire and explosion the following priorities exist when the Damage control measures are initiated:

- Rescue lives.
- Limiting the damage to vessel and cargo.
- Preventing environnemental pollution.

When alerting the local authority and firefighting contractors, report as per IMO-format (Section 2), but most important give:

- Name of vessel and nationality.
- Location.
- Type of incident and cargo on board.
- If anyone is injured or missing.
- Any oil/NLS spill or threat of spill.

3.2.6 HULL FAILURE

Should the ship loose one or more shellplatings, develop major cracks, or suffer severe damage to the hull, the Master should immediately sound the GENERAL ALARM to call the crew members to their Muster Stations, and inform them of the situation, and prepare lifeboats for launching if necessary.

The Master should then asses the situation, and confers with his senior officers.

The Master should obtain the latest weather forecast and asses its impact on the present situation.

Furthermore, the following questions should be considered and should be asked:

- Is the ship in any immediate danger of sinking or capsizing?

If YES:

- Send distress message
- Immediately abandon the ship

If NO, initiate damage control measures as found necessary by considering the following points:

- Can the vessel manoeuvre on its own?
- Has the ship lost buoyancy?
- If the ship has a list due to loss of ballast, cargo/ bunker or buoyancy, is it necessary and possible to rearrange the bunker or ballast by internal transfer operation in order to bring the ship to an even keel?
- Is it necessary to dump cargo in order to maintain stability without changing the stress situation?

- Can this operation wait till another ship/ barge can receive that cargo?
- Is there any abnormal change in the ship's stability and stress situation?
- Can the change in the ship's stability and stress situation be monitored and calculated on board? If not, the Master should seek assistance.
- Does the ship need assistance or escort to nearest port of refuge or repair port?
- Might it be prudent to salve part of the crew members in case the situation should worsen, or is it necessary to abandon the ship totally?

Inform in line with Section 2 all parties interested about the Hull Failure and the actions taken so far.

3.2.7 EXCESSIVE LIST

Should the ship for some reasons suddenly start to list excessively during discharging/ loading operations, or bunkering, all ongoing operations should be stopped immediately until the cause has been determined.

The Officer on Duty should inform the Master and/ or Chief Officer without delay.

The Master should try to determine the reason for the excessive list, and take steps to rectify the situation and to stabilize the ship's condition:

- Check reason(s) for list;
- Soundings/ ullage to be taken in all tanks;
- Bunker/ ballast/cargo pumps to be made ready;
- Consider measures to minimize list in transferring liquid from one compartment to another;
- Ensure water tightness of empty spaces;
- Close all openings;
- Secure vent pipes to avoid ingress of water;
- If bunkering: Change to corrective tanks for rectifying the situation;
- If ballasting/ deballasting: Change to corrective tanks to rectify the situation;
- If there is reason to believe that the list may cause any spill, notify as per Section 2;
- If the ship's crew is in jeopardy, prepare lifeboats for launching, and notify as per Section 2.

If the situation is brought under control, inform all parties interested.

3.2.8 EQUIPMENT FAILURE

If the main engine stops or steering gear fails, the bridge watch shall immediately:

- Call Master and Chief Engineer.
- If vessel is considered to be in immediate danger, prepare for dropping an anchor.

When the Master comes to the bridge, his first priority shall be to assess the situation and get a complete picture of the situation, and base his further action based on:

- Position of the vessel relative to shore, shallows or installations.
- Weather and drift (speed and direction).
- Estimated time to get engine or steering gear back into operations.

Action should be taken according to worst case scenario development of the situation.

Main engine failure:

The main engine instruction book failure search list should be used to locate the failure. If the engine cannot be repaired within the permissible time given by the Master, emergency operation of the main engine should be considered on the Master's order.

Steering gear failure:

For location of the steering gear failure, the ICS "STEERING GEAR GUIDANCE ON TEST ROUTINES AND CHECK LISTS" can be used in addition to the steering gear instruction book.

3.2.9 DANGEROUS REACTIONS OF CARGO (for vessels certified to carry NLSs)

In case of spillage of NLS cargo on deck, in the water or incidental mixture with other cargo through internal tank leakage consider dangerous reactions of such mixture. Promptly consult the Data Sheet available for the cargo shipped onboard about possible hazards and necessary precautions/actions to be taken according to the information provided.

Take necessary actions for the safety of the crew for the case of (possible) contamination with the spilled material or its vapours.

3.2.10 DANGEROUS CARGO RELEASE (for vessels certified to carry NLSs)

When a dangerous cargo release is detected, the vessel's emergency team must, under the leadership of the chief officer initiate the necessary steps to bring the situation under control.

Such steps should be:

If at sea or at berth

- First to Raise the alarm

The leaking product must be identified as soon as possible so that potential hazards to the vessel, crew and the environment can be determined by checking with the Material Safety Data Sheet for the substance involved. Particular concern is to be given to flammability and toxicity of vapours.

Engine room personnel should be instructed to switch ventilation to the re-circulation mode and to close air intakes. All non-essential water intakes should be closed after having determined which ones must remain open.

As soon as a source of leakage has been determined, steps to minimise/stop leakage are to be established. This may include discharging, internal cargo transferring and adjusting list and trim.

Radio warnings should be broadcast.

Spills, and probable spills, must be reported immediately to the company and to the authorities in accordance with the rules and regulations.

If at Terminal

- Stop cargo transfer, if any, and raise the alarm.

Ensure that ventilation is switched to the re-circulation mode and that all air intakes are closed. All non-essential water intakes should be closed after having determined which ones must remain open.

Be ready to leave berth without assistance in case of an emergency. Consideration should be given as to lifeboat use in case of vessel evacuation.

3.2.11 LOSS OF TANK ENVIRONMENTAL CONTROL (for vessels certified to carry NLSs)

Consider any hazards arising out of loss of environmental control in view of possible explosion dangers by contacting the Data Sheets of the cargo concerned.

Avoid any intake of air into the uncontrolled spaces to avoid a dangerous mixture to be built up within the respective space.

3.2.12 CARGO CONTAMINATION YIELDING A HAZARDOUS CONDITION (for vessels certified to carry NLSs)

Normally proper cargo stowage should have reduced this eventuality to a minimum.

Measures to be implemented immediately:

- Sound emergency alarm.
- Turn ship off wind.
- Shut accommodations ventilation.
- Eliminate all sources of ignition.
- With the help of M.S.D.S. (reactivity) try to evaluate the type of reaction you can expect.
- Records events and communications.

Personnel Safety:

- Refer to Emergency Procedure for Ship Carrying Dangerous Goods (Ems). If personnel to work in vicinity of noxious substance, they must be protected by required equipment.
- Check cargo(es) against IBC code chapter 17 column "n" if letter E is present, respiratory equipment is necessary for escape purposes. Advices crew by Public Address (P.A.) accordingly.

Further measures:

- Monitor toxic vapours.
- Assess the extend of reaction.
- Initiate mitigation of hazardous cargo contamination release if practicable (if limited quantity on deck, consider washing overboard with copious amount of water).

3.2.13 HAZARDOUS VAPOUR RELEASE (for vessels certified to carry NLSs)

Measure to be implemented immediately:

- Sound Emergency Alarm.
- Shut accommodations ventilation.
- Eliminate all sources of ignition.
- Turn vessel off wind.
- With the help of M.S.D.S. assess if fire, explosion or toxic vapours risk are present.
- Assess cause of vapour release.
- Record events and communications.

Personnel Safety

- Refer to Emergency Procedures for Ship Carrying Dangerous Goods (EmS). If personnel to work in vicinity of noxious substance, they must be protected by required equipment.
- Check cargo(es) against IBC code chapter 17 column "n" if letter E is present, respiratory equipment is necessary for escape purposes. Advices crew by Public Address (P.A.) accordingly.

Further measures:

- Monitor toxic vapours.
- Initiate mitigation of hazardous vapour release if practicable
- A very isolated source of hazardous vapour can be directed away with the air draft of an open, high pressure, fog nozzle.

When a spill on board creates toxic, corrosive or flammable vapours, the master should consider manoeuvring the vessel to the extend that, in his judgment, spill and weather conditions permit, so that vapours move away from vessel accommodation and operation spaces.

Entry into spaces with suspected gas leaks should always be with a self-contained breathing apparatus (SCBA) and protective clothing, monitoring equipment and under supervision by a responsible vessel's officer. Gases that are inert and normally considered to be non-flammable and non-toxic may cause an oxygen deficient atmosphere in compartment spaces. Other gases have narcotic effects while others change composition and produce highly poisonous gas when in contact with fire.

Ventilation to remove leaking of gases may not always be effective, particularly with heavier-than-air gases that settle and accumulate in low spaces. When dealing with flammable vapours and gases, ignition sources (naked lights, electric tools, etc.) should be prohibited.

3.3 OTHER CONSIDERATIONS

3.3.1 STRESS AND STABILITY – GENERAL CONSIDERATIONS

a. Great care must be taken when taking actions to mitigate the spillage of oil or free the ship if aground.

b. Internal transfers should only be undertaken when the overall impact on stress and stability has been calculated.

c. When damage is extensive, the impact of internal transfers on stress and stability may be impossible for the Master to assess. Contact should be made with the technical manager for the necessary calculations to be carried out.

d. Information required by the Technical Manager will include:

1) Intact Ship's condition.

2) Damage - location and extent.

3) Condition of ship- draft- cargo fuel loss or change in amount and disposition

4) Local Conditions- tide- wind- sea state- weather forecast If the ship has sustained extensive structural damage consideration may be given to transfer all or part of the cargo /bunkers to another ship. This should not be undertaken without a full assessment of the impact this will have on the stability and stress of the ship at all stages of the transfer The ship to ship transfer operations should be co-ordinated with the appropriate local authority. Current cargo, bunker and ballast information, including quantities and specifications, is available in the ships office.

3.3.2 MITIGATING ACTIVITIES

If safety of both the ship and the personnel has been addressed the Master shall care for following issues:

- Assessment of the situation and monitoring of all activities as documented evidence.
- Care for further protection of the personnel, use of protection gear,
- Assessment of further risk for health and safety.
- Containment of the spilled material by absorption and safe disposal

- Within leakprof containers of all onboard until proper delivery ashore with due consideration to possible fire risk.

- Decontamination of personnel after finishing the cleanup process.

- Disposal of removed oil and clean-up material.

- Isolation procedures.

Shipboard Marine Pollution Emergency Plan

Section 4 — National and Local Coordination

Quick efficient co-ordination between the ship and Coastal States or other parties involved becomes vital in mitigating the effects of any pollution incident.

As the identities and roles of various national and local Authorities involved vary widely from state to state and even from port to port, the Master should take note of these particularities, as far as possible. In this context the Master should call upon the owner's representatives in the state/ port of question to receive the relevant information.

Prior to undertaking mitigation actions – especially in cases of an actual discharge due to casualties in the territorial waters of a Coastal State – the Master should contact the Coastal State for authorization of his action.

The Master should co-ordinate all his activities with the Coastal State.

The Master should call the Coastal State for allowance to use chemical agents for response to pollution on the sea. Without authorization of the Authorities of the appropriate Coastal State no chemical agents should be used.

Where no responsibility for discharge response by a Coastal State is noticed the Master should take all the necessary steps as deemed appropriate to minimize the escape of oil or NLS.

With respect of the accident happened the Master should take measures as stated in Section 2 and Section 3 of this Plan.

a) Canada

Canadian Coast Guard Pollution Prevention Officer in the area that the vessel is in; Contact of a PPO can be made via any CGRS or VTS.

Operation Centre, H.O.
Phone: (613) 990-5600 – 24 hrs/day
Fax: (613) 995-4700
TLX: 0053 3128

East Coast, ECAREG VTS Centre, Dartmouth, N.S. (1-800-565-1633)
Or via any Coast Guard radio station.
Phone: (902) 426-5664/5
TLX: 019-22625 or 019-22510, Cable: ECAREG Canada

West Coast, WESTREG via any Coast Guard radio station
Phone: (604) 661-6011
TKX: 043-52586, Cable: WESTREG Canada
Arctic, NORDREG or via any Coast Guard radio station.
Phone: (819) 979-5724
TLX: 063-15529, Cable: NORDREG Canada

b) United States

U.S. Coast Guard Captain of the Port in the area that the vessel is in and National Response Centre (1-800-424-8802) as required by federal regulations. Telex: 892427

Failure to notify the National Response Centre in addition to the local Coast Guard is punishable by a fine up to $10,000 or one year in prison. It is important that both the Coast Guard and the National response Centre be notified at the toll free number whenever a spill occurs in U.S. waters.

See Vessel Response Plan Procedures

c) International Port / Waters

Appropriate equivalent government body for that particular country the vessel is in (see Appendix 1).

Section 5 — Additional Information

5.1 PLAN REVIEW PROCEDURES

This plan can only be changed and/or updated by the Quality, Safety, Security and Environment Management Team.

All comments, corrections and suggestions shall be directed to the above department through the qsse@desgagnes.com email address. All users of the plan have the responsibility of pointing out changes that affect the validity and/or use of the plan.

Major changes on the plan shall be made as soon as possible.

Any change or update which requires a page change shall be entered in the "Record of changes".

All approved changes shall be sent, without delay to the registered copy holders, as follows:

- Owners Emergency Response Room
- Vessel;
- Canadian Coast Guard, Marine Safety.

5.2 REVISION OF PLAN

The plan must be kept updated at all times which means that if any changes occur during the operation and which may affect this document, it must be corrected and recorded and all parties concerned must be advised.

5.3 ON BOARD SPILL EQUIPMENT

5.3.1 INVENTORY

To get the inventory and the storage location for all spill kit materials, consult appendix 7.

If your Vessel is also equipped with an Emergency Air Pump, please consult appendix 8 to familiarize with the Procedure and Piping Arrangement for Oil Spill Air Pump.

5.3.2 PLANNED VERIFICATIONS & MAINTENANCE SCHEDULE

1. Prevention equipment

1.1 Tank lids, checks

- Tank lids sit squarely on coatings
- Packing is in good condition
- Cleats have sufficient movement
- Ullage ports are tight
- Packing of ullage ports in good condition
- Drain valve closed and plug fitted on manifold drip trays

1.2 Deck pipelines (cargo, bunker, thermal oil and hydraulic)

- General condition of deck lines, no apparent leakage
- State of temporary repairs, if any; head office informed of situation
- Check expansion joints for signs of leakage
- All manifolds and unused hoses blanked and fully bolted
- Sample/pressure cocks fitted tightly, no leakage

1.3 Hull plating check

- Assessment condition of hull for signs of damage or possible weak spots, notify Head office of areas of concern.

1.4 Miscellaneous

- Proper opening/closing of pressure/vacuum valves on tanks
- Proper operations of Wessoe gauges

2. Containment equipment

Check:

- Drip trays are sound with no obvious cracks or holes
- Save-alls around bunker tanks are sound and drain plugs fitted
- Condition of scupper plugs
- Proper operation of diaphragm pumps
- Sufficient inventory on board at all times

3. Spillage equipment

Check:

- Oil dispersant and solvant available. USE AS DIRECTED ONLY
- Foam & dry powder fixed extinguishing systems are operational and ready for immediate use
- Company's Oil/NLS Response Plan has been brought to attention of all involved parties
- All communication methods have been proved satisfactory

4. Equipment

Check:

- All components of bilge oily separator work satisfactorily
- A sign is in place in vicinity of overboard discharge relating to use of valves and the need for them to be sealed in port
- All components of the ballast discharge monitoring system works satisfactorily
- Oil/Water interface detector is in good working order and readily available.

WARNING:

THE MASTER SHOULD ENSURE THAT BEFORE ANY DISPERSANTS OR DETERGENTS ARE USED, LOCAL AUTORISATION IS OBTAINED AS INDISCRIMINATE USE OF SUCH MATERIALS MAY BE HARMFUL TO ENVIRONMENT.

5.4 EVIDENCE REQUIRED FROM THE VESSEL

(Text extract from The Nautical Institute's The Master Role in Collecting Evidence, 1989)

"In order to defend claims of oil/NLS pollution and to prevent future spills, owners and their insurers will require a detailed account of how the spill occurred, the steps taken to prevent the spill, and the efforts made to minimise damage. Such an account should be supported by the items of evidence listed below, and the Master should ensure that such information and documents are retained and available. This information includes the following:

1. Log books in which the following information should be recorded:

    a) Use of such equipment as scupper plugs and drip trays,
    b) Carrying out of oil/NLS spills drills
    c) The procedures followed during transfer of oil/NLS within the vessel
    d) Evidence of previous oil/NLS pollution in berth or port area

2. Engine Room logs in which the following information should be recorded:

    a) Bunkering procedures
    b) Members of the crew in charge of bunkering operations
    c) Methods of effecting emergency stops
    d) Times and results of inspections of equipment used in cargo and bunkering operations, and
    e) Rates and sounding / ullages during loading and discharging operations

3. A copy of the bunkerer's instruction or delivery note containing an acceptable loading rate.

4. Records of stocks of cleaning materials such as sprayers and absorbent material

5. Samples of any oil/NLS that has been discharged from the vessel

6. Video films of the extent of the film (if possible)

7. A record of the quantity of pollutant

8. If the pollution was caused by broken equipment on board the vessel, the broken parts should be preserved

9. Accounts of the events from all the members of the crew involved in the incident

10. Oil record book

11. Cargo loading / discharge plan

12. Owners / charterer's instructions

13. Tank and pipeline diagrams

14. Sounding pipe and ullage plug diagram

15. Vessel's Contingency plan

16. All relevant telexes, cables and other correspondence

In addition of the information listed above, the Master should ensure that a record is made of the following information:

1. The operation being carried out at the time of the spill and the grades of oil/NLS involved

2. The type of oil/NLS which went over the side

3. The quantity of pollutant on deck, and the quantity which went over the side

4. Actions taken to report the spill

5. Action taken to commence cleaning operations

6. The state of the tide at the time of the spill

7. The extent of the pollution, the extent of the area which the spill covered and whether it affected other vessels or properties

8. The weather condition at the time of spill

9. The identity of any vessels in the vicinity when the oil/NLS spill occurred

10. The date, time when, and place where the spill occurred

11. Details of the action taken on board to contain and clean up the pollutant

12. Details of the action taken on shore to contain and clean up the pollutant

13. The type and industrial name of the oil dispersant or any other chemical used

Appendix 1
List of Coastal State Contacts

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Regulation ~~26~~ of Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) (Shipboard Oil Pollution Emergency Plan), entered into force on April 4, 1993. The Shipboard Marine Oil Pollution Emergency Plan should include as an appendix the list of agencies or officials of administrations responsible for receiving and processing reports as developed and updated by the Organisation in compliance with Article 8 of MARPOL 73/78.

The attached list contains contact details for coastal stated known at the time of publication. This list has three sources of information: 1) the Provisions Concerning the Reporting of Incidents Involving Harmful Substances under MARPOL 73/78 (the IMO Publication); 2) responses to the IMO Shipboard Marine Pollution Preparedness, Response and Co-operation Information System (OPRC Questionnaire); and 3) the International Tanker Owner Pollution Federation (ITOPF). It is recognised that the list may not be complete.

The information has been provided in response to the OPRC Questionnaire, as well as directly by Member States with amendments to the list. Additions and / or amendments to the list will continue to be provided by the International Maritime Organisation (IMO).

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Coast stations and their frequencies are given in the ITU List of Coast Stations, and also in appropriate national publications, e.g. Admiralty List of Radio Signals Vol 1.

Appendix 2
List of National Operational Contact Points

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This information enables compliance with Regulation ~~26~~ of Annex 1 of MARPOL 73/78 which, inter alia, requires that shipboard marine pollution emergency plans (SMPEP) shall contain a list of authorities or persons to be contacted in the event of an oil pollution incident.

Appendix 3
List of Ship Interest Contacts

Liste des contacts en cas d'urgence
Emergency Contact List

ARMATEUR ET OPÉRATEUR	**TRANSPORT DESGAGNES INC.**

OWNER & OPERATOR	***TRANSPORT DESGAGNES INC.***

SIÈGE SOCIAL	
Adresse :	**21, rue du Marché-Champlain Québec (Québec) Canada G1K 8Z8**
Téléphone :	**(418) 692-1000**
Télécopieur :	(418) 692-6044
Courriel :	info@desgagnes.com
Site Internet :	www.desgagnes.com

HEAD OFFICE	
Address:	***21 Marché-Champlain Street Quebec, Québec, Canada G1K 8Z8***
Telephone:	***(418) 692-1000***
Fax:	*(418) 692-6044*
E-mail:	*info@desgagnes.com*
Website:	*www.desgagnes.com*

SALLE D'INTERVENTION D'URGENCE	
Téléphone :	(418) 692-5525
Télécopieur :	(418) 692-5443
Courriel :	emergency@desgagnes.com

EMERGENCY RESPONSE ROOM	
Telephone:	*(418) 692-5525*
Fax:	*(418) 692-5443*
E-mail:	*emergency@desgagnes.com*

CONTACT 1 :	**Surintendant du navire**

CONTACT 1:	***Vessel Superintendent***

Pour les navires :	**Dara, Esta et Jana Desgagnés**
	Daniel Colan
Cellulaire :	(506) 533 5025
Courriel	daniel.colan@rigelcanada.com
Ou :	**Officier en devoir**
	(506) 533-9000

For vessels:	***Dara, Esta, and Jana Desgagnés***
	Daniel Colan
Cellular:	(506) 533 5025
E-mail	*daniel.colon@rigelcanada.com*
Or:	***Officer on Duty***
	(506) 533-9000

Pour les navires :	**Acadia, Sedna et Maria Desgagnés**
	Eugen Milasan
Cellulaire :	(418) 929-4961
Cellulaire 2 :	(514) 473-6076
Courriel :	eugen.milasan@desgagnes.com

For vessels:	***Acadia, Sedna and Maria Desgagnés***
	Eugen Milasan
Cellular:	*(418) 929-4961*
Cellular 2:	*(514) 473-6076*
E-mail:	*eugen.milasan@desgagnes.com*

Pour le navire :	**Mia et Paul A. Desgagnés**
	Olivier Garon
Cellulaire :	(418)-953-8293
Courriel :	olivier.garon@desgagnes.com

For vessel:	***Mia and Paul A. Desgagnés***
	Olivier Garon
Cellular:	*(418)-953-8293*
E-mail:	*olivier.garon@desgagnes.com*

Pour le navire :	**Zélada Desgagnés**
	Zélada Desgagnés
Cellulaire :	(418) 563-7573
Domicile :	(418) 635-2803
Courriel :	zelada.desgagnes@desgagnes.com

For vessel:	***Zélada Desgagnés***
	Zélada Desgagnés
Cellular:	*(418) 563-7573*
Home:	*(418) 635-2803*
E-mail:	*zelada.desgagnes@desgagnes.com*

Pour les navires :	**Nordik Express, Bella, Claude A. Miena et Nordika Desgagnés**
	Éric Desrochers
Cellulaire :	(418) 569-3597
Domicile :	(418) 683-3849
Courriel :	eric.desrochers@desgagnes.com

For vessels:	***Nordik Express, Bella, Claude A. Miena and Nordika Desgagnés***
	Éric Desrochers
Cellular:	*(418) 569-3597*
Home:	*(418) 683-3849*
E-mail:	*eric.desrochers@desgagnes.com*

Pour les navires :	**Damia, Rosaire A. et Sarah Desgagnés**
	Sylvain Tremblay
Cellulaire :	(418) 571-0429
Domicile :	(418) 889-8917
Courriel :	sylvain.tremblay@desgagnes.com

For vessels:	***Damia, Rosaire A. and Sarah Desgagnés***
	Sylvain Tremblay
Cellular:	*(418) 571-0429*
Home:	*(418) 889-8917*
E-mail:	*sylvain.tremblay@desgagnes.com*

Pour les navires :	**Espada et Laurentia Desgagnés**
	Philip John
Cellulaire :	(418) 802-7977
Courriel :	philip.john@desgagnes.com

For vessels:	***Espada and Laurentia Desgagnés***
	Philip John
Cellular:	*(418) 802-7977*
E-mail:	*philip.john@desgagnes.com*

Pour les navires :	**Argentia, Taïga Desgagnés et HHL New York**
	Geremy Girard
Cellulaire :	(418) 573-7608
Courriel :	geremy.girard@desgagnes.com

For vessels:	***Argentia, Taïga Desgagnés and HHL New York***
	Geremy Girard
Cellular:	*(418) 573-7608*
E-mail:	*geremy.girard@desgagnes.com*

CONTACT 2 :	**André Marmen** **Directeur des opérations**
Cellulaire :	(418) 931-9340
Domicile :	(418) 908-0955
Courriel :	andre.marmen@desgagnes.com

CONTACT 2:	***André Marmen*** ***Operations Manager***
Cellular:	*(418) 931-9340*
Home:	*(418) 908-0955*
E-mail:	*andre.marmen@desgagnes.com*

CONTACT 3 :	**David Fox,** **PDT - Navires Citernes** **Surintendant – Navigation**
Cellulaire :	(418) 805-1384
Courriel :	david.fox@desgagnes.com

CONTACT 3:	***David Fox,*** ***DPA - Tanker Vessels*** ***Superintendent – Navigation***
Cellular:	(418) 805-1384
E-mail:	david.fox@desgagnes.com

CONTACT 3 :	**Marc Desgagnés,** **PDT - Navires Cargo** **OSC -Tous les navires de la Flotte** **Directeur QSSE**
Cellulaire :	(418) 569-6537
Domicile :	(418) 406-1059
Courriel :	marc.desgagnes@desgagnes.com

CONTACT 3:	***Marc Desgagnés,*** ***DPA - Cargo Vessels*** ***CSO – All Fleet Vessels*** ***QSSE Manager***
Cellular:	(418) 569-6537
Home :	(418) 406-1059
E-mail:	marc.desgagnes@desgagnes.com

CONTACT 3 :	**Daniel Colan** **OSC – Dara, Esta et Jana Desgagnés**
Cellulaire :	(506) 533 5025
Courriel	daniel.colan@rigelcanada.com

CONTACT 3:	***Daniel Colan,*** ***CSO – Dara, Esta and Jana Desgagnés***
Cellular:	(506) 533 5025
E-mail	*daniel.colan@rigelcanada.com*

CONTACT 4 :	**Claude Dumais Vice-président – Opérations et projets spéciaux, Groupe Desgagnés (Chef d'intervention d'urgence)**		***CONTACT 4:***	***Claude Dumais Vice-President – Operations and Special Projects, Groupe Desgagnés (Incident Commander)***
Cellulaire :	(418) 952-6486		*Cellular:*	*(418) 952-6486*
Courriel :	claude.dumais@desgagnes.com		*E-mail:*	*claude.dumais@desgagnes.com*
CONTACT 5 :	**Serge Le Guellec Président-directeur général (TDI)**		***CONTACT 5:***	***Serge Le Guellec President and General Manager***
Cellulaire :	(581) 888-8920		*Cellular:*	*(581) 888-8920*
Courriel :	serge.leguellec@desgagnes.com		*E-mail:*	*serge.leguellec@desgagnes.com*

Communications avec les bureaux
Communications with offices

Coordonnées des compagnies | *Companies' Contact Information*

Nom *Name*	Statut *Status*	Contact *Contact*	Adresse Address	Numéros Numbers
Groupe Desgagnés inc.	Société mère *Parent company*	Louis-Marie Beaulieu	21, rue du Marché-Champlain Québec (Québec) G1K 8Z8	**Siège social** ***Head Office*** ☎ (418) 692-1000 (418) 692-6044 info@desgagnes.com **Salle d'intervention d'urgence** ***Emergency Response Room*** ☎ (418) 692-5525 (418) 692-5443 emergency@desgagnes.com
Transport Desgagnés Inc.	Armateur et exploitant *Shipowner* *and ship operator*	Serge Le Guellec	Même que ci-dessus *Same as above*	Mêmes que ci-dessus *Same as above*
Desgagnés Marine Cargo Inc.	Fournisseur d'équipage (navires de charge) *Crewing* *(general cargo ships)*	Pascal Lévesques	Même que ci-dessus *Same as above*	Mêmes que ci-dessus *Same as above*
Desgagnés Marine Petro Inc.	Fournisseur d'équipage (navires-citernes) *Crewing* *(tankers)*	Pascal Lévesques	Même que ci-dessus *Same as above*	Mêmes que ci-dessus *Same as above*
Navigation Desgagnés inc.	Affréteur (navires de charge) *Charterer* *(general cargo ships)*	Alexandre Beauchamp Parent	Même que ci-dessus *Same as above*	Mêmes que ci-dessus *Same as above*
Petro-Nav Inc.	Affréteur (navires-citernes) *Charterer* *(tankers)*	Christopher King	Bureau 601 204, rue Saint-Sacrement Montréal (Québec) H2Y 1W8	☎ (514) 843-8800 (514) 843-9195 info@petro.nav.desgagnes.com

Nom ***Name***	**Statut** ***Status***	**Contact** ***Contact***	**Adresse** **Address**	**Numéros** **Numbers**
Desgagnés Transarctik Inc.	Affréteur (navires de charges) Arctique *Charterer (general cargo ships) Artic*	Dominic Desgagnés	6565, boul. Hébert, bur. 201 Sainte-Catherine (Québec) J5C 1B5	☎ (450) 635-0833 (450) 635-5126 info@transactik.desgagnes.com
Marlow Navigation	Fournisseur d'équipage à l'international (navires de charge) *International Crewing (general cargo Ship)*	Mike Naradko	13, Alexandrias Street P.O. Box 54077 CY-3720 Limassol Cyprus	☎ +357 25882588 +357 25882599 marlow@marlow.com.cy

INSCRIPTION DES NAVIRES AUPRÈS DES ORGANISMES D'INTERVENTION *(RESPONSE ORGANIZATIONS)* AU CANADA

NAVIRE	ECRC (SIMEC) Grands Lacs, Saint-Laurent, Côte Est		ALERT St. John, NB		PTMS Port Hawkesbury, NS		WCMRC Côte Ouest	
	Nº de contrat	Échéance	Nº de contrat	Échéance	Nº de contrat	Échéance	Nº de contrat	Échéance
Acadia Desgagnés	C001-00416	31.12.17	C001-00416	31.12.17	C001-00416	31.12.17	N/A	
Argentia Desgagnés								
Bella Desgagnés								
Claude A. Desgagnés								
Nordik Express								
Rosaire A. Desgagnés								
Sedna Desgagnés								
Zélada Desgagnés								
Nordika Desgagnés								
Miena Desgagnés	TBC		TBC		TBC		N/A	
HHL New York	TBC		TBC		TBC		N/A	
Maria Desgagnés	C002-00002	31.12.17	C002-00002	31.12.17	C002-00002	31.12.17	N/A	
Sarah Desgagnés							N/A	
Damia Desgagnés								
Mia Desgagnés								
Paul A. Desgagnés	TBC		TBC		TBC		N/A	
Espada Desgagnés	C002-05959	19.11.17	C002-05959	19.11.17	C002-05959	19.11.17	N/A	
Laurentia Desgagnés	C002-05315	07.05.17	C002-05315	07.05.17	C002-05315	07.05.17	N/A	
Taïga Desgagnés	C001-21354	16.04.18	C001-21354	16.04.18	C001-21354	16.04.18	N/A	

COORDONNÉES DES ORGANISMES D'INTERVENTION

Organismes d'intervention

ECRC / SIMEC
Eastern Canada Response Corporation Ltd.
Société d'intervention maritime de l'Est du Canada ltée

275 Slater Street, Suite 1201
Ottawa (Ontario) K1P 5H9
Tél. : (613) 230-7369
Téléc. : (613) 230-7344

Mr. Paul Pouliotte, poste 304
Ms. Ann Therrien, poste 308
atherrien@ecrc.ca

Bureau régional de Québec
281, de l'Estuaire
Québec (Québec) G1K 7J8
Tél. : (418) 692-8989
Téléc. : (418) 694-9649
M. Pierre Samson, poste 2229

URGENCE 24 H
(613) 930-9690

ALERT
Atlantic Emergency Response Team

P.O. Box 2353
Saint John (New Brunswick) E2L 3V6
Tél. : (506) 632-4499
Téléc. : (506) 632-4450

Mrs. Andrea Melanson

URGENCE 24 H
(506) 632-4499

PTMS
Point Tupper Marine Services Ltd.

P.O. Box 316
Port Hastings (Nova Scotia) B0E 2T0
Tél. : (902) 625-3611 ou 625-1846
Téléc. : (902) 625-1556 ou 625-3098

Capt. Ed Kehoe, Response Manager
Cell. : (902) 227-7696
Téléav. : (902) 558-2572

URGENCE 24 H
(902) 625-1711

WCMRC
Renseignements disponibles auprès de la Chamber of Shipping of British Columbia aux numéros ci-dessous :
Tél. : (604) 681-2351
Téléc. : (604) 681-4364

Burrard Clean operations division

URGENCE 24 H
(604) 294-9116

Zones d'intervention

ECRC / SIMEC	ALERT	PTMS	WCMRC
Le réseau canadien des Grands Lacs et les canaux les reliant dans la province de l'Ontario incluant le lac Supérieur, la rivière St. Mary, le lac Huron, la rivière St. Clair, le lac St. Clair, la rivière Detroit, le lac Érié, le lac Ontario; le fleuve St-Laurent, le lac Winnipeg, la rivière Athabasca de Fort McMurray au lac Athabasca, et le lac Athabasca. Les eaux de la Baie James, de la Baie d'Hudson et de la Baie d'Ungava; les eaux de la province de Québec (incluant le St-Laurent) et les eaux des provinces atlantiques (excluant les eaux au nord de la latitude 60° Nord et les régions couvertes par ALERT et PTMSL).	Les eaux canadiennes comprises entre la frontière Ouest constituée d'un arc d'un rayon de 50 milles nautiques du point 45º08'03" N, 66º17'12" W et la frontière Est constituée d'un arc d'un rayon de 50 milles nautiques du phare de Cape Spencer.	Les eaux canadiennes à l'intérieur d'un rayon de 50 milles nautiques à partir du phare de Bearhead, 45º33' N, 61º17' W, excluant le nord du détroit de Canso dans St. Georges Bay, les eaux des lacs Bras D'or, des canaux St. Andrew, St. Patrick, Great Bras D'or et les autres eaux intérieures de l'île du Cap Breton.	Les eaux bordant la province de la Colombie-Britannique, les eaux internes de cette province, et excluant les eaux au nord du 60e parallèle de latitude.

RÉV. 2018-06-11

Numéros importants en cas d'urgence au Canada
Important numbers in case of emergency in Canada

Catégorie *Category*	Nom et adresse *Name and Address*	Numéros *Numbers*	Contacts / Remarques *Contacts / Remarks*
Hot Lines	**Shell**	☎ 24hrs (713) 241-2532	**Department Stasco**
	Valero	☎ 1-800-964-2210 1-210-736-2210	
	Suncor	☎ (905) 399-9954	**Masiz Rahman**
		Marshal Dunbar ☎ (905) 804-3449 ☎ cell. : (647) 459-2671	**Contact 1 Suncor DPP**
		Francine Dagenais ☎ (905) 804-7153 ☎ cell.: (417) 200-9140	**Contact 1 Suncor CPP**
		Marshal Dunbar *en interim* ☎ (905) 804-3449 ☎ cell. : (647) 459-2671	**Contact 1 Suncor Lub**
		A. Haq ☎ (905) 804-7150 ☎ Cell.: (905) 320-6541	**Contact 2 All products**
		24hours / 7 days ☎ (403) 296-3000	**Contact 3 All products**
		Jason He ☎ (403) 237-3498 ☎ cell.: (403) 813-8158	**Contact 1**
		Emergency line ☎ (703) 217-6121	**Contact 2**
	Irving	☎ (506) 333-9379	**Eric Olsen**
	Kildair	**Steven Packwood** ☎ (450) 746-0994 ext 322 (450) 746-0999 tracy@kildair.com kildair@kildair.com	
		Hydro Quebec CAM Operator ☎ (418) 986-7299 ext 7230	**Kildair – Cap-aux-Meules**
	La fédération des coopératives du nouveau Québec (FCNQ)	**Jean-Luc Mallette** ☎ (514) 457-9371 ext 356 (514) 457-4626	Directeur Principal/ *Senior Manager* Services Pétroliers/ *Petroleum Services*

Ports ***Ports***	**Port de Montréal**	**Urgence Marine** ☎ (514) 640-3138 🖷 (514) 640-4509	**Real Ricard Jr.** **Chargé de projet** ***Ship Maintenance Expert*** ☎cell. (514) 829-6908 **Stephen Chouinard** **Directeur des opérations** ***Director of Operations*** ☎ cell. (514) 821-7347
		Capitainerie ☎ Général (514) 283-7011 ☎ Urgence (514) 283-6911	
	Port de Québec	**Capitainerie** ☎ (418) 648-3556	**24hrs sur la voie VHF 77**
	Port-Cartier	☎ (418) 766-8753	**Quai Arcelor Mittal** ☎ (418) 766-2000 Ext 2400, 2485 ou 2439
	Trois-Rivières	☎ (819) 378-2887	
	Port de Sept-Îles	☎ (418) 968-1231	**Shawn Grant** **Harbour Master** ☎ (418) 961-1229
	Rio Tinto Alcan (Port Alfred)	☎ (418) 544-3311	
Fournisseurs ***Suppliers***	**Expédition quais et écluses** 1621, rue Gladstone Montréal, QC H4E 1C6	☎ (514) 932-9959 🖷 (514) 932-2331	**Jacques Chiasson**
	Seagulf Marine Industries Inc. **Bureau de Montréal** 815, rue Mill Montréal, QC H3C 1Y5	☎ (514) 935-6933 🖷 (514) 935-3665	**Robert Zeagman** ☎ dom. (514) 672-5202
	Seagulf Marine Industries Inc. **Bureau de Halifax** Burnside Industrial Park 38 Payzant Avenue Dartmouth, NS B3B 1Z6	☎ (902) 481-1661 🖷 (902) 481-8548	
	Seagulf Marine Industries Inc. **Bureau de St Catharines** 113 Cushman Road, Unit 16-17 St-Catharines, ON L2M 6S9	☎ (905) 688-2661	

Remorqueurs ***Tugs***	**Groupe Océan** 105 Abraham-Matin, Bureau 500 Québec, (QC), G1K 8N1 Canada	☎ (418) 694-1414 (418) 692-4572 www.groupeocean.com ocean@groupeocean.com Hamilton : ☎ (905) 528-3960	Benoit Lefrenière ☎ cell. (418) 254-7487 benoit.lafreniere@groupeocean.co Maryse Paré (Bur. / Off. QC) Maryse.Pare@groupeocean.com Frank Montecalvo (Dir, ON) Frank.Montecalvo@groupeocean.com
	The Great Lakes Group 4500 Division Ave Cleveland, OH 44102-2228 USA **Cette compagnie offre aussi un service de réparation d'urgence 24hr/7**	☎ (216) 621-4854 (216) 621-7616 www.thegreatlakesgroup.com *This company also offer a 24hr/7 emergency repair services*	**Kyles Fries** **Assistant Vice-President-Ship Repair** ☎ 1-800-321-3663 ext 132 ☎ cell. (440) 714-1439
	McKeil Marine Limited Fleet Management	☎ (905) 528-4141 ext.248	**Chris Kirby** ckirby@mckeil.com
	Corporation de gestion de la Voie maritime du Saint-Laurent ***St. Lawrence Seaway Development Corporation*** 151, rue de l'Écluse Saint-Lambert, QC J4R 2V6	☎ (450) 672-4110 (450) 672-7098 www.grandslacs-voiemaritime.com	**Position des navires Montréal au Lac Ontario** ☎ (450) 672-4115 Surveillant ext :2232 Controleurs ext :2229 **Welland Canal** Surveillant ext :5370 Control Center ext :5450

TC Sureté Maritime ***TC Marine Security***	**Sûreté des Transport** **Région du Québec** 401-1550 av d'Estimauville Québec, QC, G1J 0C8	☎ 24hrs 1-888-857-4003 ☎ Bureau (418) 648-4351 ☎ cell: (418) 572-4604 💻 langis.tremblay@tc.gc.ca	
Inspecteurs sécurité maritime ***Marine Safety Inspectors***	**St. Catharines**	☎ (905) 688-4360 🖹 (905) 688-6285	
	Sarnia	☎ 1-877-281-8824 ☎ (519) 383-1826 🖹 (519) 383-1997	
	Thunder Bay	☎ (807) 345-6953 🖹 (807) 345-0521	
	Baie-Comeau	☎ (418) 296-3524 🖹 (418) 296-6680	
	Gaspé	☎ (418) 368-2444 🖹 (418) 368-7022	
	Îles-de-la-Madeleine	☎ (418) 986-6275 🖹 (418) 986-4751	
	Kangiqsujuaq	☎ (819) 338-1213 🖹 (819) 338-1241	
	Montréal	☎ Général: 1-888-649-6262 ☎ Inspection:(514)496-2084 🖹 (514) 283-6595 💻marinesafetymtl@tc.gc.ca	
	Québec	☎ (418) 648-4166 🖹 (418) 648-3790	
	Rimouski	☎ 1-800-427-4417 ☎ (418) 722-3040 🖹 (418) 722-3332	
	Sept-Îles	☎ 1-877-303-3435 ☎ (418) 968-4991 🖹 (418) 968-5516	
	Charlottetown	☎ 1-855-859-3123 ☎ (902) 566-7987 🖹 (902) 566-7991	
	Corner Brook	☎ 1-855-859-3123 ☎ (709) 637-4390 🖹 (709) 637-4391	
	Dartmouth	☎ 1-855-859-3123 ☎ (902) 426-4421 🖹 (902) 426-6657	

	Saint-John	☎ 1-855-859-3123 ☎ (506) 636-4748 🖹 (506) 636-4756	
	St. John's	☎ 1-855-859-3123 ☎ (709) 772-5166 🖹 (709) 772-0210	
	Sydney	☎ 1-855-859-3123 ☎ (902) 564-7002 🖹 (902) 564-7648	
Inspecteur en devoir / *Surveyor on duty :* : Se référer à la Garde Cotière / *Refer to Coast Guard* 1-800-363-4735			
Sécurité Maritime Garde Côtière Canadienne *CCG Marine Safety*	**200 rue Kent, 5e étage Ottawa, ON K1A 0E6**	☎ (613) 993-6943 🖹 (613) 998-3255	
Intervention Environnementale Garde Côtière Canadienne *Environmental Response Canadian Coast Guard*	**Région de Terre-Neuve et Labrador / *Newfouldland and Labrador Region***	☎ 24hrs 1-800-563-9089	
	Région du Centre et de l'Arctique *Cenral and Arctic Region*	☎ 24hrs 1-800-265-0237	
	Région du Québec *Quebec Region*	☎ 24hrs 1-800-363-4735	
	Région des Maritimes *Maritimes Region*	☎ 24hrs 1-800-565-1633	
	Région du Pacifique *Pacific Region*	☎ 24hrs 1-800-889-8852	

Bureau des Glaces ***Ice Office***	**Région de l'Atlantique** ***Atlantic Region***	☎ (709) 779-2078 ☎ 1-800-565-1633 🖷 (709) 772-5369 Telex : 016-4530 💻 CGGCICEWATCH@DFO-MPO.GC.CA	Basé à St-John's
	Région du Québec ***Quebec Region***	☎ (418) 648-7290 ☎ (418) 648-5620 🖷 (418) 648-7305	Basé à Québec
	Région du Centre et de l'Arctique ***Arctic and Central Region***	☎ (519) 383-1814 ☎ 1-800-265-0237 🖷 (519) 337-2498	Basé à Sarnia
Recherche et Sauvetage ***Search and Rescue***	**Terre-Neuve et Labrador** ***Newfouldland and Labrador***	☎ 1-800-563-2444 ☎ (902) 427-8200	Basé à Halifax
	Nouvelle-Écosse, Nouveau-Brunswick, Ile-du-Prince-Édouard ***Nova Scotia, New Brunswick, Prince Edward Island***	☎ 1-800-565-1582 ☎ (902) 427-8200	Basé à Halifax
	Québec ***Quebec***	☎ 1-800-463-4393 ☎ (418) 648-3599	Basé à Québec
	Ontario, Territoires du Nord-Ouest, Nunavut ***Ontario, NorthWest Territories, Nunavut***	☎ 1-800-267-7270 ☎ (613) 965-3870	Basé à Trenton
	Colombie-Britannique, Yukon ***British-Columbia, Yukon***	☎ 1-800-567-5111 ☎ (250) 413-8933 ☎ cell. #727	Basé à Victoria

Société de classification ***Classification Society***	**Lloyd's Register North America** **Bureau de Montréal** 1868, boul. des Sources, Suite 125 Pointe-Claire, QC H9R 5R2	☎ (514) 630-3784 (514) 630-3923 montreal@lr.org	**Emmanuel Patrouille** **Senior Surveyor** ☎ cell. (514) 209-3710 Emmanuel-Patrouille@lr.org **Igor Potey** **Surveyor (Quebec City)** ☎ cell. (418) 564-6736 igor.potey@lr.org
NAVIRES-CITERNES **Maria** **Sarah** **NAVIRE PASSAGERS** **Bella** **Nordik Express** **NAVIRE DE CHARGE** **Acadia**	**Lloyd's Register North America** **Bureau de Halifax** Suite 812, Queen Square 45 Alderney Drive Dartmouth, NS B2Y 2N6	☎ (902) 423-7506 (902) 425-2913 halifax@lr.org	**Bud Streeter** **VP & Operations Manager** ☎ cell. (902) 499-0244 bud.streeter@lr.org **Craig Williams** **Senior Surveyor In Charge** ☎ (902) 406-4166 ☎ cell. (902) 497-9849 Craig.Williams@lr.org
	Lloyd's Register North America **Bureau de Toronto** 3050 Harvester Road, Suite 208 Burlington, ON L7N 3J1	☎ (905) 631-9420 (905) 631-9430 toronto@lr.org	**Barry Shepherd** **Marine Manager Eastern Canada** ☎ cell. (905) 515-7385 barry.shepherd@lr.org **Vitaliy Melnyk** **Senior Surveyor In Charge** ☎ cell. (905) 320-6139 vitaliy.melnyk@lr.org **Michael Skrzypczak** **Senior Surveyor** ☎ cell. (905) 515-7384 Michael.Skrzypczak@lr.org **James Zheng** **Senior Surveyor** ☎ cell. (905) 320-9039 James.Zheng@lr.org
	Lloyds' Register of Shipping **Bureau de Londres** 71 Fenchurch Street London, England EC3M 4BS	☎ 011 44 20 7709 9166 www.lr.org	

NAVIRE CITERNE **Damia** **Mia** **Paul A.** **Rossi A.** **NAVIRE DE CHARGE** **Argentia**	**Bureau Veritas (Canada) inc.** 25 rue Marché-Champlain, Suite 403, Québec, Qc, Canada, G1K 8Z8	☎ (418) 914 1741 💻 www.bureauveritas.com	**Jocelyn Roussel** **Marine Surveyor** ☎ cell. (438) 823-8285 💻 Jocelyn.Roussel@ca.bureauveritas.com **Darrell Ashley** **Marine Surveyor** ☎ cell. (418) 806-3835 💻 Darrell.Ashley@ca.bureauveritas.com
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	Halifax Office 99 Wyse Road, Suite 900 Dartmouth, Nova Scotia, B3A 4S5 Canada	☎ (902) 464-0905 💻 halifax.maritime@dnvgl.com	

Services d'intervention d'urgence en cas de déversement aux USA
Spill Emergency Response Services in USA

Catégorie *Category*	Nom et adresse *Name and Address*	Numéros *Numbers*	Contacts / Remarques *Contacts / Remarks*
USCG	*National Response Center*	☎ (800) 424-8802 ☎ (202) 267-2675 📄 (202) 479-7165	VRP Section 10
USCG	*Captain of the Port*		VRP Section 10
USCG	*State Agencies*		VRP Section 10
USCG	*Boundary States*		VRP Section 10
Qualified Individual (QI)	**Hudson Marine Management Services** Ferry Terminal Building, Suite 300 2 Aquarium Drive Camden, NJ 08103 **(under contract)**	☎ **24 h** **(856) 342-7500** 📄 (856) 342-8888 💻 hmms@hudsonmarine.com 💻 www.hudsonmarine.com	VRP Section 2 **Per W. Christensen** President and CEO **Cynthia A. Hudson** V.P. response management
Oil Spill Removal Organization (OSRO)	**National Response Corp. & Clean Pacific Alliance** Suite T-103 3500 Sunrise Highway Great River, NY 11739 **(under contract)**	☎ **24 h** **(800) 899-4672** ☎ (631) 224-9141 ext 0 📄 (631) 224-9082 📄 IOC* (631) 224-9086 💻 iocdo.@nrcc.com 💻 dwick.@nrcc.com 💻** www.nrcc.com *IOC: International Operations Center **Login username : clients Password : access2007	VRP Section 2 **Steve A. Candito** President 💻 scandito@nrcc.com
Oil Spill Removal Organization (OSRO)	**Marine Pollution Control US Great Lakes** 8631 West Jefferson Detroit, Michigan 48209-2691 **(not under contract)**	☎ **24h** (313) 849-2333 ☎ **24h** 1-800-521-8232 📄 (313) 849-1623 📄 (313) 216-1778 💻 info@marinepollutioncontrol.com 💻 www.marinepollutioncontrol.com	VRP Section 2 **Mike McInchak** Operations Manager **Jim Kemeny** Director of Operations
Oil Spill Removal Organization (OSRO)	**Washington State Maritime Cooperative (WSMC)** 100 West Harrison, suite S560, Seattle, WA 98119 **(not under contract)**	☎ **24h** (206) 448-7557 📄 (206) 443-3839 💻 admin@wsmcoop.org 💻 www.wsmcoop.org	VRP Section 2 **Roger Mowery** Executive Director

Catégorie ***Category***	**Nom et adresse** ***Name and Address***	**Numéros** ***Numbers***	**Contacts / Remarques** ***Contacts / Remarks***
Salvage, Firefighting, & Lightering	**Resolve Marine Group** P.O. Box 165485 Port Everglades, FL 33316 **(under contract)**	☎ **24 h** INTL (954) 764-8700 (954) 764-8724 ☎ **24 h** USA (866) 764-1397 www.resolvemarine.com info@resolvemarine.com	VRP Section 2 **Joseph E. Farrell Jr.** President / CEO **Todd Schauer** Senior Project Manager Mobile: (954) 658-6429 tschauer @resolvemarine.com **Frank Leckey** Director of Operations Resolve Towing and Salvage **Todd Duke** Resolve Fire and Hazards Response Cell. (954) 444-3433
Salvage, Firefighting, & Lightering	**Titan Maritime Industries Inc.** 700 NW 33rd Street, Suite 290 Pompano Beach, FL 33064, USA **(not under contract)**	☎ **24 h** (954) 545-4143 (954) 545-4552 www.titansalvage.com	**Dan Olson** **Operations Manager** Mobile (206) 854-4057 **Richard Fairbanks** **Vice President** Tel home: (954) 522-6276 Mobile: (954) 914-9876 Int'l. beeper: (954) 879-4806 **David Parrot** **Managing Director** Tel home: (954) 462-7763 Mobile: (954) 914-9874 Int'l beeper: (954) 879-6348 **Phil Reed** **Director Engineering** Tel home: (954) 753-8464 Mobile: (954) 682-9936

Salvage, Firefighting, & Lightering	**Donjon Marine Co. Inc.** 1250 Liberty Ave. Hillside, New Jersey 07205 **(not under contract)**	☎ **24 h** **(908) 964-8812** (908) 964-7426 www.donjon.com	**J. Arnold Witte** Pres. & CEO (Salv. Master) Tel. home: (908) 353-4718 **William "Billy" Kratz Jr.** Salvage Master Tel home: (609) 443-4972 **John A. Witte Jr.** Ex. V-P (Asst. Salv. Master) Tel home: (908) 352-8168
Dispersants and In-Situ Burning	**Spiltec** 19220 N.E. 143rd Place Woodinville, WA 98077-7839 USA **(not under contract)**	☎ (425) 869-0988 (425) 869-7881	VRP Section 2 **Alan A. Allen** Tel. home: (425) 869-2578
National Vessel Movement Center	Avis d'arrivée et de départ douanes américaines *Notice of arrival and departure US Customs*	☎ **24hrs** 1-800-708-9823	

Transports Canada – Région du Québec / Transport Canada – Quebec Region

Sécurité et sûreté maritimes / Marine Safety and Security

Octobre 2017 / October 2017

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DIRECTEUR RÉGIONAL / REGIONAL DIRECTOR (NM)
Michel Boulianne – (418) 648-4615
Fax (418) 648-3790

CENTRE DE TRANSPORTS CANADA – QUÉBEC / QUEBEC - TRANSPORT CANADA CENTRE

NM-SEP

Centre TC Sept-Îles / Sept-Îles TC Centre

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Fax : 418-968-5516

Gestionnaire intérimaire / Acting Manager
Bhérer, Charles

Experts maritimes / Marine Surveyors
Desrosiers, Luc (M)
Leblanc, Pierre (M)
Monger, Ken (C)
Rodrigue, Denis (C)
Thériault, Manon (N)

Adjointe / Assistant
Wright, Sindie
Poirier, Sophie-Josée

NM-POR

PORT-CARTIER

418-766-2758
Fax : 418-766-8711

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Foisy, Jérôme (M)

NM-BAI

BAIE-COMEAU

418-296-3524
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Expert maritime / Marine Surveyor
Frattin, Marino (N)

NM-RIM

Centre TC Rimouski Rimouski TC Centre

418-722-3040
Fax : 418-722-3332

Gestionnaire / Manager
Fecteau, Robert

Experts maritimes / Marine Surveyors
Bélanger, Denis (N)
Blouin, Alain (C)
D'Amours, Éric (M)
Desgagnés, Éric (C)
Guay, Mathieu (N)
Larouche, Annie (N)
Leclerc, Bernard (M)

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Laliberté, Pascale (occ.)
Thibault, Geneviève

NM-GAS

GASPÉ

418-368-2444
Fax : 418-368-7022

Expert maritime / Marine Surveyor
Pelletier, Simon (C)

NM-ILE

ILES-DE-LA-MADELEINE

418-986-3785 # 224
Fax : 418-986-4751

Experts maritimes / Marine Surveyors
Hébert, Marie-Ève (M)
Hubert, Gilles (N)

NM-MTL

Centre TC Montréal Montreal TC Centre

1-855-842-7042
Fax : 514-283-6595

Gestionnaire / Manager
Baumelle, Cédric

Adjoint au gestionnaire / Manager Assistant
Plamondon, Pierre

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Brahimi, Kamel (N)
Briffaud, Denis (EL)
Caron, Mario (C)
Chaudhry, Mazhar (N)
Gagnon, Francis (M)
Germain, Guy (N)
Leduc, Alexandre (N)
Lefebvre, Luc (M)
Leghfiri, Mohamed (N)
Paradis, Serge (M)
Tabet, Élie (PB)
Thibault, Chantale (N)
Uhel, Vincent (C)
Zroud, Hicham (M)

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Lacasse, Diane
Genaille, Ellen

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Roy, Guylaine

Adjointes / Assistants
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Deslauriers, Lise
Levac, Émilie (maternité)

NM-QUE

Division Inspection / Inspection Division

418-648-3234
Fax : 418-648-5106

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Adjointe au gestionnaire / Manager Assistant
Agnes Tomsic

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Bernier, Laurent (C)
Desaulniers, Martin (M)
Duranceau, Danielle (N)
Lachance, Bernard (N)
Lezhankin, Yevgen (N)
Lizotte, Maxim (M)
Marcoux, Antonin (C)
Rousseau, François (M)

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NMB-QUE

QUÉBEC
Sûreté des transports / Transportation Security

418-648-4351

Gestionnaire / Manager
Vigneault, Olivier

Experts maritimes Marine Surveyors
Allard, Francis
Blais, Louis
Brisson, Mireille
Lafleur, Hugues

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Duchesneau, Karen

DORVAL

Sûreté des Transports Transportation Security

514-633-2930

Experts maritimes / Marine Surveyors
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Miranda, Eusébio
Rubinato, Gino
Scott, Darren

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Vigneault, Carole

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Aquin, Marie-Claude (IE, IMH)
Vézina, Lucie (IE, IMH)

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Division Cargaisons & prévention de la pollution / Cargoes & Pollution Prevention Division

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Gestionnaire / Manager
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Breton, Bernard (M)
Gosselin, Gilbert (C)
Guay, Julie (N)
Harbour, John (N)
Ouarab, Brahim (N)
Laliberté, Charles (M)

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Division Services techniques / Technical Services Division & Nunavik

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(Vacant) (N)
Boudreau, J.-S. (C)
Gendron, Sylvain (C)
Marquis, J-P. (E / N)
Therrien, Gaël (M)

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Nadeau, Suzy

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Boivin, Nathalie
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Larouche, Véronique
Racine, Marc
Tellier, Jean

NM-KAN

KANGIQSUJUAQ

819-338-1213
Fax : 819-338-1241
011-8816-314-342926

Expert maritime / Marine Surveyor
Greig, James (PB)

NOTE : ↑ Hiérarchie organisationnelle

LEGENDE / LEGEND

(occ.)	*Employé(e) occasionnel(le), 90 jours / Temporaire*
(C)	Coque / Hull *(i.e. Architecte Naval)*
(EL)	Électrique / Electrical
(EQ)	Équipement / Equipment
(IMH)	Installations de manutention d'hydrocarbures / Oil Handling Facilities
(M)	Machinerie / Machinery
(N)	Nautique / Nautical
(PB)	Petits bâtiments / Small Vessels
(IE)	Intervention environnementale

SÉCURITÉ ET SÛRETÉ MARITIMES | MARINE SAFETY AND SECURITY

Région du Québec
401-1550, avenue d'Estimauville
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KANGIQSUJUAQ

Nanuturlik Landholding
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Téléc. : 819-338-1241
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MONTRÉAL – CENTRE DE SERVICES TC

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Sans frais : 1-800-427-4417

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GASPÉ - CENTRE DE SERVICES TC

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Téléc. : 418-368-7022

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ÎLES-DE-LA-MADELEINE- CENTRE DE SERVICES TC

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Téléc. : 418-986-4751

264 Chemin du Quai
P.O. Box 1030
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Phone : 418-986-3785
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QUÉBEC – SÛRETÉ MARTIME

Sûreté maritime
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Olivier Vigneault, Gestionnaire
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Marine Security
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Olivier Vigneault, Manager
Phone : 418-648-4368

SEPT-ÎLES - CTC

Case postale 596
701, boul. Laure, bureau 205
Sept-Îles (Québec) G4R 4K7

Charles Bhérer, gestionnaire int.
Qc. : 418-648-5340
Sept-I. : 418-968-5439
Téléc. : 418-296-6680

P.O. Box 596
701 Laure Blvd, suite 205
Sept-Iles, Quebec G4R 4K7

Charles Bhérer, Manager (int.)
Qc. : 418-648-5340
Sept-I. : 418-968-5439
Fax : 418-296-6680

PORT-CARTIER - CENTRE DE SERVICES TC

Centre Transports Canada
A l'intérieur du Centre local d'emploi,
2, rue Elie-Rochefort
Port-Cartier (Québec) G5B 2N2

Tél. : 418-766-2758
Téléc. : 418-766-8711

Transport Canada Center
Inside the Local employment centre
2, rue Elie-Rochefort
Port-Cartier (Quebec) G5B 2N2

Phone : 418-766-2758
Fax : 418-766-8711

BAIE-COMEAU - CENTRE DE SERVICES TC

337, boul. Lasalle, bureau 212
Baie-Comeau (Québec)
G4Z 2Z1

Tél. : 418-296-3524
Téléc. : 418-296-6680

337 Lasalle Blvd, suite 212
Baie Comeau, Quebec
G4Z 2Z1

Phone : 418-296-3524
Fax : 418-296-6680

DORVAL – SÛRETÉ MARITIME

Sûreté maritime
700, Leigh-Capreol, 3e étage
Dorval, Québec H4Y 1G7

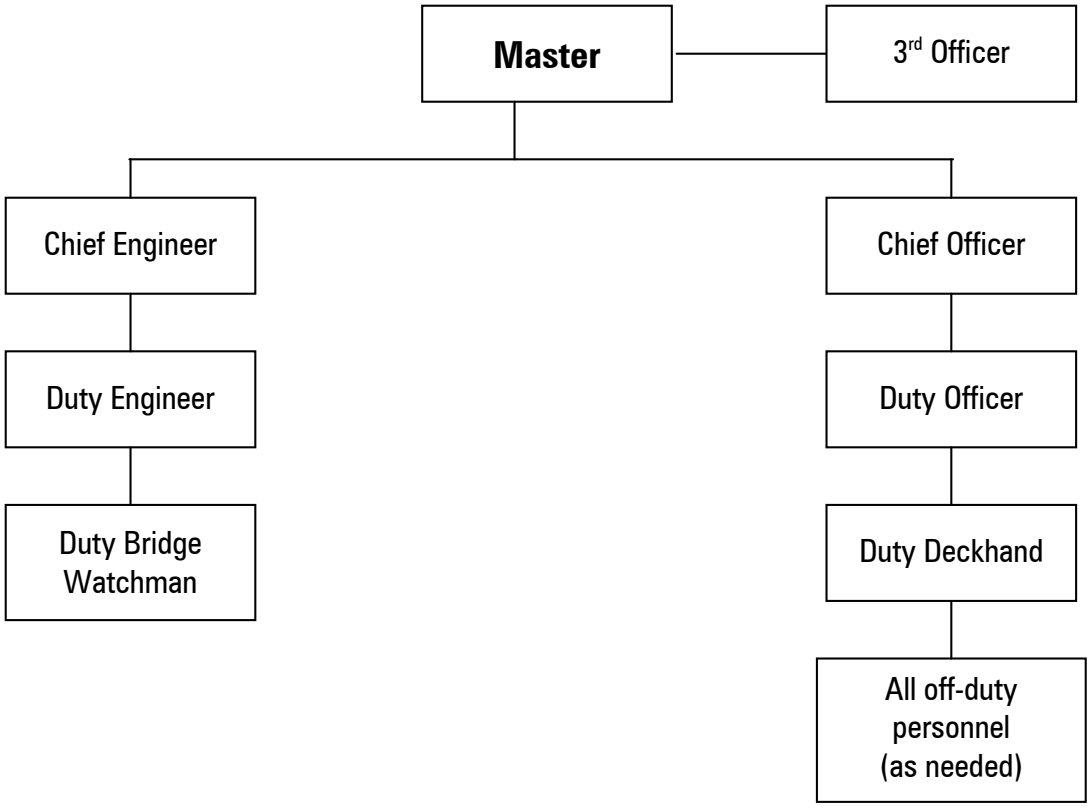
Olivier Vigneault, Gestionnaire
Tél. : 514-633-2930

Marine Security
700 Leigh-Capreol
Dorval, Quebec H4Y 1G7

Olivier Vigneault, Manager
Phone : 514-633-2930

Appendix 4
Oil Pollution Prevention Team

1. Shipboard Oil Pollution Prevention Team Organisation Chart



2. Shipboard Oil Pollution Prevention Team General Responsibilities

The following crew members are in charge in the event of a spill – actual or probable – to bring the accident under control, limit outflows, organize onboard clean-up procedures and determine the additional manpower needed.

2.1 Master

Overall in charge of operation on board dealing with a spill; responsible for all steps to be taken especially for the two main categories – reporting and action. Report incident as required (Chapt. 2,2). Remains as owner's senior representative until relieved by the Fleet Manager, Superintendent or Head Office Representative.

2.2 3rd Officer

Secretary to Master. Transmit and receive reports as requested by Master. Keep log of all events and progress.

2.3 Chief Officer

In charge of deck operation. Keep Master informed and updated on the situation and the results from actions taken to limit outflow.

2.4 Chief Engineer

In charge of bunker operation; should keep the Master informed and updated on the situation and the results from action taken to limit oil outflow.

2.5 Duty Officer

Mobilise deckhands to the best position for keeping escaping oil from running over the vessel's sides. Mobilise fire fighting squad as needed.

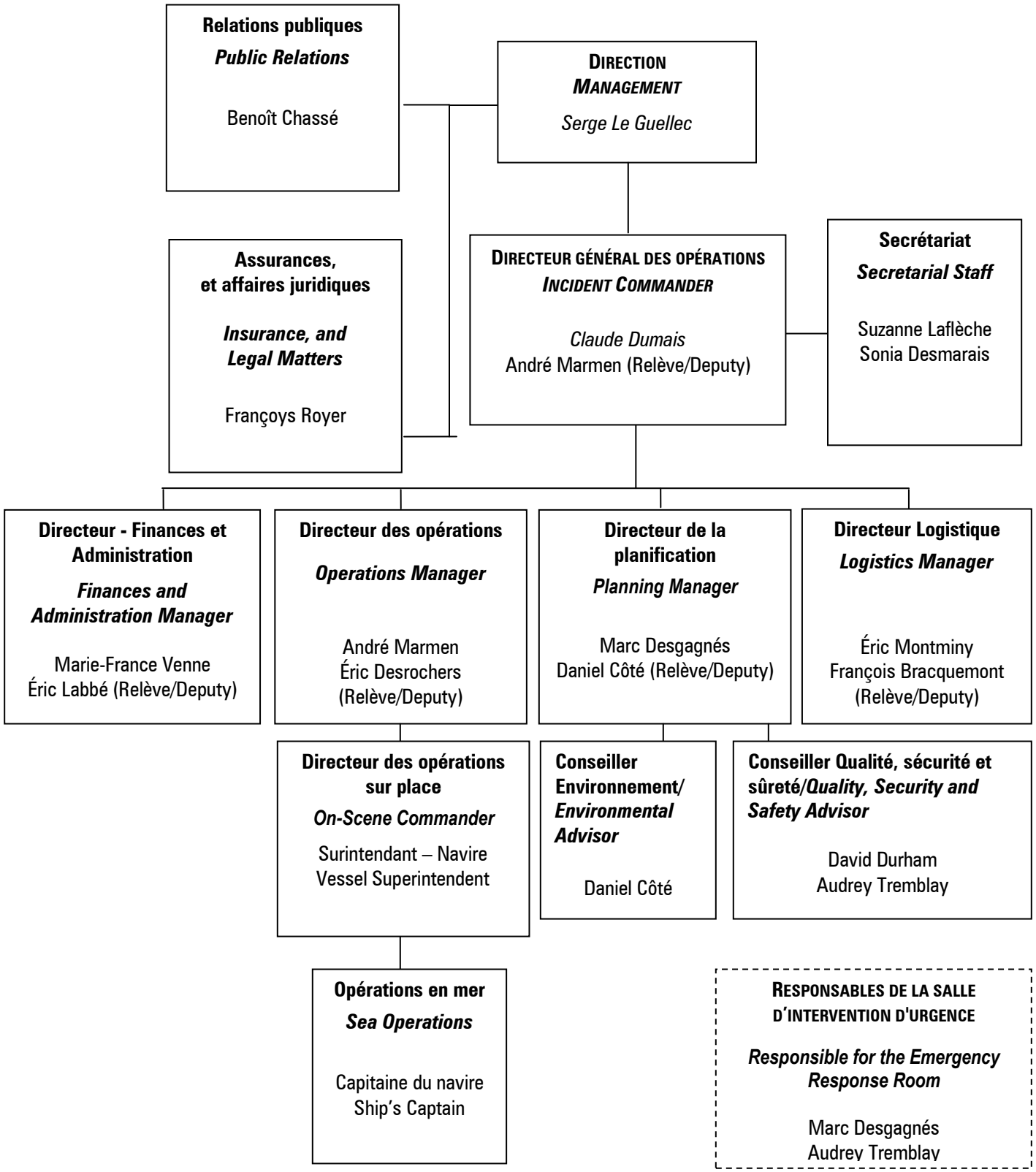
2.6 Duty Engineer

Assist Chief Engineer. Prepare for fire fighting. Ensure sufficient power and water to deck; organize on board clean-up equipment.

2.7 Duty Deckhand

Position sorbent material to prevent any oil from reaching the railing. Commence clean-up by using the on board spill clean-up equipment.

3. Shore Oil Pollution Prevention Team Organisation Chart



4. Shore Oil Pollution Prevention Team General Responsibilities

4.1 Incident Commander

He is the leader of the team and responsible for co-ordination between all parties. He is the main interlocutor of the Master, authorities and various entities. Contacts classification Societies & Shipyards.

4.2 On-Scene Commander

The Shore Operation Manager arranges and provides information for emergency, medical assistance as needed. He provides additional personnel and equipment as required.

4.3 Planning Manager

He is the adviser for safety, security and environmental matters.

He communicates with relatives or manning agency in case of casualties amongst officers and crew members.

4.4 Insurance and Finance Manager

The insurance manager advises on liability and insurance matters. He confers with underwriters and local agents. He consults and requires the advice of P & I Club average adjusters and salvage interface. He is also responsible for all matters relating to finance.

4.5 Logistics Manager

In charge to deliver to the ship the fire fighting and the pollution control equipment as well as the other spares and materials as required by circumstances.

4.6 Public Relations Coordinator

The Public Relation Coordinator as official media spokesman, will maintain a constructive dialogue with the news media, make available to the press relevant information about any on-going operation, supply additional relevant background information, prepare and distribute press releases, arrange press conferences as appropriate and assess the need to contact a public relations firm.

4.7 Secretaries

The secretaries and the operators are on duty during working hours. They are responsible for the ship documentation and will provide the Emergency Response Team with any necessary plans, notices and so forth.

5. Organisation

5.1 Permanence

The Emergency Response Team is operational on a non-stop 24-hour basis.

5.1 Emergency Response Room

A fully-equipped Emergency Response Room is at the disposal of the Emergency Response Team.

5.2 Communication equipment

The equipment listed below is available in the main office or in the emergency response room:

- Main switchboard phone lines plus dedicated phone lines
- Fax machines
- Computers with access to Internet
- Electronic board, flip charts, etc.

5.3 Documentation

- Vessels detailed plans
- Nautical documentation
- Company Contingency Plans
- SOPEP
- VRP
- SERS
- Emergency Response Team Handbook

Appendix 5
Operational Spills Check list

A. Operational oil/NLS spill response check list

This check list is intended for response guidance when dealing with an oil/NLS spill during bunkering operations. Responsibility for action to deal with other emergencies which result from the oil/NLS spill will be as laid down in existing plans, such as the Emergency Muster List.

ACTION TO BE CONSIDERED	ACTION TAKEN		PERSON RESPONSIBLE
IMMEDIATE ACTION			
Sound emergency alarm	Yes ❑	No ❑	Person discovering incident
Initiate vessel emergency response procedures	Yes ❑	No ❑	Officer on duty
INITIAL RESPONSE			
Cease bunkering operations	Yes ❑	No ❑	Chief engineer
Close manifold valves	Yes ❑	No ❑	Chief engineer
Stop air intake to accommodation	Yes ❑	No ❑	Officer on duty
Stop non-essential air intake to engine room	Yes ❑	No ❑	Engineer on duty
Locate source of leakage	Yes ❑	No ❑	Chief engineer
Commence clean-up procedures using absorbents and permitted solvents	Yes ❑	No ❑	Chief officer
Comply with reporting procedures	Yes ❑	No ❑	Master
SECONDARY RESPONSE			
Assess fire risk from release of flammable substances	Yes ❑	No ❑	Chief officer
Reduce oil level in relevant tank by dropping oil into an empty of slack tank	Yes ❑	No ❑	Chief engineer
Drain affected line to empty or slack tank	Yes ❑	No ❑	Chief engineer
Prepare pumps for transfer of oil, to other tanks or to shore or lighter	Yes ❑	No ❑	Chief engineer
FURTHER RESPONSE			
Pump water into leaking tank to create water cushion and prevent further oil loss	Yes ❑	No ❑	Chief engineer
If leakage is below waterline, arrange divers for further investigation	Yes ❑	No ❑	Master
Calculate stresses/stability. If necessary, request shore assistance with this	Yes ❑	No ❑	Chief officer
Transfer bunkers to alleviate high stresses	Yes ❑	No ❑	Chief officer
Stow residues from clean-up carefully prior to disposal			Officer on duty

B. Casualty oil/NLS spill response check list

This check list is intended for response guidance when dealing with an oil/NLS spill following a casualty. Responsibility for action to deal with the casualty itself will be as laid down in existing plans, such as the Emergency Muster List.

The term "navigator" refers to the officer responsible for passage planning and voyage analysis, usually the second officer.

ACTION TO BE CONSIDERED	ACTION TAKEN		PERSON RESPONSIBLE
IMMEDIATE ACTION			
Sound emergency alarm	Yes ❑	No ❑	Officer on duty
Initiate vessel emergency response procedures	Yes ❑	No ❑	Officer on duty
INITIAL RESPONSE			
Stop air intake to accommodation	Yes ❑	No ❑	Officer on duty
Stop non-essential air intake to engine room	Yes ❑	No ❑	Engineer on duty
Assess further danger to ship or personnel such as capsize or immediate sinking	Yes ❑	No ❑	Master
Cease all cargo and other non-essential operations	Yes ❑	No ❑	Officer on duty
Assess whether oil/NLS has actually been spilt	Yes ❑	No ❑	Chief officer
Is there a probability that it will be spilt	Yes ❑	No ❑	Master
Comply with reporting procedures	Yes ❑	No ❑	Chief engineer
Sound oil/NLS compartments			Chief officer
Sound around vessel if aground			Master
Request outside assistance	Yes ❑	No ❑	Chief officer
Counter excessive list	Yes ❑	No ❑	Officer on duty
Contain spilt oil/NLS	Yes ❑	No ❑	Chief officer
Commence clean-up procedures using absorbents and permitted solvents	Yes ❑	No ❑	Chief officer
FURTHER RESPONSE			
Assess fire risk from release of flammable substances	Yes ❑	No ❑	Chief officer
Consider evacuation of non-essential crew	Yes ❑	No ❑	Master
Assess likelihood of further damage to vessel of cargo	Yes ❑	No ❑	Master
Calculate stresses/stability. If necessary, request shore assistance with this	Yes ❑	No ❑	Chief officer
Transfer cargo or bunkers to alleviate high stresses	Yes ❑	No ❑	Chief officer
Request assistance or escort to port of refuge	Yes ❑	No ❑	Master
Manoeuvre upwind of spill/away from land	Yes ❑	No ❑	Master
Assess whether tide will worsen situation	Yes ❑	No ❑	Navigator
Obtain weather forecast and assess effect	Yes ❑	No ❑	Navigator
Prepare pumps for transfer of oil/NLS to other tanks or to shore or lightening vessel	Yes ❑	No ❑	Chief Engineer

Appendix 6
Contingency Documents
M/T *Dara Desgagnés*

List of Contingency Documents enclosed hereafter:

- Main particulars of vessel;
- Drawings
    - Cargo Piping, sheet 1 of 2 (996.51.31)
    - Schematic Cargo and Stripping Lines, sheet 2 of 2 (996.51.31)
    - Diagram of Fuel Bunkering (996.41.13)
    - General Arrangement Plan, Side (996.31.01)
    - General Arrangement Plan, Stowage (996.31.02)
    - General Arrangement Plan, Upper Deck (996.31.05)
    - Tank Plan (100.25.01b)
    - Vessel Capacity Plan (996.24.04)
- Salvage Agreement (LOF 2000, US Open Form))

Appendix 6
Contingency Documents
M/T *Dara Desgagnés*

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    - Schematic Cargo and Stripping Lines, sheet 2 of 2 (996.51.31)
    - Diagram of Fuel Bunkering (996.41.13)
    - General Arrangement Plan, Side (996.31.01)
    - General Arrangement Plan, Stowage (996.31.02)
    - General Arrangement Plan, Upper Deck (996.31.05)
    - Tank Plan (100.25.01b)
    - Vessel Capacity Plan (996.24.04)
- Salvage Agreement (LOF 2000, US Open Form))

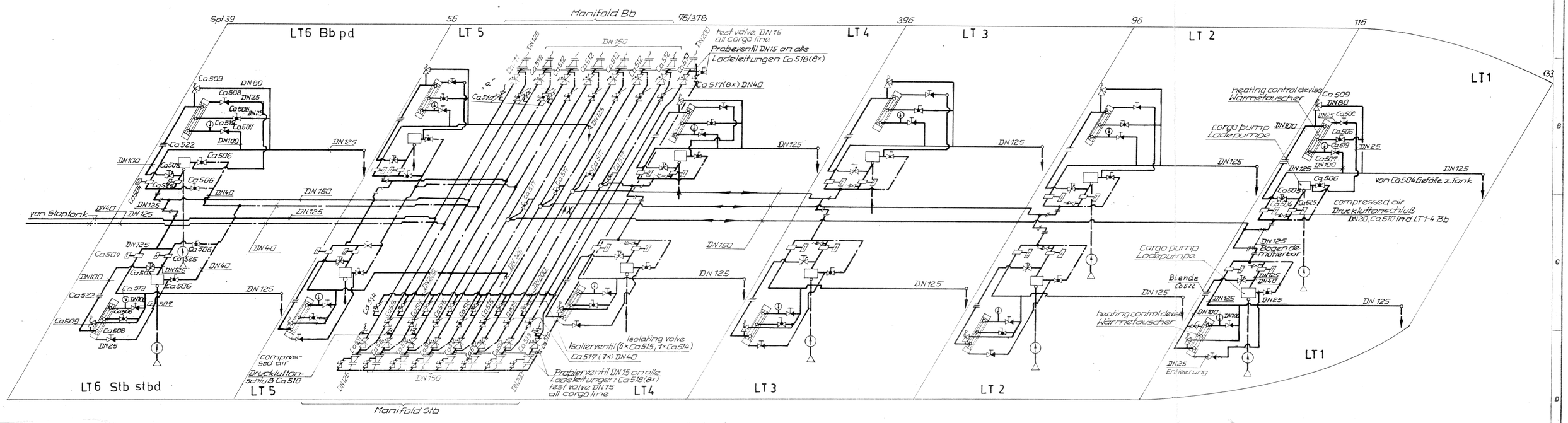
VESSEL PARTICULARS

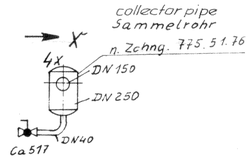
GENERALITIES

1. SHIP'S NAME :	M/V Dara *Desgagnés*
2. SHIP TYPE:	Oil/Chemical Tanker
3. PORT OF REGISTRY:	Québec
4. OWNER:	Transport Desgagnés inc.
5. INTERNATIONAL CALL SIGN:	VCBW
6. FLAG:	Canadian
7. GROSS TONNAGE/ Deadweight:	6,262 / 10,511
8. IMO NUMBER:	9040089
9. VESSEL DIMENSIONS:	
Length Overall:	123.72 M.
Breadth (Moulded):	17.70 M.
Draft – Summer DWT:	8.36 M.
10. KEEL LAID:	July 24th, 1992
11. DELIVERY:	January 1st, 1993

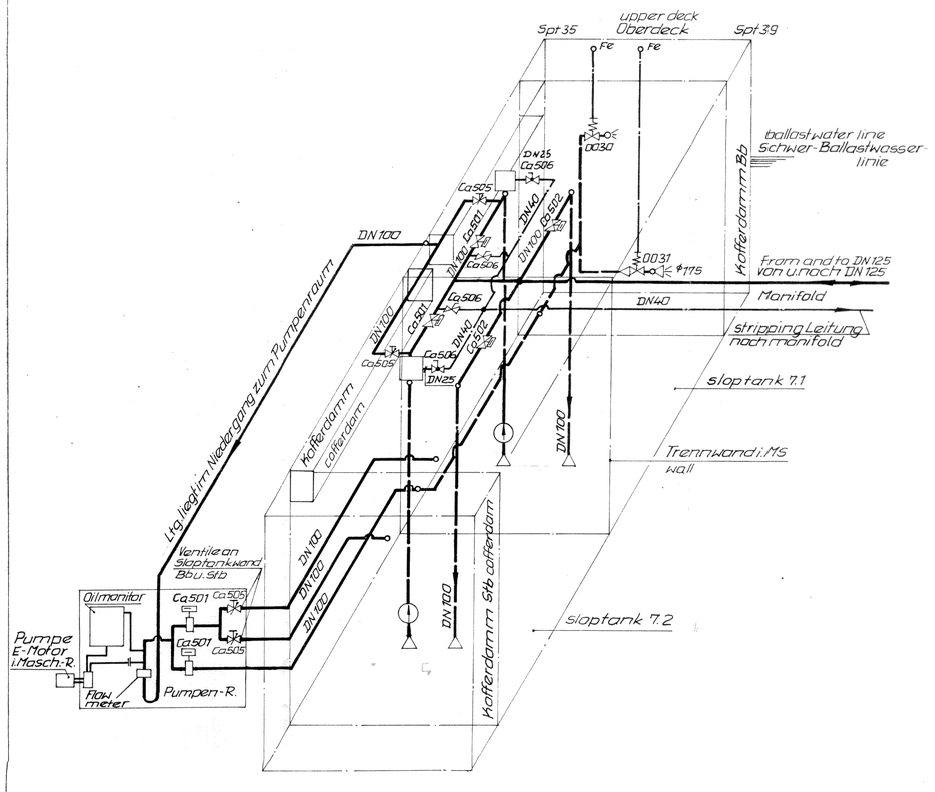
This plan should be kept available for inspection on request by a port state control officer or by a port state quarantine officer.

Cargotanks 1-6 Bb.u.Stb.
Schaltung auf Oberdeck
upper deck pd and stbd





Sloptanks Bb u. Stb



3.8

56 a

Niro-Leitungen

DN 25	–	33,7 x 1,6
40	–	44,5 x 2,0
50	–	60,3 x 2,0
80	–	88,9 x 2,0
100	–	114,3 x 2,0
125	–	139,7 x 2,3
150	–	168,3 x 2,6
200	–	219,1 x 2,9
250	–	273, x 4,0

——— Ladeleitung - cargo line
—·—·— Restlenzleitung (strippingleitung)
— — — Leitungen in den Tanks-pipe line to bzw. Kofferdamm tanks and cofferdam

Bemerkungen u. Zeichenerklärungen siehe Bl. 1 P.T.O 1

Änd.-Buchst.	Änderungs-Mitteilung Nr.	Tag	Name	Änd.-Buchst.	Änderungs-Mitteilung Nr.	Tag	Name	Änd.-Buchst.	Änderungs-Mitteilung Nr.	Tag	Name
a	142	24.6.92	[signature]								

COT 12,5 Chem. Tanker Auftr. Nr. 123-126

Werkstoff	1992	Tag	Name	Benennung	Maßstab
Niro 1.4571	Entwerfen	12.6.	[signature]	Schema der Lade- und Strippingleitungen cargo-and stripping line	ohne
	Gezeichnet	12.5.	[signature]		
	Geprüft	12.6.	[signature]		
Masse kg	Stand. techn. geprüft				Lichtpause
	Gesehen	12.6.	[signature]		

MTW Schiffswerft GmbH Wismar

Abt. TKM2 Tel.-Nr. 2853

Zeichnungs-Nr. 996.51.31

Hierzu Blatt -Liste

Bl.-Zahl 2

Bl.-Nr. 2

Ersatz für: Ersetzt durch:

Paßmaß Abmaße

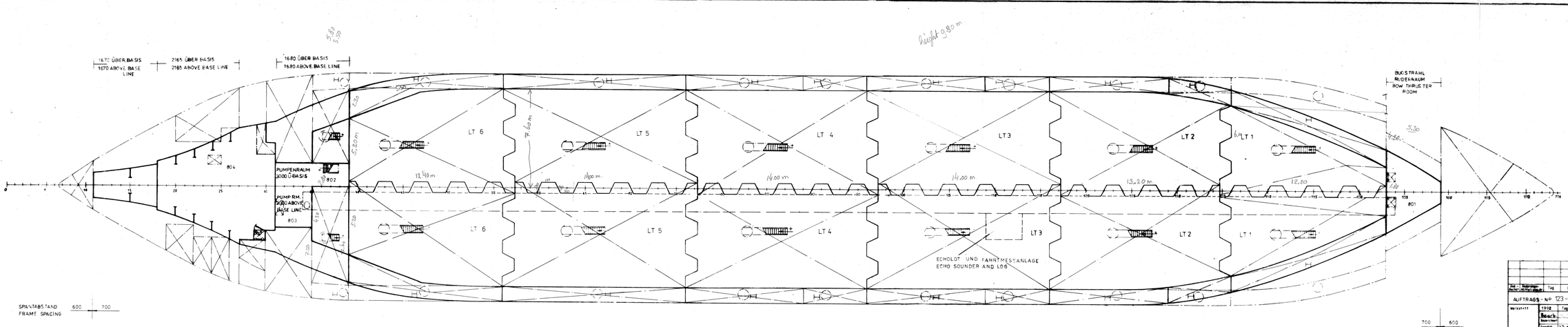
Abweichungen für Maße ohne Toleranzangabe

TGL 3897

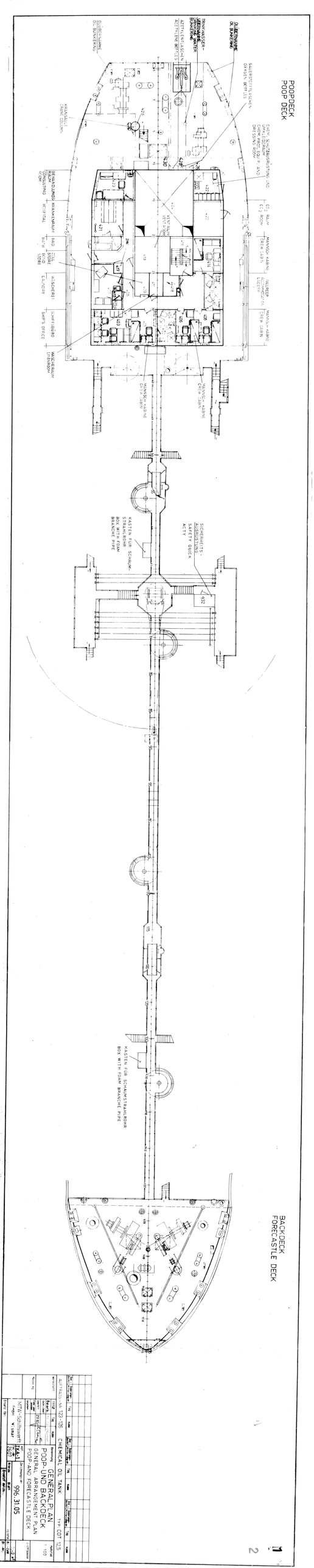
1) Genauigkeitsgrad einsetzen

8689 M 27-529 VLV Freiberg Ag 307-70 DDR III-15-4 18

35 T/C 16049 370


1672 ÜBER BASIS
1670 ABOVE BASE LINE
2165 ÜBER BASIS
2165 ABOVE BASE LINE
1680 ÜBER BASIS
1680 ABOVE BASE LINE
height 9.80 m
BUGSTRAHL RUDERRAUM
BOW THRUSTER ROOM
PUMPENRAUM 2300 ÜBER BASIS
PUMP RM. 2300 ABOVE BASE LINE
804
802
803
801
LT 6
LT 5
LT 4
LT 3
LT 2
LT 1
12.40 m
14.00 m
14.00 m
13.20 m
12.60
ECHOLOT UND FAHRTMESSANLAGE
ECHO SOUNDER AND LOG
SPANTABSTAND
FRAME SPACING
600
700

| | | |


POOPDECK
POOP DECK
BACKDECK
FORECASTLE DECK
KASTEN FÜR SCHAUM-STRAHLROHR
BOX FOR FOAM BRANCH PIPE
KASTEN FÜR SCHAUMSTRAHLROHR
BOX WITH FOAM BRANCHE PIPE
SICHERHEITS-ALARMDRUCK
SAFETY CHUCK ACTY
MANNSCHAFTS-KABINEN
CREW CABINS
OFFIZIER-KABINEN
OFFICERS CABINS
KAPITÄN
CAPTAIN
SCHIFFSBÜRO
SHIP'S OFFICE
WÄSCHEREI
LAUNDRY
BAD
BATH
TOILETTE
TOILET
STORE
KRANKENRAUM
HOSPITAL
BERATUNGS-ZIMMER
CONSULTING ROOM
MESS RAUM
MESS ROOM
MESS RAUM
MESS ROOM
SANITÄTS-RAUM
MEDICAL ROOM
SANITÄTS-RAUM
MEDICAL ROOM
SANITÄTS-RAUM
MEDICAL

LOF 2000

LLOYD'S STANDARD FORM OF SALVAGE AGREEMENT

(Approved and Published by the Council of Lloyd's)

NO CURE – NO PAY

1 Name of the salvage Contractors: (referred to in this agreement as "the Contractors")	**2** Property to be salved: The vessel: her cargo freight bunkers stores and any other property thereon but excluding the personal effects or baggage of passengers master or crew (referred to in this agreement as "the property")
3 Agreed place of safety:	**4** Agreed currency of any arbitral award and security (if other than United States dollars)
5 Date of this agreement	**6** Place of agreement
7 Is the Scopic Clause incorporated into this agreement? State alternative: Yes/No	
8 Person signing for and on behalf of the Contractors Signature:	**9** Captain or other persons signing for an on behalf of the property Signature:

A **Contractors' basic obligation:** The Contractors identified in Box 1 hereby agree to use their best endeavours to salve the property specified in Box 2 and to take the property to the place stated in Box 3 or to such other place as may hereafter be agreed. If no place is inserted in Box 3 and in the absence of any subsequent agreement as to the place where the property is to be taken the Contractors shall take the property to a place of safety.

B **Environmental protection:** While performing the salvage services the Contractors shall also use their best endeavours to prevent or minimise damage to the environment.

C **Scopic Clause:** Unless the word "No" in Box 7 has been deleted this agreement shall be deemed to have been made on the basis that the Scopic Clause is not incorporated and forms no part of this agreement. If the word "No" is deleted in Box 7 this shall not of itself be construed as a notice invoking the Scopic Clause within the meaning of sub-clause 2 thereof.

D **Effect of other remedies:** Subject to the provisions of the International Convention on Salvage 1989 as incorporated into English law ("the Convention") relating to special compensation and to the Scopic Clause if incorporated the Contractors services shall be rendered and accepted as salvage services upon the principle of "no cure - no pay" and any salvage remuneration to which the Contractors become entitled shall not be diminished by reason of the exception to the principle of "no cure - no pay" in the form of special compensation or remuneration payable to the Contractors under a Scopic Clause.

E **Prior services:** Any salvage services rendered by the Contractors to the property before and up to the date of this agreement shall be deemed to be covered by this agreement.

F **Duties of property owners:** Each of the owners of the property shall cooperate fully with the Contractors. In particular:

- **i** the Contractors may make reasonable use of the vessel's machinery gear and equipment free of expense provided that the Contractors shall not unnecessarily damage abandon or sacrifice any property on board;
- **ii** the Contractors shall be entitled to all such information as they may reasonably require relating to the vessel or the remainder of the property provided such information is relevant to the performance of the services and is capable of being provided without undue difficulty or delay;
- **iii** the owners of the property shall co-operate fully with the Contractors in obtaining entry to the place of safety stated in Box 3 or agreed or determined in accordance with Clause A.

G. **Rights of termination:** When there is no longer any reasonable prospect of a useful result leading to a salvage reward in accordance with Convention Articles 12 and/or 13 either the owners of the vessel or the Contractors shall be entitled to terminate the services hereunder by giving reasonable prior written notice to the other.

H **Deemed performance:** The Contractors' services shall be deemed to have been performed when the property is in a safe condition in the place of safety stated in Box 3 or agreed or determined in accordance with clause A. For the purpose of this provision the property shall be regarded as being in safe condition notwithstanding that the property (or part thereof) is damaged or in need of maintenance if (i) the Contractors are not obliged to remain in attendance to satisfy the requirements of any port or habour authority, governmental agency or similar authority and (ii) the continuation of skilled salvage services from the Contractors or other salvors is no longer necessary to avoid the property becoming lost or significantly further damaged or delayed.

I **Arbitration and the LSSA Clauses:** The Contractors remuneration and/or special compensation shall be determined by arbitration in London in the manner prescribed by Lloyds Standard Salvage and Arbitration Clauses ("the LSSA Clauses") and Lloyd's Procedural Rules. The provisions of the LSSA Clauses and Lloyd's Procedural Rules are deemed to be incorporated in this agreement and form an integral part hereof. Any other difference arising out of this agreement or the operations hereunder shall be referred to arbitration in the same way.

J **Governing law:** This agreement and any arbitration hereunder shall be governed by English law.

K **Scope of authority:** The Master or other person signing this agreement on behalf of the property identified in Box 2 enters into this agreement as agent for the respective owners thereof and binds each (but not the one for the other or himself personally) to the due performance thereof.

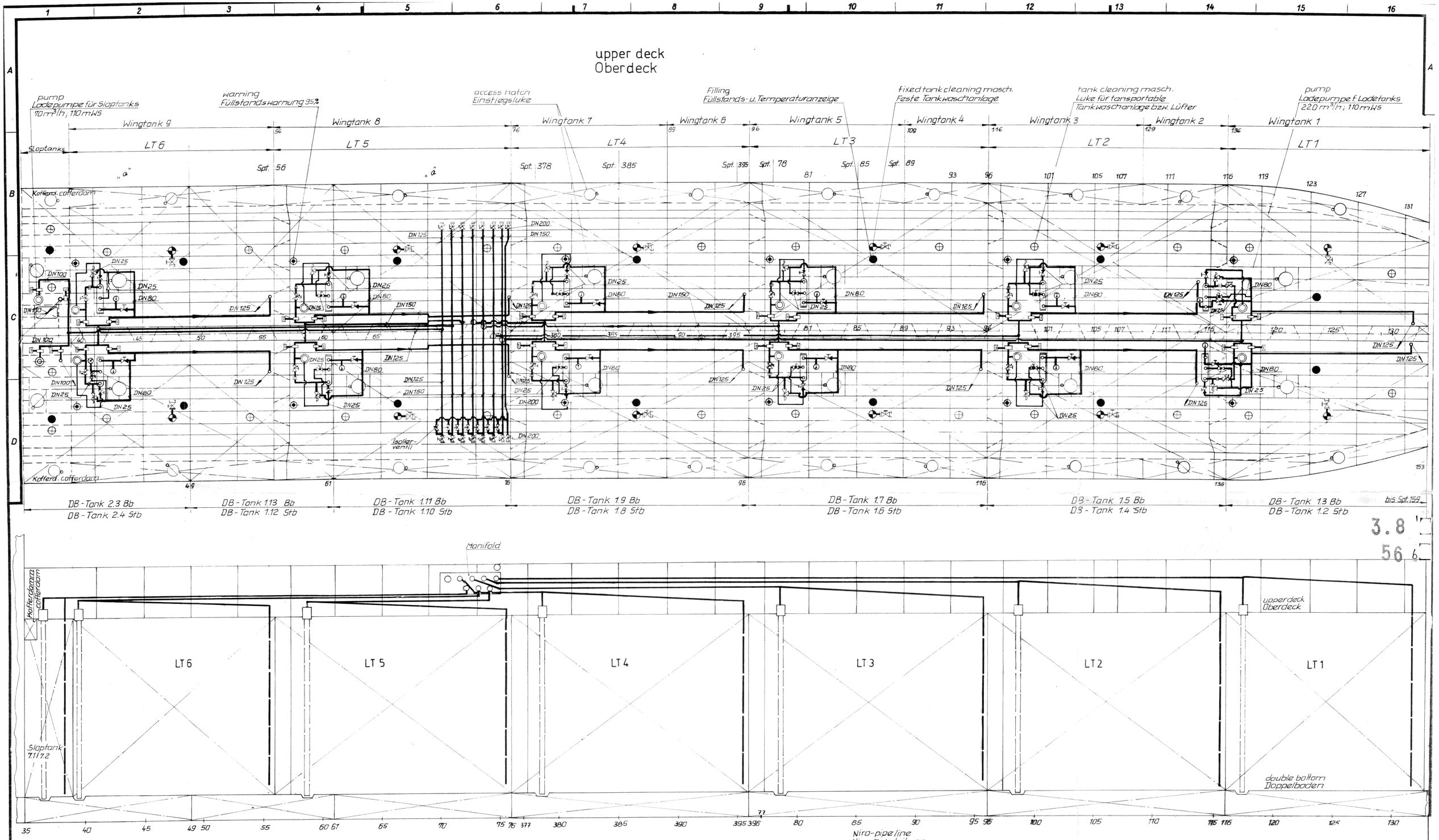
L **Inducements prohibited:** No person signing this agreement or any party on whose behalf it is signed shall at any time or in any manner whatsoever offer provide make give or promise to provide or demand or take any form of inducement for entering into this agreement.

IMPORTANT NOTICES

1 **Salvage security.** As soon as possible the owners of the vessel should notify the owners of other property on board that this agreement has been made. If the Contractors are successful the owners of such property should note that it will become necessary to provide the Contractors with salvage security promptly in accordance with Clause 4 of the LSSA Clauses referred to in Clause I. The provision of General Average security does not relieve the salved interests of their separate obligation to provide salvage security to the Contractors.

2 **Incorporated provisons.** Copies of the Scopic Clause; the LSSA Clauses and Lloyd's Procedural Rules may be obtained from (i) the Contractors or (ii) the Salvage Arbitration Branch at Lloyd's, One Lime Street, London EC3M 7HA.

Telephone + 44(0)20 7327 5408
Fax +44(0)20 7327 6827
Email lloyds-salvage@lloyds.com
www.lloydsagency.com



remarks

Filling warning 95% over flowing
Filling- and temperature
fixed tank cleaning masch.
transport washing masch.
blend
cargo pumps
access to cargo tanks
• to wingtank and cofferdam
safety valve
stop cock
ball valve
isolating valve

Zeichenerklärung

- Füllstandswarnung 95% Füllung
- Füllstands- u. Temperaturanzeige
- feste Tankwaschanlage
- Dom f. transp. Tankwaschmasch. u. Lüfter
- Blende
- Ladepumpe
- Einstieg zu den Ladetanks
- Einstieg z.d. wing tanks bzw. Kofferdamm
- Sicherheitsventil
- Absperrklappe
- Kugelhahn
- Isolierventil
- shut-off non-return valve
- absperrbares Rückschlagventil
- Druckluftventil mit Schlauchanschl.
- compressed-air valve

Cargo Oil Pumps

Type:
SD 125 für Lade- u. Wingtanks
SD 100 für Sloptanks
Frank Mohn Norwegen

Betriebsdruck: 11,0 bar
Probedruck: 16,5 bar

Nira-pipe line
Nira-Rohrleitungs-abmessungen

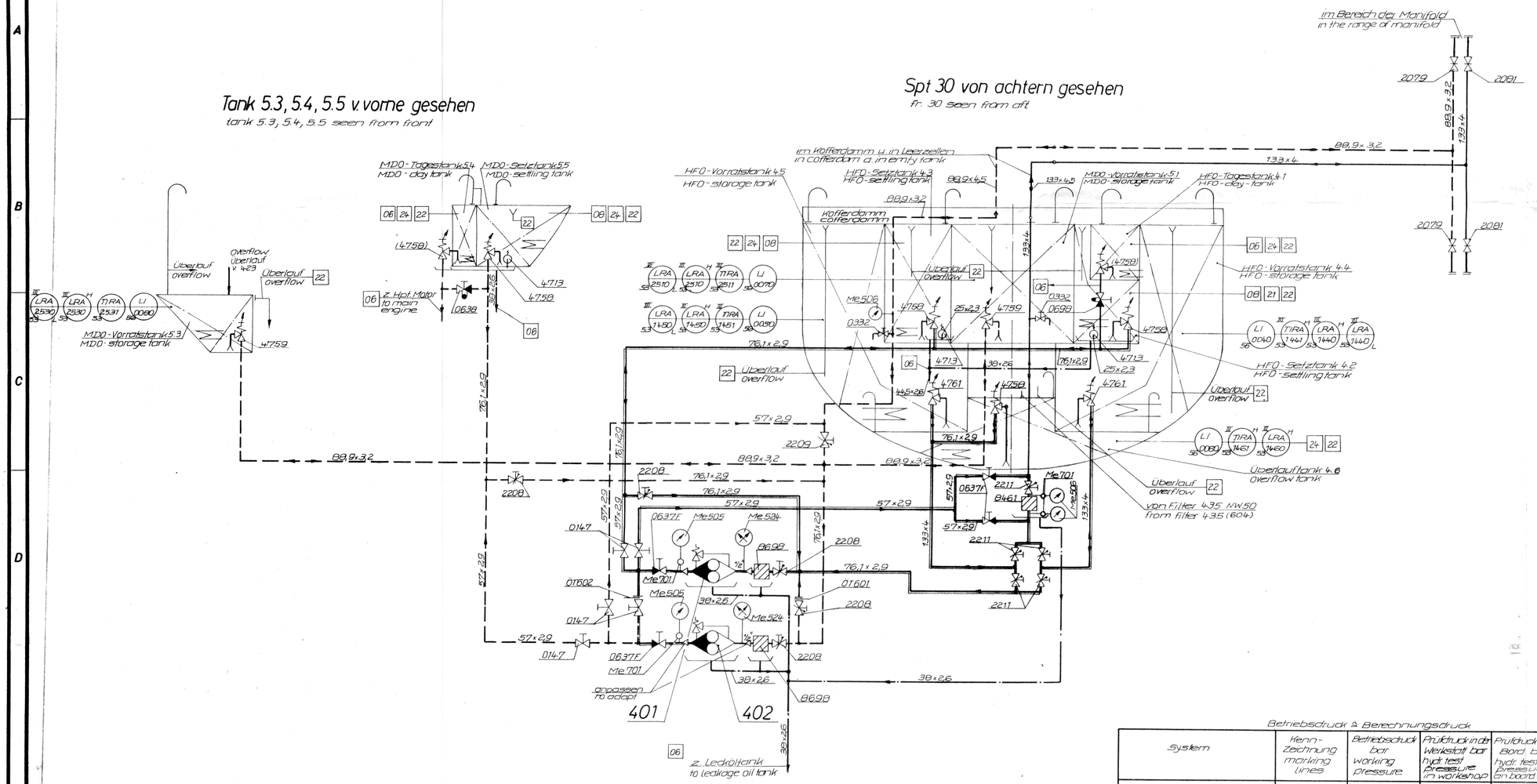
DN 25	33,7 × 1,6
40	44,5 × 2,0
50	60,3 × 2,0
80	88,9 × 2,0
100	114,3 × 2,0
125	139,7 × 2,3
150	168,3 × 2,6
200	219,1 × 2,9
250	273 × 4,0

Strippingleitungen, Druckluftanschluß u. Sloptankentleerung siehe Bl. 2
P.T.O. 2

123-126			COT-10
1992	Tag	Name	Benennung: Schema d. Ladeleitungen / Schema of cargo line
Entw.	23.10.		Maßst. 1:100
Gez.			
Gepr.			
St.gepr.			
Geseh.			
MTW-Schiffbau GmbH Wismar	Abt. TKM 2	Zeichn. Nr. 996.51.31	
	Tel. 2499		Bl. Z. 2
			Bl. Nr. 1

Vervielfältigungen, Weitergabe an Dritte, Gebäudezeichnung oder andere Nutzung dieses Kontrollbeschlusses sind ohne Genehmigung nicht gestattet. Zuwiderhandlung zieht rechtliche Folgen nach sich.

8609/M 27-529 VV Freiberg Ag 307/86 III/15/4 187 1439/6 22,0 T/C 31767



Bemerkungen:

1. Sinnbilder und allgemeine Bemerkungen siehe Zeichng. Nr. 996.41.21
2. Meßstellen (Zeichen ⊖ u. ○) siehe Liste der Meßstellen 800.62.35
3. Technische Daten der Maschinen u. Apparate siehe Zeichng. Nr. 996.41.02
4. Werkstoffe: Rohre St geschweißt
   Armaturen an Tanks: GS/Niro oder GGG/Niro
   in Leitungen: GGL/Niro
   GT/Niro
5. Anschlußzeichnungen:
   - 06 Schema Brennstoffbetriebssystem Z. Nr. 996.41.12
   - 22 Schema Luft-Peil- u. Überlaufrohre Z. Nr. 996.51.25 u. 26
   - 24 Schema Tankheizung Z. Nr. 996.51.01
   - 08 Schema Brennstoffreinigung Z. Nr. 996.41.14

3.8

10

Remarks:

1. Symbols and general remarks see drw. - N° 996.41.21
2. measuring points (characters ⊖ a. ○) see list of measuring points drw. N° 800.62.35
3. techn. data of maschines a. devices see drw. N° 996.41.02
4. materials: pipe
   fittings an tanks: cast steel / stainless steel
   modular cast iron / stainless steel or
   in lines: cast iron laminar / stainless steel
   melleable cast iron / stainless steel
5. drawing of connection:
   - 06 diagramm of fuel service lines drw. N° 996.41.12
   - 22 diagramm of vent. sounding and overflow pipes drw. N° 996.51.25 26
   - 24 diagramm of tank heating drw. N° 996.51.01
   - 08 diagramm of fuel cleaning drw. N° 996.41.14

Betriebsdruck ≙ Berechnungsdruck

System	Kenn-Zeichnung marking lines	Betriebsdruck bar working pressure	Prüfdruck in der Werkstatt bar hydr. test pressure in workshop	Prüfdruck an Bord bar hydr. test pressure an board vessel
HFO - Übernahmeleitung HFO - bunkering line	———	6	9	9
HFO - Umförderleitung HFO - transfer line	———	3,5	—	5,5
MDO - Übernahmeleitungen MDO - bunkering lines	- - - -	6	9	9
MDO - Umförderleitung MDO - transfer line	- - - -	3,5	—	5,5
Leckölleitungen Leakage oil lines	—·—	0	—	—

Pos. Qty	Stck. item	Benennung designation	Bemerkung remarks
402	1	MDO- und Reserve HFO-Förderpumpe / MDO- and stand by HFO-delivery pump	10 m³/h 3 bar
401	1	HFO-Förderpumpe / HFO-delivery pump	10 m³/h 3 bar

ÄB	Ä-Mittlg.	Tag	Name	ÄB	Ä-Mittlg.	Tag	Name	ÄB	Ä-Mittlg.	Tag	Name

COT 10/12,5 121-126

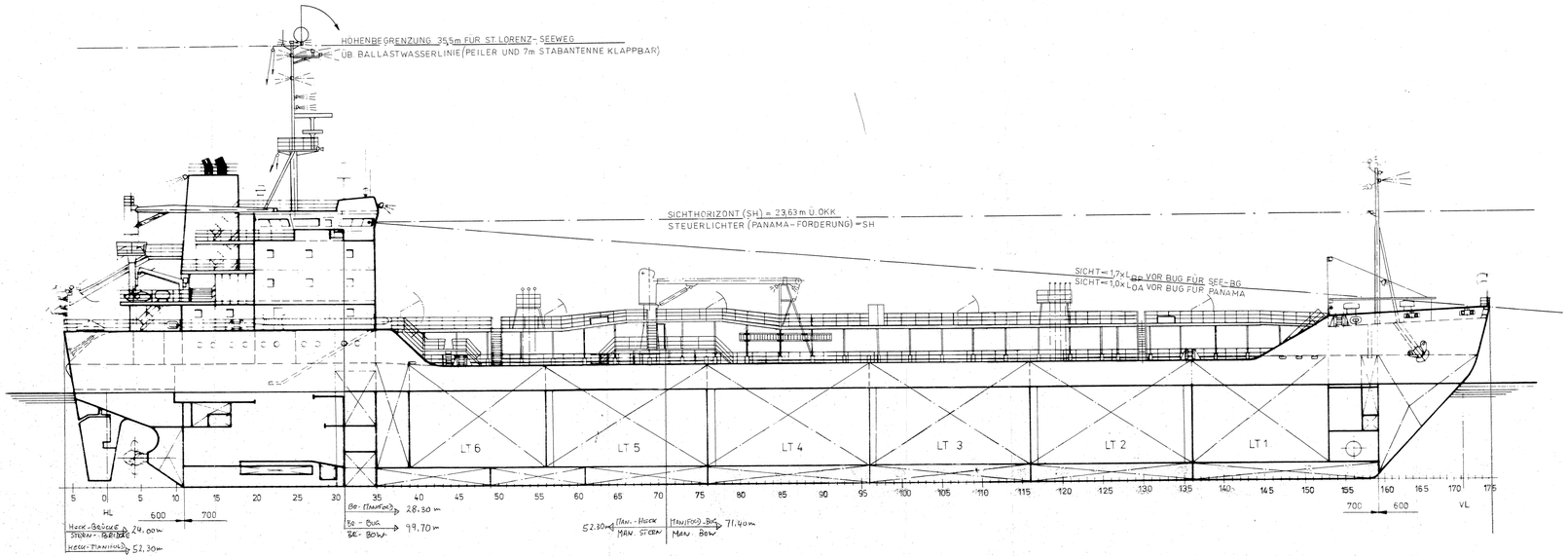
1991	Tag	Name
Entw.	18.10.	[signature]
Gez.	18.10.	[signature]
Gepr.	15.1.91	[signature]
Gepr.		
Ges.	13.3.	[signature]

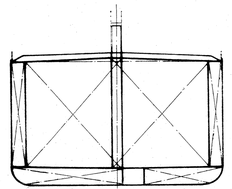
MTW GmbH Wismar

Benennung: Schema Brennstoffübernahmesystem
Diagram of fuel bunkering

Abt. TWM2 | Zeichng. Nr. 996.41.13 | Tel. 444 | Hierzu Bl. | Liste

Maßstab | Lichtpause | 0,35 mm² | Bl.-Z. | Bl.-Nr.





HAUPTDATEN / MAIN PARTICULARS

- LÄNGE ÜBER ALLES LENGHT OVERALL	ca. 124,00 m abt.
- LÄNGE ZWISCHEN DEN LOTEN LENGHT BETWEEN PERPENDICULARS	117,60 m
- BREITE AUF SPANTEN MOULDED BREADTH	17,70 m
- SEITENHÖHE OBERDECK ÜBER BASIS DEPTH TO UPPER DECK ABOVE BASE LINE	10,60 m
- TIEFGANG ENTWURF DRAUGHT DESIGNED	8,36 m
- FREIBORDTIEFGANG (SOMMER OKK) SUMMER FREEBOARD DRAUGHT REF. TO BL.	8,36 m
- TRAGFÄHIGKEIT BEI FREIBORDTIEFGANG DEADWEIGHT AT FREEBOARD DRAUGHT	ca. 10500 tdw abt.
- LADETANKS / NETTOKAPAZITÄT CARGO OIL TANKS / NET LOADING CAPACITY	ca. 10810 m^3 abt.
- HAUPTMASCHINENLEISTUNG MAIN ENGINE OUTPUT	ca. 3700 kW, 210 min^{-1} abt.
- GESCHWINDIGKEIT SERVICE SPEED	12,5 kn
- BESATZUNG CREW	16 PERSONEN PERSONS
- EIGNER OWNER	2 PERSONEN PERSONS
- LOTSE PILOT	1 PERSON

1
2

Änd.	Änderungs-Bericht/Mitteil./Anl.-Nr.	Tag	Name

AUFTRAGS-NR 123-126 — CHEMICAL OIL TANKER — TYP: COT 125

Werkstoff | Masse kg

	Tag	Name
1992		
Bearb.		
Gepr.	29.09	
Stand.-gem. Maßbl.		
Genehmigt		

Benennung: GENERALPLAN SEITENANSICHT
GENERAL ARRANGEMENT PLAN
SIDE VIEW

Maßstab 1:200

Lichtpause

MTW-Schiffswerft GmbH Wismar

Abt. KA-1 | Tel.-Nr. 2607

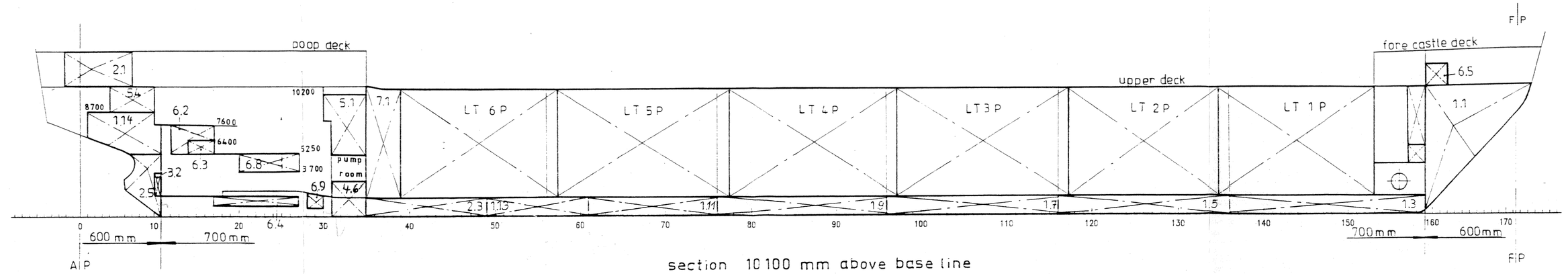
Zeichnungs-Nr. 996.31.01

Werk-Nr. | Blatt | -Liste | Bl.-Zahl | Bl.-Nr.

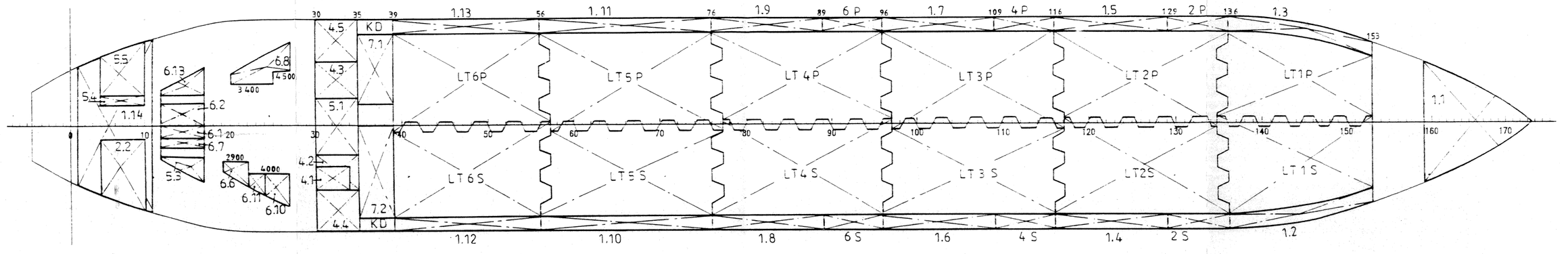
Ersatz für: | Ersatz durch:

0970172000 BOB'S COPY CENTRE LTD.

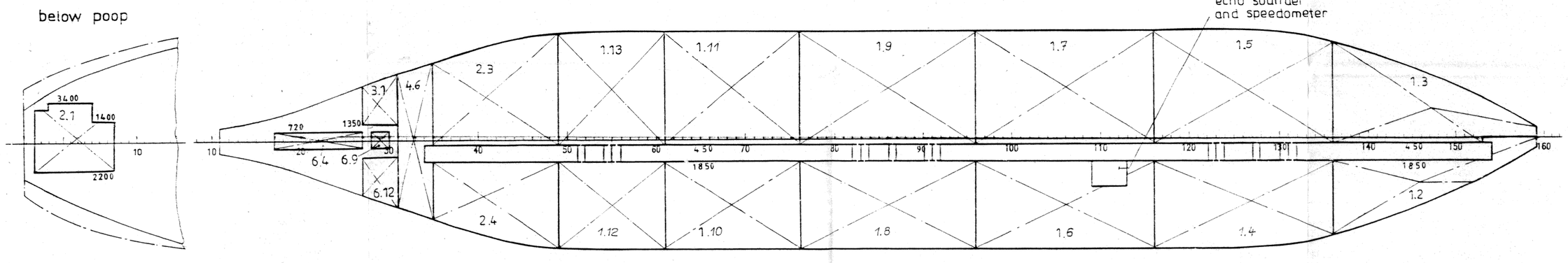
section on centre line



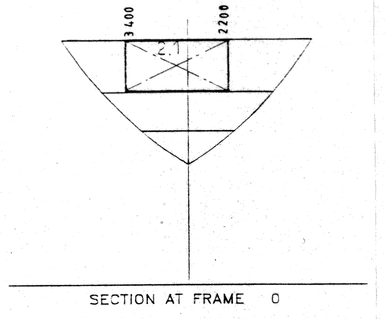
section 10100 mm above base line



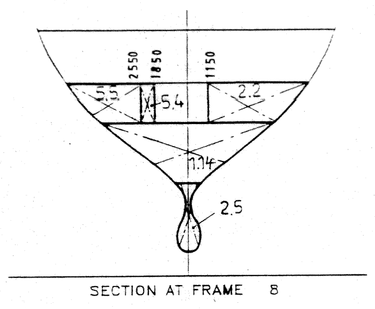
section below inner bottom



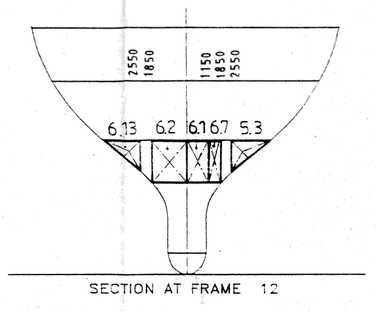
section below poop



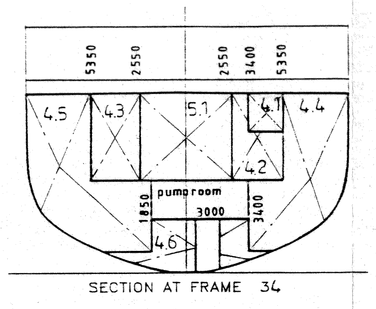
SECTION AT FRAME 0



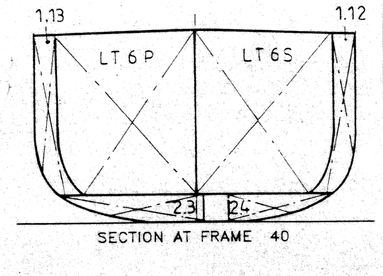
SECTION AT FRAME 8



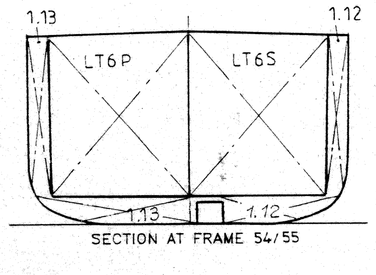
SECTION AT FRAME 12



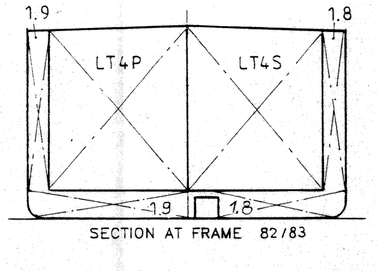
SECTION AT FRAME 34



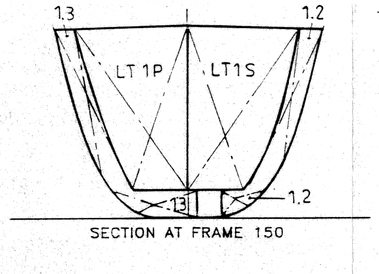
SECTION AT FRAME 40



SECTION AT FRAME 54/55



SECTION AT FRAME 82/83



SECTION AT FRAME 150

Tankprüfung:

- Alle LT für jedes Schiff mit Wasserdruck entsprechend Tabelle.
- Alle Ballasttanks mit Luftdruck 0, 2 bar. Nach Fertigstellung Prüfung mittels Überlauf durch Wasser.
- Alle Betriebstanks mit Luftdruck 0, 2 bar. Endprüfung durch Befüllen mit Medium während der Bebunkerung des Schiffes.

tank test:

- With water pressure corresponding to the table for all cargo tanks for each ship.
- With 0, 2 bar compressed air for all ballast water tanks.
  After completion tank test by means of overflow with water.
- With 0, 2 bar compressed air for all service tanks. During bunkering of the ship the final tank test will be done tank filling with medium.

TANK NO.	DESIGNATION	MEDIUM	POSITION	RANGE OF FRAME	GROSS VOLUME m³	NET VOLUME m³	CENTRE OF GRAVITY ABOVE BASE LINE ẑ m	LONGITUDINAL CENTRE OF GRAVITY x̂ m	TANK TEST OVERFLOW ABOVE TANK TOP (MM)	TANK TEST W=WATER LEVEL ABOVE TANK TOP (MM)
LT1P/LT1S	CARGO OIL TANK 1P/1S	CHEMICAL OIL	PORT/STBD	136 - 153	698 / 698	693 / 693	6.42	99.2	——	W 3875
LT2P/LT2S	CARGO OIL TANK 2P/2S	CHEMICAL OIL	PORT/STBD	116 - 136	921 / 921	914 / 914	6.18	87.1	——	W 3875
LT3P/LT3S	CARGO OIL TANK 3P/3S	CHEMICAL OIL	PORT/STBD	96 - 116	988 / 988	980 / 980	6.17	73.6	——	W 3875
LT4P/LT4S	CARGO OIL TANK 4P/4S	CHEMICAL OIL	PORT/STBD	76 - 96	988 / 988	980 / 980	6.17	59.6	——	W 3875
LT5P/LT5S	CARGO OIL TANK 5P/5S	CHEMICAL OIL	PORT/STBD	56 - 76	988 / 988	980 / 980	6.17	45.6	——	W 3875
LT6P/LT6S	CARGO OIL TANK 6P/6S	CHEMICAL OIL	PORT/STBD	39 - 56	867 / 867	860 / 860	6.19	32.4	——	W 3875
1.1	FOREPEAK	BALLAST WATER	CENTRE LINE	159 - 174	193	184	8.08	112.6	3500	W 3500
1.2	BALLAST WATER TANK	BALLAST WATER	STBD	136 - 159	197	193	4.51	99.9	2500	W 2500
1.3	BALLAST WATER TANK	BALLAST WATER	PORT	136 - 159	240	235	3.84	100.0	2500	W 2500
1.4	BALLAST WATER TANK	BALLAST WATER	STBD	116 - 136	241	236	2.98	85.9	2500	W 2500
1.5	BALLAST WATER TANK	BALLAST WATER	PORT	116 - 136	289	284	2.61	86.1	2500	W 2500
1.6	BALLAST WATER TANK	BALLAST WATER	STBD	96 - 116	242	237	2.97	72.0	2500	W 2500
1.7	BALLAST WATER TANK	BALLAST WATER	PORT	96 - 116	299	293	2.55	72.3	2500	W 2500
1.8	BALLAST WATER TANK	BALLAST WATER	STBD	76 - 96	251	246	2.89	58.1	2500	W 2500
1.9	BALLAST WATER TANK	BALLAST WATER	PORT	76 - 96	299	293	2.55	58.3	2500	W 2500
1.10	BALLAST WATER TANK	BALLAST WATER	STBD	56 - 76	265	260	3.84	45.9	2500	W 2500
1.11	BALLAST WATER TANK	BALLAST WATER	PORT	56 - 76	301	295	3.47	46.0	2500	W 2500
1.12	BALLAST WATER TANK	BALLAST WATER	STBD	39 - 61	219	214	3.94	34.3	2500	W 2500
1.13	BALLAST WATER TANK	BALLAST WATER	PORT	39 - 61	248	243	3.57	34.7	2500	W 2500
1.14	BALLAST WATER TANK	BALLAST WATER	CENTRE LINE	1 - 11	85	82	7.44	4.1	5650	W 5650
2.1	DRINKING WATER TANK	DRINKING WATER	CENTRE LINE	-4 - 7	95.7	93.8	12.37	0.7	500	W 2500
2.2	CONDENSATE TANK	FRESH WATER	STBD	4 - 10	34.5	33.8	9.88	4.3	3500	W 3500
2.3	TECHNICAL FRESH WATER TANK	TECHNICAL FRESH WATER	PORT	35 - 49	105.3	103.2	0.85	28.8	10220	W 10220
2.4	TECHNICAL FRESH WATER TANK	TECHNICAL FRESH WATER	STBD	35 - 49	71.7	70.3	0.90	29.0	10220	W 10220
2.5	AFTERPEAK	TECHNICAL FRESH WATER	CENTRE LINE	6 - 11	12.2	12.0	3.07	5.6	9150	W 9150
3.1	COOLING WATER TANK	COOLING WATER	PORT	27 - 31	5.5	5.4	1.18	18.9	12335	W 12335
3.2	COOLING WATER TANK	COOLING WATER	CENTRE LINE	10 - 11	1.5	1.5	2.90	6.3	10700	W 10700
4.1	H.F.O. DAILY SUPPLY TANK	HEAVY FUEL OIL	STBD	30 - 34	12.0	11.8	9.10	21.3	500	W 2500
4.2	H.F.O. SETTLING TANK	HEAVY FUEL OIL	STBD	30 - 35	31.1	30.5	7.38	22.0	-50	W 2500
4.3	H.F.O. SETTLING TANK	HEAVY FUEL OIL	PORT	30 - 35	48.5	47.5	7.73	21.7	-50	W 2500
4.4	H.F.O. STORAGE TANK	HEAVY FUEL OIL	STBD	30 - 35	110.3	108.1	5.86	21.7	-50	W 2500
4.5	H.F.O. STORAGE TANK	HEAVY FUEL OIL	PORT	30 - 35	130.4	128.0	5.47	21.7	-50	W 2500
4.6	H.F.O. OVERFLOW TANK	HEAVY FUEL OIL	CENTRE LINE	31 - 35	51.4	50.4	1.46	22.0	11400	W 11400
5.1	M.D.O. STORAGE TANK	MARINE DIESEL FUEL OIL	CENTRE LINE	30 - 35	78.5	77.0	7.86	21.8	-50	W 2500
5.3	M.D.O. STORAGE TANK	MARINE DIESEL FUEL OIL	STBD	12 - 17	16.8	16.5	6.66	9..	1000	W 2500
5.4	M.D.O. DAILY SUPPLY TANK	MARINE DIESEL FUEL OIL	PORT	4 - 10	5.5	5.4	9.80	4.2	1000	W 2500
5.5	M.D.O. SETTLING TANK	MARINE DIESEL FUEL OIL	PORT	4 - 10	23.4	22.9	9.92	4.4	-50	W 2500
6.1	CYLINDER OIL TANK	CYLINDER OIL	STBD	12 - 17	9.5	9.3	6.43	9.1	2800	W 2800
6.2	LUBRICATING OIL TANK	LUBE OIL	PORT	12 - 17	12.4	12.2	6.60	8.9	2800	W 2800
6.3	LUBR. O.T. AUX.ENG.DIESEL	LUBE OIL	PORT	14 - 17	2.8	2.7	5.83	9.8	4000	W 4000
6.4	LUBRICATING OIL CIRCUL. TANK	LUBE OIL	CENTRE LINE	18 - 27	6.6	6.5	1.36	14.3	9230	W 10000
6.5	HYDRAULIC OIL DRAIN TANK	HYDRAULIC OIL	CENTRE LINE	159 -162	4.5	4.4	11.50	111.1	2500	W 2500
6.6	USED OIL TANK	USED OIL	STBD	19 - 22	6.3	6.2	4.59	13.4	9150	W 9150
6.7	SEPARATED OIL TANK	LUBE OIL	STBD	12 - 17	5.8	5.6	6.43	9.1	2800	W 2800
6.8	SLUDGE OIL TANK	OIL RESIDUE	PORT	20 - 27	16.7	16.3	4.56	15.6	9150	W 9150
6.9	LEAKAGE OIL TANK	LEAKING OIL	CENTRE LINE	28 - 30	1.9	1.9	1.18	19.2	12630	W 12630
6.10	THERMICAL OIL TANK	THERMICAL OIL	STBD	24 - 27	8.4	8.3	4.55	16.8	9150	W 9150
6.11	THERMICAL OIL TANK	THERMICAL OIL	STBD	22 - 24	3.8	3.7	4.59	15.1	9150	W 9150
6.12	BILGE WATER TANK	BILGE WATER	STBD	27 - 31	8.1	7.9	1.22	19.2	12335	W 12335
6.13	BILGE WATER SETTLING TANK	BILGE WATER	PORT	12 - 17	16.8	16.5	6.66	9.3	6800	W 6800
7.1	SLOP TANK	WATER/OIL RESIDUE	PORT	35 - 39	140	137	6.49	24.8	——	W 2500
7.2	SLOP TANK	WATER/OIL RESIDUE	STBD	35 - 39	189	185	6.42	24.8	——	W 2500
2P / 2S	EMPTY COMPARTMENT	——	PORT /STBD	129 -136	53 / 53	52 / 52	6.14	91.7	——	W 2500
4P / 4S	EMPTY COMPARTMENT	——	PORT /STBD	109 -116	53 / 53	52 / 52	6.14	77.7	——	W 2500
6P / 6S	EMPTY COMPARTMENT	——	PORT /STBD	89 - 96	53 / 53	52 / 52	6.14	63.7	——	W 2500

2.1
7

TKM1 (Pagenr.)
TKM5(2 (Hahn)
FAL(TA)
TKA (Rerwh)
TKA (Ruhr) abgestimmt
TCM22x TRS4 Nr.1 und 4 44,42
TW54 FLU 2-3x FLU1, FAL(TR)TM)
FAL, FLU, TPD, LOS(Michael)
(W) (3x) 2A-H12x 2A6-10x 2A9-7x

															Auftr. Nr.	123-126		Schiff:	COT 12,5

The Society of Maritime Arbitrators, Inc.

U.S. OPEN FORM SALVAGE AGREEMENT

Codename -- MARSALV®

This **SALVAGE AGREEMENT** ("The Agreement"), between _____, Master and/or Owner and/or Underwriter of the vessel _____ ("The Vessel") and _____("The Salvor"), is for salvage services rendered or to be rendered to the Vessel, her cargo and other property currently lying at or near _____, under the following terms and conditions:

FIRST: The Salvor shall use his best endeavors to salve the Vessel, her cargo and other property and deliver same safely afloat, hauled or drydocked at or near _____, at which place and time the Salvor's services will terminate unless otherwise mutually agreed.

SECOND: The Master and crew of the Vessel agree to lend their aid and assistance to the Salvor, who shall be entitled, free of expense, to the reasonable use of the Vessel's equipment.

THIRD: The Salvor's services are to be performed on the following basis (check and initial):

[_] **No Cure-No Pay** (Compensation to be conditioned upon successful salvage of the Vessel and/or her cargo and/or other property. In such case, the Salvor's compensation shall be pursuant to the criteria and other provisions of Article 13 of the 1989 International Convention on Salvage shown on the reverse of this Agreement).

[_] **No Cure-No Pay, Fixed Fee $_____**

[_] **Per Diem/Hourly at $_____ per day/hour pro rata**

[_] **Other** _____

_____

FOURTH: Notwithstanding the election(s) made in Paragraph THIRD, the Salvor shall in any event be entitled to compensation for actions he takes to prevent or minimize damage to the environment, pursuant to Articles 13 and 14 of the 1989 International Convention on Salvage shown on the reverse of this Agreement.

FIFTH: The Salvor shall have a lien upon the Vessel, her cargo and other property for services rendered pursuant to Paragraphs THIRD and FOURTH, and his statement for services rendered shall be submitted as promptly as possible after completion or termination of such services. In lieu of arrest or attachment of the Vessel the Salvor may demand reasonable security for such services from the Vessel and cargo interests as a condition for releasing same.

SIXTH: This Agreement shall be governed by and construed in accordance with the Federal Maritime Law of the United States. Any dispute arising out of this Agreement shall be referred to arbitration in the United States in accordance with the applicable Arbitration Rules of the Society of Maritime Arbitrators, Inc. The Arbitrator(s) shall be familiar with maritime salvage. Any award made hereunder may include interest, attorney's fees and costs, and shall be final and binding. For the purpose of enforcement the Award may be entered for judgment in any court of competent jurisdiction.

Dated this ____ day of _____, 20___

For: **SALVOR**	For: **VESSEL, CARGO and/or PROPERTY**
_____	_____
(authorized signature)	(authorized signature)
_____	_____
(print name and title)	(print name and title)

White: Salvor; Yellow: Master/Owner; Pink: Underwriter

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INTERNATIONAL CONVENTION ON SALVAGE, 1989

Article 13

Criteria for Fixing the Reward

1. The reward shall be fixed with a view to encouraging salvage operations, taking into account the following criteria without regard to the order in which they are presented below:

(a) the salved value of the vessel and other property;
(b) the skill and efforts of the salvors in preventing or minimizing damage to the environment;
(c) the measure of success obtained by the salvor;
(d) the nature and degree of the danger
(e) the skill and efforts of the salvors in salving the vessel, other property and life;
(f) the time used and expenses and losses incurred by the salvors;
(g) the risk of liability and other risks run by the salvors or their equipment;
(h) the promptness of the services rendered;
(i) the availability and use of vessels or other equipment intended for salvage operations;
(j) the state of readiness and efficiency of the salvor's equipment and the value thereof.

2. Payment of a reward fixed according to paragraph 1 shall be made by all of the vessel and other property interests in proportion to their respective salved values. However, a State Party may in its national law provide that the payment of a reward has to be made by one of these interests, subject to a right of recourse of this interest against the other interests for their respective shares. Nothing in this article shall prevent any right of defence.

3. The rewards, exclusive of any interest and recoverable legal costs that may be payable thereon, shall not exceed the salved value of the vessel and other property.

Article 14

Special Compensation

1. If the salvor has carried out salvage operations in respect of a vessel which by itself or its cargo threatened damage to the environment and has failed to earn a reward under article 13 at least equivalent to the special compensation assessable in accordance with this article, he shall be entitled to special compensation from the owner of that vessel equivalent to his expenses as herein defined.

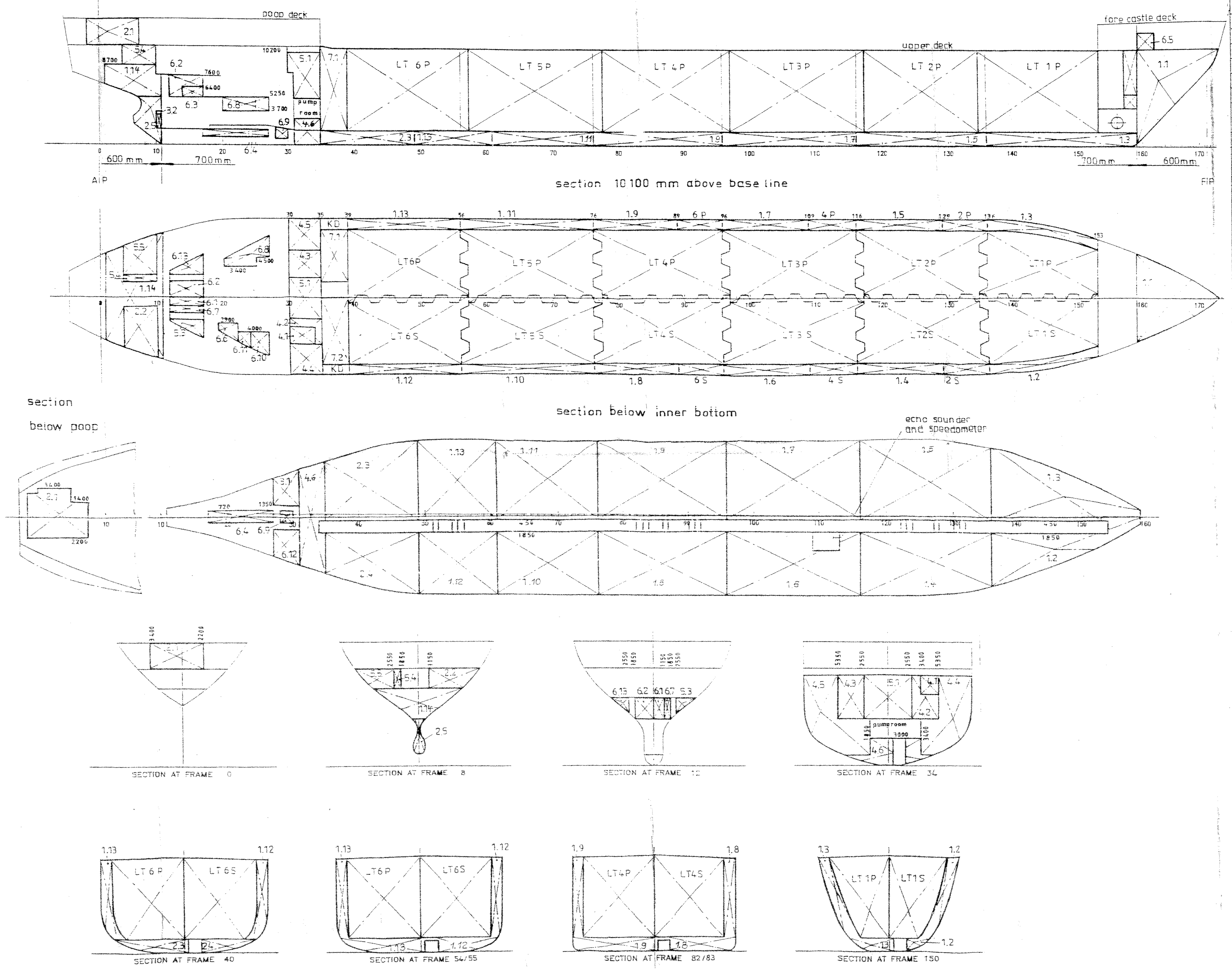
2. If, in the circumstances set out in paragraph 1, the salvor by his salvage operations has prevented or minimized damage to the environment, the special compensation payable by the owner to the salvor under paragraph 1 may be increased up to a maximum of 30% of the expenses incurred by the salvor. However, the tribunal, if it deems it fair and just to do so and bearing in mind the relevant criteria set out in article 13, paragraph 1, may increase such special compensation further, but in no event shall the total increase be more than 100% of the expenses incurred by the salvor.

3. Salvor's expenses for the purpose of paragraphs 1 and 2 means the out-of-pocket expenses reasonably incurred by the salvor in the salvage operation and a fair rate for equipment and personnel actually and reasonably used in the salvage operation, taking into consideration the criteria set out in article 13, paragraph 1(h), (i) and (j).

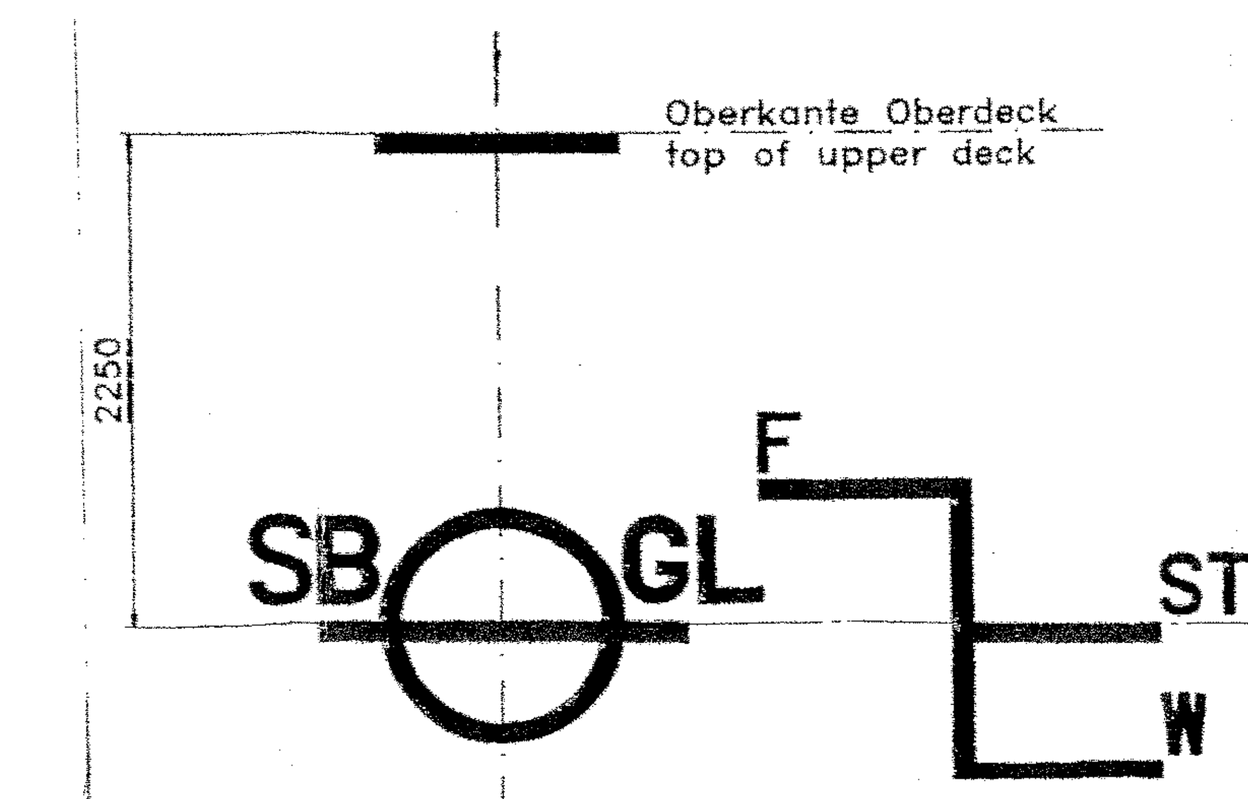
4. The total special compensation under this article shall be paid only if and to the extent that such compensation is greater than any reward recoverable by the salvor under article 13.

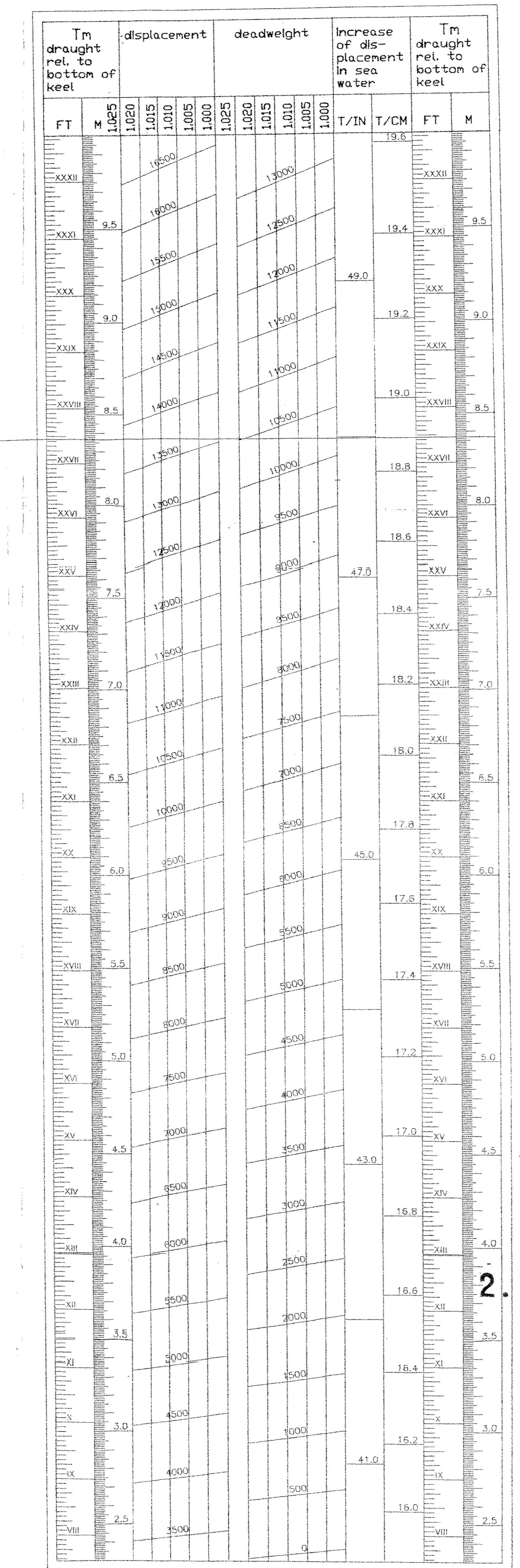
5. If the salvor has been negligent and has thereby failed to prevent or minimize damage to the environment, he may be deprived of the whole or part of any special compensation due under this article.

6. Nothing in this article shall affect any right of recourse on the part of the owner of the vessel.



TANK NO.	DESIGNATION	MEDIUM	POSITION	RANGE OF FRAME	GROSS VOLUME M^3	NET VOLUME M^3	CENTRE OF GRAVITY ABOVE BASE LINE M	LONGITUDINAL CENTRE OF GRAVITY M
LT1P/LT1S	CARGO OIL TANK 1P/1S	CHEMICAL OIL	PORT/STBD	136 - 153	698 / 698	693 / 693	6.42	99.2
LT2P/LT2S	CARGO OIL TANK 2P/2S	CHEMICAL OIL	PORT/STBD	116 - 136	921 / 921	914 / 914	6.18	87.1
LT3P/LT3S	CARGO OIL TANK 3P/3S	CHEMICAL OIL	PORT/STBD	96 - 116	988 / 988	980 / 980	6.17	73.6
LT4P/LT4S	CARGO OIL TANK 4P/4S	CHEMICAL OIL	PORT/STBD	76 - 96	988 / 988	980 / 980	6.17	59.6
LT5P/LT5S	CARGO OIL TANK 5P/5S	CHEMICAL OIL	PORT/STBD	56 - 76	988 / 988	980 / 980	6.17	45.6
LT6P/LT6S	CARGO OIL TANK 6P/6S	CHEMICAL OIL	PORT/STBD	39 - 56	867 / 867	860 / 860	6.19	32.4
1.1	FOREPEAK	BALLAST WATER	CENTRE LINE	159 - 174	193	184	8.08	112.6
1.2	BALLAST WATER TANK	BALLAST WATER	STBD	136 - 159	197	193	4.51	99.9
1.3	BALLAST WATER TANK	BALLAST WATER	PORT	136 - 159	240	235	3.84	100.0
1.4	BALLAST WATER TANK	BALLAST WATER	STBD	116 - 136	241	236	2.98	85.9
1.5	BALLAST WATER TANK	BALLAST WATER	PORT	116 - 136	289	284	2.61	86.1
1.6	BALLAST WATER TANK	BALLAST WATER	STBD	96 - 116	242	237	2.97	72.0
1.7	BALLAST WATER TANK	BALLAST WATER	PORT	96 - 116	299	293	2.55	72.3
1.8	BALLAST WATER TANK	BALLAST WATER	STBD	76 - 96	251	246	2.89	58.1
1.9	BALLAST WATER TANK	BALLAST WATER	PORT	76 - 96	299	293	2.55	58.3
1.10	BALLAST WATER TANK	BALLAST WATER	STBD	56 - 76	265	260	3.84	45.9
1.11	BALLAST WATER TANK	BALLAST WATER	PORT	56 - 76	301	295	3.47	46.0
1.12	BALLAST WATER TANK	BALLAST WATER	STBD	39 - 61	219	214	3.94	34.3
1.13	BALLAST WATER TANK	BALLAST WATER	PORT	39 - 61	248	243	3.57	34.7
1.14	BALLAST WATER TANK	BALLAST WATER	CENTRE LINE	1 - 11	85	82	7.44	4.1
2.1	DRINKING WATER TANK	DRINKING WATER	CENTRE LINE	-4 - 7	95.7	93.8	12.37	[illegible]
2.2	CONDENSATE TANK	FRESH WATER	STBD	4 - 10	34.5	33.8	9.88	4.1
2.3	TECHNICAL FRESH WATER TANK	TECHNICAL FRESH WATER	PORT	35 - 49	105.3	103.2	0.85	28.8
2.4	TECHNICAL FRESH WATER TANK	TECHNICAL FRESH WATER	STBD	35 - 49	71.7	70.3	0.90	29.0
2.5	AFTERPEAK	TECHNICAL FRESH WATER	CENTRE LINE	6 - 11	12.2	12.0	3.07	5.6
3.1	COOLING WATER TANK	COOLING WATER	PORT	27 - 31	5.5	5.4	1.18	18.9
3.2	COOLING WATER TANK	COOLING WATER	CENTRE LINE	10 - 11	1.5	1.5	2.90	6.3
4.1	H.F.O. DAILY SUPPLY TANK	HEAVY FUEL OIL	STBD	30 - 34	12.0	11.8	9.10	21.3
4.2	H.F.O. SETTLING TANK	HEAVY FUEL OIL	STBD	30 - 35	31.1	30.5	7.38	22.0
4.3	H.F.O. SETTLING TANK	HEAVY FUEL OIL	PORT	30 - 35	48.5	47.5	7.73	21.7
4.4	H.F.O. STORAGE TANK	HEAVY FUEL OIL	STBD	30 - 35	110.3	108.1	5.86	21.7
4.5	H.F.O. STORAGE TANK	HEAVY FUEL OIL	PORT	30 - 35	130.4	128.0	5.47	21.7
4.6	H.F.O. OVERFLOW TANK	HEAVY FUEL OIL	CENTRE LINE	31 - 35	51.4	50.4	1.46	22.0
5.1	M.D.O. STORAGE TANK	MARINE DIESEL FUEL OIL	CENTRE LINE	30 - 35	78.5	77.0	7.86	21.8
5.3	M.D.O. STORAGE TANK	MARINE DIESEL FUEL OIL	STBD	12 - 17	16.8	16.5	6.66	9.3
5.4	M.D.O. DAILY SUPPLY TANK	MARINE DIESEL FUEL OIL	PORT	4 - 10	5.5	5.4	9.80	4.2
5.5	M.D.O. SETTLING TANK	MARINE DIESEL FUEL OIL	PORT	4 - 10	23.4	22.9	9.92	4.4
6.1	CYLINDER OIL TANK	CYLINDER OIL	STBD	12 - 17	9.5	9.3	6.43	9.1
6.2	LUBRICATING OIL TANK	LUBE OIL	PORT	12 - 17	12.4	12.2	6.60	8.9
6.3	LUBR. O.T. AUX.ENG.DIESEL	LUBE OIL	PORT	14 - 17	2.8	2.7	5.83	9.6
6.4	LUBRICATING OIL CIRCUL. TANK	LUBE OIL	CENTRE LINE	18 - 27	6.6	6.5	1.36	14.3
6.5	HYDRAULIC OIL DRAIN TANK	HYDRAULIC OIL	CENTRE LINE	159 - 162	4.5	4.4	11.50	111.1
6.6	USED OIL TANK	USED OIL	STBD	19 - 22	6.3	6.2	4.59	13.4
6.7	SEPARATED OIL TANK	LUBE OIL	STBD	12 - 17	5.8	5.6	6.43	9.1
6.8	SLUDGE OIL TANK	OIL RESIDUE	PORT	20 - 27	16.7	16.3	4.56	15.6
6.9	LEAKAGE OIL TANK	LEAKING OIL	CENTRE LINE	28 - 30	1.9	1.9	1.18	19.2
6.10	THERMICAL OIL TANK	THERMICAL OIL	STBD	24 - 27	8.4	8.3	4.55	16.8
6.11	THERMICAL OIL TANK	THERMICAL OIL	STBD	22 - 24	3.8	3.7	4.59	15.1
6.12	BILGE WATER TANK	BILGE WATER	STBD	27 - 31	8.1	7.9	1.22	19.2
6.13	BILGE WATER SETTLING TANK	BILGE WATER	PORT	12 - 17	16.8	16.5	6.66	9.3
7.1	SLOP TANK	WATER/OIL RESIDUE	PORT	35 - 39	140	137	6.49	24.8
7.2	SLOP TANK	WATER/OIL RESIDUE	STBD	35 - 39	189	185	6.42	24.8
2P / 2S	EMPTY COMPARTMENT	—	PORT /STBD	129 - 136	53 / 53	52 / 52	6.14	91.7
4P / 4S	EMPTY COMPARTMENT	—	PORT /STBD	109 - 116	53 / 53	52 / 52	6.14	77.7
6P / 6S	EMPTY COMPARTMENT	—	PORT /STBD	89 - 96	53 / 53	52 / 52	6.14	63.7





Loading informations

To comply with the requirements of damage stability, vessel's cargo has depending on cargo's density, to be distributed as mentioned hereinafter:

Transportation of clean oil products and lightweight chemicals of category C:

–Cargo density from 0.63 t/m^3 to 0.932 t/m^3
The cargo has to be homogenly distributed over the central tanks port and starboard.

–Cargo density from 0.932 t/m^3 to 1.55 t/m^3
The cargo to be equally distributed to all central tanks.

To ensure damaged stability, ballast water in double bottom tanks is required (see damage stability).

In correspondence with the material list the dimensions of members of tank bulkheads are designed for :
–in case of central and slop tanks
density 1.31 to 1.55 t/m^3 ; pv = 0 bar (without gas pressure)
density 0.63 to 1.30 t/m^3 ; pv = 0.2 bar

In connection with this :
Transverse tank bulkheads areable to resist loading to on side and the centre longitudinal tank bulkhead to both sides only.

More cargo informations see "TRIM AND STABILITY CALCULATION" drawing No. 996.25.06 .

main engine

1 slow–speed two–stroke marine Diesel engine ,type 6 L 35 Mc ,
M A N B & W Alpha Diesel A/S ,3600 kW ,210 rpm

auxiliary Diesel engine set

3 marine sets ,type TBD 604 BV 8 ,
Rolf Janssen GmbH ,580 kW ,1200 rpm

emergency Diesel engine set

1 emergency diesel engine set ,type F 6 L 413 FR ,
Rolf Janssen GmbH ,95 kW ,1800 rpm

PTO

1 PTO ,type SFL 75 Inst 12 ,
The Newbrook engineering Co Ltd. ,515 kW

ballast pump

2 ballast pumps ,300 m^3/h ,3 bar

controlable pitch propeller

D=3,1 m z=4 m=4,6 t

bow thruster

fixed–pitch propeller with hydraulic propulsion ,410 kW

rudder and steering engine

1 semi–balanced underhung rudder area 16 m^2
1 elektr.–hydr.standard cylinder steering engine max. moment 254 kNm

anchor gear

2 bow anchors 3,54 t stud link anchor chain: diam. 46 mm
length of chains :stb 275,0 m portside 247,5 m
1 stern anchor 1.29 t hawser: diam. 34 mm
length of hawsers: 150,0 m

rescue equipment

1 free fall lifeboat in tankers condition 19 persons with slip way
2 life rafts 20 persons each
1 accident boat 6 persons

nautical instruments

gyro compass ,Anschuetz–Kiel
magnetic compass ,Cassen and Plath
hand control and autopilot steering system ,Anschuetz–Kiel
echo sounder ,Furunow–Japan
log ,Ben–France
2 radar unit ,Racal Deccar
wireless direction finder ,Debeg–Hamburg
receiver for nautical notices "Navtex"
satellite navigator (GPS) ,deccar navigator

TONNAGE

	gross	net
international measurement 1969	6262	3154
panama	6501.79 RT	4782.68 RT
suez	6494.14 RT	5177.34 RT

CLASS

Germanischer Lloyd

✠ 100 A5 E3 Chemical Tanker Type 2/Oil Tanker

✠ MC AUT E3 INERT

M A I N P A R T I C U L A R S

length overall	123.72 m
length between perpendiculars	117.60 m
breadth moulded	17,70 m
summer freeboard draugth rel.to top of keel	8,36 m
depth moulded to main deck	10,60 m
displacement at draught Tm=8.36m (top of keel)	13863 t
deadweight T_m=8.36m (top of keel)	10511 t (trim=0m)
speed at draugth T_m=8.36m (top of keel)	12,5 knots
operating range	6000 nautical miles

2.1
2

Auftrag-Nr.	123 – 126
Schiffsname	COT
Maszstab	1:125
1991 Entworfen	5.11.
Benennung	capacity plan
Tel.-Nr.	2352
Abt.	TPB-3
Zeichnungs-Nr.	996.25.04
Bl.-Zahl	1
Bl.-Nr.	1

Appendix 7
Spill Kit Inventory
M/T *Dara Desgagnés*

Item	Size	Min Quantity	Quantity Onboard	Location Onboard
Portable Pumps and hoses	Sets	2	4	1 Main Deck 1 Dog House 1 Pump Room 1 Spare
Absorbent pads	Bales	5	10	5 in chemical locker 5 distributed between spill kits and stbd rop locker
Absorbent – particulate	Bales	5	30+	Boat Deck Local spill kits
Hand scoops, buckets and shovels	Each	3	3+	
Waste container	55 gal drum	2	3	2 at aft end gangway 1 in chemical locker
Emulsifiers	1 gal	5	5	White box at crane
Tyvec coveralls	Various	12	30	Chemical locker Spill kit drum
Boots, oil resistant	Various	12 pairs	12+	7 in chemical locker drum 5+ in change room
Gloves, oil resistant	Various	12 pairs	12	Chemical locker drum
Rags	Lbs	20	100+	Stbd rope locker

RIGEL SHIPPING CANADA Inc.	SAFETY FORMS Oil Spill Response Equipment Inventory

Ref: SMPEP Section 5.1 ONBOARD RESPONSE CAPABILITIES

Vessel: **Dara Desgagnes** Date Posted: October 31 2012

Item	Size	Min Quantity	Quantity Onboard	Location Onboard
Portable Pumps and hoses	Sets	2	4	1 main deck, 1 dog house, 1 pump room, 1 spare
Absorbent pads	Bales	5	10	5 in chemical locker, 5 distributed between spill kits and stbd rope locker
Absorbent – particulate	Bales	5	30+	boat deck, local spill kits
Hand scoops, buckets and shovels	Each	3	3+	
Waste container	55 gal drum	2	3	2 at aft end gangway, 1 in chemical locker
Emulsifiers	1 gal	5	5	white box at crane
Tyvec coveralls	Various	12	30	chemical locker spill kit drum
Boots, oil resistant	Various	12 pr	12+	7 pair in chemical locker drum, 5+ in change room
Gloves, oil resistant	Various	12 pr	12	in chemical locker drum
Rags	Lbs	20	100+	stbd rope locker

Appendix 8

Foam and water extinguishing lines on cargo deck

- See drawing #996.51.35

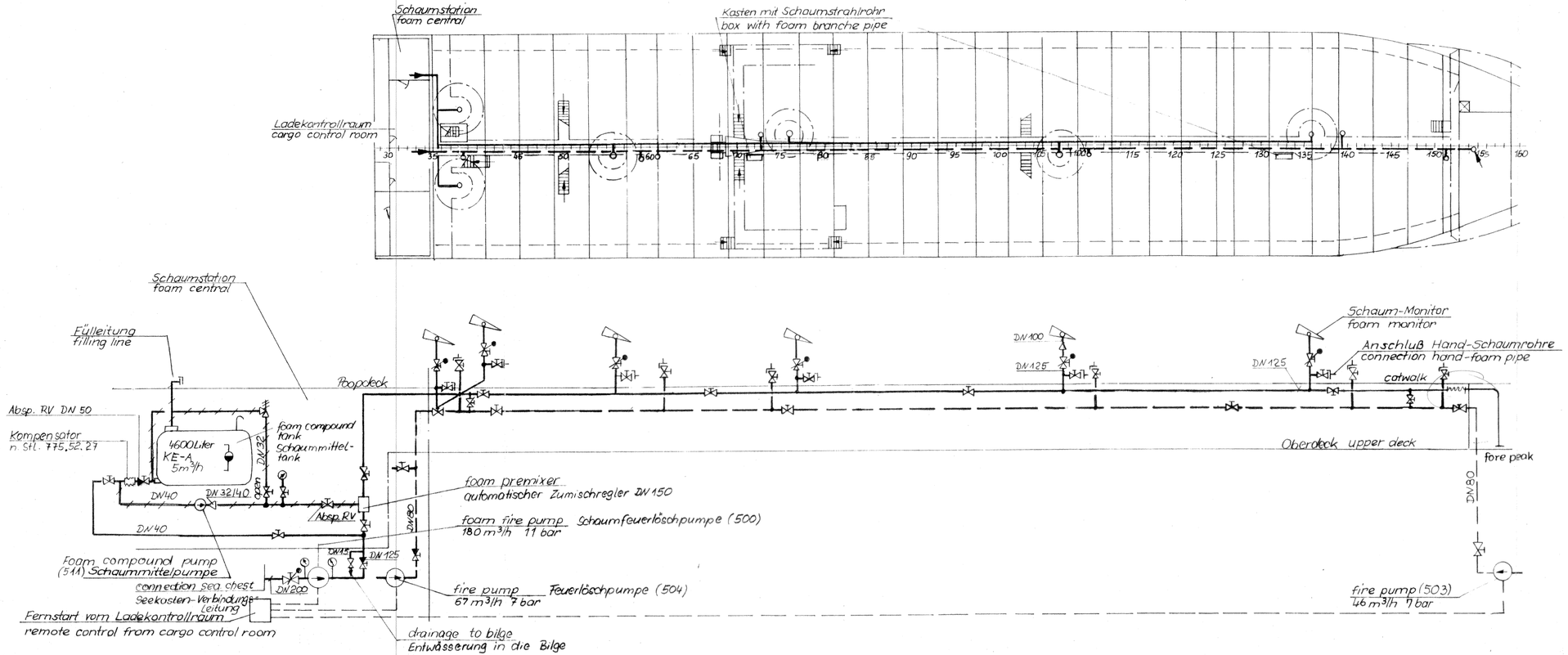
Procedures for Oil Spill Air Pump

- Procedure to pump out Driptrays Manifolds:

  1. Connect suction hose from air driven 1" pump to connections A, B, C and D as desired.
  2. Connect discharge hose of air driven 1" pump to either the port dropline E or STBD dropline F on deck. This will usually be the Port dropline E.
  3. Open valves as needed and pump contents to the connected sloptank (E or F).
  4. Close valves and continue with other drip trays using above procedure.
  5. When completed drain/purge hoses to slop tank and disconnect.

- Procedure to pump liquid from the Deck:

  1. Connect suction hoses to Y-section of air driven 2" pump.
  2. Connect port side hose with valve G and STBD side hose with valve H to Y-section.
  3. Connect discharge hose of air driven 2" pump to either the Port dropline E or STBD dropline F on deck. This will usually be the Port dropline E.
  4. Open valves as needed and pump liquids to the connected sloptank (E or F).
  5. When finished pumping liquids drain/purge hoses and close valves and disconnect.



Änd. Buch	Änd. Mitteilg. Nr.	Tag	Name

COT-12,5 123-126

1992	Tag	Name
Entw.	10.10.	B. Weber
Gez.	13.10.	Brücker
Gepr.	13.10.	Walter
St.-gep.		
ges.	13.10.	i.A. [illegible]

Benennung: Prinzipschema Schaum-u. Wasser feuerlösch Ladetank

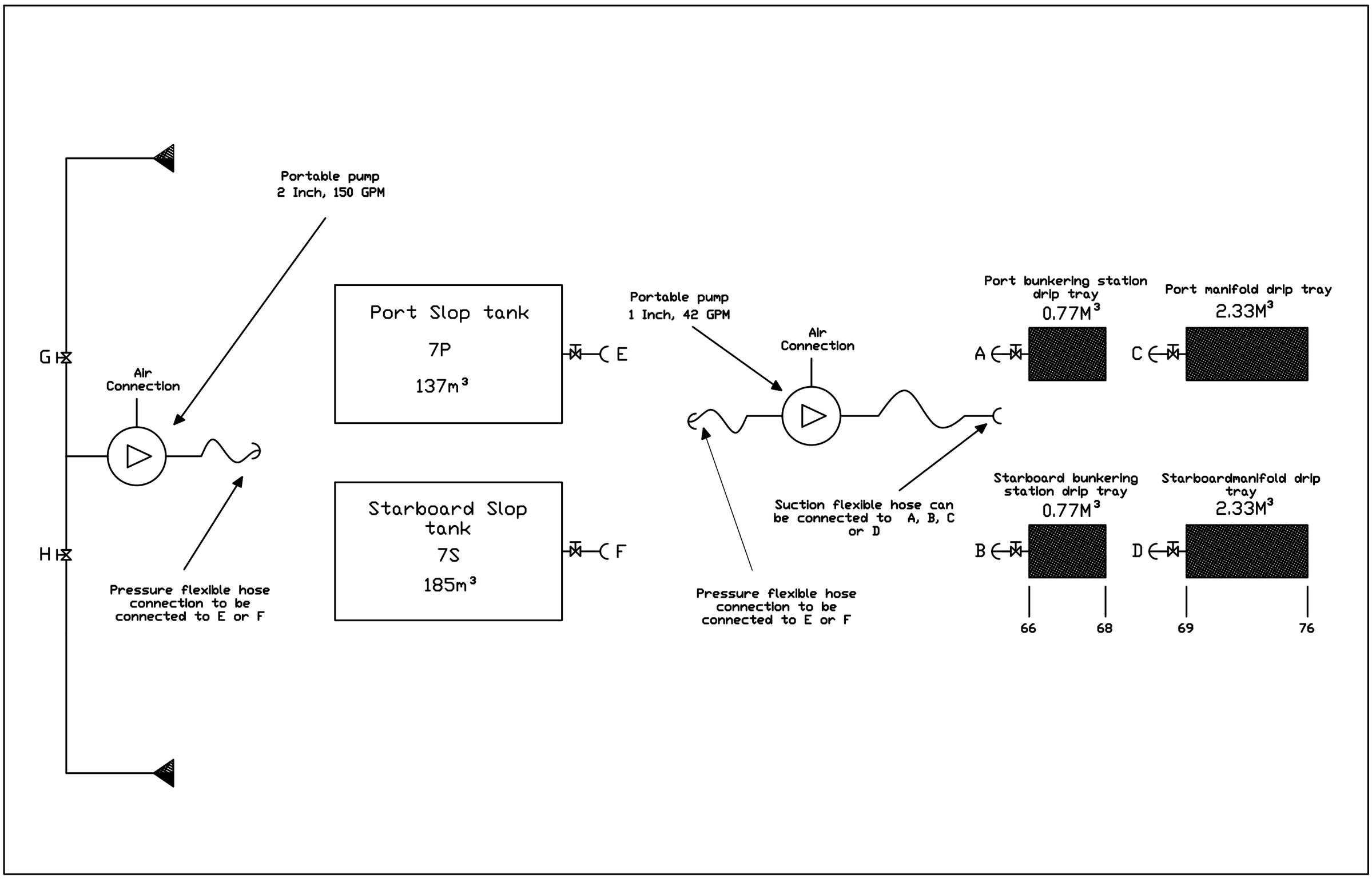
block diagram foam- and water-extinguishing cargo deck

MTW Schiffswerft GmbH

Abt. TKM-2

Tel. 2499

Zeichng-Nr. 996.51.35


Portable pump
2 Inch, 150 GPM
G
Air
Connection
H
Pressure flexible hose
connection to be
connected to E or F
Port Slop tank
7P
137m³
E
Starboard Slop
tank
7S
185m³
F
Portable pump
1 Inch, 42 GPM
Air
Connection
Suction flexible hose can
be connected to A, B, C
or D
Pressure flexible hose
connection to be
connected to E or F
Port bunkering station
drip tray
0.77M³
A
Port manifold drip tray
2.33M³
C
Starboard bunkering
station drip tray
0.77M³
B
Starboardmanifold drip
tray
2.33M³
D
66
68
69
76

APPENDIX B - Transfer Conduit Annual Pressure Test

ONTARIO HOSE & COUPLINGS LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Quebec	Maritimes
6295 Kestrel Road Mississauga, Ontario L5T 1Z4	480 Polymoor Drive Corunna, Ontario N0N 1G0	263 Barton Street Stoney Creek, Ontario L8E 2K4	639 Justus Drive Kingston, Ontario K7M 4H5	1900 Hymus Blvd Dorval, Quebec H9P 1J7	10 Akerley Blvd U#25 Dartmouth, Nova Scotia B3B 1J4
Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-8214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	SBQ	Size:	4"
Number:	PNV00034	Length:	400FT
Part Number:		HAWP (PSI):	200
Order:	Q51378	Temperature Range:	
PO:	11942	Rating:	4/5 ☆☆☆☆☆
Unit Number:	32019-07	This is in excellent condition and is ok to be in service	
Location:	Jana	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover
Cam Arm Damaged			

Repairs conducted by: sbq
Printed: Monday, June 18, 2018
To view as PDF click here

This report was created by HoseTracker.
Please refer to all instruction manuals, technical drawings and documents before using the above equipment.
All products have been tested and inspected in accordance with the appropriate ANSI stanad.

ONTARIO HOSE & COUPLINGS LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Quebec	Maritimes
6295 Kestrel Road Mississauga, Ontario L5T 1Z4	480 Polymoor Drive Corunna, Ontario N0N 1G0	263 Barton Street Stoney Creek, Ontario L8E 2K4	639 Justus Drive Kingston, Ontario K7M 4H5	1900 Hymus Blvd Dorval, Quebec H9P 1J7	10 Akerley Blvd U#25 Dartmouth, Nova Scotia B3B 1J4
Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-8214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	SBQ	Size:	4"
Number:	PNV00055	Length:	400'
Part Number:		HAWP (PSI):	200
Order:	108223	Temperature Range:	
PO:	11939	Rating:	4/5 ☆☆☆☆☆
Unit Number:	26025-03	This is in excellent condition and is ok to be in service	
Location:	marla small	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover
Cam Arm Damaged			

Repairs conducted by: sbq
Printed: Monday, June 18, 2018
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ONTARIO HOSE & COUPLINGS LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Quebec	Maritimes
6295 Kestrel Road Mississauga, Ontario L5T 1Z4	480 Polymoor Drive Corunna, Ontario N0N 1G0	263 Barton Street Stoney Creek, Ontario L8E 2K4	639 Justus Drive Kingston, Ontario K7M 4H5	1900 Hymus Blvd Dorval, Quebec H9P 1J7	10 Akerley Blvd U#25 Dartmouth, Nova Scotia B3B 1J4
Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-8214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(AL)MxF (Aluminum Male x Female Camlock)
Hose Type:	Goodyear	Size:	4"
Hose Number:	PNV00132	Length:	390'
Part Number:		HAWP (PSI):	200
Order:		Temperature Range:	
PO:	12995	Rating:	3/5 ☆☆☆☆☆
Unit Number:	2012	This Hose is acceptable for use in service	
Location:	Jana Small	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover
		Tube Leaked	

Repairs conducted by: sbq
Printed: Monday, June 18, 2018
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All products have been tested and inspected in accordance with the appropriate ANSI stanad.

ONTARIO HOSE & COUPLINGS LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Quebec	Maritimes
6295 Kestrel Road Mississauga, Ontario L5T 1Z4	480 Polymoor Drive Corunna, Ontario N0N 1G0	263 Barton Street Stoney Creek, Ontario L8E 2K4	639 Justus Drive Kingston, Ontario K7M 4H5	1900 Hymus Blvd Dorval, Quebec H9P 1J7	10 Akerley Blvd U#25 Dartmouth, Nova Scotia B3B 1J4
Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-8214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	floater hose	Size:	4
Number:	PNV00170	Length:	400'
Part Number:	GOODYEAR FITTINGS	HAWP (PSI):	200
Order:		Temperature Range:	
PO:	2014	Rating:	4/5 ☆☆☆☆☆
Unit Number:		This is in excellent condition and is ok to be in service	
Location:	marla	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover
			Damaged

Repairs conducted by: sbq
Printed: Monday, June 18, 2018
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ONTARIO HOSE & COUPLINGS LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Quebec	Maritimes
6295 Kestrel Road Mississauga, Ontario L5T 1Z4	480 Polymoor Drive Corunna, Ontario N0N 1G0	263 Barton Street Stoney Creek, Ontario L8E 2K4	639 Justus Drive Kingston, Ontario K7M 4H5	1900 Hymus Blvd Dorval, Quebec H9P 1J7	10 Akerley Blvd U#25 Dartmouth, Nova Scotia B3B 1J4
Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-8214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	floater hose	Size:	4
Number:	PNV00171	Length:	400'
Part Number:	GOODYEAR FITTINGS	HAWP (PSI):	200
Order:		Temperature Range:	
PO:	2014	Rating:	4/5 ☆☆☆☆☆
Unit Number:		This is in excellent condition and is ok to be in service	
Location:	marla	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover
Cam Arm Damaged			

Repairs conducted by: sbq
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www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	floater hose	Size:	4
Number:	PNV00174	Length:	400'
Part Number:	GOODYEAR FITTINGS	HAWP (PSI):	200
Order:		Temperature Range:	
PO:		Rating:	4/5 ☆☆☆☆☆
Unit Number:	2014	This is in excellent condition and is ok to be in service	
Location:	Jana	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover
Cam Arm Damaged			

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TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	floater hose	Size:	4
Number:	PNV00175	Length:	400'
Part Number:	GOODYEAR FITTINGS	HAWP (PSI):	200
Order:		Temperature Range:	
PO:		Rating:	4/5 ☆☆☆☆☆
Unit Number:	2014	This is in excellent condition and is ok to be in service	
Location:	Jana	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover
Cam Arm Damaged			

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TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	floater hose	Size:	4
Number:	PNV00177	Length:	400'
Part Number:	GOODYEAR FITTINGS	HAWP (PSI):	200
Order:		Temperature Range:	
PO:		Rating:	4/5 ☆☆☆☆☆
Unit Number:	2014	This is in excellent condition and is ok to be in service	
Location:	Jana	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover

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TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	floater hose	Size:	4
Number:	PNV00177	Length:	400'
Part Number:	GOODYEAR FITTINGS	HAWP (PSI):	200
Order:		Temperature Range:	
PO:		Rating:	4/5 ☆☆☆☆☆
Unit Number:	2014	This is in excellent condition and is ok to be in service	
Location:	Jana	CRN:	N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover

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TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Type:	Goodyear	Size:	4"
Number:	PNV00226	Length:	220'
Part Number:		HAWP (PSI):	200
Order:		Temperature Range:	
PO:		Rating:	4/5 ☆☆☆☆☆
Unit Number:	Cut in half from # 212	This is in excellent condition and is ok to be in service	
Location:	Quebec		N/A
Colour:	Orange		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover

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TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Hose Type:	Floater Hose	Size:	4"
Hose Number:	PNV00230	Length:	400'
Part Number:	Continental Floater Hose	HAWP (PSI):	200
Order:	1139497	Temperature Range:	
PO:	12560	Rating:	5/5 ☆☆☆☆☆
Unit Number:	2016	This is a brand new Hose and is OK to be in service	
Location:	Quebec		N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover

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www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Hose Type:	Floater Hose	Size:	4"
Hose Number:	PNV00230	Length:	400'
Part Number:	Continental Floater Hose	HAWP (PSI):	200
Order:	1139497	Temperature Range:	
PO:	12560	Rating:	5/5 ☆☆☆☆☆
Unit Number:	2016	This is a brand new Hose and is OK to be in service	
Location:	Quebec		N/A
Colour:	-		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	6/18/2018	Hydro-Pressure:	6/18/2019
Static:	6/18/2018	Static:	6/18/2019
Visual:	6/18/2018	Visual:	6/18/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover

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TEST CERTIFICATE

Customer:	Petro-Nav	**Fittings:**	Stainless Steel Male x Female Camlock
Hose Type:	floater hose	**Size:**	4"
Hose Number:	PNV00265	**Length:**	400'
Part Number:	GMFH4X400orangeRT	**HAWP (PSI):**	200
Order:	1173960	**Temperature Range:**	
PO:	12884	**Rating:**	5/5 This is a brand new Hose and is OK to be in service
Unit Number:	Fab:2018	**CRN:**	N/A
Location:	Quebec	**Colour:**	Orange

Last Test Date(s)		Scheduled Retest Date(s)	
Hydro-Pressure:	4/30/2018	**Hydro-Pressure:**	4/30/2019
Static:	4/30/2018	**Static:**	4/30/2019
Visual:	4/30/2018	**Visual:**	4/30/2019

Test PSI: 300 **Length Of Pressure Test:** N/A

No repair reasons listed

Test last conducted by: N/A
Printed: 6/15/2018

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TEST CERTIFICATE

Customer:	Petro-Nav	**Fittings:**	Stainless Steel Male x Female Camlock
Hose Type:	floater hose	**Size:**	4"
Hose Number:	PNV00267	**Length:**	400'
Part Number:	GMFH4X400orangeRT	**HAWP (PSI):**	200
Order:	1173960	**Temperature Range:**	
PO:	12884	**Rating:**	5/5 This is a brand new Hose and is OK to be in service
Unit Number:	Fab:2018	**CRN:**	N/A
Location:	Quebec	**Colour:**	Orange

Last Test Date(s)		Scheduled Retest Date(s)	
Hydro-Pressure:	4/30/2018	**Hydro-Pressure:**	4/30/2019
Static:	4/30/2018	**Static:**	4/30/2019
Visual:	4/30/2018	**Visual:**	4/30/2019

Test PSI: 300 **Length Of Pressure Test:** N/A

No repair reasons listed

Test last conducted by: N/A
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TEST CERTIFICATE

Customer:	Petro-Nav	**Fittings:**	Stainless Steel Male x Female Camlock
Hose Type:	floater hose	**Size:**	4"
Hose Number:	PNV00267	**Length:**	400'
Part Number:	GMFH4X400orangeRT	**HAWP (PSI):**	200
Order:	1173960	**Temperature Range:**	
PO:	12884	**Rating:**	5/5 This is a brand new Hose and is OK to be in service
Unit Number:	Fab:2018	**CRN:**	N/A
Location:	Quebec	**Colour:**	Orange

Last Test Date(s)		Scheduled Retest Date(s)	
Hydro-Pressure:	4/30/2018	**Hydro-Pressure:**	4/30/2019
Static:	4/30/2018	**Static:**	4/30/2019
Visual:	4/30/2018	**Visual:**	4/30/2019

Test PSI: 300 **Length Of Pressure Test:** N/A

No repair reasons listed

Test last conducted by: N/A
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TEST CERTIFICATE

Customer:	Petro-Nav	**Fittings:**	Stainless Steel Male x Female Camlock
Hose Type:	floater hose	**Size:**	4"
Hose Number:	PNV00269	**Length:**	400'
Part Number:	GMFH4X400orangeRT	**HAWP (PSI):**	200
Order:	1173960	**Temperature Range:**	
PO:	12884	**Rating:**	5/5 This is a brand new Hose and is OK to be in service
Unit Number:	Fab:2018	**CRN:**	N/A
Location:	Quebec	**Colour:**	Orange

Last Test Date(s)		Scheduled Retest Date(s)	
Hydro-Pressure:	4/30/2018	**Hydro-Pressure:**	4/30/2019
Static:	4/30/2018	**Static:**	4/30/2019
Visual:	4/30/2018	**Visual:**	4/30/2019

Test PSI: 300 **Length Of Pressure Test:** N/A

No repair reasons listed

Test last conducted by: N/A
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TEST CERTIFICATE

Customer:	Petro-Nav	**Fittings:**	Stainless Steel Male x Female Camlock
Hose Type:	floater hose	**Size:**	4"
Hose Number:	PNV00270	**Length:**	400'
Part Number:	GMFH4X400orangeRT	**HAWP (PSI):**	200
Order:	1173960	**Temperature Range:**	
PO:	12884	**Rating:**	5/5 This is a brand new Hose and is OK to be in service
Unit Number:	Fab:2018	**CRN:**	N/A
Location:	Quebec	**Colour:**	Orange

Last Test Date(s)		Scheduled Retest Date(s)	
Hydro-Pressure:	4/30/2018	**Hydro-Pressure:**	4/30/2019
Static:	4/30/2018	**Static:**	4/30/2019
Visual:	4/30/2018	**Visual:**	4/30/2019

Test PSI: 300 **Length Of Pressure Test:** N/A

No repair reasons listed

Test last conducted by: N/A
Printed: 6/15/2018

This report was created by HoseTracker.
Please refer to all instruction manuals, technical drawings and documents before using the above equipment.
All products have been tested and inspected in accordance with the appropriate ANSI standards.

ONTARIO HOSE & COUPLINGS LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Quebec	Maritimes
6295 Kestrel Road Mississauga, Ontario L5T 1Z4	480 Polymoor Drive Corunna, Ontario N0N 1G0	263 Barton Street Stoney Creek, Ontario L8E 2K4	639 Justus Drive Kingston, Ontario K7M 4H5	1900 Hymus Blvd Dorval, Quebec H9P 1J7	10 Akerley Blvd U#25 Dartmouth, Nova Scotia B3B 1J4
Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-8214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	Fittings:	(SS)MxF (Stainless Steel Male x Female Camlock)
Hose Type:	floater hose	Size:	4"
Hose Number:	PNV00272	Length:	400'
Part Number:	GMFH4X400orangeRT	HAWP (PSI):	200
Order:	1173960	Temperature Range:	
PO:	12884	Rating:	5/5 ☆☆☆☆☆
Unit Number:	Fab:2018	This is a brand new Hose and is OK to be in service	
Location:	Quebec		N/A
Colour:	Orange		

Last Test Date		Scheduled Retest Date(s)	
Hydro-Pressure:	4/30/2018	Hydro-Pressure:	4/30/2019
Static:	4/30/2018	Static:	4/30/2019
Visual:	4/30/2018	Visual:	4/30/2019

Test PSI:	300	Length of Pressure Test:	

Reasons for Repair

Fittings	Clamp/Ferrule	Tube	Cover

Repairs conducted by:
Printed: Monday, June 18, 2018
To view as PDF click here

This report was created by HoseTracker.
Please refer to all instruction manuals, technical drawings and documents before using the above equipment.
All products have been tested and inspected in accordance with the appropriate ANSI stanad.

ONTARIO HOSE SPECIALTIES LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Montreal	Maritimes
6205 Kestrel Road Mississauga, Ontario L5T 1Z4	480 Polymoor Drive Corunna, Ontario N0N 1G0	263 Barton Stree Stoney Creek, Ontario L8E 2K4	639 Justus Drive Kingston, Ontario K7M 4H5	1900 Hymus Blvd Dorval, Quebec H9P 1J7	10 Akerley Blvd U#25 Dartmouth, Nova Scotia B3B 1J4
Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-6214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	**Fittings:**	Stainless Steel Male x Female Camlock
Hose Type:	floater hose	**Size:**	4"
Hose Number:	PNV00274	**Length:**	400'
Part Number:	GMFH4X400orangeRT	**HAWP (PSI):**	200
Order:	1173960	**Temperature Range:**	
PO:	12884	**Rating:**	5/5 This is a brand new Hose and is OK to be in service
Unit Number:	Fab:2018	**CRN:**	N/A
Location:	Quebec	**Colour:**	Orange

Last Test Date(s)		Scheduled Retest Date(s)	
Hydro-Pressure:	4/30/2018	**Hydro-Pressure:**	4/30/2019
Static:	4/30/2018	**Static:**	4/30/2019
Visual:	4/30/2018	**Visual:**	4/30/2019

Test PSI: 300 **Length Of Pressure Test:** N/A

No repair reasons listed

Test last conducted by: N/A
Printed: 6/15/2018

This report was created by HoseTracker.
Please refer to all instruction manuals, technical drawings and documents before using the above equipment.
All products have been tested and inspected in accordance with the appropriate ANSI standards.

ONTARIO HOSE SPECIALTIES LTD.

HOSETRACKER

Mississauga	Sarnia	Stoney Creek	Kingston	Montreal	Maritimes
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Tel: 905-670-0113 Fax: 905-670-4958	Tel: 519-336-8541 Fax: 519-336-8543	Tel: 905-662-0276 Fax: 905-662-0542	Tel: 613-549-7316 Fax: 613-549-6214	Tel: 514-685-1266 Fax: 514-685-1606	Tel: 902-465-5220 Fax: 902-465-5296

www.ontariohose.com

TEST CERTIFICATE

Customer:	Petro-Nav	**Fittings:**	Stainless Steel Male x Female Camlock
Hose Type:	Goodyear	**Size:**	4"
Hose Number:	PNV00286	**Length:**	400'
Part Number:	GMFH4x400-ORANGE-F	**HAWP (PSI):**	200
Order:	1176561	**Temperature Range:**	
PO:	12894	**Rating:**	5/5 This is a brand new Hose and is OK to be in service
Unit Number:	14/06/18	**CRN:**	N/A
Location:	Dara	**Colour:**	-

Last Test Date(s)		Scheduled Retest Date(s)	
Hydro-Pressure:	6/14/2018	**Hydro-Pressure:**	6/14/2019
Static:	6/14/2018	**Static:**	6/14/2019
Visual:	6/14/2018	**Visual:**	6/14/2019

Test PSI: 300 **Length Of Pressure Test:** N/A

No repair reasons listed

Test last conducted by: N/A
Printed: 6/15/2018

This report was created by HoseTracker.
Please refer to all instruction manuals, technical drawings and documents before using the above equipment.
All products have been tested and inspected in accordance with the appropriate ANSI standards.

DARA - AEM

Following Testing and Load

Main Reel # 3

#	Hose #		Feet
1	34	2007	400
2	55	2007	400
3	175	2014	400
4	174	2014	400
5	177	2014	400
6	171	2014	400
7	170	2014	400
8	274	2018	400
9	270	2018	400
10	272	2018	400
11	265	2018	400
12	267	2018	400
13	269	2018	400
14	230	2016	400
15	226	2016	220
16	132	2016	390
17	286	2018	400
18			
19			
20			
	Sub-Total main reel		**6610**
	6610		

APPENDIX C - MEL-ENV-0029: Agnico Pre-discharge and Spill Response Sea Can checklists & OHF Ship to Shore Fuel Discharge Procedure

OHF / Ship to Shore Fuel Discharge

	PROCEDURE NUMBER:		**MEL-ENV-0029**
People concerned	• **Environment** • **Site Services** • **Procurement and Logistics** • **Health and Safety**	**Prepared by**	**Environment Department**
		Authorized by	**Erika Voyer – Environment General Supervisor**
Effective :	**July 12, 2017**	***"Safety First, Safety Last … Safety Always!"*** ***"No Repeats" – Our Stepping Stone to ZERO HARM***	
This procedure corresponds to the required minimum standard. Each and every one also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.			

Objective:

- To ensure that prior to the discharge of any fuel into the Agnico Eagle Rankin Inlet Tank Farm or Agnico Eagle Rankin Inlet Oil Handling Facility (OHF) that all proper steps are in place to ensure compliance with Canadian Shipping Act, as well as Nunavut Water Board License, Nunavut Impact Review Board Certificate and other laws and regulations.

Concerned departments:


Environment


Health & Safety


Site Services


Procurement and Logistics

Risks/ Impacts Legend


Health & Safety


Process/quality


Legal Requirement


Environment

Prior to the beginning of the annual fuel discharge the following must be completed.

Procedure	*Risks/ Impacts*
1. The Oil Pollution Emergency Plan (OPEP) must be reviewed on an annual basis and updated prior to the first annual discharge. This will include but not limited to: a) Reviewing the Phone numbers for emergency's b) Updating maps c) Review and if necessary update equipment lists d) Review roles and responsibilities e) Update Declaration This is the responsibility of the Environment department.	
2. Contact Canadian Coast Guard and Transport Canada Pollution Prevention and make them aware of plans for transferring of fuel into our OHF for that season. This is the responsibility of the Environment department.	
3. Complete *Inventory report for Spill Response Sea Can at AEM's Oil Handling Facility in Rankin Inlet.* (*Inventory Checklist found on Page 6) This is the responsibility of the Environment Department.	
4. Ensure Shipping Company has provided Hose Testing Annual certification. This is the responsibility of the Environment Department.	
5. All personnel who will be a part of the fuel transfer (including Rankin Inlet Supervisor and third part contractor Intertek) must review the OPEP and be familiar with preventive measures to take and with the steps to take in the case of a spill event while fueling. This is the responsibility of the Department of Procurement and Logistics.	
6. Install secondary containment underneath each connection of conduit on land. This is the responsibility of the Environment Department	

7. Monitor secondary containment underneath each connection of conduit on land. This is the responsibility of the Department of Procurement and Logistics.	
8. Ensure there is two way functional communications between the OHF and the off-loading Vessel. This is the responsibility of the Department of Procurement and Logistics.	
9. Ensure there is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours. This is the responsibility of the Department of Procurement and Logistics.	
10. Prior to any discharge Agnico Eagle must receive a copy of the Ship/Shore checklist completed by the shipping company. Agnico Eagle should also verify this has been completed (as much as realistically possibly without boarding the ship). This is the responsibility of the Department of Procurement and Logistics.	
11. Contact must be made with both the H&S and Environmental Departments prior to the discharge of fuels. Meliadine Health & Safety meliadine.healthandsafety@agnicoeagle.com Meliadine Environment meli.environment@agnicoeagle.com This is the responsibility of the Department of Procurement and Logistics.	
12. The *Pre-discharge Checklist for AEM's Oil Handling Facility in Rankin Inlet* must be completed, signed and provided to the Environment Department prior to discharge. (*Checklist found on Page 5) This must be done for each fuel tanker for each campaign. This is the responsibility of the Department of Procurement and Logistics.	
Transfer	
1. Once the above points are completed, the ship to shore transfer can commence.	

2. Photos of the complete fuel transfer process should be taken, visually proving that all above procedures have been reached. This is the responsibility of Environment and Procurement and Logistics Departments.	
3. During the ship-to-shore transfer, Agnico Eagle will have competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew. This is the responsibility of the Department of Procurement and Logistics.	
4. Monitor the fuel transfer at the beginning of each transfer and after that on an hourly basis checking the manifold, conduit, tank, and any connection points on land for spills and/or leaks. Communication between shore and ship should take place on an hourly basis. This is the responsibility of the Department of Procurement and Logistics.	
5. We are required by law to have a fuel spill scenario every two years. However, since we have shift work at Meliadine, to ensure adequate training annually we will do mock spill/training and switch shifts each year. This way each shift completes every second year. This is the responsibility of the Environment Department in conjunction with the Emergency Response Team to plan and execute.	

OHF / Ship to Shore Fuel Discharge

Pre-discharge Checklist for Agnico Eagle's Oil Handling Facility in Rankin Inlet

Date :

Inspected By :

Time :

Vessel Unloading :

Pre-Discharge Check List	Conform	Non-conform	Comments
Is there two way communications between the OHF and the off-loading Vessel?			
Has a review of response material checklist been completed?			
Current Copy of OPEP and Declaration at the OHF.			
Prior to discharge, have the certification of the transfer conduits been received?			
Has there been secondary containment placed underneath each connection of Conduit?			
Is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours.			
Prior to discharge, has the Vessels' Ship/Shore checklist been reviewed and a completed copy received by Agnico Eagle?			
Prior to discharge inform H&S and Environment Departments that fuel transfer will commence.			
Has the emergency response equipment been reviewed with all personnel and contractors on shore?			

Comments / Recommendations

Signature :

Inventory report for Spill Response Sea Can at Agnico Eagle's Oil Handling Facility in Rankin Inlet

Date :

Inspected By :

Time :

Vessel Unloading :

Subject	Conform	Non-conform	Comments
Is the material and PPE stored in a manner that is organized and accessible in order to easily respond to spill?			
Are the sea cans in physically good shape? Easy to open?			
Are the sea cans identified as "Environmental Emergency Sea Can"?			
Is all the spill material in place?			
6 x Anchor sets (25 kg anchor, chain ballast, rode line and marker buoy)			
4 x Tow bridles with bullet float			
32 x 8" float x 12" skirt Optimax 2 Boom – 25' Sections			
1 x mini Max hydraulic skimmer with pump, power pack			
1 x Aluminum boat with 15 hp prop motor			
10 x 1/2" polyester yacht braid rope (600' rolls)			
5 x Drive pin anchors			
5 x slater anchors			
5 x wing anchors			
30 x sorbent boom, 5" x 4 per bag			
4 x mustang floater suit			

8 x personal floatation devices			
12 x oil resistant gloves			
12 x leather gloves			
2 x sledge hammer with fiberglass handle			
2 x spade – long handle			
2 x Fire extinguisher – 20 lb ABC with brackets			
20 x Tyvex Suit XL			
1 x Alberta standard #3 First aid kit			
4 x Storage totes for small items			
1 x quick tank (500 gallon / 1893 ltrs.)			

Comments / Recommendations

Signature :

APPENDIX D – MSDS for P-50 Diesel

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	DIESEL FUEL
Synonyms	:	Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC). Marine Gas Oil
Product code	:	101802, 100107, 100668, 100658, 100911, 100663, 100652, 100460, 100065, 101796, 101793, 101795, 101792, 101794, 101791, 100768, 100643, 100642, 100103, 101798, 101800, 101797, 101788, 101789, 101787, 102531, 100734, 100733, 100640, 100997, 100995, 100732, 100731, 100994
Manufacturer or supplier's details		Petro-Canada P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining diesels, marine diesels, MDO and naval distillates may have a higher flash point requirement.
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	Bright oily liquid.
Colour	Clear to yellow (This product may be dyed red for taxation purposes).
Odour	Mild petroleum oil like.

GHS Classification

Flammable liquids	:	Category 3
Acute toxicity (Inhalation)	:	Category 4

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Skin irritation	:	Category 2
Carcinogenicity	:	Category 2
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)
Specific target organ toxicity - repeated exposure	:	Category 2 (Liver, thymus, Bone)
Aspiration hazard	:	Category 1

GHS Label element

Hazard pictograms :



Signal word : Danger

Hazard statements : H226 Flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H332 Harmful if inhaled.
H336 May cause drowsiness or dizziness.
H351 Suspected of causing cancer.
H373 May cause damage to organs (Liver, thymus, Bone) through prolonged or repeated exposure.

Precautionary statements : **Prevention:**
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ eye protection/ face protection.
P281 Use personal protective equipment as required.
Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312 IF INHALED: Remove victim to fresh air

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and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.

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P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P331 Do NOT induce vomiting.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Storage:
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P403 + P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.
Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Primary Routes of Entry	:	Eye contact Ingestion Inhalation Skin contact Skin Absorption
Target Organs	:	Skin Eyes Respiratory Tract
Inhalation	:	May cause respiratory tract irritation. Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.
Skin	:	Causes skin irritation.
Eyes	:	Causes eye irritation.
Ingestion	:	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.
Aggravated Medical Condition	:	None known.

Carcinogenicity:

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

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equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
kerosine (petroleum), hydrodesulfurized	64742-81-0	70 - 100 %
kerosine (petroleum)	8008-20-6	
fuels, diesel	68334-30-5	
fuel oil no. 2	68476-30-2	
Alkanes, C10-20-branched and linear	928771-01-1	0 - 25 %
Soybean oil, Methyl ester	67784-80-9	0 - 5 %
Rape oil, Methyl ester	73891-99-3	
Fatty acids, tallow, Methyl esters	61788-61-2	

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash clothing before reuse.
Seek medical advice.

In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

If swallowed : Rinse mouth with water.
DO NOT induce vomiting unless directed to do so by a physician or poison control center.
Never give anything by mouth to an unconscious person.
Seek medical advice.

Most important symptoms : First aider needs to protect himself.

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and effects, both acute and delayed

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO2) Water fog. Foam
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation.

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In case of insufficient ventilation, wear suitable respiratory equipment.
Avoid spark promoters. Ground/bond container and

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equipment. These alone may be insufficient to remove static electricity.
Avoid contact with skin, eyes and clothing.
Do not ingest.
Keep away from heat and sources of ignition.
Keep container closed when not in use.

Conditions for safe storage : Store in original container.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Keep in a dry, cool and well-ventilated place.
Keep in properly labelled containers.
To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
kerosine (petroleum), hydrodesulfurized	64742-81-0	TWA	200 mg/m3	ACGIH
kerosine (petroleum)	8008-20-6	TWA	100 mg/m3	NIOSH REL

Engineering measures : Use only in well-ventilated areas.
Ensure that eyewash station and safety shower are proximal to the work-station location.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection
Material : neoprene, nitrile, polyvinyl alcohol (PVA), Viton(R). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for

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wear and tear. At the first signs of hardening and cracks, they should be changed.

Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Bright oily liquid.
Colour	:	Clear to yellow (This product may be dyed red for taxation purposes).
Odour	:	Mild petroleum oil like.
Odour Threshold	:	No data available
pH	:	No data available
Pour point	:	No data available
Boiling point/boiling range	:	150 - 371 °C (302 - 700 °F)
Flash point	:	> 40 °C (104 °F) Method: closed cup
Auto-Ignition Temperature	:	225 °C (437 °F)
Evaporation rate	:	No data available
Flammability	:	Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.
Upper explosion limit	:	6 %(V)
Lower explosion limit	:	0.7 %(V)
Vapour pressure	:	7.5 mmHg (20 °C / 68 °F)

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Relative vapour density	:	4.5
Relative density	:	0.8 - 0.88
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	No data available
Viscosity		
Viscosity, kinematic	:	1.3 - 4.1 cSt (40 °C / 104 °F)
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Runoff to sewer may create fire or explosion hazard.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents and acids.
Hazardous decomposition products	:	May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Eye contact
Ingestion
Inhalation
Skin contact
Skin Absorption

Acute toxicity

Product:

Acute oral toxicity	Remarks: No data available
Acute inhalation toxicity	Remarks: No data available
Acute dermal toxicity	Remarks: No data available

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0000000395

Components:

kerosine (petroleum), hydrodesulfurized:

Acute oral toxicity LD50 (Rat): > 5,000 mg/kg

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Acute inhalation toxicity	LC50 (Rat): > 5.2 mg/l Exposure time: 4 hrs Test atmosphere: dust/mist
Acute dermal toxicity	LD50 (Rabbit): > 2,000 mg/kg

kerosine (petroleum):

Acute oral toxicity	LD50 (Rat): > 5,000 mg/kg
Acute inhalation toxicity	LC50 (Rat): > 5 mg/l Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	LD50 (Rabbit): > 2,000 mg/kg

fuels, diesel:

Acute oral toxicity	LD50 (Rat): 7,500 mg/kg
Acute dermal toxicity	LD50 (Mouse): 24,500 mg/kg

fuel oil no. 2:

Acute oral toxicity	LD50 (Rat): 12,000 mg/kg
Acute inhalation toxicity	LC50 (Rat): 4.1 mg/l Exposure time: 4 h Test atmosphere: dust/mist

Skin corrosion/irritation

Product:

Remarks: No data available

Serious eye damage/eye irritation

Product:

Remarks: No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

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No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.
Contaminated packaging	:	Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

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IATA-DGR

UN/ID No.	:	1202
Proper shipping name	:	Diesel fuel
Class	:	3
Packing group	:	III
Labels	:	3
Packing instruction (cargo aircraft)	:	366

IMDG-Code

UN number	:	1202
Proper shipping name	:	DIESEL FUEL
Class	:	3
Packing group	:	III
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1202
Proper shipping name	:	Diesel fuel
Class	:	3
Packing group	:	III
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

The components of this product are reported in the following inventories:

DSL	On the inventory, or in compliance with the inventory
TSCA	All chemical substances in this product are either listed on the TSCA Inventory or are in compliance with a TSCA Inventory exemption.
EINECS	On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

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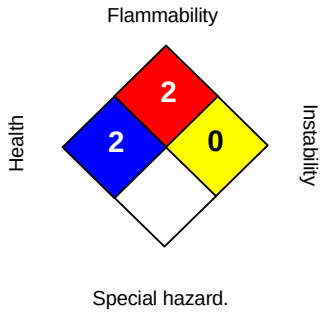
Further information

NFPA:



HMIS III:

HEALTH	2
FLAMMABILITY	2
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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APPENDIX E –Ship to shore checklist and cargo pre arrival - Coastal Shipping LTD

Ship / Shore Cargo Checklist

Vessel: _____
Port: _____
Date: _____
Operation: ❒ Discharge ❒ Load

Letter Codes

A Any procedures and agreements should be in writing in the remarks column of this checklist or other mutually acceptable form. In either case, the signature of both parties is required

P In the case of a negative answer, the operation should not be carried out without the permission of the port authority.

R Items to be rechecked regularly, not exceeding the time specified in the declaration

General cargo considerations: (check (•) under Ship/Shore if OK, otherwise provide comment)

Item	Ship	Shore	Code	Comments
Is the vessel securely moored?			**R**	Stop Cargo at_____knts wind velocity Disconnect at_____knts wind velocity Unberth at_____knts wind velocity
Are emergency towing wires correctly positioned?			**R**	
Is there safe access between the ship and the shore?			**R**	
Is the ship ready to move under it's own power?			**P R**	
Is there an effective deck watch in attendance on the ship and adequate supervision on shore?			**R**	
Is the agreed ship/shore communication system operative?			**A R**	Method:
Has the emergency signals to be used by the ship and shore been explained and understood?			**A**	
Have the procedures for cargo, bunkering and ballast been agreed upon?			**A R**	
Have the hazards associated with toxic substances within the cargo being handled been identified and understood?				
Has the emergency shutdown procedure been agreed?			**A**	
Are fire-hoses and fire fighting equipment on board and ashore positioned and ready for immediate use?			**R**	
Are cargo and bunker hoses/arms in good condition, properly rigged and appropriate for intended use?				
Are scuppers effectively plugged drip tray valves closed both on board and ashore?			**R**	
Are unused cargo and bunker connections properly secured with blank flanges fully bolted?				
Are Sea and overboard discharge valves closed when not in use?				
Are all cargo and bunker tank lids closed?			**A R**	
Is the agreed tank venting system being used?				
Has the operation of P/V valves been verified?				
Are flashlights in use of an approved type?				
Are portable VHF/UHF radios of an approved type?				
Are the ships MF/HF radios grounded, VHF radios set to low power and 10 cm radars shut off?				
Is any portable electrical equipment disconnected?				
Are all external doors and ports in the accommodation closed?			**R**	
Are air intakes, which may permit the entry of cargo vapours, closed?				
Is the galley staff informed of loading/discharged operations?				
Are Smoking regulations being observed?			**R**	
Are naked light rules being observed?			**R**	
Is there provision for an emergency escape?				

Ship / Shore Cargo Checklist

Are there sufficient personnel on board and ashore to deal with an emergency?			**R**	
Are adequate insulating means in place in the ship shore connection?				
Is the pumproom ventilation adequate?			**R**	
Have the requirements for closed loading been agreed?				
Has a vapour return line been connected?				
If so, have the operating parameters been agreed?				
Are ship emergency fire control plans located externally?				
Are appropriate signals being displayed?				

Inert Gas Systems (if in use):

Item	Ship	Shore	Code	Comments
Is the Inert Gas System operational and in good working order?			**P**	
Are deck seals in good working order?			**R**	
Are Liquid levels in P/V breakers Correct? Have O^2 Analysers been calibrated and are working properly?			**R** **R**	
Are IG pressure and Oxygen recorders working properly? Are all Cargo tanks at positive pressure with O^2content of <8%?			**R** **P R**	
Are all IG Tank valves correctly set and locked?			**R**	
Are all the persons in charge of cargo operations aware that in the case of failure of the Inert Gas Plant, discharge operations should cease and the terminal be advised?			**R**	

Tank Cleaning (if planned while ship is at berth):

Item	Ship	Shore	Code	Comments
Has the port authority approved any tank-cleaning operations planned during the ships stay?			**P**	

Operations:

Item	Value	Ship	Shore
Initial cargo transfer rate to be used (m^3/hr, bbls/hr, etc)			
Maximum cargo transfer rate to be used (m^3/hr, bbls/hr, etc)			
Topping off rate to be used (m^3/hr, bbls/hr, etc)			
Maximum hose pressure to be used (bar)			
Quantity of cargo to be transferred (m3, bbls of each grade)			
Hose to be drained after transfer complete	❒ Ashore ❒ Back to vessel		
Hose to be cleared by	❒ Gravity ❒ Comp. Air ❒ Pig		
Emergency stop button located	❒ On Ship ❒ Ashore		

Declaration:

We the undersigned have checked, where appropriate jointly the items on this checklist and are satisfied that the entries made are to the best of our knowledge correct.We have also made arrangements to carry out repetitive checks as necessary and agreed that those items with the letter **R** in the column **Code** should be rechecked at intervals not exceeding_____hours.

Signatures:

For Vessel	**For Shore**
Name: _____	Name: _____
Rank: _____	Position: _____
Signature: _____	Signature: _____
Date & Time: _____	Date & Time: _____

Cargo Preparation Checklist

Vessel: __
Port: __
Date: __

Prior to entering a port or terminal:

Item	Completed
Emergency towline, anchor releasing mechanism, and mooring lines and winches are inspected to determine that the equipment is ready for use and in good condition.	

Prior to cargo transfer operations an examination and testing of the following items:

Item	Completed
All external doors, ports, and similar openings, which lead directly from the tank deck to the accommodation or machinery spaces, are closed.	
P/V valves and the venting system have been inspected and properly set for the transfer operation and the high-level alarm system has been tested. A High Level and PV Valve Checks form has been completed	
Pumproom strainer covers, inspection plates, and drain plugs are properly positioned and secure.	
Flange connections are all fully bolted and tightened with no improvised arrangements in place.	
Visual examination of all hoses and verification of hose certificate before use.	
Sea and overboard discharge valves, when not in use, are securely closed, lashed and sealed.	
Fire extinguishing and pollution control equipment is in place and ready for immediate deployment.	
Scupper plugs have been inspected and are in place and secured.	
Bondable drip trays are available for each manifold connection to be made.	
Tools for deploying, connecting blowing, pigging, disconnecting and recovering cargo hose are prepared as required.	
All cargo transfer valves are operational and positioned as be required. Closed valves are lashed as appropriate.	
When loading multiple grades, sufficient segregation is in place and ship personnel are made aware.	
Manifold(s) to be used are fitted with the correct reducers or adaptors for expected connection and all unused manifolds are drained and blanked.	
All pressure and temperature gauges on manifolds to be used are functioning correctly and calibrated.	
Emergency shut down mechanism has been tested and ship personnel are familiar with its use.	
Fire wires are positioned correctly, if required by terminal.	
Sufficient auxiliary machinery is running to ensure adequate electrical power is available during cargo operations.	
Compressed air is available on deck to run SOPEP pumps and blow/pig hoses are required.	
A list of responsible officers on duty during transfer is posted and readily available. Crew are familiar with their watches during cargo operations.	
Arrangements have been made to ensure the Master and/or the Chief Officer will be on board and available at all times during cargo operations.	

Additional comments or conditions:

Signatures:

Name: _____ Name: _____

Rank: _____ Rank: Chief Officer

Signature: _____ Signature: _____

APPENDIX F – The Central and Arctic Regional Response Plan (2008)

Canadian Coast Guard
Central & Arctic Region



Regional Response Plan

December 2008

LETTER OF PROMULGATION

The *Central & Arctic Regional Response Plan (2008)* replaces the *Central & Arctic Region Contingency Chapter (2006)* and the *Arctic Response Strategy (1999)*. This plan is a component of the *Canadian Coast Guard Nationa Response Plan* which is the responsibility of the Director of Safety and Environmental Response Systems, Ottawa. It establishes the framework and the procedures by which Central & Arctic Region will prepare for, assess, respond to and document actions taken in response to pollution incidents in this Region.

The saving of life is of paramount consideration and the Plan is subordinate to the operational requirements of marine search and rescue.

The Plan has been reviewed by the internal partners identified in Section 3.3 in context to the services they may provide and by the external partners identified in Sections 3.4 and 3.5 to confirm their mandated response authorities.

Responsibility for the *Regional Response Plan* lies with the Assistant Commissioner Coast Guard Central & Arctic Region. The Central & Arctic Region Environmental Response branch is the custodian of the plan. The responsibility for specific sections is identified in Section 7 - Plan Maintenance and Custodians. Comments, recommendations and communications relating to the various sections are clearly identified in this section.

REVISION RECORD

CENTRAL & ARCTIC REGIONAL RESPONSE PLAN			
Section	Replace	Transmittal No.	Description of Changes
Entire Plan	All	December 1, 2005	Complete revision of Central & Arctic Regional Response Plan
Entire plan	All	April 1, 2006	Complete revision of Central & Arctic Regional Response Plan
7.1 Maintenance Process	Page 7-1	May 8, 2007	Update address to 520 Exmouth Street
8.3 CCG ER Phone List	Page 8-1	June 4, 2007	Update address to 520 Exmouth Street
Entire Plan	All	December 2008	Complete revision of Central & Arctic Regional Response Plan

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Section 1 - INTRODUCTION

1.1. Authority

This plan is based upon the policy and guiding principles set forth in the *National Response Plan* of the *Canadian Coast Guard National Response Strategy*.

1.2. Purpose

The *Central and Arctic Regional Response Plan* is designed as a guide to Canadian Coast Guard staff and relevant stakeholders involved in marine spill responses. It outlines the Regional application of the various roles of On-Scene Commander (OSC) (active response), Federal Monitoring Officer (FMO) (ensuring the Responsible Party fulfills their obligations), and as a Resource Agency (in assistance to other Lead Agencies).

It contains the specific information and activities that are pertinent to all spill response activities within Central & Arctic Region (C&A Region).

1.3. Area of Responsibility

For the purposes of marine pollution response Central & Arctic Region is defined geographically as:

- The contiguous waters of the Canadian Arctic (North of 60° Latitude) to the limits of the International Boundary, including the North Slope Area of the Yukon Territories, and internal waters of the Northwest Territories and the Territory of Nunavut; and

- The waterways contained within the provinces of Alberta, Saskatchewan, Manitoba, Ontario, and a western portion of Quebec commencing at the east wall of the Beauharnois Lock in the St. Lawrence River.

(see Figure 1-1 Fisheries and Oceans Central & Arctic Region)

Significant waterways include the Canadian Great Lakes and interconnecting waterways to the international Boundary with the United States, Hudson and James Bays, Lake Winnipeg, Lake Athabasca and interconnecting waterways, Great Slave Lake, Mackenzie River and the Northwest Passage in the Canadian Arctic.

There are also a number of specific geographic locations which, although not excluded from Canadian Coast Guard's mandate, require coordination between the managing authorities and this plan. These areas include the waters associated with

the various Port Authorities (Hamilton, Thunder Bay, Toronto and Windsor) and the St. Lawrence Seaway Authority (Welland Canal, St. Lawrence Locks) as defined by the *Canada Marine Act, 1998*.

Figure 1-1: Fisheries and Oceans Central & Arctic Region



1.4. Safety Policy

Safety is the first and foremost consideration in any pollution response in Central & Arctic Region. This commitment is expressed throughout this and other documents as well as in the programs relied on by the Environmental Response (ER) branch to prepare for such spills (i.e. training and exercising programs). General safety procedures and considerations to be followed by all members of the Regional Response Team are identified in Section 5.7 of this plan.

1.5. Links to the National Response Plan

The Guiding Principles and Mandate (including legislative, interdepartmental, intergovernmental and international agreements) as well as designation of Lead and Resource Agency roles are contained in the *National Response Plan Section 1 – Introduction.* The mechanism for activating the Environmental Response National Response Team is also defined in the *National Response Plan*.

1.6. Regional Response Plan Structure

The Regional Response Plan is structured to reflect the three fundamental phases of Environmental Response activities. These are:

1) Preparedness - through the regional application of Contingency Planning (resulting in specific response strategies), Training (state of personnel readiness), Exercising (state of system readiness) and Inventory Maintenance and Management (state of mechanical/equipment readiness).

2) Response Operations - identifying the mechanisms for:
   - *Initiating* (through a dedicated Duty Officer and Assessment process),
   - *Sustaining* (Operational functions as Lead or Resource Agency),
   - *Controlling* (using the Response Management System), and
   - *Finalizing* the response activity (decommissioning and reporting).

3) Claims, Recovery and After-action activities - for the documentation and recovery of spent resources from the polluter, their agents, national or international funding conventions.

Surrounding these fundamentals are the specifics of the Environmental Response Program in Central and Arctic Region that are too cumbersome to be included in the main text of this Response Plan. They include: Regional Agreements and Memoranda of Understanding, Regional Organization and the specific Annexes which support the program. Finally, the Response Plan includes the preliminary and supplementary matter such as Letter of Promulgation, Record of Revision and the Identification of Custodians and the Plan Maintenance process.

1.7. Linkages to other Response Plans in the Region

When a pollutant is spilled into the water, the Canada Shipping Act is not the only legislation that applies. Recognizing that being designated Lead Agency for pollution response to mystery spills and spills from vessels does not preclude other agencies from completing their mandate CCG acknowledges that the Internal and External Partners listed in Sections 3.4 and 3.5 have plans that are active within Central & Arctic Region.

1.8. Linkages to International Joint Plans

International Joint Plans and agreements affecting Central & Arctic Region include:

- Canada-United States Joint Marine Pollution Contingency Plan
- Canada-Denmark Agreement for Co-operation Relating to the Marine Environment, Annex B (Joint Marine Contingency Plan concerning Incidents resulting from Shipping Activities)
- Great Lakes Water Quality Agreement, Annex 9
- International Boundary Waters Treaty Act

The Canadian Coast Guard Environmental Response Branch also provides technical support for the Emergency Prevention, Preparedness and Response (EPPR) Working Group of the Arctic Council. The EPPR Working Group exchanges information on best practices for preventing spills, preparing to respond to spills should they occur, and practical response measures for use in the event of a spill.

The Arctic Council is an intergovernmental forum of the eight circumpolar countries (Canada, Denmark, Finland, Iceland, Norway, Sweden, the Russian Federation and the United States of America) that provides a mechanism to address the common concerns and challenges faced by the Arctic governments and the people of the Arctic.

Some work has been initiated with the Russian Federation for the development of a Joint Pollution Response Plan. To date no agreements have been signed.

Section 2 - AGREEMENTS AND MEMORANDA OF UNDERSTANDING

2.1 Overview

The Canadian Coast Guard (CCG), both Central & Arctic and National Headquarters, maintain numerous memoranda and letters of understanding and agreement between other government departments which outline shared responsibilities in pollution response. A brief description of the major agreements is listed below.

- Letter of Agreement between Canadian Coast Guard, Environmental Response Branch and Canadian Coast Guard, Operational Services and Canadian Coast Guard, Technical Services regarding the use of Environmental Response First Response Units (FRUs) by non-environmental response staff. This agreement concerns the use of FRUs at the various CCG facility sites (bases, sub-bases and search and rescue stations).

- Northwest Territories/Nunavut Spills Working Agreement. This agreement formalizes procedures whereby spill investigation and monitoring in the Northwest Territories (NT) and Nunavut (NU) can be coordinated.

- Fisheries & Oceans (DFO) and Environment Canada (EC) Letter of Agreement respecting transfer of responsibility as lead agency for mystery spills from Environment Canada (EC) to the Canadian Coast Guard/Fisheries & Oceans Canada (July 1996)

- Transport Canada (TC) and Fisheries & Oceans (DFO) Memorandum of Understanding respecting Marine Transportation Safety & Environmental Protection (May 1996). This MOU outlines the responsibilities transferred from TC to DFO in accordance with the *Public Service Rearrangement and Transfer of Duties Act*. Those pertinent to this plan include:
    a) The responsibility for ensuring the provision of pollution clean up services
    b) The authority to take actions to mitigate or prevent pollution from ships

- Letter of Understanding between the Canadian Coast Guard and the Hamilton Port Authority to outline the roles that the CCG and the HPA will

play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Thunder Bay Port Authority to outline the roles that the CCG and the TBPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Toronto Port Authority to outline the roles that the CCG and the TPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Windsor Port Authority to outline the roles that the CCG and the WPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

Some memoranda of understanding and letters of agreement have been rendered defunct by virtue of the dissolution or reorganization of the entities that signed the original document. It is the Region's intent to assess the need for an MOU and in those cases where renewal is needed, to draft a new MOU and submit to the partner organization the request for re-entry into that agreement. For further information on these memoranda, please contact the Environmental Response Planning Section.

Section 3 - ORGANIZATION

3.1 General Application

This section describes the primary working relationships between Fisheries and Oceans (DFO), Canadian Coast Guard, Environmental Response branch (CCG/ER) and the various internal and external partners, clients and external resources.

Internal partners include: Other DFO sectors, directorates and branches, and other federal departments which provide direct assistance or have specific mandates which directly affect response activities.

External partners include those entities that share the burden of pollution response for their specific area of responsibility. These agencies include the provincial and territorial government ministries with the generic mandate of pollution response.

Clients include those entities that are specifically identified by the *Canada Shipping Act (CSA)* and have direct involvement in the response regime; they include Oil Handling Facilities (OHF), Legislated Ships and Non-legislated Ships.

External resources are those resources outside of the government that the Canadian Coast Guard may engage while conducting spill response activities. These include the Response Organizations (RO) certified by Transport Canada and other independent contractors which may perform more specific functions.

3.2 Fisheries and Oceans, Canadian Coast Guard - Environmental Response Branch (CCG/ER)

The Assistant Commissioner, Canadian Coast Guard through the Maritime Services Directorate and the Superintendent of Environmental Response (ER) directs the Regional Environmental Response Team. This team represents one facet of the overall crisis management structure within Central and Arctic Region and performs the function of the Lead Response Agency for pollution incidents as defined in the *National Response Plan – Section 1* of the *Canadian Coast Guard National Response Strategy.* The branch consists of approximately seventeen (17) full time employees (FTEs).

Internally, the Environmental Response Branch is made up of five (5) distinct but integrated functions:

1) *Direction and Administration* - providing the overall guidance, management and liaison with Headquarters. The Superintendent holds the responsibility for escalating a response and/or dedicating resources.
2) *Planning* - providing the design and management of plans and procedures to facilitate the preparedness posture of the Region (responsible for developing and maintaining intradepartmental, interdepartmental, client and regime stakeholder relationships).

3) *Operations and Inventory Maintenance & Management* - provide the management and maintenance of equipment to ensure the operational response readiness of the Region.
4) *Training* - provides the coordination and delivery of educational materials, to internal as well as external partners and clients, in support of the overall preparedness posture of the Region.
5) *Exercising* - provides the management and coordination of internal and external partners and clients to validate, practice and reinforce all aspects of the Response readiness of the Region.

In addition to these core functions, each staff member is required to actively participate in the operational aspects of the response regime based upon their skill and ability levels. This includes assuming various roles within the Response Management Structure acting as Duty Officer (DO) and supporting the overall emergency preparedness structure within the Region (not necessarily related exclusively to oil spills or pollution).

In the context of this Plan, the Environmental Response Branch is tasked to:

- Fulfill the Canadian Coast Guard's obligations as Lead Agency in an OSC or FMO posture in responding to marine pollution incidents from ships in waters of Canadian interest as well as from unknown sources.
- Act as a Resource Agency in support of a response led by another agency when requested.
- Staff a Duty Officer position on a 24/7 basis which, together with other agency representatives, will assess or direct the assessment of spill reports.
- Ensure that an appropriate response to pollution incidents is initiated on a timely basis.
- Provide initial response capabilities throughout the region.
- Monitor response and clean-up priorities when polluter has accepted responsibility.
- Ensure international commitments in spill preparedness and response are fulfilled.
- Provide a pollution response capability for lightering, salvage and offshore recovery operations.
- Provide Regional and HQ briefings on status of emergency operations.
- Evaluate, acquire and maintain specialized marine emergency countermeasures equipment and develop deployment techniques.
- Develop, distribute and maintain the *Central and Arctic Regional Response Plan* of the *Canadian Coast Guard National Response Strategy* (including area annexes) on behalf of Fisheries and Oceans.
- Review and comment on other government as well as industry pollution response plans upon request.
- Provide pollution response related training to Canadian Coast Guard and civilian personnel.

- Conduct spill response exercises according to the Canadian Coast Guard National Exercise Program (NEP) standards.
- Provide detailed explanations of response operations and policies to representatives of the media, interest groups, industry, police and Provincial and Municipal governments.
- Provide a centre of expertise for pollution concerns.
- Develop and foster a good working relationship with other authorities, shipping and oil/chemical handling communities.
- Working with Environmental Response Headquarters and the Chemical Industry to develop, implement and maintain a corresponding and complimentary regional capability for spills of hazardous and noxious substances other than oil.

3.3 Internal Partners – Fisheries and Oceans

Other branches and directorates within Fisheries and Oceans which directly and in a continuous active way support preparedness and response activities include:

Marine Traffic and Communications Branch (MTCS) – CCG/Marine Programs Directorate

Marine Traffic and Communications Services operates a marine VHF/MF/HF communications system (depending on location) primarily for the provision of marine safety information, distress coordination and marine traffic regulation. MCTS will support Environmental Response (ER) activities by:

- Establishment of Movement Restriction Areas (MRA's) or exclusion zones as directed by the Federal Monitoring Officer (FMO) or On Scene Commander (OSC).
- Providing communications/radio equipment operators in support of off-site ER operations.
- Dissemination of marine information and issuing marine Notices to Shipping (NOTSHIPS).
- Providing vessel tombstone information including, but not limited to, vessel name, call sign, nationality, tonnage, dangerous cargo type and quantity.

Regional Operations Centre (ROC) and Fleet Resources – CCG/Operational Services Directorate

Regional Operations Centre

The ROC provides notification to the Environmental Response Duty Officer (ERDO) when notified of a spill or an occurrence which may result in a spill. Upon receiving information regarding a spill, the ROC confirms the report using reliable resources and agencies. When the incident has been confirmed the Operation Centre begins the alerting and notification procedure. A schedule of ERDOs, approved by the Superintendent Environmental Response Canadian Coast Guard, will be maintained by the ER Regional Emergency Operations Officer (REOO) and forwarded to ROC for distribution.

The Regional Operations Centre will support the Environmental Response Branch during a marine pollution incident by:

- Maintaining up to update contact lists for Canadian Coast Guard and other government agencies for use as incidents progress.
- Coordinating the allocation of CCG resources as required by the FMO or the OSC to respond to a marine pollution incident.
- Provide communications support (when necessary).

Fleet Resources

Fleet Resources may be called upon to provide a host of support and/or lead services depending upon the type and severity of the situation and limitations or constraints of the vessel. Commanding Officers maintain full responsibility for the operation and safety of their vessel and personnel and therefore, will/may:

- Be called upon to be interim On-scene Commander.
- Be the principal point of contact aboard ship for the Environmental Response Duty Officer or On Scene Commander.
- Investigate spill reports for the purpose of confirmation.
- Provide surveillance and monitoring of third party (or pollutant) as required.
- Initiate early spill response; containment, boom or sorbent material deployment, clean up and recovery procedures.
- Provide site safety, (i.e. fire fighting, first aid and crowd control).

Fleet does maintain their own limited capabilities to respond to their needs as required.

Canadian Coast Guard Bases

In preparation for and during a pollution incident, CCG bases may also provide resources for response. These resources are generally within the scope of normal base activities and include:

- Small vessel use
- Base facilities (boardrooms, workshops)
- Helicopter landing pads
- Boat launch and docking slips
- Staging areas

Safety, Security and Emergency Services Branch – DFO Corporate Services

For large spills of a significant nature the Regional Manager of Safety, Security & Emergency Services may provide the following:

- Advice and recommendations to the On Scene Commander on issues of site and employee safety and the application of departmental security policy measures.
- General occupational health & safety and security advice to the On-Scene Commander/Deputy On-Scene Commander as per the departmental Loss Control Manual.

- A Health & Safety Officer to perform the functions of the Heath & Safety Officer described in the Response Management System User Guide. This person will report directly to the OSC or FMO throughout the duration of the response.

On occasions when the Regional Manager of Safety & Security (or delegate) is not available, or when spills are of a minor nature, the On-Scene Commander shall appoint a member of the response team to fulfill the general duties required.

Communications Branch – DFO Communications
Communications team manages the media (external) handling inquiries from print, radio, television and internet news organizations through the application of *Fisheries & Oceans Crisis Communications Plan*. Communications branch coordinates all aspects of information being released to ensure the public is getting the most relevant, accurate information as soon as practicable.

Legal Services
The DFO Legal Services in CCG Headquarters section will provide legal advice and guidance in the event of a marine pollution incident where CCG may or has been engaged. This especially includes advice on the issuance of Letters of Undertaking (LOUs) and in situations where Canadian Coast Guard may have to take command and control of an incident away from the Polluter.

Other DFO Resources
Indirectly, but just as significant in the event of a spill, is the availability of other DFO resources. This includes any and all appropriate functions including, but not limited to the following:

- Trenton Joint Rescue Coordination Centre – CCG, Maritime Services Directorate, Search and Rescue Branch (SAR)
- Finance and Administration – Human Resources and Corporate Services Directorate
- Human Resources - Human Resources and Corporate Services Directorate
- Facilities – Real Property
- Other Technical Resources – CCG, Integrated Technical Services Directorate
- Fish Habitat Branch – Habitat Fisheries and Oceans Management

3.4 Internal Partners – Other Government Departments

Other federal departments which provide direct assistance or have specific mandates which directly affect response activities include:

Environment Canada (EC)
There are two (3) Environment Canada regions located within Central & Arctic region. They are Ontario, Prairie and Northern and Pacific and Yukon Regions.

The Environmental Emergencies Section provides:

- In Ontario, the Co-chair (with the Ontario Ministry of the Environment (MOE)) of the Regional Environmental Emergencies Team (REET).
- In the Arctic (consisting of the three Territories), the Co-chair (with the relevant Territorial Government, Department of Environment) for the Arctic Regional Environmental Emergencies Team.
- Coordination of the Shoreline Cleanup and Assessment Teams (SCAT).
- Advice concerning environmental impacts associated with vessel source spills, resource sensitivity and prioritization, environmental forecasting, spill and cleanup monitoring and clean up techniques and priorities
- Sampling assistance, identification and characterization of materials

The REET serves as a mechanism for the provision of consolidated, coordinated and comprehensive environmental information and advice concerning the fate and effects of hazardous and noxious substances, spill trajectories, resources and shoreline protection strategies, clean up priorities, physical and chemical counter measures, remedial endpoints, damage assessment, and the management of hazardous wastes generated during a spill and other matters which arise while planning and responding to emergency events which affect or risk environmental quality. In the planning mode REET members meet to improve contingency plans, resolve regional preparedness issues and exchange new scientific and response ideas.

In Ontario Region, Environment Canada has divided the province into eighteen (18) REET areas and plans to hold one (1) REET meeting per area per year, consolidating some areas where possible and maintaining annual meetings in the higher risk areas (Windsor, Sarnia, Sault Ste. Marie).

Two of three primary Arctic REET (AREET) areas are in Prairie and Northern Region: the Northwest Territories and Nunavut Territory. There is no REET established in Alberta, Saskatchewan and Manitoba.

The Meteorological Service of Canada (part of EC and REET) provides:

- Meteorological forecasting

The Canadian Wildlife Service (part of EC and REET) provides

- Advice on wildlife protection, rescue and rehabilitation
- Permits for wildlife hazing and capture

Transport Canada (TC)

The Environmental Response Systems Division in Ottawa is responsible for Canada's Marine Oil Spill Preparedness and Response Regime. It:

- works with other federal agencies and departments, such as Fisheries and Oceans Canada, the Canadian Coast Guard and Environment Canada to establish guidelines and regulatory framework for preparedness and response to oil spills and spills of noxious and hazardous substances into Canada's marine environment.

- Manages the National Aerial Surveillance Program

There are two Transport Canada regions located within Central & Arctic region. They are Ontario and Prairie and Northern regions.

The Aircraft Services Directorate provides:

- Aerial surveillance as part of the Prevention mandate within Transport Canada, and can provide aerial spill tracking, recording, and personnel transport.

The Marine Safety Branch provides:

- Technical advice and recommendations to the On-Scene Commander or the Ship Owner regarding, but not limited to, lightering, damage assessment and salvage.

  Note: The MOU between Transport Canada and Fisheries & Oceans Respecting Marine Transportation Safety & Environmental Protection (May 1996) Annex D – E-5 states that "Transport Canada and Fisheries and Oceans will jointly approve salvage operations, emergency lightering or discharge of cargo." After discussing this clause with two senior surveyors, they both agree – Marine Safety does not approve salvage plans. Marine Safety advises and recommends only.
- Restriction of transit or movement of a vessel following a damage assessment.
- Spill investigation and enforcement of the various aspects of the pollution prevention conventions and legislation in Canada
- Regional planning, in conjunction with EC and CCG, for the selection of Places of Refuge. Note: in the Great Lakes and connecting channels, selection of a place of refuge will be determined in conjunction with the USCG and USEPA.
- Monitoring of the spill preparedness activities of Oil Handling Facilities (OHFs) and certified Response Organizations (ROs) through a review and audit process.

Indian and Northern Affairs Canada (INAC)

Canadian Coast Guard (CCG) works most closely with INAC in Nunavut (NU) and the Northwest Territories (NT). INAC has lead responsibilities in the Arctic for spills on water which do not originate at federal facilities, exploration facilities or from ships and barges. INAC also, by letter of agreement, will investigate ship-source spills on behalf of CCG. INAC is also a member of the Beaufort Sea Emergency Preparedness Working Group, along with CCG/DFO, EC, TC and other appropriate agencies.

National Energy Board (NEB)

Based in Calgary, Alberta, the National Energy Board is an independent Agency that reports to parliament through the Ministry of Natural Resources. The NEB is the

Lead Agency for spills that occur at offshore and nearshore oil and gas exploration and production facilities.

In the event of a marine pollution incident where CCG is requested for assistance as a resource agency, CCG is available to provide pollution response expertise as indicated under Section 7.2 of the *National Response Plan* as it relates to NEB.

Public Safety Canada

Public Safety Canada is the federal coordinating department responsible for engaging relevant federal departments in an integrated Government of Canada response to an emergency.

For emergencies requiring an integrated Government of Canada response, federal support is based on a regional "single- window" concept. This concept is intended to facilitate regional interdepartmental and intergovernmental coordination, while not unduly restricting operations. Coordination includes sharing of pertinent information in order to maintain situational awareness.

The Government Operations Centre (GOC) is a 24/7facility where an integrated Government of Canada response is managed. It is the focal point of information management flow and provides strategic-level activities. It's permanent staff includes watch officers, duty officers specializing in national communications as well as a geomatics team to map incidents.

Indirect support from other federal departments in the form of advice or resources also comes from: Heritage Canada (Parks Service) in the form of support to REET, National Defense regarding assistance and resources, RCMP with respect to investigations and those sections or departments specifically identified in the various Memorandums of Understanding (MOU) as outlined in Section 2 of this chapter.

3.5 External Partners - Provincial and Territorial Ministries and Departments

In general, liaison with provincial and territorial concerns is facilitated through REET (Regional Environmental Emergencies Team), which is chaired by Environment Canada (EC) or, in the case of the Province of Ontario, is co-chaired by Environment Canada and the Ontario Ministry of the Environment (MOE). The following agencies have the primary mandate for marine or freshwater pollution response in their province or territory of jurisdiction:

Territory or Province	Department
Northwest Territories	Environment and Natural Resources
Nunavut	Department of Environment
Alberta	Alberta Environment
Saskatchewan	Saskatchewan Environment

Manitoba	Manitoba Conservation
Ontario	Ontario Ministry of the Environment

In emergency situations conflicts sometimes arise with respect to legal and administrative jurisdiction and application of standards and common practices. To facilitate these issues the various Ministries related to emergency measures are usually contacted to provide coordination and clarify where necessary the concerns. These include:

- Government of Nunavut – Department of Community of Government Services, Emergency Management Division
- Government of the Northwest Territories – Department of Municipal and Community Affairs – Emergency Services Division
- Government of the Yukon Territories – Department of Community Services, Emergency Measures Organization
- Government of Ontario - Ministry of the Community Safety & Correctional Service, Emergency Measures Ontario
- Government of Manitoba –Manitoba Emergency Measures Organization
- Government of Saskatchewan – Resource Management and Corrections & Public Safety, Saskatchewan Emergency Measures Organization
- Government of Alberta – Ministry of Municipal Affairs, Public Safety Division, Emergency Management Alberta

Provincial Governments can provide consolidated access to local, municipal and provincial resources.

Central & Arctic Region recognizes that First Nations have a vested interest in response operations that may occur in their territory and will ensure that they are represented on the REET or have access to the Federal Monitoring Officer or On Scene Commander through the CCG Liaison Officer.

3.6 Clients

With respect to ship-source pollution incidents, there are three major groups the Canadian Coast Guard will be directly engaged with. These are Oil Handling Facilities, Legislated Ships and Ships as defined in *Part XV* of the *Canada Shipping Act.*

Oil Handling Facilities (OHF)

Operators of facilities that transfer oil to or from oil tankers over 150 gross registered tonnes or other vessels over 400 gross registered tonnes are required by the Canada Shipping Act (2001) to:

- Have an Oil Pollution Emergency Plan (OPEP) on site.
- Have a declaration conforming to the regulations on site.
- Take reasonable measures to implement their required oil pollution emergency plan in the event of an oil pollution incident.

- Have on site the resources required to contain a spill of oil equal to the facility's rated capability within one hour.
- Begin recovery/cleanup operations of oil equal to the facility's rated capability within 6 hours.
- Have an arrangement with a certified Response Organization (RO) that permits the handling of spills beyond the rated capabilities of the Oil Handling Facility.[1]

Legislated Ships

In Canadian waters, ships over 400 gross registered tonnes and oil tankers over 150 gross registered tonnes are required to have a Shipboard Oil Pollution Emergency Plan (SOPEP) and an arrangement with a certified Response Organization (RO) to respond to an oil pollution incident of an amount equivalent to the maximum amount of product that the vessel can carry as fuel and/or as cargo up to a maximum of 10,000 tonnes.[1]

Other ships as defined by Part XV of the Canada Shipping Act (CSA)

Any ship that is less than 400 GRT or any tanker less than 150 GRT is still covered by the *Canada Shipping Act (2001)* in that it must report the potential or actual pollution incident to a Pollution Response Officer, or in the case of an incident in Canadian Arctic Waters as defined by the Arctic Waters Pollution Prevention Act to a Pollution Prevention Officer. The ship must take immediate steps to mitigate or remedy the situation. These ships are not required to have a Shipboard Oil Pollution Emergency Plan nor an arrangement with a certified Response Organization.

3.7 External Resources

There are two main categories of external resources that the Canadian Coast Guard (CCG) will engage. These are the Response Organizations certified by Transport Canada under the *Canada Shipping Act (2001)* and other contractors.

Response Organizations (ROs)

Response Organizations are privately established pollution response companies certified by Transport Canada. These companies hold a certificate of designation to handle oil spills of up to 10,000 tonnes (T). Response Organizations can provide the polluter or any lead agency with the resources, trained personnel and operational management structure to deal with a marine oil pollution incident within its identified Geographical Area of Response (GAR).

The Eastern Canada Response Corporation (ECRC) is the only certified response organization in Central & Arctic Region. The company is certified to ten thousand tonnes (10 000T) and two of its three regions cover Central & Arctic Region.

[1] There is no requirement for an Oil Handling Facility nor a Legislated Ship to have an arrangement with a Response Organization certified by Transport Canada in Canadian waters north of 60° North Latitude

1) ECRC Great Lakes Region is managed from the Response Centre in Corunna, Ontario. Its area of coverage includes all waters
   - south of 60 degrees north in the provinces of Alberta, Saskatchewan, Manitoba and Ontario to that portion of the St. Lawrence River in the Province of Ontario
   - to a line drawn between Butternut Bay (Latitude 44 31' 12" north and Longitude 75 46' 54" west) on the Canadian side
   - to Oak Point (Latitude 44 30' 48" north and Longitude 75 45' 20" west) on the US side of the St. Lawrence River.

2) ECRC Quebec Region (also known as Societé d'Intervention Maritime Est du Canada - SIMEC) is managed from the Response Centre in Quebec City, Quebec and has staffed Response Centres in Verchères, Quebec and in Sept-Iles, Quebec. Their coverage includes:
   - James Bay, Ungava Bay and in Hudson Bay south of the sixtieth parallel North and that portion of the St. Lawrence River in the Province of Ontario
   - to a line drawn between Butternut Bay (Latitude 44 31' 12" North and Longitude 75 46' 54" West) on the Canadian side to Oak Point (Latitude 44 30' 48" north and Longitude 75 45' 20" West) on the US side of the St. Lawrence River.

There are no certified response organizations established north of 60° N latitude.

Although resources from the Response Organizations in the south may be made available for use north of 60°, they must obtain the necessary approvals to move equipment from their designated area of response.

Contractors

Private sector contractors may be engaged by the CCG as required. All standard government contracting rules apply.

Section 4 – PREPAREDNESS

4.1 Overview

Oil spill preparedness is defined by the advanced planning used to create systems to effectively and efficiently combat the range of spills likely to be encountered.

In Central and Arctic Region, preparedness involves:

- The development of regional procedures to be followed in the event of an incident, coordinated by the Planning section.
- The implementation, training and maintenance of the Response Management System (RMS) to manage and combat the incident.
- The identification of priorities, development of strategies, logistics and tactics necessary to fulfill those priorities, lead by the Planning section.
- The liaising with internal and external partners, clients and resources that may be involved in pollution response activities, lead by the Planning section.
- The training and continued maintenance and upgrading of skills, coordinated through the Training specialist.
- The exercising and quality assurance activities required to continuously reinforce the training and contingency planning activities, facilitated through the Exercise specialist.
- The asset management including the acquisition, lifecycle maintenance, operational readiness and storage of equipment lead by the Operations section and Inventory specialist.
- The integration of other Canadian Coast Guard Assets and Human Resources, when necessary, through the Training and Exercising processes.

The Memorandum of Understanding (MOU) between the Director General/Maritime Services (MS) and the Director General/Integrated Technical Support (ITS) of the Canadian Coast Guard (March 2004) specifies that the ITS Directorate will be the single CCG focus for the life cycle management of all CCG physical assets and for the development of all technical solutions. It is unknown when ITS will assume the services of design, procurement, in-service support and disposal of all equipment and systems required to satisfy ER's mandate. In the interim, ER will remain the focal point.

4.2 Response Management System (RMS)

The Canadian Coast Guard uses the Response Management System (RMS) as its emergency management system. It is based on, and operates under the same principles as the Incident Command System (ICS) which was developed in the U.S. to coordinate multi-agency responses to large forest fires. The system was adjusted to reflect the current marine oil spill response regime and Canadian law. The Canadian Coast Guard does not implement the ICS principle of unified command, but will participate in any command structure used by the Polluter or Other Lead Agency.

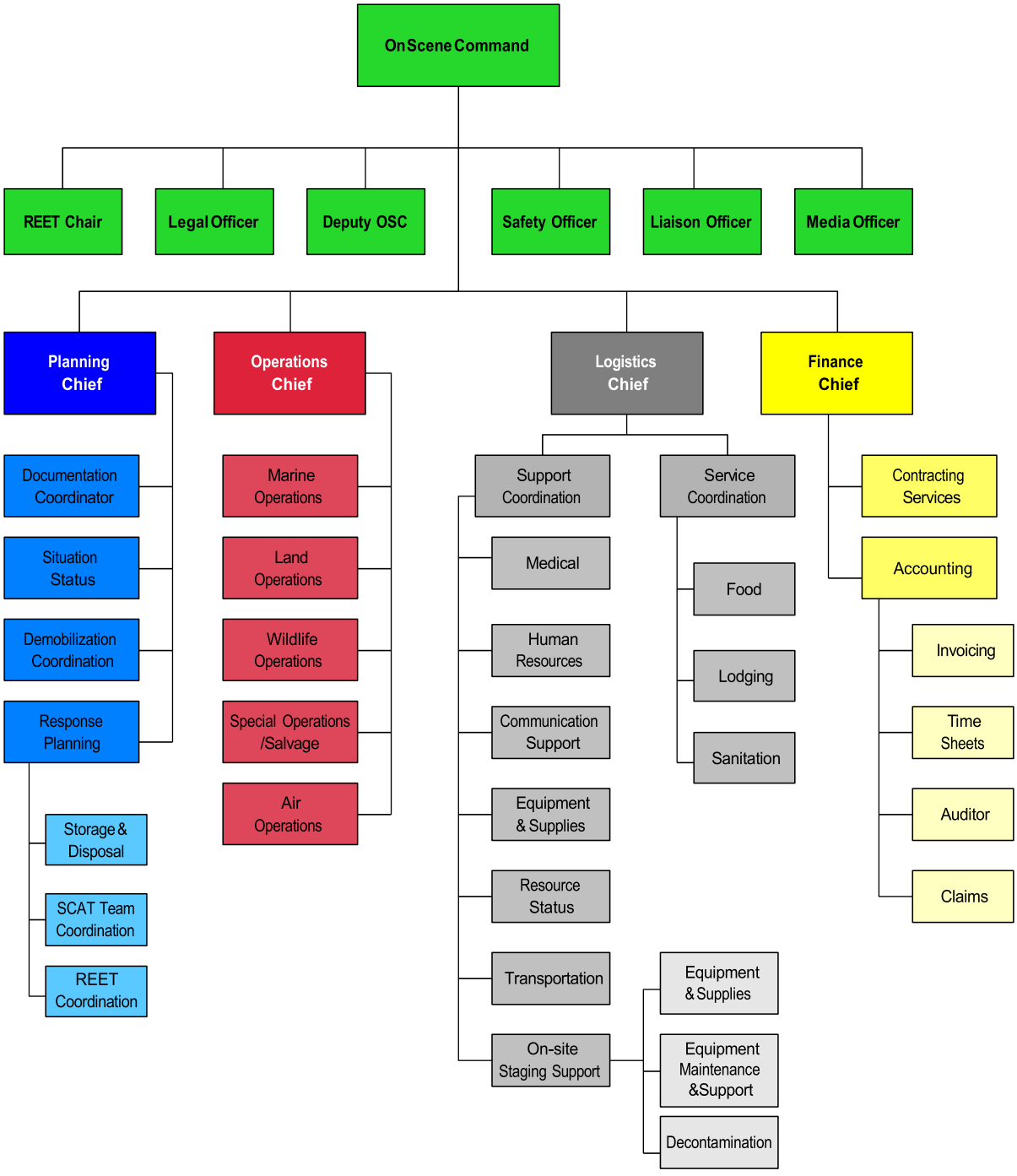
The RMS uses a “management by objectives” approach. It outlines the roles and responsibilities of individual positions, identifies the reporting structure, establishes a common set of terminology and uses standardized forms and paperwork. The central document in the RMS process is the Incident Action Plan, which documents the existing conditions and outlines objectives and strategies for recovery and response.

The system structure is designed to expand or contract to best fit the specific circumstances of the incident. Not all positions within the system will be staffed for every incident; in those cases the supervising position shall be responsible for all subordinate tasks/roles. Regional staff members have been designated as members of the Regional Response Team and may be called upon to fill specified roles in this management system (see Figure 4.1 for a fully expanded system design).

The system also contains management tools that can be used by the On Scene Commander and response personnel to better manage the system and the spill incident. These tools include a field operations guidebook, forms, reports, established meeting schedules and agendas. The RMS will also be used by the Federal Monitoring Officer and their Incident Monitoring Team while monitoring the Polluter’s response to an incident.

The detailed RMS process is contained in a separate document referenced in Section 9.1 of this plan (Response Management Systems User’s Guide, Version 3.0 (May 2006)).

Figure 4.1 - CCG RMS Command Structure



4.3 Planning

Area Plans

To facilitate an effective and efficient response, Canadian Coast Guard administers 16 area plans as an annex to the Central & Arctic Regional Response Plan. They are Keewatin, Baffin, Beaufort Sea & Amundsen Gulf, Great Slave Lake, Hudson & James Bay, Kitikmeot, Mackenzie River & Delta, Inland Waters S of 60, Lake Erie, Lake Huron, Lake of the Woods, Lake Ontario, Lake Superior, St. Lawrence, St. Mary's and St. Clair & Detroit areas. These plans incorporate detailed response information for specific manageable geographic areas or response communities. The normal operating period for an area plan is the first 12-24 hours of a spill response.

They are developed and maintained as follows:

1) Risk Analysis
   The risk analysis determines which communities or areas are most likely to be endangered by a potential oil spill and why, their associated environmental sensitivities, plus the typical type of spill that could be expected. When considering the environmental sensitivities, the focus is on what is most likely to be impacted and to consider as many factors as are applicable. A single factor discovered in the risk assessment is just one of many layers in the decision to make a site a priority.

2) Priority Identification/Verification
   Current priorities are discussed with members of the Regional Environmental Emergencies Team (REET) at planning meetings. It provides the opportunity for additions, deletions or modifications. Where there are no REET meetings held, community consultations are organized by the Planning section.

3) Strategy and Tactics Development
   Canadian Coast Guard determines RMS objectives for the agreed upon priorities. Strategies are designed, that name the activities relative to those objectives. Those activities may be response actions to be implemented, or may be the type of resources that could be affected by the spill. For area plan development, tactics provide the detail for implementing the selected strategies. Tactics then specify the resources, both human and equipment, to facilitate, to install or to maintain the strategy.

4) Updating
   Area plans are reviewed and updated annually.

Regional Procedure Development

Regional procedures for notification, verification, activation and cost recovery of a response are all described in the *Central & Arctic Regional Response Plan* of the *Canadian Coast Guard National Response Plan*. Supporting documentation in the

form of Standard Operating Procedures and supplementary plans (e.g. Health & Safety Plan and Media Relations Plan) are not included in the Regional Response Plan but are referenced in Section 9.

Liaison with External and Internal Partners, Clients and Resources

To ensure that all partners, clients and resources are aware of the Canadian Coast Guard's mandate and responsibilities as they pertain to pollution preparedness and response, the Environmental Response Planning Section takes the initiative to:

- Work with Internal Partners within Fisheries & Oceans to communicate the branch's needs in the event of a pollution incident.

  Exception: Coordination of the Duty Officer (DO) function between Environmental Response (ER) and the Regional Operations Centre (ROC) is coordinated by the Regional Emergency Operations Officer REOO).
- Work with other government departments that have a mandate for pollution response within their jurisdiction to communicate the role that Canadian Coast Guard plays in marine and freshwater pollution incidents and to share what resources Canadian Coast Guard maintains for pollution response activities and the mechanism to access these resources in the event that another Lead Agency may require them for a non-CCG mandated spill or other type of emergency.
- Liaise with potential clients (oil handling facilities, shipping companies and other operators) so that CCG expectations in the event of an incident are understood.
- Provide copies of area plans to CCG vessels that are relevant to their area of operations. CCG ER will brief Operations at the pre and post season conferences on any changes to the plans and/or to the captain and/or crew's responsibilities.
- Maintain a network of contractors that can provide services to Canadian Coast Guard in the event of a pollution incident that exceeds the resource capability of the region.
- Upon request of the Regional Advisory Councils (RACs) or Secretariat (Transport Canada) on Marine Oil Spill Response, provide information on Central & Arctic Region's preparedness and spill response activities.

Arctic Community Emergency Plans

The Canadian Coast Guard is committed to assisting Arctic communities in the development of the marine pollution component of their Community Emergency Plans. This commitment was made in 1999 when the CCG Arctic Response Strategy (ARS) was published. The Arctic Response Strategy has since been re- assessed and viable components have been incorporated into the text of this Plan.

4.4 Training Program and Curriculum

Introduction

The Training Curriculum of the Environmental Response Branch is focused on providing the necessary skills and knowledge for responders to function effectively during a spill response operation. As the competencies required for an effective spill response are described and organized within the Response Management System (RMS), so too can the training curriculum be described in the context of RMS.

With RMS as the framework for spill response, all response team members will be trained in theory and application of RMS. The level of training complexity will vary by level of individual responsibility, but all members will have fundamental knowledge of the structure and processes that drive the RMS.

In addition to the training curriculum described in this section, it is understood that there are competencies and certifications required that are not specific to ER or spill response. These would include driver's licenses, radio operator's licenses, and familiarity with basic electronic equipment such as phones, fax machines, cell phones and laptop computers.

Training Curriculum

Command Staff

During a spill response operation, the command staff will vary depending on the size and complexity of the spill.
On a smaller spill, senior ER staff members may be appointed to command positions with few subordinate or supporting positions.
On larger scale spills, the OSC may be the Director of Maritime Services, or Assistant Commissioner Canadian Coast Guard, with multiple support positions from ER staff, CG fleet, base personnel and contractors.

To adequately prepare personnel for the management functions of spill response, the following curriculum has been identified:

On Scene Command Course (OSC)
This course trains participants in all aspects of spill response including planning, implementation, and supervision. Other topics include legislation, legal issues, financial responsibilities, and media relations. Prerequisites include BOSRC, MSROC, PPO designation, media relations and management training.

Response Management System Course (RMS)
The current RMS curriculum is an introductory two-day course on the system and its user's guide. It is anticipated that future development will include multiple levels of training which will include organizational structure and

responsibilities, as well as in-depth requirements of each position within this emergency management structure.

Federal Monitoring Course (FMO) - Proposed
Subject to national development, this course will augment the On Scene Command Course to provide those persons designated as Canadian Coast Guard Federal Monitoring Officers the necessary skills and knowledge to perform FMO duties.

Operations Section

During a spill response operation, the operations section of the RMS may be populated by regional ER staff, CCG fleet officers and crew, CCG/DFO base personnel or contractors. The resident knowledge of this group will vary, and a comprehensive ER training program exists to train responders in spill response operations. Training for members of the CCG Regional Response Team (RRT) personnel is offered in the following three areas:

(a) Safety Training
(b) Operational Training
(c) Specialty Training

(a) Safety Training

Health and Safety training is required to ensure compliance with federal and provincial legislation with the ultimate goal of ensuring the health and safety of response personnel. Additional video and printed reference material is available through the Canadian Coast Guard ER Training Officer.

Site Safety Course
The Site Safety Course is designed for response personnel prior to commencing work on a response site. Topics include employer and employee responsibilities, classification and hazards of petroleum products, and the safety practices and considerations associated with both water-based and shore-based operations. Site safety training is mandatory for Regional Response Team members and all volunteers or short time workers who may be employed during a response.

Workplace Hazardous Materials Information System (WHMIS)
This 3-hour course is provided to Canadian Coast Guard employees to ensure compliance with appropriate worker safety legislation. It was developed to ensure workers have the necessary information to work safely with hazardous materials in their workplace.

First Aid/CPR
This 16 hour course provides the participants with the skills and knowledge to successfully obtain the St. John Ambulance Standard First Aid Certificate. The primary focus of this 14-hour course is to provide adequate knowledge

and level of skill to persons in positions of responsibility to provide for persons suffering from respiratory and circulatory arrest. Preventative measures are discussed.

Small Non-Pleasure Vessel Basic Safety Course - MED A3
The 8-hour MED A3 course is *required by regulation* for crewmembers of small non-pleasure vessels of not more than 150 GT operating not more than 20 miles offshore. Topics include marine hazards and emergencies, marine firefighting, lifesaving appliances and abandonment and survival and rescue skills.

Transportation of Dangerous Goods (TDG)
This 6-hour course provides personnel with the responsibility for the transportation of dangerous goods to be aware of and comply with safety measures and appropriate legislation concerning TDG.

(b) Operational Training
There are various levels of oil spill response courses designed for response team members, ships crews and other responders who may be expected to assist with marine oil spill response. Operational training related to the assessment and response to petroleum spills is delivered by ER while training for response to hazardous and noxious materials spills is obtained outside of the Branch.

First Responder Oil Spill Training (FROST)
This 1 day course is designed specifically for CCG personnel in Central & Arctic Region who are designated custodians of First Response Units (FRUs), and may be tasked with deployment of the pollution countermeasures equipment. It has also been adapted for use in communities north of 60° where Arctic Community packs function as first response units.
It teaches First Responders to:

- assess an oil spill according to its extent, possible source and likely behavior
- deploy boom for containment and protection purposes and in support of response activities
- work safely at the spill site

Basic Oil Spill Response Course (BOSRC)
This 20 hour course instructs First Responders how to:

- assess an oil spill according to its extent, possible source and likely behavior
- deploy boom for containment and protection purposes and in support of response activities
- operate oil recovery equipment
- undertake basic shoreline cleanup operations
- work safely at the spill site

Marine Spill Response Operations Course (MSROC)

This 40-hour course will enable trained and experienced personnel to coordinate and supervise the response operations of a marine oil spill. It is intended to train individuals to be On Scene Commander (OSC) for small (tier 1) spills, or operations section chief on larger spills. Topics include legislative framework, safety, equipment suites and strategies, media relations, RMS, shoreline assessment and cleanup techniques, and disposal. Prerequisites include BOSRC, a Radio Operator License and current or future deployment to a spill response team.

Environmental Response Duty Officer (ERDO) Training

This 15 hour course is a prerequisite for duty officers for the ER branch and the regional operations centre. It introduces the participant to CCG mandate, lead agency responsibilities and introductory spill assessment techniques. It also integrates delivery of training on the Marine Pollution Incident Reporting System (MPIRS), the database used to capture spill report and response information.

Pollution Response Officer (PRO) Training

This three day course is currently provided by the Environmental Response Branch of the Canadian Coast Guard and is required training for all Environmental Response personnel. Participants who successfully complete this course earn the designation of Pollution Response Officer under Part 8 of the Canada Shipping Act (2001). This course examines the powers of a PRO, specific procedures related to vessel directions and detentions and the legal framework and implications surrounding the execution of those powers. Course participants also learn sampling procedures and gain an understanding of the role of other government agencies involved in a marine pollution incident.

Pollution Prevention Officer (PPO) Training

This 40 hour course is currently provided by the Marine Safety Branch of Transport Canada. It is a prerequisite for any officer of the Canadian Coast Guard to be delegated Pollution Prevention Officer (PPO) powers under the *Arctic Waters Pollution Prevention Act*. Participants learn the existing pollution prevention and response regime, the powers of a PPO and the specific tasks of prevention, control, investigation and prosecution.

Small Vessel Operator Proficiency

This 21-hour course meets the training needs of the small vessel master. This course is required by regulation (for vessels less than 5GT on sheltered and near coastal voyages) and teaches participants to effectively manage safety of those on board, protect the vessel from damage and protect the marine environment.

Basic Barge Operator Training
This course was developed and is delivered by regional ER staff. Through both classroom and practical sessions, the course introduces participants to safe boating practices and procedures, rules of the road, collision regulations, load plans for pollution response vessels, safe deployment of oil spill response equipment and basic trailer towing and maneuvering.

Single Side Sweep System
The single side sweep is an equipment suite designed to allow one vessel to perform oil containment and recovery, and allow for temporary storage. This two day training session is provided to some ER staff and crews of Canadian Coast Guard vessels that can support this equipment. This training typically is conducted with crews who have previously completed BOSRC.

HAZMAT Awareness
This 6-hour course is intended for First Responders on the scene of a hazardous materials incident and shows how to assess the incident. Topics include; First Responder's role and responsibilities, scene safety, recognizing and identifying hazardous materials, incident management, and sources of assistance.

HAZMAT Technicians Level
This 40-hour course is designed for responders to releases or potential releases of hazardous substances. The focus is on recognizing and evaluating a hazardous materials incident, organizing the response team, protecting response personnel, identifying and using response resources, implementing basic control measures, decision-making, and protecting the public and environment. Emphasis is on hands-on use of equipment practically applying lecture information through exercises. Participants will wear fully encapsulating suits.
Prerequisite: Hazmat Awareness.

(c) Specialty Training
Specialty training includes training that only select members of the Regional Response Team (RRT) will have to apply.

Shoreline Clean up and Assessment (SCAT)
This 24-hour course covers how oil impacts the shoreline. Specific topics include shoreline types and effects of oil, wind, waves and ice on shorelines. Shoreline protection and cleanup methods are described in depth. Field exercises are conducted as part of the training.

Media Training
This 16-hour course is designed to provide participants with the skills and knowledge to communicate effectively and proficiently with various forms of media. Topics include; developing and disseminating incident information to

news media, incident personnel, other appropriate agencies and organizations.

Communications System Training
This 8 hours hands-on course provides participants with the knowledge and skills to provide communications in support of a spill response. Topics include; mobile telephone, fax, and intercom set up, preparing communication plans, and internal/external spill response communications.

Wildlife Rehabilitation
The capture and treatment of oiled wildlife is typically assigned to the trained experts at Canadian Wildlife Service (CWS). This CWS training is periodically made available to outside agencies, and some ER staff may participate to facilitate a better understanding of each others' role at the time of a spill.

Financial Management
This training is provided by the Public Service Commission (PSC) and teaches government spending and cost accounting principles. It is imperative that any response team member who may have to purchase assets or manage contracts be familiar with these practices and procedures.

Planning Section

During a spill response operation, the planning section of the RMS will likely be populated with ER staff whose substantive positions are as Planning Officers within the branch. Therefore, the planning skills and training required to effectively and efficiently perform these tasks should be resident within our branch staff.

Should additional personnel be required to fulfill these roles, they would require training in RMS, as well as Site Safety (as required by OSH regulation). The required planning skills and spill response knowledge may be acquired through various training or experience factors, and would be assessed prior to assignment on the response team. In addition to planning skills, preferred training might include SCAT, FROST and/or BOSRC, and MSROC.

Logistics Section

During a spill response operation, the logistics section of the RMS will likely be populated with ER staff whose substantive position involves the tracking of spill response equipment inventory and human resources within the region. Therefore, the skills and training required to efficiently and effectively perform the logistics function should be resident within our regional ER staff.

Should additional personnel be required to fulfill these roles, they would require training in RMS, as well as Site Safety (as required by OSH regulation). The required logistical skills may be acquired through various training or experience factors (knowledge of IRCMS and TMA, BOSRC training) and would be assessed prior to assignment on the response team.

Finance Section

During a spill response operation, the finance section of the RMS will likely be populated by regional finance staff whose substantive positions involve government expenditure and cost accounting knowledge and application. Therefore, the skills and knowledge required to effectively and efficiently perform the finance function should be resident within regional Canadian Coast Guard staff. These personnel will require RMS and Site Safety training prior to deployment on a spill response team.

Training Records

Records for personnel trained in spill response and/or emergency management are maintained by the Region.

4.5 Exercise Program

Introduction

Under the guidelines of the National Exercise Program (NEP), the Environmental Response Branch will implement a Regional Exercise Program. This program will be conducted over a three-year cycle. Coordination of the program will be the responsibility of the Regional Exercise Officer (RXO) of the Environmental Response Branch. Exercises will be designed and conducted in coordination with departmental staff, CCG base staff and CCG vessels on a regular basis. The purpose of the Regional Exercise Program is to validate environmental response training and regional emergency preparedness standards, policies and procedures.

Canadian Coast Guard will, through regional and area-specific exercising, ensure high priority initiatives such as exercising complex equipment (i.e. Lori Brush skimmers, sweep systems and command/communications facilities) are undertaken and will use industry and private sources of personnel where possible and/or appropriate.

Exercise Planning Matrix

The matrix below represents a typical three year exercising cycle followed by Canadian Coast Guard. The program cycle is designed to test all 17-response functions as outlined under NEP as well as including the different types of exercises. It includes internal, external (with other government departments as well as private sector organizations) and international exercises.

Table 4.1 *- Central & Arctic Region Exercise Matrix*

EXERCISE TYPE	YEAR1	YEAR2	YEAR3
Notification	**Quarterly**	**Quarterly**	**Quarterly**
Management	**2**	**2**	**2**
Operational drills	**3**	**3**	**3**
Combined Functional	**1**	**1**	**1**
Full Scale	**0**	**1**	**0**

Notification exercises will test the regional call-out system. Some of these exercises will be internal to the branch, some will be a full regional call-out to all CCG and DFO staff as well as to external resources (eg: freight contractors to check their availability to move Marine Emergency Response Trailers (MERTs) or First Response Units (FRUs).

Management exercises will focus on the development of the spill through the Response Management System (RMS).

Operational Drills will focus on equipment deployments in packages (i.e. a First Response Unit, NOFI V-Sweep).

Combined Functional exercises will be an equipment deployment (operational drill) with the goal of implementing a tactic designed in one of the Region's Area Plan Annexes.

A *Full Scale* exercise will incorporate a management-type exercise with the concurrent deployment of a spill countermeasure system (system = pollution containment, recovery, primary and secondary storage devices)

Exercising Partnership

Canadian Coast Guard will endeavor to participate, by request and on a situation by situation basis, in exercises lead by Oil Handling Facilities (OHFs), certified Response Organizations (ROs) and other government agencies throughout the Region.

Central and Arctic Region is a part of the Canadian Coast Guard response community and as such is also part of the International Response Community. Canadian Coast Guard's regional boundaries are in such close proximity with our United States neighboring response communities that joint exercising is a high priority. Specifically this region conducts joint exercises in the geographic areas of the Great Lakes and the Beaufort Sea with the United States Coast Guard's (USCG) (9th) ninth (Great Lakes) and (17th) seventeenth (Alaska) districts, respectively.

Exercise Evaluation and Shared Learnings

An important part of the National Exercise Program is the evaluation and use of subsequent findings. Four types of information can be learned from an exercise, all of which lead to improvement of overall response capability.

1) Contingency planning
2) Response techniques
3) Response training
4) Exercise program development

The primary sources of the information and learning will be the formal exercise evaluation report that is produced for every exercise by the evaluation team. This formal exercise report will follow the format laid out in Section 11 of the *Canadian Coast Guard National Exercise Program Planning and Evaluation Guide*.

4.6 Inventory Management, Maintenance and Infrastructure

Inventory Response Control Management System

To ensure that a nationally consistent and effective state of preparedness is maintained, an Inventory Response Control & Management System (IRCMS) has been implemented which utilizes The Management Authority database as its main tool. CCG HQ administers this system in concert with regional IRCMS Officers. In this region the program is administered by the Logistics and Statistics Officer in the Operations Section.

This system has been developed to:

- Maintain a real time record of the location and quantity of resources;
- Maintain a proper state of readiness through a pro-active approach using work orders and preventative maintenance;
- Assist in keeping response managers informed about Environmental Response's state of preparedness;
- Assist in the tracking of National Response Team personnel or equipment assigned to National or International incidents

Pre-positioned Equipment Caches and Depots

Central and Arctic Region covers an extremely large geographical and culturally diverse portion of Canada. There are, in essence, two zones of operation which are entrenched in the *Canada Shipping Act*. These are:

- the Arctic Zone, or all areas of Canadian jurisdiction north of 60^0 North Latitude; and
- the Central Zone, dominated in a marine transportation sense by the Great Lakes, but which include the southern portions of Hudson and James Bay, along with the major waterways and watersheds of Lake Winnipeg, Winnipegosis, Lake of the Woods, and Lake Athabasca.

The Environmental Response (ER) Branch has pre-positioned equipment to facilitate and maintain an effective response operation. Response strategies in each of the two zones (Central or Arctic) are based upon identification of local and regional response. This is means that the equipment generally required for such a spill size is contained within the Region. This capacity is supplemented by nationally available resources, which would be "cascaded" from/to other regions when and if required. Preparedness capacities in other regions are identified in their respective Regional Response Plans.

Arctic Zone

Arctic Community Packs (ACPs) are placed in northern communities for rapid (local) initial response. Canadian Coast Guard provides initial response training to members of the communities so that they may effectively deploy equipment in the ACPs in the event of a spill. Access (keys) for the ACPs have been given to an official in each community in most cases. The Senior Response Officer (ER-Hay River) maintains the current key holder listing.

The inventory for each Canadian Coast Guard Arctic Community Pack location is listed in Table 4-2. The program has received funding under the Health of the Oceans Initiative to proceed with placing Arctic Community Packs in additional sites. The equipment profiles at the existing Arctic Community Pack sites will be changed to reflect characteristics of the community. The inventory at all communities will be "site specific" and will coincide with response strategies designed by the ER planning group. The locations for the proposed additional Arctic Community Packs are: Baker Lake, Broughton Island (Qikiqtarjuaq), Chesterfield Inlet, Churchill, Hall Beach, Kimmirut, Iqaluit, Pangnirtung, Tuktoyaktuk and Yellowknife.

The main base of operations with Environmental Response dedicated personnel is located in Hay River, Northwest Territories. This base is home to a Rapid Air Transportable (RAT) cache of equipment known as the "RAT150". The RAT150T used in conjunction with the "Delta" (Δ) 1000T meets planning standards for a 1000 tonne (T) response. The selection of equipment for the RAT150 must meet pumping rates / capacities of 1000T thresholds and be complimentary[2] to the equipment held in the Δ1000T depots.

The response package, warehoused in Hay River, will be maintained in 100% readiness during the shipping season. The equipment will be broken down and be containerized such that it will fit through the smallest cargo door of any of the selected aircraft. Equipment will be TDG compliant, be palletized as appropriate, and labelled for ease of selection and loading.

[2] The logistics of moving large bulky items (ISO containers) in the arctic necessitates a LCM, deck barge, cargo vessel, icebreakers or any combination thereof. Consequently it is estimated that the 1000T design capacity would be available staged on-scene in 5 - 7 days. Following the doctrine *something sooner rather than everything later* having 150T of the 1000T equipment suite air-lifted within 48 hours is preferable to having nothing until the entire 1000T capacity arrives a week later.

Table 4-2 *- Canadian Coast Guard Arctic Community Pack Locations*

LOCATION	EQUIPMENT SUMMARY			
	Boom (24")	**Skimmers**	**Boats**	**Storage**
Arctic Bay (Ikpiarjuk)	3,650'	TDS-118	16' Aluminum	Open top Tank
Cambridge Bay (Ikaluktutiak)	1,350'	TDS-118	16' Aluminum	Open top Tank
Cape Dorset (Kinngait)	1500'	TDS-118	16' Aluminum	Open top Tank
Clyde River (Kangiqtugaapik)	4,500'	TDS-118	16' Aluminum	Open top Tank
Coppermine (Kugluktuk)	1,350'	TDS-118	16' Aluminum	Open top Tank
Coral Harbour (Salliq)	1,500'	TDS-118	16' Aluminum	Open top Tank
Gjoa Haven (Uqsuqtuuq)	1,350'	TDS-118	16' Aluminum	Open top Tank
Holman (Ulukhaktok)	1,500'	TDS-118	16' Aluminum	Open top Tank
Rankin Inlet (Kangiqsiniq)	2,200'	TDS-118	16' Aluminum	Open top Tank
Resolute (Qausuittuq)	1,350'	TDS-118	16' Aluminum	Open top Tank
Hay River FRU +	1,000'	-	37' Seatruck 42' Cutter	-

In combination with the RAT150T, equipment found in the ∆1000T depots will be at a 1000T capacity. Hence, the delta or "∆" is the difference between the RAT150T and a full 1000T. The ∆1000T depots will have containerized heavier equipment (not suitable for air transport to smaller communities) augmenting the RAT150T to a 1000T capacity, ready to be loaded on deck barge, Canadian Coast Guard icebreaker or freighter. While response personnel cascade in to the spill site pre-identified local, CCG base and available ER personnel will mobilize to the centres and load the equipment on suitable marine transport.

Three ∆1000T depots are strategically located in the northern communities of Tuktoyaktuk (NorthWest Territories), Iqaluit (Nunavut), and in Churchill (Manitoba). For the purposes of response in Central & Arctic Region, Churchill is included in the Arctic Zone of operations despite it being south of 60° North Latitude due to the similarities in response characteristics that it shares with locations north of 60° North Latitude.

Table 4-3 *- Canadian Coast Guard Arctic Design Inventory*[3]

PCM equipment	Description	Hay River RAT150T	Tuk Δ1000T	Iqaluit Δ1000T	Churchill Δ1000T
Skimmers	Light to medium product /disk type	3	1	1	1
	Heavy product /weir type	0	2	2	2
Boom	24" river type	0	10000'	10000'	10000'
	24" lay-flat type	5000'	0	0	0
Land storage	4T Open top tank	0	0	0	0
	8T Open top tank	7	3	3	3
	45T shore bladders	3	0	0	0
O/w storage	Total (in 5-25T Seaslugs)	50	250T	250T	250T
Pumps	2" low pres / volume style	4	1	1	1
	4" trash	5	1	1	1
	3" positive displacement	6	1	1	1
Vessels	"Car-topper" + 9.9hp	0	0	0	0
	Seatruck	0	2	2	2
	RAT RHI	2	0	0	0
Generators	5KW gas	7	2	2	2
Pressure washer	Larger hot water type	1	1	1	1
	Small cold water type	3	1	1	1
Incinerator	Sorbent	2	0	0	0
	Liquid waste	2	0	0	0

Central Zone

The Central zone is dominated by the Great Lakes and has well defined road transportation infrastructure.

Local / first response inventories have been established at all regional Canadian Coast Guard shore-side facilities that have fleet assets or a significant number of program vessels and that have operational personnel to deploy the equipment. Standardized inventory consists of a 20-24' trailer with a 1000' (nominal) of 24" boom and related accessories.

The 2500T Rapid Road Transportable cache is centred around the St. Mary's River and from time to time in major CCG facilities in Ontario. The response package warehoused in a series of 45' transport trailers will be maintained in 100% readiness during the shipping season. The primary purpose of the RRT 2500T system is significant containment of resources; shoreline, sheltered, and off-shore sweep and recovery ability; and staging and storage transfer area equipment.

[3] Inventories in Tuktoyaktuk and Iqaluit are at 95% completion. The Churchill Depot is at about 50% (pending the construction of a new and adequate facility) with the bulk of the inventory in storage at the Thundar Bay Coast Guard base. The RAT 150 needs an evaluation of the command and control component as well as storage for the second Saccke burner.

Table 4-4 *Canadian Coast Guard RRT 2500T Design Inventory*

PCM equipment	Description	BOOMERT #1-5 (each)	SKIMMERT #1 and #2[4]	Softside
Skimmers	Light to medium product/ disk type	-	3	
	Heavy product/ weir type	-	1	1
Boom	24" river type	4000'		
Sweep	36" Nofi V-sweep	-		1
Land storage	4T Open top tank	-	7	1
O/w storage	25T Towable bladders	-	4	4
Pumps	3" positive displacement	-	4	1
Generators	5KW gas	-	2	

Table 4-5 *Canadian Coast Guard locations for First Response Units (FRUs)*

Location	Relevant Area Plan(s)	Primary custodian	Secondary custodian
Amherstburg	Lake Erie/St. Clair-Detroit	SAR crew	ITS field services
Cobourg	Lake Ontario	SAR crew	
Gimli	Lake Winnipeg	SAR crew	
Goderich	Lake Huron	SAR crew	
Kenora	Lake of the Woods	ITS field services	
Kingston	Lake Ontario	SAR crew	
Meaford	Lake Huron	SAR crew	
Parry Sound	Lake Huron	ER personnel	ITS field services
Port Dover	Lake Erie	SAR crew	
Port Weller	Lake Ontario	SAR crew	
Prescott	St. Lawrence River	ER personnel	ITS field services
Selkirk	Lake Winnipeg	ITS field services	
Thunder Bay	Lake Superior	SAR crew	ITS field services
Tobermory	Lake Huron	SAR crew	
Hay River	Mackenzie River & Delta	ER personnel	ITS field services

[4] An additional SkimMERT is being added this year to accommodate additional hoses. The exact configuration of each SKIMMERT is not known yet so the inventories will remain listed together for this year.

Section 5 - RESPONSE OPERATIONS

5.1 Pattern of Response

Based upon the principles outlined in the *National Response Plan*, *(Sections 1.3, 1.5 & 4.4),* Central and Arctic Region assesses, notifies relevant parties, and initiates the tasking/deployment of necessary resources. This is based upon the determination of CCG's role as Lead or Resource Agency and the appropriate CCG Posture. The Duty Officer (DO) is tasked with this initial assessment, which is then verified by the Superintendent, Environmental Response. The appropriate response is activated by the Superintendent who in turn assigns an On-scene Commander (OSC) or Federal Monitoring Officer (FMO) and notifies Canadian Coast Guard (CCG) Management. Upon termination of the incident cost recovery actions are undertaken. To illustrate the generic process see Figure 5-1-Typical Sequence of Events and Table 5-1-Typical Functions Descriptions has been provided.

CCG Expectations of Ships for Response

In most instances when a spill occurs the initial report will trigger the mobilization of local response organizations. It is not normally practical for ship personnel to be directly involved in the clean up activities.

Small Spills

Ships are expected to take whatever actions listed in their Shipboard Oil Pollution Emergency Plan (SOPEP) that are reasonable and necessary to prevent the oil from escaping over the side and having done so, to take action to clean-up the oil contained on deck. Spilled oil should not be washed overboard, nor should degreasers or dispersants be used on spilled oil in the water. Once the oil is in the water, the ship's ability to respond in a practical manner is greatly reduced. It is Canadian Coast Guard's expectation that a response organization or other competent contractor be called upon to provide operational response capability at the discretion of the Polluter.

Where there is no availability of local response contractors or where there is a delay in response activation, the Master of the vessel should consider the use of available materials to contain and clean up the spilled oil by, for example, using ship-stocked absorbent material or utilizing mooring ropes or air filled hoses as makeshift booms.

Large Spills

The ship is restricted as to what action it can take to respond to a major spill. In the case of a casualty the safety of the ship and crew take priority. Therefore the ship's actions will be limited to reporting the incident details

to the appropriate authorities and to ensure that a response is initiated. In large spills it is Canadian Coast Guard's expectation that the Polluter appoint an On-Scene Commander (OSC) which may be a representative of the company that owns the ship or the ship's insurer.

Canadian Coast Guard needs to be kept informed as to the escalating response costs accrued by the Polluter during a response in order to prepare for the possibility that the Polluter will cease their response activities once their Limit of Liability is reached.

CCG expectations of Oil Handling Facilities (OHF) for Response

In most instances when a spill occurs, the initial report will trigger the mobilization of the facility response team. It is normal, in most cases, for the oil handling facility personnel to be the initial responders when a spill occurs.

Small Spills

For the purpose of this plan, a small spill will be defined based on the maximum oil transfer rate of the oil handling facility (i.e. what Level it is assigned under the *Canada Shipping Act, 2001),* which directly links to the minimum spill size to which it must be prepared to respond to within one hour. Oil handling facilities are required to have the resources on site to contain a spill of a minimum size within one hour and have the resources required to recover, or where the oil cannot be recovered the resources to control a spill of a minimum spill size within six hours. Response organizations may be called upon to provide additional operational response capability at the discretion of the Polluter.

Large Spills

For the purposes of this plan, any spill above the facility's minimum spill size will be characterized as a large spill. Oil handling facility personnel are still expected to deploy their on-site equipment. Response organizations will likely be called upon to provide additional operational response capability at the discretion of the Polluter.

Figure 5-*1 - Pattern of Response – Typical Sequence of Events*

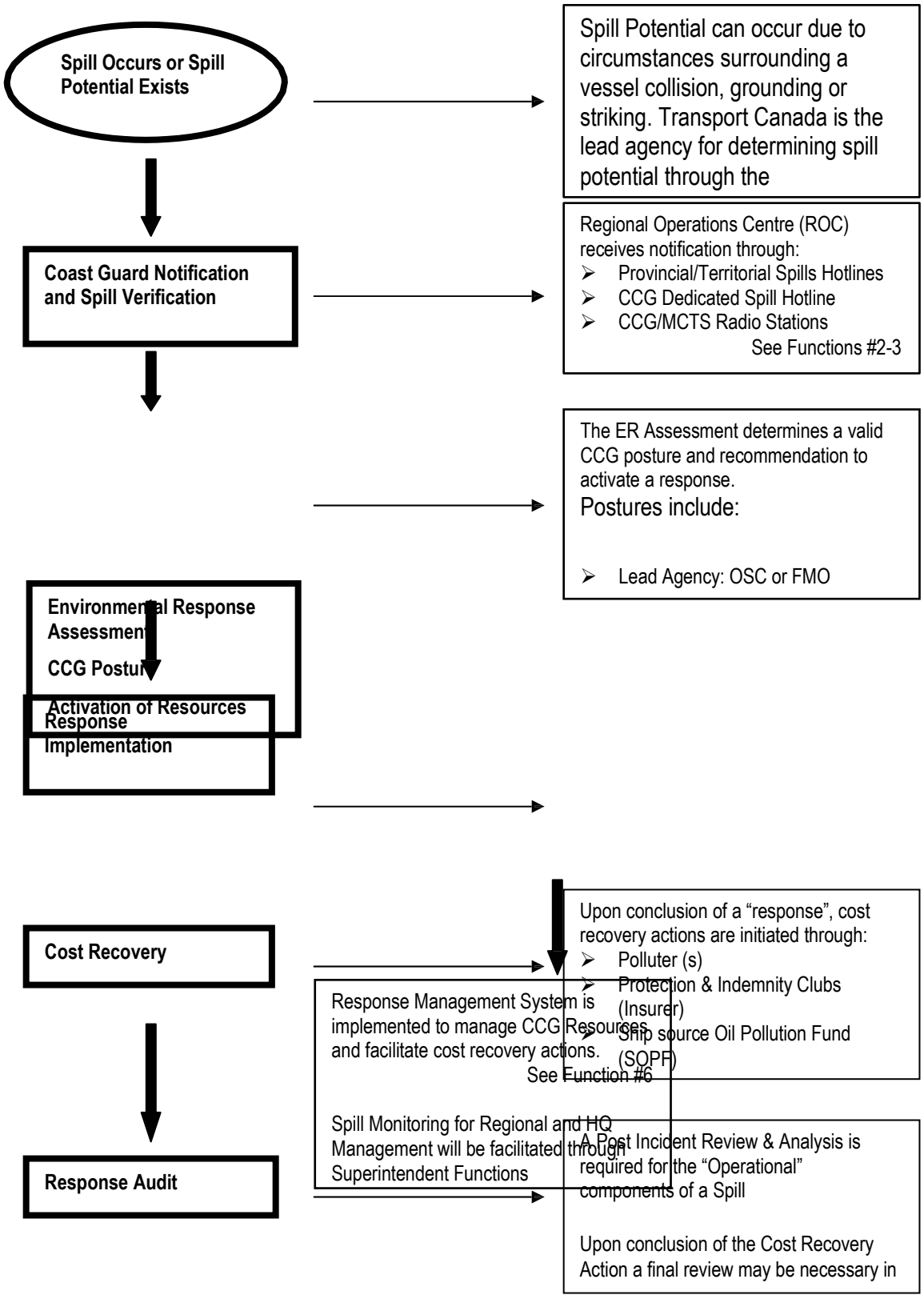


Table 5-1 *- Pattern of Response – Function Descriptions*

Function		***Description***
1	**Responsible Party/Third Party Functions** *(Spill occurs or sufficient potential risk exists)*	• Spill is sighted/reported. Spill reports originate from source (to regulatory body) or by third party (to various emergency or dedicated pollution hotlines) • Transport Canada is responsible for determining potential risk
2	**Spills Hotline Functions** *(Canadian Coast Guard Notification)*	• Assessment for dissemination • Dissemination (fan out according to applicable procedures) to relevant parties, calls from other spill hotlines are received by CCG-ROC.
3	**CCG-ROC Duty Officer Functions** *(Canadian Coast Guard Spill Verification)*	• Spill Assessment-pollution verification ➢ Mandate Confirmation ➢ Pollution Verification ➢ Source Credibility • Notification to ERDO • Dissemination • Initiation of MPIRS
4	**ER Duty Officer Functions** *(Environmental Response Assessment – CCG Posture)*	• Spill Assessment-response analysis • Source Control/Mitigation • Safety Issues • Tactical & Logistical Issues • Recommendation to Superintendent of likely Response Posture • Documentation – MPIRS
5	**Superintendent Functions** *(Environmental Response Assessment – Activation of CCG Resources)*	• Response Posture Evaluation ➢ Potential Risk to CCG Personnel and Equipment ➢ Propriety of request ➢ International Implications • Identification of OSC/FMO • Obtain an Order-In-Council (Arctic) • Obtain a Finance Code & Regional File Number • Notification of Senior Management and ongoing monitoring • MPIRS documentation • Obtain AC CCG sign off on MPIRS situation report
6	**OSC/FMO Functions** *(Response Implementation*	• Management or monitoring of response using the Response Management System (RMS). Escalation or de-escalation in accordance with needs of the incident. • Consolidation of all documentation upon conclusion of the response for Cost Recovery purposes. • Coordinate final debrief to facilitate future improvements to the systems and processes in place.
7	**Chief Financial Officer Function** *(Cost Recovery)*	• Utilizing CCG Ship-source and Marine Pollution Response Costing Principles and Documentation Standards (DFO 6332) compile pollution response costs recovery claim.

8.	**Internal** **Review Team Functions** *(Audit)*	• Utilizing the National Exercise Program Planning and Evaluation Guide, a Team is selected to complete the Post-Incident Review of an incident. • Improvements & corrective actions are to be documented

5.2 Spill Potential or Pollution Risk Assessment

Given an actual spill (i.e. pollutant in the water), the activities specified in this plan are rather obvious. However, in the event of vessel grounding, striking or collision that does not immediately result in a release, the responsibility for determining the risk of pollution rests with a Pollution Prevention Officer (PPO) within the Marine Safety (MS) branch of Transport Canada (TC). Should TC-MS be unable to make that determination, the Canadian Coast Guard (CCG), Environmental Response Duty Officer (ERDO) will complete that requirement. In some cases this may involve engaging a marine architect as no accredited expertise for vessel stability assessment resides within the ER section.

For all other areas where Canadian Coast Guard is the Lead Agency, this activity shall be considered the responsibility of the Canadian Coast Guard, Environmental Response Duty Officer.

5.3 Notification

To facilitate the notification of Canadian Coast Guard, and in addition to the existing Marine Communications system, a series of call-out or “Spill Hotline” agreements with the Province of Ontario, Nunavut and Northwest Territories and other Federal Departments within the Region have been implemented.

In addition, Central and Arctic Region, provides a 24 hr public access spills hotline:

24 hour toll free - Spills Hotline:
1-800-265-0237

Notification may occur through various mechanisms, depending upon the manner in which the spill (incident) occurs.

5.4 Verification

In all cases, spill information is initially processed and verified through the Regional Operations Centre (ROC) located in Sarnia, Ontario (See Section 3.3 – Organization). The ROC Officer on duty:

1. Determines whether the pollution is within Canadian Coast Guard’s mandate as Lead Agency or as a potential Resource Agency
2. Establishes the credibility of the source

3. Identifies the following:
    - Incident name (nature of incident)
    - Time of call (local / UTC)
    - Time of spill (local/UTC) *(if available)*
    - Reported by / call back particulars
    - Source determination
    - Incident background and description of clean-up activities (if any)
    - On-scene environmental/atmospheric conditions
    - Pollutant type and quantity
    - Verifying party contact information (as applicable)
4. Initiates an MPIRS entry for the following cases:
    - Originally pursuing verification as Canadian Coast Guard mandate but additional information about source changes lead to another agency
    - Canadian Coast Guard mandate and verified no pollution
    - Canadian Coast Guard mandate and verified pollution
    - Likely to impact on / impacting on foreign waters
    - Significant impact on region, though not falling under Canadian Coast Guard mandate.
    - Request for Canadian Coast Guard as a resource agency.
5. Enters information into MPIRS (indicated in #3 above) as well as name of paged ERDO.

This information is then relayed to the Environmental Response Duty Officer to determine Canadian Coast Guard posture. It should be noted that all spill incidents, irrespective of CCG's mandate, may require Canadian Coast Guard resources if requested (see Resource Agency Role in Section 1.5 of the *National Response Plan).*

By agreement, spill verification will be completed by the Regional Operations Centre (ROC) Duty Officer. The verification will be complete when the ER Duty Officer is advised where Canadian Coast Guard is Lead Agency. (see Figure 5.2 Pollution Verification Process and Figure 5.3 Response Analysis Process)

5.5 Spill Assessment – Environmental Response Duty Officer

To facilitate the requirement for efficient and rapid notification and assessment of incidents, Central and Arctic Region, in accordance with the *National Response Plan,* Section 4.4, has instituted a 24-hr year round monitoring regime integrated with the Regional Operations Centre (ROC). The following sections identify the context in which this activity is carried out.

Coordination

The coordination of the ER Duty Officer is the responsibility of the ER Regional Emergency Operations Officer (REOO). These duties include assigning shifts in an equitable manner, keeping records of the duty officer schedules, maintaining equipment required to perform ER Duty Officer functions, reviewing individual ER Duty Officer performance, reviewing ER Duty Officer procedures, and liaising with the ROC and National HQ.

Performance

The ER Duty Officer function shall be performed by the following positions provided sufficient experience, appropriate training, and at the discretion of the Superintendent ER:

- ✓ Senior Officers
- ✓ Those in capacity to act for Senior Officer.

Review

The ER Duty Officer procedures shall be reviewed in reaction to:

- Changes at the Regional Operations Centre (ROC) affecting the ER Duty Officer function
- Changes in Canadian Coast Guard (CCG) policy on the response to ship source pollution
- In consideration of accepted recommendations stemming from exercises and operational responses.

The individual officer performance shall be reviewed in context of their execution of a spill assessment.

Responsibilities

At the beginning of the ER Duty Officer's shift the following are required:

- Functioning communication equipment (pager, cell phone/Blackberry);
- The necessary analytical tools (e.g. spill assessment forms, Greenwood's Guide to Great Lakes Shipping, Area Plans, Oil Spill Response Field Guide, OSH reference tools, and the CANUTEC Emergency Response Guide book.)

During the ER Duty Officers shift the following are required to be complete:

- MPIRS cases for any spill reports that required ER Duty Officer analysis by noon of the next business day;
- Extra Duty Reports;
- Notification of the next ER Duty Officer and the ER Regional Emergency Operations Officer of any on-going cases.

Availability

The availability of the ER Duty Officer is 24 hours/7 days a week. Pages must be responded to within 10 minutes of notification. Should the ER Duty Officer (DO) be unable to fulfill their duties at any time during the shift, they are required to

notify the ER Regional Emergency Operations Officer (REOO) immediately who will notify the ROC of any changes immediately. The following activities conflict with the performance of the ER Duty Officer function:

- travel out of country / region / pager range;
- inability to respond immediately due to performance of other job functions (instructing a course, running an exercise, delivering a presentation, involved in a maintenance run that would be too difficult to reschedule, chairing a meeting, or participating in any activity that requires attendance or would be inappropriate to leave);
- inability to respond immediately due to personal reasons (vacation, sickness, etc.).

Should an individual become unavailable for a significant portion of the shift for reasons noted above, that shift may be assigned to another officer at the discretion of the ER Regional Emergency Operations Officer.

Function

The primary function of the ER Duty Officer is to complete an initial incident assessment and analysis, making a recommendation to the Superintendent of ER as to the appropriate course of action. [**]

The initial assessment will be complete for the following cases:

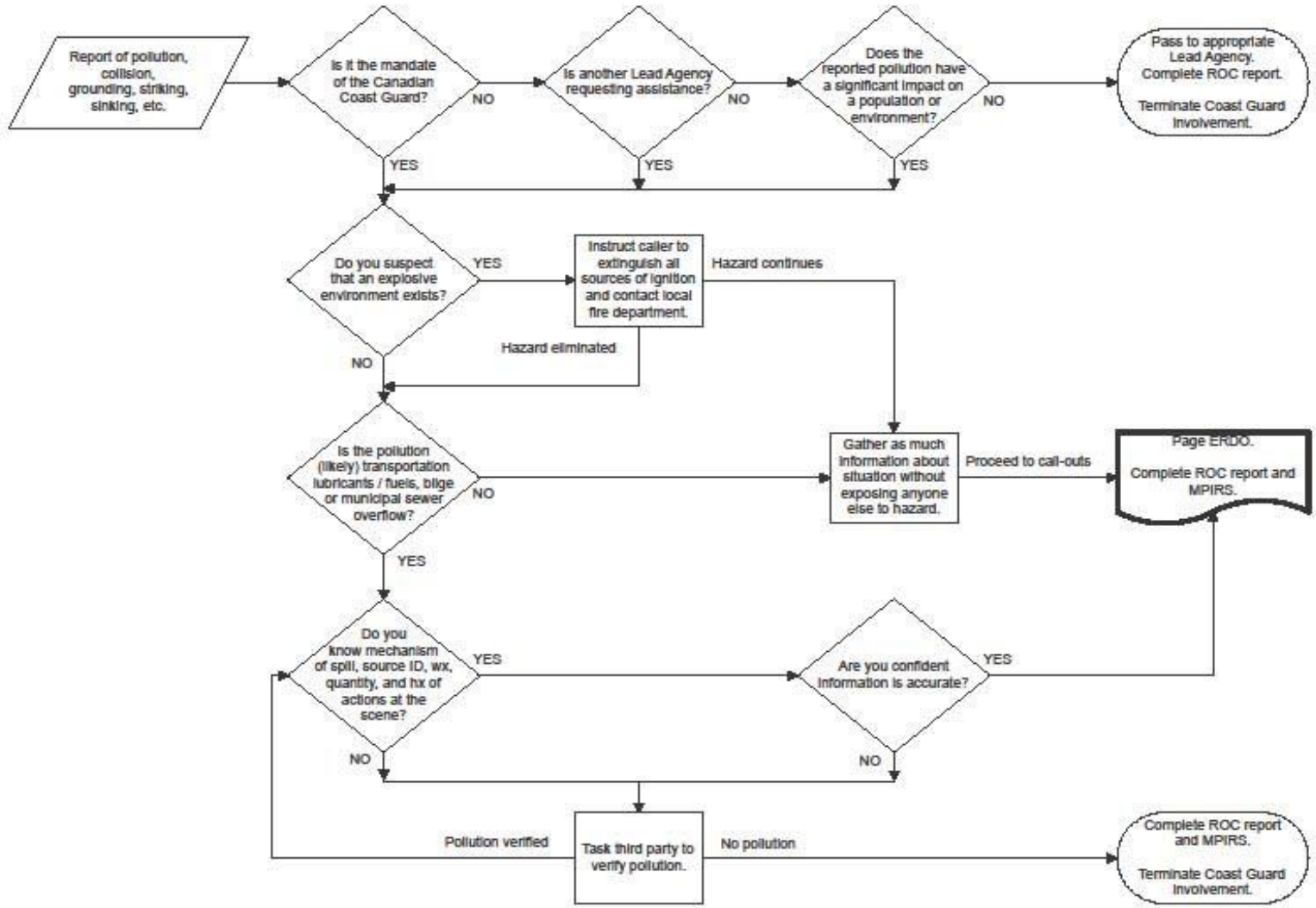
- Canadian Coast Guard mandate and verified pollution
- Likely to impact on / impacting on foreign waters
- Significant impact on region, though not falling under Canadian Coast Guard mandate.
- Request for Canadian Coast Guard as a resource agency.

The analysis function is complete when the Superintendent ER is informed and advised of the recommended course of action that will consider the following (see flow chart):

- polluter's actions and intentions (if applicable);
- safety concerns, tactical, logistical, and environmental feasibility of any response.

[**] The ER Duty Officer does not need to notify the Superintendent of any incidents that require "no activation" of CCG resources (assets/personnel) in monitoring/clean-up activity.

Spill assessment: *pollution verification process*



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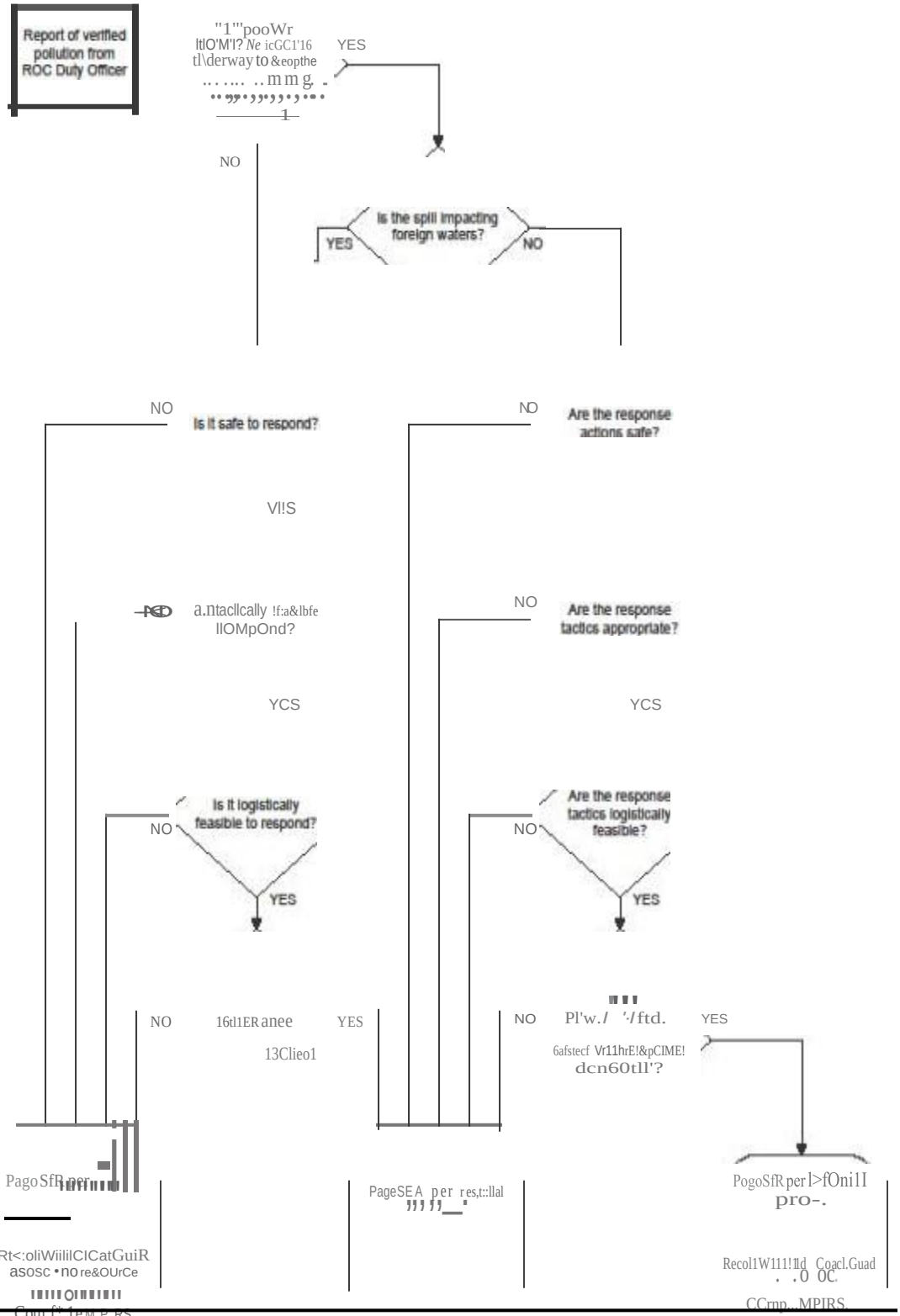

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5.6 Activation of Canadian Coast Guard Response Resources

In the event of small (0-150 T) to medium size (150-1000 T) spill incidents, the Superintendent, Environmental Response, acting upon the assessment provided by the Duty Officer, initiates/activates the appropriate response. This entails, but is not limited to, the following activities:

- Identification of overall health and safety risks to response personnel.
- Establishing the propriety of the recommended response posture. This includes the verification of international issues in border areas.
- Verification of Canadian Coast Guard capability to respond, impact on normal regional operations and, if necessary, the potential requirement for the notification and activation of the National Response Team.
- Assignment of the designated On-Scene Commander (OSC) or Federal Monitoring Officer (FMO). SROs are typically assigned as FMO/OSC for incidents occurring within their geographic area.
- Obtaining the necessary Order-in-Council, for spills in Arctic Waters
- Obtaining the financial project code, and forwarding it to the OSC/FMO.
- Signing a contract with the Response Organization (RO) in accordance with PWGSC contracting rules.
- Creation and dissemination of initial situation report to Regional and National management in accordance with the *Safety and Environmental Response Systems (SERS) – Incident Notification Guidelines*.
- Completion of MPIRS to document above activities.

For significantly larger spill incidents (1000T and above) the Superintendent, Environmental Response shall immediately assume the OSC/FMO role, notify Regional and National management of the situation and initiate the Response Management System (RMS) (and activation of the National Response Team, if necessary) in addition to the above activities. Upon stabilization of the immediate emergency, the Assistant Commissioner, Canadian Coast Guard, Central and Arctic Region and/or Director General, Canadian Coast Guard shall assess the requirement for assigning a new OSC/FMO.

5.7 Response Implementation

As stated previously (Section 4 - Preparedness), the Canadian Coast Guard will employ the Response Management System (RMS) as its primary management and operational tool. At the heart of this system is the development of clear obtainable objectives and the implementation of the supporting tactical deployment. This is achieved through the creation of incident action plans spanning specified operational time periods. For small spills these plans can be rather informal. As spill size and impacts increase, so to will the complexity of

operational assignments and hence a need for greater formalization of the Incident Action Plan.

All operations shall be carried out in accordance with the Guiding Principles set out in *Section 1.3* of the *National Response Plan* and the *Oil Spill Response Field Guide* (ISBN 0-660-16112-5).

Central and Arctic Region covers an extremely large geographical and culturally diverse portion of Canada. There are, in essence, two zones of operation which are entrenched in the *Canada Shipping Act*.
These are the:

- Arctic zone, or all areas of Canadian jurisdiction north of 60^0 N Latitude;
- Central zone, dominated in a marine transportation sense by the Great Lakes, but which include the southern portions of Hudson, James and Ungava Bay, along with the major waterways and watersheds of Lake Winnipeg, Winnipegosis, Lake of the Woods, and Lake Athabasca.

Arctic zone – first response
The highest risk of pollution in the arctic is during a ship fuel transfer to facilities in Canada's northern communities. Should pollution occur, the vessel and oil handling facility have responsibilities to implement their Oil Pollution Emergency Plans (OPEP) that deal with source control. The next step would be for the community to respond using its response plan, protecting the identified priority area(s) and employing the response equipment in an Arctic Community Pack, if so equipped.

Arctic zone – escalation
If the pollution is beyond the ship, facility, and community response then the Rapid Air Transportable (RAT)150T will be the first line Canadian Coast Guard ER response (Arctic icebreakers or Special River Nav-aid Tenders may have been on-scene first). Upon activation of the RAT150T, standing offers with aviation contractors will be called up. Closest ER personnel will be dispatched to the community to assess, plan, assemble (and train) responders, while preparing to stage the in-coming equipment. The Hay River base personnel will transport the pallets to the airport where they will be loaded into the awaiting airframe. Upon arrival the pallets will be unloaded and a trailer tongue and wheels affixed to the pallet to facilitate movement (by ATV if necessary) to a forward staging area and ultimately to a beach site. The timeframe for full forward staged capacity with personnel at any community with suitable runways is under 48 hours.

The hospitality industry of Arctic communities can be rapidly overwhelmed with the influx of as little as 10 people. Experience has shown that these communities could only support 10-15 additional personnel and only offer 10-15 community responders. Consequently, the RAT was designed considering the amount and type of equipment that is most easily handled by a combination of trained

Canadian Coast Guard personnel and community responders. The RAT150T response is predicated on an in-community response with the following positions identified in the table below:

Table 5-2 *Anticipated personnel usage for the RAT150T in an Arctic community*

Position	Canadian Coast Guard responder	Community responder
OSC	X	
OSC support		X
Chief Ops & Planning	X	
Logs – services	X	X
Logs – support	X	X
Ops skimming (A)	X	X
Ops skimming (B)	X	X
Ops shoreline (A)	X	X X X X
Ops shoreline (B)	X	X X X X
Ops booming vessel (A)	X	X
Ops booming vessel (B)	X	X
Transfer / disposal	X	X
Totals	**11**	**16**

Upon escalating beyond a RAT150T response, the Δ1000T will be stood up. Standing offers / arrangements with local contractors will be activated to move the containers / seatrucks to a location where they can be transferred to a ship / barge. If required, closest Canadian Coast Guard base personnel will be dispatched to the depot to assist. The closest suitable marine transportation asset will also be contracted to move the equipment to the spill site. The timeframe for full forward staged capacity with personnel is estimated at one week.

As the 150T response is predicated on an in-community response a larger spill would have to be supported by a Canadian Coast Guard icebreaker, rented camp barge, or flown in from surrounding communities.

Table 5-3 *Anticipated personnel usage for the 1000T in an Arctic community.*

Position	Canadian Coast Guard ER responder	CCG Fleet or professional contractor	Community responder
OSC	X		
OSC support		X	X
Chief of Planning	X		
Plan – response	X		
Plan – demobilization	X		
Chief of Logs	X		
Logs – services		X	X
Logs – support	X X	X X X	
Chief of Ops	X		
Air Ops		X	
Ops on-water	X X	X X X X	
Ops shoreline	X X		X X X X X X X X X
Ops booming	X X	X X X X	
Transfer / disposal	X	X	X
Totals	**14**	**13**	**13**

Central Zone – first response

The highest risk of pollution occurring in the region is found in the Great Lakes. Statistically the areas in the Great Lakes of highest risk are the connecting channels due to volumes, numbers of transits, and convergence factors (existing VTS / navigational aid systems recognize this). Areas with traditionally high pleasure craft and small commercial craft traffic experience frequent (though low in volume) pollution incidents.

If the pollution is in the local vicinity of a Canadian Coast Guard Search and Rescue (SAR) station or facility with operational staff, a First Response Unit (FRU) may be deployed as an initial attempt at containment. If more equipment sweeps systems or recovery units are required then the Rapid Road Transportable (RRT) 2500T will be activated.

Transfer of Lead Agency

Transfer of Lead from CCG

Should an incident initially appear to fall within the jurisdiction of the Canadian Coast Guard yet later is determined to be another government agency's

responsibility, the CCG-appointed OSC or FMO will verbally acknowledge the transfer of Lead Agency responsibility followed by written confirmation on the terms of the transfer (this may require time for termination of a response contract with CCG and the establishment of a response contract with the appropriate Lead Agency.) When the Lead is transferred from CCG to another Lead Agency, CCG will submit an invoice of its response costs to the Lead Agency for response activities undertaken up to the time of transfer recognition.
Should the Lead Agency wish to retain CCG as a Resource Agency, the criteria in Section 7 of the *National Response Plan* of the *CCG National Marine Spills Response Plan* will apply.

Transfer of Lead to CCG
When the Lead is transferred to Canadian Coast Guard from another agency, the Canadian Coast Guard will incorporate the appropriate costs borne by the other agency in the initial stages of the spill into its claim to the Polluter or to the Ship Source Oil Pollution Fund, (SOPF) as the case may be.

Safety Procedures and Considerations

All petroleum cargoes are considered hazardous substances. Canadian Coast Guard command, clean-up, monitoring and verification personnel have protective equipment and training available to them up to Level “D”. All Environmental Response branch staff have been issued with a variety of personal protective equipment (PPE) and are expected to deploy to a spill site (includes exercises and training) with all appropriate gear. Safety glasses and rain suits with rubber boots and gloves are appropriate for Canadian Coast Guard's traditional verification of and response to oil pollution.

Bulk chemical carriers, rail cars, road trailers, sour (H2S) petroleum products or BTX (benzene, toluene, xylene) carried on oil tankers are all sources of substances for which Canadian Coast Guard personnel are not readily equipped for. In most cases where the pollutant reported is suspected to be from one of these sources Canadian Coast Guard assets should not be tasked to verify. If it falls within Canadian Coast Guard mandate the ER program personnel will get directly involved in the verification, likely looking to other government departments or contractors to continue with the assessment and response.

When the pollution is reported to the ROC by a member of the public, or by a credible professional as a mystery spill, closer examination of the circumstances or probable cause of the pollution will occur as part of spill verification. During the conversation with the individual reporting the incident the ROC Duty Officer will want to find out what it is that they observed. These are:

- Colour [typical petroleum silvery to rainbow to dark purple / brown or is it frothy, green organic matter, rusty, etc.]
- Odour [does it smell like gas, diesel, rotten eggs, no odour]
- Proximity to any likely source [vessel, industrial outfall, municipal outfall, midlake, mid channel, washed up industrial storage drum]

- Volumes [football field sized, shopping mall parking lot big, or a thin ribbon]
- Other factors [heavy rainfall in last 12 hours; seasonal conditions / times / areas known for algae blooms; fish or animal kills].

By picking up on any "flags" during an assessment it can be reasonably determined whether the pollution should not/should be classified as a hazardous substance (for which CCG personnel are unable to respond to). The ER duty officer will consult with experts in Environment Canada (EC), Spills Action Centre (SAC), and CANUTEC, as appropriate to determine the safety for personnel.

Alternative countermeasures

Alternative countermeasures are those non-mechanical techniques utilized in oil spill response operations such as in-situ burning, dispersant application, and shoreline cleaner application.

Central Zone

The likelihood of approval of in-situ burning operations on the Great Lakes or in connecting channels or inland lakes is minimal. The use of dispersants in the Great Lakes, connecting channels or in inland waterways will not be considered. Shoreline cleaner agents approved by Environment Canada may be considered.

Arctic Zone

In view of the difficulties associated with mounting an effective response in the Arctic, the CCG has recommended that further research be done in the areas of in-situ burning, the use of dispersants (reference Quebec paper) and other oil in ice recovery methods. This research should be operational R&D and assume that the product spilled is Arctic diesel and that the spill occurs during the Arctic shipping season.

5.8 Summary Report and Post Incident Review

It is regional policy to provide a Summary Report and/or conduct a formal Post Incident Review for incidents deemed noteworthy or valuable by the OSC/FMO or Assistant Commissioner, Canadian Coast Guard.

Summary Report

The summary report shall contain at minimum the following, but can include any information deemed relevant by the OSC/FMO.

Summary Incident Report Format

(a) Overview of Crisis Event

- spill source (not cause), initial environmental conditions and assessment of situation

(b) Spill chronology
- spill response activities and climate/wind /sea condition data
- key response objectives (success and failures in implementation), major shifts in tactics, other agencies involvement

(c) Costs and cost recovery issues
- total estimated cost summary
- identification of Cost Recovery requirements and options

(d) References
- Situation Reports

Post Incident Review

The main objective of a Post Incident Review is the evaluation of the incident to ultimately improve Canadian Coast Guard's effectiveness at spill response. To that end, this requirement is essentially similar to the principles of exercise evaluation. Therefore, when required, the review shall be conducted in accordance with the principles contained in the *National Exercise Program – Evaluation guidelines, Chapter 11*.

This entails six distinct tasks:

1) Brief the Evaluation Team
2) Brief the Response Team
3) Evaluate the Incident
4) Prepare a Preliminary Summary of Key Observations
5) Hold an Incident Debriefing Session
6) Prepare an Official Post Incident Evaluation Report

Post Incident Evaluation Report Format

(a) Executive Summary -Summarizes overall findings and observations

(b) Overview of Incident Objectives -Briefly describes the key objectives, environmental conditions and initial situation assessment

(c) Evaluation Techniques and Criteria - Describes the technique(s) (i.e. self, peer or independent evaluation) and the major evaluation criteria used

(d) Assessment of Key Incident Objectives - This provides a critical appraisal of the incident objectives or major shifts in tactics. Each key objective assessment will include the following:

Findings – A summary statement describing key positive and negative findings.

Specific Observations - Observed decisions and tasks noted during the incident by responders, management and interested parties.

Conclusions - Assessment of the impact of the finding on overall achievement of the incident objective(s)

Recommendations – A description of potential corrective or follow-up action required to implement the findings to improve overall marine spill response preparedness.

(e) Appendices or Attachments - May or may not be required

Section 6 – CLAIMS & COST RECOVERY

6.1 Purpose

The purpose of this section of the *Regional Response Plan* is to outline the requirements and regional processes to assist in the creation of a claim to the relevant fund or directly to a polluter.

The ability of Canadian Coast Guard to recover or pursue recovery of response expenses or costs associated with monitoring activities is set out in the *Marine Liability Act, Part 6, "Liability and Compensation for Pollution"*. This ability to recover costs is seen as the embodiment of the polluter-pay-principle set out in the *National Response Plan, Guiding Principles, Section 1.3*.
Note: That at this time there is no mechanism to recover monitoring costs from an oil handling facility.

In addition to the above and recognizing the potential financial risks and impacts to Canada, Canadian legislation also provides for the creation and maintenance of a Ship-Source Oil Pollution Fund, (SOPF). This fund, in addition to the International Oil Pollution Compensation Fund (IOPCF) and the Protection & Indemnity (P&I) Clubs, provides for the assessment of claims/loss against member ships and/or shipping companies. Neither of these funds hinder nor otherwise limit Canadian Coast Guard's ability to lay claims directly against a Polluter. However, the Polluter is only required to reimburse a claim up to its Limit of Liability. This limit is calculated using the guidelines established in the *Convention on Limitation of Liability for Maritime Claims (LLMC), 1976*.

6.2 Policy Guidelines

The following points serve as regional guidelines for pursuing cost recovery activities:

- The decision to seek cost recovery should be made based on common sense and in consultation with other operational and finance team members.
- Cost recovery should be avoided in situations where the administrative costs of recovery action exceed the dollars expected to be recovered.
- Cost recovery embodies the "Polluter Pays" principle.
- Costs incurred while acting as a resource agency must be recovered from the lead agency.
- Costs incurred while acting as OSC/FMO are recoverable from either the polluter, its P&I Club, the Ship-Source Oil Pollution Fund or from the International Oil Pollution Compensation Fund.

6.3 Responsibilities

On-Scene Commander/Federal Monitoring Officer (OSC/FMO)
The OSC/FMO is responsible for ensuring that complete and accurate documentation is provided for a timely and effective cost recovery process. The OSC/FMO is responsible for preparing all documentation necessary to initiate cost recovery.

Regional Finance Staff
Response, monitoring and administrative costs must be calculated in accordance with national financial accounting and recording practices. Senior administrative officers within Maritime Services may be called upon to provide expert advice as required. It is recommended that a regional finance representative be on-scene as soon as possible to help establish procedures, to safeguard documentation, and to ensure the integrity of the costing process.

Environmental Response Headquarters
The Environmental Response Senior Advisor for Cost Recovery and Claims will submit those claims that are intended for the Ship-Source Oil Pollution Fund and to International Fund Conventions in accordance with the guidelines specified by each. The Advisor will also issue equipment charge-out rates periodically for use by all regions.

6.4 Process
The Response Management System (RMS) documentation (field notes, Incident Action Plans, Minutes and meeting records, time sheets and any and all expense records, invoices/requisitions etc.) shall form the basis of data for the Cost Recovery action.

The Region will initiate cost recovery actions against the Polluter. Should the Polluter be unable or unwilling to pay the costs, the Region will forward the claim to HQ Senior Advisor for Cost Recovery and Claims for submission to the Ship-Source Oil Pollution Fund. Should the costs of the response exceed the Limit of Liability of the Polluter, reimbursement of costs will be through the SOPF and then through the IOPCF. Claims associated with mystery spills will be submitted directly to HQ for a claim against the SOPF.

6.5 Documentation
Proper documentation alleviates the need to reconstruct the incident after the fact, reduces the volume of questions, and adds credence to the claim. The key source of information that enables various parties to determine the degree of reasonableness of the actions taken and the costs claimed is the part of the cost recovery summary known as a “narrative”. That justification is considered to be a critical component to successful and timely claims.

The regional guideline for producing cost summaries and documentation handling is as follows:

Incidents of minimum complexity and limited expenditures (under $15K)

- Expenditures may be summarized within the body of the Final Report, including any description of "calculated" values (i.e. administration costs)
- Original invoices shall be kept on the dedicated spill file.

Incidents of medium complexity and moderate expenditures (up to $50K)

- Expenditures will be summarized in a single table by Cost Element within the body of the Final Report.
- A supporting cost summary document or appendix shall be created to provide a detailed cost summary by date. Copies of the expenditure documentation will be included.
- Original invoices shall be kept on the dedicated spill file organized by date.

Incidents of high complexity and significant expenditures ($50K plus)

- Expenditures will be summarized in a single table by Cost Element within the body of the Final Report. (similar to medium complexity incidents)
- A supporting cost summary document will be created summarizing the daily expenditures by individual cost element, followed by a cumulative summary of each cost element (spreadsheet of all daily summaries). The sum total of all cost elements will then be summarized for use in the final report.
- Due to the volume of transactions, copies of the expenditure documents will not be provided in the supporting cost summary document.
- Original invoices will be kept in their original state, filed by date and archived when feasible to a dedicated file.

Table 6.1 Sample Cost Element Table

Cost Element	Description
Personnel	Includes hourly regular and overtime costs associated with CCG Staff (includes EBP)
Equipment	Includes cost of all CCG assets, based upon established charge out rates
Purchases/Expendables	Includes expendables such as office supplies and PPE
Travel	Includes meals and accommodation costs incurred by CCG staff accordance with TB travel directive.
Contractors	Includes the costs of all private sector contractor/goods and services.
Administration	Includes the cost of CCG administration.
Total Estimated Cost	

6.6 References

- CCG Ship Source and Marine Pollution Response Costing Principles and Documentation Standards DFO2004-6332
- Cost Recovery of Ship Source and Marine Pollution Response Directive # D-4010-2001-01
- Cost Recovery Related Policies, Memorandum dated October 26, 1998, File AWE 1001-5-2-1 (AWEA)

6.7 Third Party Claims

While monitoring or responding to an incident, Canadian Coast Guard will refer all inquiries regarding third party claims to the Polluter. In the case of a mystery spill, the Canadian Coast Guard will encourage claimants to submit a claim directly to the Ship Source Oil Pollution Fund.

Section 7 - PLAN MAINTENANCE AND CUSTODIANS

7.1 *Maintenance Process*

Responsibility
The *Regional Response Plan* of the *Canadian Coast Guard Marine Spills Response Plan* for Central & Arctic Region is the responsibility of:

Assistant Commissioner, Canadian Coast Guard
Central & Arctic Region
520 Exmouth Street
Sarnia, Ontario
N7T 8B1
fax (519) 383-1991

Revision Requests
All requests or suggestions for revision to this plan should be forwarded, in writing, to the above noted address and should include the following information:

- Originator (including return address and telephone number)
- Date
- Subject (i.e. request for revision)
- Suggested change (including section and page number references)
- Reason for revision

All formally received requests will be acknowledged in writing and assessed for inclusion into the plan. Upon approval the revision will be distributed accordingly.

Revision Record
Upon receiving a revision transmittal, recipients are requested to ensure that its number is next in sequence to the previous issue, process the amendments according to the transmittal instructions and complete the revision record in this section.

Should there be any discrepancies or questions, the recipient should contact the Canadian Coast Guard, Assistant Commissioner, Central & Arctic Region at the above address.

The onus is on the plan holder to maintain a current plan.

7.2 *Canadian Coast Guard Custodians*

This document is structured to reflect the fundamental phases of Environmental Response (ER) activities and hence reflects the co-operative nature of each

aspect of the Central and Arctic Region Environmental Response organization. In conjunction with this, each component has been assigned to a specific section within the branch (e.g. training is the responsibility of the Training Officer). The Assistant Commissioner – Canadian Coast Guard, Central and Arctic Region retains the overall responsibility for the document's implementation. The Emergency Plan Development Officer (EPDO) facilitates the physical management and co-ordination of this document.

These custodial relationships herein are designed to facilitate the annual review and maintenance of the *Regional Response Plan*.

Letter of Promulgation	Emergency Plan Development Officer
Record of Revision	Plan Holders
Section 1 – Introduction	Emergency Plan Development Officer
Section 2 - Agreements & Memoranda of Understanding	Emergency Plan Development Officer
Section 3 – Organization	Emergency Plan Development Officer
Section 4 – Preparedness 4.2 RMS	 Regional Training Officer
4.3 Planning	Emergency Plan Development Officer
4.4 Training	Regional Training Officer
4.5 Exercising	Regional Exercise Officer
4.6 Inventory Maintenance & Management	Regional Emergency Operations Officer
Section 5 – Response Operations	Regional Emergency Operations Officer
Section 6 – Claims & Cost Recovery	TBD
Section 7 - Plan Maintenance & Custodians	Emergency Plan Development Officer
Section 8 – Contacts	Emergency Plan Development Officer
Section 9 – References & Annexes	Responsibility for each annex is assigned in each Annex.

All unassigned sections shall be considered the responsibility of the Emergency Plan Development Officer unless otherwise indicated.

7.3 Plan Distribution

The *Regional Response Plan* shall be distributed to all holders of the *Canadian Coast Guard Marine Spills Response Plan*, in accordance with the Area of Responsibility set in Section 1 - Introduction. This includes the relevant Federal and Provincial Lead Agencies as described in the National Response Plan Section 1, sub-section 1.5; all Canadian Coast Guard Management; Facilities and Vessels; all Oil Handling Facilities and relevant certified Response Organizations by request and in accordance with Transport Canada-Marine

Safety, Compliance and Enforcement division. All subsequent revisions will be automatically distributed to these plan holders.

Any member of the general public wishing to obtain a copy may do so through the Fisheries and Oceans, Canadian Coast Guard, National Headquarters. These plan holders will not be advised of revisions.

Section 8 – CONTACTS

8.1 Pollution Reports for Canadian Coast Guard, Central & Arctic Region

To report a pollution emergency anywhere within Central & Arctic Region telephone the Canadian Coast Guard, Regional Operations Centre (ROC) toll free at:

1-800-265-0237

or report via

Marine Radio on VHF, Channel 16.

8.2 Other Lead Agencies that Maintain Spill Report Lines

- Ontario Ministry of the Environment - Spills Action Centre: 1-800-268-6060
- Territorial Spills Line – Arctic Alarm: 1-867-920-8130
- Manitoba Conservation: 1-204-944-4888
- Saskatchewan Environment - Saskatchewan Spill Centre: 1-800-667-7525
- Alberta Environment: 1-800-222-6514

8.3 Canadian Coast Guard, Environmental Response Branch (CCG/ER) Phone List – Regular Office Hours

Regional Office, Canadian Coast Guard **520 Exmouth Street** **Sarnia, ON N7T 8B1**	
Title	**Telephone**
Superintendent, Environmental Response	519-383-1954
Emergency Plan Development Officer	519-464-5126
Assistant Contingency Planning Officer	519-383-1953
Regional Exercise Officer	519-383-1978
Regional Emergency Operations Officer	519-383-1956
Environmental Training Officer	519-383-1957
Administrative Assistant	519-383-1951

Canadian Coast Guard Base **42037 McKenzie Highway** **Hay River, NT X0E 0R9**	
Title	**Telephone**
Senior Response Officer	867-874-5557
Response Specialist	867-874-5558
Response Specialist	867-874-5559

Canadian Coast Guard Base **PO Box 1000, 401 King Street** **Prescott, ON K0E 1T0**	
Title	**Telephone**
Senior Response Officer	613-925-2865 x 157
Response Specialist (2)	613-925-2865 x 262
Logistics and Statistics Officer	613-925-2865 x 126

Canadian Coast Guard Base **28 Waubeek Street** **Parry Sound, ON P2A 1B9**	
Title	**Telephone**
Senior Response Officer	705-746-2196 x 228
Response Specialist	705-746-2196 x 270
Response Specialist	705-746-2196 x 201

Section 9 – REFERENCES & ANNEXES

9.1 References

The following list includes those documents which supplement the Regional Response Plan.

Supplement	Custodian
Environmental Response Manual – Standard Operating Procedures and Directives	Canadian Coast Guard, Environmental Response, Headquarters
Response Management System User's Guide, version 3.0 (May 2006)	Canadian Coast Guard, Environmental Response, Headquarters
Environmental Response Superintendent's Manual	Superintendent, Environmental Response, Regional Office
Environmental Response Regional Health & Safety Plan	Environmental Response, Regional Emergency Operations Officer
National Exercise Program (NEP) Manual	Canadian Coast Guard, Environmental Response Headquarters
Inventory Control and Response Management System – TMA database	Regional Logistics and Statistics Officer, Environmental Response
DFO Crisis Communications Plan	DFO Corporate Services, Communications Branch

9.2 Annexes

The following Area Plans make up the Annexes to the Regional Chapter:

1) St. Lawrence River and Lake Francis
2) Lake Ontario
3) Lake Erie
4) St. Clair and Detroit River
5) Lake Huron, Georgian Bay and North Channel
6) St. Mary's River
7) Lake Superior
8) Lake of the Woods
9) Inland waters (South of 60°N Latitude)
10) Hudson and James Bay
11) Baffin Region
12) Keewatin Region
13) Kitikmeot Region
14) Great Slave Lake Region
15) Mackenzie River and Delta
16) Beaufort Sea and Amundsen Gulf

APPENDIX G – Agnico Internal Spill Report Form

Spill >100 L need to be declared to Env. Dept. Immediately

Meliadine Gold Project
Internal Spill Report Form

Everyone is responsible of cleaning their spills

	Date of spill
	Date of spill report
AGNICO EAGLE	Date at the end of cleanup/incident
	* special note :

Reported by / Unreported	Select one Cause for the incident	
Contractor Involved	☐	In the selection under :
Employee Involved	☐ Chec	Equipment Breakdown
Supervisor Involved	☐ Chec	Equipment malfunction
Equipment Involved	☐ Chec	Human error
Nature of Contaminant	☐ Chec	Improper storage
Quantity of Contaminant	☐ Chec	Act of god
Exact Location : Easting / Northing	☐ Chec	Non respect of procedure
Environmental Personnel Contacted	Chec	Other

Description of the incident

Immediate Corrective Action

Action to be taken to reduce/eradicate risk of similar incident in the future

Volume (in m3 - cubic meter) of soil transferred to the landfarm

Report Completed by

For Environmental Department Purpose Only

Incident Investigation Recommended
Government agency notified
Date of notification to government agency
Comment :
Environment Personnel Signature

APPENDIX H – NT-NU Spill Report

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME	☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	_____
C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)		
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN		
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS		
F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION		
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION		
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER	
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES	
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT	
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS			

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

APPENDIX I – Latest MOCK Scenario

AGNICO EAGLE

On August 4, 2018 the AEM Environment Department conducted a mock spill event at the Itivia refueling station/tank farm with AEM emergency response (ERT) members, Orbit Garant Environmental/health and safety AEM warehouse staff, AEM Site Service/HTO vice president and AEM community relations personnel., Spill Training contractor, Nunatta Environmental was on site to assist and provide advice/training, The Rankin Inlet Fire Chief also attended the event as an observer.

An AEM ENV Tech documented the spill response actions and acted as the "Control Room" responder, Rankin Inlet dispatch and the ENV Tech/ENV Coordinator on site.

The mock scenario involved a broken fuel line fitting at the onshore receiving manifold during refueling (from offshore ship) of the fuel storage tanks at Itivia.

14:12 – Spill occurs (4000 L of leaking fuel towards the shoreline) Dave Loder spotted fuel leaking from the broken fitting/line



14:13 – ERT responder calls the vessel to stop transfer of fuel ASAP and relays the message of a leaking fitting to the Captain.

14:18 - Confirmation from the Captain that the transfer has stopped. During that time, AEM Site Service blocked the access to the area and called "CODE 1" to Rankin Inlet dispatch and requested to have environmental personnel contact ERT responder on the radio.

14:19- ERT responder asks ENV Coordinator to contact the coast guard
14:20 – ERT responder requested heavy equipment from construction/site services to dig a trench (no operators in area)

14:25 – Fire Marshall from Rankin Inlet arrived (did not participate but was ready with staff if assistance needed assistance)

14:25- AEM Warehouse staff from Itivia and started deploying booms along coast from emergency sea-can/ ERT responder supported.

14:38- Additional AEM Environment Dep't staff were travelling on the road to Meliadine site when the "CODE 1" was called (came to Itivia to provide support) and helped deploy absorbent booms and rags as ERT responder instructed.

15:50 – full ERT team arrived for assistance- First ERT responder (Commander) instructed immediate deployment of marine curtain (water was too rough 80 km/hr winds- did not want to put anyone's safety at risk; deployed on shore)





16:00 – More absorbent booms are placed in front of the marine barrier to collect spill and prevent it from going under marine barrier- no operators present for heavy equipment; ERT and environment staff attempted to make a trench – did not succeed due to bed rock



16:04 – Absorbent padding was placed on top of spill where visible product was observed behind marine barrier (wind blowing toward shore)





17:25 – ERT, ENV and Agnico staff declare the spill has been contained and absorbed; called off the ”CODE 1” and spill report prepared with follow up investigation of event.

Summary:

Nunatta - guided and assisted AEM staff (total 14 on site) to implement the correct procedures and equipment handling to successfully participate in the mock spill training event (fuel leak/water); the ERT commander did a great job of delegating responsibilities with everyone; all communication was satisfactory during the event. Heavy equipment (excavator) would be required as the area is underlain be bedrock – shovels and picks were not effective to dig a collection trench. It took 23 minutes for the spill to go from the pipe connection to the marine barrier- it would in a realistic scenario take ERT a minimum of 1 hour (It took 1.5hr) to get from Meliadine to Rankin Inlet (includes time to prepare) and Environment Dep’t staff members could mobilize within 50 minutes. In order to provide additional line of defense to capture fugitive oil/fuel spills the overburden on the inter-tidal zone should be removed so that loose absorbent can be spread. Nunatta advised that we contact Department of Fisheries and Oceans and ask if we can remove some rock along the beach in case of an emergency (this is fish habitat). A collection trench or sump would reduce the speed of any spill.

AEM and Nunatta Comments/Recommendations

- Buoys that can be attached to the maritime barrier or the fuel line were not blown up- these should be blown up prior to refueling season
- Sea-cans that contain Emergency environmental spill response should be placed together (one is placed on top of hill- these sea-cans should be placed as close to the shore manifold as possible)
- Shore line where fuel line connects should be cleaned of all obstructions to prevent injury to staff and damaging the containment booms
- Life jackets or mustang suits must be worn while working near the water and/or on boats
- It’s required that AEM warehouse staff working at Itivia area review the OPEP and Emergency Response Plan with ENV Tech prior to barge/fuel transfer season (both rotations)
- AEM observed that the OPEP and Spill Contingency plan was located in the Itivia warehouse office
- Follow up with DFO; if strip of overburden can be removed from inter-tidal zone to facilitate spill response and pro spill prevention measures
- Order more shackles
- OPEP should include the local municipality emergency numbers (I included this document in the PDF)
- AEM and ERT members will conduct annual training with Environment Dep’t staff.
- Lighter anchors (20 pound range) for the boat (ordered); currently have 60 pound anchors

Annual Mock Spill Attendee List

AGNICO EAGLE
MEL IADINE

CREDO
An injury can be avoided: drop the excuses. When we believe in safety, we first follow the instructions. Everyone is responsible for behavior that ensures its safety.

4 m^3 - water truck

ANNUAL MOCK SPILL EVENT

Fill out this form, attach the minutes and handouts

Department: ENV
Supervisor: _____

DATE: 2018-08-04

MEETING (DÉTAILS) :
Topic: Mock Spill event - Itivia refueling area
Safety Concerns: High winds

NAMES (PRINT)	SIGNATURE	NAMES (PRINT)	SIGNATURE
Randy Schwandt			
Jean-Francois Demers			
Hugues Dubé			
David Loder			
Claudia Remillay			
Robert Eno			
Candace Ramcharan			
Richard Jackson			
ISRaiel Aliyah			
Matt Caitlin			
Sean Arida			
MARK WYATT			
[illegible]			

Emergency Contact Numbers

Last update: Jan 15, 2017 Version D

Radio: Channel 1; call "CODE 1, CODE 1, CODE 1"

AGNICO EAGLE
MELIADINE

Agnico-Eagle Mines (AEM) Meliadine Project
25 km north-north-west of Rankin Inlet

63.027400 (N), - 92.171700 (W) (Helipad)

Meliadine Site Telephone Number: **819-759-3555**
Rankin Office: (Ext:3199) 867-645-2920

Onsite Health Care Professional: 3911

Medical Emergency		
Rankin Inlet Health Center Head Nurse: Gracy Dcunha	Monday - Friday 8h30 to 17h00 AFTER HOURS EMERGENCY	**(867) 645-8300** **(867) 645-6700**
Rankin Inlet Ambulance Service (Fire Dept.)	**Emergency**	**(867) 645-2525**
Rankin Inlet Search and Rescue		(867) 645-3300
Poison Control Centre (Qikiqtani General Hospital, Iqaluit)	Emergencies General inquiries	(867) 979-7350 (867) 979-7300
Law Enforcement, Rescue, Wildlife		
RCMP in Rankin Inlet (Death on camp or for Search & Rescue) (0123 = General Information, 1111 for emergency, 24H)		(867) 645-1111 (867) 645-0123
Workers' Safety and Compensation Commission (WSCC) Mine Inspector: Lex Lovatt		(800) 661-0792 **Hot Line** (867) 920-3849
Coroner		(867) 975-7292 (867) 975-1063 cell
Conservation & Wildlife officer in Rankin Inlet Officer Johanne Coutut Autut		(867) 645-8084 (867) 645-8085
Hazmat & Spills		
CANUTEC		(613) 996-6666
Spills Hotline	Phone	(867) 920-8130
Agnico-Eagle Mines (AEM)		
Program Manager: Martin Plante martin.plante@agnico-eagle.com	Office	(819) 759-3555 ext:8058 (819) 856-1873 Cell
Others		
Health & Safety Superintendent: Dominic Richard dominic.richard@agnicoeagle.com Environment Superintendent: Nancy Harvey nancy.harvey@agnicoeagle.com Human Resources Superintendent : Sandra Marseille sandra.marseille@agnicoeagle.com		(819) 856-4104 Cell (819) 856-4385 Cell (819) 860-3723 Cell
FM Radio Frequencies		
Channel 1 – CAMP (Emergency call Channel)		Rx & Tx: 167.43000
Channel 2 – CONSTRUCTION		Rx & Tx: 163.32000
Channel 3 – EXPLORATION		Rx: 163.57500 Tx: 168.70500
Channel 8 – ROAD Meliadine		Rx: 162.54000 Tx: 165.57000
Channel 9 – ROAD Rankin		Rx: 162.66000 Tx: 167.64000
Channel 10 – UG OPERATION		
Channel 11 – UG Spare		

APPENDIX J – Product Transfer Area Assessment



Meliadine Gold Project

Product Transfer Area Assessment – Rankin Inlet Itivia Oil Handling Facility

January 6th 2019

Prepared for:

Environment and Climate Change Canada

Prepared by:

Agnico Eagle Mines Limited – Meliadine Division

Document Control

Version	Date	Tank/EC number	Section	Revision	Author
1	January 2019	EC# 00044507		Implementation of the Product Transfer Area Assessment – Rankin Inlet Itivia Oil Handling Facility for the ERP	Dan Gorton Env. Coordinator
2					

1. Introduction

The purpose of this document is to satisfy the requirement of section 15 of the Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations made pursuant to Canadian Environmental Protection Act, 1999 which states

15 (1) The owner or operator of a storage tank system must ensure that petroleum product and allied petroleum product transfer areas are designed to contain any releases in liquid form in the environment that occur during the transfer process. In accordance to the STSPPR a ''transfer area" means the area around the connection point between a delivery truck, railcar, aircraft or vessel and a storage tank system in which the tanks have an aggregate capacity of more than 2 500 L. Furthermore, Subparagraph 2.1(2) of the STSPPR states a person must not release or permit or cause any release of a petroleum product or allied petroleum product, in liquid form in the environment, during the transfer of the product to or from a storage tank system if, in the case of a system that has a transfer area, the release during transfer reaches outside the transfer area.

2. Summary

Location: 62°48'16.66" N, 92°05'5.32" W. Itivia Road, Rankin Inlet.

Tank System ID: EC# 00044507



Figure 1 and 2: Agnico Eagle Ltd.'s Itivia Site Fuel Storage Area



Figure 3 and 4: Agnico Eagle Ltd.'s Itivia Site Fuel Storage Containment

The diesel (13.5ML and 20ML) storage tank system owned by Agnico Eagle Mines (AEM), located at Rankin Inlet was evaluated in accordance with Environment and Climate Change Canada's (ECCC) approach to transfer area protection. A number of potential incidents, risk and related receiving environments were identified for this product transfer area. The risk evaluation identified two risks requiring action. The risks were mitigated by designing secondary containment for the two product transfer areas.

At the marine line connection point, a 400L concrete spill basin was installed to catch small quantities of product in the event of a pinhole leak at the connection point, or during disengagement of the coupling. At the vehicle refueling station, a secondary containment area was designed to accommodate a fuel tanker during refueling. This containment area is designed to capture small spills that may result during disengagement of the dry quick connect coupling.

In addition, there were several procedures related mitigation measures developed for this site to address the identified risks (see Section 5 - SOP).

3. Background

The oil handling facility contains two steel tanks of 13.5ML (tank 1) and 20ML (tank 2) capacity. The tank system is owned and operated by Agnico Eagle Mines Limited. Tank 1 was installed in 2017 and Tank 2 was installed in 2018. Both tanks are operational 12 months of the year. The tanks are refilled annually (July to October). There have been no previous failures where product reached the environment with this storage tank system.

Refueling station to truck transfer area

There is one loading arm with dry quick connect coupling for tank truck filling operation, connected to an insulated pumping station (watertight 20' container). A single continuous 3m x 100mm hose transfers fuel from the loading arm to the fuel truck. The flow rate is a maximum of 800 L/min, or less, depending on the truck.

Transfer of fuel into trucks is performed in conformance with procedures outlined in:

- The National Fire Code of Canada (NFCC);
- The American Petroleum Institute (API) Standard: 2610-94: *"Design, Construction,*
- *Operation, Maintenance and Inspection of Terminal and Tank Facilities"*
- The Canadian Petroleum Products Institute (CPPI, 1992*): "Professional Driver's*
- *Manual".*
- Canadian Council of Ministers of Environment (CCME) – Code of Practice (COP) 2003.
- Agnico Eagle fuel transfer procedure.

Ship to shore transfer area

The ship to shore PTA consists of a marine line connection with flange connection and check value. A 400L concrete spill basin is present beneath the connection point. Product is transferred via a 120m x

100mm hose at a rate of 250m^3/h. The ship's pumping system is fitted with an emergency shut off system which is activated when pumping pressure is lost.

Transfer of from ship to shore is performed in conformance with procedures outlined in:

- The National Fire Code of Canada (NFCC);
- The American Petroleum Institute (API) Standard: 2610-94: *"Design, Construction,*
- *Operation, Maintenance and Inspection of Terminal and Tank Facilities"*
- The Canadian Petroleum Products Institute (CPPI, 1992*): "Professional Driver's*
- *Manual".*
- Canadian Council of Ministers of Environment (CCME) – Code of Practice (COP) 2003.

The risks identified under the following table (Section 3) as needing action have been addressed.

4. Analysis of Product Transfer Area Risks

The table below lists potential incidents, outcomes, description of PTA and receiving environments that have been identified for the storage tank system on site. The table also provides an evaluation of identified risks and an assessment on whether further action is required, and a list of mitigation measures.

Table 1: Product Transfer Risk Assessment - refueling station to fuel truck

Potential Incident	Outcome	PTA and Receiving Environment	Spill Consequence	Probability	Potential Impact	Evaluation	Mitigation Measures
Overfill during loading of fuel truck	Approximately 132.27L product is captured in secondary containment	Secondary containment Adjacent soil/gravel area within ~10m Melvin Bay	Low: the product is confined secondary containment. Moderate: the product reaches bare ground. High: the product reaches a water body.	Moderate	Low	No Action Required	Secondary containment with 40000L capacity at tanker connection point Scully fitted with optic overfill prevention system Permanent indoor structure with visual display for operator in cold weather
Overfill device fails	Product flows into 40000L secondary containment			Moderate	Low	No Action Required	Shut off button and tanker overfill pipe
Coupling/equipment fails at pump station-hose connection.	Broken piping/hose releases ~1000L of fuel to adjacent gravel area.			Moderate	Moderate	No Action Required	Shut off button, drainage to low point on roadside. Emergency Response Plan and Spill Contingency Plan Trained spill response staff and equipment for large spills on site.
Absence of inspection (pre-op, checklist)	Faulty component or leak is not detected resulting in slow release of ~1L of product			Moderate	Moderate	No Action Required	Pre-op inspection (daily by M&T and AEM) Standard Operating Procedure (SOP)
Public access	Member of the public attempts to take or release fuel			Low	Low	No Action Required	Signage and surveillance cameras Fuel system security coded Community awareness conducted by AEM
Vehicle contact with building/equipment	Broken piping releases ~1000L of fuel to adjacent gravel area.			Low	Moderate	No Action Required	Secondary containment structure protects fuel station from collision by forming a barrier. Fuel lines connected to tank farm can only release contents of the line.

Table 2: Product Transfer Risk Assessment – refueling station to fuel truck cont.

Potential Incident	Outcome	PTA and Receiving Environment	Spill Consequence	Probability	Potential Impact	Evaluation	Mitigation Measures
Inappropriate equipment for arctic conditions (arm/valve)	Valves and components fail in arctic conditions releasing ~100L of product			Moderate	Moderate	No Action Required	Valves and hoses suitable for arctic conditions installed. Pre-op inspection (daily by M&T and AEM)
Operator spills small amount of fuel while uncoupling hose	~100ml of fuel is captured in secondary containment			High	Low	No Action Required	Portable drip tray used within secondary containment

Table 3: Product Transfer Risk Assessment – Ship to shore

Potential Incident	Outcome	PTA and Receiving Environment	Spill Consequence	Probability	Potential Impact	Evaluation	Mitigation Measures
Leakage if fuel remains in line after off loading and leakage at all couplings in the line (by the boat and outside the connections)	Maximum of ~1500L of fuel is released to Melvin Bay	Secondary containment Adjacent soil/gravel area within ~10m Melvin Bay	Low: the product is confined secondary containment. Moderate: the product reaches bare ground. High: the product reaches a water body.	Moderate	High	No Action Required	Trained Intertek Personal oversee product transfer Line is cleared of fuel following transfer
Coupling/equipment fails at onshore coupling	Maximum of ~1500L of fuel is released to Melvin Bay			Moderate	High	No Action Required	Ships pumping system shuts off if hose pressure is lost. Trained Intertek Personal oversee product transfer Transfer point is up gradient of pumping point so line does not completely drain if uncoupled. Emergency Response Plan and Spill Contingency Plan Marine spill response equipment adjacent to transfer point.
Coupling/equipment fails at offshore coupling	Maximum of ~1500L of fuel is released to Melvin Bay			Moderate	High	No Action Required	Spill contained onboard at pumping area.
Public interference	Transfer hose is damaged by passing boat or transfer impacted by public protest			Low	High	No Action Required	Community awareness conducted by AEM Boat traffic monitored by Desgagnes and Intertek
Operator spills small amount of fuel while uncoupling hose	~100ml of fuel is captured in secondary containment			High	Low	No Action Required	Portable drip tray used within secondary containment

Table 4: Product Transfer Risk Assessment - Ship to shore cont.

Potential Incident	Outcome	PTA and Receiving Environment	Spill Consequence	Probability	Potential Impact	Evaluation	Mitigation Measures
Vehicle contact with piping between transfer point and tank	Broken piping releases ~5000L of fuel to adjacent gravel area, potentially reaching Melvin Bay.			Low	High	No Action Required	Rock barrier protects pipeline from vehicles. Double walled piping installed beneath roadway. Fuel lines connected to tank farm can only release contents of the line.

Please see Appendix A for the calculations relating to the product transfer areas. In summary, potential product spillage, volume has been calculated as follows:

Fueling station: a confirmed maximum delivery rate of 800 L/min and an emergency shut off time of 8 seconds would result in a product spillage volume of approximately 108.72L. Based on 10cm hose at 3m in length, a potential spill at the tank / hose connection would result in an additional volume of 23.55 L, for a total 132.27 L of fuel spilled.

Ship to shore: a confirmed maximum delivery rate of 4166.67 L/min and an emergency shut off time of 8 seconds would result in a product spillage volume of approximately 556 L. Based on 10 cm hose at 122 m in length, a potential spill at the tank / hose connection would result in an additional volume of 957 L, for a total 1512 L of fuel spilled.

5. Mitigation of Risks

Refueling station to truck transfer area
At the vehicle refueling station, a 40,000L secondary containment area was installed to accommodate a fuel tanker in the event of an accidental overfill or connection failure during fuel transfer. This area is a lined and bermed depression where the transfer station and the fuel truck are located during the fuel transfer process.

In the event of a spill three potential receiving environments have been identified for the refueling system: the gravel area surrounding the refueling station and extending a distance of approximately 10 meters, the adjacent soil/ground surface, and the adjacent body of water, Melvin Bay.

Any product amount of 1000L or less that spills onto the gravel area can be recovered using the spill kit and heavy equipment on site. For spills of over 1000L, the product will likely reach the adjacent soil/ground surface and/or the Melvin Bay directly via overland surface flow (depending on the season). The low point containing a double wall culvert would contain the product before reaching soil or Melvin Bay. During winter, the likely hood of product flowing to the shoreline increases; however, snow berms can be quickly installed. Mitigation measures include;

- 60 L secondary containment for hose storage
- 40000L secondary containment for refueling of fuel trucks
- Standard Operating Procedure
- Trained operators
- Spill kit at refueling area containing absorbent pads
- Personnel monitor transfer from viewing window in pump station
- Five wire optic transfer system to prevent overfill
- Containment designed to hold 110% of fuel truck load limit

Ship to shore transfer area
At the marine line connection point, a 400L concrete spill basin was installed to catch small quantities of product in the event of a pinhole leak at the connection point, or during disengagement of the coupling.

In the event of a spill three potential receiving environments have been identified for the fuel transfer system: the gravel area partially surrounding the secondary containment and extending a distance of approximately 5 meters, the adjacent soil/ground surface, and the adjacent body of water, Melvin Bay.

Any product amount of 100L or less that spills onto the gravel area can be recovered using the spill kit and shovels. For spills of over 100 L, the product will likely reach the adjacent soil/ground surface and/or Melvin Bay directly via overland surface flow (depending on the season). During winter, the likely hood of product flowing to the shoreline increases; however, snow berms can be quickly installed. Mitigation measures include;

- 400L secondary containment at onshore connection point
- Pump and 1000L portable containments on standby during transfer if concrete containment overfills
- Trained Intertek Personnel oversee product transfer
- Standard Operating Procedure

- Emergency Response Plan and Spill Contingency Plans on site
- Oil Pollution Prevention Plan on site
- Marine spill response equipment on site

6. Standard Operating Procedure (SOP)

Refueling station to truck transfer area

The AEM procedure for refueling fuel trucks in summarized as follows;

1. Perform an inspection of the vehicle.
2. Park the vehicle in the vicinity of the refueling tank and shut off your ignition.
3. Install wheel chocks on either side of the tanker tire.
4. Inspect the entire working area including the steps up to the HMI and the area in front of the loading arm and scully system; call your supervisor if there are problems.
5. Install the portable spill containment underneath the connection point.
6. Check the maximum capacity for the tanker being used. Ensure to only fill the tanker at 90% of the capacity to have room for fuel expansion at different temperatures, and a safe level for haulage. Verify the current tank level from the electronic gauge on the side of the tanker, fill the tank to 37800 L maximum (18.9 in each compartment).
7. At the valve control panel, lift all the levers up, and make sure the valves are open.
8. Remove the cap of the scully plug and push and twist it onto the receiving end on the truck. Make sure the green light is on before continuing.
9. Connect the loading arm to the tanker.
10. Below is a picture of the final arrangement. Make sure the valve are open on each side.
11. Open the valve on the building.
12. Enter the control room and begin to program the fuel loading on the HMI.
13. Enter the applicable Microload identification and load sequence.
14. Enter the volume measure with the pop-up keypad.
15. Select the tank from which to pump fuel.
16. Select the start button to activate the pump.
17. Once the fueling begins, the operator must monitor the situation diligently; this includes checking for leaks or monitoring any other unusual situations. The operator must be at the connection point at all times during fueling.
18. When finished pumping, close the valve on the building.
19. Disconnect the loading arm first, and then the truck level control.
20. Put the arm back and the truck level control in place. Close the valve.
21. Put the protection bag over the scully and the hose. Verify if the caps are put back on the truck.
22. Put back the portable spill containment, and unhook the overflow hose, install the cap and close the valve.
23. At the valve control panel, pull down all the lever to close valve, and make sure they are closed.
24. Complete the mechanical verification in the pump station, just beside the HMI trailer. Make sure they have no leaks on the equipment.
25. Before you leave, make sure the three doors are locked at the fuel station.
26. Remove the wheel chocks and fully inspect the vehicle before beginning to bring the fuel to the Meliadine Fuel Tank Farm.

27. If you encounter any emergency or a spill occurs, call your supervisor immediately and the supervisor of Agnico Eagle Mine Meliadine.

Ship to shore transfer area

The AEM procedure for refueling tanks in summarized as follows, however the fuel transfer is overseen by Intertek (contracted first responder);

1. The Oil Pollution Emergency Plan (OPEP) must be reviewed on an annual basis and updated prior to the first annual discharge. This will include but not limited to:
   a) Reviewing the phone numbers for emergencies
   b) Updating maps
   c) Review and if necessary update equipment lists
   d) Review roles and responsibilities
   e) Update Declaration
2. Contact Canadian Coast Guard and Transport Canada Pollution Prevention and make them aware of plans for transferring of fuel into our Oil Handling Facility (OHF) for that season.
3. Complete *Inventory report for Spill Response Sea Can at AEM's Oil Handling Facility in Rankin Inlet.*
4. Ensure Shipping Company has provided Hose Testing Annual certification.
5. All personnel who will be a part of the fuel transfer (including Rankin Inlet Supervisor and third part contractor Intertek) must review the OPEP and be familiar with preventive measures to take and with the steps to take in the case of a spill event while fueling.
6. Install and monitor secondary containment underneath each connection of conduit on land.
7. Ensure there is two-way functional communications between the OHF and the off-loading vessel.
8. Ensure there is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours.
9. Prior to any discharge Agnico Eagle must receive a copy of the ship/shore checklist completed by the shipping company. Agnico Eagle should also verify this has been completed (as much as realistically possibly without boarding the ship).
10. Contact must be made with both the H&S, Environment, Warehouse and Community Relations Departments prior to the discharge of fuels.
11. The *Pre-discharge Checklist for AEM's Oil Handling Facility in Rankin Inlet* must be completed, signed and provided to the Environment Department prior to discharge.
12. Photos of the complete fuel transfer process should be taken, proving that all above procedures have been reached.
13. During the ship-to-shore transfer, Agnico Eagle will have competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew.
14. Monitor the fuel transfer at the beginning of each transfer and after that on an hourly basis checking the manifold, conduit, tank, and any connection points on land for spills and/or leaks. Communication between shore and ship should take place on an hourly basis.
15. Have a fuel spill scenario annually to cover both crews .

7. Conclusion

The Itivia Fuel Tank Farm, owned by Agnico Eagle Mines and located in Rankin Inlet, NU, has recently undergone modifications to mitigate risks associated with transfers of fuel at the ship to shore transfer area, as well as the truck transfer station. A 400L concrete spill basin was installed at the ship to shore PTA, beneath the on-shore connection point from the ship. This ship to shore PTA was designed to contain spills that may occur in the event of a pinhole leak at the connection point, or during unexpected disengagement of the coupling. Additionally, a 40,000L secondary containment was constructed for the truck transfer area. Fuel transfer vehicles now park within a lined and bermed depression, designed to contain spills that may occur from an accidental overfill, coupling device failures, and other spill scenarios while transferring fuels.

In addition to the secondary containment areas noted above, emergency spill response equipment is located near the ship to shore transfer valve on shore. In the event of a spill reaching Melvin Bay, Marine containment booms, anchors, trench shovels, absorbant pads, pumps and a dedicated boat and ATV are accessible year-round, and regular spill response training is conducted with members of the Meliadine Emergency Response Team and Environment Department. Meliadine Environment Technicians also conduct regular inspections of the Itivia site in order to ensure proper spill prevention and containment equipment is available, and that proper fuel transfer protocols are followed. All of the measures noted above are in place in order to contain, mitigate and prevent spills during the process of transferring fuel.

Appendix A - Potential Spill Quantities

Fuel Station to Fuel Truck

Flow rate = 800L/min maximum rate
Scully arm and hose length: 300cm, 10cm diameter

1. Calculate Volume of Spill (from time it takes operator to shut off pumping)
   800L/min = 800/60s = 13.34
   8s = time it takes for operator to turn off the pump should the tank start to overflow

   Volume = 13.34L/s * 8s
   = 108.72
2. Calculate the Volume of the pipe:

   Radius = (diameter of the pipe / 2)

   Radius = (10/2)
   = 5

   Volume of a cylinder: V = πr2h

   Volume = 3.14 * 5^2 * 300
   = 23550

3. 1 Litre = 1000m^3
   Volume in Litres = (volume in cm^3) * (1L/1000cm^3)
   Volume = (23550 / 1000 L)
   = 23.55 L

   Total Potential Spill = 108.72 + 23.55
   = 132.27 L

Therefore, the amount of a potential spill at the site would be 23.55L of fuel in the hose, plus 108.72L (using 8s before shut off) for a total of 132.27L.

Ship to shore:

Flow rate = 4166.67L/min maximum rate
Transfer hose length: 12192cm, 10cm diameter

1. Calculate Volume of Spill (from time it takes operator to shut off pumping)
   4166.67L/min = 4166.67/60s = 69.45
   8s = time it takes for operator to turn off the pump should the tank start to overflow

   Volume = 69.45L/s * 8s
   = 555.6L

2. Calculate the Volume of the pipe:

   Radius = (diameter of the pipe / 2)

   Radius = (10/2)
   = 5

   Volume of a cylinder: V = πr2h

   Volume = 3.14 * 5^2 * 12192
   = 957072

3. 1 Litre = 1000m^3
   Volume in Litres = (volume in cm^3) * (1L/1000cm^3)
   Volume = (957072 / 1000 L)
   = 957.07 L

   Total Potential Spill = 555.6 + 957.07
   = 1512.67 L

Therefore, the amount of a potential spill at the site would be 957.07 L of fuel in the hose, plus 555.6 L (using 8s before shut off) for a total of 1512.67 L.

APPENDIX K – STR’s Cross Reference Table

Table 1. Cross-reference of STS Regs, s. 30 to 32, to this emergency plan for P-50 Diesel Storage Tank System STS EC-00044507

STS Regs reference	Information required	Location of information in this emergency plan
s. 30(1)	The owner or operator of a storage tank system must prepare an emergency plan taking into consideration the following factors:	
s. 30(1)(a)	- the properties and characteristics of each petroleum product (i.e. Jet A1) or allied petroleum product stored in each tank of the system and	- MSDS for P-50 Diesel in Appendix D of the OPEP - Spill Contingency Plan and Hazardous Materials Management Plan, submitted with the annual report
s. 30(1)(a) continued	- the maximum expected quantity of the petroleum product or allied petroleum product to be stored in the system at any time during any calendar year; and	Can be find in section 4.1
s. 30(1)(b)	- the characteristics of the place where the system is located and of the surrounding area that may increase the risk of harm to the environment or of danger to human life or health.	- Site Description outline in section 4.1 and 4.3 of the OPEP
s. 30(2)	The emergency plan must include:	
s. 30(2)(a)	- a description of the factors considered under s. 30(1)	- See the rows above.
s. 30(2)(b)	- a description of the measures to be used to prevent, prepare for, respond to, and recover from any emergency that may cause harm to the environment or danger to human life or health;	- OPEP: s. 10 Spill Procedures s. 10.2 Spill Reporting s. 11 Spill Scenarios and Responses; s. 12 Spill Prevention; s. 12.1 Spill Training; .
s. 30(2)(c)	- a list of the individuals who are required to carry out the plan and a description of their roles and responsibilities;	- OPEP: s. 9 Roles and Responsibilities s. 9.1 First Responder s. 9.2 Emergency Control Group Figure 3. response Management System.

Table 1. Cross-reference of STS Regs, s. 30 to 32, to this emergency plan (continued)

STS Regs reference	Information required	Location of information in this emergency plan
s. 30(2)(d)	- identification of the training required for each of the individuals listed under s. 30(2)(c);	- OPEP s. 12.1 Training and Appendix I Mock scenario
s. 30(2)(e)	- a list of the emergency response equipment included as part of the plan, and	- OPEP s. 7 Equipment and PPE

	the equipment's location; and	
s. 30(2)(f)	- the measures to be taken to notify members of the public who may be adversely affected by the harm or danger referred to in s. 30(2)(b)	- OPEP s. 8.1.1 Communication with the Public
s. 30(3)	The owner or operator of a storage tank system must ensure that the emergency plan is ready to be implemented:	
s. 30(3)(a)	- in the case of a storage tank system that is installed before the coming into force of these Regs, no later than two years after the day on which these Regs come into force (i.e. by 12 Jun 2010); and	N/A
s. 30(3)(b)	- in any other case, before the day on which the first transfer of petroleum products or allied petroleum products into any tank of the storage tank system occurs.	- OPEP v.1.1 Sept 2017 - Spill Contingency Plan v6 March 2017
s. 31(1)	The owner or operator of a storage tank system must keep: - the emergency plan up-to-date and - keep a copy of it readily available for the individuals who are required to carry it out, - as well as a copy at the place where the storage tank system is located if that place is a place of work.	- OPEP is reviewed annually prior every shipping season and a hard copy is available at the Rankin Inlet Marshalling facility during transfer operations - Spill Contingency Plan is reviewed annually season and a hard copy is available at the Rankin Inlet Marshalling facility during transfer operations
s. 31(2)	The owner or operator must notify the Minister of the civic address of each location where the emergency plan is kept.	- No civil address, coordinates are at page ii of this document.

Table 1. Cross-reference of STS Regs, s. 30 to 32, to this emergency plan (continued)

STS Regs reference	Information required	Location of information in this emergency plan
s. 32(1)	If the owner or operator of a storage tank system has prepared an emergency plan with respect to the system on a voluntary basis or for another government or under an Act of Parliament and the plan meets the requirements of s. 30(1) and (2), they may use that plan for the purposes of meeting those requirements.	- OPEP and Spill Contingency Plan
s. 32(2)	If the plan does not meet all of the requirements of s. 30(1) and (2), the owner or operator may use the plan if they amend it so that it meets all of those requirements.	- OPEP and Spill Contingency Plan

Natural Recovery of Tundra Vegetation Following Exploration Drilling at Meliadine, Nunavut

Prepared for Agnico Eagle Mines Limited

November 2018

Dr. Katherine Stewart and Dr. Alix Conway

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Preface

On June 1, 2018 Agnico Eagle Mines and the University of Saskatchewan were successful in receiving a Natural Sciences and Engineering Research Council (NSERC) Collaborative Research and Development grant. The grant entitled "Tundra Restoration: Niche construction in early successional plant-soil systems" will support on-site and laboratory research from June 2018 to June 2022. The primary objective of this research is to address Term and Condition no. 41 of the Project Certificate for the Meliadine site: *"Prior to the commencement of operations, the Proponent shall develop a progressive re-vegetation program for disturbed areas that are no longer required for operations, such program to incorporate measures for the use of test plots, reseeding and replanting of native plants as necessary."* Several additional scientific objectives that support this primary objective will also be examined: i) Characterization of initial and realized niches of biological soil crusts and tundra vascular plants across a chronosequence of naturally recolonized drilling waste dumps; ii) Characterization of initial and realized niches of actively restored biological soil crusts on disturbed substrates iii) Characterization of initial and realized niches of actively restored tundra vascular plants on disturbed substrates. In addition to the scientific work, the project will include the development of a youth education program and local community engagement in Rankin Inlet and Baker Lake, NU.

Below is a summary timeline for key project activities and deliverables. For a timeline including all activities and deliverables see Appendix A.

Milestone	Description of activities	Anticipated starting date	Anticipated completion date
Natural recolonization of drilling wastes	Study natural recolonization of drilling waste dumps 2-17 yrs old by biological soil crusts and vascular plants. Specific recommendations of species for restoration will be developed.	2018-06-01	2019-08-31
Active restoration with tundra surface layers	Transplanting of tundra plugs, shredded surface layers and biological soil crusts onto disturbed substrates. Specific recommendations of restoration practice and species for restoration will be developed.	2019-06-01	2021-08-31
Youth education program	Collaboratively develop and deliver an education program on-site for one week in 2019 and 2020 for youth from Rankin Inlet and Baker Lake, NU. The program will focus on arctic ecology, restoration and skills in environmental monitoring and research.	2019-01-31	2021-01-31
Community meetings	We will hold community meetings in Rankin Inlet and Baker Lake. Working with Agnico's community relations department we will identify key groups to host. Our research and restoration of tundra environments will be presented and discussed.	2019-06-01	2021-08-31
Website development	Creation of project website providing information to restoration practitioners and the public on general arctic ecology and restoration practice in the North, as well as key findings from the research.	2019-08-31	2022-06-01

Technical reports for Agnico Eagle	Detailed technical reports for AEM on the restoration techniques examined. Guidelines and standard operating procedures for on-going monitoring will be included. Preliminary report January 2021, final report January 2022. Yearly progress reports November 2018-2021.	2018-11-30	2022-06-01

Executive Summary

This technical report directly addresses the first of several objectives associated with a Natural Sciences and Engineering Research Council (NSERC) Collaborative and Research Development grant held by Agnico Eagle Mines and the University of Saskatchewan. The grant entitled "Tundra Restoration: Niche construction in early successional plant-soil systems" will support on-site and laboratory research from June 2018 to June 2022. The primary objective of this research is to address Term and Condition no. 41 of the Project Certificate for the Meliadine site: "*Prior to the commencement of operations, the Proponent shall develop a progressive re-vegetation program for disturbed areas that are no longer required for operations, such program to incorporate measures for the use of test plots, reseeding and replanting of native plants as necessary.*" The specific objective addressed in the following technical report is the characterization of initial and realized niches of biological soil crusts and tundra vascular plants across a chronosequence of naturally recolonized drilling waste dumps. This work was completed in summer 2018.

A total of 25 drilling waste sites were examined across a range of ecotypes including low-lying hummock-hollow complexes dominated by sedges, upland hummock-hollow complexes dominated by heath and upland lichen-heath often with frost boil features. Following delineation of each drilling waste site, a transect was placed along the long axis of the waste site and three survey plots ($1m^2$) were placed at the center of this transect. In addition, at each site a control transect was placed at least 10 m from the edge of the drilling waste and three adjacent 1 m^2 plots were placed in undisturbed vegetation of the same type, slope and aspect as the disturbed area. The percent cover of all vegetation species present was estimated by eye and the drilling waste and organic matter depth was measured in the center of each plot.

We found that natural revegetation of drilling wastes is occurring at the Meliadine site. The community composition between drilling wastes and the paired undisturbed tundra was similar 20-25 years post disturbance and species richness recovered within 6 years. Due to the different life history characteristics of tundra plants, individual species responses to disturbance were observed. While sedges and mosses may recover more rapidly on these drilling wastes, dwarf shrubs and lichens may require longer to recover. These trends in natural recovery are important for guiding future restoration efforts and techniques. Specifically, targeting sedge and moss species for transplanting and/or seeding of disturbed substrates may be a highly effective strategy for initiating the development of early successional tundra communities.

Based on our findings we provide the following suggestions to improve and/or maintain the relatively rapid natural revegetation of the drilling wastes: i) Placement of drilling wastes on the landscape that allow for remnant patches or islands of intact tundra throughout the disturbed area; ii) Apply drilling wastes in thin layers to allow for vegetative establishment; and iii) Promote establishment of bryophyte communities in the early stages of revegetation to support long-term ecosystem recovery.

Given the findings of this study we suggest that active restoration of the drilling wastes is likely not required for the recovery of the tundra plant communities, if the timeline for recovery is ~20 years. Therefore, in our on-going work to develop tundra restoration techniques, we suggest developing active restoration trials at other disturbed areas on the Meliadine site.

Drilling Waste Site Description

Ecotypes

A total of 25 drilling waste sites were examined across a range of ecotypes including low-lying hummock-hollow complexes dominated by sedges, upland hummock-hollow complexes dominated by heath and upland lichen-heath often with frost boil features. Low-lying hummock-hollow complexes dominated by sedges were characterized by high soil moisture, often with standing water surrounding hummock-hollow complexes of approximately 30 cm in height. The primary vegetation found in this ecotype was *Dryas integrifolia*, *Carex aquatilis*, and *Scorpidium scorpioides*. Upland hummock-hollow complexes were similar in size to low-lying complexes, however due to a high landscape position had drier soil conditions and were dominated by *Rhododendron lapponicum, Loiseleuria procumbens, Cassiope tetragona,* and species of *Cetraria* lichen. The upland heath ecotype were typically associated with upper slope locations and well developed frost boil features. The primary vegetation in the upland heath ecotype was *Alectoria ochroleuca*, *Cassiope tetragona, Tomentupnum nitens,* and species of *Cetraria* lichen.

Drilling waste sites were grouped by time since drilling and included sites created in 1993, 1997-1998, 2008, 2012-2013 and 2017 (n=5 per age group) (Figure 1). Of the sites surveyed, 5 were low-lying sedge, 9 upland heath, 7 transitional between low-lying sedge and upland heath, and 4 lichen-heath ecotypes (Figures 2 and 3, Table 1). Ecotypes were not equally represented across age categories because drilling tended to be localized within the landscape for a given year. Older sites (1993, 1997-1998) occurred more frequently in low-lying sedge and sedge-heath transitions, while four of the five 2017 sites were in lichen-heath tundra. Due to the nature of drilling, some sites we sampled were spatially clustered together (i.e. 2008 and 2017 sites).

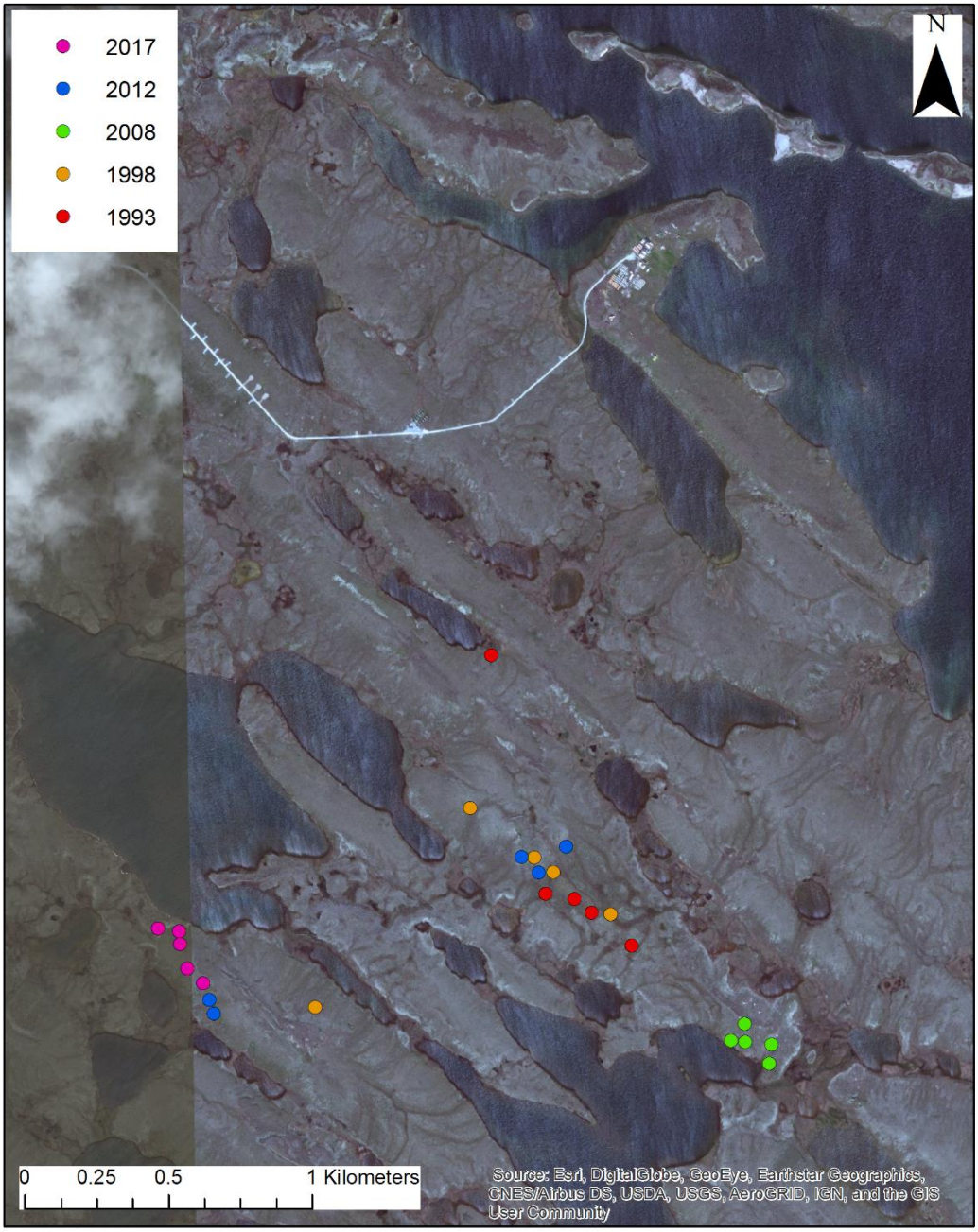

Figure 1. Map of drilling waste areas sampled in 2018. The year of drilling is given for each of the sites surveyed. The Meliadine site is shown for reference and all drilling waste sites were outside of the mine footprint.

Table 1. Drilling waste areas surveyed for natural revegetation. Site name, location, year and ecotype of each area surveyed is included. Ecotypes are described as low-lying sedge hummock-hollow (SH), upland heath hummock-hollow (HH) and upland lichen-heath (LH). Some drilling waste areas were in transitional areas between ecotypes (SH/HH).

Site	Location (UTM)	Year	Ecotype
W93-29	15V 0541749 6986813	1993	SH
W93-30	15V 0541809 6967640	1993	SH
W93-32	15V 0541948 6986649	1993	SH
W93-40	15V 0541439 6987661	1993	SH/HH
W93-44	15V 0541647 6986830	1993	SH
M97-155	15V 0540844 6986435	1997	HH
M98-230	15V 0541609 6986957	1998	HH
M98-242	15V 0541675 6986906	1998	SH/HH
M98-243	15V 0541385 6987129	1998	SH/HH
M98-244	15V 0541874 6986759	1998	SH
M08-729	15V 0542342 6986377	2008	HH
M08-734	15V 0542295 6986320	2008	SH/HH
M08-735	15V 0542344 6986314	2008	SH/HH
M08-740	15V 0542435 6986305	2008	HH
M08-741	15V 0542427 6986240	2008	HH
M12-1528	15V 0541565 6986959	2012	HH
M12-1860	15V 0541625 6986905	2012	HH
M12-1863	15V 0541720 6986994	2012	HH
M13-1948	15V 0540492 6986413	2012	SH/HH
GT13-71	15V 0540477 6986460	2013	SH/HH
M17-2394	15V 0540298 6986710	2017	LH
M17-2395	15V 0540375 6986656	2017	LH
M17-2396	15V 0540500 6986571	2017	LH
M17-2398	15V 0540455 6986519	2017	LH
M17-2415	15V 0540371 6986700	2017	HH

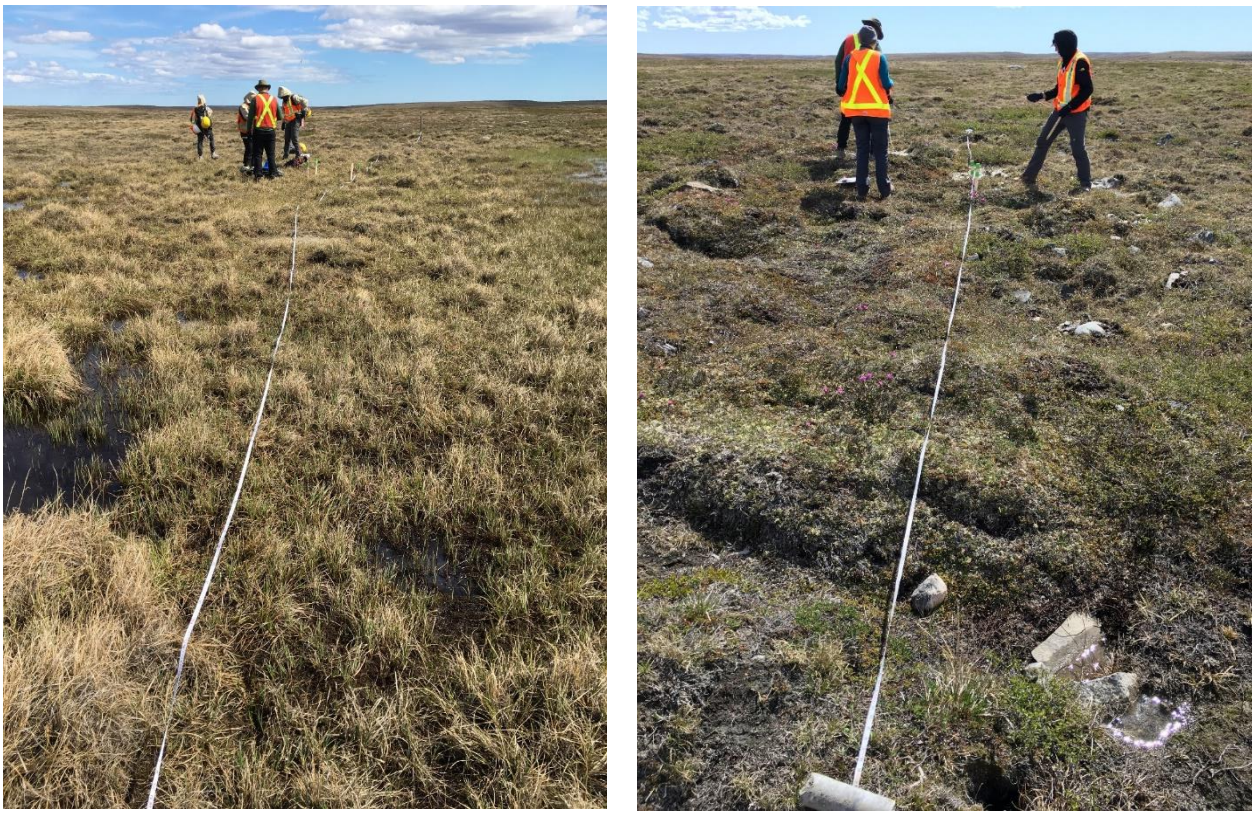

Figure 2. Low-lying sedge hummock-hollow (M93-30) (left) and upland heath hummock-hollow (M12-1860) (right).

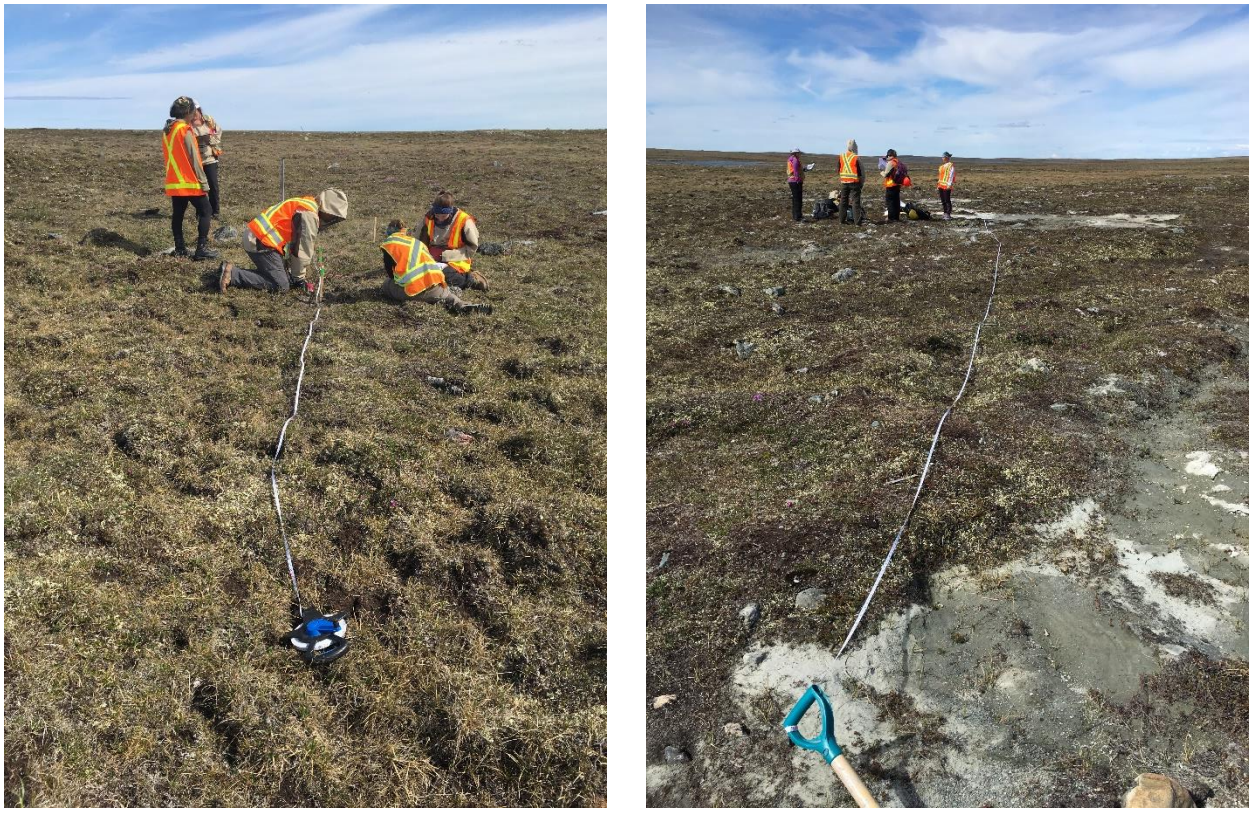

Figure 3. Transitional form low-lying sedge hummock-hollow to upland heath (M08-735) (left) and upland lichen heath (M17-2396) (right).

Delineation of Drilling Waste Sites

The approximate area of each drilling waste site was delineated by determining the extent of drilling waste at each location. The presence of drilling waste was either observed on the surface or below the surface by digging up to ~15 cm in depth. The average size of the drilling waste sites was 21 m x 9 m or 189 m^2. The largest drilling waste area sampled was from 1993 (W93-32) with an area of 1472 m^2. On average the 2008 drilling waste sites surveyed had the smallest area (77 m^2). In general, older drilling waste sites were covered with more vegetation and at times were difficult to locate. However, even at sites created in 1993 small patches of drilling waste were present at the surface (Figure 4). Newer drilling waste sites (i.e. 1-5 years old) generally had large patches of waste visible at the surface (Figure 5).





Figure 4. Small pockets of drilling waste evident at the surface of older sites (Left M93-30, Above M93-40).





Figure 5. Larger patches of drilling waste evident at the surface on newer drilling sites (left M12-1863; right M17-2398).

Sampling Design

Following delineation of each drilling waste site (see description above), a transect was placed along the long axis of the waste site and three survey plots were placed at the center of this transect (Figure 6). The three plots were each 1 m^2 and were placed immediately adjacent to one another. In each plot percent cover was estimated by eye for all species present. Following completion of the vegetation survey, a soil/drilling waste sample was taken in the center of each plot and the depth of both drilling waste and organic matter were measured.

At each drilling waste site a control transect was placed at least 10 m from the edge of the drilling waste. Along the transect three adjacent 1 m^2 plots were placed in undisturbed vegetation of the same type, slope and aspect as the disturbed area. In control plots, percent cover was estimated by eye for all species present and a soil sample was taken in the center of each plot to determine the depth of the organic matter. For all statistical analyses the average across the three plots either on the drilling wastes or in the control plots was used for each site.

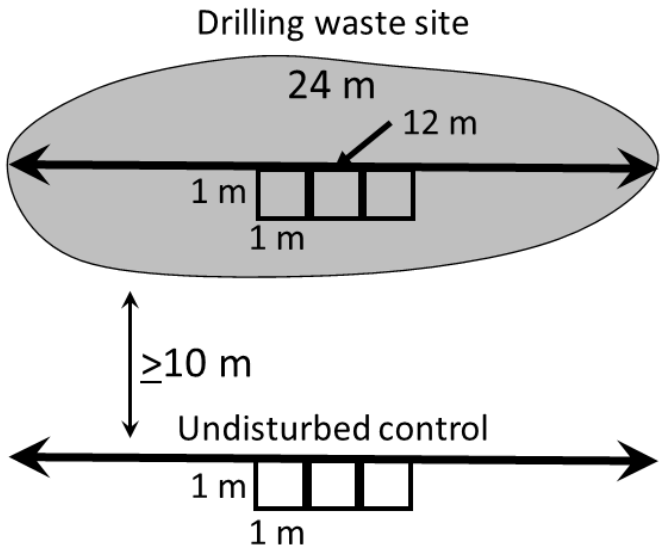

Figure 6. Sampling design at each drilling waste site. Three 1 m^2 plots were placed directly adjacent to one another at the center of the long axis of the delineated drilling waste area (ex. at a drilling waste area 24 m long, the center sampling plot would be placed from 11.5-12.5 m). At each site an undisturbed control transect was placed at least 10 m from the edge of the drilling wastes and 3 control plots (1m^2 each) were placed in undisturbed vegetation.

Vegetation Community Recovery

Community-level Differences

Recovery of the tundra vegetation at the drilling waste sites was examined through comparison of vegetation in disturbed and undisturbed survey plots at each site, as well as, examination of vegetative recovery over time (i.e. across time since disturbance). Community differences between drilling wastes and undisturbed controls over time were explored using non-metric multidimensional scaling ordination (NMDS). NMDS provides an ordination based on a distance or dissimilarity matrix, therefore objects that are ordinated closer to one another are more similar than those that are far apart (McCune and Grace, 2002). Overlap between drilling sites from 1993 and 1998 and their respective controls were evident (i.e. overlapping black and red squares and circles) suggesting that 20-25 years following disturbance the plant communities on drilling wastes are similar to undisturbed tundra (Figure 7). More recently disturbed sites from 2008, 2012 and 2017 had distinct communities (i.e. black and red triangles,

crosses and x's are separated along the axes) suggesting that >10 years is required for disturbed tundra communities to naturally recover.

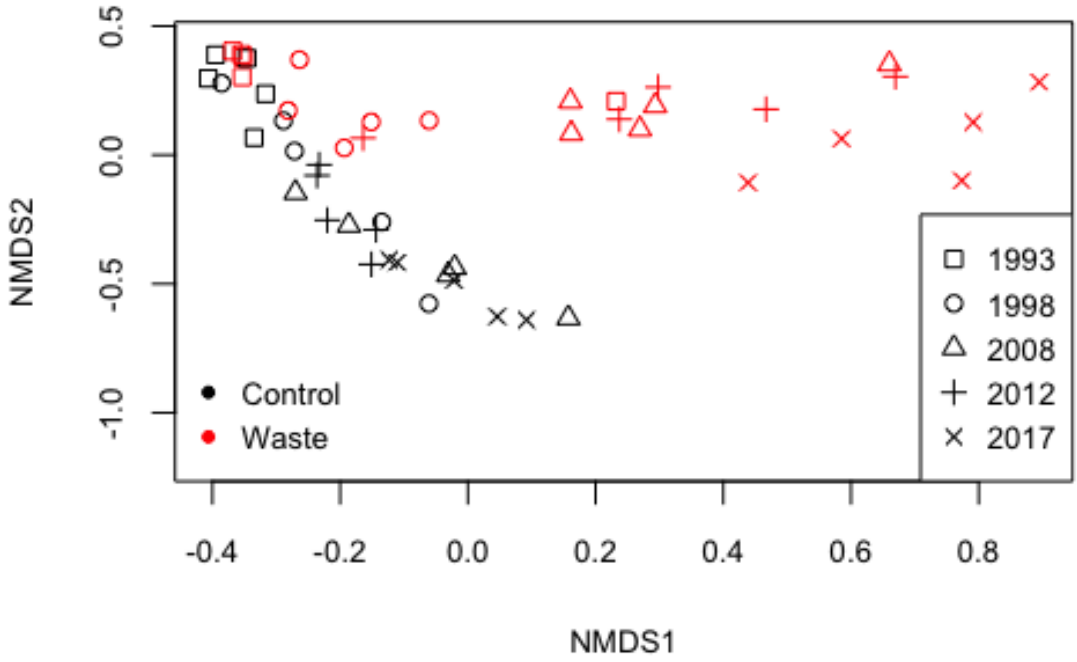

Figure 7. Non-metric multidimensional scaling ordination of species percent cover data on drilling wastes (red) and undisturbed control sites (black) in the disturbance years of 1993 (squares), 1998 (circles), 2008 (triangles), 2012 (crosses) and 2017 (x's). A stress value of $\leq$ 0.05 indicates a good fit. The stress value for the above ordination was 0.047.

To test for the effect of drilling wastes on community composition over time a PERMANOVA with Euclidean distances was used (Okasanen et al., 2015). PERMANOVA is a non-parametric multivariate analysis of variance that uses distance matrices. Treatment (i.e. drilling waste or control), year (i.e. 1993, 1998, 2008, 2012, 2017) and the interaction of treatment and year were fixed effects in the analysis and species cover was the response. All fixed effects were significantly different indicating that the plant communities are different between drilling wastes and control sites, as well as with time since disturbance ($p < 0.05$). A significant interaction between treatment and year is consistent with the NMDS since we observed that plant communities at older sites (1993, 1998) were similar between the drilling waste and control sites, but more recently disturbed communities were not.

Species Richness

Species richness was compared between the disturbed drilling wastes and the undisturbed control plots for each year included in the study. There were significant differences in species richness over time ($df=4$, $F=2.96$, $p=0.03$), between drilling waste and undisturbed controls ($df=1$, $F=19.763$ $p < 0.001$), and the interaction between time and drilling waste/control ($df=4$, $F=3.24$, $p=0.02$). Sites disturbed in 2017 had significantly lower species richness compared to their respective controls ($p < 0.001$), however, there were no significant differences in species richness between disturbed and undisturbed plots for sites

from 1993, 1998, 2008 and 2012 (Figure 8). Natural recovery of the tundra ecosystem results in similar species richness within 6 years. This trend is encouraging as it suggests that species richness can recover quickly and similar numbers of species are able to colonize the disturbed area. However, individual species may still be excluded on these recovering drilling wastes due to differences in the life history traits (i.e. growth form, reproduction and growth rate) of arctic vegetation.

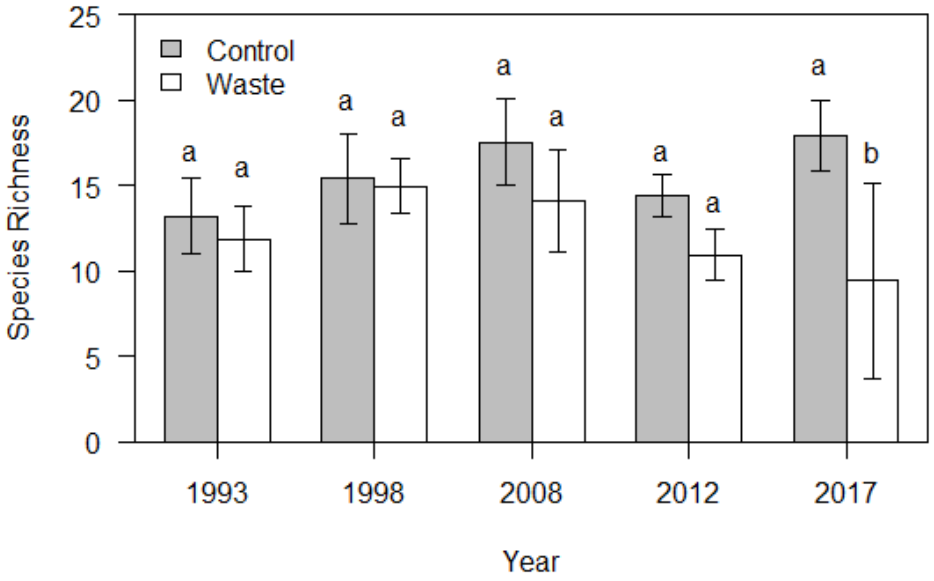

Figure 8. Species richness of drilling wastes and undisturbed control plots in different disturbance years. Both treatment (drilling waste and control) and year (1993, 1998, 2008, 2012, 2017) were significantly different (ANOVA, p<0.0f). Different letters represent significant differences (p <0.05) between control and waste sites within each year from a Tukey HSD post-hoc test. Bars present means with standard deviation (n=5).

Individual Species Response

Delayed dwarf shrub establishment was observed in recently disturbed sites, with the three most abundant ericaceous dwarf shrubs (*Cassiope tetragona, Dryas integrifolia* and *Loiseleuria procumbens*) having lower cover 1-2 years following disturbance (Table 2). Although there was variability across years since disturbance, in general, low-lying shrub cover increased over time with similar dwarf shrub cover present following 20 years of natural recovery.

Table 2. Difference in the percent cover of species between the drilling waste and paired undisturbed control plots. Values are the average % differences with standard error across all sites within a given year and only species with >5% differences in at least one year are included. Negative values indicate lower cover on the drilling wastes compared with the control and positive values indicate higher cover on the drilling waste compared to the control.

Year	Difference in Species percent cover (average % difference)				
	Dwarf Shrubs			**Sedge**	
	Cassiope tetragona	*Dryas integrifolia*	*Loiseleuria procumbens*	*Carex aquatilis*	
2017	**-9.0 (3.4)**	-4.3 (1.7)	-1.2 (1.2)	**8.6 (0.8)**	
2012	**5.3 (1.8)**	-2.4 (1.6)	0 (0)	1.5 (0.7)	
2008	1.6 (1.0)	2.9 (1.4)	**-9.6 (4.6)**	-0.7 (1.4)	
1998	4.1 (3.7)	**8.4 (3.8)**	0 (0)	-0.3 (3.0)	
1993	-0.6 (0.5)	-1.3 (2.4)	-1.2 (0)	0 (4.5)	
	Mosses		**Lichens**		
	Bryum spp.	*Scorpidium scorpioides*	*Cetraria* sp.	*Alectoria ochroleuca*	Fruticose Lichen
2017	-1.3 (1.2)	-0.3 (0.3)	**-20 (7.7)**	**-6.3 (1.3)**	**-8.7 (4.2)**
2012	4.1 (4.3)	-0.1 (0.1)	**-7.2 (3.1)**	0 (0.6)	-0.4 (0.4)
2008	**8.3 (2.3)**	0 (0)	**-14 (4.7)**	**-7.7 (3.0)**	**-4.1 (0.8)**
1998	**5.3 (2.9)**	-0.3 (0.2)	**-6.4 (3.2)**	-2.2 (1.4)	-1.9 (1.7)
1993	0.9 (1.5)	**-13 (5.4)**	-1.5 (1.1)	0.1 (0.1)	-0.9 (0.4)

Higher cover of *Carex aquatalis* in the early years of recovery are not surprising since sedges can often rapidly establish on disturbed arctic sites. Previous revegetation studies from Alaskan tundra found that native sedges established on disturbed sites in 5-10 year and had an aboveground biomass equal to undisturbed tundra (Chapin and Chapin, 1980). Sedges are often more dominant in lower-lying landscape positions in tundra ecosystems. Higher sedge cover on drilling wastes were observed only in 2012 and 2017. The 2012 sites were located in sedge (n=2) or heath (n=3) dominated hummock-hollow complexes, whereas, 2017 sites were in heath dominated hummock-hollow (n=1) and lichen heath (N=4) ecotypes. Therefore, sedge establishment of disturbed substrates may be occurring naturally across ecotypes indicating that these species could be useful for active restoration efforts.

One to two years following disturbance both mosses and lichens had a lower cover on the drilling wastes than the undisturbed controls. However, some moss species, such as *Bryum* spp. appear to recover quickly and establish at higher percentages on drilling wastes than the undisturbed tundra. *Bryum* sp. are acrocarpous, or carpet forming, are tolerant of high levels of solar radiation and are known to establish on disturbed substrates, especially slightly alkaline substrates (McKnight et al., 2013). Other moss species, such as *Scorpidium scorpioides*, have lower establishment on the disturbed substrates. *S. scorpioides* are pleurocarpous, or branched, and tend to be found in moist depressions in the landscape. In addition, saline conditions are known to inhibit or prevent growth of S. *scorpioides* (Vitt et al., 1993). Salinity associated with the drilling waste materials may be inhibiting the establishment of *S. scorpioides* over time. Lichen cover was lower across almost all ages of drilling wastes which is not surprising as

lichens are commonly regarded as slow-growing (Werner, 1990; Seminara et al., 2018). Despite the lower percent cover of lichens on the drilling wastes there was a clear trend of increasing cover over time. This is exemplified by *Cetraria* sp. that had 20% less cover on the drilling wastes 1-2 years following disturbed but only 1.5% less cover 25 years following disturbance.

Sedges and mosses may be important early colonizers and appear to establish relatively rapidly under natural recolonization. Dwarf shrubs and lichens are likely to require more time for natural recolonization and these growth forms may require active restoration efforts if shorter revegetation timelines (i.e. < 20 years) are required.

Presence/absence of plant species had similar trends to those observed for the percent cover differences (Table 3). Investigating presence/absence data is critical to understanding specific species response, because it reveals species that could be excluded from the disturbed sites. Dwarf shrubs (*Cassiope tetragona* and *Dryas integrifolia)* including *Salix* spp. were absent from 60-80% of recently disturbed drilling waste sites (i.e. 2012, 2017) (Table 3). Similarly, several moss and lichen species were absent from 60-100% of drilling waste sites that were disturbed within the last 10 years. As discussed above the slow-growing nature of these species likely accounts for the slow rates of colonization. It also appears that there may be some *Carex* spp. that are absent from the drilling wastes even after 25 years of natural recovery.

Table 3. Species presence/absence on the drilling wastes compared with paired undisturbed control plots. Negative values represent the total percentage of sites where a species was present in the paired control plots but not on the drilling waste. Positive values represent the total percentage of sites where a species was present on the drilling waste but not the paired control plots. All values are expressed as a percentage of sites where a species was present/absent (i.e. x/5*100). Only species where presence/absence differences were found at > 2 sites (>40%) are included.

Year	Presence/absence of species on drilling wastes vs. paired controls (% of sites)						
	Shrubs	**Dwarf Shrubs**				**Sedge**	**Forb**
	Betula glandulosa	*Cassiope tetragona*	*Dryas integrifolia*	*Salix spp.*	*Salix reticulata*	*Carex spp.*	*Pedicularis sp.*
2017	0	**-80**	**-80**	20	-20	-20	0
2012	20	**-60**	0	**-60**	**-80**	0	0
2008	0	0	40	0	-20	0	-20
1998	**60**	-40	0	40	-40	-20	**60**
1993	0	-40	20	0	40	**-60**	-40
	Mosses		**Lichens**				
	Tomenthypnum nitens	*Distichium spp.*	*Alectoria ochroleuca*	*Dactylina arctica*	*Thamnolia spp.*	*Xanthoparmelia spp.*	
2017	**-60**	-40	0	**-100**	**-60**	**-60**	
2012	**-60**	-40	-20	-20	-40	-20	
2008	**-60**	**-60**	**-80**	**-60**	**-80**	-20	
1998	0	0	-40	-40	20	-20	
1993	-20	20	0	-0	-20	-20	

Only two species were found to occur on the majority of drilling waste sites in comparison to the paired control plots: *Betula glandulosa and Pedicularis sp* (Table 3). Both species were found on 60% of the drilling waste at sites disturbed in 1998, and *B. glandulosa* was also found on 20% of the drilling waste sites in 2012. It is possible that both of these species benefit from the exposed substrate and high light conditions on the drilling waste surfaces. A survey of more sites across the landscape is needed to support these initial results, but it is clear that there are species that may be excluded from the drilling wastes and others that may benefit from the disturbance.

Overall tundra disturbed by the deposition of drilling wastes at the Meliadine site appears to recover relatively rapidly (i.e. within 20 years) without any active restoration. The community composition between drilling wastes and the paired undisturbed tundra was similar 20-25 years post disturbance and species richness recovered within 6 years. Due to the different life history characteristics of tundra plants, individual species responses to disturbance were observed. While sedges and mosses may recover more rapidly on these drilling wastes, dwarf shrubs and lichens may require longer to recover. These trends in natural recovery are important for guiding future restoration efforts and techniques. Specifically, targeting sedge and moss species for transplanting and/or seeding of disturbed substrates may be a highly effective strategy for initiating the development of early successional tundra communities.

Invasive Species

We examined 25 drilling wastes sites ranging in age from 1-25 years across the landscape at Meliadine, NU (Figure 1). At each of these sites we surveyed all species present in six $1m^2$ plots (3 on drilling wastes, 3 in undisturbed tundra). Within these 150 survey plots no invasive species were detected. In addition, no invasive species were noted at any other location on site, however, no systematic survey was conducted.

The University of Saskatchewan will conduct invasive plant surveys once a year during the summers of 2019, 2020, and 2021. We will provide and implement "*protocols for reducing Project-related effects to plant populations and communities, primarily through the mitigation and management of invasive species, and includes both environmental and follow-up monitoring"* as required by the Project Certificate (No.006, Condition 37) for the Meliadine site. These surveys will allow for early detection of any non-native invasive species present on the Meliadine site and provide the distribution and abundance of any invasive species found. A targeted monitoring approach, which focuses on high probability sites of initial invasive species establishment will be used.

Invasive plant monitoring will follow the survey protocol outlined by Oldham 2006 for exotic plants along Northwest Territories highways. Our survey study area will include the footprint of the Meliadine mine, as well as, the main access road from Rankin to the Meliadine site. Road surveys will consist of driving at a low speed (30km/hr on the road into site, and posted speed limits within the mine footprint) along all roadways in the study area. During road surveys, we will be looking for any invasive plants. All roads will be driven twice, to ensure both roadsides are surveyed.

On the main access road, we will stop every 2km for an informal roadside walking survey. At each informal roadside survey, we will record latitude and longitude, walk 50 meters along both sides of the road and record if any invasive species are encountered (location, pictures). Within the mine

footprint, areas of high likelihood of invasive species colonization, such as intersections, will be surveyed through formal roadside surveys. At each formal roadside survey location, we will record the latitude and longitude, describe the local habitat with reference to native species nearby, and walk 50m in all directions looking for invasive species. Additional locations with a high likelihood of invasive species colonization within the mine footprint, such as the exploration camp and main camp, will also be surveyed by the formal approach with a focus on the perimeter of the disturbed area. We will consult with the AEM environment team for other targeted locations (storage buildings, gravel pits) while ensuring we are only conducting surveys in safe areas clear of mining related activity.

Based on a 2010 report from the Canadian Endangered Species Conservation Council, there are 14 non-native plant species that have been recorded in Nunavut (Table 4). While looking for species previously recorded as invasive in Nunavut, we will take samples of any plants we cannot identify in the field to confirm their identification.

Table 4. Non-native invasive plant species identified by the Canadian Endangered Species Conservation Council that have been found in Nunavut.

Scientific name	**Common name**
Carum carvi	Wild Caraway
Taraxacum officinale	Common Dandelion
Sonchus arvensis	Field Sow Thistle
Leucanthemum vulgare	Oxeye Daisy
Thlaspi arvense	Field Pennycress
Capsella bursa-pastoris	Shepherd's Purse
Barbarea vulgaris	Yellow Rocket
Amaranthus retroflexus	Green Amaranth
Hordeum vulgare	Common Barley
Puccinellia distans	Spreading Alkali Grass
Vicia cracca	Tufted Vetch
Papaver somniferum	Opium Poppy
Plantago major	Common Plantain
Polygonum aviculare	Prostrate Knotweed

Colonization of Drilling Wastes

Bryophytes played an important role in the initial and early colonization of drilling wastes across the landscape. Moss species, particularly *Bryum* spp. were found on 88% of the drilling waste sites and were only absent at three sites all of which were disturbed in 2017. In addition, *Bryum* spp. had higher cover on the drilling wastes compared with the paired undisturbed tundra controls 10-20 years following disturbance. These early colonizing acrocarpous moss species appear to be the first macro biological soil crust component to establish. Biological soil crusts (BSCs) are communities of mosses, liverworts, lichens, bacteria, cyanobacteria and fungi that are commonly found throughout the arctic, especially on recently disturbed soils (Bowker et al, 2018). Mature BSCs appear to naturally develop approximately 10 years following disturbance with BSCs present on all but one drilling waste site from the disturbance years 1993-2008. These early colonizers and the subsequent development of mature biological soil crusts (Figure 9) likely play an important role in increasing water hold capacity and maintaining soil moisture at the surface, which is critical for soil nutrient cycling processes and germination of vascular plants from seed (Forbes and Jefferies 1999; Stewart et al. 2011a,b,c). In addition, early bryophyte colonizers provide surface roughness that can trap wind blown seed (Belnap and Harper, 2003). Through wetting and drying cycles moss mats can also provide a significant input of carbon, nitrogen and phosphorus that in turn promote key ecosystem processes, such as carbon and nitrogen cycling (Stewart 2011a,b).



Figure 9. Early acrocarpous moss establishment on 4-5-year-old drilling waste (left GT13-70) and mature biological soil crust 20-year-old drilling wastes (right M98-230).

On-going work is being completed in the laboratory at the University of Saskatchewan to examine the development and function of BSC assemblages in relation to soil physical, chemical and microbial properties. We are also working to develop successional models of BSCs based on the realized niche of primary macro and micro BSC phyla. This will allow us to assess the primary factors that determine the initial colonization of the disturbed substrates and the subsequent development and function of these critical early successional communities.

BSC and underlying substrate samples were collected from three drilling waste sites for each of the following disturbance years: 1998, 2008 and 2013. Five samples of crust and the underlying

substrate were collected by pushing a 7 cm diameter by 6.5 cm deep cylindrical sampling cup into the ground, cutting around it with a knife and extracting the sample. Samples were then tapped out of the sample jar, turned upright and returned to the cup and closed tightly. Samples were stored in coolers until brought to the university, where they were then housed in the PhytoTRON (Diurnal cycle of 18.5 hrs light/5.5 hrs dark with 15°C during light and 5°C during dark with relative humidity ~50%) and watered regularly with approximately 125 ml of water (MilliQ ®Ultra-Pure). Subsamples of each crust surface (~ 2.5 cm) and underlying substrate (> 2.5 cm to depth of sample) were collected within 1 week of return from the field and were stored at -80°C until analysis. DNA will be extracted (DNeasy PowerPlant Pro Kit, Qiagen) from these BSCs and underlying substrate. Molecular analysis will be conducted using Illumina MiSeq sequencing. Bryophytes and lichens, bacteria (16S) and fungal ITS will be examined for each BSC and underlying soil sample. In addition, BSC and substrates immediately underlying BSCs will be characterized for pH, ammonium (NH_4), nitrate (NO_3), dissolved organic nitrogen and dissolved organic carbon.

To better understand the role these early colonizing communities have in driving recovery of ecosystem function, gas flux measurements and enzyme assays have and will be completed. Gas flux measurements of all sampled BSCs were measured in August 2018. A Fourier Transform InfaRed-Multicomponent Gas Analyzer was used to determine carbon dioxide (CO_2), methane (CH_4) and nitrogen dioxide (N_2O) flux under both dark and light conditions. Measurements of N_2 fixation were made using acetylene reduction assays (Stewart et al., 1967). For the subsequent years of sampling (2019 and 2020), a series of enzyme assays to measure mineralization (chitinase and protease assays, following Hendel & Marxsen (2005)), nitrification (potential nitrification assay, following Hoffman et al. 2007)) and denitrification (potential denitrification assay, following Luo et al., 1996)) will be performed.

Finally, two microclimate monitoring stations were deployed on drilling wastes from 2013. At each site, two zones were established; one with exposed drilling waste and no BSC establishment and the other colonized by BSCs. In each zone, soil surface temperature is being monitored with fine wire copper constant thermocouples, BSC moisture is being monitored with impedence clips (Coxson, 1991) and soil moisture sensors were inserted to measure below surface moisture conditions. PAR (Photosynthetically Active Radiation) sensors were installed to measure light intensity and Leaf Wetness Smart sensors were deployed to provide the percent wetness just above the surface of the BSCs. These instruments were connected to a dataloggers (CR1000X Campbell Scientific Inc or HOBO loggers) and hourly means are being recorded until 2020. Additionally, an inventory of BSC was conducted by use of $5cm^2$ grids in a $25cm^2$ quadrats to measure surface cover by visual estimates. This will allow us to examine the microclimatic conditions associated with these developing BSC communities.

Substrate Characterization

The average depth of drilling waste and organic matter in impacted sites was 3.7 ± 3.2 and 2.4 ± 3.2 respectively (Figure 10). The average depth of organic matter in control sites across the landscape was 7.7 ± 2.9 cm. The deepest deposits of drilling waste were > 15 cm and found at 1993 sites, M93-40 and M98-230. The deepest organic layer depth was found in a control site at 20 cm. While drilling waste depth was similar across the differently aged sites, higher organic matter accumulation was evident at older sites (Figure 11).



Figure 10. Drilling waste ~3 cm in depth underlain by an organic soil horizon (left) and organic matter accumulation over drilling waste (right).

The depth of drilling waste and organic matter (OM) was assessed at each site by measuring the depth of each substrate type within the center of each 1 m^2 vegetation survey plot. Drilling waste depth was similar across all disturbance years and OM in undisturbed control plots was also similar across the landscape (Figure 11). The highest amount of OM found on drilling wastes was found in sites >25 years old (i.e. 1993), while very low to no OM was found on recently disturbed sites (i.e. 2017).

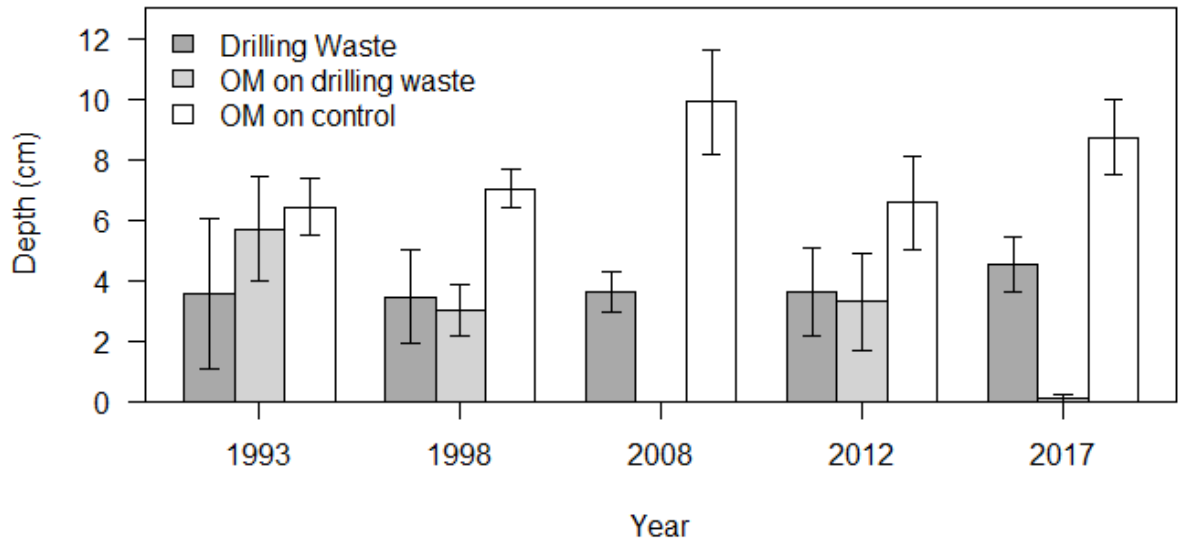

Figure 11. Depth of drilling waste, organic matter found over drilling waste and depth of organic matter in undisturbed controls plots. Bars are means with standard error (n=5).

Sites surveyed in 2008 were an anomaly with no OM depth detected (Figure 11). It possible that our sampling design biased placement of survey plots to areas with exposed drilling waste. However, we also found lower percent cover of several species (Table 2) and the highest number of absent species on drilling wastes (Table 3) at 2008 sites. The lack of organic matter accumulation could be due to the physicochemical properties of the drilling wastes inhibiting vegetative establishment or may be associated with the landscape position of 2008 sites. All 2008 sites were in close proximity to one another and were the most south-easterly sites sampled (Figure 1). Differences in landscape conditions (i.e. moisture, aspect, soil properties) in this area may impact natural revegetation. The 2008 sites were classified as heath hummock-hollow or transitional sites between heath hummock-hollow and sedge hummock-hollow. The mid-slope position of these sites would likely contribute to drier soil conditions, which may be limiting vegetative growth and hence OM accumulation. To confirm if/why lower OM accumulation is occurring in 2008, further survey of 2008 drilling waste sites in other landscape locations and assessment of the physicochemical characteristics of these drilling wastes is needed.

The relatively high OM depth measured at 2012 sites is also unexpected (Figure 11). Accumulation of OM in tundra ecosystems is generally considered to occur very slowly due to the short growing season and relatively low biomass production each year (Hobbie et al. 2002; Hugelius et al. 2010). It is very unlikely that approximately 4 cm of OM would accumulate within 6 years. We noted that on several drilling waste sites, wastes were found in depressions or hollows, with hummocks remaining intact above the level of the wastes. It is highly possible that some slumping is occurring in these hummock-hollow landscapes that could result in the burial of drilling wastes and appearance of OM accumulation on the drilling waste surface. These results should be interpreted with caution both due to the possible biasing of measurement due to the sampling design and the low numbers of replication (i.e. n=5) in each age category.

Best Practices to Promote Natural Recovery on Drilling Wastes

Based on the characterization of drilling waste sites and the tundra vegetation present on drilling wastes ranging from 1-25 years it is evident that natural revegetation is occurring on these wastes. Sources of vegetative materials for recolonization and depth of drilling waste appear to be two of the primary driving factors in determining the extent of recovery. Given these driving factors we suggest the following practices to promote natural revegetation processes.

1. Leaving areas of intact tundra vegetation dispersed throughout the area where drilling wastes are contained is essential. In hummock-hollow tundra, dispersal of drilling wastes into hollows, allows for hummocks to stay intact and act as source population for revegetation. Hummocks provide not only aboveground islands for revegetation but also maintain connectivity with intact belowground soil systems.

2. Thinly spread drilling wastes appear to undergo revegetation processes more quickly. In general, a depth of ~3 cm allowed for natural recolonization to proceed. Whereas depth of drilling waste > 15 cm can impede ecosystem recovery with little recovery observed even 20 years after disturbance. Underlying microtopography of drilling waste sites should be considered in managing wastes with an emphasis placed on limiting drilling wastes.

3. Direct colonization of drilling wastes in the first ~5 years is primarily driven by the colonization of acrocarpous mosses. Establishment of these early colonizing moss communities appears to facilitate the development of cohesive and diverse biological soil crusts in later years (~10-20 years). Mature biological soil crusts may act to further stabilize exposed drilling wastes and promote establishment of vascular plant species. **Promoting bryophyte cover in early stages may be beneficial to long-term tundra vegetation establishment.** Surface moisture is essential for establishment of early bryophyte communities and therefore practices that promote retention of surface moisture may assist in recovery.

Conclusions

Natural revegetation of drilling wastes is occurring at the Meliadine site. In our initial project proposal, we had proposed to examine active restoration on drilling waste sites. The first step in preparing to conduct active restoration was to examine a chronosequence of drilling waste sites across the landscape. This approach allows us to determine patterns of natural recolonization and use this information to inform active restoration practice. From the 25 drilling waste sites with paired undisturbed controls that were examined, we found that the community composition between drilling wastes and the paired undisturbed tundra was similar 20-25 years post disturbance and species richness recovered within 6 years. Due to the different life history characteristics of tundra plants, individual species responses to disturbance were observed. While sedges and mosses may recover more rapidly on these drilling wastes, dwarf shrubs and lichens may require longer to recover. These trends in natural recovery are important for guiding future restoration efforts and techniques. Specifically, targeting sedge and moss species for transplanting and/or seeding of disturbed substrates may be a highly effective strategy for initiating the development of early successional tundra communities.

Drilling waste depth was similar across all disturbance years and OM in undisturbed control plots was also similar across the landscape. The highest amount of OM found on drilling wastes was

found in sites >25 years old (i.e. 1993), while very low to no OM was found on recently disturbed sites (i.e. 2017). However, we found surprisingly large depths of OM on the drilling wastes in a short time period (ex. ~4 cm in 6 years). This trend warrants further investigation to determine the source and cause of this OM.

Based on our findings we provide suggestions to improve and/or maintain the relatively rapid natural revegetation of the drilling wastes. Placement of drilling wastes on the landscape that allow for remnant patches or islands of intact tundra throughout the disturbed area are essential for recolonization. Applying drilling wastes in thin layers may also assist with more rapid vegetative establishment. Finally, promotion of bryophyte communities in the early stages of revegetation may have long-term benefits for ecosystem recovery. Over the next three summers we will continue to monitor, survey and conduct laboratory trials to better understand the initial colonization and succession of species on these drilling wastes, particularly by bryophytes, lichens and biological soils crusts.

Finally, given the findings of this study we suggest that active restoration of the drilling wastes is likely not required for the recovery of the tundra plant communities, if the timeline for recovery is ~20 years. Therefore, in our on-going work to develop tundra restoration techniques, we suggest developing active restoration trials at other disturbed areas on the Meliadine site.

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Appendix A

Project Timeline and Deliverables

Dates have been modified to reflect that the grant was not awarded until June 1, 2018. Modification of research activities and additional reporting are also indicated.

4 (RPP)

Personal identification no. (PIN)	Family name of applicant
441262	Stewart

ACTIVITY SCHEDULE
(Refer to instructions to see if this section applies to your application. Use additional page(s) if necessary.)

Milestone	Description of activities	Anticipated starting date	Anticipated completion date
Milestone 0.1: Hiring HQP and field season preparation	All HQP will be hired and preparation for the field season completed. Preparations will include start-up meetings with the project team including AEM representatives. Planning of project logistics for year 1 and development of field plans.	2018-01-01 2018-06-01	2018-05-31 2018-07-01
Milestone 1.1: Natural recolonization of drilling wastes	Study natural recolonization of drilling waste dumps 2-17 yrs old by biological soil crusts and vascular plants. Specific recommendations of species for restoration will be developed.	2018-06-01 2018-07-01	2019-08-31 2018-11-30 Initial Technical report
Milestone 1.2: Development of HOF models	Hierarchical logistic regression modelling or Huisman Olff Fresco (HOF) models will be applied to examine optima and niche ranges of key naturally recolonizing foundational and early successional tundra species.	2018-09-01	2019-09-01
Milestone 1.3: Belowground niche ranges on waste dumps	Root density of key naturally recolonizing vascular plants will be plotted against key physicochemical parameters to determine niche ranges. This information will be used to further define HOF models in Milestone 1.2.	2018-09-01	2019-09-01
Milestone 0.3: Youth Education program	Collaboratively develop and deliver an education program on-site for one week in 2019 and 2021 for youth from Rankin Inlet and Baker Lake, NT. The program will focus on arctic ecology, restoration and skills in environmental monitoring and research.	2019-01-31	2020-01-31
Milestone 3.3: Assesment soil propagules in donor materials	The soil propagule bank in homogenized and plugs for transplant with be assessed. Specific recommendations on species present for restoration in local tundra will be developed.	2019-06-01	2020-01-01
Milestone 2.1: Active restoration with BSCs waste dumps	Transplanting of biological soil crusts on 10 drilling waste dumps. Specific recommendation of restoration practice and species for restoration will be developed. Active restoration of drilling wastes not required. Site of active restoration TBD. BSC development on drilling wastes will be examined through a chronosequence but not active restoration.	2019-06-01	2021-08-31

Personal identification no. (PIN)	Family name of applicant
441262	Stewart

ACTIVITY SCHEDULE
(Refer to instructions to see if this section applies to your application. Use additional page(s) if necessary.)

Milestone	Description of activities	Anticipated starting date	Anticipated completion date
Milestone 2.4: Active restoration with BSCs Waste Rock	Transplanting of biological soil crusts on 5 waste sites. Specific recommendation of restoration practice and species for restoration will be developed. This will be included in active restoration trial, location TBD.	2019-06-01	2021-08-31
Milestone 3.1: Active restoration with vascular plants	Transplanting of tundra plugs on 25 drilling waste dumps. Specific recommendation of restoration practice and species for restoration will be developed. This will be included in active restoration trial, location TBD.	2019-06-01	2021-08-31
Milestone 3.2: Belowground niches ranges at donor sites	The belowground niches ranges at undisturbed donor sites will be determined for key tundra vascular plants.	2019-06-01	2021-08-31
Milestone 2.3: Recovery of ecosystem function restored BSCs	Role of BSCs in recovery of key ecosystem services will be determined through examining community composition of actively restored BSCs with indicators of ecosystem function (ex. N and C fixation).	2019-06-14	2021-09-01
Milestone 0.4: Community meetings	We will hold community meetings in Rankin Inlet and Baker Lake. Working with Agnico's community relations department we will identify key groups to host. Our research and restoration of tundra environments will be presented and discussed	2019-08-01	2021-08-31
Milestone 2.2: Niche ranges of restored BSCs	Initial and realized niches of actively restored BSCs will be determined on drilling waste dumps and waste rock.	2019-09-01	2021-09-01
Milestone 0.6: Technical reports for Agnico Egale	Detailed technical reports for AEM on the restoration techniques examined. Guidelines and standard operating procedures for on-going monitoring will be included. Preliminary report January 2021, final report January 2022. Additional dates of yearly updates/technical reports on project progress.	2020-01-01 2018-11-30 2019-11-30	2022-01-01

Personal identification no. (PIN)	Family name of applicant
441262	Stewart

ACTIVITY SCHEDULE
(Refer to instructions to see if this section applies to your application. Use additional page(s) if necessary.)

Milestone	Description of activities	Anticipated starting date	Anticipated completion date
Milestone 0.5: Website development	Creation of project website providing information to restoration practitioners and public on general information on arctic ecology and restoration practice in the North, as well as key findings from the research.	2020-01-31 2019-06-01	2022-01-31
Milestone 3.4: Belowground niche ranges restored vasculars	The belowground niches of transplanted tundra species will be delineated on drilling waste dumps that were actively restored. Specific recommendation of restoration practice and species for restoration will be developed.	2020-06-01	2022-01-01

PROTECTED B WHEN COMPLETED

Canada

AGNICO EAGLE

Meliadine Division

Sediment and Erosion Management Plan

MARCH 2019
VERSION 1

EXECUTIVE SUMMARY

This document presents the Sediment and Erosion management plan (the Plan) at the Meliadine Gold Project. The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by reviewing the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the license requirements, followed by the periods and types of activities subjected to erosion, and the specific monitoring and mitigating measures.

General findings on the effects of TSS on fish and fish habitat have been listed, such as sublethal and lethal effects on fish and their eggs. Federal TSS Guidelines have been cited, distinguishing the short-term and long-term exposure thresholds. Turbidity guidelines are also discussed in the present document. The Plan presents the monitoring and mitigating actions related to three (3) specific periods of activity: Periods of construction near water – during construction and operation; periods of freshet or significant runoff events – during construction, operation and closure; periods of potential impact to waterbodies – during operation. The proposed monitoring and mitigating measures are discussed for those periods of activity.

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1	March 2019	ALL	-	Comprehensive plan

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Acronyms

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
CCME	Canadian Council of Ministers of the Environment
DFO	Fisheries and Oceans Canada
NIRB	Nunavut Impact Review Board
NTU	Nephelometric Turbidity Units
NWB	Nunavut Water Board
Plan	Sediment and Erosion Management Plan
TSS	Total Suspended Solids

UNITS

h	hour
km	kilometre
km^2	square kilometre
mg/L	milligram per litre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit owned lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

As presented in Table 1.1, there are four phases to the development of the Tiriganiaq deposit: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year -1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Table 1.1 Overview of Timeline and General Activities

Phase	Year	General Activities
Construction	Year -5 to year -1	• Construct site infrastructure • Develop the underground mine ramp • Stockpile ore
Operations	Year -1 to 8	• Mining operations • Stockpile ore • Dry stack tailing deposition
Closure	Year 9 to 11	• Decommission of underground mine surface opening • Cover on top of tailings • Decommission non-essential mine infrastructure • Fill open pits with active pumping
Post-Closure	Year 11 forwards	• Site and surrounding environment monitoring

This document presents the Sediment and Erosion Management Plan (the Plan). The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by presenting first a review of the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the license requirements, followed by the periods and type of activities subjected to erosion, and the specific monitoring and mitigating measures.

As per Nunavut Impact Review Board (NIRB) Meliadine Project Certificate No.006 Condition 28, the Sediment and Erosion Management Plan should be developed to prevent or minimize the effects of destabilization and erosion that may occur due to Project activities. The plan should also detail sediment control plans to prevent and/or mitigate sediment loading into surface water within the Project area.

The objectives of the plan are:

- To prevent the release of sediment into streams and waterbodies during construction activities;
- To reduce and mitigate erosion and the release of sediment during operations activities;
- To specify erosion and sediment control measures that, if implemented and maintained, will help Agnico Eagle maintain compliance with the Federal Fisheries Act, specifically with Section 36(3) of the Act, which prohibits the deposition of deleterious substances into waterbodies frequented by fish; and
- To provide references to approvals, relevant standards, control plans and procedures for training, communications, investigation and corrective action, and audits that are required under the Project Agreement.

SECTION 2 • TOTAL SUSPENDED SOLIDS/TURBIDITY EFFECTS, FEDERAL GUIDELINES AND LICENSE REQUIREMENTS

2.1 Effects of Total Suspended Sediments on Fish Habitat

Suspended sediments, and associated effects on water clarity, have the potential to affect fish and fish habitat in a variety of ways, including but not limited to:

- Smothering of deposited eggs or siltation of spawning habitats;
- Smothering of benthic invertebrate communities;
- Decreased primary productivity caused by reduced light penetration;
- Reduced visibility, which may decrease feeding efficiency and/or increase predator avoidance; and
- Clogging and abrasion of gills.

Moreover, the general findings for effects of TSS on fish and fish habitat indicate the following:

- Effects of TSS depend on both the concentration of TSS and duration of exposure;
- Effects of TSS can also be influenced by the size and shape of suspended particles;
- Lethal concentration of TSS on fish over acute exposure ranges from hundreds to hundreds of thousands of mg/L;
- Sublethal effects on fish (reduced growth, changes in blood chemistry, histological changes) associated with chronic exposures tend to be exhibited at TSS concentrations ranging from the tens to hundreds of mg/L;
- There is considerable uncertainty about potential effects of low TSS concentrations over long time periods;
- Overall, the most sensitive group of aquatic organisms to TSS appears to be salmonids, and guidelines are developed to protect this group;
- Adult salmonids are generally more sensitive to short durations of high concentrations of suspended sediments than juvenile salmonids; and
- Low suspended sediment levels are known to cause egg mortality (40 %) to rainbow trout at long durations (7 mg/L at 48 days). Guidelines for long-term exposure reflect these findings.

More details are located in the report from Fisheries and Oceans Canada (DFO) on the effects of sediments on fish and their habitat (Fisheries and Oceans Canada, 1999).

2.2 Federal Guidelines

2.2.1 TSS Guidelines

The Canadian Council of Ministers of the Environment (CCME) specifies separate guidelines for TSS for clear and high flow periods. The guidelines are derived primarily from Caux *et al*. (1997), with application intended mainly for British Columbia streams. In the case of the application to the Meliadine Project lakes, the clear flow guidelines would be most relevant; even during freshet. The

lakes would not expect to see large natural fluctuations in TSS except in localized areas for short periods.

The guidelines put forth by the CCME recognize that the severity of effects of suspended sediments is a function of both the concentration of suspended sediments and the duration of exposure. Guidelines are intended to protect the most sensitive taxonomic group and the most sensitive life history stages.

Table 2.1 Existing Federal TSS Guidelines (after Agnico Eagle, 2018)

Source	Short-Term Exposure	Long-Term Exposure
CCME (1999)	Anthropogenic activities should not increase suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-h).	For longer term exposure (e.g., 30 days or more), average suspended sediment concentrations should not be increased by more than 5 mg/L over background levels.
MMER (2002)	Maximum authorized concentration in a composite effluent sample = 22.5 mg/L. Maximum authorized concentration in a grab sample of effluent = 30 mg/L.	Maximum authorized monthly mean effluent concentration = 15 mg/L.

2.2.2 Turbidity Guidelines

Turbidity guidelines put forth by the CCME (1999) are based on extrapolation from the TSS guidance above, adjusted by a factor of about 3:1 (a typical average ratio for TSS: turbidity). In the case of turbidity for clear water, CCME (1999) recommends a maximum increase of 8 Nephelometric Turbidity Units (NTU) from background levels for a short-term exposure (e.g., 24-hour period), and a maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., 30-day period).

CCME (1999) notes that in some cases short-term resuspension of sediments and nutrients in the water column can augment primary productivity, and in other cases, changes in light penetration may be inconsequential if a system is limited by other factors such as nutrients. The Caux *et al*. (1997) study considered effects of suspended sediment not only on fish but also on algae and zooplankton. In summary, the recommendations put forth by Caux *et al*. (1997) are based mainly on the most sensitive taxonomic group, which is salmonids.

However, research has shown that widespread, chronic turbidity can result in reduced light penetration and subsequent reductions of primary productivity (Fisheries and Oceans Canada, 1999; Canadian Council of Ministers of the Environment, 1999; Lloyd, Koenings, & Laperriere, 1987). Consequently, water clarity is of concern at broader spatial scales and longer time frames. It should be noted that DFO's report on effects of sediment on fish and their habitat (DFO, 1999) endorses the guidelines for TSS put forth by the CCME (1999), but does not recommend following guidelines for turbidity. Rather, turbidity may be used as a surrogate for suspended sediment only when the relationship between the two parameters is established for a particular waterbody.

2.3 License Requirements for the Protection of Fish and Fish Habitat at Meliadine

The Nunavut Water Board (NWB) Type A Water License for the Meliadine Project includes:

All surface runoff and/or discharge from drainage management systems, at the Monitoring Program Stations MEL-SR-1 to MEL-SR-TBD referred to in Part I, Item 11, during the Construction/Operation of any facilities and infrastructure associated with this project, including laydown areas and All-weather Access Road, where flow may directly or indirectly enter a Water body, shall not exceed the Effluent quality limits in Table 2.3.

Table 2.3 Effluent Quality Limits

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids (TSS) (mg/L)	50.0	100.0
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

SECTION 3 • SEDIMENT AND EROSION MONITORING AND MITIGATION

3.1 Sediment and Erosion During Specific Periods

The purpose of the Plan is to ensure that Agnico Eagle will successfully monitor signs of sedimentation and erosion and minimize its resulting effects. This plan presents the monitoring and mitigating actions related to three (3) specific periods of activity for Meliadine:

- Periods of construction near water – during construction and operation;
- Periods of freshet or significant runoff events – during construction, operation and closure;
- Periods of potential impact to waterbodies – during operation.

The construction of water management infrastructure could potentially lead to excess TSS. Therefore, erosion control methods must be considered during construction of water management infrastructure. In addition, erosion control must be considered during any dewatering activity.

The freshet season at Meliadine occurs approximately from mid-May until the end of June. In addition, there can be periods of high water flow due to rainfall events from late May – early October. As most site construction has been completed at the Meliadine site there are new areas and infrastructure that have become potentially vulnerable to excess water during the freshet season and in response to rainfall, such as, but not limited to:

- Culverts and other water management infrastructures;
- Newly constructed embankments, such as roads and berms;
- Water channels; and
- Surface runoff.

Water transfer and water discharge during operation can also lead to erosion and sedimentation.

3.2. Erosion and Sediment Monitoring

In order to monitor potential erosion and sedimentation, smaller water management infrastructure such as culverts, cross drains, surface runoff and ditches are inspected daily during freshet, on a monthly basis thereafter and daily after significant rain events. Larger culverts and bridges are inspected more often if they represent a risk for daily operations, for the receiving environment or for the health and safety of workers. More specifically, the following aspects are monitored during visual inspections:

- Accumulation of debris near the inlet of the crossings, impeding the free flow of water at those locations;
- Bed erosion upstream and downstream of watercourse crossing structures;
- Scour under bridge abutments and abutment foundations; and
- Erosion along cutslopes and fillslopes of embankments (rill and gully erosion), etc.

Newly excavated channels are inspected on a regular basis and after significant rain events. Erosion signs along the channel flow are monitored and documented. Inspections are carried out during the spring when surficial ice moves towards the inlet of the diversion channels to ensure that no ice

blockage causes water buildup upstream of the channel, which could lead to subsequent erosion problems. It is important to develop a database to determine if adverse trends are occurring. If adverse trends are observed, then mitigation will be undertaken to prevent a major incident.

The frequency of water and turbidity sampling are in accordance with the requirements of the Type A Water License. The frequency will be increased if required during the freshet season or during heavy rainfall events. Procedures for turbidity monitoring include:

- Collection of water at the site of sediment entrance (exposure), and at a reference site (i.e., in the same watercourse/waterbody in an area unaffected by the sedimentation [upstream, at least 50 m away where water does not appear to be impacted]).
- Analyze samples for turbidity using a field turbidity meter and compare the exposure sample to the reference sample.
- If the exposure sample results are higher than the reference then mitigation will be undertaken (ie installation of silt fencing, silt barrier booms, etc) to prevent any impact to watercourses.

If Agnico Eagle is actively working in an area with elevated turbidity – the work will stop until the level of clarity returns to an acceptable level.

Monitoring will be documented with site photographs and inspection forms.

3.3 Mitigating Measures

The following mitigation measures could be used, if required, to reduce risks associated with erosion and sedimentation.

- Riprap or clean non-acid generating/non-metal leaching rockfill could be used to armor shorelines, bridge abutments, culverts inlets and outlets and toe berms;
- Ditches managing high volumes of water could be armored for erosion control and reduce the speed of water flow;
- Sedimentation basins could be constructed at sensitive locations to allow settlement of finer sediments;
- Ditches, culverts and other water crossing structures should be maintained free of debris to allow free flow of runoff water;
- Installation of erosion control material such as turbidity barriers, silt curtains or straw booms;
- Site-specific erosion issues may arise during the mine operation that require specific local corrective actions;
- In-stream construction during periods when streams are expected to be dry or frozen to the bottom (i.e., during winter or fall). Isolation methods will be used for work below the high water mark for streams with flowing water at the time of construction;
- Materials installed below the high water mark (i.e., riprap) will be cleaned prior to installation to avoid adding deleterious substances to watercourses. Where concrete is installed, it will be allowed to cure fully prior to installation;

- Riparian areas will be maintained whenever possible to minimize erosion and impacts to fish habitat, with vegetation removal limited to the width of the workspace footprint. Disturbed areas along the streambanks will be stabilized and allowed to re-vegetate upon completion of work to minimize future erosion;
- Debris and excess materials resulting from construction will be removed from the work site to prevent them reaching water bodies; and
- When using equipment that creates tracks on the surface, run the equipment slowly to create grooves running perpendicular the slope and not parallel to the slope. This type of texture on slopes can slow the speed of runoff and reduce the amount of erosion and sediment transported downhill. This method must also be combined with an additional method of catching sediment at the base of the slope, such as a silt fence, straw log, etc.

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AGNICO EAGLE

MELIADINE GOLD MINE

Shipping Management Plan

MARCH 2019

VERSION 8

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Version	Date	Section	Page	Revision	Author
1	December 2012			First draft of the Shipping Management Plan	John Witteman, Env. Consultant, AEM
2	March 2013			DEIS re-submission; rebranding	
3	April 2014	1.1	1	Anticipated increased shipping traffic	John Witteman, Env. Consultant, AEM
		1.2	4	Updated Figure 1-1	
		3	10-11	Added details on AWPPA and regs. and Shipping Safety Control Zone	
		4	14	Mention of marine birds and ship track data	
		4.2	16	Distance of release from Itivia Spill vs marine wildlife	
4	January 2016	1.1	1	Decrease in shipping traffic	Phil Rouget, Golder Associates Ltd.
		1.3.3	6	Added details for cyanide	
		2.3	7	Update spill support	
		2.4	8	Added details to SOPEP	
		4.1	13-14	Reference to Spill Risk	
		4.2	14-15	Assessment	
		4.3	15-16	Updated mitigation and reference to MEMP and MMSO program in accordance with Project Certificate conditions.	
		9.2	23	Updated monitoring activities and reference to MEMP and MMSO program.	
		10	24	Removed last paragraph	
		A-B		Update to safety	
		A-D		Added Revised Marine Baseline Assessment	
		A-E		Added Marine Environmental Management Plan (MEMP)	
				Added Revised Spill Risk Assessment	
5	August 2016	1.3.3	6	Up to date Safety Bulletin in relation to vessels	Katelyn Zottenberg, Golder Associates Ltd.
				Added that ammonium nitrate is listed under schedule 1 of the Environmental Emergency Regulations.	
		Table 3-1	12	Update to Navigation Protection Act.	

				Added Section 36(3) of the *Fisheries Act.*	
		4.2	15	Updated wording "Subject to safe navigation…" Footnote added to include how vessel wake was assessed in the FEIS. Updated to wording around marine mammal mitigation. (changed to 500 m buffer zones).	
		Appendix D	2.2.1.2	Added Government of Nunavut as lead management responsibility for polar bears.	
		Appendix D	Table D-4	Changed wording regarding the handling of birds during a spill.	
		Appendix D Appendix B Figure B3	1.0	Updating wording to state the intent of the MMSO program. Revised	
6	February 2017	Appendix D	2.1.3	Updated to include more detailed protocols for marine mammal and seabird surveys/observations (specifically the ECSAS protocols for seabirds as request by ECCC)	Katelyn Zottenberg, Golder Associates Ltd.
		Figure 1-1 Executive Summary Sections 1.0, 4.0, 11, 12 and 13	4 vi 1, 14, 26, 30, 28	Updated text to reflect comments received from dry cargo shipping contractor (Desgagnes Transarktic). Key edits related to shipping of dry cargo shipping operations included (description of lightering operations, potential anchor location (dry cargo vessels only), number of vessel, and potential nighttime operations).	
6	March 2017	Throughout the Shipping Management Plan		Minor wording updates to the text to reflect comments received from dry cargo shipping contractor (Desgagnes Transarktic).	Katelyn Zottenberg, Golder Associates Ltd.
7	March 2019	Throughout the Shipping Management Plan		Updated wording to reflect current management status.	Dan Gorton
		Section 4.3	17	Updated to address NIRB condition 127.	

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EXECUTIVE SUMMARY

The Shipping Management Plan was developed in accordance with federal legislation, notably the *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act,* and associated regulations. It also recognizes the international conventions and protocols signed by Canada. Agnico Eagle provides the necessary human, material and financial resources to meet or exceed the legal requirements attributable to the company that arise from shipping-related activities. Shipping contractors are encouraged to do the same. Agnico Eagle and its shipping contractors carry third party liability insurance.

All shipping is carried out during the open water season and follows the recommended shipping routes that are presently in use for the annual sea lift to Rankin Inlet and other Kivalliq communities. Ice breaking is not conducted to extend the shipping season.

Upon arrival at Rankin Inlet, all vessels anchor either outside or inside Melvin Bay. Dry cargo is lightered onto barges for transport through the access passage using tugs. The barges then transport the dry cargo by barge to the existing gravel ramp used by the hamlet of Rankin Inlet during the annual sealift to dock. Large fuel tankers anchor outside of Melvin Bay. Ship-to-ship fuel transfer is the first step in moving the fuel to the Itivia tank farm. The small tanker navigates the access passage and anchors off Itivia where a ship-to-shore floating hose transfers the fuel to the tank farm.

It is Agnico Eagle's intent to prioritize the road transport of hazardous materials, including explosive-related materials, to the Meliadine site to avoid having such cargo remain in storage at the Itivia laydown yard. Other contingency measures associated with shipping-related activities include the Spill Contingency Plan, Risk Management and Emergency Response Plan, and the Oil Pollution Emergency Plan (OPEP). Risk and hazard assessments of shore-based marine response activities are undertaken as part of training the Emergency Response Team (ERT).

Agnico Eagle personnel and the Master of the ship are responsible for security matters related to the shipping-related activities. While it is anticipated that the RCMP will not be involved in security matters, all criminal activities or matters of a grave nature (e.g., smuggling) will be referred to the RCMP in Rankin Inlet. Mitigation measures to prevent smuggling are in place. Mitigation measures are also employed to minimize potential negative socio-economic effects from shipping-related activities; positive socio-economic impacts are anticipated.

Navigation through the Labrador Sea, Hudson Strait and Hudson Bay is not challenging during the open water season. No major hazards were identified along the shipping and tug-barge routes under normal conditions. Shipping can be carried out without pilotage as the shipping routes entail minor hazards not significantly reducing ship safety.

All ships, tugs and tankers use electronic charts and other electronic navigational aids to provide safety in transit, reduce the risk of accidents, and remain within the recommended shipping routes.

Traffic through the access passage is coordinated to avoid shipping conflicts, and speed is reduced to ensure safety. To maximize the safety of the persons travelling in boats near the Rankin Inlet access passage, Agnico Eagle informs the community of the shipping activities, promotes actions that will allow the ship and the small boats to see one another, and, through the Community Liaison Committee, recommends that all those in small boats wear personal floatation devices.

On board waste management (solid and hazardous wastes, sewage) is the responsibility of shipping contractors. Agnico Eagle requires the shipping contractors to conform to the *Ballast Management Control and Management Regulations*, which should reduce the risk of invasive species being introduced as a result of shipping activities. Agnico Eagle expects to contract vessels that meet applicable environmental requirements in addition to being reliable and having a superior safety record.

Care is taken to avoid disturbing marine mammals within the shipping routes as much as possible. As part of shipping companies' standard operating procedures, ship crew monitors the shipping routes for marine mammals from the Hudson Strait to Rankin Inlet. Mitigation measures may comprise, if safe to do so, slowing the ship and stay at distance from marine mammals.

Vessels contracted by Agnico Eagle are required to have an approved Shipboard Oil Pollution Emergency Plan (SOPEP). If an environmental emergency occurs along the shipping routes, the SOPEP is activated. Close coordination is maintained with Agnico Eagle's shore-based supervisors who can activate Agnico Eagle Emergency Response Plan and OPEP to provide assistance to a vessel. Accidents or malfunctions during transit will be reported to Transport Canada, in accordance with provisions under the *Canada Shipping Act* (CSA 2001) and subsequent regulations. Spills would also be reported to the Environmental Emergencies 24-Hour Report Line and, if necessary, advice would be requested from the Regional Environmental Emergencies Team (REET). Assistance could be sought from nearby ships and the Canadian Coast Guard (CCG).

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
BWMP	Ballast Water Management Plan
CCG	Canadian Coast Guard
ECCC	Environment and Climate Change Canada
EIA	Environmental Impact Assessment
ERP	Emergency Response Plan
ERT	Emergency Response Team
IMO	International Marine Organization
MARPOL	International Convention for the Prevention of Pollution from Ships
MEMP	Marine Environmental Management Plan
MMSO	Marine Mammal and Seabird Observer
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
RCMP	Royal Canadian Mounted Police
REET	Regional Environmental Emergencies Team
SOLAS	International Convention for the Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
TEU	Twenty-foot Equivalent Unit, a measure used for capacity in container transportation (sea can)
TK	Traditional Knowledge
WSCC	Workers' Safety Compensation Commission

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) gained extensive experience in shipping fuel and dry cargo to the Meadowbank Gold Mine (Meadowbank) since its construction began in 2008 and commercial production in 2010. Similar shipping, lightering and ship-to-shore fuel transfer procedures developed and in use for Meadowbank are employed for the Meliadine Gold Mine in Rankin Inlet.

Dry cargo barges undergo lightering operations at the existing gravel ramp used by the hamlet during the annual sealift in Itivia Harbour[1]. A tank farm, sea can storage and a laydown yard is also located at Itivia (Figure 1-1).

1.1 Shipping Needs

A total of approximately 40,000 tonnes of dry cargo (equipment and supplies) and 50 million litres of diesel fuel is required annually for the operations of the Meliadine Mine. To meet these needs, approximately 8 vessels annually deliver dry goods and up to 6 tankers will annually deliver diesel fuel. At this time, dry cargo shipping operations have been contracted to Desgagnes Transarktic.

All shipping is carried out during the open water season (typically from early July to late October) and follow the recommended shipping routes presently in use for the annual sea lift to Rankin Inlet and other Kivalliq communities. There will not be any ice breaking to extend the shipping season.

The priorities in shipping dry cargo and fuel are:

- The protection of the crew and others in small boats that the ship may come across;
- The protection of the marine environment; and
- The preservation of the ship and its cargo.

All ships, tugs and tankers are equipped with electronic navigational aids. Ships are not serviced in Rankin Inlet and arrive with enough fuel for the return voyage south.

The Meliadine Mine is anticipated to contribute to shipping in Hudson Strait and Hudson Bay by about 14 ships during construction and 8 to 12 ships during operations. This represents an increase in ship traffic in Hudson Strait, Hudson Bay and to Rankin Inlet, and extra care is required in regards to marine safety. This includes ensuring there is adequate spill response equipment on the ships and at the Itivia

[1] The current plan is to lighter cargo using the existing gravel ramp in Itivia Harbour. This ramp is currently used by the Hamlet of Rankin Inlet during the annual sealift. The assessment of potential effects related to the use of this ramp are consistent with those discussed in Section 8.3.4 of the FEIS (e.g., propeller wash from nearshore Mine vessels berthing at the landing ramp may result in adverse effects to marine water quality with associated indirect effects on marine wildlife). The conclusions of the assessment remain the same.

Oil Handling Facility. Spill response personnel need to have adequate training and equipment to effectively respond to a spill in the marine environment[2].

1.2 Shipping Routes

The marine transport of dry cargo is comprised of four main segments, all within the recommended shipping routes:

- Bécancour, Québec on the St. Lawrence River, along the coast of Labrador to the Hudson Strait;
- Through Hudson Strait to Hudson Bay (see Appendix A for marine hydrographic charts showing the shipping routes);
- Across Hudson Bay to Marble Island, this being approximately 45 km offshore Rankin Inlet; and
- From Marble Island to the barrier islands, through the islands to an anchoring point either inside or outside of Melvin Bay and Itivia. Access to anchoring locations inside Melvin Bay occurs through the access passage (Figure 1-1).

Dry cargo and transport barges are loaded onto ocean-going container ships in eastern ports, almost exclusively Bécancour, and delivered directly to Rankin Inlet[3]. The first vessels of the year normally arrive in Rankin Inlet in early July or August. This first container ship includes two (2) transport barges to transport dry cargo to shore, and two (2) tugs.

Up to twelve (12) container ships arrive throughout the open water shipping season delivering dry cargo[4]. All ships follow the recommended shipping routes and are equipped with complete electronic navigation aids for navigation in restricted waters.

The port of departure for transporting fuel is different from that for dry cargo. The first leg of the voyage is from an east coast refinery along the coast of Labrador to the Hudson Strait with the remainder of the voyage being the same as for the ships carrying dry goods.

1.3 Lightering Procedures

1.3.1 Dry Cargo

Sea cans, large equipment, machinery, general cargo and vehicles are lightered onto the barges (that arrived during the first dry cargo trip) for transport to shore using tugs and then lightered to shore using the existing gravel ramp in Itivia Harbour. During lightering operations, attention is directed to

[2] Oil Pollution Emergency Plan details spill response at the Itivia Oil Handling Facility.
[3] Agnico Eagle's shipping routes within Nunavut are non-compulsory pilotage areas during the ice free shipping season.
[4] To this point there are no alternative routes under consideration, however future routing may include Churchill to Rankin Inlet on occasion.

stabilizing the barges at the gravel ramp, with due consideration being given to the prevailing and expected wind, weather, and tide conditions.

Most dry cargo is transported in marine shipping containers (TEUs; Twenty-foot Equivalent Unit) of general cargo vessels fitted with cranes. Most materials arrive in sea cans, which are stacked in the Itivia laydown yard or moved immediately to site. The use of sea cans provides secondary protection against spills and facilitates rapid transfer from ship to shore.

The tug-barge used to ferry the dry cargo to shore is highly manoeuvrable and capable of transiting the access passage with its changing current patterns. The tidal current in the area is half a knot (0.93 km/h). Navigation proceeds at a slow speed in periods of low visibility. Traffic through the access passage is coordinated through communication between the tugs to avoid shipping conflicts and to ensure safety.

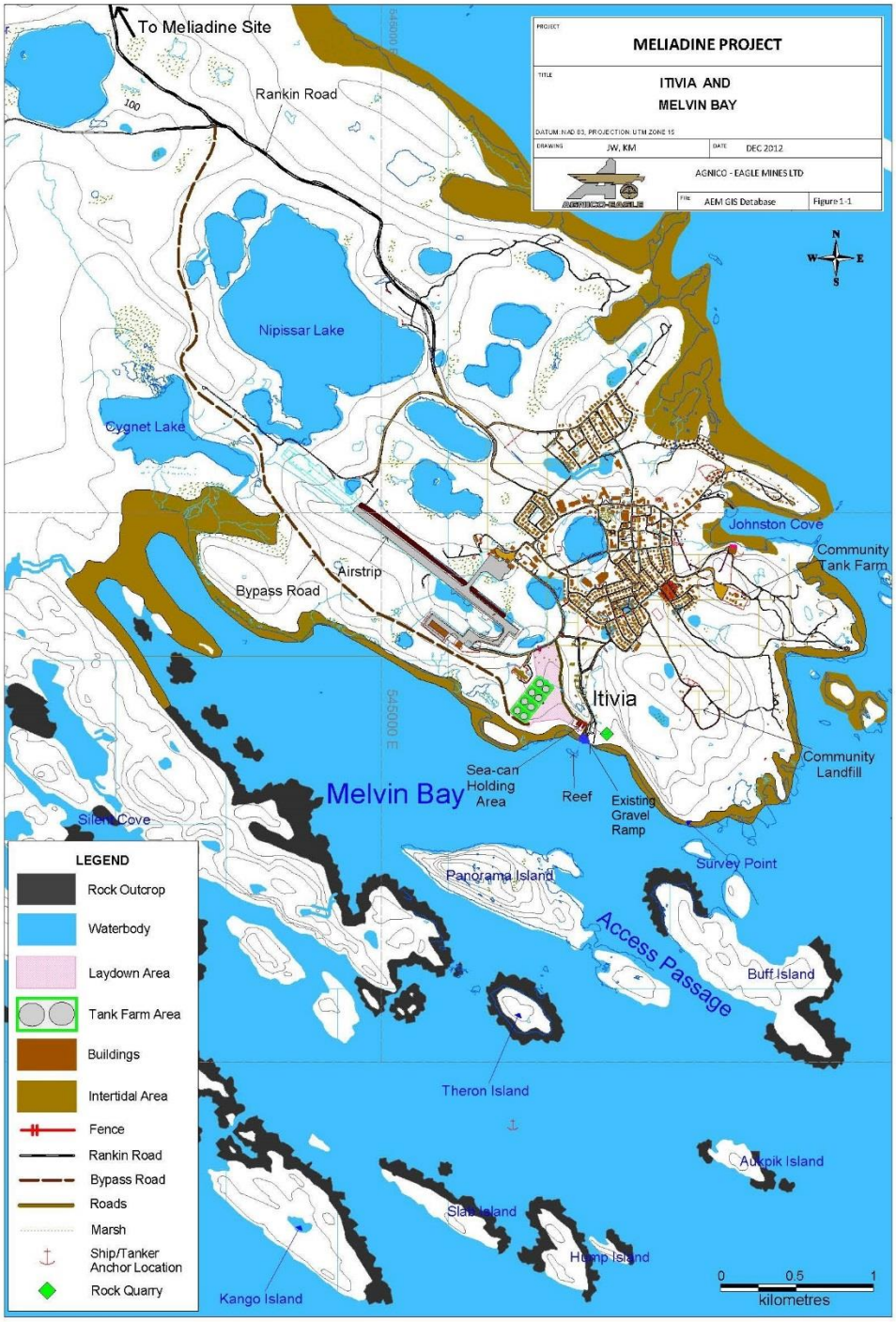

Figure 1.1 Itivia and Melvin Bay

Masters of tugs, large and small tankers, and dry cargo ships are responsible for their vessels at all times – for the safe navigation of their vessels from the port of departure to Rankin Inlet. For tugs this also includes responsibility for the barge they are towing or pushing. When a barge is laid alongside a dry cargo vessel for lightering containers or equipment from the cargo ship to the barge, a loading supervisor on the ship takes charge of the barge. When a cargo barge is stabilized at the gravel ramp for lightering to shore, a shore supervisor takes charge of the cargo barge.

The shore crew then conducts a "roll-on/ roll-off' operation using wheel loaders equipped with forks, trucks and trailers to unload the cargo from the barges. Cargo is stockpiled on the laydown area before being transported to the Meliadine Mine.

For the majority of the shipping season, outgoing cargo is loaded onto lightering barges and subsequent container ships for the return trip to southern ports. Outgoing cargo could include construction equipment being demobilized following the completion of construction and/or hazardous or other waste being sent to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction. No barges, fuel vessels or tugs remain at Rankin Inlet over the winter; all return to southern ports.

1.3.2 Diesel Fuel

Large tankers delivering diesel fuel anchor in the same general location as the dry cargo vessels (Figure 1-1). Ship-to-ship transfer of fuel occurs at this location from the larger tanker to a smaller tanker that can navigate the access passage. The carrying capacity of the small tanker will be either 7,300 m^3 or 10,500 m^3. The one selected at any one time is subject to its availability when a large fuel tanker is set to deliver fuel to Agnico Eagle. The smaller tankers are able to navigate the access passage into Melvin Bay while the large tanker cannot. The small tanker anchors opposite Itivia[5]. From there a floating hose of some 300-500 m is connected to a shore-based pipeline for transfer of fuel to the tank farm. Contingency measures related to the transfer of fuel are described in the Oil Pollution Emergency Plan.

1.3.3 Explosives and Hazardous Materials

Part of the dry cargo received each year is ammonium nitrate, which is used on site to manufacture explosives. Bulk ammonium nitrate is shipped as prill, which is inert and does not require special handling during transit. The ammonium nitrate remains in sea cans at the mine site until needed[6]. Other needed raw materials and blasting related products arrive in sea cans and are stored in secure locations at the mine site. Ammonium Nitrate (to be used as an explosive) is also listed in schedule 1 of the *Environmental Emergency Regulations* under the *Canadian Environmental Protection Act*. Further information related to transport of ammonium nitrate is provided in the Explosives

[5] The anchoring location will vary based on a number of factors such as tide, wind and draught of the small tanker.
[6] An on-site Emulsion Plant has been constructed for the manufacturing of explosives. More details on that subject are available in the Explosives Management Plan.

Management Plan (Agnico Eagle 2018). Agnico Eagle notified Environment and Climate Change Canada of the expected quantity of ammonium nitrate to be shipped by barge and stored on site, and received a response from ECCC indicating that Agnico Eagle has met the requirements of the E2 registration.[7]

It is Agnico Eagle's intent to prioritize the road transport of hazardous materials, including explosive-related materials, to the Meliadine site to avoid having such cargo remain in storage at the Itivia laydown yard. Sensitive products such as explosives, boosters and caps are transported directly to the Meliadine Mine. However, in the eventuality of a delay in their transit to the mine site, these products will be temporarily stored in Rankin Inlet according to applicable regulations which include locked storage under constant surveillance. All handling, transport, storage, manufacture and use of explosives are subject to federal approval under the *Explosives Act*, and the *Nunavut Mine Health and Safety Act*. In addition, the latest Ship Safety Bulletin issued by Transport Canada's Marine Safety Directorate is followed when loading and unloading explosives.

Sodium cyanide is used to optimize gold recovery from the ore. This product is used at the Meliadine site. Due to transportation restrictions, normally a full year's supply of sodium cyanide is transported and stored on site. The product is transported, stored, handled, transferred and used in compliance with appropriate legislation and applicable Best Management Practices. Agnico Eagle is a signatory to the International Cyanide Management Code.

Hazardous waste and contaminated soil is managed on a yearly basis; consequently there will be little to no accumulation of such wastes at the mine site during operations, subject to seasonal shipping considerations. Hazardous waste that cannot be managed on site is appropriately packaged for transport in sea cans and sent via a dry cargo vessel to a certified hazardous waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction. Agnico Eagle contracts shipping companies that are certified under the IMDG code (International Maritime Dangerous Goods).

Itivia is presently connected to the hamlet by a municipal road and a private bypass road, which is used for the transport of all its dry cargo and fuel around the community. This includes explosives, cyanides and dangerous goods.

[7] E-mail submitted by Martin Theriault of Agnico Eagle to ECCC on September 13, 2018 and an e-mail received by Martin Theriault of Agnico Eagle from Christina Firth of ECCC, September 13, 2018.

SECTION 2 • RELATED DOCUMENTS

The Shipping Management Plan covers the scope of shipping activities for the Meliadine Mine. It is part of the Environmental Management and Protection Plan.

Management and monitoring plans for the Meliadine Mine that provided input to the Shipping Management Plan include the following:

- Spill Contingency Plan;
- Risk Management and Emergency Response Plan;
- Oil Pollution Emergency Plan;
- Shipboard Oil Pollution Emergency Plan (shipping companies); and
- Occupational Health and Safety Plan.

2.1 Spill Contingency Plan

The cornerstone of spill contingency planning for Agnico Eagle is the Spill Contingency Plan covering all spills on land, water and ice. It forms part of the Environmental Management and Protection Plan. The Spill Contingency Plan, coupled with the Risk Management and Emergency Response Plan, describes the processes to be followed when responding to a spill to the environment.

2.2 Risk Management and Emergency Response Plan

The Risk Management and Emergency Response Plan focuses on responding to all emergencies in a timely and adequate manner. It commits Agnico Eagle to being prepared for and providing adequate resources - qualified personnel and equipment - to handle a wide variety of emergency situations.

Risk and hazard assessments of shore-based marine response activities are undertaken as part of training for Emergency Response Team (ERT).

2.3 Oil Pollution Emergency Plan (OPEP)

The Oil Pollution Emergency Plan complements the Spill Contingency Plan and should not be construed as superseding it. The OPEP only provides contingency planning for the Oil Handling Facility (OHF) at Itivia.

The OPEP complies with the requirements for procedures, equipment and resources as set out in the *Canada Shipping Act* (s.s. 660.2(4)) specific to the fuel handling facility, the bulk incoming transfer of fuel from ship-to-shore and spill scenarios directly relating to this operation. Further, the OPEP provides direction to Agnico Eagle personnel and/or contractors and to Agnico Eagle's ERT in emergency spill response situations. It also contributes in developing oil pollution scenarios, defining the roles and responsibilities of management and responders, and outlining the measures taken to prevent spills. The OPEP seeks to minimize potential health and safety hazards, environmental damage and cleanup costs.

Spills resulting from ship-to-ship fuel transfer will be the responsibility of the ships contracted by Agnico Eagle and ship's Master. Agnico Eagle will provide assistance wherever possible in these instances.

2.4 Shipboard Oil Pollution Emergency Plan

The Shipboard Oil Pollution Emergency Plan (SOPEP)[8] contains all information and operational instructions as required by the International Marine Organization's "*Guidelines for the Development of the Shipboard Marine Pollution Emergency Plan*". Vessels contracted by Agnico Eagle will be required to have an approved SOPEP. The preparation of the SOPEP is the responsibility of the shipping company and is maintained by the vessel's Master. However, close coordination is maintained with Agnico Eagle's shore-based Itivia supervisors who can activate the Emergency Response Plan (ERP) and OPEP in providing assistance to a vessel in the near-shore area. These two plans have close links to the SOPEP and, as required, include training exercises at regular intervals to ensure ship and shore can cooperate in responding to any spill of fuel or any other hazardous product in the immediate vicinity of Itivia. SOPEP(s) arerequired to include how vessel contractor(s) maintain spill equipment and the frequency and framework for training vessel personnel in vessel-based spill response. This includes, but is not limited to:

- Spill equipment audits;
- Maintaining posted list of spill equipment;
- Requirements for spill response drills; and
- On-going training refreshers (e.g. annual renewals).

Accidents or malfunctions during transit will be reported to Transport Canada, in accordance with CSA 2001 and subsequent regulations. If the accident involves the loss of fuel or chemicals, the SOPEP would be activated and on-board spill response materials and equipment put to use. Spills would also be reported to the Government of Nunavut Spill Line and to the Environmental Emergencies 24-Hour Report Line and, if necessary, advice would be requested from the Regional Environmental Emergencies Team. Assistance could be sought from nearby ships and the Canadian Coast Guard (CCG). Spill response resources such as those maintained by the Canadian Coast Guard at select locations along the Kivalliq coast could be dispatched to the spill site. A sea can with spill response materials is maintained by the CCG in Rankin Inlet. Permission to use this material will have to be obtained from CCG before usage.

Outside help could be requested for major accidents such as accidental grounding/stranding of a vessel. Under these circumstances, the safety of the crew and maintaining the integrity of the vessel would be the first priority.

[8] Spills and their effect on Marine Wildlife are addressed in Oil Pollution Emergency Plan.

2.5 Occupational Health and Safety

All activities carried out by Agnico Eagle must consider the attendant risks and be carried out with safety first in mind. Agnico Eagle will conduct all activities in accordance with the Workers' Safety and Compensation Commission (WSCC) Occupational Health and Safety legislation.

SECTION 3 • APPLICABLE FEDERAL ACTS, REGULATIONS AND GUIDELINES

The Plan was prepared in accordance with federal legislation outlined in Table 3-1. Numerous regulations exist under the *Canada Shipping Act* and these can be found at www.tc.gc.ca and www.canada.ca The regulations included here are most relevant to the environment and the Shipping Management Plan.

Table 3-2 lists international conventions and protocols signed by Canada. Canada is a signatory to International Marine Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL) and International Convention for the Safety of Life at Sea (SOLAS). As such, Canadian marine laws, regulations and guidelines rules are a reflection of these international conventions, protocols and agreements.

At this time, Agnico Eagle has contracted Desgagnes Transarktic to ship to Rankin Inlet. Even so, the shipping companies could change over the construction, operation and closure phases of the Meliadine Mine. Shipping contractors used by Agnico Eagle will abide by Canadian laws and regulations, applicable MARPOL 73/70 annexes, and international conventions. Inspections carried out by federal inspectors will ensure that all applicable statutes are followed. This could include the review of required plans (SOPEP), an audit of the emergency response equipment carried by the vessel, and the means to prevent the discharge of any oil, oily water or other hazardous waste in Arctic waters. Agnico Eagle will notify Transport Canada if contracted shipping companies change.

All vessels transiting through and operating in Canadian Arctic waters are required to comply with the *Arctic Waters Pollution Prevention Act* (AWPPA), the *Canada Shipping Act* 2001 (CSA 2001), the *Marine Transportation Security Act* (MTSA), the Marine Transportation Security Regulations (MTSR), the *Marine Liability Act* (MLA), and all associated regulations, including requirements for vessel construction and operations (see Table 3-1). While the provisions of the CSA 2001 apply in all Canadian waters, vessels in Arctic waters north of 60°N and out to the 200 nautical mile limit of Canada‘s Exclusive Economic Zone are also subject to the provisions of the AWPPA. The AWPPA prohibits discharges of oil, chemicals, garbage and other wastes generated onboard vessels. It does allow for the discharge of untreated sewage[9]. The *Marine Liability Act* sets out a regime that requires vessels operating in Canadian jurisdiction, including Arctic waters, to carry insurance to pay for damages from oil spills.

Two vessel control systems are established under the *Arctic Shipping Pollution Prevention Regulations* – the Zone/Date System and the Arctic Ice Regime Shipping System, which provide for operational safety by taking into account the vessel‘s capability to operate safely by virtue of ice strengthening, and the ice conditions it will encounter[10].

[9] Ships are to only discharge gray water and treated sewage when the ship is at least 50 km from Rankin Inlet.
[10] Agnico Eagle will only ship dry goods and fuel during the open water season.

Vessels servicing the Mine will be required to comply with the AWPPA and regulations while in a Shipping Safety Control Zone[11].

Shipping companies contracted by Agnico Eagle must have an approved SOPEP, and verify that equipment and operating procedures are consistent with Canadian Marine laws, regulations and guidelines, and with IMO agreements to which Canada is a signatory. It is the responsibility of the Master of the ship to ensure safe passage through Canadian waters and to maintain up-to-date charts and publications[12].

Agnico Eagle will provide the necessary human, material and financial resources to meet or exceed the legal requirements attributable to the company that arise from shipping. The marine equipment used on the Meliadine Mine will meet task specifications for reliability, safety and capability of meeting or exceeding environmental requirements and guidelines. Shipping contractors will be encouraged to do the same.

Table 3-1 Applicable Acts, Regulation and Guidelines

Acts	Regulations	Guidelines
Federal Legislation		
Canada Shipping Act, 2001 (S.C. 2001, c. 26) [An Oil Pollution Emergency Plan is required under the Act (168(1)d)]	*Response Organizations and Oil Handling Facilities Regulations* (SOR/95-405) *Pollutant Discharge Reporting Regulations*, 1995 (SOR/95-351) *Environmental Response Arrangements Regulations* (SOR/2008-275) *Ballast Water Control and Management Regulations* (SOR/2006-129) *Vessel Pollution and Dangerous Chemicals Regulations*	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP 12401E 1995 Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Marine Liability Act (S.C. 2001, c. 6)	*Marine Liability Regulations* (SOR/2002-307)	
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	*Arctic Waters Pollution Prevention Regulations* (C.R.C., c. 354) *Arctic Shipping Pollution Prevention Regulations* (C.R.C., c. 353)	

[11] Rankin Inlet is in Zone 16.
[12] Transport Canada is not the source to provide up-to-date information on changing sea levels or on emergence of new reefs or shoals.

Acts	Regulations	Guidelines
Transportation of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Marine Transportation Security Act (1994, C.40)	*Marine Transportation Security Regulations* (SOR/2004-144)	
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Oceans Act (S.C. 1996, c. 31)		
Navigation Protection Act (R.S. 1985 c. N-22)		
Canada Water Act (1985 c.11)		
Fisheries Act (R.S.C. c. F-14)	*Marine Mammal Regulations* (SOR/93-56) *Marine Mammal Regulations* (SOR/93-56) Prohibition of Depositing Deleterious Substances (Section 36[3])	
Species at Risk Act (2002 c.29)		Species at Risk Policies
Canadian Environmental Protection Act (1999 c.33)	*Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301) *Release and Environmental Emergency Notification Regulations* *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197	

Table 3-2 International Conventions and Protocols Signed by Canada

Conventions	
International Convention for the Prevention of Pollution from Ships MARPOL 73/78 Annexes	
	Objective of Annex is to Prevent Pollution from:
Annex 1	Oil from ships
Annex 2	Noxious liquid substances carried in bulk
Annex 3	Harmful substances carried by ships in packaged form
Annex 4	Sewage treatment and disposal
Annex 5	Garbage handling
Annex 6	Air Pollution from Ships
International Maritime Dangerous Goods Code	
International Convention for the Safety of Life at Sea, 1974, SOLAS 74	

SECTION 4 • MARINE WILDLIFE

> Marine mammals have been the basis of the Inuit economy for over 4,000 years. They provide meat, fat, oil, leather, tools and materials for fabrication of arts and crafts. The top layers of the skin yield "muktuk", which is still highly prized as a food rich in vitamin C and high in energy content. *(Fisheries and Oceans Canada http://www.dfo-mpo.gc.ca/Science/publications/uww-msm/articles/beluga-eng.htm)*

The reaction of marine wildlife to vessel traffic is predicted to not be significant and, providing mitigation measures are employed, should not lead to any residual effects (see Volume 8, Marine Environment and Impact Assessment). The effects of vessel traffic on marine mammals and birds were assessed in the Environmental Impact Assessment (EIA). This included a Traditional Knowledge (TK) study of the marine environment between Chesterfield Inlet and Whale Cove. Together, scientific and traditional knowledge were used to develop mitigation measures to eliminate potential residual effects. Of greatest interest in the TK study was the distance vessels remained from Marble Island, this being an important area for whales, seals, marine birds, and, on occasion, walruses.

Agnico Eagle includes in its contracts that ships must remain mindful of marine areas having a high density of marine mammals and birds and stay within the recommended shipping route, wherever possible[13]. Agnico Eagle requests that ships provide their ship track data for inclusion in annual reporting.

4.1 Interactions and Potential Effects

Vessel discharges (sewage, solid wastes, ballast water), the sight of the vessels and their movement, vessel noise, as well as accidental spills and releases have the potential to interact with and disturb marine wildlife and affect life cycle activities. Possible interactions between shipping and marine wildlife can have the following potential effects:

- Marine mammals may retreat to the water should a vessel pass too close to an island or reef where they have pulled themselves out of the water;
- The foraging of marine birds and mammals may be interrupted when vessels approach and pass them in the shipping route;
- The improper treatment and release of ballast water, grey water and bilge water could alter the water quality and contaminate the food supply;
- Marine mammal mortalities or injuries may result from collisions with the ship;

[13] Frobisher Bay and Button Islands key marine habitat sites overlap with the proposed shipping route at their southern and northern boundaries, respectively. This overlap is unavoidable as these two sites almost completely cover the entrance to Hudson Strait from the Atlantic Ocean (see Volume 8 for more details).

- Marine bird mortalities or injuries may result from collisions with the ship; and
- Fuel and/or oil spills could result in mortalities and, for marine birds, could lead to the loss of foraging and brood rearing habitat. A Spill Risk Assessment is provided in Appendix E.

4.2 Mitigation Measures

As part of shipping companies' standard operating procedures, ship crews monitor the shipping route for marine mammals from Hudson Strait to Rankin Inlet. In addition, a vessel-based Marine Mammal and Seabird Observer (MMSO) program has been implemented during all routine shipping activities in the Regional Study Area (RSA). Protocol for the MMSO program is provided in the Marine Environmental Management Plan (MEMP) in Appendix D. The MEMP is based upon the most current marine mammal and seabird baseline information available for the area impacted by shipping for the Meliadine Mine, as documented in the revised marine baseline report (Appendix B). The ship's Master will be notified if there is a concern of the ship striking a marine mammal. Ship personnel will make a decision if actions are required to avoid a possible collision. This may include, if safe to do so, slowing the ship until the animal has travelled clear of the ship's course. Subject to safe navigation and emergency response, ship personnel shall take every precaution to avoid disturbance, harassment, injury or mortality of marine wildlife by implementation of the following mitigation measures:

- Adherence to monitoring requirements as outlined in the vessel-based MMSO program (Appendix D);
- Ships will, when possible, maintain a straight course and constant speed, and avoid erratic behaviour;
- Marine mammals will be given right of away as safe navigation allows. Under no circumstances, other than in the case of an emergency, will ships approach within 300 m of a walrus or polar bear observed on sea ice[14];
- Ships will remain at least 2 km from Marble Island to avoid disturbing seals, walrus and marine birds that might be in the vicinity. This would significantly reduce interactions between marine wildlife and vessels, and also reduce the noise in near-shore areas;
- Ships will look out for marine mammals and avoid them as possible. If marine mammals are encountered, and remain in the area, effort will be made to avoid them by maintaining a 500 m buffer zone;
- Ships will maintain a minimum distance of 500 m from marine mammals engaged in feeding activities;
- Ships will avoid accelerating within 500 m of a marine mammals;
- If it is not possible for the ship to move away from or detour around a stationary marine mammal or group of marine mammals, the ship will reduce its speed and wait until the animal(s) move to the side and remain at least 500 m from the ship prior to resuming speed;

[14] As all shipping will occur during the open water season, collision with young seals in liars will not happen.

- When marine mammals appear to be trapped or disturbed by ship movements, the ship will implement appropriate measures to mitigate disturbance, including stoppage of movement until the marine mammal has moved away from the immediate area;
- The ship will not be operated in such a way as to separate an individual member(s) of a group of marine mammals from other members of the group. When weather conditions require, such as when visibility decreases, the ship will adjust its speed accordingly to avoid the likelihood of the ship striking an animal;
- Subject to ship and human safety considerations, the following mitigation techniques will be implemented to avoid impacts to migratory birds nests in low lying shoreline habitats:
    - Barge-tug or shipping vessels will travel at a slow speed (2 knots or less) when transiting through the near shore islands and reefs to reduce wake[15];
    - Barge-tug or shipping vessels would only travel through the near shore islands and reefs when there is good visibility or adjust their speed according to the conditions;
- Implementation of monitoring and reporting procedures for ship-bird collisions. Any incidents of bird mortalities associated with near-shore lighting and infrastructure, intertidal construction activities, and ship operations are to be recorded and reported to Environment Canada (Canadian Wildlife Services) as outlined in Appendix D;
- Ballast water will only be released in designated areas and if there is no marine wildlife in the area; and
- Bilge water, grey water and sewage will be properly treated and only released in areas where no marine wildlife is present and at least 50 km from Itivia.

Spills from ships in transit could affect marine wildlife coming in contact with any petroleum product spilled. In the event of a spill, the ship personnel will discourage marine wildlife from coming in contact with the spilled material. The product most likely to be spilled would be diesel fuel, which floats on the water surface and has a high rate of evaporation. However, these occurrences are expected to be rare and the activation of the SOPEP would significantly reduce their impact. Preventive and contingency measures already in place substantially reduce the risk to marine wildlife from spills.

Adaptive management will allow mitigation measures to be modified in response to new information arising from monitoring carried out by the vessel crews and from traditional knowledge. Appendix D summarizes how and when adaptive management will be implemented during shipping activities for the Meliadine Mine.

[15] Vessel wakes from nearshore Mine vessels engaged in transportation activities were assessed as a minor linkage in the FEIS. Potential effects assessed included shoreline erosion. The conclusion of the FEIS was that any wake effects from Mine related barges are expected to be within the normal variation experienced during tidal cycles and storms within Melvin Bay (see Section 8.3.4.3 of the FEIS for additional details).

4.3 Monitoring and Reporting

Agnico Eagle will discuss with contracted vessel operators the monitoring of marine wildlife. Contracted vessels by Agnico Eagle will be requested to collect incidental monitoring data during their voyage and to report it to Agnico Eagle. In addition, a vessel-based MMSO program will be implemented during routine shipping activities in the RSA. This program will be executed by trained observers stationed on-board vessel(s). A proposed protocol for this program is provided in the MEMP in Appendix D.

The MMSO program includes protocols on data collection and reporting requirements. Agnico Eagle will share the data with Inuit organizations and/or government agencies for their information. If effects monitoring identifies potential for effects on marine mammal populations along the shipping route, Agnico Eagle will provide updates and identify adaptive management measures in consultation with the Kivalliq Inuit Association and the Hunters and Trappers Organizations of the Kivalliq communities.

SECTION 5 • SAFETY OF PERSONS USING SMALL BOATS IN THE SHIPPING ROUTE

The most likely areas where interactions may occur between small boats and barges-tugs and/or ships or vessels are:

1. Melvin Bay, particularly in the access passage;
2. Where the ship is transiting through the near shore islands and reefs; and
3. The area between Marble Island and the near shore islands.

Subject to ship and human safety considerations, mitigation measures to safeguard the safety of those in small boats will include the following:

- Agnico Eagle will consult with the community members mooring or beaching their boats in Melvin Bay on the shipping activities that can be expected over the ice free shipping season. Protocols will be developed to minimize the interaction between barge-tug or ship and small boats;
- Barge-tug or ship will travel at a slow speed (2 knots or less) when transiting through the near shore islands and reefs to reduce the wake and not compromise the safety of people travelling in small boats along the shipping route. The slower speed will reduce the wake of the ship;
- Barge-tugs or ships would only travel through the near shore islands and reefs when there is good visibility or adjust their speed according to the conditions. This would allow the ship and the small boats to be in visual contact;
- Barge-tugs or ships will restrict themselves to the recommended shipping route thereby not surprising any small boat travelling outside the shipping route;
- The ship will sound its horn if a small boat seems unaware of its presence; and
- Agnico Eagle, through the Community Liaison Committee, will recommend that all those in small boats wear personal floatation devices.

SECTION 6 • SMUGGLING PREVENTION AND POLICE SERVICES

Smuggling, particularly alcohol and prohibited substances, could have negative socio-economic effects on the community. It is Agnico Eagle's intent to avoid or minimize all negative socio-economic effects.

Measures to prevent smuggling will include:

- The crew of the ship will not be allowed to take any alcohol ashore;
- Any crew member under the influence of alcohol, or attempting to take alcohol ashore will be disciplined by the ship's Master; and
- Agnico Eagle security will send any crew member having alcohol back to the ship for disciplinary action, or refer the matter to the Royal Canadian Mounted Police (RCMP) if prohibited substances are involved.

While it is anticipated that the RCMP will not be involved in security matters, all criminal activities or matters of a grave nature will be referred to the RCMP in Rankin Inlet.

SECTION 7 • IDENTIFIABLE THIRD PARTY LIABILITIES

Agnico Eagle and its shipping contractors will carry third party liability insurance. Identifiable third party liabilities related to shipping include but are not limited to:

- Hamlet of Rankin Inlet, in the event of spill in Melvin Bay that adversely impacts the marine environment;
- Hunters and trappers, should a ship or tanker run aground and adversely impact the marine environment by spilling fuel or other chemicals into the marine environment;
- Small boat owners, should a ship or tanker collide with a small boat in the shipping route; and
- Hunters and trappers, should a vessel collide with a large marine mammal such as a whale along a shipping route.

Mitigations for possible third party liabilities are identified in Section 11 of this Plan (Hazard Identification Analysis of Marine Routes).

SECTION 8 • ON BOARD WASTE MANAGEMENT

The six (6) annexes of MARPOL promote the elimination of deliberate, negligent or accidental discharge of ship-source pollutants into the marine environment (see also Transport Canada 2009). The list of harmful ship-source discharges includes: oil, noxious liquid substances and dangerous chemicals, sewage, garbage and air pollution. Canadian laws and regulations mirror the MARPOL annexes and conventions.

Agnico Eagle will contract vessels that meet applicable environmental requirements in addition to being reliable and having a superior safety record.

8.1 Sewage

Vessels are to have an approved sewage treatment plant meeting Canadian standards[16]. Holding tanks with the capacity for all grey and treated sewage while in port are expected to be part of the ship's infrastructure. Agnico Eagle will advise ships that disposal of waste water into the environment is to be avoided within 50 km of Rankin Inlet.

Sewage sludge from the sewage treatment plant can be incinerated in the on-board incinerator.

8.2 Solid Waste

Solid waste materials are to be incinerated on board, not disposed of in the marine environment. Modern incinerators operating at very high combustion temperatures are expected on all vessels. These will be capable of incinerating food and other domestic waste, residual oil separated from bilge water, waste oil and sludge. Ash from incineration will remain on board and be taken south for treatment, recycling and/or disposal in a certified waste management facility. By incinerating waste on board, the risk of introducing invasive non-aquatic species to the Rankin Inlet area is reduced. This would not be the case if the waste was transferred onshore for incineration/disposal.

The design and operation of shipboard incinerators in Canada are specified under the International Marine Organization, Marine Environmental Pollution Committee 76 (40), Annex V. Standard specifications for shipboard incinerators allow for the incineration of solid wastes approximating in composition to household waste and liquid wastes arising from the operation of the ship, e.g., domestic waste, cargo-associated waste, maintenance waste, operational waste, cargo residues, and fishing gear. Operating temperatures are similar to those for the incinerator at the Meliadine site, and flue gases are cooled rapidly to limit the *in vivo* formation of dioxins.

[16] If all sewage is to be incinerated, there will not be any need for sewage treatment.

Tugs will remain on site for the duration of the shipping season. Their waste will be incinerated with the ash stored in containers, which will be shipped south at the end of the shipping season for treatment, recycling and/or disposal in a certified waste management facility.

Hazardous waste will not be incinerated but returned south for treatment, recycling and/or disposal in a certified waste management facility.

SECTION 9 • BALLAST WATER MANAGEMENT

Ballast water is essential to control trim, list, draught, stability, and/or stresses on a vessel. Ballast water control and management regulations protect waters under Canadian jurisdiction from non-indigenous aquatic organisms and pathogens that can be harmful to ecosystems. Agnico Eagle recognises that when a new organism is introduced to an ecosystem, negative and irreversible changes may result, including a change in biodiversity. The *Ballast Management Control and Management Regulations* are intended to minimize the probability of introduction of harmful aquatic organisms and pathogens from vessels' ballast water while also protecting the safety of vessels (Transport Canada 2007).

While an exemption exists in the regulations for vessels operating exclusively in waters under Canadian jurisdiction or certain adjacent waters, any Canadian vessel that has operated outside these waters may carry harmful aquatic organisms or pathogens in their residual ballast and, as such, is not eligible to exemption.

Agnico Eagle expects to use vessels largely active in the coasting trade that operate almost exclusively in waters under Canadian jurisdiction. However, these vessels do on occasion venture into waters outside Canadian jurisdiction and, as such, will require a Ballast Water Management Plan (BWMP). The regulations require the preparation and carriage of a BWMP for each vessel, and for copies to be submitted to Transport Canada. The BWMP will be specific to the vessel.

If Agnico Eagle were to contract vessels originating from waters outside the jurisdiction of Canada, a BWMP would be required. All BWMP (reviewed by the National Administration) carried on ships of foreign origin would be based on the following international guidelines and guiding principles:

- IMO Resolution A.868(20): *Guidelines for the Control and Management of Ships Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens*, in particular Section 7.1;
- The *Model Ballast Water Management Plan* developed by the International Chamber of Shipping and the International Association of Independent Tanker Owners;
- Regulation B-1 of the IMO's *Regulations for the Control and Management of Ships' Ballast Water and Sediments*; and
- Part B of the Annex to Resolution MEPC.127 (53): *Guidelines for Ballast Water Management and Development of Ballast Water Management Plans*.

Agnico Eagle will require contracted vessels not eligible for exemption to have a BWMP and provide Agnico Eagle with a copy.

9.1 Ballast Water Exchange

It is recognised by the IMO that the exchange of ballast water in deep ocean areas or open seas offers a means of limiting the probability that harmful aquatic organisms and pathogens be transferred from/in vessels ballast water. If it is necessary to take on and discharge ballast water in the same port to facilitate safe cargo operations, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another port as this could introduce harmful aquatic organisms. In particular, sediment found in the vessel's ballast tanks should be disposed of at sea in areas outside 200 nautical miles (370 km) from land and in water depths exceeding 2,000 m.

Vessels take on ballast water in segregated chambers for the main purpose of stabilizing the vessels by adding the weight of the water and maintaining a specified draught. Vessels laden with dry cargo or fuel will take on less ballast water than empty vessels. As all ships on the inward voyage to Rankin Inlet will be laden, they will have a minimum of ballast water. However, on the outward journey, these vessels will take on ballast water.

In the event that a ship is contracted from waters outside jurisdiction of Canada, ballast exchange is to occur before entering Canadian waters. The ballast exchange and documentations needs to be made according to the *Ballast Management Control and Management Regulations* (Transport Canada 2007).

In the case of non-transoceanic navigation, and where ballast water is taken on-board outside waters of Canadian jurisdiction, the water is to be exchanged before entering Canadian waters at a location at least 50 nautical miles offshore, in water at least 500 m deep. If this is not possible due to safety or other reasons, the ballast water exchange can occur in the alternate designated area in Hudson Strait, east of 70°west longitude, where the water is over 300 m deep.

All coastal trade vessels will in all likelihood not venture more than 200 nautical miles from shore and will not exchange ballast water outside waters of Canadian jurisdiction. All the same, ballast water exchanges for all vessels operating in waters under Canadian jurisdiction are expected to meet the provisions of the Regulations, and to follow Part A of the IMO *Guidelines for Ballast Water Management and Development of Ballast Water Management Plans*, and the IMO *Guidelines for Ballast Water Exchange*.

SECTION 10 • SAFETY

Safety is a top priority for Agnico Eagle. It begins with all personnel (Agnico Eagle, contracted employees and contractors) wearing the appropriate personal protection equipment suitable for the task at hand and for the weather conditions at the time. Secondly, personnel must understand the hazards associated with the task, the safe procedures in carrying it out, and how not to place oneself in harm's way. Accident prevention will be supported by a proactive program to identify and correct potential hazards before an accident occurs.

Agnico Eagle or contracted supervisors will ensure that the interactions between ship and shore are carried out with the safety and the health of the employees first in mind.

SECTION 11 • HAZARD IDENTIFICATION ANALYSIS OF MARINE ROUTES

Hazard: Anything that has the potential to cause harm.

Likelihood: The probability/chance of harm occurring as a result of exposure to a hazard.

Severity: The level of harm that may occur as a result of exposure to or contact with a hazard.

Risk: The likelihood of harm occurring combined with the potential severity to produce a level of risk or risk rating.

Navigation through the Labrador Sea, Hudson Strait and Hudson Bay is not challenging during the open water season[17]. No major hazards were identified along the shipping and tug-barge routes under normal conditions. Electronic charts combined with electronic navigation aids for the shipping routes ensure the vessel remains on course where bathymetry and physical hazards are known.

Subject to ship and human safety considerations, the average speed of the vessels in open waters is expected to be less than 14 knots (26 km/h). Once ships approach the offshore islands and reefs off Rankin Inlet, and subject to ship and human safety considerations, the ship's speed will be slowed to 2 knots or less (3.7 km/h) to navigate the shipping route through the islands to their anchor point outside Melvin Bay. Shipping can be carried out without pilotage as the shipping routes entail minor hazards that do not significantly reduce ship safety. Any actions required by the crews of the ships and tugs are expected to be well within their capabilities.

At the anchor point, cargo will be lightered from the ships onto barges which will travel to the lightering location via the access passage. The tugs-barges will be highly manoeuvrable and capable of transiting the access passage with its changing currents and will not require pilotage. The tidal current in the access passage can be half a knot (0.93 km/h). Navigation will proceed at a slow speed in periods of low visibility. Traffic through the access passage will be coordinated to avoid shipping conflicts and to ensure safety.

However, out of the ordinary events have been identified that could increase the level of hazard and necessitate associated mitigation measures:

- Mechanical failure occurring on the ship or tug thereby placing it in jeopardy in the shipping route;
- Tug-barge or ship running aground due to a navigational error or mechanical failure;

[17] Agnico Eagle's shipping routes within Nunavut are non-compulsory pilotage areas during the ice free shipping season

- Loss or damage to sea cans in heavy seas;
- Barge tow line breaking in heavy seas;
- Collision of tug-barge or ship carrying dry cargo and fuel to Itivia through the access passage;
- Tug-barge or ship sinking upon hitting ice; and
- Tug-barge or ship colliding with a small boat.

The access passage deserves special attention as:

- Dry cargo for Agnico Eagle and the hamlet and fuel for Agnico Eagle could all be unloaded at the same time; and
- The access passage is 150 m wide at its narrowest point and, although two-way traffic is theoretically possible, it raises the risk of collisions and groundings. To reduce the risk, it is best that a single tug-barge or ship be in the access passage at any one time.

SECTION 12 • RISK ANALYSIS OF MARINE ROUTES

All ships, tugs and tankers use electronic charts and other electronic navigational aids to provide safety in transit, reduce the risk of accidents, and remain within the recommended shipping route presently in use for the annual sea lift to Rankin Inlet and other Kivalliq communities. For an extra measure of safety, weather warnings are updated regularly. Also, shipping companies likely to be employed by Agnico Eagle commonly sail in Hudson Bay and to Rankin Inlet and are aware of its marine hazards.

The potential severity of shipping hazards[18] cannot be changed in most circumstances, what can be reduced is their likelihood. This is possible through the application of mitigation measures. And the level of risk can be defined as the likelihood of harm posed by a hazard combined with its potential severity. The objective is, through the use of mitigation measures, to reduce the risk as low as practically possible. Residual risk is what remains after mitigation measures have been applied. And those having the highest potential residual risk would be aggressively managed.

Mitigation reduces the probability of occurrence and increases safety. The following mitigation/safety measures will be implemented subject to ship and human safety considerations:

- Where available, electronic navigation aids be used in all instances;
- Ship speeds in open water remain less than 14 knots in the absence of marine mammals, and once within the barrier islands and reefs near Rankin Inlet, 2 knots or less;
- Shipping is only carried out during the ice free season. Should ice be encountered, the vessel will either sail around it at a reduced speed or proceed slowly through the ice;
- Tug-barge or ship will remain within recommended shipping routes ;
- Fuel tankers and the fuel tanker barges will be double hulled;
- Tug-barge operations will proceed when there is good visibility from the anchor point of the ships to the barge at Itivia and/or adjust their speed according to the conditions;
- Traffic through the access passage will be coordinated to avoid conflicts and ensure safety. Communication between tugs will coordinate movement through the access passage;
- Agnico Eagle will provide emergency response equipment and materials as outlined in the OPEP if necessary. Tug or ship will also provide their own emergency response equipment.
- Crews will follow standard operating procedures and adherence to these will be monitored; and
- Tug-barge or ship crews are to be trained for responses to hazards that can normally be expected in northern waters.

[18] One hazard that can be reduced is shipping when ice is present. Agnico Eagle has opted to only ship during the ice-free season thereby greatly reducing this hazard.

Appendix C outlines the methodology used in the risk analysis of the transportation routes and how various mitigation measures reduced the risk level.

SECTION 13 • SOCIO-ECONOMIC IMPACT OF SHIPPING

Agnico Eagle does not believe that shipping activities related to the Meliadine Mine will result in an increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Rankin Inlet. In most circumstances, any emergency response will be undertaken by Agnico Eagle personnel and/or the ship's crew. Agnico Eagle personnel and the Master of the ship will be responsible for security matters related to the shipping-related activities.

Shipping may impact socio-economic activities in Rankin Inlet. Itivia will be jointly used by the hamlet and Agnico Eagle during the ice free shipping season, which will require coordination. Mitigation measures will be employed to minimize negative socio-economic effects:

- Communication between tugs will coordinate movement through the access passage and use of the Designated Hamlet Landing Beach during lightering operations to avoid conflicts and ensure safety;
- Agnico Eagle has a separate storage area from the community.

The mitigation of negative socio-economic effects in smuggling alcohol and prohibitive substances into the community were described earlier.

Positive socio-economic effects will arise from the increased number of dry cargo and fuel tankers coming to the community. The crews of these ships will in all likelihood come ashore when the boat is anchored and contribute to the local economy through the:

- Use of restaurants, hotels and stores in the community;
- Purchase of local Inuit art; and
- Guided tours to the barrens for fishing and wildlife experiences.

SECTION 14 • PUBLIC AND MEDIA COMMUNICATIONS

When an environmental emergency occurs, the public will be provided with timely and accurate information as to the nature of the incident, the steps being taken to correct the problem, and, if necessary, what citizens should do to protect themselves. This information is intended to protect the overall community well being, including human health, to provide timely information amongst the public, to ensure cooperation from all interested parties, and to reduce the spread of concern or alarm through the dissemination of inaccurate information.

Each agency involved in a major spill event may provide its own media communications, and may designate spokespersons for such; however, from the Arctic REET's (Regional Environmental Emergencies Team) perspective, a coordinated response is preferable. To that end, the government lead Agency is expected to act as the official spokesperson for the response, with support provided by personnel within the Arctic REET, as required.

Transport Canada guidelines will be followed to ensure proper authorities are informed without delay so that appropriate action may be taken when:

- Any incident occurs involving the loss, or likely loss, of dangerous goods into the marine environment; or
- Any incident occurs giving rise to pollution or threat of pollution to the marine environment; or
- Any oil pollution incident occurs involving the loading or unloading of oil to or from tanker-to-tanker and from tanker to the OHF.

REFERENCES

Agnico Eagle Limited. 2015. Risk Management and Emergency Response Plan. Submitted in support of the Type A Water Licence Application to the Nunavut Water Board, May 2015.

Transport Canada. 2007. A Guide to Canada's Ballast Water Control and Management Regulations. Guideline TP 13617E

Transport Canada. 2009. Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants. Guideline TP 9834E.

APPENDIX A • MARINE HYDROGRAPHIC CHARTS

Chart 5002 Hudson Bay and Hudson Strait

Chart 5629 Marble Island to Rankin Inlet

Chart 5628 Rankin Inlet including Melvin Bay and Prairie Bay

Fisheries and Oceans Canada | Pêches et Océans Canada

Canada

5002
INT 406

NUNAVUT

SOUTHAMPTON ISLAND

CHESTERFIELD INLET

ROSS WELCOME SOUND

THE GULLET STRAIT

BAY OF GODS MERCY

FISHER STRAIT

SOUTH BAY

BELL PENINSULA

FOXE CHANNEL

FOXE PENINSULA

EVANS STRAIT

COATS ISLAND

MANSEL ISLAND

NOTTINGHAM ISLAND

Salisbury Island

Charles I.

HUDSON STRAIT / DÉTROIT D'HUDSON

BAFFIN ISLAND / ÎLE DE BAFFIN

IQALUIT

HALL PENINSULA

META INCOGNITA PENINSULA

FROBISHER BAY

DAVIS STRAIT / DÉTROIT DE DAVIS

PÉNINSULE D'UNGAVA

QUEBEC/QUÉBEC

RESOLUTION ISLAND

AKPATOK ISLAND

AKPATOK BANK

LABRADOR SEA / MER DU LABRADOR

UNGAVA BAY / BAIE D'UNGAVA

SAGLEK BANK

NEWFOUNDLAND AND LABRADOR / TERRE-NEUVE-ET-LABRADOR

HUDSON BAY / BAIE D'HUDSON

MANITOBA

ONTARIO

BELCHER ISLANDS

King George Islands

Ottawa Islands

Inukjuak

Kangiqsualujjuaq

Kangiqsujuaq

Povungnituk

Puvirnituq

Akpatok Island

Mosonee

Fort Albany

Attawapiskat

Chisasibi

Fort Rupert

Washagamish

AKIMISKI ISLAND

Charlton I.

JAMES BAY / BAIE JAMES

CONTINUATION A

QUEBEC / QUÉBEC

ONTARIO

Adjoining Chart / Carte adjacente 7010

Adjoining Chart / Carte adjacente INT 406

Continuation A

INTERNATIONAL CHART SERIES

SÉRIE DE CARTES INTERNATIONALES

CANADA

HUDSON BAY AND STRAIT
BAIE ET DÉTROIT D'HUDSON

Scale 1:3 500 000 (22°30'N) Échelle

Projection : Mercator

DEPTHS are in metres.

ELEVATIONS, spot elevations and clearances are in metres.

SOURCES: Compiled by the Canadian Hydrographic Service from information to 1973.

For Symbols and Abbreviations, see Chart No. 1.

DOUBTFUL DATA

Reported but unconfirmed Depths or Dangers are indicated by an encircling dotted line.

Magnetic Variation Curves are for the 2015 epoch. Figures in parentheses indicate the annual change.

LES PROFONDEURS sont en mètres.

LES ALTITUDES, les points cotés et les hauteurs libres sont en mètres.

SOURCES : Compilé par le Service hydrographique du Canada de l'information de 1973.

Pour les signes conventionnels et les abréviations, consulter la Carte n° 1.

DONNEES DOUTEUSES

Des profondeurs ou des dangers signalés mais non confirmés sont encerclés d'une ligne pointillée.

Les courbes de déclinaison magnétique correspondent À l'époque 2015. Les chiffres entre parenthèses représentent la valeur de la variation annuelle.

PREVIOUS EDITIONS / ÉDITIONS ANTÉRIEURES 1975
NEW EDITION / NOUVELLE ÉDITION: MAY/MAI 25 2015
Corrected to NOTICES TO MARINERS / Corrigée jusqu'à l'AVIS AUX NAVIGATEURS :
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PUBLISHED BY THE CANADIAN HYDROGRAPHIC SERVICE
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METRIC/MÉTRIQUE

HUDSON BAY AND STRAIT / BAIE ET DÉTROIT D'HUDSON

5002
INT 406

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Canada

5629

SOURCE CLASSIFICATION DIAGRAM/DIAGRAMME DE CLASSIFICATION DES SOURCES

Area/Zone	Origin/Origine	Date	Line Spacing/Espacement des lignes
a	CHS/SHC	1954	65m
b	CHS/SHC	1995-96	100m
c	CHS/SHC	1958	180m
d	CHS/SHC	1957-58	300m

Larger-scale chart/Carte à plus grande échelle

TIDAL INFORMATION / RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevation above Chart Datum / Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level / Niveau moyen de l'eau
	HHW(PMG)	LLW(BMI)	HHW(PMG)	LLW(BMI)	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Marble Island	3.7	0.0	3.1	0.6	1.9
Panorama Island	4.6	0.0	3.9	0.7	2.4

MAGNETIC COMPASS ERRATIC / COMPAS MAGNÉTIQUE INSTABLE

MAGNETIC VARIATION 1995 / VARIATION MAGNÉTIQUE 1995

MAGNETIC VARIATION 2005 / VARIATION MAGNÉTIQUE 2005

MAGNETIC VARIATION 2000 / VARIATION MAGNÉTIQUE 2000

CANADA

NUNAVUT

HUDSON BAY/BAIE D'HUDSON

MARBLE ISLAND TO/À RANKIN INLET

Scale 1:60 000 (62°48'N) Échelle

Projection : Mercator

DEPTHS are in metres and are reduced to Chart Datum (Lowest Normal Tide), which at Marble Island is 1.9 metres below Mean Water Level (MWL).

ELEVATIONS and spot elevations are in metres above Higher High Water Large Tides (HHWLT). Underlined figures on drying areas or in brackets against drying features are in metres above Chart Datum. Topographic contours are in metres above Mean Sea Level. The contour interval is 5 metres.

HORIZONTAL DATUM: North American Datum 1983 (NAD 83), which is equivalent to WGS 84.

SOURCES: The hydrographic data are shown in the SOURCE CLASSIFICATION DIAGRAM. Topography is from National Topographic System maps.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites au zéro des cartes (le marée normale la plus basse), soit à Marble Island est de 1,9 mètre au-dessous du niveau moyen de l'eau (NME).

LES ALTITUDES et les points cotés sont en mètres au-dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les zones asséchantes ou entre parenthèses contre les entités découvrantes sont en mètres au-dessus du zéro des cartes. Les courbes topographiques sont en mètres au-dessus du niveau moyen de la mer. L'équidistance des courbes est de 5 mètres.

SYSTÈME GÉODÉSIQUE : Système de référence géodésique de l'Amérique du Nord 1983 (NAD 83), qui correspond au WGS 84.

SOURCES : Les données hydrographiques sont présentées dans le DIAGRAMME DE CLASSIFICATION DES SOURCES. La topographie provient des cartes du Système national de référence cartographique.

Pour les signes conventionnels et les abréviations, consulter la carte n° 1.

Corbett Inlet

Adjoining Chart/Carte adjacente 5630

Adjoining Charts/Cartes adjacentes 5600

NEW CHART / CARTE NOUVELLE OCT 27 2006

NOTICE TO MARINERS / AVIS AUX NAVIGATEURS 2004-08-18

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| METRES | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | METRES |
|---|---|---|---|---|---

Canada

5628

CANADA

NORTHWEST TERRITORIES

TERRITOIRES DU NORD-OUEST

HUDSON BAY/BAIE D'HUDSON

RANKIN INLET

INCLUDING/Y COMPRIS

MELVIN BAY AND/ET PRAIRIE BAY

Projection : Mercator

PRAIRIE BAY

THOMSON PASSAGE

THOMSON ISLAND

MELVIN BAY

RANKIN INLET

KUGLUKTUK PENINSULA

PANORAMA ISLAND

TUGLIK PENINSULA

BUFF ISLAND

KAMOO ISLAND

HORSESHOE DEEP

GUILLEMOT BANK

SEPARATION SHOALS

METRIC/MÉTRIQUE

5628

APPENDIX B • REVISED MARINE ENVIRONMENTAL BASELINE

August 10, 2016

REVISED MARINE ENVIRONMENTAL BASELINE REPORT

Appendix B

Submitted to:
Agnico Ealge Mines Limited
10200, Route de Preissac
Rouyn-Noranda QC
Stephane Robert, Manager Regulatory Affairs

REPORT

Report Number:

Distribution:

1 copy - Agnico Ealge Mines Limited
2 copies - Golder Associates Ltd.

Golder Associates

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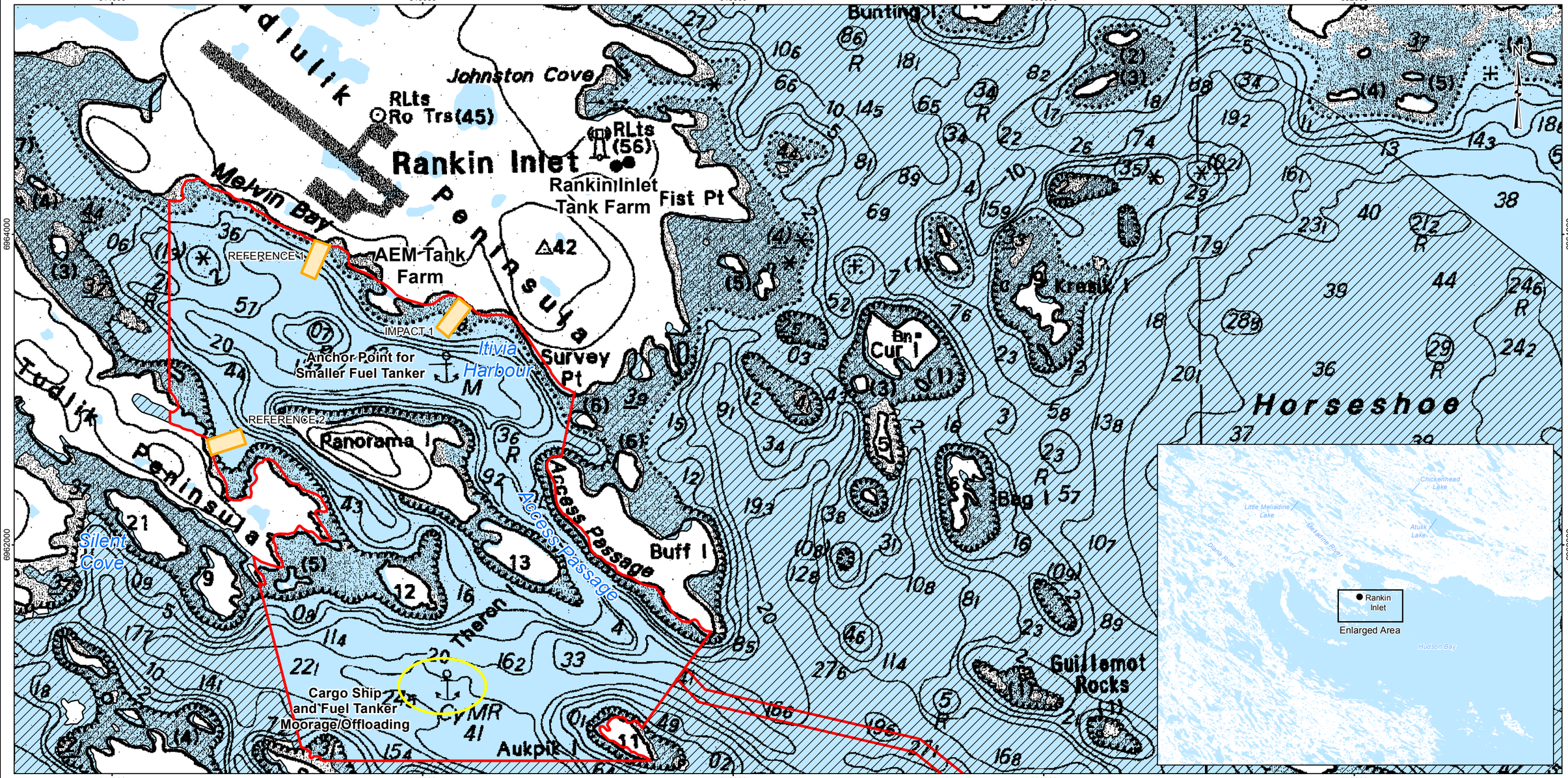
1.0 MARINE ENVIRONMENT REVISED BASELINE

1.1 Purpose and Scope

This report represents an update to the marine baseline information originally presented in Agnico Eagle's Final Environmental Impact Statement (FEIS). These revisions have been undertaken in accordance with Meliadine Gold Project (Project) Certificate Condition 79, which states the following:

"Prior to any Project-related shipping, the Proponent will update its marine baseline information to ensure that it includes the most recent information on marine wildlife abundance and distribution, carefully considers seasonal distribution patterns of marine wildlife, and incorporates western scientific and Inuit Qaujimajatuqangit knowledge sources. The updated marine baseline should be made available to appropriate authorities for feedback, then incorporated into the Proponent's Shipping Management Plan (SMP), with continued updates on a regular basis as new information becomes available."

This report was updated with new environmental information now available in the public domain (as of January 2016), as well as information provided through consultation with regulators and as a result of technical responses prepared by the proponent in response to information requirements (IRs) submitted as part of the FEIS review process. The majority of the new information provided relates specifically to the abundance and distribution of marine wildlife species in the Local Study Area (LSA) and Regional Study Area (RSA) (Figure B-1 and Figure B-2) and incorporates best available science with Inuit Qaujimajatuqangit. Information presented in this report should be reviewed in conjunction with the Marine Environmental Management Plan (MEMP) (Appendix D) and the Spill Risk Assessment (Appendix E), to inform monitoring, mitigation and adaptive management strategies for the Project.



500 0 500
METRES

LEGEND

- BASELINE SAMPLING AREA
- MOORAGE AND OFFLOADING
- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- BATHYMETRIC DEPTH CONTOUR
- WATERBODY

REFERENCE

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DATUM: NAD 83 PROJECTION: UTM ZONE 15

PROJECT

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AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

MARINE LOCAL STUDY AREA

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	25 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	MH	15 Mar. 2018	FIGURE B-1	
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

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-10200000 -9200000 -8200000 -7200000

9000000

8000000

Nunavut

Chesterfield Inlet

See Inset

Rankin Inlet

Whale Cove

Manitoba

Southampton Island

Nunavut

Coats Island

Nunavut

Mansel Island

Nottingham Island

Salisbury Island

Western Hudson Strait

Baffin Island

Nunavut

10 km wide RSA shipping corridor (5 km on either side)

Eastern Hudson Strait

Akpatok Island

Kuujjuaq

Puvirnituq

Hudson Bay

AREA / ZONE A

AREA / ZONE B

AREA / ZONE C

AREA / ZONE C

AREA / ZONE D

BAIE D'HUDSON

HUDSON BAY

DÉTROIT D'HUDSON
HUDSON STRAIT

Projection : Mercator

N

Rankin Inlet

Marble Island

200 0 200

KILOMETRES

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA) (SEE INSET)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- COMMUNITY
- WATERBODY

REFERENCE

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NAUTICAL CHART DATA OBTAINED FROM THE CANADIAN HYDROGRAPHIC SERVICE. PROVINCIAL DATA OBTAINED FROM ESRI.
DATUM: WGS 84 PROJECTION: WORLD MERCATOR

PROJECT

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AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

MARINE REGIONAL STUDY AREA

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	16 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	18 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-2

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1.2 Existing Environment in Melvin Bay / Itivia Harbour

In August 2011, a field program was conducted by Nunami Stantec at Itivia and at two nearby reference sites in Melvin Bay (Figure B-1). The objective of the field program was to collect physical and biological baseline information in the marine LSA (Figure B-1), with a focus on the Project footprint corresponding with the proposed floating dock facility (landing barge). The field program investigated bathymetry, water and sediment chemistry, aquatic lower-trophic organisms (phytoplankton, zooplankton, and benthic invertebrates) and fish and fish habitat. Results from Nunami Stantec's field program are provided in detail in Appendix 8.2-A of the FEIS, with a general summary provided below for bathymetry, water, and sediment chemistry (Agnico Eagle 2014).

1.2.1 Physical Environment

Depth soundings were collected along shore-perpendicular transects in the LSA. Water depths at Itivia and in Melvin Bay were determined to be shallow, with maximum depths in the Project footprint reaching 6.6 metres (m). A large rocky reef is present approximately 125 m offshore of the high water mark near the proposed landing barge facility. Cobble and gravel were the dominant substrates in the nearshore environment of the Project footprint (Figure B-3).

NO. DESSIN
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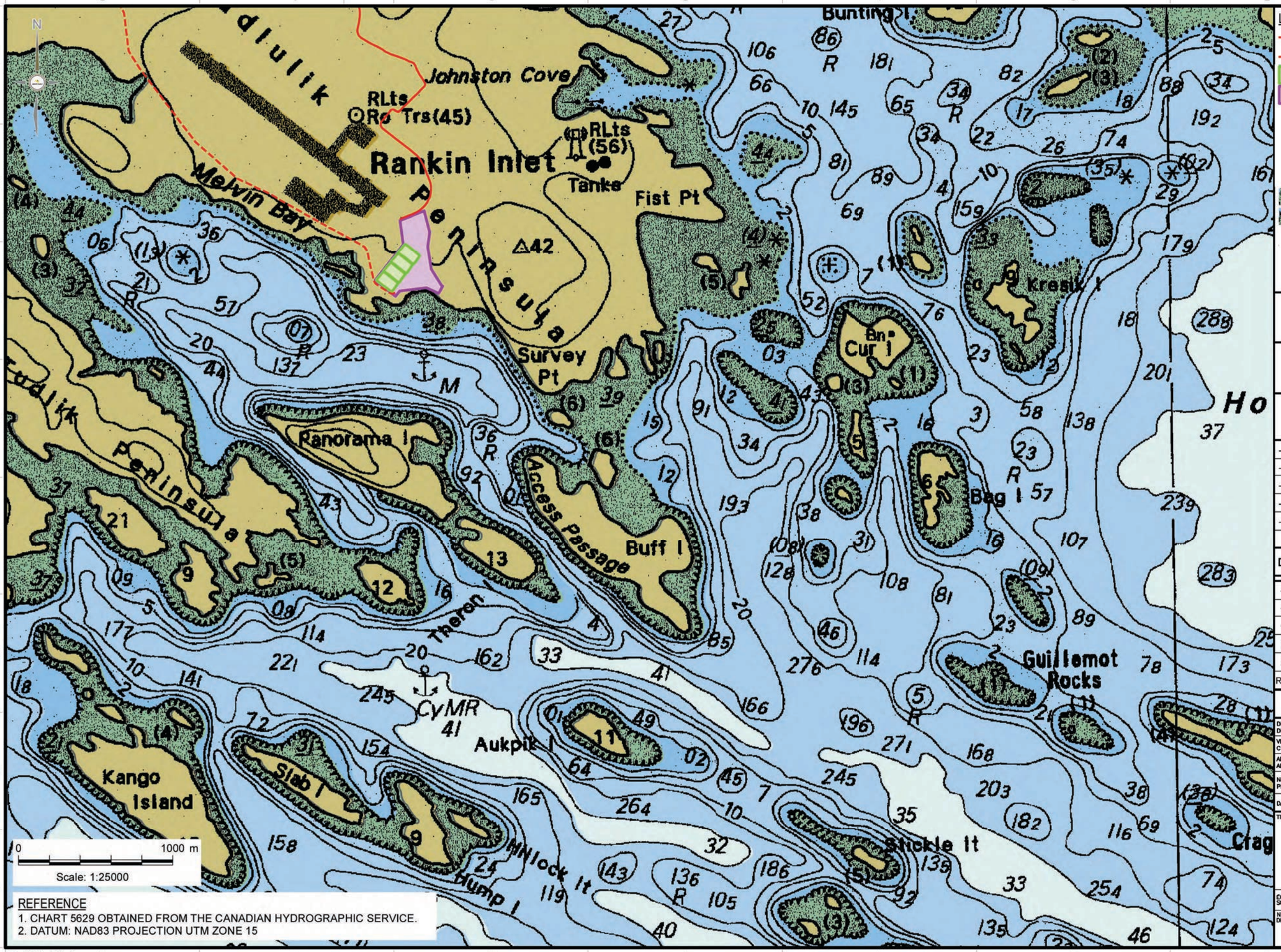
FORMAT ANSI B-11x17



REFERENCE
1. CHART 5629 OBTAINED FROM THE CANADIAN HYDROGRAPHIC SERVICE.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

LEGEND

- RANKIN ROAD
- BYPASS ROAD
- TANK FARM AREA
- LAYDOWN AREA
- SHIP/TANKER ANCHOR LOCATION
- M MUD
- Cy CLAY
- R ROCK, ROCKY
- LOW WATER LINE
- ROCKY AREA, WHICH COVERS AND UNCOVERS

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0	FINAL	09-08-2016	CDB
A	DRAFT	08-08-2016	CDB

REVISIONS

DESSINÉ PAR DRAWN BY	KZ	DATE	08-08-2016
VÉRIFIÉ PAR CHECKED BY	KZ		09-08-2016
APPROUVÉ PAR APPROVED BY	LY		09-08-2016
No. PROJET PROJECT NO.	1656645		
DATE	–		

TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION
FIGURE B3 SHORELINE TYPES
IN ITIVIA HARBOUR AND MELVIN BAY

ÉCHELLE/ SCALE	1:25000	FICHIER FILE	.MXD
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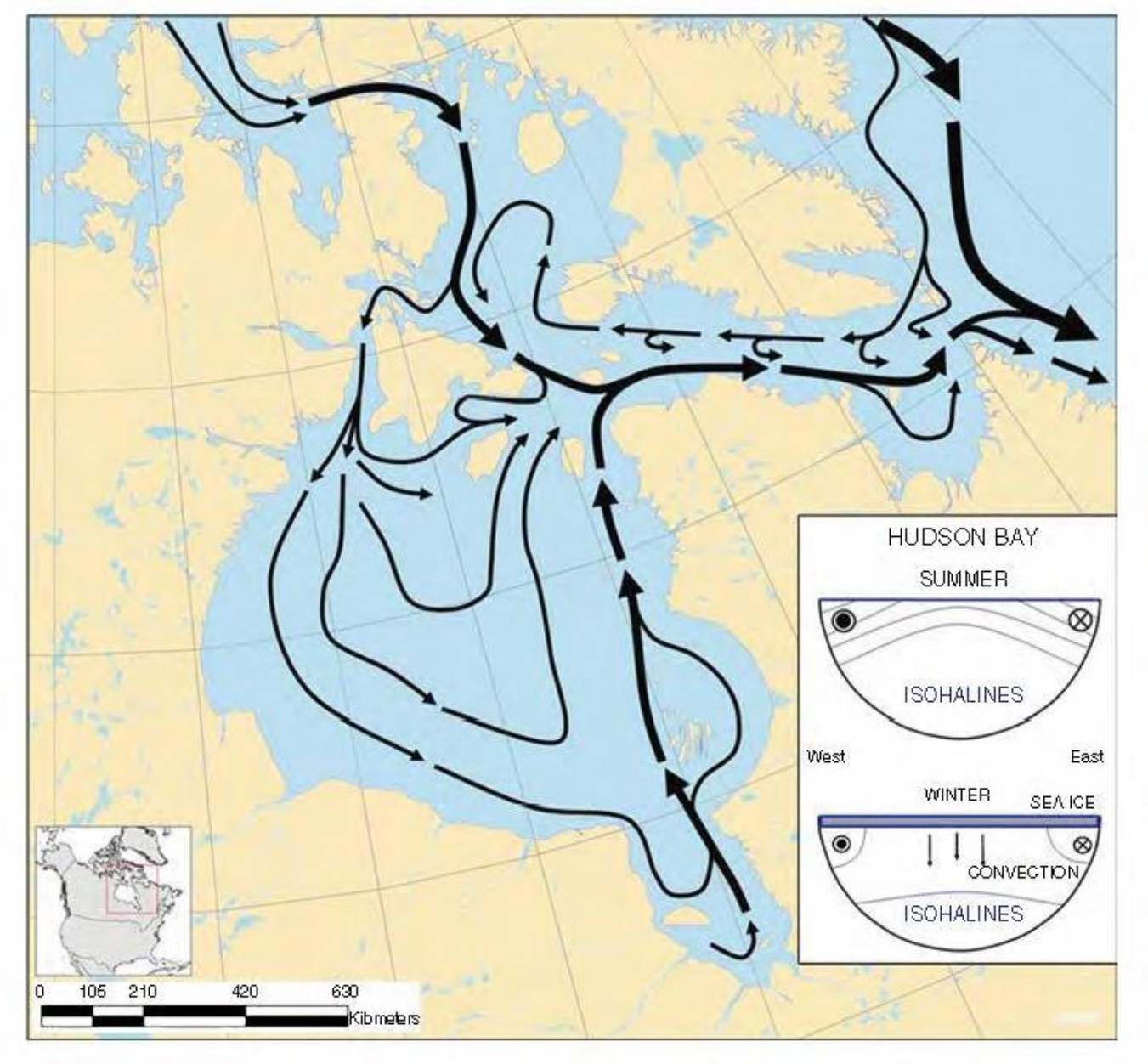


Figure B-4: Summer circulation of water in the Hudson Bay Complex (extracted from Stewart and Barber 2010; inset after Ingram and Prinsenberg 1998)

Water quality profiles were collected at one location in the LSA with an YSI 600QS multi-meter. Parameters measured included temperature, conductivity, pH, dissolved oxygen, salinity, and oxidation-reduction potential. Mean surface water temperature (at 1 m depth) in the harbour was 8.86 ± 0.52 degrees Celsius (°C), with a salinity of 29.32 ± 0.03 ppt, and a pH of 8.08 ± 0.03. Bottom water was slightly colder than surface water at 8.49 ± 0.57°C; with similar salinity and pH values. No thermal stratification was observed. The pH was near constant across the LSA (range from 8.05 to 8.10) and throughout the water column (range from 8.05 to 8.10).

Mean conductivity ranged from 45.6 ± 0.1 mS/cm at the surface to 45.7 ± 0.1 mS/cm at the bottom. Dissolved oxygen ranged from 114.5 ± 1.0% at the surface to 114.1 ± 1.2% at the bottom.

Water samples were collected for chemistry analysis at one location in the LSA using a Van Dorn sampler deployed at mid-depth. Parameters analyzed included major anions, alkalinity, total suspended solids, total dissolved solids, pH, conductivity, total metals, total Kjeldahl nitrogen, ammonia, nitrate and nitrite, total phosphate, and total organic carbon. Results were compared to Canadian Council of Ministers of the Environment (CCME) guidelines (maximum levels) for Protection of Marine Aquatic Life (PMAL). Total alkalinity in the marine LSA ranged from 142 to 144 milligrams per litre (mg/L), with bicarbonate (HCO3-) as the major representative ion. Nitrate, nitrite, total Kjeldahl nitrogen, dissolved orthophosphate, and total phosphorus were below detection limits (typically <0.050 mg/L). Total organic carbon values were low (ranging from 2.8 to 3.6 mg/L). Approximately 78% of all analyzed metals (33 of 42) were below detection limits. All sample parameters for which CCME PMAL guidelines exist were within acceptable limits.

Sediment samples were collected for chemistry analysis at 3 locations in the marine LSA footprint using a petite ponar grab. Metal concentrations were compared to CCME Interim Sediment Quality Guidelines (ISQG). Sediment chemistry was near constant across the LSA. Metal concentrations were variable and ranged from below analytical detection limits to exceeding CCME ISQCs. Chromium slightly exceeded the CCME ISQG of 52.3 milligrams per kilogram (mg/kg) at all sample stations, with average (±SD) concentrations in the marine LSA footprint measured at 55.8 ± 5.89 mg/kg. The precision analyses (CV) indicate some heterogeneity of marine sediments in the study area.

1.2.2 Biological Environment

Plankton

Phytoplankton abundance, richness, and diversity were similar across all sites within the marine LSA, and a total of 33 taxa were recorded. Dinoflagellates were the dominant taxa at all sites and included Peridinium/Gonyaulax spp. and Dinophysis spp. The ciliate *Tintinnida* was present at low percentages at 2 of the sites.

Zooplankton abundance, richness, and diversity differed between sites, and a total of 44 taxa were recorded. An unidentified rotifer species, possibly Notommatidae, was identified as the dominant taxa at all sites. Calanoid copepods were also present at all 3 sites.

Benthic Invertebrates

Benthic invertebrate abundance, richness, and diversity differed amongst sites. Polychaetes were the dominant taxa at all sites and included Polychaeta: Sedentaria (burrowing or tube-dwelling), Capitellidae, and Cirratulidae and/or Paraonidae. Polychaeta: Errantia (free-swimming) were the next dominant taxa and included Nephtyidae, Syllidae, and Pholoidae. Also present was nematode subclass Hoplonemertea, the Myidae and Tellinidae clams, the amphipod families of Ischyroceridae, Oedicerotidae, and Zopfiaceae, as well as 11 additional polychaete families. At 1 site, a single sponge (*Porifera*), 2 hydrozoan taxa, 1 flatworm (*Playhelminthes*), Terebellidae and Opheliidae polychaetes, 3 gastropod, and 3 bivalve taxa, several crustaceans (copepod, amphipod, decapods), and one sea squirt (*Urochordata*) were also identified.

Benthic species are not thought to occupy the intertidal zone in Hudson Bay on a permanent basis; rather, they occur seasonally when the habitat is not influenced by ice (Stewart and Lockhart 2005). Baseline studies completed in the LSA support this assumption (Nunami Stantec Ltd. 2012). Few invertebrate species were observed in the nearshore habitat, and abundance was low. Most of the individuals observed were less than 1 cm, suggesting a low biomass. Nearshore macrophyte coverage was found to be equally sparse (ranging from 2 to 5% coverage).

Fishes

Six species of marine fish (n=156) were identified during gill net and beach seine sampling in the marine LSA, including Greenland cod (*Gadus ogac*) (52%), slender eelblenny (*Lumpenus fabricii*) (27%), fourhorn sculpin (kanayok in Inuktitut) (*Myoxocephalus quadricornis1*[1]) (15%), unidentified sculpin (possibly juvenile; 3%), Arctic staghorn sculpin (*Gymnocanthus tricuspis*) (2%), and Arctic sculpin (*Myoxocephalus scorpioides*) (1%). The range of total lengths of the dominant fish taxa were 118 to 520 mm for Greenland cod, 180 to 210 mm for slender eelblenny, and 205 to 315 mm for fourhorn sculpin species. Arctic char were not observed during the baseline field study but were reported to be in the area at the time of the field study (west of Melvin Bay near the Barrier Islands).

Marine Birds

A black guillemot (*Cepphus grylle*) and a pair of sandhill cranes (*Grus canadensis*) were identified in the LSA during the baseline field program.

Marine Mammals

No marine mammals were observed in the LSA during the baseline field program.

1.3 Existing Environment within Hudson Bay / Hudson Strait Shipping Corridor

Golder conducted a comprehensive literature review to characterize the physical and biological environment in the proposed shipping corridor in Hudson Bay and Hudson Strait (Figure B-2). The following information sources were reviewed:

- available records of consultation with regulatory agencies, public stakeholders, and Inuit communities;
- available scientific literature / data reports;
- DFO Integrated Fisheries Management Plans;
- DFO Stock Status Reports;
- DFO's Mapster database;
- DFO's Ocean Data Inventory;

[1] Referenced by it's European (Triglopsis quadricornis) name in Appendix 8.2-A of the FEIS - Nunami Stantec Marine Baseline Report for Itivia Harbour, Rankin Inlet, NU

- Environment Canada's Key Marine Habitat for Migratory Birds;
- Fisheries and Oceans Canada's (DFO) Mapster database;
- governmental and non-governmental environmental resources including:
- Important Bird Areas (IBAs) spatial database;
- Marine Baseline Report - Itivia and Melvin Bay, Rankin Inlet, NU produced by Nunami Stantec Ltd. (2012);
- NIRB Guidelines for the Preparation of an Environmental Impact Statement for the Agnico Eagle Mines Ltd. Meliadine Project (NIRB File No. 11MN034) (NIRB 2012);
- Nunavut Planning Commission web resources including the Nunavut Wildlife Resource and Habitat Values final report (2008);
- Nunavut Wildlife Management Board Reports / Guidance Documents;
- OBIS-Seamap database (Duke University);
- previous marine-based environmental impact statements completed in the Project area (e.g., AREVA and others as available);
- regional fisheries catch statistics (e.g., DFO annual catch data);
- federal Species at Risk Act (SARA) database;
- The Canadian Circumpolar Institute and the Tungavik Federation of Nunavut, Nunavut Atlas (1992); and
- Inuit Qaujimajatuqangit (IQ) collected for local coastal areas.

1.3.1 Physical Environment

Hudson Bay is one of the world's largest inland seas, with a total surface area of approximately 830,000 square kilometres (km^2) (Prinsenberg 1984). It is connected to the Atlantic Ocean by Hudson Strait and the Labrador Sea; and to the Arctic Ocean by the Foxe Basin, Fury and Hecla Strait. Hudson Bay is a relatively shallow waterbody, with an average depth of approximately 100 m. The oceanographic regime in Hudson Bay is complex and manifests all the features of an Arctic system (Macdonald and Kuzyk 2011). It is highly influenced by the influx of cold saline waters (between approximately 32.5 and 33.5 ppt) from the Arctic Ocean and Baffin Bay, through Foxe Basin and Hudson Strait, by wind-stress during both the open-water and ice-cover season, by powerful tides (Stewart and Barber 2010), and by a large freshwater input from both runoff and ice melt (Stewart and Lockhart 2005; Ingram and Prinsenberg 1998). Less saline surface outflows occur along the eastern shores of James Bay and Hudson Bay north to Hudson Strait. In Hudson Bay, estimates of average residence time of water range from 1.0 to 6.6 years (Ingram and Prinsenberg 1998).

Water in the region freezes over each winter and becomes ice-free each summer, with sea-ice first forming in late October and continuing to expand until a maximum ice cover is reached by the end of April. In winter and early spring, the ice floes that cover most of Hudson Bay are kept in constant motion by wind forces. A shore lead system develops along the land-fast ice that forms from the coast of Hudson Bay as a result of wind blowing

seaward (Barber and Massom 2007). Major polynyas (stretches of open-water surrounded by sea ice) are found in the northwest sector (including Foxe Basin) and in the vicinity of the Belcher Islands in Eastern Hudson Bay. The northwestern region of Hudson Bay, encompassing part of the Project LSA and RSA, is an area where there is a large and persistent reoccurring polynya (Saucier et al. 2004).

Waters in the Hudson Bay region are characterized by moderate to strong semidiurnal tides of Atlantic origin, a marked summer pycnocline, and greater mixing inshore than offshore (Stewart and Lockhart 2005; Ingram and Prinsenberg 1998). Although marine productivity in Hudson Bay proper is low in comparison with other oceans of similar latitudes, productivity in Hudson Strait is typically twice higher than in other oceans of similar latitudes because of the sustained nutrient availability supplied by tidal mixing throughout an extended ice-free season (Ferland et al. 2011; Sibert et al. 2011).

The southern James Bay region is shallower and influenced to a much greater extent by freshwater runoff, thus supporting a wider variety of temperate-water species that are rare or absent elsewhere in Canada's Eastern Arctic waters (Stewart and Lockhart 2004). Seasonal ice cover also occurs in James Bay, with ice beginning to recede in late May, and the area becoming ice-free by the end of July. Polynyas are found predominantly along both coasts of James Bay during winter.

The Hudson Bay marine ecosystem is abnormally cold relative to other regions of the same latitude, and its climate is characterized by long and cold winters and cool summers (Stewart and Lockhart 2004). The entire area exhibits extreme temporal (seasonal and annual) and spatial variations in the range of average temperatures and average precipitation. Northwestern Hudson Bay experiences the greatest influence of cold Arctic air masses and has the harshest climate, with typical strong winds and persistent low temperatures. Other areas of the bay have less extreme conditions affected by moderate southern or marine influences. There is also a strong average precipitation gradient across the region, from less than 200 millimetres (mm) per year in the northwest to over 800 mm per year in the southeast (Stewart and Lockhart 2004). The upper air circulation of weather systems over Hudson Bay water is mainly related to the persistent, counter-clockwise air flow around a low pressure vortex that is situated over Baffin Island in winter, but weakens and retreats northward in summer (Stewart and Barber 2010).

There is considerable seasonal variation in Hudson Bay with respect to water circulation. In summer, surface water in Hudson Bay moves cyclonically (counter clockwise), influenced by cold saline Arctic water from Foxe Basin that enters in the northwest via Roes Welcome Sound (Prinsenberg 1986a; Tan and Strain 1996). During the transit, surface water is diluted by meltwater and runoff from the land, warmed by the sun, and mixed by the wind as it circulates, thus generating strong vertical stratification of the water column. Most of the river runoff water remains in the nearshore coastal regime in summer, with limited exchange into the interior of the Bay (Granskog et al. 2011). These water masses move eastward along the southern coast and are subsequently deflected northward and exit to the northeast into Hudson Strait (Figure B-2). About half of the freshwater transport from Hudson Bay to Labrador Sea is the result of water pulses associated with anticyclonic, surface-trapped eddies that propagate through Hudson Strait as a result of storms and/or local instability processes (Sutherland et al. 2011).Deep water in Hudson Bay moves in the same general direction as surface water, although it is influenced by bottom topography (Ingram and Prinsenberg 1998; Wang et al. 1994). Intermittent flow of this dense water (approximately 34.1 ppt) over the sill that separates Foxe Channel from Hudson Bay likely maintains the homogeneous bottom layer in Hudson Bay (Stewart and Barber 2010). The incursion of

Arctic waters creates Arctic oceanographic conditions in Hudson Bay, which extend farther south than elsewhere in North America and serve as the main driver of the Hudson Bay ecosystem (Stewart and Lockhart 2004).

The residual currents in Hudson Bay that are independent of tides are wind-driven and density-driven. Monthly mean current velocities are in the range of 4 to 6 centimetres per second, with stronger currents occurring in summer than in winter and more variability occurring at the surface than at depth (Prinsenberg 1986b). Winds are generally weaker and more variable in summer than in fall when strong northwesterly winds occur. The density-driven component is stronger in early summer when surface freshwater input from runoff and ice melt is highest (Prinsenberg 1982), and weakest in late winter/early spring when surface runoff input is lowest, local salinity is offset by salt excreted by the growing sea-ice, and wind-driven mixing of surface waters is not possible due to ice cover.

The tidal regime in Hudson Bay is influenced by powerful tides from the Atlantic Ocean that surge twice a day via Hudson Strait (Stewart and Barber 2010). These tides move as a Kelvin wave and propagate counter clockwise around Hudson and James Bay following the shoreline contour and overshadowing local tides and the Arctic tidal influence (Freeman and Murty 1976). In general, both tidal amplitude and range decreases as one moves counter-clockwise along the coast. The semidiurnal tidal amplitude ranges from 1.50 m along the western shore at Churchill to 0.10 m along the eastern shore near Inukjuak (Prinsenberg and Freeman 1986; Prinsenberg 1988a). The range in height between high and low water also varies, ranging from 0.5 m at Inukjuak (Inoucdjouac) and 2 m along the east side of James Bay to as high as 4.6 m along the west coast of Hudson Bay (Dohler 1968).

Hudson Bay is nearly entirely covered by ice in winter and is free of ice in summer. Depending on the weather, timing of sea ice formation or breakup may occur earlier or later by up to a month, but the general patterns remain similar. The ice formation in Hudson Bay usually begins in the north-western part (Repulse Bay) in October and spreads rapidly southward along the western coast during November (Cohen et al. 1994). By mid-December, from 90 to 100% of Hudson and James bays are covered with ice. Maximum ice cover usually occurs in April and May, and maximum ice thickness can occur between late February and early June and can reach 285 centimetres (cm) (Loucks and Smith 1989). The ice breakup begins in June in southern James Bay and Chesterfield Inlet and the region is usually entirely ice free in the first week of August (Stewart and Lockhart 2004; Cohen et al. 1994). Ice cover is an important feature of the Hudson Bay marine ecosystem. Ice distribution determines the distribution of marine biota and affects marine ecological processes in the water column and near the ice edge (Melnikov 1980). During ice formation, most of the seawater salt is expelled from the ice. This increases the salinity of the surface water, thereby increasing its density and deepening its layer (up to 100 m) and enhancing mixing of the water column (Prinsenberg 1988b). Formation of dense deep water is facilitated in the shore lead polynya system within which increased brine rejection is able to overcome buoyancy in the surface layer. This provides a mechanism to shunt approximately 6 to 16% of river runoff inputs into deeper waters that have an apparent residence time of about 4 to 14 years (Granskog et al. 2011).

As the pack-ice forms in northwestern Hudson Bay, predominant northwest winds continuously push it to southeastern Hudson Bay. The pack-ice forms rafts and ridges and increases in overall ice thickness, which increases freshwater input in this area in the spring (Prinsenberg 1988b). In northwest Hudson Bay, in contrast, the ice is constantly formed and removed continuing the salt input into the water column. This constant removal of the ice by northwest winds and tidal mixing develops leads and recurring polynyas. There are several polynyas that form close to shore, such as in Roes Welcome Sound, at the northern tip of Coats Island, and at

Akimiski Island, which is one of the most southerly polynyas in Canadian waters. These polynyas provide important habitat for various species of marine birds, such as the Hudson Bay eider, which overwinters in this region (Martini and Protz 1981; Nakashima 1988).

The Hudson Bay marine ecosystem is characterized by strong vertical stratification of the water column in spring and summer, particularly offshore (Roff and Legendre 1986; Anderson and Roff 1980; Prinsenberg 1986a). The vertical stratification is caused by a dilution of cold Arctic saline surface water by freshwater runoff and sea-ice melt, which is subsequently warmed by the sun, and mixed by the wind. The stratification results in a strong vertical density gradient between fresh, warm water at the surface and cold, saline deeper water. The vertical density gradient impedes vertical mixing, thereby limiting nutrient input to surface waters and lowering biological productivity. A strong summer pycnocline can be observed at depths between 15 and 25 m (Anderson and Roff 1980; Prinsenberg 1986a; Ferland et al. 2011). Heating of the surface layer and freshwater input decrease as summer progresses. This increases the depth of the pycnocline. In winter, the vertical stratification is the weakest due to the increase in density of surface water and, therefore, there is an increase in vertical mixing.

Physical conditions that promote large-scale mixing or upwelling in the region during spring and summer remain limited, but ice edges along the well-developed shore lead system (where the coastal fast ice and mobile pack ice meet) correspond with areas of upwelling and associated stimulation of nutrient fluxes and primary production (Stewart and Barber 2010). In the area where the shore lead prevails (nearshore), the isotopic composition of phytoplankton during summer suggests the presence of an open system influenced by the upwelling of deep waters and related nutrient replenishment (Kuzyk et al. 2010). Another key process that supports the re-injection of nutrients in surface waters in Hudson Bay is the vertical mixing driven by tidal currents (Sibert et al. 2011). Tides in the region are known to enhance marine productivity (Stewart and Barber 2010) and to contribute to the development of local biological hotspots that are used by marine mammals as summer habitats, such as in the northwest region of the Bay (Higdon and Ferguson 2010).

At a deep-water station in southeastern Hudson Bay, surface salinity ranged from 24 ppt in August to 28 ppt in April, and surface temperature ranged from -1.5°C in April to 8°C in August (Figure B-5). At depths below 50 m, water temperature and salinity were relatively stable throughout the year. As water depth increased, water temperature progressively decreased as salinity increased, with mean water temperature below -1.4°C and salinity greater than 33 ppt at approximately 100 m water depth (Ingram and Prinsenberg 1998).

Freshwater runoff, wind-driven mixing, and tidal influence have great effects on water column characteristics in the Hudson Bay ecosystem. Vertical stratification near large river plumes varies seasonally and spatially. It is usually directly related to the runoff volume and inversely related to the tidal kinetic energy (Freeman et al. 1982). The water column stratification is stronger during freshet and weaker with distance from the river mouth. The salinity and temperature gradients are usually weaker when wind-driven mixing and tidal energy are strongest. The volume of the freshwater runoff in the region is high, with a mean discharge rate of 30 900 cubic metres per second for all rivers combined (The Canadian Encyclopaedia). These high runoff volumes determine oceanographic conditions in the area by creating very low surface salinities and strong vertical density gradients.

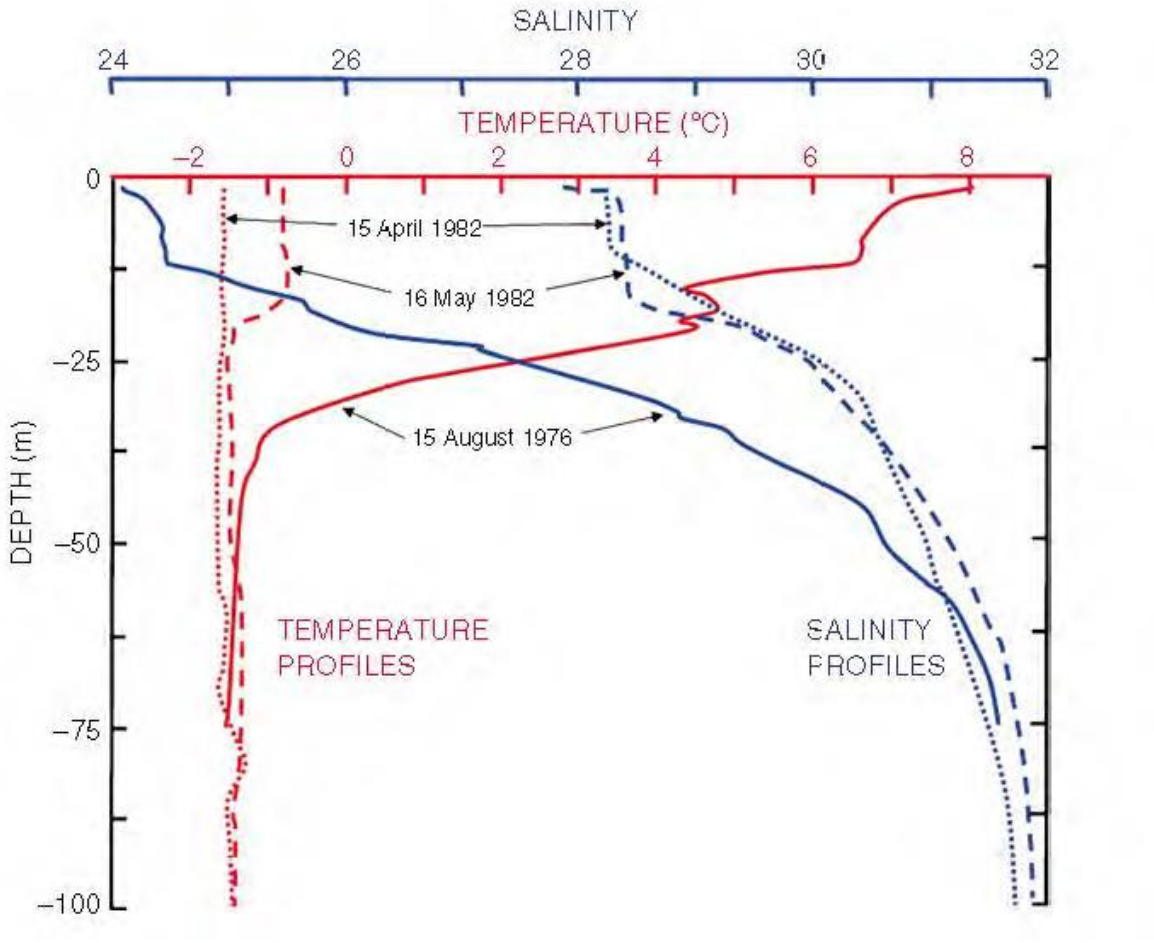


Figure B-5: Representative Vertical Profiles of Temperature and Salinity in Southeastern Hudson Bay in April (dashed line), May (dashed-dotted line), and August (solid line) (extracted from Stewart and Barber 2010; Redrawn from Ingram and Prinsenberg 1998)

High freshwater runoff volumes are also partly responsible for the difference between inshore and offshore oceanographic conditions in Hudson Bay during summer. In general, salinity and temperature in Hudson Bay increases with distance from shore (during summer). For example, surface salinity in Hudson Bay ranged from 10 ppt near major rivers to 30 ppt in offshore locations of the bay, and surface temperature ranged from 4°C in nearshore areas to 11°C in offshore locations (Anderson and Roff 1980; Prinsenberg 1986a). Lower salinities in the inshore region are due to dilution effects, whereas lower nearshore temperatures in western Hudson Bay are due to strong northwesterly wind effects causing upwelling of colder deep water to the surface (Figure B-6). In southern Hudson Bay, lower temperatures are a result of pack-ice, which lingers along the shore well into summer. Higher temperatures offshore cause stronger vertical stratification. During periods with low water temperatures (−1.75°C to 1.25°C), considerably higher rates in both bedload and suspended sediment transport are observed along the shore in comparison with a summer situation (9°C to 17°C), with similar wave heights and current velocities (Héquette and Tremblay 2009). The winter increase in suspended sediment transport is likely due to lower sediment settling velocities resulting from significant increases in fluid kinematic viscosity at low temperature. Hudson Strait is a wide, deep-water channel (on average 150 km wide, 750 km long, and

400 m deep) that connects Hudson Bay and Foxe Basin with the Labrador Sea and Davis Strait (Harvey et al. 2001). It acts as a transition zone between brackish waters in Hudson Bay and more oceanic waters of the Labrador Sea. Hudson Strait is covered with ice from mid-December to July (Hudon et al. 1993). The oceanographic regime in Hudson Strait is affected by strong tidal currents (up to 2 to 3 m/s) and high tidal elevations (tidal amplitudes are 6 to 9.5 m). These tides cause intensive vertical mixing in the water column, disrupting vertical density stratification and, therefore, enhancing biological productivity by increasing nutrient availability in the surface layer (Drinkwater and Jones 1987; Drinkwater 1986, 1990; Harvey et al. 2001).

The physical processes in Hudson Bay and Hudson Strait have a strong influence on the oceanographic and biological processes over the Labrador Shelf, affecting the water temperature and salinity characteristics in the area (Drinkwater and Harding 2001). At the eastern entrance of Hudson Strait, low salinity waters from Hudson Bay and Foxe Basin flowing eastward converge with cold Baffin Land Current waters from the north and warmer deep West Greenland Current waters. The Hudson Strait strong tidal currents result in intensive vertical mixing of these waters and the residual current carries the resulting mixture eastward onto the Labrador Shelf (Drinkwater and Jones 1987). This results in increased mixing over the Labrador Shelf, with reduced vertical density stratification relative to the Baffin Island Shelf to the north (Lazier 1982). Primary productivity is subsequently enhanced by elevated surface nutrient concentrations in eastern Hudson Strait (Drinkwater and Jones 1987) and on the northern Labrador Shelf (Kollmeyer et al. 1967).

Since 2005, recurrent expeditions of the CCGS Amundsen in Hudson Bay (Arcticnet 2014) have supported the collection of ambient noise and acoustic backscattering data. The primary dataset is composed of records obtained with a SIMRAD EK60 3-frequency split-beam echosounder that was operated continuously during the field campaigns (Polar Data Catalogue 2014). In parallel, AURAL-M2 (Autonomous Underwater Recorder for Acoustic Listening-Model 2) passive hydrophones were attached on mooring arrays deployed nearby Churchill and Great Whale River to document the seasonality of underwater sound, including marine mammal vocalizations and ambient noise (Polar Data Catalogue 2014).

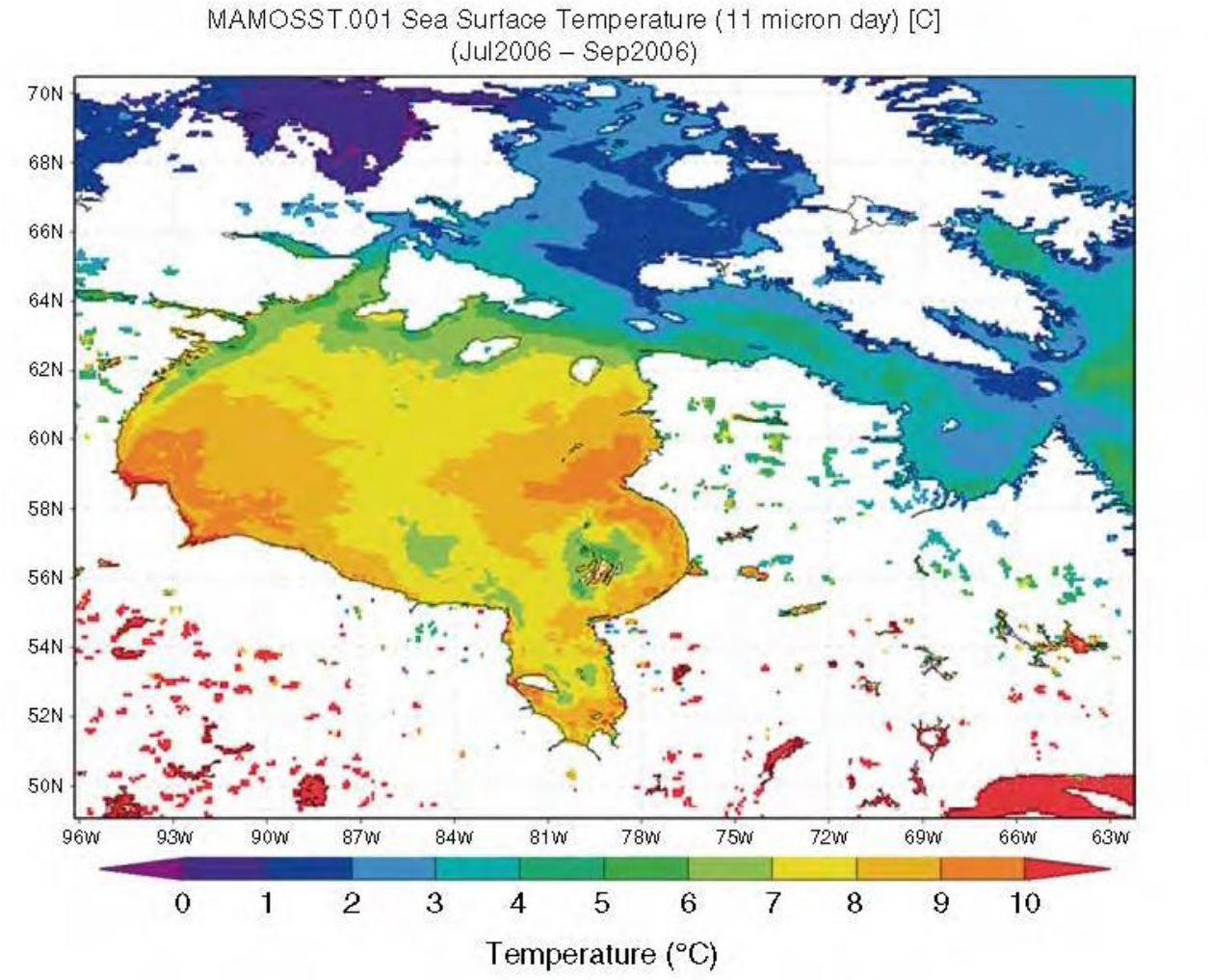


Figure B-6: Summer (July to September) sea surface temperature in 2006 (Stewart and Barber 2010)

1.3.2 Biological Environment

The marine ecosystem of Hudson Bay encompasses a large geographical area that includes James Bay, Hudson Bay, Fox Basin, and Hudson Strait. Four important features characterize this unique ecosystem:

1) an extreme southerly penetration of Arctic marine water from the north;

2) a very large volume of freshwater runoff that enters the Hudson Bay watershed each year from land;

3) seasonal coverage of sea-ice; and

4) the dynamic coastal geomorphology of the coastal zone where exposure of new shoreline (made up of coastal salt marshes and wide tidal flats) presently occurs at a rate of up to 15 m/year (horizontal) as part of an isostatic rebound of the land from the weight of the Laurentide Ice Sheet, which once covered this entire region (Stewart and Lockhart 2004).

These key features combine to form critical habitat areas for many species of marine fauna including anadromous fish and large concentrations of migratory species including shorebirds, waterfowl, seabirds, and marine mammals. The following section provides an overview of the biological characteristics of each taxa (by key species) potentially impacted by shipping activities in the RSA.

1.3.2.1 Fishes

Approximately 60 species of fish are known to inhabit estuarine waters of Hudson Bay and James Bay (CARC 1991). Fewer species are present in the northern limits of the RSA, where arctic species predominate. Arctic char, Arctic cod, and other species contribute directly to the domestic fishery, and indirectly to the food chain of marine and terrestrial mammals and birds. Fish species considered important to the local commercial, recreational, and subsistence fisheries are identified in Table B-1. An overview on the biology of these species is provided below.

Table B-1: Overview of Marine Fish Species Found within the Local and Regional Study Areas

Common Name	Species	Inuktitut Name	Habitat	*SARA* Status[(a)]	COSEWIC Status[(b)]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
Arctic char	*Salvelinus alpinus*	ᐃᖃᓗᒃ ᐱᒃ / ᑕᕆᐅᕐ ᒥ ᐅᑕᖅ	Anadromous (Riede 2004). In the marine environment, they are found in coastal areas in waters 30 to 70 m deep (Billard 1997).	No status	Not assessed	Yes	✔	✔
Greenland cod	*Gadus ogac*	ᐆᒐᖅ	Demersal[(c)]. Coastal waters up to 400 m deep (Coad and Reist 2004; Cohen et al. 1990).	No status	Not assessed	Yes	✔	✔
Polar cod	*Arctogadus glacialis*	ᐆᒐᖅ	Cryopelagic[(d)] or epontic[(e)] (Coad and Reist 2004). Marine waters down to 1,000 m; Mainly found in the shallower areas of the water column (Scott and Scott 1988).	No status	Not assessed	Yes	✔	✔
Arctic cod	*Boreogadus saida*	ᐆᒐᖅ	Cryopelagic or epontic. Marine waters down to approximately 1400 m. Favour coastal areas during the summer and winter months (Coad and Reist 2004). Spawning occurs under the Arctic ice (DFO 2011b).	No status	Not assessed	Yes	✔	✔
Fourhorn sculpin (marine form)	*Myoxocephalus quadricornis*	ᑲᓇᔪᖅ	Benthic. Shallow coastal estuarine environments (Morrow 1980). In spring, they move to deeper waters for the summer and are generally found in waters 45 m to 100 m deep (Muus 1999).	No status	Not at Risk	Yes	✔	✔
Arctic staghorn sculpin	*Gymnocanthus tricuspis*	ᑲᓇᔪᖅ	Benthic. Prefers sandy bottoms (Fedorov 1986; Coad and Reist 2004). Coastal areas, close to shore (ArcOD 2011).	No status	Not assessed	Yes	✔	✔
Arctic sculpin	*Myoxocephalus scorpioides*	ᑲᓇᔪᖅ	Benthic. Shallow marine environments up to 275 m (Coad and Reist 2004).	No status	Not assessed	Yes	✔	✔
Slender eel blenny	*Lumpenus fabricii*	ᒪᓯᖃᙱᑭᑐᑦ	Sandy to rocky habitats. Seem to prefer seagrass and algae, where they spawn (Mecklenburg and Sheiko 2004).	No status	Not assessed	No	✔	✔
Greenland halibut	*Reinhardtius hippoglossoides*	ᖃᓕᕋᓕᒃ	Epibenthic. Surface to deep waters down to 2000 m (Coad and Reist 2004).	No status	Not assessed	Yes	✔	✔

(a) SARA.The *Act* is a key federal government commitment to prevent wildlife species from becoming extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity (extracted from *SARA* 2012).

(b) COSEWIC (Committee on the Status of Endangered Wildlife in Canada) is a committee of experts that assesses and designates which wildlife species are in some danger of disappearing from Canada. It is up to Government to legally protect wildlife species designated by COSEWIC. The potential impacts of legal listing are for Government to analyse, and the SARA applies only to wildlife species on the SARA legal list (extracted from COSEWIC 2012).

(c) live on or near the seafloor.

(d) cold, deep marine environments.

(e) associated with the lower interface of the sea ice.

Arctic char (*Salvelinus alpinus*)

Arctic char exhibit anadromous and land-locked life history types (DFO 2006c). The anadromous forms of this species spend a large portion of its life cycle in the coastal marine environment (Riede 2004; Billard 1997). Spawning occurs in freshwater rivers, with annual migrations to marine waters occurring in the spring after the first 2-6 years of life (DFO 2006c). During autumn, adults migrate back to freshwater habitats to overwinter (Richardson et al. 2001). Arctic char feed on crustacean and other fish including capelin (Mallotus villosus), sand lance (Ammodytes spp.), Arctic cod, and juvenile Greenland cod (Richardson et al. 2001; Coad and Reist 2004).

In the RSA, Arctic char can be found along the western and northern coast of Hudson Bay and coastal areas of Hudson Strait (Coad and Reist 2004), with high abundances identified near Arviat, Chesterfield Inlet, Cape Dorset, and Kimmirut (NPC 2008) (Figure B-7). Arctic char are harvested commercially, recreationally, and for subsistence use (Canadian Circumpolar Institute 1992; Heather and usher 2004). Kangiqliniq Hunter and Trappers Association consider Arctic char an important food fish species for the residents of Rankin Inlet (Nunami Stantec Ltd. 2012).

Greenland cod (*Gadus ogac*)

Greenland cod are a demersal[2] fish found most commonly in coastal waters up to 400 m deep (Coad and Reist 2004; Cohen et al. 1990). They feed on crustaceans, molluscs, sea stars, worms, and other fish including capelin, polar cod juvenile Greenland cod and Greenland halibut (Coad and Reist 2004). Greenland cod spawn at the mouths of freshwater rivers during spring (DFO 2006a). Their habitat range overlaps with the RSA, primarily occupying inlets and estuaries along both coasts of Hudson Bay extending south to Arviat along the west coast and to the Eastmain River estuary in James Bay along the east coast (Coad and Reist 2004; Ochman and Dodson 1982; Hunter et al. 1984).

Polar cod (*Arctogadus glacialis*)

The habitat range of polar cod includes offshore continental shelf waters of the RSA in Hudson Bay and Hudson Strait (Cohen et al. 1990; NPC 2008). They exhibit cryopelagic[3] or epontic[4] life history types (Coad and Reist 2004), although they frequent primarily the upper surface waters in Hudson Bay (Scott and Scott 1988). Polar cod are closely associated with sea-ice and spawn underneath the ice during winter (Bradstreet et al. 1986; Craig et al. 1982). Prey species include other fish and crustaceans; predators include seabirds, seals, whales, and other fish (Bradstreet 1982).

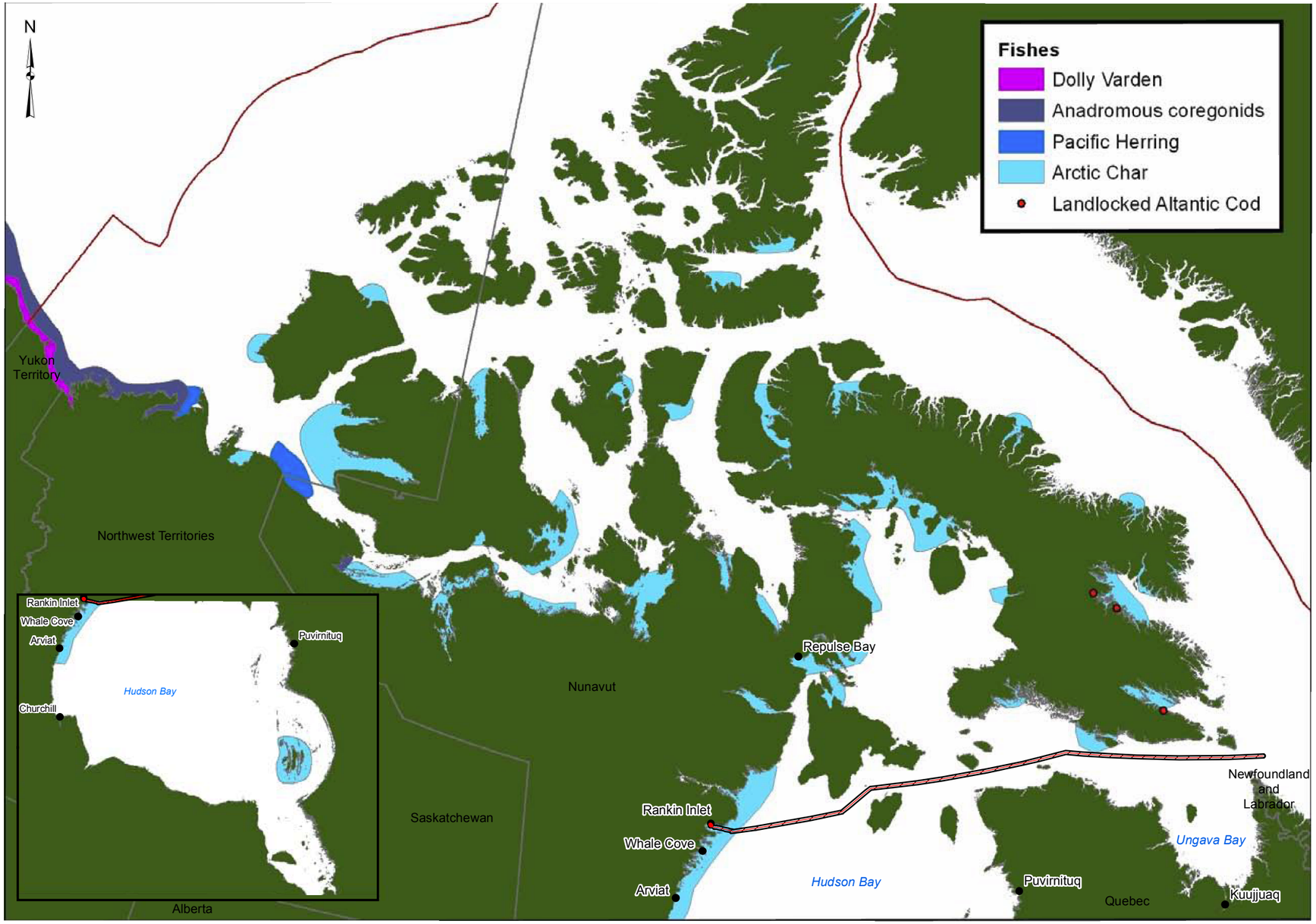
Arctic cod (*Boreogadus saida*)

Arctic cod are a key species in the arctic marine ecosystem (DFO 2011b). Like polar cod, Arctic cod exhibit cryopelagic or epontic life history types and have a short life span (Coad and Reist 2004). They live in marine waters down to 1,400 m (Coad and Reist 2004) and inhabit coastal areas during the summer and winter months (Cohen et al. 1990). Arctic cod feed on epibenthic mysids, amphipods, copepods, and other fish (Coad and Reist 2004). Spawning is thought to occur in late autumn and winter under the sea-ice. Arctic cod are a main food source for marine mammal and seabirds, particularly narwhals and murres (DFO 2011b).

[2] live on or near the seafloor

[3] associated with cold, deep marine environments

[4] associated with the lower interface of the sea ice



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

POVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF ARCTIC CHAR (*Salvelinus alpines*) AND OTHER SELECTED FISH SPECIES IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.	1535029	FILE No.		
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	20 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-7

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There is no commercial harvest of Arctic cod in the Canadian Arctic (DFO 2011b). Subsistence fishery records indicate that Arctic cod have been traditionally harvested in Arviat, Whale Cove, Coral Harbour, Cape Dorset, Kimmirut (Canadian Circumpolar Institute 1992; Heather and Usher 2004). Their habitat range overlaps with that of the RSA and extends into the Hudson Bay and Hudson Strait (Coad and Reist 2004).

Fourhorn sculpin (*Myoxocephalus quadricornis*)

Fourhorn sculpins are a benthic species (Coad and Reist 2004) and are generally found in shallow coastal estuarine waters (Morrow 1980). In the spring, this species migrates to deeper waters for the summer months where they are typically found in waters 45 to 100 m in depth (Muus 1999). They feed on crustaceans, molluscs, and fish (Coad and Reist 2004). Spawning occurs in shallow waters where pairing and egg laying occur in gravel substrate (Muus 1999). This species is distributed throughout Hudson Bay and Hudson Strait (Coad and Reist 2004). Fourhorn sculpins have been traditionally harvested in Arviat, Whale Cove, Coal Harbour, Cape Dorset, and Kimmirut (Canadian Circumpolar Institute 1992; Heather and Usher 2004).

Arctic staghorn sculpin (*Gymnocanthus tricuspis*)

The Arctic staghorn sculpin are a benthic species preferring sandy bottom types but also frequenting mud, gravel, and rocky habitats (Fedorov 1986; Coad and Reist 2004). This species tends to inhabit near-shore areas (ArcOD 2011). Spawning occurs in late autumn and winter (ArcOD 2011). Artic staghorn sculpin feed primarily on benthic amphipods and worms (Fedorov 1986). They are not a commercially harvested species and do not represent a major target species of the subsistence fishery.

Arctic sculpin (*Myoxocephalus scorpioides*)

Arctic sculpin are known to occur in the RSA, with a regional distribution extending from James Bay and the Straits of Belle Isle to Greenland (Fishbase 2012). They are a benthic species found primarily in shallow marine environments up to 275 m in depth (Coad and Reist 2004). Spawning occurs during autumn (Coad and Reist 2004). Prey items include mainly crustaceans (Coad and Reist 2004). They are not a commercially harvested species and do not represent a major target species of the subsistence fishery.

Slender eelblenny (*Lumpenus fabricii*)

The slender eel blenny can be found in a variety of marine environments from sandy bottoms to rocky habitats but are rarely found in intertidal areas (Coad and Reist 2004; Mecklenburg and Sheiko 2004). They are closely associated with seagrass and macroalgae in the nearshore where they spawn during autumn (Mecklenburg and Sheiko 2004). This species feeds on crustaceans, worms, clams, and other fish eggs (Coad and Reist 2004). Its habitat range includes both Hudson Strait and Hudson Bay (Coad and Reist 2004). They are not a commercially harvested species and do not represent a major target species of the subsistence fishery.

Greenland halibut (*Reinhardtius hippoglossoides*)

The Greenland halibut is an epibenthic species and can be found at the surface to waters down to 2,000 m (Coad and Reist 2004). This species feeds on other fishes, crustaceans and squids (Coad and Reist 2004). Its habitat range includes the Hudson Strait (Coad and Reist 2004). The Greenland halibut has become increasingly important in developing commercial fisheries in the eastern Arctic (Coad and Reist 2004); however, they do not represent a major target species of the subsistence fishery.

Hearing Abilities of Marine Fish

It is well known that fish use sound for communication, detection of predators and prey, and learning about their environment (Popper and Fay 1999; Zelick et al. 1999; Fay and Popper 2000; Popper et al. 2003). All fish species can hear with varying degrees of sensitivity within the frequency range of sound produced by seismic sources and other industrial sound sources (Popper and Fay 1973; Fay 1988; Popper and Fay 1993; Fay 2000). The hearing range for most fish is believed to be in the frequency range of 100 to 1000 hertz (Hz) (Fay 1988). A smaller number of species can detect sounds to over 3,000 Hz, while a very few can detect sounds to well over 100 kHz. Because of wide differences in hearing capability and morphologies among fish species, behavioural responses and the susceptibility of fish to auditory trauma varies greatly. There is considerable anatomical and physiological variation amongst fish with respect to hearing structures, suggesting that various species may detect and process sound in different ways (Popper and Fay 1993). Fish can be divided into 2 broad categories: hearing generalists and hearing specialists (Popper et al. 2003; Ladich and Popper 2004). Hearing generalists are fish species without any auditory system specializations. They have poor auditory sensitivity characterized by a narrow bandwidth of hearing, typically detecting sounds from below 50 Hz up to 1 or 1.5 kHz (Popper et al. 2003). This includes most bottom-dwelling species such as Greenland halibut (Popper et al. 2003). The majority of fish species that fall into this category generally do not hear frequencies much above 1 kHz, with peak sensitivities around 300 to 500 Hz (Ladich and Popper 2004). The sound pressure detection threshold can be as high as 120 dB re 1 µPa at 1 m at the most sensitive frequency (Nedwell et al. 2004). Hearing specialists have specialized auditory structures connected to well-developed pressure sensitive organs (Popper and Fay 1993). These morphological adaptations allow hearing specialists to detect sound pressure with greater sensitivity (i.e., lowering their hearing threshold) and in a wider bandwidth than “generalists”, and makes hearing specialists more sensitive to high-amplitude sound introduced into the marine environment.

Hearing thresholds for many Arctic species of fish are largely unknown. Underwater noise generated by vessel engines and cavitation can affect fish behaviour. Behavioural changes may cause disruption to migration patterns or spawning events and movement away from valuable food sources and have the potential to cause population-level effects. Fish are particularly sensitive if these changes occur over a critical period when they have a short window of opportunity to complete an activity.

Over 60 species of marine fish may be found in the LSA and RSA including: Greenland cod (*Gadus ogac*), slender eelblenny (*Lumpenus fabricii*), fourhorn sculpin (*Triglopsis quadricornis*), Arctic staghorn sculpin (*Gymnocanthus tricuspis*) and Arctic sculpin (*Myoxocephalus scorpioides*), Arctic char (*Salvelinus alpinus*), Arctic cod (*Boreogadus saida*), and polar cod (*Arctogadus glacialis).* Polar cod and Arctic cod are both hearing specialist species and are likely to be present in the RSA. Cod fish can detect both sound acceleration and sound pressure over a substantial frequency range; 20 to 150 KHz. Sound pressure thresholds in cod fish in the frequency range 60 to 300 Hz lie in the range 80 to 90 dB re 1 µPa at 1 m. Although hearing thresholds for most of these fish species are largely unknown, hearing thresholds for closely related species such as the walleye pollock

(*Theragra chalcogramma*) and the Atlantic cod (*Gadus morhua L.)* are known and may be used as surrogates for Greenland cod. The hearing ability of walleye pollock, from three different age groups (corresponding to size-classes), was determined from auditory evoked potentials by Mann et al. 2009. Walleye pollock hearing was most sensitive between 100 and 200 Hz, with thresholds around 75 dB re: 1 µPa (Mann et.al 2009). Hearing sensitivity decreased as frequency increased up to 450 Hz. The three age groups of walleye pollock did not show a difference in hearing sensitivity, although there was a noticeable interaction between frequency and age

as well as a trend with older fish having a slightly lower mean threshold level. Water temperature appears to have an effect on the hearing thresholds at 350 Hz for walleye pollock. Each degree of temperature increase (from 8 to 12°C) resulted in an 8.3-dB decrease in hearing threshold, with hearing being largely changed by local temperature over their natural range of occurrence. However, walleye pollock are generally found in the marine environment at temperatures less than those used during the Mann et al. 2009 laboratory experiments. In the Bering Sea, walleye pollock are generally found in 3–6°C waters and avoid temperatures less than 0°C (Kotwicki et al. 2005). They may be found in temperatures as warm as 10–12°C (Bailey et al. 1999). Based on the above results, Mann et al. 2009 suggests that the hearing thresholds of walleye pollock are generally similar to those of other gadid fishes.

Hearing studies on Atlantic cod demonstrated that this species is sensitive to pure tones in the frequency range of 30 to 470 Hz. Greatest sensitivity was observed between 60 to 310 Hz and the hearing threshold ranged from 78 to 117 dB re: 1 µPa (Chapman and Hawkins 1973). Changes in levels of ambient sea noise caused variation in thresholds in most frequency bands. In calm sea conditions, unmasked thresholds can be obtained. Thresholds were largely independent of the sound source distance within 1.7 to 50 m, suggesting that cod are sensitive to acoustic pressure (Chapman and Hawkins 1973).

1.3.2.2 Marine Birds

The Hudson Bay marine ecosystem provides resources of critical importance to resident and migrant marine birds throughout the year. At least 43 species of seabirds, shorebirds, waterfowl, and marine-associated raptors frequent offshore, inshore, intertidal, or salt marsh habitats of the Hudson Bay marine ecosystem (Table B-2). Few of these species are year-round residents. Most pass through the area during summer for staging, moulting, nesting, and brooding purposes (Canadian Circumpolar Institute 1992) prior to transiting to their traditional wintering grounds in the south, many of which fall outside the NSA (e.g., Arctic terns, red-necked phalaropes). Thus, impacts to certain long-range migratory species have the potential for transboundary effects. Marine bird species present year-round in Hudson Bay / Hudson Strait are limited to common eider, king eiders, black guillemot, dovekie, and ivory gull. These species have adapted to accessing prey in polynyas, where current and tidal action keep waters ice-free throughout the winter. FigureB- 8 and Figure B-9 provide an overview of marine bird distribution in the RSA based on historical sightings, current scientific knowledge, and IQ.

Table B-2: Overview of Seabird Species Potentially Present within the Local and Regional Study Areas

Common Name	Species	Seasonal Occurrence	Distribution	Other Relevant Information	SARA Status[a]	COSEWIC Status[b]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
Black guillemot	*Cepphus grylle*	year-round	coastal / offshore	Harvested for subsistence. Nests in small colonies on steep shores on Southampton and Coats islands.	No status	Not assessed	Yes	✔	✔
Thick-billed murre	*Uria lomvia*	summer	coastal / offshore	Large breeding colony (520 000 pairs) on Akpatok Island in Hudson Strait. Traditional knowledge suggests that murres winter in large numbers in area of open water west of the Belcher Islands in southeast Hudson Bay. Moulting adult birds with their young complete swimming migration in August from a number of known bird colonies in Hudson Bay through the Hudson Strait to offshore areas of Newfoundland and Labrador (Mallory and Fontaine 2004).	No status	Not assessed	Yes	✔	✔
King eider	*Somateria spectabilis*	year-round	coastal	Widely distributed in James Bay and Hudson Bay.	No status	Not assessed	Yes	✔	✔
Common eider	*Somateria mollissima*	year-round	coastal / offshore	Hudson Bay subspecies overwinter in areas where open water and shallow depth coincide. Breeds along rocky coasts or tundra throughout Hudson Bay. Present along ice edge and at polynyas. Feed exclusively on blue mussel.	No status	Not assessed	Yes	✔	✔
Northern fulmar	*Fulmarus glacialis*	summer / fall	coastal / offshore	Rare visitor to James Bay in late fall. Observed at Coats Island.	No status	Not assessed	No	✔	✔
Black-legged kittiwake	*Rissa tridactyla*	summer	coastal / offshore	Occurs on the open waters of northern Hudson Bay in July and August, and occasionally at Churchill in early summer.	No status	Not assessed	No	✔	✔
Dovekie	*Alle alle*	year-round	coastal / offshore	Winter offshore in Hudson Bay, Hudson Strait and Gulf of St. Lawrence.	No status	Not assessed	No	✔	✔

Table B-2: Overview of Seabird Species Potentially Present within the Local and Regional Study Areas

Common Name	Species	Seasonal Occurrence	Distribution	Other Relevant Information	SARA Status[a]	COSEWIC Status[b]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
Long-tailed duck	*Clangula hyemalis*	May-Oct	coastal	Occur in large numbers close to shore in Hudson and James Bay. Some individuals also overwinter on open water of James Bay.	No status	Not assessed	No	✔	✔
Canada goose	*Branta canadensis*	summer and fall	coastal	Spring and fall transient. Breeds in large numbers along the coasts (McConnell River Migratory Bird Sanctuary) and on the islands of Hudson Bay and James Bay (e.g., Southampton Island).	No status	Not assessed	Yes	✔	✔
Lesser snow goose	*Anser caerulescens*	May – Sept	coastal	Migratory species. Breeding colonies occur along the coasts (McConnell River Migratory Bird Sanctuary) and on the islands of Hudson Bay (e.g., Southampton Island). Hudson Bay supports over 50% of the eastern Arctic breeding population.	No status	Not assessed	Yes	✔	✔
Atlantic Brant	*Branta bernicla*	April to October	coastal	Migratory species. Breed on Southampton Island. During the fall migration, > 50% of the population frequents eelgrass habitat in James Bay.	No status	Not assessed	No	✔	✔
Glaucous gull	*Larus hyperboreus*	summer	coastal / offshore	Breed along the northern coasts of Hudson Bay, the Belchers, and widely throughout the Canadian Arctic.	No status	Not assessed	No	✔	✔
Herring gull	*Larus argentatus*	April-Nov	coastal / offshore	Migratory species. Breed along the coasts of Hudson Bay and James Bay in summer and in the Belchers.	No status	Not assessed	No	✔	✔
Ross's gull	*Rhodostethia rosea*	spring and autumn	coastal / offshore	Established nesting areas near Churchill, McConnell River Migratory Bird Sanctuary, and in the Canadian High Arctic (Devon Island). May overwinter in polynyas.	TH (Schedule 1)	TH	No	✔	✔
Ivory gull	*Pagophila eburnean*	year-round	coastal / offshore	Occur in Hudson Bay during both summer and winter, but breed in the	EN (Schedule 1)	EN	No	✔	✔

Table B-2: Overview of Seabird Species Potentially Present within the Local and Regional Study Areas

Common Name	Species	Seasonal Occurrence	Distribution	Other Relevant Information	SARA Status[(a)]	COSEWIC Status[(b)]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
				Canadian High Arctic.					
Sabine's gull	*Xema sabini*	summer	coastal / offshore	Migratory species. Breeds on colonies along the northern coasts of Hudson Bay. Pelagic outside breeding season.	No status	Not assessed	No	✔	✔
Thayer's gull	*Larus thayeri*	summer	coastal / offshore	Migratory species. Breeds along the coasts of northern Hudson Bay during summer including Coats and Southampton islands.	No status	Not assessed	No	✔	✔
Arctic tern	*Sterna paradisaea*	summer	coastal / offshore	Migratory species that breeds throughout the Hudson Bay and Hudson Strait.	No status	Not assessed	No	✔	✔
Pacific loon	*Gavia pacifica*	summer	coastal	Migratory species. Arctic breeding species common and numerous along the mainland and island coasts of the Hudson Bay coast.	No status	Not assessed	No	✔	✔
Red-throated loon	*Gavia stellata*	summer	coastal	Migratory species. Arctic breeding species common and numerous along the mainland and island coasts of the Hudson Bay coast.	No status	Not assessed	No	✔	✔
Common loon	*Gavia immer*	summer	coastal	Migratory species. Common in southeastern Hudson Bay and James Bay.	No status	Not at risk	No	✔	✔
Black scoter	*Melanitta americana*	summer	coastal	Migratory species. Common on the Belchers and along the coast from southeastern Hudson Bay west to Churchill. May overwinter in small numbers in James Bay.	No status	Not assessed	No	✔	✔
Red-breasted merganser	*Mergus serrator*	summer	coastal	Migratory species. Common along the coasts of James Bay and southwestern Hudson Bay. Males and non-breeding birds frequent coastal marine waters.	No status	Not assessed	No	✔	✔
Red-necked phalarope	*Phalaropus lobatus*	summer	coastal / offshore	Migratory species. Breeds widely across the Arctic and throughout Nunavut.	No status	Not assessed	No	✔	✔

Table B-2: Overview of Seabird Species Potentially Present within the Local and Regional Study Areas

Common Name	Species	Seasonal Occurrence	Distribution	Other Relevant Information	SARA Status[(a)]	COSEWIC Status[(b)]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
Red phalarope	*Phalaropus fulcarius*	summer	coastal / offshore	Migratory species. Breeds along the west coast of the Hudson Bay, on the Ungava Penninsula and on the southern end of Baffin Island in Nunavut.	No status	Not assessed	No	✔	✔
Parasitic jaeger	*Stercorarius parasiticus*	summer	coastal / offshore	Migratory species. Breed along the coast and islands of Hudson Bay.	No status	Not assessed	No	✔	✔
Long-tailed jaeger	*Stercorarius longicaudus*	summer	coastal / offshore	Migratory species. Breeds along the Quebec coast of Hudson Bay, on Southampton Island, and along the Kivalliq coast.	No status	Not assessed	No	✔	✔
Pomarine jaeger	*Stercorarius pomarinus*	summer	coastal / offshore	Migratory species. Breeds along the Quebec coast of Hudson Bay and on Southampton Island.	No status	Not assessed	No	✔	✔
Sandhill crane	*Grus canadensis*	summer	coastal	Migratory species. Summer visitors to the southern and western coasts of James Bay and Hudson Bay, from Boatswain west and north. Also reported on the Belchers and Southampton islands.	No status	Not at risk	No	✔	
Dunlin	*Calidris alpina*	summer	coastal	Migratory species. Breeds along the west coast of the Hudson Bay, on Southampton and Coats Island and on the southern end of Baffin Island in Nunavut.	No status	Not assessed	No	✔	
Semi-palmated sandpiper	*Calidris pusilla*	summer	coastal	Migratory species. Breeds in in the Hudson Bay including Southampton Island, Coats Island and the southern end of Baffin Island.	No status	Not assessed	No	✔	

Table B-2: Overview of Seabird Species Potentially Present within the Local and Regional Study Areas

Common Name	Species	Seasonal Occurrence	Distribution	Other Relevant Information	SARA Status[a]	COSEWIC Status[b]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
Least sandpiper	*Calidris minutilla*	summer	coastal	Migratory species. Common breeder on the mainland shores of Hudson Bay south of Chesterfield Inlet in the west and Inukjuak in the east	No status	Not assessed	No	✔	
White-rumped sandpiper	*Calidris fuscicollis*	summer	coastal	Migratory species that breeds on the southern tip of Baffin Island and on the northwestern side of the Hudson Bay.	No status	Not assessed	No	✔	
Baird's sandpiper	*Calidris bairdii*	summer	coastal	Migratory species that breeds on the northern end of Baffin Island and in the coastal areas of the northern Foxe Basin.	No status	Not assessed	No	✔	
Pectoral sandpiper	*Calidris melanotos*	summer	Coastal	Migratory species that breeds along the northwest coast of the Hudson Bay, on Southampton and Coats islands in Nunavut.	No status	Not assessed	No	✔	
American golden plover	*Pluvialis dominica*	summer	Coastal	Migratory species that breed along the shores of Hudson Bay and James Bay and Southampton Island.	No status	Not assessed	No	✔	
Semi-palmated plover	*Charadrius semipalmatus*	summer	Coastal	Migratory species that breed along the shores of Hudson Bay and James Bay.	No status	Not assessed	No	✔	
Black-bellied plover	*Pluvialis squatarola*	summer	Coastal	Migratory species that breeds on the shores of northern Hudson Bay and Southampton Island.	No status	Not assessed	No	✔	
Ruddy turnstone	*Arenaria interpres*	summer	Coastal	Migratory species that breeds on the southern end of Baffin Island, along the coastal areas of the northern Foxe Basin and on Southampton Island and Coats Island.	No status	Not assessed	No	✔	

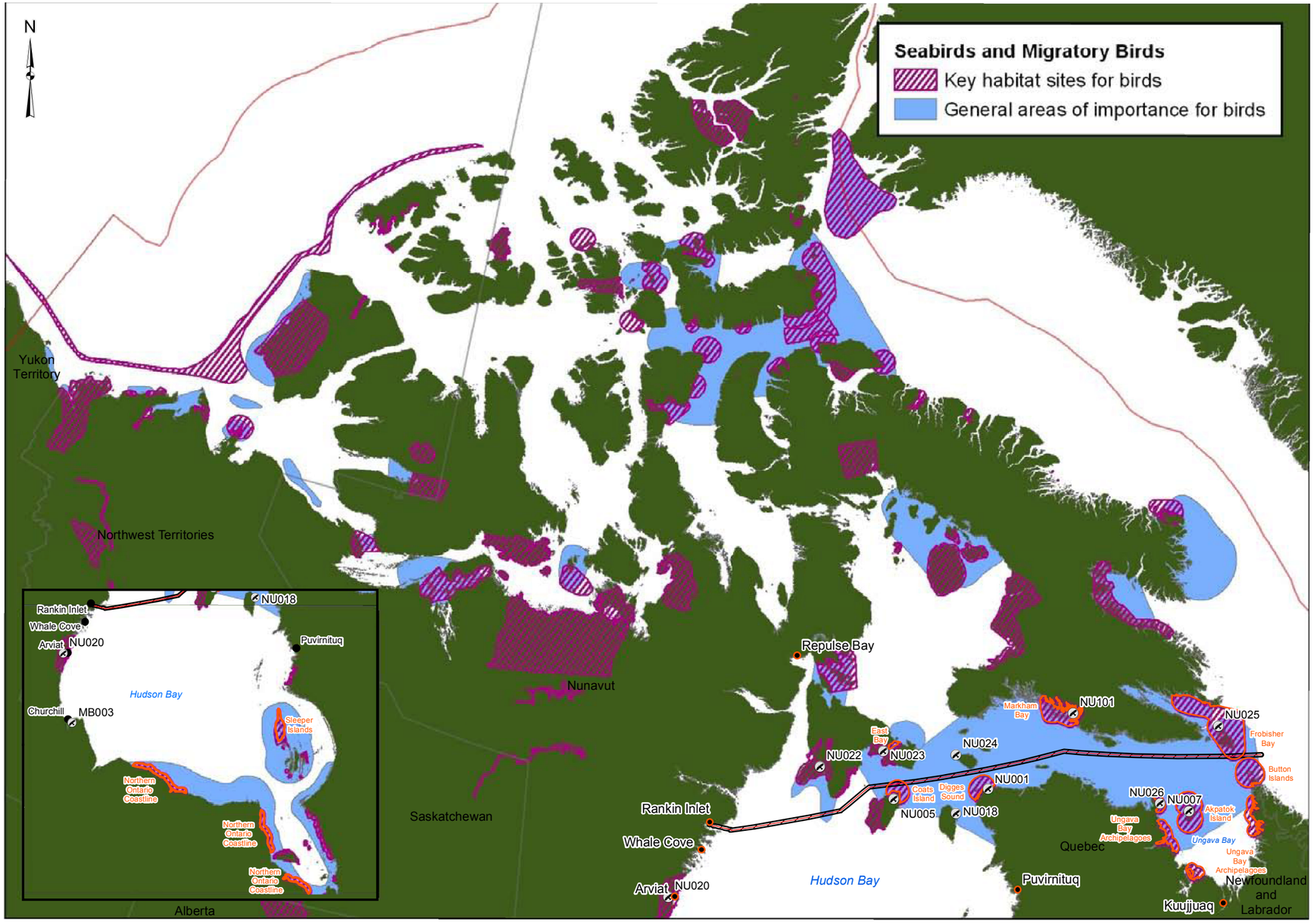
Table B-2: Overview of Seabird Species Potentially Present within the Local and Regional Study Areas

Common Name	Species	Seasonal Occurrence	Distribution	Other Relevant Information	SARA Status[a]	COSEWIC Status[b]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
Sanderling	*Calidris alba*	spring / summer	Coastal	Migratory species. Common spring migrant along the coast near Churchill en-route to its breeding grounds in the Arctic.	No status	Not assessed	No	✔	
Red knot	*Calidris canutus*	summer	Coastal	Migratory species. Hudson Bay ecosystem provides critical resources for this species.	EN-*rufa ssp*. (schedule 1) SC-*islandica ssp*. (schedule 1)	EN-*rufa ssp*. SC-*islandica ssp*.	No	✔	
Peregrine falcon	*Falco peregrinus tundrius*	summer	coastal	Breed and hunt along the coasts of Hudson Bay and James Bay in summer. Breed in areas with high to moderate relief along the Hudson Bay coast of Manitoba, Nunavut, and northern Quebec and on Southampton, Coats and the Belcher and Nastapoka islands	SC (Schedule 1)	SC	No	✔	
Snowy owl	*Bubo scandiacus*	summer	coastal	Breed and forage along the coasts of Hudson Bay and James Bay	No status	Not at risk	No	✔	

[a] SARA (Species at Risk Act). The Act is a key federal government commitment to prevent wildlife species from becoming extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity (extracted from SARA 2012).

[b] COSEWIC (Committee on the Status of Endangered Wildlife in Canada) is a committee of experts that assesses and designates which wildlife species are in some danger of disappearing from Canada. It is up to Government to legally protect wildlife species designated by COSEWIC. The potential impacts of legal listing are for Government to analyse, and the *Species at Risk Act* (SARA) applies only to wildlife species on the SARA legal list (extracted from COSEWIC 2012).

EN=Endangered, TH=Threatened, SC = Special Concern



LEGEND

- IMPORTANT BIRD AREAS
- COMMUNITY
- KEY MARINE HABITAT AREAS FOR MIGRATORY BIRD
- MARINE REGIONAL STUDY AREA (MARINE RSA)

ID#	Important Bird Areas
NU022	Harry Gibbons Migratory Bird Sanctuary (federal)
MB003	Wapusk National Park (federal)
NU005	Cape Pembroke
MB013	Seal River Estuary Heritage River (federal)
NU020	McConnell River Migratory Bird Sanctuary (federal) & Ramsar Site
NU023	East Bay Migratory Bird Sanctuary (federal)
NU024	Fraser Island
NU001	Digges Sound
NU101	Markham Bay Eider Colony
NU026	Eider Islands
NU007	Akpatok Island
NU018	Mansel Island
NU025	Hantzsch Island

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010, IBA 2012
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

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PROJECT
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MELIADINE GOLD PROJECT
NUNAVUT

TITLE
KEY HABITAT AREAS FOR MARINE BIRDS

Golder Associates

PROJECT NO.	1535029		FILE No.	
DESIGN	KZ	06 Feb. 2014	SCALE AS SHOWN	REV. 0
GIS	MH	06 Feb. 2014	**FIGURE B-8**	
CHECK	KZ	16 Feb. 2014		
REVIEW	DRW	16 Feb. 2014		

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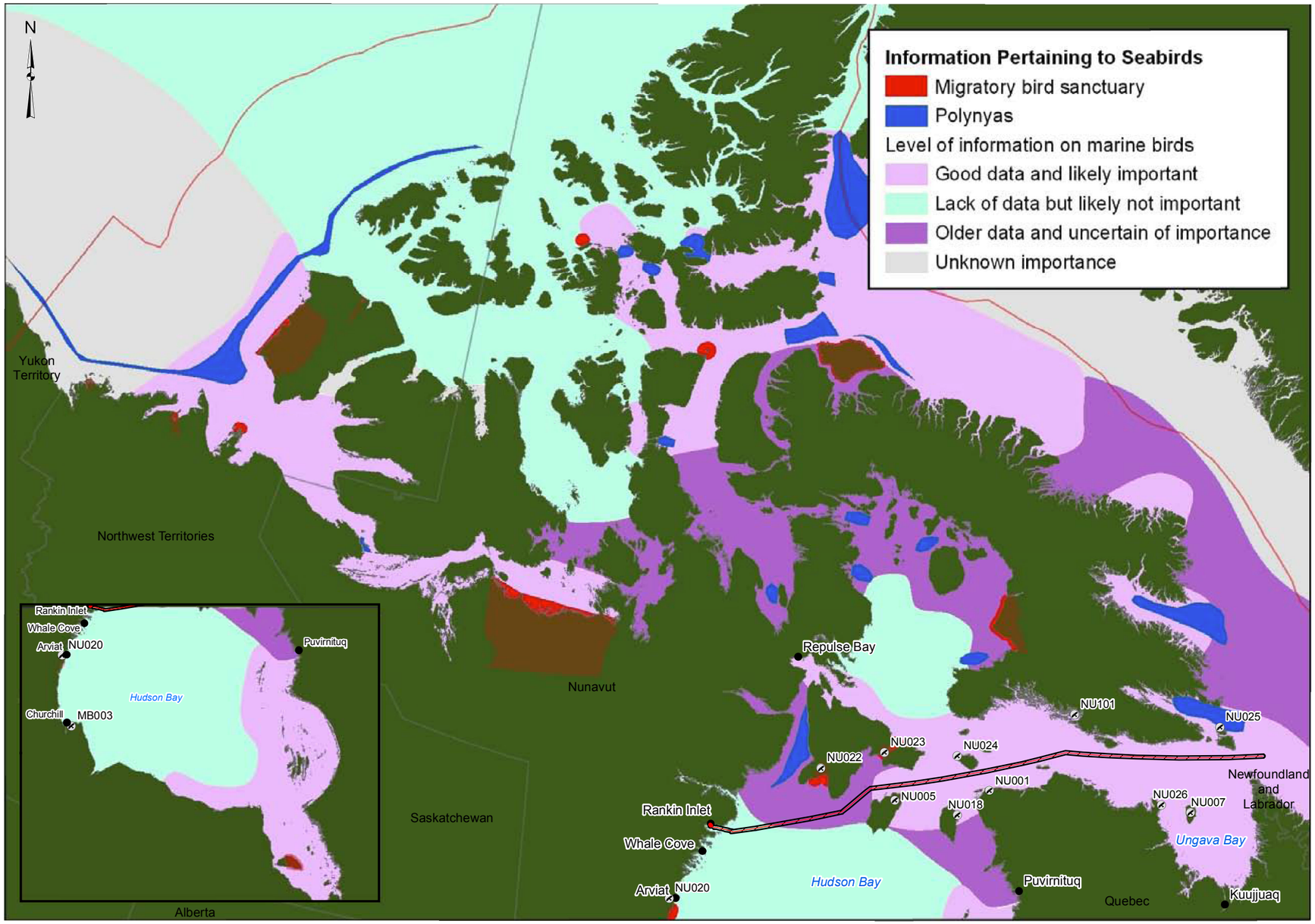


LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

ID#	Important Bird Areas
NU022	Harry Gibbons Migratory Bird Sanctuary (federal)
MB003	Wapusk National Park (federal)
NU005	Cape Pembroke
MB013	Seal River Estuary Heritage River (federal)
NU020	McConnell River Migratory Bird Sanctuary (federal) & Ramsar Site
NU023	East Bay Migratory Bird Sanctuary (federal)
NU024	Fraser Island
NU001	Digges Sound
NU101	Markham Bay Eider Colony
NU026	Eider Islands
NU007	Akpatok Island
NU018	Mansel Island
NU025	Hantzsch Island

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010, IBA 2012
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF MARINE BIRDS AND BIRD HABITAT IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.	1535029	FILE No.		
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	24 Jul. 2012		
CHECK	PR	18 Jan. 2013	FIGURE B-9	
REVIEW	DW	18 Jan. 2013		

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1535029_WL_Tech_Sup\02_PRODUCTION\5000\MXD\Report\1535029_Figure_B-9_Distribution_of_Birds.mxd

Hudson Bay / Hudson Strait provides key breeding habitat for numerous species, including many birds that are primarily Arctic breeders and others that are rarely seen in breeding condition outside the Arctic Islands. The only species listed under the SARA with the potential to occur in the RSA are the Ross's gull and the ivory gull (listed as Threatened and Endangered under Schedule 1 of SARA, respectively) (Table B-2). Those bird species identified as having special ecological or cultural importance, or holding special conservation status, with home ranges overlapping with the RSA are identified in Table B-2.

Three designated migratory bird sanctuaries occur along the shorelines of Hudson Bay / Hudson Strait: one south of Arviat in western Hudson Bay (McConnell River), and 2 on Southampton Island in northern Hudson Bay (Harry Gibbons and East Bay). Although these sites are generally a fair distance from the proposed shipping route, birds do forage offshore to considerable distances and may be vulnerable to impacts associated with shipping activities. For instance, hundreds of thousands of thick-billed murre fledglings migrate with molting adults from colonies in Hudson Strait (Hantzsch Island and Digges Sound) to Newfoundland by swimming, while those that nest on Akpatok Island overwinter west of the Belcher Islands.

Approximate densities of seabirds in the RSA during late summer / early fall have been identified by means of vessel-based seabird surveys undertaken in Hudson Bay and Hudson Strait in 2005 as part of the 2005 ArcticNet expedition (McKinnon et al. 2009). Mean seabird density indices were highest in Hudson strait (8.3 ± 1.9 birds/km^2) and lowest in southern Hudson Bay (0.36 ± 0.2 birds/km^2). Where mean density indices were high, sightings were dominated by northern fulmars or dovekies (or both). The results suggest that several seabird populations that migrate eastward through Hudson Strait converge at the eastern mouth of the Hudson Strait, thus representing a major staging area for migrant seabirds during September and October, particularly for northern fulmar, dovekie, and thick-billed murre.

In Hudson Strait, the mean density index of seabirds sighted within transects (both sitting on the sea and in flight) was 8.3 ± 1.9 birds/km^2. The species most commonly documented sitting on the sea were northern fulmar (65.8% of sightings) and dovekie (14.2%). The species most commonly documented in flight were Dovekie (48.3% of sightings) and northern fulmar (38.7%). Other species sighted (sitting on the sea and in flight) included, in order of abundance, thick-billed murre, black-legged kittiwake, glaucous gull, common eider and black guillemot (McKinnon et al. 2009).

In Hudson Bay, the mean density index of seabirds within transects (both sitting on the sea and flying) was 0.36 ± 0.2 birds/km^2. Species sighted sitting on the sea included thick-billed murre, herring gull, and glaucous gull. The species most commonly documented in flight were Canada goose (36.4% of sightings) and herring gull (23.6%). Other species sighted in flight included, in order of abundance, thick-billed murre, northern fulmar, black guillemot, black-legged kittiwake, glaucous gull, common eider, and long-tailed duck (McKinnon et al. 2009).

1.3.2.3 Marine Mammals

There are 11 species of marine mammals potentially present within the RSA for variable periods of time and at different times throughout the year (Table B-3). This includes 4 species of cetaceans (3 toothed whales and one baleen whale), 6 species of pinnipeds (seals and walrus), and the polar bear. Narwhal (*Monodon monoceros*), beluga (*Delphinapterus leucas*), and bowhead whales (*Balaena mysticetus*) are known to overwinter in Hudson Strait and in polynyas within Hudson Bay. Atlantic walrus (*Odobenus rosmarus rosmarus*), bearded seal (*Erignathus barbatus*), ringed seal (*Phoca hispida*), and harbour seal (*Phoca vitulina concolor*) are year-round residents to at least portions of Hudson Bay. Polar bears are also common in the RSA, entering the pack-ice in early November following their denning season but retreat to coastal areas during the summer ice-free season. The remainder of marine mammals identified in Hudson Bay / Hudson Strait are migratory and seasonal visitors, limited largely by the presence of solid land-fast ice throughout the winter and spring. There is a pronounced geographic bias on the distribution of several species within Hudson Bay; for example, belugas are strongly associated with the western part of Hudson Bay with substantial attraction to estuaries such as the Churchill River. Table B-4 provides a summary of marine mammal species harvested throughout the year by Coastal Inuit communities in Nunavut. An overview on the biology of each marine mammal species potentially present in, or in the vicinity of, the RSA is provided below.

Table B-3: Overview of Marine Mammal Species Found within the LSA and RSA

Common Name	Species	Seasonal Occurrence	Habitat	SARA Status[a]	COSEWIC Status[b]	Of Cultural, Economic or Subsistence Importance	LSA	RSA
Ringed seal	*Pusa hispida*	Year-round	Shore-fast ice and pack-ice	No Status	Not at Risk	Yes	✔	✔
Harp seal	*Pagophilus groenlandica*	Open-water season (July-Sept)	Pack-ice	No Status	Not assessed	Yes	✔	✔
Bearded seal	*Erignathus barbatus*	Year-round	Pack-ice	No Status	DD	Yes	✔	✔
Harbour seal	*Phoca vitulina concolor*	Year-round	Coastal terrestrial areas and edge of shore-fast ice	No Status	Not assessed	Yes	✔	✔
Hooded seal	*Cystophora cristata*	Open-water season (July-Sept)	Pack-ice	No Status	Not assessed	Yes	✔	
Atlantic walrus	*Odobenus rosmarus*	Year-round	Pack-ice or coastal waters during summer; floe-edge / polynyas during winter	No Status	SC	Yes	✔	✔
Polar bear	*Ursus maritimus*	Year-round	Spring: shore-fast ice; Summer: coastal areas and inland; and Winter: shore fast-ice and coastal areas for denning	SC (Schedule 1)	SC	Yes	✔	✔
Beluga whale	*Delphinapterus leucas*	Winter (Nov-May) and Summer	Spring: ice-edges/leads; Summer: shallow coastal areas (around Southampton Island and western Hudson Bay); Fall: deep water (foraging); Winter: offshore pack-ice (Hudson Strait)	No Status	EN	Yes	✔	✔
Narwhal	*Monodon monoceros*	Year-round	Winter: deep water / edge of banks; Summer: fjords / coastal waters	No Status	SC	Yes	✔	✔
Bowhead whale	*Balaena mysticetus*	Winter (Feb-Jun)	Spring : along the ice-edge; Summer: open-water /pack-ice; Winter: heavy pack-ice	No Status	SC	Yes	✔	✔
Killer whale	*Orcinus orca*	Jun-Aug	Coastal / offshore	No Status	SC	No	✔	✔

(a) SARA (*Species at Risk Act*). The Act is a key federal government commitment to prevent wildlife species from becoming extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity (extracted from SARA 2012).

(b) COSEWIC (Committee on the Status of Endangered Wildlife in Canada) is a committee of experts that assesses and designates which wildlife species are in some danger of disappearing from Canada. It is up to Government to legally protect wildlife species designated by COSEWIC. The potential impacts of legal listing are for Government to analyse, and the Species at Risk Act (SARA) applies only to wildlife species on the SARA legal list (extracted from COSEWIC 2012).

EN=Endangered, SC=Special Concern, DD=Data Deficient

Table B-4: Marine Mammal Species Harvested Throughout the Year by Coastal Inuit Communities in Nunavut

Target Species	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Ringed seal	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Bearded seal	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Harp seal	✔			✔		✔	✔	✔	✔	✔	✔	
Hooded seal							✔	✔	✔	✔	✔	✔
Harbour seal							✔	✔	✔	✔	✔	
Walrus	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Beluga	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Narwhal	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Bowhead								✔				
Polar bear	✔	✔	✔	✔	✔					✔	✔	✔

Source: Priest and Usher (2004)

Ringed seal (*Phoca hispida*)

The ringed seal has a circumpolar distribution that is closely associated with the distribution of land-fast ice. This species occurs at the southern limit of their range in Hudson Bay where it is present year-round (Mansfield 1967; Stewart and Lockhart 2005). Ringed seals are the most abundant and widespread seal in the Arctic; however, their numbers in western Hudson Bay declined between 1995 and 2010 based on annual aerial surveys conducted during spring/summer (Lunn et al. 2000; Vincent-Chambellant 2010; Ferguson and Young 2011). The results of two DFO aerial surveys in 2007 and 2008 indicate the relative density of ringed seals in western Hudson Bay falls in the range estimated in previous years and is consistent with estimates derived from surveys conducted in other Arctic areas (DFO 2009). In western Hudson Bay, density estimates for ringed seals varied greatly from year to year and there is inter-annual variation widely reported in the literature for the density of ringed seals hauled-out on the ice (DFO 2009). In 2007 and 2008, ringed seal relative densities in western Hudson Bay were estimated at 0.92 ±0.07 seal/km^2 and 0.44±0.05 seal/km^2 respectively with an abundance of 73170±5440 and 33701±3704 individuals respectively (DFO 2009)... Several factors, in addition to an actual change of seal abundance, could contribute to inter-annual variation including: ice type and conditions, water depth, temperature, wind speed and cloud cover, and time of the day and year could potentially affect ringed seal presence, haul-out activity and detectability (DFO 2009). DFO (2009) notes that many ringed seals may not have been available for detection in 2008 relative to 2007, and a declining population might not be an accurate interpretation of results.

The ability of ringed seals to maintain breathing holes in the land-fast ice enables them to occupy large areas that are inaccessible to other marine mammals except during the summer. During winter, their preferred habitat consists of ice leads and polynyas where breathing holes are easiest to maintain. In spring, breeding adults occur in highest densities in areas of stable land-fast ice with good snow cover where they maintain birth lairs for pup rearing (Hamill and Smith 1991), whereas non-breeders occur at the floe edge or in the moving pack-ice (Stewart and Lockhart 2005). Pups are born in early spring (March/April) and weaned prior to break-up of the sea-ice in late June (Evans and Raga 2001). Pups will remain in subnivean[5] dens during a 5 to 8 week lactation

[5] situated or occurring under the snow

period to avoid detection from predators such as polar bears (Evans and Raga 2001). During the open-water season (July-Sept), ringed seals are commonly observed hauled-out on the sea-ice in large numbers. Juveniles may move offshore at this time, but adults remain around islands and within the bays and fiords (McLaren 1958a; Dunbar and Moore 1980). As such, seals are unlikely to occur in large numbers in the proposed offshore shipping corridor during summer.

Figure B-10 provides an overview of ringed seal distribution in the RSA based on historical sightings, current scientific knowledge, and IQ.

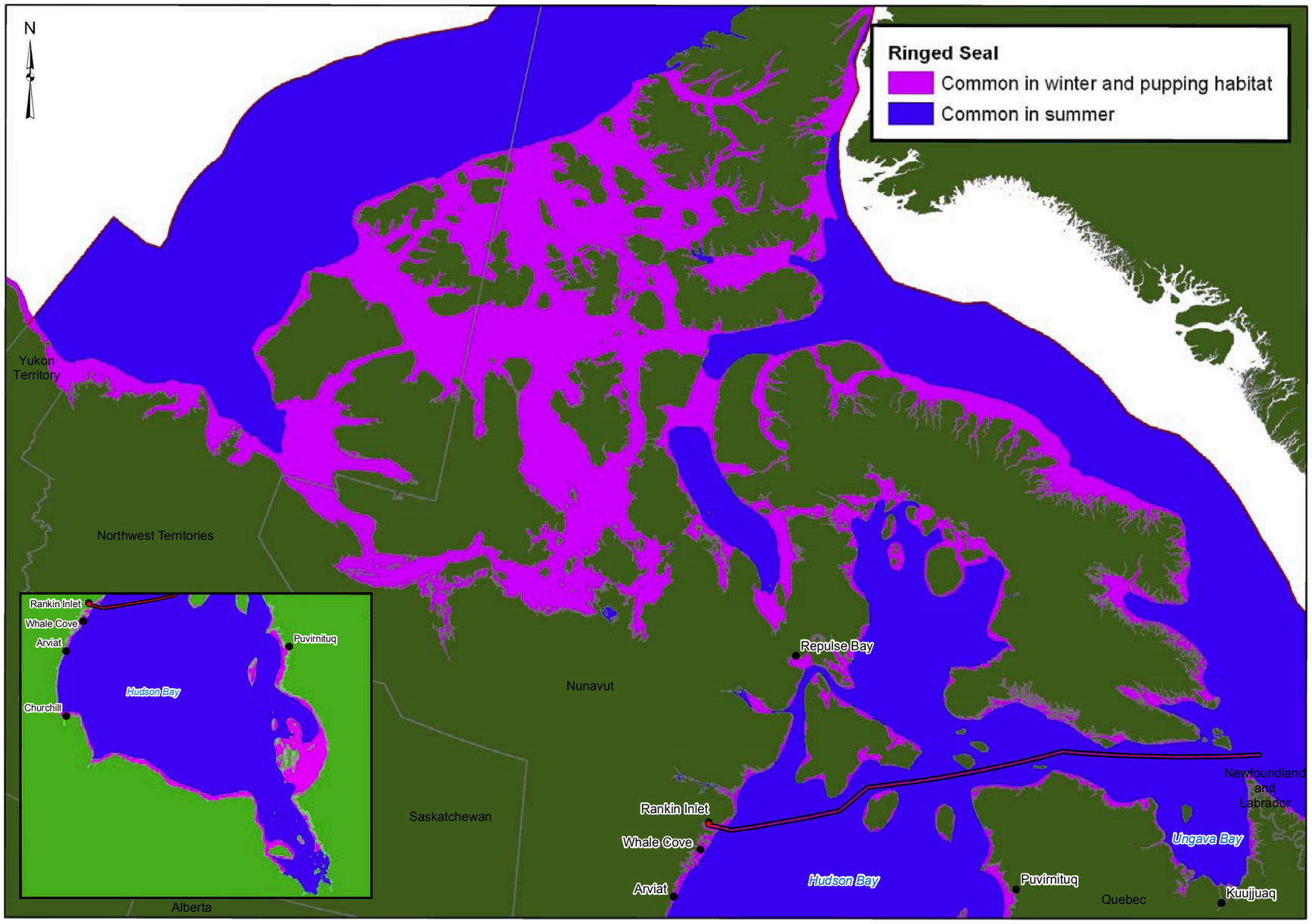
Ringed seals are considered a keystone species[6] (Ferguson et al. 2005), as both adults and pups are an important food source for polar bears (Smith et al. 1991). Other predators include Arctic fox, walrus, wolves, humans, and dogs (Hammill and Smith 1991). Juvenile ringed seals prey mainly on crustaceans under the ice, whereas adults prey on crustaceans and small fish (e.g., Arctic cod) (Richard 2001). This species serves as the main target of the Coastal Inuit subsistence hunt, with all communities in Nunavut (28 out of 28) actively harvesting this species (Priest and Usher 2004). The number of ringed seals harvested in Rankin Inlet is variable, ranging from 55 to 356 animals over a 5 year period (Priest and Usher 2004). The meat is considered a staple of the local diet, and seal hides are used for clothing and sold commercially. Concerns have been raised over possible declines in ringed seal abundance in western Hudson Bay, as indicated by Inuit traditional knowledge, due to reduced pregnancy rate (Stirling 2005), reduced pup survival and recruitment (Holst et al. 1999; Ferguson et al. 2005), later age of maturation and older age structure (Vincent-Chambellant 2010), and increased number of polar bears (Regehr et al. 2007).

Bearded seal (*Erignathus barbatus*)

Bearded seals are large, solitary seals, which have a circumpolar distribution in Arctic and sub-Arctic waters (Mansfield 1967). This species is sparsely distributed throughout their range, and are most abundant in areas where they have access to sea-ice upon which to haul-out, and in shallow water depths where they can access the seafloor (typically <200 m; Kingsley et al. 1985) to feed on crustaceans, molluscs, and fish (e.g., Arctic cod, polar cod, sculpin) (Burns and Frost 1979; Finley and Evans 1983). They are commonly found along continental shelf areas associated with high benthic productivity.

Since this species has only a limited capability to maintain breathing holes in solid ice, they are generally excluded from areas of land-fast ice during much of the year (e.g., High Arctic Archipelago) and are mostly found amongst the pack-ice where the surface is always accessible (Burns et al. 1981). As such, bearded seals move with the receding and forming ice, often travelling considerable distances to the north (seawards) in the summer and back south in the winter (Gilchrist and Robertson 2000). Studies of their general distribution have led to adopt the 250 m benthic contour interval as a measure to delineate the area in which bearded seals are commonly seen (Stephenson and Hartwig 2010). Figure B-11 provides an overview of bearded seal distribution in the RSA based on historical sightings, current scientific knowledge, and IQ.

[6] a keystone species is a species that plays a critical role in maintaining the structure of an ecological community and whose impact on the community is greater than would be expected based on its relative abundance or total biomass



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISTRIBUTION OF RINGED SEAL (*Phoca hispida*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.	1535029		FILE No.	
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	19 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-10

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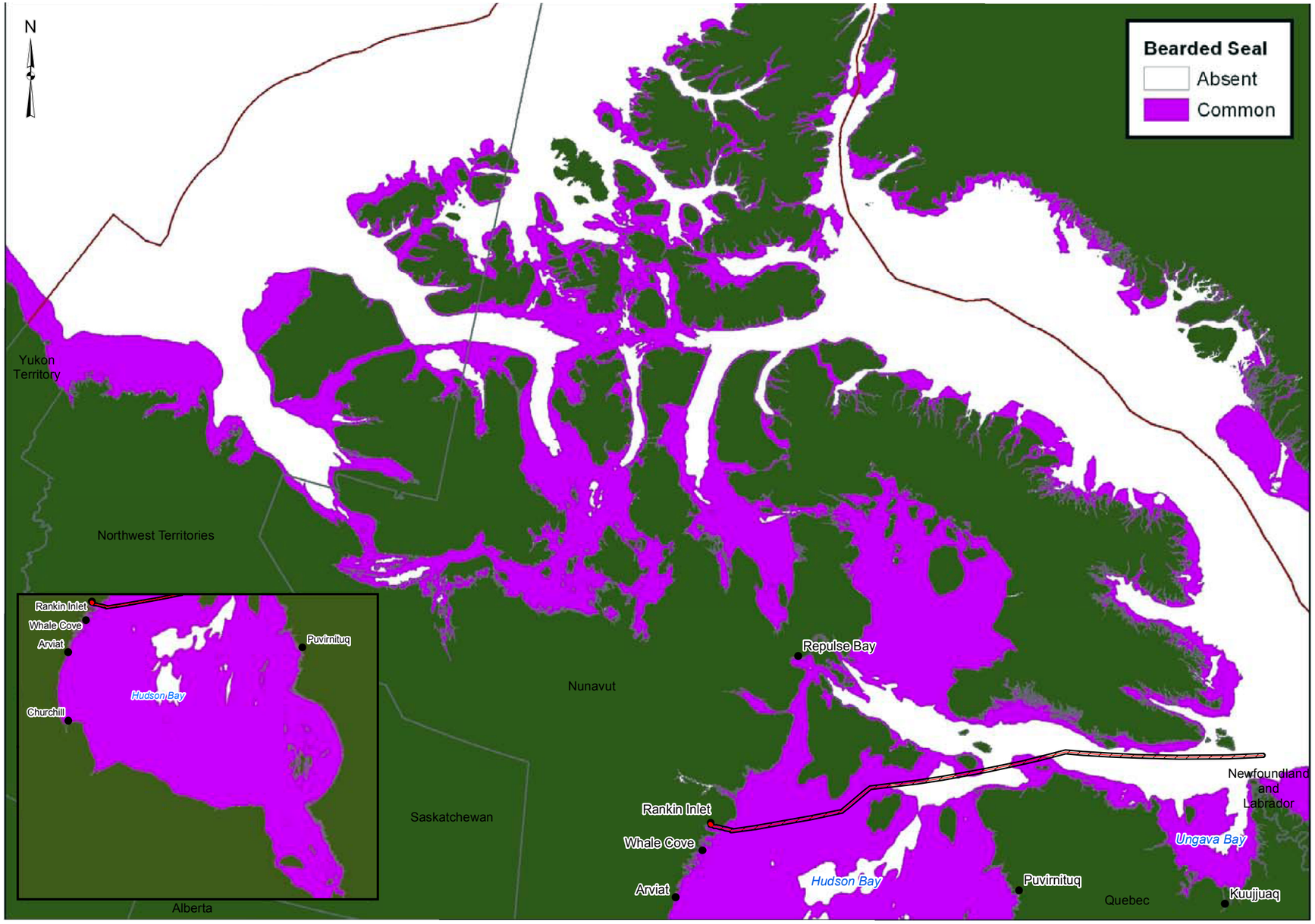

LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISTRIBUTION OF BEARDED SEAL (*Erignathus barbatus*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	23 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-11

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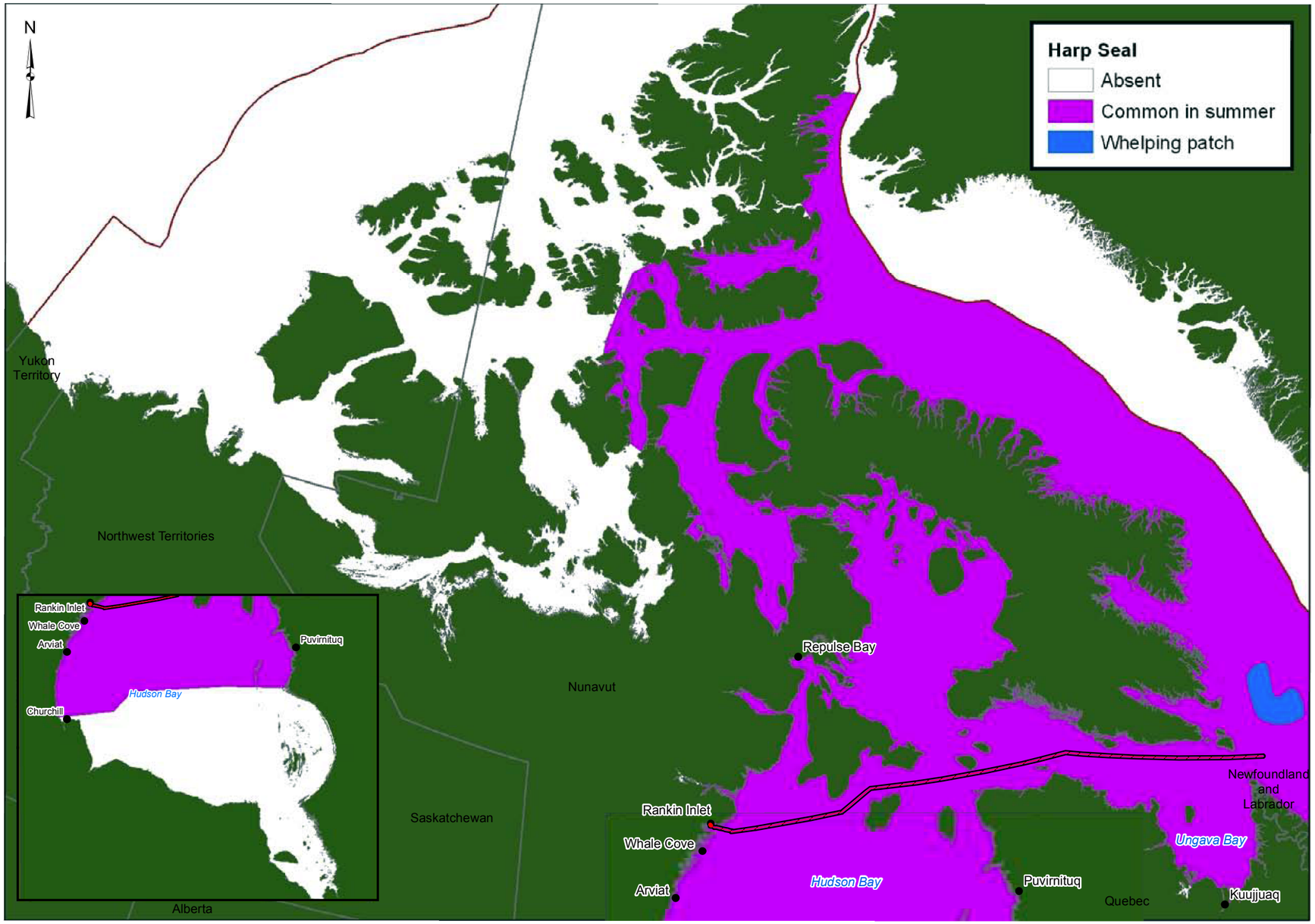
Bearded seal pups are born in late April on the ice, weaned approximately 12 to 18 days later, and then abandoned (Evans and Raga 2001). Mating occurs in the water shortly after weaning, and involves a 2-month delayed uterine implantation period. Both males and females mature around 6 years of age and reproduce biannually until 20 to 30 years of age (Evans and Raga 2001). Males actively vocalize underwater during the breeding season, with calling behaviour associated with territorial or mating displays (Richardson et al. 1995a). Bearded seals are estimated to number approximately 100 000 in the Canadian Arctic, and are especially abundant in Hudson Strait, Foxe Basin, and along the west coast of Hudson Bay (Mansfield 1967; Davis et al. 1980). The main predators of the bearded seal are polar bears and humans. This species is harvested throughout the year by virtually all coastal Inuit communities in Nunavut (27 of 28) (Furgal et al. 2002; Hovelsrud et al. 2008; Priest and Usher 2004), with hunting taking place from July to October. The meat is consumed and the tough flexible hide is used for harpoon lines, dog harnesses, whips, boot soles, and to cover boats called Umiak (Richard 2001). No Total Allowable Catch (TAC) limits exist for bearded seal in Nunavut. Population trends are listed as unknown by DFO (DFO 2015) and COSEWIC defines the status of bearded seals as 'Data Deficient' (DFO 2015)

Harp seal (*Pagophilus groenlandicus*)

The harp seal is a widespread species found in the northern Atlantic and Arctic oceans (Sergeant 1976). Their range includes northern Hudson Bay, Foxe Basin, Baffin Island, Davis Strait, Gulf of St Lawrence, Newfoundland, southern Greenland, Iceland, northern Norway, the White Sea, the Barents Sea, and the Kara Sea. Three distinct genetic populations are recognized: the Northwest Atlantic stock, the Greenland Sea stock, and the White Sea stock. Genetic evidence demonstrates that little gene flow occurs between the 3 stocks (Perry et al. 2000). Harp seals in Hudson Bay / Hudson Strait belong to the Northwest Atlantic stock and are only present in the RSA from ice break-up in early June until just before freeze-up (early October), at which point they migrate east outside the NSA and into the Gulf of St. Lawrence. Thus, impacts to harp seals due to the Project have the potential for transboundary effects. Harp seals are less common than ringed or bearded seals, but may have been more numerous and widespread in the past and may be re-occupying their former range (Stewart and Lockhart 2004). Figure B-12 provides an overview of harp seal distribution in the RSA based on historical sightings, current scientific knowledge, and IQ.

During spring (late February to April), female harp seals aggregate on the pack-ice along the southeast coast of Labrador ('Front') and in the Gulf of St. Lawrence where they form dense and highly-synchronized "whelping herds" and give birth to a single pup. Pups are nursed for 12 days, after which they remain fasting on the pack-ice for approximately 2 weeks before entering the water to feed (Lavigne and Kovacs 1988; Lydersen and Kovacs 1996). Adult females attain sexual maturity at 4 to 6 years of age (Frie et al. 2003). Reproductive maturity occurs in males at about 8 years of age. Towards the end of lactation, females come into estrus and mate (Lavigne and Kovacs 1988). Gestation lasts about one year, including a 3 to 4 month period of delayed implantation (Stewart et al. 1989). The life span of harp seals is approximately 20 to 30 years. Both males and females are sexually active until the ends of their lives, showing no evidence of reproductive senescence (Ronald and Healey 1981).



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF HARP SEAL (*Pagophilus groenlandica*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	23 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-12

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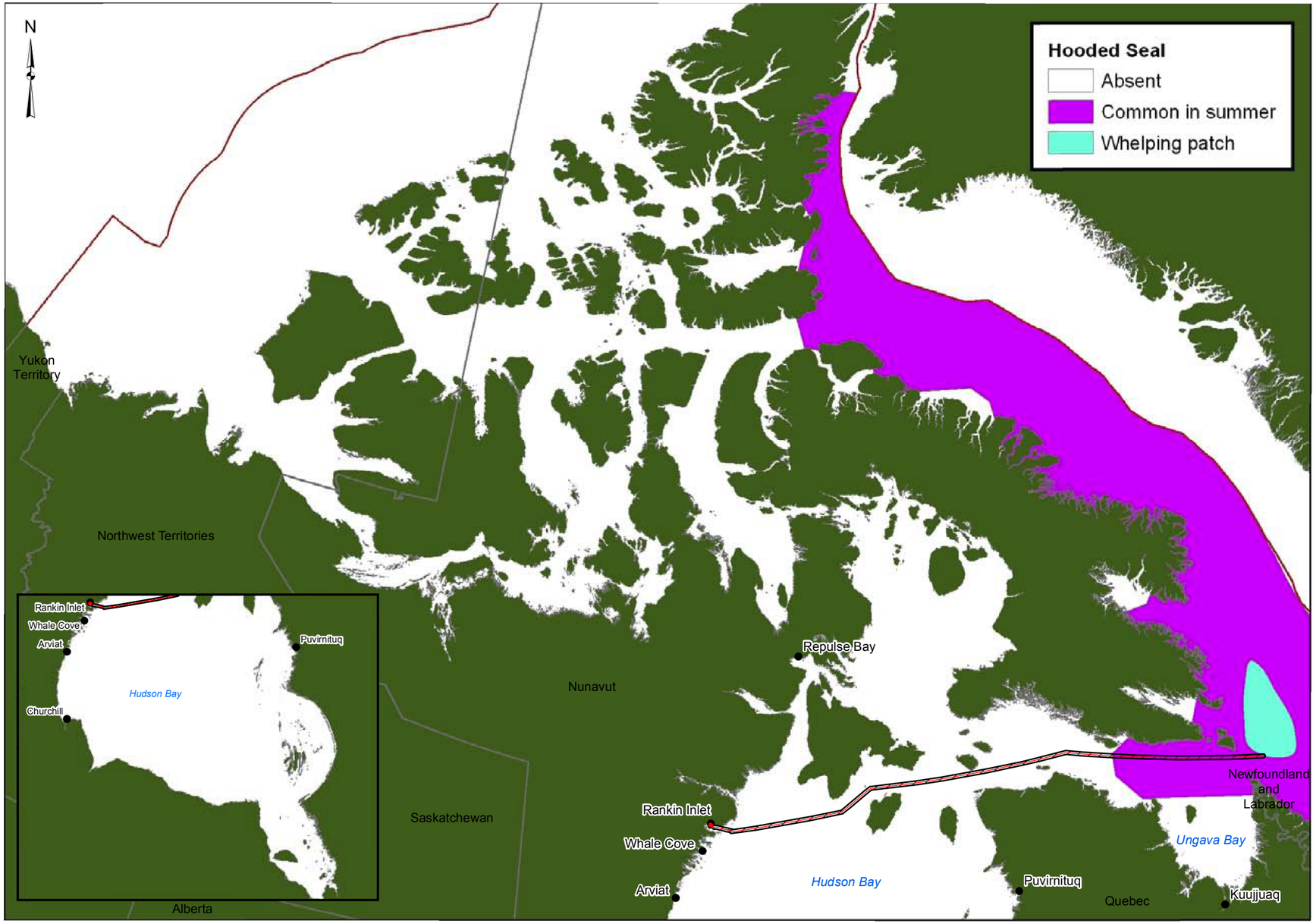
Harp seals undergo a moult in the post-breeding months, from early April to early May (Lavigne and Kovacs 1988). They are a highly social species that travel and forage in groups. The Northwest Atlantic population is highly migratory; after breeding, individuals follow the pack-ice up the coast of Labrador and spend the summer feeding in Baffin Bay, with small numbers entering Hudson Bay and Hudson Strait around Baffin Island before returning south to the Gulf of St. Lawrence during autumn, resulting in an annual migration of over 5000 km (Lavigne and Kovacs 1988). Natural predators of harp seals include polar bears, killer whales, Greenland shark, and humans (Lavigne and Kovacs 1988). Harp seals consume a wide range of fish and invertebrate prey that varies along their migration route (Lavigne 2002). Fish prey includes capelin, Arctic cod, Atlantic cod (Gadus morhua), Atlantic herring (Clupea herringus), and redfish (Sebastes sp.) (Lawson et al.1995). Pups and juveniles prey primarily on crustaceans, particularly euphausiids and amphipods (Haug et al. 2000; Nilssen et al. 2001).

The harp seal global population is presently estimated at 8 million individuals, with pup production at 1.4 million pups per year (Stenson et al. 2003; Potelov et al. 2003; Haug et al. 2006). The Northwest Atlantic stock is estimated to number 5.9 million individuals (DFO 2005a). This is a marked recovery from an estimated low of around 1.8 million recorded in the early 1970s (Sergeant 1976) linked to a population crash from overharvesting. This led to the near cessation of hunting and the gradual recovery of this stock. Catch levels have increased repeatedly during the last decade, with the Canadian and Greenland hunt now presently the largest marine mammal harvest in the world (DFO 2007). As of 2011, the Northwest Atlantic harp seal population was at the highest levels observed since monitoring began almost 60 years ago. Pup production in 2008 was on the order of 1.63 million animals with a total population size of around 8.0 to 8.7 million animals increasing to 8.6 to 9.6 million animals in 2010 (Hammill and Stenson 2011).According to Hammill and Stenson (2011) the likelihood that the population is no longer growing exponentially needs to be considered further, particularly within the context of levels of carrying capacity (K) to understand the dynamics of the population. It is important to note however, there is some uncertainty associated with reproductive rates and how density dependence is expressed in the models used to predict these population trends (DFO 2012). The 2010 assessment assumed that reproductive rates would remain high, predicting a population between 8.61 to 9.55 million animal (95% CI 7.80 to 10.80 million; DFO 2012). However, since 2008 reproductive rates have declined resulting in a 2012 population estimate of 7,700,000 (95% CI=6,900,000-8,400,000). The current population of Northwest Atlantic harp seals is estimated to have declined slightly since 2008; nevertheless it is near its highest level since the mid-19th Century (DFO 2012).

This species is hunted throughout Nunavut primarily during the months of June through September (Priest and Usher 2004), with pups representing the majority of the harvest. Both meat and blubber are consumed, and the pelts are sold commercially. Subsistence harvests are currently not regulated, but the commercial harvest is regulated by the 2011 to 2015 Integrated Fisheries Management Plan for Atlantic Seals. Seals are also caught incidentally in fishing gear (DFO 2012). DFO sets TACs within a 3-year period for the Northwest Atlantic population. In addition to Canada's commercial harvest, some harp seals are still taken in subsistence hunts in Labrador, Newfoundland, northern Quebec, and in Nunavut. Aboriginal peoples and non-Aboriginal coastal residents who reside north of latitude 53 degrees can hunt seals for subsistence purposes without a permit (DFO 2006b). Between 1983 and 1995, Canadian catches of Northwest Atlantic harp seals averaged approximately 52,000 seals per year, with catches increasing significantly to a range of 226,000 to 366,000 between 1996 and 2006 (DFO 2012). Since 2007 Canadian catches have declined significantly with DFO (2012) reporting a catch of 40,370 in 2011. Catches in the Canadian Arctic remains low at under 1,000 Northwest Atlantic harp seals per year (DFO 2012).

Hooded seal (*Cystophora cristata*)

The hooded seal occurs throughout much of the North Atlantic and Arctic Oceans (King 1983) preferring deeper water and occurring farther offshore than harp seals (Sergeant 1976; Campbell 1987; Lavigne and Kovacs 1988; Hammill and Stenson 2006). They are a highly migratory species, and are considered a rare visitor to Hudson Bay / Hudson Strait (Stewart and Lockhart 2004). Thus, impacts to hooded seals due to the Project have the potential for transboundary effects. As primarily deep-water feeders, the 200 m bathymetric contour interval has been adopted to estimate the offshore distribution boundary of this species (Stephenson and Hartwig 2010). Figure B-13 provides an overview of hooded seal distribution in the RSA based on historical sightings, current scientific knowledge, and IQ. They are generally associated with heavy pack ice, and their presence would extend until ice break-up (Sergeant 1974).



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF HOODED SEAL (*Cystophora cristata*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.	1535029	FILE No.		
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	23 Jul. 2012		
CHECK	PR	18 Jan. 2013	**FIGURE B-13**	
REVIEW	DW	18 Jan. 2013		

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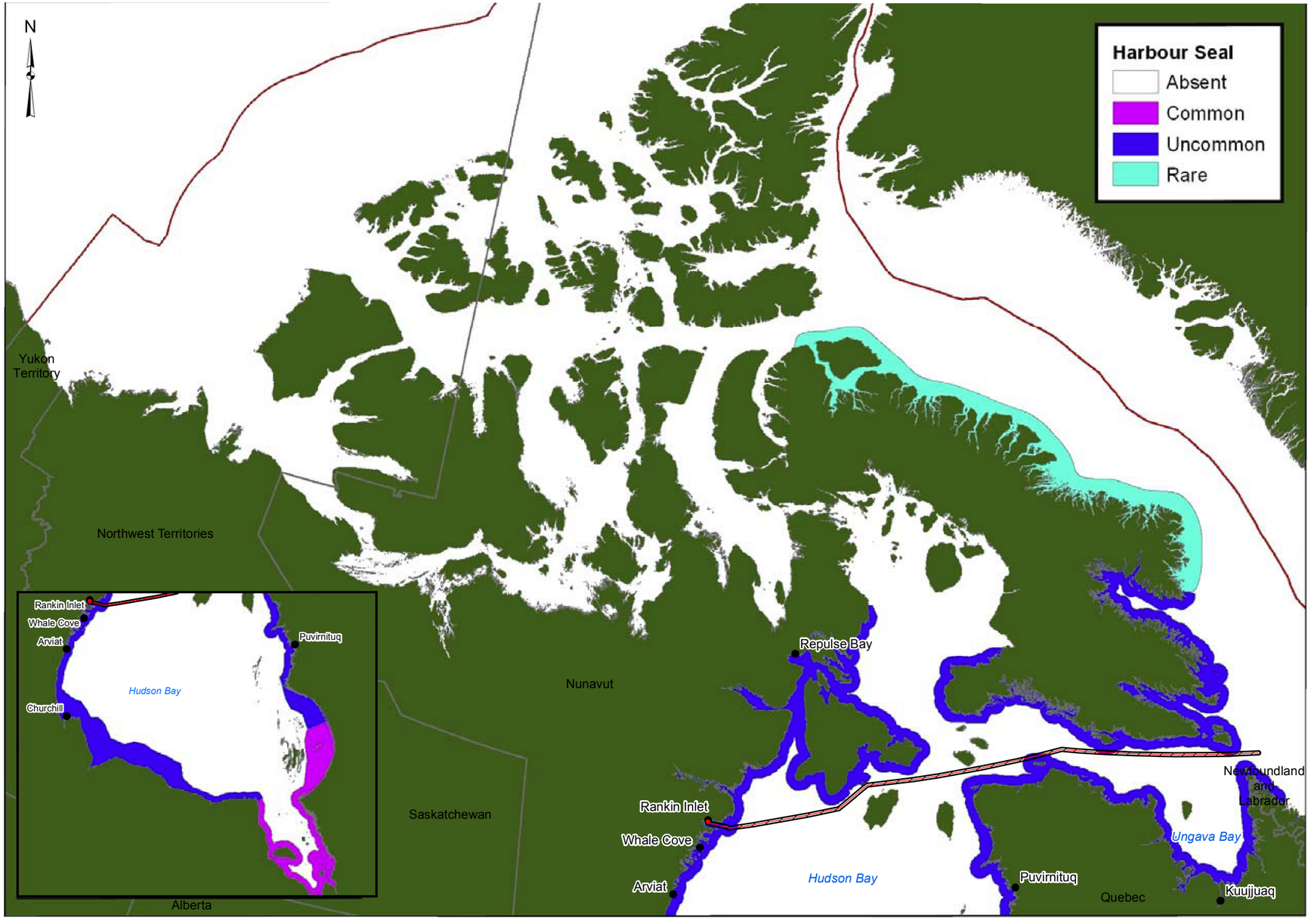
Hooded seals of the Western North Atlantic stock breed synchronously during mid to late March in heavy pack-ice areas off the coast of eastern Canada and around Greenland. Breeding of this population is divided into 4 whelping areas. The “Front” herd (largest of the 4) breeds off the coast of Newfoundland and Labrador, the “Gulf” herd breeds in the Gulf of St. Lawrence, the “Davis Strait” herd breeds between Baffin Island and western Greenland, and the “West Ice” herd breeds in the Greenland Sea near the island of Jan Mayen (Sergeant 1974, 1976; Folkow et al. 1996). These breeding herds are considered to belong to 2 recognized populations (Hammill and Stenson 2006). Seals whelping near Jan Mayen are thought to constitute the Northeast Atlantic population, while hooded seals whelping and breeding in Davis Strait, the Gulf and at the Front are all thought to belong to the Northwest Atlantic population (Hammill and Stenson 2006). The breeding season for this polygamous species is brief lasting only 2 to 3 weeks, with mating taking place in the water (Boness et al. 1988; Kovacs 1990). This species has the shortest lactation period for any mammal, with most pups being weaned in 4 days (Bowen et al. 1987). Hooded seals moult in July, with each breeding stock congregating at separate traditional sites away from the whelping areas. Many seals are reported to migrate to the pack-ice east of Greenland in Denmark Strait at this time (Sergeant 1974, 1976; Folkow et al. 1996). Hooded seals form loose aggregations in specific areas during the breeding and moulting season and generally remain solitary outside this period. Hooded seal life span is approximately 25 to 30 years (Kovacs 2002).

The Northwest Atlantic population has been estimated at approximately 600 000 animals (593 500, +67 200 SE, Hammill and Stenson 2006), of which 90% are estimated to whelp at the Front (Stenson et al. 2006). The DFO 2011 to 2015 Integrated Fisheries Management Plan for Atlantic Seals still estimates the hooded seal herd in the northwest Atlantic to have increased from 478,000 in 1965, to approximately 600,000 animals currently (DFO 2011c). The Northeast Atlantic population is estimated at between 70 000 and 90 000 animals, although there is considerable uncertainty around these estimates due to scarcity of data and limited understanding of the relationships between whelping areas (ICES 2006). Hooded Seals are annually harvested by coastal Inuit of Greenland and Canada for subsistence purposes (Kovacs 2002) and have been commercially hunted at the Front since the late 1800s (Kovacs 2008b). Harvesting occurs primarily during the months of July through December (Table B-5). For the Canadian harvest, the TAC has been set at 10 000 seals per year since 1998 (ICES 2006). For the period 2000-2004, the total estimated catch of hooded seals was 48 188 (Kovacs 2008b). By-catch of hooded seals in coastal net fisheries has been reported from the United States, from trawl fisheries off Norway and Newfoundland, and salmon drift nets used off Greenland (Woodley and Lavigne 1991; Reeves et al. 1992; Waring et al. 2005).

Harbour seal (*Phoca vitulina concolor*)

The harbour seal is the most widely-distributed of all pinnipeds, inhabiting temperate, sub-Arctic and Arctic coastal areas on both sides of the North Atlantic and North Pacific Oceans. As this species does not maintain breathing holes in the ice, their distribution in the RSA is limited to locations where currents maintain open water year-round, typically in freshwater or estuarine rapids, in small coastal polynyas, or at the ice floe edge (Mansfield 1967). Harbour seals are not typically found in offshore waters exceeding 50 m depth (COSEWIC 2007). This depth limitation is supported by radio telemetry studies that have indicated that the 50 m benthic contour line may be used to demarcate their offshore limit of distribution (Stephenson and Hartwig 2010). Figure B-14 provides an overview of their distribution in the RSA based on historical sightings, current scientific knowledge, and IQ. Adults tend to be solitary in the water but haul out in small sedentary groups on rocky shores, where pupping occurs. Harbour seals are harvested by coastal Inuit communities primarily during the period from July through October (Table B-4).



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF HARBOUR SEAL (*Phoca vitulina concolor*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	23 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-14

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1535029_WL_Tech_Sup\02_PRODUCTION\5000\MXD\Report\1535029_Figure_B-14_Distribution_of_Harbour_Seal.mxd

Atlantic walrus (Odobenus rosmarus rosmarus)

The walrus (*Odobenus rosmarus*) has a circumpolar distribution and is the largest pinniped occurring in the Canadian Arctic. Individuals inhabiting coastal areas of the RSA belong to the Atlantic stock, 1 of 2 subspecies recognised. Walrus in the Canadian Arctic include two genetic populations, with seven different stocks (DFO 2013). The Baffin Bay (BB), west Jones Sound (WJS) and Penny Strait-Lancaster Sound (PS-LS) stocks comprise the high Arctic population. The central Arctic population is composed of the north and central Foxe Basin (N-FB and C-FB) and Hudson Bay-Davis Strait (HB-DS) stocks (DFO 2013). According to DFO (2013), the relationship between these six stocks and walrus distributed in south and east Hudson Bay (S&E-HB) is currently unknown. Recent aerial and satellite telemetry studies have been used to develop abundance estimates for six of the walrus stocks that make up the high Arctic and central Arctic populations in Canada. Based on those estimates, total allowable removals (TARs) were calculated for each stock using the Potential Biological Removal method (PBR) (DFO 2013). The aerial surveys of walrus haul outs conducted in 2007 to 2011 provided data to enable the calculation of abundance estimates for all stocks, with the exception of the S&E-HB stock (DFO 2013). However, it is likely that individual stock abundance estimates were underestimated due to incomplete survey coverage, inter-annual variability in distribution, and unfavourable weather and ice conditions (DFO 2013).

According to DFO (2013) stock estimates and associated TARs for walrus belonging to the high Arctic population are as follows:

- Baffin Bay stock was estimated at approximately 1,250 walrus in 2009 (based on a count of 571) resulting in an annual TAR of 10 to11 walruses;
- West Jones Sound stock was estimated at 503 (coefficient of variation (CV) = 0.07) walruses in 2008, (based on a count of 404) resulting in an annual TAR of seven or eight walrus; and
- Penny Strait-Lancaster Sound stock was estimated at between 661 (CV = 2.08) and 727 (CV = 0.07) walrus in 2009 (based on a count of 557) resulting in an annual TAR of 10to12 walrus.

However, dividing the harvest of the three stocks that make up the high Arctic population was not possible (DFO 2013). The average annual Canadian reported harvest (reported over 25 years) was approximately 14, less than the combined annual TAR of 27 to 31 walrus (DFO 2013).

The combined population estimates for the north and central Foxe Basin stocks in 2011 ranged from 8,153 (CV = 0.07) to 13,452 (CV = 0.43) animals and was based on counts of 6,043 and 4,484, respectively, using different survey dates and different adjustment factors (DFO 2013). The annual TARs is currently 106 to166 walruses and with a yearly harvest level of approximately 185 animals (DFO 2013). Further investigation into walrus movements within Foxe Basin and exchange with the larger Hudson Bay-Davis Strait stock is required to better understand how and if these stocks interact (DFO 2013).

Walruses from the Hudson Bay-Davis Strait stock summer in the Hoare Bay area on southeast Baffin Island. Population estimates were between 1,420 (CV = 0.07) and 2,533 individuals (CV = 0.17) in 2007 (based on a count of 1,056 animals; DFO 2013). The calculated annual TARs for the Hudson Bay-Davis Strait stock is currently 18 to 38 with local annual harvests of approximately 36 walruses (DFO 2013).

According to DFO (2013), the central Arctic population lacks sufficient data for a meaningful population estimate. Changes in the abundance of the Atlantic walrus population during the past 45 years remain unclear (COSEWIC 2006). Modelling indicates that populations in the Eastern Canadian Arctic have been in steady decline (Witting and Born 2005). The current total abundance of the Atlantic walrus is poorly known, the most recent information suggests a population size of 18,000 to 20,000 individuals (COSEWIC 2006). The population status of Atlantic walrus was recently upgraded to “Special Concern” (COSEWIC 2006). Walruses are harvested year-round by coastal Inuit communities in the Nunavut region (Table B-4; Priest and Usher 2004). Between 1996 and 2001, hunters reported an average annual walrus catch (landed) of 2/year from Arviat, 3/year from Chesterfield Inlet, 5/year from Rankin Inlet and none for the communities of Baker Lake or Whale Cove during that same period (NWMB 2004). Walrus hunting is subject to the terms of the Nunavut Land Claims Agreement and is legislated under the Marine Mammal Regulations of the *Fisheries Act*.

Walrus require large areas of shallow water (<80 m) with substrate that supports a productive bivalve community, the reliable presence of open water over these feeding areas, and suitable ice or land nearby upon which to haul out (Evans and Raga 2001). Atlantic walrus are highly gregarious and are associated with moving pack-ice for most of the year. In Hudson Bay, the paucity of sea-ice during summer forces walrus to haul-out in predictable locations on land. The main concentration of walruses in southern Hudson Bay is in the Belcher Islands (Sanikiluaq) (Figure B-15; DFO 2002). The main concentration of walruses in northern Hudson Bay resides on the northeast side of Coats Island and in Coral Harbour on the southeast side of Southampton Island (Figure B-15; DFO 2002). Walrus in both areas are present year-round with an estimated summer population of 2000 animals. The main concentration of walruses in Hudson Strait resides at Cape Dorset on the Foxe Peninsula (Figure B-15; DFO 2002). Walruses may occasionally haul out at the East Bay Bird Sanctuary on Southampton Island and the Bowman Bay Wildlife Sanctuary on Baffin Island (COSEWIC 2006).The general distribution of walrus and their preference for shallow near shore areas substantially reduces the potential for interaction of walrus with Project vessels in the shipping corridor (RSA). Figure B-16 provides a summary of distribution of haul-outs and areas of known important habitat for Atlantic Walrus in the Marine RSA and Adjacent Arctic Waters.

Walrus are characterized by a highly polygamous mating system, with breeding herds forming in January - April. They are long-lived animals (approximately 40 years) with a low reproductive rate. Females attain reproductive maturity at approximately 5 to 7 years of age, with a typical calving interval of 3 years (Garlich-Miller and Stewart 1999). Males reach sexual maturity at 6 to 10 years of age, although likely cannot successfully compete for females until they are older. Mating takes place in the water, usually from January to April, and pregnancy lasts 15 to 16 months. Females, therefore, can only give birth a maximum of once every 2 years, though it is more commonly 3 years between calves. This results in a pregnancy rate that is much lower than that of other pinnipeds. Walrus calves are born on land or on the pack-ice between late April and early June. The nursing period typically lasts for 2 years, with weaning occurring gradually over this time.

Behavioral responses of walrus to man-made noise are shown to be variable (DFO2002). Aircraft noise has been correlated with evidence of stampedes, with attendant mortality, as well as partial habituation to the noise (Born et al. 1995). Some individuals at haul outs may allow ships to approach quite close while others will react to ships 2 km away (Born et al. 1995). Displacement from haul outs for up to 9 hours has been noted as a result of in-air noise, with females and calves being the most susceptible to this type of disturbance (Salter 1979, Miller 1982). Suitable walrus habitat has been shown to be decreasing as human activities in the north expand

(COSEWIC 2006). Noise disturbance caused by motorized transportation and hunting have caused herds to abandon haul out near communities in favour of less accessible islands and shores (Born et al. 1995).

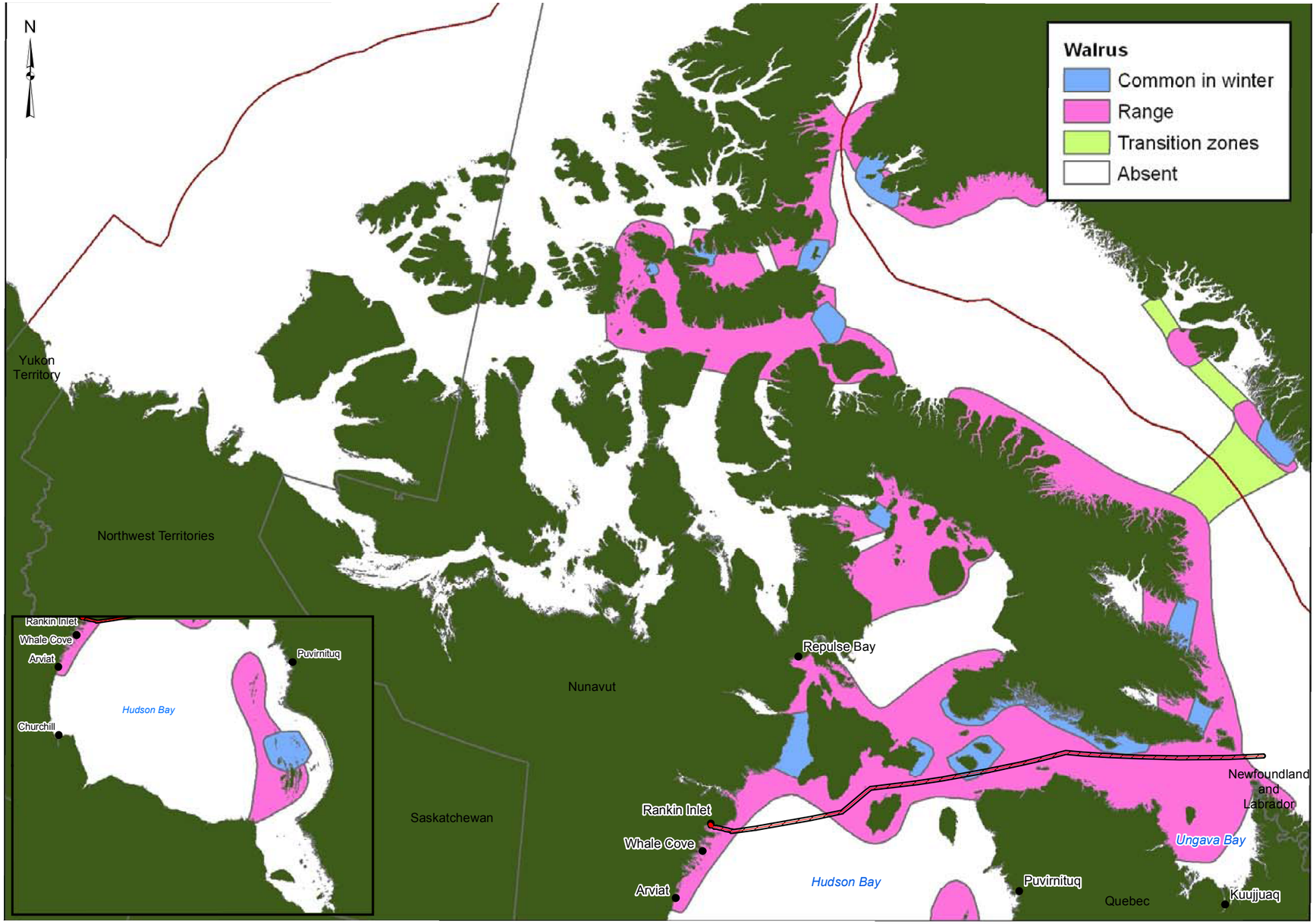
Interviews were conducted with Inuit hunters from Coral Harbour and Cape Dorset to document their knowledge regarding the seasonal distribution and abundance of walruses in northern Hudson Bay and western Hudson Strait (Orr and Rebizant 1987). Harvesters for Coral Harbour noted that during the winter, walruses were found along the floe edge from Leyson Point to Hut Point, with sightings of usually less than 100 walruses (Orr and Rebizant 1987). At the floe edge of Ruin Point, as many as 1,000 walruses have been noted, although usually sightings were around 500 individuals. Reports of sightings of 500 walrus at South Bay were also shared (Orr and Rebizant 1987). In the spring walrus were primarily noted in the area of South Bay, between Native Point and Ruin Point, with most sightings consisting of groups less than 100 individuals. The highest concentrations of walrus, up to 500, appeared to be at the floe edge near Renny Point. As ice breaks up in late spring, greater numbers of walrus (>500) are found near Leyson Point (Orr and Rebizant 1987). During the summer greater numbers of walrus were reported, with sightings common from Sea Horse Point, west along Bell Peninsula, to Ruin Point. Walrus Island, Bencas Island, the north and eastside of Coats Island and Evans Strait are all areas reported to have high concentrations (>1000) of walrus by hunters (Orr and Rebizant 1987). Harvesters noted that there appears to be a localized migration in the early fall, from the Coats Island and Walrus Island area, across to Evans Strait (Orr and Rebizant 1987). Harvesters reported more than 1,000 walrus hauled out or swimming in the area of Cape Pembroke (Orr and Rebizant 1987).

Cape Dorset hunters noted that during the winter months, walrus are sporadically distributed along the coast of Foxe Peninsula from Cape Dorchester to Chamberlain Island, with the largest number of walruses around Cape Dorchester (Orr and Rebizant 1987). Salisbury Island and Nottingham Island reported as many as 500 walruses in the area between the two islands. Most sightings documented were in groups from 20 to 50 individuals during the winter months (Orr and Rebizant 1987). Cape Enavolik, Shuke Island and Sakkiak Island were all noted to support as many as 1,000 walruses, with most individuals observed either swimming or hauled out on floating pack ice near the floe edge. During the spring, walruses can be found from Cape Dorchester to Dorset Island, commonly in groups of ~1,000 animals along the coast, while the groups from around the tip of Salisbury Island and the southeast side of Nottingham Island were similar to the winter numbers of approximately 500 individuals. In the spring, walrus were most commonly observed hauled out on floating pack ice (Orr and Rebizant 1987). In the summer months, walrus numbers decline in the vicinity of Cape Dorset; hunters suggested that walrus prefer the area along the west coast of Foxe Peninsula, from Lloyd Point to the group of islands north of Cape Dorchester during this time (Orr and Rebizant 1987). Walruses are known to travel around the islands of Mills, Salisbury and Nottingham in late summer, but hunting usually occurs along the west coast of Foxe Peninsula. Large groups of walrus of 500 to1000 individuals have been noted in the summer along the south, west and north coast of Salisbury Island and along the southeast coast of Nottingham Island (Orr and Rebizant 1987). In July and August, concentrations of over 1,000 walruses were reported around Cape Dorchester. During the fall, reports by hunters are similar to those made during the summer, with a slight decrease in the numbers along the northwest coast of Foxe Peninsula. This may be due to a seasonal migration of these animals to islands in Hudson Strait with noted increases in the number of animals observed around Nottingham and Salisbury Islands during this time (Orr and Rebizant 1987).

The main changes in seasonal distribution of the Northern Hudson Bay-Davis Strait walrus population occurred in the early to mid-1900 (COSEWIC 2006). This included the abandonment of haul outs along the west coast of Hudson Bay north to Chesterfield Inlet, Digges Island, Cumberland Sound, and on the Gyrfalcon Islands (Born et

al. 1995). During this time, walruses were rare in western Hudson Bay, but were moving northward where the coastline offered more suitable haul out (COSEWIC 2006). Walruses were numerous at islands near the community of Whale Cove from 1942 to 1945, but are uncommon in this area now (Fleming and Newton 2003). Small groups are sometimes seen at the floe edge south of Whale Cove (Gamble 1988; Fleming and Newton 2003). Inuit report that walruses were more numerous in the Chesterfield Inlet area in the early 1990s than in times previous (Fleming and Newton 2003). Some haul out in western Hudson Bay have been abandoned, but walrus have been noted to be hauled out (Figure B-16) in small numbers in summer at:

- Bibby Island (61°53'N, 93°05'W);
- Term Point (62°08'N, 92°28'W);
- “Little Walrus Island” in Mistake Bay;
- Sentry Island (61°10'N, 93°51'W);
- Wag Island (63°23'N, 90°38'W);
- Marble Island (62°41'N, 91°08'W); and
- Fairway Island (63°15'N, 90°33'W;Low 1906; Degerbøl and Freuchen 1935; Loughrey 1959; Reeves 1978; Born et al. 1995; DFO 2000; Fleming and Newton 2003).



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISTRIBUTION OF ATLANTIC WALRUS (*Odobenus rosmarus rosmarus*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.	1535029		FILE No.		
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV.	0
GIS	DSC	23 Jul. 2012			
CHECK	PR	18 Jan. 2013	**FIGURE B-15**		
REVIEW	DW	18 Jan. 2013			

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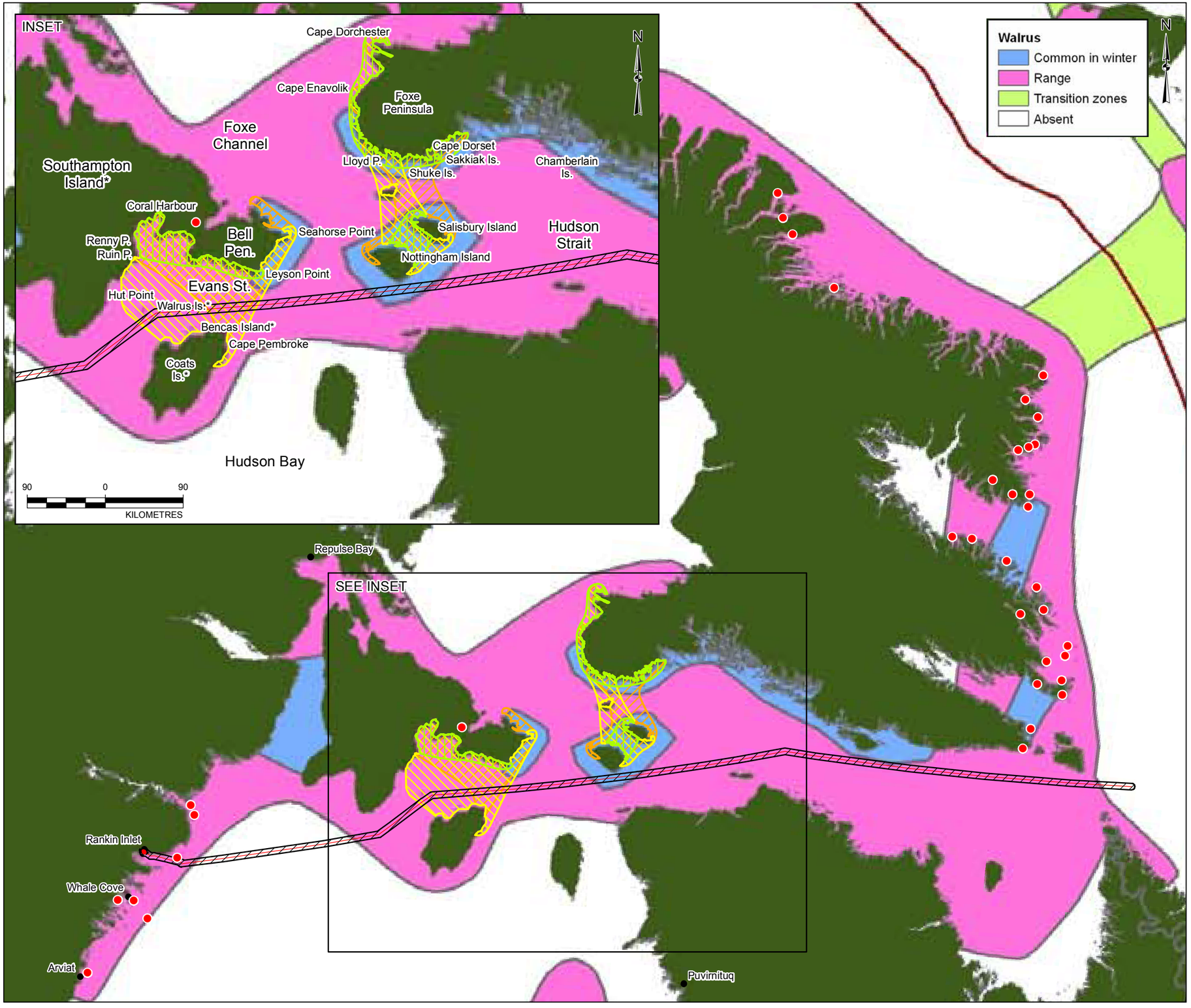

LEGEND

- KNOWN WALRUS HAUL OUT
- WALRUS DISTRIBUTION (SPRING)
- WALRUS DISTRIBUTION (SUMMER)
- WALRUS DISTRIBUTION (FALL)
- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

* HAUL OUTS AND MAIN CONCENTRATION AREAS

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
KNOWN WALRUS HAUL OUT LOCATIONS FROM STEWART ET AL. 2014; LOW 1906; DEGERBØL AND FREUCHEN 1935; LOUGHREY 1959; REEVES 1978; BORN ET AL. 1995; DFO 2000; FLEMING AND NEWTON 2003.
SPRING/SUMMER/FALL WALRUS DISTRIBUTION FROM ORR AND REBIZANT, 1987.
*HAUL OUTS AND MAIN CONCENTRATION AREAS FROM DFO, 2002.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010.
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

120 0 120
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF HAUL OUTS AND IMPORTANT HABITAT ATLANTIC WALRUS IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	EL	12 Jan. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	12 Jan. 2016		
CHECK	KZ	15 Jan. 2016		
REVIEW	PR	15 Jan. 2016		

FIGURE B-16

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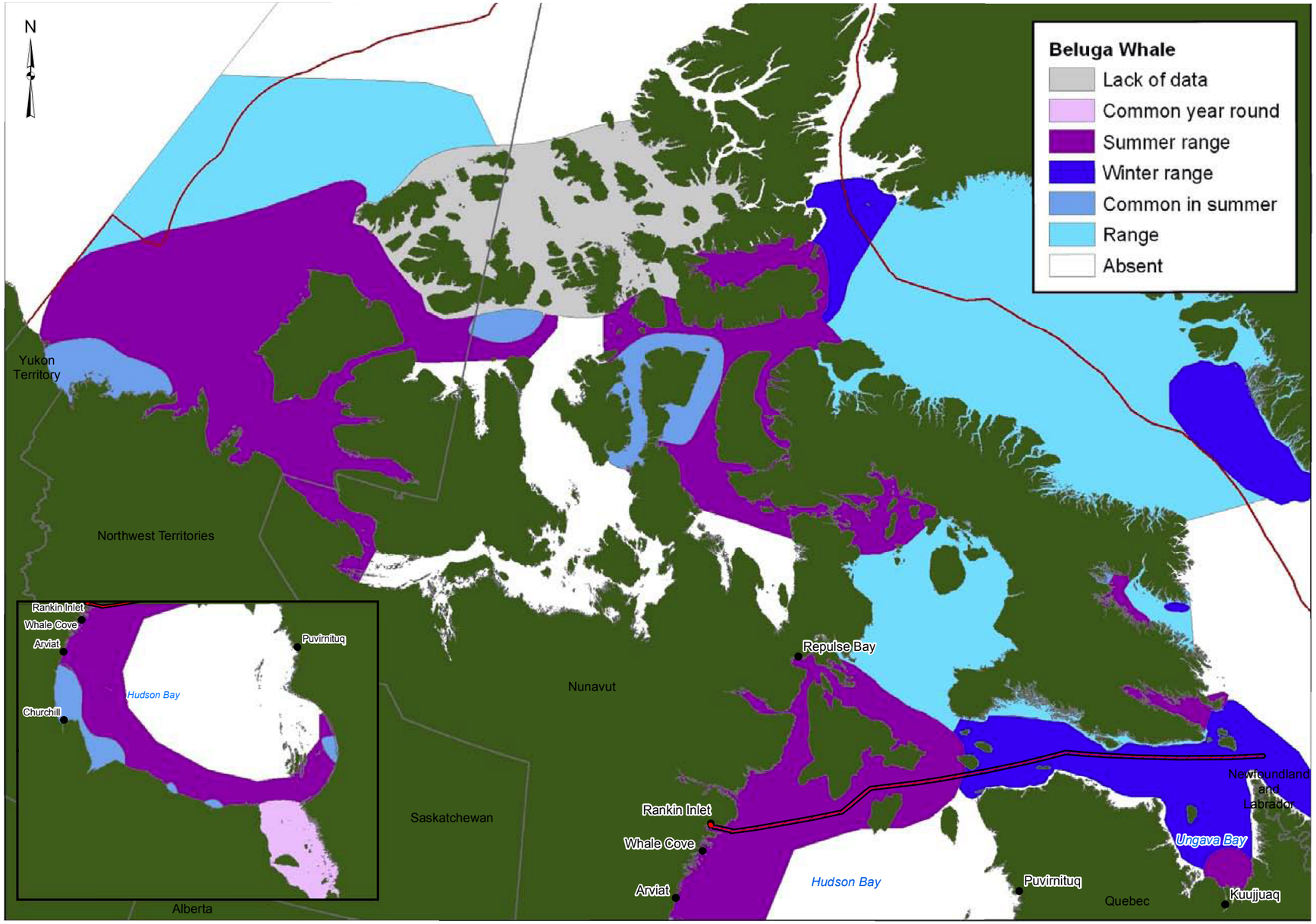
Beluga whale (Delphinapterus leucas)

Beluga whales are circumpolar in distribution, typically occurring in warm shallow estuaries during summer and migrating south during autumn to over-winter in the pack-ice, at established polynyas, or along prominent ice leads where open water conditions prevail (Doidge and Finley 1993; NAMMCO 2005). Beluga whales in the Canadian Arctic are sub-divided into 7 populations based on summer distribution and genetic differences (COSEWIC 2004a). The highest concentrations of belugas in the Canadian Arctic occur in the Hudson Bay region (Stephenson and Hartwig 2010), where animals during summer are observed in concentrated groups along both eastern and western coasts, as well as in James Bay and in nearby Ungava Bay (Gosselin et al. 2013). Each spring and fall, Hudson Strait is considered an important migration route for over 60,000 beluga whales from the Eastern and Western Hudson Bay populations (Gosselin et al., 2013; Richard 2005, 2010). Estuaries serve as important feeding and calving grounds for beluga whales, with their first arrival in these areas timed with the initial ice breakup in late June and their abundance increasing into the summer. Molecular genetic studies indicate at least two populations in Hudson Bay: a western Hudson Bay (WHB) stock and an eastern Hudson Bay (EHB) stock (Brennin et al. 1997; Brown Gladden et al. 1997; De March and Postma 2003). The WHB stock numbers about 57 000 individuals (Richard 2005). Genetic studies (Turgeon et al. 2012) and satellite telemetry (Bailleul et al. 2012) have shown that the two stocks overwinter together, where interbreeding likely occurs. Beluga whales in James Bay appear to constitute a distinct breeding population (Postma et al. 2012).

Most beluga whales present during summer in the Hudson Bay region belong to the WHB stock and occur in shallow coastal waters along western Hudson Bay (Martin et al. 2001), concentrating in the Churchill, Nelson, and Seal River estuaries (Stephenson and Hartwig 2010). The most recent population estimate for the WHB population was estimated at approximately 57,300 animals (95% C.I.: 37,700 to 87,100) (Richard 2005), making this stock of beluga the most abundant cetacean species in the region. Individuals from the EHB stock occur during summer along the shores of eastern Hudson Bay, including the Nastapoka River and the Little Whale River estuaries in northeastern Nunavik (Quebec's Arctic region) (Stephenson and Hartwig 2010). The EHB stock, currently listed as endangered by COSEWIC, was depleted by intensive commercial hunting between the 1860s and the early 1900s and has decreased from an estimated pristine population size of 12,500 to about 3,000 individuals in 2009 (Hammill et al. 2009). Aerial line transect surveys conducted in 2011 provided revised abundance estimates of the EHB stock at 3,351 animals (CV 48.9%; 95% CI: 1552 to 7855), which included correction factors for submerged animals and an additional 354 individuals counted during dedicated surveys in Little Whale River estuary (Gosselin et al. 2013). An uncorrected density estimate of 0.02 individuals / km^2 (CV 47.1%) was reported for EHB beluga whales in the eastern Hudson Bay survey area (Gosselin et al. 2013). The 2011 EHB abundance estimate is higher than that of 2008 (2,646 individuals; Gosselin et al. 2009), lower than that of 2004 (4,274 individuals; Gosselin 2005), and in line with model predictions of the stock abundance for 2011 (Doniol-Valcroze et al. 2011).

Belugas have been observed in many areas of Hudson Strait during the summer months (July and August), and even throughout the fall from September to November (Lewis et al. 2009). Migration is believed to begin northward along the coast of Hudson Bay during late August / early September (COSEWIC 2004a). In early August, satellite tagging studies and aerial surveys indicate a behavioural shift with beluga starting to migrate from southwestern Hudson Bay estuaries (e.g., Seal, Churchill and Nelson rivers; Sergent 1973; Smith 2007). Most beluga have left Hudson Bay by early September, with some following the west coast of Hudson Bay northward into Rankin inlet, while others mover eastward along the southern coast of Hudson Bay then northward along the Nunavik coastline or crossing Hudson Bay via offshore waters (Smith 2007). In late

September, beluga whales tagged in eastern Hudson Bay begin migrating northward along the coast and move through Hudson strait in the months of October and November (Lewis et al., 2009). Although some beluga whales have been reported to overwinter in polynyas in northwest Hudson Bay and in James Bay, in general, beluga whales over-winter in highly productive areas in Hudson Strait, Davis Strait, and Baffin Bay (Gosselin et al. 2009; Hammill and Lesage 2009; Hammill et al. 2009; DFO 2010a; Stephenson and Hartwig 2010). Smith (2000) suggests that it appears that the Western Hudson Bay, Eastern Hudson Bay, Ungava Bay and possibly James Bay stocks join together to winter in Hudson Strait. Figure B-17 provides an overview of beluga whale distribution in the RSA based on historical sightings, current scientific knowledge, and IQ. The presence of beluga whales along the shipping corridor is thought to be low, given their general distribution pattern and preference for shallow nearshore waters.



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF BELUGA WHALES (*Delphinapterus leucas*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	24 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DRW	18 Jan. 2013		

FIGURE B-17

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1535029_WL_Tech_Sup\02_PRODUCTION\5000\MXD\Report\1535029_Figure_B-17_Distribution_of_Beluga_Whales.mxd

Beluga whales are harvested year-round by most coastal Inuit communities (20 out of 28) (Table B-4) (Priest and Usher 2004). During summer, they are mostly hunted along the western coast of Hudson Bay up to 35 km offshore (Canadian Circumpolar Institute 1992) from Arviat to Cape Fullerton. They are hunted primarily for their tusks and their meat. The meat is eaten or fed to dogs.with (Born *et al.* 1995).

Over the 5-year period from 1996 to 2001, the total annual mean number of beluga whales taken through hunting was approximately 1,339 for all of Nunavut, whereas annual rates of belugas harvested from the community of Rankin Inlet ranged from 22 in 1998 to 1999 to 116 in 1999 to 2000 (Priest and Usher 2004). Subsistence harvest of beluga whales by Nunavik Inuit communities is directed towards a mixture of the WHB and EHB stocks, with the reported 2010 harvest consisting of 45 beluga whales taken near Sanikiluaq (Belcher Islands), 16 in the eastern Hudson Bay area, 15 in Ungava Bay, 146 in Hudson Strait in the spring and 58 in the fall (Doniol-Valcroze et al. 2011).

Narwhal (*Monodon monoceros*)

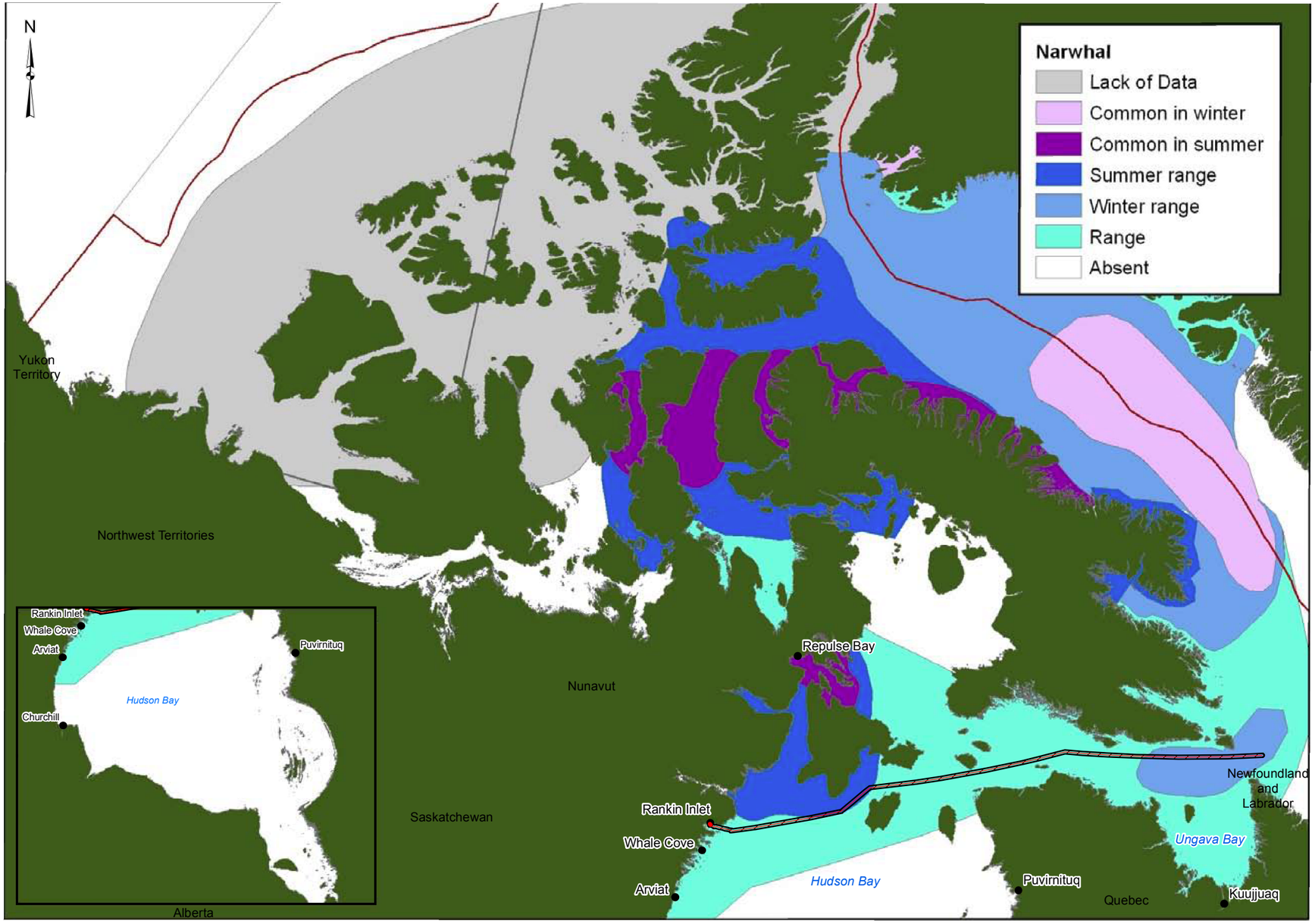
Two of 3 recognized populations of narwhals occur in the Canadian Arctic (Baffin Bay and Hudson Bay), with the third stock residing in East Greenland (COSEWIC 2004b). The populations are distinguished by means of their summer distribution, although the degree of genetic interchange between the 3 stocks is poorly known. The summer range of northern Hudson Bay narwhals includes the waters surrounding Southampton Island, with the larger aggregations in Repulse Bay, Frozen Strait, Western Foxe Channel, and Lyon Inlet (Figure B-18). Most narwhal are assumed to winter in eastern Hudson Strait and range over an area of roughly 250 000 km² (COSEWIC 2004b), while some occur in open leads and polynyas in northern Hudson Bay and western Hudson Strait. The core summering areas potentially overlap with the proposed open-water shipping route between Rankin Inlet and eastern Hudson Strait (Figure B-18).

Little information is known on narwhal habitat requirements. Throughout the year, they appear to be closely associated with the Arctic pack-ice, following the distribution of the ice and moving towards coastal areas when these are ice free. In summer, they appear to prefer coastal areas and ice-free shallow bays. During freeze-up, the coastal areas are abandoned, and the narwhals move offshore (Heide-Jørgensen 2002). During their fall migrations, and later while wintering in the pack ice, narwhals tend to prefer deep fjords and the continental slope, where depths range from -1000 to -1500 m and upwelling zones may increase biological productivity. The quality of sea-ice habitat, particularly the presence of leads in fast-ice and the density of broken pack-ice, appears to highly influence habitat selection (COSEWIC 2004b). Given that narwhal are an ice-associated species, it is likely that potential effects of climate change will result in changes to their habitats, prey availability, and increased natural mortality and may lead to changes in abundance, distribution and stock structure (Laidre and Heide Jorgensen 2005, Laidre et al. 2008). Narwhals generally travel in small groups in summer (<10 individuals), but gather in concentrations of many hundreds of animals during migrations in the spring and fall.

In Nunavut, local residents and scientists have observed killer whales feeding and hunting on marine mammals including narwhals (Steltner et al. 1984; Campbell et al. 1988; Stewart et al. 1995; Laidre et al. 2002; Higdon and Ferguson, 2009). Killer whales may be an important predator of narwhals, as indicated by their evasive behavioural responses when killer whales are nearby (Campbell et al. 1988; Laidre et al. 2002). This evasive behaviour may lead to more narwhals being available to hunters as narwhals tend to seek protection near shorelines, in bays or in inlets when killer whales are present. DFO is working with Nunavut HTOs to gather information on killer whale abundance and distribution in Nunavut, to evaluate their impact on their prey (Ferguson et al. 2012, 2011, Higdon et al. 2011).

Mating in narwhals occurs between March and May, and calving occurs in July and August. Since the lactation period exceeds 12 months, the interval between successive conceptions is usually 3 years, but about 20% of females conceive at the first breeding season following birth of their calves (Heide-Jorgensesn 2002). The basic life history features of the narwhal are similar to those of other medium-sized toothed whales (Hay 1985), with long life spans and sexual maturity estimated to be 6 to 7 years for females and 9 years for males (Garde et al. 2007). Narwhals feed heavily during migrations, but very little during the open water season (Hay and Mansfield 1989). Fish, squid, and shrimp make up the narwhal diet, particularly Arctic cod and polar cod (Heide-Jorgensen 2002). Their main predators are killer whales, polar bears, and humans, and possibly occasionally Greenland sharks and walruses (Hay and Mansfield 1989). Narwhal are harvested by coastal Inuit communities in Nunavut throughout the year under a quota system. The blubber is highly prized by the Inuit for food and is consumed locally or traded to other Inuit communities. The meat is also consumed as food. Narwhal tusks are a valuable economic commodity. Coral Harbour, Chesterfield Inlet, Rankin Inlet, Cape Dorset, Whale Cove, Kimmirut, Arviat, Baker Lake, and Hall Beach.

In 2008, DFO conducted a survey of the summer aggregation area for the Northern Hudson Bay narwhal population. Given apparent defects in the 2008 survey and uncertainty in the results, including the estimation of sustainable catches, a new survey was recommended (DFO 2012a,b). In August 2011, DFO conducted additional aerial surveys of the Northern Hudson Bay summer aggregation area. The 2011 surveys of the summering aggregations of Northern Hudson Bay narwhals produced a population estimate of 12,485 (95% CI: 7,515 to 20,743) (DFO 2012a). On the basis of this survey, an annual Total Allowable Landed Catch (TALC) of 157 narwhals for the Northern Hudson Bay population was allocated (DFO 2012a). In northern Hudson Bay, the harvest quota is to be shared among hunters in Repulse Bay, Coral Harbour, Chesterfield Inlet, Rankin Inlet, Cape Dorset, Whale Cove, Kimmirut, Arviat, Baker Lake, and Hall Beach (DFO 2012b). COSEWIC (2004b) currently recognizes narwhal in the Canadian Eastern Arctic as a species of “Special Concern”.



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF NARWHAL (*Monodon monoceros*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.	1535029	FILE No.		
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	24 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-18

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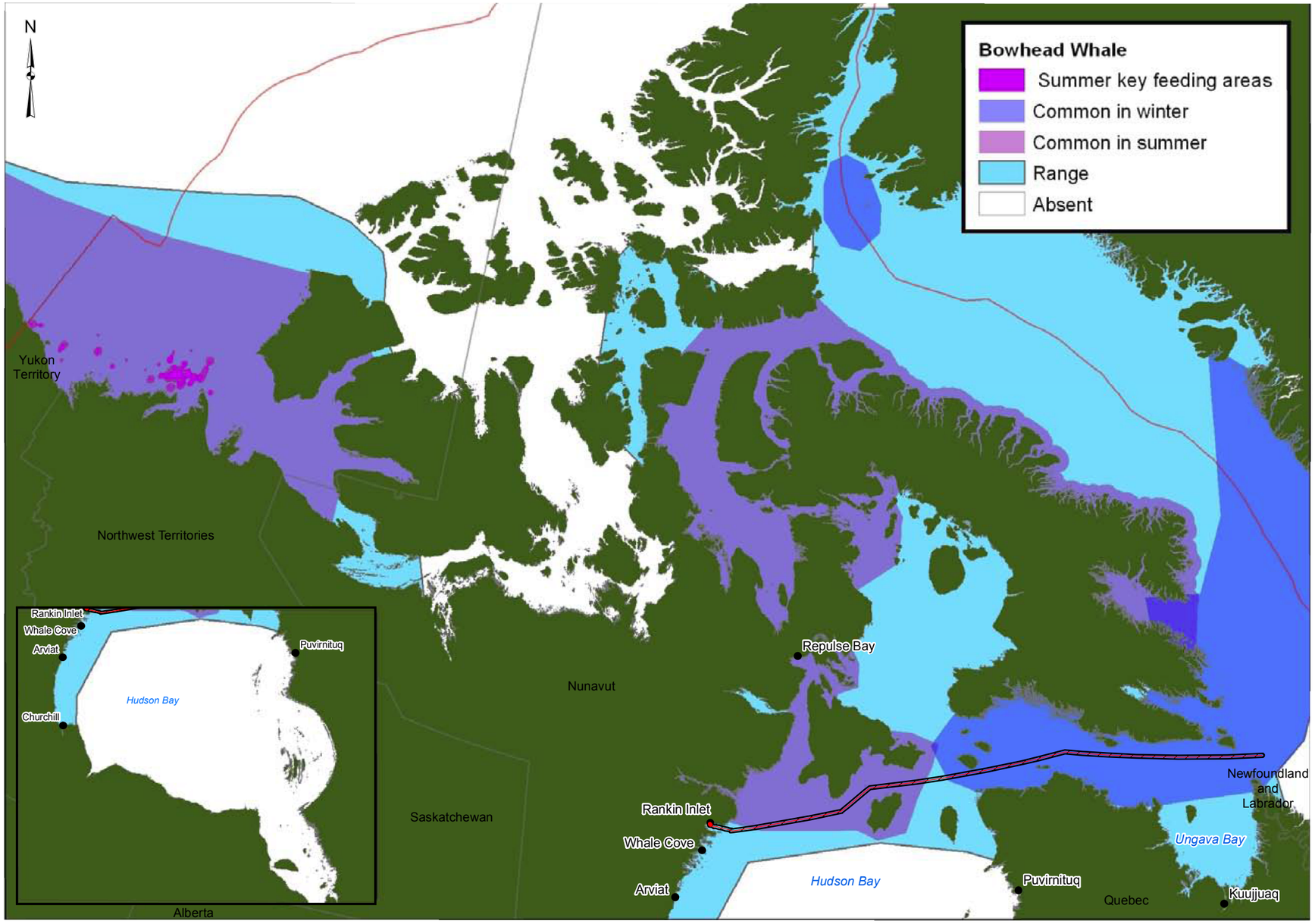
Bowhead whales (*Balaena mysticetus*)

The bowhead whale is the only baleen whale that occurs in circumpolar Arctic waters year-round. This species is especially well adapted to life in seasonally ice-covered seas by having no dorsal fin, a thick blubber layer, a low surface area to volume body ratio, and an enlarged head that they use to break through thick sea-ice (Montague 1993). Males tend to be smaller than females and reach sexual maturity at 12 to 13 m body length (Koski et al. 1993). Females reach sexual maturity at 12 to 14 m (Koski et al. 1993), which corresponds to >25 years in age (Rosa et al. 2004). There is evidence that the lifespan of bowhead whales can exceed 150 years (DFO 1999). Mating is believed to occur in February or March, with calves born from April to early June. Calves remain with their mothers for nearly a year (Koski et al. 1993).

Bowhead whales that occur in Hudson Bay/Hudson Strait belong to the Eastern Canadian Arctic-West Greenland (EC-WG) population, 1 of 4 populations present in Arctic waters. This population has a home range of approximately one million square kilometres, with summering grounds occurring in western Baffin Bay, the Canadian High Arctic, northern Foxe Basin, and northwestern Hudson Bay (COSEWIC 2009). Thus, impacts to the EC-WG bowhead whale population due to the Project have the potential for transboundary effects. Studies indicate that EC-WG bowhead whales travel large distances (Dueck et al. 2006; Ferguson et al. 2010a), may be spread over thousands of kilometres, and may segregate by size, sex, or reproductive status (Finley 2001). In the Hudson Bay region there are important areas of aggregation including the spring nursery area in northern Foxe Basin, northwest Hudson Bay for summering locations and Hudson Strait for wintering habitat in (Higdon and Ferguson 2010). Historic bowhead concentration areas, including possible nursery areas, include Roes Welcome Sound and around Rankin inlet (Reeves and Cosens 2003). The fall migration occurs over 2 to 3 months starting in late August/September. Wintering grounds are located in areas of unconsolidated pack-ice, such as northern Hudson Bay, Hudson Strait, central Davis Strait, southern Baffin Bay, and off West Greenland. These areas provide shelter and protection from their main predator killer whales. During spring, whales from southeastern Baffin Island travel to summering areas in Prince Regent Inlet and Gulf of Boothia by either a southern route via Hudson Strait and Fury and Hecla Strait, or a northern route via Lancaster Sound. In April and May, some bowheads move west transiting through Hudson Strait to their summer aggregation areas in northwest Hudson Bay (Reeves and Mitchell 1990) and also to northern Foxe Basin (NWMB 2000). Bowhead cow-calf pairs have been observed using the flow edge as a nursery area in northern Foxe Basin (Cosens and Blouw 2003). Figure B-19 provides an overview of bowhead whale distribution in the RSA based on historical sightings, current scientific knowledge, and IQ. Seasonal migration and general distribution patterns of EC-WG bowhead whales are thought to be largely dictated by ice conditions (Ferguson et al. 2010a), water depth and temperature (Thomson et al. 1986; Finley 2001; Harwood et al. 2010), predators (NWMB 2000; Finley 2001; Laidre et al. 2008; Ferguson et al. 2010b), and abundance and distribution of their main prey species including euphausiids, copepods, and epibenthic organisms (mysids and gammariid amphipods) (Thomson et al. 1986; LGL 1987; Finley 2001; Harwood and Smith 2002; COSEWIC 2009).



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISTRIBUTION OF EASTERN CANADIAN ARCTIC / WEST GREENLAND BOWHEAD WHALES (*Balaena mysticetus*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.	1535029		FILE No.	
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	24 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

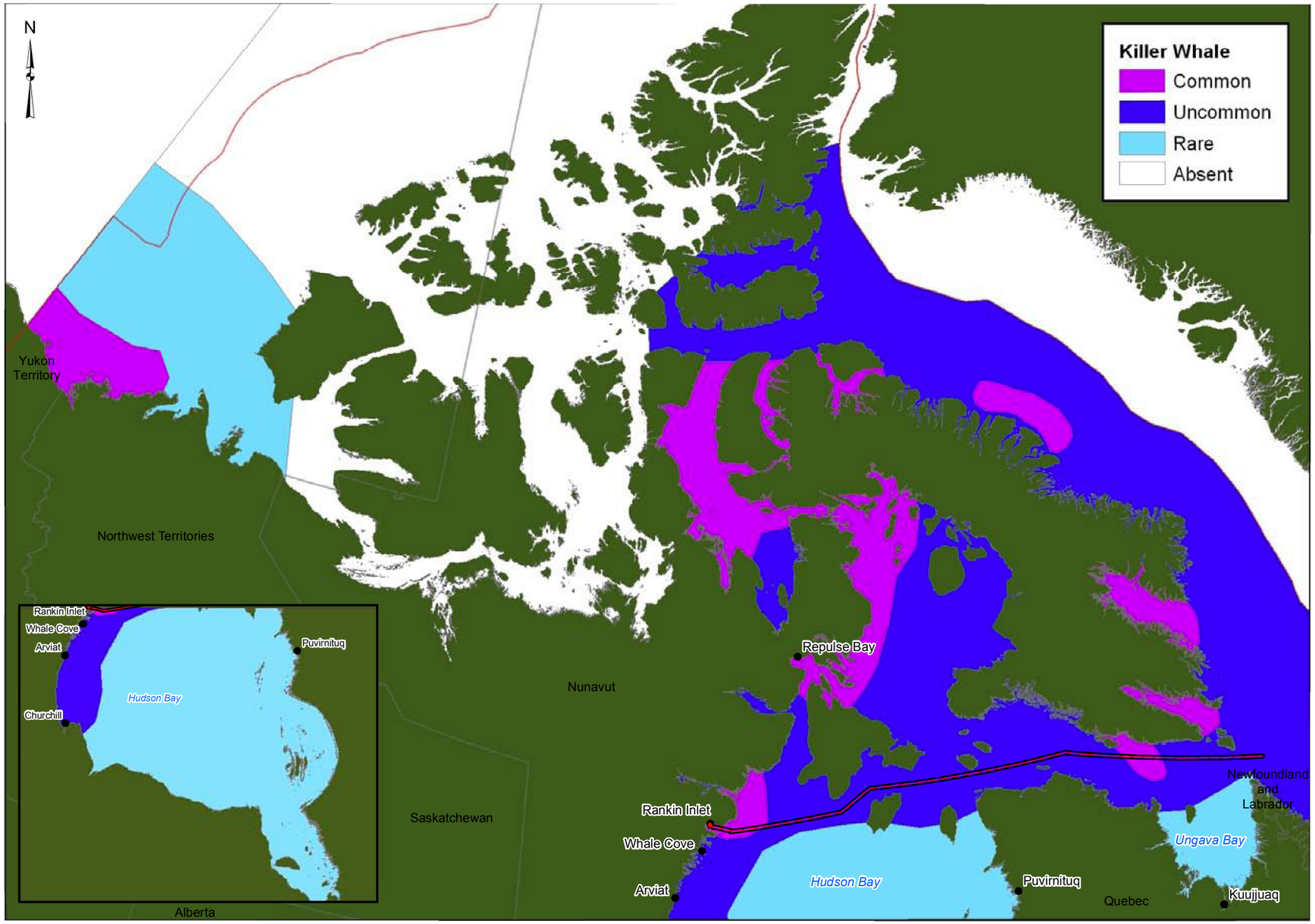
FIGURE B-19

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1535029_WL_Tech_Sup\02_PRODUCTION\5000\MXD\Report\1535029_Figure_B-19_Distribution_of_Bowhead_Whales.mxd

The population of EC-WG bowhead whales is currently estimated at 6,344 animals (95% CI 3119 to 12 906; COSEWIC 2009). EC-WG bowhead whales are currently designated as 'special concern' (COSEWIC 2009) and are being considered for listing under the federal SARA. EC-WG bowhead whales currently support a limited subsistence harvest by Inuit in Nunavut, which is co-managed by the Nunavut Wildlife Management Board (NWMB) and DFO. The population crosses international boundaries and in 2007, the International Whaling Commission granted Greenland a quota of two animals per year from this population pending annual review of the hunt sustainability.

Killer whale (Orcinus orca)

Killer whales are widely distributed throughout the Canadian Arctic, where they likely prey on a large variety of marine mammal species, including those harvested by coastal Inuit communities. They are known to migrate into Hudson Bay, Foxe Basin, and the central High Arctic each summer when open-water conditions allow (Dunbar and Moore 1980; Higdon 2007; COSEWIC 2008a), likely seeking out prey, such as seals (Leatherwood et al. 1976) and juvenile bowhead whales (Finley 2001). Declining summer sea ice may be allowing killer whales to expand their range in the Arctic, as they have been observed with increasing frequency in the Hudson Bay region (Higdon 2007). There is little available information on abundance or density of killer whales in Nunavut, and it is unknown if increases in sightings are representative of a growing population (Higdon 2007). The Inuit Traditional Ecological Knowledge of Killer Whales (Westdal 2009) summarised information on killer whales provided by workshop participants from Rankin Inlet, Arviat, Repulse Bay, Igloolik, and Hall Beach. Participants from Rankin Inlet indicated that killer whales have been around for a long time. In the past, there were not many killer whales seen near Rankin Inlet. About half the participants said that sightings have increased in recent years, and two participants mentioned that killer whales have been sighted by people in the community every summer since 2000 (Volume 9, Section 9.3.1.3.3.3). Figure B-20 provides an overview of killer whale distribution in the RSA based on historical sightings, current scientific knowledge (satellite telemetry studies and prey distribution), and IQ. Killer whales are not actively hunted by coastal Inuit communities in the Canadian Arctic.



LEGEND

- LOCAL STUDY AREA (LSA)
- MARINE REGIONAL STUDY AREA (MARINE RSA)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISTRIBUTION OF KILLER WHALE (*Orcinus orca*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	24 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE B-20

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1535029_WL_Tech_Sup\02_PRODUCTION\5000\MXD\Report\1535029_Figure_B-20_Distribution_of_Killer_Whales.mxd

Polar bear (Ursus maritimus)

Polar bears in the Canadian Arctic are segregated into 13 sub-populations, with those occurring in the RSA belonging to the Western Hudson Bay (WHB), Foxe Basin (FB), and Davis Strait (DS) sub-populations (Thieman et al. 2008). Delineation of the geographic separation of these three sub-populations is shown on Figure B-21. Polar bears generally occur at low densities throughout their range and are most abundant in shallow water areas near shore or where currents or upwellings increase biological productivity near ice edges associated with open water, polynyas, or lead systems (Schliebe et al. 2008). The productivity of polar bear habitat is closely linked to the physical attributes of sea ice and the density and distribution of ice-dependent seals, especially ringed and harp seals (COSEWIC 2008b; Peacock et al. 2013). From early winter until spring, polar bears are dispersed predominantly over sea-ice along the coast where they may range >200 km offshore. The annual ice melt generally forces polar bears in Hudson Bay and James Bay ashore from mid-July through late August, when they are at their maximum yearly weight from feeding on fat, newly-weaned seals. IQ on aspects of climate change from residents of Baker Lake and Arviat suggests that ice is melting earlier in recent years (as early as June) and may be forcing bears to retreat ashore sooner than in previous years (GN 2005). Polar bears tend to show long-term site fidelity with respect to preferred terrestrial summering grounds and spend several months of the open-water season in coastal areas, with some individuals also found inland (COSEWIC 2008b). During the summer, the WHB sub-population tends to congregate on coastal capes and headlands between Cape Churchill and Arviat (Figure B-22; Stapleton et al. 2014; Stirling et al. 1999). Arviat residents have reported that polar bears are becoming more common in areas in which they have not been observed previously, particularly during the summer months (GN 2005). The FB polar bear sub-population concentrates along the coastline during late summer and is observed in highest densities on Southampton Island, on several islands near Lyon Inlet, and on coastal islands throughout the Foxe Basin area (Figure B-23; Garshelis et al. 2012). In the Project area, the DS sub-population congregates along coastal areas of Frobisher Bay, on Akpatok Island, and along the northern tip of Ungava Bay (Labrador / Quebec border) at the entrance to Hudson Strait (Figure B-23; Peacock et al. 2013). During the open-water season, polar bears also have been observed offshore swimming in ice-free waters of Hudson Bay as reported during aerial surveys and other field investigations being conducted in the region (S. Atkinson 2013, pers. comm.). The majority of these sightings occurred less than 5 km from shore and in waters adjacent to larger islands (S. Atkinson 2013, pers. comm.; M. Dyck 2014, pers. comm.). No open-water surveys targeting polar bears have been conducted during the summer, and, therefore, no at-sea density estimates are available for this species during this period. However, the number of polar bears occurring offshore during the open-water summer season is thought to be minimal (S. Atkinson 2013, pers. comm; M. Dyck 2014, pers. comm.).

During fall, there is a gradual northward movement of the WHB subpopulation along the south coast of Hudson Bay, as bears gather to await the formation of new sea ice in November (Amstrup et al. 2007). Some polar bears tagged in the Churchill region moved northward along the Kivalliq Coast as far as Chesterfield Inlet (Stirling et al. 1999). Polar bears may overlap with the RSA and LSA in Melvin Bay during the winter time. During winter and spring, polar bears belonging to the Davis Strait sub-population use the sea ice along Davis Strait, Labrador Sea, and west to Ungava Bay and eastern Hudson Strait (Peacock et al. 2013). During winter, the FB sub-population generally is restricted within the mouth of Hudson Strait (COSEWIC 2008b). Figure B-23 provides an overview of polar bear distribution in the RSA based on historical sightings, current scientific knowledge, and IQ.

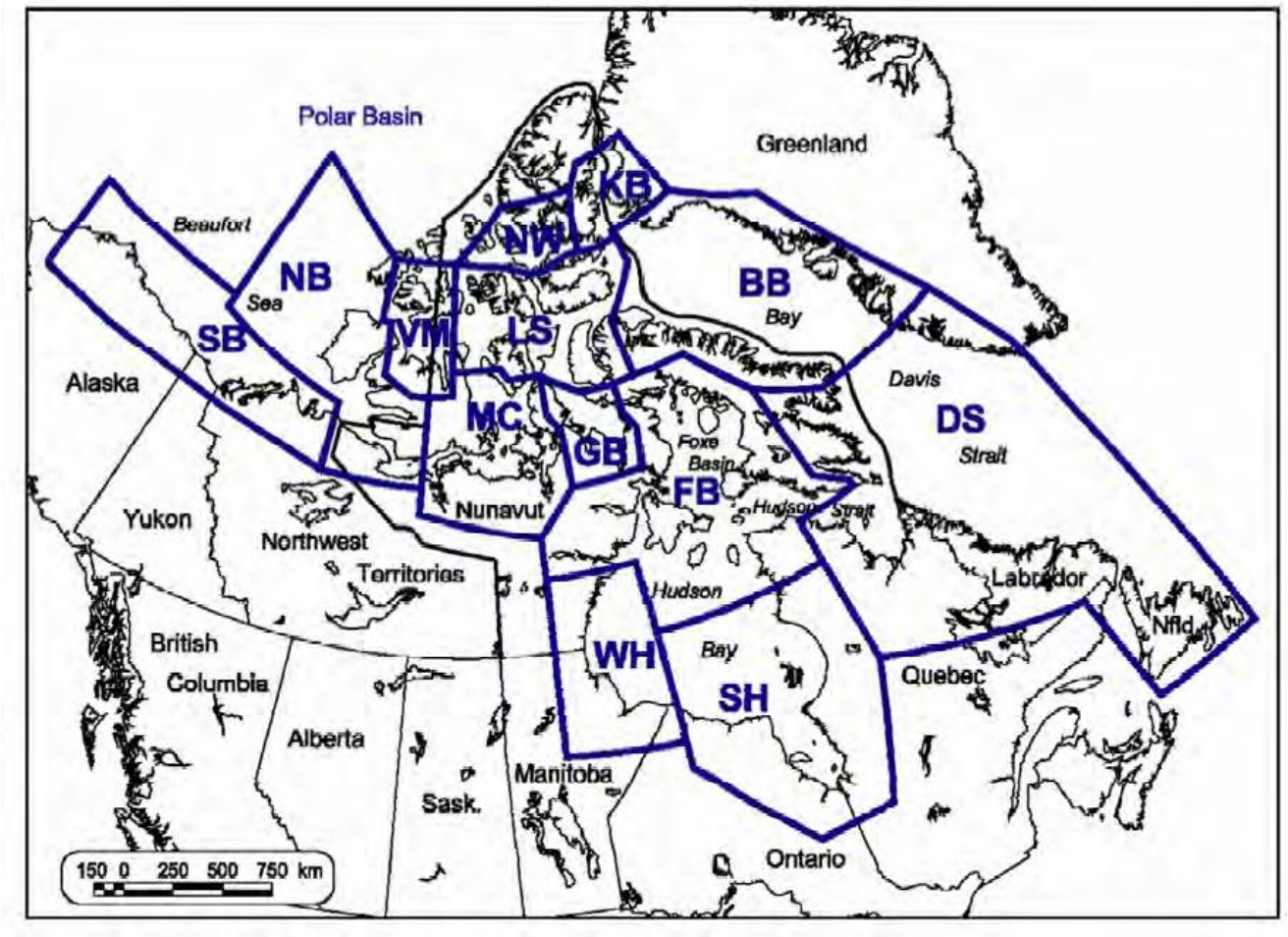


Figure B-21: Canadian Sub-populations of Polar Bears. Abbreviations of Delineated Sub-populations include Viscount Melville Sound (VM), Norwegian Bay (NW), Kane Basin (KB), Lancaster Sound (LS), Baffin Bay (BB), Davis Strait (DS) Southern Hudson Bay (SH), Western Hudson Bay (WH), Foxe Basin (FB), Gulf of Boothia (GB), M'Clintock Channel (MC), Southern Beaufort Sea (SB), and Northern Beaufort Sea (NB) (adapted from COSEWIC 2008b)

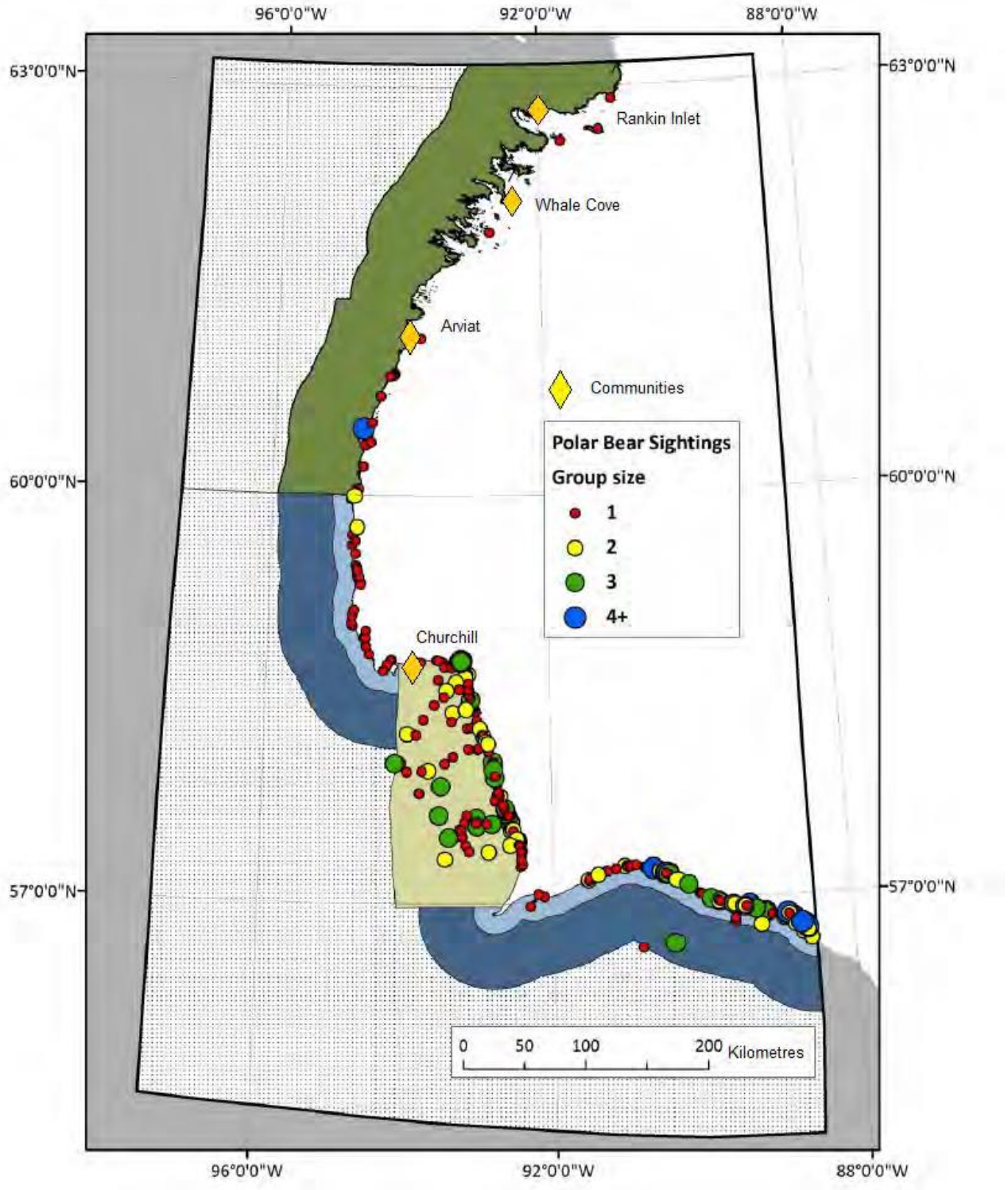
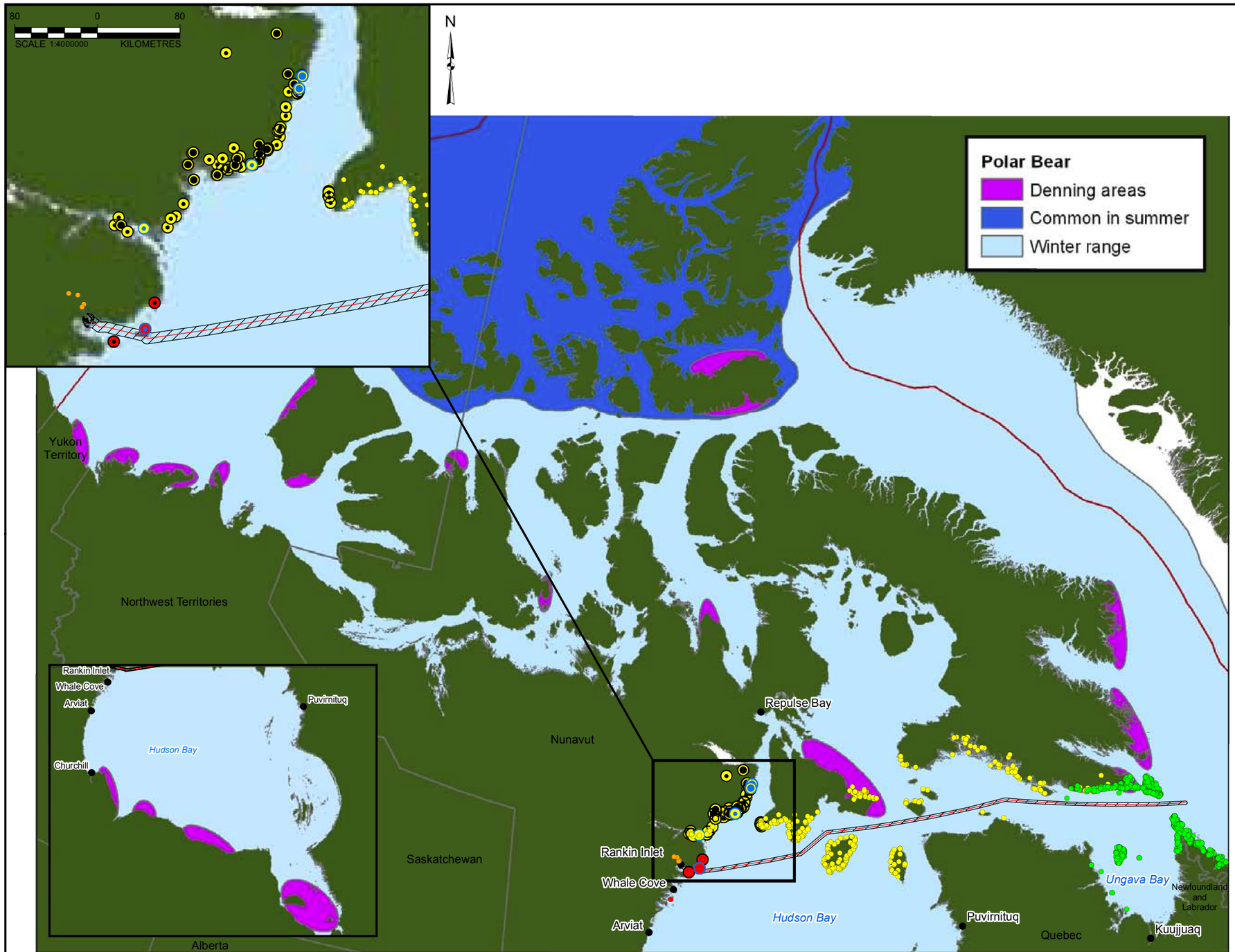


Figure B-22: Polar Bear of the Sightings Recorded During Aerial Surveys in the Western Hudson Bay in August of 2011 (extracted from Stapleton et al. 2014)



LEGEND

POLAR BEAR SIGHTINGS

- 2009/2010 AERIAL SURVEY SIGHTINGS DURING LATE SUMMER (GN UNPUBLISHED DATA)
- 2005-2007 MARK CAPTURE-RECAPTURE SURVEY (GN UNPUBLISHED DATA)
- WEST HUDSON BAY - AUGUST 2011 AERIAL SURVEY (GN UNPUBLISHED DATA)
- SUMMER POLAR BEAR SIGHTINGS COLLECTED DURING FIELD WORK
- 1 SPOTTING
- >1 SPOTTING
- SPOTTED IN WATER
- SHIPPING ROUTE (APPROXIMATE)

REFERENCE

PROVINCIAL DATA OBTAINED FROM E.S.R.I.
BASE IMAGE OBTAINED FROM STEPHENSON AND HARTWIG, 2010
GOVERNMENT OF NUNAVUT (GN) UNPUBLISHED DATA PROVIDED BY M.DYCK AND S.STAPLETON
DATUM: NAD 83 PROJECTION: CANADA ALBERS EQUAL AREA CONIC

240 0 240
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISTRIBUTION OF POLAR BEAR (*Ursus maritimus*) IN THE MARINE RSA AND ADJACENT ARCTIC WATERS (ADAPTED FROM STEPHENSON AND HARTWIG 2010, GN UNPUBLISHED DATA)

Golder Associates

PROJECT NO.	1535029	FILE No.		
DESIGN	AK	19 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	24 Jul. 2012		
CHECK	KZ	16 Feb. 2014		
REVIEW	DRW	16 Feb. 2014		

FIGURE B-23

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When the majority of individuals move back onto the ice in November during freeze–up, pregnant females remain on land near the coast to dig maternity dens in deep snowdrifts and frozen ground. Breeding occurs in March to May, implantation is delayed until fall, and birth is generally thought to occur from late November to mid-January. Although some cubs are born in earth dens, most births occur in snow dens that may be occupied for 5 to 6 months during the maternal event (Schliebe et al. 2008). Only pregnant female polar bears den for this extended period of time, during which time they rely on fat stores for energy and sustenance. The average litter size is less than 2. Cubs are dependent upon mothers until after the start of their third year of life. Age of first reproduction is normally 5 to 6 years for females. These factors contribute to the low reproductive potential for the species (Schliebe et al. 2008).

The WHB subpopulation was shown to have declined by 22% between 1987 and 2004, from approximately 1294 indiviudals in 1,987 to 935 individuals in 2004 (Regehr et al. 2007). However, recent aerial surveys conducted during summer of 2011 estimate abundance of the WHB sub-population at just over 1000 animals (Stapleton et al. 2014). The highest concentrations of bears occurred along the coasts and surrounding islands, particularly in the area south of Arviat. This study is supported by IQ shared by Inuit Elders indicating that the number of polar bears and dens along the western coast of Hudson Bay are increasing (COSEWIC 2008b). Results from a compilation of interviews conducted with local Inuit by the Nunavut Tunngavik Incorporated (NTI) indicate that polar bear numbers in the Rankin Inlet region have been increasing since the 1980s (GN 2005).

The DS sub-population was recently estimated by Peacock et al. (2013) by compiling 35 years of mark-recapture studies. This sub-population was estimated to number 2,158 individuals (±180 SE) in 2007 - an increase from the last population assessment conducted in 1970. The population is thought to be influenced by low recruitment rates, average adult survival rates, high population density when compared to other sub-populations in the area, as well as high prey density but variable ice conditions. Peacock et al. (2013) suggest that the DS subpopulation appears to be stable and likely may be experiencing the effects of density dependence.

Mark-recapture surveys conducted from 1989 to 1994 estimated the FB sub-population at 2,197 individuals (+256 SE) (Taylor et al. 2006). In 2004, the estimated abundance of this sub-population had increased to 2,300 animals. Information from traditional knowledge studies suggested the population was increasing and the opinion of various scientists agreed that an increase may have occurred due to low historical harvests rates (COSEWIC 2008b). Recent aerial surveys conducted during the late summer of 2009 and 2010 generally agreed with these previous population assessments, and estimate polar bear abundance for the FB subpopulation at approximately 2580 individuals (95% CI about 2,100 to 3,200),; Garshelis et al. 2012). The FB sub-population, characterized by average litter sizes, robust annual growth rates, and good body conditions (Garshelis et al. 2012), appears to be near stable taking into account current harvest levels.

Polar bears are harvested by coastal Inuit communities in Nunavut throughout the year under a quota system. The polar bear quota increased from 8 to 21 bears from the 2010-2011 to the 2011-2012 annual quota for the Western Hudson Bay sub-population, which includes the area around the communities of Arviat, Baker Lake, Whale Cove, Rankin Inlet, and Chesterfield Inlet (GN 2011). The 2013-2014 recommended quota is 24 bears (GN 2013). The number of polar bears hunted in Rankin Inlet from 1996 to 2001 ranged from 1 to 13 bears (Priest and Usher 2004). The annual 2013-2014 hunting quota for the FB subpopulation is 106 bears and includes 7 communities in Nunavut and 4 in Quebec (GN 2013; COSEWIC 2008b). The annual quota for the DS

subpopulation was 61 bear for 2012-2013; the recommended 2013-2014 quota is 48 bears (GN 2013). COSEWIC (2008b) currently recognizes polar bears in the Canadian Arctic as a species of “Special Concern”.

Hearing Abilities of Marine Mammals

Marine mammals are acoustically diverse, with wide variations in ear anatomy, frequency range, and amplitude sensitivity (Ketten 1991). An animal’s sensitivity to sound varies with frequency. Response to underwater sound likely depends strongly on the presence of and level of sounds in the frequency bands or range of frequencies to which the animal is most sensitive (Richardson et al. 1995a). The general trend is that larger species, such as bowhead whales, tend to have better hearing sensitivities at lower frequency ranges than smaller species, such as beluga whales and narwhal. Hearing abilities are generally only well understood in certain captive species where audiograms (plots of hearing threshold at different sound frequencies) have been developed based on behavioural response studies (reactions to sound) and electrophysiological experiments (measuring auditory evoked potentials) (Erbe 2002).

Toothed Whales (Beluga, Narwhal, Killer Whale)

The hearing abilities of beluga whales and narwhals at high frequencies are exceptionally well developed. This likely is related to their use of high frequency sounds for echolocation. Audible frequencies for toothed whales range from 80 Hz to 150 kHz, but they are most sensitive to sounds in the frequency range of 8 to 90 kHz (Richardson et al. 1995a).

Beluga whales are considered ‘mid-frequency cetaceans’ (Southall et al. 2007), meaning their most sensitive hearing range occurs in the mid-frequency range. Using sound for foraging, navigation, and social purposes, they are a highly vocal species with call types consisting of echolocation clicks, pulsed tones, whistles, and noisy vocals. Echolocation clicks are produced in the 40 to 60 kHz and 100 to 120 kHz range, with source levels reported at 206 to 225 dB re 1 µPa at 1 m (Au 1993). Non-echolocation calls (e.g., whistles) are centered on frequencies below 6 kHz, but may sometimes attain frequencies up to 14 kHz (Schevill and Lawrence 1949; Sjare and Smith 1986), with dominant frequencies ranging between 400 Hz and 8.3 kHz. Belugas can detect frequencies as low as 40 to 75 Hz; however, their sensitivity at this range is poor (Awbrey et al. 1988). Beluga whales have been documented to communicate with one another at distances of over 300 to 500 m (Bel’kovich and Shchekotov 1992).

No behavioural or electrophysiological audiograms are available for narwhals. Their vocalizations include echolocation clicks, pulsed tonal calls, and whistles. Narwhal echolocation sounds have been recorded at 40 kHz, with source levels reported at 218 dB re 1 µPa at 1 m (Mohl et al. 1990). Pulsed tones are produced in the 500 Hz to 5 kHz range, and whistles have been reported in the 300 Hz to18 kHz range, with dominant frequencies occurring at 300 Hz to10 kHz (Ford and Fisher 1978).

Baleen Whales (Bowhead Whales)

On a comparative basis, the baleen whale auditory system does not appear as specialized as that of toothed whales (Ketten 1997). Audiograms are not available for baleen whales due to the lack of these animals in captive settings, which is required (based on current technology) to conduct behavioural and electrophysiological hearing studies. Hearing thresholds and frequency sensitivities in baleen whales are thus inferred from anatomical ear structure, vocalizations, and behavioural studies in the wild (Richardson et al. 1995a). In general,

most baleen whale species have been shown to react to frequencies below 1 kHz (Richardson et al. 1995a). They have an estimated auditory bandwidth of 7 Hz to 22 kHz (Southall et al. 2007).

Hearing in bowhead whales can be inferred indirectly by the frequency at which they vocalize and the levels of sound at which behavioural reactions occur. Bowhead whales have been shown to react to sound with dominant frequencies between 50 and 500 Hz (Richardson et al. 1995a). Avoidance behaviour has been reported when bowhead whales were exposed to low broadband sounds of 90 dB re 1µPa (Richardson et al. 1995a). The majority of the sounds produced by bowhead whales are low frequency-modulated calls, with reported frequency ranges of approximately 25 to 900 Hz (Ljungblad et al.1982; Clark and Johnson 1984; Cummings and Holliday 1984). Bowhead vocalizations include pulsive and tonal sounds, the latter either descending, ascending, constant, or inflecting in frequency (Clark and Johnson 1984). The duration of bowhead vocalizations range from short 0.5 second signals to long and melodic 4 to 5 second tones (Clark and Johnson 1984). Most single-note tones carry little sound energy above 400 Hz (Wursig and Clark 1993). Source levels from tonal moans and pulsive sounds range from 128 to 185 dB re 1 µPa at 1 m, with some vocalizations recorded by hydrophones up to 20 km away from calling whales (Clark et al. 1986).

Singing behaviour is considered to be an advanced form of vocalization in baleen whales (Clark 1991). Songs are composed of units, phrases, and themes; units sung in a sequence form phrases, a repetition of a phrase is a theme, and several themes combined create a song that can last several minutes (Payne and McVay 1971). Songs have been documented to change within and between seasons (Clark and Johnson 1984; Würsig and Clark 1993; Tervo et al. 2007).

Pinnipeds (Seals and Walrus)

Underwater hearing sensitivity in seals and walrus falls in between that of baleen and toothed whales, with an estimated auditory bandwidth between 75 Hz and 75 kHz. Phocinid seals, such as the ringed seal and bearded seal, have underwater hearing thresholds between 60 and 85 dB re 1 µPa at 1 m, with flat audiograms between 1kHz and 30 to 50 kHz (Mohl 1968; Terhune and Ronald 1972, 1975; Terhune 1981). Some phocinids have been documented to be able to detect very high frequency sounds up to 180 kHz, although, their sensitivity to sounds above 60 kHz is poor and frequencies cannot be discriminated (Mohl 1968).

Ringed seal vocalizations include barks, clicks, and yelps, all of which occur in the 400 Hz to 16 kHz frequency range, with dominant frequencies concentrated above 5 kHz (Stirling 1973; Cummings et al. 1984). Source levels are between 95 and 130 dB re 1 µPa at 1 m, considerably lower in energy than other marine mammal vocalizations, and likely the reason why ringed seal vocalizations generally are detectable only within 1 km of the source (Cummings et al. 1984).

Bearded seals vocalize in the form of ‘songs’, which are presumed to be associated with territoriality and courtship (Ray et al. 1969; Budelsky 1993). Songs have been recorded at between 20 Hz and 6 kHz, with dominant frequencies occurring at 1 to 2 kHz, and source levels of 178 dB re 1µPa at 1 m (Ray et al 1969; Stirling et al 1983; Cummings et al. 1984). Unlike ringed seals, bearded seal vocalizations can be detected as far as 25 km from the source (Cleator et al. 1989).

Few studies have measured the audiogram of the walrus. In general, walrus have sensitive hearing to low frequency sounds (Kastelein et al. 2002). A study of an 18-year-old captive walrus reported an optimal hearing range between 1 kHz and 12 kHz, with maximum sensitivity (67 dB re 1 µPa at 1 m) occurring at 12 kHz

(Kastelein et al. 2002). Hearing sensitivity fell gradually below 1 kHz and dropped off sharply above 12 kHz (Kastelein et al. 2002). Walrus vocalizations include bell tones (male-specific), clicks, taps, knocks, rasps, and grunts. The dominant frequencies of most vocalizations occur between 400 and 1200 Hz (Ray and Watkins 1975). Clicks and taps are produced in the 100 Hz to 10 kHz range, with dominant frequencies concentrated below 2 kHz. Rasps are produced in the 200 to 600 Hz range, with dominant frequencies occurring between 400 and 600 Hz. The dominant frequencies of grunts occur below 1 kHz (Scheville et al. 1966; Ray and Watkins 1975; Stirling et al. 1983). Vocalizations in walrus are typically associated with herd organization and coordination behaviour (Richardson et al. 1995a).

Polar Bear

Little is known on underwater hearing abilities in polar bears. In-air hearing has been studied on captive subjects (using auditory evoked potentials to produce audiograms) demonstrating that polar bears can likely hear in-air at a slightly wider range of frequencies than humans (up to 25 kHz) and have absolute hearing thresholds below 27 to 30 dB re 20 µPa at 1 m (Nachtigall et al. 2007).

1.3.2.4 Species at Risk

COSEWIC and SARA-listed species potentially occurring within the RSA include 4 marine bird species and 6 marine mammal species, as outlined in Table B-5.

Table B-5: Species at Risk Potentially Occurring in the Shipping Corridor in Hudson Bay / Hudson Straight

Common Name	Species	SARA Status[(a)]	COSEWIC Status[(b)]
Marine Mammals			
Narwhal	*Monodon monoceros*	No status	SC
Beluga whale	*Delphinapterus leucas*	No status	EN – EHB stock SC – WHB stock
Bowhead whale	*Balaena mysticetus*	No status	SC
Polar bear	*Ursus maritimus*	SC – Schedule 1	SC
Walrus	*Odobenus rosmarus*	No status	SC
Killer Whale	*Orcinus orca*	No status	SC
Marine Birds			
Peregrine falcon	*Falco peregrinus tundrius*	SC-Schedule 1	SC
Ross's gull	*Rhodostethia rosea*	TH – Schedule 1	TH
Ivory gull	*Pagophila eburnea*	EN – Schedule 1	EN
Red knot	*Calidris canutus*	EN - *rufa ssp.* – Schedule 1 SC - *islandica ssp.* – Schedule 1	EN - *rufa ssp.* SC - *islandica ssp.*

(a) SARA (Species at Risk Act).The Act is a key federal government commitment to prevent wildlife species from becoming extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity (extracted from SARA 2012).

(b) COSEWIC (Committee on the Status of Endangered Wildlife in Canada) is a committee of experts that assesses and designates which wildlife species are in some danger of disappearing from Canada. It is up to Government to legally protect wildlife species designated by COSEWIC. The potential impacts of legal listing are for Government to analyse, and the Species at Risk Act (SARA) applies only to wildlife species on the SARA legal list (extracted from COSEWIC 2012).

EN=Endangered, SC=Special Concern, TH=Threatened

Mitigation measures will be implemented to avoid or minimize any adverse effects from the Project on species at risk (SAR) in the marine environment regardless of the 'significance' of effects determined as part of the assessment. If marine-based SAR are encountered during the Project, including evidence of a SAR (e.g., dens, nests or eggs of a SAR), the primary mitigation measure implemented will be avoidance. A monitoring program will be undertaken to confirm that mitigation measures are successful. The results of monitoring will be provided to the relevant agency with management responsibility for the applicable SAR involved. Mitigation and monitoring strategies will be consistent with applicable status reports, recovery strategies, action plans and management plans that may become available during the Project.

Detailed mitigation measures proposed for the Project effects are discussed in detail in the sections below. In some instances, mitigation measures for one species are also relevant for other species. Follow-up and monitoring is discussed for all species in Section 8.3.11 of the FEIS.

1.3.2.5 Sensitive/Protected Areas

Measures have been taken by federal, provincial, and territorial governments, non-governmental organizations, as well as international organizations to identify, evaluate and protect areas of biological importance in Nunavut's marine and coastal environment. This section provides an overview of these protected areas in Hudson Bay / Hudson Strait in relation to the proposed shipping corridor (RSA).

Marble Island

Marble Island, located approximately 45 km southeast (offshore) of Rankin Inlet (Figure B-24) in proximity to the existing shipping corridor, was identified during the traditional knowledge study as an important congregation area for whales, seals, and birds (FEIS Volume 9, Section 9.3). This area has a long history of diverse use by Inuit who first came to the island as seasonal hunters, taking advantage of its wide variety of wildlife (Davis 1996). Marble Island is formally listed on the Canadian Register of Historic Places (Parks Canada 2012). Stewart et al. (1991) recommended the Rankin Inlet–Marble Island marine area to Parks Canada for consideration as a national marine park to conserve and protect the following key ecological and cultural features of this area:

- a dense, breeding population of threatened peregrine falcons near Rankin Inlet;
- a large breeding colony of common eider on Marble Island;
- anadromous stocks of Arctic char, which are locally harvested by Inuit communities;
- unique oceanographic conditions influenced by the influx of Chesterfield Inlet waters;
- maritime historical sites at Marble Island from the Knight Expedition and the whaling period including 2 shipwrecks; and
- evidence of historical coastal Inuit cultures (Stewart and Lockhart 2005).

Both the exceptional peregrine population and the maritime historical sites at Marble Island are facing increasing human disturbance and would benefit from the protection afforded by National Parks designation as they are

located near the growing community of Rankin Inlet and are a stop for tourists visiting by cruise ship. The area's rocky Canadian Shield shoreline provides a greater variety of marine habitats than the Churchill-Nelson area. Diana and Meliadine rivers provide small-scale estuarine habitats. This area would afford some protection to historical bowhead whale habitats, although more suitable bowhead whale habitat is present to the north in Roes Welcome Sound. All Project vessels along the shipping route will maintain a minimum distance of 2 km from Marble Island in order to avoid disrupting sensitive marine species located on or around the Island.

Ecologically and Biologically Significant Areas

DFO has identified a number of Arctic Ecologically and Biologically Significant Areas (EBSAs) in Hudson Bay and Hudson Strait using criteria from the Convention on Biological Diversity (Cobb 2011). These areas have been previously identified as important in ecosystem overviews, stock status reports, and traditional knowledge studies. Those EBSAs in the Hudson Bay Complex biogeographic region that overlap with the proposed shipping corridor are described below and illustrated in Figure B-24:

Southampton Island (including Coats Island) (EBSA 1.5)

- Largest island in Hudson Bay and situated near the confluence of Hudson Bay and Foxe Basin waters resulting in dynamic oceanographic mixing, and high marine productivity.
- Summer and winter use by the Northern Hudson Bay-Davis Strait population of Atlantic Walrus (Special Concern under COSEWIC).
- The waters surrounding Southampton Island are important spring and fall migration routes for beluga whales (Endangered under COSEWIC) and EC-WG bowhead whales (Special Concern under COSEWIC).
- Important nesting areas occur on Coats Island for seabirds (thick-billed murre, common eider, and black guillemot), which feed on aggregations of marine fish (e.g., capelin and Arctic cod) (Mallory and Fontaine 2004). The largest single colony of common eider in Nunavut occurs in East Bay.
- Southampton, Coats, and Mansel islands also are considered important denning and summer refuge habitat for the Foxe Basin polar bear population. Polar bears also frequent the land-fast ice adjacent to the islands in winter.
- Data confidence for this area is high due to intensive marine bird studies, tagging and survey data for marine mammals, and published IQ. The Southampton Island area scores high for several EBSA criteria.

Western Hudson Bay (Whale Cove to Arviat) (EBSA 1.6)

- Important area for beluga, killer whale, seabirds and Arctic char.
- Dense kelp beds occur along the coastline and provide important habitat for fish in the area.
- Area supports a wealth of LEK and TEK from the communities of Whale Cove, Rankin Inlet, and Arviat on the importance of marine mammals and fish (DFO 2011a).
- Important Arctic char stocks exist in this area and use the marine environment for feeding.

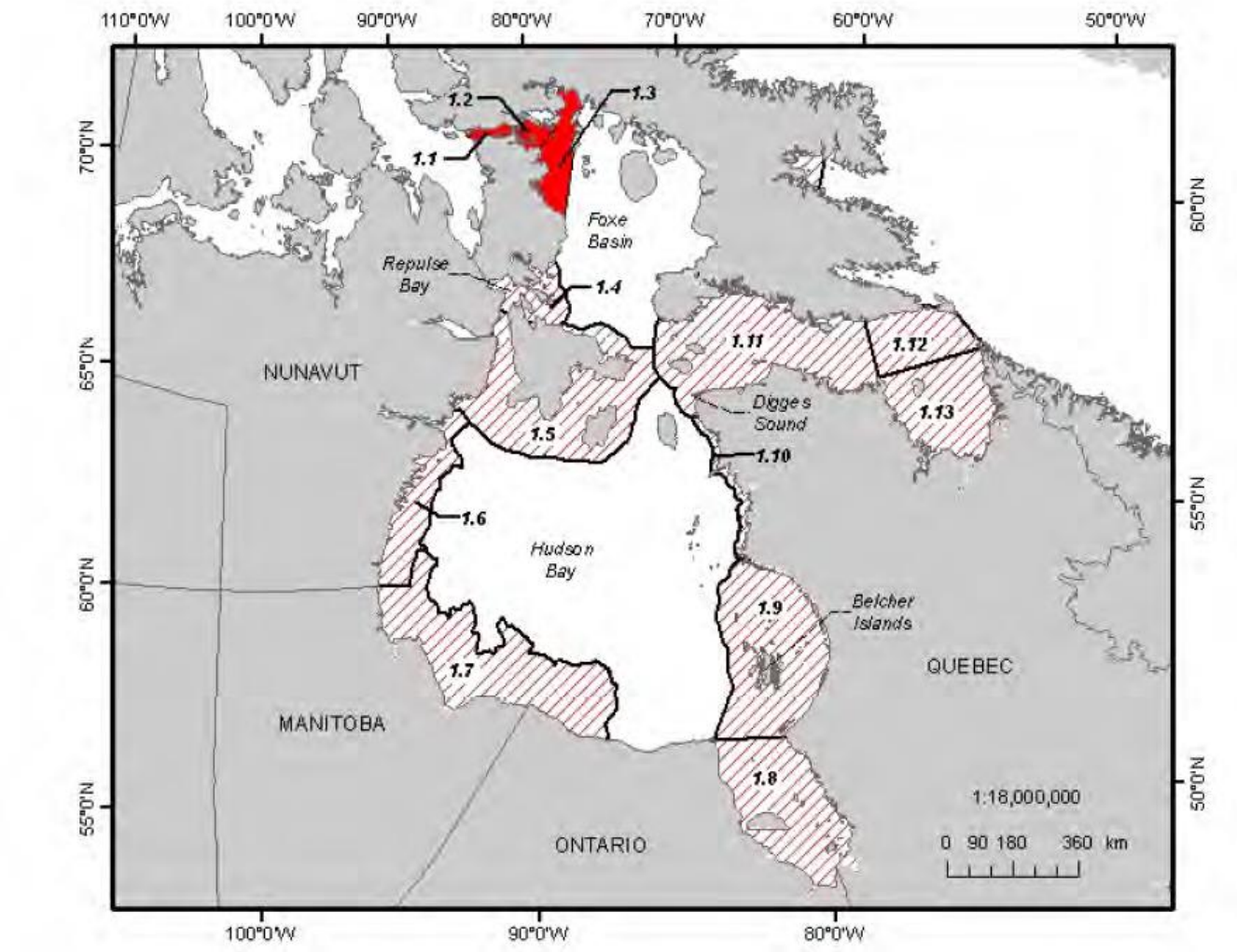

Figure B-24: Preliminary EBSA Identification Results for Foxe Basin (in solid red; 1.1 to 1.3) and for Hudson Bay / Hudson Strait (in red hatched lines; 1.4 to 1.12) as Determined Through a Series of Workshops Conducted in 2009 (DFO 2010b) (extracted from Cobb 2011)

Western Hudson Bay/Churchill/Nelson/Seal Estuaries (EBSA 1.7)

- The Nelson and Churchill estuaries provide an important habitat for a number of marine mammals and fish including the world's largest summer aggregation of beluga whales (Endangered under COSEWIC). Up to 3000 beluga whales congregate annually in the Nelson River estuary, with smaller numbers in the Churchill River estuary, to rear young and feed in these waters. Although the reason for these aggregations is not known, 2 commonly reported hypotheses are 1) thermal advantage from warm freshwater to initiate moulting; and 2) an evolutionary adaptation to take refuge from predation by killer whales in the shallow estuaries. Aggregations of approximately 70 000 beluga whales in this area are important for population fitness consequences.

- The Churchill region represents a key denning, feeding, and point of mobilization for Western Hudson Bay polar bear, which head north along the newly formed sea-ice to hunt ringed seal during fall/winter.
- A high degree of certainty exists for biophysical data available for this area due to Manitoba Hydro EIA Projects on the Nelson and Churchill rivers, as well as ongoing studies investigating the effects of climate change on marine mammals.
- The Seal River estuary was identified in 1999 as an Important Bird Area and is globally important for migrating black scoter.
- The Seal River is a Canadian Heritage River and remains a pristine, high-grade, remote wilderness river. It is the largest remaining undammed river in northern Manitoba. Harbour seals travel considerable distances up the Seal River estuary, representing an important adaptation to the freshwater environment by a marine mammal.
- The Province of Manitoba has designated a number of legally protected and managed lands, and identified Areas of Special Interest (candidate protected areas) along the Manitoba coastline for various ecological and biological reasons.
- Five internationally recognized Important Bird Areas have been identified along this part of Hudson Bay.
- Wapusk National Park and the provincially designated Churchill Wildlife Management Area, which extends to the Manitoba border and protects one of the world's largest known polar bear maternity denning areas. This national park also protects important caribou habitat. Similarly, the Kaskatamagan Wildlife Management Area (provincial designation) was established to protect the fragile coastal and tundra ecosystems and to protect important habitat for a number of bird species. The Churchill Special Conservation Area, designated to conserve and protect the Ross's gull, is also an integral part of the primary polar bear migration corridor in Manitoba.
- Hubbart Point, located north of the Seal River estuary, is an aggregation area for older male polar bears during the ice-free season. Beluga whales also congregate in waters off Hubbart Point, which is part of the North Hubbart Area of Special Interest.

West and Central Hudson Strait (EBSA 1.10):

- Serves as a key channel for Arctic waters via Foxe Basin, the outflow of Hudson Bay water, and also periodic intrusions of Atlantic water into northeastern Hudson Bay.
- Major seasonal migration route for all marine mammals that spend the summer in Hudson Bay and Foxe Basin and winter in either Hudson Strait or Davis Strait, including beluga whale, narwhal, and bowhead whale. The use of Hudson Strait by migrating marine mammals has been well documented through tagging studies and IQ.
- Walrus spend winters in west and central Hudson Strait on ice flows and on islands, such as Nottingham and Salisbury, where strong currents maintain open water. Walrus also overwinter on the northern shore of Hudson Strait near Kimmirut.
- Productivity is higher in West and Central Hudson Strait than Foxe Basin or Hudson Bay.

Support a number of important seabird nesting and feeding areas that occur on the northern and southern shores. Twenty percent of the North American population of thick-biller murres and a small colony of Atlantic Puffins are found near the Digges Sound and 10% of the Canadian population of common eiders breed and feed near Markham Bay (Mallory and Fontaine 2004).

- Physical oceanography in this EBSA has been well studied as part of long-term studies on Arctic flow-through.

Eastern Hudson Strait (EBSA 1.11):

- Heavily influenced by oceanographic conditions from Davis Strait resulting in high productivity.
- Important area for shrimp - Canadian Shrimp Fishing Area 3 occurs near Northern Ungava Bay eastward to Resolution Island.
- Supports western extent of Greenland halibut habitat.
- Provides significant overwintering refuge for Hudson Bay beluga whales and approximately 5000 to 8000 bowhead whales during winter.
- Support important occurrences of cold water corals in the deeper waters of the strait (Kenchington et al. 2011).

Ungava Bay (EBSA 1.12):

- Support Ungava Bay beluga whale stock, which has been reduced to as few as approximately 50 animals and may be extirpated (presently listed as Endangered under COSEWIC).
- Support important occurrences of corals in the deeper waters of the bay (Kenchington et al. 2011).
- Support 2 large colonies of thick-billed murre on Akpatok Island (Mallory and Fontaine 2004). Collectively, these colonies constitute the largest number of breeding thick-billed murre in Canada (>20% of the Canadian population). Black guillemots also nest along the Akpatok Island coast.
- A large portion of the breeding population of common eiders aggregate on the islands off the western shore of Ungava Bay. Key nesting sites occur at the Eider, Plover, Payne, and Gyrfalcon islands and the islands of northeastern Ungava Bay.
- Approximately 80 to 100 polar bear (~5% of the Davis Strait population) den and rear cubs along the southern shore of Akpatok Island during summer.

National Parks

To date, Parks Canada has established 2 National Parks in the Hudson Bay marine ecosystem: Wapusk and Ukkusiksalik (Stewart and Lockhart 2005). Wapusk National Park, established on 24 April 1996, is situated east of Churchill and protects an area of 11 475 km^2 that extends southward from Cape Churchill. Resources within the boundaries of the park are of national and international importance, including one of the world's largest known polar bear denning areas, and vital habitat for hundreds of thousands of waterfowl and shorebirds that nest along the coast of Hudson Bay or gather and feed there during the annual spring and fall migrations

(Stewart and Lockhart 2005). Park management is overseen by a board with representatives from the federal and provincial governments, the municipality of Churchill, and the First Nations of Fox Lake and York Factory. Ukkusiksalik National Park, established on 23 August 2003, extends westward from Roes Welcome Sound to include Wager Bay and the Brown and Piksimanik rivers, encompassing an area of 23 500 km^2 (Stewart and Lockhart 2005). Inuit residents from the Kivalliq communities, including Chesterfield Inlet, use this area for subsistence hunting and fishing.

Parks Canada also has identified several marine regions in arctic Canada within which it plans to recognize as Natural Areas of Canadian Significance. Two of the Natural Areas of Canadian Significance overlap with the proposed RSA, including Hudson Bay and Hudson Strait (Stewart and Lockhart 2005). The National Marine Parks Policy guides this process. Each area is intended to represent the natural, historical, and cultural diversity within a region. While National Marine Parks have yet to be established in northern Canada, Parks Canada has sought advice on which areas might make the best and most representative marine parks in the Hudson Bay and Hudson Strait marine regions. In Hudson Bay, Stewart et al. (1991) recommended 2 areas to Parks Canada for consideration as national marine parks – the Churchill-Nelson area and the Rankin Inlet-Marble Island area.

The Churchill-Nelson area was recommended for consideration as a National Marine Park prior to the establishment of Wapusk National Park, with the primary goal to protect the summer resident population of beluga whales in the Nelson, Churchill, and Seal rivers estuaries (known as the largest concentration of beluga whales in the world) (Stewart and Lockhart 2005). Other important physical, biological, and human use characteristics of this area include 1) extensive low-lying marshy coastal plains with wide tidal mud flats; 2) large estuarine habitats of the Churchill and Nelson rivers; 3) exceptional autumn concentrations of polar bears on the islands and headlands near Cape Churchill; 4) breeding shorebirds and waterfowl including the common eider; and 5) pre-historical coastal cultures, historical ports of entry instrumental in the exploration and development of central Canada, and the region's only deep water port for international shipping (Stewart and Lockhart 2005).

As noted earlier, the Rankin Inlet-Marble Island area was recommended as a National Marine Park to conserve and protect several key ecological and cultural features in this area (Stewart et al. 1991). The area of Hudson Strait immediately northeast of the Hudson Bay marine region was recommended as the most representative candidate for consideration as a future national marine park in the Hudson Strait marine region (DFO 2005b).

Migratory Bird Sanctuaries

Environment Canada's Canadian Wildlife Service (EC-CWS) has established 11 migratory bird sanctuaries in Nunavut to control and manage areas of key importance for the protection of migratory bird species and their habitat (Stewart and Lockhart 2005). Three of these sanctuaries occur within, or in the vicinity of, the proposed RSA: the McConnell River Migratory Bird Sanctuary south of Arviat, and the Harry Gibbons and East Bay Migratory Bird Sanctuaries on the southeast coast of Southampton Island. Both areas include terrestrial, wetland, and marine habitats, with the latter typically consisting of nearshore foraging areas for migratory birds. The Migratory Birds Convention Act prohibits activities in Migratory Bird Sanctuaries. Canadian Wildlife Service manages the activities that can be carried out within these areas. Prohibitive measures are placed on what activities can occur in these areas, as outlined in the Bird Sanctuary Regulations. Although important fish habitat could be protected through migratory bird sanctuaries, it is not an effective measure unless there is valuable bird habitat associated with the area that coincides with important or critical fish habitat.

The McConnell River Migratory Bird Sanctuary, established in 1960 to protect a small colony of lesser snow geese, encompasses 32 800 hectares (ha) along the west coast of Hudson Bay south of Arviat. This sanctuary is owned by the Coastal Inuit of Nunavut and subject to co-management agreements under the Nunavut Land Claims Agreement (Stewart and Lockhart 2005). Subsistence hunting and fishing activities presently occur within the sanctuary, mostly by community members of Arviat. In 1982, under the terms of the Ramsar Convention, the sanctuary was designated as a "Wetland of International Importance especially as Waterfowl Habitat" (Ramsar Site 248) because it provided major nesting habitat for multiple migratory bird species including Canada geese, lesser snow geese, and Ross's goose. Up to 200 000 birds colonize this sanctuary on an annual basis, with habitat degradation presently occurring due to a local increase in the snow goose population (Stewart and Lockhart 2005).

The Harry Gibbons Migratory Bird Sanctuary is located on Southampton Island in northern Hudson Bay, encompassing extensive tidal flat and wetland habitat areas along the Boas River delta and associated estuarine environment in the Bay of God's Mercy. This area supports large nesting colonies of lesser snow goose (population >500 000 birds in 1997), Atlantic brant, Canada goose, and tundra swan (Stewart and Lockhart 2005). Smaller breeding colonies of migratory birds are located outside the sanctuary at Ell Bay and Bear Cove (Stewart and Lockhart 2005).

The East Bay Migratory Bird Sanctuary is located on Southampton Island near the community of Coral Harbour. Established in 1959, this area encompasses 113 800 ha including marine, intertidal, and subtidal components. Notable bird species include Arctic tern, Atlantic brant, lesser snow goose, Canada goose, common and king eider, black guillemot, jaeger, herring and Sabine's gull, red knot, red phalarope, red-throated loon, ruddy turnstone, and several species of plover and sandpiper.

Important Bird Areas

Important Bird Areas (IBAs) are sites recognized as being globally important habitat for the conservation of bird populations, as designated by Bird Studies Canada, Nature Canada, and Birdlife International (Birdlife International 2012), an international bird protection organization. Collectively, these organizations support the international conservation of discrete sites that provide habitat for threatened birds, large groups of birds, and birds restricted by range or by habitat. Three Important Bird Areas occur within, or in the vicinity of the RSA; including Harry Gibbons and East Bay Migratory Bird Sanctuaries (sites #NU022 and #NU023 respectively) on Southampton Island, and McConnell River Migratory Bird Sanctuary south of Arviat.

International Biological Programme

In 1975, the International Biological Programme recognized a number of areas of biological, geological, and historical importance in northern Canada that were in urgent need of special protection (Nettleship and Smith 1975). Several of these areas, which have since been offered protection, and which occur within or in the vicinity of the RSA, include McConnell River (McConnell River Migratory Bird Sanctuary), and Boas River (Harry Gibbons Migratory Bird Sanctuary). Other areas near the RSA that have been identified as International Biological Programme sites but are not yet protected include Coats Island and Digges Islands. Coats Island is located northeast of Southampton Island. Digges Islands (West and East) are located in Digges Sound, at the northwest tip of the Ungava Peninsula in Western Hudson Strait. Both areas support key terrestrial habitats for migratory birds and seasonal habitats for several marine mammal species (Nettleship and Smith 1975).

Key Marine Habitat for Migratory Birds

EC-CWS has established 'key marine habitat' sites for migratory birds located near the proposed shipping route. Some of these sites overlap with existing protected/sensitive areas such as migratory bird sanctuaries designated by EC-CWS, IBAs, and/or International Biological Program sites. These areas were primarily established to protect terrestrial or coastal resources for marine birds. 'Key marine habitat' sites designated by EC-CWS aim specifically to identify important marine habitat areas for marine avifauna. Not all of these sites are protected under legislation; however, as local knowledge increases regarding habitat use and the overall importance of these sites to marine birds, legal protection status may follow. Generally, these areas are used by marine birds from late April through September. Additional details on the key marine habitat sites for migratory birds located near the proposed shipping route are summarized in Table B-6 and FigureB- 8 (adapted from Mallory and Fontaine 2004).

Table B-6: Environment Canada Key Marine Habitat Sites for Migratory Birds Located Near the Proposed Shipping Route

Site Name	Sensitivities	Biological Significance	Status	Size (km^2)		Distance from shipping lane (km)
				Marine	Land	
Coats Island near Cape Pembroke	Sensitive to disturbance of important nesting sites along coast, important foraging grounds and staging / breeding areas in the marine environment, and key migratory corridors. Concerns around increases in vessels in the area coming close to Coats and Walrus islands.	Important nesting areas occur on Coats Island for seabirds (thick-billed murre, common eider, and black guillemot), which feed on aggregations of marine fish (e.g., capelin and Arctic cod). Glaucous gull and peregrine falcon can be found along the cliffs at the colonies. Home to a large Iceland gull (*Larus glaucoides*) colony and the largest single colony of common eider in Nunavut occurs in East Bay.	International Biological Programme site (Region 9, Site No. 6-3) and an IBA (NU005).	1918	0	Overlaps
Digges Sound	Sensitive to disturbance of important nesting sites along coast, important foraging grounds and staging / breeding areas in the marine environment, and key migratory corridors. Concerns around increases in vessels in the area. Colonies are considered to be some of the most disturbed by human activities in the Canadian Arctic.	20% of North American population of thick-billed murre and a small colony of Atlantic puffin (*Fratercula arctica*) and razorbill (*Alca torda*) occur near Digges Sound. 10% of the Canadian population of common eider breed and feed near Markham Bay. Other species that also breed here are black guillemot, glaucous gull, Iceland gull, herring gull, and Arctic tern.	International Biological Programme site (Region 9, Site No. 6-7) and an IBA in Canada (NU001).	2207	102	~3

Table B-6: Environment Canada Key Marine Habitat Sites for Migratory Birds Located Near the Proposed Shipping Route

Site Name	Sensitivities	Biological Significance	Status	Size (km²)		Distance from shipping lane (km)
				Marine	Land	
Frobisher Bay	Sensitive to disturbance of important nesting sites along coast, important foraging grounds and staging / breeding areas in the marine environment, and key migratory corridors. Concerns around increases in vessels in the area and potential hydrocarbon exploration. The complex nature of currents in the region suggests that a potential oil spill in southern Davis Strait could not reach this marine area.	Colony of 3% of Canadian thick-billed murre population. Glaucous gull, black-legged kittiwake, and possibly Northern fulmar breed here. Nearby Loks Land is thought to support Nunavut's largest known colony of razorbill (not been visited since 1953). Dovekies congregate off the Hall Peninsula in August. An important nesting, feeding, and migration stop-over for common eider, Iceland gull, ivory gull, and harlequin duck (*Histrionicus histrionicus*). Canada goods and long-tiled ducks may also be found here.	Hantzsch Island is an International Biological Programme site (Region 9, Site No. 7-10) and a Canadian IBA (NU025).	12442	1336	Overlaps
Button Islands	Sensitive to disturbance of important nesting sites along coast, important foraging grounds and staging / breeding areas in the marine environment, and key migratory corridors. Concerns around increases in vessels in the area and potential hydrocarbon exploration. The complex nature of currents in the region suggests that oil spills in southern Davis Strait could enter this marine area. Oil spills associated with shipping could endanger a large number of marine birds and pollute their feeding areas.	Black-legged kittiwake and northern fulmar forage near the Button Islands. Ivory gulls and common eider have been observed. Thick-billed murre breed here.	International Biological Programme site (Region 9, Site No. 6-8).	3909	81	Overlaps

Table B-6: Environment Canada Key Marine Habitat Sites for Migratory Birds Located Near the Proposed Shipping Route

Site Name	Sensitivities	Biological Significance	Status	Size (km^2)		Distance from shipping lane (km)
				Marine	Land	
Akpatok Island	Sensitive to disturbance of important nesting sites along coast, important foraging grounds and staging / breeding areas in the marine environment, and key migratory corridors - particularly for murres. Shoreline around Akpatok Island is considered to be "high hazardous risk of oil spills". Concerns around increases in vessels in the area and potential hydrocarbon exploration. The complex nature of currents in the region suggests that oil spills in southern Davis Strait could reach this marine area. Oil spills associated with shipping could endanger a large number of marine birds and pollute their feeding areas.	Large breeding colony of thick-billed murre. Black guillemots also nest along the Akpatok Island coast. Black guillemot nest along the island's coast. Peregrine falcon and glaucous gull also breed here.	Biological Programme site (Region 9, Site No. 6-6) and an IBA in Canada (NU007).	4943	859	82
Ungava Bay Archipelagoes	Sensitive to disturbance of important nesting sites along coast, important foraging grounds and staging / breeding areas in the marine environment, and key migratory corridors.	Support a large portion of breeding common eider. Eider occur in this area from April through October	The Plover and Payne, Gyrfalcon, and north eastern Ungava Bay islands are Canadian IBA (NU027, NU028, NU029).	5624	5	93
Sleeper Islands	Degradation of staging and foraging areas, particularly for eiders. Potential hydrocarbon exploration. Prevailing west and north west winds render the east coast of the Bay most susceptible to oil damage.	Common eiders nest here in the summer months. Over 30 species of birds have been observed in the Sleeper Islands.	IBA site (NU033).	1880	90	536

Table B-6: Environment Canada Key Marine Habitat Sites for Migratory Birds Located Near the Proposed Shipping Route

Site Name	Sensitivities	Biological Significance	Status	Size (km^2)		Distance from shipping lane (km)
				Marine	Land	
Belcher Islands	Degradation of staging and foraging areas, particularly for eiders. Excessive harvest of down from breeding colonies. Potential hydrocarbon exploration. Prevailing west and north west winds render the east coast of the Bay most susceptible to oil damage.	Common eider nest here in the summer. In the winter, polynyas and the floe edge support substantial numbers of common eider and long-tailed duck.	The North Belcher and South Flaherty islands are Canadian IBA (NU031, NU100).	5 to 15 recurrent, small polynyas		680
Northern Ontario Coastline	Degradation of staging and foraging areas, particularly for ducks. Potential hydrocarbon exploration.	Black scoter moult along this marine area feeding on blue mussels and other molluscs. Common eiders are year-round residents. Canada geese and lesser snow geese make use of coastal areas.	Waters in James Bay are part of the James Bay Preserve.	7860	41	607
Markham Bay	Disturbance and sensitivity to potential pollution of foraging, staging and migrating areas.	Support a large portion of breeding common eider. Support substantial numbers of Kumlien's gull (*Larus glaucoides kumlieni*) colonies and black guillemot. Eiders occur in this area from April through October.	No special designation.	4015	423	58
East Bay	Disturbance and sensitivity to potential pollution of foraging, staging and migrating areas.	Supports Arctic Canada's largest single colony of common eider. Supports colony of black guillemot and a large population of lesser snow goose. Substantial numbers of Atlantic brant and Sabine's gull also breed here. Supports some of the highest known breeding densities of shorebirds in the eastern Arctic. Red phalarope are the most common shorebirds.	Migratory Bird Sanctuary and a Canadian IBA (NU023).	274	1	84

Areas of High Biological Importance

Fisheries and Oceans Canada sponsored an Arctic Marine Workshop to bring together expert knowledge on marine fauna and habitat use in the Canadian Arctic (Stephenson and Hartwig 2010). The objective of the workshop was to identify overlapping areas of habitat use by different Arctic species, and, therefore, areas of High Biological Importance (HBI) to wildlife. In total, 19 HBI were identified; 3 of these occur within, or in the vicinity of, the proposed RSA including Southampton Island, Chesterfield Inlet, and Hudson Strait. The Southampton Island HBI extends from Cape Bylot to Ell Bay and includes the north and west coasts of Coats Island. This area provides important habitat for several species of seal, walrus (including an overwintering area), and numerous marine bird species. It also provides key denning habitat for polar bears and important foraging grounds for bowhead whales. The Chesterfield Inlet HBI consists of the Hudson Bay coast from Whale Cove to Arviat. This area provides key habitat for beluga whales, killer whales, several species of seal, Arctic char, and several seabird species along the coast. The Hudson Strait HBI, which includes Akpatok, Salisbury, and Nottingham Islands, has been identified as being amongst the most productive areas in the Arctic (Stephenson and Hartwig 2010), supporting several large seabird colonies along the coast, key shrimp habitat, and important overwintering areas for several marine mammals including narwhal, beluga whale, and walrus. This area is known to be more productive than Hudson Bay due to an increased level of surface mixing and a large tidal exchange. The ice edge, which extends the length of the Strait during winter, is also considered dynamic habitat for numerous Arctic marine species.

Bowhead Whale Critical Habitat Areas

Wheeler et al. (2012) investigated critical summer and fall habitat for bowhead whales in the eastern Canadian Arctic by performing a monthly ecological niche factor analysis for 3 bowhead whale spatial datasets in contrast to concurrent eco-geographical variable datasets (including sea surface temperature, chlorophyll, ice cover, water depth, slope, and distance to shore) to determine overall bowhead whale habitat suitability in this region. The study produced 11 habitat suitability models, and resulted in the development of a composite map of predicted high suitability habitat for the months of June to October. In total, 21 discrete areas were identified (with low confidence) within the Eastern Canadian Arctic as ‘critical habitat’ during the open-water season (Figure B-25). Of these, 9 (Areas 13, 14, 15, 16, 17, 18, 19, 20, and 21) were located within, or in the vicinity of, the proposed RSA or shipping corridor between Rankin Inlet and eastern Hudson Strait. Coastal Inuit knowledge (referred to as Inuit Qaujimajatuqangit or IQ – see Figure B-26) supported the identification of critical habitat in northwest Ungava Bay (Big Island; Area 15). Aerial surveys (Cosens and Innes 2000) and telemetry studies (Dueck et al. 2006) supported the identification of critical habitat near Southampton and Coats islands (Area 20). There was no corroborating IQ or scientific evidence to support other identified critical habitat in northern Hudson Bay, Hudson Strait, and Labrador (Areas 13 to 15, 18, and 19). This may be due to bowhead whales no longer frequenting these areas, or population surveys and IQ studies were not conducted in these areas.

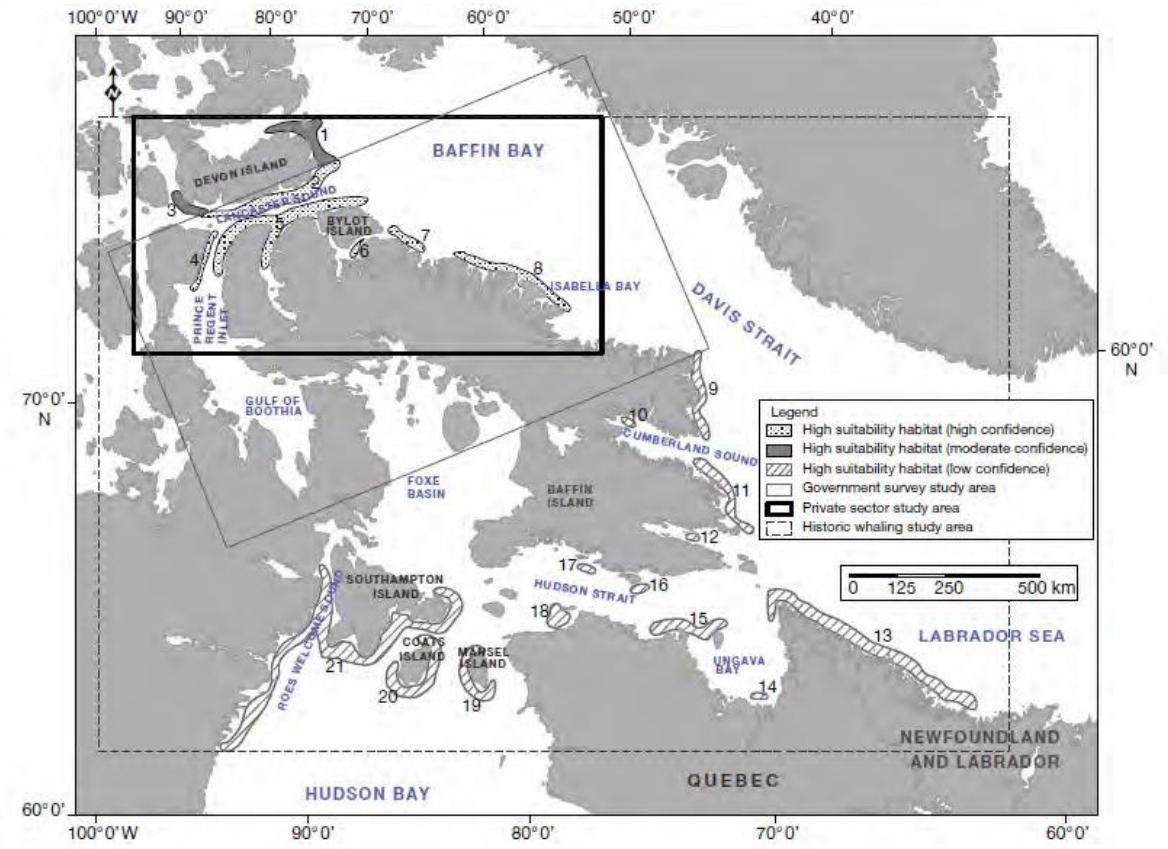

Figure B-25: Discrete Areas of Highly Suitable Bowhead Whale Habitat Identified for 3 or More Months from June to October in the Eastern Canadian Arctic (by analytical confidence) Produced by Ecological Niche Factor of 3 Bowhead Location Datasets and Associated Eco-Geographical Variables (extracted from Wheeler et al. 2012)

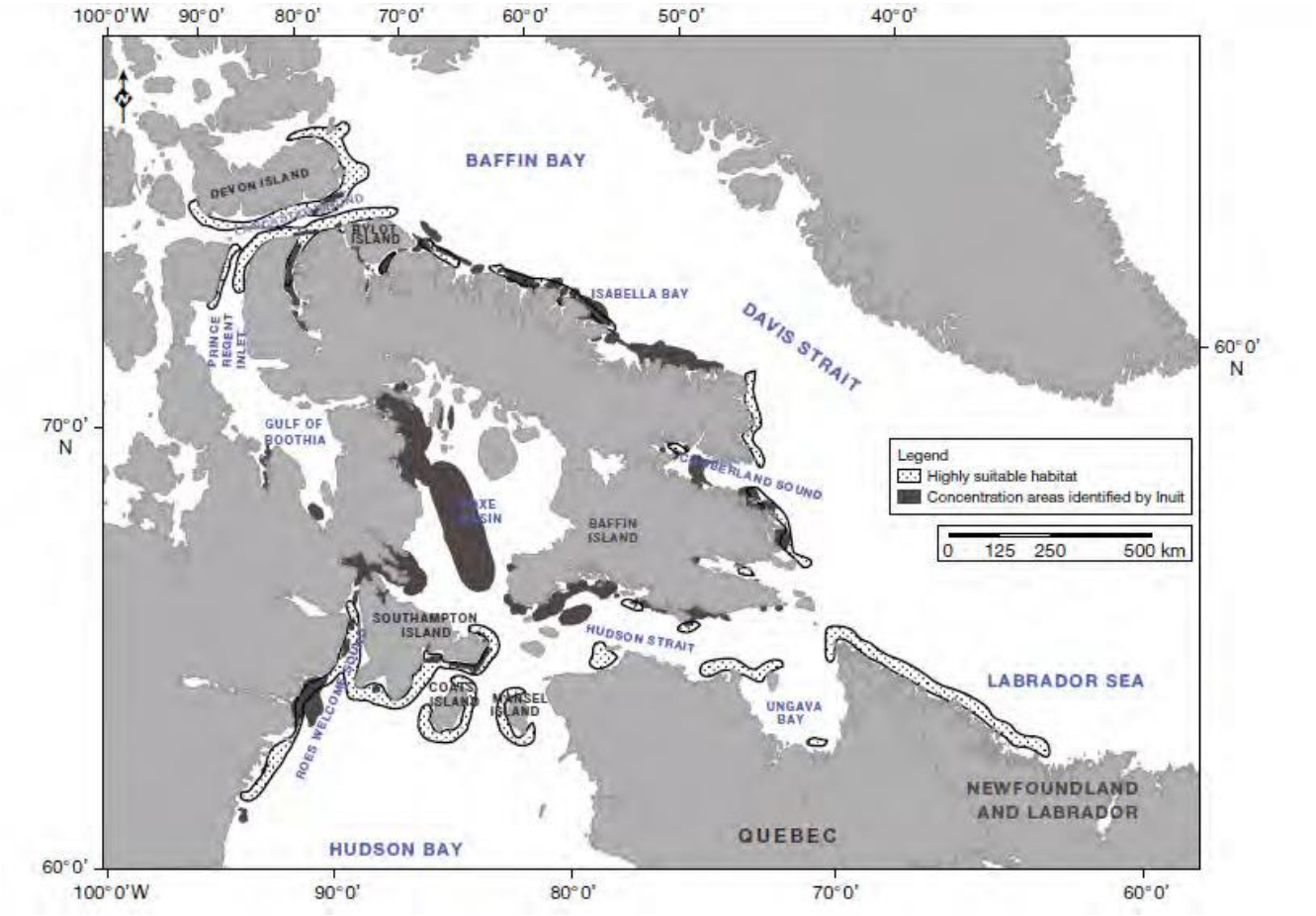

Figure B-26: Comparison of Highly Suitable Bowhead Whale Habitat Predicted by Ecological Niche Factor Analyses with Bowhead Concentration Areas Identified by Inuit in Nunavut, Canada, in Late Spring, Summer, and Early Fall (adapted from NWMB 2000 and Wheeler et al. 20

1.4 Traditional Knowledge

Sources of IQ for marine wildlife included the following:

- IQ studies conducted by Nanuk Enterprises in 1997 and 1998 in Rankin Inlet and Chesterfield Inlet. The results of these studies are summarized in FEIS Volume 9, Section 9.3;
- IQ studies conducted by Nanuk Enterprises in 2010-2011 in Rankin Inlet, Chesterfield Inlet, and Whale Cove. The full report is included as FEIS Volume 9, Appendix 9.3-A and summarized in FEIS Volume 9, Section 9.3;
- Interview conducted on 15 July 2011 by Nunami Stantec in Rankin Inlet with representatives from the Kangiqliniq Hunters and Trappers Organization. The full report is included as Appendix 8.2-A of the FEIS;
- IQ studies conducted by Nanuk Enterprises / Outcrop Ltd. during 2012, consisting of interviews with local hunters, fishers, tour operators, and experienced seamen representing the communities of Rankin Inlet,

Chesterfield Inlet, and Whale Cove. The 2012 interviews focused on marine resources along the proposed shipping route through Hudson Bay and the marine approaches to Rankin Inlet. The full report is included as FEIS Volume 9, Appendix 9.3-C and summarized in FEIS Volume 9, Section 9.3; and

- A literature review of the Nunavut Atlas (Canadian Circumpolar Institute 1992) and the Inuit Land and Occupancy Project (Freeman and Murty 1976) conducted by Golder in 2012 summarizing historical Traditional Resource Use (TRU) in the Rankin Inlet region and surrounding communities as described in FEIS Volume 9, Section 9.3.

Collectively, these studies identify the following main points of interest with respect to traditional resource use and traditional knowledge in the Project area:

- Itivia is commonly used by local community members for small boat operations including boat mooring and launching. The location of the proposed landing barge corresponds with the only navigable area at Itivia during a low tide;
- Arctic char represent an important food species for the local community and are mainly harvested during August in the Rankin Inlet region. Some residents also participate in the commercial Arctic char fishery, which occurs approximately 40 to 50 km (25 to 30 miles) outside Rankin Inlet, although it occurred closer historically. Other fish species locally harvested in the Project area (in marine waters) include sculpin, cod, capelin, whitefish, and trout;
- Hunting and fishing in Melvin Bay is thought to be less productive today than in the past (1960s and 1970s), a factor potentially linked to recent increases in local vessel traffic in the bay;
- Marine mammal species harvested in the Rankin Inlet region include the following:
- Beluga whales - hunted during the open-water season (primarily in August and September) – mainly near Marble Island. Most individuals summer near Churchill and migrate north along the west coast of Hudson Bay beginning in late August. Some individuals overwinter in polynya areas (when ice conditions allow) in northwestern Hudson Bay, Roes Welcome Sound, and Hudson Strait;
- Walruses – uncommon in Rankin Inlet in recent years, this species is hunted year-round in areas north of Marble Island. During summer and winter, large numbers of walruses haul-out on Bencus, Coats, Walrus, and Southampton islands;
- Polar bears – hunted primarily during winter on the sea-ice. Hunting is based on a quota system, which was lowered for the WHB sub-population during the 2010-2011 harvest to 8 individuals due to concerns for the population size, and then raised to 21 individuals for the 2011-2012 quota following increased reports by community members of problem bears near the communities (GN 2011). Some individuals have been observed on Marble Island and swimming offshore during the summer months between the surrounding islands. There is some concern by community members that increased shipping in the area may result in adverse impacts on polar bears, including behavioural disturbance (active avoidance or displacement effects) and/or physical injury / mortality from potential ship strikes;

- Four species of seal (ringed, bearded, harp, and harbour) – hunted throughout the year (on sea-ice and in open-water), with ringed seals being the most commonly hunted species. Recent increases in the number of harp seals near Rankin Inlet may represent influx of animals from adjacent Chesterfield Inlet that have been displaced by increased shipping / icebreaking activities in this area;
- Hunters have expressed concern over the proximity of the shipping route to Marble Island and potential effects of shipping on marine mammal distribution / migration, and hunting activities in this area. However, the implementation of a 2 km buffer (exclusion zone) around Marble Island for all Project vessels is deemed sufficient to mitigate these concerns;
- Narwhals and bowhead whales are not an important subsistence species for the Rankin Inlet community and are uncommon in the Rankin Inlet area. Narwhals summer north of Rankin Inlet in Daly Bay, Roes Welcome Sound, and Foxe Basin and winter in pack-ice regions of eastern Hudson Strait and Davis Strait. Bowhead whales are occasionally observed near Repulse Bay, Frozen Strait, Southampton Island, and Chesterfield Inlet;
- Hudson Strait is considered an important migratory corridor for marine mammals (beluga whales, narwhals, bowhead whales, and harp seals) transiting between Davis Strait / Labrador Sea and Hudson Bay / Foxe Basin. The critical migratory periods are early summer (June) and fall (late August to October). Proposed shipping activities for the Project coincide with the fall migratory period;
- Killer whales appear to be increasing locally in number particularly near Marble Island, although this species is not traditionally harvested. Concerns have been raised regarding the potential effects of the increasing killer whale population on other marine mammals due to predation, particularly with respect to bowhead whales;
- Several marine bird species are known to forage and/or nest in the Project area, including eider ducks (common eiders), black guillemots, Arctic terns, and several species of gull. Most nesting periods fall outside the shipping season (open-water). Egg harvesting occurs in spring for goose, eider duck, tern, guillemot, and gull. Shorebirds and raptors are not harvested by Inuit. The number of marine birds in Melvin Bay in recent years is thought to have decreased;
- Locally harvested shellfish species include blue mussels and clams. Historically, shellfish harvesting occurred along the north shore of Melvin Bay. Today, the harvest mainly occurs outside the harbour due to related health advisories from the Department of Health and Social Services. Scallops collected from the stomachs of hunted walruses are highly regarded by elders;
- Seaweeds (marine vegetation) are not locally harvested in the Project area in Melvin Bay;
- With respect to climate change, several major changes have been observed over the past 20 years in Rankin Inlet and include later freeze-ups, shorter sea-ice periods, decreases in land-fast ice, greater uncertainty in weather conditions, higher frequency of severe storm events, decreases in marine mammals observed in July, and changes in the timing of moulting of ringed seals (occurring as early as April); and
- Rankin Inlet community members recognize 2 shipping routes for access to Rankin Inlet (see Maps 1 and 2 in FEIS Volume 9, Appendix 9.3-C). In the deep-water sections of the shipping corridor, the exact shipping routes are not marked and likely vary by several kilometres. Recent increases in local shipping activity have been linked to several large Projects in the region including Meliadine, Meadowbank, Kiggavik, Baffinland, and Roche Bay.

2.0 CLOSURE

We trust that this report meets your immediate requirements. If you have any questions regarding the content of this report, please do not hesitate to contact this office.

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APPENDIX C • RISK ANALYSIS OF MARINE TRANSPORTATION ROUTES

The approach used for the risk assessment draws on that of Areva for the Kiggavik Project[21].

A hazard is a condition with the potential to cause personal injury or death, property damage, environmental harm, or loss of service. Hazard severity along shipping and tug-barge routes can range from catastrophic resulting in fatalities and/or loss of the ship to minor where the incident does not significantly reduce ship safety and where mitigation measures are well within the crew's capabilities. A complete range of hazard severity is presented below in Table C-1.

Table C-1 Hazard Severity for Ship and Tug with Barge Routes

Hazard Severity and Rating Value	Definition
Catastrophic (Value 4)	Results in multiple fatalities and/or loss of the ship, tug or barge.
Hazardous (Value 3)	Reduces the capability of the ship or its operator's ability to cope with adverse conditions to the extent that there would be: • Large reduction in safety margin or functional capability; • Crew physical distress/excessive workload such that operators cannot be relied upon to perform required tasks accurately or completely; • Serious injuries to a small number of the crew; and • Possible fatality of one or more of the crew.
Major (Value 2)	Reduces the capability of the ship or its operators to cope with adverse operating conditions to the extent that there would be: • Significant reduction in safety margin or functional capability; • Significant increase in operator workload; • Conditions impairing operator efficiency or creating significant discomfort; • Physical distress to crew, including injuries; and • Major environmental damage, and/or major property damage.
Minor (Value 1)	Does not significantly reduce ship safety. Actions required by operators are well within their capabilities. Include: • Slight reduction in safety margin or functional capabilities; • Slight increase in workload such as routine ship navigation plan changes; • Some physical discomfort to the crew; and • Minor occupational illness and/or minor environmental damage, and/or minor property damage.

Likelihood ranges from probable where the incident is anticipated to occur one or more times in shipping and barge movements over the life of the Project, to extremely improbable where it is not anticipated to occur during the entire life-of-mine for the Project to any of the ships, tugs and barges contracted to AEM. Table C-2 provides a complete range of likelihoods.

[21] Areva. 2011. Kiggavik Project, Environmental Impact Statement, Marine Transportation, Tier 3 Technical Appendix 2J.

Table C-2 Likelihood of Mishap along Ship and Tug-Barge Routes

Likelihood and Rating Value	Definition
Probable (Value 4)	Qualitative: Anticipated to occur one or more times in ship or tug-barge operations over the life of the Project. Quantitative: Probability of occurrence per operational hour is greater than $1x10^{-5}$.
Remote (Value 3)	Qualitative: Unlikely to occur to each ship or tug-barge during its contract with the mine. May occur several times in the life of all ships and tankers for the life of the Project. Quantitative: Probability of occurrence per operational hour is less than $1x10^{-5}$ but greater than $1x10^{-7}$.
Extremely Remote (Value 2)	Qualitative: Not anticipated to occur to each ship or tug-barge while it is contracted by AEM during the life of the Project. May occur a few times in the life-of-mine to the ships and tankers contracted to AEM. Quantitative: Probability of occurrence per operational hour is less than $1x10^{-7}$ but greater than $1x10^{-9}$.
Extremely Improbable (Value 1)	Qualitative: So unlikely that it is not anticipated to occur during the entire life-of-mine for the Project to any of the ships and tankers contracted to AEM. Quantitative: Probability of occurrence per operational hour is less than $1x10^{-9}$.

The hazard severity value is multiplied by the likelihood value to determine the risk level. Table C-3 outlines the risk levels outcomes, which range from negligible to catastrophic.

Table C-3 Risk Levels

Severity and Value		Likelihood			
		Extremely Improbable	Extremely Remote	Remote	Probable
		1	2	3	4
Minor	1	1	2	3	4
Major	2	2	4	6	8
Hazardous	3	3	6	9	12
Catastrophic	4	4	8	12	16

Risk Levels 1-2 represent a negligible to low level of hazard to shipping. It does not significantly reduce the safety of the ship or tug-barge. Actions required by the ship's or tug's crew are well within their capabilities to avoid harm to the vessel, the crew and the environment.

Risk Levels 3-4 represent low to major risk. There is a significant reduction in the safety margin or functional capability of the ship or tug-barge. A great effort on the part of the crew will be required to avoid damage to the ship, major environmental effects and/or injuries to the crew.

Risk Levels 6-9 represent major to hazardous risk. The ship's or tug-barge's crew will have difficulty in coping with the adverse conditions to the extent the ship or tug barge will have a large reduction in its safety margin or functional capability, which could lead to serious injury to the crew and possible environmental harm.

Risk Levels 12-16 represent hazardous to catastrophic risk and is to be avoided. There could be fatalities, loss of the vessel, and/or major environmental harm.

Table C-4 Preliminary Risk Analysis of Tug-Barge and Ship Marine Routes

Preliminary Risk Analysis of Tug-Barge and Ship Marine Routes							
Hazard	Before Controls			Mitigation Measures	After Mitigation		
	Severity	Likelihood	Risk Level		Severity	Likelihood	Residual Risk
Tug-barge or ship runs aground	3	3	9	• Use electronic navigation aids; • Remain in shipping lanes; • Buoys within the near-shore islands; • Monitor adherence to standard operating procedures; and • One way traffic only in the access passage to Melvin Bay and Itivia harbour.	3	2	6
Loss of or damage to sea cans in heavy seas	2	3	6	• Lock sea cans to the deck; • Use appropriate stacking height for voyage; and • Slow tug tow speed in heavy seas.	2	2	4
Tug-barge or ship has mechanical failure	2	3	6	• Regular preventative maintenance schedule; • Maintain an inventory of critical parts on board; and • Have redundant critical systems.	2	2	4
Barge tow line breaks	2	3	6	• Have redundant tow line for safety purposes; and • Slow tow speed in heavy seas.	2	2	4
Collision or grounding of tugs between mooring location of large ships and Itivia harbour	3	4	12	• One way traffic only in the access passage to Melvin Bay and Itivia harbour; • Install Automatic Identification System on all tugs; and • Tugs proceed at a slower speed during low visibility periods.	3	2	6
Tug-barge or ship collides with a small boat from Rankin Inlet	2	3	9	• Education of public on use of shipping lanes; • Make public aware of incoming ships and tug-barge traffic in Melvin Bay; • Tugs-barge and ships proceed at a slow speed in periods of low visibility; and • Tug-barge and ships use horn in periods of heavy fog.	2	2	4
Tug-barge or ship sinks upon hitting ice	4	3	12	• Shipping is scheduled for open water; • Sail around ice; and • Slow vessel speed to avoid damage.	3	2	6

APPENDIX D • MARINE ENVIRONMENTAL MANAGEMENT PLAN (MEMP)

March 29, 2017

MARINE ENVIRONMENTAL MANAGEMENT PLAN (MEMP)

Appendix D

Submitted to:
Agnico Eagle Mines Limited
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REPORT

Report Number: Doc 613-1671431
Distribution:

1 copy - Agnico Eagle Mines Limited
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Golder Associates

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Marine Mammal Sightings Record

Attachment B
Record Sheet for a Moving Platform Survey[3]

Record Sheet for a Stationary Platform Survey[3]

Appendix I - Estimating Distance Categories Using Ruler Gauge[3]

Appendix II Through VI - Codes for General Weather Conditions and Glare, Sea State and Beaufort Wind Force, Ice Conditions, Species Codes for Eastern Seabirds, and Codes for Associations and Behaviours[3]

Attachment C
MMSO Daily Reporting Template

Attachment D
Birds and Oil - CWS Response Plan Guidance

Attachment E
DFO's Marine Foreshore Environmental Assessment Procedure

Acronyms

Agnico Eagle	Agnico Eagle Mines Limited
BTEX/VPH	benzene, toluene, ethylbenzene, o-xylene, m-xylene, p-xylene/Volatile Petroleum Hydrocarbons
CCG	Canadian Coast Guard
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
ECSAS	Eastern Canada Seabirds at Sea
ECCC	Environment and Climate Change Canada
ERT	Emergency Response Team
EPH	Extractable Petroleum Hydrocarbon
IQ	Inuit Qaujimajatuqangit
JNCC	Joint Nature Conservation Committee
MEMP	Marine Environmental Management Plan
MMSO	Marine Mammal and Seabird Observer
PAHs (parent)	Polyaromatic Hydrocarbons
QEP	Qualified Environmental Professional
RSA	Regional Study Area
SOPEP	Shipboard Oil Pollution Emergency Plan
TOC	Total Organic Carbon
TK	Traditional Knowledge
UTM	Universal Transverse Mercator
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

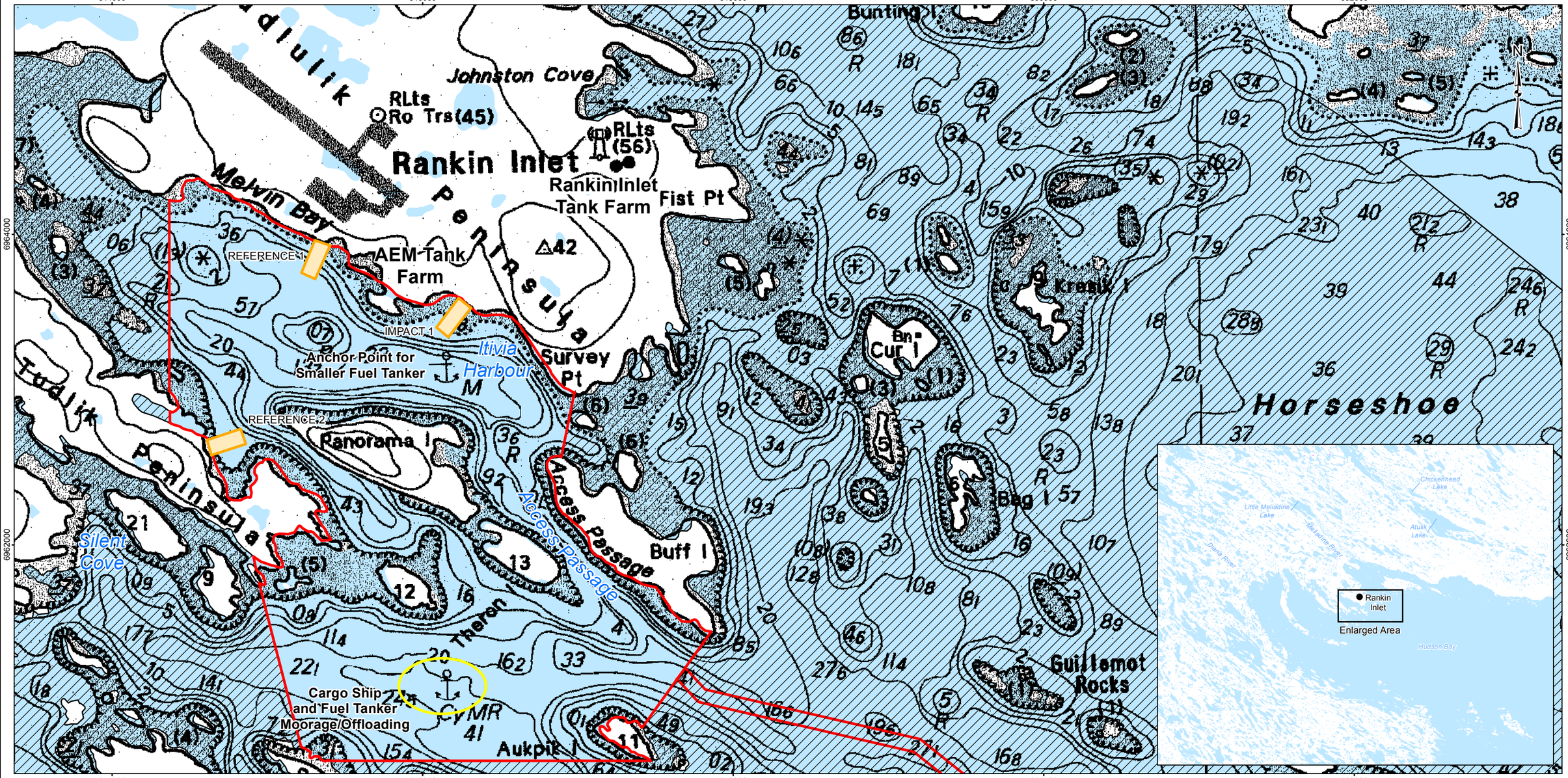
Agnico Eagle Mines Limited (Agnico Eagle) plans to ship approximately 40,000 tonnes of dry cargo (equipment and supplies) and 122 million litres of diesel fuel annually for the operations of the Meliadine Gold Mine in Rankin Inlet, Nunavut (the Mine). To meet these needs, approximately 8 ships per year will be needed to deliver dry cargo and up to 4 additional ships per year to deliver fuel. All shipping will be carried out during the open water season (typically from early July to late October) and will follow recommended shipping routes that are presently in use for the annual sea lift to Rankin Inlet and other communities (Figure D-1 and Figure D-2). The Mine will not involve any ice breaking to extend the shipping season. This Marine Environmental Management Plan (MEMP) has been developed for the Mine to meet the Terms and Conditions of the Project Certificate related to shipping activities and potential marine spills. It should be considered a living document that can be updated throughout the Mine lifecycle in order to implement adaptive management techniques. Updates shall be made in consultation with the relevant regulatory agencies (e.g., DFO, CWS, and the Government of Nunavut) as appropriate.

The MEMP has been designed to provide protocols for conducting a vessel-based Marine Mammal and Seabird Observer (MMSO) program during all routine shipping activities in the Local and Regional Study Area (LSA and RSA) and for conducting monitoring of marine wildlife and their habitats (wildlife defined as mammals, fish, and birds - including upland birds, migratory birds, waterbirds, raptors, and seabirds) in the event of any Mine-related fuel spill in the RSA.

During routine shipping operations, Mine-specific mitigation measures designed to minimize Mine impacts on marine mammals and seabirds will be initiated by vessel-based MMSOs and implemented by the ship's crew. In the event of a spill, the shipping contractor will be responsible for retaining a qualified environmental professional (QEP)[1] to implement the wildlife monitoring framework described below. The MMSO will work with the QEP to provide on-site information as required.

Data collected by the MMSOs will provide information to the Government of Nunavut and other applicable regulators (e.g., Canadian Wildlife Service) regarding the location, behaviour, abundance, and species observed as well as any interactions with Mine vessels during shipping activities in the RSA.

[1] An applied scientist or technologist who is registered and in good standing with an appropriate professional organization constituted under an Act. The QEP must be acting under that association's code of ethics, and subject to the organization's disciplinary action. The QEP should have experience in the area of interested. In this case the area of interest includes marine spill response monitoring for marine mammals, birds fish and their habitats.



500 0 500
METRES

LEGEND

- BASELINE SAMPLING AREA
- MOORAGE AND OFFLOADING
- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- BATHYMETRIC DEPTH CONTOUR
- WATERBODY

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED (AEM). BASELINE SAMPLING OBTAINED FROM NUNAMI STANTEC ON BEHALF OF AGNICO EAGLE MINES LIMITED (AEM). ATLAS OF CANADA DATA OBTAINED FROM © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. NAUTICAL CHART DATA OBTAINED FROM THE CANADIAN HYDROGRAPHIC SERVICE. COUNTRY BACKGROUND DATA OBTAINED FROM ESRI.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

MARINE LOCAL STUDY AREA

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	25 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	MH	15 Mar. 2018	FIGURE D-1	
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

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-10200000 -9200000 -8200000 -7200000

9000000 8000000

Nunavut
Chesterfield Inlet
See Inset
Rankin Inlet
Whale Cove
Manitoba
Southampton Island
Nunavut
Nottingham Island
Salisbury Island
Western Hudson Strait
Baffin Island
Nunavut
Coats Island
Nunavut
Mansel Island
AREA / ZONE D
AREA / ZONE C
AREA / ZONE B
AREA / ZONE A
Hudson Bay
10 km wide RSA shipping corridor (5 km on either side)
Eastern Hudson Strait
Akpatok Island
Kuujjuaq
Quvirnituq
DÉTROIT D'HUDSON
HUDSON STRAIT
Rankin Inlet
Marble Island
N

-10200000 -9200000 -8200000 -7200000

200 0 200
KILOMETRES

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA) (SEE INSET)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- COMMUNITY
- WATERBODY

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED (AEM).
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NAUTICAL CHART DATA OBTAINED FROM THE CANADIAN HYDROGRAPHIC SERVICE. PROVINCIAL DATA OBTAINED FROM ESRI.
DATUM: WGS 84 PROJECTION: WORLD MERCATOR

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

MARINE REGIONAL STUDY AREA

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	AK	16 Jul. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	18 Jul. 2012		
CHECK	PR	18 Jan. 2013		
REVIEW	DW	18 Jan. 2013		

FIGURE D-2

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1535029_WL_Tech_Sup\02_PRODUCTION\5000\MXD\Report\1535029_Figure_D-2_Marine_RSA_Nautical_Charts.mxd

2.0 MARINE MAMMAL AND SEABIRD OBSERVER PROGRAM

2.1 Routine Shipping Operations

This section outlines the protocol for undertaking a vessel-based Marine Mammal and Seabird Observer (MMSO) program involving full-time marine wildlife monitoring during all routine shipping activities in the LSA and RSA (Figure D-1 and Figure D-2) in accordance with Project Certificate Condition 82, which states the following:

"The Proponent shall require all contracted shipping companies to provide full-time marine wildlife monitoring using trained observers and established data collection and recording protocols. Monitoring plans should include provisions for all Species at Risk Act (SARA) and for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed species (birds and mammals)."

The seabird survey protocols were revised in February 2017 to include specific survey protocols for seabirds as laid out in Section 4.0 of the Eastern Canada Seabirds at Sea (ECSAS) standardized protocol for pelagic seabird surveys from moving and stationary platforms.

A review of relevant marine mammal survey protocols was also undertaken and the marine mammal survey protocols were revised based on the following guidance documents:

- Guidelines for Minimising the Risk of Disturbance and Injury to Marine Mammals from Seismic Surveys (JNCC 2010).
- Recommended seabird and marine mammal observational protocols for Atlantic Canada (Moulton and Mactavish 2004)

The MMSOs will record marine mammal and seabird observations based on the protocols presented below through the LSA and RSA (Figure D-1 and Figure D-2). Datasheets outlined in Attachment A and Attachment B and daily reports outlined in Attachment C will be completed throughout the transit, copied for backup purposes and provided to Agnico Eagle upon arrival in Rankin Inlet or, when transiting from Rankin Inlet, will be provided as online communications allows, once the vessel has exited the RSA. Additional reporting requirements in the event of a spill are outlined in Section 2.2.1.5.

2.1.1 Observer Qualifications and Training

Appropriately qualified MMSOs should be selected based on their knowledge and experience with the MMSOs protocols laid out below. Previous wildlife observation field experience will be considered an asset during the MMSO selection process. Depending on the level of experience of the selected MMSO, a MMSO training session(s) will be considered and will be completed by qualified/certified marine wildlife observers with previous arctic wildlife monitoring experience. The training, if required, will review the monitoring protocols outlined below and provide instruction on how to spot and identify marine mammal and seabird species.

Primary objectives of the training will could include the following, dependent on the expertise of the MMSOs:

- Role and responsibilities of MMSOs;
- Review of the MEMP including mitigation measures;
- Health, Safety, and Environment;

- Review of marine mammal and seabird species identification (including upland birds (including migratory birds), waterbirds, raptors, as well as seabirds) observation, identification, and distance estimation methods;
- Review of operation of MMSO equipment (reticle binoculars, GPS system);
- Distances estimation techniques for various scenarios (reticle binoculars, no horizon);
- Review of, and classroom practice with, data recording and data entry; and
- Reporting templates and requirements.

2.1.2 Program Protocol

Mitigation measures outlined in Section 4.2 of the Shipping Management Plan will be implemented during all Mine shipping activities by the shipping contractor(s). MMSOs will not be directly responsible for implementing mitigation measures. The role of the MMSO is to record and report on marine mammals and seabird sightings during shipping activities, and to advise the contractor (i.e., captain and ship crew) on the location of observed marine mammals and if any action is recommended based on mitigation measures outlined in the Shipping Management Plan.

The following protocol will be implemented during the MMSO program:

- A minimum of one trained MMSO will be present on-board the Mine shipping vessels during all transits within the RSA;
- The MMSO will conduct marine mammal and seabirds observations in the RSA from the bridge during daylight hours as described in Section 2.1;
- The MMSO will observe and record sightings of marine mammals and birds during vessel movements in the RSA (including upland birds, migratory birds, waterbirds, raptors, and seabirds) as well as environmental conditions as described in Section 2.1;
- A communication plan will be established between the MMSO(s) and the ship's crew in order to provide information regarding marine mammal and seabird sightings;
- The shipping contractor will initiate mitigation measures designed to minimize Mine impacts on marine mammals and seabirds, as identified in the Shipping Management Plan; and
- MMSOs will assist in observing for marine mammals and seabirds in the event of a spill (see Section 2.2).

The MMSO program will allow for the opportunity of adaptive management techniques to be implemented if monitoring identifies potential for adverse effects on marine wildlife along the shipping route. This may include modification of mitigation measures in response to new information arising from the monitoring carried out by the MMSO and vessel crew. Adaptive management will be conducted in consultation with the Kivalliq Inuit Association, the Hunters and Trappers Organizations of the Kivalliq communities, and the relevant regulators.

2.1.3 Marine Mammal Observing Protocols

Dedicated marine mammal observations will be conducted in the RSA. The protocol outlined in this section are best conducted along a transect line, therefore, it is best to start a marine mammal observation period when the vessel is and will be moving in a straight line for an extended period of time. Note the time and location (GPS) of the start and end of each observation period as well as the vessel speed (in knots). If vessel speed or direction changes significantly during the observation period, record the time and location and the change.

Observer Position

Observations will be done from a high location on the vessel and ideally outdoors if possible and will be conducted at the same location each time. For marine mammal observations with a single observer, the MMSO will position themselves in the middle of the ship at the front (bow) to observe marine mammal on both the starboard and the port side (Figure D-3).

Observation Period

MMSO observation periods (marine mammal and seabird observations) should not last longer than 2 hours to mitigate observer fatigue and eye strain, and a MMSO observation day should not exceed 12 hours. Based on these requirements, dedicated marine mammal observations will be conducted over a 1.5 hours period following a seabird survey (approximately 30 minutes). A suggested MMSO schedule for moving and stationary ships is provided below in Table D-1 and Table D-2.

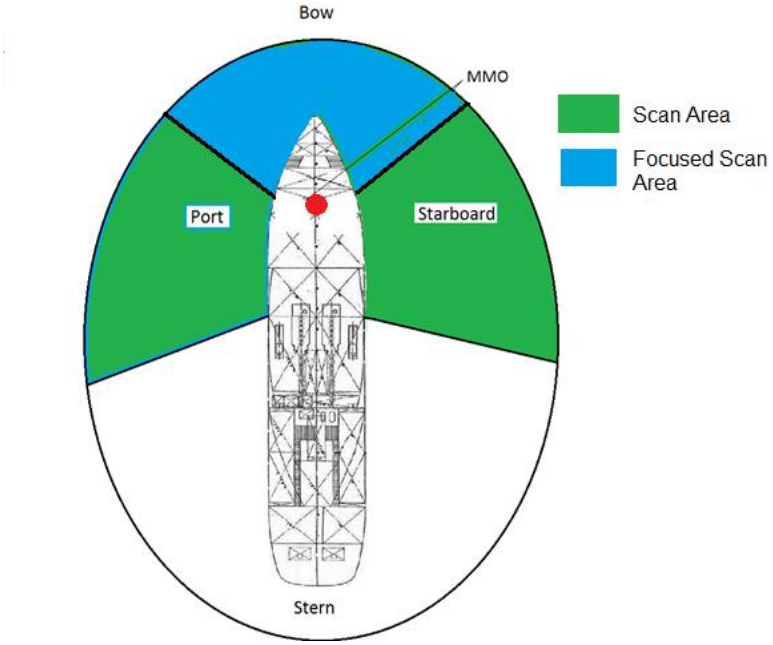

Figure D-3: MMSO position and respective observation field on a hypothetical ship

2.1.3.1 Scan Routine

The following scan routine should be conducted throughout the marine mammal observation period. Scan the water with the naked eye and use binoculars only to focus on possible sightings. Perform S and U scans of the observation field about every 20 seconds (Figure D-4). The most important aspect of marine mammal observing is to constantly scanning the observation field to capture animals that could be located in the peripheral view for brief moments (e.g., surfacing). Scans should be made from the middle of the vessel (for one MMSO) and cover the scan area shown in Figure D-3 with a focus on the water ahead and to the side to the moving vessel (e.g., focused scan area in Figure D-3). If the vessel is stationary (e.g., anchored) scans should be conducted over the entire scan area (e.g., blue and green in Figure D-3) in a uniform fashion. When the vessel is stationary, less priority can be attributed to marine mammal observations and the MMSO can switch to an observation schedule similar to that shown in Table D-2.

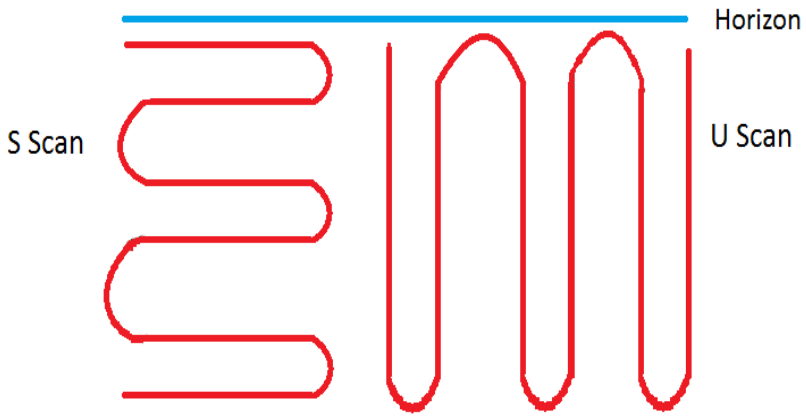

Figure D-4: S and U scanning techniques

All marine mammals observed during the dedicated marine mammal observational periods as well as incidental sightings will be recorded including GPS location, distance to animal, angle to animal, number of individuals, species, behaviour etc. (see Section 2.1.5.2 below). If a species is unknown or if a blow is the only detection of the animal observed, then mark the sighting as unknown. Marine mammals in large groups that are close together should be marked as a single sighting. When possible, photographs of marine mammal sightings will be taken and recorded alongside sightings records.

Angle to a marine mammal or group of marine mammal can be calculated using a Pelorus or by estimating the angle with an angle board. Figure D-5 shows how an angle to a marine mammal from the vessel should be estimated.

On-effort sightings should be recorded by the MMSO only, with no assistance permitted by other crew members. If additional sightings are made by other crew members or if sightings are made outside the designated marine mammal observation period (see Table D-1) then these sighting should be marked as incidental sightings on the marine mammal sighting record (Attachment A). Sightings of pinnipeds hauled-out on land will be recorded as off-effort sightings. Bow-riding dolphins or porpoises are also not recorded as on-effort sightings unless they are observed prior to their initial approach to the vessel (as it was assumed that the sighting of a bow-riding cetacean was not random but rather influenced by the presence of the vessel). Bow-riding dolphins or porpoises are recorded as incidental (off-effort) sightings.

All efforts will be made to avoid double counting individuals or groups of individuals. If a marine mammal is counted twice in the sightings record, then a note of a re-sighting should be marked. Additional information to be collected for marine mammals is outlined in Section 2.1.5.2 below.

Table D-1: Example of Daily MMSO Schedule – Moving Ship

Time of Day (24 hour Clock, UTM)	Shift Type
7:00	Seabird
7:30	Marine Mammal
8:00	Marine Mammal
8:30	Marine Mammal
9:00	Break
9:30	Break
10:00	Seabird
10:30	Marine Mammal
11:00	Marine Mammal
11:30	Marine Mammal
12:00	Break
12:30	Break
13:00	Seabird
13:30	Marine Mammal
14:00	Marine Mammal
14:30	Marine Mammal
15:00	Break
15:30	Seabird
16:00	Marine Mammal
16:30	Marine Mammal
17:00	Marine Mammal
17:30	Break
18:00	Daily Reporting
18:30	Daily Reporting

Table D-2: Example of Daily MMSO Schedule – Stationary Ship

Time of Day (24 hour Clock, UTM)	Shift Type
7:00	Seabird
7:30	Marine Mammal
8:00	Seabird
8:30	Marine Mammal
9:00	Break
9:30	Break
10:00	Seabird
10:30	Marine Mammal
11:00	Seabird
11:30	Marine Mammal
12:00	Break
12:30	Break
13:00	Seabird
13:30	Marine Mammal
14:00	Seabird
14:30	Marine Mammal
15:00	Break
15:30	Seabird
16:00	Marine Mammal
16:30	Seabird
17:00	Marine Mammal
17:30	Break
18:00	Daily Reporting
18:30	Daily Reporting

Notes: The full 30 minutes may or may not be used for seabird surveys depending on the survey method implemented. Further details are described in Section 2.1.4 below.

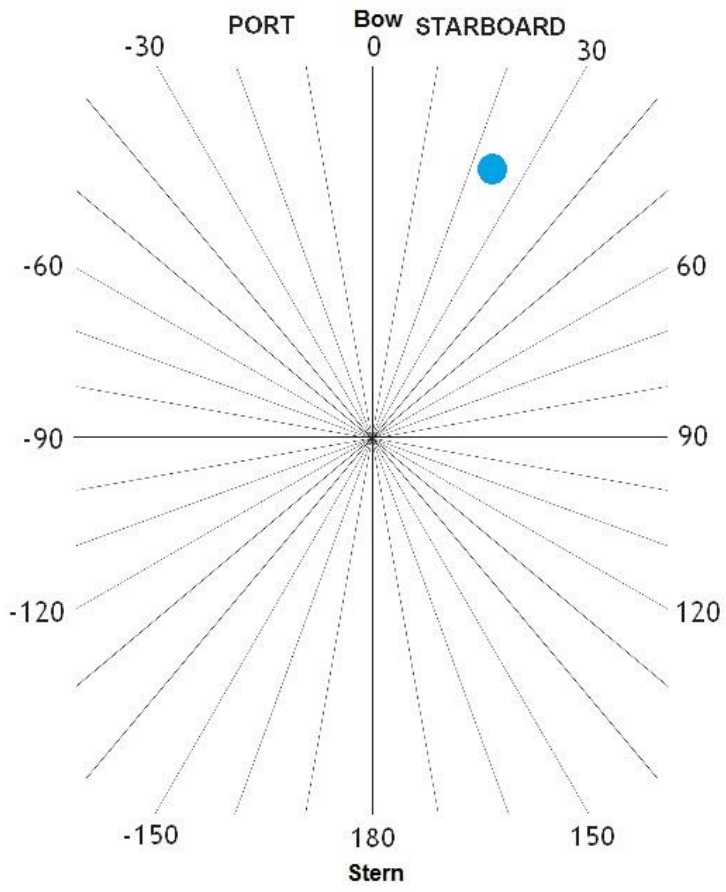

Figure D-5: Angle to Marine Mammal (blue dot) is approximately 22º

2.1.3.2 Estimating Distance

Observers should practice estimating the distance bands prior to beginning surveys. This can be accomplished by using reticle binoculars as described below or with a distance gauge made from a transparent plastic ruler (see Attachment B).

Record the distance to each marine mammal or group of marine mammal (to the centre of the group). For all marine mammals, estimate the angular distance between the marine mammal(s) and the observer.

Using Reticle binoculars

Reticle binoculars have a built in scale called a reticle (Attachment B). Estimating distances to marine mammals using reticles is based upon the distance to the horizon which is dependent on:

- the height of the observer eye above sea level in meters; and
- radians per reticle mark for the type of binoculars.

The height of the eye includes the height of the platform above the surface of the water. The number of radians (usually milliradians[2]) will depend on the type of reticles binoculars that are used. The number of radians per reticle mark can be used to produce a distance table based on an equation provided by the binocular manufacture. An example of an equation provided by Fujinon 2006 is:

Distance = (eye height + height above sea level in meters) x 1000 / # of milliradians

Reticle binoculars cannot be used to estimate distance if the horizon is obscured (by fog or land), or if they are used from a different height above sea level. Their use becomes minimal in nearshore waters.

2.1.4 Seabird Survey Protocols

Seabird survey will be conducted in the RSA. The protocols laid out bellow were extracted and adapted from the Canadian Wildlife Service (CWS) standardized protocol for pelagic seabird surveys from moving and stationary platforms (Gjerdrum et al. 2012).

Observer Position

Observations should be done from a high location on the vessel, when possible, at a location as close to the edge of the platform as possible to increase the detection of seabirds, especially for individuals that use the waters at the base of the vessel. All surveys should be conducted at the same location each time.

2.1.4.1 Survey Protocol – Moving Vessel

Transect Methods

Moving vessel seabird surveys should be conducted along a transect line when the vessel is and will be moving along a straight line for an extended period of time. Note the time and location (GPS) of the start and end of each survey period (described below) as well as the vessel speed (in knots) as laid out in the seabird survey sighting form (Attachment B).

During transect surveys, the observer is to look forward from the vessel, scanning at a 90° angle from either the port (left) or starboard (right) side depending where he or she is located. The transect width within seabirds are recorded is 300 m from the side of the vessel (see Figure D-6). Scan ahead regularly (e.g., every minute) to spot birds that may dive as the vessel approaches.

All birds observed within this 300 m transect, whether flying or on the water, are recorded and are considered in-transect sightings. The methods for recording birds on the water verses birds in flight are outlined below. All five minute surveys should begin with a snapshot survey to capture flying birds. The perpendicular distance from the line to the seabirds detected on the water or in flight is estimated for each sighting. Birds observed outside the 300 m transect are also recorded if this does not affect observations within the 300 m transect. Distance categories “E” and “T” in Figure D-6 are both considered not in transect. Binoculars and spotting scopes can be used to confirm species identification and other details as necessary. Information that will be collected during each sighting is outlined in Section 2.1.5.4.

[2] unit of angular measurement

Moving platform transect survey are best conducted when travelling at a minimum of 4 knots (7.4 km/h) and a maximum of 19 knots (35.2 km/h). These surveys can be done when the ship is travelling less than 4 knots, but birds are often attracted to slow moving or stationary ship. If birds are clearly gathering around the ship and settling on the water when the ship is moving at decreased speeds cease the surveys until the ship resumes a higher speed. If the ship is no longer moving (e.g., anchored or on standby) switch to the stationary platform survey methods described below.

Observation Period

Each seabird survey period will be conducted during six consecutive five-minute periods which is repeated three times a day to capture morning, afternoon and evening periods (see Table D-1). These five minute surveys should be dedicated to surveying for seabirds only. These surveys should be completed regardless if birds are present or not. If the vessel is not moving (stationary), use the method for stationary vessel described in Section 2.1.4.2 below.

Short breaks should be taken at the end of each five minute period to record the vessel's position and any conditions that may have changed since the last five minute survey period. If ship speed or direction changes significantly the survey period, record the time and location (GPS), cease the current survey and begin a new five minute survey period.

The frequency of the seabird surveys outlined in Table D-1 has been selected to provide time for the MMSO to:

- have dedicated seabird and marine mammal observation periods (as described above);
- take necessary breaks to avoid observer fatigue; and
- conduct daily reporting.

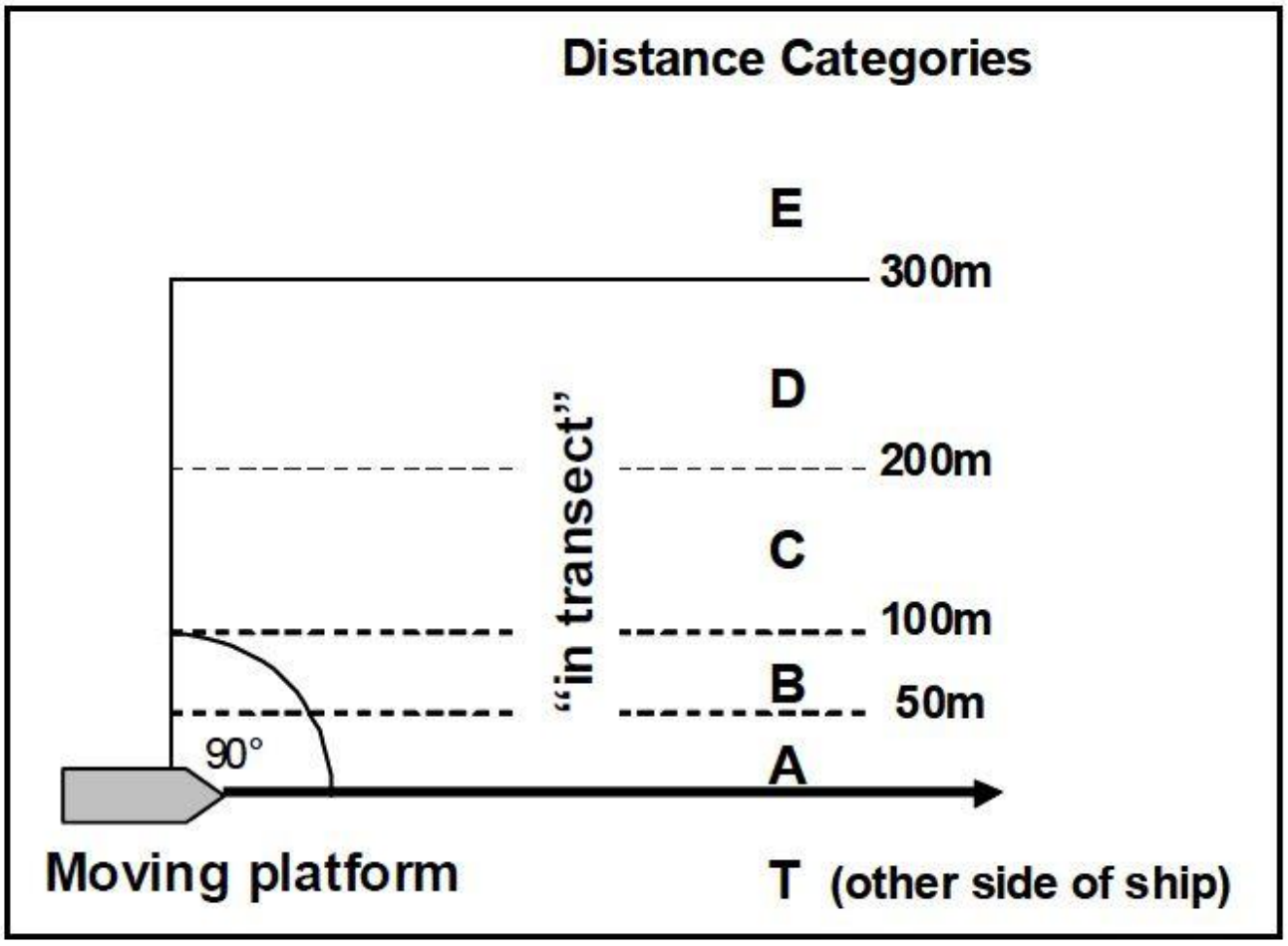

Figure D-6: Illustration of a survey using a 90° scan, covering a 300 m transect from a moving platform (extracted from Gjerdrum et al. 2012)

Birds on the Water

All birds observed on the water are continuously recorded throughout the five minute survey period. If birds in the transect fly off the surface of the water as the vessel approaches, use binoculars to help count them, and record these birds as being on the water as outlined in the seabird survey sighting form (Attachment B). These birds are not subsequently counted as a flying bird during a snapshot survey (described below for flying bird).

Birds on the water may be observed up ahead of the platform, perhaps as far as 400 m or 500 m, but still within the 300 m transect (Figure D-6). Because these individuals may dive or fly away as a result of the approaching ship, they should be counted as in transect and their perpendicular distance recorded when they are first observed. If the five minute survey will end before the ship reaches them they should be recorded in the next five minute survey period.

Birds in Flight – Snapshot method

All five min surveys should begin with a snapshot of flying birds. Flying birds are not recorded continuously throughout the five minute survey period as with birds on the water, as this would overestimate bird density. Create a routine of snapshot counts to record flying birds during the survey period. Only use the snapshot method when there are many birds observed flying in the area. The number of snapshots done will depend on the speed of the vessel (Table D-3).

During each snapshot, record flying birds as in transect if they are flying above the 300 m transect. Record all other flying birds that are seen outside of the 300 m transect or between snapshot intervals as not in transect.

Some species may fly in long lines across the 300 m survey transect. At the time of the snapshot, the number of birds in the flock is recorded and the distance class is assigned according to the location of the centre of the flock. All the birds in the flock are recorded as in transect if the centre is within the 300 m transect. If the centre of the flock is outside the 300 m transect, all birds are recorded as not in transect.

Large Groups of Birds

When very large numbers of birds are encountered that overwhelm the observer's ability to count the number of birds and measure the distance to flocks the snapshot method can be used to count all birds in flight and on the water. If this protocol is used, note the change in protocol on the seabird survey sighting form (Attachment B). If it is not practical to estimate distance to each bird or flock of birds, the observer should at least indicate whether the birds were observed in or out of transect. If it is not practical to note which birds are on the water and which are in flight use the following guidelines:

- If the majority of the birds are in the air, they can be recorded as flying.
- If birds appear first on the water and then fly away as the vessel approached, or they continuously move between the water and air, recorded them being as on the water.

Birds that follow the Vessel

To avoid double counting birds, once a bird is recorded in-flight it is not subsequently recorded again if it follows the ship and it is not recorded on subsequent snapshots. If many birds are following the vessel and it becomes difficult to determine which individuals have already been recorded, the number of birds following the ship can be estimated and recorded at regular intervals (i.e., in between each five minute survey or as possible).

Table D-3: Intervals at Which Instantaneous or "Snapshot" Counts of Flying Birds Should be conducted during a Moving Vessel Survey

Platform Speed (knots)	Interval Between Counts (minutes)
<4.5	2.5
4.5 – 5.5	2.0
5.5 – 8.5	1.5
8.5 – 12.5	1.0
12.5 - 19	0.5

Poor Visibility

When a survey period cannot be done because of poor visibility (i.e., when the entire width of the 300 m transect is not visible), the extent of visibility should be noted on the seabird survey information form.

Observation Periods with no birds

If no birds are observed during a five minute survey period, “no seabirds observed” must be noted on the seabird survey information form.

2.1.4.2 Survey Protocol – Stationary Vessel

Scan Method

Surveys while the vessel is stationary (e.g., on standby or anchored) are done using instantaneous counts, or “snapshots” of birds within a 300 m “semi-circle” area from the vessel. These surveys are conducted by scanning through a 180° arc, limiting observations to a semi-circle around the observer (Figure D- 7)

The area should be scanned from one side to the other, and all seabirds on water and in flight that are observed within 300 m are systematically recorded. Birds visible beyond 300 m are also, if possible. The distance to seabirds (inside and outside the 300 m area) from the observer is estimated and recorded for all birds. Birds observed outside the 300 m semi-circle are recorded as not in semi-circle on the seabird survey information form. Binoculars and spotting scopes can be used to confirm species identification and other details as necessary.

Observation Period

When the vessel is stationary, less priority can be attributed to marine mammal observations. Therefore, scans should be completed once every hour when the vessel is stationary (Table D-2). The length of each scan will depend on the number of birds present at the time of the scan (e.g., it may only last a few seconds if there are no birds present).

Poor Visibility

When an observation period cannot be done because of poor visibility (i.e., when the entire width of the 300 m transect is not visible), the extent of visibility should be noted on the seabird survey information form.

Observation Periods with no birds

If no birds are observed during a five minute survey period, “no seabirds observed” must be noted on the seabird survey information form.

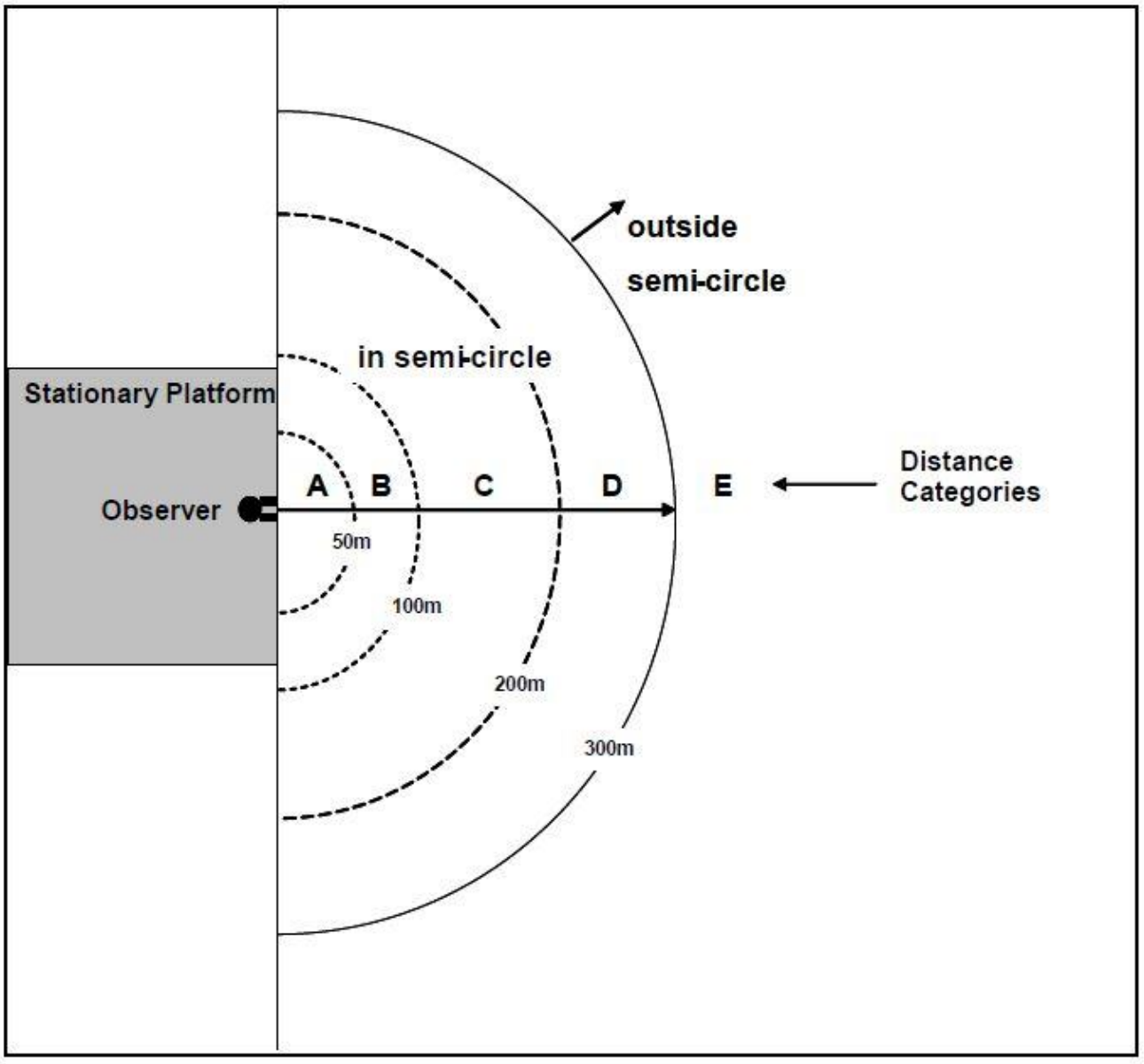

Figure D- 7: Survey using an 180º scan, surveying an area 300 m from a stationary observer (Extracted from Gjerdrum et al. 2012)

2.1.4.3 Estimating Distance

Observers should practice estimating the various distance bands prior to beginning surveys. This can be accomplished by using reticle binoculars as described above in Section 2.1.3.2 or with a distance gauge made from a transparent plastic ruler (see Attachment B).

Record the distance to each bird or flock of birds (to the centre of the flock). For all birds, estimate the perpendicular distance between the bird(s) and the observer (Figure D-6). If a group of birds is straddling the 300 m boundary with the flock centre located in D (some individuals inside and some individuals outside the transect) record the entire flock as being in D. If the flock centre is outside the transect, record the entire flock as distance class E. It is very important to record distance to birds within the 300 m strip, but if this is not possible (i.e., too busy), you may use the code 3 = within 300 m but no distance recorded. Distance T is used to indicate that the bird or flock was observed on the opposite side of the vessel.

2.1.5 Recording Observations

2.1.5.1 General Environmental Information

This information should be collected for both marine mammal and seabird observations as shown on the marine mammal and seabird sightings forms in Attachment A and Attachment B.

Ship name, agency and type: Agency is the company that has requested the survey (e.g., Agnico Eagle Mines Limited, Meliadine Division). Type may include container vessel, barge, tug, or fuel supply vessel.

Observer(s): Indicate the first and last name of the observer. Also record the name of any additional observers assisting with the survey.

Date: Date that the observation period occurred. Use format DD-MMM-YYYY (e.g. 12-Apr-2008)

Time start/Time end: Time (using 24-hour notation) at the start and end of each seabird survey or marine mammal observation. Use Universal Time (UTC) to standardize across regions.

Coordinates at start and end of observation period of track of observation period: GPS coordinates of the vessel.

Platform activity: Platform activity may influence observations and should therefore be noted. Activities could include traveling, off-loading, anchored etc.

Visibility: Estimate visibility in km from 0.3 (which is 300 m) to 20 km; estimates should also be made on foggy days.

Sea state code: Select Sea state code according to codes in Appendix II.

Swell height: Estimate the height of the swell.

Weather conditions: Record the general weather conditions at the time of the survey according to codes in Appendix II. Record the most prominent conditions within the survey area. For example, if there are distant fog patches that do not directly affect the survey conditions, the weather code will be 0 or 1. Alternatively, if there is <50% cloud cover but you are travelling through fog patches, the weather code will be 2.

Glare conditions: Light reflecting off the surface of the water can often influence detection. Record the glare conditions at the time of the survey according to codes in Appendix II.

Wind speed or force: Enter the speed of the wind in knots if instrument to measure wind is available on the bridge or use Beaufort code from Appendix III. When taking measurements from a moving platform, be sure to record the TRUE wind speed/direction.

Wind direction: Enter compass direction (**N, NE, E, SE, S, SW, W, or NW**) of the wind. See note above regarding true wind speed/direct.

Ice Type and Concentration: If ice is present during the survey, indicate the type and concentration using codes from Appendix IV. Indicate in the notes if the ice is present only beyond the transect limits.

Platform speed (knots): If speed changes during observation period, enter new speed and time that the change happened.

Platform direction: Enter compass direction (**N, NE, E, SE, S, SW, W, or NW**); if direction changes during the observation period enter new direction and time at which change happened.

Observation side: Starboard (right) or Port (left).

Height (metres): Enter height of observers' eye above water from observation point in metres.

Outdoors or Indoors: Circle **Out** when doing observations from a position outdoors and **In** for indoor observations. Remember survey should be conducted from the same location on the vessel each time.

Other Notes: Make note of disturbances or relevant activities in the area, especially if there are large vessels or fishing activities nearby, or if your vessel is sounding the fog horn.

2.1.5.2 Marine Mammal Sightings Record

Species: choose the species observed. Record all unknowns, even if they are identified only as "baleen whale" or "toothed whale".

Number of individuals: Record the number of marine mammals in each sighting. Record groups as one sighting (e.g., one line item), if they behave as a group and have the same morphological and behavioural characteristics (e.g., all adults of the same species). Record other individuals from the group that have different characteristics (e.g., different species or juveniles of the same species) in the next line but link all the sighting together to indicate they were a single sighting.

Distance: Record the distance to the marine mammal when first observed

Angle: Sighting angle to the marine mammal can be calculated using a Pelorus or an angle board

Behaviour: Chose a behaviour based on the list below

- ***Surfacing***: Marine mammals will surface in order to breathe, often exposing their backs.
- ***Breaching***: full or partial jump out of the water
- ***Fluking***: Some whales bring their tail flukes high up into the air on a deeper dive.
- ***Flipper-slapping***: Marine mammals may use their flippers to slap the surface of the water.
- ***Lob-tailing***: Whales raise their fluke high into the air in order to slap the surface of the water.
- ***Spyhopping***: Head of the marine mammal will surface out of the water as a means to get an in-air look.

- ***Porpoising***: high speed swimming is more efficiently accomplished if an animal jumps out of the water, usually observed in dolphins, porpoises, and pinnipeds.
- ***Bow- or Wake-riding***: Some species of dolphins and porpoises are attracted to ride the bow or the wake of a passing vessel.
- ***Logging***: Marine mammals resting at the surface.
- ***Feeding***: Marine mammals observed feeding on fish, krill or other marine mammals
- ***Hauled*-out**: For pinnipeds only. When they haul themselves onto land. Remember these individuals should be recorded as off-effort sightings.

Age: If possible, select whether the marine mammal is a:

- **Adult**
- **Juvenile**
- **Immature**

Sex: If possible, Male or Female

Direction of travel (N, NE, E, SE, S, SW, W, or NW): which direction the marine mammals are traveling. Not if they change the direction of travel in response to the vessel.

Note: Space is provided to record other important information, such as the presence of fishing vessels in the survey area, if the marine mammal suddenly changes behaviour etc.

2.1.5.3 Seabird Sightings Record

Observation period information: Fill in all the fields within the seabird survey form at the beginning of every five minute transect survey period (moving survey) or every scan (stationary survey).

Scan type (for stationary platforms only): Conduct a 180° scan for all stationary surveys. If part of the survey area is obstructed, indicate the scan angle used.

Scan direction (for stationary platforms only): Indicate the true (not magnetic) bearing when looking straight ahead, at centre of semi-circle.

With snapshot? Enter whether the snapshot method for birds in flight is being used by checking **Y or N.**

Species: choose the species observed. Record all unknowns, even if they are identified only as “gull” or “bird”.

Number of individuals: Record the number of birds in each sighting in the count field. Record groups of birds as one sighting, if they behave as a group and have the same morphological and behavioural characteristics (e.g., all adults of the same species in breeding plumage flying in the same direction). Record other individuals from the group that have different characteristics (e.g., different species or juveniles of the same species) in the next row but link all the sighting together to indicate they were a single sighting.

In transect or semi-circle? Y or N: Enter whether a bird observed is in (Y) or out (N) of the transect. Give priority to birds that are in transect; record birds seen outside of the observation area if this does not affect "in-transect" observations.

Behaviour (flying, on sea, and/or feeding): Record which activity a bird or group of birds is doing by selecting the activity from the drop-down menu.

Associated with platform? Y or N: Enter whether birds are following/associated with the moving platform with either a **Y** (Yes) or **N** (No).

Distance: Record the distance to each bird or flock of birds (to the centre of the flock). For all birds, estimate the perpendicular distance between the bird(s) and the observer (Figure D-6). Distance categories are as follows: A = 0 to 50 m, B = 51 to100 m, C = 101 to 200 m, D = 201 to 300 m, and E = >300 m.

Age: If possible, select whether the bird is a:

- **A** (adult plumage)
- **J** (juvenile, first coat of true feathers acquired before leaving nest)
- **I** (immature, first fall or winter plumage that replaces juvenile plumage and may continue in a series that includes first-spring plumage, but is not the complete adult plumage).

Plumage of adults: If possible, choose whether the bird has:

- **B** (breeding plumage usually in spring and summer – will apply to most birds seen during the survey)
- **NB** (non-breeding plumage, fall and winter plumage)
- **M** (moult, transitional phase between these two plumages, often with some flight feathers missing; generally not flying when molting)

Sex: (Male or Female)

Flight direction (N, NE, E, SE, S, SW, W, or NW): which direction birds in flight are heading, if not associated with platform (this info can be obtained from instruments on the bridge). If birds are flying erratically such that no one direction is appropriate, record them as ND (no direction).

Note: Space is provided to record other important information, such as the presence of fishing vessels in the survey area, if a particular bird was carrying fish, etc.

2.1.5.4 Additional Information

MMSOs will record any responsive actions undertaken by the vessel crew in response to sightings (e.g., reducing vessel speeds). This will be recorded on a daily basis as outlined in the MMSO daily reporting template provided in Attachment C and will include:

- Description of any vessel mitigation implemented (e.g., reduction in speeds, evasive maneuvers etc.); and
- Record of any vessel-animal collision (marine mammal or seabird) including the following information:
  - date, time, spatial coordinates;

- wind speed and direction, visibility, precipitation, sea state;
- number of animals found dead or injured on the deck (seabirds) and on the water (seabirds or marine mammals); and
- if search lights or vessel lighting sources were active at the time of collision.

This information will be summarized in a daily report by the MMSO. All records of vessel strikes on marine mammals and bird collisions will be provided to Fisheries and Oceans Canada (DFO) and the Canadian Wildlife Service (CWS) on a weekly basis, as vessel communications allow (i.e., as internet connections allow). Immediate reporting will be required in the event that a ship strike occurs on a marine mammal, or multiple bird collisions occur (involving more than five individuals) and the incidents appear related (i.e., similar time period, location, and weather conditions). In this instance, the regional Environment Canada (EC) Wildlife Enforcement Officer (contact information provided below) will be contacted to provide advice on the implementation of adaptive management techniques (see Merkel and Johansen 2011) to attempt to reduce the likelihood of collisions occurring in the future.

2.2 Spill Scenario

This section outlines the protocol for undertaking wildlife monitoring in the event of a major fuel spill in the LSA and RSA in accordance with Project Certificate Condition 64, which states the following:

"*The Proponent shall develop a framework for monitoring of marine bird species and their habitat in the event of a major marine fuel spill. Specific details regarding the scope of follow-up monitoring may be further refined if and when such an event were to occur."*

There are three potential scenarios during Mine shipping operations when a fuel spill could occur:

1) During shipping activities;

2) During ship-to-ship fuel transfer; or

3) During ship-to-shore transfer of fuel.

A spill risk assessment (SD8-1: Appendix E) was conducted at 14 sites along the shipping route to better understand how a potential fuel spill would behave over time within the RSA.

In the event of a fuel spill, the following wildlife monitoring framework will be implemented. It will be the responsibility of the shipping contractor(s) to employ a qualified environmental professional (QEP) to implement this framework in the event of an incident and will be a requirement of the shipping contract. It is recommended that a QEP be retained under contract on a stand-by basis during the shipping season to be able to respond to a spill in a timely fashion.

Not all spill scenarios will require the implementation of all aspects of this framework (i.e., a small spill contained close to the vessel will not require the same level of monitoring as a larger spill). It is the responsibility of the QEP, in consultation with the relevant regulators, to determine what aspects of the framework should be implemented.

The monitoring framework outlined below is intended to be a 'living document' which provides an opportunity for adaptive management techniques to be implemented throughout an event. The objective of the framework is to provide a strategy for the coordination of marine wildlife monitoring in order to minimize potential effects as a result of an incident. The framework should be amended as new information becomes available (e.g., changes to the extent of a spill) and should ultimately address both potential acute effects to wildlife and their habitats as well as potential long term chronic effects.

There is an opportunity to involve local communities and hunters, other organizations, institutions, government departments and/or individual researchers during the initial response phase and the follow-up phase during an incident. These opportunities include, but are not limited to:

- Providing information regarding sensitive resources in the area;
- Assisting in collecting baseline sediment and water quality samples;
- Assisting with wildlife surveys;
- Collecting wildlife who have come into contact with the spill;
- Providing information regarding the extent and direction of a spill; and
- Assisting with on-going wildlife monitoring.

The involvement of these organizations in the wildlife monitoring framework should be coordinated by the QEP as well as the vessel response team (to be identified in Shipboard Oil Pollution Emergency Plan (SOPEP) or Agnico Eagle's Emergency Response Team (ERT) depending on who is taking on coordination of the clean-up efforts (See section 2.0 of the Shipping Management Plan).

Monitoring during a spill event is divided into two phases, an 'Initial Response Phase' and a 'Follow-up Phase'.

2.2.1 Initial Response Phase

The initial response phase addresses the management of anticipated acute effects of the spill on marine wildlife and their habitats. The framework for the initial response phase should be managed and updated to incorporate new information as it becomes available.

Within 24 hours of an incident, the following marine wildlife monitoring objectives should be achieved:

- Identify a QEP to coordinate the wildlife monitoring framework; and
- Set-up of a 24 hour communication line and provide contact information to the community where local community members and other interested parties can call-in to report fouled or at-risk wildlife sightings.

2.2.1.1 Surveys and Sampling

2.2.1.1.1 Marine Wildlife

During the initial phases of a spill, all wildlife observed in direct contact with the fuel spill or present in the vicinity of the spill will be recorded in a wildlife sightings record (see example in Table D-4). Encounters may be called in by local community members, other vessels, MMSO(s) onboard Mine vessel(s), or by the spill response teams themselves. If possible, the QEP or suitable designate will conduct an initial survey of the affected area to record all species occurrences as soon as possible following a spill. This may be via ground, small support vessel or by aircraft and if possible, should be continued on a daily basis until the spill is contained. Aerial surveys can assist the focus of ground surveys, depending on the extent of a spill. The purpose of these surveys is to identify wildlife resources at risk within the vicinity of the spill and develop appropriate management strategies for minimizing risk and/or impacts to these resources. Resources to be identified during the surveys include presence of pelagic birds, waterfowl, marine mammals, and sensitive fish and wildlife habitat.

In the event that a spill reaches landfall, an intertidal community structure survey should be completed in affected areas and at suitable reference locations in the region. The intertidal surveys should involve intertidal quadrat-based transect sampling and should be conducted in accordance with DFOs marine habitat assessment guidelines as outlined in Attachment E.

Table D-4: Example of a Wildlife Sightings Record in the Event of a Spill

Common Name	Number of Individuals	Date/Time	Location (GPS location if possible in UTM)	Behaviour	Condition of Animal*	Photos**
MAMMALS						
BIRDS						
FISH						

Notes: * - note if the animal has been in contact will the spill or not, if individuals have been observed moving towards the spill, or if the animal is dead.

** Photos should be attached when possible

2.2.1.1.2 Marine Habitats and Benthic Communities

Marine water, surficial sediment, and benthic invertebrate tissue samples should be collected in the affected area(s) as soon as practical to establish baseline and initial spill conditions for water, sediment and tissue quality at the time of the spill. Samples should be collected from a near field to far field direction and should start as close to the spill as possible. The sampling plan should be evaluated on an on-going basis during the initial response phase to determine if the sampling intensity is appropriate relative to the nature of the spill (e.g., additional sampling sites may be required if the trajectory of the fuel spill changes).

Standard sample collection and environmental effects monitoring methods and analytical requirements implemented during fuel spills are provided in Table D-5. Ultimately, monitoring requirements will be at the discretion of the applicable regulators (e.g., EC-CWS and DFO).

Table D-5: Example of Sampling Methods and Analytical Requirements

Parameter	Location	Collection Methods	Laboratory Analyses
Water	Sites should be distributed from a near field to far field direction. Locations as close as possible to the perimeter of the spill should be collected first.	*In situ* measurement of pH, conductivity, salinity, temperature and turbidity throughout the water column. One sample should be collected at each site with a grab sampler (e.g., a Niskin bottle or Kemmerer). *In situ* and water samples should be collected at the surface, mid-water and deep water.	• BTEX/VPH • EPH • VOCs • PAHs (parent) • Total and Dissolved Metals (including mercury) • TOC • Major ions • General parameters
Sediment	Sites should be distributed from a near field to far field direction. Locations as close as possible to the perimeter of the spill should be collected first.	Five replicates collected at each shore site where sediments are sand-sized (e.g., less than approximately 2.0 mm) or finer. For shoreline areas, samples collected with a grab sampler (e.g., Ponar) at high tide, or a stainless steel spoon and bowl at low tide, with replicates randomly distributed within the sample area. For each station, samples should be collected at high and mid to low intertidal zone. For deepwater stations, one surface sediment sample should be collected.	• BTEX/VPH • EPH • VOCs • PAHs (parent) • Metals (including mercury) • TOC • Grain size distribution
Tissue – Requires a DFO scientific fish collection permit	Sites should be distributed from a near field to far field direction. Locations as close as possible to the perimeter of the spill should be collected first.	Five replicates consisting of a composite of 20 individual bivalves collected randomly at each station where bivalves are present. Bivalves should be shucked and the soft tissues rinsed in with deionized water to remove shell pieces and other debris. Tissue samples will be handled with clean stainless steel instruments (i.e., scalpels), weighed and divided between two certified-clean, laboratory-supplied glass containers with Teflon®-lined lids, which will be then stored in a freezer. The samples will be transported on ice (frozen) to an accredited lab for analysis of parent and alkylated PAHs (following silica-gel cleanup to remove natural polar organic compounds that can cause false positives), metals, lipids and moisture content.	• PAH (parent) after silica-gel clean-up. • Metals • Moisture • Lipids

2.2.1.2 Species and Habitats of Immediate Risk

Marine species and habitats of immediate risk from the spill should be identified in order of priority (see Table D-6). This will depend on a variety of factors including the location of the spill, timing, and prevalent weather conditions. Examples of sensitive habitats of potential immediate risk include fish bearing streams, narwhal congregation areas, walrus haul-outs, coastal nesting bird sites etc. Specific locations of habitats are important to note. A revised marine baseline report (SD8-1: Appendix B of the Shipping Management Plan) provides the most current information on known sensitive marine resources in the RSA. Figure B-3 of SD8-1: Appendix B – Revised Baseline – Marine Environment outlines the various coastal habitat types in Melvin Bay in the event of a spill within the limits of the harbour.

The above information should be provided by the QEP to the spill response team and others involved in the spill clean-up (e.g., the Canadian Coast Guard) along with recommendations on what environmental resources are of greatest concern to protect. The QEP should also be involved in discussions relating to the implement of mitigation measures to avoid impacts to sensitive resources. Recommendations regarding mitigation from the QEP should be made in consultation with the relevant regulatory agencies (DFO for marine mammals and fish, CWS for marine birds and the Government of Nunavut for polar bears). The CWS provides spill response guidance on what techniques are available to be used during a spill in relation to marine birds (provided in Attachment D), this includes:

- Hazing;
- Dispersing Oil;
- Bird Collection;
- Wildlife Monitoring (as covered by this framework);
- Beached Bird Surveys (as covered by Section 3.2.1.1);
- Drift Blocks; and
- Live Oiled Bird Response (CWS 2012).

Several of these techniques require specific training and permit authorization before implementation. Therefore, prior to initiation of any of these techniques, the CWS should be contacted for input and guidance.

No similar guidance is provided by DFO for dealing with marine mammals in the event of a spill. DFOs Marine Mammal Response Program is responsible for tracking and responding to contaminated animals (DFO 2015). In the event of a major fuel spill in the RSA, DFO should be contacted immediately by the QEP to determine appropriate mitigation techniques to be utilized to limit potential adverse impacts on marine mammals.

Table D-6: Species and Habitats of Immediate Management Concern

Species and/or Habitat	Location*	Comments

Notes: * A general description of the location of the species (e.g., haul-out areas, congregating areas, fish bearing streams etc.) or specific GPS locations (in UTM) if available

2.2.1.3 Fish and Marine Wildlife Permitting

Table D-7 provides an overview of permitting requirements that may be required to implement the wildlife monitoring framework in the event of a major fuel spill. The CWS and DFO should be contacted to determine the course of action in relation to the collection of live or dead wildlife during the initial response phase.

Table D-7: Potential Permitting Requirements

Agency	Permit	Required for
CWS	Variance Order to the Migratory Bird Regulations	Required for collection, transportation, holding, treating and hazing of migratory birds (live and dead).
DFO	Fish Collection Permit	Required for the collection of marine species (live or dead).
Government of Nunavut	Scientific Research Permit	May be required for the collection of wildlife in Nunavut (live or dead).

2.2.1.4 Daily Assessment Objectives in Order of Priority

Daily assessment objectives should be reviewed each morning and updated as necessary by the QEP. An example of daily assessment objective list is provided below. These objectives will change over the course of an event as the spill is contained and cleaned up.

1) Determine maximum extent of spill area to define hazard zones to marine wildlife and their habitats. The extent of the spill will be in-flux, therefore, seek an update each morning from the spill response team.

2) From the spill origin, travel by boat along the shoreline to search for wildlife or evidence of wildlife.

3) Survey pelagic areas for birds and marine mammals.

4) Document species observations and important habitat areas that may potentially be at risk from spilled product. Bird species observations should detail species, number, behaviour, condition (oiled, not oiled), and location (UTMs). Visual and auditory indications should be used.

5) Conduct marine mammal monitoring; use binoculars to scan for the presence of marine mammals within spill area from on-shore vantage points located at a high location that have good vantage areas. The MMSO(s) can assist with this duty.

6) Update the spill response team and relevant regulators (CWS and DFO) regarding the observations of wildlife.

7) Maintain and monitor the 24 hour wildlife hotline and respond to information gathered.

8) Document impacts to wildlife and habitat, severity of impact, and potential biological implications on a daily and cumulative basis.

9) Implement and maintain wildlife deterrence strategies from oil impacted areas in consultation with the relevant regulatory agency.

2.2.1.5 Reporting

Updates to CWS and DFO regarding observations of wildlife should be a daily objective during a major fuel spill event. In addition, all wildlife sightings records (Table D-4) should be provided on a weekly basis to DFO and the CWS by the QEP.

2.2.2 Follow-up Phase

During the initial phase, all resources should be focused on limiting the effects of the spill. The follow-up phase consists of follow-up monitoring that should be executed through a long-term monitoring framework. The objective of this framework is to assess impacts to wildlife resources and their habitats as a result of the spill and any cleanup measures implemented (e.g., dispersants), as well as to measure the success of applied mitigation techniques.

The follow-up monitoring framework should be developed after the completion of the initial phase monitoring. This allows the follow-up monitoring to focus on species and habitats that have been most impacted by the spill. The framework may contain, but will not be limited to:

- Marine bird surveys;
- Coastal nest surveys;
- Marine mammal surveys;
- Fish surveys;
- Sediment quality monitoring; and
- Water quality monitoring.

The follow-up phase framework should be completed in consultation with the relevant regulatory agencies. It should also provide a mechanism to allow for local community members to be involved in monitoring, remediation and reporting efforts.

3.0 SUMMARY

This MEMP outlines the protocol for monitoring of marine mammals and seabirds during routine shipping operations of the Meliadine Gold Mine. Mine-specific mitigation measures designed to minimize Mine impacts on marine mammals and seabirds will be initiated by vessel-based MMSOs and implemented by the ship's crew. The MEMP also provides a framework to monitor for marine wildlife and their habitats in the event of a Mine-related spill. An opportunity for inclusion of local community members exists and should be considered an asset when implementing this plan. Communication and consultation with relevant regulatory agencies is essential when attempting to implement adaptive management strategies during routine operations as well as during a spill event.

This plan should be considered a living document that can be updated throughout the Mine in order to implement adaptive management techniques.

Report Signature Page

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https://golderassociates.sharepoint.com/sites/10440g/shared documents/3000 on-call regulatory support/shipping management plan/shipping management plan/appendixd_memp/appd_memp 28macrh17.docx

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ATTACHMENT A

Marine Mammal Sightings Record

Observation Period Information:			
Company/agency		Sea state code	
Platform name and type		Wave height (m)	
Observer (s)		True wind speed (knots) **OR** Beaufort code	
Date (DD/MMM/YYYY)		True wind direction	
Time at start (UTC)		Ice type code	
Time at end (UTC)		Ice concentration code	
Latitude at start / end		True platform speed (knots)	
Longitude at start / end		True platform direction	
Visibility (km)		Observation side	Starboard Port Middle
Weather code		Height of eye (m)	
Glare conditions code		Outdoors or Indoors	Out or In
Platform Activity		Notes	

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting? (Y or N)	Sighting Waypoint or Lat/Long(Garmin GPS)	Species, Number of Individuals	Distance to Animal (m or km)	Angle to Sighting	Behaviour/Travel Direction	Age/Sex	Mitigation Required?	Photo Number (if any)
Notes:											

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Looking – Seals
Bearded Seal			Feeding
Ringed Seal			Flipper Slapping
Harbour Seal			Surfacing
Hooded Seal			Resting
Harp Seal			Diving
Polar Bear			Diving (Fluke Visible)
Killer Whale			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bow Riding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

ATTACHMENT B

Record Sheet for a Moving Platform Survey[3]

Record Sheet for a Stationary Platform Survey[3]

Appendix I - Estimating Distance Categories Using Ruler Gauge[3]

Appendix II Through VI - Codes for General Weather Conditions and Glare, Sea State and Beaufort Wind Force, Ice Conditions, Species Codes for Eastern Seabirds, and Codes for [3]Associations and Behaviours[3]

[3] Eastern Canada Seabirds at Sea (ECSAS) Seabird Sightings Records and Background Material (Extracted from Gjerdrum et al. 2012)

Record sheet for a moving platform survey

Observation Period Information:

Company/agency		Sea state code	
Platform name and type		Wave height (m)	
Observer (s)		True wind speed (knots) **OR** Beaufort code	
Date (DD/MMM/YYYY)		True wind direction (deg)	
Time at start (UTC)		Ice type code	
Time at end (UTC)		Ice concentration code	
Latitude at start / end		True platform speed (knots)	
Longitude at start / end		True platform direction (deg)	
Platform activity		Observation side	Starboard Port
Visibility (km)		Height of eye (m)	
Weather code		Outdoors or Indoors	Out or In
Glare conditions code		Snapshot used?	Yes or No

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In transect?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

Record sheet for a stationary platform survey

Scan Information:

Company/agency		Weather code	
Platform name and type		Glare conditions code	
Observer (s)		Sea state code	
Date (DD/MMM/YYYY)		Wave height (m)	
Time at start (UTC)		True wind speed (knots) **OR** Beaufort code	
Latitude		True wind direction (deg)	
Longitude		Ice type code	
Platform activity		Ice concentration code	
Scan type	180º or other (specify:)	Height of eye (m)	
Scan direction		Outdoors or Indoors	Out or In
Visibility (km)			

Notes:

Bird Information: *this field must be completed for each record

* Species	* Count	* Fly or Water?	* In semi-circle?	* Distance[1]	Assoc.	Behav.	Flight Direc.[2]	Age[3]	Plum.[4]	Sex	Comments

[1] ***A*** = 0-50m, ***B*** = 51-100m, ***C*** = 101-200m, ***D*** = 201-300m, ***E*** = > 300m, ***3*** = within 300m but no distance recorded.
[2]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction
[3]***J***(uvenile), ***I***(mmature), or ***A***(dult); [4]***B***(reeding), ***NB***(non-breeding), ***M***(oult)

APPENDIX I. Estimating distance categories

The various distance categories can be estimated using the following equation[1]:

$$d_h = 1000\frac{(ah3838\sqrt{h}) - ahd}{h^2 + 3838d\sqrt{h}}$$

e.g. if a = 0.730 m, h = 12.5 m, and d = 300 m

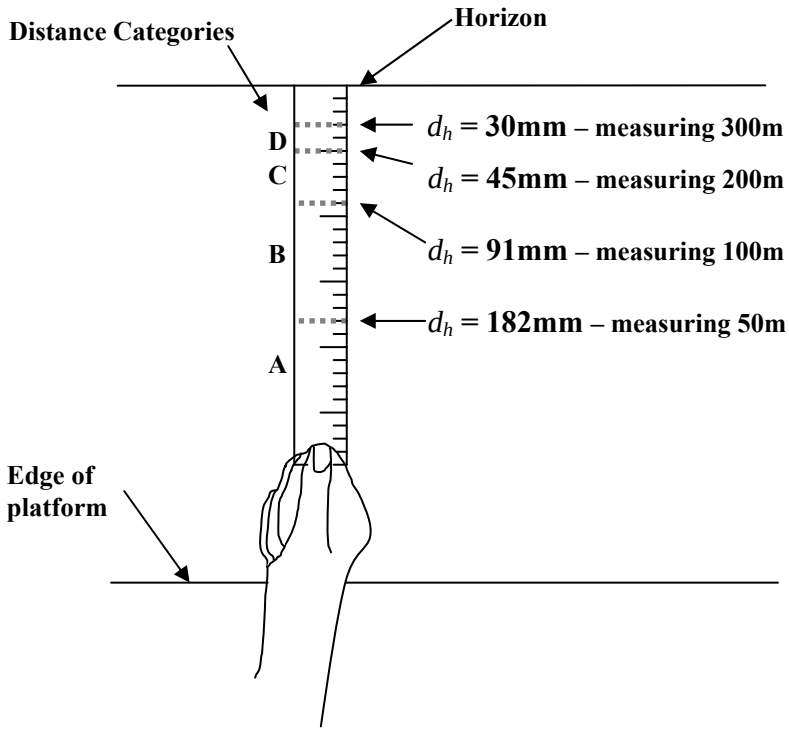
then d_h = 30.0 mm

where:

d_h = distance below horizon (mm)
a = distance between the observer's eye and the ruler when observer's arm is fully out-stretched (m)
h = height of the observer's eye above the water at the observation point (m)
d = distance to be estimated (m; a separate calculation is required for each of 50, 100, 200, 300)

Distances are easily estimated using a gauge made from a transparent plastic ruler. A different ruler will be required for each combination of observer arm length (a) and platform height (h). Calculate d_h for the boundary of each distance class (A, B, C, D) and mark them on the ruler (dashed lines in figure). To use the gauge, extend the arm fully and keep the top end of the ruler aligned with the horizon. The dashed lines now demark the distance class boundaries on the ocean surface. Keep the gauge nearby during surveys to quickly verify bird distances.

Measurements for an observer with a = 73 cm and h = 12.5 m:



[1] Formula derived by J. Chardine, based on Heinemann 1981. A spreadsheet is available from the corresponding author to perform this calculation.

APPENDIX II. Codes for general weather conditions and glare

Code	Description	Explanation
	Weather conditions	
0		< 50% cloud cover (with no fog, rain, or snow)
1		> 50% cloud cover (with no fog, rain, or snow)
2		patchy fog
3		solid fog
4		mist/light rain
5		medium to heavy rain
6		fog and rain
7		snow
	Glare conditions	
0		none
1		slight/grey
2		bright on the observer's side of vessel
3		bright and forward of vessel

APPENDIX III. Codes for sea state and Beaufort wind force

Wind Speed (knots)	Sea state code and description	Beaufort wind force and description
0	**0** Calm, mirror-like	**0** calm
01 – 03	**0** Ripples with appearance of scales but crests do not foam	**1** light air
04 – 06	**1** Small wavelets, short but pronounced; crests do not break	**2** light breeze
07 – 10	**2** Large wavelets, crests begin to break; foam of glassy appearance; perhaps scattered white caps	**3** gentle breeze
11 – 16	**3** Small waves, becoming longer; fairly frequent white caps	**4** moderate breeze
17 – 21	**4** Moderate waves with more pronounced form; many white caps; chance of some spray	**5** fresh breeze
22 – 27	**5** Large waves formed; white foam crests more extensive; probably some spray	**6** strong breeze
28 – 33	**6** Sea heaps up; white foam from breaking waves blows in streaks in direction of wind	**7** near gale
34 – 40	**6** Moderately high long waves; edge crests break into spindrift; foam blown in well-marked streaks in direction of wind	**8** gale
41 – 47	**6** High waves; dense streaks of foam in direction of wind; crests of waves topple and roll over; spray may affect visibility	**9** strong gale
48 – 55	**7** Very high waves with long overhanging crests; dense foam streaks blown in direction of wind; surface of sea has a white appearance; tumbling of sea is heavy; visibility affected	**10** storm
56 - 63	**8** Exceptionally high waves; sea is completely covered with white patches of foam blown in direction of wind; edges blown into froth; visibility affected	**11** violent storm
64 +	**9** Air filled with foam and spray; sea completely white with driving spray; visibility seriously affected	**12** hurricane

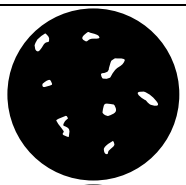
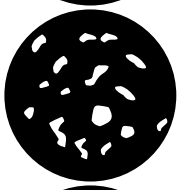
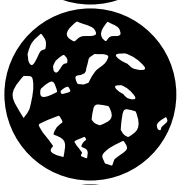
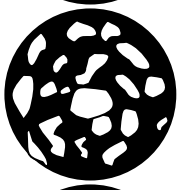
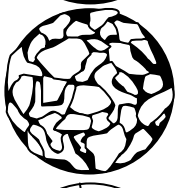
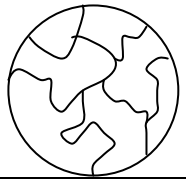
APPENDIX IV. Codes for ice conditions

Adapted from NOAA: Observers Guide to Sea Ice

Sea Ice Forms

Code	Name	Description
0	New	small, thin, newly formed, dinner plate-sized pieces
1	Pancake	rounded floes 30 cm - 3 m across with ridged rims
2	Brash	broken pieces < 2 m across
3	Ice Cake	level piece 2 - 20 m across
4	Small Floe	level piece 20 - 100 m across
5	Medium Floe	level piece 100 -500 m across
6	Big Floe	level, continuous piece 500 m - 2 km across
7	Vast Floe	level, continuous piece 2 - 10 km across
8	Giant Floe	level, continuous piece > 10 km across
9	Strip	a linear accumulation of sea ice < 1 km wide
10	Belt	a linear accumulation of sea ice from 1 km to over 100 km wide
11	Beach Ice or Stamakhas	irregular, sediment-laden blocks that are grounded on tidelands, repeatedly submerged, and floated free by spring tides
12	Fast Ice	ice formed and remaining attached to shore

Sea Ice Concentration

Code	Concentration	Description	
0	< one tenth	"open water"	
1	two-three tenths	"very open drift"	
2	four tenths	"open drift"	
3	five tenths	"open drift"	
4	six tenths	"open drift"	
5	seven to eight tenths	"close pack"	
6	nine tenths	"very close pack"	
7	ten tenths	"compact"	

APPENDIX V. Species codes for birds seen in Eastern Canada

Common name	Species code	Latin name
COMMON, REGULAR OR FREQUENTLY SEEN SPECIES		
Northern Fulmar	NOFU	*Fulmarus glacialis*
Great Shearwater	GRSH	*Puffinus gravis*
Manx Shearwater	MASH	*Puffinus puffinus*
Sooty Shearwater	SOSH	*Puffinus griseus*
Wilson's Storm-Petrel	WISP	*Oceanites oceanicus*
Leach's Storm-Petrel	LESP	*Oceanodroma leucorhoa*
Northern Gannet	NOGA	*Morus bassanus*
Red Phalarope	REPH	*Phalaropus fulicaria*
Red-necked Phalarope	RNPH	*Phalaropus lobatus*
Long-tailed Jaeger	LTJA	*Stercorarius longicaudus*
Parasitic Jaeger	PAJA	*Stercorarius parasiticus*
Pomarine Jaeger	POJA	*Stercorarius pomarinus*
Great Skua	GRSK	*Stercorarius skua*
Herring Gull	HERG	*Larus argentatus*
Iceland Gull	ICGU	*Larus glaucoides*
Glaucous Gull	GLGU	*Larus hyperboreus*
Great Black-backed Gull	GBBG	*Larus marinus*
Black-legged Kittiwake	BLKI	*Rissa tridactyla*
Common Murre	COMU	*Uria aalge*
Thick-billed Murre	TBMU	*Uria lomvia*
Razorbill	RAZO	*Alca torda*
Dovekie	DOVE	*Alle alle*
Atlantic Puffin	ATPU	*Fratercula arctica*
SPECIES MORE COMMONLY SEEN INSHORE		
Common Loon	COLO	*Gavia immer*
Red-throated Loon	RTLO	*Gavia stellata*
Red-necked Grebe	RNGR	*Podiceps grisegena*
Horned Grebe	HOGR	*Podiceps auritus*
Great Cormorant	GRCO	*Phalacrocorax carbo*
Double-crested Cormorant	DCCO	*Phalacrocorax auritus*
Greater Scaup	GRSC	*Aytha marila*
Common Eider	COEI	*Somateria mollissima*
Harlequin Duck	HARD	*Histrionicus histrionicus*
Long-tailed Duck	LTDU	*Clangula hyemalis*
Surf Scoter	SUSC	*Melanitta perspicillata*
Black Scoter	BLSC	*Melanitta nigra*
White-winged Scoter	WWSC	*Melanitta fusca*
Red-breasted Merganser	RBME	*Mergus serrator*
Black Guillemot	BLGU	*Cepphus grylle*

Common name	Species code	Latin name
INFREQUENTLY OR RARELY SEEN SPECIES		
Cory's Shearwater	COSH	*Calonectris diomedea*
Audubon's Shearwater	AUSH	*Puffinus lherminieri*
Lesser Scaup	LESC	*Aythya affinis*
King Eider	KIEI	*Somateria spectabilis*
South Polar Skua	SPSK	*Stercorarius maccormicki*
Bonaparte's Gull	BOGU	*Larus philadelphia*
Ivory Gull	IVGU	*Pagophila eburnea*
Black-headed Gull	BHGU	*Larus ridibundus*
Laughing Gull	LAGU	*Larus articilla*
Ring-billed Gull	RBGU	*Larus delawarensis*
Lesser Black-backed Gull	LBBG	*Larus fuscus*
Sabine's Gull	SAGU	*Xema sabini*
Common Tern	COTE	*Sterna hirundo*
Arctic Tern	ARTE	*Sterna paradisaea*
Roseate Tern	ROTE	*Sterna dougallii*
CODES FOR BIRDS IDENTIFIED TO FAMILY OR GENUS		
Unknown Bird	UNKN	
Unknown Shearwater	UNSH	*Puffinus* or *Calonectris*
Unknown Storm-Petrel	UNSP	Hydrobatidae
Unknown Duck	UNDU	Anatidae
Unknown Eider	UNEI	*Somateria*
Unknown Phalarope	UNPH	*Phalaropus*
Unknown Jaeger	UNJA	*Stercorarius*
Unknown Skua	UNSK	*Stercorarius*
Unknown Gull	UNGU	Laridae
Unknown Tern	UNTE	*Sternidae*
Unknown Alcid	ALCI	Alcidae
Unknown Murre or Razorbill	MURA	*Uria* or *Alca*
Unknown Murre	UNMU	*Uria*

APPENDIX VI. Codes for associations and behaviours

From Camphuysen and Garthe (2004). Choose one or more as applicable.

Code	Description
Association	
10	Associated with fish shoal
11	Associated with cetaceans
13	Associated with front (often indicated by distinct lines separating two water masses or concentrations of flotsam)
14	Sitting on or near floating wood
15	Associated with floating litter (includes plastic bags, balloons, or any garbage from human source)
16	Associated with oil slick
17	Associated with sea weed
18	Associated with observation platform
19	Sitting on observation platform
20	Approaching observation platform
21	Associated with other vessel (excluding fishing vessel; see code 26)
22	Associated with or on a buoy
23	Associated with offshore platform
24	Sitting on offshore platform
26	Associated with fishing vessel
27	Associated with or on sea ice
28	Associated with land (e.g., colony)
50	Associated with other species feeding in same location

Code	Description	Explanation
Foraging behaviour		
30	Holding or carrying fish	carrying fish towards colony
32	Feeding young at sea	adult presenting prey to attended chicks (e.g., auks) or juveniles (e.g., terns)
33	Feeding	method unspecified (see behaviour codes 39,40,41,45)
36	Aerial pursuit	kleptoparisitizing in the air
39	Pattering	low flight over the water, tapping the surface with feet while still airborne (e.g., storm-petrels)
40	Scavenging	swimming at the surface, handling carrion
41	Scavenging at fishing vessel	foraging at fishing vessel, deploying any method to obtain discarded fish and offal; storm-petrels in the wake of trawlers picking up small morsels should be excluded
44	Surface pecking	swimming birds pecking at small prey (e.g., fulmar, phalaropes, skuas, gulls)
45	Deep plunging	aerial seabirds diving under water (e.g., gannets, terns, shearwaters)
49	Actively searching	persistently circling aerial seairds (usually peering down), or swimming birds frequently peering (and undisturbed by observation platform) underwater for prey
General behaviour		
60	Resting or apparently sleeping	reserved for sleeping seabirds at sea
64	Carrying nest material	flying with seaweed or other material; not to be confused with entangled birds
65	Guarding chick	reserved for auks attending recently fledged chicks at sea
66	Preening or bathing	birds actively preening feathers or bathing
Distress or mortality		
71	Escape from ship (by flying)	escaping from approaching observation platform
90	Under attack by kleptoparasite	bird under attack by kleptoparasite in an aerial pursuit, or when handling prey at the surface
93	Escape from ship (by diving)	escaping from approaching observation platform
95	Injured	birds with clear injuries such as broken wings or bleeding wounds
96	Entangled in fishing gear or rope	birds entangled with rope, line, netting or other material (even if still able to fly or swim)
97	Oiled	birds contaminated with oil
98	Sick/unwell	weakened individuals not behaving as normal, healthy birds, but without obvious injuries
99	Dead	bird is dead

ATTACHMENT C

MMSO Daily Reporting Template

1.0 MARINE MAMMALS AND SEABIRD OBSERVING (MMSO) DAILY REPORT

Project Information

Client:	**Date:**
Project Name:	**Location:**

Ship Contractor Information

Ship Contractor Name:	**Site Supervisor or Captain:**
Ship Name/Type:	

MMSO name:	
General weather conditions (throughout the day)	**Cloud cover:** **Precipitation:** **Wind (knots):** **Sea state:** **Swell height:** **Air temperature:** **Ice presence:** **Notes:**
Time start/Time end MMSO duties (UTC):	

2.0 MITIGATION LOG

Mitigation Implemented	Time (UTC)	GPS Location	Rational for Implementation

Under Activity note the following: Description of any vessel mitigation implemented (e.g., reduction in speeds, evasive maneuvers etc.)

3.0 RECORD OF VESSEL-ANIMAL COLLISIONS/INTERACTIONS

Species	Number of Individuals	Time (UTC)	GPS Coordinates	Visibility/Sea State	Comments

In the comments note the following: Animals observed on the deck (seabirds) or in the water (seabirds or marine mammals), if search lights or vessel lighting sources were active at the time of collision, and any other relevant notes.

4.0 MMSO CHECKLIST

Item or Location to Check	Yes	No	Comments - Discussed (D) with relevant Ship personnel - Observed (O) - Not Applicable (NA) - Action required (as/if applicable)
General			
Copy of SMP and appendices posted on-site			
Orientation to mitigation measures outlined in Section 4.2 of the SMP			
Overview of MMSO duties and protocols (e.g., ship crews should be made aware that the MMSO is the only individual that can mark sightings during the dedicated surveys/observation periods)			
Add additional items as necessary and depending on the role of the MMSO			

General Notes:

5.0 SUMMARY OF ISSUES AND RECOMMENDATIONS / ACTIONS

Date Noted	Issue	Recommendation/Action	Completed (Date Resolved)	Comments

ATTACHMENT D

Birds and Oil - CWS Response Plan Guidance

March 29, 2017
Report No. Doc 613-1671431

Birds and Oil - CWS Response Plan Guidance

In all circumstances where a polluter is identified the burden of cleanup and response lies with the polluter. However, responsibility for government overview of a response to an oil spill depends on the source of the spill. The identified **lead agency** has responsibility to monitor an oil spill response and to take control if an appropriate response is not undertaken by a polluter or their agent.

Lead agency responsibilities lie with:

- **Environment Canada**
  - For spills and incidents on federal lands and from federal vessels
  - Potentially for land-based incidents in waters frequented by fish
  - May take lead if environment is not being protected by other leads, Cabinet Directive 1973
- **Canadian Coast Guard**
  - For spills from ships
  - All spills of unknown sources in marine environment
- **Provincial Department of Environment**
  - For spills from land-based sources
- **Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) and Canada-Nova Scotia Offshore Petroleum Board (C-NSOPB)**
  - For spills related to offshore oil and gas exploration and production
- **Transport Canada**
  - To investigate ship source and mystery spills in the marine environment

The Canadian Wildlife Service has the responsibility for licensing activities which involve the handling or disturbance of birds, and of providing advice and often direction to other agencies, responders and the polluter during oil spill incidents.

1. Hazing[1]

Purpose: Prevent birds from coming in contact with oil

Options:

- Hazing by helicopter
- Hazing by FRC or other watercraft
- Release of scare devices (e.g. Breco Buoys, Phoenix Wailer)
- Use of hazing sound makers: propane cannons, whizzers, bangers, pyrotechnic devices etc.

Scare devices have a limited range of influence and likely are not a viable option with a large slick. Use of Breco Buoys and Phoenix Wailers can be used but we consider them to be largely ineffective in the situation of a large slick. Logistically, helicopter hazing would be difficult unless it was possible for a helicopter to remain on a platform offshore overnight. Hazing by FRC or other vessels would be ideal.

[1] There are several scare techniques which may be effective and do not require a permit, however a permit under the Migratory Bird Regulations **is required** for the use of aircraft or firearms (defined as capable of emitting at projectile at more than 495 feet per second). Propane cannons, blank pistols or pyrotechnical pistols firing crackers shells with **less than 495fps are legal without a permit**. Most scare tactics are relatively short lived in terms of effectiveness as birds acclimatize to the disturbance so scare techniques should be alternated to be effective.

Short-term focused hazing by the most expedient means should be attempted to move the birds away from the slick, if logistical conditions permit. Vessels at the site should have the ability to use sound makers (propane canons, pyrotechnic devices) to disperse birds in local areas. Such equipment should be deployed immediately to these ships with trained personnel to operate them. The vessels on site should be tasked to actively search and monitor for congregations of birds which could be vulnerable to oiling. If such groups are found then attempts should be made to disperse the birds away from the oil.

2. Disperse oil

Purpose: Prevent birds from contacting oil by getting oil off the surface of the water as soon as possible.

Options:

- Dispersants
- Mechanical dispersal with FRCs or other vessels
- Natural dispersal by environmental conditions

For small spills, mechanical dispersal would be the preferred method.

3. Bird Collection[2]

Purpose: Implement a humane response to oiled birds as required by Environment Canada's National Policy on Oiled Birds and Oiled Species At Risk (http://www.ec.gc.ca/ee-ue/default.asp?lang=En&n=A4DD63E4-1)

Options:

- The only option would be a ship-based effort to detect and collect dead and live oiled birds, both within the slick and adjacent to it.

All vessels in or near the slick should understand the need to collect birds. All vessels should have dip-nets, large plastic collecting bags to hold dead birds, and cloth bags or cardboard boxes in which to hold live oiled birds. Efforts should be made to retrieve live oiled birds to ensure they are dealt with humanely.

4. Wildlife monitoring

Purpose: Determine potential impact of spill

Options:

- Ship-based surveys for oiled and unoiled wildlife
- Aerial surveys for oiled and unoiled wildlife. Will require structured surveys (e.g. strip or transect surveys of spill area)
- Placement of CWS staff on vessels and aircraft

[2] Only those individuals authorized to do so (nominee on an existing federal salvage permit) can be involved with the collection of migratory birds.

Dedicated ship-based bird surveys should be initiated immediately. Ideally arrangements should be made to have a CWS observer on vessels or flights. In addition trained seabird observers need to be placed on all vessels monitoring a slick. This should continue until the slick is dispersed.

5. Beached Bird Surveys

Purpose: Determine impact of spill on wildlife and retrieve any live oiled wildlife on beaches.

Options:

- Conduct daily beached bird surveys during the incident and until one week after slick has been removed or dissipated.

CWS or other government officials (CCG, Enforcement Officers) will oversee the collection of dead and live oiled birds[3] as instructed in CWS' protocol for collecting birds during an oil spill response. This would only be required in circumstances where a large number of birds are potentially oiled or if the spill occurs in a sensitive area.

6. Drift Blocks

Purpose: Drift blocks may be deployed in slick to provide an estimate of bird mortality.

Options:

- Release from vessel
- Release from aircraft

The deployment of drift blocks would only be expected if there was a large spill and blocks should be released as soon as possible after a spill (CWS should be consulted to determine protocol for drift block deployment and tracking). The polluter or their agent would be expected to ensure drift blocks are tracked and collected as appropriate.

7. Live oiled bird response

Purpose: Implement a humane response to oiled birds as required by Environment Canada's National Policy On Oiled Birds And Oiled Species At Risk

Options:

- Rehabilitation
- Euthanization

CWS will be consulted to determine the appropriate response and treatment strategies which may include cleaning and rehabilitation or euthanization. CWS policy specifically requires that species at risk or other species of concern be rehabilitated.

[3] Only those individuals authorized to do so (nominee on an existing federal salvage permit) can be involved with the collection of migratory birds.

ATTACHMENT E

DFO's Marine Foreshore Environmental Assessment Procedure

March 29, 2017
Report No. Doc 613-1671431

MARINE FORESHORE ENVIRONMENTAL ASSESSMENT PROCEDURE

Marine development projects have the potential to effect fish[1] and fish habitat[2]. Fisheries and Oceans Canada (DFO) is responsible for the protection and management of fish habitats under the authority of the *Fisheries Act* and may request plans, specifications and environmental assessments specific to marine projects where more detailed information is required. Assessments may be necessary for all types of projects, including, but not limited to aquaculture, log handling, industrial port development, marinas, private moorage facilities, marine repair facilities, pipeline or outfall installations, vessel launches or barge ramps, dredging projects and shoreline protection projects (breakwaters and seawalls). Presented below are standardized, transect-based assessment procedures intended to provide DFO with the basic information required to determine the potential effects of a development project on fish habitat.

Assessment Area

For comparative purposes, the assessment area should include both the foreshore site proposed for development as well as the adjacent foreshore. This will provide a context for the project and may provide data about cumulative effects if similar developments already occur on-site. A large scale site plan, preferably an enlargement of the hydrographic chart, with a small scale insert of the general geographic location will serve as a base map of the study area.

Tidal Height and Water Depth Measurements

The lowest normal tide (0.0 m), or chart datum, will be used as the reference point for the measurement of tidal height and water depth. Tidal height is recorded as positive relative to chart datum, while water depth below chart datum will be recorded as a negative value. For example, if the assessment is made when the tide is at 2 m, and observations are taken at a water depth of 6 m, then the depth will be recorded as -4 m. Tidal height will be corrected using the closest secondary port to the reference port found in the Canadian Tide and Current Tables, with further correction made for daylight savings time as required.

Transect Layout

Transects should be established perpendicular to the shoreline at regular intervals both within and adjacent to the proposed or active development area so as to sample representative fish habitat conditions. A preliminary low water reconnaissance or dive survey may be advisable to establish

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[1] shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;

[2] shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;

appropriate boundaries for the assessment. Transects should begin at the highest high water mark (HHWM: distance referenced as Station 0.0 m) and, at a minimum, extend to a depth of -20 m (–30 m if the development has the potential to effect deeper benthic habitats). Though small-scale intertidal projects may only require intertidal transects, care must be taken to ensure that a representative sample is collected across the proposed development area. Procedural manuals are available from DFO if sampling of intertidal clam or benthic invertebrates is required. To ensure complete assessment of marine plants and animals in the photic zone, deeper transects may be necessary, especially to determine the effects of sunken debris or woodwaste accumulations resulting from existing developments. Transects should be spaced approximately 25 m apart, although this interval may vary depending on the width of the site. The number of transects required will depend on the nature of the foreshore development proposed, anticipated effects of the development, and local site conditions (tides and currents, geography, fetch, geology, etc.). Transects should be individually numbered and indicated on the site plan, and their commencement point referenced to benchmarks, where possible.

Recording Observations

Habitat inventories should be conducted during the more productive spring and summer months. At that time, algae and saltmarsh species are more readily identifiable, enabling a better assessment of the productive capacity of the site.

Observations should be recorded every 5 m along the transect or at significant changes in habitat type. Observations should include substrate type and composition, presence and relative abundance of marine animals and plants, and any other notable features (e.g., debris accumulations) using the following format:

Substrate

Substrate types are to be subdivided into the following size class categories:

- Bedrock
- Boulder (>256 mm diameter)
- Cobble (64-256 mm diameter)
- Gravel (2-64 mm diameter)
- Sand (0.0625-2 mm diameter)
- Silt/Mud/Clay (<0.0625 mm diameter)

Substrate types are recorded cumulatively as percentages out of a total of 100% (e.g., Boulder 5%; Cobble 15%; Gravel 60%, Sand 20%)

Marine Plants

Marine plants include rooted vascular vegetation (e.g., eelgrass, saltmarsh vegetation, etc.) and marine algae (e.g., rockweed, kelp, etc.). Marine plant observations are recorded as percent areal coverage estimated per 5 m × 1 m transect segment. Observations can be recorded as percentages (5%, 10%, 15%, etc.) or by utilizing the following areal coverage classes:

+	<5%
1	5-25%
2	>25-50%
3	>50-75%
4	>75-100%

Sessile Animals

Many marine animals permanently attached to substrates function as important fish habitat (e.g., barnacles, bay mussels, etc.). Sessile animals are recorded as percent areal coverage along the transect line using either estimated percentages or by areal coverage classes, as presented above.

Motile Animals

Motile animals include fish and marine invertebrates such as crabs and snails. These can be individually counted along the transect or, where too numerous, their estimated numbers can be recorded. Population estimates will most likely be applied to species such as herring or mysid shrimp that naturally occur in large numbers.

Other Features

Accumulations of wood bark and debris, sunken logs or other waste materials arising from onsite or nearby development activities should also be recorded. For wood bark and related small size debris, observations are recorded as percent areal coverage estimates per 5 m × 1 m transect segment and estimated deposition depth (e.g., 15% / 10 cm). For larger materials (sunken logs, wood chunks, etc.), observations can be recorded by individual piece count or by estimate of percent areal coverage.

Observations should be correlated to the transect distance from the HHWM and (corrected) tidal height or water depth (e.g., Sta. 0+80 m / +4.5 m), with information compiled in tabular form, by transect. Common names of observed animals and plants are acceptable for the data table; a species list with scientific names should, however, be appended to the report.

General marine plant categories (e.g., rockweed, eelgrass, bull kelp, saltmarsh, etc.) and any other notable features should be sketched to scale directly on a copy of the site plan, drawings or photographs of the site. A site profile should be prepared for each transect showing the slope of the foreshore and the location of indicator marine plants or invertebrates. A sketch of the proposed marine development should be superimposed over the site plan so that any potential effect of the project on fish habitat is clear. Compensatory habitat proposed for offsetting altered habitat should also be sketched on site maps and profiles to enable review of the positioning of replacement habitat relative to the project.

Photographic Documentation

It is essential to produce a photographic record along the intertidal and subtidal transects. A videographic record of subtidal transects is also recommended. Photos and videos provide a real-time record of characteristic fish habitat at the proposed site and can be invaluable to future post-development site monitoring. Photographic records also facilitate comparison of the productivity of natural habitats with any compensatory habitat constructed to offset habitat losses. As visibility may be a problem, careful attention should be given to appropriate tidal levels, and midday lighting conditions are recommended. Aerial photos, taken at low tide, are often useful to put the site into context with the surrounding area and to verify information provided from other sources.

Assessment reports should include photographs of representative fish habitat types. Depending upon the scope of the proposed foreshore development, an unedited, labelled copy of the assessment video may also be required for the report submission. The video footage should be referenced with pertinent information (e.g., time, date, depth, heading, etc.), and a written or recorded interpretation should accompany the video.

Summary of information to be submitted

1. Basemap showing tenure area boundaries, surrounding area, transect locations and sampling stations
2. Shoreline video/photographs of intertidal zone
3. Underwater video/photographs of transects
4. Tabular data for each transect describing substrate type and composition, marine plants, sessile and motile marine animals, and other notable features
5. Habitat map showing location of different substrate types, plants, animals and operational infrastructure
6. Profile diagrams of each transect showing slope, sediment types and the major marine plants or animals observed
7. Photographs of site and aerial photographs if available.

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APPENDIX E • SPILL RISK ASSESSMENT

March 10, 2016

SPILL RISK ASSESSMENT

Appendix E

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REPORT

Report Number: Doc 552-1535029-R-RevA

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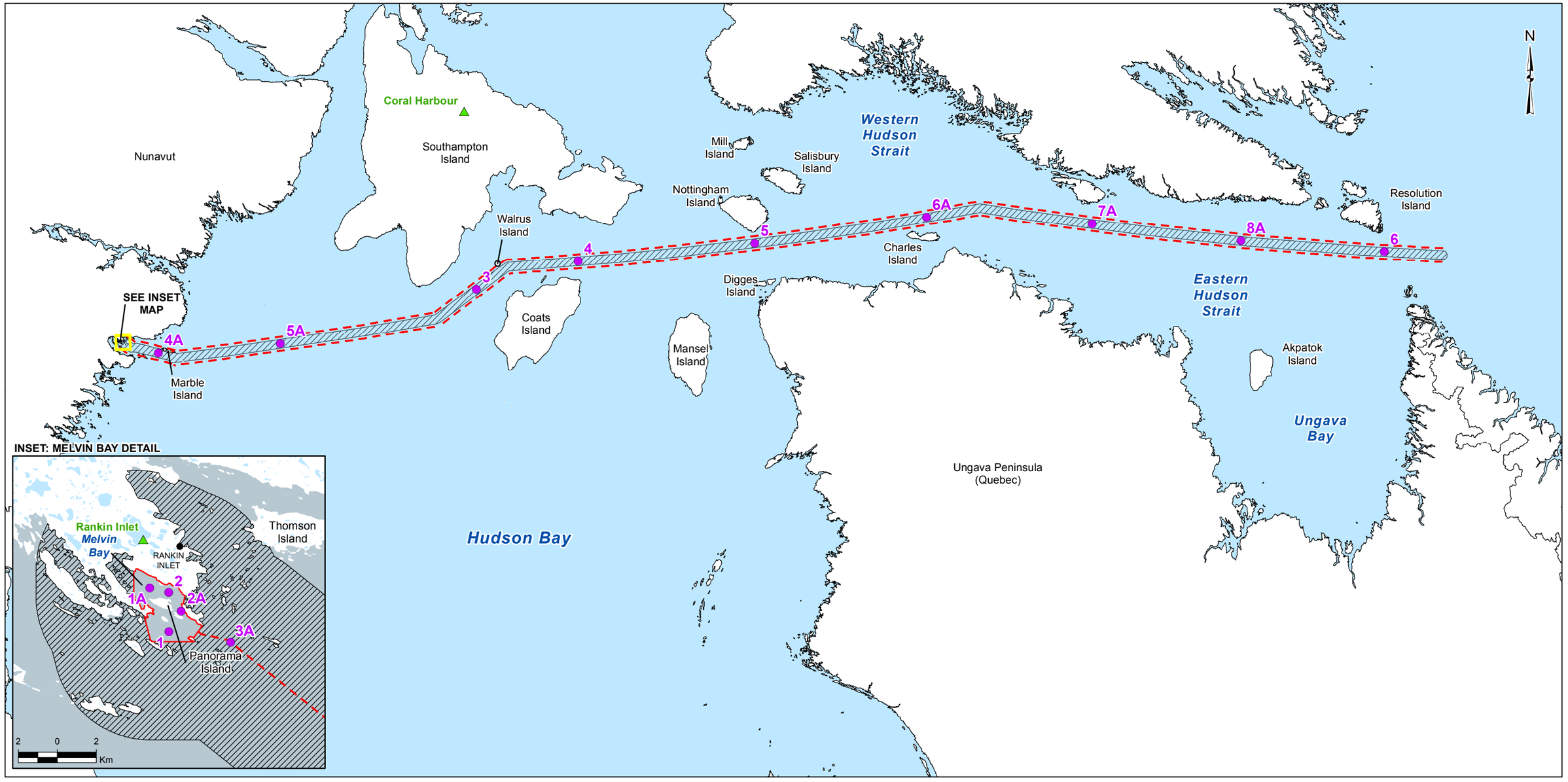
ATTACHMENT A

ADIOS2 Hypothetical Spill Modelling Inputs and Outputs

1.0 INTRODUCTION

This report presents a desktop level assessment of potential diesel fuel spill risk in the marine environment related to the Meliadine Gold Project (Project). The effects of fuel spills on sensitive biological receptors such as marine mammals and marine birds are discussed in Section 8.3.6.5 of the Final Environmental Impact Statement (FEIS) for the Meliadine Project. Golder Associates Inc. (Golder) has applied a modified version of the risk assessment strategy presented in ITOPF-TIP16 Contingency Planning for Marine Oil Spills (ITOPF 2011) based on existing Project information and available biophysical data in the Project area. This report includes an overview of oil spills in Canadian waters and potential open-water P50 diesel spills near Melvin Bay (ship-to-shore and ship-to-ship fuel transfer areas near Rankin Inlet) and along the primary deep-draught shipping route used by Project vessels during Project construction and operations phases (Figure E-1). The behavior of a diesel fuel spill in the marine environment was assessed at 14 different hypothetical spill locations in the Project area, considering aspects of evaporation, dispersion, spreading and potential distance traveled from the spill location. Five locations near Melvin Bay were considered in the assessment as these corresponded with ship-to-shore and ship-to-ship fuel transfer areas where a higher potential for fuel spills would occur (Figure E-1). Nine locations along the shipping route were also considered in the assessment as these corresponded with navigation zones in close proximity to islands or known sensitive/important coastal areas for marine mammals and/or marine birds; including Walrus Island, Coats Island, Ungava Peninsula, and Eastern Hudson Strait (Figure E-1). This assessment considered a low-probability, large spill scenario of 2 Million Litres (ML) (2,000 cubic metres [m^3]) of P50 diesel and a worst case spill scenario of 20 ML (20,000 m^3) of P50 diesel released at sites in Melvin Bay and along the shipping route. An additional spill scenario of a 100,000 litres (L) (100 metres m^3) spill was also considered at the ship-to-ship and ship-to-shore fuel transfer sites near Melvin Bay, representing smaller spills that could occur during fuel transfer activities.

The Project is primarily land-based with operations in the marine environment limited to six fuel tanker transits to Rankin Inlet from eastern North America during the open-water season (approximately August to October), and subsequent transfer of this fuel to shore using established fuel transfer locations near Melvin Bay. There were no Project-specific meteorological or oceanographic data collected as part of the baseline assessment for the Project; therefore, this assessment is based solely on information from existing literature and available third party data. Because of the limited marine operations planned for the Project, resulting in an overall low probability of a spill, this analysis was conducted with a simple fuel weathering model that does not include detailed hydrodynamic modelling.



LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- HYPOTHETICAL FUEL SPILL RELEASE LOCATION

HYPOTHETICAL FUEL SPILL RELEASE LOCATION	LOCATION NAME	UTM ZONE	EASTING	NORTHING
1	Ship-to-ship fuel transfer site outside Melvin Bay	15	546173	6961117
1A	West Melvin Bay	15	545185	6963365
2	Ship-to-shore fuel transfer site in Melvin Bay	15	546143	6963142
2A	East Melvin Bay	15	546798	6962172
3	Shipping route south of Walrus Island	16	641869	6988220
3A	Entrance to Melvin Bay	15	549334	6960588
4	Shipping route north of Coats Island	17	456430	7000031
4A	West Hudson Bay	15	585757	6949020
5	Shipping route north of Ungava Peninsula	18	351235	6986598
5A	Hudson Bay crossing	16	416455	6950265
6	Shipping route in Eastern Hudson Strait	20	399876	6775840
6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

REFERENCE

CANVEC DATA OBTAINED FROM © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
NAUTICAL CHART DATA OBTAINED FROM THE CANADIAN HYDROGRAPHIC SERVICE. PROVINCIAL DATA OBTAINED FROM ESRI.
DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

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PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
SPILL RISK ASSESSMENT FOR FOURTEEN LOCATIONS

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	GC	06 Jan. 2016	SCALE AS SHOWN	REV. A
GIS	CDB	06 Jan. 2016		
CHECK				
REVIEW				

FIGURE E-1

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2.0 OIL SPILLS IN CANADIAN WATERS

No information is available in the public domain/published literature related to existing fuel spill rates (e.g., frequency of spills) in the Hudson Bay region, although broader-scale information is available. The Arctic Monitoring and Assessment Programme (AMAP 2010) conducted an assessment of the effects of oil and gas activities in the Canadian Arctic to quantify the potential impacts from oil spills to the Arctic ecosystem and human health. Spills in the Arctic are considered rare and are typically associated with tanker traffic, with the most common location of spills occurring near ports (ITOPF 2011). From 1972 to 2003, a total of 1,226 oil spills were reported in the Canadian Arctic region; equivalent to a total volume of 3.3 ML (3,300 m^3) and a spill frequency of 2.5 spills per year. Of this total, 75 spills consisted of diesel fuel, equivalent to 334,000 L (334 m^3) and a frequency of one spill every 0.4 years (AMAP 2010).

Transport Canada commissioned WSP (formerly GENIVAR) to prepare a risk assessment for marine ship-based spills in Canadian waters north of the 60° North parallel (WSP 2014a). The study found the probability of oil spills in the Canadian Arctic is significantly lower than in the rest of Canada primarily due to the lower vessel traffic and volumes of oil transported. For the years 2002 to 2011, the volume of refined cargo products transported in the Arctic represented 0.18% of total volumes in Canada. The risk assessment found there to be a very low risk across the Canadian Arctic for a ship-source oil spill, however, the risk is slightly higher for the Hudson Strait and the coast of Labrador, mostly due to higher volumes of oil transported and traffic in these areas. Estimates of fuel spill frequency rates in the Arctic ranged from a return period of 285 years (i.e., one spill approximately every 285 years) for small spills (10 to 99.9 m^3) to 920 years for medium spills (100 to 999.9 m^3) and 92,000 years for large spills (1,000 to 9999.9 m^3) (WSP 2014a). According to the study, the frequency estimate for spills larger than 10,000 m^3 (10 ML) is zero for fuel oil and refined cargo products due to the lack of historical spills in this size range.

The trends of spill frequency have decreased over time due to improved technology, navigation, construction of vessels, and more stringent regulations (AMAP 2010; Anderson et al. 2012; WSP 2014b). Marine transportation in the Arctic is limited due to seasonal presence of ice. The lower frequency of ship transits in the Arctic region will downward bias spill rates calculated from Arctic data when compared to global statistics of spill frequency. However, as climate change causes a decrease in ice cover and the potential for transportation and other industrial activities in the Arctic increases, potential for spills may increase as well.

A study titled “Probability of Oil Spills from Tankers in Canadian Waters” by SL Ross Environmental Research Ltd. (SL Ross) predicts the frequency of oil spills from tankers in various areas of Canada (SL Ross 1999). The expected spill rate per year is calculated by multiplying the tonnage of oil loaded and unloaded at Canadian ports by spill frequencies derived from historical statistics. The expected spill rates for large (> 159,000 L) medium (8,000 to 159,000 L), and small (< 8,000 L) spills of product oil is 2.5, 12.3, and 36 spills per 10^8 ML loaded or unloaded per year, respectively.

3.0 MARINE TRANSPORT OF DIESEL FUEL FOR THE MELIADINE PROJECT

The FEIS for the Meliadine Project states that approximately 122 ML (122,000 m^3) of P50 diesel fuel will be delivered annually during operations. P50 is an Arctic diesel fuel with a lower temperature pour point than other diesel fuels. Based on the total volume of diesel fuel that will be transported throughout the life of the Project and spill rates reported by SL Ross (1999), the overall likelihood of a fuel spill for the Project is once every 36 years for small spills and once every 526 years for large spills. The approximate Project life that includes construction, operations, and closure is 18 years.

During construction and operations, approximately six large tankers will arrive to deliver P50 diesel fuel throughout the open-water shipping season. Each vessel trip will deliver approximately 20 ML (20,000 m^3) of P50 diesel fuel. The large tankers will anchor in deeper waters outside of Melvin Bay upon arrival in Rankin Inlet (Figure E-1). Large tanker to small tanker transfer of diesel fuel will occur at the large freighter anchor location. The carrying capacity of the small tanker will be either 7,300 m^3 or 10,500 m^3, depending on which vessel is used. Therefore, each of the six large tanker deliveries will take two to three trips to offload all of the fuel. The small tankers will anchor opposite Itivia and a floating pipeline of some 300 to 500 metres (m) will connect to a shore-based pipeline for transfer of fuel to the Project tank farm located near Itivia in Rankin Inlet. Fuel will be transferred through the pipeline at approximately 400 cubic metres per hour (m^3/h) for about 18 to 26 hours (h), depending on the carrying capacity of the small tanker. Agnico Eagle Mines Limited (AEM) has prepared an Oil Pollution Emergency Plan (SD 8-2) that details necessary actions to be implemented to reduce or minimize the loss of diesel fuel. Communication between the small tanker and the shore will be maintained throughout the transfer to safeguard the transfer of the diesel and to avoid overfilling of the tanks.

4.0 WEATHERING PROCESSES OF OIL SPILLS

The fate, toxic effect and weathering of an oil spill depends on the specific gravity, pour point, viscosity, chemical composition of refined and non-refined components, volume released, area of spreading, and the environmental conditions involved (ITOPF 2002). Environmental conditions include wind speed and direction, water depth, wave energy, solar radiation, current speed and direction, water temperature and distance to land. The weathering processes include dispersion, evaporation, spreading, adsorption to sediments, biodegradation, dissolution, emulsification, and photo oxidation (Figure E-2). Dispersion, evaporation, and spreading are the primary processes for determining fate and transport of diesel fuel, which is the primary fuel type being used for the Project. Oil dispersion is largely dependent upon the type of oil and the sea state, dispersing most rapidly with low viscosity oils, in the presence of breaking waves (ITOPF 2002). The rate of evaporation depends on ambient temperatures, wind speeds, and type of fuel. Spreading of the slick depends to a great extent on the viscosity of oil, the volume and the wind stress on the slick and surface water (Lehr et al 2002).

Diesel fuel has a low viscosity and will weather rapidly when spilled into the marine environment (NOAA 2006). With a lower density than water, diesel fuel will tend to stay on the water surface and be readily dispersed by wave action. Over 90% of a small spill of diesel in the marine environment is either evaporated or naturally dispersed over a time scale of several hours to days (NOAA 2006).

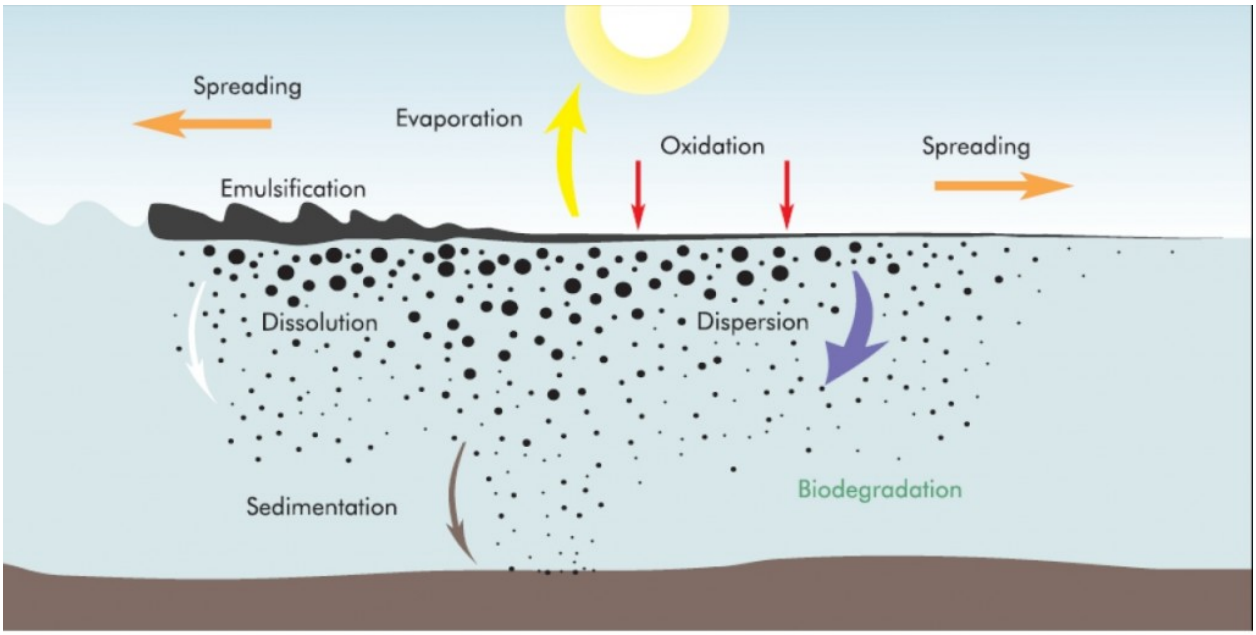


Figure E-2: Weathering Processes Action on Spilled Oil. Source: ITOPF 2002

5.0 OIL SPILL INTERACTION WITH SEA ICE

This section provides a summary of the potential ice conditions along the transportation route during the months of August to October and addresses potential effects of oil and fuel interactions and dispersion on ice covered waters in the event of a spill. The ADIOS model does not incorporate oil-ice interaction in its algorithms. Other models like the Oil Weathering Model (OWM) and Sea Ice-Ocean-Oilspill Modelling System (SIOMS) do, but they are still under development. The limited marine operation for the Project and the lack of data along the route limits the necessity and applicability of ice process-based models to this Project.

5.1 Sea Ice along the Transit Corridor

Hudson Bay is usually completely covered by ice by December or January and typically free of ice from August to October (Gagnon and Gough 2005). Sea ice in southwestern Hudson Bay typically does not breakup until well into the summer because winds and ocean currents tend to push large accumulations of ice into this region (Etkin 1991). The presence of sea ice into summer keeps waters of Hudson Bay at lower temperatures in comparison with other regions situated at similar latitudes. Hudson Bay is an enclosed bay sheltered by land with limited narrow access channels to larger ocean basins. Therefore, Hudson Bay water temperature, sea ice flows, and circulation are not strongly influenced by ice flows from other ocean basins. Instead, Hudson Bay dynamics are primarily controlled by local meteorological and micro-climate influences such as local wind and air temperature variations (Saucier and Dionne 1998; Gagnon and Gough 2005).

Ice melt starts in May and June, as an open water area develops along the northwestern shore, and a narrow coastal lead (i.e., space between ice floes, refer to Figure E-6) develops around the rest of the Bay. Open water

starts to appear and expand around the shorelines in June and July. By the end of July, large patches of ice are limited to only the southern reaches of the Bay (CIS 2011). Figure E-3 shows that along the transportation route, the average ice break-up dates occur on July 2 for most of the route and on June 18 on the west side of Hudson Bay near Rankin Inlet.

Normal clearing of the pack ice progresses southward from the Chesterfield Inlet - Southampton Island area and westward from Eastern Hudson Bay. The melting of sea ice is a slow process which accelerates in July as air and water temperatures begin to warm with increased summer solar radiation. The ice pack in Hudson Bay typically breaks up into several large patches of ice prior to finally clearing in August (CIS 2011).

Sea ice typically begins to form along the northwestern shores of Hudson Bay in late October. Ice flows from Foxe Basin may also start to move into northeastern Hudson Bay in late fall. In November, the sea ice begins to accumulate and thicken as prevailing winds push it east and southeast toward the margins of the Bay. Finally, by December, Hudson Bay becomes covered with first-year ice, which continues to thicken into the winter months (CIS 2011).

In Hudson Strait, freeze-up starts as early as mid-October and as late as the first week of December as shown in Figure E-4, while complete clearing has occurred as early as late as July and as early as September. Sea ice in Hudson Strait and Ungava Bay is mostly formed locally but winds and currents can carry floes from Foxe Basin or Davis Strait into these areas. Freeze-up typically starts in western Hudson Strait and ice formation progresses eastward over the late fall months and cover the entire Hudson Strait by December (CIS 2011).

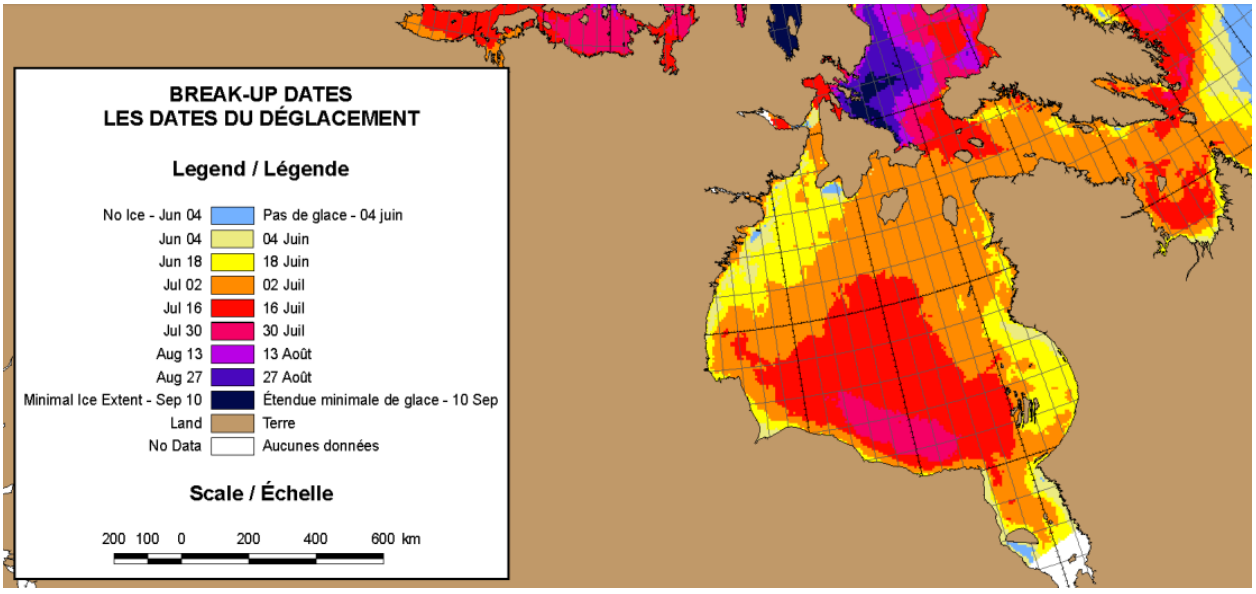


Figure E-3: Ice break-up and dates at Hudson Bay and Hudson Strait, source: CIS (2011)

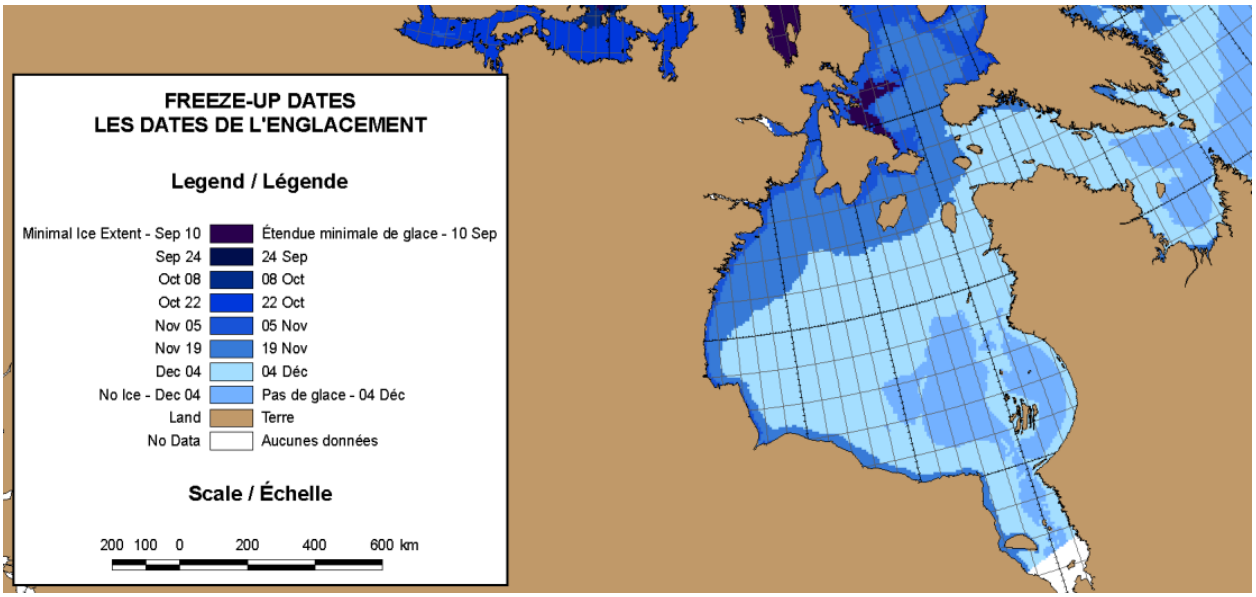


Figure E-4: Ice freeze-up dates at Hudson Bay and Hudson Strait, source: CIS (2011)

Ice-break up along the transportation route break-up occurs on June 18 in northwestern Hudson Bay in northeastern Hudson Bay as shown in Figure E-3. Therefore, early June and July are the months of greatest relevance in terms of potential oil spill interaction with sea ice.

The dates of ice freeze-up and break-up are derived from sea ice concentration data, which refers to the proportional surface area, covered by ice and is categorized over a range presented as fractional tenths (0 to 10/10). The ice break-up date represents the earliest day of the year when ice concentration reaches 5/10 or less. The ice freeze-up date represents the earliest day of the year when ice concentration reaches 5/10 or more (Gagnon and Gough 2005).

Figure E-5 presents ice concentration maps of Hudson Bay from July to November taken from the Sea Ice Climatic Atlas prepared by CIS (2011). The following observations are made from Figure E-5:

- In July (Figure E-5a), the median concentration of ice along the eastern portion of the transportation route is around 3-4/10 (open drift ice) and close pack fast ice (8-9/10) is expected on the northwest shoreline;
- The area within the route is considered ice-free for the months of August (Figure 8.2-B-4a), September (Figure E-5b) and October (Figure E-5c); and
- During November, freeze-up is expected on the northwest shoreline (4-9/10) and south shoreline of Southampton Island.

According to Dickins (2011), 1-5/10 drift ice conditions represent the greatest challenge in terms of spill containment and recovery. For ice concentrations of 6/10 and greater, spilled oil will tend to move at similar drift rates as sea ice. The intrusion of drift ice from Foxe Basin could interfere with Project vessels along the navigation route during the open water season from August to October.

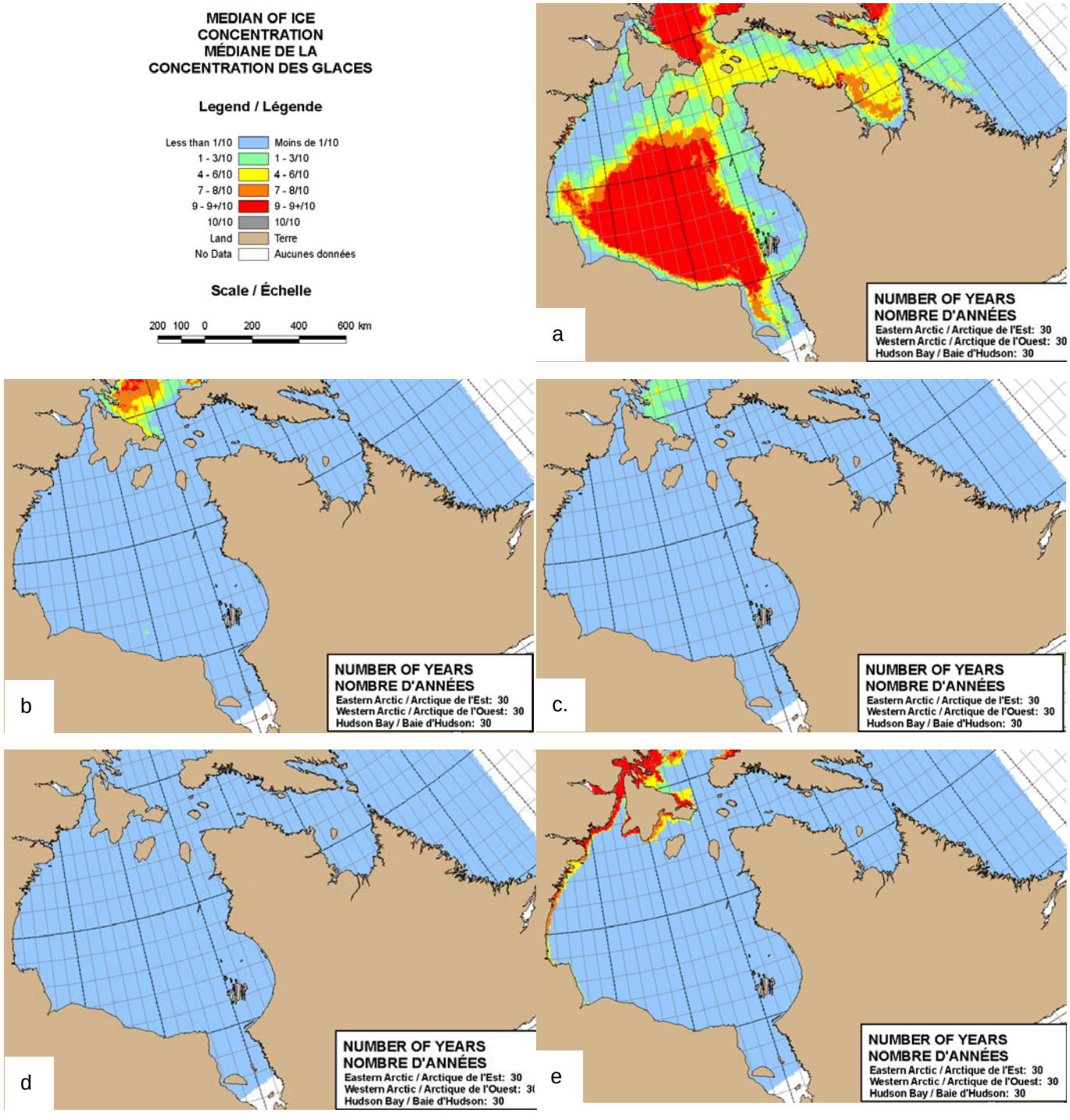


Figure E-5: Median of ice concentration in Hudson Bay and Hudson Strait during a) July, b) August, c) September, d) October and e) November, source: CIS (2011)

5.2 Ice Dispersion of a Potential Oil Spill

The behaviour of a spill in ice-covered waters is determined by the sea ice conditions at the time of the spill. Sea ice can be present in the seawater in multiple forms. A thorough understanding of the ice condition, ice coverage, energy conditions and the type of the spill and oil properties may help inform the study to determine the potential spill behaviour and fate and, consequently, improve the effectiveness for human response strategies to different spill events.

Several experiments described in Dickins (2011) have been designed to evaluate the response of the spill in different ice conditions: on and under drift and closed pack and fast ice, on surface melt pools, on snow and ice, in slush between floes, and under ice floes. Figure E-6 presents a schematic showing a range of ice and oil interactions resulting from oil spills in ice-covered waters.

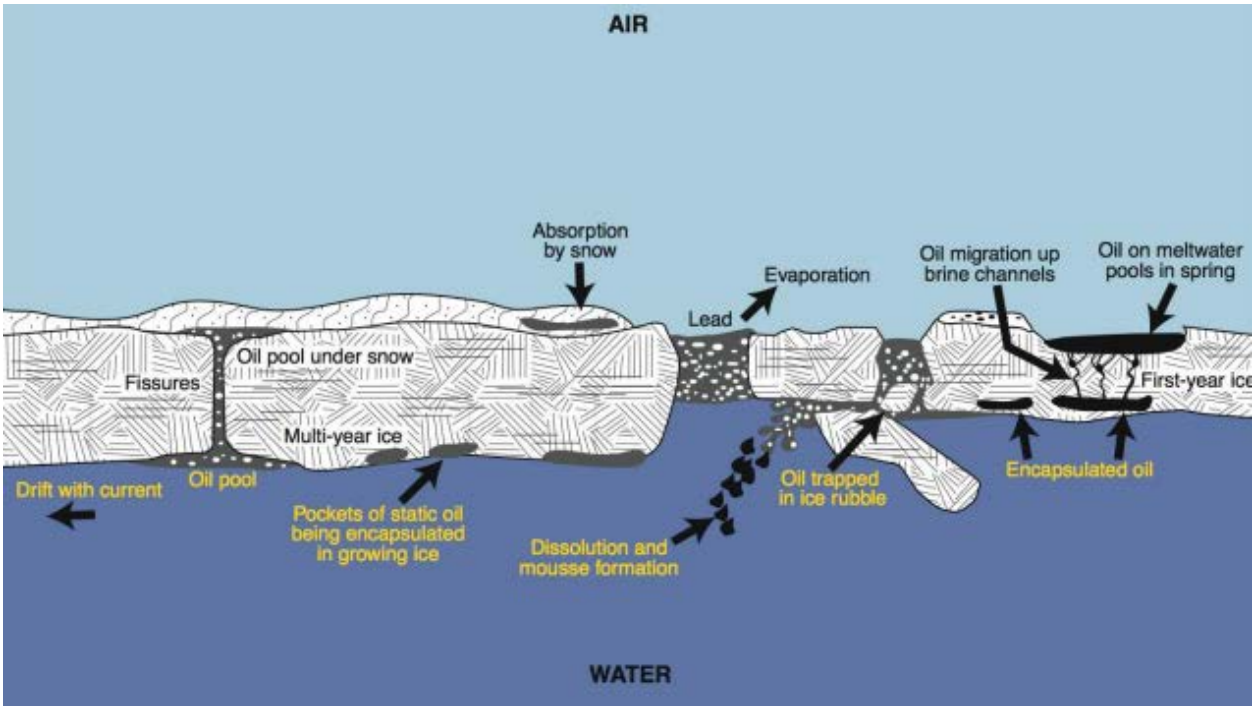


Figure E-6: Schematic showing ice and oil interactions (source: Dickins, 2011; derived from original sketch by A. Allen)

For the purposes of this study, the oil type P50 diesel fuel is examined. Some characteristics of P50 diesel are listed below:

- Most crude oils and light products such as diesel and gasoline experience significant evaporation (Potter et al. 2012);
- Small diesel spills usually evaporate and disperse naturally within a day for spills of 500 to 5,000 gallons, even in cold water (NOAA 2016);
- Diesel oil spreads very quickly to a thin film of rainbow and silver sheens (NOAA 2016);

- Diesel has a very low viscosity and is readily dispersed into the water column when winds reach 5-7 knots or with breaking waves (NOAA 2016);
- Since diesel is much lighter than seawater it is not possible to sink and accumulated on the seafloor (NOAA 2016);
- Wave action can disperse diesel to form droplets that are small enough to be kept in suspension and moved by the currents (NOAA 2016);
- Moderately volatile; will leave residue (up to one-third of spill amount) after few days (OSHA 2013);
- Moderate concentrations of toxic (soluble) compounds (OSHA 2013);
- Will “oil” intertidal resources resulting in potential for long-term contamination (OSHA 2013); and
- Cleanup can be very effective (OSHA 2013).

Table E-1 outlines different oil spill response methods for oil releases in cold and icy conditions, including a description of advantages and disadvantages for each method, as described by Lampala (2011).

Table E-1: Response Methods Used on Oil Spill Events

Method	Description
Mechanical recovery	From the environmental point of view, the mechanical recovery is usually considered as the most favorable oil spill combating method. Several skimmer types and techniques exist, but, because of variations in circumstances and climate conditions, ice coverage varies case-specifically and conditions may change even during response to a single incident, necessitating a toolbox of several response tools.
In-situ burning	*In situ* burning is particularly suitable for use in icy conditions, sometimes offering the best option for removal of surface oil. *In situ* burning of thick, fresh oil slicks can often be initiated very quickly through ignition of the oil with simple devices such as an oil-soaked sorbent pad. Oil from the water's surface can be removed efficiently and well via *in situ* burning: It is reported that the removal efficiency for thick slicks can exceed 90%. Oil removal rates of 2,000 m^3/hr can be achieved with a fire area of about 10,000 m^2.
Chemical Recovery	Dispersant chemicals work by enhancing the natural dispersion of the oil into the water column. A dispersant consists of a mixture of surfactants (surface-active agents) in a solvent. When applied to an oil slick, the surfactants will be positioned at the oil–water interface and contribute to formation of small oil droplets that will readily be mixed into the water column and be rapidly diluted and later biodegraded.
Bioremediation	Bioremediation is natural biodegrading of spilled oil, which to a certain extent can be accelerated through the addition of nutrients, oil-degrading bacteria, or both. Nutrient and bacteria addition has been tested, and some positive effects have been observed. It had been assumed that biodegrading does not occur in cold and icy conditions or is at least very slow; however, lab and field tests have shown that a low water temperature and even the presence of ice do not hamper the biodegrading of oil as much as expected. Nonetheless, it should be noted that bioremediation is a slow process that very seldom, if ever, can be considered as the primary countermeasure. The most beneficial use of bioremediation is as a secondary combating method that completes the recovery result after application of some other cleanup method.
Others	■ Use of vacuum pumps to suck oil between and under ice blocks. ■ Use of air bubbles to separate the oil and ice, with an air-induced current directing the oil into free water between ice blocks. ■ Use of propeller flow to direct oil under ice in the desired direction. ■ Creation of an ice boom to prevent drifting of oil in an undesired direction. ■ Use of specialized saw to cut slots in ice where oil can be removed.

Note:
The information in this table was derived from Lampala (2011).

In general, interactions between Project vessels and sea ice along the navigation route are predicted to be rare during the open- water season. However, changes in climate and larger scale weather patterns can result in variation to the typical break-up and/or freeze-up dates. Also, occasional incursions of drift ice from Foxe Basin and Davis Strait can be expected along the navigation route, particularly in Hudson Strait and Ungava Bay.

6.0 DIESEL FUEL SPILL SCENARIOS

For this analysis, we considered a worst case spill scenario of 20 ML (20,000 m^3) assuming all (100%) of the P50 diesel fuel carried on the ship was spilled. A second spill scenario was considered for 2 ML (2,000 m^3) based on the conservative assumption of 10% of the total P50 diesel fuel (20 ML) being carried on a single ship for the Project. Previous research indicates that spill volumes are best expressed as being equivalent to 5% to 10% of the total fuel being transported (McKenna and McClintock 2005; Coastal Ocean Resources 2013).Therefore, the 100% diesel spill assumed in the worst case scenario is extremely conservative and unlikely.

The Automated Data Inquiry for Oil Spills (ADIOS2), an oil weathering model (NOAA 2014), was used to provide estimates of the expected characteristics and behavior of fuel spilled in the marine environment. We analyzed a 20 ML and a 2 ML fuel spill at four locations in Melvin Bay and ten locations along the shipping route (Table E-2). Additional scenarios of 100,000 L (100 m^3) spills were analyzed at the four fuel transfer locations in Melvin Bay – as these represent smaller-scale spills that could occur during transfer of fuel from ship-to-ship or ship-to-shore. One of the main causes of fuel spills is related to navigational error where a tanker deviates from its planned track along the shipping route. The modelled scenarios assumed that the fuel spill would occur near the center of the main shipping lane and that ships would not deviate from this route (Figure E-1).

Table E-2: Hypothetical Fuel Spill Locations

Location Number	Location Name	UTM Zone	Easting (metres)	Northing (metres)
1	Ship-to-ship fuel transfer site outside Melvin Bay	15	546,173	6,961,117
2	Ship-to-shore fuel transfer site in Melvin Bay	15	546,143	6,963,142
3	Shipping route south of Walrus Island	16	641,869	6,988,220
4	Shipping route north of Coats Island	17	456,430	7,000,031
5	Shipping route north of Ungava Peninsula	18	351,235	6,986,598
6	Shipping route in Eastern Hudson Strait	20	399,876	6,775,840
1A	West Melvin Bay	15	545,185	6,963,365
2A	East Melvin Bay	15	546,798	6,962,172
3A	Entrance to Melvin Bay	15	549,334	6,960,588
4A	West Hudson Bay	15	585,757	6,949,020
5A	Hudson Bay crossing	16	416,455	6,950,265
6A	Western Hudson Strait	18	546,017	6,967,899
7A	Mid-Hudson Strait	19	415,679	6,911,718
8A	Eastern Hudson Strait	19	570,404	6,842,009

6.1 Model Parameters

6.1.1 Extremal Analysis for Rankin Inlet and Coral Harbour Winds

Historical hourly wind records were obtained for Rankin Inlet (station ID: 71083) and Coral Harbour (station ID: 71915). The Rankin Inlet station is located at 62.82° N, 92.12° W at an elevation of 32.3 metres (m) above mean sea level (msl) and the Coral Harbour station is located at 64.78° N, 83.92° W at an elevation of 62.2 m above msl. Figure E-7 shows wind roses for the hourly record at Rankin Inlet from 1981 through 2012 for all wind measurements over the duration of the record (Figure E-7a) and for a filtered subset of only wind measurements made during the open water seasons (August to October) over the duration of the record (Figure E-7b). Figure E-8 shows wind roses for the hourly record at Coral Harbour for the same time period for all wind measurements over the duration of the record (Figure E-8a) and for a filtered subset of only wind measurements made during the open water seasons (August to October) over the duration of the record (Figure E-8b). In general, the prevailing wind direction at both sites is from the north-northwest (prevailing winds from 343° at both stations). The wind distribution observed between the full record and the record limited to open water seasons only are nearly identical at both stations. This indicates that there is no seasonal bias during the open water season that is not observed during the full annual distribution. Wind speed statistics were calculated for both stations and the results are shown in Table E-3 and Table E-4. Data were filtered for “0” values.

Wind speeds recorded at Rankin Inlet and Coral Harbour between 1981 and 2012 were used to determine probability distributions of wind speeds and their associated return periods. A peaks-over-threshold (POT) analysis was used to calculate the peak wind speeds of the largest storms during the 31-year record at each site. Extreme wind speeds were determined by filtering the record for peak wind speeds during storms with speeds greater than the 95 percentile value (Table E-3) sustained for at least 4 hours.

An extremal analysis following Leenknecht et al. (1992) was applied to the station record of extremes in order to determine the 5, 10, 25, 50 and 100-year wind speeds at the site. A time series of 77 maximum wind speeds measured during discrete storms between 1981 and 2012 were input to the extremal analysis. The analysis included the application of Fisher Tippett Type 1 (FT-1) and Weibull distributions to the peak water level time series. Results of the analysis for Rankin Inlet are summarized in Table E-5 and a plot of the Weibull distribution with shape parameter (k) = 1.15 is shown in Figure E-9. Results of the analysis for Coral Harbour are summarized in Table E-6 and a plot of the Weibull distribution with k = 2.00 shown in Figure E-10. The wind analysis indicates that the prevailing winds are from the north-northwest (343°) at both Rankin Inlet and Coral Harbour, while the extreme storm winds are from the north-northwest (343°) at Rankin Inlet and from the northeast (40°) at Coral Harbour. Therefore, wind direction for the 50-year storm should be applied as 343° for oil spill model points near Melvin Bay (represented by Rankin Inlet winds) and as 40° for oil spill model points along Hudson Strait (represented by Coral Harbour winds).

Table E-3: Wind Statistics for Rankin Inlet and Coral Harbour (1981-2012) in Metres/Second

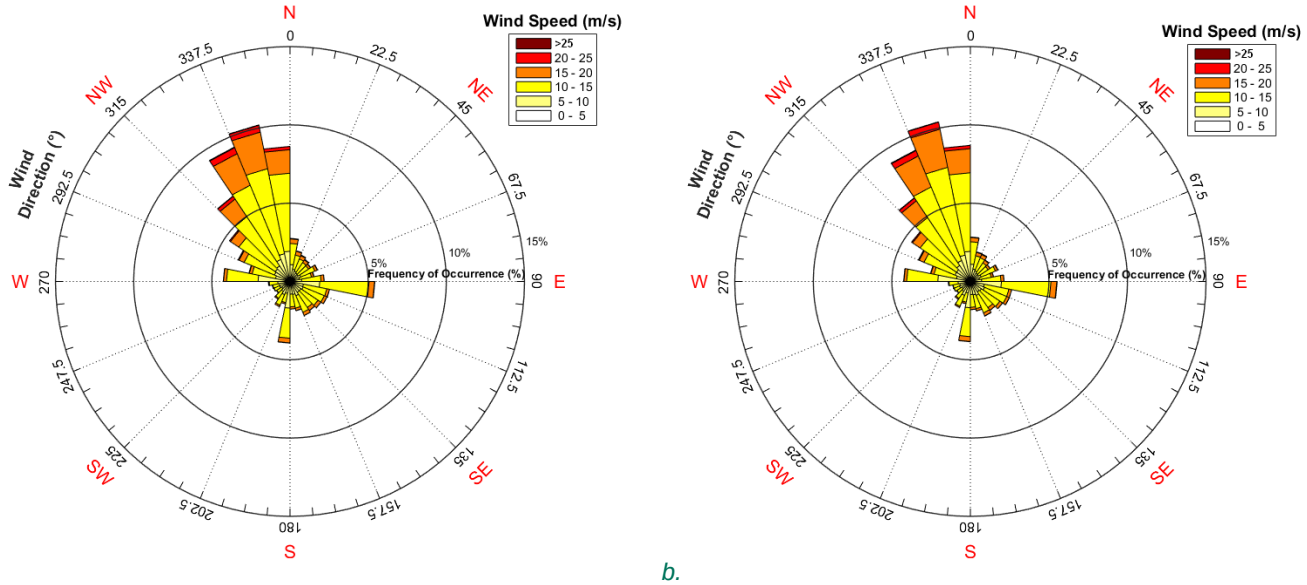
	Min	1%	5%	25%	Median	Mean	75%	95%	99%	Max	Std
Rankin Inlet	0.6	1.1	1.9	4.2	6.1	6.6	8.3	12.8	15.8	28.3	3.3
Coral Harbour	0.6	1.1	1.7	3.1	5.3	5.4	7.2	11.4	15.0	28.3	3.1

Minimum (Min), Maximum (Max), Standard Deviation (Std)

Table E-4: Wind Statistics for Rankin Inlet and Coral Harbour (1981-2012)

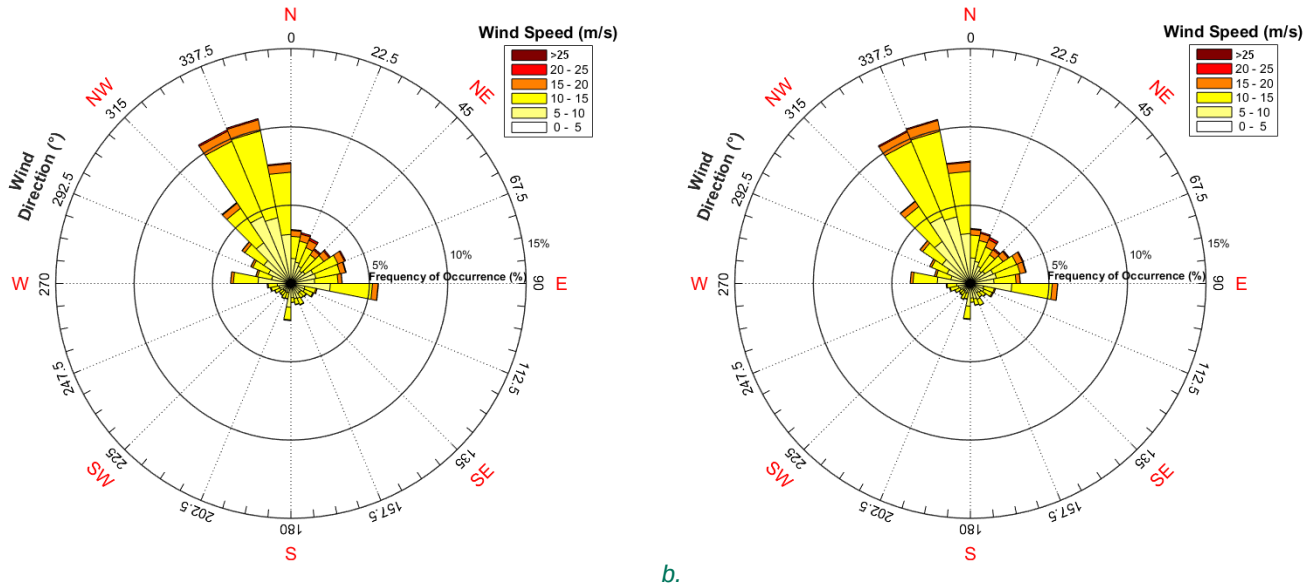
	Record Length	Missing	Number Invalid	% Invalid
Rankin Inlet	281,088	0	8,474	3%
Coral Harbour	280,608	480	23,285	8%

Invalid = “0” value



a. *b.*

Figure E-7: Wind Roses for Rankin Inlet from 01 October 1981 to 01 October 2012 for (a) all wind measurements and (b) wind measurements during the open water seasons only



a. *b.*

Figure E-8: Wind Roses for Coral Harbour from 01 October 1981 to 01 October 2012 for (a) all wind measurements and (b) wind measurements during the open water seasons only

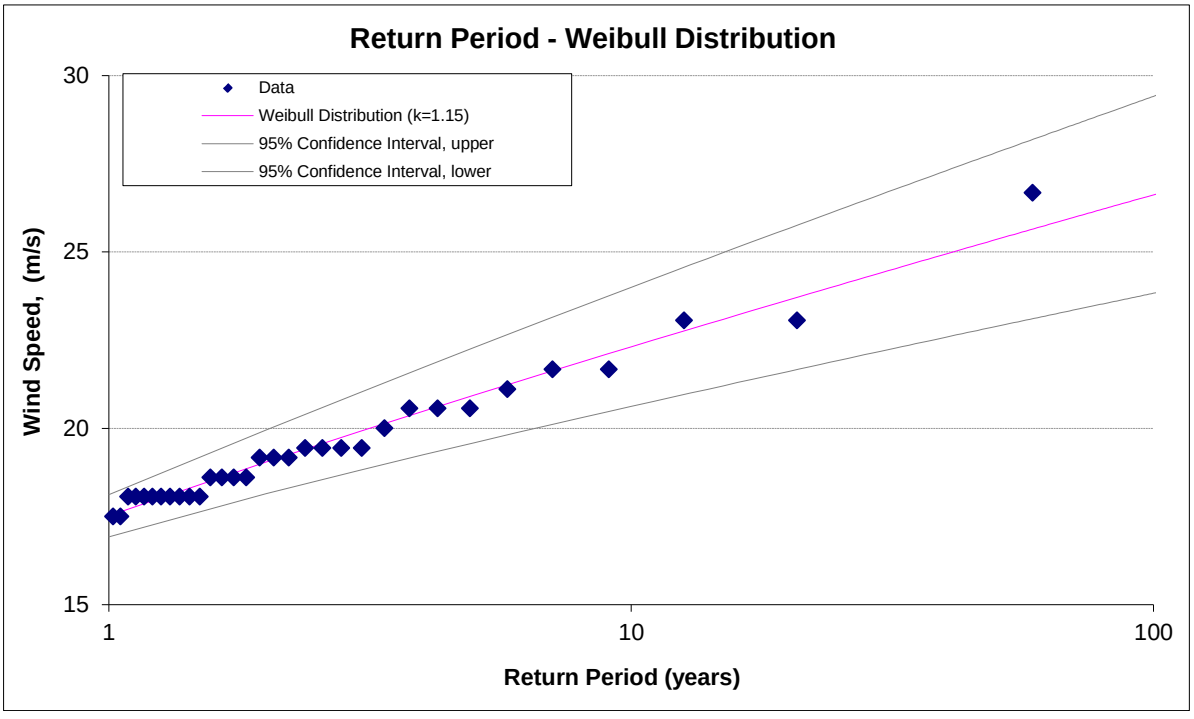


Figure E-9: Wind speed as a function of return period for a Weibull (k=1.15) distribution for Rankin Inlet wind record

Table E-5: Extreme Wind Speeds (m/s) and Associated Return Periods for Rankin Inlet

N= 77 Nu= 1.00 NT= 77 K= 32 Lambda=2.41		FT-I	Weibull k= 0.75	Weibull k= 1.15	Weibull k= 1.49	Weibull k= 2.00
Correlation Coefficient		0.9880	0.9711	0.9918	0.9860	0.9708
Sum Square of Residuals		8.23	19.72	5.65	9.64	19.89
Return Period (yr)		m/s	m/s	m/s	m/s	m/s
	2	19.2	18.52	19.05	19.23	19.33
	5	20.8	20.59	20.94	20.92	20.80
	10	22.0	22.34	22.31	22.07	21.73
	25	23.6	24.85	24.06	23.46	22.82
	50	24.7	26.88	25.35	24.44	23.56
	100	25.9	28.20	26.62	25.03	24.00
Confidence Interval	Return Period (yr)	m/s	m/s	m/s	m/s	m/s
95 % C.I.	5	19.7 - 21.9	18.4 - 22.7	19.6 - 22.3	19.8 - 22.0	19.9 - 21.7
95 % C.I.	10	20.7 - 23.3	19.4 - 25.3	20.6 - 24.0	20.7 - 23.4	20.7 - 22.8
95 % C.I.	25	21.9 - 25.2	20.7 - 29.0	21.9 - 26.2	21.9 - 25.0	21.6 - 24.0
95 % C.I.	50	22.8 - 26.6	21.8 - 31.9	22.9 - 27.8	22.7 - 26.2	22.2 - 24.9
95 % C.I.	100	23.7 - 28.1	22.5 - 33.9	23.8 - 29.4	23.1 - 26.9	22.6 - 25.4

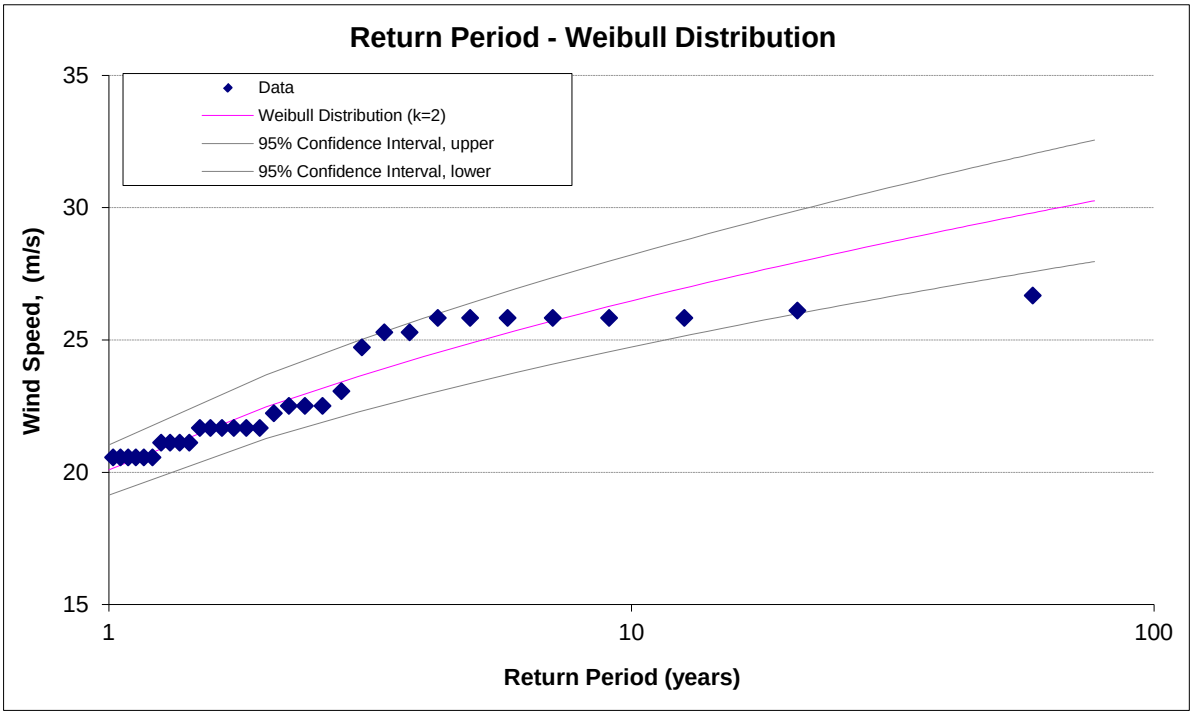


Figure E-10: Wind speed as a function of return period for a Weibull (k=2.00) distribution for Coral Harbour wind record

Table E-6: Extreme Wind Speeds (m/s) and Associated Return Periods for Coral Harbour

N= 77	Nu= 1.00					
NT= 77	K= 32	FT-I	Weibull	Weibull	Weibull	Weibull
Lambda=2.41			k= 0.75	k= 1.15	k= 1.49	k= 2.00
Correlation Coefficient		0.9580	0.8222	0.9195	0.9535	0.9757
Sum Square of Residuals		78.25	308.39	147.11	86.46	45.71
Return Period (yr)		m/s	m/s	m/s	m/s	m/s
	2	22.1	20.90	21.83	22.21	22.48
	5	24.8	23.80	24.74	24.92	24.92
	10	26.7	26.26	26.84	26.76	26.48
	25	29.2	29.79	29.54	28.99	28.29
	50	31.1	32.64	31.52	30.57	29.53
	100	32.9	34.49	33.47	31.52	30.26
Confidence Interval	Return Period (yr)	m/s	m/s	m/s	m/s	m/s
95 % C.I.	5	23.0 - 26.5	20.2 - 27.4	22.5 - 27.0	23.1 - 26.8	23.4 - 26.4
95 % C.I.	10	24.5 - 28.9	21.3 - 31.2	24.0 - 29.6	24.6 - 29.0	24.7 - 28.2
95 % C.I.	25	26.4 - 31.9	23.0 - 36.6	26.0 - 33.1	26.4 - 31.6	26.3 - 30.3
95 % C.I.	50	27.9 - 34.2	24.2 - 41.0	27.4 - 35.6	27.6 - 33.5	27.3 - 31.7
95 % C.I.	100	29.3 - 36.5	25.1 - 43.9	28.8 - 38.1	28.4 - 34.7	28.0 - 32.6

6.1.2 Spill Scenarios and Input Parameters

ADIOS2 predicts changes over time in the density, viscosity, and water content of diesel fuel, including evaporation and dispersion rates. The following assumptions were made for model set-up:

- ADIOS 2 diesel fuel oil (Canada), equivalent to P50;
- Spill of 100,000 L (100 m^3) and 2 ML (2,000 m^3) for near-shore spills;
- Spill of 2 ML (2,000 m^3) for shipping route spills;
- Spill of 20 ML (20,000 m^3) for shipping route spills;
- Sea salinity of 32 parts per thousand (ppt);
- Surface water and diesel fuel temperature of 5° Celsius (C);
- Sediment load of 5 milligrams per litre (mg/L);
- Spill occurs near the center of the proposed shipping lane; and
- Spill scenarios assume no mitigation.

Winds and waves are generally the driving physical forces used to determine the oil drift slick speed and distance travelled (DNV 2011). Golder analyzed winds from Rankin Inlet and Coral Harbour and performed an extremal analysis for 31-years of hourly data (Section 6.1.1). For modeling simulations, Golder used mean, 2-year, and 50-year wind conditions. For the 31-year record, the majority of the winds from both stations originated from 343° (North-Northwest). The extreme winds at Rankin Inlet also originate from North-Northwest (typically 343°), but the extreme winds at Coral Harbour originate from the northeast (typically 40°). For all scenarios except the 50-year extreme wind scenario, the fetch was measured along the axis of prevailing wind direction from 343° to 163°. The 50-year extreme wind scenario was measured along the axis of the dominant wind direction. In Rankin Inlet, extreme winds typically blow from 343° to 163° and this wind alignment would be applicable for points in Melvin Bay and Hudson Bay (points 1, 1A, 2, 2A, 3A, 4A, and 5A). At Coral Harbour, extreme winds blow from 40° to 220° and this wind alignment would be applicable for points along Hudson Strait (points 3, 4, 5, 6A, 7A, 8A and 6). Wind-related model parameters (i.e., fetch, distance to shore, and wind speeds) for the hypothetical fuel spill locations are provided in Table E-7. Summary tables and figures from the ADIOS2 model simulations inputs and outputs are provided in Attachment A.

Table E-7: Wind Related Model Parameters for Spill Scenarios along Shipping Route

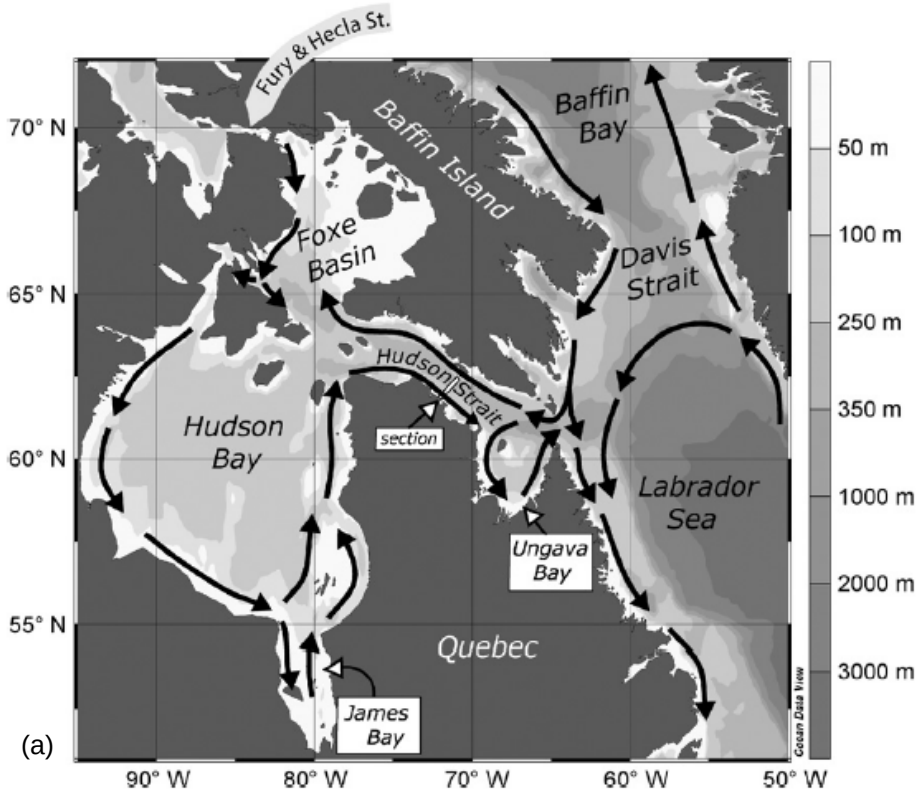
Location (Number)	Fetch (km)			Distance to Shore (km)			Wind Speed (m/s)		
	Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr
Ship-to-ship fuel transfer (1)	0.5	Mean[1]	Mean[1]	0.9	Mean[1]	Mean[1]	6.6	19.0	25.4
Ship-to-shore fuel transfer (2)	0.4	Mean[1]	Mean[1]	0.4	Mean[1]	Mean[1]	6.6	19.0	25.4
West Melvin Bay (1A)	0.9	Mean[1]	Mean[1]	0.6	Mean[1]	Mean[1]	6.6	19.0	25.4
East Melvin Bay (2A)	1.3	Mean[1]	Mean[1]	0.3	Mean[1]	Mean[1]	6.6	19.0	25.4
Walrus Island (3)	43	Mean[1]	134	55	Mean[1]	760	5.4	22.5	29.5
Coats Island (4)	58	Mean[1]	50	23	Mean[1]	22	5.4	22.5	29.5
Ungava Peninsula (5)	16	Mean[1]	24	46	Mean[1]	106	5.4	22.5	29.5
Eastern Hudson Strait (6)	26	Mean[1]	775	46	Mean[1]	325	5.4	22.5	29.5

Location (Number)	Fetch (km)			Distance to Shore (km)			Wind Speed (m/s)		
	Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr
Entrance to Melvin Bay (3A)	2	Mean[1]	Mean[1]	12	Mean[1]	Mean[1]	6.6	19	25.4
West Hudson Bay (4A)	14	Mean[1]	Mean[1]	700	Mean[1]	Mean[1]	6.6	19	25.4
Hudson Bay crossing (5A)	148	Mean[1]	Mean[1]	857	Mean[1]	Mean[1]	6.6	19	25.4
Western Hudson Strait, Charles Island (6A)	183	Mean[1]	115	20	Mean[1]	21	5.4	22.5	29.5
Mid-Hudson Strait (7A)	45	Mean[1]	29	160	Mean[1]	93	5.4	22.5	29.5
Eastern Hudson Strait, north Ungava Bay (8A)	47	Mean[1]	48	305	Mean[1]	164	5.4	22.5	29.5

Notes:
1. Cells listed as “Mean” indicates that cell values are equivalent to the mean wind case values.

The 2 ML and 20 ML spill scenarios were each modelled with and without the influence of currents on the slick trajectory. A summary of the predominant current velocities at each location is presented in the results table in Section 6.3, Table E-9 through Table E-11. A background literature review was conducted to provide the oceanographic conditions along the shipping route with particular attention to the surface currents along the route. Current velocity along the western portion of the shipping route (Rankin Inlet to Coats Island) is predominantly forced by tides running along the axis of the route, but the eastern portion of the route through Hudson Strait east of Coats Island is dominated by the cyclonic circulation forcing a current to the east-southeast (Drinkwater 1986; Drinkwater 1988; Saucier et al 2004). South of the proposed shipping route in Hudson Bay, currents have been modelled to predict the seasonal cycle of water masses and sea ice by Saucier et al. (2004) and Wang et al. (1994). Currents from the Arctic Ocean flow around both sides of Southampton Island from the north (Ingraham and Prisenburg 1998). Coastal currents flow counter-clockwise along the southwestern portion of Hudson Bay towards James Bay, north along the eastern coast of Hudson Bay and through the southern Hudson Strait into the Labrador Sea. The surface eddy current is strongest during ice-free periods and reaches 15 to 20 centimetres per second (cm/s) (Saucier et al. 2004) in northeastern Hudson Bay. Current enters into Hudson Strait from the Atlantic along the southern shore of Baffin Island and exits along the northern shore of Quebec (Drinkwater 1986; Drinkwater 1988; Ingraham and Prisenburg 1998; Straneo and Saucier 2008). In the center of Hudson Strait there is a cyclonic pattern which brings the current across the channel from the north to south. Figure E-11 provides an overview of circulation patterns for the region, adapted from Straneo and Saucier (2008) and Drinkwater (1986).

Current data are available at several mooring locations in Hudson Strait and west of Southampton Island from the MERICA (*etudes des MERs Interieures du Canada*) 2003 to 2007 oceanographic data collection program (DFO 2015). Surface current data from representative sites were used to supplement or verify the literature review.



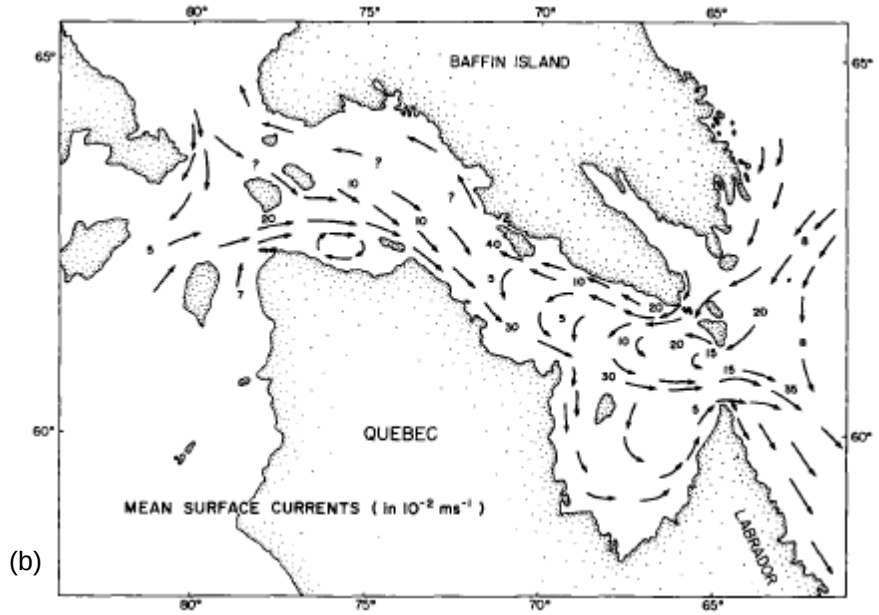


Figure E-11: (a) Hudson Bay system bathymetry and schematic circulation. Source: Straneo and Saucier 2008 and (b) Surface circulation in Hudson Strait and Ungava Bay. Source: Drinkwater 1986

Mean surface currents were considered at the locations along the shipping route when available. No information on currents in Melvin Bay near Rankin Inlet were available, therefore, no currents were applied to locations 1, 2, 1A, 2A, or 3A in the calculations. For the purpose of this analysis, predominant current direction and velocity at each location were used based on the availability of data, influence of currents on dispersion, and periodicity of the tides. Peak tidal currents were not considered because the tides are semi-diurnal and would switch direction multiple times during the course of a potential oil spill which could continue weathering for 12 hours or longer.

Currents were not input into the ADIOS2 model because these scenarios were considered instantaneous releases of fuel and each part of the slick would therefore experience the same net displacement (Lehr et al. 2002). The input of currents into the ADIOS2 model is generally used for modeling a spill from a fixed point such as an offshore platform. Mean surface currents were used for calculation of the slick velocity as a vector sum in combination with drift resulting from wind velocity.

6.1.3 Modelling Methodology

The ADIOS2 model output provided weathering half-life, and equations presented by the Australian Maritime Safety Authority were used to calculate the time for a spill to reach shore and the quantity of fuel from a spill that would be deposited on shore (DNV 2011). The quantity and proportion of fuel deposited on shore was determined after calculating the quantity of fuel remaining in the slick at the shore. The time between the occurrence of the spill and the slick initially reaching the shore (T_{shore}) depends primarily on the distance to shore (D_{zone}), wind velocity in the direction of the shore (V_{wind}), and the slick's velocity represented as a fraction (3%) of the wind velocity (RV_{drift}) (DNV 2011):

$$T_{shore} = \frac{D_{zone}}{V_{wind} RV_{drift}}$$

The quantity remaining in the slick (Q_s) relates to the original spill quantity (Q), weathering half-life to the quantity of fuel remaining (H), and time to shore (T_{shore}) (DNV 2011).

$$Q_s = Q * 2^{-T_{shore}/H}$$

For the scenarios where the mean surface current was considered, the slick velocity was calculated as a vector combination of the wind velocity and the current velocity:

$$V_{slick} = V_{wind} RV_{drift} + V_{current} RV_{drift}$$

Studies have found that slick transport due to surface currents is typically 60% (RV_{drift}) of the ambient current speed (Blaikley et al 1977): A new distance to shore was calculated based on the trajectory of the slick (V_{slick}) and used to determine the quantity deposited on shore.

6.2 Spills near Melvin Bay

The spill scenarios in Melvin Bay were completed for three different spill volumes: 100,000 L, 2 ML, and 20 ML, representing an average spill scenario, a large but low-probability spill scenario (10% spilled from a large tanker), and a worst case spill scenario (100% spilled from a large tanker), respectively. The weathering half-life (time required for removal of 50% of the diesel fuel from the sea surface) was determined using the ADIOS2 model. The amount of time it would take for a fuel spill to reach the shoreline given anticipated wind effects was then determined (originating from approximately 343º from the spill location) (Table E-8) along with the proportion of fuel estimated to be deposited on shore under the different spill scenarios.

Weathering characteristics for a 2 ML fuel spill are shown in Figure E-12. This figure illustrates the amount of fuel that would evaporate and disperse over time following the initial spill. For all spill scenarios considered at the fuel transfer locations near Melvin Bay, the weathering half-life was determined to be < 35 h. The time required for the spill to reach shore varied from approximately 6 minutes (min) (0.1 h) to 1 h 20 min. For all sites in Melvin Bay, it was determined that between 89% and 100% of the total volume of spilled diesel fuel would reach shore assuming no responsive mitigation occurred.

Table E-8: Distance to Shore, Weathering Half-Life, Time to Shore, and Estimated Percent of Spill Deposited on Shore for 100,000 L, 2 ML, and 20 ML Diesel Fuel Spill Scenarios in Melvin Bay

Location	Spill Amount (L)	Distance to Shore (km)	Weathering Half-Life (h)			Time to Shore (h)			% Deposited on Shore		
			Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr
Ship-to-ship fuel transfer (1)	100,000	0.9	7.8	3.4	2.7	1.3	0.4	0.3	89%	91%	92%
Ship-to-ship fuel transfer (1)	2,000,000	0.9	18.5	9.2	6.9	1.3	0.4	0.3	95%	97%	97%
Ship-to-ship fuel transfer (1)	20,000,000	0.9	34.8	16.1	14.8	1.3	0.4	0.3	98%	98%	98%
Ship-to-shore fuel transfer (2)	100,000	0.4	7.8	3.4	2.7	0.6	0.2	0.1	95%	96%	96%
Ship-to-shore fuel transfer (2)	2,000,000	0.4	18.5	9.2	6.9	0.6	0.2	0.1	98%	99%	99%
Ship-to-shore fuel transfer (2)	20,000,000	0.4	34.8	16.1	14.8	0.6	0.2	0.1	99%	99%	99%
West Melvin Bay (1A)	100,000	0.6	8	3.5	2.7	0.8	0.3	0.2	93%	94%	95%
West Melvin Bay (1A)	2,000,000	0.6	18.5	8.7	6.9	0.8	0.3	0.2	97%	98%	98%
West Melvin Bay (1A)	20,000,000	0.6	33.7	16.5	17.4	0.8	0.3	0.2	98%	99%	99%
East Melvin Bay (2A)	100,000	0.3	8	3.5	2.7	0.4	0.1	0.1	97%	97%	97%

Location	Spill Amount (L)	Distance to Shore (km)	Weathering Half-Life (h)			Time to Shore (h)			% Deposited on Shore		
			Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr
East Melvin Bay (2A)	2,000,000	0.3	18.5	8.7	6.9	0.4	0.1	0.1	99%	99%	99%
East Melvin Bay (2A)	20,000,000	0.3	33.7	16.5	17.4	0.4	0.1	0.1	99%	99%	100%

km (kilometre); yr (year); h(hour); L (liter)

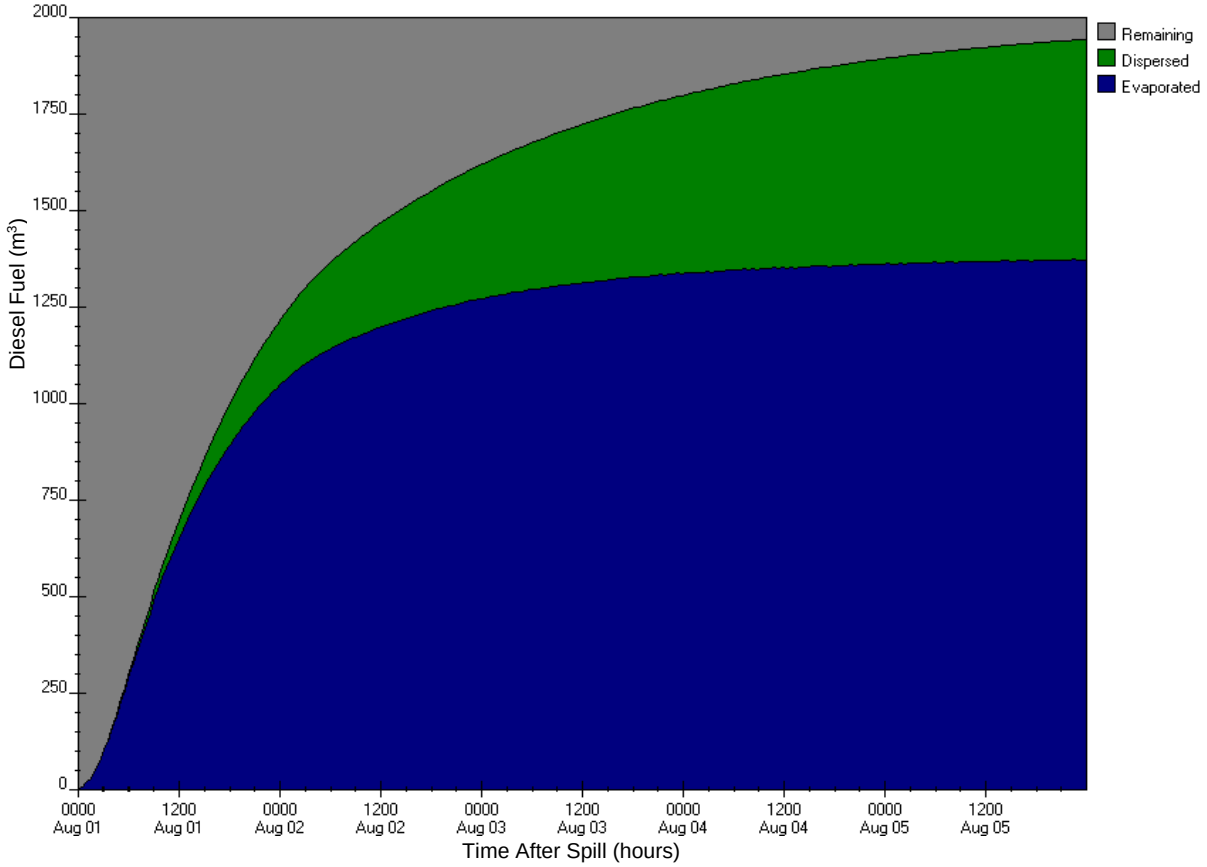
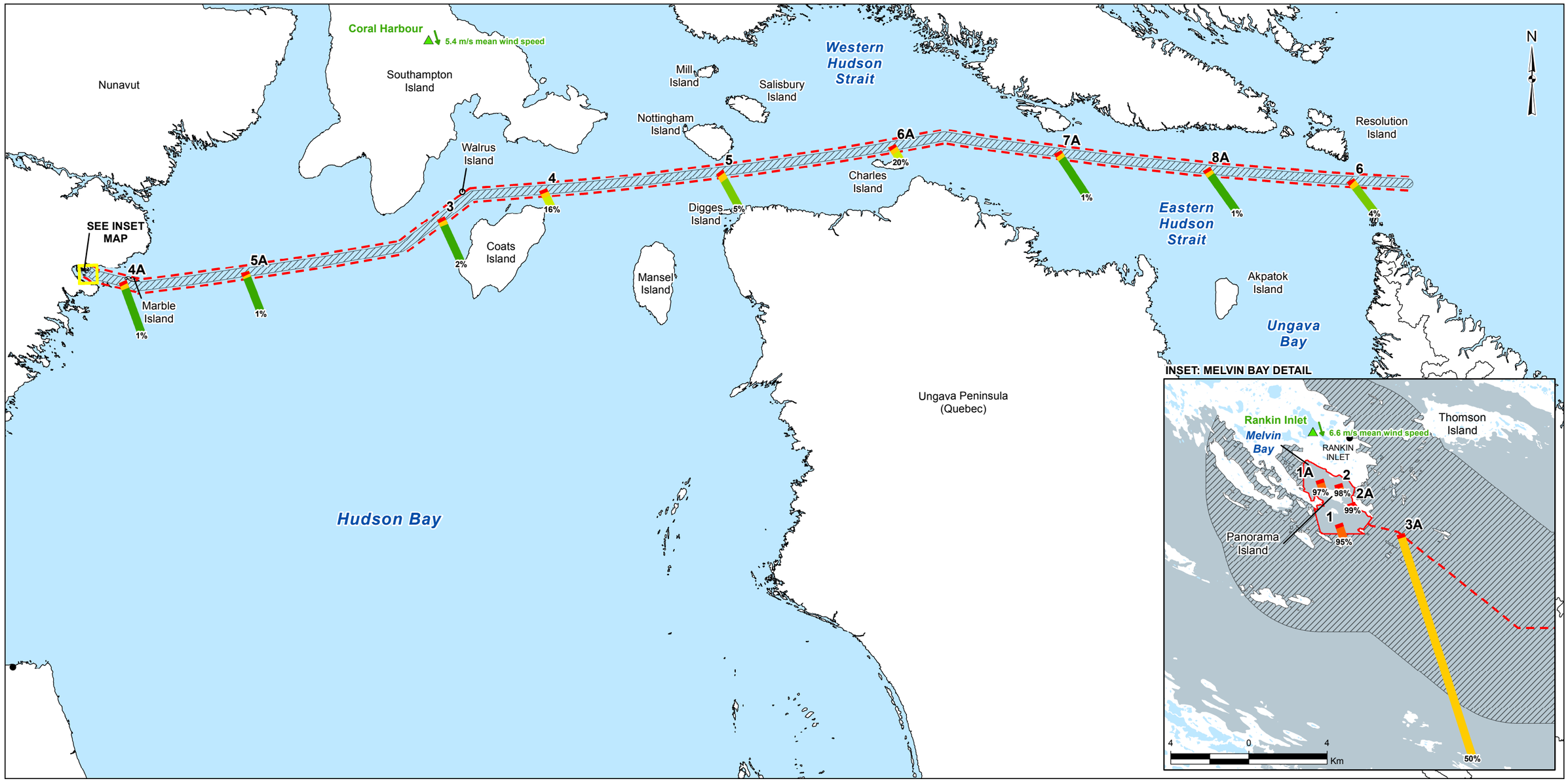


Figure E-12: Weathering Characteristics of a 2 ML Diesel Fuel Spill in Melvin Bay under Mean Wind and Wave Conditions



LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

- LENGTH OF LINE REPRESENTS THE ESTIMATED TRAVEL DISTANCE FOR A GIVEN SPILL VOLUME
- WIDTH OF LINE IS NOT TO SCALE
- ANGLE OF LINE REPRESENTS THE CALCULATED SPILL TRAJECTORY

REFERENCE

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HYPOTHETICAL FUEL SPILL RELEASE LOCATION	LOCATION NAME	UTM ZONE	EASTING	NORTHING
1	Ship-to-ship fuel transfer site outside Melvin Bay	15	546173	6961117
1A	West Melvin Bay	15	545185	6963365
2	Ship-to-shore fuel transfer site in Melvin Bay	15	546143	6963142
2A	East Melvin Bay	15	546798	6962172
3	Shipping route south of Walrus Island	16	641869	6988220
3A	Entrance to Melvin Bay	15	549334	6960588
4	Shipping route north of Coats Island	17	456430	7000031
4A	West Hudson Bay	15	585757	6949020
5	Shipping route north of Ungava Peninsula	18	351235	6986598
5A	Hudson Bay crossing	16	416455	6950265
6	Shipping route in Eastern Hudson Strait	20	399876	6775840
6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 2,000,000 L SPILL, MEAN WIND, NO SURFACE CURRENT

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FIGURE E-13

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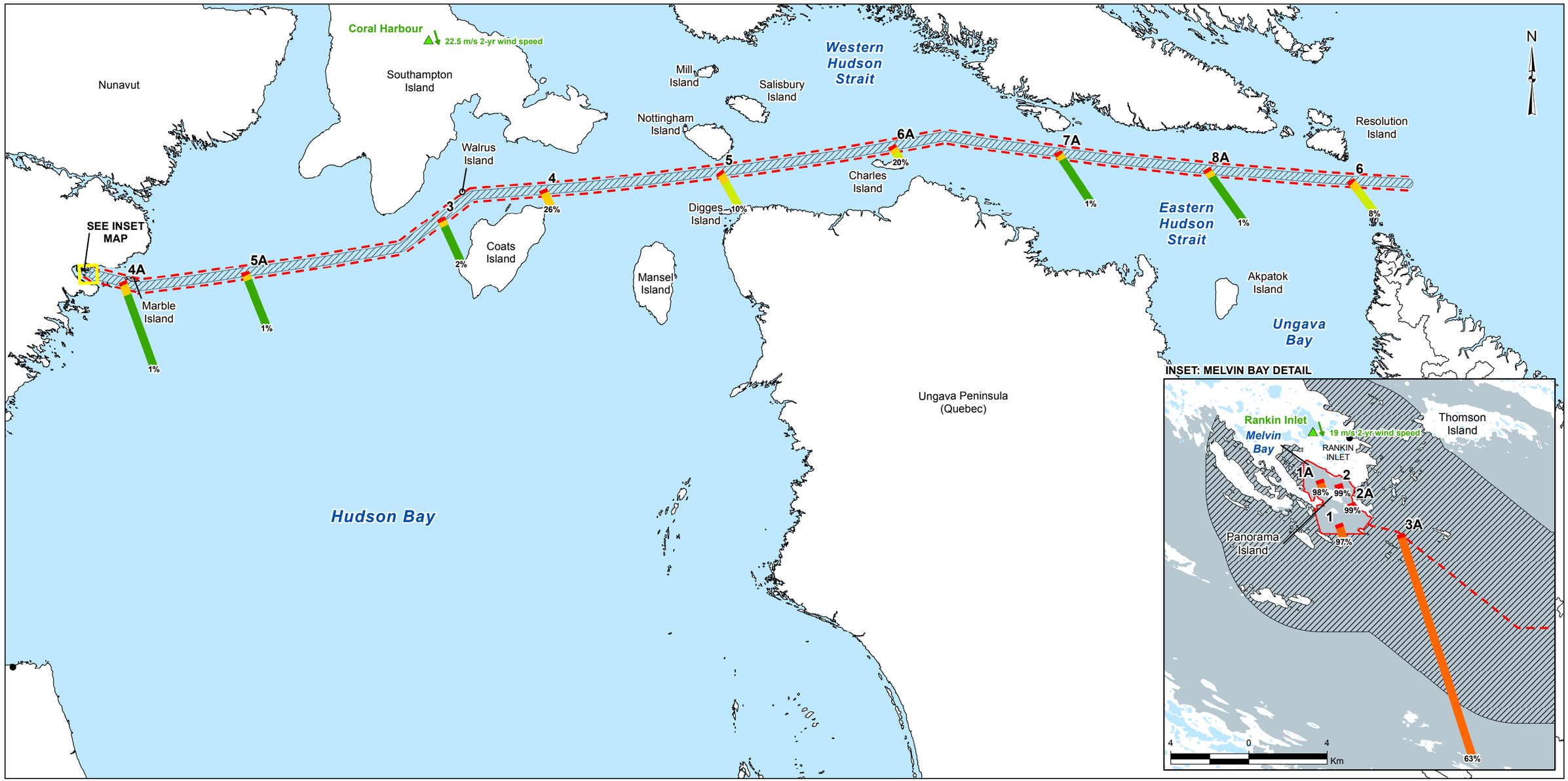

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

- LENGTH OF LINE REPRESENTS THE ESTIMATED TRAVEL DISTANCE FOR A GIVEN SPILL VOLUME
- WIDTH OF LINE IS NOT TO SCALE
- ANGLE OF LINE REPRESENTS THE CALCULATED SPILL TRAJECTORY

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

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4A	West Hudson Bay	15	585757	6949020
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5A	Hudson Bay crossing	16	416455	6950265
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6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
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Golder Associates

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REVIEW	LY	06 Jan. 2016		

FIGURE E-14

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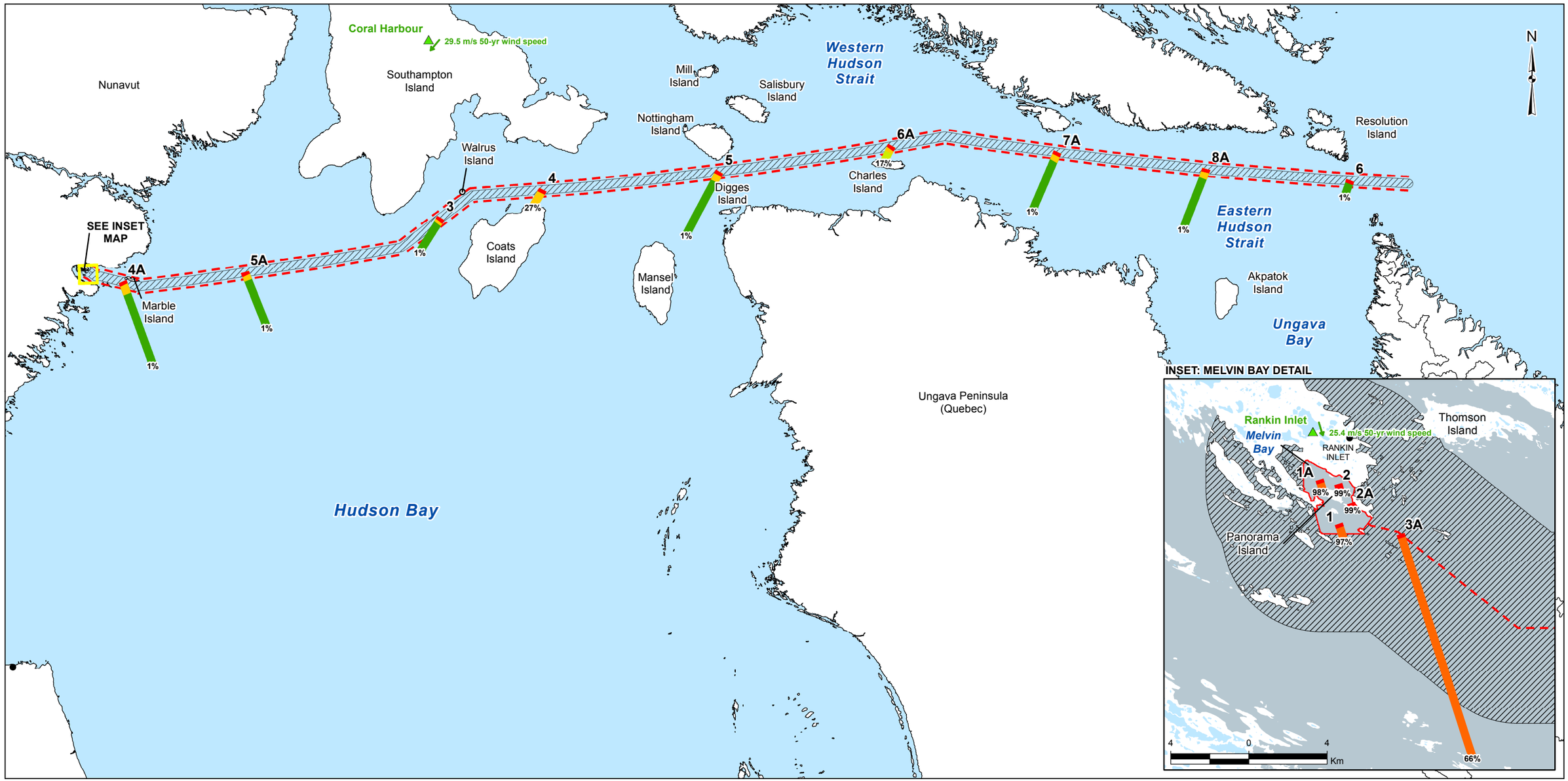

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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- WIDTH OF LINE IS NOT TO SCALE
- ANGLE OF LINE REPRESENTS THE CALCULATED SPILL TRAJECTORY

REFERENCE

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

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6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 2,000,000 L SPILL, 50-YR WIND, NO SURFACE CURRENT

Golder Associates

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REVIEW	LY	06 Jan. 2016		

FIGURE E-15

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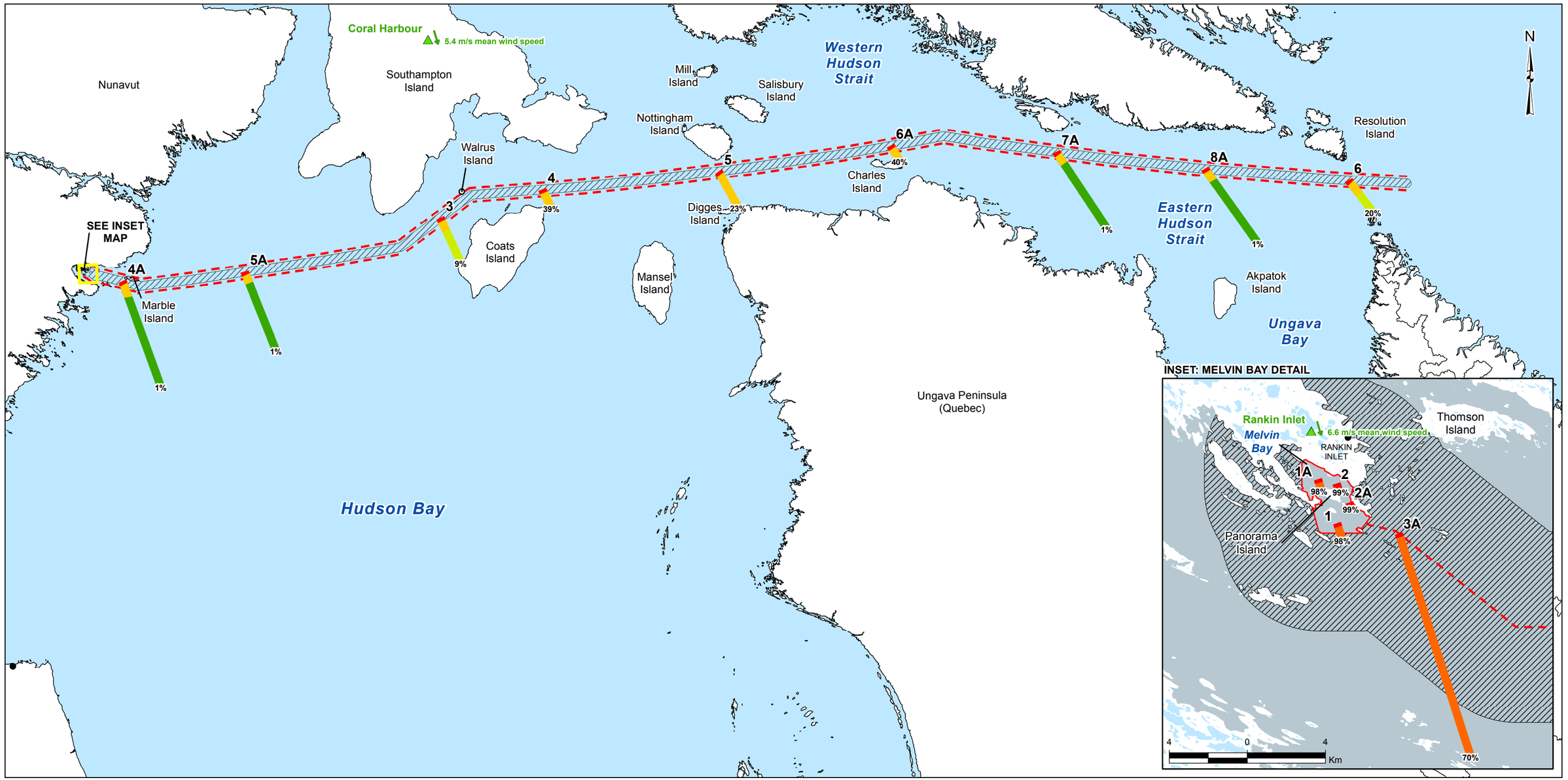

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

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6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 20,000,000 L SPILL, MEAN WIND, NO SURFACE CURRENT

Golder Associates

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FIGURE E-16

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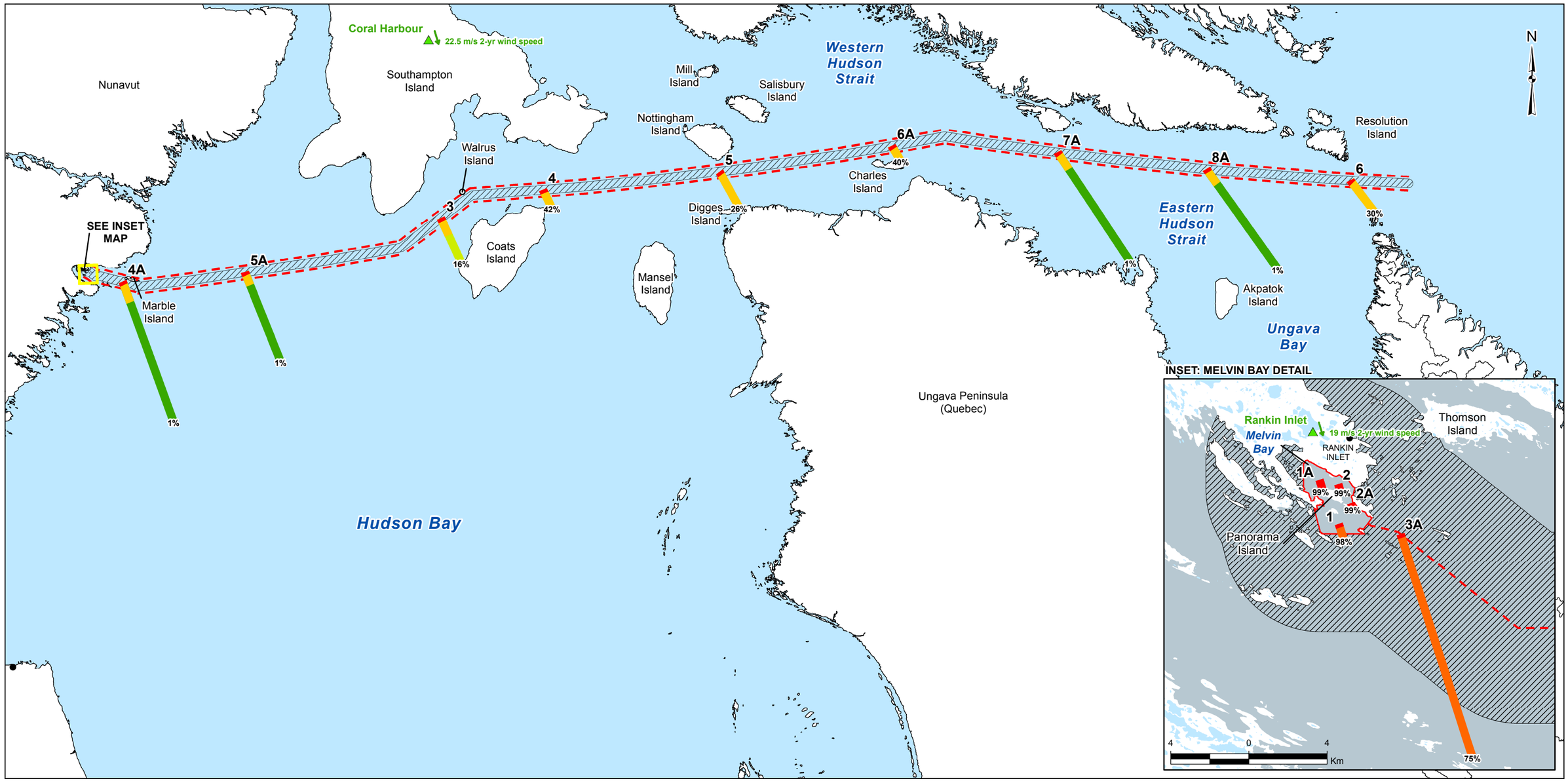

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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- ANGLE OF LINE REPRESENTS THE CALCULATED SPILL TRAJECTORY

REFERENCE

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

HYPOTHETICAL FUEL SPILL RELEASE LOCATION	LOCATION NAME	UTM ZONE	EASTING	NORTHING
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3A	Entrance to Melvin Bay	15	549334	6960588
4	Shipping route north of Coats Island	17	456430	7000031
4A	West Hudson Bay	15	585757	6949020
5	Shipping route north of Ungava Peninsula	18	351235	6986598
5A	Hudson Bay crossing	16	416455	6950265
6	Shipping route in Eastern Hudson Strait	20	399876	6775840
6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 20,000,000 L SPILL, 2-YR WIND, NO SURFACE CURRENT

Golder Associates

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REVIEW	LY	06 Jan. 2016		

FIGURE E-17

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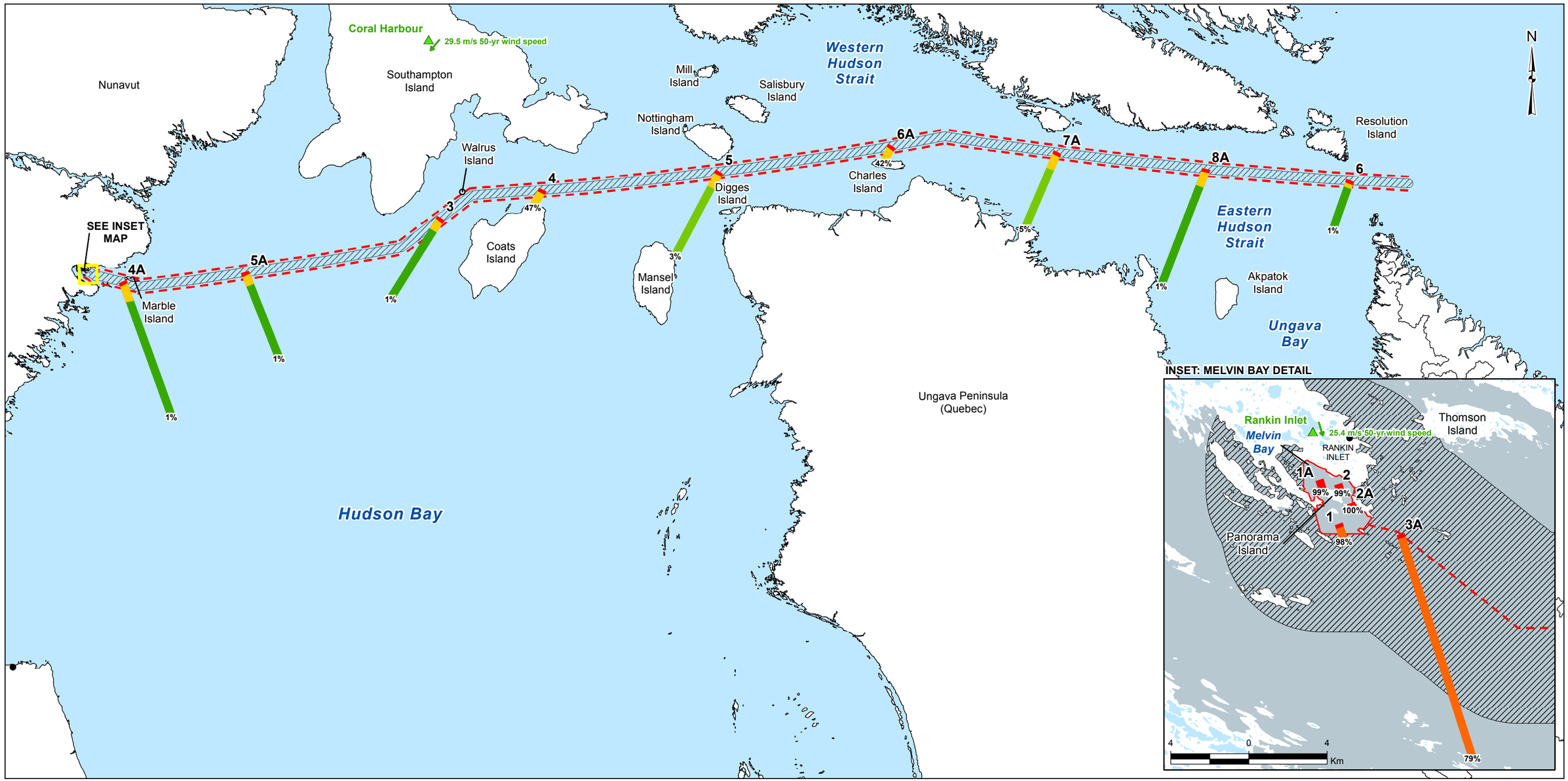

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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REFERENCE

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

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5A	Hudson Bay crossing	16	416455	6950265
6	Shipping route in Eastern Hudson Strait	20	399876	6775840
6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 20,000,000 L SPILL, 50-YR WIND, NO SURFACE CURRENT

Golder Associates

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FIGURE E-18

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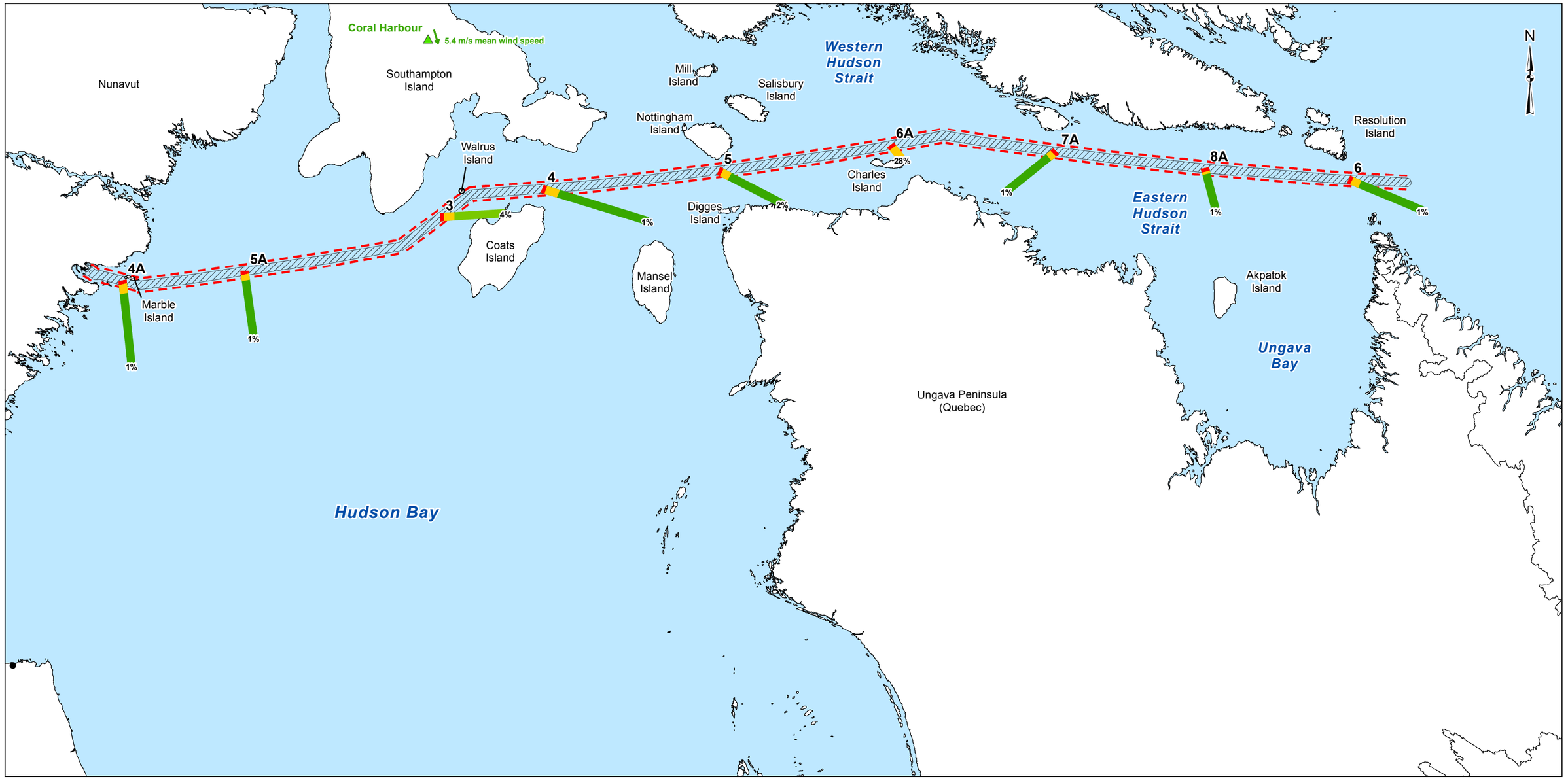

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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5A	Hudson Bay crossing	16	416455	6950265
6	Shipping route in Eastern Hudson Strait	20	399876	6775840
6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 2,000,000 L SPILL, MEAN WIND, SURFACE CURRENT

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	GC	06 Jan. 2016	SCALE AS SHOWN	REV. A
GIS	CDB	06 Jan. 2016		
CHECK	JC	06 Jan. 2016		
REVIEW	LY	06 Jan. 2016		

FIGURE E-19

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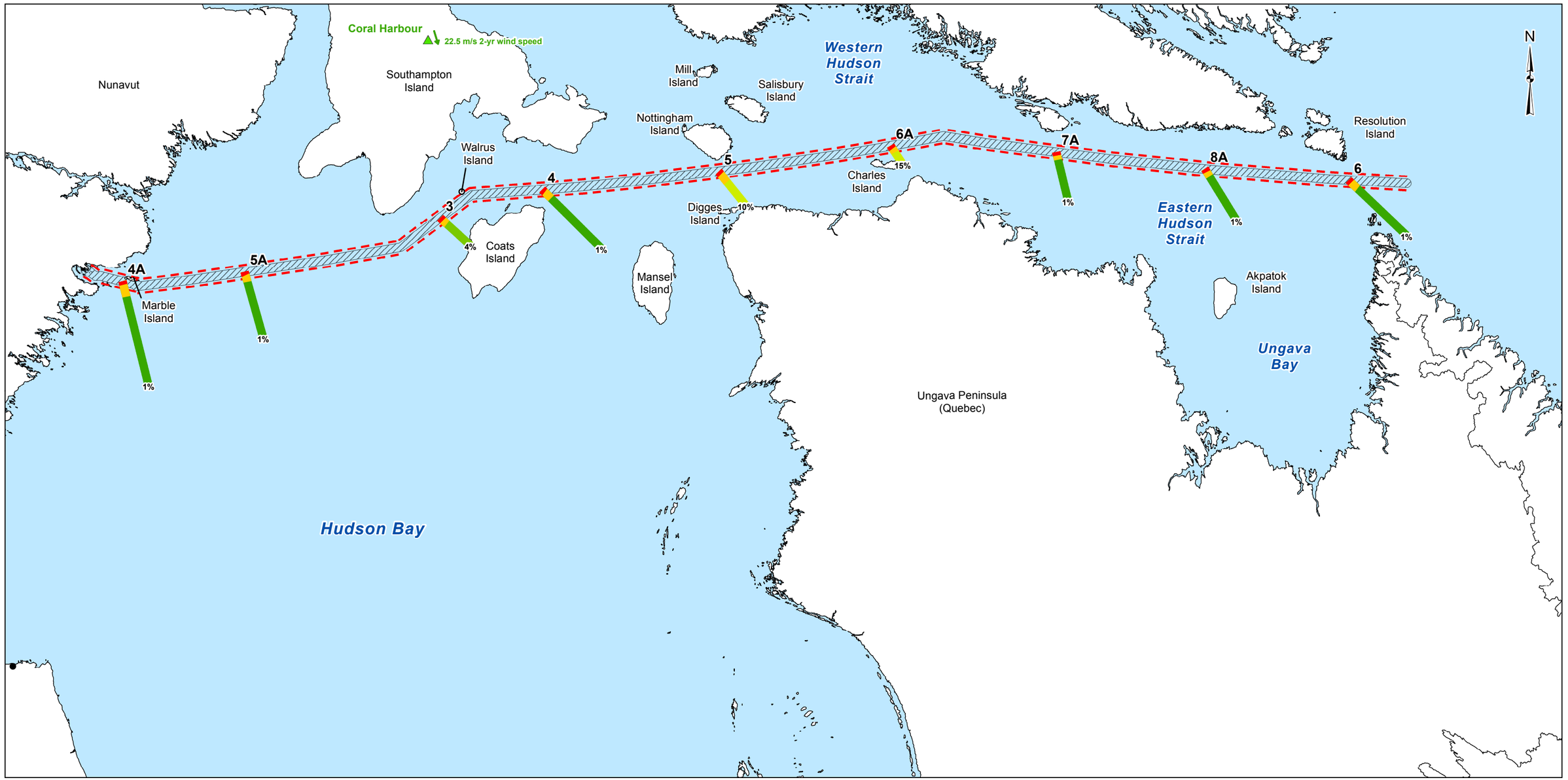

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

- LENGTH OF LINE REPRESENTS THE ESTIMATED TRAVEL DISTANCE FOR A GIVEN SPILL VOLUME
- WIDTH OF LINE IS NOT TO SCALE
- ANGLE OF LINE REPRESENTS THE CALCULATED SPILL TRAJECTORY

REFERENCE

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

HYPOTHETICAL FUEL SPILL RELEASE LOCATION	LOCATION NAME	UTM ZONE	EASTING	NORTHING
1	Ship-to-ship fuel transfer site outside Melvin Bay	15	546173	6961117
1A	West Melvin Bay	15	545185	6963365
2	Ship-to-shore fuel transfer site in Melvin Bay	15	546143	6963142
2A	East Melvin Bay	15	546798	6962172
3	Shipping route south of Walrus Island	16	641869	6988220
3A	Entrance to Melvin Bay	15	549334	6960588
4	Shipping route north of Coats Island	17	456430	7000031
4A	West Hudson Bay	15	585757	6949020
5	Shipping route north of Ungava Peninsula	18	351235	6986598
5A	Hudson Bay crossing	16	416455	6950265
6	Shipping route in Eastern Hudson Strait	20	399876	6775840
6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 2,000,000 L SPILL, 2-YR WIND, SURFACE CURRENT

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DESIGN	GC	06 Jan. 2016	SCALE AS SHOWN	REV. A
GIS	CDB	06 Jan. 2016		
CHECK	JC	06 Jan. 2016		
REVIEW	LY	06 Jan. 2016		

FIGURE E-20

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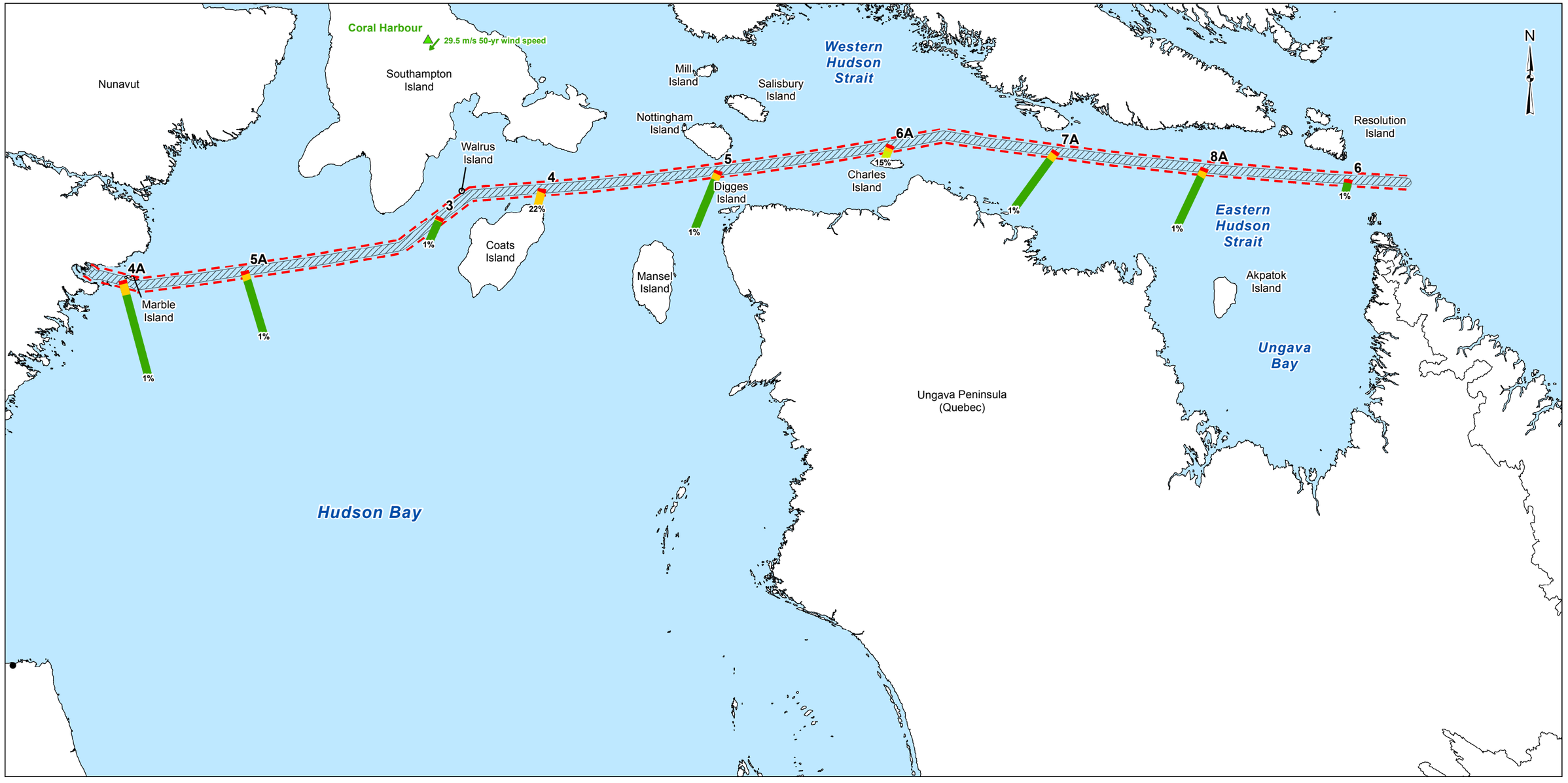

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
- WIND VECTOR (DIRECTION BLOWING TOWARDS)

% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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REFERENCE

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

HYPOTHETICAL FUEL SPILL RELEASE LOCATION	LOCATION NAME	UTM ZONE	EASTING	NORTHING
1	Ship-to-ship fuel transfer site outside Melvin Bay	15	546173	6961117
1A	West Melvin Bay	15	545185	6963365
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2A	East Melvin Bay	15	546798	6962172
3	Shipping route south of Walrus Island	16	641869	6988220
3A	Entrance to Melvin Bay	15	549334	6960588
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4A	West Hudson Bay	15	585757	6949020
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5A	Hudson Bay crossing	16	416455	6950265
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6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 2,000,000 L SPILL, 50-YR WIND, SURFACE CURRENT

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DESIGN	GC	06 Jan. 2016	SCALE AS SHOWN	REV. A
GIS	CDB	06 Jan. 2016		
CHECK	JC	06 Jan. 2016		
REVIEW	LY	06 Jan. 2016		

FIGURE E-21

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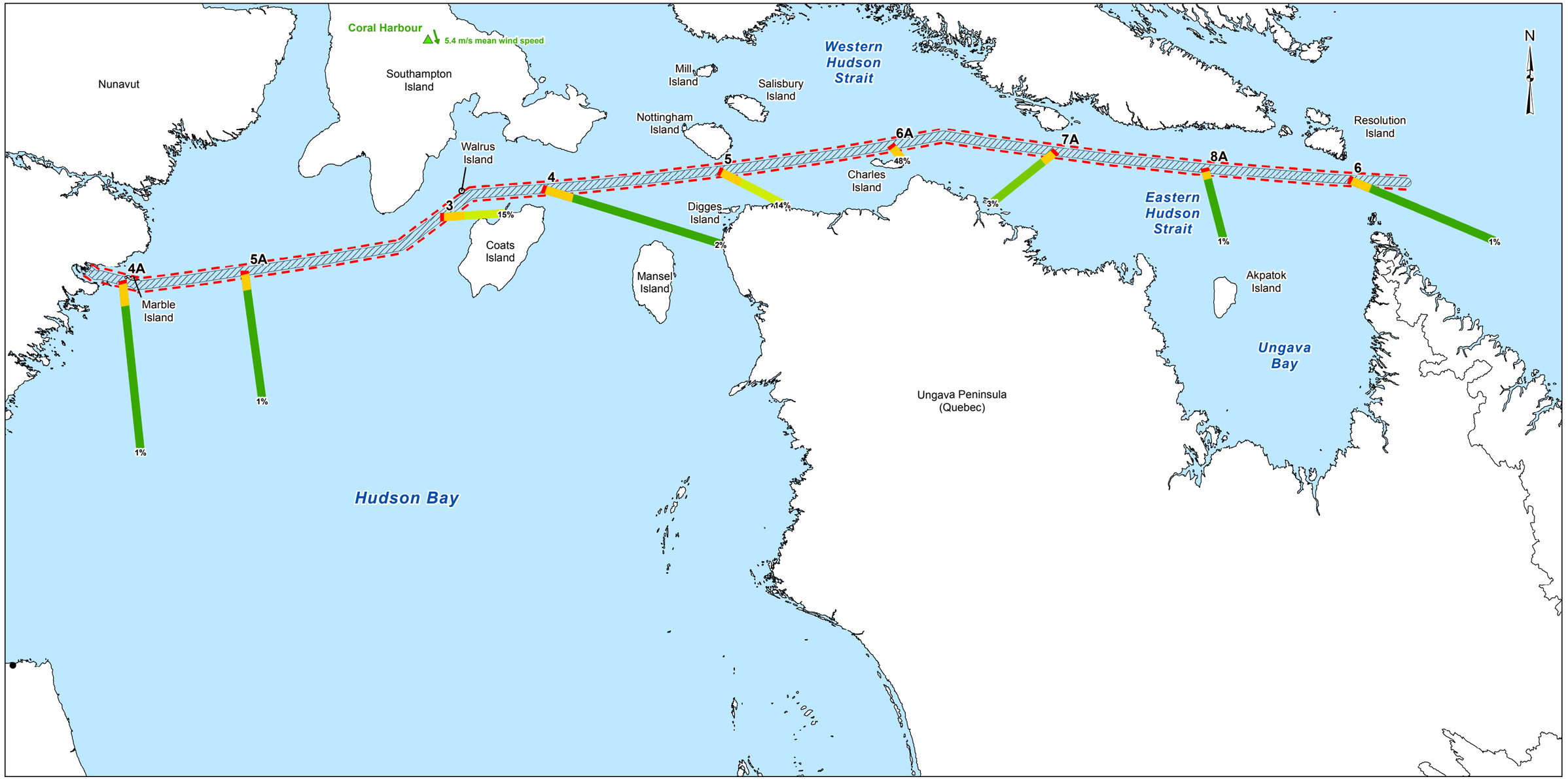

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
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% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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REFERENCE

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NAUTICAL CHART DATA OBTAINED FROM THE CANADIAN HYDROGRAPHIC SERVICE. PROVINCIAL DATA OBTAINED FROM ESRI.
DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

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7A	Mid Hudson Strait	19	415679	6911718
8A	Eastern Hudson Strait, north Ungava Bay	19	570404	6842009

90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 20,000,000 L SPILL, MEAN WIND, SURFACE CURRENT

Golder Associates

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DESIGN	GC	06 Jan. 2016	SCALE AS SHOWN	REV. A
GIS	CDB	06 Jan. 2016		
CHECK	JC	06 Jan. 2016		
REVIEW	LY	06 Jan. 2016		

FIGURE E-22

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Coral Harbour
22.5 m/s 2-yr wind speed

Nunavut

Southampton Island

Mill Island

Salisbury Island

Western Hudson Strait

Nottingham Island

Resolution Island

Walrus Island

Charles Island

Digges Island

Coats Island

Mansel Island

Eastern Hudson Strait

Akpatok Island

Ungava Bay

Ungava Peninsula (Quebec)

Marble Island

Hudson Bay

N

90 0 90
KILOMETRES

LEGEND

- MARINE REGIONAL STUDY AREA (MARINE RSA)
- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
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% SPILL VOLUME REMAINING

- 98.1 - 100.0
- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

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PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 20,000,000 L SPILL, 2-YR WIND, SURFACE CURRENT

Golder Associates

PROJECT NO.	1535029	FILE No.		
DESIGN	GC	06 Jan. 2016	SCALE AS SHOWN	REV. A
GIS	CDB	06 Jan. 2016		
CHECK	JC	06 Jan. 2016		
REVIEW	LY	06 Jan. 2016		

FIGURE E-23

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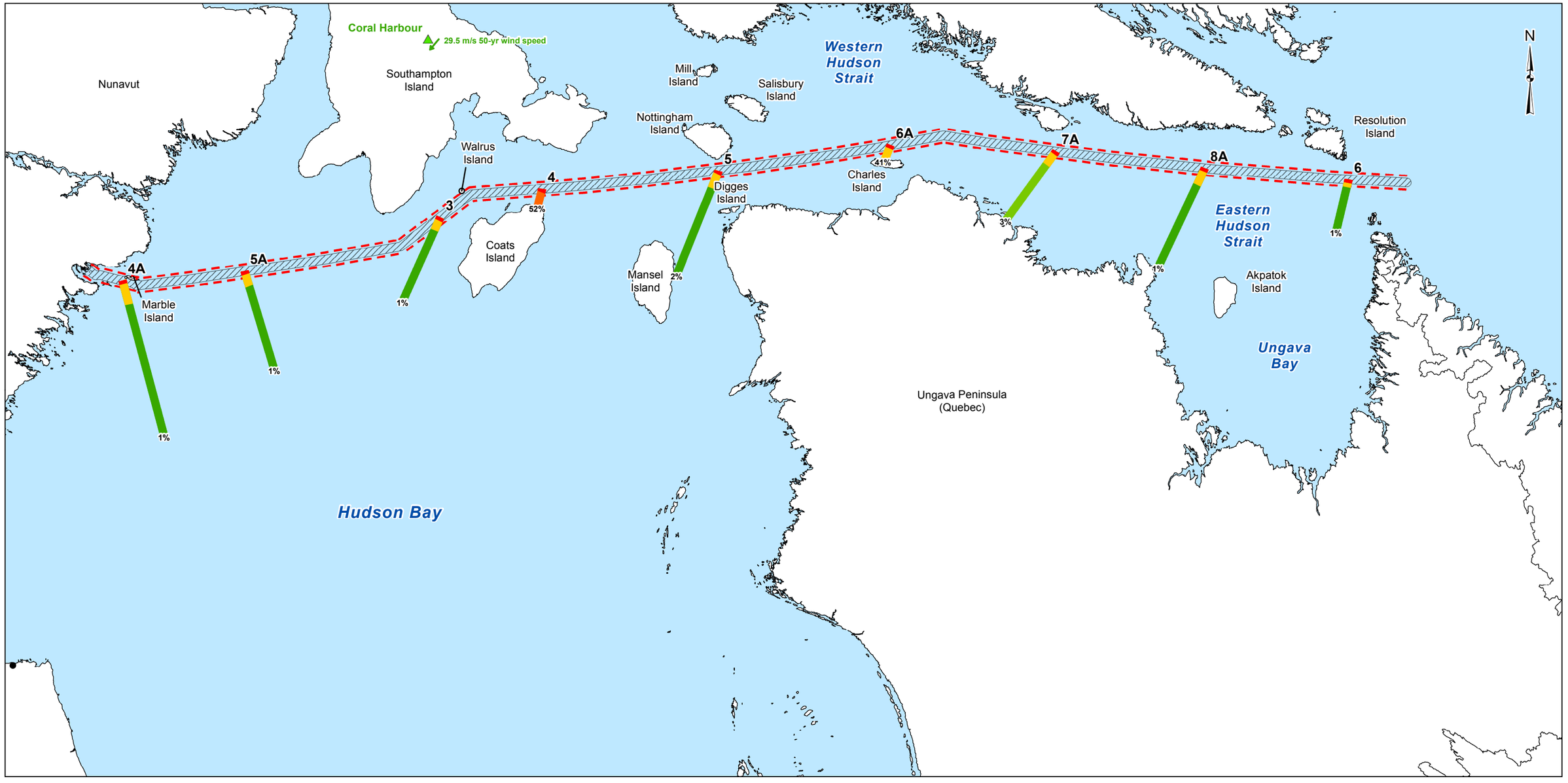

LEGEND

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- MARINE LOCAL STUDY AREA (MARINE LSA)
- WATERBODY
- SHIPPING ROUTE (APPROXIMATE)
- WIND STATION
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% SPILL VOLUME REMAINING

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- 50.1 - 98.0
- 20.1 - 50.0
- 5.1 - 20.0
- 2.1 - 5.0
- 1.0 - 2.0

NOTES

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DATUM: NAD 83 PROJECTION: LAMBERT CONFORMAL CONIC

HYPOTHETICAL FUEL SPILL RELEASE LOCATION	LOCATION NAME	UTM ZONE	EASTING	NORTHING
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1A	West Melvin Bay	15	545185	6963365
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6A	Western Hudson Strait, Charles Island	18	546017	6967899
7A	Mid Hudson Strait	19	415679	6911718
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90 0 90
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
OIL SPILL SCENARIO: 20,000,000 L SPILL, 50-YR WIND, SURFACE CURRENT

Golder Associates

PROJECT NO.		1535029	FILE No.	
DESIGN	GC	06 Jan. 2016	SCALE AS SHOWN	REV. A
GIS	CDB	06 Jan. 2016		
CHECK	JC	06 Jan. 2016		
REVIEW	LY	06 Jan. 2016		

FIGURE E-24

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6.3 Spills along Shipping Route

Diesel fuel spills have the potential to occur anywhere along the shipping route. For the purpose of the ADIOS2 analysis, ten (10) sites were chosen along the shipping route that correspond with either areas of the route that are in close proximity to land (e.g., pinch points) or established sensitive habitat areas for marine mammals and/or marine birds. These sites include Walrus Island, Coats Island, Ungava Peninsula and Eastern Hudson Strait (sites numbered 3 to 6); and entrance to Melvin Bay, western Hudson Bay, Hudson Bay crossing, western Hudson Strait near Charles Island, mid-point Hudson Strait, and eastern Hudson Strait north of Ungava Bay (sites numbered 3A to 8A). Tables E-4 and E-5 include the weathering half-life, time to shore, and proportion of spill deposited on shore for the 2 ML and 20 ML spill scenarios, respectively, (for mean, 2-yr, and 50-yr wind speeds). The weathering half-life was predicted to be less than 19 h for all the 2 ML scenarios and less than 34 h for all the 20 ML scenarios. Depending on the distance to shore and wind scenario, the time to shore would vary from about 4 h to 50 days for the 2 ML scenario and the amount of fuel predicted to be deposited on shore would vary from 0% to 66%. For the 20 ML scenario, the amount of fuel predicted to be deposited on shore would vary from 0% to 79%. The trajectory of the slick drift is a primary factor in the amount, if any, of fuel deposited on shore. For example, at site 3 (Walrus Island), 16% of the spill is deposited on shore for the 20 ML, 2-yr wind spill scenario because the direction of the slick drift is 163°, directly towards Coats Island. For the 50-yr wind scenario, the direction of the slick drift is 220°, towards the open water of Hudson Bay.

The influence of currents on the trajectory of the slick drift was considered using the mean currents at each site when data was available. Table E-9 provides the mean current velocity at each site, resultant wind and current vector speed and direction, distance to shore in the direction of the resultant vector, time to shore, and proportion of spill deposited on shore for the different 2 ML and 20 ML spill scenarios.

The predominant current patterns enhance the rate at which the fuel would spread across the water surface, particularly along narrower portions of the route where current speeds can be enhanced and slicks spread in the direction of the current. This typically results in the slick trajectory being altered to more parallel to the shipping route and in most cases less fuel deposited on the shore. However, in some cases, the change in trajectory results in a shorter distance to shore and a higher proportion of fuel deposited onshore.

Table E-9: Distance to Shore, Weathering Half-Life, Time to Shore, and Estimated Percent of Spill Deposited on Shore for 2 ML Diesel Fuel Spill Scenarios along Shipping Route

Location (Number)	Distance to Shore (km)	Distance to Shore (km); 50-yr wind	Weathering Half-Life (h)			Time to Shore (h)			% Deposited on Shore		
			Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr
Walrus Island (3)	55	760	15.6	4.1	2.1	94.3	22.6	239	2%	2%	0%
Coats Island (4)	23	22	14.7	4.9	3.7	39.4	9.5	6.9	16%	26%	27%
Ungava Peninsula (5)	46	106	18.5	5.8	3.8	78.9	18.9	33.3	5%	10%	0%
Eastern Hudson Strait (6)	46	325	17.0	5.3	0.9	78.9	18.9	102	4%	8%	0%
Entrance to Melvin Bay (3A)	12	N/A	17.5	8.7	7.4	16.8	5.8	4.4	51%	63%	66%
West Hudson Bay (4A)	700	N/A	13.3	7.6	5.5	982	341	255	0%	0%	0%
Hudson Bay crossing (5A)	857	N/A	10.4	4.9	3.7	1202	417	312	0%	0%	0%
Western Hudson Strait, Charles Island (6A)	20	21	14.8	3.5	2.6	34.3	8.2	6.6	20%	20%	17%
Mid-Hudson Strait (7A)	160	93	15.6	4.2	3.4	274	65.8	29.2	0%	0%	0%
Eastern Hudson Strait, north Ungava Bay (8A)	305	164	15.6	4.5	3.4	523	126	51.5	0%	0%	0%

Notes:
km (kilometre); yr (year); h(hour); L (liter)

Table E-10: Distance to Shore, Weathering Half-Life, Time to Shore, and Estimated Percent of Spill Deposited on Shore for 20 ML Diesel Fuel Spill Scenarios along Shipping Route

Location (Number)	Distance to Shore (km)	Distance to Shore (km); 50-yr wind	Weathering Half-Life (h)			Time to Shore (h)			% Deposited on Shore		
			Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr
Walrus Island (3)	55	760	26.8	8.7	5	94.3	22.6	239	9%	16%	0%
Coats Island (4)	23	22	28.7	7.6	6.4	39.4	9.5	6.9	39%	42%	47%
Ungava Peninsula (5)	46	106	37	9.7	6.4	78.9	18.9	33.3	23%	26%	3%
Eastern Hudson Strait (6)	46	325	33.7	10.9	2.8	78.9	18.9	102	20%	30%	0%
Entrance to Melvin Bay (3A)	12	N/A	32.8	14.4	12.7	16.8	5.8	4.4	70%	75%	79%
West Hudson Bay (4A)	700	N/A	26.8	12.4	8.9	982	341	255	0%	0%	0%
Hudson Bay crossing (5A)	857	N/A	20.3	8	5.7	1202	417	312	0%	0%	0%
Western Hudson Strait, Charles Island (6A)	20	21	26	6.2	5.3	34.3	8.2	6.6	40%	40%	42%
Mid-Hudson Strait (7A)	160	93	26.8	9.3	6.7	274	65.8	29.2	0%	1%	5%
Eastern Hudson Strait, north Ungava Bay (8A)	305	164	26.8	8.7	6.7	523	126	51.5	0%	0%	0%

Notes:
km (kilometre); yr (year); h(hour); L (liter)

Table E-11: Weathering Half Life and Time to Shore for 2 ML and 20 ML Diesel Fuel Spill Scenarios along Shipping Route with Currents

Location (Number)	Mean Current		Vector Sum Speed (Direction), m/s and deg			Distance to Shore (km)			Time to Shore (h)			% Deposited on Shore 2 ML			% Deposited on Shore 20 ML		
	Speed (m/s)	Dir (deg)	Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr	Mean	2-yr	50-yr
Walrus Island (3)	0.45[a]	60	0.3(94)	0.7 (140)	0.6 (212)	74	46	732	73.1	19.0	316	4%	4%	0%	15%	22%	0%
Coats Island (4)	0.45[a]	90	0.4 (116)	0.8(144)	0.7 (204)	211	144	22	167	49.9	8.2	0%	0%	22%	2%	1%	52%
Ungava Peninsula (5)	0.2[b]	80	0.2 (129)	0.7 (153)	0.8 (214)	81	49	127	106	19.3	44.0	2%	10%	0%	14%	25%	2%
Eastern Hudson Strait (6)	0.2[b]	90	0.2 (133)	0.7 (154)	0.8 (214)	1000	354	33	1227	136	113	0%	0%	0%	0%	0%	0%
West Hudson Bay (4A)	0.2[c]	200	0.3 (177)	0.7 (169)	0.9 (168)	600	650	652	547	270	210	0%	0%	0%	0%	0%	0%
Hudson Bay crossing (5A)	0.2[c]	200	0.3 (177)	0.7 (169)	0.9 (168)	684	784	789	623	325	255	0%	0%	0%	0%	0%	0%
Western Hudson Strait, Charles Island (6A)	0.2[b]	135	0.2 (155)	0.7 (161)	0.9 (216)	21	25	23	27.2	9.5	6.8	28%	15%	15%	48%	35%	41%
Mid-Hudson Strait (7A)	0.4[b]	290	0.2 (248)	0.6 (183)	1.0 (233)	92	138	97	133	67.4	27.0	0%	0%	0%	3%	1%	3%
Eastern Hudson Strait, north Ungava Bay (8A)	0.1[b]	290	0.1 (184)	0.6 (167)	0.9 (224)	134	319	125	280	137	38.1	0%	0%	0%	0%	0%	1%

Notes:
km (kilometre); yr (year); dir (direction); ML(million litres); m/s (metres per second); N/A (not available)
[a] DFO (2015); mooring H9
[b] Drinkwater (1986)
[c] DFO (2015); mooring H7

6.4 Discussion of Mapped Results

Maps representing the results of the hypothetical spill scenarios are presented in Figure E-13 through Figure E-24. The maps are provided for the 2 ML and 20 ML spill scenarios, three (mean, 2-yr, and 50-yr) wind scenarios, and with and without currents. Each map shows the estimated trajectory of the spill at the fourteen locations based on the wind and current for the given scenario and the spill volume remaining (percentage) at a given distance based on the weathering results from the ADIOS2 model. The percentage of the spill volume remaining is shown by the color ramp gradation from red (more remaining) to green (less remaining). The extent of the slick drift is shown at the start of the spill (100% volume), at one half-life (50% spill volume remaining), and when the slick reaches shore or is weathered to 1% of the spill volume remaining (whichever occurs first). If the slick is estimated to reach shore, the percentage of the spill volume remaining is labeled at this location. In some cases, particularly in Melvin Bay, the spill reaches shore quickly and only two colored lines are shown on the map. Wind vectors are also provided for each scenario to illustrate the wind direction and speed used for a given map scenario.

There is a slight apparent difference in spill trajectory angles between the westernmost points when compared to the easternmost points despite scenarios that use the same wind direction. This slight apparent difference in spill trajectory angles is a function of the map projection extending over a large area and over multiple UTM zones and is therefore a projection distortion rather than a measureable difference in trajectory.

It is important to consider these maps as a depiction of the potential fuel spill trajectory and percent remaining at a coarse scale under a very specific set of climate conditions. As noted on the maps, the length of the fuel spill path represents the estimated travel distance and the angle represents the calculated spill trajectory given the specific wind, current, and spill volume conditions bracketed by each spill scenario. The actual distance travelled and the angle of the spill trajectory will be highly dependent on the site-specific ambient conditions and the nature and location of the spill at the time of a potential spill. In general, the width of a fuel spill at land fall and the length of shoreline that could potentially be affected by a given fuel spill is difficult to estimate due to the high degree of uncertainty related to the spreading of a slick (DNV 2011).

A summary of the mapped scenarios follows:

- The dominant slick drift trajectory for the modelled scenarios is towards the south-southeast (163°) for all scenarios without currents except for the 50-yr wind scenario at sites east of site 5A, where it is towards the southwest (220°). The south-southeast trajectory results in a slick trajectory headed towards open water at sites 4A, 5A, 7A, and 8A. At sites in Melvin Bay (1, 2, 1A, and 2A) the fuel slick reach shore within a few hours. Trajectory at these sites is less important as they are almost entirely bounded by land, resulting in a majority of the spill reaching land in any direction. At sites 3A, 3, 4, 5, 6A, and 6, the slick is estimated to reach shore with 50% or less of the spill volume remaining.
- The 50-yr wind scenario at sites 3 and sites further east results in a slick trajectory to the southwest (220°). Under this scenario a slick at site 3 would head towards open water and sites 5 and 6 would have a longer distance to travel to shore than for the other wind scenarios. Differences in the direction to shore for slicks originating at sites 4, 6A, 7A, and 8A are minimal between wind scenarios.
- The percentage of the fuel deposited on shore increases for the 20 ML spill scenario versus the 2 ML spill scenario because of the increase in the weathering half-life.

- The addition of mean currents in the modelling typically results in altering the slick trajectory to a more parallel orientation to the shipping route and in most cases less fuel deposited on the shore. However in some cases the trajectory results in a shorter distance to shore and more fuel deposited on the shore. For example, at site 6 the trajectory of the spill drift is altered when an eastward current is considered such that the slick heads towards open water rather than south-southeast towards land in close proximity. Conversely, for site 3, 9% of a 20 ML spill volume is estimated to reach shore for the mean wind and no surface current scenario, but due to the orientation of the shipping route with respect to Coats Island, 15% of the spill volume is estimated to reach shore when the surface current is considered. Similarly, site 6A increases from 20% to 28%, and site 7A increases from 1% to 3% with the addition of the current forcing.

7.0 CONCLUSIONS

Although diesel spills have a low likelihood of occurrence, it is important to understand where the spill will travel and the best way to mitigate impacts. Based on the total amount of diesel fuel transported and predicted spill rates reported by SL Ross (1999), the overall likelihood of a fuel spill ranges from a return period of 285 years (i.e., one spill approximately every 285 years) for small spills (10 to 99.9 m^3) to 920 years for medium spills (100 to 999.9 m^3) and 92,000 years for large spills (1,000 to 9999.9 m^3) (WSP 2014a). If a spill was to occur near Melvin Bay, it is predicted that for all spills, a majority of the fuel would reach the nearby shoreline within several hours without mitigation efforts. If a spill was to occur along the shipping route, the amount of weathered fuel, the trajectory of the slick, and amount deposited on shore varies by site and wind and current scenario. The different spill scenarios are provided in summary tables in Sections 6.2 and 6.3 and presented in oil spill projection maps in Appendix C. Proximity of land in the direction of the slick drift is a primary consideration for the potential for fuel to be deposited on shore. The inclusion of mean currents in the modelling typically results in reorienting the slick trajectory along an alignment that is more parallel to the shipping route and in most cases this results in less fuel deposited on the shore, with the exception of sites 3, 6A, and 7 where there is an increase in percentage (of about 2% to 8%) of remaining fuel that reaches the shore.

An important consideration when interpreting the hypothetical fuel spill scenarios is the relative response times. Without mitigation, a spill in Melvin Bay is estimated to reach shore relatively quickly and with a higher proportion of the spill reaching shore before being naturally dispersed, however, there is potential for a more rapid spill response in this area. Open water spills along the shipping route are predicted to be less severe in most cases, but the potential response time is slower due to the distance offshore. As part of the Oil Pollution Emergency Plan (SD 8-2), AEM has committed to pre-emptive and responsive mitigation actions to reduce or minimize the loss of diesel fuel during ship-to-ship and ship-to-shore transfers near Melvin Bay.

This analysis has been conducted to assess the potential for impacts associated with a diesel fuel spill in the marine environment. The ADIOS2 model was used with the input of local wind speed to approximate wave conditions and then predict the weathering half-life of the fuel. This is a one-dimensional analysis and does not account for other site-specific effects such as modifications to the wave height, period and direction due to local bathymetry. Therefore it is an approximation of the travel time and percent diesel fuel remaining to be used for planning and decision making purposes.

8.0 CLOSURE

We trust that this report meets your immediate requirements. If you have any questions regarding the content of this report, please do not hesitate to contact this office.

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https://capws.golder.com/sites/capws2/1114280011meliadine/type a water license/5_post-submission/project certificate conditions/shipping management plan/appendix e - spill risk assessment/552-1535029-r-reva-sd8-1-appespill risk assmt.docx

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ATTACHMENT A

ADIOS2 Hypothetical Spill Modelling Inputs and Outputs

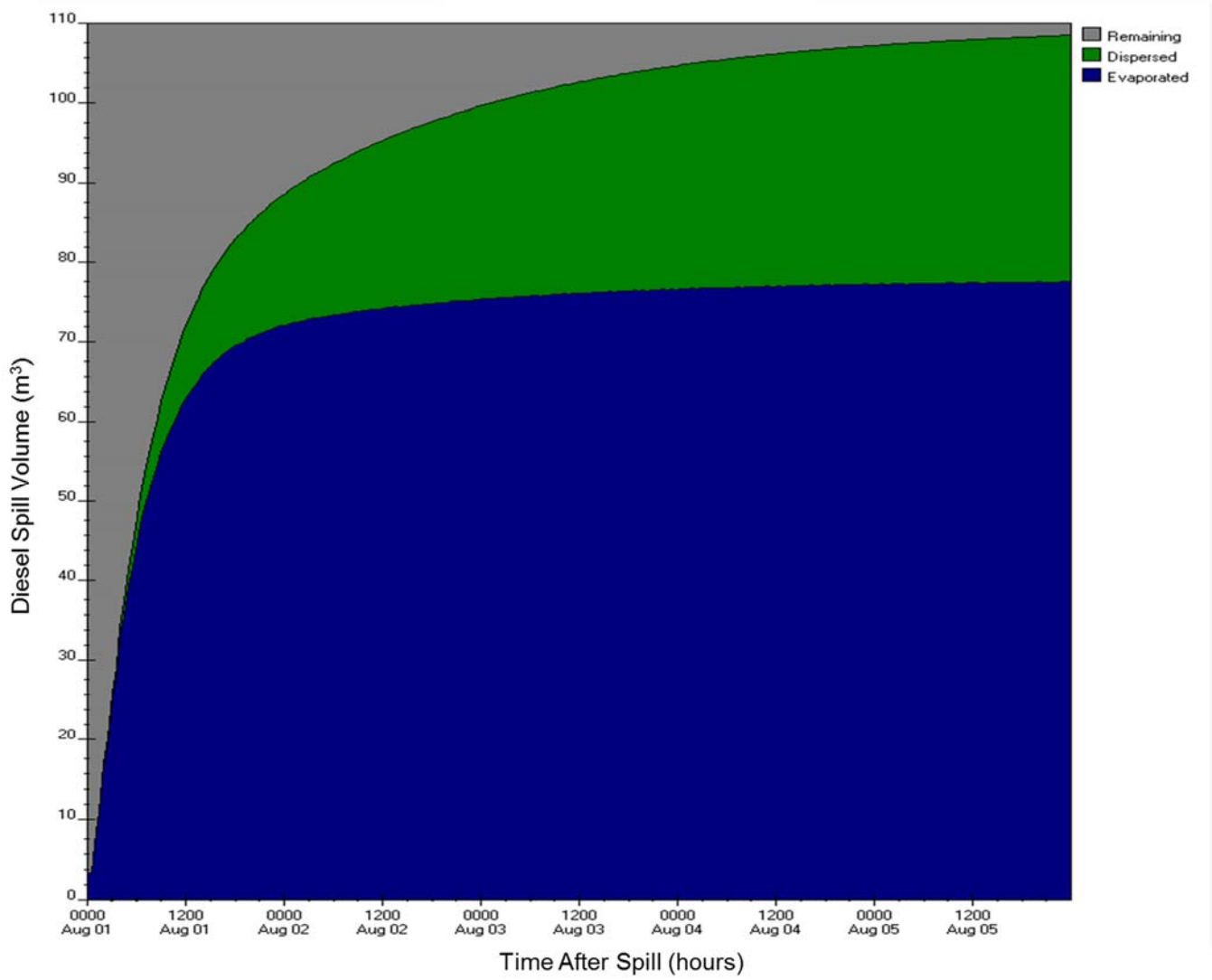

Figure E-A1: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 100 m^3, mean wind speed scenario

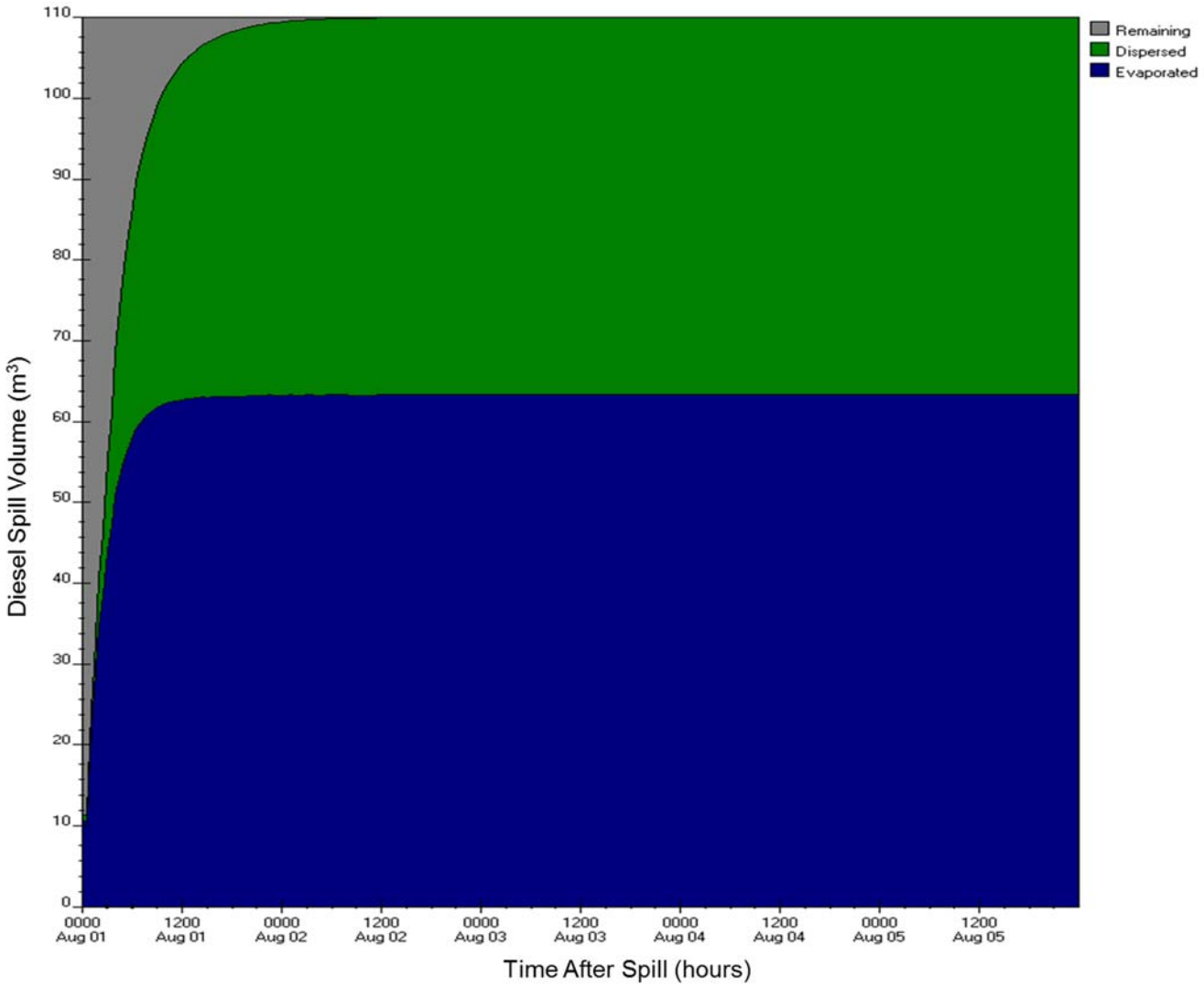

Figure E-A2: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 100 m^3, 2-yr wind speed scenario

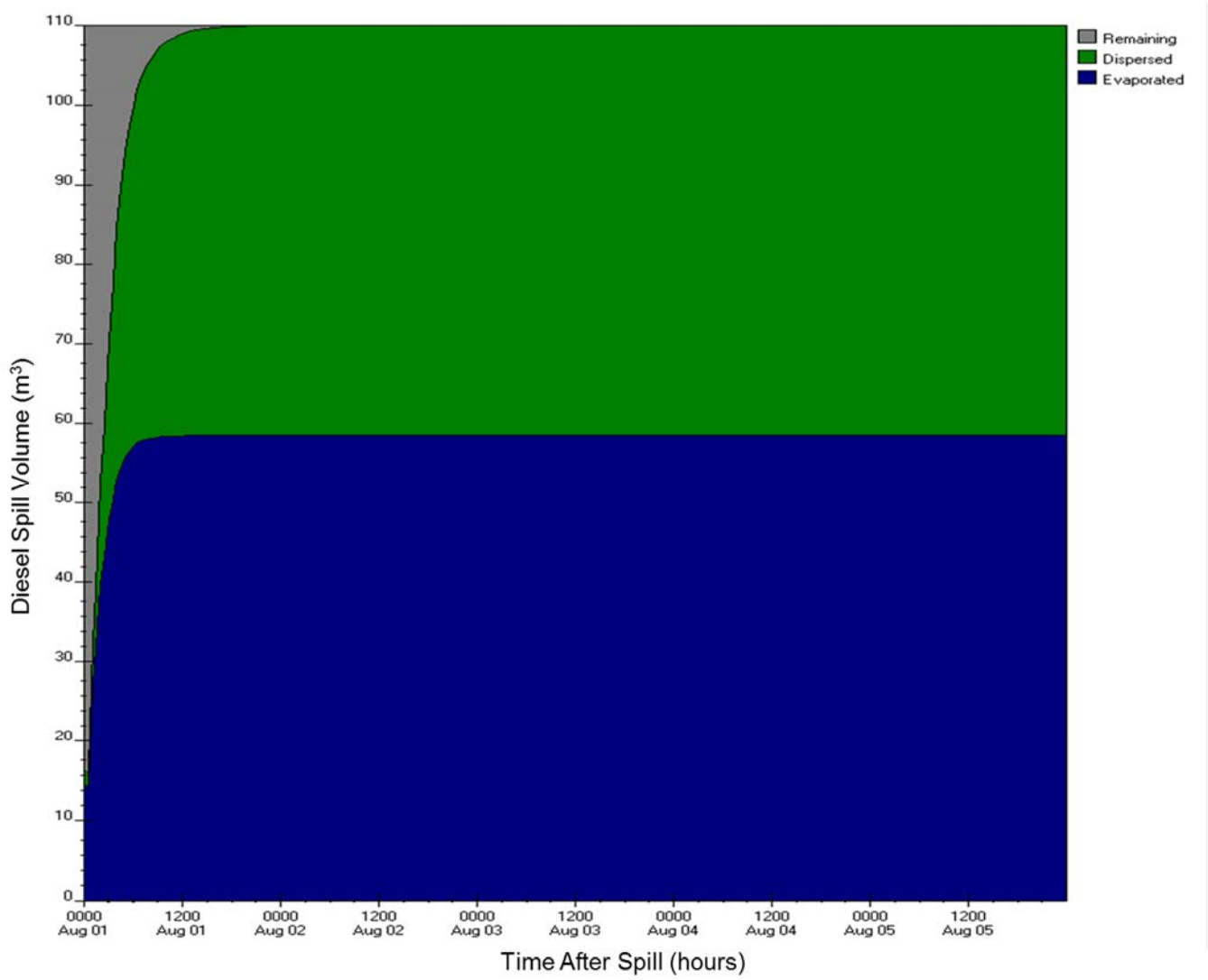

Figure E-A3: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 100 m^3, 50-yr wind speed scenario

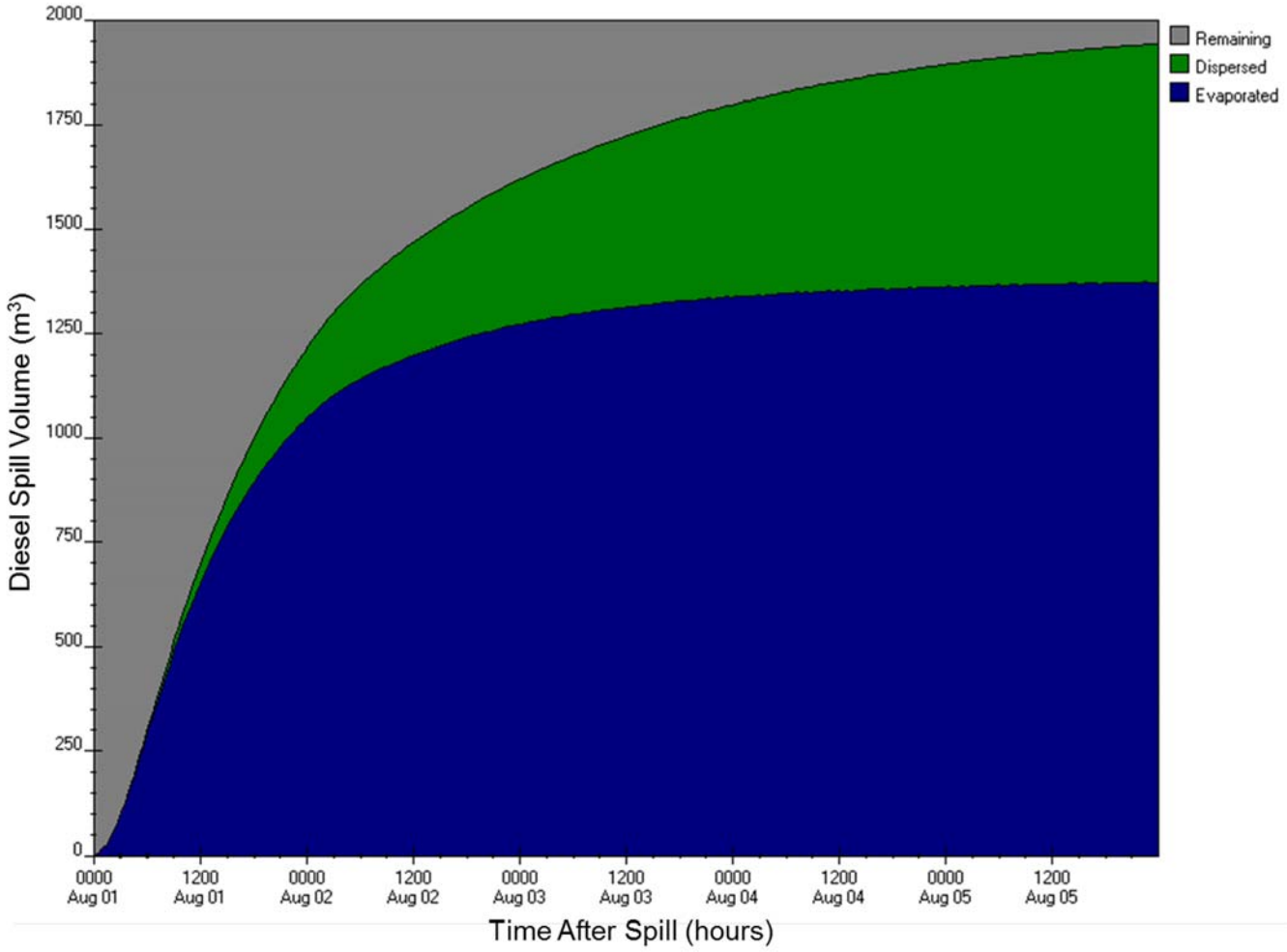

Figure E-A4: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 2,000 m^3 spill, mean wind speed scenario

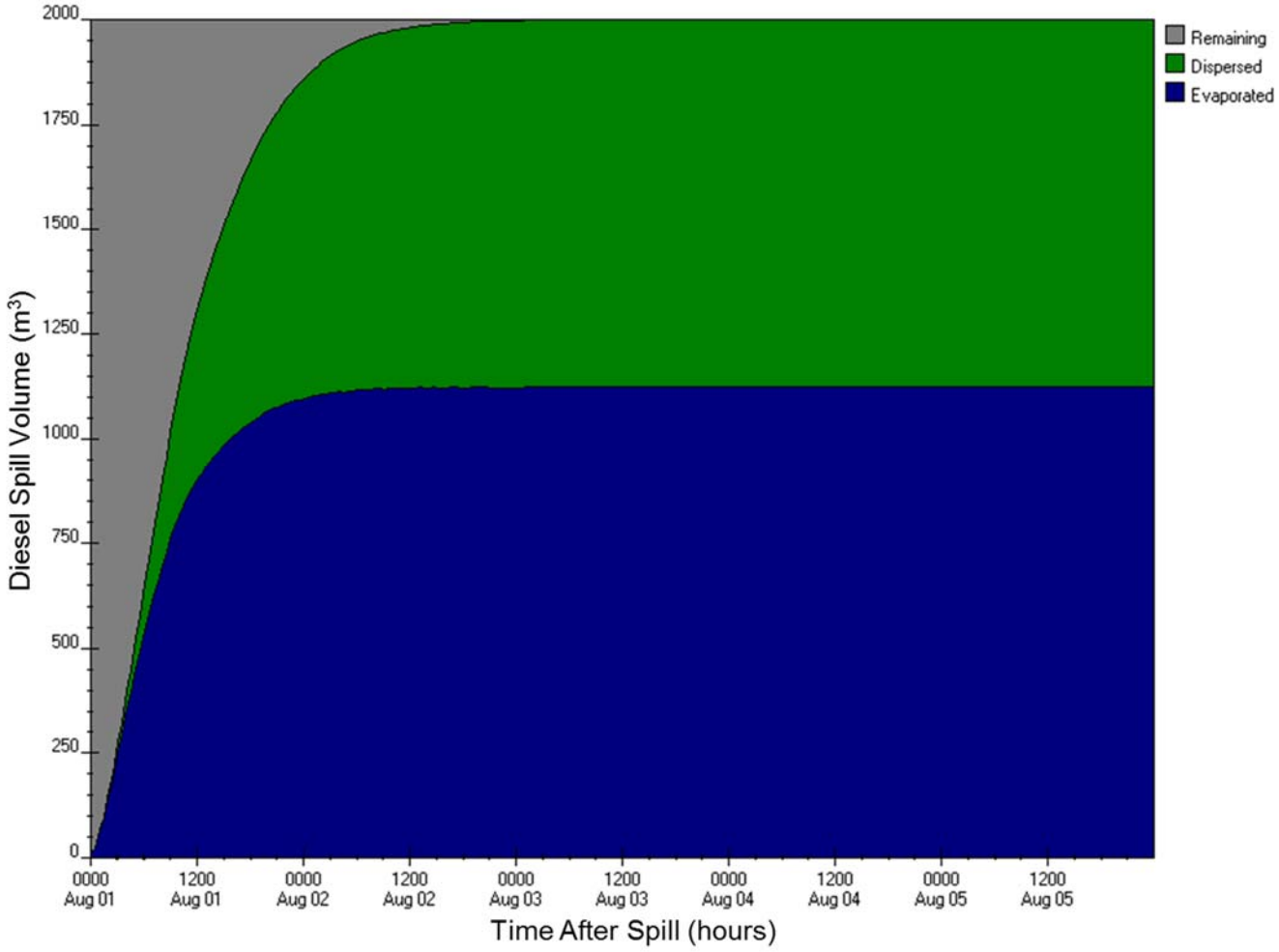

Figure E-A5: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 2,000 m^3, 2-yr wind speed scenario

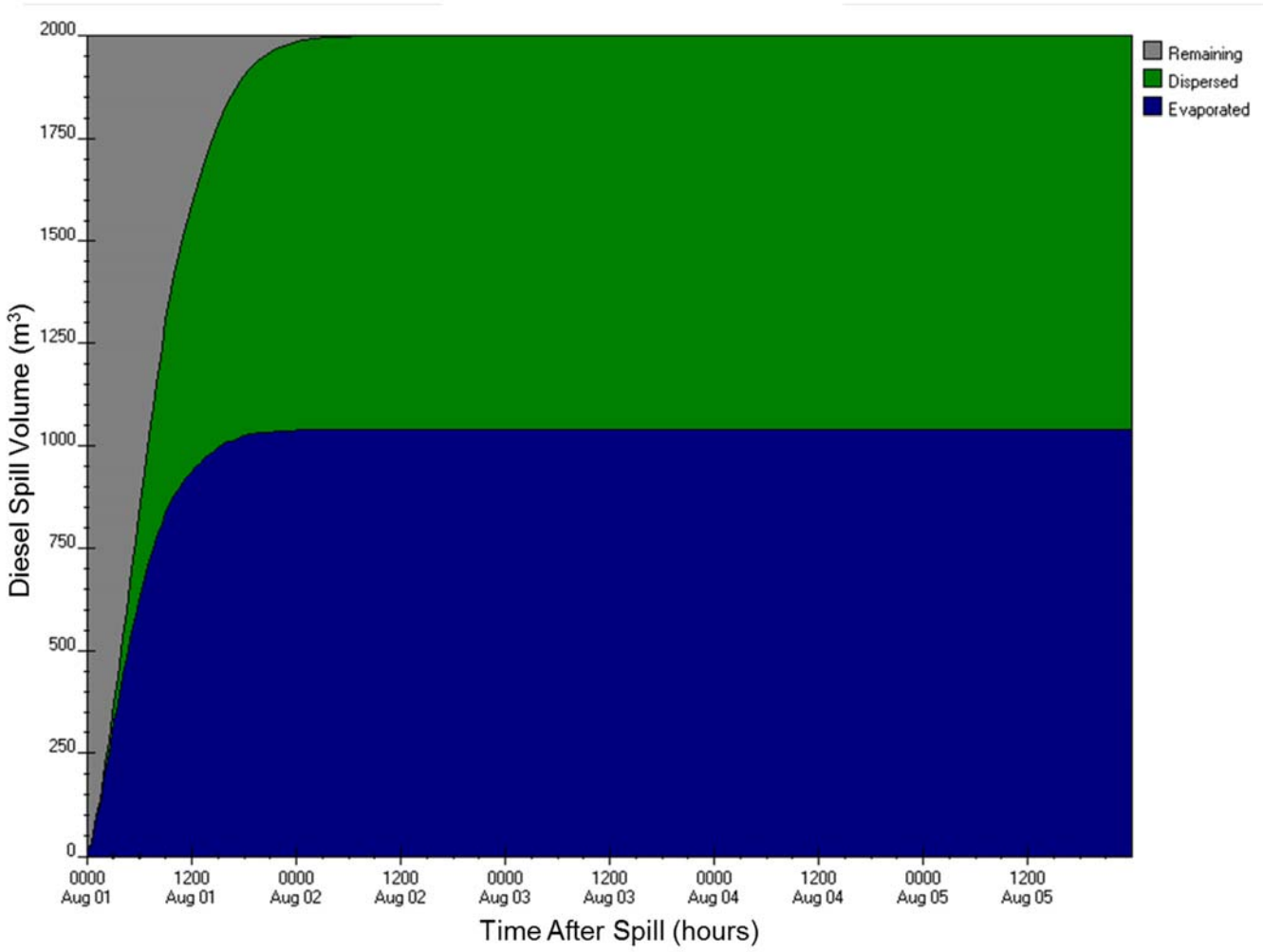

Figure E-A6: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 2,000 m^3, 50-yr wind speed scenario

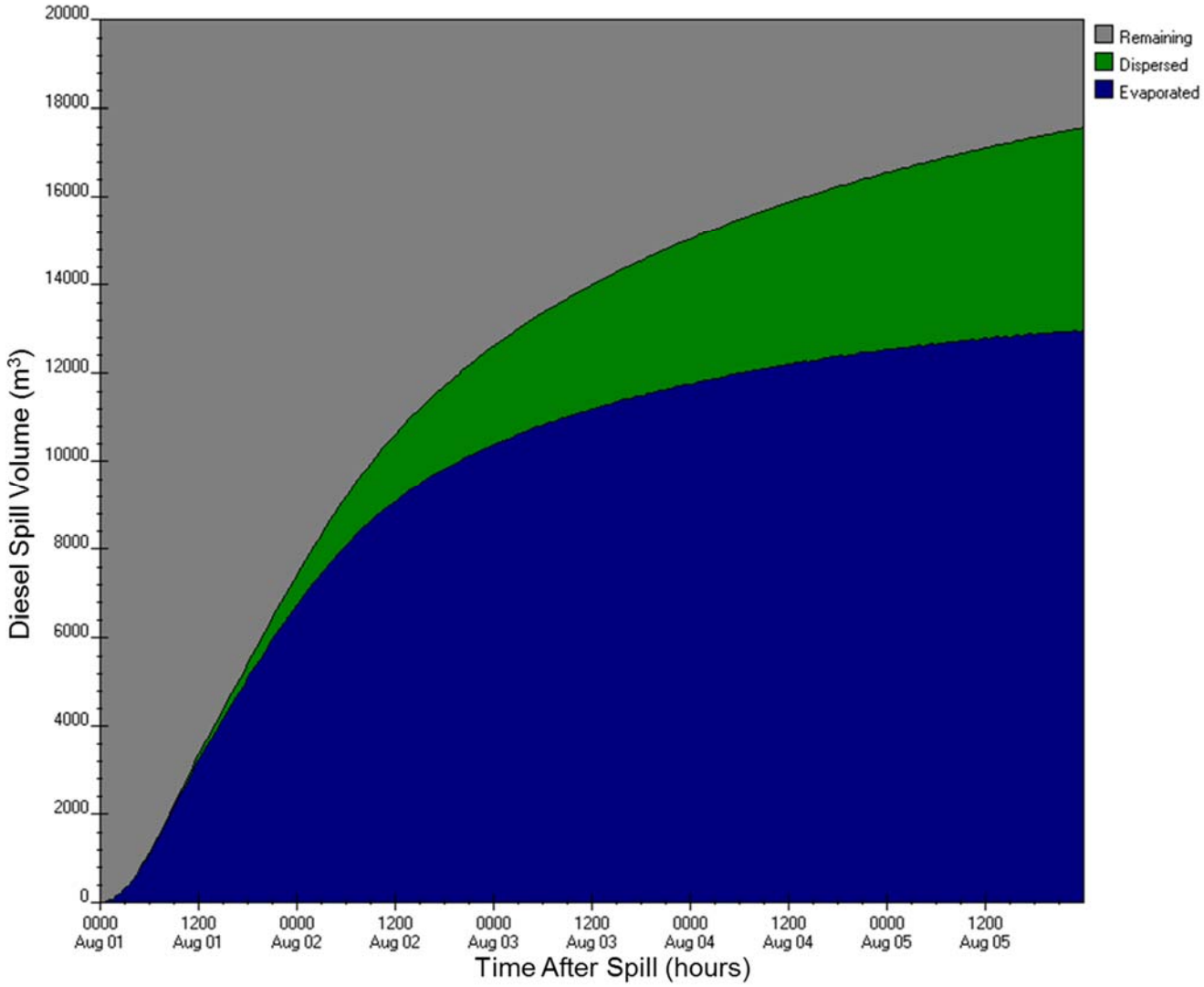

Figure E-A7: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 20,000 m^3 spill, mean wind speed scenario

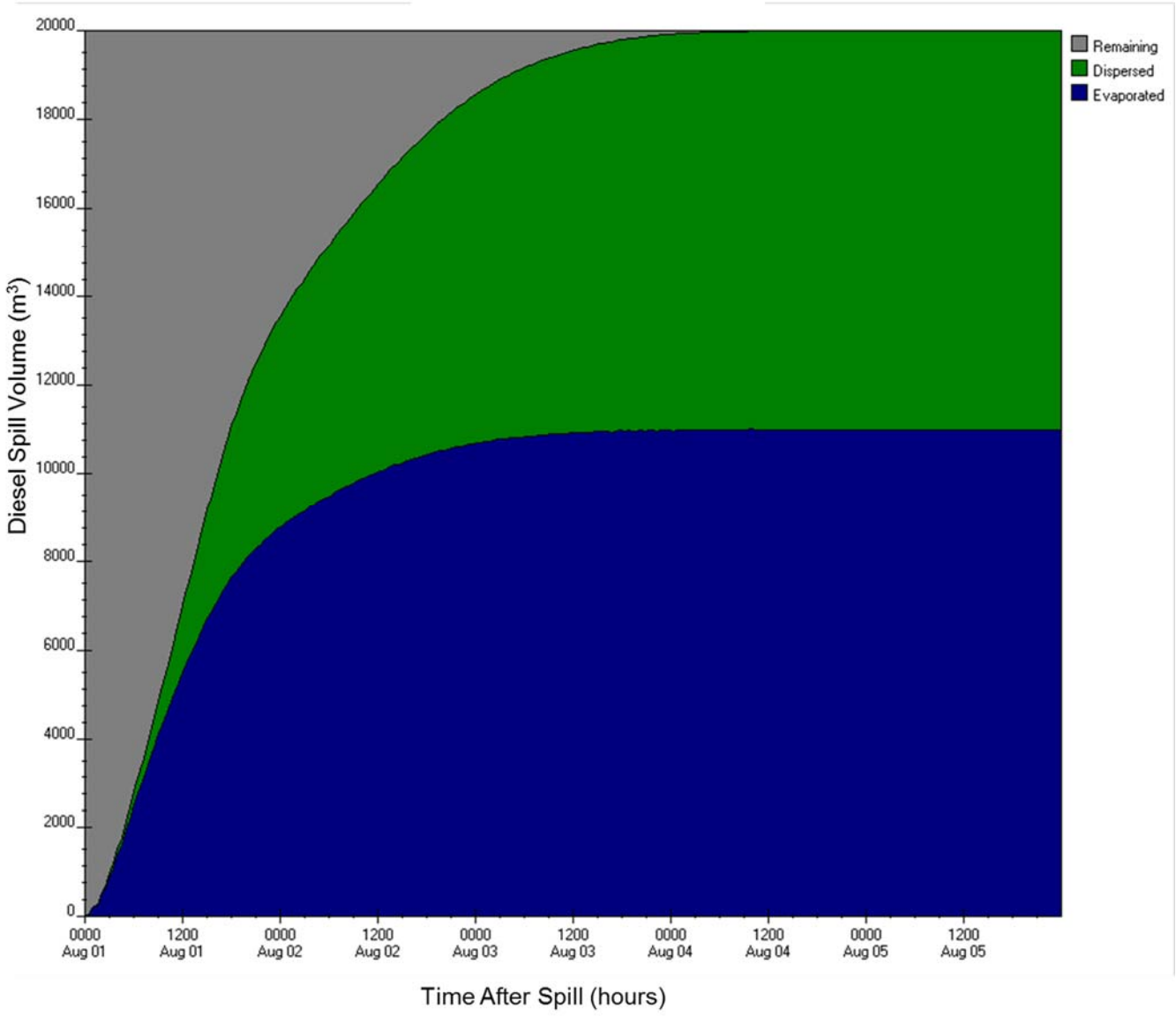

Figure E-A8: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 20,000 m^3, 2-yr wind speed scenario

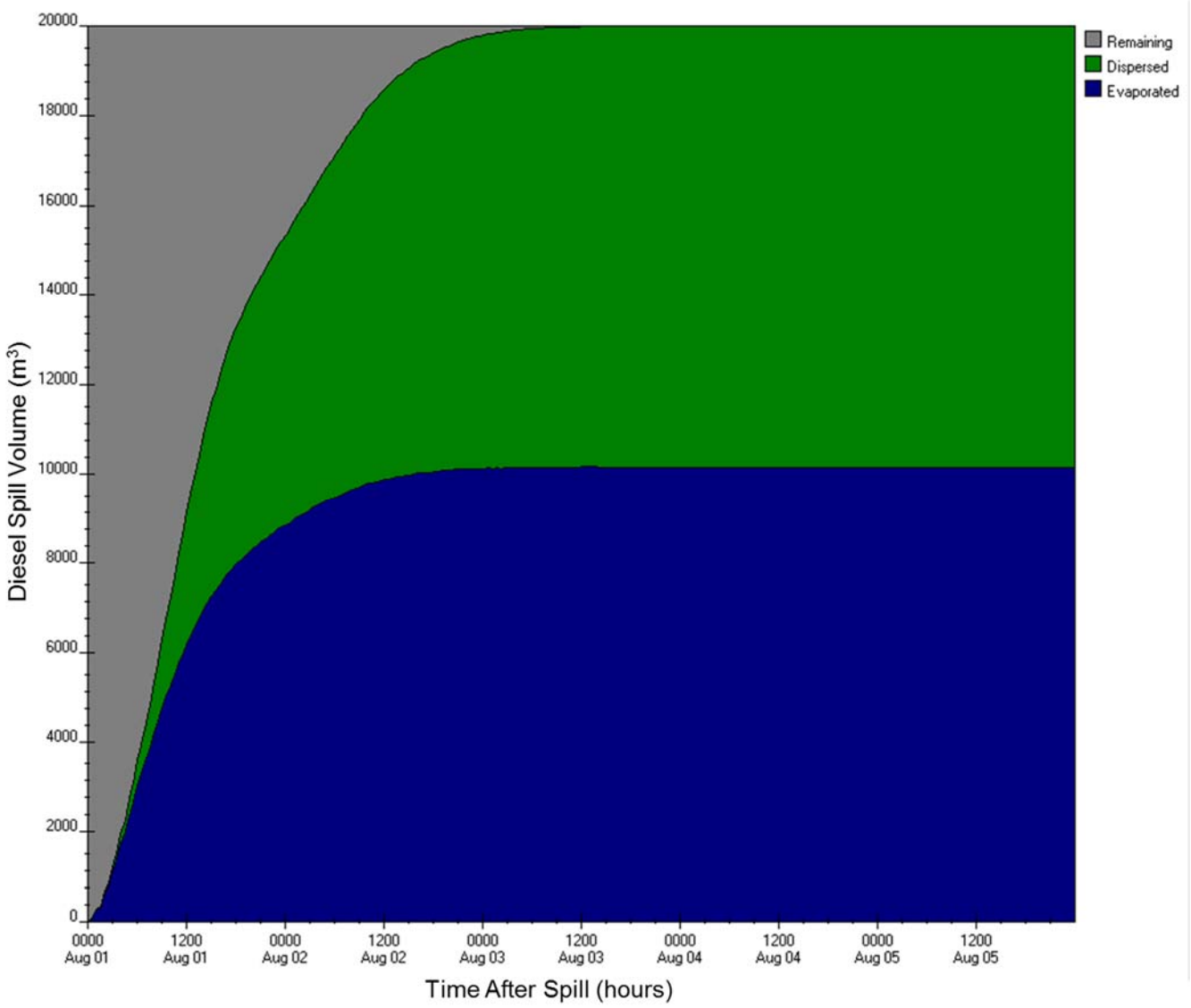

Figure E-A9: ADIOS2 diesel fuel budget output for two fuel transfer stations (1 and 2) near Melvin Bay for 20,000 m^3, 50-yr wind speed scenario

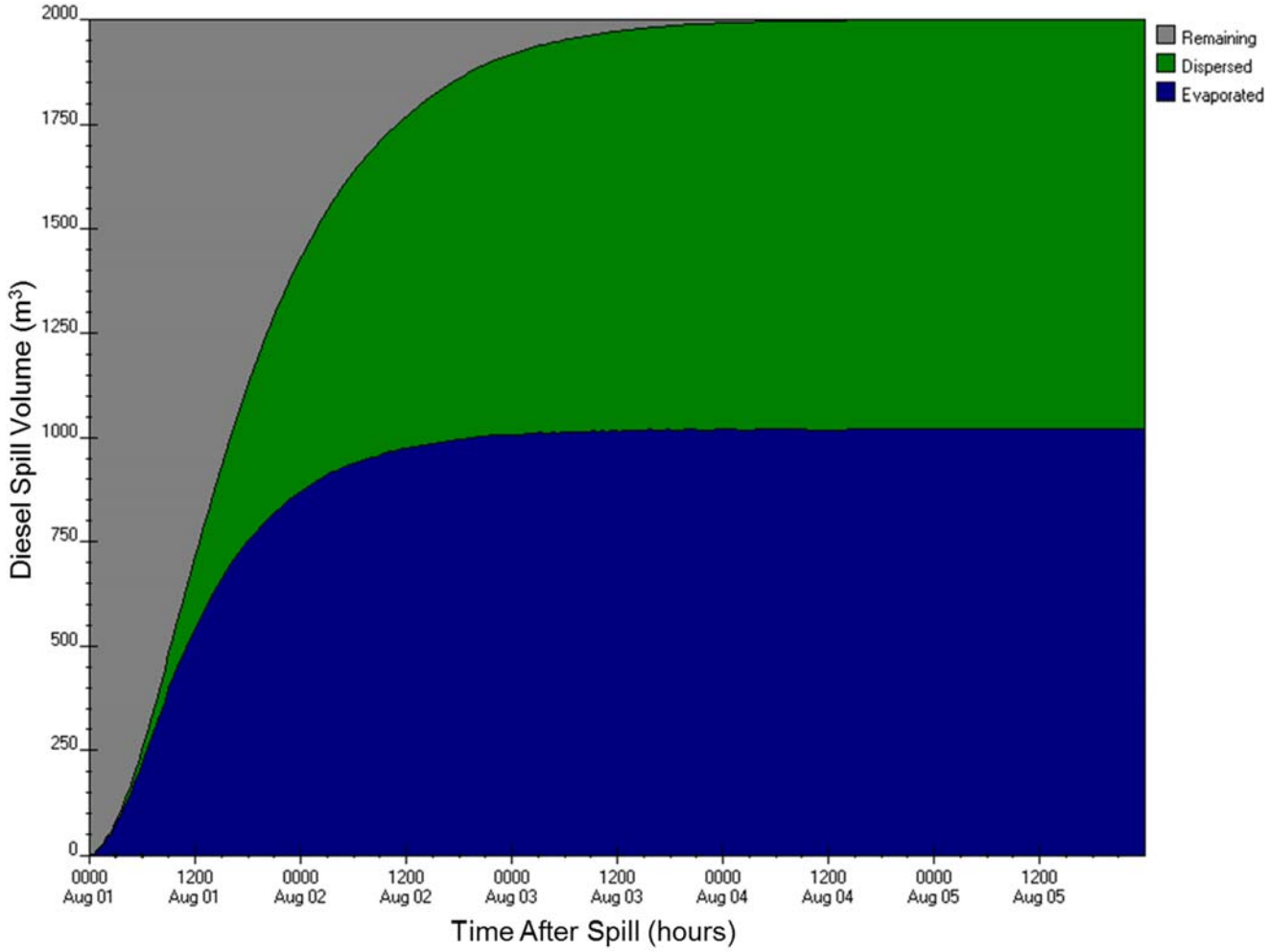

Figure 8E-A10: ADIOS2 diesel fuel budget output for Walrus Island station (3) for 2,000 m^3, mean wind speed scenario

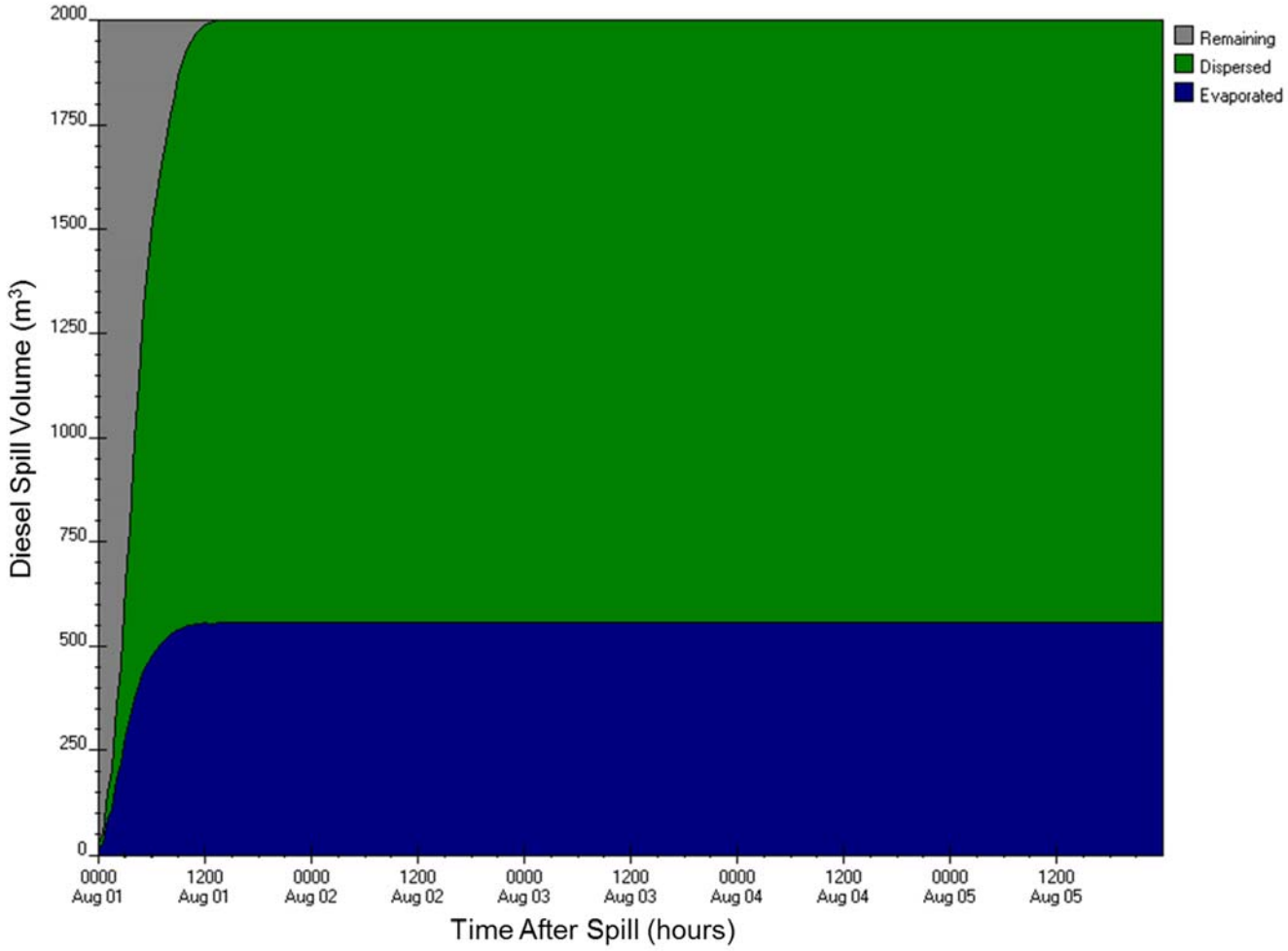

Figure E-A11: ADIOS2 diesel fuel budget output for Walrus Island station (3) for 2,000 m^3, 2-yr wind speed scenario

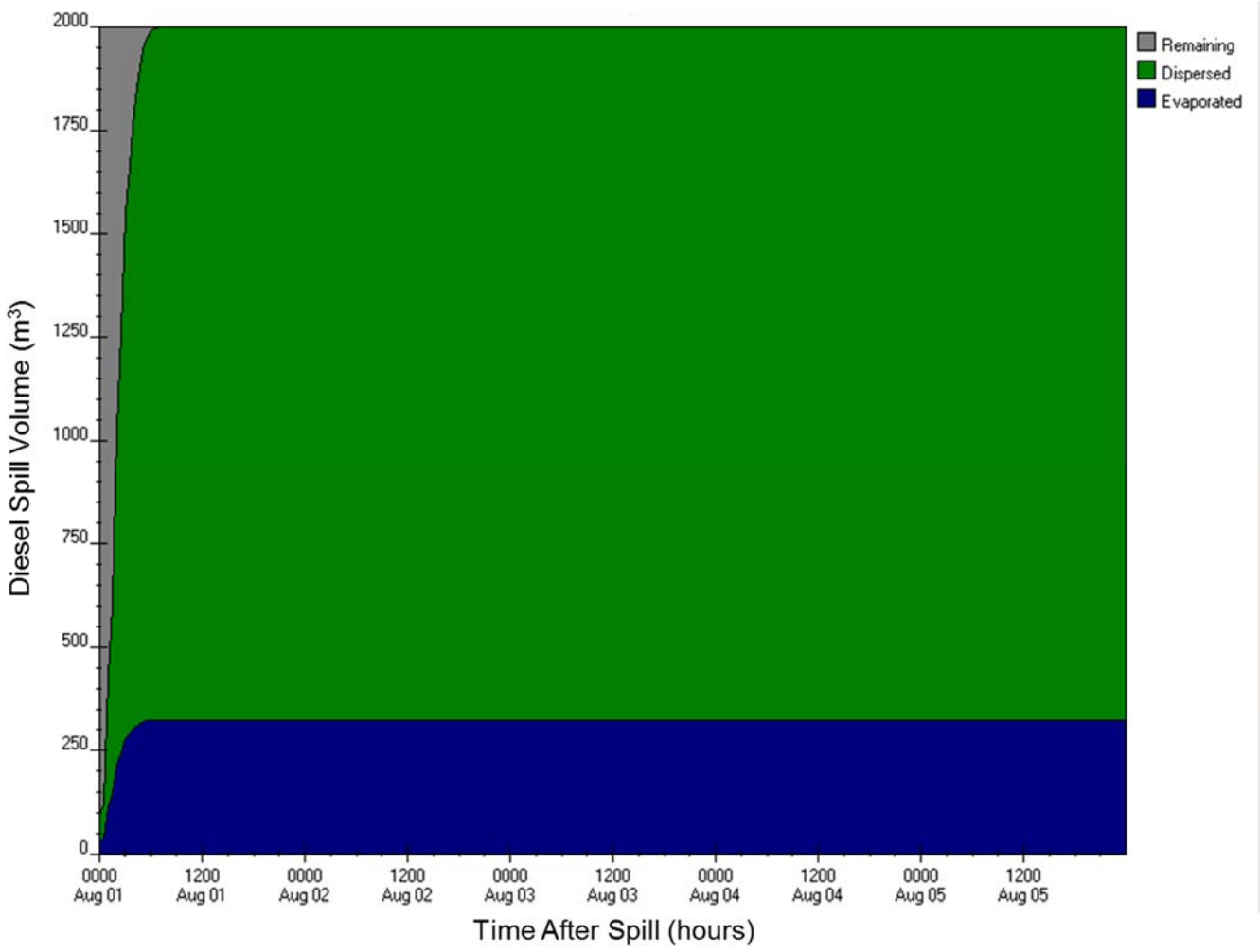

Figure E-A12: ADIOS2 diesel fuel budget output for Walrus Island station (3) for 2,000 m^3, 50-yr wind speed scenario

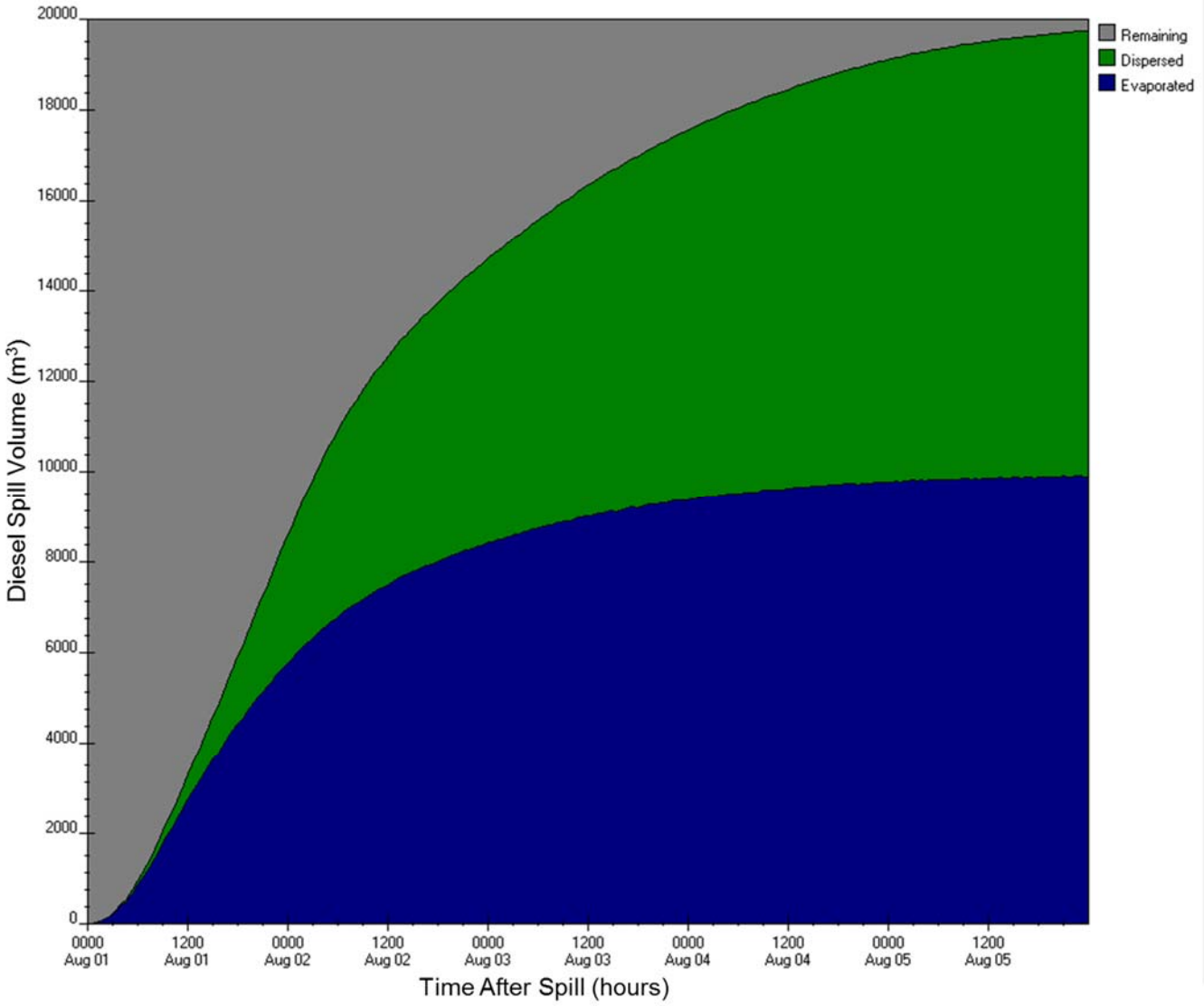

Figure E-A13: ADIOS2 diesel fuel budget output for Walrus Island station (3) for 20,000 m^3, mean wind speed scenario

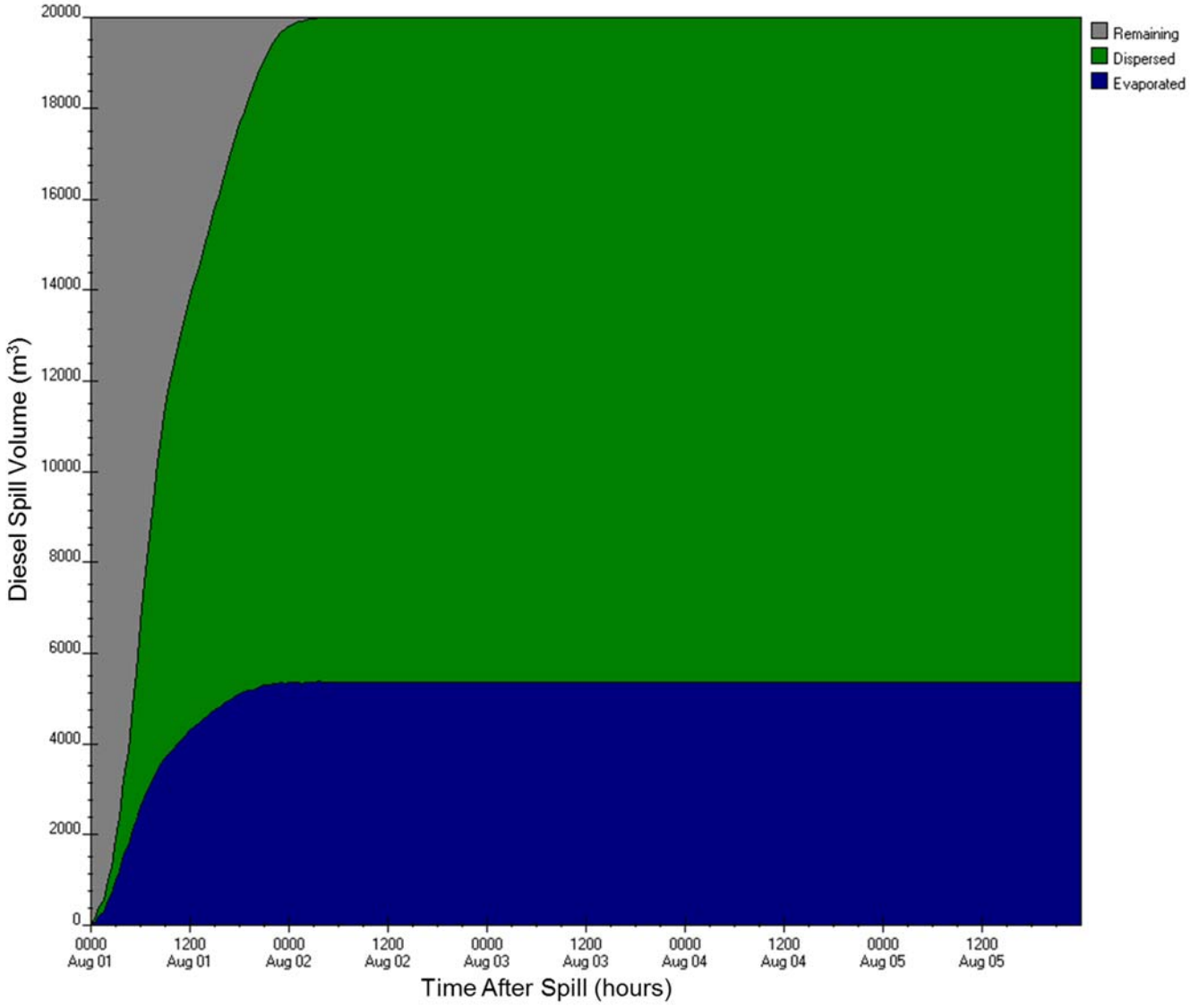

Figure E-A14: ADIOS2 diesel fuel budget output for Walrus Island station (3) for 20,000 m^3, 2-yr wind speed scenario

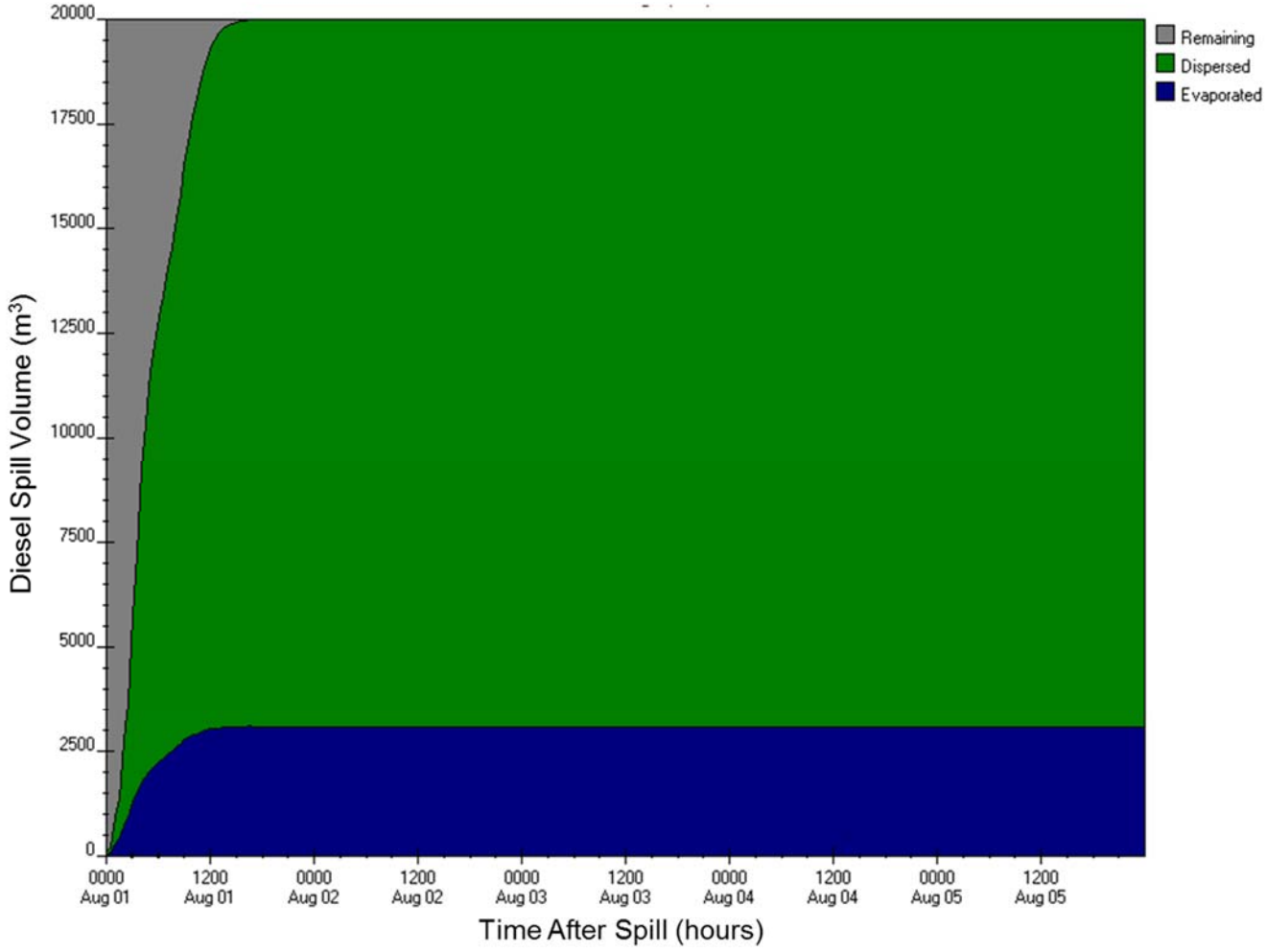

Figure E-A-15: ADIOS2 diesel fuel budget output for Walrus Island station (3) for 20,000 m^3, 50-yr wind speed scenario

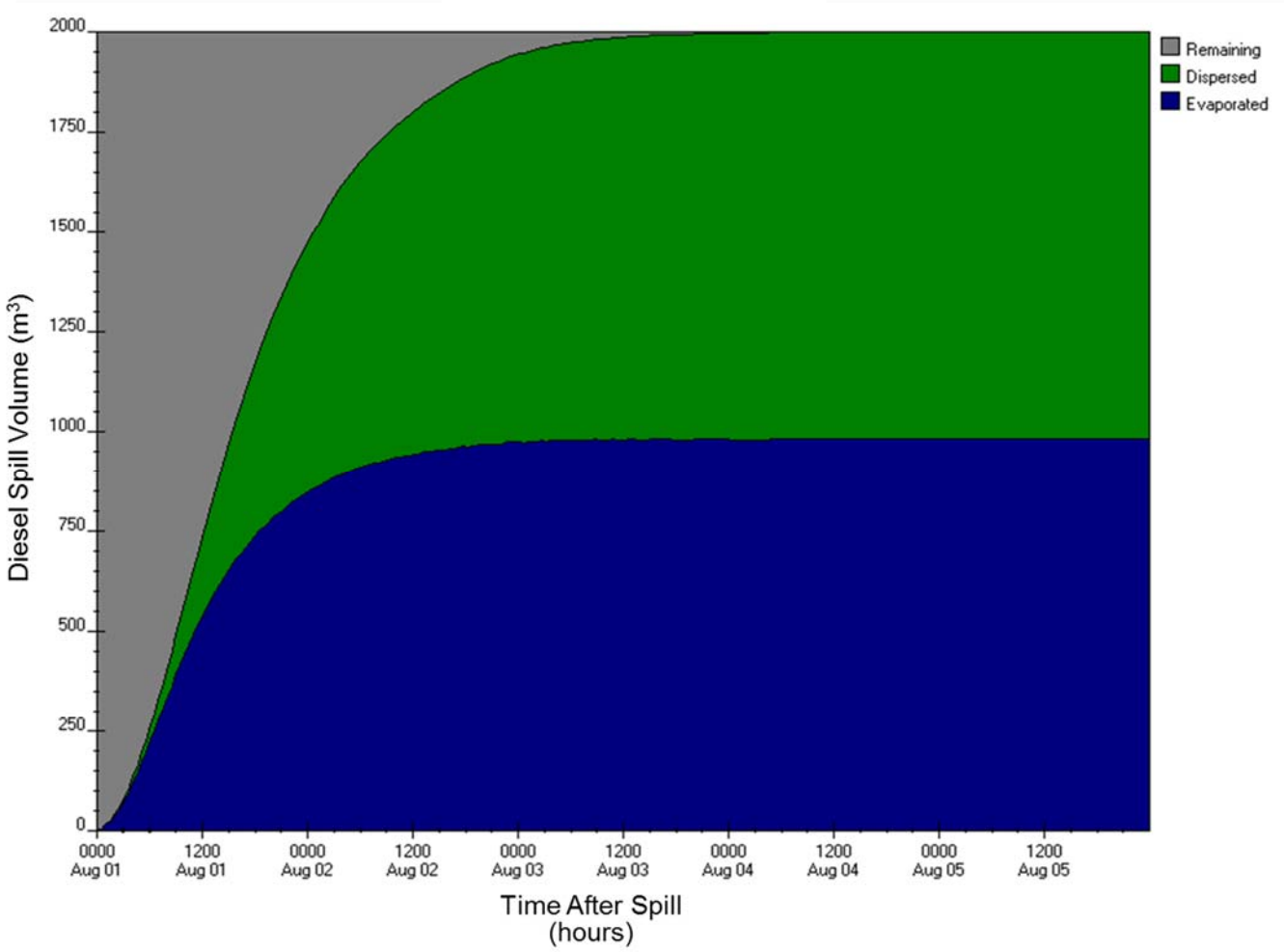

Figure E-A16: ADIOS2 diesel fuel budget output for Coats Island station (4) for 2,000 m^3, mean wind speed scenario

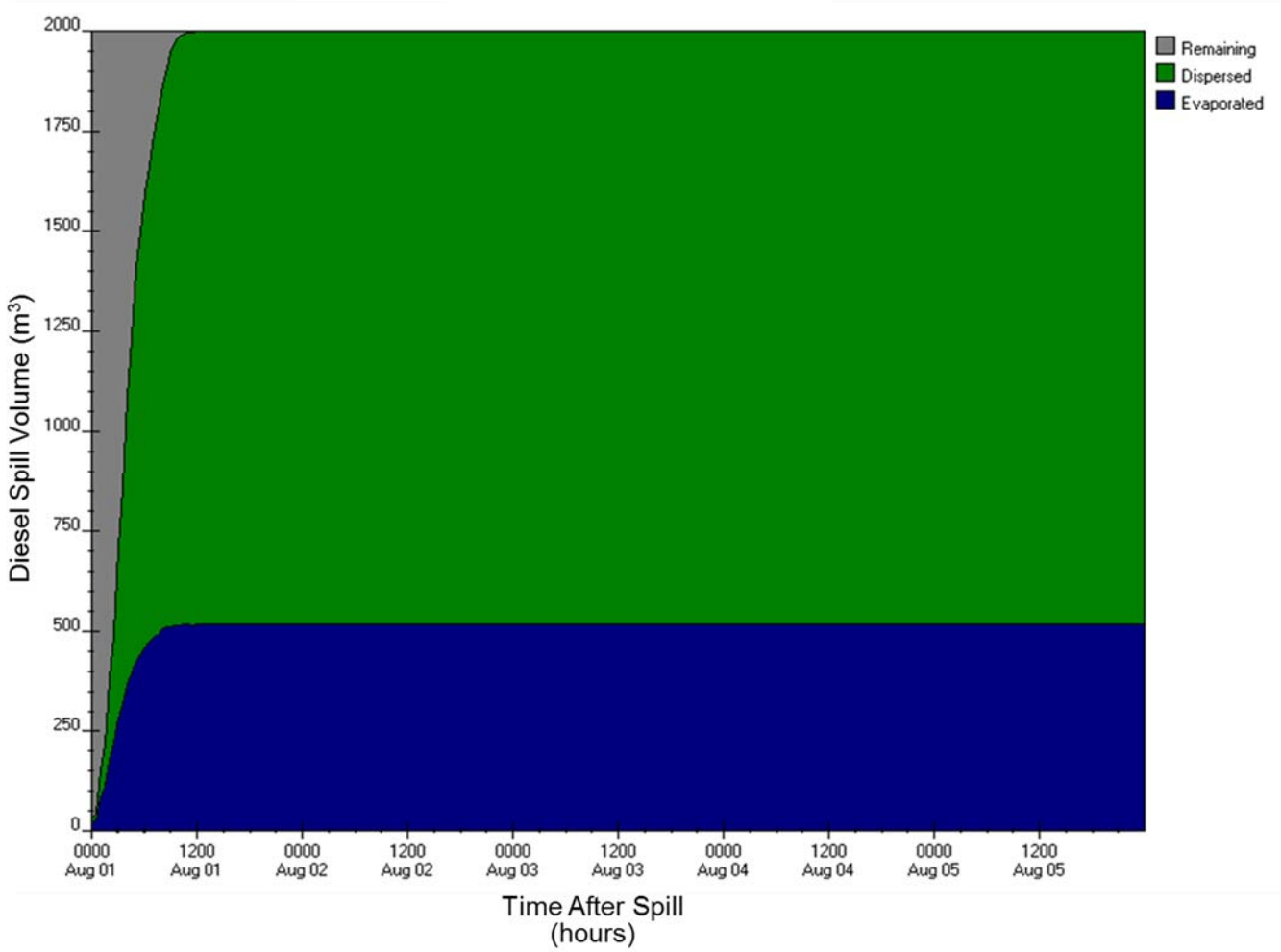

Figure E-A17: ADIOS2 diesel fuel budget output for Coats Island station (4) for 2,000 m^3, 2-yr wind speed scenario

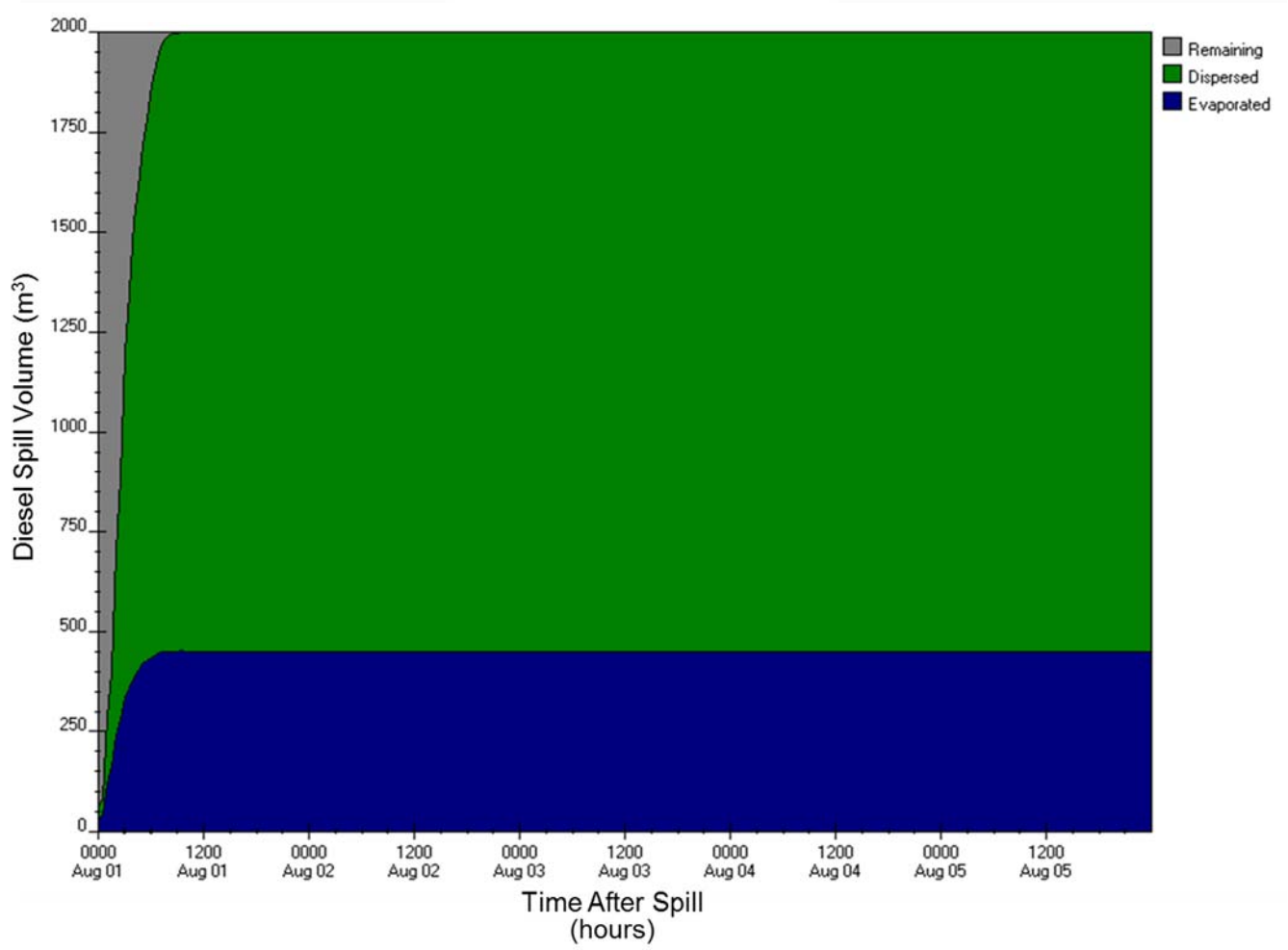

Figure E-A18: ADIOS2 diesel fuel budget output for Coats Island station (4) for 2,000 m^3, 50-yr wind speed scenario

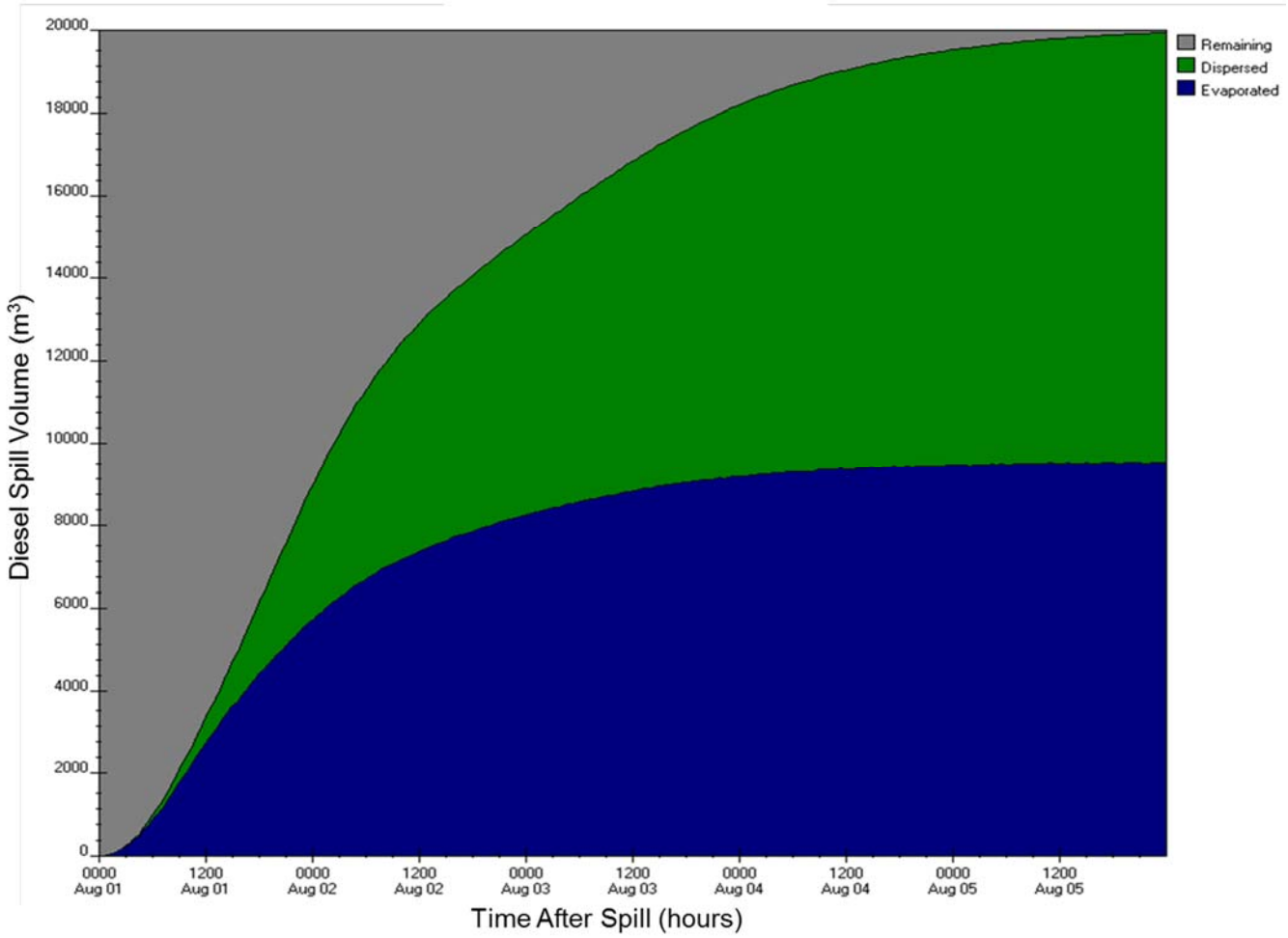

Figure E-A19: ADIOS2 diesel fuel budget output for Coats Island station (4) for 20,000 m^3, mean wind speed scenario

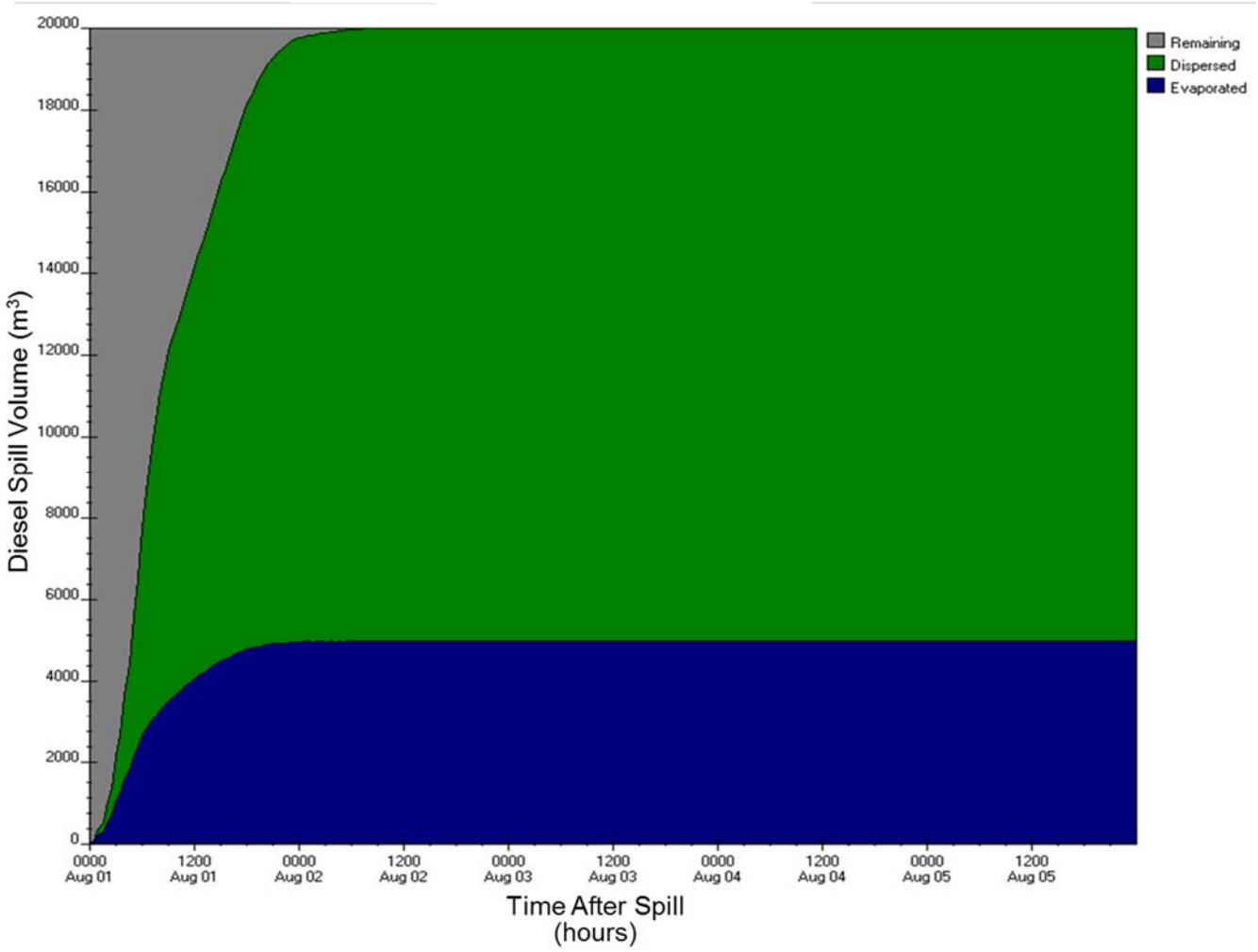

Figure E-A20: ADIOS2 diesel fuel budget output for Coats Island station (4) for 20,000 m^3, 2-yr wind speed scenario

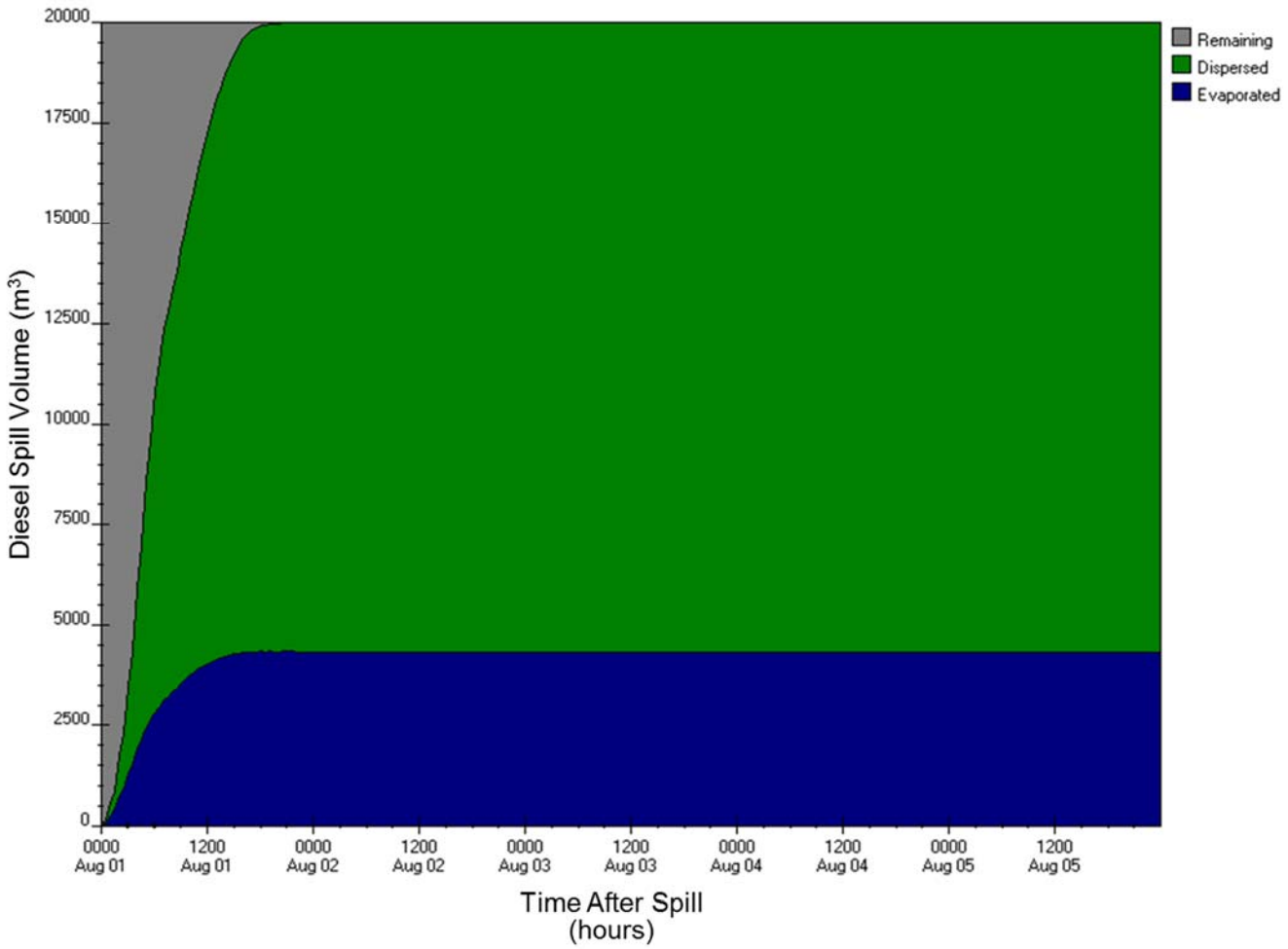

Figure E-A21:ADIOS2 diesel fuel budget output for Coats Island station (4) for 20,000 m^3, 50-yr wind speed scenario

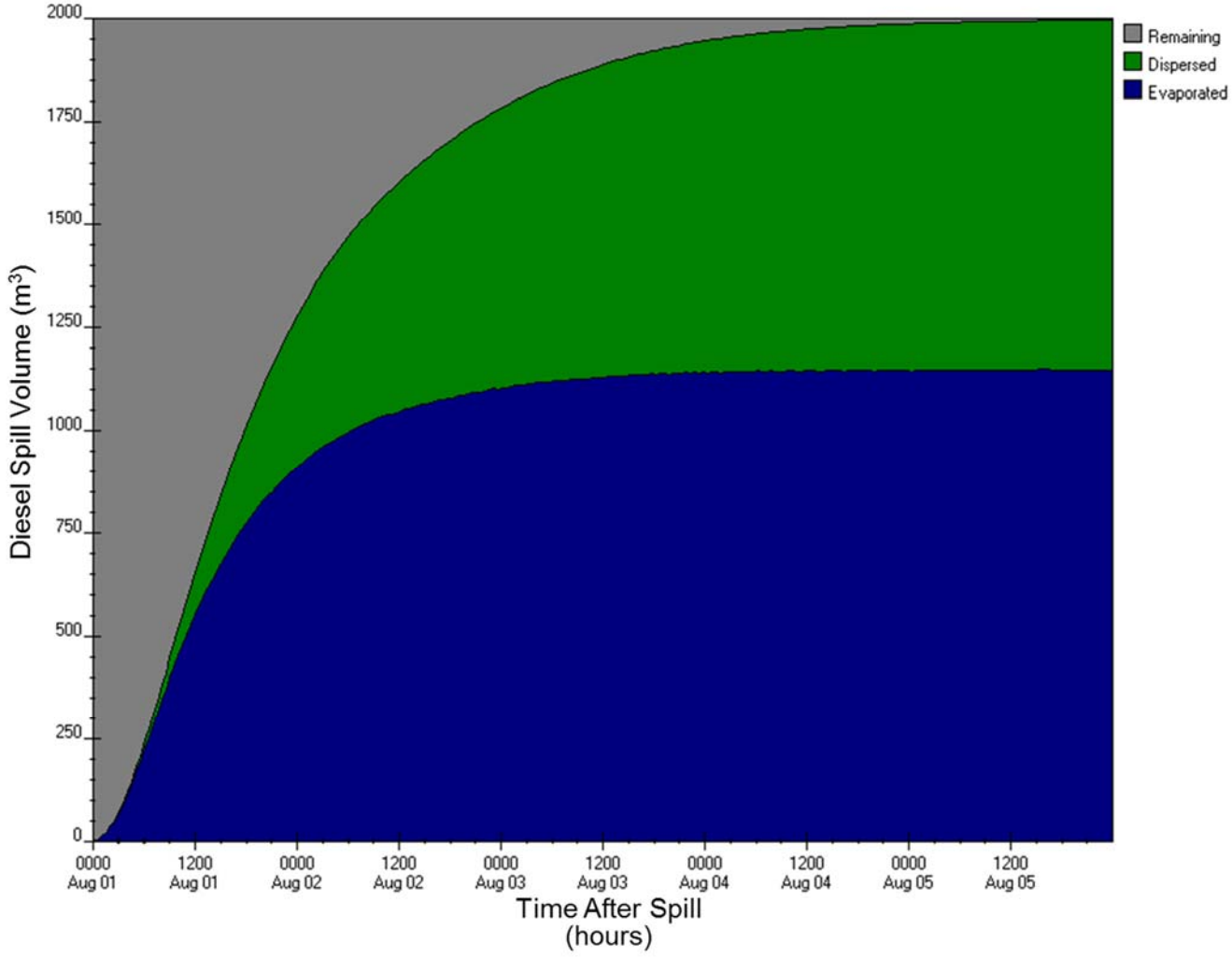

Figure E-A22:ADIOS2 diesel fuel budget output for Ungava Peninsula station (5) for 2,000 m^3, mean wind speed scenario

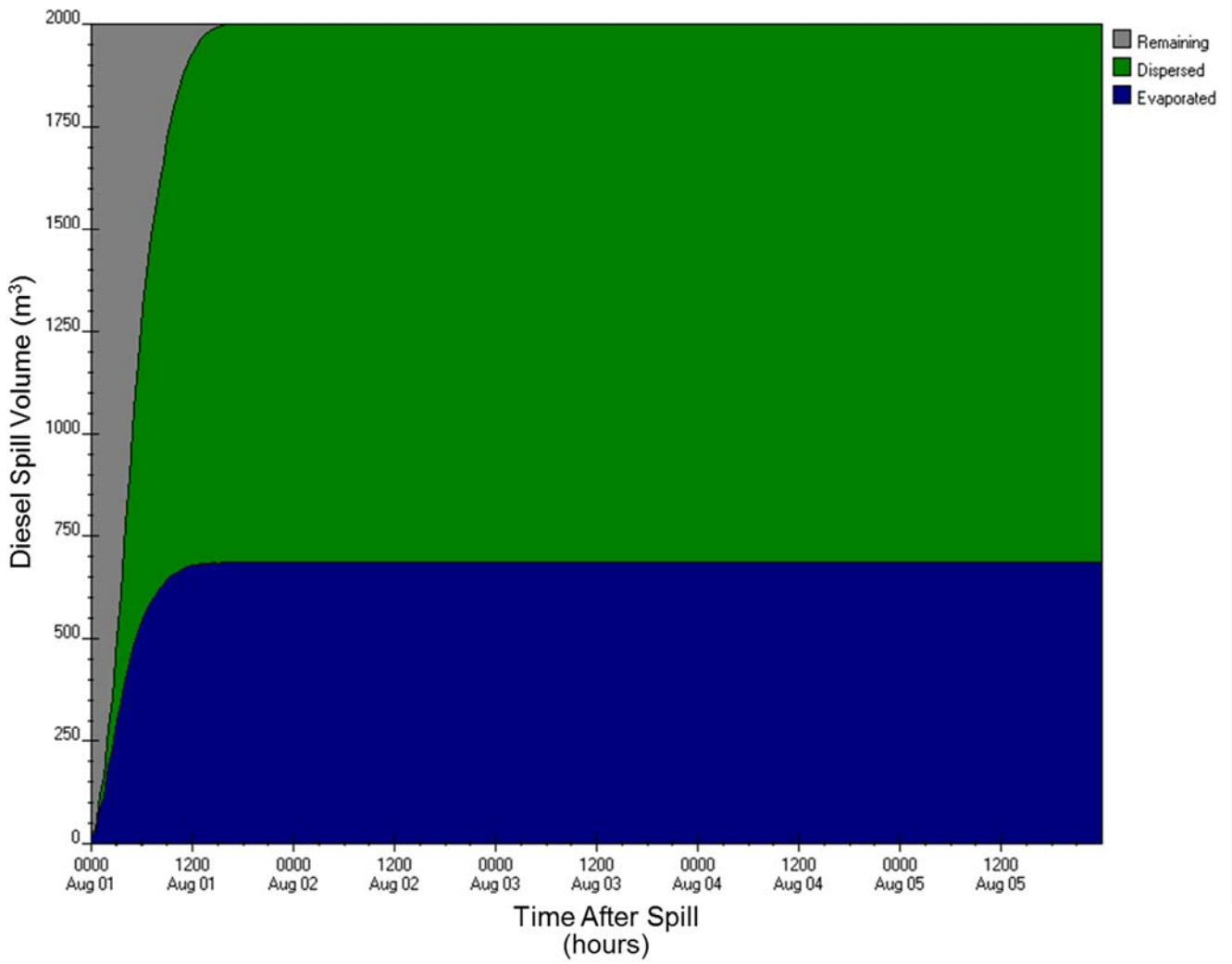

Figure E-A23: ADIOS2 diesel fuel budget output for Ungava Peninsula station (5) for 2,000 m^3, 2-yr wind speed scenario

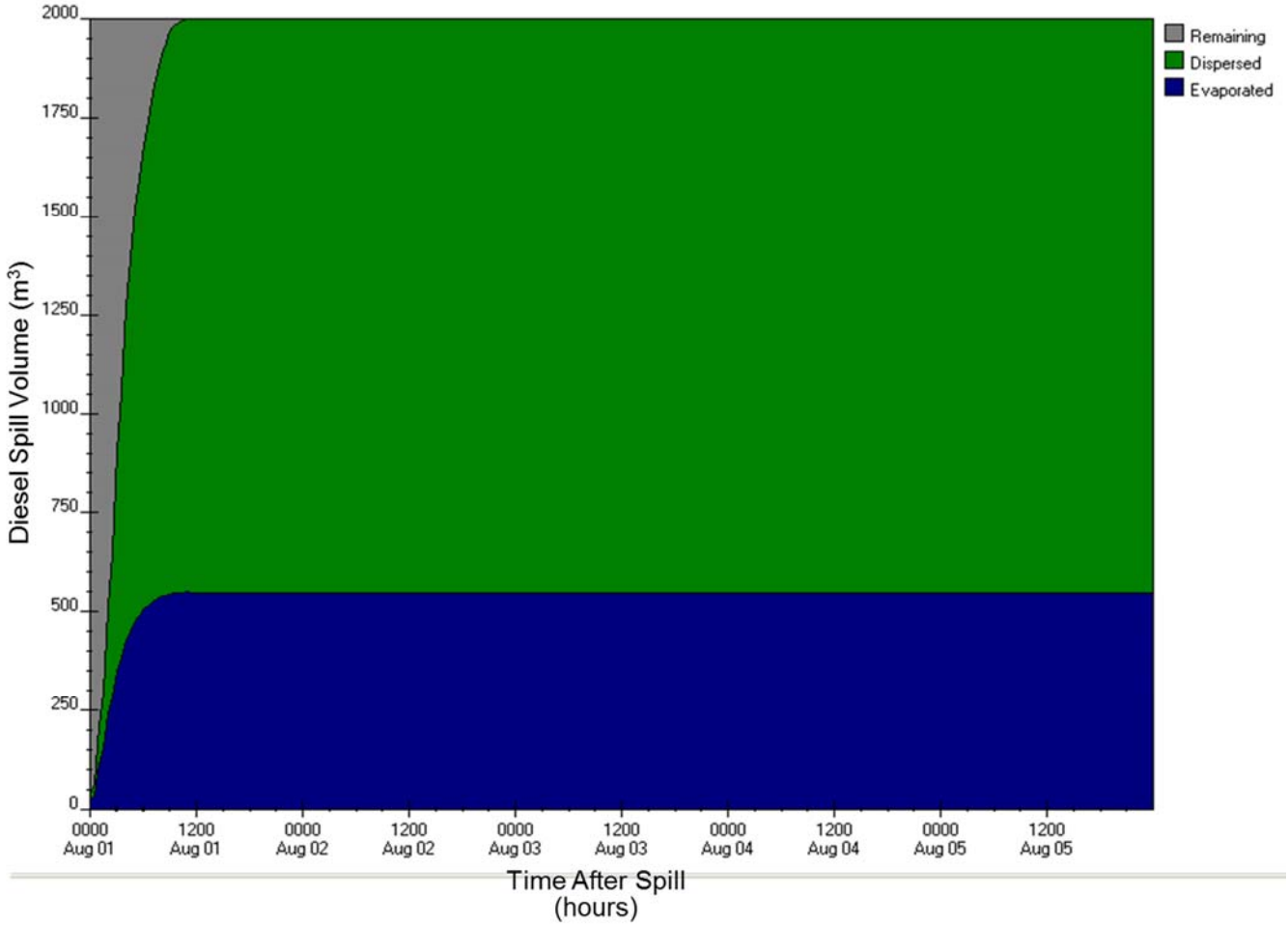

Figure E-A24: ADIOS2 diesel fuel budget output for Ungava Peninsula station (5) for 2,000 m^3, 50-yr wind speed scenario

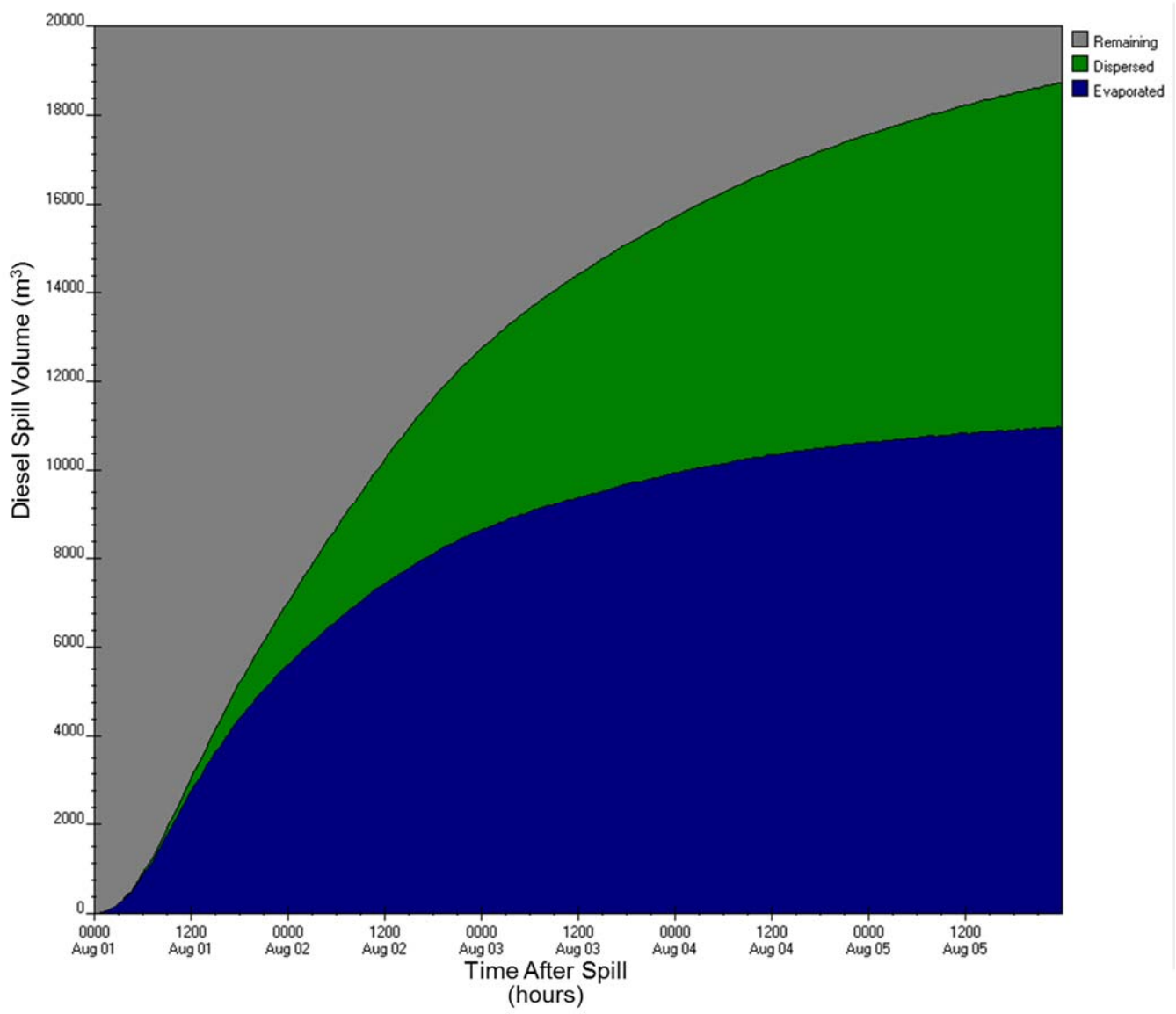

Figure E-A25: ADIOS2 diesel fuel budget output for Ungava Peninsula station (5) for 20,000 m^3, mean wind speed scenario

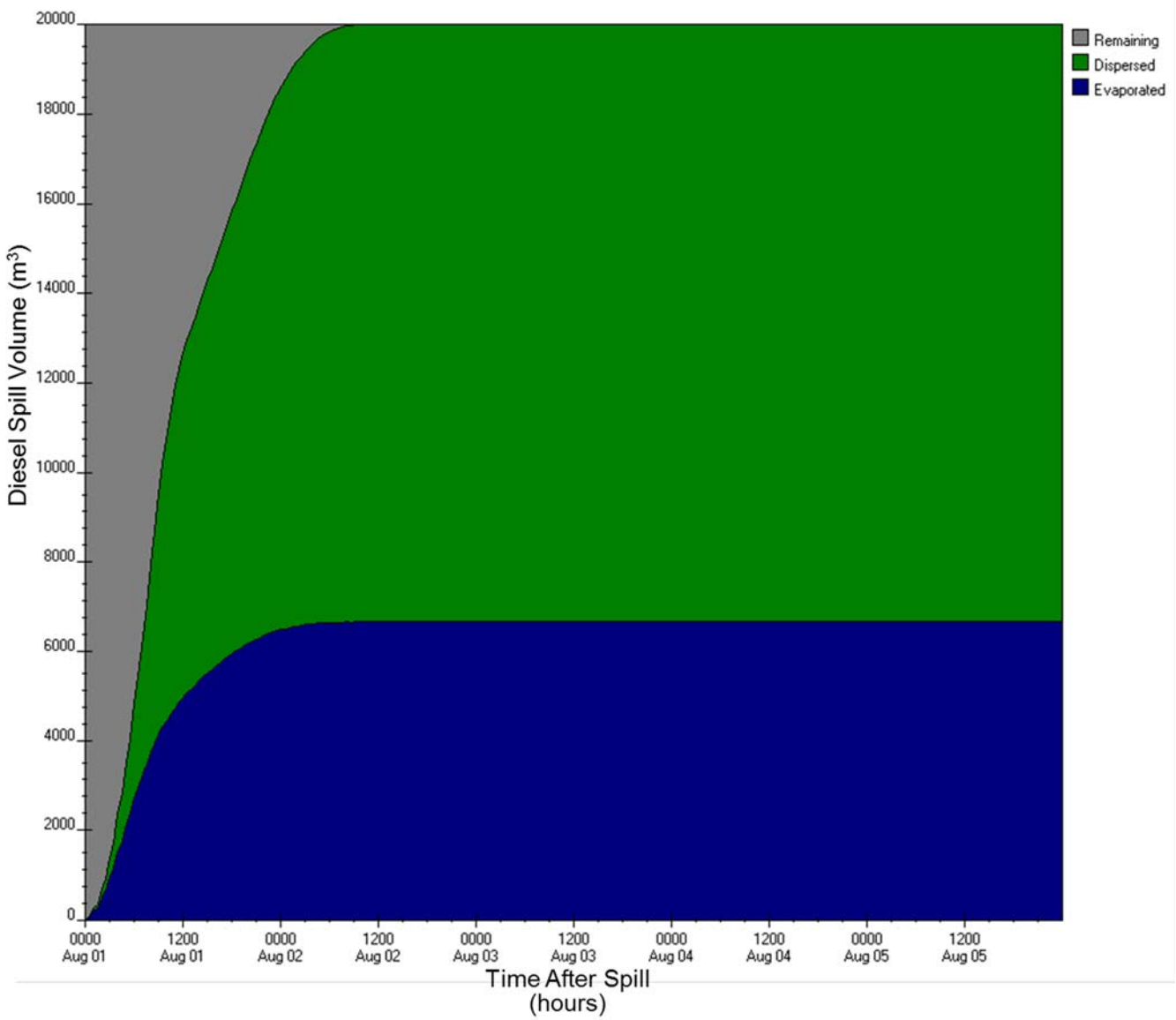

Figure E-A26: ADIOS2 diesel fuel budget output for Ungava Peninsula station (5) for 20,000 m^3, 2-yr wind speed scenario

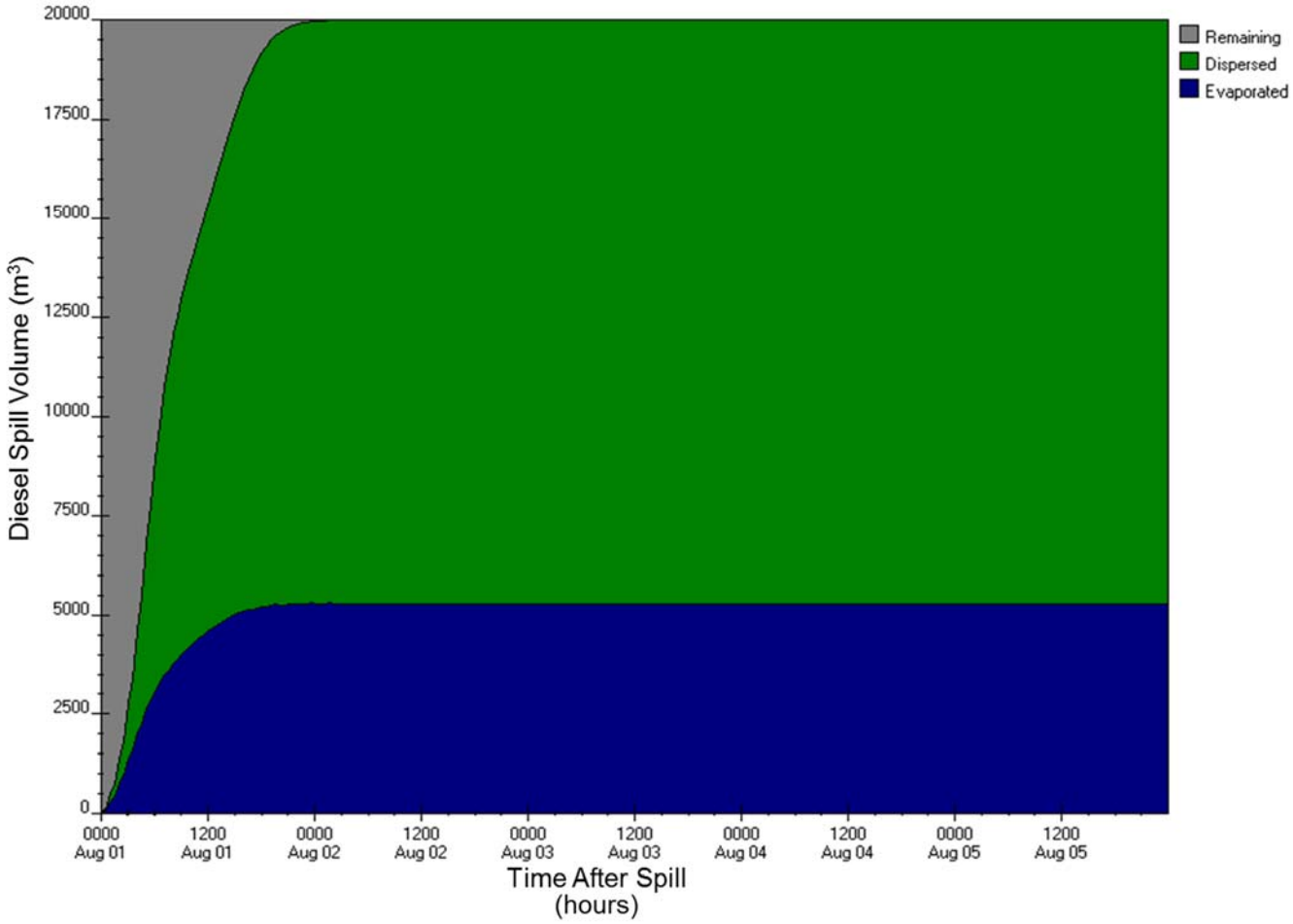

Figure E-A27: ADIOS2 diesel fuel budget output for Ungava Peninsula station (5) for 20,000 m^3, 50-yr wind speed scenario

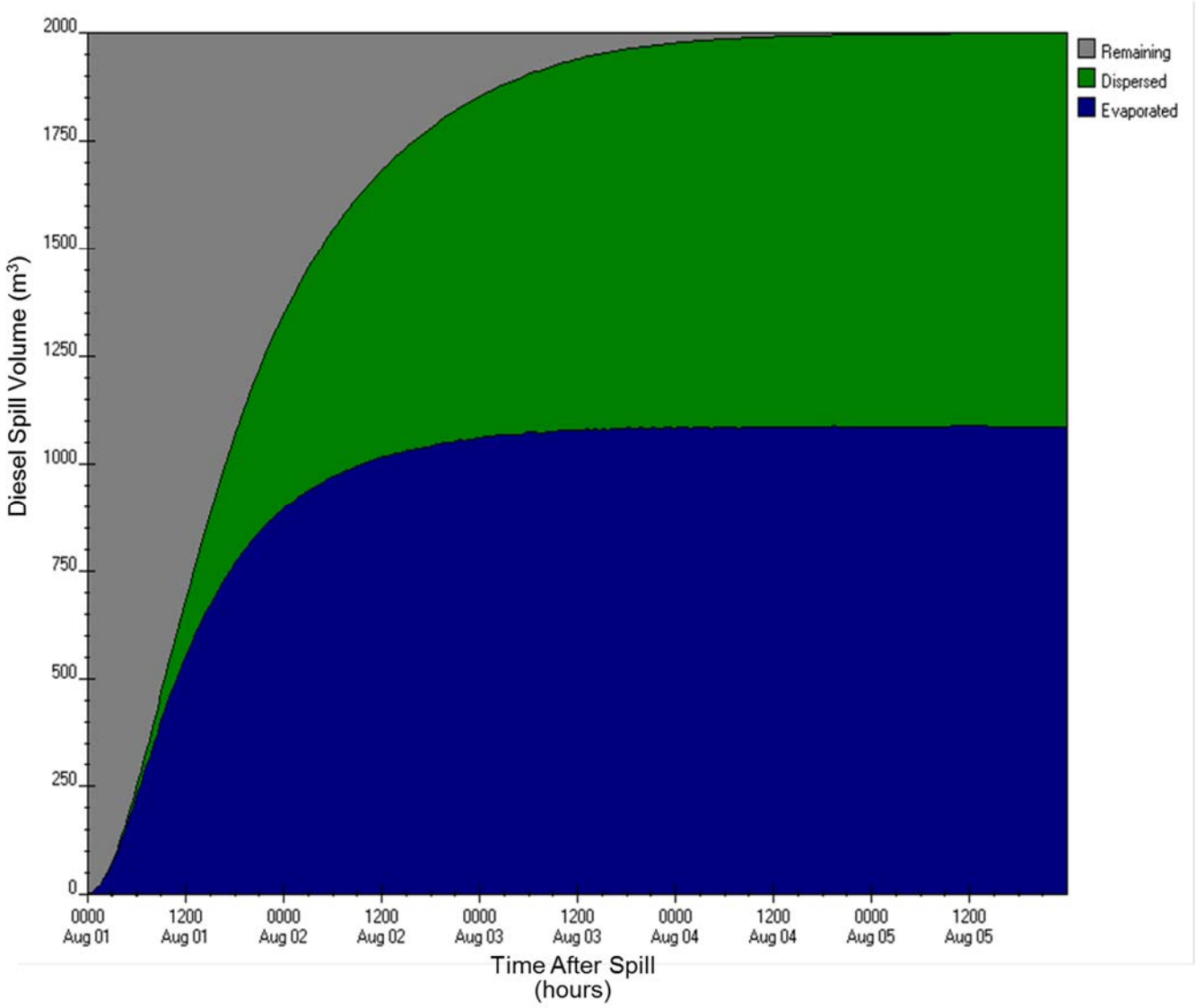

Figure E-A28: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (6) for 2,000 m^3, mean wind speed scenario

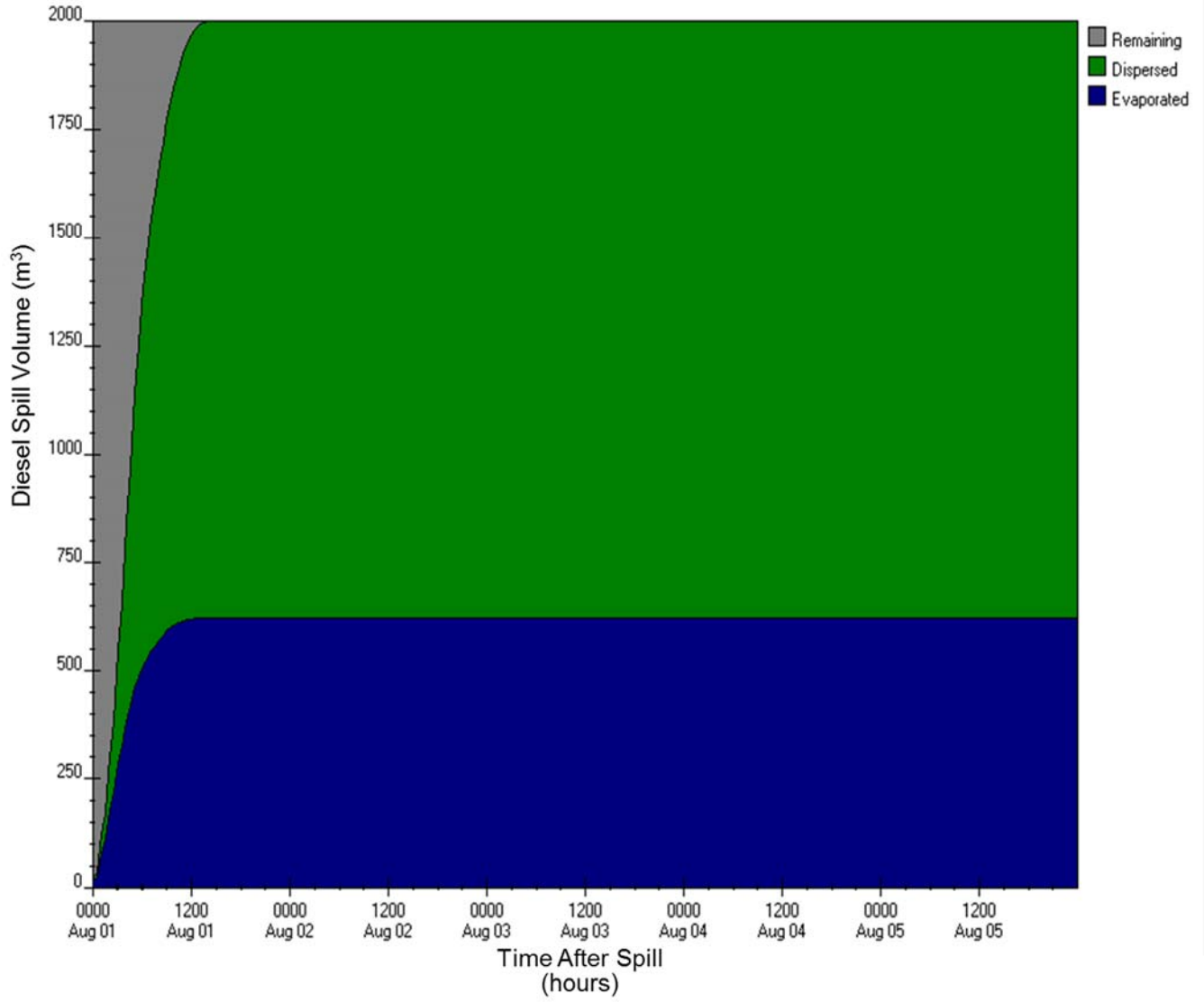

Figure E-A29: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (6) for 2,000 m^3, 2-yr wind speed scenario

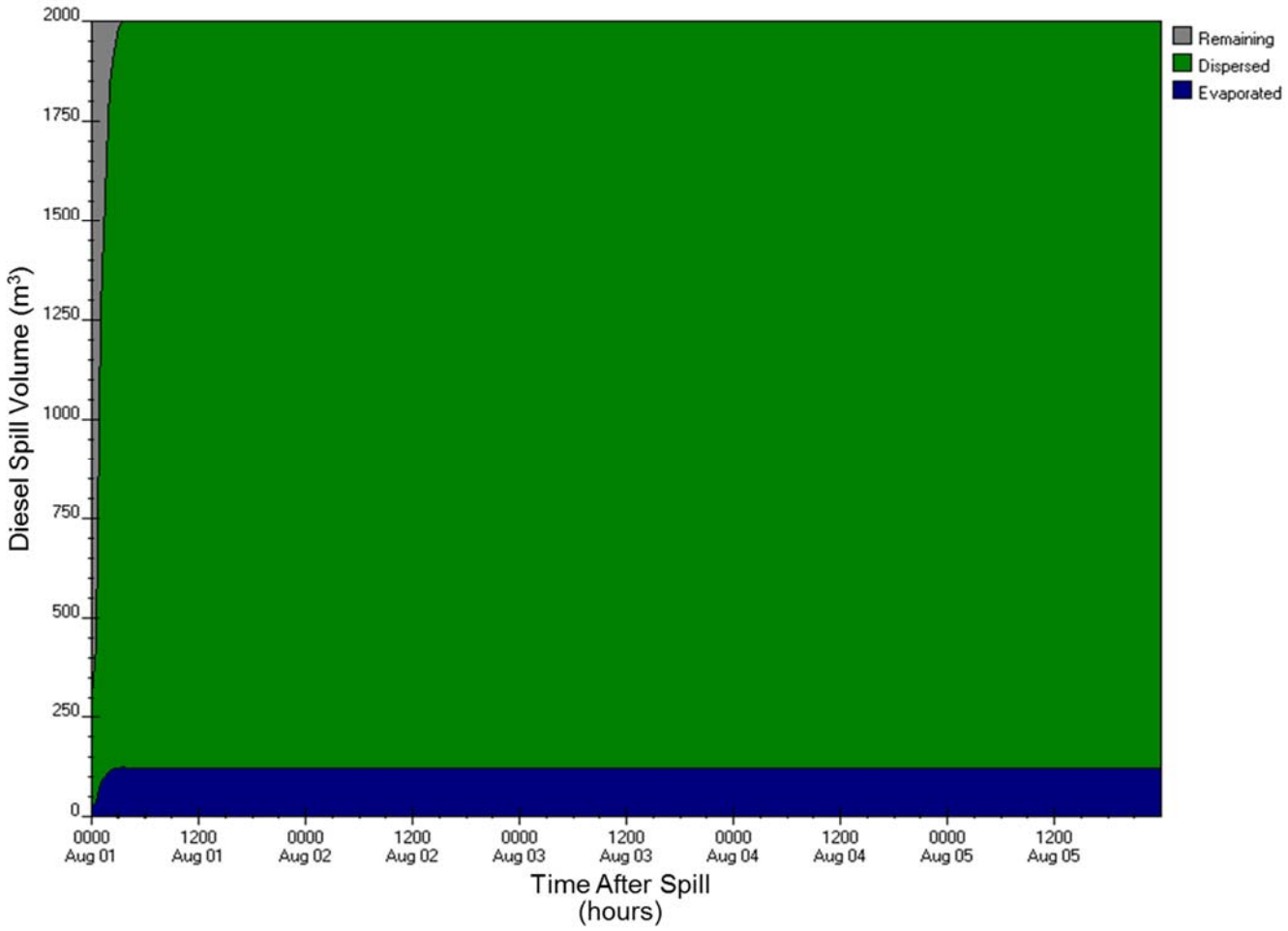

Figure E-A30: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (6) for 2,000 m^3, 50-yr wind speed scenario

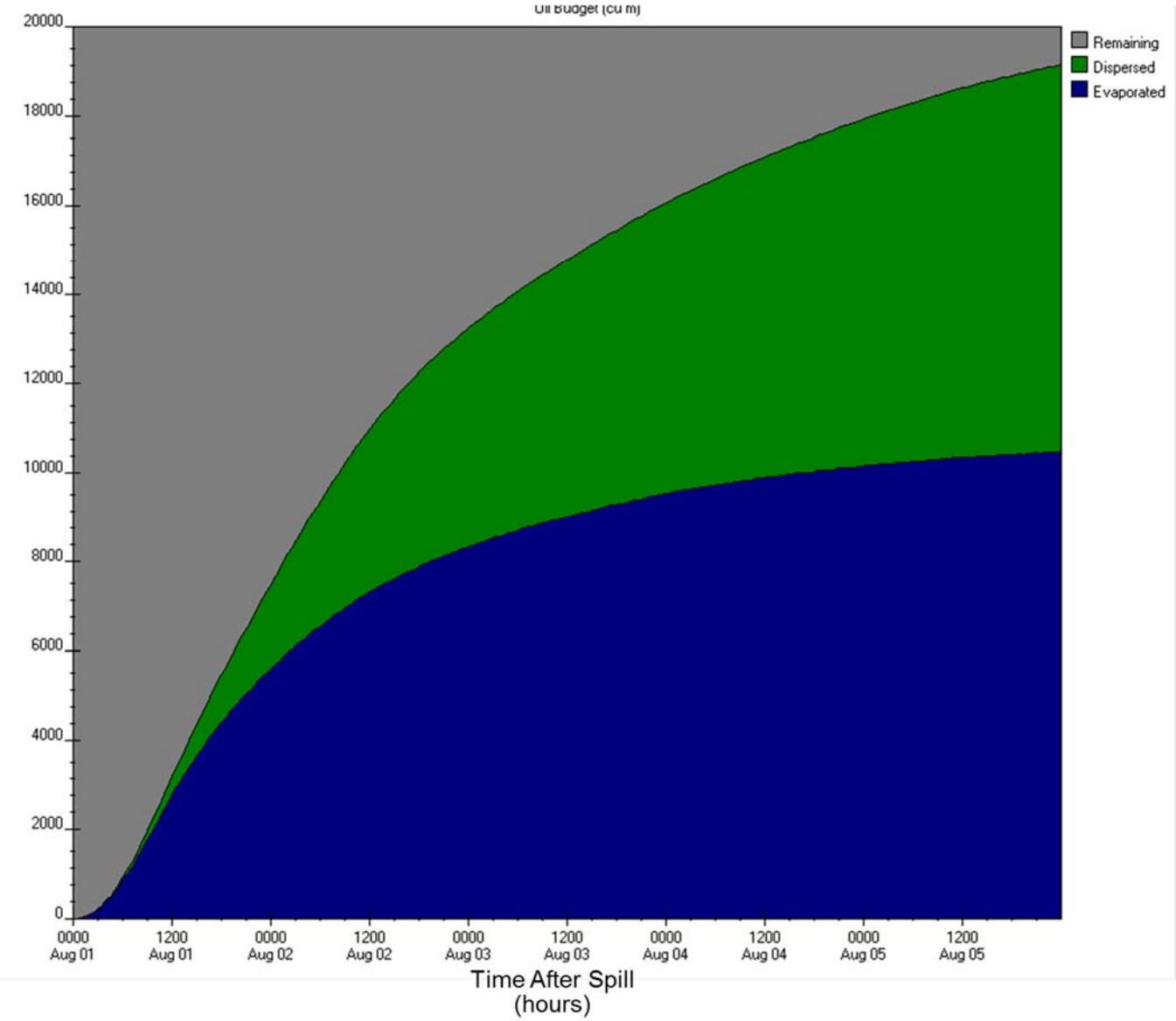

Figure E-A31: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (6) for 20,000 m^3, mean wind speed scenario

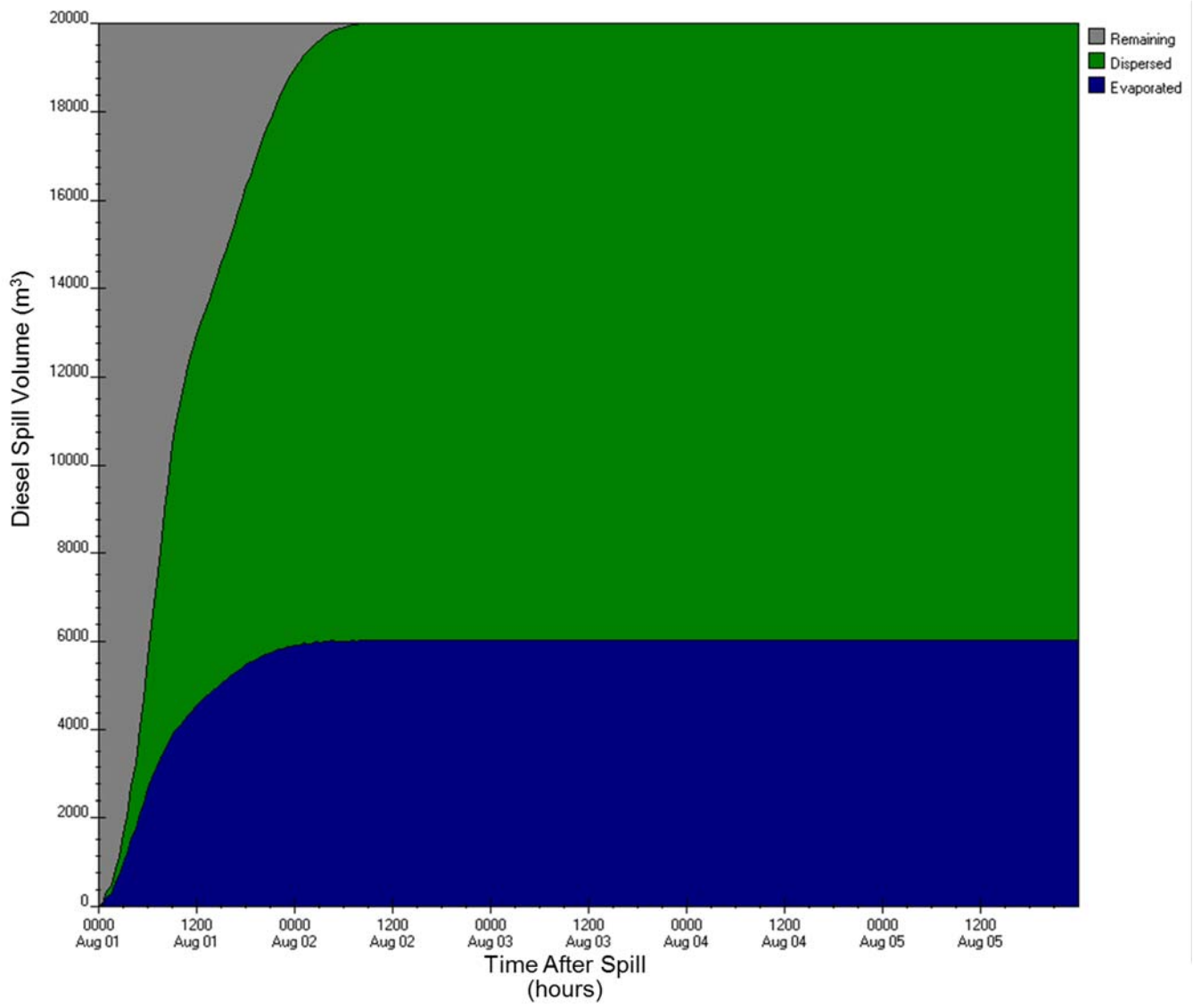

Figure E-A32: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (6) for 20,000 m^3, 2-yr wind speed scenario

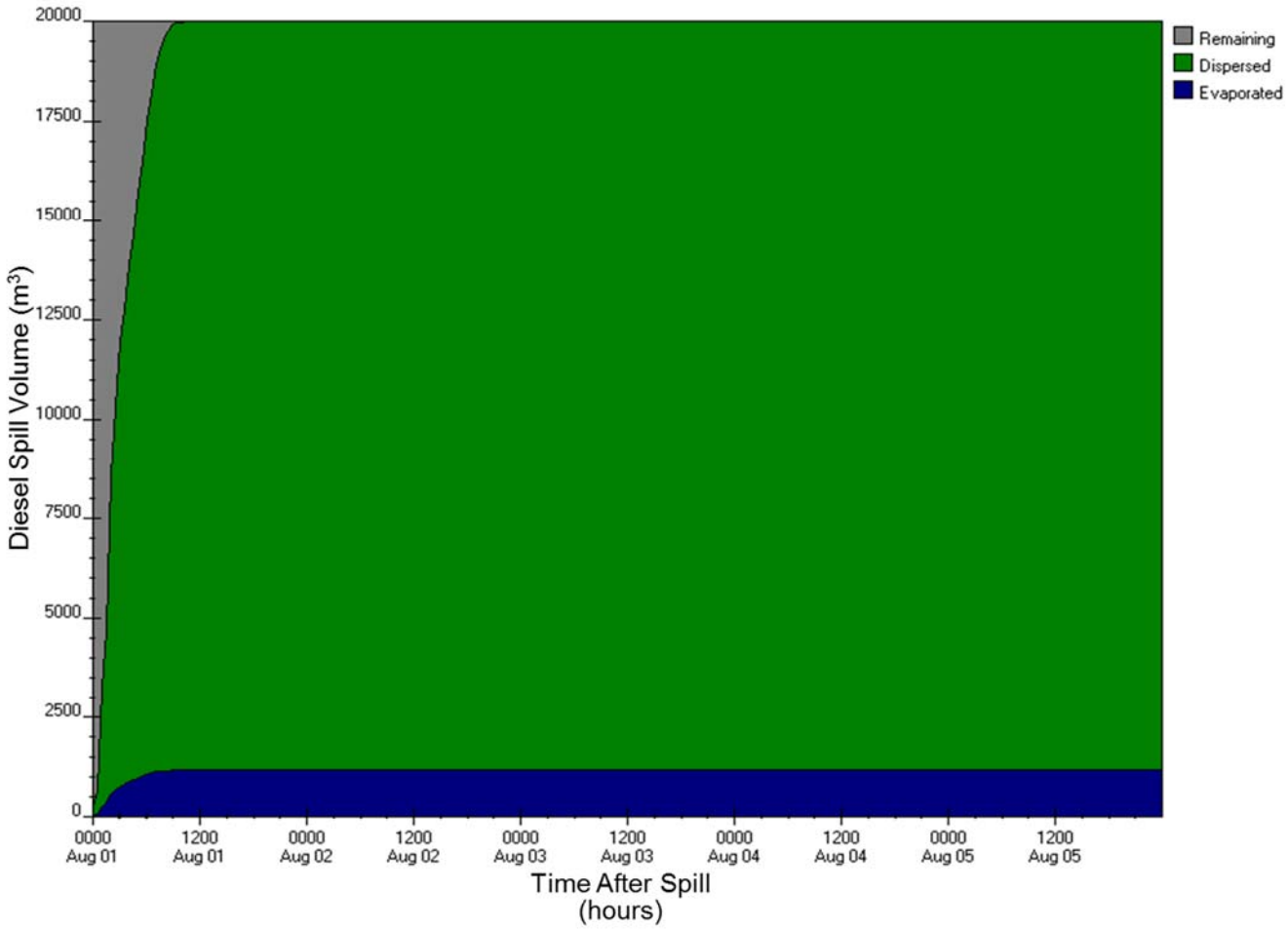

Figure E-A33: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (6) for 20,000 m^3, 50-yr wind speed scenario

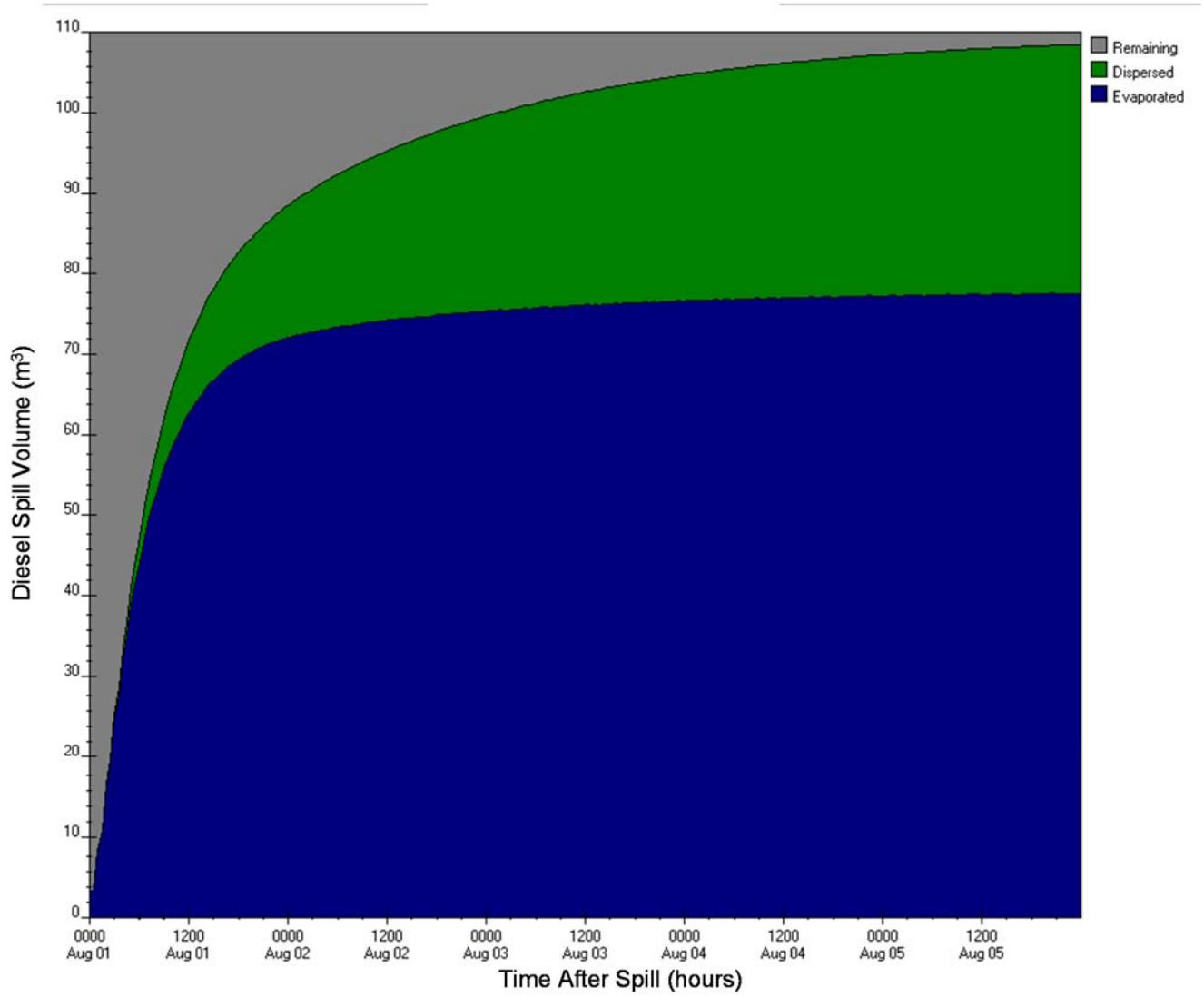

Figure E-A34: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 100 m^3, mean wind speed scenario

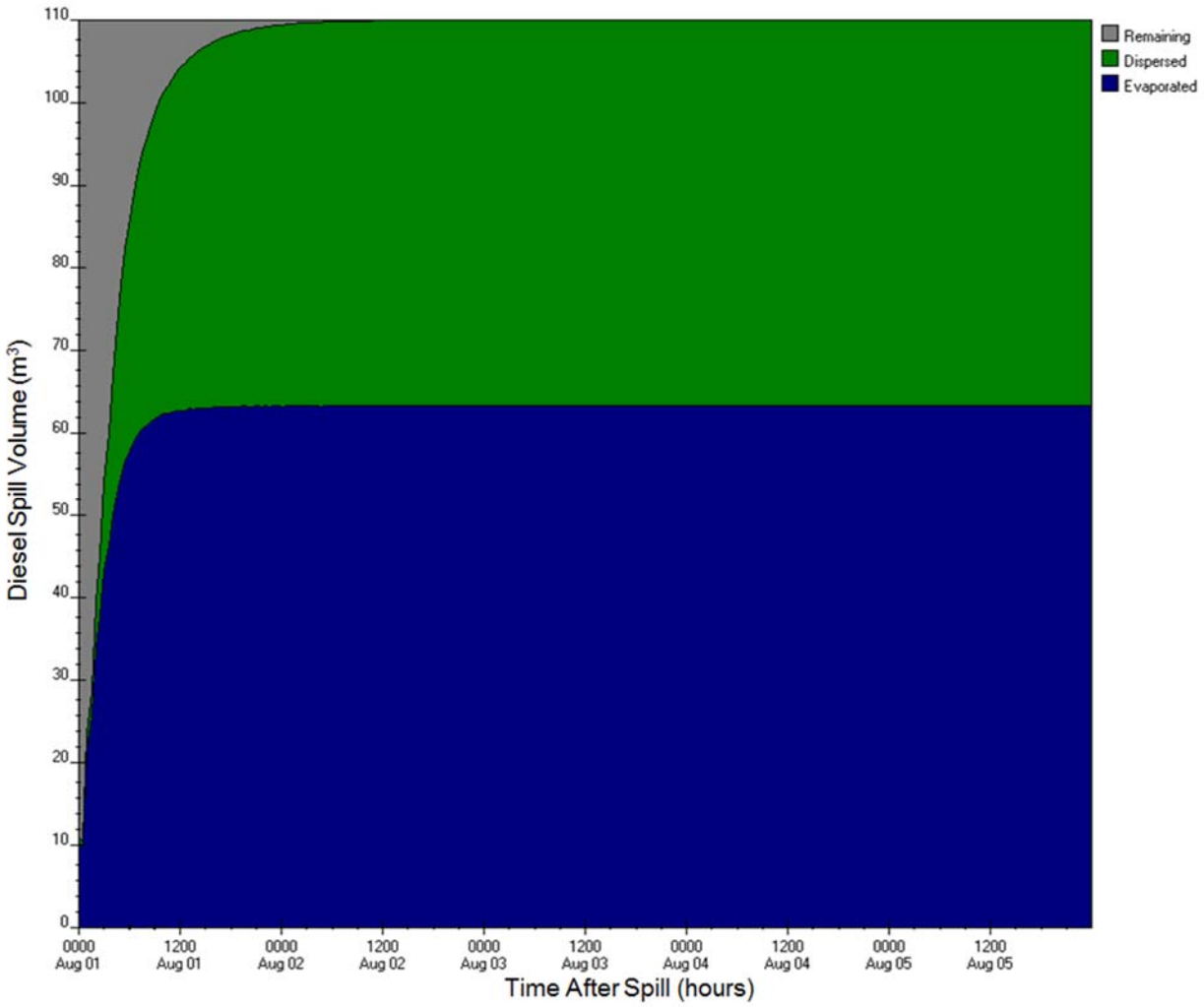

Figure E-A35: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 100 m^3, 2-yr wind speed scenario

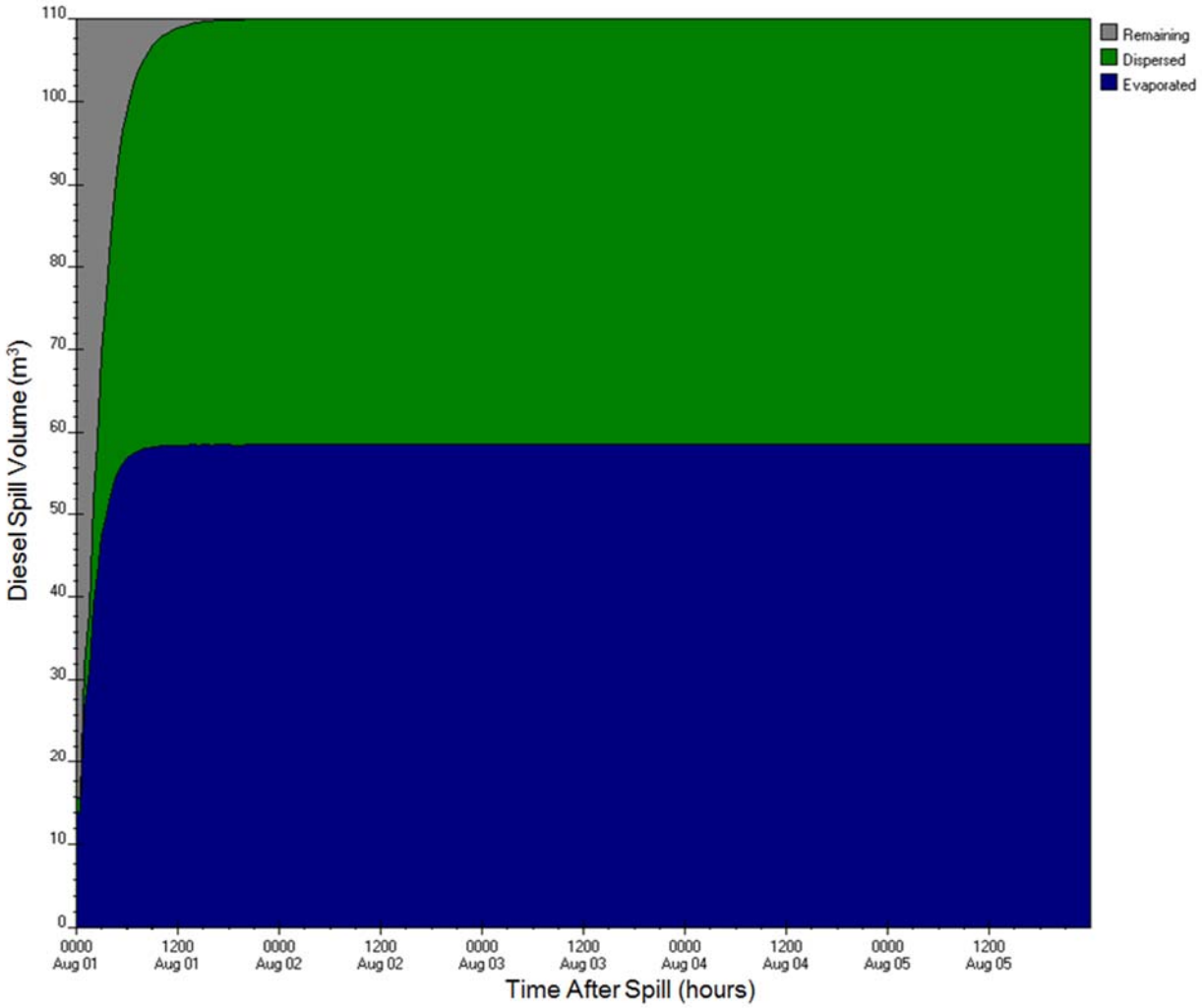

Figure E-A36: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 100 m^3, 50-yr wind speed scenario

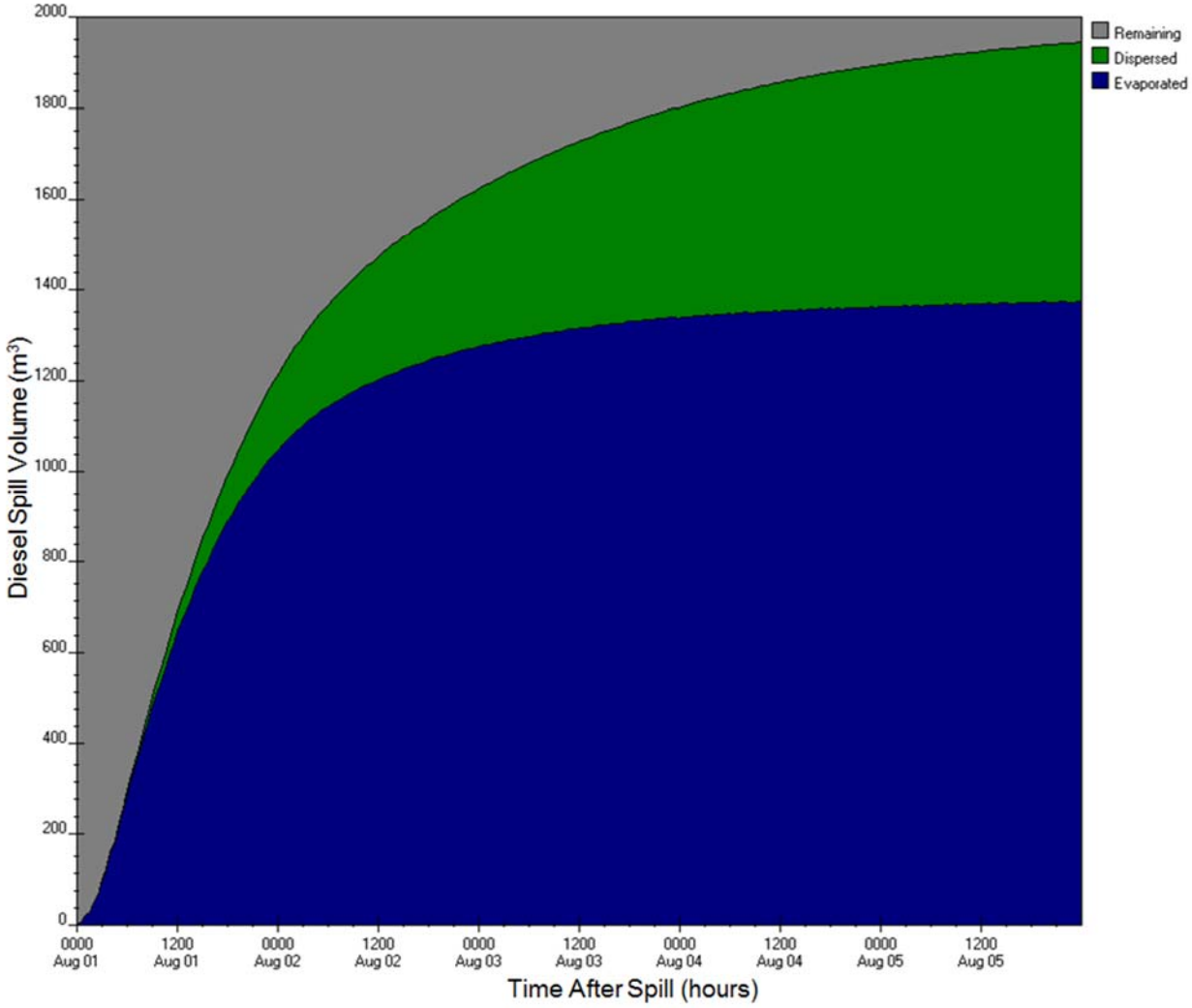

Figure E-A37: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 2,000 m^3, mean wind speed scenario

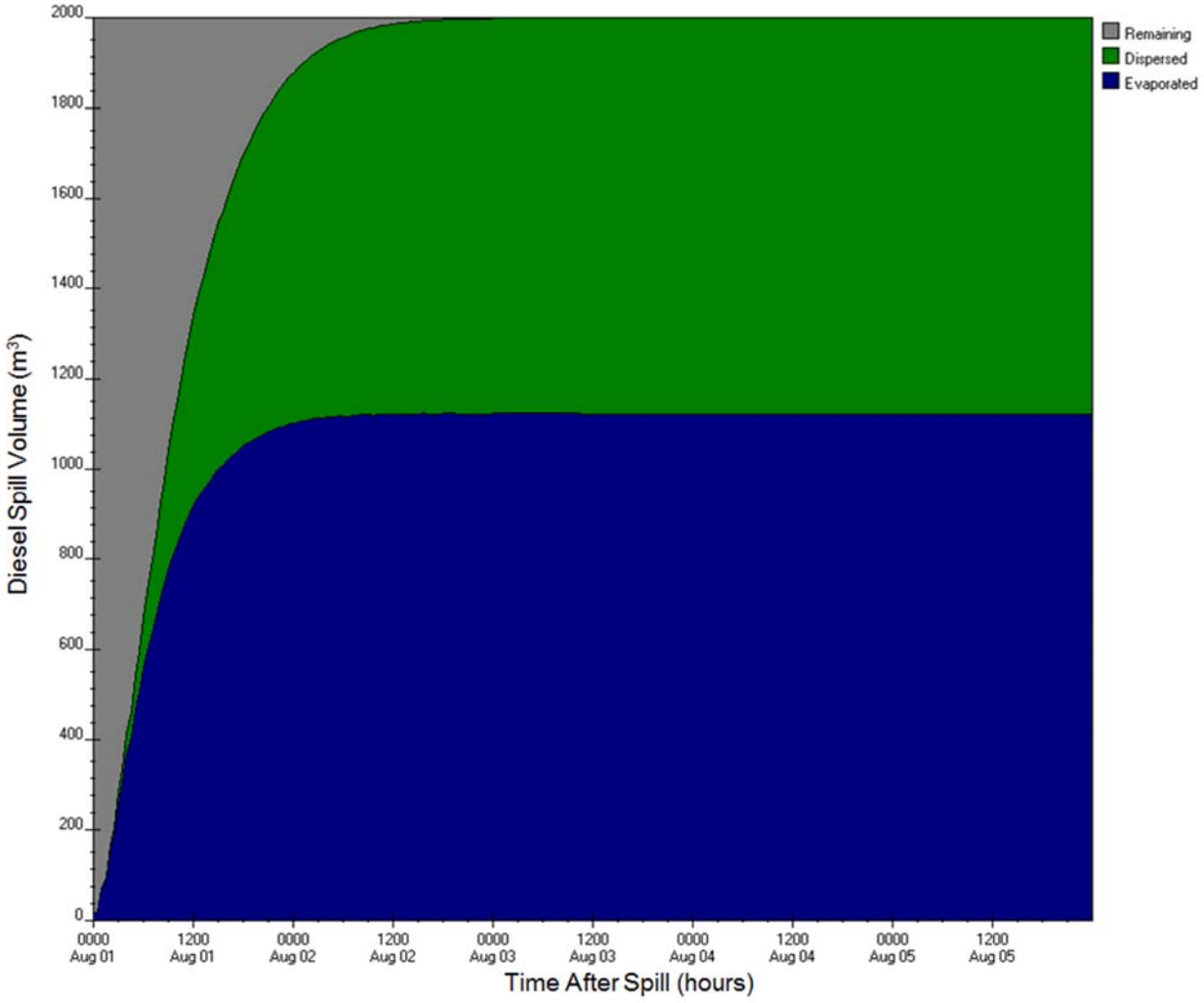

Figure E-A38: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 2,000 m³, 2-yr wind speed scenario

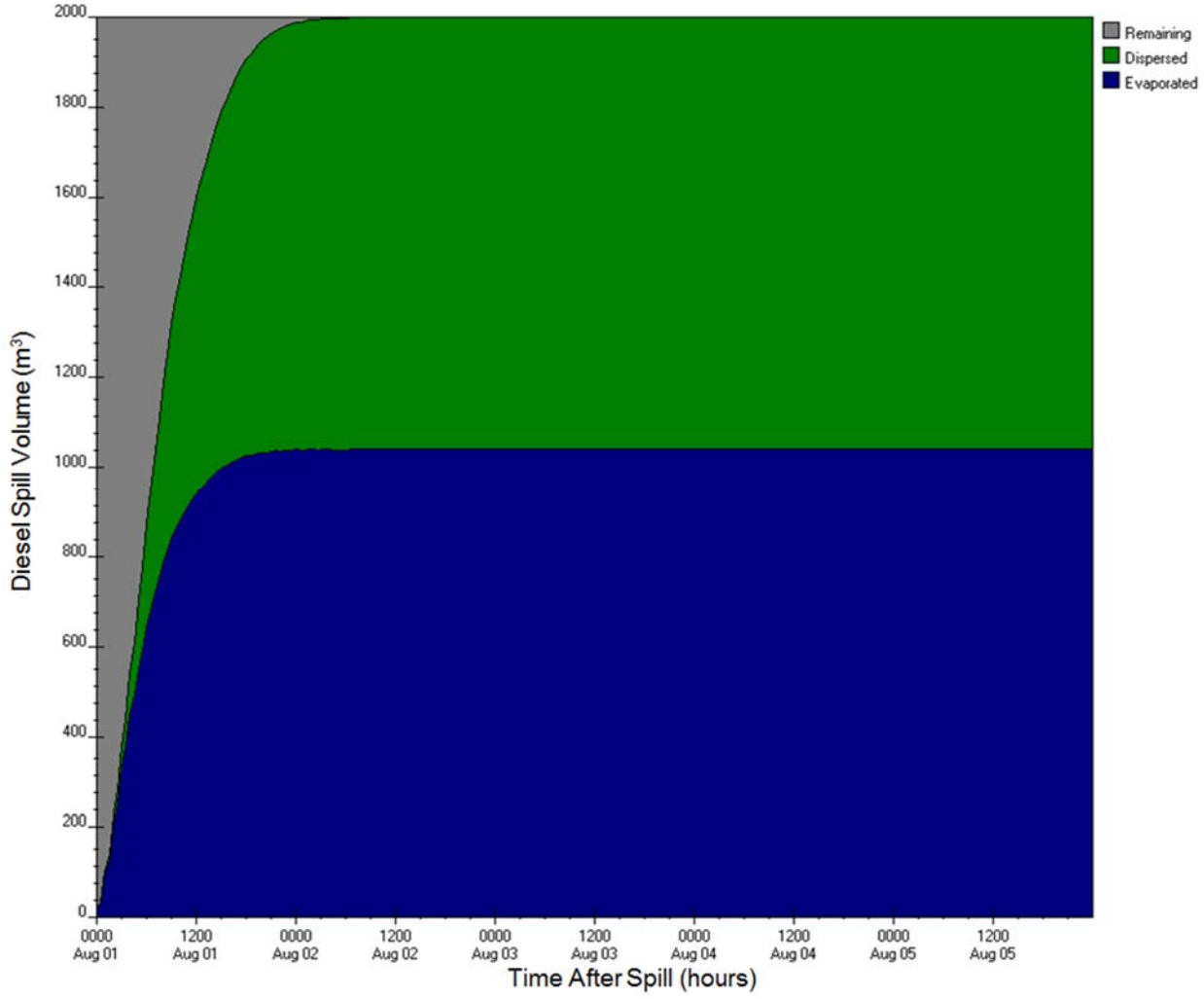

Figure E-A39: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 2,000 m^3, 50-yr wind speed scenario

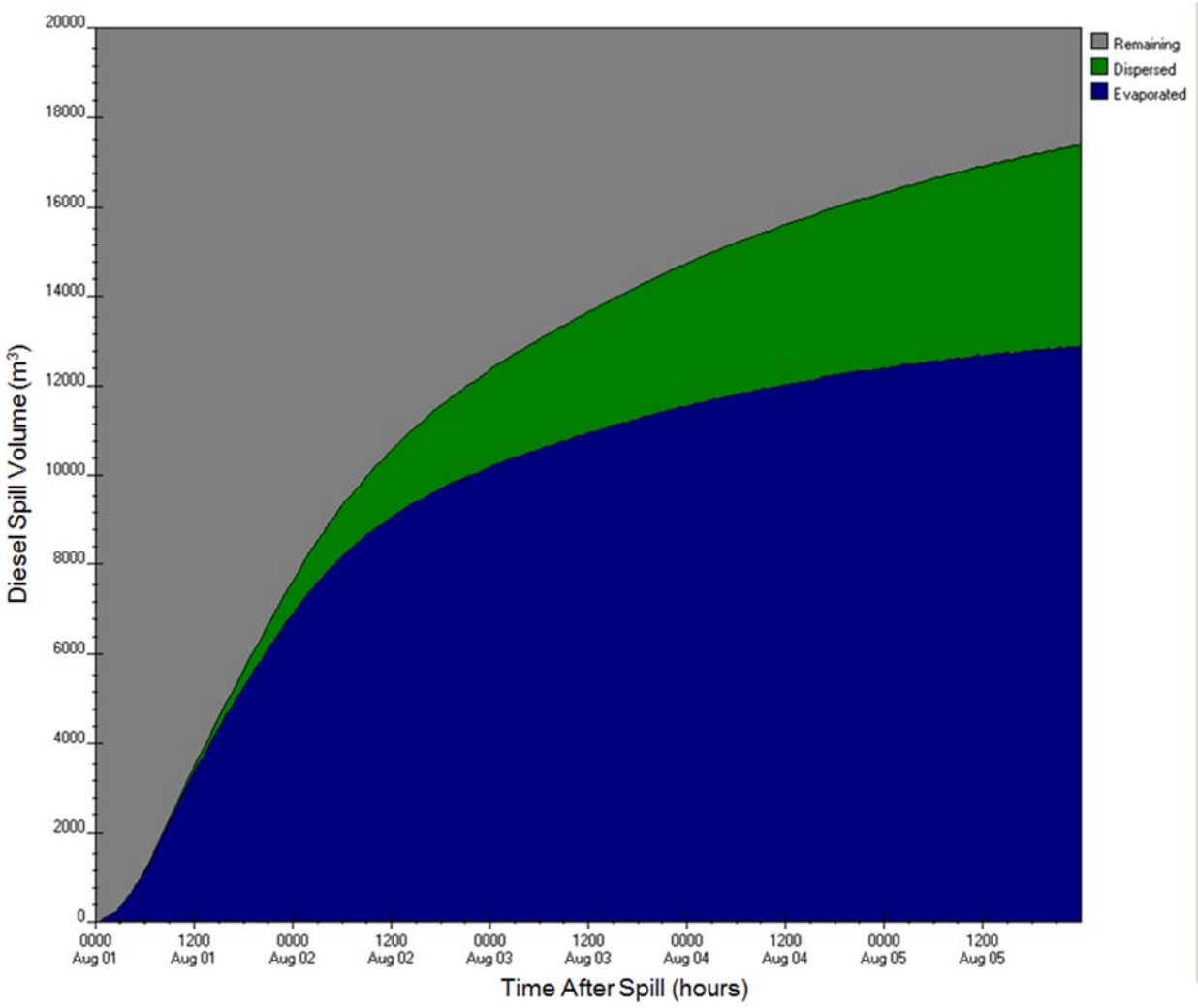

Figure E-A40: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 20,000 m^3, mean wind speed scenario

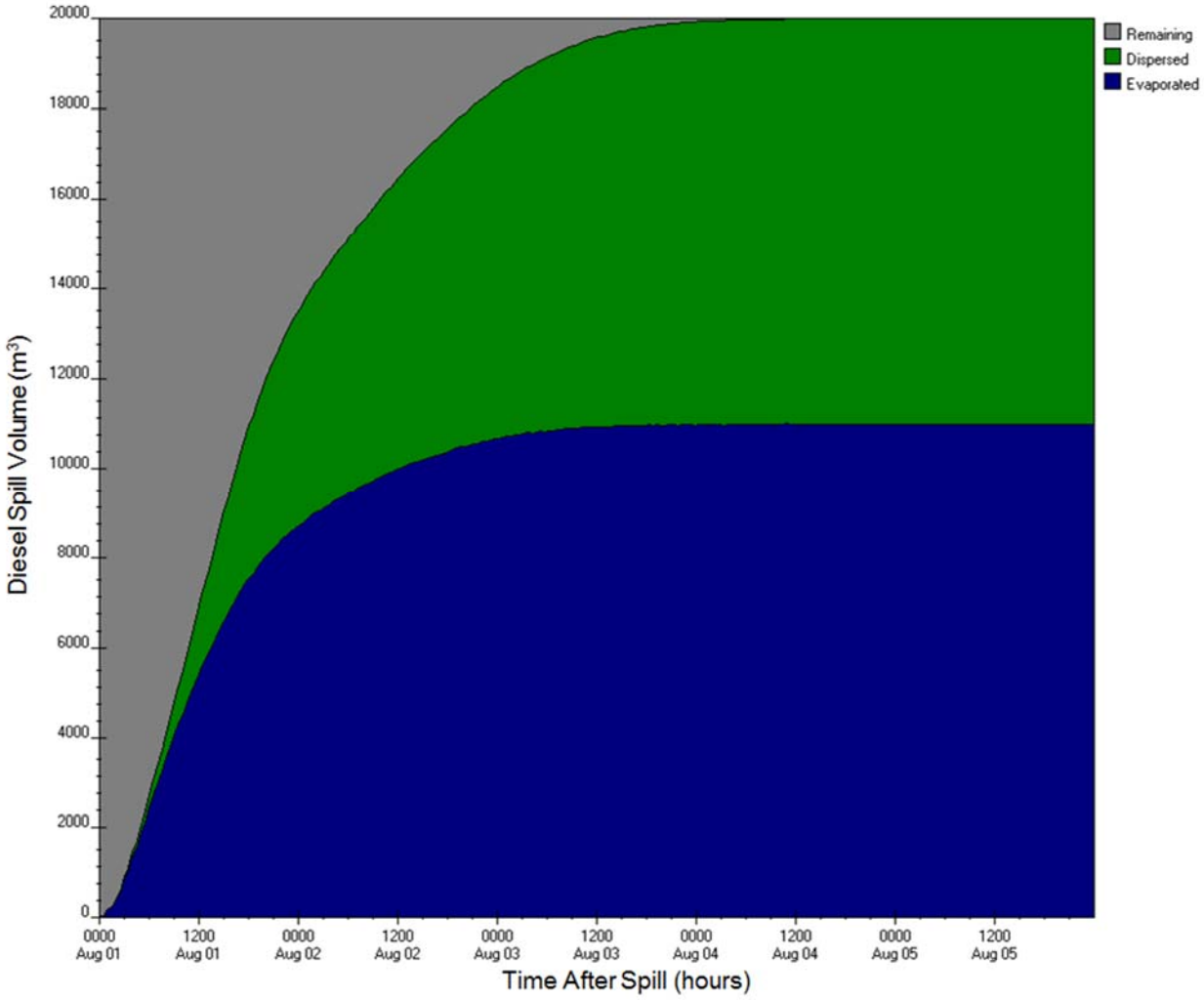

Figure E-A41: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 20,000 m^3, 2-yr wind speed scenario

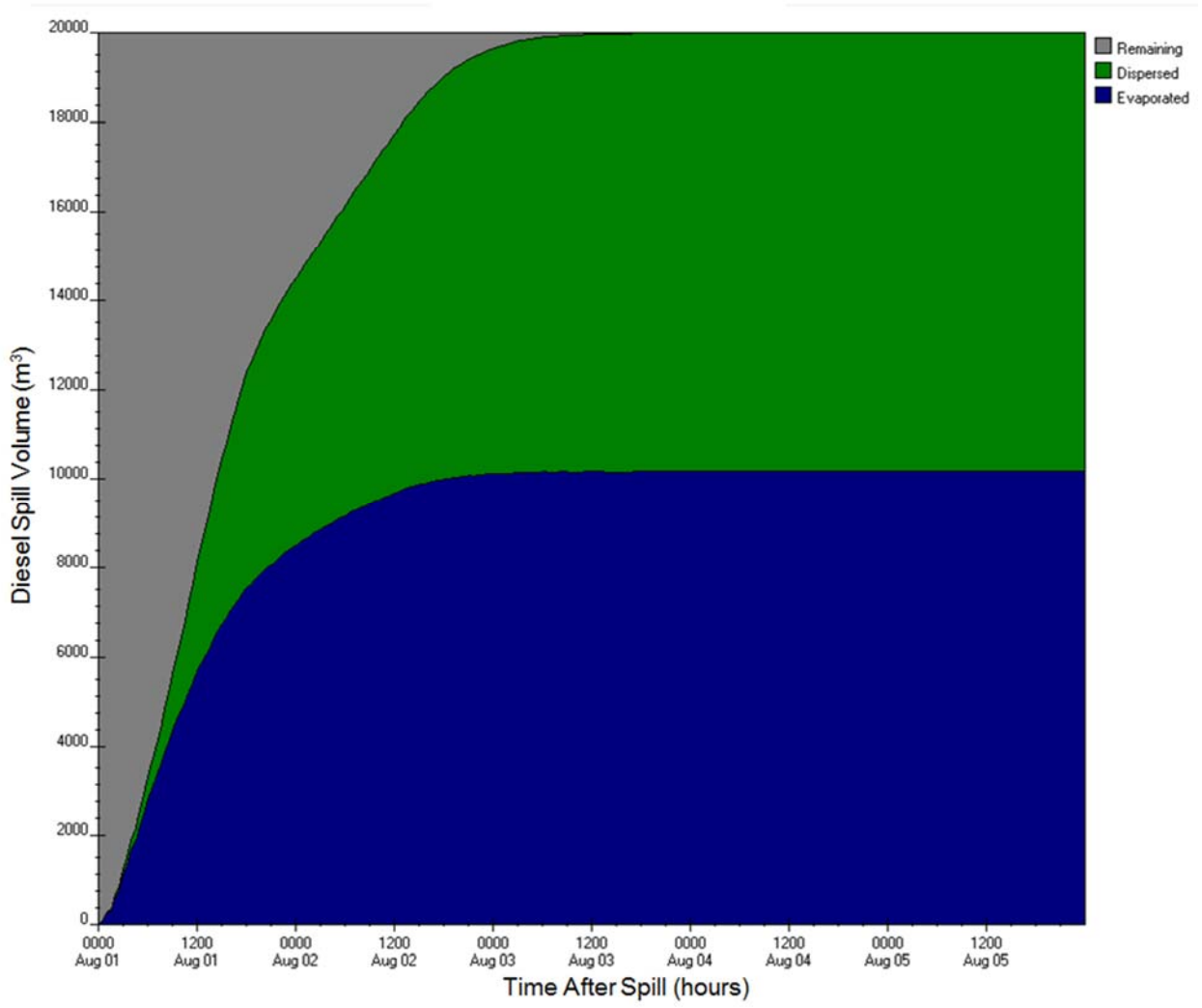

Figure E-A42: ADIOS2 diesel fuel budget output for West and East Melvin Bay stations (1A and 2A) for 20,000 m^3, 50-yr wind speed scenario

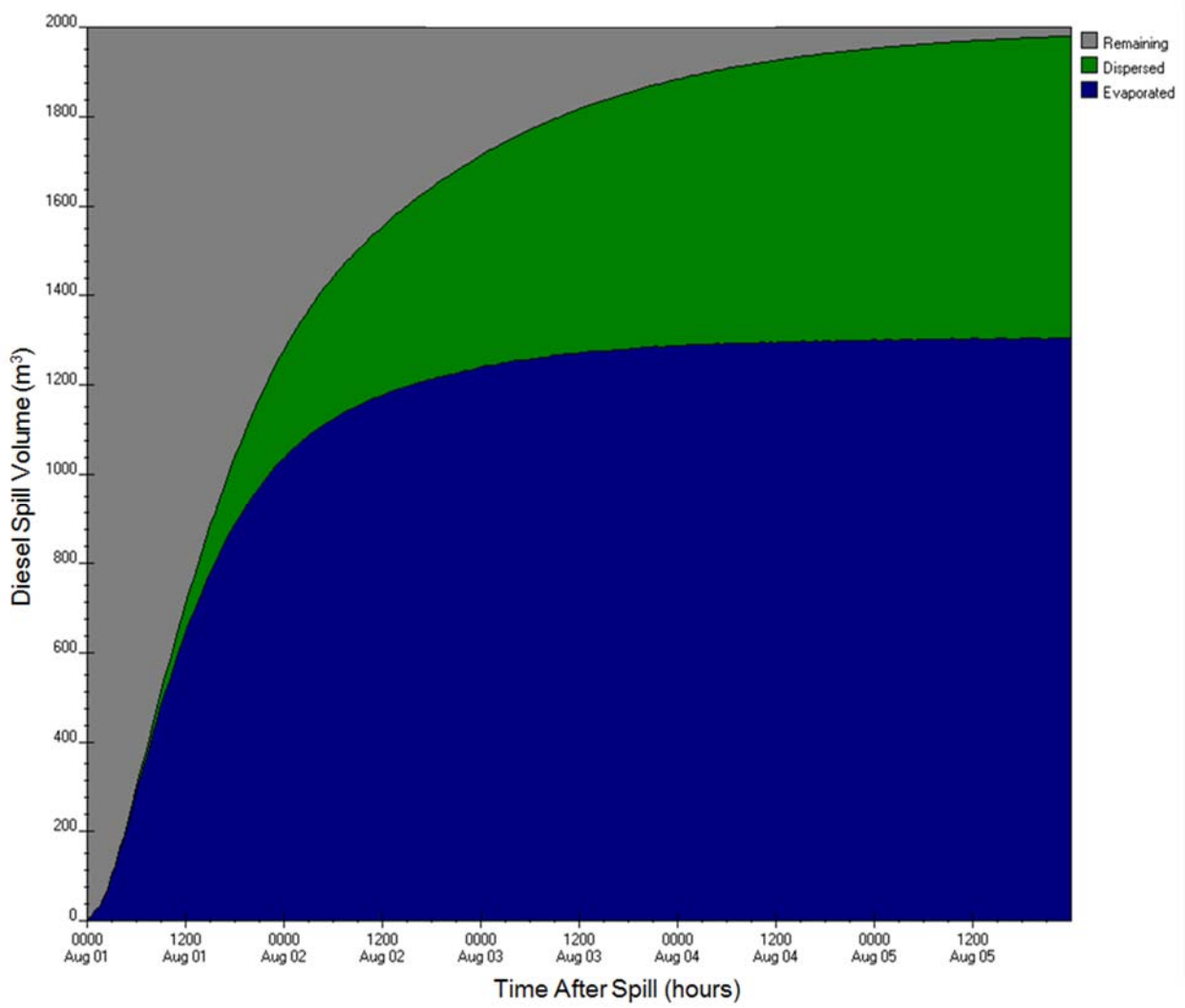

Figure E-A43: ADIOS2 diesel fuel budget output for Entrance to Melvin Bay station (3A) for 2,000 m^3, mean wind speed scenario

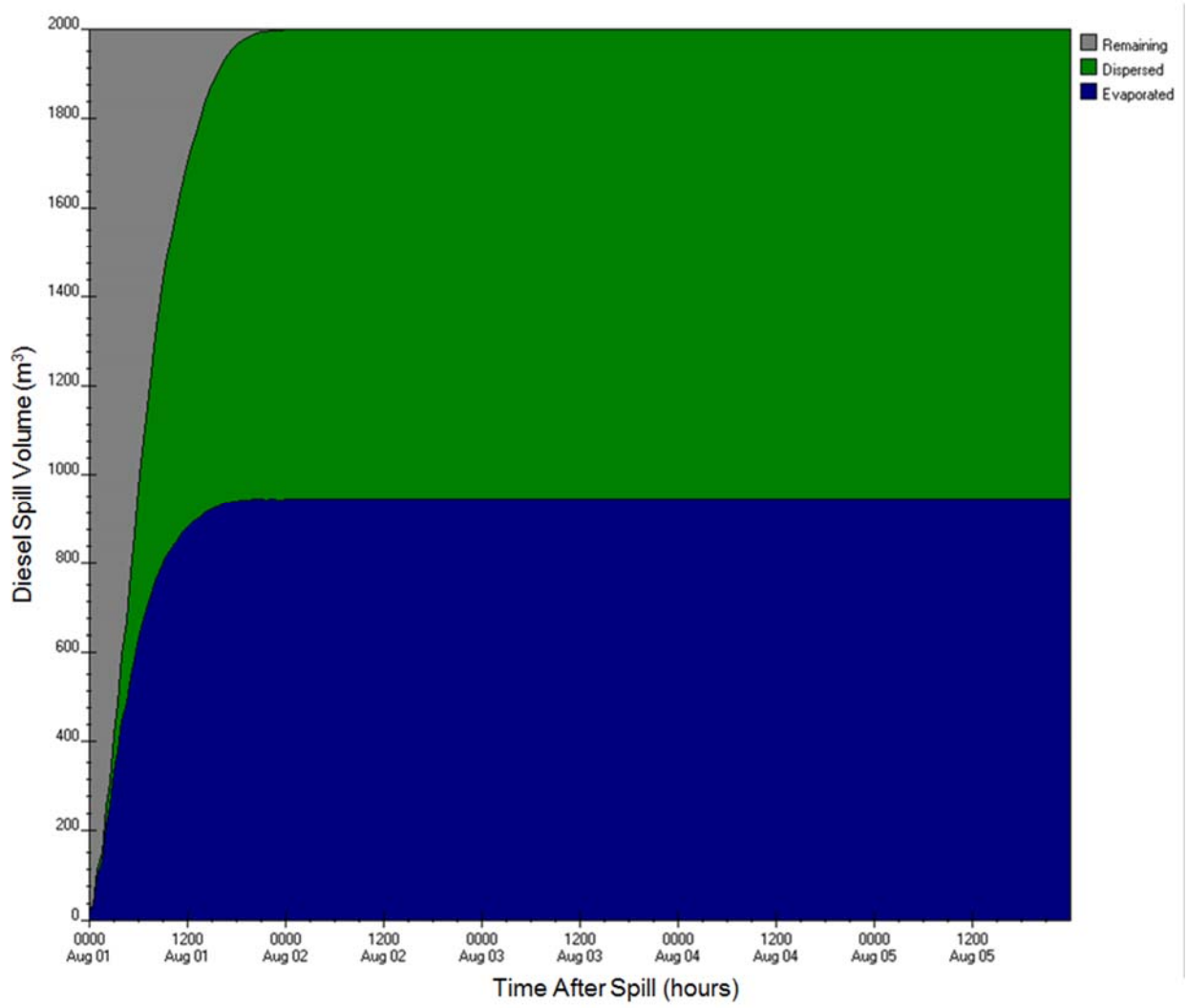

Figure E-A44: ADIOS2 diesel fuel budget output for Entrance to Melvin Bay station (3A) for 2,000 m^3, 2-yr wind speed scenario

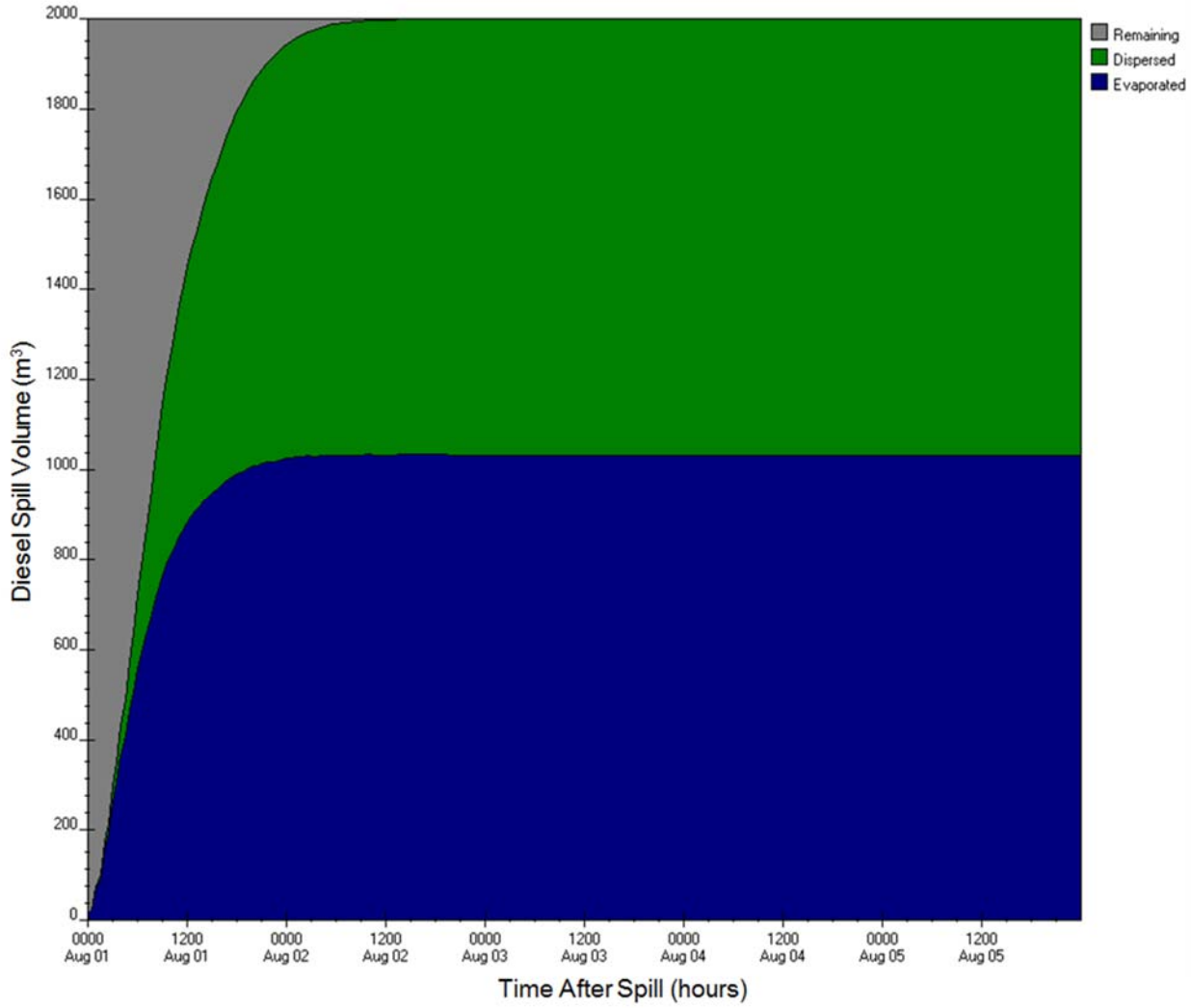

Figure E-A45: ADIOS2 diesel fuel budget output for Entrance to Melvin Bay station (3A) for 2,000 m^3, 50-yr wind speed scenario

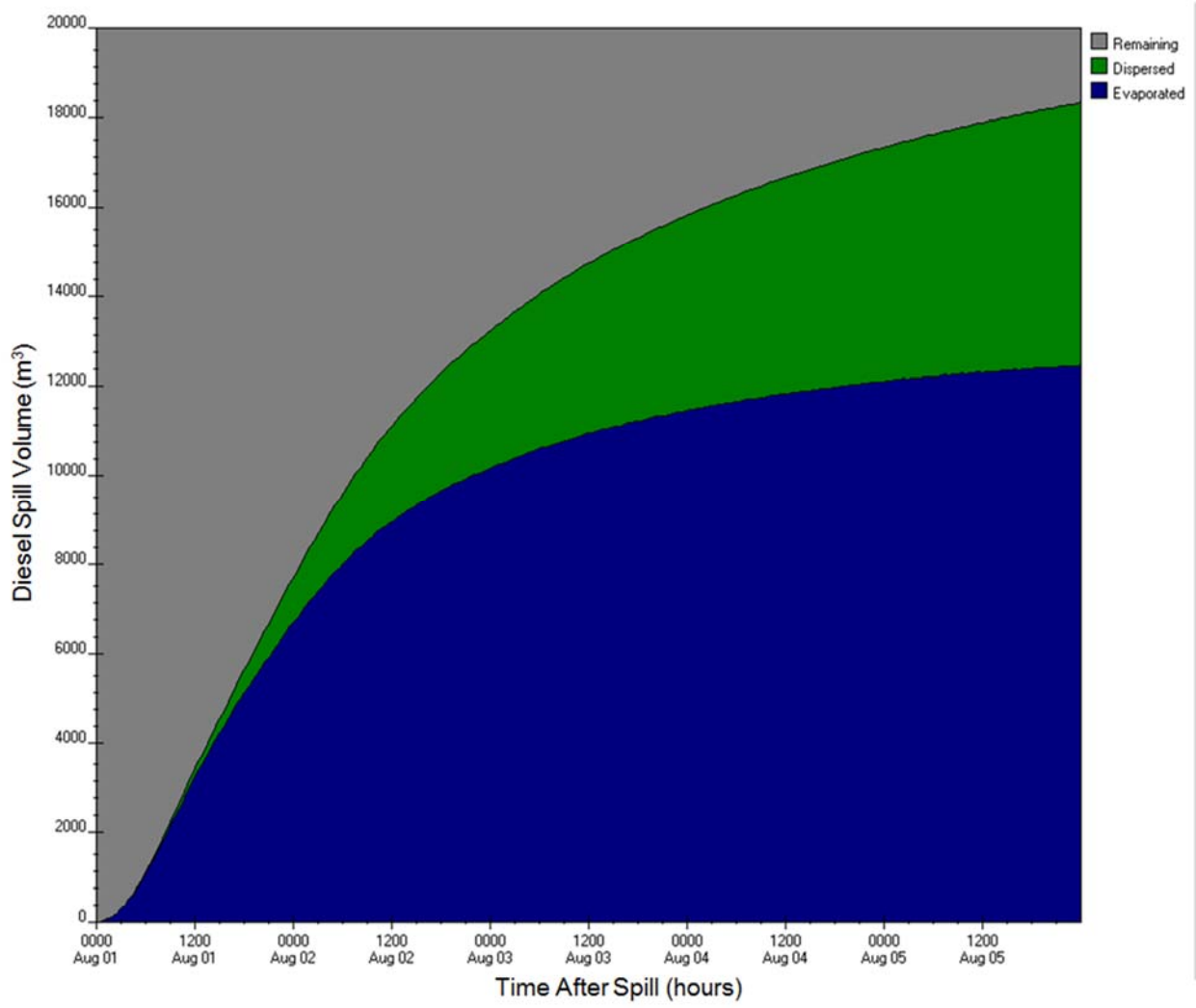

Figure E-A46: ADIOS2 diesel fuel budget output for Entrance to Melvin Bay station (3A) for 20,000 m^3, mean wind speed scenario

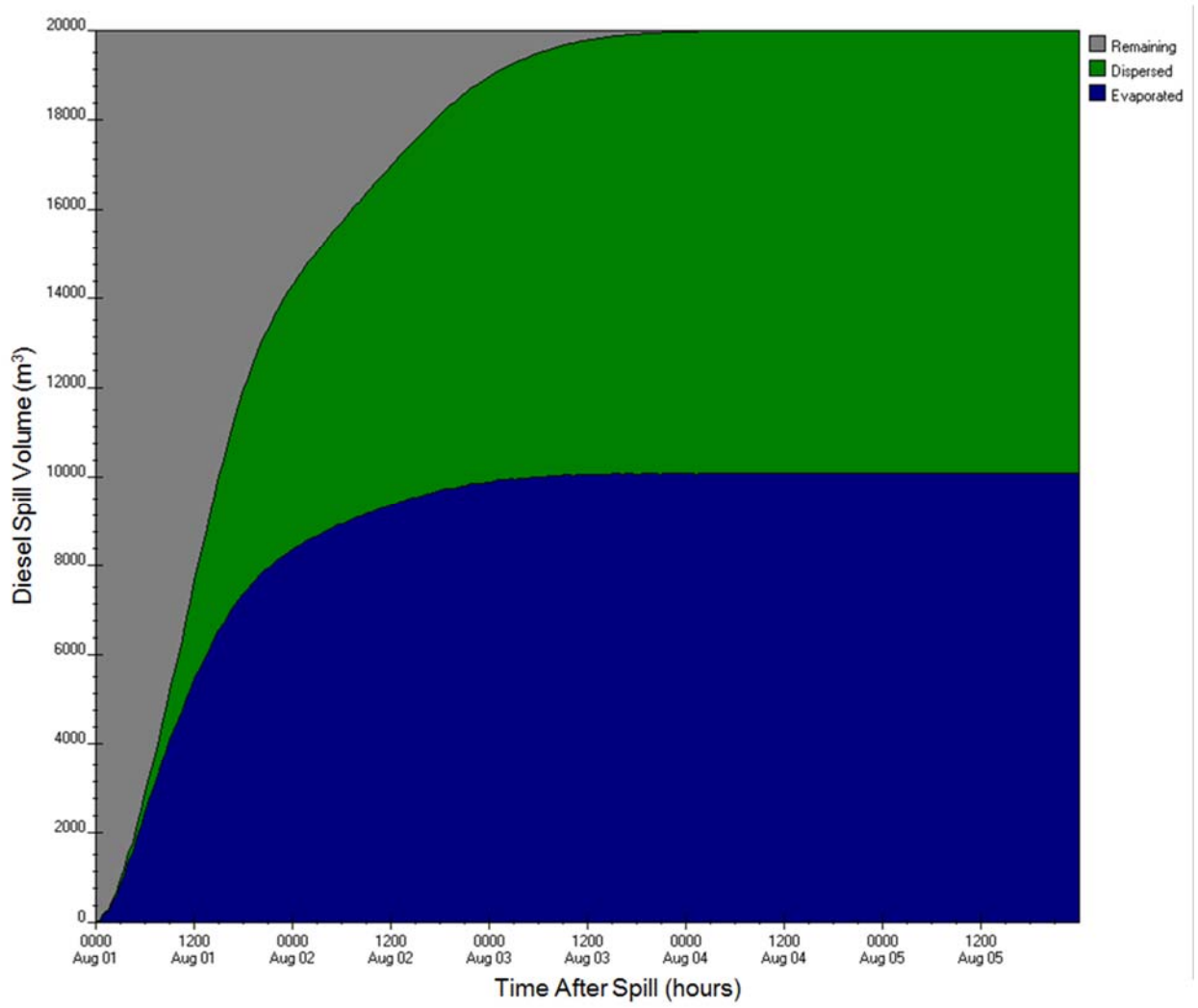

Figure E-A47: ADIOS2 diesel fuel budget output for Entrance to Melvin Bay station (3A) for 20,000 m^3, 2-yr wind speed scenario

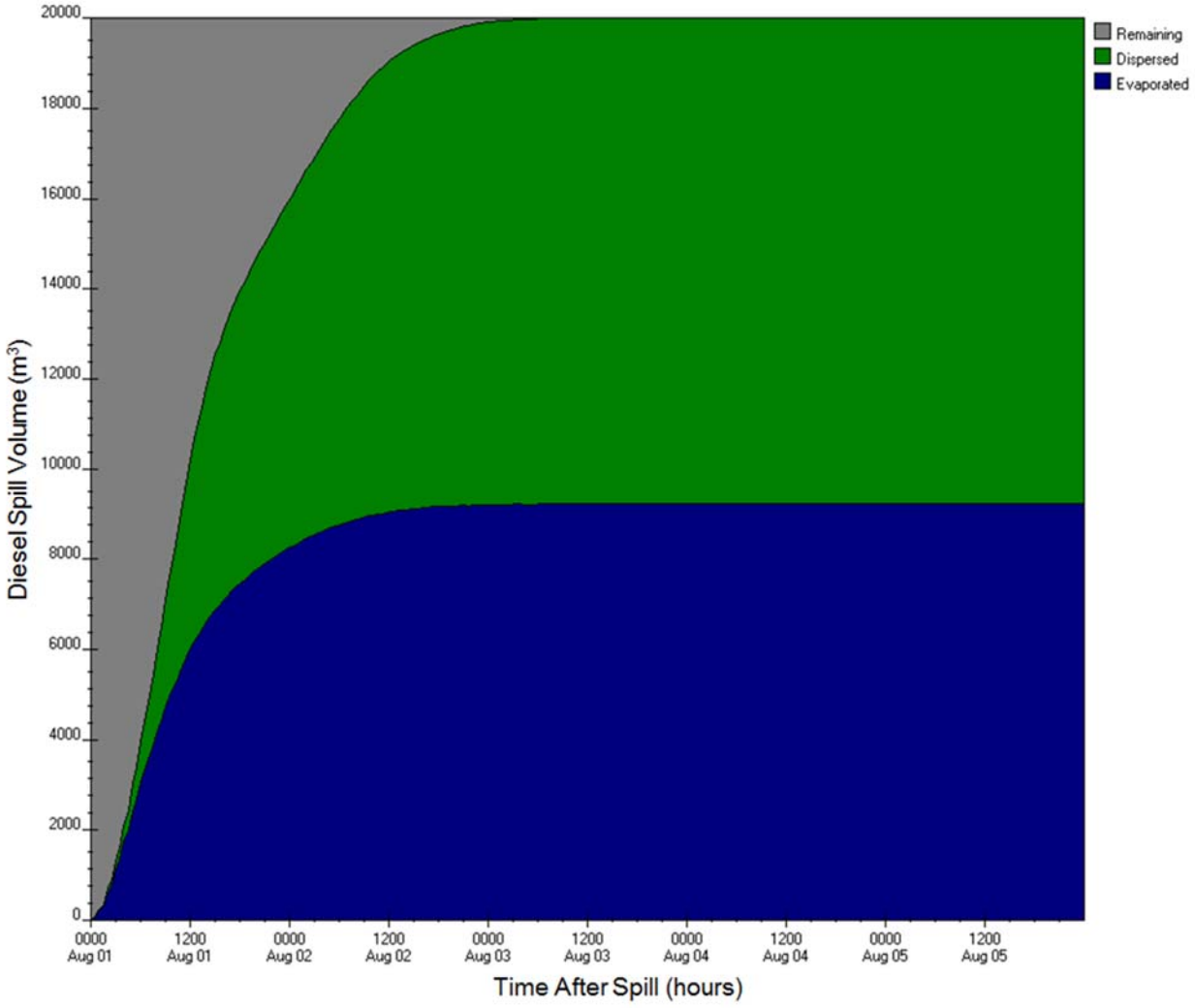

Figure E-A48: ADIOS2 diesel fuel budget output for Entrance to Melvin Bay station (3A) for 20,000 m^3, 50-yr wind speed scenario

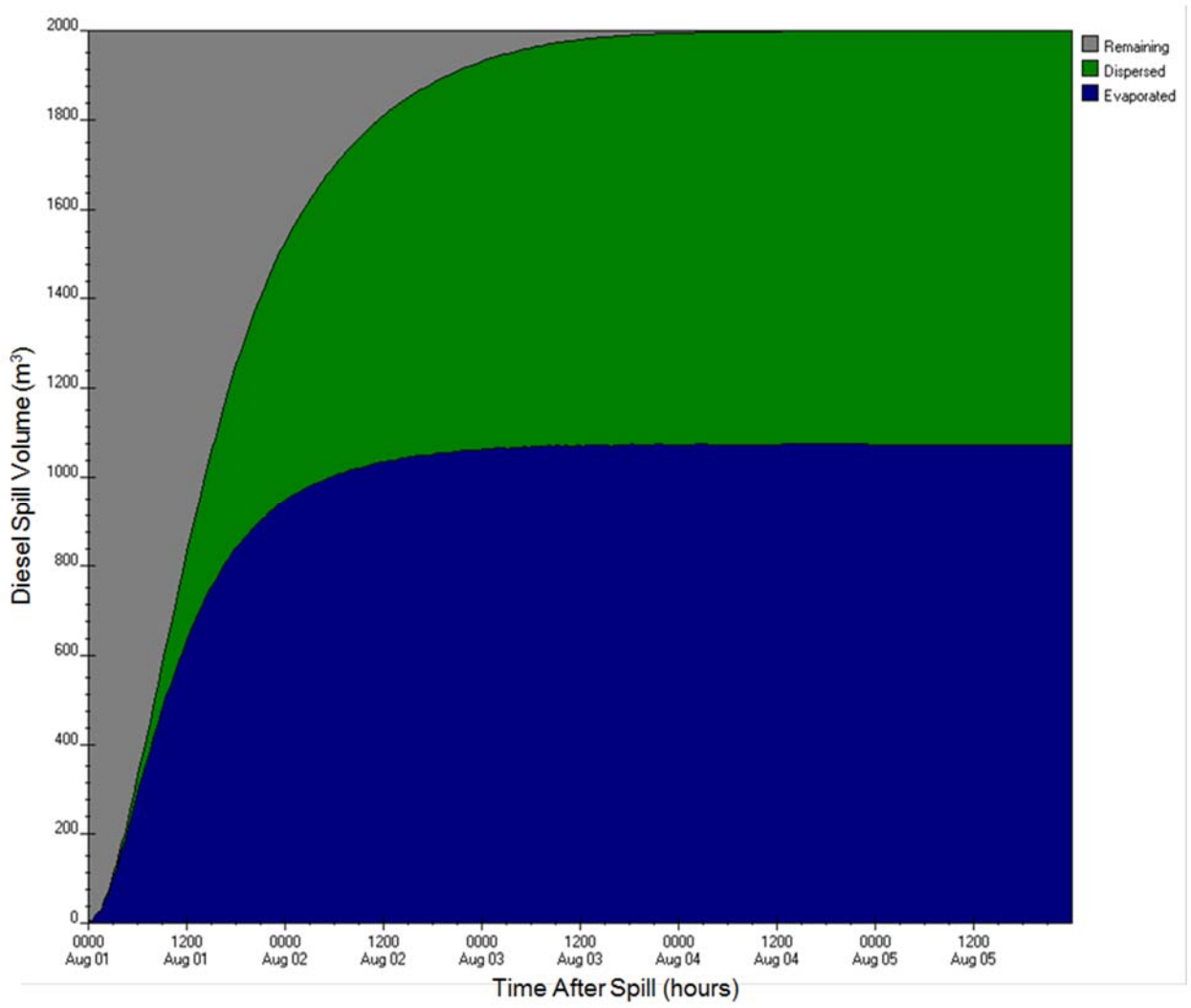

Figure E-A49: ADIOS2 diesel fuel budget output for West Hudson Bay station (4A) for 2,000 m^3, mean wind speed scenario

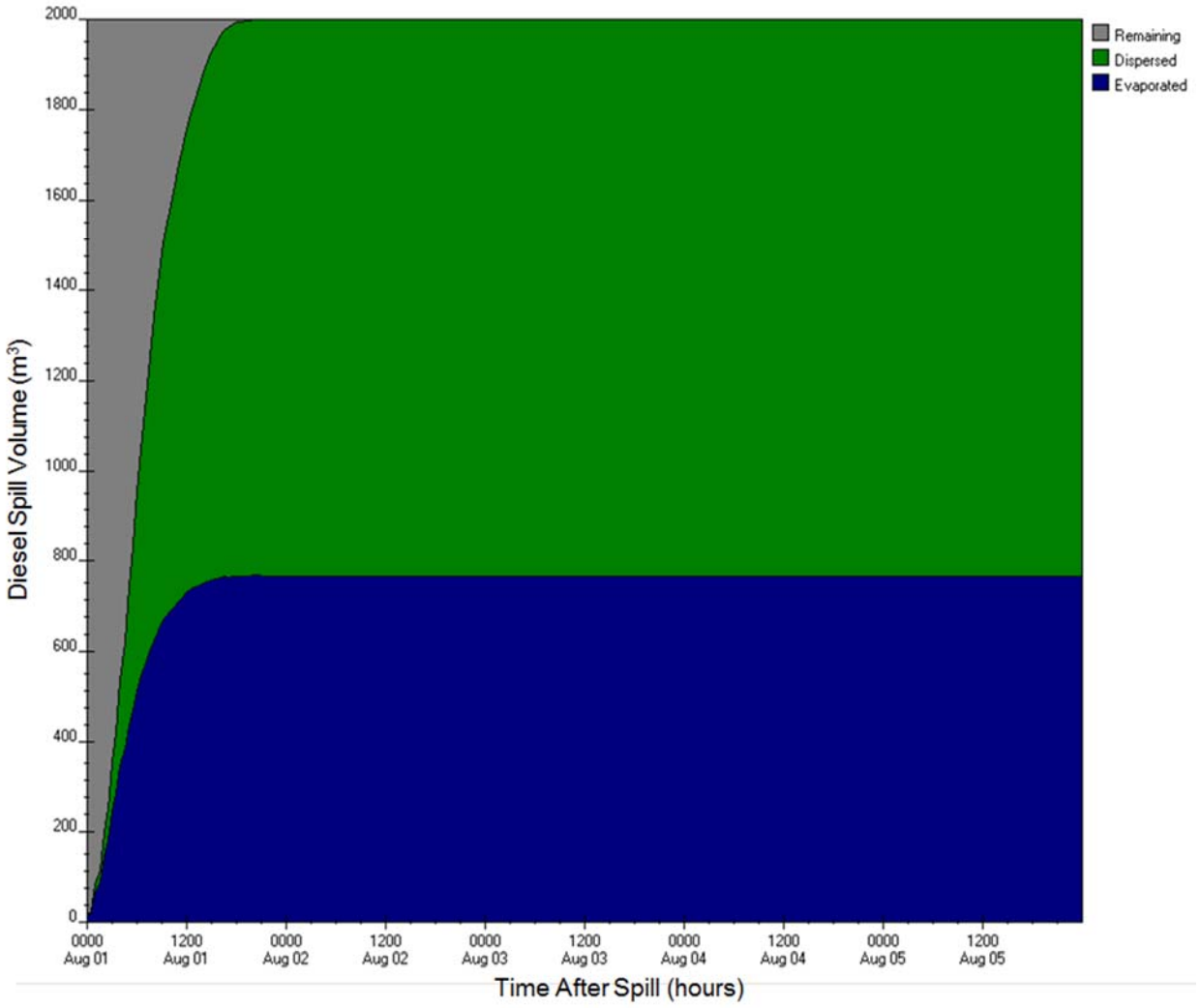

Figure E-A50: ADIOS2 diesel fuel budget output for West Hudson Bay station (4A) for 2,000 m^3, 2-yr wind speed scenario

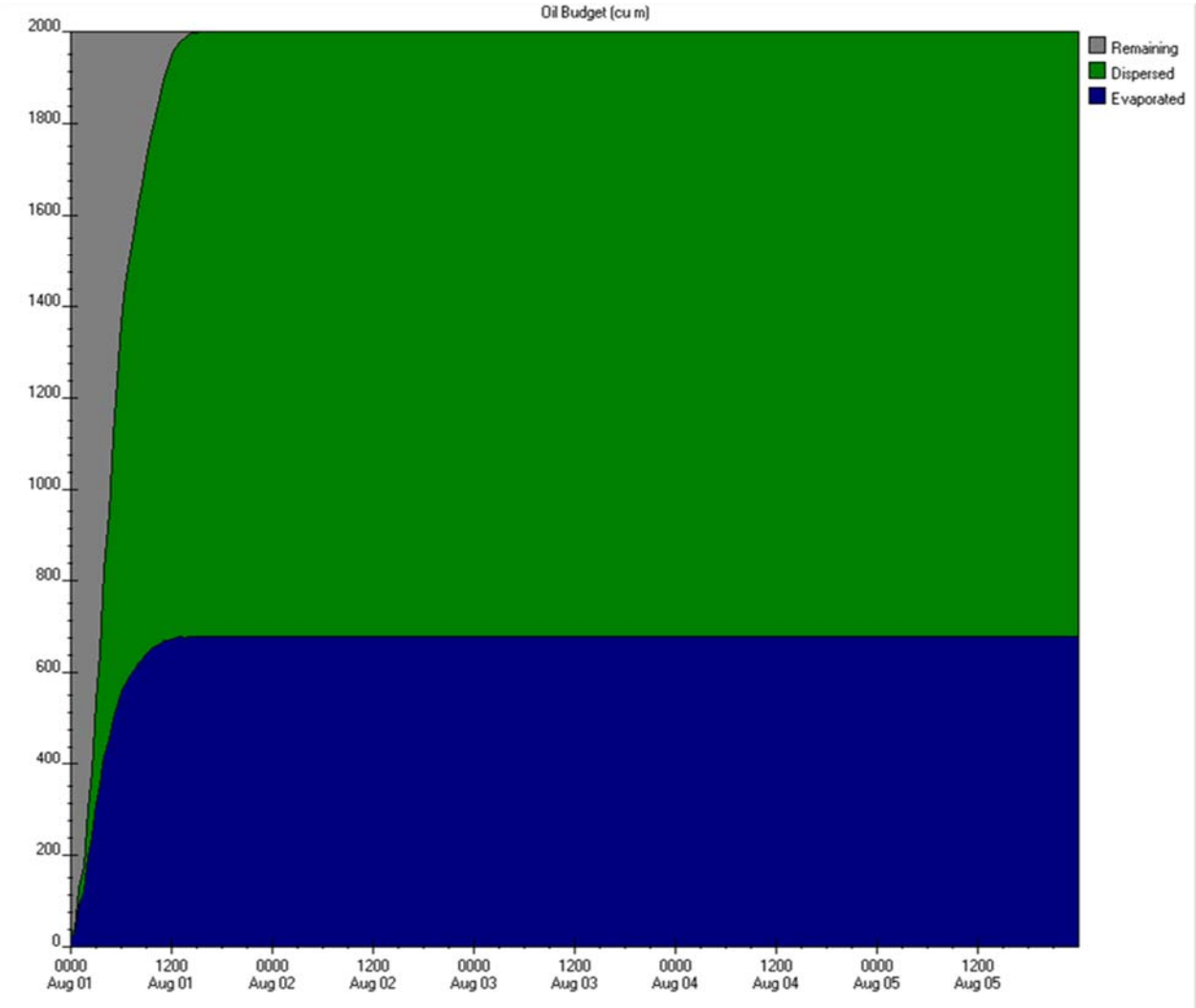

Figure E-A51: ADIOS2 diesel fuel budget output for West Hudson Bay station (4A) for 2,000 m^3, 50-yr wind speed scenario

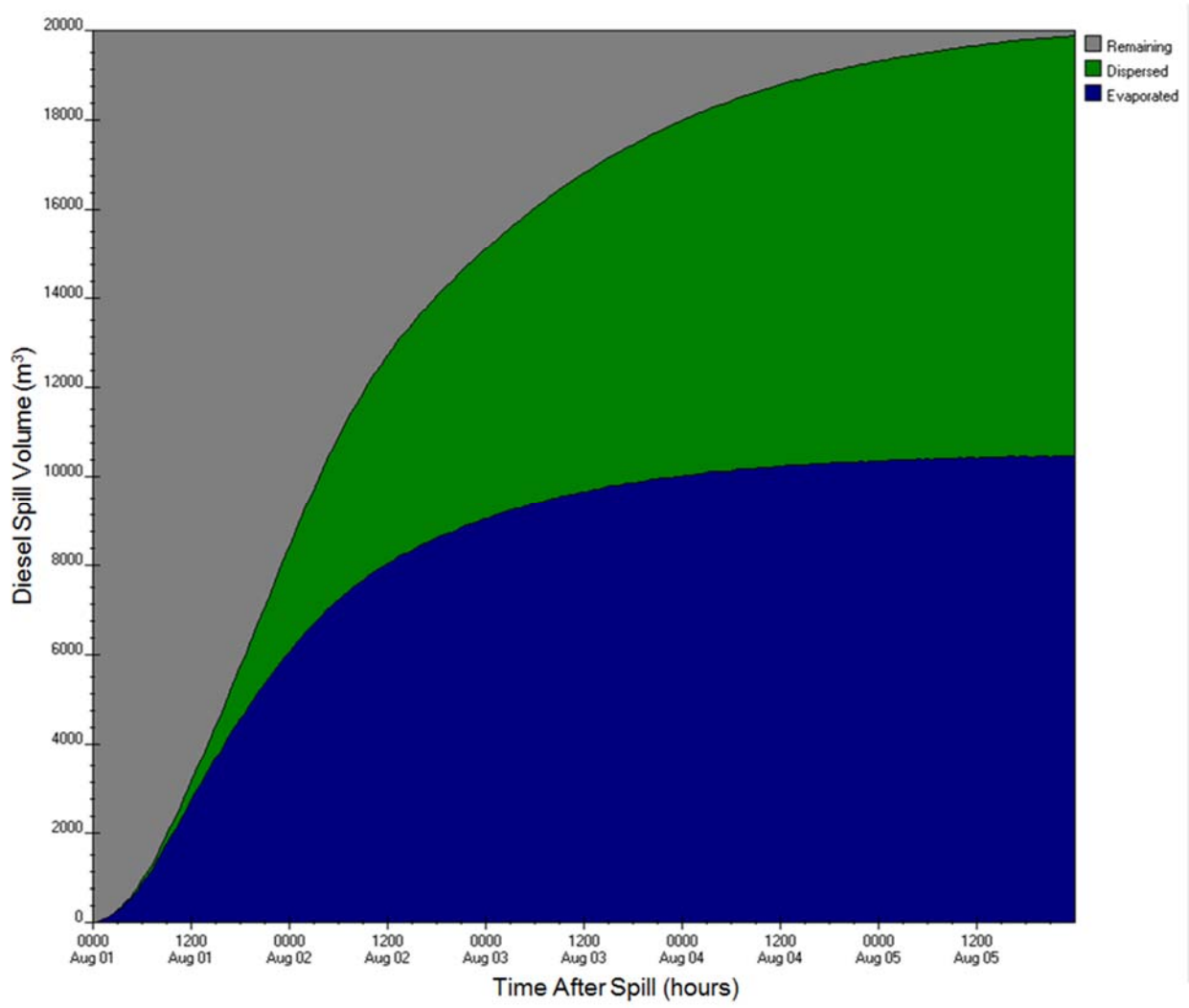

Figure E-A52: ADIOS2 diesel fuel budget output for West Hudson Bay station (4A) for 20,000 m^3, mean wind speed scenario

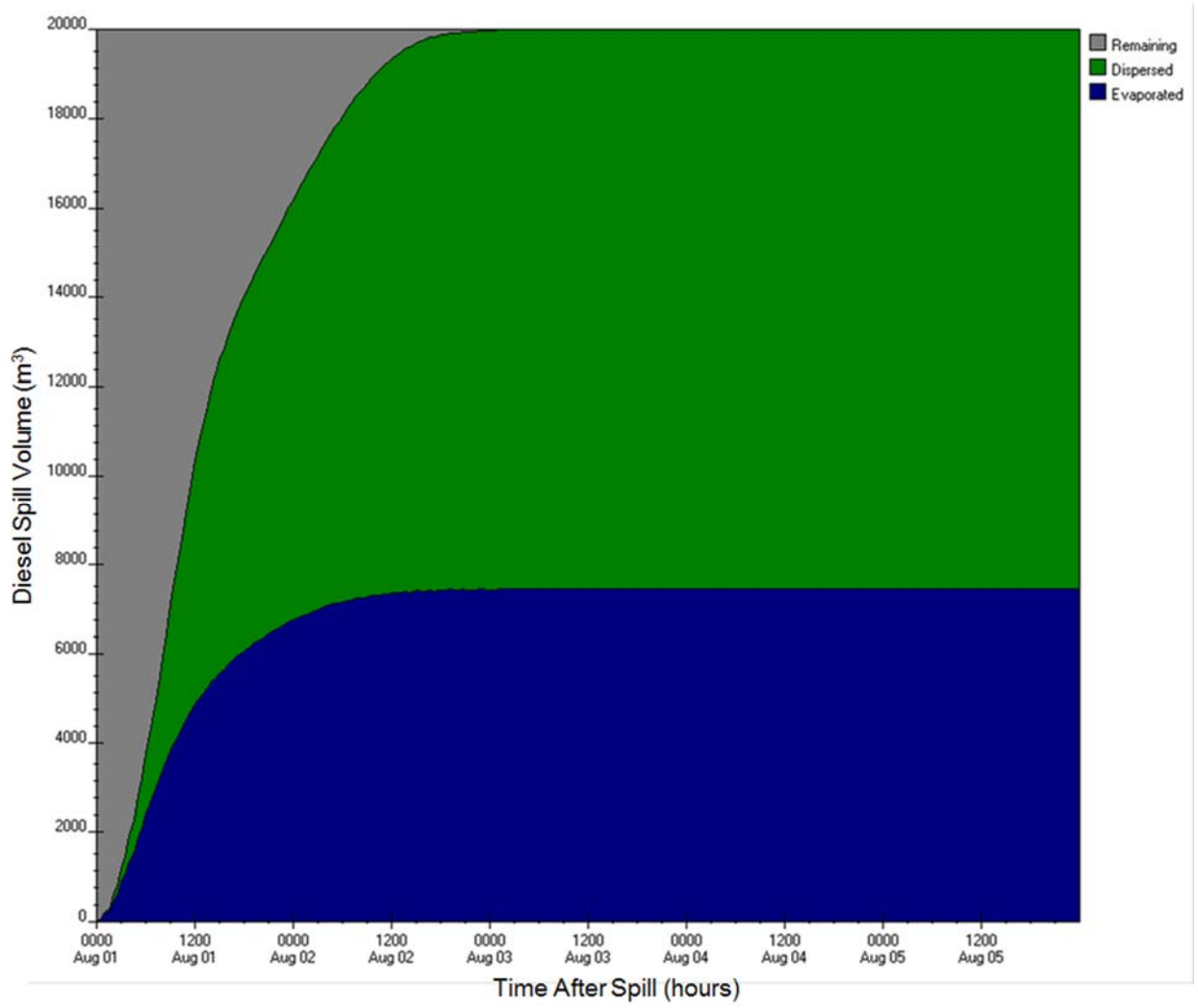

Figure E-A53: ADIOS2 diesel fuel budget output for West Hudson Bay station (4A) for 20,000 m^3, 2-yr wind speed scenario

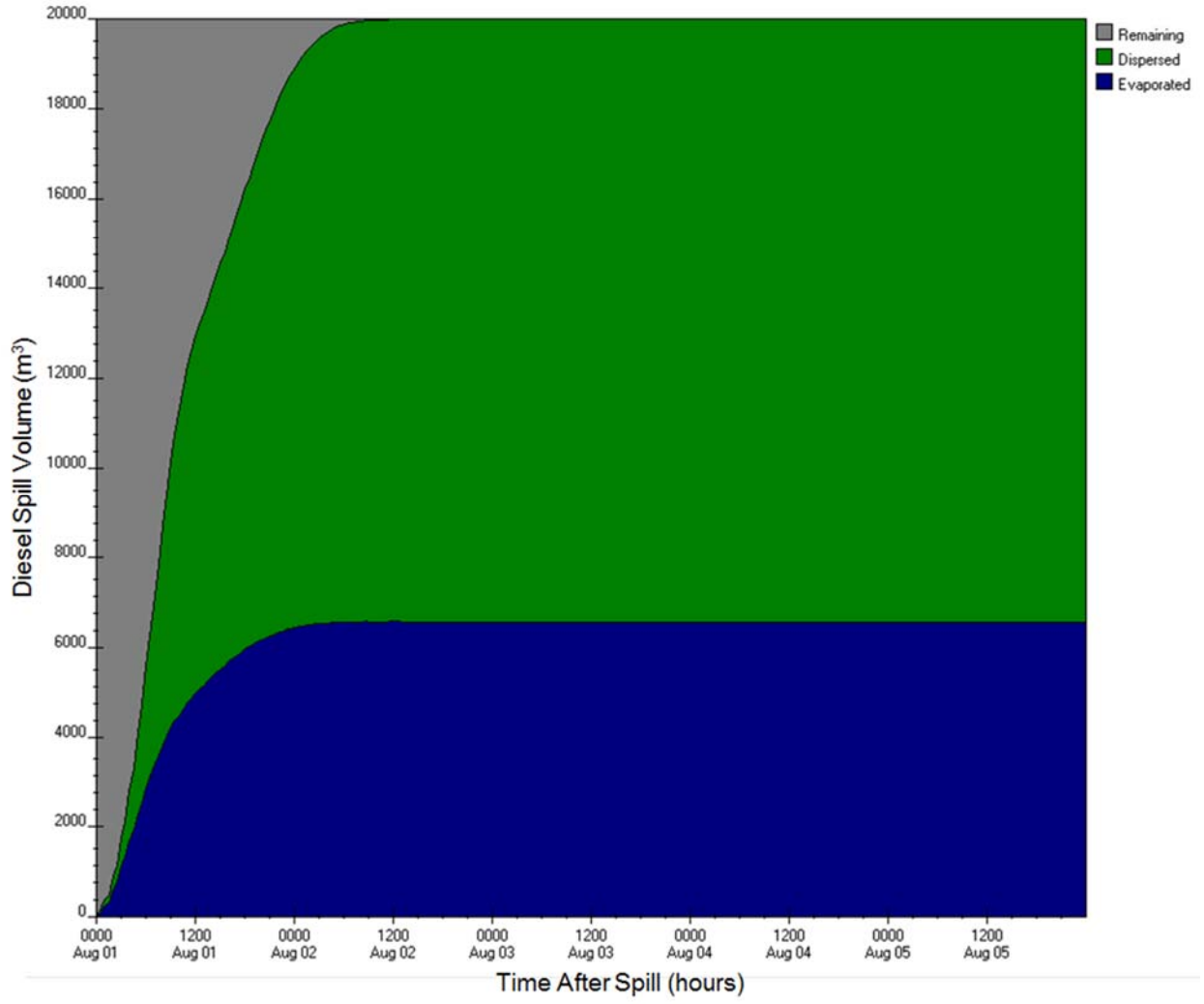

Figure E-A54: ADIOS2 diesel fuel budget output for West Hudson Bay station (4A) for 20,000 m^3, 50-yr wind speed scenario

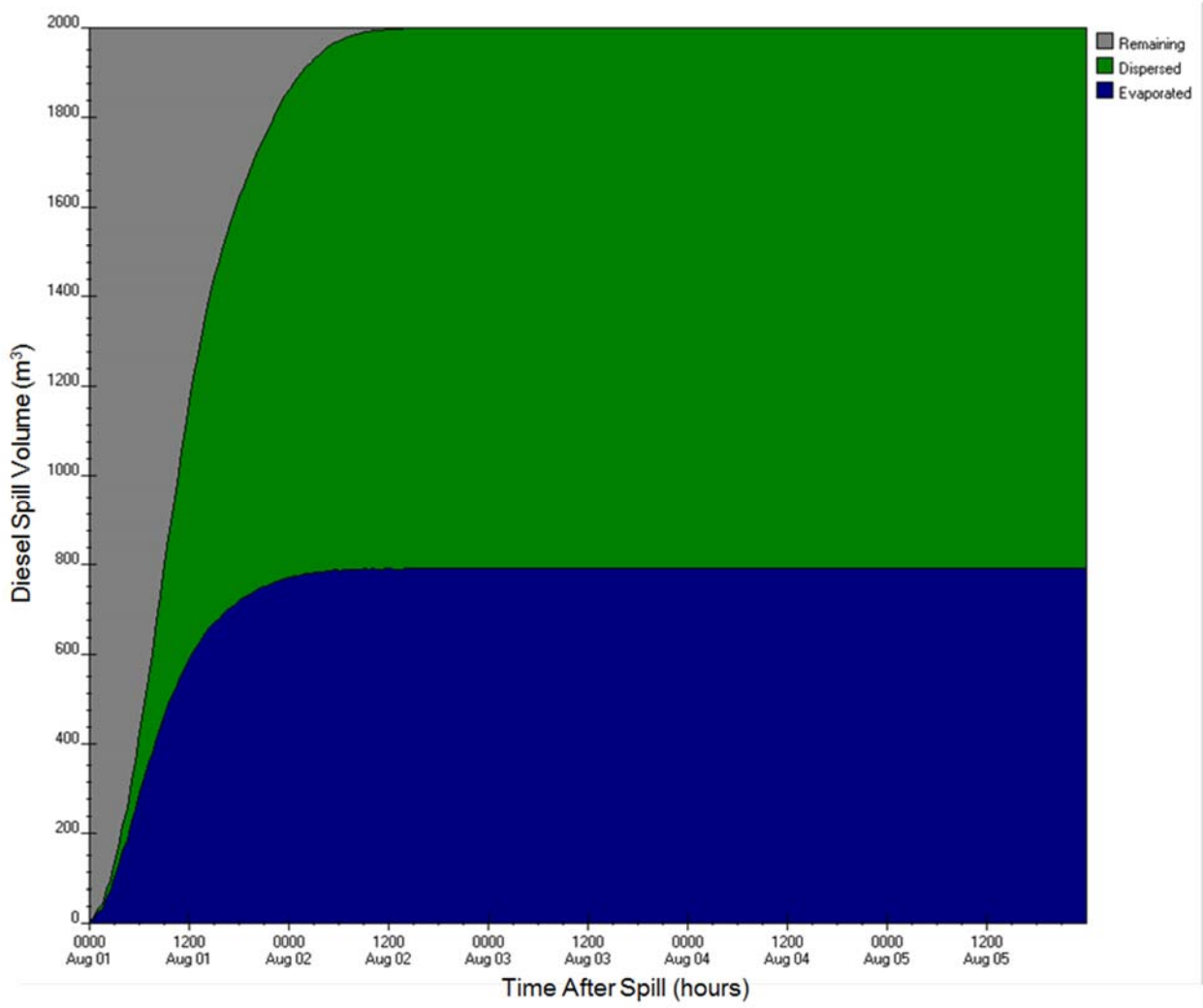

Figure E-A55: ADIOS2 diesel fuel budget output for Hudson Bay crossing station (5A) for 2,000 m^3, mean wind speed scenario

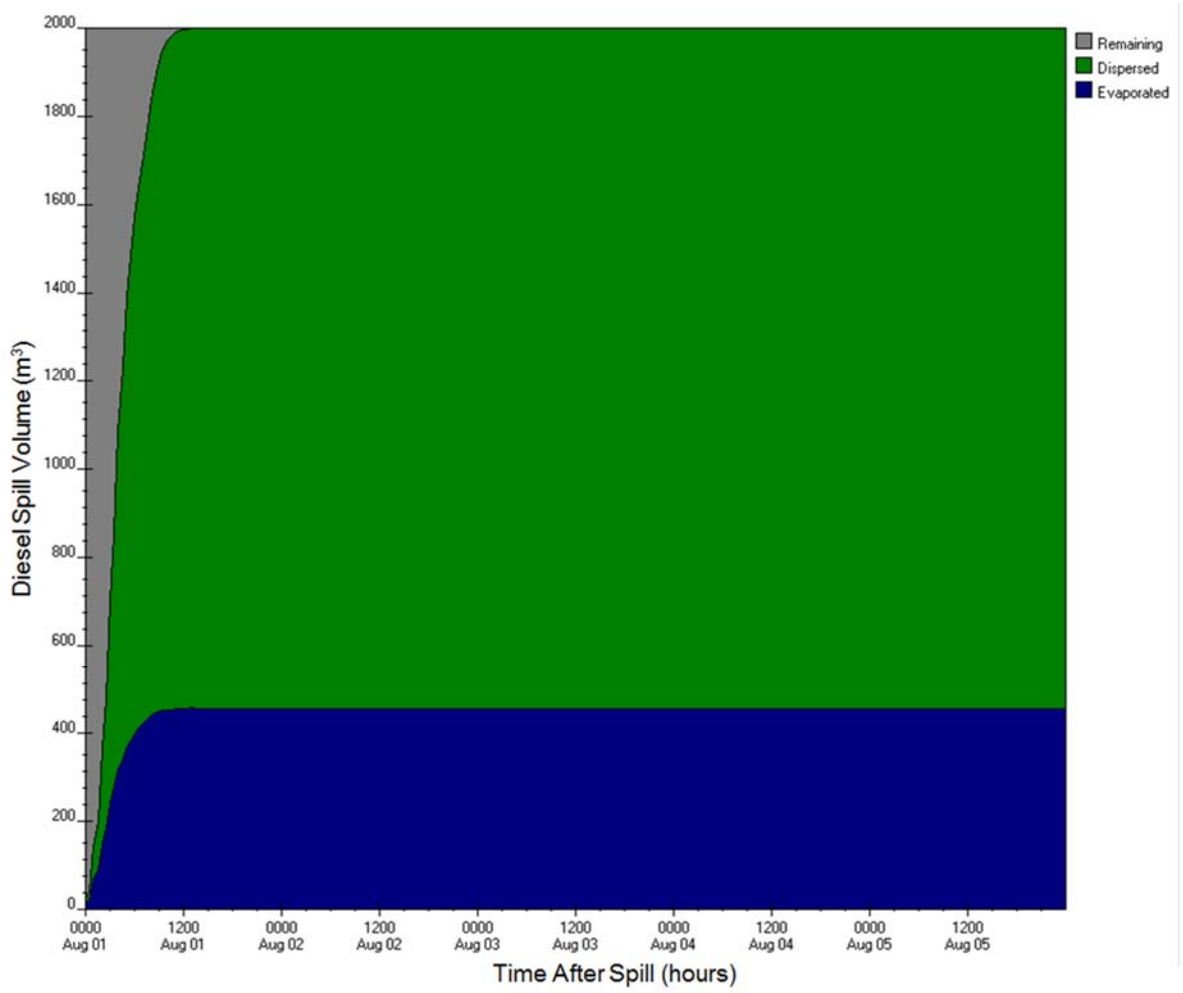

Figure E-A56: ADIOS2 diesel fuel budget output for Hudson Bay crossing station (5A) for 2,000 m^3, 2-yr wind speed scenario

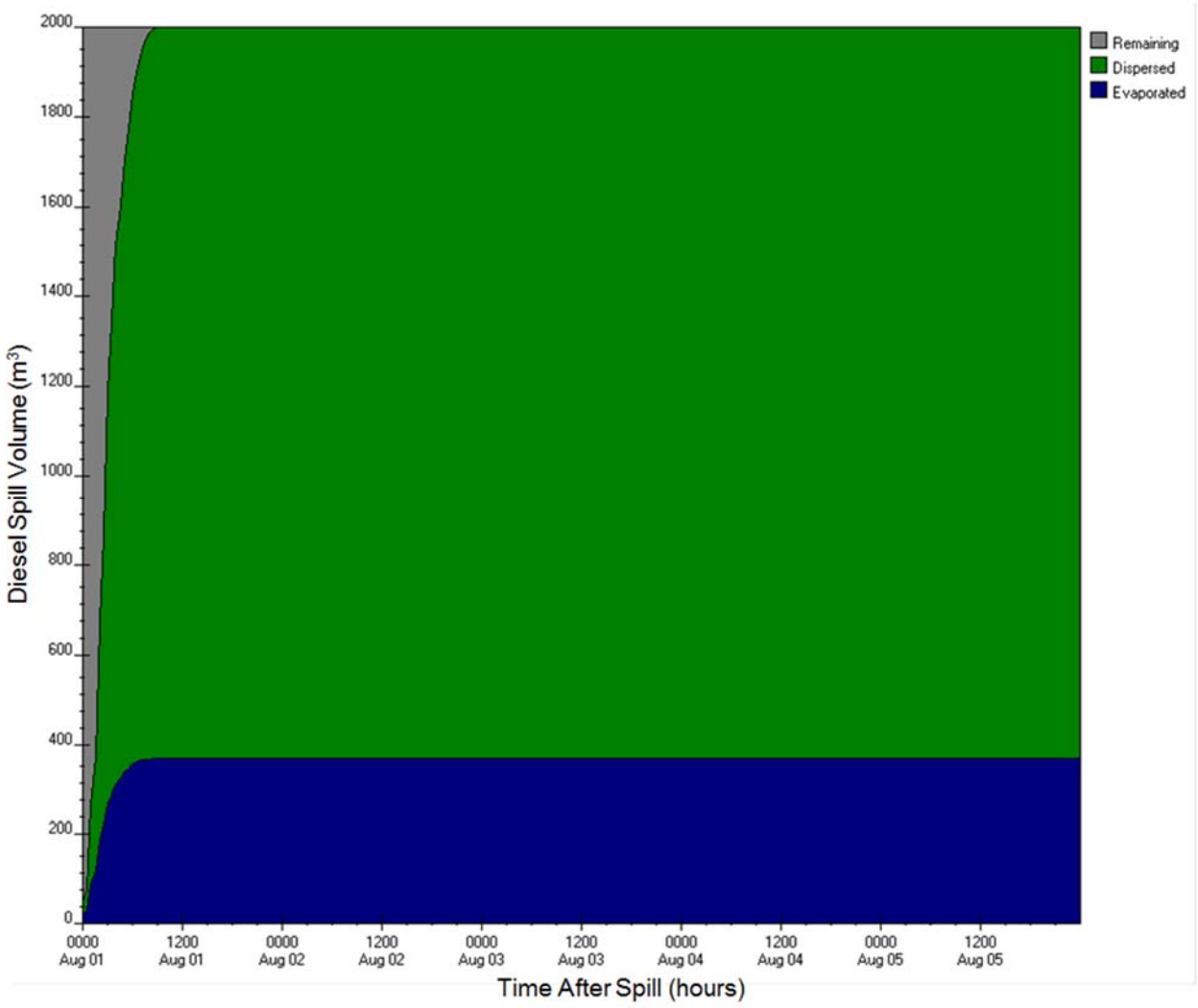

Figure E-A57: ADIOS2 diesel fuel budget output for Hudson Bay crossing station (5A) for 2,000 m^3, 50-yr wind speed scenario

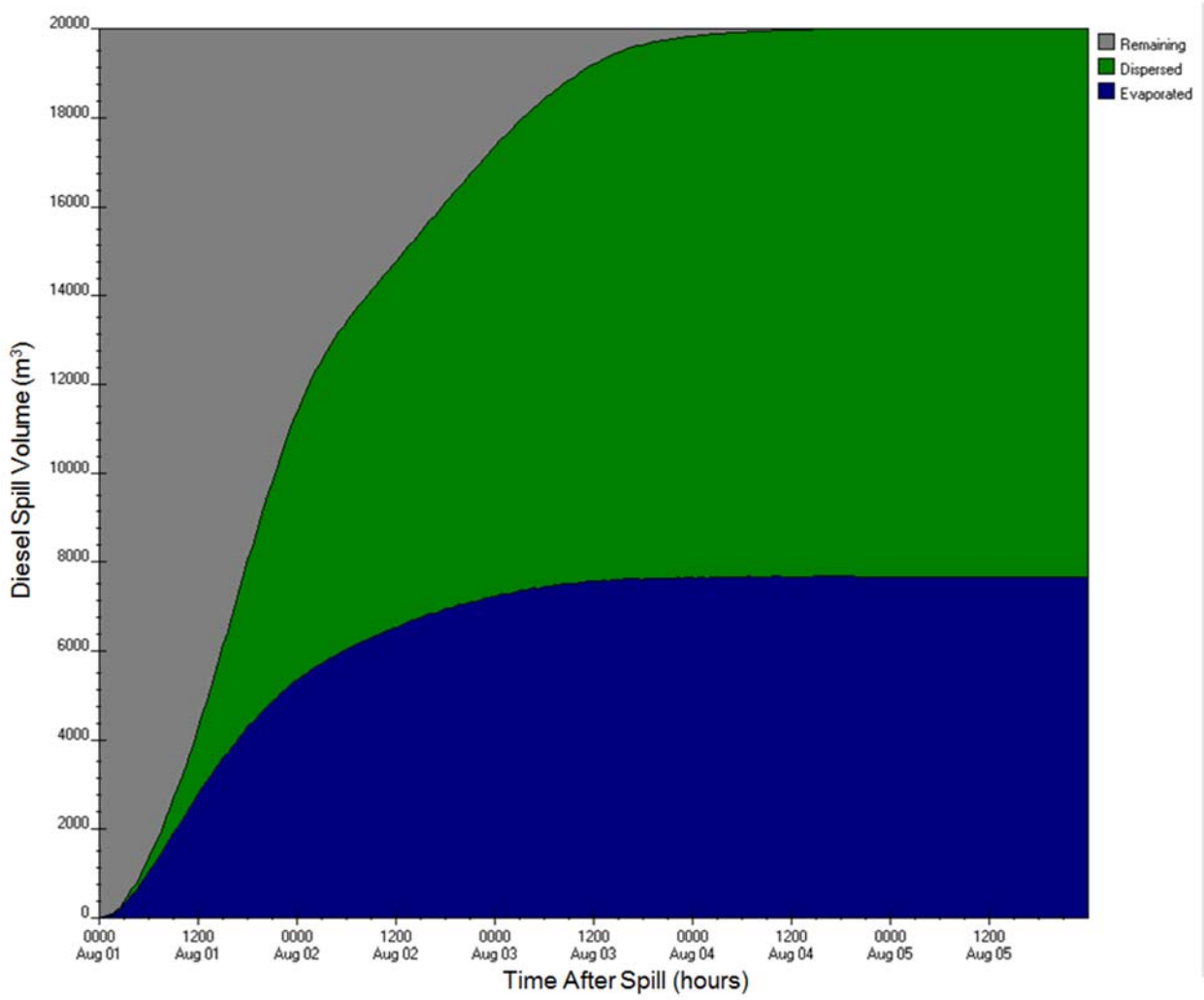

Figure E-A58: ADIOS2 diesel fuel budget output for Hudson Bay crossing station (5A) for 20,000 m^3, mean wind speed scenario

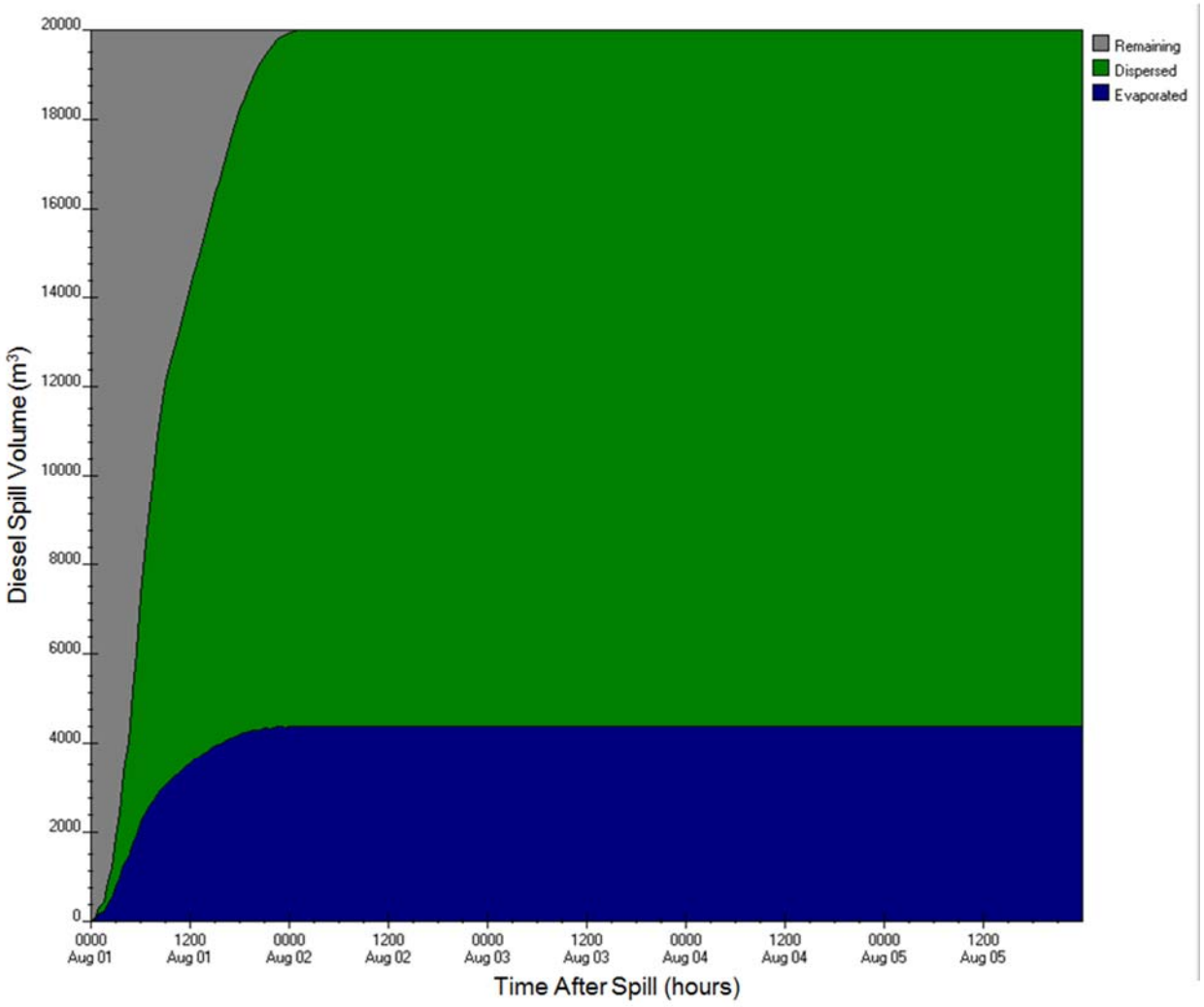

Figure E-A59: ADIOS2 diesel fuel budget output for Hudson Bay crossing station (5A) for 20,000 m^3, 2-yr wind speed scenario

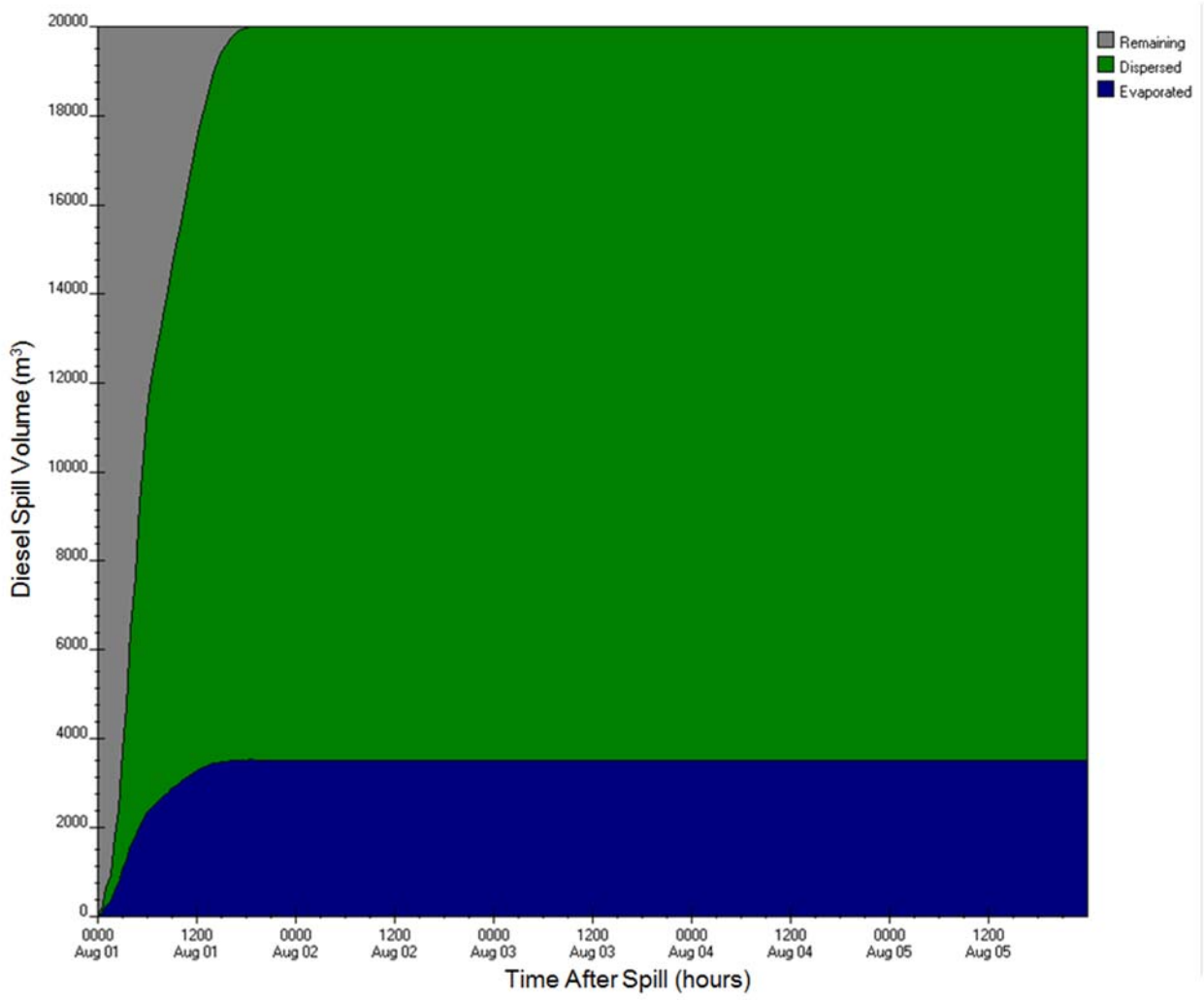

Figure E-A60: ADIOS2 diesel fuel budget output for Hudson Bay crossing station (5A) for 20,000 m^3, 50-yr wind speed scenario

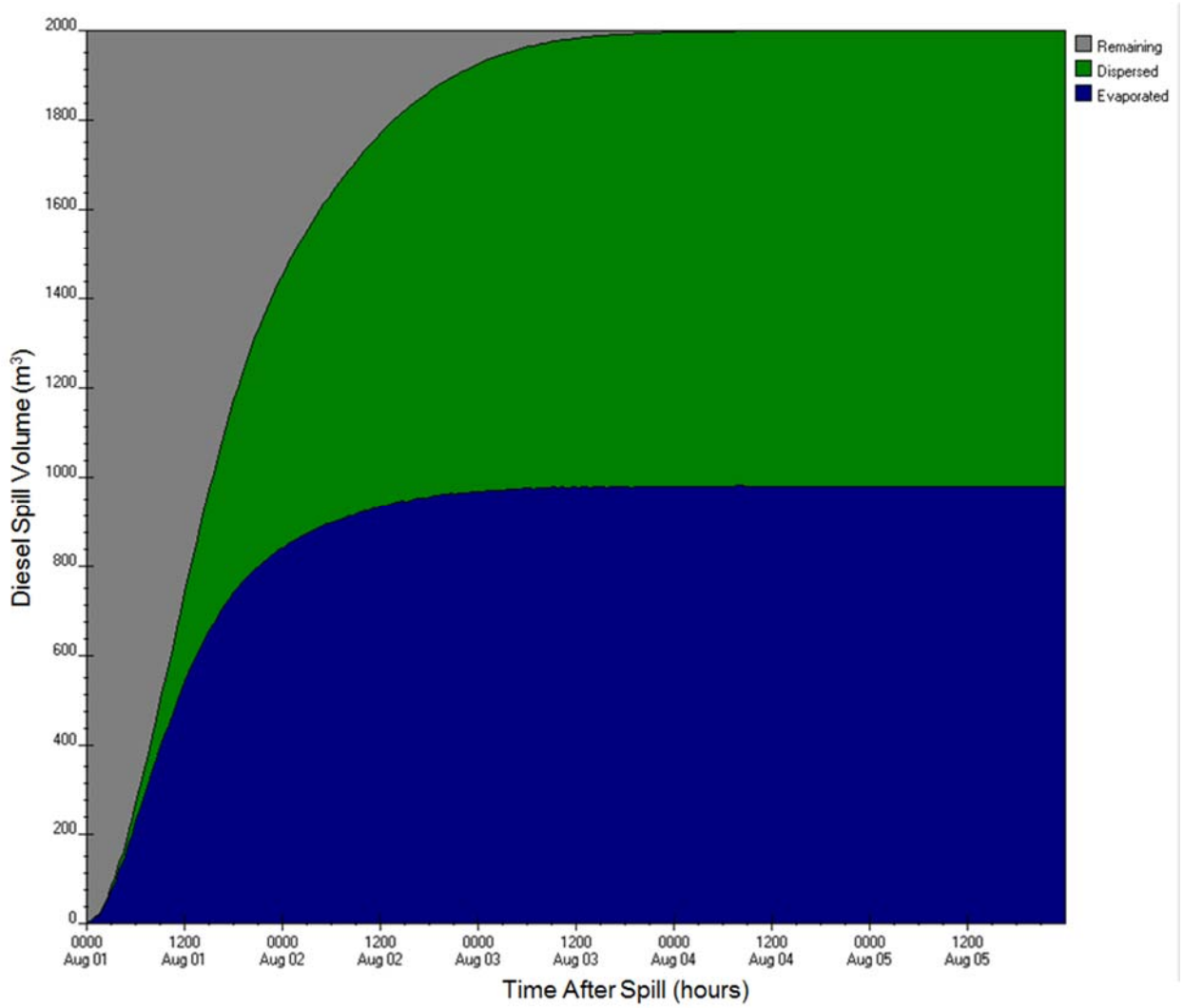

Figure E-A61: ADIOS2 diesel fuel budget output for Western Hudson Strait, Charles Island station (6A) for 2,000 m^3, mean wind speed scenario

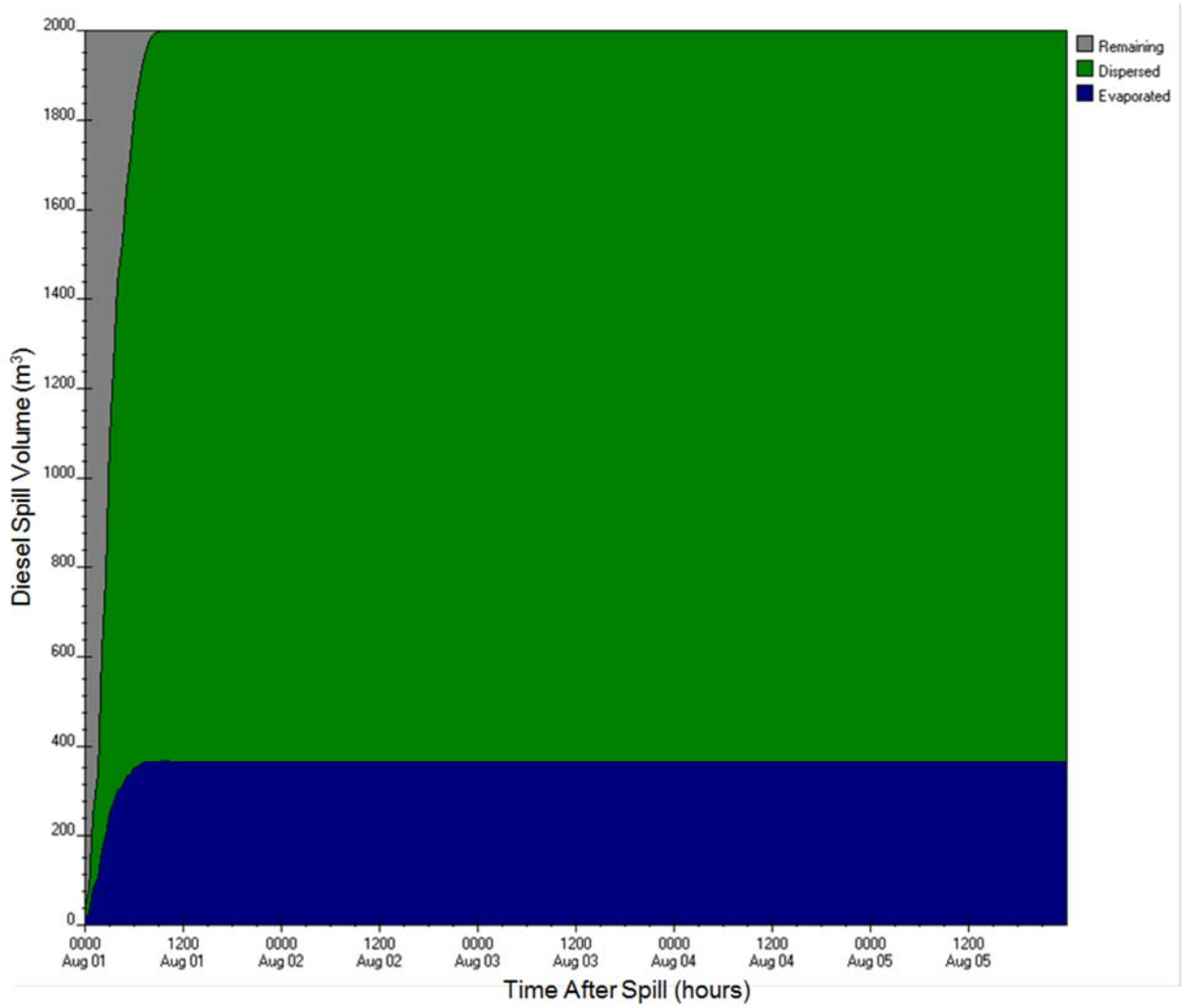

Figure E-A62: ADIOS2 diesel fuel budget output for Western Hudson Strait, Charles Island station (6A) for 2,000 m^3, 2-yr wind speed scenario

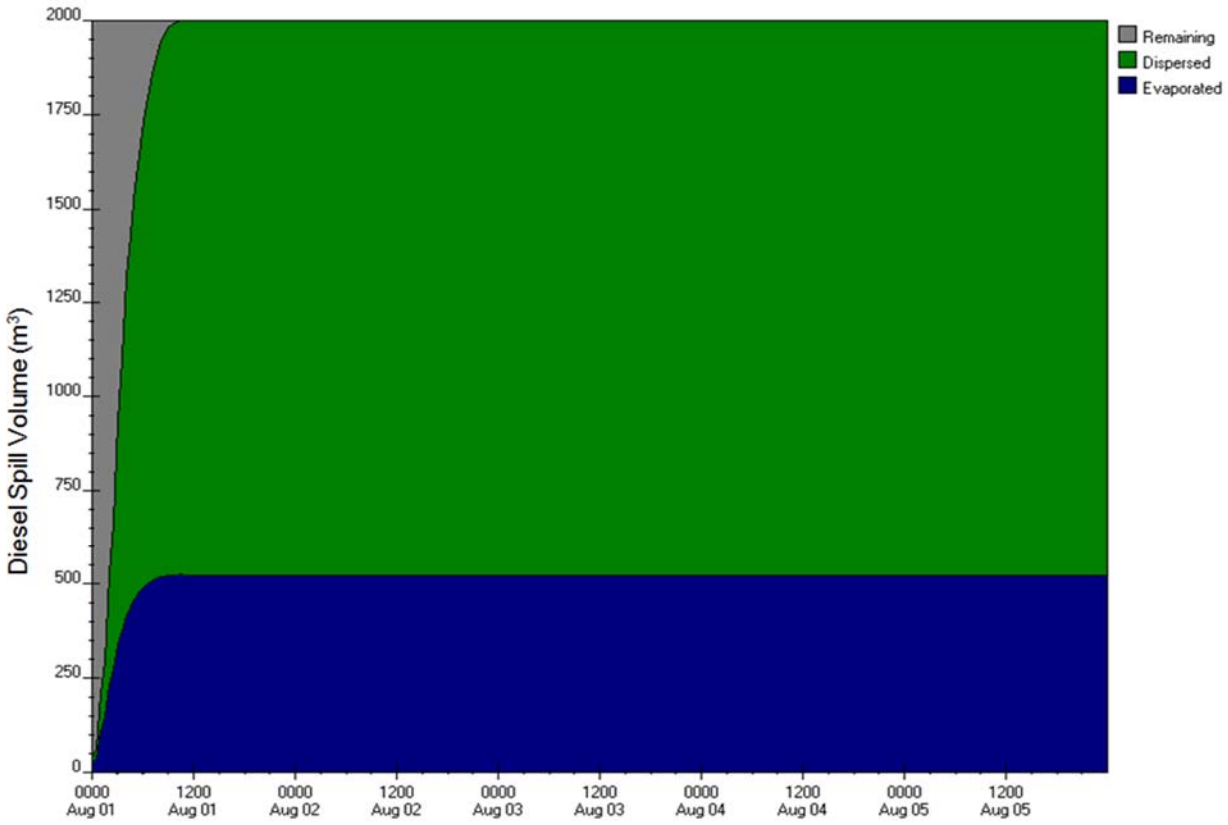

Figure E-A63: ADIOS2 diesel fuel budget output for Western Hudson Strait, Charles Island station (6A) for 2,000 m^3, 50-yr wind speed scenario

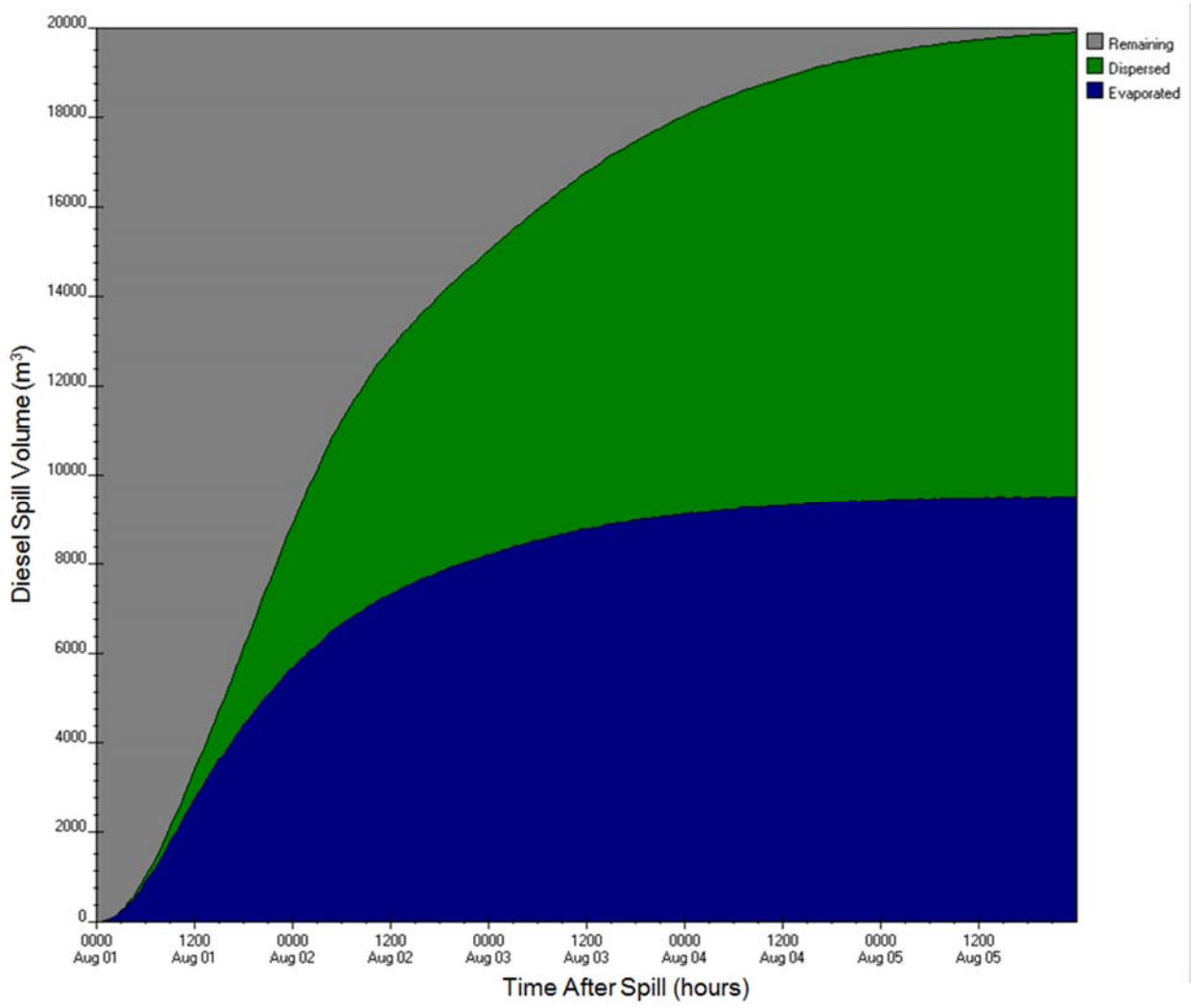

Figure E-A64: ADIOS2 diesel fuel budget output for Western Hudson Strait, Charles Island station (6A) for 20,000 m^3, mean wind speed scenario

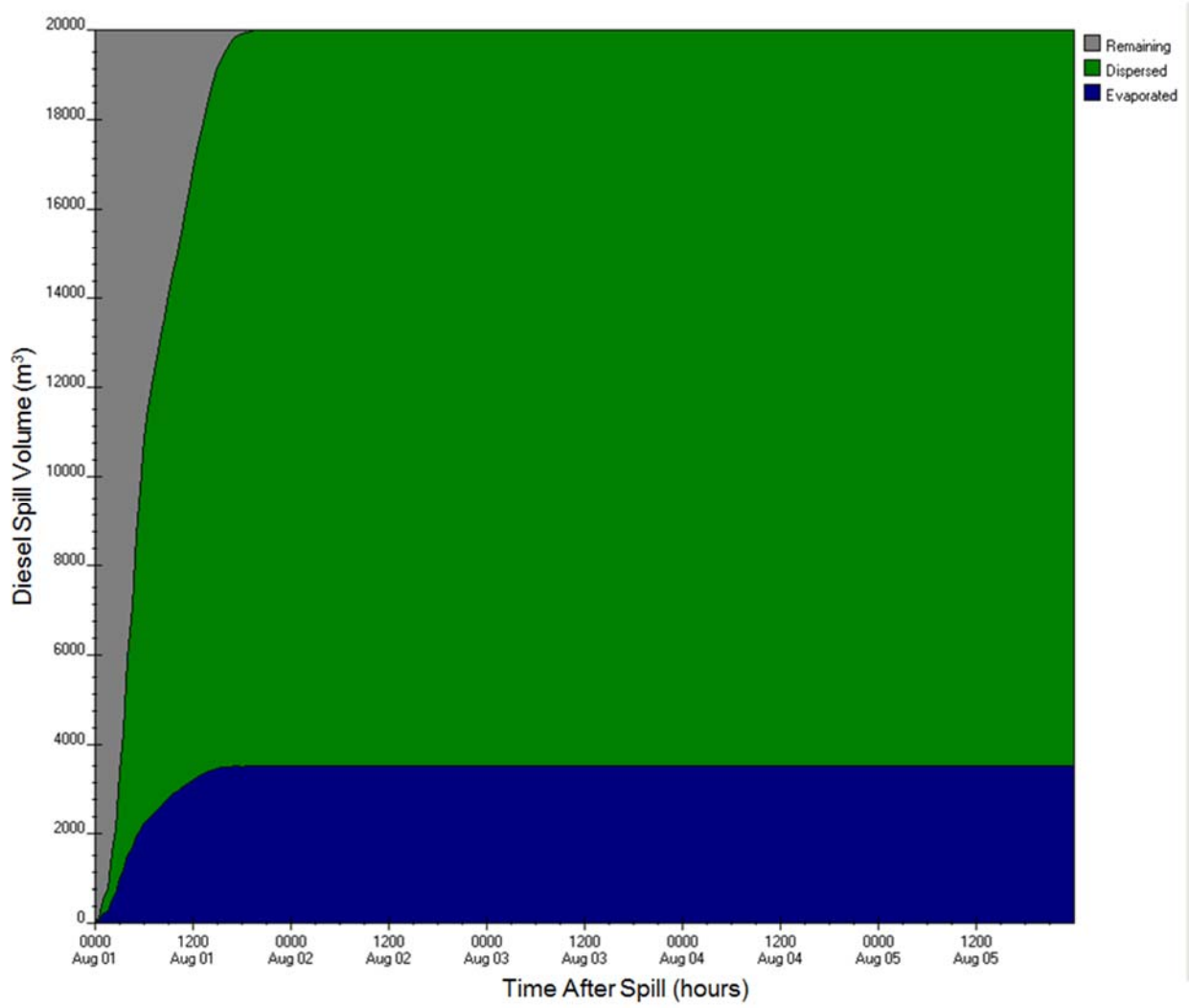

Figure E-A65: ADIOS2 diesel fuel budget output for Western Hudson Strait, Charles Island station (6A) for 20,000 m^3, 2-yr wind speed scenario

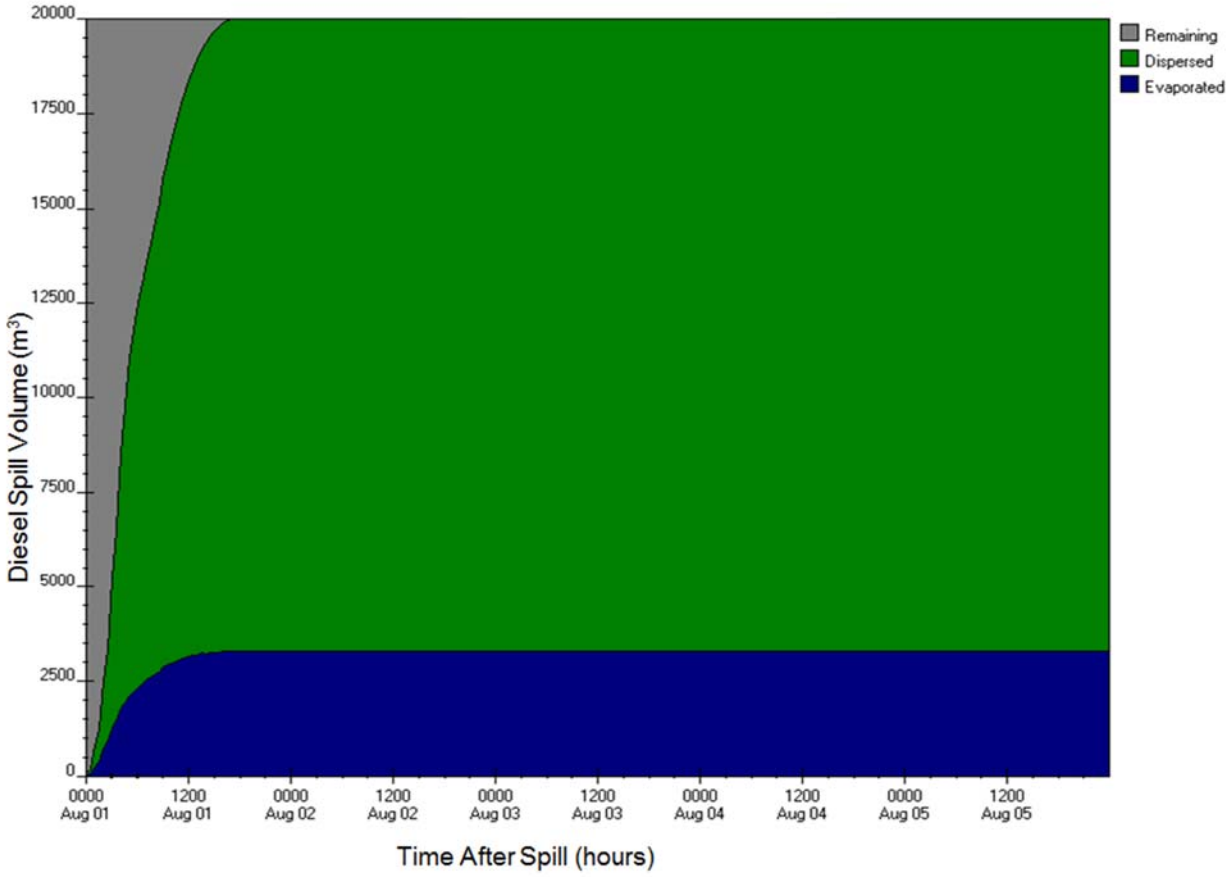

Figure E-A66: ADIOS2 diesel fuel budget output for Western Hudson Strait, Charles Island station (6A) for 20,000 m^3, 50-yr wind speed scenario

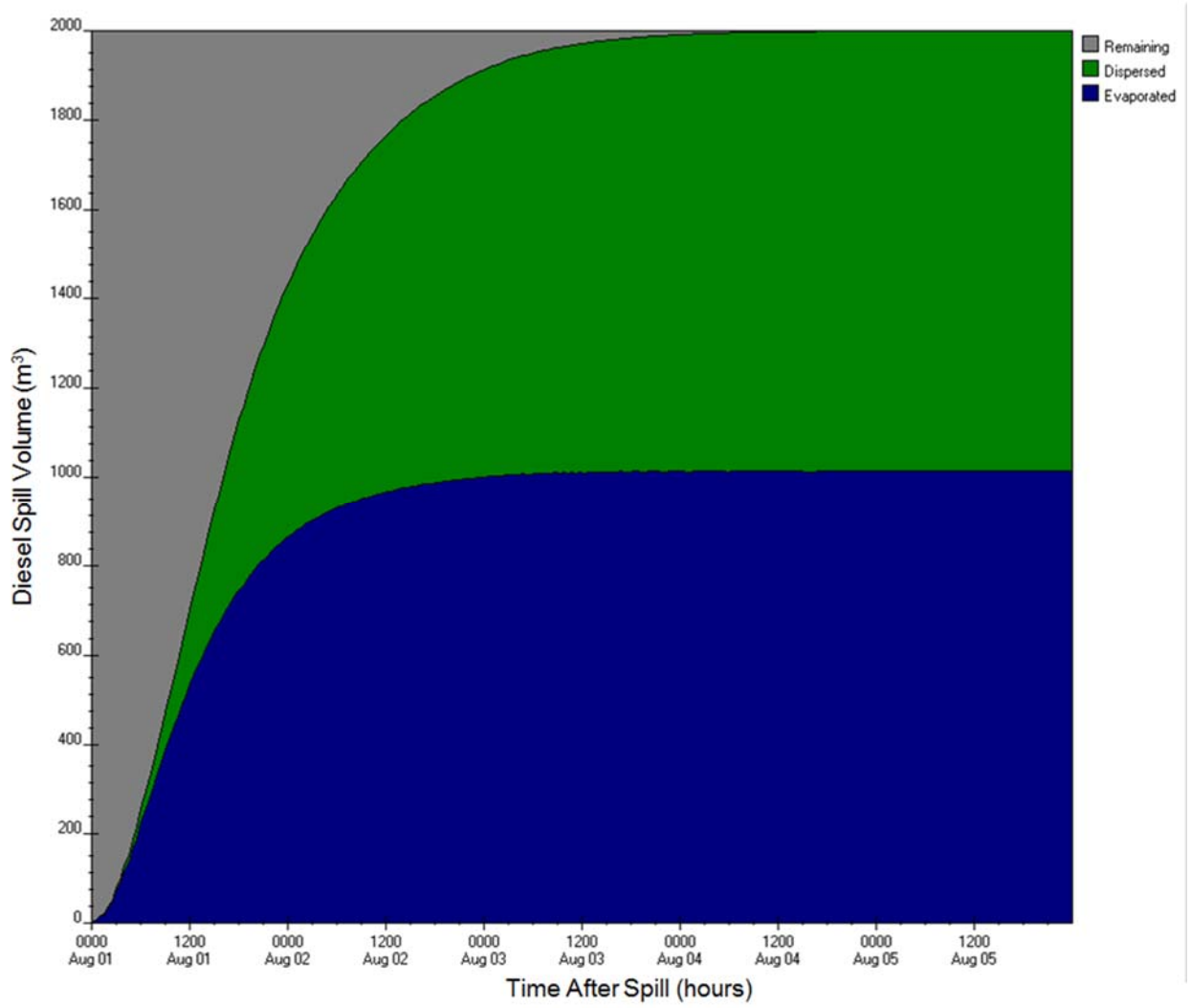

Figure E-A67: ADIOS2 diesel fuel budget output for Mid Hudson Strait station (7A) for 2,000 m^3, mean wind speed scenario

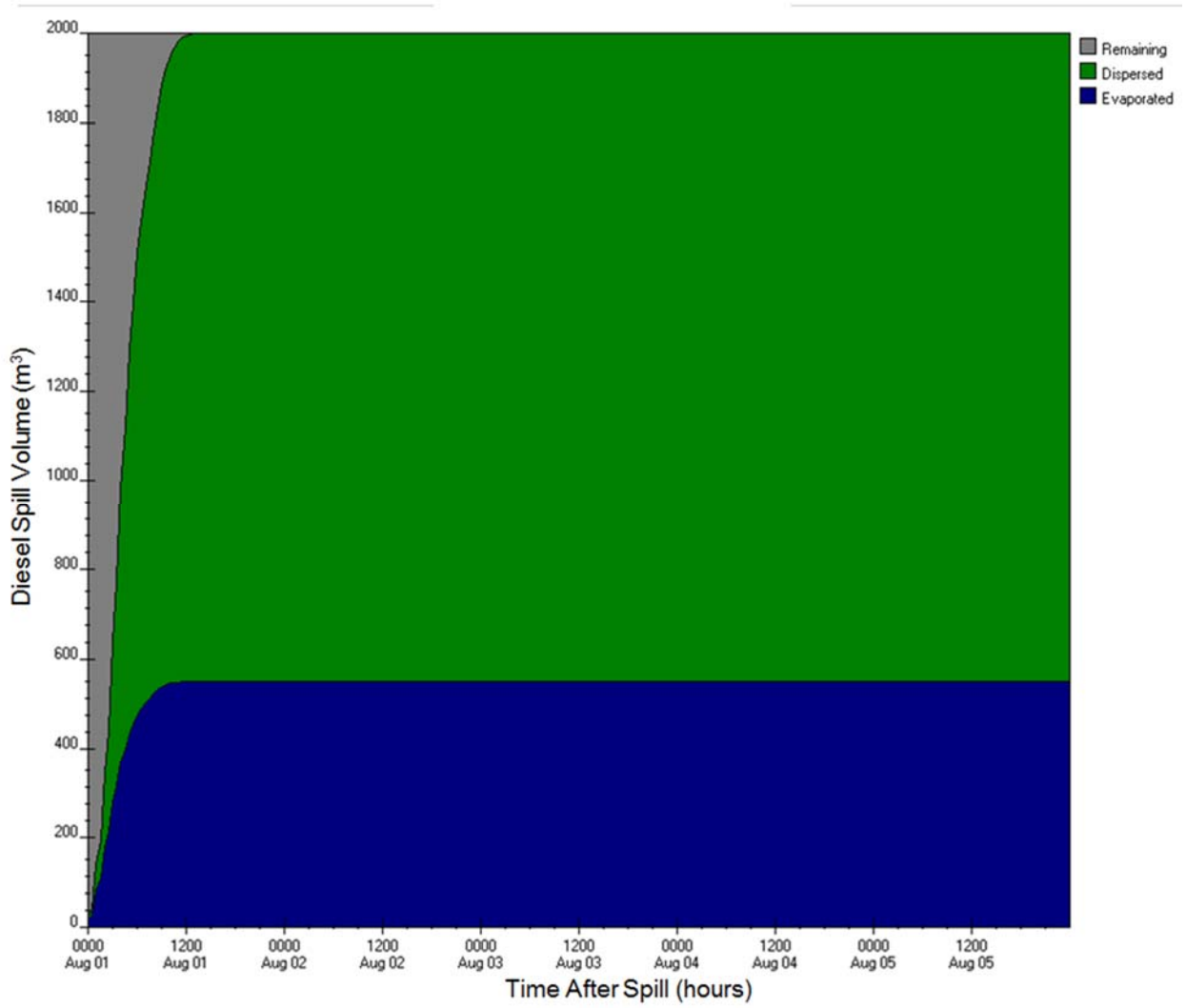

Figure E-A68: ADIOS2 diesel fuel budget output for Mid Hudson Strait station (7A) for 2,000 m^3, 2-yr wind speed scenario

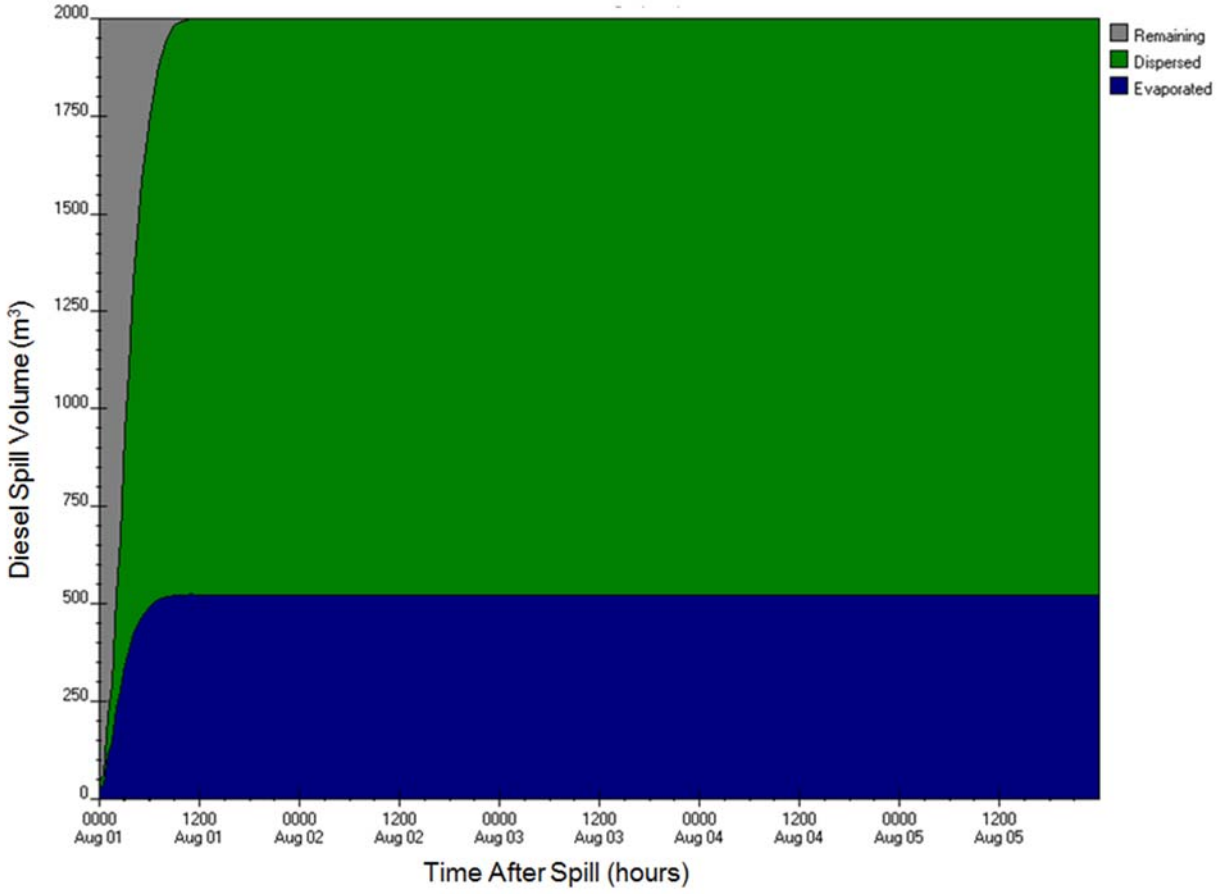

Figure E-A68: ADIOS2 diesel fuel budget output for Mid Hudson Strait station (7A) for 2,000 m^3, 50-yr wind speed scenario

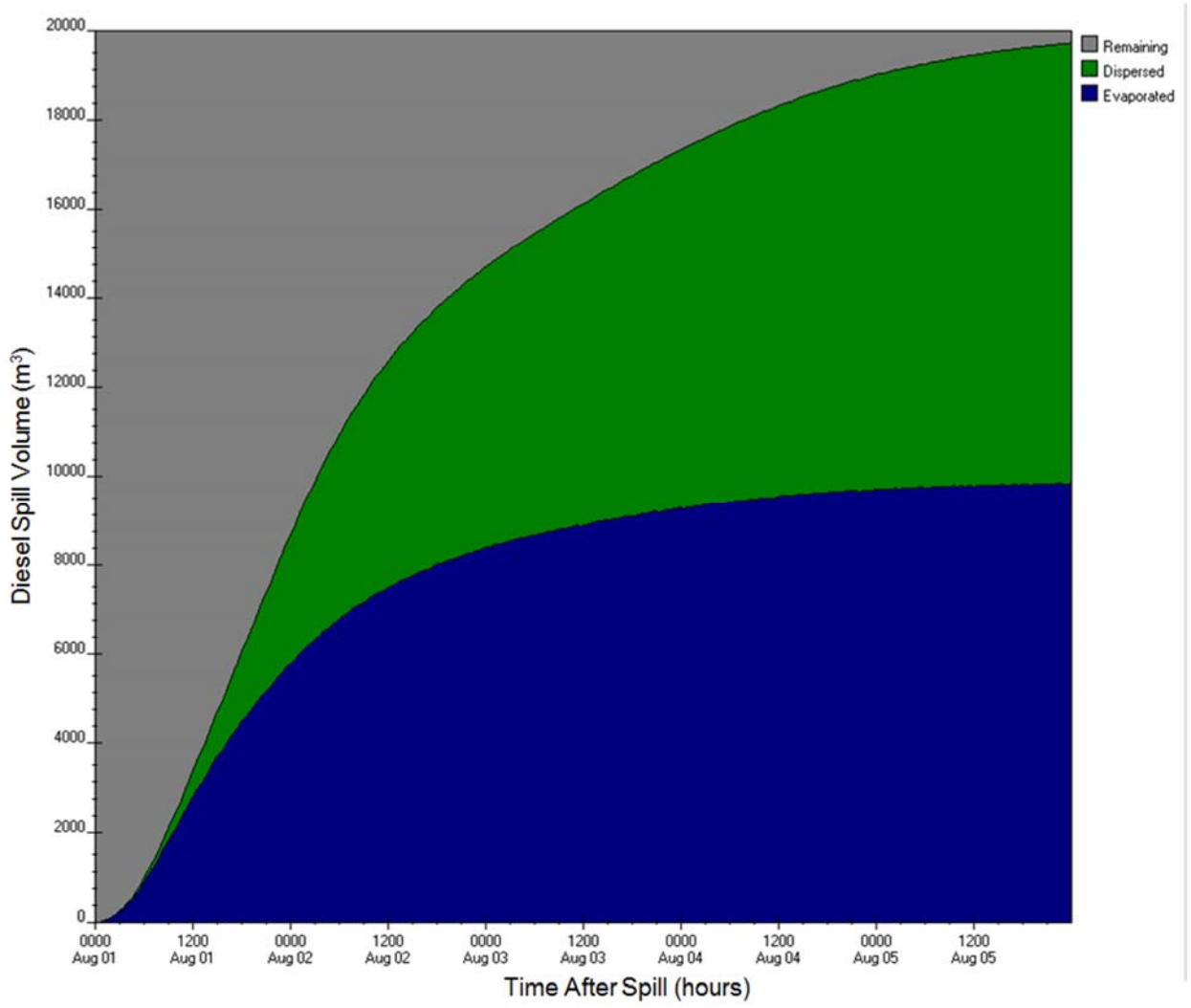

Figure E-A69: ADIOS2 diesel fuel budget output for Mid Hudson Strait station (7A) for 20,000 m^3, mean wind speed scenario

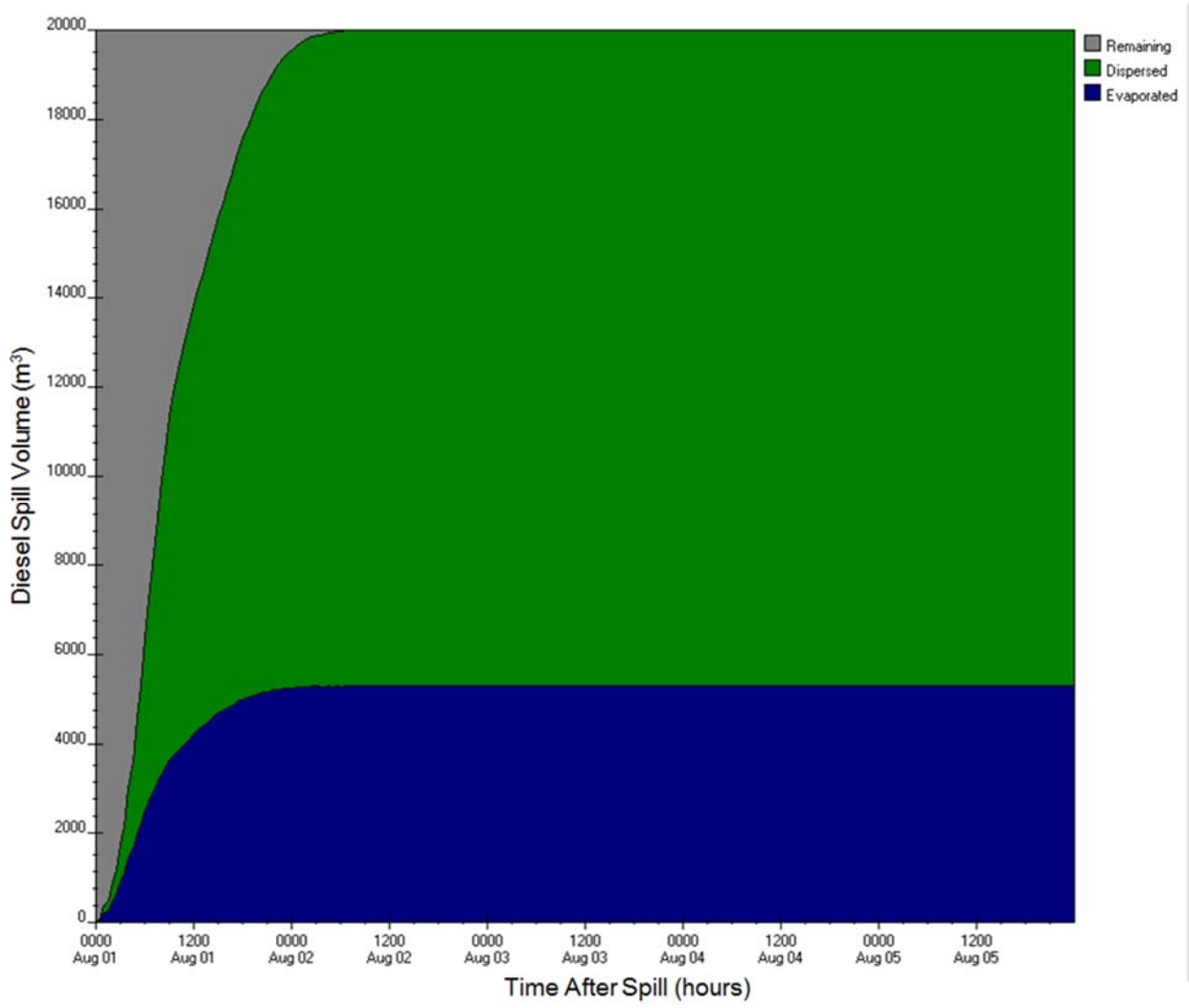

Figure E-A70: ADIOS2 diesel fuel budget output for Mid Hudson Strait station (7A) for 20,000 m^3, 2-yr wind speed scenario

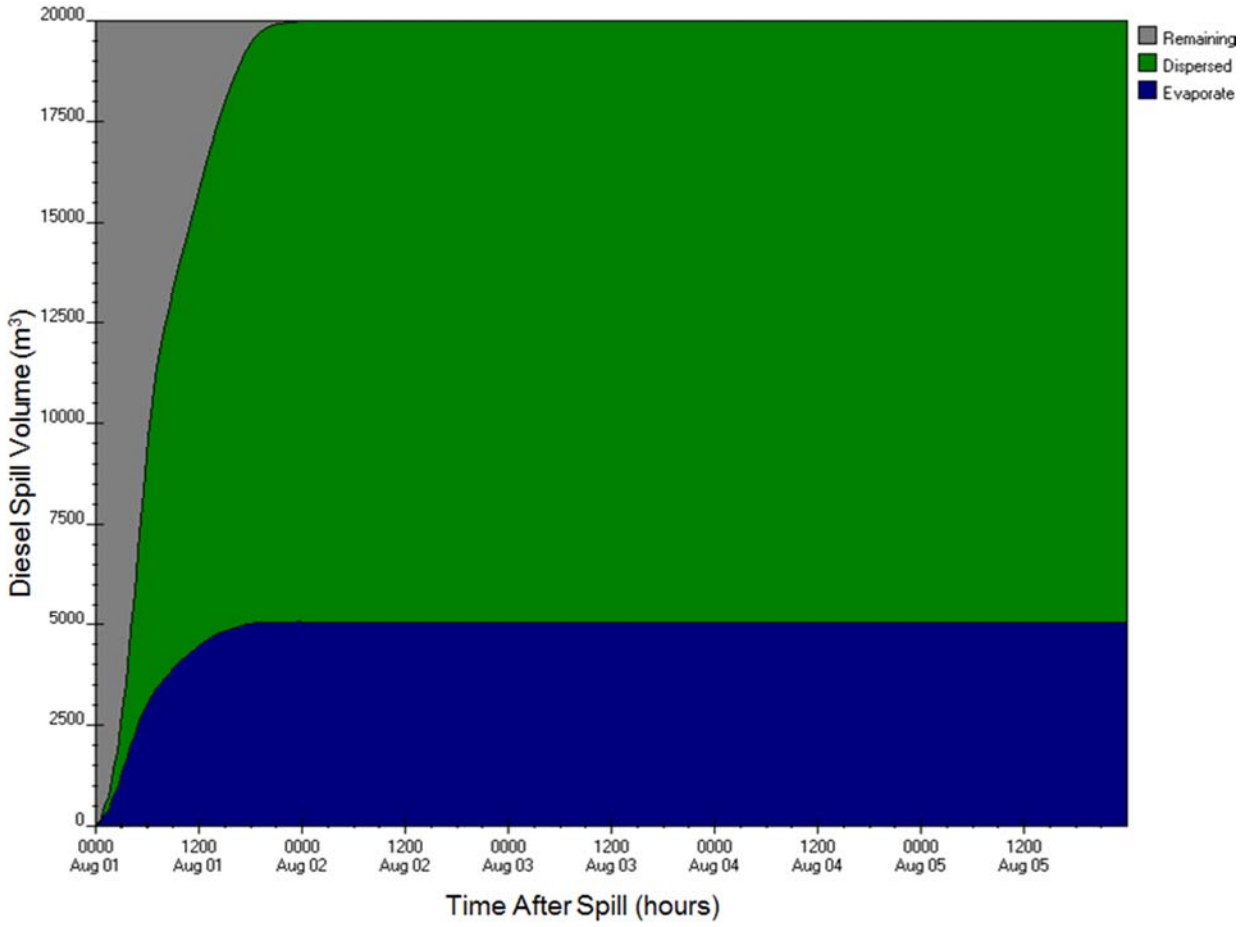

Figure E-A71: ADIOS2 diesel fuel budget output for Mid Hudson Strait station (7A) for 20,000 m^3, 50-yr wind speed scenario

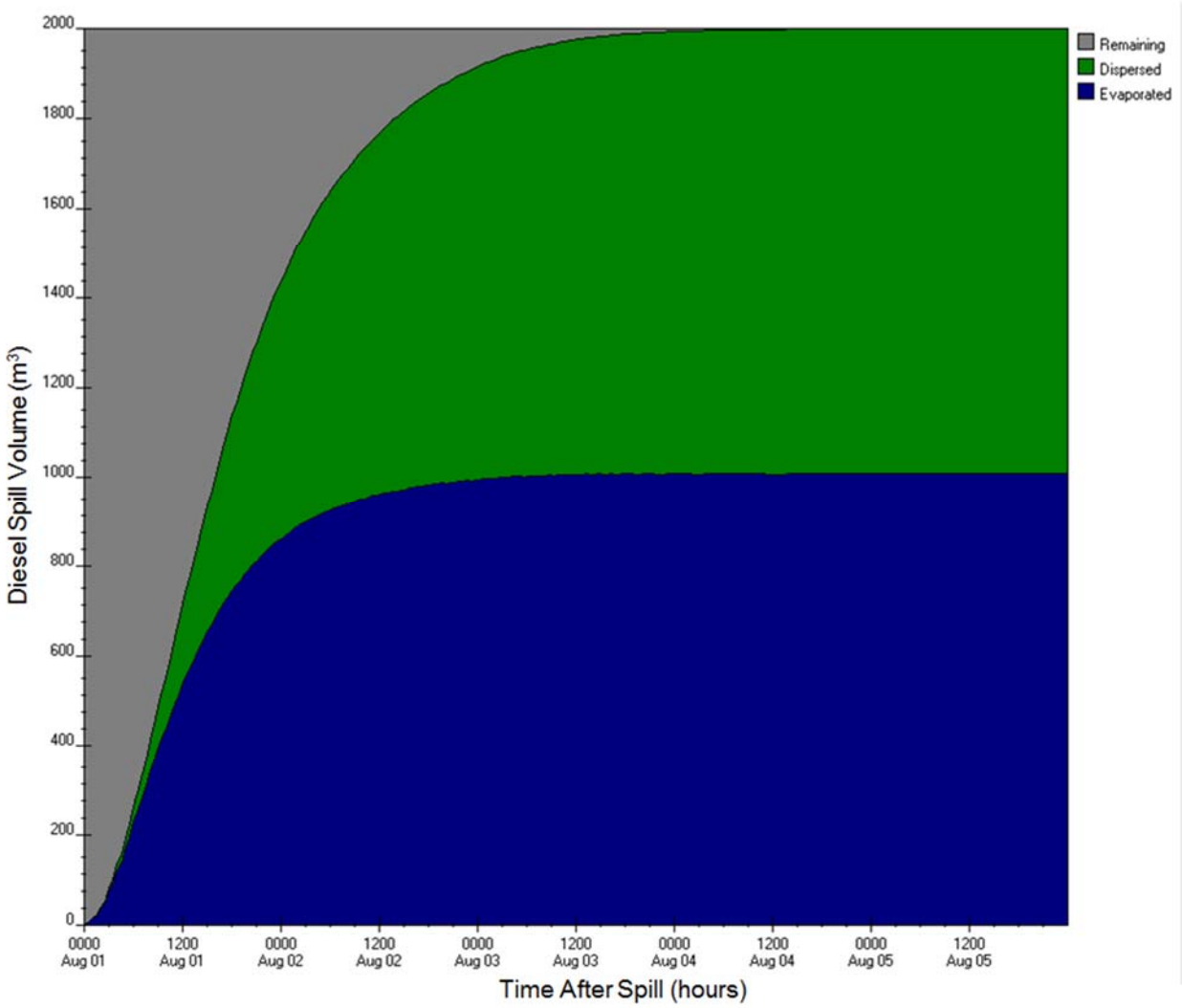

Figure E-A72: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (8A) for 2,000 m^3, mean wind speed scenario

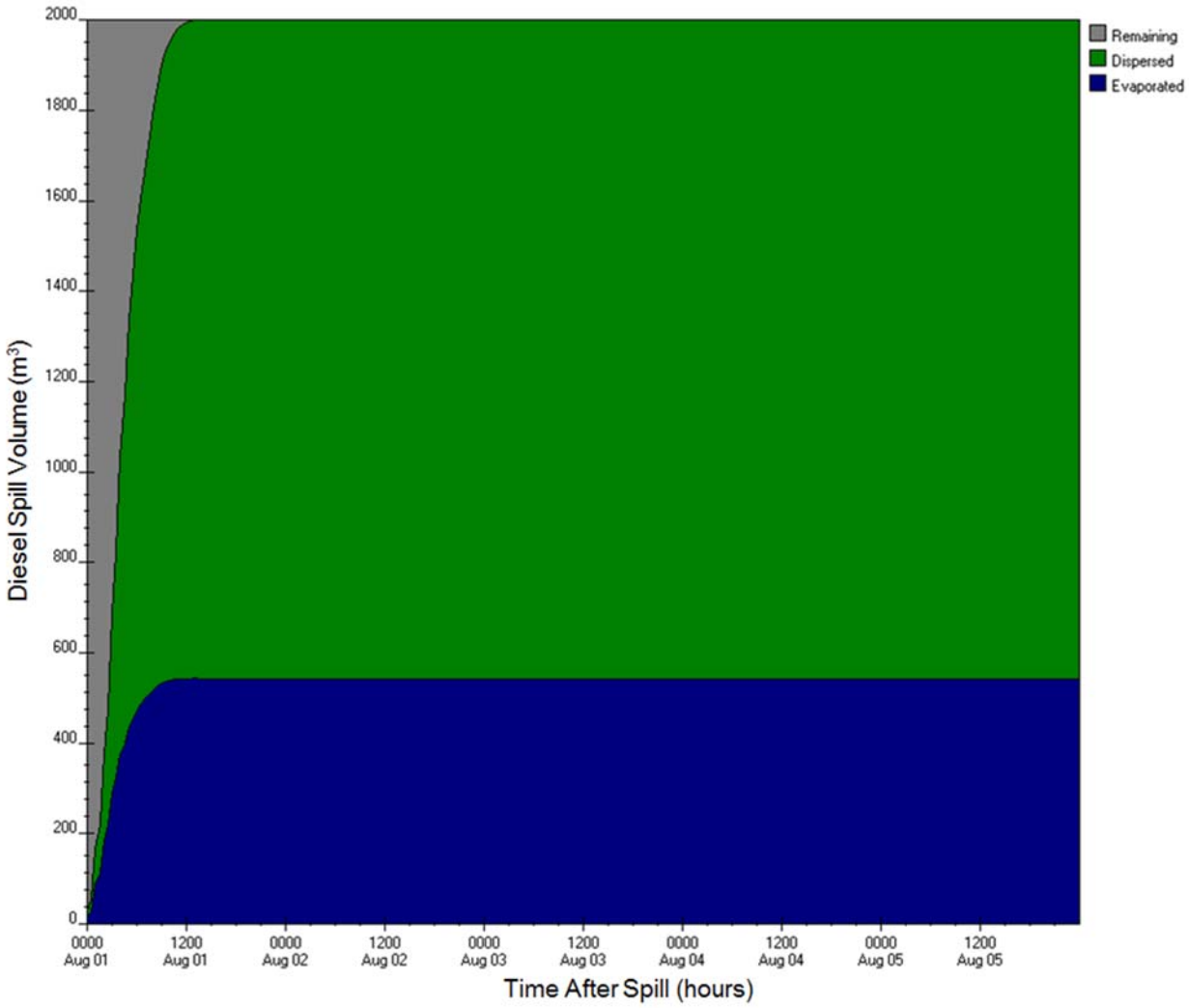

Figure E-A73: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (8A) for 2,000 m^3, 2-yr wind speed scenario

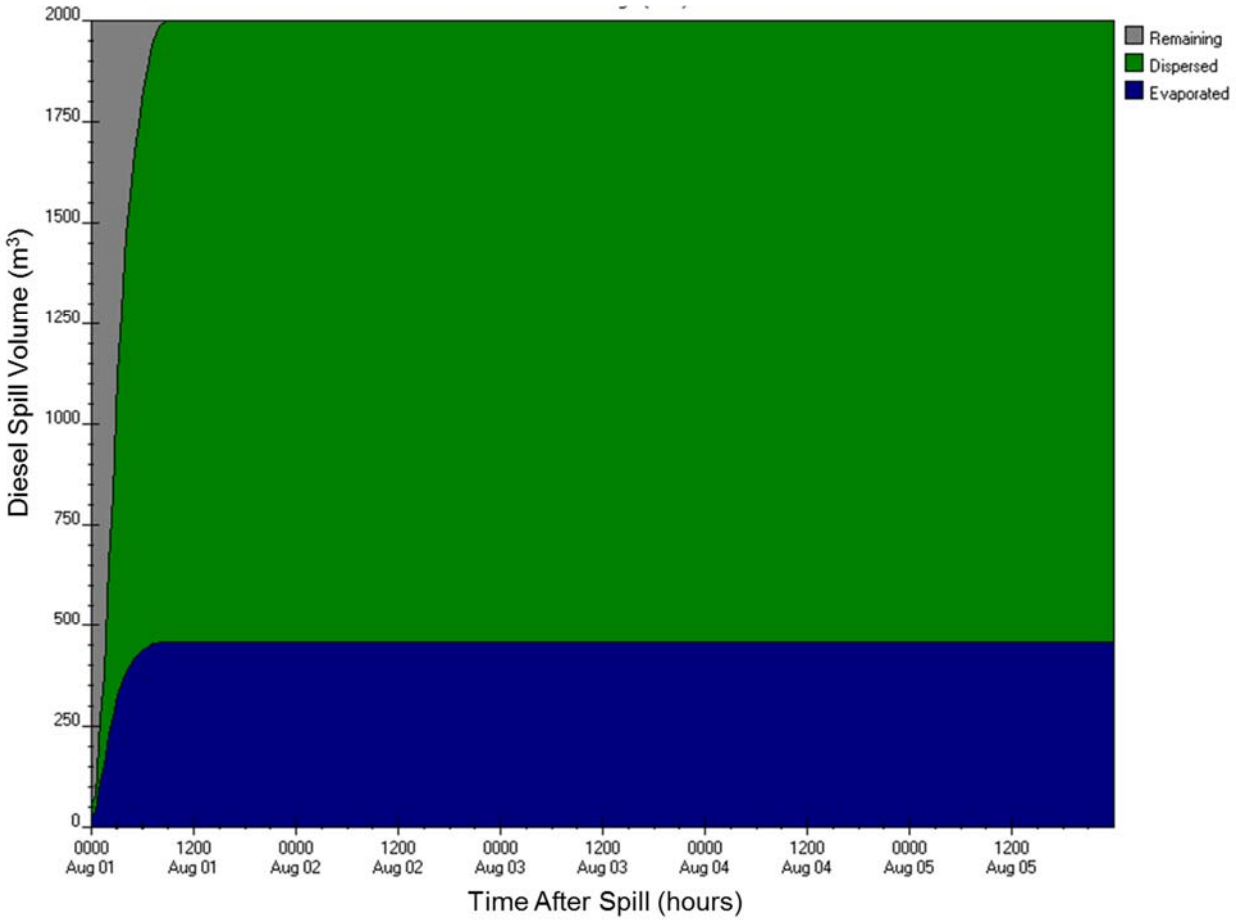

Figure E-A74: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (8A) for 2,000 m^3, 50-yr wind speed scenario

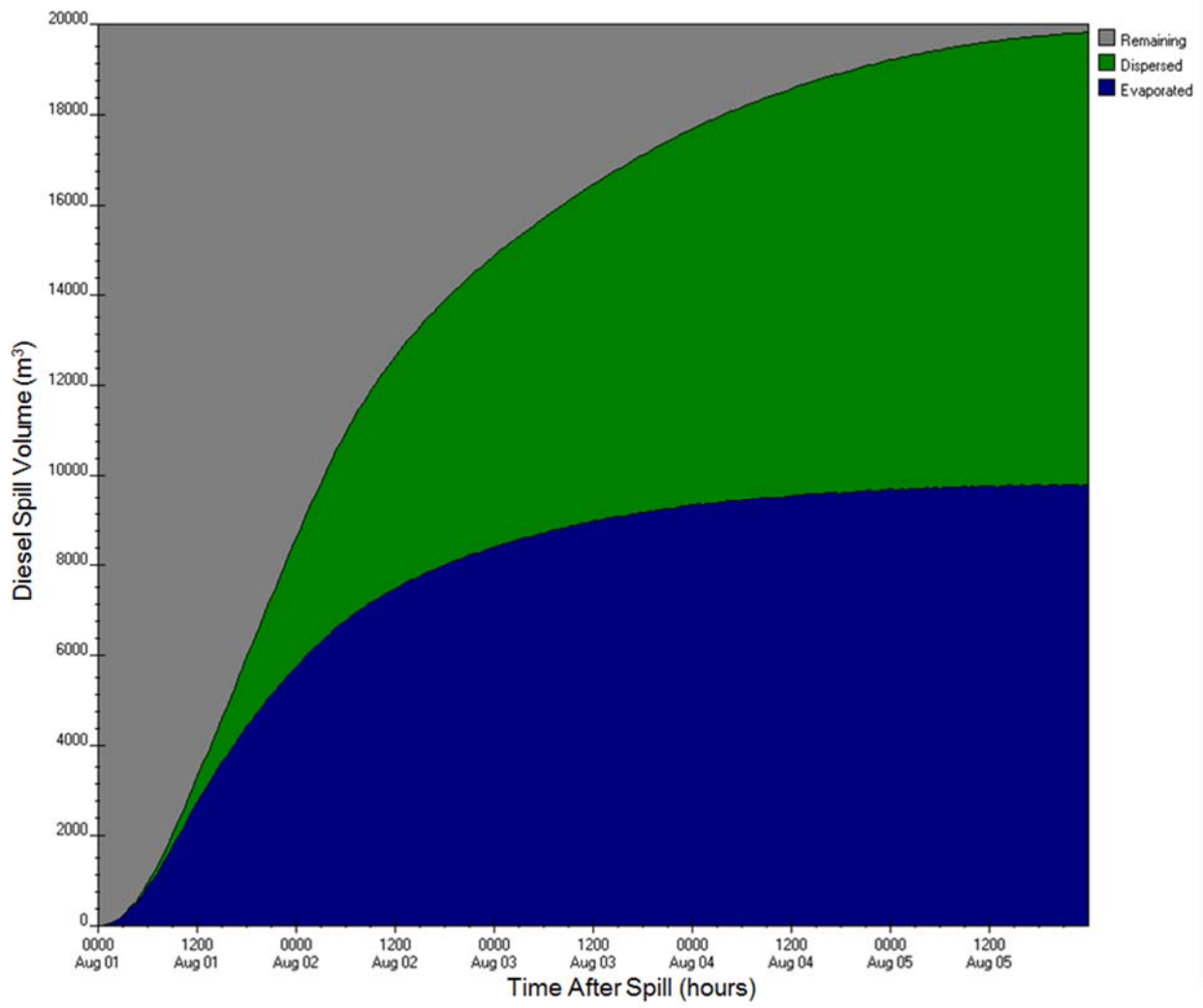

Figure E-A75: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (8A) for 20,000 m^3, mean wind speed scenario

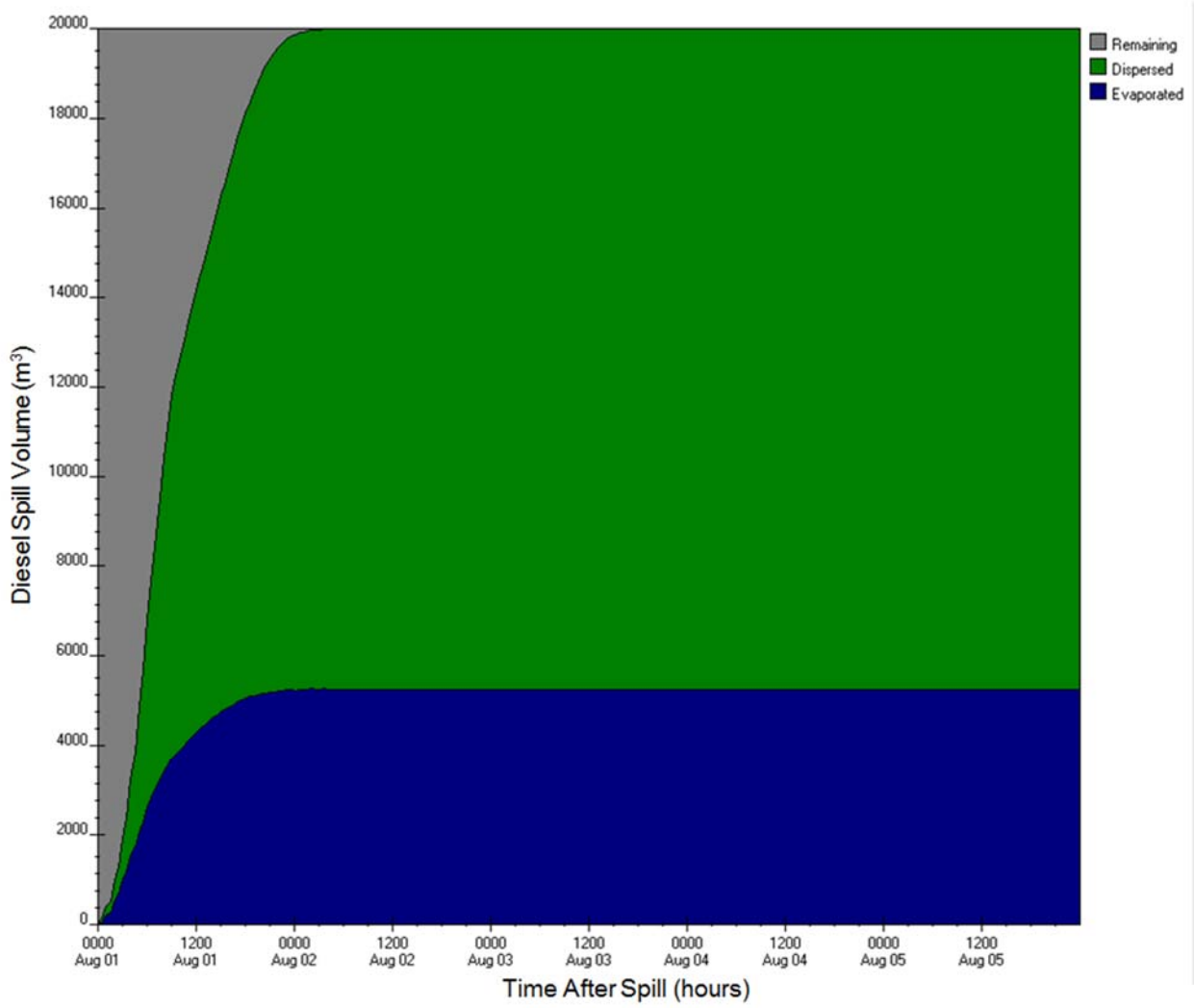

Figure 8.2-B-B-76: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (8A) for 20,000 m^3, 2-yr wind speed scenario

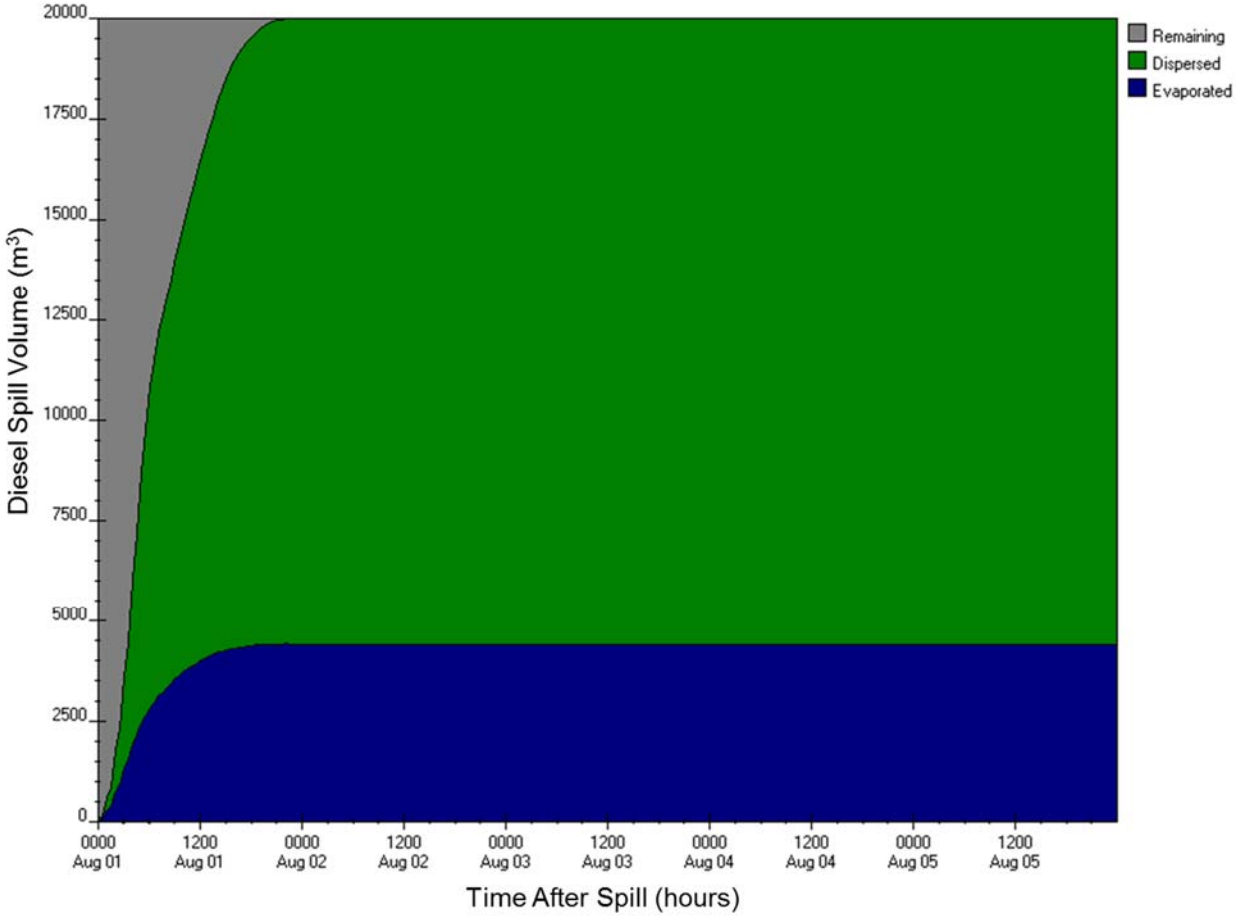

Figure E-A77: ADIOS2 diesel fuel budget output for Eastern Hudson Strait station (8A) for 20,000 m^3, 50-yr wind speed scenario

https://capws.golder.com/sites/capws2/1114280011meliadine/type a water license/5_post-submission/project certificate conditions/shipping management plan/appendix e - spill risk assessment/att a.docx



AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfarm Management Plan

February 2019
Version 3
6513-MPS-15

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EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) has developed the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan includes open pits and underground mining methods for the development of the Tiriganiaq gold deposit, which includes two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Landfarm Management Plan for the Project and forms a component of the documentation series produced for the Type A Water Licence Application. The Plan describes the design features and operational procedures for the landfarm located at the Project for the storage and treatment of petroleum hydrocarbon contaminated soils.

On-site storage and remediation has been established as the preferred method for treatment of light petroleum hydrocarbon contaminated soil that may be generated on the proposed mine site. The landfarm is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons such as diesel and gasoline being treated in the landfarm.

The landfarm is located just off the industrial pad, approximately 200 metres from Collection Pond 1 (CP1) and is shown on Figure 2-1. The central location of the landfarm (Figure 2-1) was chosen to minimize the footprint of the site and the transport distance of contaminated material from potential spill locations. The landfarm is expected to effectively treat up to 5,000 cubic metres of contaminated soil over the construction, operations, and closure of the Project, and 500 cubic metres of snow and ice annually. Water accumulating in the landfarm is not discharged directly to the receiving environment. It is first sent through an oil/water separator, before being discharged to CP1 for further treatment. The landfarm has an impervious liner and no impacts on shallow groundwater are anticipated.

A report of landfarm activities is prepared annually by Environment Department, indicating the volume of material added to the facility, amount of material removed, disposal or re-use location, analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped.

Soils contaminated with light end petroleum hydrocarbons are remediated in accordance with the criteria stated in The Government of Nunavut, Environment Department's Environmental Guideline for the Management of Contaminated Sites. When remediated, the soils will be removed from the facility and can be used for construction purposes, such as part of the cover of the Tailings Storage Facility, Landfill or stacked in the Waste Rock Storage Facility.

In addition Agnico Eagle continues remediation of the historical landfarm associated with the Type B Water License – 2BB-MEL1424 that was in use for the former Meliadine Exploration Camp.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First version of the Landfarm Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	February 2018	Figure 2-1	5	- "Main Infrastructure for the Meliadine Project, including the Landfarm" - figure added to figure reference	Meliadine Environment Department
		3.1	9	- Antifreeze removed from list of acceptable contaminates for landfarm disposal	
		2.1	3	-Approximate volume of material adjusted to 700 m^3	
		1.3	2	- Updated Oil Pollution Emergency Plan revision date and version	
		All	All	-General review and revision	
3	February 2019	1.1	1	-Estimated quantity of material in Type A landfarm adjusted to 1500 m^3	Sean Arruda
		2.1	3	-Estimated quantity of material in both landfarms adjusted to 3706 m^3 (1500 m^3 in Type A landfarm, 2206 m^3 in Type B landfarm) -Paragraph containing estimated annual inputs to landfarm has been removed - gasoline and light oil added -microbial activity 'slows' (changed from 'stops')	
		2.2.1	4	-'oil' changed to 'hydrocarbons'	
		Figure 2-1	5	-Site map figure updated.	
		Table 2-2	8	-Sump surface area was a typo (10,040 m^2). Changed to 144 m^2	

3.1.1	10	-'Aboriginal Affairs and Northern Development Canada' changed to 'Crown-Indigenous Relations and Northern Affairs' -Sentence added "If there is uncertainty whether or not the material contains additional, unknown contaminants, the material should be placed in totes/drums until lab results confirm that they can be placed in the landfarm."
3.3	11	-Contaminated snow is now being sent to the snow cell area

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
BTEX	benzene, toluene, ethylbenzene, and xylene
CP1	Collection Pond 1
GN	Government of Nunavut
NWB	Nunavut Water Board
PHC	Petroleum hydrocarbons
Project	Meliadine Gold Project
RMMS	Responsible Mining Management System
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

SECTION 1 • INTRODUCTION

1.1 Project History

Agnico Eagle Mines Limited (Agnico Eagle) has developed the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years of construction (Q4 Year -5 to Year -1), 8 years of mine operation (Year 1 to Year 8), 3 years of closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

The Landfarm Management Plan (Plan) focuses on minimizing the waste footprint on-site, and maximizing remediation potential through implementation of bioremediation experience and research carried out at the Agnico Eagle's Meadowbank Gold Mine.

During the advanced exploration phase of the Project, the Nunavut Water Board (NWB) approved amendment #6 to Water Licence 2BB-MEL1424, which allowed the operation of a light PHC soil stockpile. This approval supported using a landfarm developed inside a bermed and lined area previously used to store fuel bladders. Soil contaminated with light PHC is being deposited in this bermed and lined area for treatment. To date, there is approximately 1500 cubic metres (m^3) of contaminated soil being treated. This quantity resulted from inadvertent spills that occurred during the advanced exploration phase of the Project.

When possible, materials contaminated with heavy hydrocarbons (e.g., hydraulic fluid or grease), are to be segregated, packaged, and shipped south for treatment and/or disposal.

1.2 Objectives

On-site storage and remediation has been established as the preferred method for treatment of light PHC contaminated soil that may be generated at the proposed mine. Specifically, remediation through landfarming has been identified as the primary treatment option and, as such, is the focus of this contaminated soil management plan. A pilot project to enhance rates of bioremediation through addition of a nutrient source is being carried out at Meadowbank and will be employed at the Project should it prove successful. Alternate contingency options in the event that landfarming is not successful or as efficient as planned are also discussed.

This Plan is a component of the Responsible Mining Management System (RMMS)[1]. The objectives of this Plan are to:

- provide an overview of contaminated soil management at the Project;
- describe the physical setting, location, and design criteria of the landfarm;
- define acceptable types of contaminated soils to be placed in the landfarm and conditions for removal of treated soil;
- define operating procedures and monitoring requirements for the landfarm; and
- describe contingency options for alternate treatment/storage of PHC contaminated soil.

1.3 Related Documents

Spill prevention is the first stage in contaminated soil management at the Project. Documents containing information related to this Plan and submitted as part of the Type A Water Licence Application include:

- Spill Contingency Plan;
- Environmental Management and Protection Plan; and
- Risk Management and Emergency Response Plan.

There is also a related Oil Pollution Emergency Plan (Agnico Eagle 2018), which is specific to spills at Agnico Eagle's Itivia Oil Handling Facility located in Rankin Inlet. The Oil Handling Facility is located on the shore of Melvin Bay, which is part of Hudson Bay. The Oil Pollution Emergency Plan was prepared as a requirement of the *Canadian Shipping Act* and associated regulations. It is submitted to Transport Canada for approval prior to any shipping related to the Project.

1.4 Spill Prevention

Similar to the waste management philosophy, plans are to actively work towards minimizing spills through suitable work procedures. Plans developed from the environmental impact study address the management of spills on land, ice, water, and into the marine environment. When spills do occur, the goal is to limit the spread of the spill, and then manage contaminated material resulting from the spill. The Spill Contingency Plan describes spill prevention measures.

[1] The RMMS is described in the Environmental Management and Protection Plan.

SECTION 2 • LANDFARM DESIGN

2.1 Background

In the event of a spill, on-site storage and remediation is the most practical and efficient method in handling contaminated soil, particularly in an isolated location such as the Project. Any PHC contaminated soils generated during the construction, operation, and closure phases will be adequately managed. Soils contaminated with light PHCs, such as diesel, gasoline, and light oils will be treated on-site in a landfarm. This method involves spreading, mechanical mixing, addition of nutrients and water and placing the contaminated soil in windrows within a containment area, and promoting conditions favorable for the volatilization and aerobic microbial degradation of hydrocarbons. When possible, materials contaminated with heavy hydrocarbons (e.g., hydraulic fluid or grease), are to be segregated, packaged, and shipped south for treatment and/or disposal.

There are currently PHC contaminated soils, totalling approximately 3706 m³, stored on-site in two landfarms resulting from spills that occurred during the exploration and construction phases (approximately 1500 m^3 in Type A Landfarm, and 2206 m^3 in Type B Landfarm).

Landfarm option analysis prepared for Agnico Eagle by Golder Associates (2007) identified factors relevant to landfarming in the north. This includes environmental factors and physical properties of the soil that affect microbial growth and rates of biodegradation, including temperature, pH, soil moisture, nutrient content, salinity, and soil particle size.

Although rates of biodegradation decline with temperature, landfarming is still a feasible technique in Arctic climates as demonstrated by the Meadowbank landfarm. Degradation in the north is typically restricted because microbial activity slows between 0 to -5 degrees Celsius (°C) restricting biodegradation to the months of June to September[2]. Nevertheless, degradation was reported at 90% over two summers on Resolution Island (Paudyn et al. 2008).

It is estimated that soils contaminated with light end PHCs would require three full summer seasons for complete remediation. When remediated, the soils will be removed from the facility and can be used for construction purposes such as part of the cover of the Tailings Storage Facility (TSF) or stacked in the Waste Rock Storage Facility (WRSF). Based on a remediation period of three seasons, it would be possible to close the landfarm facility on three years after the end of the process plant operation.

2.2 Location

The overall site plan showing the main infrastructure for the Project, including the landfarm, is shown in Figure 2-1. The area has no exposed bedrock and up to 20 metres (m) of glacial-fluvial till that has little ground ice and shows no permafrost degradation. The central location of the landfarm was chosen to minimize the footprint of the site and the transport distance of contaminated material from

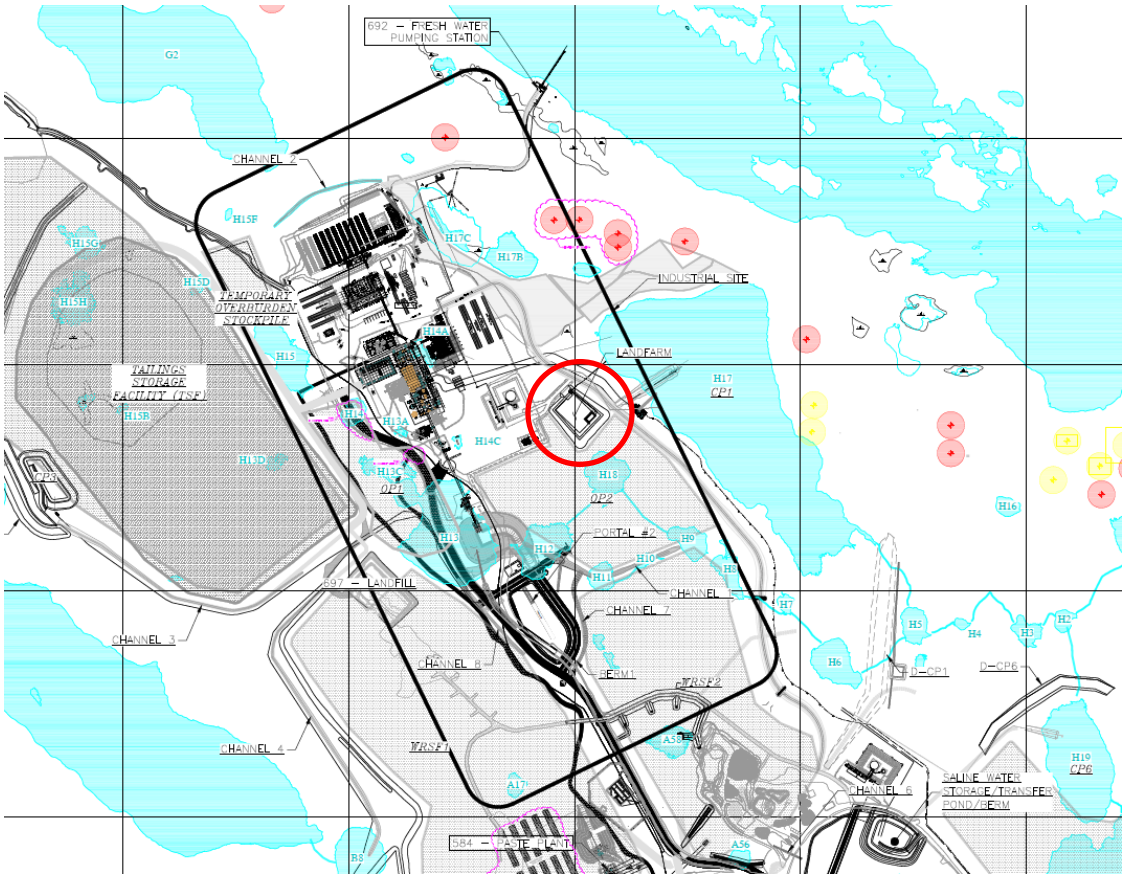
[2] Even though bioremediation ceases below -5°C, volatilization of the PHCs does continue but at a much slower rate.

potential spill locations. The management of all waste generated at the Project in the form of dry stack tailings, waste rock, incinerator, and landfill waste are located in close proximity to the main infrastructure.

2.2.1 Proximity of Surface Water

The landfarm is located adjacent to the infrastructure pad, approximately 200 m from Collection Pond 1 (CP1). The landfarm is located on land that slopes towards the southwest corner, which results in any rainwater or snowmelt draining to temporary water storage having the capacity to store a 1:100 wet year spring freshet plus 500 m^3 of water from melting of contaminated snow/ice. Drainage from the landfarm may be used as water in the turning of the windrows during the remediation process. Excess water is collected within a sump inside the landfarm and will be pumped to an oil pre-treatment plant to remove any hydrocarbons. The treated water will then be discharged into the CP1. Discharge from CP1, is controlled by a dike, which stops direct flow to Meliadine Lake. Meliadine Lake is the source of freshwater for the site and is used by Inuit for traditional pursuits. If water is to be discharged from CP1 to Meliadine Lake, it is treated to meet compliance criteria. Except for a short duration during the spring freshet or a heavy rainfall, water ponding will be eliminated in the landfarm by the end of the summer such that a sufficient storage capacity is available for the upcoming spring freshet.

Figure 2-1 Landfarm Site Location Plan



2.2.2 Proximity of Groundwater

In the Project area, the groundwater within the active layer is estimated to reach 1.5 m in October. The active layer begins to form in July when temperatures largely remain above 0°C, and deepens to a maximum in October. Shallow groundwater flow in the area of the landfarm is towards the industrial site.

To prevent movement of contaminants from the landfarm facility into groundwater and the surrounding environment, Environment Canada (SAIC 2006) recommends implementation of a barrier with 10^{-7} centimetres per second hydraulic conductivity at a thickness of 0.6 m. The Meliadine landfarm has an impervious liner and no impacts on shallow groundwater are anticipated.

2.3 Design

The landfarm is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons such as diesel and gasoline. The design volume of the landfarm is based on allowances for the materials being treated at Meadowbank.

The average floor slope is 3.1% going in the designed direction of northwest to southeast, matching the natural ground slope. This slope is still adequate allowing leachate/drainage from the PHC soils and internal runoff to gradually seep through the filter berm into the sump area. The water collected in the sump will be pumped to the oil separator for oil removal before being discharge into CP1. The sump area was built as per design capacity.

The geomembrane liner crest elevation was installed at an elevation of 74.80 m, it does allow for 0.45 m of freeboard before reaching the geomembrane liner crest elevation.

2.3.1 Soil Volume Requirements

The landfarm was built with the expectation of effectively treating up to 5,000 m^3 of contaminated soil over the construction, operations, closure of the Project, and 500 m^3 of snow and ice annually. Based on the experience at Meadowbank, the volume of PHC would be approximately 350 m^3 per year during construction, operation, and closure phases. Table 2-1 outlines the estimated volumes of contaminated soils and rock, and contaminated snow and ice expected during each phase of the mine.

Table 2-1 Estimated Volume of Petroleum Hydrocarbon Contaminated Soil and Ice/Snow to be Managed

Project Phase	Volume of PHC Soil/Rock (m^3)	Annual PHC Snow/Ice (m^3)
Advanced exploration	2,209 (volume in exploration landfarm to date)[(a)]	500 per year
Predevelopment (2 years)	350 (175 per year)	
Construction (3 years)	1,050 (350 per year)	
Operations (7 years)	2,450 (350 per year)	
Closure & Reclamation (2 years)	700 (350 per year)	
Total	**4,970**	

[(a)] The contaminated soil in the advanced exploration landfarm will be transferred to the mine landfarm upon its completion and commissioning.

As described in the Landfarm Design & Management Plan (Agnico Eagle 2008), it is estimated that soils contaminated with light end PHCs would require three full summer seasons for complete remediation. When remediated, the soils will be removed from the landfarm and used on-site, placed in a WRSF or used as cover at the TSF.

2.3.2 Design Specifications

The design criteria for the landfarm is outlined in Table 2-2. Its footprint is approximately 11,000 square metres (m^2), with a perimeter berm that is approximately 2.0 m high over the landfarm surface. The geometry and characteristics of the landfarm are shown in Table 2.2.

Table 2-2 Geometry and Characteristics of the Landfarm

Item	Actual
Dimensions of Perimeter Berm Crest Exterior (avg.)	86.8 m x 68.4 m
Dimensions of Perimeter Berm Crest Interior (avg.)	74.4 m x 53.3 m
Side Slopes of Perimeter Berm (avg.)	1V:2.5H (40%)
Perimeter Berm Crest Width (avg.)	3.5 m
Perimeter Berm Height (Min. to Max.)	1.4 m to 5.2 m
Perimeter Berm Crest Elevation (avg.)	75.25 m
Dimensions of Filter Berm Crest Interior (avg.)	19.0 m x 12.0 m
Side Slopes of Filter Berm (avg.)	1V:1.5H (67%)
Filter Berm Crest Width (avg.)	1.0 m
Geomembrane Liner Crest Elevation	74.80 m
Interior Floor Slope (avg.)	-3.1% (NW to SE)
Fill Thickness Above Original Ground for Inside Base/ Sump Area (Min.)	1.52 / 1.48 m
Fill Thickness Above Liner	0.5 m
Inside Base Surface area Including Sump Area	3,794 m^2
Sump Surface Area	144 m^2

Table 2-3 indicates the growth and stabilization of the volume of PHC considering remediation over three years and the maximum volume of contaminated material that is anticipated to be stored over a period of 13 years.

The size of the landfarm is based on the design criteria (Table 2-2), the estimated volume of material (Table 2-3), and the requirement to turn over the surface of the piles during the summer months. The designed footprint of the landfarm is 11,000 m^2 with a useful landfarm surface of 3,650 m^2. Contaminated material is piled 1.5 m so that the material is below the crest height of the perimeter berm. At the maximum estimated capacity of the facility, three windrows having each 890 m^3 of PHC will cover 1,800 m^2 allowing 1,850 m^2 for turnover and water management.

Table 2-3 Volume of Petroleum Hydrocarbon Contaminated Material in the Landfarm

Mine Year	Estimated PHC Produced (m^3)	Accumulated PHC in Landfarm for Remediation (m^3)	Treated PHC Removed from Landfarm (m^3)	Hydrocarbon Contaminated Snow or Ice to Landfarm (m^3)	Maximum Accumulated PHC in Landfarm (m^3)
Before -6	420			0	0
-6 and -5	350			0	0
-4	350			0	0
-3	350	1,470		500	1,970
-2	350	1,820		500	2,320
-1	350	2,170		500	2,670
1	350	1,400	1,120	500	1,900
2	350	1,400	350	500	1,900
3	350	1,400	350	500	1,900
4	350	1,400	350	500	1,900
5	350	1,400	350	500	1,900
6	350	1,400	350	500	1,900
7	350	1,400	350	500	1,900
8	350	1,400	350	500	1,900
9	0	1,050	350	0	1,050
10	0	525	525	0	525
11	0	0	525	0	0

SECTION 3 • LANDFARM OPERATION AND MANAGEMENT

Agnico Eagle is responsible for managing and implementing the landfarm operation plan. Operation and monitoring of the landfarm as well as designation of training requirements will be the responsibility of the Environment General Supervisor, Coordinators or designate.

3.1 Acceptable Landfarm Material

3.1.1 Contaminants

The landfarm facility will only treat and/or store light PHC contaminated soils that have been generated through mine related activities at the Project and which have been transferred from the Project's advanced exploration camp landfarm upon closure. Material from the Hamlet of Rankin Inlet or other sites will not be accepted without approval from the NWB, Crown-Indigenous Relations and Northern Affairs, Water Resources Inspectors, and the Kivalliq Inuit Association.

The following products are acceptable for treatment in the landfarm if generated on-site and spilled on soil:

- diesel fuel;
- gasoline;
- hydraulic oil
- aviation fuel (Jet A);
- other light oil (e.g., engine oil, lubricating oil);

In the event that the contaminant source is unknown, soil samples will be analyzed for PHCs and possibly additional contaminants prior to placement in the landfarm. These additional parameters could include total metals, oil and grease, and volatile organic compounds. Analysis for additional compounds will be determined by the Environment Department on a case-by-case basis. If there is uncertainty whether or not the material contains additional, unknown contaminants, the material should be placed in totes/drums until lab results confirm that they can be placed in the landfarm.

Concentrations of contaminants will be compared to the site background values (for metals) and/or criteria in the Government of Nunavut (GN) *Guidelines for Contaminated Site Remediation* (GN 2009). If this analysis indicates soil contamination above background or GN guidelines for any substance not approved for landfarming (i.e., non-PHC contaminants), the spill material will not be placed in the landfarm. This is to ensure that PHC contaminated soils are not contaminated with other products.

Spills of non-PHC material (e.g., solvents) will be placed in drums and stored on-site for shipment to approved facilities during shipping season.

3.1.2 Grain Size

Bioremediation of very coarse-grained, larger soil material, is inhibited as it does not readily retain moisture. However, volatilization will occur more rapidly (SAIC 2006). It has been noted that this material likely contains lower concentrations of contaminants due to a lower volume-to-surface area ratio, and can typically be screened out prior to landfarming (SAIC 2006). As a result, soils and rock material with grain size less than 2.5 centimetres (cm) will be separated from larger-grained material, where possible. This will occur at the spill location or in the landfarm using a screen sieve, should it prove necessary. The two soil fractions will be treated separately in the landfarm.

3.2 Contaminated Soil Additions

3.2.1 Spill Excavation

Soil contaminated with the above-described petroleum hydrocarbon materials will be excavated and transported to the landfarm facility in dump trucks or other approved methods. Care will be exercised to ensure that the entire spill is excavated (verified by olfactory and visual assessment, or sampling if necessary) and that none of the contaminated material is lost during transport.

3.2.2 Placement in the Landfarm

As described above, larger coarse material (rocks) will be separated from the finer material (sand and gravel) in the landfarm and assessed visually for PHC staining and product. If the material is saturated it will be spread to allow volatilization in the designated area of the landfarm.

Materials identified as acceptable in the landfarm will be placed in windrows with dimensions about 18 m wide at base x 1.5 m high x 34 m long. Windrows may be piled wider, higher, or longer as space permits. A record will be kept by the on-site Environmental Coordinator or designate of the amount of contaminated soil placed in the landfarm and the location of each load within it.

3.2.3 Decontamination of Soil Movement Equipment

The decontamination of soil movement equipment is outlined in the Landfarm Soil Movement Procedure, included as the Appendix A to this Management Plan.

3.3 Contaminated Snow

Petroleum hydrocarbon contaminated snow and ice will be placed in a designated snow-cell area and treated as contact water after snowmelt. After snowmelt, the contaminated water will pumped through the site's oil-water separator to remove PHC residue. The treated water will be discharged to the CP1.

Snow accumulation in the Landfarm will be allowed to melt and accumulate in the Landfarm sump where it will be treated through the oil-water separator as needed upon melt or used in the bioremediation process for the contaminated soil. Any excess snow accumulation in the Landfarm will be moved to the snowcell.

3.4 Remediation

Remediation of fine grained PHC contaminated soil in the landfarms occurs naturally through volatilization and aerobic microbial degradation. Soil aeration, nutrient amendment and water addition, are recognized as methods for improving rates of remediation. Agnico Eagle commissioned the National Research Council Canada to undertake the bioremediation research study to optimize the biodegradation process. Agnico Eagle will look at increasing biodegradation rates through potential opportunities such as nutrient amendment.

3.4.1 Absorbent Materials

Coarse-grained soils are not readily bio-remediated, but concentrations of PHC contaminants may still be reduced through volatilization. Oil absorbent pads will be used to help remove visible product from coarse-grained material.

3.4.2 Aeration

To promote aerobic conditions throughout the windrows, soil will be mixed mechanically with earth-moving equipment. This turnover of soil piles will occur approximately two to four times per year, during the summer months.

3.4.3 Soil Moisture

Prior to turning, site personnel will ensure that soil is not so dry as to generate significant dust, nor overly saturated. If soil is too dry, non-contaminated water from within the landfarm containment area will be used as a moisture source and sprayed on the piles. If no accumulated water is available, water from CP1 or freshwater will be used. If the windrows are saturated, aeration will be delayed until the moisture content is reduced.

3.4.4 Nutrient Amendment

The use of sewage sludge as a nutrient amendment has precedent in the north. Sewage sludge as a nutrient source has also been proposed for the Milne Inlet Mary River Project (EBA 2010). This material not only provides the benefit of nutrients, but also adds organic matter to help retain moisture and microorganisms. Furthermore, the use of sewage sludge produced on-site helps to reduce the waste footprint of the mine by re-directing this material from disposal facilities and avoids needing to import a chemical fertilizer. The use of sewage sludge or another recommended nutrient amendment will be considered for optimization of biodegradation.

3.5 Removal of Soil From the Landfarm

3.5.1 Government of Nunavut Remediation Guidelines

The following parameters will be measured and compared with the GN industrial remediation criteria to determine whether PHC contaminated soil has been adequately remediated:

- benzene, toluene, ethylbenzene and xylene (BTEX); and
- petroleum hydrocarbon fractions 1 - 4.

The GN remediation criteria are characterized for agricultural/wildlife, residential/parkland, commercial, and industrial land uses. At the Project, remediation to agricultural/wildlife criteria is targeted; however, if these criteria cannot be met, industrial criteria will be followed.

The GN remediation criteria for coarse-grained soils will be applied. Table 3-1 presents the applicable Tier 1 criteria for coarse-grained soil, assuming agricultural/wildlife or industrial land uses.

Table 3-1 Summary of Relevant GN Tier 1 Soil Remediation Criteria for Surface Soil (mg/kg)

	Land Use Criteria (mg/kg)	
	Agricultural/Wildlife	**Industrial**
Benzene	0.03	0.03
Toluene	0.37	0.37
Ethylbenzene	0.082	0.082
Xylene	11	11
PHC Fraction 1	30	320
PHC Fraction 2	150	260
PHC Fraction 3	300	1,700
PHC Fraction 4	2,800	3,300

mg/kg = milligram per kilogram

3.5.2 Sampling and Analysis

Landfarm windrows will be sampled annually at the end of the summer season to determine if remediation objectives have been met. Representative composite samples will be taken of each windrow to estimate remaining PHC concentrations. For each 10 m of windrow length, one composite sample will be collected, each consisting of three surface sub-samples and three sub-samples at 1 m depth. Sub-samples will be taken approximately 3.3 m apart, and will be taken from both sides of the windrow. Sampling QA/QC measures will include collection of 1 duplicate per 10 samples.

After two seasons of treatment in the landfarm, degradation rates will be assessed to estimate the total remediation time required for PHC contaminated soil under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, landfarm operations will continue, with aeration and possible nutrient amendments as described above. If rates of degradation are not sufficient through this method, alternate options will be further investigated as described in Section 4.2.

3.5.3 Soil Removal

Coarse-grained soils will be assessed near the end of the summer season by Environment Department technicians for PHC product and odour. Based on the experience learned at Meadowbank, Agnico

Eagle is confident that confirmatory sampling and laboratory analysis is not required prior to removing coarse-grained soil from the Landfarm. Observations show that volatilization of PHCs from coarse-grained soil occurs more rapidly than biodegradation. It has been noted that this material likely contains lower concentrations of contaminations due to a lower volume-to surface area ratio, and can typically be screened out prior to landfarming. Thus, the use of a photoionization detector (PID) is sufficient to confirm material is in a suitable state to be removed from the landfarm. When PHC odours are no longer detected, the material will be removed to waste rock storage facility or at the TSF to be used as cover material.

When sample analysis of fine-grained material at the end of a season indicates that concentrations of contaminants are below GN guidelines, a soil pile or the appropriate section of a pile will be deemed acceptable for removal from the facility. Interim monitoring may be conducted through measurements of headspace with a portable instrument (e.g., flame ionization detector), but samples will be confirmed by an accredited laboratory prior to soil removal.

When remediated, the soils will be removed from the facility and can be used for construction purpose such as normal overburden (i.e., part of the cover of the TSF) or stacked in the WRSF. Based on a remediation period of three seasons, it would be possible to close the landfarm facility three years after the end of the process plant operation.

3.6 Water Management

Since the landfarm facility is uncovered to facilitate natural weathering, water accumulating inside the bermed area may come into contact with contaminated material.

While the landfarm has an impermeable liner, visual inspections by the Environment Department will be conducted for seepage of contact water coming through the perimeter berm, or the accumulation of water within the containment berm. This will be conducted on a weekly basis starting after freshet and continuing until October when water is likely to be present. In the event of water accumulation or seepage, the ponded water will be pumped through the site's oil-water separator to remove PHC residue and will be analyzed for BTEX, lead, and oil and grease prior to discharge to CP1 or used on the windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged directly to the receiving environment.

3.7 Winter landfarm management

Uncontaminated snow will be removed as much as possible during winter to minimize the quantity of spring melt water inside the berm. Care will be taken to ensure contaminated snow/soil is not disturbed by leaving a base layer of snow of no less than 10 cm in place. Following snowmelt, any contaminated product left from winter spill clean-up operations will be padded up. The base soil in these areas will be excavated and added to existing remediation windrows as soon as possible after snowmelt to minimize migration into the facility substrate.

3.8 Landfarm Closure and Reclamation

After removal of all remediated soil and prior to closure and reclamation of the landfarm, the berm and base will be sampled on a 10 m grid, to determine if these soils are free from PHC contamination. Results of this analysis will be compared to GN criteria set out in Table 3-1. No excavation will be necessary if agricultural/wildlife criteria are met. If industrial criteria are used, the landfarm will be covered with 2 m of waste rock or other material used for reclamation. The surrounding berm will be breached to avoid water accumulation on the landfarm.

3.9 Summary of Activities

A summary of landfarm activities including monitoring of the physical condition and potential environmental impacts of the landfarm is provided in Table 3-2. An annual report will be prepared indicating the volume of material added to the facility, amount of material removed, disposal or reuse location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped. This information will be appended to Agnico Eagle's NWB Annual Report.

Table 3-2 Summary of Landfarm Activities, Analyses, and Records

Activity	Analysis	Frequency of Analysis	Record
Excavation of spill and transport of contaminated material to landfarm.	If unsure of full excavation - F1-F4, BTEX If contaminant source unknown, F1-F4, BTEX, metals, oil and grease, VOCs	As needed	Date, time and location of spill and excavation; estimated volume of spill; estimated quantity of excavated soil; storage/disposal location of excavated soil, if applicable. Any evidence of remaining product
Soil aeration	NA	Two to four times over the summer	Date and time of the aeration; location; soil condition (moisture, odour, granulometrie, etc.)
Soil treatment with sewage sludge as nutrient supplement.	Visual inspection to ensure proper incorporation	At least once during summer on selected windrows	Date and time; type of treatment (aeration or nutrient amendment); location in landfarm; any odour noticed during aeration
Sampling for progress of remediation	Hydrocarbon vapour in headspace (by PID); F1-F4, BTEX (laboratory)	Vapour – as needed; Laboratory - annually	Date and time; location; odour; laboratory report
Soil removal from landfarm	Removal subject to meeting GN criteria	Once GN criteria are met	Date and time; location; quantity of soil removed; final location
Ponded contact water	BTEX, oil and grease, lead – as specified in Water Licence	Prior to any dewatering; if re-used in landfarm, no sampling necessary	Date and time, location, laboratory report, in Annual Report
Seepage	Visual inspection; BTEX, oil and grease, lead – as specified in Water License	Weekly during summer	Location, extent, approximate depth, evidence of sheen
Identification of maintenance requirements	Visual inspection of landfarm	Twice over the summer	Inspected areas; condition of berm and base; previously unidentified safety concerns

SECTION 4 • CONTINGENCY OPTIONS

This section describes the contaminated soil management plan, should a large spill event occur, and if landfarm treatment prove not successful.

4.1 Large Spill Event

A large spill event producing a quantity of soil that cannot be contained in the landfarm is unlikely because the landfarm is designed to hold nearly two times as much contaminated soil as is expected to be produced. Nevertheless, in this event, soils will be placed in a temporary storage area. A temporary stockpile area would be set up on an emergency basis, such as in the Waste Rock Storage Facility (WRSF) or the Tailings Storage Facility (TSF). As space becomes available, the soil would be added to the landfarm. Through spill prevention measures discussed earlier in this Plan, Agnico Eagle is minimizing the probability of this scenario occurring.

4.2 Alternate Treatment Options

Should landfarm treatment not perform as anticipated and it is evident that rates of degradation are not sufficient to meet GN Tier 1 criteria within the life-of-mine and the anticipated closure, the following alternative treatment options will be considered. Implementation will be after development of a more detailed protocol and approval of a revised plan by the NWB.

4.2.1 Soil Amendment

Since pH, salinity, moisture content, and microbial population density all affect rates of biodegradation by microbes, these factors may be monitored and adjusted through soil amendments if they are not found to be optimal (SAIC 2006). In addition, the height of soil windrows could be reduced to maximize air exposure if space in the landfarm allows.

4.2.2 Tier 2 – Modified-Criteria Approach

According to the GN *Environmental Guideline for Contaminated Site Remediation* (GN 2009), in cases where site conditions, land uses, receptors, or exposure pathways are different from those assumed in the development of the Tier 1 criteria, modified criteria may be permitted. This process requires the collection of site-specific information on exposure and risk estimates, and is subject to GN approval. For this Project, landfarmed soils are to be encapsulated in a WRSF rather than used in surface applications, as assumed in Tier 1, reducing the likelihood of exposure to any remaining contamination. Therefore, the Tier 2 approach could be warranted if Tier 1 criteria cannot be met. Any consideration for this approach would be based on soil sampling results and science based information.

4.2.3 Direct Placement in Waste Rock Storage Facility or on Tailings Storage Facility

Another option for management of contaminated soil if bioremediation proves not effective would be the direct placement of this material in a WRSF or on the TSF. Although the use of PHC contaminated soils in these storage areas is not optimal, the quantity generated on-site is small in comparison to the quantity of waste rock and cover on the TSF. While this method would not result in the treatment of soil, it is a viable contingency option because it would allow for the safe disposal of the contaminated material. Encapsulation and freeze-back would occur, eliminating any movement of contaminants. Over time, this material would undergo natural degradation. Consideration of this option would also include a suitable monitoring program for PHCs, which would be incorporated into the Closure and Reclamation Plan.

SECTION 5 • ASSESSMENT AND REPORTING

5.1 Feasibility

After two seasons of treatment in the landfarm, degradation rates of PHC contaminants are assessed to estimate the total remediation time required under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, landfarm operations will continue, with aeration and possible nutrient amendments as described above. If rates of degradation are not sufficient through this method, alternate options will be further investigated (Section 4).

5.2 Reporting

Reporting of landfarm activities is submitted annually by the Environment Department, indicating the volume of material added to the facility, amount of material removed and disposed or the re-use location, and confirmatory analysis results. This information will be appended to Agnico Eagle's NWB Annual Report.

5.3 Plan Review and Continual Improvement

The Landfarm Management Plan is reviewed annually by the Meliadine Environmental Department, and, if necessary, updated at least every two years of operation.

REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2008. Landfarm Design and Management Plan In Accordance with Water License 2AM-MEA0815, Meadowbank Gold Project, 20 p. + Figures and Appendix. October 2008.

Agnico Eagle. 2017. Version 1.1, Supporting Document 8-2 Oil Pollution Emergency Plan, Final Environmental Impact Statement, Meliadine Gold Project, Nunavut. Submitted to the Nunavut Impact Review Board. September 2017.

EBA. 2010. Hydrocarbon Impacted Soils Storage and Landfarm Facility Operations, Maintenance and Monitoring Plan, Milne Inlet, Mary River Project, Nunavut. Prepared for: Baffinland Iron Mines Corporation. Issued for Review. December 2010.

Golder (Golder Associates Ltd). 2007. Technical Memorandum: Landfarm Option Analysis, Meadowbank Gold Project, Nunavut. Prepared for: Agnico-Eagle Mines Ltd. August 23, 2007.

Government of Nunavut, March 2009. Environmental Guideline for Contaminated Site Remediation http://env.gov.nu.ca/sites/default/files/Guideline%20Contaminated%20Site%20Remediation.pdf

Paudyn, K. et al, 2008. Remediation of hydrocarbon contaminated soils in the Canadian Arctic by landfarming. Cold Regions Science and Technology, v53, p 102-114, n 1 June 2008

SAIC (Science Applications International Corporation), 2006. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Final report presented to: Contaminated Sites Division and Emergencies Engineering Technologies Office (EETO), Environmental Technology Centre, Environment Canada. SAIC Canada Project #: 11953.B.S08. CM #: 001659. March 31, 2006.

TetraTech EBA. 2014. Tailings, Waste And Water Management For Feasibility Level Study Meliadine Project, Nunavut, FILE: E14103188-01, AEM Report Number: 6509-REP-05, 145 p. + Appendix.

APPENDIX A

AGNICO EAGLE
NUNAVUT

DOCUMENT ID: NU-E&I-PRO – Land farm soil movement	
People concerned: Site services HEO, environmental department	**Effective Date: 2018-03-13**
This procedure corresponds to the required minimum standard. Each and everyone also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.	

Rev #	Date	Description	Initiator
0	2018-03-13	Draft	Guillaume Gemme

Objective:

- Safe operation of equipment during land farm soil movement

Definitions (If applicable):
This procedure is in place to ensure proper usage of heavy equipment on the land farm during the soil movement process.

Page 1 of 4

2019-02-17 *This document is void 24 hours after printing*

Tool/Equipment Required	PPE Required
• Heavy equipment (Backhoe/excavator/ Dozer/ Etc.) equipped with flat lip bucket to avoid membrane damage • Measuring device (Ex: Measuring tape) • Shovel and broom	• Standard PPE

Specific Training Requirements
• Appropriate Heavy equipment operator training. (Class 2 Operator or equivalent)

1. Access to the Land farm a. Before entering the land farm, the operator need to have the approval of the Site Services field Supervisor and be accompanied by an environmental representative. 2. Soil movement a. Following the environmental department direction, proceed with the requested soil movement work. (Drawing of the work to be done including exact location, dimension of the area and maximum deepness to reach need to be done by Environment department before proceeding with the work) b. Sampling will be completed by environment department following procedure : MEL-ENV-Permanent Land farm & Soil Sampling

AGNICO EAGLE NUNAVUT

3. Equipment decontamination
   a. Before exiting the area, make sure to remove all contaminated soil from the heavy equipment.
   b. Using a hand shovel remove all contaminated soil on the equipment. If required use a broom to reach all potential contaminated parts of equipment
   c. Call the field supervisor to assess the equipment cleanness before exiting the land farm.

Related Documentation (If applicable):
• N/A

References (If applicable):
• Meliadine Water license type A (Land farm Management plan)

Appendix (If applicable):
• Pictures • Plans

AGNICO EAGLE

MELIADINE GOLD MINE

Water Quality and Flow Monitoring Plan

JANUARY 2019
VERSION 1

EXECUTIVE SUMMARY

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEL1631. The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Plan* and the *Metal and Diamond Mining Effluent Regulations (MDMER)*.

Section 2 of this Plan includes an overview of the monitoring programs and mine development schedule. Section 3 provides specific details (including sampling locations and parameters to be measured) for the compliance monitoring program, along with general guidance for the event monitoring program. An adaptive management program is described for regulated discharge and non-regulated discharges in Section 3. Requirements of the flow monitoring program are described in Section 4, and an overview of the reporting requirements in Section 5.

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IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEL1631, Part B, Item 10, the proposed implementation schedule for this Plan is outlined below.

This Plan will be implemented immediately (December 2018) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Environmental Superintendent
Environmental Coordinators
Environmental Technicians

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	18/12/16	All	All	Comprehensive plan for Meliadine project. First version composed by Meliadine Environment Department.

Prepared by:

Agnico Eagle Mines Limited - Meliadine Division

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SECTION 1. INTRODUCTION

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEL1631 (the License). The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Plan* and the *Metal and Diamond Mining Effluent Regulations (MDMER)*. The implementation and periodic updates to this Plan are the responsibility of the Meliadine Environment Department under the guidance of the Meliadine Environment Superintendent or designate.

The Plan summarizes the monitoring locations, sampling frequency, monitoring parameters, compliance discharge criteria and an adaptive management plan for water quality at the Meliadine Gold Project.

The purpose of this Water Quality and Flow Monitoring Plan is to establish the program that is to be implemented and followed by AEM's Meliadine environmental management team to monitor the performance of the waste and water management systems at the Meliadine Gold Project. The program includes:

- Verifying and validating the predicted water quality values with empirical measurements of the mine site water quality and flows;
- A comparison of measured water quality data to compliance requirements stipulated in the License; and
- A framework for adaptive management that allows the identification and rectification, where necessary, of unexpected trends or non-compliance in water quality and flows.

The Plan provides information on the locations of the monitoring stations at the various stages of mining. These monitoring locations are used to evaluate the performance of the mine waste and water management system.

The objectives of the monitoring program are:

1) To track the chemistry of the contact and non-contact water prior to and during discharge;

2) To assist in identifying if water treatment is required prior to discharge; and

3) To minimize the potential impacts of mining activities on the surrounding environment.

Additional locations outside the footprint of the mine (and outside the scope of this Plan) will be monitored under the *Meliadine Gold Project Aquatic Effects Management Program* (Golder 2016).

SECTION 2. OVERVIEW

2.1 OVERVIEW OF SITE WATER MANAGEMENT PLAN

Details of overall water management are discussed in the Meliadine Water Management Plan which is updated annually. A network of berms, dikes, containment ponds, channels, culverts and sumps are in place and maintained to facilitate water management (Section 3 of the *Water Management Plan*).

As specified in the *Water Management Plan*, surface contact water is intercepted, diverted and contained within various containment ponds prior to evaporation or treatment. Contact water from the Underground Mine is collected in underground sumps and recirculated for use in various underground operations. Underground contact water that is not used for operations is stored underground and any excess water that cannot be stored underground is pumped to the Saline Ponds or to the Saline Water Treatment Plant (SWTP) for treatment (See Section 3.9 of the *Water Management Plan*). Additional Saline Storage ponds will be developed on the Meliadine site (surface) in the future as groundwater inflows in the underground workings of the mine are greater than predicted. Agnico Eagle has received approval from the Nunavut Impact Review Board to discharge saline water via a diffuser to the sea in Rankin Inlet (Melvin Bay).

2.2 MONITORING PROGRAMS

This Plan has been divided into two levels of monitoring to characterize the range of impacts between the sources of contact water in the individual mine facilities and the point of discharge or release to the receiving environment. The two levels of monitoring include:

1) Compliance monitoring; and

2) Event monitoring.

2.2.1 Compliance Monitoring Program (CM)

The CM sites are those stipulated in the License; these sites vary from contact water collection ponds, structures such as ditches, culverts prior to discharge to the receiving environment and local lakes surrounding the mine site. The requirements of the License, including water quality limits, will be applied at the applicable mine discharge points identified in the CM program.

The CM program provides a mechanism to assess water quality at specified sites, and to confirm and document compliance of discharge with regulatory requirements. As part of adaptive water management, these internal monitoring stations provide protection to the receiving water environment, provide data to predict pit re-flooding water quality and ensure exceedances of predicted or regulated levels are appropriately managed or mitigated to reduce impacts.

2.2.2 Event Monitoring Program (EM)

The EM sites result from unexpected events such as spills, accidents, and malfunctions. The response programs for such events are discussed in greater detail in the following four (4) documents:

- Meliadine Spill Contingency Plan (March 2019;
- Meliadine Emergency Response Plan (May 2018);
- Meliadine Freshet Action Plan (March 2019); and
- Meliadine Water Management Plan (March 2019).

Each accidental release will require mobilization of site equipment to stabilize the release, procedures to contain, neutralize, and dispose of the discharge, and recommendations for monitoring the site following the incident.

2.3 OVERVIEW OF MINE DEVELOPMENT SCHEDULE

The Mine Plan and key mine development activities, including mine waste management are currently used concurrently with the *Water Management Plan*.

The Mine Plan proposes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

The Mine is estimated to produce approximately 14.9 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 14.9 Mt of tailings. The following phased approach is proposed for the development of the Tiriganiaq gold deposit;

- Phase 1: 3.5 years for Mine Construction. Construction began in 2015 and is estimated to be completed in Q2 of 2019 (Q4 Year -5 to Year Q2 -1);
- Phase 2: 8.5 years for Mine Operations, beginning in 2019 (Q2 Year -1 to Year 8);
- Phase 3: 3 years Mine Closure (Year 9 to Year 11); and;
- Phase 4: Post-Closure (Year 11 forward).

Mining facilities on surface will include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a series of water treatment plant

SECTION 3. MONITORING PROGRAM

The monitoring program is presented in three sections; requirements of the compliance monitoring program, an overview of the event monitoring program, and then details of the adaptive management program for monitoring results.

3.1 COMPLIANCE MONITORING PROGRAM

The CM program monitors the chemistry of four local lake surrounding the mine site (E3, G2, H1 and B5) as well as mine contact water collected and diverted at specified locations prior to release into the receiving water environment. The sampling is conducted in order to confirm and document compliance with regulatory requirements. The types of water and the timing of the CM program include:

- Non-contact water from local lakes;
- Mine contact water collected from drainage of different structures; and
- Monitoring points located within the containment ponds prior to release into the receiving water environment

The CM sampling program has multiple monitoring stations across the project site, with sampling at different stages of the mine life. All of the CM stations, a description of their location, parameters to be monitored and sampling frequency are listed in Table 3.1. Specific details for the monitoring parameter groups are provided in Table 3.2. In summary, Agnico Eagle follows 5 groups of parameters, as identified in Meliadine's Type A Water License Schedule I Table 1.

Figures 3.1 shows the approximate location of each of the sampling sites. The actual location of each sampling site is determined by access and safety considerations and are marked by a stake that defines the exact location of the collection point for sampling events with appropriate attached signage in English, Inuktitut and French.

GPS coordinates for all compliance monitoring stations were confirmed, as required in Part I, Item 6 of the NWB Type A water license.

3.1.1 General Sampling and Analysis Program

Samples are collected in clean laboratory-supplied containers and preserved as directed by the analytical laboratory. During all phases, samples are analyzed offsite at an accredited commercial lab (ALS in Burnaby BC, Maxxam Analytics in Ottawa, AquaTox in Puslinch, or H2Lab in Val d'Or). Samples sent to commericial laboratories may change as the site matures and additional requirements occur.

Table 3.3 summarizes the minimum sample volumes, container, preservation, and holding times for each analyte. This information is from the *USEPA Methods for Chemical Analysis of Water and Waste Water* (*EPA-600/4-79-020, 1979*).

Table 3.1: Monitoring Program

Station	Description	Phase	Monitoring Parameters	Frequency
Mine Site				
MEL-D-1	Dewatering: Water transferred from lakes to Meliadine Lake during dewatering of lakes	Construction	As defined in the Water Management Plan referred to in Part D, Item 12	Prior to discharge and Weekly during discharge
			Volume (m3)	Daily during periods of discharge
MEL-SR-1 to TBD	Surface Runoff – runoff downstream of Construction areas at Meliadine Site and Itivia Site, Seeps in contact with the roads, earthworks and any Runoff and/or discharge from borrow pits and quarries	Construction, and Operation	As defined in the Water Management Plan referred to in Part D, Item 18 and Part I, Item 11	Prior to Construction, Weekly during Construction
			Group 1	Monthly during open water or when water is present upon completion
MEL-11	Water Intake from Meliadine Lake	Construction, Operation, and Closure	Full Suite	Monthly during periods of intake
			Volume (m3)	Daily during periods of intake
MEL-12	Water treatment plant (pre-treatment) coming from CP1, off the pipe and not in the pond	Construction (prior to release), Operations, and Closure	Group 1	Monthly during periods of discharge
MEL-03-01 (and AEMP Stations)	Mixing zone in Meliadine Lake, Station 1; and MDMER exposure stations for final discharge point within mixing zone	Construction (prior to release), Operations, and Closure	Full Suite, Group 3 (MDMER)	Monthly during periods of discharge
MEL-14	Water treatment plant from CP-1 (post-treatment), end of pipe (before offsite release) in the plant before release.	Construction (upon effluent release), Operations, and Closure	Full Suite, Group 3	Prior to discharge and Weekly during discharge

			Volume (m3)	Daily during periods of discharge Once prior to discharge and Monthly thereafter
			Acute Lethality	Once prior to discharge and Monthly thereafter
MEl-15	Local lake E-3	Operations, and Closure	Group 2	Bi-annually during open water
MEL-16	Local Lake G2	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-17	Local Pond H1	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-18	Local Lake B5	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-19	CP-2 Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-20	CP-3 Collection of drainage from dry stacked tailings	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-21	CP-4 Collection of drainage from WRSF1	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-22	CP-5 Collection of drainage from WRSF1 and WRSF2	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-23	CP-6 Collection of drainage from WRSF3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-24	Seepage from the Landfill between the landfill and Pond H3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-25	Secondary containment area at the Itivia Site Fuel Storage and Containment Facility	Construction, Operation, Closure	Group 4, Volume (m3)	Prior to discharge or transfer of Effluent

Table 3.2: Monitoring Parameters

Group	Parameters
1	pH, turbidity, hardness, alkalinity, chloride, fluoride, sulphate, total dissolved solids (TDS), total suspended solids (TSS), total cyanide, ammonia nitrogen, nitrate, nitrite, phosphorus, orthophosphate, Total Metals (aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, and zinc).
2	**Total and Dissolved Metals**: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc. **Nutrients**: ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, orthophosphate, total phosphorus, total organic carbon, dissolved organic carbon, and reactive silica. **Conventional Parameters**: bicarbonate alkalinity, chloride, carbonate alkalinity, turbidity, conductivity, hardness, calcium, potassium, magnesium, sodium, sulphate, pH, total alkalinity, TDS, TSS, total cyanide, free cyanide, and weak acid dissociable (WAD) cyanide..
3	**MDMER parameters**: total cyanide, arsenic, copper, lead, nickel, zinc, radium-226, TSS, pH, total ammonia and temperature. **MDMER additional requirements**: Effluent volumes and flow rate of discharge, Acutely Lethality tests (Rainbow Trout and Daphnia magna) and environmental effects monitoring (EEM).
4	Total arsenic, total copper, total lead, total nickel, TSS, ammonia, benzene, toluene, ethylbenzene, xylene, total petroleum hydrocarbons (TPH), and pH
Full Suite	Group 2, Total Petroleum Hydrocarbons, Turbidity. Non Acutely-lethal (Rainbow Trout and Daphnia magna) for discharge only.
Flow	Flow data-logger
Field measurements	Field pH, specific conductivity, dissolved oxygen, and temperature.

Table 3.3: Summary of Sampling Requirements for each Analyte

Parameters	Matrix Holding Time				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Microbiology							
Escherichia coli, total coliforms, A.A.H.B	48h	48h	48h	48h	PPS	TS, E	250ml
Enterococcus	48h	48h	48h	48h	PPS	TS, E	250ml
Thermo tolerant coliforms (fecal)	48h	48h	48h	48h	PPS	TS, E	250ml
Inorganic Chemistry							
Absorbance UV, Transmittance UV				24h	P. T. V	N	125ml
Alkalinity, Acidity, Bicarbonates, Carbonates	14d	14d	14d	14d	P, T, V	N	250ml
Ammonia nitrogen (NH_3-NH_4)	28d	28d	28d	28d	P, T, V	AS	125ml
Kjeldahl ammonia (NTK)		28d	28d	28d	P, T, V	AS	125ml
Anions (Cl, F,SO_4)	28d	28d	28d	28d	P, T, V	N	250ml
Color, Free & total Chlorine	48h	48h	48h	48h	P, T, V	N	125ml
Conductivity	28d	28d	28d	28d	P, T, V	N	250ml
Cyanides total/available, Cyanides	14d	14d	14d	14d	P, T, V	NaOH	250ml
BOD_5/Carbonated BOD_5 (2)		48h/4°	48h/4°		P, T, V	N	250ml
COD (chemical oxygen demand)		28d	28d		P, T, V	AS	125ml
Mercury (Hg)	28d	28d	28d	28d	P, T, V	AN	250ml
Total/dissolved metals (filtered on field)	180d	180d	180d	180d	P, T, V	AN	250ml
Dissolved Metals (filtered in the laboratory)	24h	24h	24h	24h	P, T, V	N	250ml
Total suspended solids & Volatile TSS		7d	7d	7d	P. T. V	N	500ml
NH_3 or NH_4		24h	24h	24h	P.T.V	N+AS	2/125ml
Nitrites (NO_2), Nitrates (NO_3), Turbidity	48h	48h	48h	48h	P, T, V	N	250ml
Nitrites-Nitrates (NO_2-NO_3)	28d	28d	28d	28d	P, T, V	AS	250ml
O-Phosphates (O-PO_4)	48h	48h	48h	48h	P, T, V	N	500ml
pH	24h	24h	24h	24h	P, T, V	N	125ml
Total Phosphorus (P-tot)	28d	28d	28d	28d	P, T, V	AS	125ml
Dissolved solids (TDS)		7d	7d	7d	P. T. V	N	250ml
Total solids		7d	7d	7d	P. T. V	N	250ml
Sulphides (H_2S) (3)	28d	28d	28d	28d	P. T. V	AcZn + NaOH	125ml
Thiosulfates	48h	48h	48h	48h	P. T. V	N	125ml
Radioactive & Organic Chemistry							
Fatty resin acids (S-T)	--	28d	28d	--	VA, VT	AS	1L
Congeners PCB (S-T)	28d	28d	28d	28d	VA, VT	N	1L
Chlorobenzene	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml
Total Organic Carbon (TOC)	28d	28d	28d	28d	P, T, V (B)	AC	100ml
Dissolved Organic Carbon (DOC)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Total Inorganic Carbon (CIT)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Phenolic compound (GC-MS)	28d	28d	28d	28d	VA, VT	AS	1L
Glyphosate (S-T)	14d	14d	14d	14d	P.T	N	500ml
PAH	28d	28d	28d	28d	VB	AS	1L
Oil & Greases (total and non-polar)	28d	28d	28d	28d	VA, VT	AS	1L
C10-C50 HP and/or Petroleum Product Identification	28d	28d	28d	28d	VA, VT	AS	1L

Phenol index	28d	28d	28d	28d	VA, VT	AS	500ml
Radium-226	180d	180d	180d	180d	P, T. V	AN	1L
VOC (MAH, CAH, THM, BTEX) (3)	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml

Type of bottle:
P.S.V.T.: plastic bottle, bag or glass bottle with Teflon cap
P, T: Plastic bottle or plastic bottle with Teflon cap
P.T.V.: Plastic bottle or glass bottle with plastic or Teflon cap
PPS: Sterile propyl ethylene bottle
VA: Clear or amber glass with aluminium or Teflon seal
VB: Amber glass (or clear glass covered with aluminium paper) aluminium seal of Teflon
VT: Clear or amber glass bottle with Teflon seal
Preservative:
AC: 0.1ml (100µl) of HCl per 100ml of sample
AcZn: 0.2ml zinc acetate 2N per 100ml of sample and NaOH 10N to pH >9
AN: HNO3 to pH <2
AS: H2SO4 to pH <2
E: 2.5ml EDTA 1.5% (p/v) per 100ml of sample if heavy metals are suspected
ED: 0.1ml diamine ethylene 45 mg/l per 100 ml of sample
EDTA: 1ml EDTA 0.25M per 100ml of sample
N: No preservative
NaOH: NaOH 10N to >12
TS: Sodium thiosulfate final concentration in the sample of 0.1% (p/v)

3.1.2 Compliance Monitoring Stations and Discharge Criteria

Further details of the specific CM stations and discharge criteria stipulated under the License are provided below.

3.1.2.1 *Dewatering Activities*

All Waters from dewatering activities at Monitoring Program Stations MEL-D-1 through MEL-D-TBD shall be directed to Meliadine Lake and shall not exceed the quality limits presented in Table 3.4 as stipulated in Part D, Item 12 of the License.

Table 3.4: TSS and pH Criteria at CM Stations MEL-D-1 through MEL-D-TBD

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample
TSS	15.0	30
pH	6.0 to 9.5	6.0 to 9.5

All surface runoff and/or discharge from drainage management systems, at the Monitoring Program Stations MEL-SR-1 to MEL-SR-TBD during the Construction/Operation of any facilities and infrastructure associated with this project, including laydown areas and All-weather Access Road, where flow may directly or indirectly enter a Water body, shall not exceed the Effluent quality limits presented in Table 3.5, as stipulated in Part D, Item 18 of the License.

Table 3.5: Effluent Criteria at CM Station MEL-SR-1 to MEL-SR-TBD

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids (TSS) (mg/L)	50.0	100.0
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	6.0 to 9.5	6.0 to 9.5

3.1.2.2 *Water Collection System*

A water collection system comprised of berms, dikes, containment ponds, channels, culverts and sumps was developed to control water at the Meliadine project (Section 3 of the *Water Management Plan*). Diversion berms, diversion channels and culverts will direct surface water towards containment ponds and associated dikes. Pending salinity levels, water in containment pond CP5 will be treated by a Reverse Osmosis (RO) treatment plant prior to be discharged in CP1.

Contact water from the Underground Mine is collected in underground sumps and recirculated for use in various underground operations. Underground contact water that is not used for operations is stored underground and any excess water that cannot be stored underground is pumped to the Saline Ponds. Saline water collected in the Saline Ponds is temporarily stored and then actively evaporated or pumped to the SWTP for treatment prior to being pumped to CP1.

At CP1, the water is treated for total suspended solids (TSS) at the Effluent Water Treatment Plant (EWTP) and either transferred to the process plant for use as make-up water or discharged through the diffuser located in Meliadine Lake

Effluent discharged from CP1 at CM station MEL-14 shall be directed to Meliadine Lake through the Meliadine Lake Outfall Diffuser and shall not exceed the effluent quality limits presented in Table 3.7, as stipulated in Part F, Item 3 of the License.

Table 3.6: Effluent Criteria at CM Station MEL-14

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
pH	6.0 to 9.5	6.0 to 9.5
TSS (mg/L)	15	30
TDS (mg/L)	1400	1400
Total (T)-Al (mg/L)	2.0	3.0
T-As (mg/L)	0.3	0.6
T-CN (mg/L)	0.5	1
T-Cu (mg/L)	0.2	0.4
NH_4-N (mg/L)	14	18
T-Ni (mg/L)	0.5	1
T-Pb (mg/L)	0.2	0.4
T-P (mg/L)	2.0	4.0

T-Zn (mg/L)	0.4	0.8
Total Petroleum Hydrocarbons (TPH) (mg/L)	5	5

The Discharge of Effluent from the Final Discharge Point at Monitoring Program Station MEL-14 shall be demonstrated to be non-Acutely Lethal under the following test in accordance with the Schedule I of the License:

a. Acute Lethality of Effluents to Rainbow Trout (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13 July 1990, published by the Department of the Environment, as amended in December 2000, and as may be further amended from time to time.

Itivia Marshalling Area

Surface water runoff from the bulk fuel tank storage areas is collected within the tank's secondary containment enclosures that are equipped with an HDPE liner; these are designed to contain petroleum products released due to spill events. Water collected in the secondary containment enclosures at CM station MEL-25 is discharged to land in a controlled manner according to the Nunavut Water Board Type A water license # 2AM-MEL16331.

All effluent being discharged from the secondary containment enclosures at the itivia marshalling facility shall not exceed the effluent quality limits presented in Table 3.9, as stipulated in Part F, Item 5 of the water license.

Table 3.7: Effluent Criteria at CM Station MEL-25

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
pH	6.0 to 9.5	6.0 to 9.5
TSS (mg/L)	15.0	30.0
Benzene (ug/L)	370	370
Toluene (ug/l)	2	2
Ethylbenzene (ug/L)	90	90
Lead (mg/L)	0.1	0.1
Oil and Grease (mg/L)	5.0 and no visible sheen	5.0 and no visible sheen

3.1.2.3 *Receiving Environment*

Receiving water quality monitoring is discussed in the Aquatic Effects Management Program (AEMP) (March 2019). Within the AEMP are numerous monitoring programs: water quality, sediment quality, benthic invertebrate communities, and fish health and fish tissue chemistry. The Meliadine Lake monitoring program was designed around the key aspects of Environmental Effects Monitoring (EEM) requirements under the Metal and Diamond Mining Effluent Regulations. Water quality data are analyzed to determine if there are differences between the Near-field exposure area, the Mid-field exposure area, and the pooled reference areas of Meliadine Lake.

3.2 EVENT MONITORING

The Event Monitoring (EM) program addresses the site specific monitoring that is required following any accidental release. A "release" may be caused by:

- Spills, including unidentified seepage (Meliadine Spill Contingency Plan; March 2018); or
- Emergencies (Meliadine Emergency Response Plan; May 2017).

The EM program is designed to verify whether contamination of the surface soil and/or any nearby receiving environment and active zone has occurred as a result of an accidental release of a hazardous material or contaminated water. Verification is done through monitoring of surface runoff and nearby receiving environment during and following remedial activity. It is anticipated that due to the presence of permafrost beneath most of the mine footprint (active layer app 1.5m in depth), there will be minimal impact to groundwater from surface spills or accidental releases.

The EM plan is developed on a site specific basis subsequent to a spill or other incident, and considers the type of product spilled, the potential receptors and the potential for any remaining contamination after clean up. The plan is coordinated by the Environmental Department.

In the event of an accidental release, the water quality of any downstream receptor as well as an upstream reference (background) is sampled to determine severity of impact. Should the spill have happened over snow cover, as much contaminated snow will be removed as possible. Verification sampling would occur in the area after thaw to determine if the clean – up is complete or if further remediation is necessary. The specific parameters monitored as part of the EM program will depend on the nature of the spill, and will be determined for the specific material released.

The EM program for a particular spill will cease upon obtaining satisfactory analytical results from the potentially affected areas or as required by regulators.

3.3 ADAPTIVE MANAGEMENT PROGRAM

Results of the water quality monitoring are reviewed by the Meliadine Environment Department. Chemical trends of constituents of interest are tracked for mine site monitoring and for the AEMP program. This allows for early detection of significant changes in water quality within the mine site prior to discharge. If triggers and thresholds, such as in the AEMP program, are exceeded in the receiving environment action plans are then implemented to ensure that environmental protection objectives are met.

An adaptive management program has been designed for the Meliadine Gold Project to evaluate the monitoring data and provide a framework for action, if necessary. The program has two levels - a trigger level to compare the monitoring data against, and an action plan of mitigative measures for identified exceedances.

The adaptive management program is divided into two sections, one for parameters with regulated discharge criteria at specific monitoring locations, as specified in the License and by the Metal Diamond Mining Effluent Regulations (MDMER). The second section is for measured parameters for which no discharge limits have been identified in the License such as those in the AEMP or EEM.

Saline Water Treatment Plant Influent and Effluent

Water samples are collected weekly at both the inlet and outlet of the SWTP. Samples taken at the inlet of the SWTP represent the water quality of either Sump 75 or the Saline Pond, which will vary depending on the treatment priority for saline water storage. The results of the sample analysis are used by SWTP

operators to fine-tune the treatment process and ensure its optimal performance. Samples taken at the outlet of the SWTP are analyzed to provide the quality of treated water produced by the SWTP that is transferred to CP1.

Water samples are analyzed for the following parameters: pH, conductivity, temperature, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), chloride, ammonia, nitrite, nitrate, total phosphorus, total metals, total cyanide, and total mercury.

3.3.1 Adaptive Management Program for Regulated Discharge

3.3.1.1 *Action Plan*

In the case of an exceedance of a License limit or MDMER discharge limit, an action plan will be implemented. The adaptive management program requires that if one or more of the key monitored parameters exceed the respective limits, a staged sequence of responses will follow. Table 3.12 summarizes the staged adaptive action plan for the CM program for regulated discharge. Figure 3.1 is a logic diagram showing the decision path for evaluating analytical results for regulated discharges.

In addition to the mitigative measures listed above, a number of other possible alternatives are available to reduce or treat contaminants. These mitigation measures include:

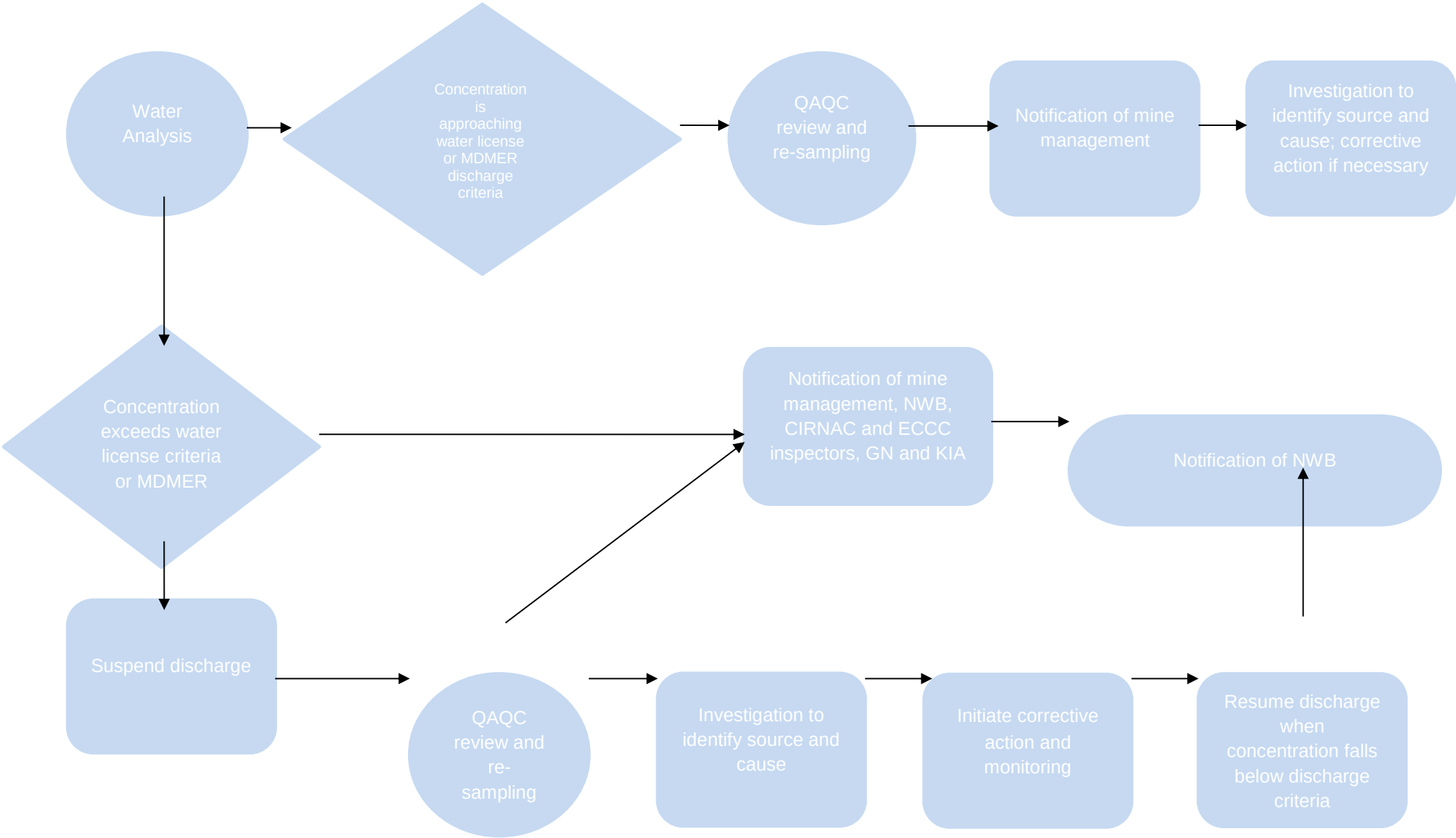
- Best management practices for sediment and erosion control would be employed to reduce TSS concentrations (i.e., flow control, sedimentation basin construction silt fencing, etc; see Sediment and Erosion Management Plan);
- Addition of a coagulant for the reduction of TSS in pond water;
- Use of geotextile or reamouring of banks to filter and reduce TSS in pond/ditch water;
- Deployment of absorbent booms and/or barriers within ponds to isolate surface petroleum hydrocarbon films for removal and/or treatment;
- Adjustments to on-site sewage treatment for the reduction of BOD and E. coli concentrations; Addition of lime to increase a low pH value or reduce metal concentrations;
- Removal of the offending source rock or the prevention of surface waters coming into contact with the offending source rock in the case of ARD; and/or
- Implementation of the *Freshet Action Plan* to proactively identify any issues around areas of concern; conduct additional monitoring, and control and contain seepage or movement of TSS on site.

Table 3.6: Action Plan for Regulated Discharge

Example	Action Plan

Exceeds water license discharge criteria or MDMER	1. Suspension of discharge activities; 2. QA/QC review and analysis, and re-sample water at the particular location if necessary; 3. Notification of mine management (General Mine Manager or designate and Environment Superintendent, or designate) and the regulators: Nunavut Water Board, CIRNAC and ECCC inspectors, GN and the Kivalliq Inuit Association; 4. Investigation to identify possible source(s) and cause(s) of the exceedance; 5. Initiation of corrective actions or water treatment, and follow up monitoring; and 6. Resumption of discharge when concentrations are below the discharge criteria

Figure 3.2: Logic Diagram for Regulated Discharge



3.3.2 Adaptive Management Program for Non-Regulated Discharge

Aside from targeted monitoring studies (i.e. “Effects Assessment Studies”) such as those following construction, the AEMP is the main program aimed at measuring and assessing potential impacts of contaminants in the receiving aquatic environment that are not regulated under MDMER or NWB. This program combines with the Environmental Effects Monitoring (EEM) required under MDMER.

The program is designed to take an integrated, ecosystem-based approach that links mitigation and monitoring of physical/chemical effects to key ecological receptors in the receiving environment. It addresses key issues identified in the Meliadine EA (i.e., mining-related activities with the potential to affect water quality, fish habitat and fish populations). Monitoring results are intended to inform the “adaptive management” process”, supporting the early identification of potential problems and development of mitigation options to address them by comparing results to established threshold and trigger levels.

3.3.2.1 *AEMP Action Level and Significance Threshold*

The AEMP Response Framework links monitoring results to management actions, with the purpose of maintaining the assessment endpoints within acceptable ranges. It is a systematic approach for evaluating AEMP results and responding appropriately, such that potential unexpected effects are identified and mitigation is undertaken to reduce or reverse them, thereby preventing the occurrence of a significant adverse effect. This is accomplished by continually evaluating monitoring data and implementing follow-up actions (e.g., confirmation, further study, mitigation) at pre-defined levels of change in measurement endpoints (i.e., Action Levels). For purposes of this Response Framework, the following terms are used: effect, normal range, benchmark, Action Level, and Significance Threshold.

Action Level – Action Levels (Low, Moderate, and High) are pre-defined levels of environmental change that exceeds normal ranges or benchmarks, or results of statistical tests, or a combination of these. For example, exceedance of the normal range and approach of a benchmark by a water quality parameter in the near-field exposure area may be defined as the Low Action Level. A change that falls within the normal range of variability for the study area would not trigger an Action Level.

Significance Threshold – The Significance Threshold, for the purposes of an AEMP Response Framework, is a magnitude of change that would result in significant adverse effects. It is a clear statement of environmental change that must never be reached. The AEMP Response Framework is designed to prevent reaching the significance threshold for all assessment endpoints.

3.3.2.2 *Action Levels*

The proposed Action Levels are designed to provide an early warning indication of potential adverse effects to plankton and benthos (i.e., food for fish), to fish health, and to the assurance of normal ecological function (including water quality and sediment quality). The proposed Low Action Levels (Table 8-2 and 8-3) are designed such that changes of sufficient magnitude to trigger a Low Action Level response are reported, documented, investigated, and ultimately addressed (i.e., mitigation measures or operation changes are implemented) before Significance Thresholds would ever be reached; if a Low Action Level is reached, Medium and High Action Levels (with response actions) are developed to provide further adaptive management guidance to the Mine to avoid reaching the Significance Thresholds. The type of management response taken after reaching an Action Level will depend on the type and magnitude of effect observed.

Further details on the integrated aquatic effects action plan are provided in Golder, 2018.

SECTION 4. FLOW VOLUMES

Flow volumes within the mine footprint will be measured daily during periods of discharge. Flow volume measurements will be conducted using volumetric flow meters attached to applicable pumps. For permanent pumping arrangements such as fresh water pumping systems flows will be measured using permanent in line flow meters. For periodic batch discharges, such as secondary containment sumps, portable flow meters or calculated pump time and capacity methods will be used.

Detailed pump records are maintained including date, pond/sump number, receiving location of pumped water, pump ID, duration of pumping, and total volume pumped. The average flow rates, total discharge per event and total cumulative discharge will be reported annually.

The monitoring locations for water flow volumes, in accordance with Part I, Item 9, and Table 2 of the Water License, include:

- The volume of fresh Water obtained from Meliadine Lake at Monitoring Program Station MEL-11;
- The volume of fresh Water transferred to the Meliadine Lake during lakes' dewatering activities;
- The volume of fresh Water obtained along the road and Meliadine River for dust suppression activities;
- The volume of Effluent discharged from Final Discharge Point at Monitoring Program Station MEL-14;
- The volume of reclaim Water obtained from CP1;
- The volume of Effluent discharged onto tundra at Monitoring Program Station MEL-25 or transferred to CP1 from the Itivia Site Fuel Storage and Containment Facility; and
- The volume of Effluent and Fresh Water transferred to the pits during pits' flooding.

SECTION 5. REPORTING

Reporting of water quality results is to be conducted on two levels a) monthly and annually with the results of the monitoring program and per MDMER requirements and b) in response to exceedances.

5.1 ANNUAL REPORTING

An annual report is to be submitted to the NWB, KIA, Department of Fisheries and Oceans, Crown-Indigenous Relations and Northern Affairs Canada, Nunavut Impact Review Board, Government of Nunavut, and other interested parties by March 31st of the following year. The report is to summarize the following:

- Monitoring results for each sampling station during the year and for the life of mine (construction to end of closure); activities during the year at each station; and any exceedances at stations, the action plan applied to the exceedance, and the results of the action plan;
- Annual seep water chemistry results; including location of the samples, sources of the water collected, and results of chemical analyses of the samples;
- Receiving water monitoring results;

- Spills and any accidental releases; event monitoring activities conducted following containment, remediation, and reclamation; and the results of EM program, any exceedance in EM results, and the action plan following the exceedance;
- Measured flow volumes;
- Effluent flow rates, volumes and calculated chemical loadings following the requirements of MDMER; and
- Results of QA/QC analytical data.

5.2 EXCEEDANCE REPORTING

Any measured concentration at a CM station exceeding a regulated discharge criterion stipulated in the License or MDMER will be reported to the NWB and Environment Canada and Climate Change upon receipt of the analysis. In addition, results of the action plan will be reported and, where necessary, mitigation options identified within 90 days after receipt of the analyses.

Exceedances in the concentration of a parameter in receiving water will be reported as specified in the AEMP and EEM – MDMER accordingly.

SECTION 6. REFERENCES

Golder Associates Ltd. 2016. Aquatic Effects Monitoring Program (AEMP) Design Plan. Version 1. June 2016. 6513-REP-03.

Appendix J-1

Daily AWAR users

SECURITY MONTHLY REPORT MELIADINE
January 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	30	36	35	38	46	24	20	52	1	48	52	15	51	26	40	12	35	42	20	47	38	54	47	39	46	46	30	40	52	44	40	1146	1146
NOT PROJECT RELATED ON THE ROAD	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	3	0	0	0	0	10	10

SECURITY MONTHLY REPORT
February 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	59	68	24	29	45	45		66	55	37	30	58	42	56	58	47	35	20	53	51	36	56	44	30	17	55	54	33	1203	2349
NOT PROJECT RELATED ON THE ROAD	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10

SECURITY MONTHLY REPORT
March 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	
PROJECT RELATED VEHICLES ON THE ROAD	43	43	27	34	46	47	36	42	42	16	22	37	34	37	54	42	20	19	46	30	30	49	43	20	21	22	34				4	940	3289
NOT PROJECT RELATED ON THE ROAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	4	14

SECURITY MONTHLY REPORT
April 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	22	38		30	44	32	36	37		31	28	44	38	20	20	38	36	30	49	40	25	20	32	41	40	46	55	25	22	27	946	4235
NOT PROJECT RELATED ON THE ROAD	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	5	19

SECURITY MONTHLY REPORT
May 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	38	36	30	49	40	25	20	32	41	40	46	55	16	35	50	29	64	50	21	20	63	68	42	57	57	66	27	67	60	57	60	1361	5596
NOT PROJECT RELATED ON THE ROAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	2	0	0	2	0	0	0	0	0	0	0	8	27

SECURITY MONTHLY REPORT
June 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	70	57	52	71	72	69	86	75	83	35	85	74	81	79	79	71	54	86	96	79	87	104	47	44	78	68	66	60	77	74	2159	7755
NOT PROJECT RELATED ON THE ROAD	0	0	0	0	0	13	0	16	11	1	1	0	14	17	7	13	2	5	11	2	7	3	32	18	9	0	20	2	5	30	239	266

SECURITY MONTHLY REPORT
July 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	69	101	118	86	75	82	79	0	0	0	56	101	0	92	33	53	108	43	124	155	120	94	126	147	132	126	128	95	94	84	132	2653	10408
NOT PROJECT RELATED ON THE ROAD	29	9	7	16	41	24	26	22	23	26	21	15	11	35	42	15	15	1	10	19	24	14	14	14	19	14	13	22	21	12	19	593	859

SECURITY MONTHLY REPORT MELIADINE
August 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	106	106	111	76	89	111	99	99	95	136	83	83	113	117	115	101	118	115	74	141	167	164	142	136	121	101	112	102	88	110	118	3449	13857
NOT PROJECT RELATED ON THE ROAD	15	13	3	18	37	18	2	8	9	13	16	13	11	17	10	18	18	20	19	5	14	6	6	12	20	27	9	19	10	17	12	435	1294

SECURITY MONTHLY REPORT - MELIADINE
SEPTEMBER 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	78	33	107	118	82	114	134	108	113	119	112	134	114	111	124	106	126	117	106	93	73	72	74	108	132	88	110	83	77	57	3023	16880
NOT PROJECT RELATED ON THE ROAD	0	28	33	0	15	10	19	0	0	0	2	12	19	19	25	25	15	4	7	9	5	32	41	16	13	0	0	10	14	15	388	1682

SECURITY MONTHLY REPORT
October 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	89	127	85	87	78	72	64	76	78	77	95	89	76	78	109	97	93	99	104	73	80	105	99	72	106	89	48	62	76	73	56	2612	19492
NOT PROJECT RELATED ON THE ROAD	5	5	11	5	6	28	2	12	6	12	12	0	23	21	0	0	0	0	0	0	0	8	8	4	2	0	11	12	4	9	1	207	1889

SECURITY MONTHLY REPORT
November 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	94	87	67	62	78	88	77	89	94	24	31	59	65	54	51	63	32	38	75	61	69	60	40	61	70	64	43	80	78	88	1942	21434
NOT PROJECT RELATED ON THE ROAD	6	0	0	0	0	8	0	0	6	3	10	0	0	0	0	0	6	0	0	8	4	1	0	0	0	0	0	0	2	1	55	1944

SECURITY MONTHLY REPORT
December 2018

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	YTD
PROJECT RELATED VEHICLES ON THE ROAD	69	35	62	62	57	70	57	40	31	60	48	78	59	45	44	28	60	60	59	68	55	31	30	38	32	36	41	60	13	14	50	1492	22926
NOT PROJECT RELATED ON THE ROAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1944

Appendix K-1

Public consultations and engagements

As required by NWB Water License : ***A summary of public consultation/participation, describing consultation with local organizations and residents of the nearby communities, if any were conducted.***

Project	Type of event (meeting, public meeting, event)	Stakeholder Group	Description	Date	Location	Discussed	Outcomes (if applicable)	Comments
Exploration	Public Meeting	Whale Cove Public	Huckleberry - Exploration meeting	21-Feb-18	Whale Cove	Present the Huckleberry Exploration project to the Whale Cove community.	No recorded outcomes	Complete
Exploration	Public Meeting	Whale Cove Public	Exploration Projects Update - Whale Cove	28-Aug-18	Whale Cove	Public meeting to give update on exploration projects	Questions and comments on naming of projects, road building, Land Use Plan, employment for	Complete
Exploration	Meeting	Whale Cove Hamlet Council	Exploration Projects Update - Whale Cove	19-Jul-18	Whale Cove	Land Use License with KIA, draft Land Use plan, relationship building with the community	No recorded outcomes	Complete
Exploration	Public Meeting	Whale Cove Hamlet Council	Exploration Projects Update - Whale Cove	13-Feb-18	Whale Cove	Meetings with Hamlet SAO/Mayor/Council members.	No recorded outcomes	Complete
Exploration	Public Meeting	Rankin Inlet Public	Huckleberry - Exploration meeting	15-Feb-18	Rankin Inlet	Present the Huckleberry Exploration project to the Hamlet of Rankin Inlet.	No recorded outcomes	Complete
Exploration	Public Meeting	Arviat Public	Huckleberry - Exploration meeting	14-Feb-18	Arviat	Huckleberry exploration project	No recorded outcomes	Complete
Exploration	Meeting	Arviat HTO	Exploration HTO meetings	21-Sep-18	Arviat	Presentation of AEM Exploration areas; explain the mining cycle timeline; Status of Permits (waiting on KIA); Explanation of AEM approach to naming from exploration projects moving forward. Request for input on names of locations, traditional hunting and fishing spots, calving grounds, burial sites, and any other land use points. Questions around how they want to be engaged and their expectations of AEM. Comments, Questions.	Main outcomes: • See if we can merge heritage Canada Map with Inuktitut names with our exploration maps (as a lot of the naming work has already been done) o Inuit Heritage Trust – Traditional Names Maps by Region – Click Here o Viewing Named Nunavut Places in - Google MyMaps – Click Here • They would like more regular contact (minimum 2 times a year) • Next meeting will be in December or January (depending on the progress of the maps with Inuktitut names) • Next time bring more zoomed in maps of specific mining claims along with larger map (so that traditional areas and water bodies can be more easily identified	Complete
Exploration; Itivia; Rankin Inlet Diffuser	Public Meeting	Rankin Inlet Public	Rankin Inlet Community Meetings	30-Aug-18	Rankin Inlet	Rankin Inlet Open House: Information tables with Agnico employees available to answer any questions; Topics: upcoming projects, employment, diffuser, Itivia project	No recorded outcomes	Complete
Exploration; Meliadine; Rankin Inlet Diffuser	Meeting	Community Liaison Committee	Rankin Inlet CLC Meeting	19-Feb-18	Rankin Inlet	Huckleberry exploration project (Company overview, Nunavut division overview, logistics, employment opportunities, workforce planning), Rankin Inlet diffuser	No recorded outcomes	Complete
Exploration; Rankin Inlet Diffuser	Public Meeting	Rankin Inlet Public	Huckleberry - Exploration and Rankin Inlet Diffuser meeting	26-Feb-18	Rankin Inlet	Huckleberry exploration project, Rankin Inlet diffuser	Request by Rankin HTO to be consulted with any exploration activities in the Whale Cove area	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Chesterfield Inlet Mayor, SAO, HTO	Annual Chesterfield Inlet Shipping Meeting	17-Sep-18	Chesterfield Inlet	Community questions and concerns: shipping logistics, noise, oil spills, wildlife compensation, wildlife monitoring, deep sea port	Outcomes included: • Desgagne to share their environmental logs with the Hamlet and HTO in Chester, • Look into the possibility of having wildlife monitor on board from Chester to Baker, • Follow up with Marine Biologist and researcher - Glen Hatcher –to possibly participate in his study, • Follow up regarding training to use the equipment that the coastguard has provided. • Hamlet wants to see reports/presentations with the number of trips with Barges, not only the number of ships (as their concern is traffic in the inlet, and barges create noise and traffic they are concerned about)	Complete
Meadowbank and Whale Tail; Meliadine	Event	Arviat Youth	Arviat Career Fair	9-May-18	Arviat	Agnico Eagle attended a career fair in Arviat	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Event	Arviat Public	Arviat Family Day	23-Sep-18	Arviat	Family Day sponsored by Agnico Eagle as per IIBA	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Coral Harbour Public	Employment Information Session	9-Mar-18	Coral Harbour	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Coral Harbour Public	Employment Information Session	29-Jun-18	Coral Harbour	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Coral Harbour Public	Employment Information Session	14-Sep-18	Coral Harbour	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Coral Harbour Public	Employment Information Session	21-Dec-18	Coral Harbour	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Baker Lake Public	Employment Information Session	22-Mar-18	Baker Lake	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Baker Lake Public	Employment Information Session	14-Jun-18	Baker Lake	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Baker Lake Public	Employment Information Session	5-Sep-18	Baker Lake	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Baker Lake Public	Employment Information Session	13-Nov-18	Baker Lake	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Arviat Public	Employment Information Session	26-Mar-18	Arviat	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Arviat Public	Employment Information Session	28-Jun-18	Arviat	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Arviat Public	Employment Information Session	11-Sep-18	Arviat	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Whale Cove Public	Employment Information Session	10-May-18	Whale Cove	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Whale Cove Public	Employment Information Session	17-Jul-18	Whale Cove	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Whale Cove Public	Employment Information Session	18-Sep-18	Whale Cove	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Public Meeting	Whale Cove Public	Employment Information Session	15-Nov-18	Whale Cove	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Business Opportunities Committee (BOC)	7-Feb-18	Rankin Inlet	1.1 The Business Opportunities Committee (the "BOC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule B (Business Opportunities) and report as required to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedule B and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 provide advice to AEM and KIA on mechanisms which may be used by AEM to promote the objectives of Schedule B (Business Opportunities); 1.1.5 review the information and notices provided to it from time to time pursuant to the process to pre-qualify firms and the Tendering Process; 1.1.6 review the pre-qualification process and Tendering Process and make recommendations to the Implementation Committee for improvements; and 1.1.7 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The BOC may, for the purposes of pre-qualification and of the Tendering Process, advise AEM and KIA as to the actual or potential capacity of Inuit Firms to perform work or supply goods and services. 1.3 The BOC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee, as	N/A	Complete

Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Business Opportunities Committee (BOC)	4-Apr-18 Rankin Inlet	1.1 The Business Opportunities Committee (the "BOC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule B (Business Opportunities) and report as required to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedule B and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 provide advice to AEM and KIA on mechanisms which may be used by AEM to promote the objectives of Schedule B (Business Opportunities); 1.1.5 review the information and notices provided to it from time to time pursuant to the process to pre-qualify firms and the Tendering Process; 1.1.6 review the pre-qualification process and Tendering Process and make recommendations to the Implementation Committee for improvements; and 1.1.7 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The BOC may, for the purposes of pre-qualification and of the Tendering Process, advise AEM and KIA as to the actual or potential capacity of Inuit Firms to perform work or supply goods and services. 1.3 The BOC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee, as	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Business Opportunities Committee (BOC)	13-Jun-18 Rankin Inlet	1.1 The Business Opportunities Committee (the "BOC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule B (Business Opportunities) and report as required to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedule B and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 provide advice to AEM and KIA on mechanisms which may be used by AEM to promote the objectives of Schedule B (Business Opportunities); 1.1.5 review the information and notices provided to it from time to time pursuant to the process to pre-qualify firms and the Tendering Process; 1.1.6 review the pre-qualification process and Tendering Process and make recommendations to the Implementation Committee for improvements; and 1.1.7 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The BOC may, for the purposes of pre-qualification and of the Tendering Process, advise AEM and KIA as to the actual or potential capacity of Inuit Firms to perform work or supply goods and services. 1.3 The BOC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee, as required.	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Business Opportunities Committee (BOC)	22-Aug-18 Rankin Inlet	1.1 The Business Opportunities Committee (the "BOC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule B (Business Opportunities) and report as required to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedule B and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 provide advice to AEM and KIA on mechanisms which may be used by AEM to promote the objectives of Schedule B (Business Opportunities); 1.1.5 review the information and notices provided to it from time to time pursuant to the process to pre-qualify firms and the Tendering Process; 1.1.6 review the pre-qualification process and Tendering Process and make recommendations to the Implementation Committee for improvements; and 1.1.7 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The BOC may, for the purposes of pre-qualification and of the Tendering Process, advise AEM and KIA as to the actual or potential capacity of Inuit Firms to perform work or supply goods and services. 1.3 The BOC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee, as	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Business Opportunities Committee (BOC)	17-Oct-18 Meliadine	1.1 The Business Opportunities Committee (the "BOC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule B (Business Opportunities) and report as required to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedule B and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 provide advice to AEM and KIA on mechanisms which may be used by AEM to promote the objectives of Schedule B (Business Opportunities); 1.1.5 review the information and notices provided to it from time to time pursuant to the process to pre-qualify firms and the Tendering Process; 1.1.6 review the pre-qualification process and Tendering Process and make recommendations to the Implementation Committee for improvements; and 1.1.7 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The BOC may, for the purposes of pre-qualification and of the Tendering Process, advise AEM and KIA as to the actual or potential capacity of Inuit Firms to perform work or supply goods and services. 1.3 The BOC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee, as	N/A	Complete

Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Business Opportunities Committee (BOC)	5-Dec-18 Rankin Inlet	1.1 The Business Opportunities Committee (the "BOC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule B (Business Opportunities) and report as required to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedule B and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 provide advice to AEM and KIA on mechanisms which may be used by AEM to promote the objectives of Schedule B (Business Opportunities); 1.1.5 review the information and notices provided to it from time to time pursuant to the process to pre-qualify firms and the Tendering Process; 1.1.6 review the pre-qualification process and Tendering Process and make recommendations to the Implementation Committee for improvements; and 1.1.7 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The BOC may, for the purposes of pre-qualification and of the Tendering Process, advise AEM and KIA as to the actual or potential capacity of Inuit Firms to perform work or supply goods and services. 1.3 The BOC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee, as required.	N/A		Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Employment and Culture Committee (ECC)	24-Jan-18 Rankin Inlet	1.1 The Employment and Culture Committee (the "ECC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule C (Training and Employment) and Schedule D (Social and Cultural Wellness) and report as needed to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedules C and D and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 review and recommend to the Implementation Committee solutions related to: a) the enhancement of employment and training initiatives; b) corrective measures to better achieve the purposes and goals of Schedule C (Training and Employment), including, but not limited to, diversification of the Job Categories occupied by Inuit workers, training programs and hiring practices; c) initiatives and measures to promote employment opportunities at the Meadowbank Project; d) new training initiatives for Inuit workers; e) turnover and absenteeism issues and their impacts, including corrective measures and alternatives; f) employment-related matters faced by workers when they are away from the Meadowbank Project site; and g) measures to better achieve community engagement and integration of cultural practices, as set out in Schedule D (Social and Cultural Wellness). 1.1.5 review, develop and recommend solutions related to the Labour Pool Process and the Labour Pool Coordinator; 1.1.6 provide input and recommend initiatives AEM will use to promote awareness and education about the mining industry in Nunavut; 1.1.7 provide guidance into how Inuktitut may be better incorporated within all parts of the Meadowbank Project; 1.1.8 recommend measures that AEM may incorporate into cross-cultural awareness and training programs; 1.1.9 recommend measures to incorporate and accommodate Inuit family values and enhance social and cultural wellness; 1.1.10 recommend measures to overcome real Inuit workforce barriers; 1.1.11 recommend measures to incorporate Inuit Qaujimajatuqangit into the Meadowbank Project; 1.1.12 recommend measures for the advancement of Inuit women, youth and challenged workers within the Meadowbank Project; and 1.1.13 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The ECC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee as required.	N/A		Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Employment and Culture Committee (ECC)	10-Apr-18 Rankin Inlet	1.1 The Employment and Culture Committee (the "ECC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule C (Training and Employment) and Schedule D (Social and Cultural Wellness) and report as needed to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedules C and D and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 review and recommend to the Implementation Committee solutions related to: a) the enhancement of employment and training initiatives; b) corrective measures to better achieve the purposes and goals of Schedule C (Training and Employment), including, but not limited to, diversification of the Job Categories occupied by Inuit workers, training programs and hiring practices; c) initiatives and measures to promote employment opportunities at the Meadowbank Project; d) new training initiatives for Inuit workers; e) turnover and absenteeism issues and their impacts, including corrective measures and alternatives; f) employment-related matters faced by workers when they are away from the Meadowbank Project site; and g) measures to better achieve community engagement and integration of cultural practices, as set out in Schedule D (Social and Cultural Wellness). 1.1.5 review, develop and recommend solutions related to the Labour Pool Process and the Labour Pool Coordinator; 1.1.6 provide input and recommend initiatives AEM will use to promote awareness and education about the mining industry in Nunavut; 1.1.7 provide guidance into how Inuktitut may be better incorporated within all parts of the Meadowbank Project; 1.1.8 recommend measures that AEM may incorporate into cross-cultural awareness and training programs; 1.1.9 recommend measures to incorporate and accommodate Inuit family values and enhance social and cultural wellness; 1.1.10 recommend measures to overcome real Inuit workforce barriers; 1.1.11 recommend measures to incorporate Inuit Qaujimajatuqangit into the Meadowbank Project; 1.1.12 recommend measures for the advancement of Inuit women, youth and challenged workers within the Meadowbank Project; and 1.1.13 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The ECC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee as required.	N/A		Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Employment and Culture Committee (ECC)	16-May-18 Rankin Inlet	1.1 The Employment and Culture Committee (the "ECC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule C (Training and Employment) and Schedule D (Social and Cultural Wellness) and report as needed to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedules C and D and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 review and recommend to the Implementation Committee solutions related to: a) the enhancement of employment and training initiatives; b) corrective measures to better achieve the purposes and goals of Schedule C (Training and Employment), including, but not limited to, diversification of the Job Categories occupied by Inuit workers, training programs and hiring practices; c) initiatives and measures to promote employment opportunities at the Meadowbank Project; d) new training initiatives for Inuit workers; e) turnover and absenteeism issues and their impacts, including corrective measures and alternatives; f) employment-related matters faced by workers when they are away from the Meadowbank Project site; and g) measures to better achieve community engagement and integration of cultural practices, as set out in Schedule D (Social and Cultural Wellness). 1.1.5 review, develop and recommend solutions related to the Labour Pool Process and the Labour Pool Coordinator; 1.1.6 provide input and recommend initiatives AEM will use to promote awareness and education about the mining industry in Nunavut; 1.1.7 provide guidance into how Inuktitut may be better incorporated within all parts of the Meadowbank Project; 1.1.8 recommend measures that AEM may incorporate into cross-cultural awareness and training programs; 1.1.9 recommend measures to incorporate and accommodate Inuit family values and enhance social and cultural wellness; 1.1.10 recommend measures to overcome real Inuit workforce barriers; 1.1.11 recommend measures to incorporate Inuit Qaujimajatuqangit into the Meadowbank Project; 1.1.12 recommend measures for the advancement of Inuit women, youth and challenged workers within the Meadowbank Project; and 1.1.13 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The ECC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee as required.	N/A		Complete

Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Employment and Culture Committee (ECC)	11-Jul-18 Rankin Inlet	1.1 The Employment and Culture Committee (the "ECC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule C (Training and Employment) and Schedule D (Social and Cultural Wellness) and report as needed to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedules C and D and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 review and recommend to the Implementation Committee solutions related to: a) the enhancement of employment and training initiatives; b) corrective measures to better achieve the purposes and goals of Schedule C (Training and Employment), including, but not limited to, diversification of the Job Categories occupied by Inuit workers, training programs and hiring practices; c) initiatives and measures to promote employment opportunities at the Meadowbank Project; d) new training initiatives for Inuit workers; e) turnover and absenteeism issues and their impacts, including corrective measures and alternatives; f) employment-related matters faced by workers when they are away from the Meadowbank Project site; and g) measures to better achieve community engagement and integration of cultural practices, as set out in Schedule D (Social and Cultural Wellness). 1.1.5 review, develop and recommend solutions related to the Labour Pool Process and the Labour Pool Coordinator; 1.1.6 provide input and recommend initiatives AEM will use to promote awareness and education about the mining industry in Nunavut; 1.1.7 provide guidance into how Inuktitut may be better incorporated within all parts of the Meadowbank Project; 1.1.8 recommend measures that AEM may incorporate into cross-cultural awareness and training programs; 1.1.9 recommend measures to incorporate and accommodate Inuit family values and enhance social and cultural wellness; 1.1.10 recommend measures to overcome real Inuit workforce barriers; 1.1.11 recommend measures to incorporate Inuit Qaujimajatuqangit into the Meadowbank Project; 1.1.12 recommend measures for the advancement of Inuit women, youth and challenged workers within the Meadowbank Project; and 1.1.13 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The ECC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee as required.	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Employment and Culture Committee (ECC)	23-Oct-18 Meadowbank	1.1 The Employment and Culture Committee (the "ECC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule C (Training and Employment) and Schedule D (Social and Cultural Wellness) and report as needed to the Implementation Committee; 1.1.2 develop as a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedules C and D and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 review and recommend to the Implementation Committee solutions related to: a) the enhancement of employment and training initiatives; b) corrective measures to better achieve the purposes and goals of Schedule C (Training and Employment), including, but not limited to, diversification of the Job Categories occupied by Inuit workers, training programs and hiring practices; c) initiatives and measures to promote employment opportunities at the Meadowbank Project; d) new training initiatives for Inuit workers; e) turnover and absenteeism issues and their impacts, including corrective measures and alternatives; f) employment-related matters faced by workers when they are away from the Meadowbank Project site; and g) measures to better achieve community engagement and integration of cultural practices, as set out in Schedule D (Social and Cultural Wellness). 1.1.5 review, develop and recommend solutions related to the Labour Pool Process and the Labour Pool Coordinator; 1.1.6 provide input and recommend initiatives AEM will use to promote awareness and education about the mining industry in Nunavut; 1.1.7 provide guidance into how Inuktitut may be better incorporated within all parts of the Meadowbank Project; 1.1.8 recommend measures that AEM may incorporate into cross-cultural awareness and training programs; 1.1.9 recommend measures to incorporate and accommodate Inuit family values and enhance social and cultural wellness; 1.1.10 recommend measures to overcome real Inuit workforce barriers; 1.1.11 recommend measures to incorporate Inuit Qaujimajatuqangit into the Meadowbank Project; 1.1.12 recommend measures for the advancement of Inuit women, youth and challenged workers within the Meadowbank Project; and 1.1.13 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The ECC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee as required.	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Employment and Culture Committee (ECC)	19-Dec-18 Rankin Inlet	1.1 The Employment and Culture Committee (the "ECC") shall: 1.1.1 act as the forum for collaborative, open exchange and coordination between the Parties with respect to Schedule C (Training and Employment) and Schedule D (Social and Cultural Wellness) and report as needed to the Implementation Committee; 1.1.2 develop a a first priority an implementation and monitoring plan outlining the process and timing for the implementation and monitoring of Schedules C and D and deliver such to the Implementation Committee; 1.1.3 implement the decisions of the Implementation Committee and any directives issued jointly by the Parties; 1.1.4 review and recommend to the Implementation Committee solutions related to: a) the enhancement of employment and training initiatives; b) corrective measures to better achieve the purposes and goals of Schedule C (Training and Employment), including, but not limited to, diversification of the Job Categories occupied by Inuit workers, training programs and hiring practices; c) initiatives and measures to promote employment opportunities at the Meadowbank Project; d) new training initiatives for Inuit workers; e) turnover and absenteeism issues and their impacts, including corrective measures and alternatives; f) employment-related matters faced by workers when they are away from the Meadowbank Project site; and g) measures to better achieve community engagement and integration of cultural practices, as set out in Schedule D (Social and Cultural Wellness). 1.1.5 review, develop and recommend solutions related to the Labour Pool Process and the Labour Pool Coordinator; 1.1.6 provide input and recommend initiatives AEM will use to promote awareness and education about the mining industry in Nunavut; 1.1.7 provide guidance into how Inuktitut may be better incorporated within all parts of the Meadowbank Project; 1.1.8 recommend measures that AEM may incorporate into cross-cultural awareness and training programs; 1.1.9 recommend measures to incorporate and accommodate Inuit family values and enhance social and cultural wellness; 1.1.10 recommend measures to overcome real Inuit workforce barriers; 1.1.11 recommend measures to incorporate Inuit Qaujimajatuqangit into the Meadowbank Project; 1.1.12 recommend measures for the advancement of Inuit women, youth and challenged workers within the Meadowbank Project; and 1.1.13 carry out any other duties and responsibilities attributed to it by the terms and conditions of the Agreement or as may be assigned to it from time to time by the Implementation Committee or as may be agreed by the Parties. 1.2 The ECC shall review, develop and recommend solutions with respect to any issue, question, matter or disagreement related to its responsibilities and shall communicate and collaborate with the On-Site Working Group and the Implementation Committee as required.	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Implementation Committee (IC)	21-Feb-18 Rankin Inlet	1.1 The Implementation Committee shall: 1.1.1 act as the forum for collaborative, open exchange and coordination by the Parties with respect to Schedule F (Implementation) and report as needed to the Parties; 1.1.2 as a first priority, (i) review the implementation and monitoring plans received from the Committees and direct the Committees to apply such plans with additional recommendations, if any; and (ii) develop an overall implementation plan of the Agreement and submit such to the Parties; 1.1.3 ensure the implementation, management and follow-up in regards to the Agreement and attempt to resolve any matters of concern arising out of the Meadowbank Project that affect Inuit interests; 1.1.4 identify and make recommendations to the Parties for possible amendments to the Agreement that would facilitate the attainment of its objectives or the effective implementation and performance of its terms; 1.1.5 review and respond in a timely manner to the recommendations of the Parties and the recommendations of the On-Site Working Group and all Committees; 1.1.6 review at least annually the performance of the On-Site Working Group and the Committees and make recommendations to improve their effectiveness; 1.1.7 review at least annually the duties and responsibilities of the Administration Officer and make recommendations for changes to his/her duties; 1.1.8 provide input to the Parties regarding the role and performance of the Implementation Coordinators; 1.1.9 monitor all community and information sessions required to be held pursuant to this Agreement, to ensure that adequate time and resources are devoted to achieve the intent of the sessions; and 1.1.10 carry out any other duties and responsibilities required by the Agreement and as may	N/A	Complete

Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Implementation Committee (IC)	9-May-18	Rankin Inlet	1.1 The Implementation Committee shall: 1.1.1 act as the forum for collaborative, open exchange and coordination by the Parties with respect to Schedule F (Implementation) and report as needed to the Parties; 1.1.2 as a first priority, (i) review the implementation and monitoring plans received from the Committees and direct the Committees to apply such plans with additional recommendations, if any; and (ii) develop an overall implementation plan of the Agreement and submit such to the Parties; 1.1.3 ensure the implementation, management and follow-up in regards to the Agreement and attempt to resolve any matters of concern arising out of the Meadowbank Project that affect Inuit interests; 1.1.4 identify and make recommendations to the Parties for possible amendments to the Agreement that would facilitate the attainment of its objectives or the effective implementation and performance of its terms; 1.1.5 review and respond in a timely manner to the recommendations of the Parties and the recommendations of the On-Site Working Group and all Committees; 1.1.6 review at least annually the performance of the On-Site Working Group and the Committees and make recommendations to improve their effectiveness; 1.1.7 review at least annually the duties and responsibilities of the Administration Officer and make recommendations for changes to his/her duties; 1.1.8 provide input to the Parties regarding the role and performance of the Implementation Coordinators; 1.1.9 monitor all community and information sessions required to be held pursuant to this Agreement, to ensure that adequate time and resources are devoted to achieve the intent of the sessions; and 1.1.10 carry out any other duties and responsibilities required by the Agreement and as may	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle IIBA Implementation Committee (IC)	8-Aug-18	Rankin Inlet	1.1 The Implementation Committee shall: 1.1.1 act as the forum for collaborative, open exchange and coordination by the Parties with respect to Schedule F (Implementation) and report as needed to the Parties; 1.1.2 as a first priority, (i) review the implementation and monitoring plans received from the Committees and direct the Committees to apply such plans with additional recommendations, if any; and (ii) develop an overall implementation plan of the Agreement and submit such to the Parties; 1.1.3 ensure the implementation, management and follow-up in regards to the Agreement and attempt to resolve any matters of concern arising out of the Meadowbank Project that affect Inuit interests; 1.1.4 identify and make recommendations to the Parties for possible amendments to the Agreement that would facilitate the attainment of its objectives or the effective implementation and performance of its terms; 1.1.5 review and respond in a timely manner to the recommendations of the Parties and the recommendations of the On-Site Working Group and all Committees; 1.1.6 review at least annually the performance of the On-Site Working Group and the Committees and make recommendations to improve their effectiveness; 1.1.7 review at least annually the duties and responsibilities of the Administration Officer and make recommendations for changes to his/her duties; 1.1.8 provide input to the Parties regarding the role and performance of the Implementation Coordinators; 1.1.9 monitor all community and information sessions required to be held pursuant to this Agreement, to ensure that adequate time and resources are devoted to achieve the intent of the sessions; and 1.1.10 carry out any other duties and responsibilities required by the Agreement and as may be mutually agreed by the Parties.	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	SEMC	Kivalliq Socio-Economic Monitoring Committee annual meeting	24-Apr-18	Arviat	Presented Agnico Eagle's socio-economic monitoring results for Meadowbank and Meliadine Projects and discussed impacts from mining on the Kivalliq region.	Main outcomes: - Additional monitoring on gender differences by skill level - GN to encourage KIA attendance - AEM to increase job opportunity advertisements	Complete
Meadowbank and Whale Tail; Meliadine	Event	Business community	Kivalliq Trade Show	24-Sep-18	Rankin Inlet	Three booths on Trade Show floor, information on recruitment, training and procurement/business opportunities. Agnico Eagle also held a presentation during the Trade Show on business ideas for entrepreneurs and small businesses and contract tailoring.	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Event	Business community	Nunavut Mining Symposium	9-Apr-18	Iqaluit	Agnico Eagle attended Nunavut Minng Symposium	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	SEMWG	Socio-Economic Monitoring Working Group (SEMWG) meeting	30-May-18	Phone	1. KvSEMC (GN)- Discussion on lessons learned and propose improvements, Tentative scheduling for 2019 (month & location) 2. 2017 Socio-Economic Monitoring Report (SEMR) (AEM) -Data gaps, Translation, Review process expectations (before submitting to NIRB) 3. Update to SEMP to include Whale Tail (AEM)	Main outcomes: - consider reformatting meeting to improve understanding and participation - consider 2019 meeting in Chesterfield Inlet - send draft SEMP update	Complete
Meadowbank and Whale Tail; Meliadine	Event	Whale Cove Youth	Whale Cove Career Fair	10-May-18	Whale Cove	Career Opportunities presentation at Inuglak School Whale Cove. There were approx 25 high school students Gr 5-12, and 6 teachers/support staff at the presentation. We discussed Career opportunities at Agnico and in the mining sector, training and apprenticeship, and the students/teachers asked relevant questions.	Positive feedback from teachers	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Rankin Inlet Public	Employment Information Session	27-Jul-18	Rankin Inlet	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Rankin Inlet Public	Employment Information Session	30-Aug-18	Rankin Inlet	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Rankin Inlet Mayor, Government - ED&T	Agnico Eagle Arviat Training Initiatives meeting	22-May-18	Phone	Conference call with Michelle Malla (Economic Development Arviat), Mayor Bob Leonard, SAO Steve England	No recorded outcomes	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Naujaat Public	Employment Information Session	19-Mar-18	Naujaat	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Naujaat Public	Employment Information Session	12-Jun-18	Naujaat	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Naujaat Public	Employment Information Session	14-Sep-18	Naujaat	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Government - ED&T	Business Development Meeting	15-May-18	Rankin Inlet	Business registration in Kivalliq, AEM's business development IIBA efforts, KTS and entreprenerial program, CEDO conference	Programs available for businesses in the Kivalliq provided to AEM, possible involvement in KTS	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Chesterfield Inlet Public	Employment Information Session	23-Mar-18	Chesterfield Inlet	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Chesterfield Inlet Public	Employment Information Session	25-Jun-18	Chesterfield Inlet	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Recruitment Event	Chesterfield Inlet Public	Employment Information Session	16-Sep-18	Chesterfield Inlet	Employment Information Session: how to access job opportunities with Agnico Eagle, information on life at site, Labour Pool process	N/A	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Business community	Baffin Regional Chamber of Commerce	12-Apr-18	Iqaluit	Plans for Northern Perspectives event in Winnipeg Feb 6-9, 2019, plans for Kivalliq Chamber of Commerce, and the subsequent formation of Nunavut Chamber of Commerce. Also talked about the Iqaluit food bank operation.	No recorded outcomes	Complete
Meadowbank and Whale Tail; Meliadine	Meeting	Business community	Kivalliq Chamber of Commerce AGM	17-Jun-18	Rankin Inlet	Agnico attended as a continuing Kivalliq Chamber Member (also the host of the KCC AGM at Meadowbank in 2017). Attended and contributed as Agnico rep as SecretaryTreasurer 2017-18	No recorded outcomes	Complete
Meadowbank; AWAR	Public Meeting	Baker Lake Youth	Baker Lake AWAR Meeting	22-May-18	Baker Lake	Meeting with youth (13-25yrs) to discuss safety on the AWAR.	Good dialogue with youth. Approx 25 in attendance. Also representation from BLHTO and KIA. Possibility of arranging a special summer Meadowbank tour.	Complete
Meadowbank; In-Pit Deposition	Public Meeting	Baker Lake Public	In-Pit Deposition Consultations	8-Feb-18	Baker Lake	Explain the project to the community: 1. No new impacts; 2. Using existing footprint; 3. At closure. reducing freshwater transfer up to 60%; 4. Monitoring remains the same; 5. Provide up to 10 years of additional production if necessary.	Only one attendee. Agnico Eagle planned another meeting to increase attendance.	Complete
Meadowbank; In-Pit Deposition	Public Meeting	Baker Lake Public	In-Pit Deposition Consultations	6-Mar-18	Baker Lake	Explain the project to the community: 1. No new impacts; 2. Using existing footprint; 3. At closure. reducing freshwater transfer up to 60%; 4. Monitoring remains the same; 5. Provide up to 10 years of additional production if necessary.	Second meeting to increase attendance. No significant outcomes, positive response with interest in more informational meetings, casual approach was well received, some questions from community members	Complete

Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	28-Feb-18	Phone	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	14-Mar-18	Phone	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	30-May-18	Meliadine	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	20-Jun-18	Phone	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	19-Jul-18	Meliadine	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete

Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	21-Aug-18 Phone	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	12-Sep-18 Rankin Inlet	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	7-Nov-18 Phone	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Meeting	Kivalliq Inuit Association (KIA)	KIA and Agnico Eagle Meliadine On-Site Working Group	29-Nov-18 Meliadine	1.1 The On-Site Working Group shall: 1.1.1 share information and communicate among themselves relating to on-site matters; 1.1.2 attempt to resolve on-site issues and matters of concern arising out of the Meadowbank Project that affect Inuit interests, in an informal way, if appropriate and in a timely manner; 1.1.3 assign follow-up responsibility to the most appropriate member, AEM or KIA department; 1.1.4 refer recurrent or unresolved issues to the appropriate Committee, providing any information and documentation as may be required to assist the Committee in addressing any such issues; 1.1.5 address any matter related to the implementation of the Agreement as the Implementation Committee or any other Committee may direct from time to time; 1.1.6 carry out any other duties and responsibilities as set out in the Agreement or as may be agreed by the Parties.	N/A	Complete
Meliadine	Site Visit	Rankin Inlet Public	Meliadine Open House Site Visit	20-Oct-18 Meliadine	Meliadine Open House for Rankin Inlet Residents Underground tour contest 5 different bus departure times (9 a.m, 10:30 a.m., 12 p.m., 1:30 p.m, 2:30 p.m)	N/A	Complete
Meliadine	Event	Rankin Inlet Public	Rankin Inlet Charity Fundraiser Gala	1-Dec-18 Rankin Inlet	AEM sponsored event organized and hosted by the Hamlet of Rankin Inlet. The event raises funds and provides $45,000 in funding towards 5 non-profit/charitable community organizations	N/A	Complete
Meliadine	Meeting	Community Liaison Committee	Rankin Inlet CLC Meeting	10-May-18 Rankin Inlet	1. review current terms of reference 2. draft of updated TOR 3. expectations of committee by AEM 4. expectations of committee by hamlet representatives 5. AEM update on initiatives and meladine camp program status 6. Hamlet council update on community wellness initiatives 7. Legacy project discussions	Survey was carried out by Councilor Lindell about possible infrastructure needs in community. Needs were identified as a cultural center and housing units.	Complete
Meliadine	Meeting	Community Liaison Committee	Rankin Inlet CLC Meeting	4-Jun-18 Rankin Inlet	Two items were discussed:Community Information Session scheduled June 13th (dust, blasting, shipping, construction and caribou).	Follow up meeting to be secured with Council with construction manager.	Complete
Meliadine	Event	Rankin Inlet Public	Rankin Inlet Family Day	28-Jul-18 Rankin Inlet	Rankin Inlet Family Day organized by hamlet, sponsored by AEM Adrian Angidlik (Guest Services Leader) said a few words to welcome everyone.	N/A	Complete
Meliadine	Site Visit	Rankin Inlet Youth	Rankin Inlet Students Site Visit	9-Nov-18 Rankin Inlet	Rankin Inlet high school visits visited Meliadine site - kitchen, maintenacne and coreshack. Presentation was given on health and safety rules, the site and opportunities for the future.	N/A	Complete
Meliadine	Meeting	Rankin Inlet RCMP	Agnico Eagle RCMP Meeting	8-Aug-18 Rankin Inlet	Alcohol and drugs, violence, collaboration with site Security team, monitoring	Further information sharing and collaboration.	Complete
Meliadine	Meeting	Rankin Inlet HTO	Rankin Inlet HTO Meetings	15-May-18 Rankin Inlet	Environment and Community Relations to discuss EIS for difusser project, wildlife monitoring and ICMC	- Agnico Eagle will contact HTO when EIS for diffuser project is available - continue discussions on wildlife monitoring - Agnico Eagle will involve HTO in ICMC meetings	Complete
Meliadine	Meeting	Rankin Inlet HTO	Rankin Inlet HTO Meetings	14-Sep-18 Rankin Inlet	to address the concerns of the community that were shared during the community roundtable on the evening of September 13, 2018. Agnico Eagle and Kangiqlinq discussed the concerns raised by the community regarding drinking water and changes to fish in the area the Char River and Meliadine Lake	Main outcomes: - It was decided that in addition to wildlife monitoring previously discussed, that a community-based monitoring program should also be included to look at fish monitoring, air quality and dust, and water quality. - Agnico Eagle and Kangiqlinq agreed that they will work together to draft an agreement that Kangiqlinq members will be directly involved in Agnico Eagle's monitoring of freshwater in the area of the Char River and Meliadine Lake and to ensure that the results of that monitoring are communicated directly to Kangiqlinq. If the monitoring shows negative results, Kangiqlinq and Agnico Eagle will discuss potential mitigation measures and communicate these to the appropriate regulatory authorities. Agnico Eagle will also provide capacity support to Kangiqliq - Kangiqlinq and Agnico Eagle agreed that the final designs will be shared with Kangiqlinq at the same time as it shared with regulatory bodies (CIRNAC, DFO, ECC) and that if Kangiqlinq thinks it is necessary at that time, meet in person to explain the design details and give Kangiqlinq the opportunity to provide any further advice to be incorporated in or improve the design. Agnico will also inform Kangiqlinq if they ever become aware of any pipeline engineering failures.	Complete
Meliadine	Meeting	Rankin Inlet HTO	Rankin Inlet HTO Meetings	26-Sep-18 Rankin Inlet	MOU with Rankin Inlet HTO and donating cabin material to HTO	- Funding agreement for wildlife monitoring and community-based monitoring - Main areas of focus are: air quality and dust, water quality, and fish	Complete

Meliadine	Meeting	Rankin Inlet HTO	Rankin Inlet HTO Meetings	7-Dec-18 Rankin Inlet	The purpose of the meeting was to discuss the possible location of TSS sediment Control structures at the Itivia site. Currently there is a large volume of TSS laden runoff coming from upstream of the Itivia site (Hamlet of Rankin Inlet) which passes through AEM's leased land adjacent to the Itivia site during the freshet period.	– Agnico staff advised Clayton of our intent to address the TSS even though the majority came from a 3rd party (Hamlet) upstream of the culvert on the leased property. Clayton understood and advised that any impingement on the snowmobile trail would be an issue. AEM staff mentioned to Clayton that we likely won't be installing structures because of reason already stated above (velocity of freshet flow too high). Also we would look at other solutions. We did state that there should be a lot less potential for elevated TSS as the construction has been completed, the snow appears to be clean now, and a cover was placed on the northernmost pad (not there last spring). At any rate we told Clayton that we would look at other solutions and he was ok with that. He did think that the Hamlet should be involved and I said we would contact them at some point – meeting adjourned.	Complete
Meliadine	Site Visit	Government - ED&T	CEDO Visit to Meliadine	15-Mar-18 Meliadine	presentation about training and project advancement and tour of the facilities.	N/A	Complete
Meliadine	Site Visit	Government	Meliadine visit by Senator Patterson	19-Mar-18 Meliadine	Meliadine visit by Senator Denis Patterson - supper and site tour.	N/A	Complete
Meliadine	Site Visit	Government	Meliadine Government Site Tour	6-Jun-18 Meliadine	June 6th: Tour to view facilities and discuss AEM training and hiring challenges	No recorded outcomes	Complete
Meliadine; AWAR	Public Meeting	Rankin Inlet Public	ICMC Meetings	30-Aug-18 Rankin Inlet	Covered: • What is the International Cyanide Management Code, and what is Agnico Eagle trying to achieve (ICMC certification) • What is cyanide, what is it used for, how is it used, how is it disposed of • How is cyanide transported to Meliadine • Health and safety management on cyanide (storage, monitoring), risks of accidental releases • Where can community members go if they have concern (Tusaajugut, Community Complaints System)	Questions on road closure and risks of cyanide spills	Complete
Meliadine; AWAR	Meeting	Rankin Inlet Emergency Services, Rankin Inlet HTO, Government, Rankin Inlet Health Centre, Rankin Inlet Gun Club, Nunavut Parks, Rankin Inlet RCMP, Airports	ICMC Meetings	5-Jun-18 Rankin Inlet	Covered: • What is the International Cyanide Management Code, and what is Agnico Eagle trying to achieve (ICMC certification) • What is cyanide, what is it used for, how is it used, how is it disposed of • How is cyanide transported to Meliadine • Health and safety management on cyanide (storage, monitoring), risks of accidental releases • Where can community members go if they have concern (Tusaajugut, Community Complaints System) • Commitments: sharing draft Emergency Response plan, continue outreach, some training sessions	Main outcomes: - The Department of Defence will restrict access to their site during transportation - Agnico Eagle to provide shipping window dates and mock drill date - Agnico Eagle will reach out to other stakeholders suggested by attendees - Consider lending radios to external respondures or ensure a common channel is available Rankin community to be notified at least 72 hours in advance	Complete
Meliadine; AWAR	Meeting	Rankin Inlet Emergency Services, Rankin Inlet HTO, Government	ICMC Meetings	31-Jul-18 Rankin Inlet	Covered: • What is the International Cyanide Management Code, and what is Agnico Eagle trying to achieve (ICMC certification) • What is cyanide, what is it used for, how is it used, how is it disposed of • How is cyanide transported to Meliadine • Health and safety management on cyanide (storage, monitoring), risks of accidental releases • Where can community members go if they have concern (Tusaajugut, Community Complaints System) • Commitments: sharing draft Emergency Response plan, continue outreach, some training sessions	No further concerns on route proposed, som suggestions on further stakeholders to contact	Complete
Meliadine; Itivia; AWAR	Public Meeting	Rankin Inlet Public	Rankin Inlet Community Meetings	13-Jun-18 Rankin Inlet	Meliadine Project Update (construction on site, infrastructure, targets) Itivia Project Update (bypass road construction, dust control, boat launch, barge season) AWAR (health and safety procedures) Caribou management (levels/triggers, rules of the road)	It was clarified with attendees that they could use the bridge at Little Meliadine, that buggy whip	Complete
Meliadine; Rankin Inlet Diffuser	Public Meeting	Rankin Inlet Hamlet Council	Rankin Inlet Diffuser Meetings	6-Mar-18 Rankin Inlet	Inform the Hamlet about the project (summary of the pipeline, diffuser and storage tank connection point).	No recorded outcomes	Complete
Meliadine; Rankin Inlet Diffuser	Public Meeting	Rankin Inlet Public	Rankin Inlet Diffuser Meetings	15-Mar-18 Rankin Inlet	Community meeting to present the diffuser project.	No recorded outcomes	Complete

Appendix L-1

Training list

Course ID	Course Type	Course Name	Lenght of Training (hrs)	Regulation Source	Recognized vs in-house
2531	General	2015 Fusion Goal Setting Process	2		In-House
2532	General	2015 Fusion Goal Setting Process Training for Managers	2		In-House
1088	Health and Safety	Accident/Incident Investigation	0		In-House
1061	General	Aerial Work Platform	5		In-House
2582	Specific	Air Conditioning	24		In-House
2889	Specific	Ansul Vehicle F.S.S Overview	8		In-House
5031	Specific	APS Emulsion Pump	12		In-House
2670	Specific	Backhoe	84		In-House
3450	Health and Safety	Bearwise Training	12		Recognized
1063	Health and Safety	Blasting Certificate - Surface	0	Nunavut Mine Act	Recognized
1065	Health and Safety	Blasting Certificate - Underground	0	Nunavut Mine Act	Recognized
2481	Health and Safety	Boat License	0		Recognized
2461	Specific	Cat Hose	24		In-House
2689	Specific	Caterpillar SIS Introduction and Overview	12		In-House
1035	Health and Safety	Chemical Awareness	0.5		In-House
2890	General	Civility in the Workplace	4		In-House
1016	General	Civility in the Workplace - for Employees	2		In-House
3014	Specific	Coaching on Equipment	3		In-House
2205	Health and Safety	Coaching Phase - Supervision Formula	5		In-House
2891	General	Communication 101	3		In-House
2219	Health and Safety	Conduct a Safety Meeting	3		In-House
1113	Health and Safety	Confined Space	2		In-House
225	Health and Safety	Construction General Health and Safety (CGHS)	3		In-House
947	Specific	Container Handler	24		In-House
2502	Specific	Crane Truck F-450	5		In-House
1001	General	Cross-Cultural	5		In-House
1011	Specific	Crushing Circuit	84		In-House
3200	Specific	Dispatcher Wenco (e-learning)	30		In-House
931	Specific	Dozer - Open Pit	84		In-House
2153	Specific	Dozer - Site Services	84		In-House
973	Specific	Drill CM785	84		In-House
934	Specific	Drill DM45	84		In-House
2545	Specific	Driver License Class 1	0		Recognized
2546	Specific	Driver License Class 2	0		Recognized
3301	Health and Safety	Emergency Measures Induction - Meadowbank	1.5		In-House
3300	Health and Safety	Emergency Measures Induction - Meliadine	1.5		In-House
2412	Health and Safety	Emergency Medical Responder	80		Recognized
2411	ERT	ERT Practice	12		In-House
229	Health and Safety	ERT Practice Meliadine	10		In-House
2093	Specific	Excavator - 6020	84		In-House
927	Specific	Excavator - Auxiliary Equipment	84		In-House
1790	Specific	Excavator - Production Equipment	84		In-House
982	Specific	Excavator - Service Equipment	84		In-House
2882	Health and Safety	Explosive Access Regulation Document	0		Recognized
2631	Specific	Failure Analysis	16		In-House
1067	Health and Safety	Fall Protection	2		In-House
1070	Health and Safety	Fire Suppression System	0.5		In-House
1072	Health and Safety	First Aid & AED/CPR Level A	16	Red Cross/St-John/CNE	Recognized
1074	Health and Safety	First Responder	40	Red Cross/St-John/CNE	Recognized
2573	Specific	Fixed Equipment	5		In-House
935	General	Forklift	5		In-House
975	Specific	Front Shovel - RH120	84		In-House
2571	Specific	Fundamentals of Industrial Mechanic	84	Northern College	Recognized
996	Health and Safety	General Induction	0.5		In-House
946	Specific	Grader - Open Pit	84		In-House
2159	Specific	Grader - Site Services	84		In-House
1012	Specific	Grinding Circuit	84		In-House
2658	Specific	Haul Truck - 773	84		In-House
963	Specific	Haul Truck - 777	84		In-House
981	Specific	Haul Truck - 785	0		In-House
2854	Specific	Haul Truck Trainee Program	336		In-House
1346	Specific	Haul Truck Trainee Program I (NGA)	168		In-House
1346	Specific	Haul Truck Trainee Program II	168		In-House
2108	Health and Safety	Hoisting and Rigging	2		In-House
3420	Health and Safety	How to Conduct a Job Hazard Analysis	4		In-House

Course ID	Course Type	Course Name	Lenght of Training (hrs)	Regulation Source	Recognized vs in-house
2262	Specific	Hyster Forklift	5		In-House
3109	General	Intelex Basics and Incident Management	1		In-House
2572	Specific	Intermediate Industrial Mechanic	72	Northern College	Recognized
1085	Health and Safety	Intermodal Transportation of Dangerous Goods	36		In-House
1779	General	Introduction to Driving	5		In-House
2263	Specific	Introduction to Grade Control - Meadowbank	1		In-House
3000	General	Inuit Impact and Benefit Agreement Awareness	1.5		In-House
1786	General	JDE Maintenance Planner	6		In-House
1785	General	JDE Maintenance Supervisor	2		In-House
1007	General	JDE Maintenance Tradesmen	4		In-House
1787	General	JDE Process Plant Operators	2		In-House
1782	General	JDE Procurement & Logistics	2		In-House
1097	Health and Safety	Job Hazard Analysis	1		In-House
2176	Health and Safety	Job Hazard Analysis and Work Card	0.5		In-House
2991	Health and Safety	Job Task Observation	5		In-House
3400	Health and Safety	Joint Occupational Health and Safety Committee Certification	42		In-House
304	Health and Safety	Joint Occupational Health and Safety Committee eLearning	8		In-House
303	Health and Safety	Joint Occupational Health and Safety Committee Induction	0		In-House
2993	Specific	Kidde Vehicle F.S.S Overview	5		In-House
2198	General	Labour Relation System	2		In-House
4000	General	LDP - M0: Launching Activity	10		In-House
4001	General	LDP - M1: Communicating for Performance	10		In-House
4002	General	LDP - M2: Coaching to Enhance Capabilities	10		In-House
4003	General	LDP - M3: Mobilizing in Action	10		In-House
4004	General	LDP - M4: Managerial Courage	10		In-House
1114	Specific	Leach/CIP Stripping Circuit	84		In-House
2172	Specific	Leach/CIP Stripping Circuit Evaluation	0		In-House
2539	Specific	Lincoln Grease System	6		In-House
929	Specific	Loader - Auxiliary Equipment - Open Pit	84		In-House
2156	Specific	Loader - Auxiliary Equipment - Site Services	84		In-House
952	Specific	Loader - Production Equipment	84		In-House
2496	Specific	Loader - Service Equipment - Open Pit	84		In-House
953	Specific	Loader - Service Equipment - Site Services	84		In-House
1121	Health and Safety	Lockout	2		In-House
2225	Specific	Long Haul Truck	84		In-House
2211	Specific	Mechanics Service Truck TRK 44	24		In-House
307	Health and Safety	MHFA - Mental Health First Aid	4		In-House
1009	Health and Safety	Mill Induction	0.5		In-House
1055	ERT	Mine Rescue - Surface	48		Recognized
2848	Health and Safety	Mine Rescue - Underground	40		Recognized
1731	Specific	Mixing and Distribution Circuit	84		In-House
2180	Health and Safety	Occupational Health and Safety	0.5		In-House
3410	Health and Safety	OHSC Act Regs - Duties Roles and Responsibilities - IRS Training	4		Recognized
2520	Specific	Oil Sampling and Filtration	2		In-House
2497	Specific	Operations in Aircraft Ground Icing Conditions	8		Recognized
1013	General	Overhead Crane	3		In-House
2259	Health and Safety	Oxygen Administration	4	Red Cross/St-John/CNE	Recognized
2235	Specific	Passenger Bus	5		In-House
3020	General	People Management Tools	3		In-House
2626	Specific	Planning and Scheduling	16		In-House
2569	Specific	PMO Training	2		In-House
3013	Specific	Primary Evaluation	0		In-House
2570	Specific	Process Plant Trainee Program	504		In-House
2849	General	Professional Development	0		In-House
2600	Specific	PSS BG4 Technician	24		In-House
335	Health and Safety	Quantitative Fit Test	0		In-House
3016	Specific	Respa CF	4		In-House
1068	Health and Safety	Respiratory Protection	2		In-House
2182	Health and Safety	Roles and Responsibilities	3		In-House
2204	Health and Safety	Scaffolds	12		In-House
1632	Health and Safety	SCBA	4		Recognized
2589	Specific	Service Truck - Powerhouse	84		In-House
1082	Health and Safety	Shiftboss - Surface	0	Nunavut Mine Act	Recognized
1084	Health and Safety	Shiftboss - Underground	0	Nunavut Mine Act	Recognized
1091	General	Skid Steer	5		In-House

Course ID	Course Type	Course Name	Lenght of Training (hrs)	Regulation Source	Recognized vs in-house
2850	Specific	Sleipner	5		In-House
1867	Specific	Snow Blower	24		In-House
2265	Specific	Snow plow - Open Pit	24		In-House
5050	Health and Safety	SOP Mine - Underground Visitor	2		In-House
5051	Health and Safety	SOP Mine - Underground Worker	3		In-House
5052	Health and Safety	SOP Surface - Meliadine	2		In-House
2662	Specific	Specialized Building Mechanic	3		In-House
1791	Health and Safety	Spills Response	0.5		In-House
1071	Health and Safety	Stairs & Ladder Safety	1		In-House
1093	Health and Safety	Standard Operating Procedure Mine	2		In-House
1083	Health and Safety	Standard Operating Procedure Surface	2		In-House
2210	Specific	Steam Cleaner	5		In-House
1094	Health and Safety	Supervision Formula	5		In-House
2397	Health and Safety	Supervisor Safety Responsibilities	10		In-House
1087	Health and Safety	Supervisor's Certificate Level 1 - Exploration	0	Nunavut Mine Act	Recognized
1077	Health and Safety	Supervisor's Certificate Level 1 - Surface	0	Nunavut Mine Act	Recognized
1078	Health and Safety	Supervisor's Certificate Level 1 - Underground	0	Nunavut Mine Act	Recognized
1086	Health and Safety	Supervisor's Certificate Level 2 - Exploration	0	Nunavut Mine Act	Recognized
1079	Health and Safety	Supervisor's Certificate Level 2 - Surface	0	Nunavut Mine Act	Recognized
1081	Health and Safety	Supervisor's Certificate Level 2 - Underground	0	Nunavut Mine Act	Recognized
4990	Specific	Surface Articulated Haul Truck	84	Nunavut Mine Act	Recognized
2491	Specific	Tandem Truck - Open Pit	84		In-House
1977	Specific	Tandem Truck - Site Services	84		In-House
938	General	Telehandler	5		In-House
985	Specific	Tow Haul	24		In-House
4997	Specific	Underground Block Holer	168		In-House
4999	Specific	Underground Boom Truck	5		In-House
4992	Specific	Underground Cable Drill	168		In-House
4993	Specific	Underground Cassette Man Carrier	12		In-House
4995	Specific	Underground Concrete Truck	84		In-House
5000	Specific	Underground Development Bolter	84		In-House
5010	Specific	Underground Development Jumbo	84		In-House
5020	Specific	Underground Development Scoop	84		In-House
5030	Specific	Underground Emulsion Charger	84		In-House
5070	Specific	Underground Grader	84		In-House
5100	Specific	Underground Haul Truck	168		In-House
5095	Specific	Underground Haul Truck 50T	168		In-House
5101	Specific	Underground Jumbo 422	84		In-House
5065	Specific	Underground Lube/Fuel Truck	84		In-House
5102	Specific	Underground Man Carrier	5		In-House
5104	Specific	Underground Modules (Common Core) Certification	0		In-House
5140	Specific	Underground Production Cubex Drill	168		In-House
5143	Specific	Underground Production Emulsion Loader	168		In-House
5150	Specific	Underground Production Rhino	168		In-House
5153	Specific	Underground Production Scoop	168		In-House
5156	Specific	Underground Production Solo Top Hammer Drill	168		In-House
5126	Specific	Underground Remote Controlled Scoop - 12 yards	5		In-House
5125	Specific	Underground Remote Controlled Scoop - 8 yards	5		In-House
5110	Specific	Underground Scissor Lift	84		In-House
5105	Specific	Underground Service Excavator	5		In-House
5107	Specific	Underground Service Loader	5		In-House
5108	Specific	Underground Service Scoop	84		In-House
5120	Specific	Underground Service Tractor	5		In-House
5130	Specific	Underground Shotcrete Sprayer	168		In-House
2495	Specific	Used Oil Analysis	10		In-House
1099	Specific	Utility Person Circuit	84		In-House
977	Specific	Water Truck - 773	24		In-House
2501	Specific	Water Truck - Kenworth	5		In-House
2208	Specific	Water Truck - Kenworth	5		In-House
933	Specific	Wheel Dozer	84		In-House
1080	Health and Safety	WHMIS	0.5		In-House
102	Health and Safety	WHMIS 2015	0.5		In-House
1064	Health and Safety	Work Card	1		In-House
2149	General	Work Readiness	40		In-House
1946	General	Work Readiness Part 1	20		In-House

Appendix M-1

Socio-Economic Monitoring Report

Agnico Kivalliq Projects

2017 SOCIO-ECONOMIC MONITORING REPORT

DATE OF SUBMISSION:

July-2018

SUBMITTED TO:

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Executive Summary

The Agnico Kivalliq Projects

The Meadowbank and Meliadine gold mines are located in the Kivalliq region of Nunavut on Inuit owned lands (IOL). Meadowbank falls approximately 70 km north of the Hamlet of Baker Lake, or 110 km by road. Whale Tail, a satellite deposit to the Meadowbank mine, is located approximately 50km north of Meadowbank. Meliadine is located near the western shore of Hudson Bay, about 25 km north of Rankin Inlet.

Agnico Eagle Mines (AEM) acquired the Meadowbank property from Cumberland in 2007, with construction of the mine taking place between 2007 and 2010. The mine began production in 2011 and processes an average of 11,000 tonnes of ore per day from three deposits. It is expected to continue to produce gold until 2019, though the nearby Whale Tail development is expected to effectively extend the life of the mine for years to come.

About 290 km southeast of Meadowbank, Agnico Eagle's Meliadine gold project began construction and development activities in 2017. Meliadine is forecast to begin operation in 2019, producing an estimated 5.7 million ounces of gold over a 15-year mine life.

About this Report

This report provides the results of the Agnico Eagle Projects Socio-Economic Monitoring Program (SEMP), developed in consultation with the Kivalliq Socio-Economic Monitoring Committee (SEMC). The purpose of this report is to:

- comply with the relevant sections of the **Nunavut Land Claims Agreement** (NLCA),
- comply with the terms and conditions of the **Meadowbank Project Certificate** issued by the NIRB, including reporting on the socio-economic impact predictions made in Cumberland Resource's Final Environmental Impact Statement (Meadowbank FEIS);
- comply with the terms and conditions of the **Meliadine Project Certificate** issued by the NIRB, including reporting on the socio-economic impact predictions made in Agnico Eagle's Final Environmental Impact Statement (Meliadine FEIS);
- identify any **unanticipated effects** associated with the mines;
- identify and recommend **mitigation measures**;
- act as the primary vehicle for reviewing the findings of the SEMP in **collaboration** with members of the Socio-Economic Monitoring Committee (SEMC);
- fulfill best practices in **social responsibility**; and
- act as a **valuable resource** for communities, governments and interested stakeholders.

Summary of Findings

Table 1 below provides an overview of the results of this year's monitoring program. Please refer to the Methods section for a more detailed description of how to read the table.

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Table 1. Monitoring results summary[1]

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
VSEC 1. EMPLOYMENT						
1.1 Total project employment (Agnico Eagle & contractors)						
Project employment (permanent, temporary, on-call & contractor)	N/A	→	↓	N/A	↑	Total Meadowbank employment levels measured as a snapshot in December, were relatively stable in 2017 and continue to significantly exceed the levels predicted in the FEIS. Meliadine employment increased significantly in 2017, corresponding with the onset of major construction activity.
1.2 Project Inuit employment (Agnico Eagle)						
Project Agnico Eagle employment (Inuit & non-Inuit)						Meadowbank Agnico Eagle Inuit FTEs have been holding relatively steady for the past 3 years (221, 221 and 218), representing between 28% and 29% of the total Agnico Eagle workforce. Contractor Inuit employment over the same time timeframe increased from 25 to 48 – though this may be a result of better tracking in 2017 where FTES are used compared with employment numbers in prior years. In 2017, there were 130 total Inuit FTEs at Meliadine (including both Agnico Eagle and contractor employees), representing approximately 18% of the workforce. This is below the Meliadine FEIS prediction of a 20% Inuit workforce during peak construction (340 employees). While the number of Meliadine Agnico Eagle FTEs has varied between 8 and 15 over the past five years, 2017 saw a sharp decline in the Inuit employment rate due to a large increase in non-Inuit employees. This may be explained by the requirements for more specialized labour during the construction phase.
Inuit FTEs	N/A	→	→	N/A	→	
Inuit FTE rate	N/A	→	→	N/A	→	
Project contractor employment (Inuit & non-Inuit)						
Employees / FTEs	N/A	→	↑	N/A	↑	
Inuit employee / FTE rate	N/A	↓	↑	N/A	↓	
1.3 Project Agnico Eagle employment by Kivalliq community						
Project employment by Kivalliq community	N/A	↑	↑	N/A	↑	In 2017, over half (53%) of Meadowbank's Kivalliq-based employees were from Baker Lake and approximately 61% of Meliadine's Kivalliq-based employees were from Rankin Inlet. Additionally, Arviat supplies a large and increasing proportion of Agnico Eagle's Inuit workforce, reaching a high of 70 employees in 2017. Employees from the remaining Kivalliq communities (Chesterfield Inlet, Coral Harbour, Whale Cove and Naujaat) rose in each community, increasing cumulatively from 26 employees to 44 between 2016 and 2017.
1.4 Project employment by gender						
Project employment (gender)						Agnico Eagle female employment at Meadowbank has been steadily increasing since 2013, from a low of 10% up to 20%. It is at its highest level since the mine began production and has now surpassed the Canadian mining sector average of 17%. Meliadine female employment has increased steadily, though the rate declined from 24% to 15% in 2017 due to a substantial increase in the number of employees and contractors for construction activity.
employees	N/A	↑	↑	N/A	↑	
rate	N/A	↑	↑	N/A	↓	
1.5 Project turnover						
Project turnover (Inuit & non-Inuit)	N/A	↓	↓	N/A	/	The turnover rate for Meadowbank permanent Inuit employees remained stable in 2017 at 28%, while temporary employee turnover rate is showing signs of stabilizing near 50% following a drop from 2010 to 2014.
Agnico Eagle Inuit employee turnover by reason	N/A	↓	↓	N/A	↓	

[1] For the current reporting year, all 'last year' Meliadine movements are considered neutral, as 2017 represents the first year of major construction activities and therefore has no comparable year against which to measure trends.

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
Percent turnover by community	N/A	↑	↑	N/A	↓	Meliadine's turnover rate for permanent Inuit employees continued a sharp 2-year decline in 2017, with 0 employee turnover, while it's temporary employee turnover rate remained similar to Meadowbank's at 55%. Of the 6 Inuit employees comprising 2017 turnover, 4 resigned and 2 were dismissed. 2017 saw a large increase in turnover in Meadowbank employees from Coral Harbor and Naujaat, with nearly as many employees leaving as were working there when the annual snapshot was taken (just over for Coral Harbor at 109% and just under at Naujaat at 92%).
VSEC 2. INCOME						
2.1 Income paid to projects' Inuit employees						
Income paid to Agnico Eagle project Inuit employees	N/A	↑	→	N/A	↑	2017 total income paid to Agnico Eagle's Inuit employees remained relatively stable from the previous year at $19.4M. This follows a steady annual increase between 2013 and 2016, with the 2015 and 2016 increase largely attributable to increased activity at Meliadine.
2.2 Income by Kivalliq community						
Median employment income of tax filers by Kivalliq community	↑	↑	N/A	↑	N/A	The most recent data available for this indicator is from 2015. Median employment income has increased gradually overall in the Kivalliq region since 2006, with no significant inflection (i.e. change in growth rate) since 2010. Among the Kivalliq communities with highest levels of Meadowbank employment (Baker Lake, Rankin Inlet, and Arviat), only Rankin Inlet shows a significant increase in the income growth rate when comparing the 2006-2010 period to the 2010-2015 period.
VSEC 3. CONTRACT EXPENDITURES						
3.1 Contract expenditures						
Contract expenditures on NTI-registered businesses						In 2017, contract expenditures doubled from a total of $205M to $408M across the two projects, largely due to increased spending at the Whale Tail site, as well as the start of construction at Meliadine. This increase corresponded with a decline in the total proportion of expenditures (Meadowbank, including Whale Tail, and Meliadine) going to NTI-registered vs. non-NTI registered firms, from 55% in 2016 to 47% in 2017. This decline in proportion is fully attributable to Meliadine spending, where the proportion declined from 55% in 2016 to 41% in 2017.
NTI expenditures	N/A	↑	↑	N/A	↑	
Proportion NTI	N/A	↑	→	N/A	↓	
2017 NTI-registered business expenditures by Nunavut community	N/A	N/A	N/A	N/A	N/A	In 2017, just over half of the spending on NTI-registered firms went to firms located in Rankin Inlet, followed closely by Baker Lake and Iqaluit, with 23% each. Meliadine is expected to far exceed the FEIS predictions of $175M contract spending on Kivalliq-based businesses over the 3.5-year construction phase.
Contract expenditure on Nunavut-based businesses						Total contract expenditures on Nunavut-based businesses more than doubled in 2017 from $216M to $511M. The proportion of contract expenditure spending on Nunavut-based businesses remained relatively stable at 59% over this time period across the two projects.
Nunavut-based expenditures	N/A	↑	↑	N/A	↑	
Proportion Nunavut-based	N/A	/	↑	N/A	↓	
Contract expenditures from Meadowbank on Baker Lake-based businesses and from Meliadine on Rankin Inlet-based businesses	N/A	↓	↑	N/A	↑	Meadowbank expenditures on Baker Lake-based businesses and Meliadine expenditures on Rankin Inlet-based businesses continued a 2-year upward trend in 2017, corresponding with construction at Meliadine and Whale Tail, respectively. The proportion of contract expenditures has risen by $43M over the past two years in Baker Lake, although this is still less than when Meadowbank began operation. This suggests that spending has diversified to other communities across the territory.
VSEC 4. EDUCATION AND TRAINING						
4.1 Investment in school-based initiatives						
Agnico Eagle investments in school-based initiatives	N/A	↓	↑	N/A	↑	Up until 2014, Agnico Eagle contributed approximately $284K/year to a variety of school-based initiatives. With the expiry of the MOU with the Department of Education in 2015, these contributions dropped to $39K. They remained unchanged in 2016 and rose to $55K in 2017 due to a doubling of scholarship funding.
4.2 Secondary school graduation by region						

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
Secondary school graduation rate by region	↑	↑	N/A	↑	N/A	The graduation rate in Kivalliq region fluctuates from year to year, though shows an overall upward trend that began in 2008. Rates have been at all-time highs for the region, and consistently higher than those in the other two regions, since 2010.
4.3 Project training and education						
Agnico Eagle investments in mine training and education programs	N/A	→	↓	N/A	↓	From 2014 to 2016, there was a consistent level of investment by Agnico Eagle (~$2.3M/year) in external mine training programs (e.g. Kivalliq Mine Training Society). In 2017, this dropped to $195K as the KMTS lost their federal funding; the future of the organization is currently uncertain.
Average mandatory training hours provided to Agnico Eagle Inuit employees	N/A	↑	→	N/A	↑	In 2017, mandatory training hours remain fairly stable at Meadowbank, indicative of steady rates of turnover. These hours have increased at Meliadine, likely due to the influx of new employees. Specific training hours declined at Meadowbank from 84 hours / Inuit FTE in 2015, down to 51 hours in 2017, while Meliadine values have fluctuated from 28 in 2015 to 10 in 2016 and up again to 25 in 2017. Annual fluctuations in the number of training hours largely reflect changing demand for additional positions and so are not considered negative or positive.
Average specific training hours provided to Agnico Eagle Inuit employees	N/A	↑	↓	N/A	↑	
Participation in career and skills programs	N/A	/	↓	/	↓	Participants in TASK week and graduates from the Arviat Diamond Drillers and Welders Program had remained steady until last year, decreasing by 12 and 11 respectively. Meadowbank's Haul Truck Driver Program also saw a decline in 2017 from 34 to 26 participants. These fluctuations could be explained by the success of each program as well as changing demand for specific skills at Meadowbank.
Meadowbank pre-apprenticeship and apprenticeship participation by type	N/A	↑	↑	N/A	N/A	The number of Inuit apprenticeships increased by 3 in 2017. In addition to the number of Inuit participants, the apprenticeship program has seen growth over the past 4 years in diversity, moving from two offered programs in 2013 to seven in 2017.
4.4 Project employment by skill level						
Project Agnico Eagle Inuit employees by skill-level	N/A	↑	↑	N/A	↑	2017 has seen an increase in Inuit employees at higher skill levels, with the total number of skilled, management and professional employees rising from 6 in 2016 to 15 in 2017.
VSEC 5. CULTURE AND TRADITIONAL LIFESTYLE						
5.1 Perceptions of culture and traditional lifestyle						
Self-reported effect of project on culture and traditional activities	N/A	N/A	N/A	N/A	N/A	Data currently unavailable.
5.2 Culture and traditional lifestyle						
Proportion of total population identifying Inuktitut as their mother tongue by community	→	↓	N/A	↓	N/A	The proportion of the population identifying Inuktitut as their mother tongue has remained relatively stable in the smaller Kivalliq communities from 2006 to 2016, but has declined in Rankin Inlet, Baker Lake, and Chesterfield Inlet (by 10 to 18 percentage points) over this period.
Use of AWAR by community	N/A	↑	↓	N/A	N/A	The Agnico Eagle-owned and operated all-weather access road (AWAR) that connects Baker Lake to the Meadowbank mine is accessible to the communities for hunting purposes. Community members accessed the road 2366 times in 2015, 1874 times in 2016, and 1716 times in 2017.
5.3 Country food use at project						
Country food kitchen usage	N/A	→	→	N/A	N/A	Meadowbank has maintained its practice of offering meals including char, muskox, and caribou (approximately 4,500 meals/year, or one per month per employee, since 2011). At Meliadine, Agnico Eagle offered about 21 meals with Arctic char this past year, twice on a five-week rotational schedule, which was consumed by approximately 50% of the staff.
Country food night events	N/A	→	↓	N/A	N/A	The number of country food events held at Meadowbank decreased from 14 in 2016 to 4 in 2017 – largely due to a lack of country food availability. Turnout for these events has averaged 36 attendees per event in 2016 and 43 in 2017. Agnico Eagle also offered country food at an event as a part of Pakallak Tyme, a cultural festival held in Rankin Inlet to celebrate the end of the Arctic winter and the coming of spring.
VSEC 6. POPULATION DEMOGRAPHICS						
6.1 Employee migration						
Project Agnico Eagle Inuit employees						There has been a gradual increase in the number of Inuit Meadowbank workers who now reside in outside of Nunavut, from 7 in 2011 to 21 in

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
residing outside Nunavut						2015 (or 7% of the Inuit workforce), though this number has remained stable in 2016 and 2017. The FEIS predicts both "positive and negative components" of migration but does not refer to migration out of Nunavut.
Total Inuit employees	N/A	↑	→	N/A	↑	
Proportion of Inuit to Non-Inuit employees	N/A	↑	→	N/A	↑	
6.2 Population estimates in Kivalliq communities						
Population estimates of Kivalliq communities						Yearly population estimates do not indicate an increase in the population growth rate of Baker Lake or of other communities with significant Meadowbank employment (Arviat, Rankin Inlet) since the mine opened, or relative to other communities in the region. If other factors (births and deaths) are assumed constant, the population data does not suggest significant migration to Baker Lake (or other communities with high Meadowbank employment).
Estimates in communities	↑	↑	↑	↑	↑	
Annual percent change	→	→	→	→	→	
VSEC 7. INDIVIDUAL AND COMMUNITY WELLNESS						
7.1 Agnico Eagle Programs						
Agnico Eagle wellness programs offerings & utilization by project employees	N/A	/	/	N/A	/	Meadowbank and Meliadine have a number of ongoing programs that offer readiness, counselling and support services to employees and their families. Due to difficulties in assessing participation in counselling programs (in part due to privacy issues), no trends can be drawn on employee targeted program utilization. Program utilization offered to communities has increased over the past two years – largely due to the new Mandatory Training (Site Readiness) and Work Readiness programs.
Agnico Eagle wellness programs offerings & utilization by community members	N/A	↑	↑	N/A	↑	
7.2 Perceptions of health & wellness						
Self-reported effect of project on health & wellness	N/A	N/A	N/A	N/A	N/A	Data for this metric is currently unavailable.
7.3 Criminal violations						
Criminal violations per hundred people by Kivalliq community	↑	→	N/A	↑	N/A	Total criminal violation rates in Baker Lake and Rankin Inlet reached historic high levels in 2011 and 2012, following the opening of Meadowbank. Recent data (2017) indicates a continuing downward trend (since 2012) in criminal violations in Baker Lake, along with those in Arviat. However, Rankin Inlet and Chesterfield Inlet have seen sharp rises in criminal violations over the past one to two years.
Criminal violations per hundred people by type (Baker Lake, Rankin Inlet, Chesterfield Inlet)						
Baker Lake	→	↓	↓	→	↓	
Rankin Inlet	→	↓	↑	→	↑	
Chesterfield Inlet	↑	→	↑	↑	↑	
7.4 Health centre visits						
Health centre/clinic visits by Kivalliq community by reason for visit	N/A	N/A	N/A	N/A	N/A	Data for this metric is currently unavailable.
7.5 Housing						
Persons on waitlist for public housing by community	/	/	/	/	/	The number of persons on a waitlist for housing has been increasing in Baker Lake and Arviat steadily since 2010. Rankin Inlet has seen a substantial decrease in wait lists over this same period. This may be the result of additional construction of private dwellings as an economic center for the region.
7.6 Food security						
Food security by region or community	N/A	N/A	N/A	N/A	N/A	Data for this metric is currently unavailable.
7.7 Suicide						
Suicides per 10,000 people by region	/	/	/	/	/	There is a persistent and territory-wide suicide crisis in Nunavut. The factors contributing to suicide are numerous and complex, so it is difficult to assess impacts of Meadowbank on suicide rates. Community suicide rates (e.g. for Baker Lake) are highly variable from year to year. Trends are more apparent in long-term and/or regional data.
VSEC 8. HEALTH AND SAFETY						

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
8.1 Health and safety training						
Average (per FTE) mandatory training hours provided to Agnico Eagle Inuit employees	N/A	/	→	N/A	↑	A steady increase in overall mandatory training hours for full-time employees has occurred at both Meadowbank and Meliadine from 2015 to 2017. Health and safety training increased for Inuit and non-Inuit employees in 2017 at Meliadine. None of the data collected permits an assessment of the impacts of Agnico Eagle's projects and their programs on the general health status of workers and their families.
8.2 Health and safety on-site						
Average (per-FTE) visits by project Agnico Eagle employees to clinic for work-related or other reasons	N/A	↓	→	N/A	↓	There was a small rise in visits to Agnico Eagle clinics for work-related injuries in 2017, though this is largely accounted for by an increase in employment. Overall, the number of clinic visits has been fairly stable since 2012, and the clinic continues to serve an important function in addressing the health and medical needs of workers.
Project combined lost-time and light duty accident frequency (per 200,000 person-hours)	N/A	↓	↑	N/A	↓	Lost-time and light duty accident frequency decreased for four years in a row up to 2015 but increased in 2016 (from .57 to .72) and in 2017 to 1.62.
VSEC 9. COMMUNITY INFRASTRUCTURE AND SERVICES						
9.1 Use of GN health services						
Kivalliq community health centre visits per capita	↓	↑	N/A	↑	N/A	Per capita health centre visits in communities with the most Agnico Eagle employees (Baker Lake, Rankin Inlet, and Arviat) are beginning to show an upward trend, most notably in Baker Lake and Arviat. The number of employees referred to their community health care centres for personal or work-related reasons ranges from 14 to 58 people per year, though it is difficult to draw a relationship between changes in this indicator and use of GN Health Services.
Persons transported from site to access health services (province & Nunavut)	N/A	↑	↓	N/A	↑	
Incidents requiring use of GN health services	N/A	/	↓	N/A	↑	
9.2 Use of public infrastructure						
Estimates of use of public physical infrastructure directly related to Project (airports, port, meeting facilities, roads)	N/A	N/A	N/A	N/A	N/A	The use of public physical infrastructure by Meadowbank and its employees consists primarily of the use of airports and has been relatively consistent since operation began in 2010. There are no indications of significant positive or negative impacts on this infrastructure. Having just begun construction and development in 2017, it is too soon to conclude what impacts Meliadine may be having on Rankin Inlet's airport or port.
All-weather access road (AWAR)	N/A	/	↓	N/A	N/A	
9.3 Social assistance						
Per capita social assistance expenditures by community	↓	/	N/A	↓	N/A	Despite declines from historical highs, social assistance data does not show a clear correlation between mine-related employment and social assistance requirements in Baker Lake or Arviat. Data suggests that both expenditures and percentage of households receiving social assistance have been declining in Rankin Inlet since Meadowbank opened.
Percentage of households receiving social assistance by community	↓	↓	↓	↓	↓	
VSEC 10. NUNAVUT ECONOMY						
10.1 Royalties and taxes						
Project compensation, royalties and taxes paid	N/A	↑	↑	N/A	↑	Cumulative project royalties, taxes and other payments paid by Agnico Eagle to the GN, GoC, NTI and KIA increased at both Meadowbank and Meliadine in 2017. At Meadowbank this is largely due to IIBA payments to the KIA following 2017 agreements. At Meliadine this is largely due to increases in payroll taxation following the onset of major construction.
10.2 Trade balance						
Nunavut trade balance	↓	↑	N/A	↑	N/A	Nunavut's net exports have increased steadily since 2008, following a dramatic increase in the trade deficit from 2006 to 2008 that was linked to the construction activities at Meadowbank. Since Meadowbank began operations in 2010, Nunavut's net exports have increased by approximately $131M. No trend regarding the impacts of Meliadine on Nunavut's trade balance can be determined with the current available data.

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
10.3 Nunavut GDP						
Nunavut GDP by all industries and mining, quarrying and oil & gas	↑	↑	↑	N/A	↑	Coinciding with Meadowbank becoming operational, Nunavut's GDP has grown at an average of 6% annually from 2009 to 2017. A sharp increase of 12% occurred in 2017.
Nunavut GDP by all industries and mining, quarrying and oil & gas	↓	↑	↑	N/A	↑	According to the Conference Board of Canada, Meadowbank has been a driver of Nunavut's GDP growth, both during the construction of the mine and since production began in 2010. The 12% increase observed over the past year may in part be attributed to construction activities at Meliadine and Whale Tail, most notably a large increase in contract expenditures for the two construction projects.

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Introduction

The Agnico Kivalliq Projects

The Meadowbank and Meliadine gold mines are located in the Kivalliq region of Nunavut on Inuit owned lands (IOL). Meadowbank falls approximately 70 km north of the Hamlet of Baker Lake, or 110 km by road. Whale Tail, a satellite deposit to the Meadowbank mine, is located approximately 50km north of Meadowbank. Meliadine is located near the western shore of Hudson Bay, about 25 km north of Rankin Inlet.



Agnico Eagle Mines (AEM) acquired the Meadowbank property from Cumberland in 2007, with construction of the mine taking place between 2007 and 2010. The mine began production in 2011 and processes an average of 11,000 tonnes of ore per day from three deposits. As of December 31, 2017, Meadowbank had approximately 5 million tonnes of proven and probable reserves grading 2.28 grams of gold per tonne, containing 345,000 ounces of gold. It is expected to continue to produce gold until 2019, though the nearby Whale Tail development is expected to effectively extend the life of the mine for years to come.

About 290 km southeast of Meadowbank, Agnico Eagle's Meliadine gold project began construction and development activities in 2017. The project has approximately 16 million tonnes of proven and probable reserves grading 7.12 grams of gold per tonne, containing 3.7 million ounces of gold. Meliadine is forecast to begin operation in 2019, producing an estimated 5.7 million ounces of gold over a 15-year mine life. The project is expected to produce approximately 170,000 ounces of gold in 2019 and 385,000 ounces in 2020.

Report Purpose

This report provides the results of the Agnico Eagle Projects Socio-Economic Monitoring Program (SEMP), developed in consultation with the Kivalliq Socio-Economic Monitoring Committee (SEMC). The purpose of this report is to:

- comply with the relevant sections of the **Nunavut Land Claims Agreement** (NLCA),
- comply with the terms and conditions of the **Meadowbank Project Certificate** issued by the NIRB, including reporting on the socio-economic impact predictions made in Cumberland Resource's Final Environmental Impact Statement (Meadowbank FEIS);
- comply with the terms and conditions of the **Meliadine Project Certificate** issued by the NIRB, including reporting on the socio-economic impact predictions made in Agnico Eagle's Final Environmental Impact Statement (Meliadine FEIS);
- identify any **unanticipated effects** associated with the mines;
- identify and recommend **mitigation measures**;
- act as the primary vehicle for reviewing the findings of the SEMP in **collaboration** with members of the Socio-Economic Monitoring Committee (SEMC);
- fulfill best practices in **social responsibility**; and
- act as a **valuable resource** for communities, governments and interested stakeholders.

Report Structure

The following two sections provide background information on the SEMP, including relevant context and methodology. The remainder of this report presents project-specific and public data related to 10 valued socio-economic components (VSECs) to ensure the requirements of individual project certificates are being adequately met. Additionally, whenever possible, the report provides a cumulative / regional lens to better identify and assess the effects of Agnico Eagle's projects on the Kivalliq region.

The report is organized by VSEC, including: a summary page describing the VSEC, relevant FEIS predictions, the associated indicators and metrics used to monitor the VSEC, and key findings; and descriptions of existing Agnico Eagle programs and practices that are relevant to performance (enhancing benefits or mitigating impacts) for indicators associated with that VSEC.

For each indicator, this report addresses the following:

- **Prediction:** Provide the prediction from the projects' FEIS against which the indicator will be assessed. This will include directionality and magnitude as well as specific targets/levels, where available.
- **Data and Trends:** Present and describe the indicator data in a clear manner through the use of charts, tables and text.
- **Interpretation:** Analyse the data and assess trends against the specific indicator prediction and impact / goal statements, more generally. Where possible, examine changes in trends over time with respect to the periods before and after the commenced operation, recognizing that isolating the effects of individual projects will become challenging with multiple operations in the region.

Context

Socio-Economic Monitoring Committees

In 2007, the Government of Nunavut established three regional-based socio-economic monitoring committees (SEMCs) to monitor the socio-economic impacts of projects in each of the Territory's regions against project certificate terms and conditions specified by the NIRB. The SEMCs' Terms of Reference state that the committees will assist proponents in developing project monitoring programs and prepare reports and publish information on the impact of major development projects on the health and well-being of communities and residents in the region.

Both the Kivalliq and Meadowbank committees are required to produce annual monitoring reports, with the former focused at the level of the region and the latter at the project level. This system allows for project-level information to inform a regional picture of the socio-economic health of the Kivalliq, better capturing cumulative effects. This will become increasingly important as additional mining operations come on line in the region.

The first Meadowbank socio-economic monitoring report was completed in consultation with the Kivalliq SEMC and accepted by the Nunavut Impact Review Board in 2015. This is the first report produced under the new Agnico Eagle Projects SEMP, providing monitoring data for both Meadowbank and Meliadine. It builds on the foundation laid in the previous Meadowbank reports, evolving to address gaps, minimize overlap with regional SEMC reporting, increase consistency across SEM reports from different operators, and improve Agnico Eagle's and the SEMC's understanding of trends (i.e. relationships between indicators and causality). The Methods section of this report provides further information on the report's design, indicator selection and differences between this report and the previous report.

NIRB Project Certificate Conditions

Conditions 63 and 64 of the Meadowbank Mine Project Certificate issued by the NIRB require that a Meadowbank SEMC be established and that the project proponent work with the Governments of Nunavut (GN) and Canada to develop a Terms of Reference for a Meadowbank Socio-Economic Monitoring Committee. Agnico Eagle submitted the Terms of Reference for the Meadowbank SEMC in July of 2007, satisfying Condition 63. In order to better reflect the socio-economic monitoring needs and priorities of the Meadowbank SEMC, the terms of reference were modified in 2012 (see Appendix A). Following a number of iterations and meetings, a Terms of Reference for the Meadowbank Socio-Economic Monitoring Program was finalized in October 2014, at the SEMC working group meeting in Baker Lake.

Meadowbank Project Certificate, Condition 63:
"Within six (6) months of the issuance of a Project Certificate, the GN and INAC shall form a Meadowbank Gold Mine Socio-Economic Monitoring Committee ("Meadowbank SEMC") to monitor the socio-economic impacts of the Project and the effectiveness of the Project's mitigation strategies. The monitoring shall supplement, not duplicate, the monitoring required pursuant to the IIBA negotiated for the Project, and on the request of Government or PC, could assist in the coordination of data collection and tracking data trends in a comparable form to facilitate the analysis of cumulative effects. The terms of reference shall focus on the Project, include a plan for ongoing consultation with KivIA (Kivalliq Inuit Association) and affected local governments and a funding formula jointly submitted by GN, INAC and Cumberland. The terms of reference shall be submitted to NIRB for review and subsequent direction within six (6) months of the issuance of a Project Certificate. Cumberland is entitled to be included in the Meadowbank SEMC." (Nunavut Impact Review Board, 2006, p. 20)

Condition 64:
"Cumberland shall work with the GN and INAC to develop the terms of reference for a socio-economic monitoring program for the Meadowbank Project, including the carrying out of monitoring and research activities in a manner which will provide project specific data which will be useful in cumulative effects monitoring (upon request of Government or NPC) and consulting and cooperating with agencies undertaking such programs. Cumberland shall submit draft terms of reference for the socio-economic monitoring program to the Meadowbank SEMC for review and comment within six (6) months of the issuance of a Project Certificate, with a copy to NIRB's Monitoring Officer." (Nunavut Impact Review Board, 2006, p. 20)

Meliadine Project Certificate, Condition 89
"The Proponent shall develop the Meliadine Socio-economic Monitoring Program to monitor the predicted impacts outlined in the FEIS as well as regional concerns identified by the Kivalliq Socio-economic Monitoring Committee (SEMC). Where possible, the Proponent is encouraged to work in collaboration with all other socio-economic stakeholders such as the KIA, GN, AANDC and the communities of the Kivalliq region in developing this program, which should include a process for adaptive management and mitigation in the event unanticipated impacts are identified. Details of the Meliadine Socio-economic Monitoring Program are to be provided to the NIRB upon finalization, and within one year of issuance of the Project Certificate."

The Inuit Impact and Benefit Agreement (IIBA)

The original Inuit Impact and Benefits Agreement (IIBA) between Cumberland Resources and the Kivalliq Inuit Association (KIA) was signed in August of 2006. A Production Decision under the IIBA was given to the KIA by Agnico Eagle in December of 2007. This Production Decision was a key point in triggering many of the requirements under the IIBA and led to implementation of the agreement after Meadowbank went into production.

In 2009, Agnico Eagle and the KIA began a review of the IIBA with both parties suggesting changes in the text to refine and improve the functionality of the IIBA in achieving its objective of maximizing Inuit benefit from the Meadowbank Project in the form of employment, training and business opportunities. Agreement on a revised IIBA was subsequently reached with the final revised IIBA Agreement approved by the two parties on October 18, 2011. The IIBA for Meadowbank was renegotiated in 2017 and is well-aligned with the 2015/2017 Meliadine IIBA and 2017 Whale Tail IIBA.

A key feature of the IIBA was the establishment of an Implementation Committee with members from the KIA and Agnico Eagle to monitor and manage the implementation of the IIBA. The 2017 Meadowbank IIBA, following the structure established by the 2015/2017 Meliadine IIBA, also established the Employment and Culture Committee (ECC) and the Business Opportunities Committee (BOC). These three committees work together to consider Inuit employment, contracting, training and other project-related IIBA matters.

Methods

Indicator Selection

In the summer of 2017, Agnico Eagle, with their partners in the SEMC, created the Agnico Kivalliq Projects Socio-economic Monitoring Program. This program provides the framework for socio-economic monitoring of Agnico Eagle's mineral projects in the Kivalliq Region of Nunavut. This includes monitoring against the predicted impacts described in the Final Environmental Impact Statements (FEIS) of each project, as well as the concerns and priorities identified by the Kivalliq Socio-Economic Monitoring Committee (Kivalliq SEMC). This program superseded the project-specific SEMP for the Meadowbank Gold Mine. By integrating multiple projects within a single monitoring framework, it aimed to promote consideration of cumulative impacts and streamline development and review of monitoring reports, while respecting the unique regulatory requirements of individual projects.

The Agnico Kivalliq Projects Socio-Economic Working Group (Working Group) was established to support the design and implementation of the SEMP. The Working Group supported the development of the Program framework and supported the identification of and access to priority data useful in improving the socio-economic performance of the projects.

Other key inputs into the development of the SEMP included:

- A Gap Analysis undertaken in June 2017 that reviewed the Meliadine FEIS, IIBA, Project Certificate and previous Meadowbank SEMP as well as data availability and reliability to develop a short-list of potential indicators for inclusion in the Program.
- Participation in a territorial socio-economic monitoring workshop to discuss and collaboratively develop a group of core indicators and identify and discuss common assessment methodologies, practices and challenges.

Data Sources

Table 1 outlines the data sources for each metric. Data collected by Agnico Eagle cover the years 2010 (or 2011) to 2017. Data from non-project sources (e.g. GN departments, Nunavut Bureau of Statistics, StatsCan) often cover the years 2006 to 2016. For consistency, analysis typically begins in 2010, unless pre-2006 data is needed for a better understanding of baseline conditions prior to mine construction. Where Government of Canada census data is required, only 2006, 2011, and 2016[2] data is available and changes during intervening years cannot be reported.

For certain metrics reliant on non-project sources, data for the reporting year (2017) was not available at the time of publication. In some cases, there is a regular time lag in the release of data due to verification and approval requirements and only data up to 2015 or 2016 is reported. In other cases, data for the reporting year is expected but had not been made available at the time of report finalization. These cases are flagged for the reader wherever such data is presented.

[2] Some 2016 census data was not yet released when this report was finalized.

Analysis and Interpretation

Throughout this report, we present available data using a combination of narrative, tables and charts. We provide an interpretation of the data for each indicator, including identification of significant trends and an explanation for the trends where possible. Given the complexity of socio-economic phenomenon (i.e. multiple factors at play), there are limitations in establishing causal relationships between mining activities and certain and certain socio-economic indicators.

In addition, to the narrative interpretation provided for the indicators, summary tables are included at the front end of each VSEC section. These tables provide a high-level snapshot of trends for the various indicators and metrics through the use of arrows and symbols. These trends are considered separately for both Meadowbank and Meliadine. The dimensions are used to summarize trends in the summary table:

Time horizon

The time horizons over which trends / movements are viewed.

- **Pre-development (pre-dev)**: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine)
- **Post-development (post-dev)**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year.
- **Last year**: movement from 2016 to 2017

Direction

The direction of movement of the indicator over the given time period.

- 🡅: Increasing
- 🡇: Decreasing
- 🡆: Remaining stable
- **/:** No discernable trend
- **N/A:** Not applicable

Value

The value of the movement / trend relating to the achievement of desired impacts or goals.

- **Positive**: change in indicator towards the achievement of the desired impact or goal
- **Negative**: change in indicator away from the achievement of the desired impact or goal
- **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

For the current reporting year, all ‘last year’ Meliadine movements are considered neutral, as 2017 represents the first year of major construction activities and therefore has no comparable year against which to measure trends.

Involvement of Socio-Economic Monitoring Committee

Stratos engaged with members of the SEMC to ensure the content, structure, and look and feel of this report are as useful as possible. This engagement included ongoing discussions with GN’s department of Economic Development and Transportation (who coordinate and chair the SEMC), as well as participation in the April 2018 SEMC meeting in Arviat at which Stratos presented a plain language summary of early results.

VSEC 1: Employment

IMPACT / GOAL STATEMENT

Increased, stable employment for Inuit (including women and challenged workers) across Kivalliq communities

OVERARCHING FEIS PREDICTIONS

Meadowbank: "The potential impacts of employment are likely to take some time to gain full momentum, and overall are considered of high magnitude, positive, long term and of high significance, specifically to those individuals and their families who are able to benefit." (Cumberland Resources, 2006, 120)

Meliadine: "Project would increase the demand for labour during construction and operational phases, which should lead to a considerable number of local jobs." (Golder Associates, 2014, 1-C-46)

TRENDS & INTERPRETATIONS

	Meadowbank trends			Meliadine trends		
Metric	Pre-dev	Post-dev	Last year	Pre-dev	Last year	**Interpretation**
1.1 Total project employment (Agnico Eagle & contractors)						
Project employment (permanent, temporary, on-call & contractor)	N/A	→	↓	N/A	↑	Total Meadowbank employment levels measured as a snapshot in December, were relatively stable in 2017 and continue to significantly exceed the levels predicted in the FEIS. Meliadine employment increased significantly in 2017, corresponding with the onset of major construction activity.
1.2 Project Inuit employment (Agnico Eagle)						
Project Agnico Eagle employment (Inuit & non-Inuit)						Meadowbank Agnico Eagle Inuit FTEs have been holding relatively steady for the past 3 years (221, 221 and 218), representing between 28% and 29% of the total Agnico Eagle workforce. Contractor Inuit employment over the same time timeframe increased from 25 to 48 – though this may be a result of better tracking in 2017 where FTES are used compared with employment numbers in prior years. In 2017, there were 130 total Inuit FTEs at Meliadine (including both Agnico Eagle and contractor employees), representing approximately 18% of the workforce. This is below the Meliadine FEIS prediction of a 20% Inuit workforce during peak construction (340 employees). While the number of Meliadine Agnico Eagle FTEs has varied between 8 and 15 over the past five years, 2017 saw a sharp decline in the Inuit employment rate due to a large increase in non-Inuit employees. This may be explained by the requirements for more specialized labour during the construction phase.
Inuit FTEs	N/A	→	→	N/A	→	
Inuit FTE rate	N/A	→	→	N/A	→	
Project contractor employment (Inuit & non-Inuit)						
Employees / FTEs	N/A	→	↑	N/A	↑	
Inuit employee / FTE rate	N/A	↓	↑	N/A	↓	
1.3 Project Agnico Eagle employment by Kivalliq community						
Project employment by Kivalliq community	N/A	↑	↑	N/A	↑	In 2017, over half (53%) of Meadowbank's Kivalliq-based employees were from Baker Lake and approximately 61% of Meliadine's Kivalliq-based employees were from Rankin Inlet. Additionally, Arviat supplies a large and increasing proportion of Agnico Eagle's Inuit workforce, reaching a high of 70 employees in 2017. Employees from the remaining Kivalliq communities (Chesterfield Inlet, Coral Harbour, Whale Cove and Naujaat) rose in each community, increasing cumulatively from 26 employees to 44 between 2016 and 2017.
1.4 Project employment by gender						
Project employment (gender)						Agnico Eagle female employment at Meadowbank has been steadily increasing since 2013, from a low of 10% up to 20%. It is at its highest level since the mine began production and has now surpassed the Canadian mining sector average of 17%. Meliadine female employment has increased steadily, though the rate declined from 24% to 15% in 2017 due to a substantial increase in the number of employees and contractors for construction activity.
employees	N/A	↑	↑	N/A	↑	
rate	N/A	↑	↑	N/A	↓	
1.5 Project turnover						
Project turnover (Inuit & non-Inuit)	N/A	↓	↓	N/A	/	The turnover rate for Meadowbank permanent Inuit employees remained stable in 2017 at 28%, while temporary employee turnover rate is showing signs of stabilizing near 50% following a drop from 2010 to 2014. Meliadine's turnover rate for permanent Inuit employees continued a sharp 2-year decline in 2017, with 0 employee turnover, while it's temporary employee turnover rate remained similar to Meadowbank's at 55%. Of the 6 Inuit employees comprising 2017 turnover, 4 resigned and 2 were dismissed. 2017 saw a large increase in turnover in Meadowbank employees from Coral Harbor and Naujaat, with nearly as many employees leaving as were working there when the annual snapshot was taken (just over for Coral Harbor at 109% and just under at Naujaat at 92%).
Agnico Eagle Inuit employee turnover by reason	N/A	↓	↓	N/A	↓	
Percent turnover by community	N/A	↑	↑	N/A	↓	

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management & Mitigation

A number of programs are in place to encourage Inuit employment and retention at Meadowbank and Meliadine, as outlined in Table 2 below. Agnico Eagle offers programs to increase general educational and skills attainment among Kivalliq residents, facilitate entry into Meadowbank and Meliadine employment, as well as training, career development and upward mobility programs for existing employees. While many of these training programs are primarily relevant to VSEC 4: Education and Training, they are also discussed here due to a positive supporting effect on Inuit employment rates and retention.

Table 2: Agnico Eagle Employment Management and Mitigation Initiatives

Program	Purpose / Description / Outcomes
MOU with Department of Education	A Memorandum of Understanding was first signed in April 2012 to establish a strengthened partnership between the Government of Nunavut Department of Education and Agnico Eagle, with a focus on increasing the number of students in the Kivalliq region who are able to successfully transition from high school to trades and mining-related career opportunities. This work involved *Mining Matters*, a branch of the Prospectors and Developers Association of Canada (PDAC) that is dedicated to bringing knowledge and awareness about Canada's geology and mineral resources to students and educators. In 2013, Agnico Eagle and the *Mining Matters* group participated with the GN Department of Education, Curriculum Review Services to assist in a review of the Earth Sciences Curriculum of Nunavut Schools. During 2014, Agnico Eagle continued to sponsor the Mining Matters program as part of the MOU with Education. Agnico Eagle continued to pursue a renewed MOU with the Department of Education through 2016. In September 2017, Agnico Eagle and the Government of Nunavut established a Memorandum of Understanding that identifies 10 priority areas for collaboration, including education.
Kivalliq Science Educations Community	In 2017, Agnico Eagle once again invested $25,000 for the 2017-2018 regional Math Camp, Science Camp and Kivalliq Science Fair programs operated by the Kivalliq Science Educators Community. The regional science camp was organized in Chesterfield Inlet and the weeklong program included a mix of traditional, cultural and educational studies related to sciences. The program provides science credits to participants.

Program	Purpose / Description / Outcomes
Kivalliq Mine Training Society	The KMTS is an Inuit-private sector partnership created to strengthen the Kivalliq region labour force through the creation and funding of training opportunities in the seven Kivalliq hamlets. The KMTS has also enjoyed financial support from the Nunavut Department of Economic Development and Transportation and Agnico Eagle Mines. A major focus of the KMTS program has been to support Agnico Eagle's Mine Training Initiatives, such as the Career Path, different trainee programs, pre-trades programs, work readiness programs and workplace literacy strategies. Prior to 2015 the KMTS also supported the development and delivery of the community-based Work Readiness to help prepare Inuit for employment opportunities. The KMTS also supported the Arviat Drillers program as well as some other community-based initiatives, such as the Making it Work program, which provided support to employees and their families to cope with the challenges that come with employment at a mine site. Since 2017 KMTS was no longer able to receive funding to support program delivery to Agnico Eagle and communities. Despite the lack of substantial funding, Agnico Eagle Mines did not reduce its training delivery since the company is strongly committed to developing the local workforce.
Labour Pool Process	The Labour Pool Process (formerly 'Labour Pool Initiative'), implemented in 2014 and revised in 2015, is based on an agreement between Agnico Eagle and the KIA through the IIBAs to offer pre-employment opportunities to Inuit from all Kivalliq communities. The goal of the program is to pre-qualify candidates from Kivalliq communities through 5 steps: employment information sessions, online application (facilitated by Employment Information Sessions), the Work Readiness Program, mandatory trainings (more details provided below), and the Labour Pool List (facilitated by the Labour Pool Coordinator).
Labour Pool Process - Step 1: Employment Information Sessions	As part of the Labour Pool Process, employment information sessions are conducted in all Kivalliq communities. The purpose of the information sessions is to give information about the mines, the work lifestyle, and career opportunities as well as knowing how to apply online. In 2017, Agnico Eagle held employment information sessions in all seven communities on a quarterly basis.
Labour Pool Process – Step 2: Online Application (Community Coordinators)	The first step in the Labour Pool Process is to apply online. In order to facilitate online application in the communities, Agnico has a Community Coordinator in each Kivalliq community who can deliver employment information sessions, and provide one-on-one assistance to interested candidates with their online application.
Labour Pool Process – Step 3: Work Readiness Training Program	In collaboration with the Kivalliq Mine Training Society (KMTS), Agnico Eagle developed a Work Readiness Training program as a pre-employment initiative. In 2017, the Work Readiness Training was delivered by Northern College. The Work Readiness program is the first step of the Labour Pool Process for those individuals who have applied online. The objective of the program is for Inuit workers to be better prepared for the work environment in an industrial setting. Graduates of the program are eligible to continue the Labour Pool Process and attend the mandatory trainings given on-site. The program provides coaching on a range of issues including: awareness of employers' unspoken expectations, communication in the workplace, and problem-solving skills for resolving workplace issues. The program was implemented in April 2013. The program is delivered over a five-day period at the community level and is scheduled throughout the year. In 2017, the program was delivered by a visiting instructor in six Kivalliq communities resulting in 240 participants from various communities, from which 84% successfully completed the program. Arviat runs its own Work Readiness training sessions and had 78 graduates in 2018.

Program	Purpose / Description / Outcomes
Labour Pool Process – Step 4: Mandatory Training Program (previously 'Site Readiness')	The mandatory training program delivered on site is the second step of the Labour Pool process, following the Work Readiness Program. Graduates of the mandatory trainings are eligible to enter the Labour Pool. The Mandatory Training Program is a five-day training provided at the Meadowbank site. Throughout the week, participants are enrolled in diverse activities such as mandatory training sessions, site visits, job initiation, information sessions on training and career opportunities, as well as interviews and discussions on employment opportunities with a Human Resource representative to assess career ambitions and identify work interest. Afterwards, candidates wanting to work for the Camp Department are given short term on-call assignments. All other applicants become part of the Labour Pool list until a job opportunity matching their interest and competencies becomes available. In 2017, 193 individuals participated in Site Readiness, of which 173 successfully completed the program.
Labour Pool Process – Step 5: Labour Pool List	The Labour Pool List is a list of candidates who have successfully completed the steps of the Labour Pool Process. These candidates are now eligible for opportunities with Agnico Eagle or Agnico Eagle's contractors. The list is managed by the Labour Pool Coordinator.
Summer Student Employment Program	Agnico's companywide policy offers summer employment programs to the children of all Agnico employees (both Inuit and non-Inuit) that are undertaking postsecondary education. Summer job opportunities were also offered to Inuit students who are participating in post-secondary activity, even if they had no family relative working at the mine. Historically, there have been no applications to Agnico Eagle's Summer Student program by the children of Inuit employees. The program will continue to be offered in 2018. In 2017, Agnico advertised a summer student program to attract Inuit post-secondary students from Kivalliq communities, including students enrolled in trades with the Nunavut Arctic College and with the Nunavut Sivuniksavut program. This program was offered and advertised in each Kivalliq Community. The posting attracted three eligible applicants, of which all were contacted. Two applicants declined the offer and one accepted but later resigned before starting employment. At the 2018 Socio-Economic Monitoring Committee (SEMC) meeting, the GN Department of Finance expressed that it was sometimes difficult to place summer student applicants. Agnico Eagle is open to working with the GN in potentially placing eligible and interested Inuit summer students at the projects, who can otherwise not be accommodated with the GN.
Haul Truck Trainee Program	The Haul Truck Trainee program is a 28-day (336 hour) program to certify haul truck operators, which includes training on a simulator, in the classroom, and on the job. The program is aimed at existing employees in entry level positions (dishwashers, janitors, chambermaids, etc.). This year, 26 employees were enrolled in the Haul Truck Trainee Program. Among those, a total of 23 trainees successfully completed the Program (18 men, 5 women). In order to provide the best training possible to all the trainees, there is a maximum of 4 trainees at a time with one trainer.
Process Plant Trainee Program	With the success of the Haul Truck Trainee Program, a Process Plant Trainee Program was developed in 2015. The 28-day program provides employees with an understanding of the mining and milling process and trains them to be competent and certified to fill positions as a process plant helper or a utility person. In 2017, a total of five (5) employees enrolled in the program. Amongst those, two (2) were delivered to the Process Plant.

Program	Purpose / Description / Outcomes
Super Operator Program	Implemented in the second half of 2016, the Super Operator Program is an extension of the Process Plant Trainee Program. This 168-hour training is provided to employees who have successfully completed the Process Plant Trainee Program. The extension of the Process Plant Trainee Program will consist in teaching the basics of maintenance principles in order to have employees with more diversified skills in the Process Plant Department. These employees will eventually be able to perform specific basic maintenance repairs throughout the plant. In 2017, every Inuit employee that was trained as a Process Plant Trainee received the Super Operator Training.
Arviat Community Training Programs	In 2011, the Hamlet of Arviat proposed a partnership to invest in a community-based drilling school that would provide Inuit with the skills needed to work in diamond drilling. With advice and support from Agnico Eagle, the Hamlet brought together a range of partners to acquire the drilling equipment, develop the curriculum, and operate the training program. Government training agencies, the KIA, and drilling companies provided partnership investments. In 2013, the program offering was expanded to include a Welder's Helper program. Agnico Eagle invested $195,000 in the Arviat training programs in the 2017-2018 funding year. Over the past 5 years the program has graduated 65 trained driller's helpers, all of whom have found employment. In 2017-2018 funding year, the Mechanical Welding Program graduated 6 students.
Career Path Program	The Career Path Program was designed in 2012, with the intention of supporting upward mobility of Inuit employees at Meadowbank. This program identifies the incremental steps that an employee is required to complete to advance in their chosen career of interest. In 2017, the Career Path system was available in eight (8) areas of activity; Underground (Meliadine only), Drill, Industrial Mechanic, Maintenance, Process Plant, Road Maintenance, Field Services, and Mine Operations. The objective of the Career Path Program is to have only internal promotions for Inuit, and for no external candidates (southerners) to be hired to fill a position that is part of the program.
Training Formula (formerly 'Training Curriculum')	The Training Formula program, implemented in 2014, provides tools, tips, guideline and standards to improve the proficiency of Agnico trainers. The formal manual includes three sections: training theory, training standards, and training delivery.
E-Learning Training	Before coming to an Agnico site for the first time, newly hired employees must complete their Mandatory Training online, which consists of six (6) modules: General Induction, WHMIS, Fire Suppression, Job Hazard Analysis and Work Card, Spill Response, and Occupational Health and Safety (Personal Protective Equipment, Ladder Safety, Surface Standard Operating Procedure). The General Induction chapter provides general information about Agnico Eagle and working life at the mines. As per the requirement of the IIBAs, in 2017 two new e-learning lessons were developed and added to the General Induction. The Inuit Impact and Benefit Awareness module (IIBA) provides general awareness on: Agnico's Commitment to Indigenous People, history of the Nunavut Agreement and the different Inuit organization branches, what an IIBA is and why the sites have one, and a high level overview of the benefits and impact mitigation provided through the IIBAs. The Archaeology module informs workers on how to identify potential archaeological sites (ex. fox traps, tent circles, hunting blinds) and what to do if a worker finds one when working in the tundra. An objective of these lessons is also to give each employee and contractor employee cross-cultural context before arriving on one of Agnico's sites.
Training and Learning Management System	The Training Management System (TMS) as well as the Learning Management System (LMS) were initially implemented in 2013, in order to ensure better management of training activities and to monitor the proper management of the e-learning training. In response to the GN's request for increased information on training programs in 2014, both systems were modified in 2015. The systems are now capable of producing more detailed reports: by training program, by participation level, by graduation level and by hour.

Program	Purpose / Description / Outcomes
Apprenticeship Training ('Apprenticeship Program' and 'Pre-Apprenticeship Program')	The Apprenticeship Program combines on-the-job learning and in-school technical instruction to allow Inuit employees the opportunity to be educated and trained in the trade of their choice. By the end of the program, the apprentice is able to challenge their Certificate of Qualification (COQ) to become a Journeyperson and will also have the opportunity to challenge their Red Seal Exams. Currently, we offer seven (7) trades: cook, carpenter, millwright, electrician, heavy duty equipment technician, welder, and plumber. In 2015, two (2) employees completed their apprenticeship training within Agnico and in 2016, two (2) employees completed their apprenticeship training within the company. As of the end of 2017, there were 16 apprentices and pre-apprentices. There were no graduates for the 2017 year, but since the program takes time to complete, we are expecting to have three (3) graduates in the next two (2) years.
Role Model Program	The Role Model program began in 2015 as a way to recognize exemplary Inuit employees. Since then, it has grown into a program to: recognize the hard work of individual Inuit employees; identify examples to inspire Inuit employees, community members, youth, etc. on how to achieve personal and/or work success; and serve as an incubator program to identify and support future Inuit leadership in the company. Role models are nominated and chosen by a committee annually. They can be nominated and chosen for a variety of reasons, including demonstrating good work-life balance/dedication to upgrading one's education/skills; positive attitude; exemplifying traditional Inuit values at home or at work; overcoming personal challenges; involvement in communities; demonstrating leadership skills, etc. A Role Model is recognized through posters and is also provided opportunities to represent the company and speak on behalf of their own experiences at various events (trade shows, symposiums, high school visits, etc.). Some Role Models are also enrolled in the Leadership Development Program in order to continue to foster management and supervisory skills. In 2017, there were 8 Role Models at Meadowbank and 4 Role Models at Meliadine.
TASK Week	The Trades Awareness Skills and Knowledge Week (TASK Week) was initiated in 2012 and has evolved in its structure through the years. TASK week is now a full week program that allows students to focus on one trade for the entire week. TASK week is also aligned with Agnico's IIBA commitment Schedule C, 16, by promoting the mine industry through career awareness and co-operating with educational authorities in the implementation of mining sector content in schools. TASK Week is a joint initiative between Jonah Amitnaaq Secondary School (JASS) and Agnico Eagle, and has active cooperation from other authorities and businesses each year. The 2017 TASK Week was held in Baker Lake from May 8th to May 12th and saw 58 senior high school students from JASS participate. Six (6) trades were features: Mechanics, Welding, Electrical, Culinary Arts, Hairdressing, and Environmental Studies (which included Work Readiness training). In 2017 Agnico again brought trainers and apprentices/tradespeople from Meadowbank, including four of Meadowbank's Inuit apprentices/Red Seal, all from Baker Lake. Agnico believes that having students exposed to role models from their community has a positive impact on participants in the program.

Program	Purpose / Description / Outcomes
Financial Literacy Training	In collaboration with CPA Canada, in 2017 a Financial Literacy training course was delivered at Meadowbank mine site. The need for financial literacy training was identified through the Baker Lake Wellness Plan. The training overviews why financial literacy is important, savings vehicles, budgeting, and goal setting. The training was held twice at Meadowbank with 33 participants, including Inuit participants. Modified Financial Literacy trainings were also held in Baker Lake, both at a public community session as well as delivery to grades 7-9 & 12 at the Jonah Amitnaaq Seconary School. Basic financial literacy training is also included in the Work Readiness program. Agnico has also had preliminary discussions with the Nunavut Housing Corporation to include financial literacy information on site, on subjects like rent scales or home savings programs. Agnico Eagle plans to continue offering opportunities at both mine sites to improve financial literacy in 2018 in collaboration with Sunlife Financial.

1.1 Total project employment (Agnico Eagle & contractors)

Predictions

MEADOWBANK

"It is expected that the construction phase workforce will average 160 and peak at 310, and the operation phase workforce is estimated at 370."

MELIADINE

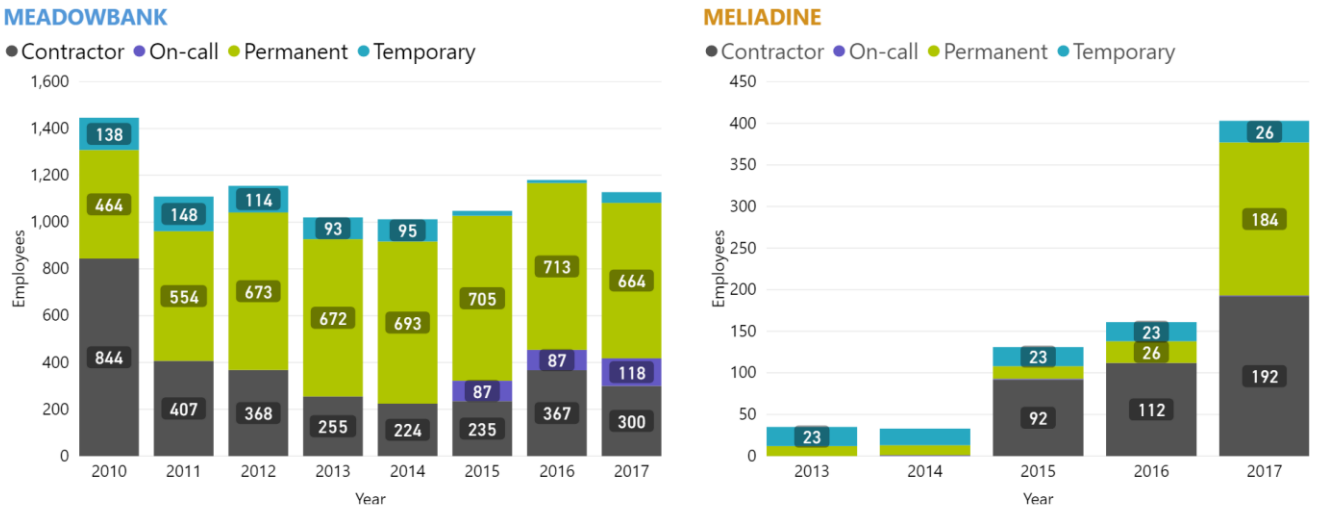
- "1700 positions, mostly contractors during construction phase" (Golder Associates, 2014, p. 1-117)
- "700 positions during operational phase" (Golder Associates, 2014, p. 1-118)

Data & Trends

Chart 1 provides an overview of direct employment at Meadowbank and Meliadine. These numbers are measured as a snapshot of employment taken in December of each year. This data may differ largely from Full-Time Equivalent data (FTEs) – especially for contractors. Additional FTE descriptions and data are provided in the following section. Employees at the mines are divided into one of the following categories:

- *Permanent*: Agnico Eagle employees whose current jobs are not specifically tied to a short-term project, with positions expected to be required throughout the life of the mines
- *On-call*: Agnico Eagle employees with an indefinite contract who are called upon when the need arises
- *Temporary*: Agnico Eagle employees whose current job will not continue beyond a specified period of time (a set contract)
- *Contractors*: Employees of contractors

Chart 1. Project employment (permanent, temporary, on-call & contractor)



(Agnico Eagle Mines, 2017)

Interpretations

The years between 2010 and 2012 saw Meadowbank moving from construction and commissioning phases to a fully operational mine. As is to be expected, this coincided with a movement away from contractors and towards employees hired by Agnico Eagle directly. An increase in contractors is noticeable again in 2016, due to increased activity at the Whale Tail site. The total Meadowbank employee figures to date have significantly exceeded the values predicted in the FEIS for employment at the mine, largely due to an expansion of the project scale from the initial Cumberland project proposal. The drop in Meadowbank temporary employees seen in 2015 and continuing in 2016 is largely due to Agnico Eagle shifting employees in certain departments to on-call status as turnover occurred. This was due to uncertainty about the Whale Tail project. Permanent employment also decreased by 7%, from 705 to 713 from 2016 to 2017, while on-call employees increased by 35%, from 87 to 118. With the approval of the Whale Tail project, this trend towards on-call status is expected to reverse in 2018.

Meliadine employment grew dramatically in 2017, coinciding with the movement of the advanced exploration project into the construction phase. This is most pronounced for contractors, with the number of FTE contractor employees jumping from 112 to 591 between 2016 and 2017. This number is still dramatically below the estimated 1700 positions predicted in the FEIS for the peak construction phase, estimated to be between Q3 2017 and Q2 2018. It should be noted that 2017 contractor figures for both Meliadine and Meadowbank are scientifically lower than the FTE values presented in the following section. This may be due to the timing of the snapshot data.

1.2 Project Inuit employment (Agnico Eagle)

Predictions

MEADOWBANK

There are no specific predictions in the Meadowbank FEIS regarding Inuit or Nunavummiut employment rates at Meadowbank.

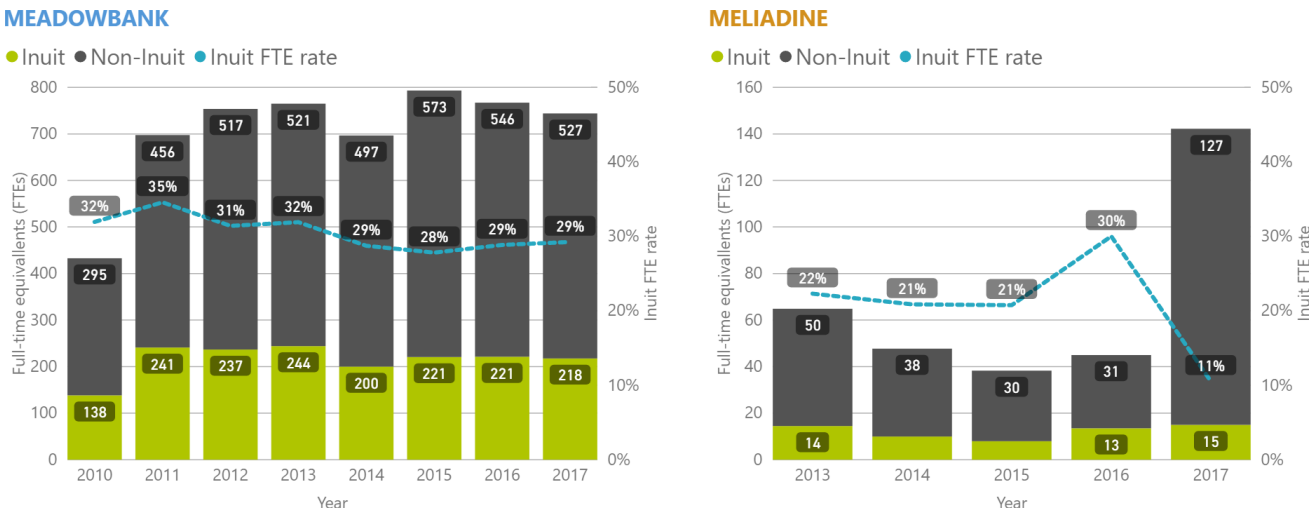
MELIADINE[3]

- 20% (340 positions) of peak construction phase workforce will be Inuit. (Golder Associates, 2014, p. 1-117)
- 20% (140 positions) of operational phase workforce will be Inuit. (Golder Associates, 2014, p. 1-118)

Data & Trends

Chart 2 provides an overview of Agnico Eagle Inuit and non-Inuit full time equivalents (FTEs) at Meadowbank and Meliadine. FTEs are a way to control for differences in the number of hours worked by different individuals, thereby providing a more accurate and comparable picture of employment over time and between projects. One FTE represents 2,184 person-hours of work – or the approximate number of hours worked by one employee on a full-time basis for a year. In other words, in 2017, there was the equivalent of approximately 218 full-time Inuit employees working at Meadowbank. The blue lines are the Inuit FTE rate each year.

Chart 2. Project Agnico Eagle employment (Inuit & non-Inuit)

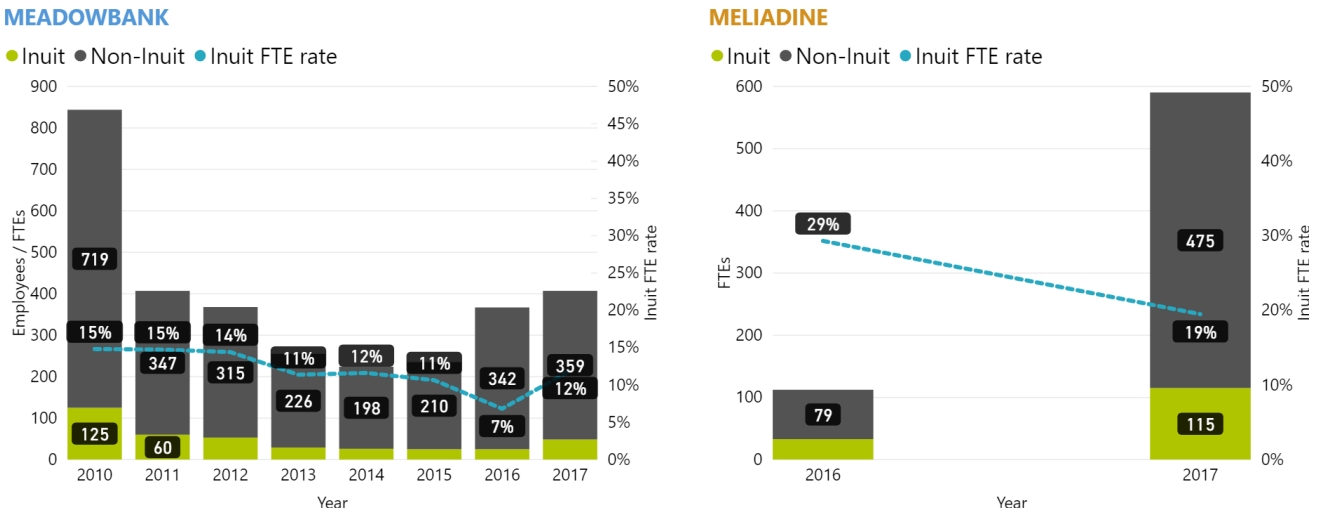


(Agnico Eagle Mines, 2017)

Chart 3 provides an overview of Agnico Eagle Inuit and non-Inuit employees / full time equivalents (FTEs) at Meadowbank and Meliadine.

[3] Note that the Meliadine predictions include contractors.

Chart 3. Project contractor employment (Inuit & non-Inuit)[4]



(Agnico Eagle Mines, 2017)

Interpretation

Meadowbank Agnico Eagle Inuit FTEs has been holding relatively steady for the past 3 years (221, 221 and 218), representing between 28% and 29% of the total Agnico Eagle workforce. There were no predictions made in the Cumberland FEIS regarding Inuit employment rates at Meadowbank.

In 2017, there were 130 total Inuit FTEs at Meliadine (including both Agnico Eagle and contractor employees), representing approximately 18% of the workforce. This is below the Meliadine FEIS prediction of a 20% Inuit workforce during peak construction (340 employees). While the number of Meliadine Agnico Eagle FTEs has varied between 8 and 15 over the past five years, 2017 saw a sharp decline in the Inuit employment rate due to a large increase in non-Inuit employees. This may be explained by the requirements for more specialized labour during the construction phase.

1.3 Project Agnico Eagle employment by Kivalliq community

Predictions

MEADOWBANK

There are no specific predictions in the Meadowbank FEIS regarding Kivalliq community resident employment rates.

MELIADINE

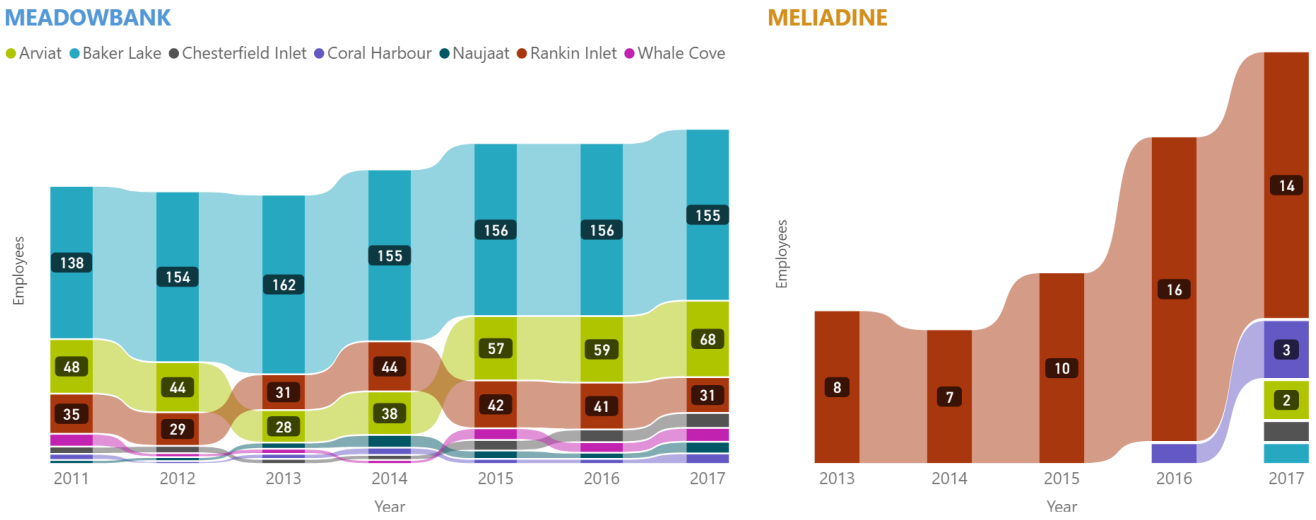
There are no specific predictions in the Meadowbank FEIS regarding Kivalliq community resident employment rates.

Data & Trends

Chart 4 provides an overview of the total number of Inuit employees by community of hire in the Kivalliq. Note that the chart is displaying the number of employees (permanent, temporary and on-call) as opposed to FTEs as provided in the previous section.

[4] Due to data availability, 2017 Meadowbank contractor data and all Meliadine contractor data represent full time equivalents (FTEs), derived based on person-hours worked. The remainder of data points (Meadowbank 2010 to 2016) represent the number of employees as a snapshot at one time of year. Trends between these years should be interpreted with caution.

Chart 4. Project employment by Kivalliq community



(Agnico Eagle Mines, 2017)

Interpretation

In 2017, over half (53%) of Meadowbank's Kivalliq-based employees were from Baker Lake and approximately 61% of Meliadine's Kivalliq-based employees were from Rankin Inlet. This likely reflects a number of factors, including: the size of those communities, the mines' proximities to the respective communities; preferential hiring provisions outlined in the IIBA to give preference to Inuit from those communities; as well as training and recruiting efforts by Agnico Eagle focused in Rankin Inlet and Baker Lake.

Additionally, Arviat supplies a large and increasing proportion of Agnico Eagle's Inuit workforce, reaching a high of 70 employees in 2017, up from 57 and 59 the previous 2 years. 2017 employment numbers for the remaining communities are: Chesterfield Inlet (13); Whale Cove (11); Coral Harbour (11); and Naujaat (9).

1.4 Project employment by gender

Predictions

MEADOWBANK

There are no specific predictions in the Meadowbank FEIS regarding Kivalliq community resident employment rates.

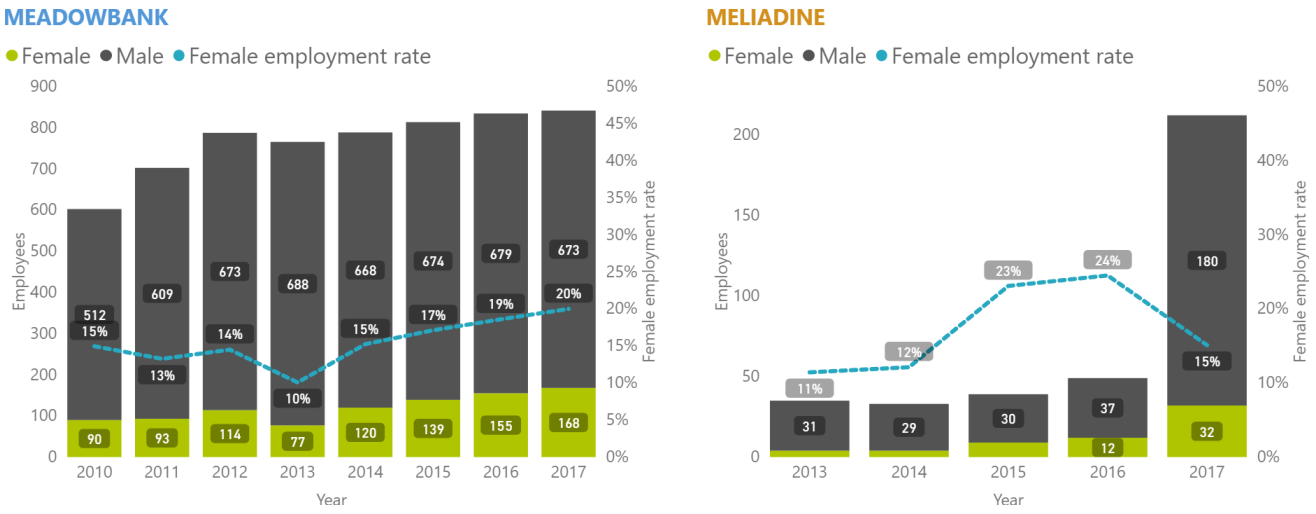
MELIADINE

There are no specific predictions in the Meadowbank FEIS regarding Kivalliq community resident employment rates.

Data & Trends

Chart 5 provides an overview of the number and rate of Agnico Eagle female employment at Meadowbank and Meliadine.

Chart 5. Project employment (gender)



(Agnico Eagle Mines, 2017)

Interpretation

There are no formal goals for gender employment rates at either Meadowbank or Meliadine. Agnico Eagle female employment at Meadowbank has been steadily increasing since 2013, from a low of 10% up to 20%. It is at its highest level since the mine began production and has now surpassed the Canadian mining sector average of 17%. Meliadine female employment has increased steadily, though the rate declined from 24% to 15% in 2017 due to a substantial increase in the number of employees and contractors for construction activity.

During 2017, there were 116 permanent, 24 temporary and 53 on call female employees at both Meadowbank and Meliadine. Agnico Eagle participates in the Mining Industry Human Resource Council's *Gender Equity in Mining (GEM) Works Initiative*, which works towards achieving greater gender equality in the mining sector.

1.5 Project turnover

Predictions

MEADOWBANK

There are no specific predictions in the Meadowbank FEIS regarding Kivalliq community resident employment rates.

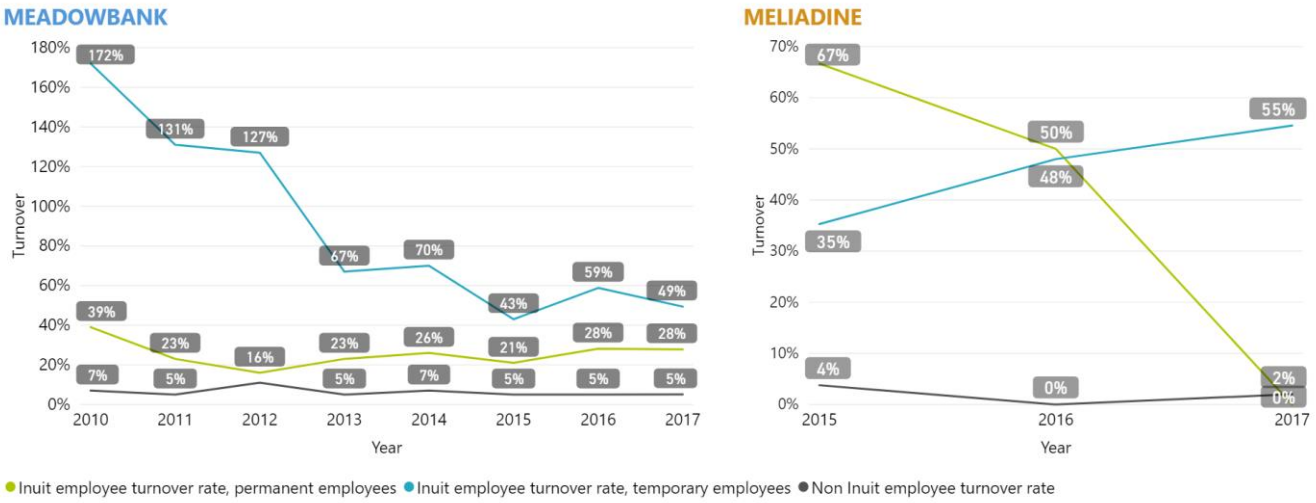
MELIADINE

There are no specific predictions in the Meadowbank FEIS regarding Kivalliq community resident employment rates.

Data & Trends

Chart 6 below provides an overview of Inuit and non-Inuit turnover rates for permanent and temporary / on-call employees. Turnover rates are the percentage of Meadowbank employees that leave Agnico Eagle's employ during each fiscal year by dividing the number of terminations by the average number of employees in a given year.

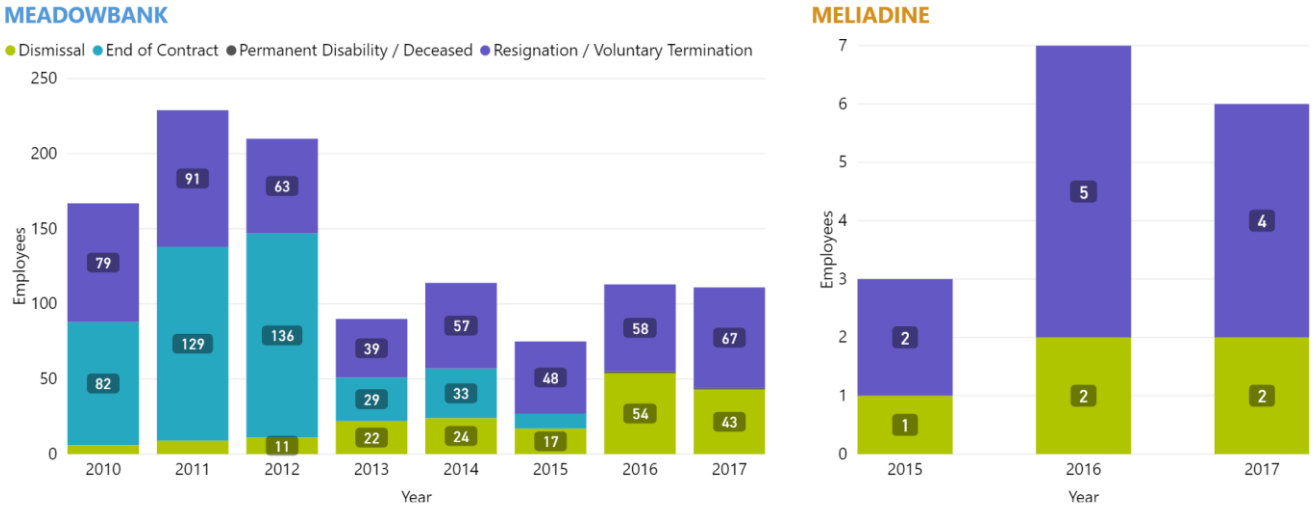
Chart 6. Turnover rates, 2010 – 2016 (Inuit and non-Inuit)



(Agnico Eagle Mines, 2017)

Chart 7 provides an overview of turnover by reasons for leaving at both Meadowbank and Meliadine.

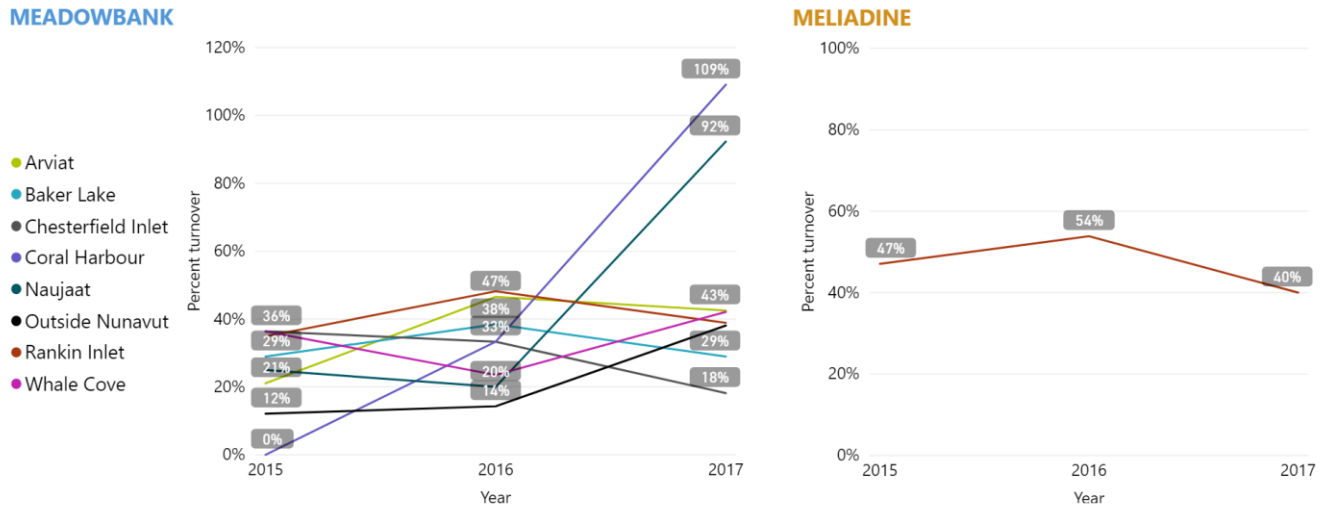
Chart 7. Agnico Eagle Inuit employee turnover by reason



(Agnico Eagle Mines, 2017)

Chart 8 below shows the percentage of turnover by community for both projects for 2015 through 2017, the only years for which this data is currently available.

Chart 8. Percent turnover by community



(Agnico Eagle Mines, 2017)

Agnico Eagle conducts focus group meetings to gather information on reasons for resignation and voluntary termination. Interviews were used to collect qualitative information on common reasons why employees have left. This investigation and exit interview information collected since 2010 has led to the below list of reasons commonly cited in exit interviews. These include:

- Does not like the schedule/camp life
- Miss their family
- Found another job
- Family situation or spousal relationship issues
- Conflict with employee/supervisor
- No babysitter
- Does not like the job/lack of advancement

In 2017, the majority of resignations at Meadowbank were related to family situation (43%), followed by lack of childcare (14%) and dislike of the schedule or camp life (including homesickness) (14%). At Meliadine, almost all resignations were due to the employee finding another job (75%).This data should be interpreted with caution, as self-reported data may be subject to a number of reporting biases.

In 2017 Agnico Eagle and Kivalliq Inuit Association commissioned an Inuit Workforce Barriers Study, which is expected to be finalized mid-2018. The purpose of the study is to better understand existing barriers and develop potential strategies for Inuit employment at the project sites. The outcomes of this study will inform future SEMRs interpretation of turnover.

Interpretation

Since 2010, turnover rate for Meadowbank permanent Inuit employees has been consistently higher than that for permanent non-Inuit employees (approximately four to six times higher over the past four years). The turnover rate for permanent Inuit employees remained stable in 2017 at 28%, up from 21% in 2015 but approximately the same as in 2014 (26%). Dismissals decreased in 2017, down to 43, after a jump in the previous year from 17 to 54. Meadowbank's drop in the temporary & on-call Inuit employee turnover rate between 2010 and 2013 is likely due the shift of temporary employees away from set-contracts (contracts with a defined end-point which therefore manifest as turnover) towards on-call temporary employees. These employees now have an indefinite contract

and are called upon when the need arises. This turnover rate increased to 59% in 2016 from a low of 43% in 2015.

2017 saw a large increase in turnover in Meadowbank employees from Coral Harbor and Naujaat, with near as many employees leaving as were working there when the annual snapshot was taken (just over for Coral Harbor at 109% and just under at Naujaat at 92%). While relatively small in number (6 for each community), this still represents a large increase from pervious years, as well as a much higher value generally than can be found across employees coming from other Kivalliq communities.

Meliadine's turnover rate for permanent Inuit employees continued a sharp 2-year decline in 2017, with permanent 0 employee turnover, due in part to a small number of permanent employees (the number of permanent employees grew from 2 to 18 during 2017). In 2017 most Inuit employees were in temporary status. Of the 6 Inuit temporary employees comprising 2017 turnover, 4 resigned and 2 were dismissed.

VSEC 2: Income

IMPACT / GOAL STATEMENT

Increased income in Kivalliq communities

OVERARCHING FEIS PREDICTIONS

Meadowbank: "The potential impacts of increased income are considered of high magnitude, positive, long-term and of high significance, particularly to those individuals and their families who are able to benefit. It is expected that overall community effects, moderate in significance, are likely to be most experienced in Baker Lake, as most direct employment will occur here." (Cumberland Resources Ltd., 2006, p. 121)

Meliadine: "Project would directly and indirectly contribute to disposable income of employees and other local people." (1-C-48)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
2.1 Income paid to projects' Inuit employees						
Income paid to Agnico Eagle project Inuit employees	N/A	↑	→	N/A	↑	2017 total income paid to Agnico Eagle's Inuit employees remained relatively stable from the previous year at $19.4M. This follows a steady annual increase between 2013 and 2016, with the 2015 and 2016 increase largely attributable to increased activity at Meliadine.
2.2 Income by Kivalliq community						
Median employment income of tax filers by Kivalliq community	↑	↑	N/A	↑	N/A	The most recent data available for this indicator is from 2015. Median employment income has increased gradually overall in the Kivalliq region since 2006, with no significant inflection (i.e. change in growth rate) since 2010. Among the Kivalliq communities with highest levels of Meadowbank employment (Baker Lake, Rankin Inlet, and Arviat), only Rankin Inlet shows a significant increase in the income growth rate when comparing the 2006-2010 period to the 2010-2015 period.

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management & Mitigation

Programs aimed at encouraging greater educational attainment, recruiting local employees, supporting professional development and skill advancement, and increasing local contracting and business opportunities can all have a positive supporting effect on income indicators in the Kivalliq. These programs are outlined in the respective sections of this report (VSEC 1, 3 and 4).

2.1 Income paid to projects' Inuit employees

Predictions

MEADOWBANK

"Direct project wages paid to people in Kivalliq Region, primarily Baker Lake, could exceed $4 M annually"

MELIADINE

"Project would directly and indirectly contribute to disposable income of employees and other local people." (Golder Associates, 2014, 1-C-48)

Data & Trends

Chart 9 shows employment income paid to Meadowbank's Agnico Eagle Inuit employees from 2010 to 2017, as well as Income paid to Meliadine's Agnico Eagle Inuit employees from 2014 to 2017. Meadowbank income data for certain years has been re-stated from previous reports to address past data collection gaps or errors.

Chart 9. Income paid to Agnico Eagle project Inuit employees



(Agnico Eagle Mines, 2017)

Interpretation

2017 total income paid to Agnico Eagle's Inuit employees remained relatively stable from the previous year at $19.4M. This follows a steady annual increase between 2013 and 2016, with the 2015 and 2016 increase largely attributable to increased activity at Meliadine.

Meadowbank saw a 4% reduction in income paid to their Inuit employees in 2017, corresponding with a similar reduction in person-hours worked. With 89% of Meadowbank's Inuit workforce residing in the Kivalliq region (50% in Baker Lake), income in 2017 continues to significantly exceed (by approximately 4.5 times) the FEIS prediction of $4 million in direct project wages annually to Kivalliq residents.

Meliadine has seen income nearly double annually since 2015, corresponding to an increase in construction activity and employment. Meliadine's FEIS does not offer any specific dollar-value predictions of income, instead noting an increase in disposable income of employees and other local people. The $1.3M paid to Inuit employees in 2017 likely corresponds closely to the location of Meliadine's Inuit workforce, with 87% residing in the Kivalliq, and 61% residing in Rankin Inlet.

Contractors working at both Meliadine and Meadowbank also have Inuit employees who receive income. In previous reports, this income was estimated based on the Inuit employment rates of contractors and contract value. Due to methodological concerns, these estimates are no longer included in this report.

2.2 Income by Kivalliq community

Predictions

MEADOWBANK

The Meadowbank FEIS makes no specific predictions regarding changes in the median income of Kivalliq communities but does predict that Baker Lake will experience the most positive effects of increased income.

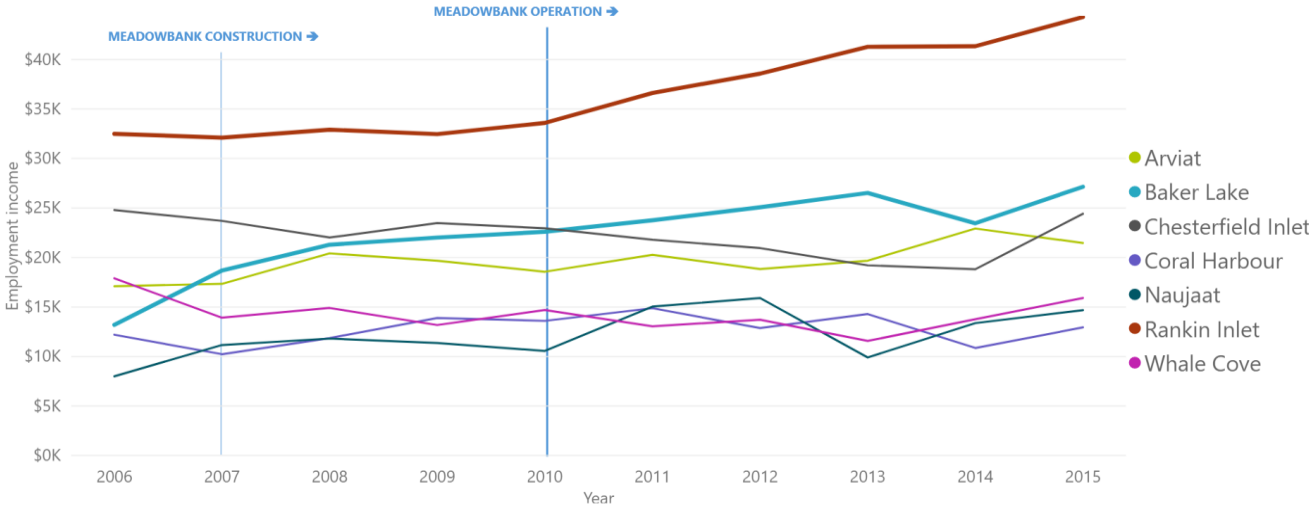
MELIADINE

"Project would directly and indirectly contribute to disposable income of employees and other local people." (Golder Associates, 2014, 1-C-48)

Data & Trends

Chart 10 shows the median income of tax filers in each Kivalliq community from 2000 through to 2015, the latest year for which data is available.

Chart 10. Median employment income of tax filers by Kivalliq community



(Statistics Canada, 2017c)

Interpretation

As shown in Chart 10, median income in Baker Lake and Rankin Inlet have been above the median income for the Kivalliq region during several years since Meadowbank opened, including 2015. It is recognized that other factors influence median employment income in each community (spin-off effects, unrelated economic

development, changes in public sector employment, etc.) and that these factors may mask the effect of Meadowbank and Meliadine employment income, especially for communities that have relatively few Agnico Eagle employees or that have a high median employment income to start with (e.g. Rankin Inlet, as the Government of Nunavut regional centre for the Kivalliq Region, has significant public-sector employment).

Median employment income has increased gradually in the Kivalliq region since 2006, with no significant inflection (i.e. change in growth rate) since 2010. Among the Kivalliq communities with highest levels of Meadowbank employment (Baker Lake, Rankin Inlet, and Arviat), only Rankin Inlet shows a significant increase in income growth rate when comparing the 2006-2010 period to the 2010-2015 period. Employment income increased in 2015 in all Kivalliq communities, after a decline or stabilization in income in most communities in 2014.

VSEC 3: Contracting and Business Opportunities

IMPACT / GOAL STATEMENT

Increased opportunities for Inuit-owned and local businesses

OVERARCHING FEIS PREDICTIONS

Meadowbank: “The potential impacts of employment are likely to take some time to gain full momentum, and overall are considered of high magnitude, positive, long term and of high significance, specifically to those individuals and their families who are able to benefit.” (Cumberland Resources Ltd., 2006, p. 121)

Meliadine: "Project spending on goods and services would increase the demand locally, allowing local businesses (and new businesses) to grow and become more cost-effective." (1-C-47)

TRENDS & INTERPRETATIONS

Indicator / Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
3.1 Contract expenditures						
Contract expenditures on NTI-registered businesses						In 2017, contract expenditures doubled from a total of $205M to $408M across the two projects, largely due to increased spending at the Whale Tail site, as well as the start of construction at Meliadine. This increase corresponded with a decline in the total proportion of expenditures (Meadowbank, including Whale Tail, and Meliadine) going to NTI-registered vs. non-NTI registered firms, from 55% in 2016 to 47% in 2017. This decline in proportion is fully attributable to Meliadine spending, where the proportion declined from 55% in 2016 to 41% in 2017.
NTI expenditures	N/A	↑	↑	N/A	↑	
Proportion NTI	N/A	↑	→	N/A	↓	
2017 NTI-registered business expenditures by Nunavut community	N/A	N/A	N/A	N/A	N/A	In 2017, just over half of the spending on NTI-registered firms went to firms located in Rankin Inlet, followed closely by Baker Lake and Iqaluit, with 23% each. Meliadine is expected to far exceed the FEIS predictions of $175M contract spending on Kivalliq-based businesses over the 3.5-year construction phase.
Contract expenditure on Nunavut-based businesses						Total contract expenditures on Nunavut-based businesses more than doubled in 2017 from $216M to $511M. The proportion of contract expenditure spending on Nunavut-based businesses remained relatively stable at 59% over this time period across the two projects.
Nunavut-based expenditures	N/A	↑	↑	N/A	↑	
Proportion Nunavut-based	N/A	/	↑	N/A	↓	
Contract expenditures from Meadowbank on Baker Lake-based businesses and from Meliadine on Rankin Inlet-based businesses	N/A	↓	↑	N/A	↑	Meadowbank expenditures on Baker Lake-based businesses and Meliadine expenditures on Rankin Inlet-based businesses continued a 2-year upward trend in 2017, corresponding with construction at Meliadine and Whale Tail, respectively. The proportion of contract expenditures has risen by $43M over the past two years in Baker Lake, although this is still less than when Meadowbank began operation. This suggests that spending has diversified to other communities across the territory.

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management & Mitigation

The IIBA acts as the primary vehicle for increasing the level of Inuit participation in contracting. Details are provided in Table 3 below.

Table 3: Agnico Eagle Contracting and Business Opportunities Management and Mitigation Initiatives

Initiative	Purpose / Description / Outcomes
Agnico Eagle Nunavut IIBA Procurement Process	Through the implementation of the Meliadine IIBA in 2015, Agnico Eagle moved to a prequalification procurement process, which requires all suppliers to prequalify in categories in order to submit a tender. Additionally, NTI-registered companies are eligible for preference points. This process replaces the Inuit Business Opportunities Initiative. In 2017 with the signing of the IIBAs for Meadowbank and Whale Tail, as well as the revision of the Meliadine IIBA, all three sites followed the new procurement process. and Whale Tail).
IIBA Pre-qualification Assistance, Workshops and Entrepreneurial Training	As per the IIBAs, Agnico provides workshops and assistance to Inuit Firms to promote and facilitate their access to Agnico Eagle's business opportunities as well as entrepreneurial training and support to Inuit businesses. In 2017, Agnico Eagle partook in a number of activities to achieve the objectives of these requirements, including a workshop at the 2017 Kivalliq Trade Show in Rankin Inlet on prequalification and tendering, one-on-one contract management support, and supporting a CPA Canada Financial Training for businesses in Rankin Inlet on financial statements and money management and growth. In 2018, Agnico Eagle is expanding its offerings in workshops and assistance through on-line and in-person lessons and trainings to interested businesses, and regular information and resources through a quarterly e-newsletter for businesses.
Inuit Arts and Crafts	In 2017, Agnico Eagle invited local Arts and Crafts vendors at both sites to showcase work and sell to interested employees. Ivalu came to Meliadine during the site Pakallak Tyme festivals, and Jessie Oonark came to Meadowbank before Christmas. Both vendors visited their respective site twice to see both crews. In 2017 Agnico Eagle and KIA worked on developing a list of Inuit arts and crafts dealers. In 2018 a strategy will be developed to facilitate internal purchasing (for gifts or prizes, for example). Agnico is also considering ways to include Agnico employees who are also artists in the strategy.

3.1 Contract expenditures

Predictions

MEADOWBANK

"With continuing preferential contracting, local business participation in the project is expected to grow with time." (Cumberland Resources Ltd., 2006, p. 7)

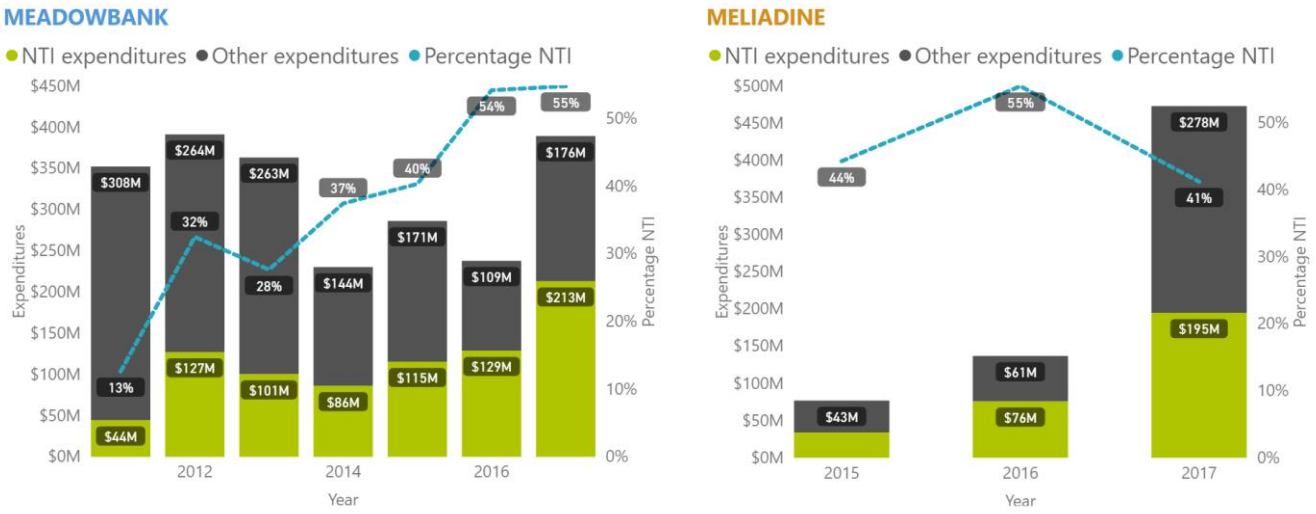
MELIADINE

- $866M (2012 dollars) over 3.5-year construction phase on contracted goods and services; 20% ($175M) in Kivalliq (Golder Associates, 2014, 1-117)
- $127M over 10-year operations phase; 20% ($25M annually) in Kivalliq. (Golder Associates, 2014, 1-118)

Data & Trends

Chart 11 details the value and proportion of contract expenditures that went to Nunavut Tunngavik Incorporated (NTI)-registered businesses over time.

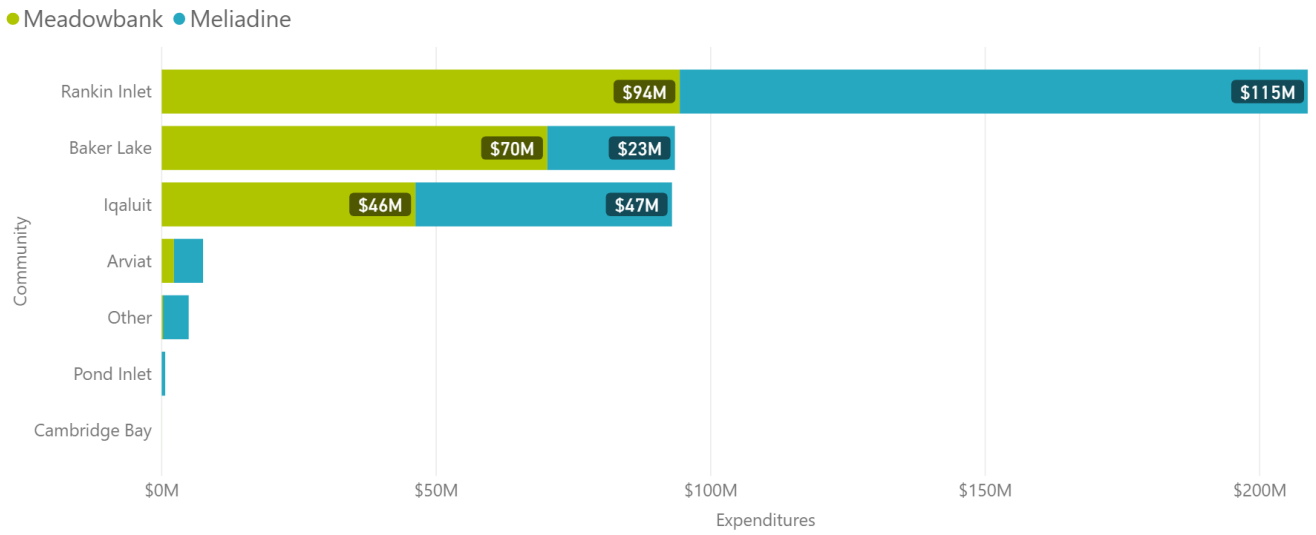
Chart 11. Contract expenditures on NTI-registered businesses



(Agnico Eagle Mines, 2017)

Chart 12 further breaks down contract expenditures on NTI-registered businesses in 2017 by the community in which those businesses are registered. This data is currently only available for 2017, though will be available for subsequent years in future reports.

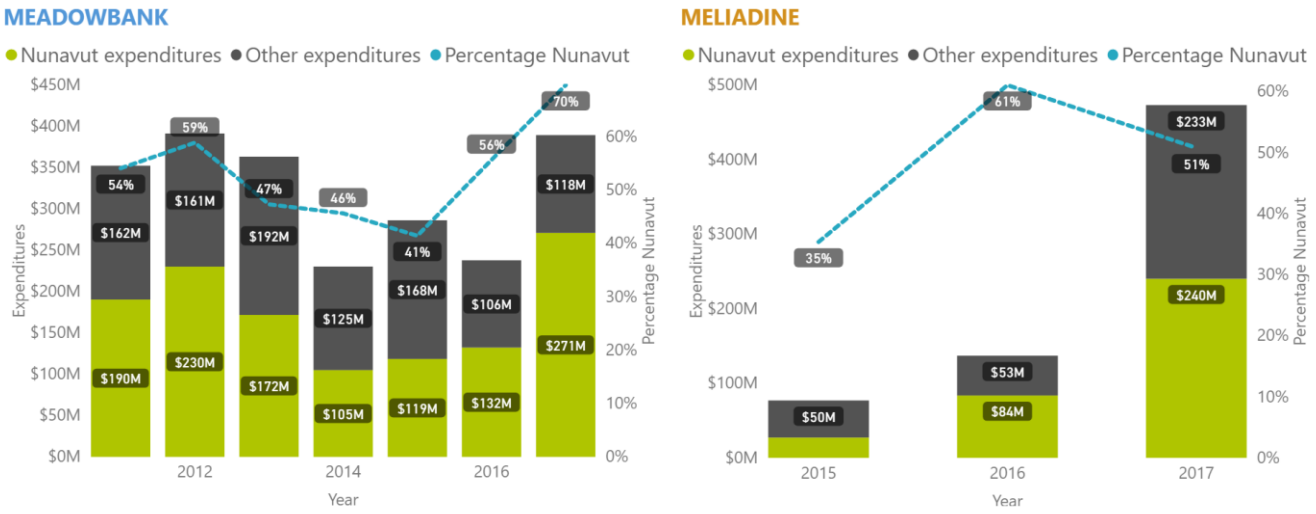
Chart 12. 2017 NTI-registered business expenditures by Nunavut community



(Agnico Eagle Mines, 2017)

Chart 13 details the value and proportion of contract expenditures that went to Nunavut-based businesses over time.

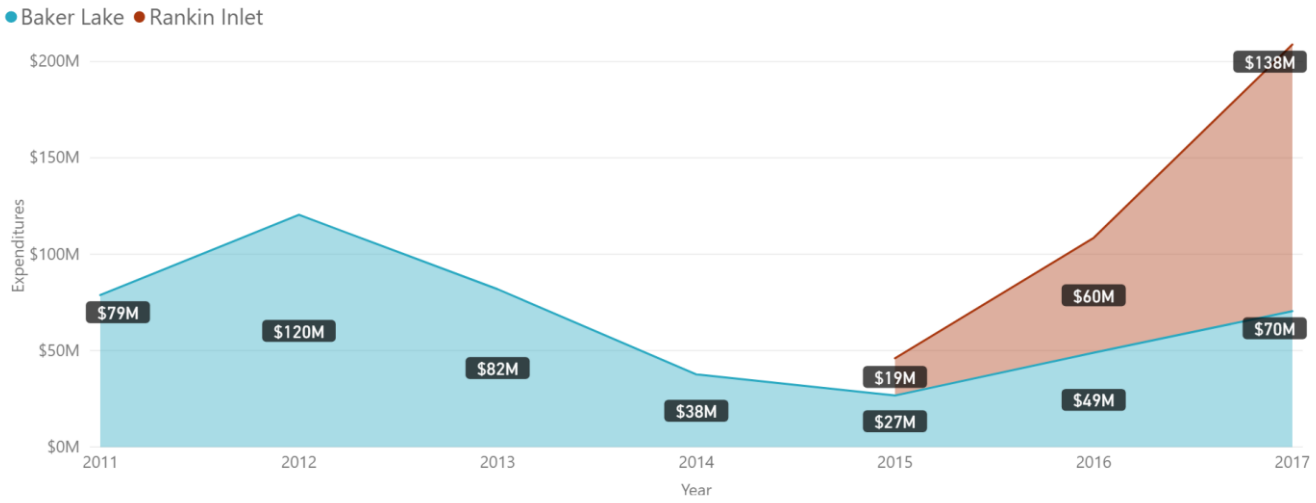
Chart 13. Contract expenditure on Nunavut-based businesses



(Agnico Eagle Mines, 2017)

Chart 14 shows the value from Meadowbank contract expenditures on Baker Lake-based businesses as well as the value of contract expenditures from Meliadine on Rankin Inlet-based businesses.

Chart 14. Contract expenditures from Meadowbank on Baker Lake-based businesses and from Meliadine on Rankin Inlet-based businesses



(Agnico Eagle Mines, 2017)

Interpretation

NTI maintains a registry of Inuit firms in accordance with Article 24 of the *Nunavut Land Claims Agreement*. In 2017, expenditures on NTI-registered businesses essentially doubled from a total of $205M to $408M across the two projects. This sizable increase is largely attributable to increased spending at the Whale Tail site (captured as part of Meadowbank's spending), as well as the beginning of major construction at Meliadine.

This large dollar-value increase corresponded with a decline in the total proportion of expenditures going to NTI-registered vs. non-NTI registered firms, from 55% in 2016 to 47% in 2017 across the two projects. This decline in proportion is fully attributable to Meliadine spending, where the proportion declined from 55% in 2016 to 41% in

2017. There are a number of factors that may have contributed to this decline, including the need for specialized services not offered by local firms and the meeting of local business capacity. The proportion of Meadowbank spending on NTI-registered firms remained relatively steady in 2017 at 55%, following three years of steady increases. In 2017, just over half of the spending on NTI-registered firms went to firms located in Rankin Inlet, following closely by Baker Lake and Iqaluit, with 23% each.

Agnico Eagle's contract expenditures on Nunavut-based businesses (which includes NTI-registered businesses) more than doubled in 2017 from $216M to $511M, amounting to 70% of the total contract expenditures. The proportion of contract expenditure spending on Nunavut-based businesses remained relatively stable at 59% over this time period across the two projects. This increase in expenditures on Nunavut-based businesses above those on NTI-based businesses reflects additional spending on businesses located in the territory but which are not registered as Inuit firms through NTI – either because they do not meet the criteria or have not registered for other reasons. Meadowbank expenditures on Baker Lake-based businesses and Meliadine expenditures on Rankin Inlet-based businesses continued a 2-year upward trend in 2017, corresponding with construction at Whale Tail and Meliadine, respectively. Contract expenditures are still lower in Baker Lake than when Meadowbank opened, suggesting that spending has diversified to other communities across the territory.

Meliadine is expected to far exceed the FEIS predictions of $175M (2012 dollars) of contracted of goods and services from Kivalliq-based businesses over the 3.5-year construction phase, with the 2017 (the first year of major construction) value alone estimated at $134M (2012 dollars[5]) in expenditures on Kivalliq-based, NTI-registered businesses.

[5] 2012 dollars calculated with Bank of Canada's Inflation Calculator https://www.bankofcanada.ca/rates/related/inflation-calculator/

VSEC 4: Education and Training

IMPACT / GOAL STATEMENT

Improved educational attainment in Kivalliq communities, increasing mining-related skill level of Kivalliq workforce, and enhanced skill profile and promotion of Inuit employees.

OVERARCHING FEIS PREDICTIONS

Meadowbank: "The potential impacts of education and training are considered of medium magnitude, positive, long term and of high significance, specifically to those individuals and their families who are able to benefit." (Cumberland Resources Ltd., 2006, p. 121)

Meliadine: Improved educational attainment in Kivalliq communities (i.e. high school graduation rates), increasing mining-related skill level of Kivalliq workforce, and an enhanced skill profile and promotion of Inuit employees. (Golder Associates, 2014, p. 1-C-48)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
4.1 Investment in school-based initiatives						
Agnico Eagle investments in school-based initiatives	N/A	↓	↑	N/A	↑	Up until 2014, Agnico Eagle contributed approximately $284K/year to a variety of school-based initiatives. With the expiry of the MOU with the Department of Education in 2015, these contributions dropped to $39K. They remained unchanged in 2016 and rose to $55K in 2017 due to a doubling of scholarship funding.
4.2 Secondary school graduation by region						
Secondary school graduation rate by region	↑	↑	N/A	↑	N/A	The graduation rate in Kivalliq region fluctuates from year to year, though shows an overall upward trend that began in 2008. Rates have been at all-time highs for the region, and consistently higher than those in the other two regions, since 2010.
4.3 Project training and education						
Agnico Eagle investments in mine training and education programs	N/A	→	↓	N/A	↓	From 2014 to 2016, there was a consistent level of investment by Agnico Eagle (~$2.3M/year) in external mine training programs (e.g. Kivalliq Mine Training Society). In 2017, this dropped to $195K as the KMTS lost their federal funding; the future of the organization is currently uncertain.
Average mandatory training hours provided to Agnico Eagle Inuit employees	N/A	↑	→	N/A	↑	In 2017, mandatory training hours remain fairly stable at Meadowbank, indicative of steady rates of turnover. These hours have increased at Meliadine, likely due to the influx of new employees.
Average specific training hours provided to Agnico Eagle Inuit employees	N/A	↑	↓	N/A	↑	Specific training hours declined at Meadowbank from 84 hours / Inuit FTE in 2015, down to 51 hours in 2017, while Meliadine values have fluctuated from 28 in 2015 to 10 in 2016 and up again to 25 in 2017. Annual fluctuations in the number of training hours largely reflect changing demand for additional positions and so are not considered negative or positive.
Participation in career and skills programs	N/A	/	↓	/	↓	Participants in TASK week and graduates from the Arviat Diamond Drillers and Welders Program had remained steady until last year, decreasing by 12 and 11 respectively. Meadowbank's Haul Truck Driver Program also saw a decline in 2017 from 34 to 26 participants. These fluctuations could be explained by the success of each program as well as changing demand for specific skills at Meadowbank.
Meadowbank pre-apprenticeship and apprenticeship participation by type	N/A	↑	↑	N/A	N/A	The number of Inuit apprenticeships increased by 3 in 2017. In addition to the number of Inuit participants, the apprenticeship program has seen growth over the past 4 years in diversity, moving from two offered programs in 2013 to seven in 2017.
4.4 Project employment by skill level						
Project Agnico Eagle Inuit employees by skill-level	N/A	↑	↑	N/A	↑	2017 has seen an increase in Inuit employees at higher skill levels, with the total number of skilled, management and professional employees rising from 6 in 2016 to 15 in 2017.

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management and Mitigation

Agnico Eagle offers a number of programs outlined in Table 4 below to increase general educational and skills attainment among Kivalliq residents as well as training, career development and upward mobility programs for existing employees.

Table 4: Agnico Eagle Employment Management and Mitigation Initiatives

Program	Purpose / Description / Outcomes
MOU with Department of Education	A Memorandum of Understanding was first signed in April 2012 to establish a strengthened partnership between the Government of Nunavut Department of Education and Agnico Eagle, with a focus on increasing the number of students in the Kivalliq region who are able to successfully transition from high school to trades and mining-related career opportunities. This work involved *Mining Matters*, a branch of the Prospectors and Developers Association of Canada (PDAC) that is dedicated to bringing knowledge and awareness about Canada's geology and mineral resources to students and educators. In 2013, Agnico Eagle and the *Mining Matters* group participated with the GN Department of Education, Curriculum Review Services to assist in a review of the Earth Sciences Curriculum of Nunavut Schools. During 2014, Agnico Eagle continued to sponsor the Mining Matters program as part of the MOU with Education. Agnico Eagle continued to pursue a renewed MOU with the Department of Education through 2016. In September 2017, Agnico Eagle and the Government of Nunavut established a Memorandum of Understanding that identifies 10 priority areas for collaboration, including education.
Kivalliq Science Educations Community	In 2017, Agnico Eagle once again invested $25,000 for the 2017-2018 regional Math Camp, Science Camp and Kivalliq Science Fair programs operated by the Kivalliq Science Educators Community. The regional science camp was organized in Chesterfield Inlet and the weeklong program included a mix of traditional, cultural and educational studies related to sciences. The program provides science credits to participants.
Kivalliq Mine Training Society	The KMTS is an Inuit-private sector partnership created to strengthen the Kivalliq region labour force through the creation and funding of training opportunities in the seven Kivalliq hamlets. The KMTS has also enjoyed financial support from the Nunavut Department of Economic Development and Transportation and Agnico Eagle Mines. A major focus of the KMTS program has been to support Agnico Eagle's Mine Training Initiatives, such as the Career Path, different trainee programs, pre-trades programs, work readiness programs and workplace literacy strategies. Prior to 2015 the KMTS also supported the development and delivery of the community based Work Readiness to help prepare Inuit for employment opportunities. The KMTS also supported the Arviat Drillers program as well as some other community-based initiatives, such as the Making it Work program, which provided support to employees and their families to cope with the challenges that come with employment at a mine site. Since 2017 KMTS was no longer able to receive funding to support program delivery to Agnico Eagle and communities. Despite the lack of substantial funding, Agnico Eagle Mines did not reduce its training delivery since the company is strongly committed to developing the local workforce.

Program	Purpose / Description / Outcomes
Labour Pool Process	The Labour Pool Process (formerly 'Labour Pool Initiative'), implemented in 2014 and revised in 2015, is based on an agreement between Agnico Eagle and the KIA through the IIBAs to offer pre-employment opportunities to Inuit from all Kivalliq communities. The goal of the program is to pre-qualify candidates from Kivalliq communities through 5 steps: employment information sessions, online application (facilitated by Employment Information Sessions), the Work Readiness Program, mandatory trainings (more details provided below), and the Labour Pool List (facilitated by the Labour Pool Coordinator).
Labour Pool Process - Step 1: Employment Information Sessions	As part of the Labour Pool Process, employment information sessions are conducted in all Kivalliq communities. The purpose of the information sessions is to give information about the mines, the work lifestyle, and career opportunities as well as knowing how to apply online. In 2017, Agnico Eagle held employment information sessions in all seven communities on a quarterly basis.
Labour Pool Process – Step 2: Online Application (Community Coordinators)	The first step in the Labour Pool Process is to apply online. In order to facilitate online application in the communities, Agnico has a Community Coordinator in each Kivalliq community who can deliver employment information sessions, and provide one-on-one assistance to interested candidates with their online application.
Labour Pool Process – Step 3: Work Readiness Training Program	In collaboration with the Kivalliq Mine Training Society (KMTS), Agnico Eagle developed a Work Readiness Training program as a pre-employment initiative. In 2017, the Work Readiness Training was delivered by Northern College. The Work Readiness program is the first step of the Labour Pool Process for those individuals who have applied online. The objective of the program is for Inuit workers to be better prepared for the work environment in an industrial setting. Graduates of the program are eligible to continue the Labour Pool Process and attend the mandatory trainings given on-site. The program provides coaching on a range of issues including: awareness of employers' unspoken expectations, communication in the workplace, and problem-solving skills for resolving workplace issues. The program was implemented in April 2013. The program is delivered over a five-day period at the community level and is scheduled throughout the year. In 2017, the program was delivered by a visiting instructor in six Kivalliq communities resulting in 240 participants from various communities, from which 84% successfully completed the program. Arviat runs its own Work Readiness training sessions and had 78 graduates in 2018.
Labour Pool Process – Step 4: Mandatory Training Program (previously 'Site Readiness')	The mandatory training program delivered on site is the second step of the Labour Pool process, following the Work Readiness Program. Graduates of the mandatory trainings are eligible to enter the Labour Pool. The Mandatory Training Program is a five-day training provided at the Meadowbank site. Throughout the week, participants are enrolled in diverse activities such as mandatory training sessions, site visits, job initiation, information sessions on training and career opportunities, as well as interviews and discussions on employment opportunities with a Human Resource representative to assess career ambitions and identify work interest. Afterwards, candidates wanting to work for the Camp Department are given short term on-call assignments. All other applicants become part of the Labour Pool list until a job opportunity matching their interest and competencies becomes available. In 2017, 193 individuals participated in Site Readiness, of which 173 successfully completed the program.
Labour Pool Process – Step 5: Labour Pool List	The Labour Pool List is a list of candidates who have successfully completed the steps of the Labour Pool Process. These candidates are now eligible for opportunities with Agnico Eagle or Agnico Eagle's contractors. The list is managed by the Labour Pool Coordinator.

Program	Purpose / Description / Outcomes
Summer Student Employment Program	Agnico's companywide policy offers summer employment programs to the children of all Agnico employees (both Inuit and non-Inuit) that are undertaking postsecondary education. Summer job opportunities were also offered to Inuit students who are participating in post-secondary activity, even if they had no family relative working at the mine. Historically, there have been no applications to Agnico Eagle's Summer Student program by the children of Inuit employees. The program will continue to be offered in 2018. In 2017, Agnico advertised a summer student program to attract Inuit post-secondary students from Kivalliq communities, including students enrolled in trades with the Nunavut Arctic College and with the Nunavut Sivuniksavut program. This program was offered and advertised in each Kivalliq Community. The posting attracted three eligible applicants, of which all were contacted. Two applicants declined the offer and one accepted but later resigned before starting employment. At the 2018 Socio-Economic Monitoring Committee (SEMC) meeting, the GN Department of Finance expressed that it was sometimes difficult to place summer student applicants. Agnico Eagle is open to working with the GN in potentially placing eligible and interested Inuit summer students at the projects, who can otherwise not be accommodated with the GN.
Haul Truck Trainee Program	The Haul Truck Trainee program is a 28-day (336 hour) program to certify haul truck operators, which includes training on a simulator, in the classroom, and on the job. The program is aimed at existing employees in entry level positions (dishwashers, janitors, chambermaids, etc.). This year, 26 employees were enrolled in the Haul Truck Trainee Program. Among those, a total of 23 trainees successfully completed the Program (18 men, 5 women). In order to provide the best training possible to all the trainees, there is a maximum of 4 trainees at a time with one trainer.
Process Plant Trainee Program	With the success of the Haul Truck Trainee Program, a Process Plant Trainee Program was developed in 2015. The 28-day program provides employees with an understanding of the mining and milling process and trains them to be competent and certified to fill positions as a process plant helper or a utility person. In 2017, a total of five (5) employees enrolled in the program. Amongst those, two (2) were delivered to the Process Plant.
Super Operator Program	Implemented in the second half of 2016, the Super Operator Program is an extension of the Process Plant Trainee Program. This 168-hour training is provided to employees who have successfully completed the Process Plant Trainee Program. The extension of the Process Plant Trainee Program will consist in teaching the basics of maintenance principles in order to have employees with more diversified skills in the Process Plant Department. These employees will eventually be able to perform specific basic maintenance repairs throughout the plant. In 2017, every Inuit employee that was trained as a Process Plant Trainee received the Super Operator Training.
Arviat Community Training Programs	In 2011, the Hamlet of Arviat proposed a partnership to invest in a community-based drilling school that would provide Inuit with the skills needed to work in diamond drilling. With advice and support from Agnico Eagle, the Hamlet brought together a range of partners to acquire the drilling equipment, develop the curriculum, and operate the training program. Government training agencies, the KIA, and drilling companies provided partnership investments. In 2013, the program offering was expanded to include a Welder's Helper program. Agnico Eagle invested $195,000 in the Arviat training programs in the 2017-2018 funding year. Over the past 5 years the program has graduated 65 trained driller's helpers, all of whom have found employment. In 2017-2018 funding year, the Mechanical Welding Program graduated 6 students.

Program	Purpose / Description / Outcomes
Career Path Program	The Career Path Program was designed in 2012, with the intention of supporting upward mobility of Inuit employees at Meadowbank. This program identifies the incremental steps that an employee is required to complete to advance in their chosen career of interest. In 2017, the Career Path system was available in eight (8) areas of activity; Underground (Meliadine only), Drill, Industrial Mechanic, Maintenance, Process Plant, Road Maintenance, Field Services, and Mine Operations. The objective of the Career Path Program is to have only internal promotions for Inuit, and for no external candidates (southerners) to be hired to fill a position that is part of the program.
Training Formula (formerly 'Training Curriculum')	The Training Formula program, implemented in 2014, provides tools, tips, guideline and standards to improve the proficiency of Agnico trainers. The formal manual includes three sections: training theory, training standards, and training delivery.
E-Learning Training	Before coming to an Agnico site for the first time, newly hired employees must complete their Mandatory Training online, which consists of six (6) modules: General Induction, WHMIS, Fire Suppression, Job Hazard Analysis and Work Card, Spill Response, and Occupational Health and Safety (Personal Protective Equipment, Ladder Safety, Surface Standard Operating Procedure). The General Induction chapter provides general information about Agnico Eagle and working life at the mines. As per the requirement of the IIBAs, in 2017 two new e-learning lessons were developed and added to the General Induction. The Inuit Impact and Benefit Awareness module (IIBA) provides general awareness on: Agnico's Commitment to Indigenous People, history of the Nunavut Agreement and the different Inuit organization branches, what an IIBA is and why the sites have one, and a high level overview of the benefits and impact mitigation provided through the IIBAs. The Archaeology module informs workers on how to identify potential archaeological sites (ex. fox traps, tent circles, hunting blinds) and what to do if a worker finds one when working in the tundra. An objective of these lessons is also to give each employee and contractor employee cross-cultural context before arriving on one of Agnico's sites.
Training and Learning Management System	The Training Management System (TMS) as well as the Learning Management System (LMS) were initially implemented in 2013, in order to ensure better management of training activities and to monitor the proper management of the e-learning training. In response to the GN's request for increased information on training programs in 2014, both systems were modified in 2015. The systems are now capable of producing more detailed reports: by training program, by participation level, by graduation level and by hour.
Apprenticeship Training ('Apprenticeship Program' and 'Pre-Apprenticeship Program')	The Apprenticeship Program combines on-the-job learning and in-school technical instruction to allow Inuit employees the opportunity to be educated and trained in the trade of their choice. By the end of the program, the apprentice is able to challenge their Certificate of Qualification (COQ) to become a Journeyperson and will also have the opportunity to challenge their Red Seal Exams. Currently, we offer seven (7) trades: cook, carpenter, millwright, electrician, heavy duty equipment technician, welder, and plumber. In 2015, two (2) employees completed their apprenticeship training within Agnico and in 2016, two (2) employees completed their apprenticeship training within the company. As of the end of 2017, there were 16 apprentices and pre-apprentices. There were no graduates for the 2017 year, but since the program takes time to complete, we are expecting to have three (3) graduates in the next two (2) years.

Program	Purpose / Description / Outcomes
Role Model Program	The Role Model program began in 2015 as a way to recognize exemplary Inuit employees. Since then, it has grown into a program to: recognize the hard work of individual Inuit employees; identify examples to inspire Inuit employees, community members, youth, etc. on how to achieve personal and/or work success; and serve as an incubator program to identify and support future Inuit leadership in the company. Role models are nominated and chosen by a committee annually. They can be nominated and chosen for a variety of reasons, including demonstrating good work-life balance/dedication to upgrading one's education/skills; positive attitude; exemplifying traditional Inuit values at home or at work; overcoming personal challenges; involvement in communities; demonstrating leadership skills, etc. A Role Model is recognized through posters and is also provided opportunities to represent the company and speak on behalf of their own experiences at various events (trade shows, symposiums, high school visits, etc.). Some Role Models are also enrolled in the Leadership Development Program in order to continue to foster management and supervisory skills. In 2017, there were 8 Role Models at Meadowbank and 4 Role Models at Meliadine.
TASK Week	The Trades Awareness Skills and Knowledge Week (TASK Week) was initiated in 2012 and has evolved in its structure through the years. TASK week is now a full week program that allows students to focus on one trade for the entire week. TASK week is also aligned with Agnico's IIBA commitment Schedule C, 16, by promoting the mine industry through career awareness and co-operating with educational authorities in the implementation of mining sector content in schools. TASK Week is a joint initiative between Jonah Amitnaaq Secondary School (JASS) and Agnico Eagle, and has active cooperation from other authorities and businesses each year. The 2017 TASK Week was held in Baker Lake from May 8th to May 12th and saw 58 senior high school students from JASS participate. Six (6) trades were features: Mechanics, Welding, Electrical, Culinary Arts, Hairdressing, and Environmental Studies (which included Work Readiness training). In 2017 Agnico again brought trainers and apprentices/tradespeople from Meadowbank, including four of Meadowbank's Inuit apprentices/Red Seal, all from Baker Lake. Agnico believes that having students exposed to role models from their community has a positive impact on participants in the program.
Financial Literacy Training	In collaboration with CPA Canada, in 2017 a Financial Literacy training course was delivered at Meadowbank mine site. The need for financial literacy training was identified through the Baker Lake Wellness Plan. The training overviews why financial literacy is important, savings vehicles, budgeting, and goal setting. The training was held twice at Meadowbank with 33 participants, including Inuit participants. Modified Financial Literacy trainings were also held in Baker Lake, both at a public community session as well as delivery to grades 7-9 & 12 at the Jonah Amitnaaq Seconary School. Basic financial literacy training is also included in the Work Readiness program. Agnico has also had preliminary discussions with the Nunavut Housing Corporation to include financial literacy information on site, on subjects like rent scales or home savings programs. Agnico Eagle plans to continue offering opportunities at both mine sites to improve financial literacy in 2018 in collaboration with Sunlife Financial.

4.1 Investment in school-based initiatives

Predictions

MEADOWBANK

"Cumberland and KIA will address the need for a broader based project education and training initiatives [sic] to assist those who wish to develop skills that will position them for project employment. This education and training initiatives [sic] will also include an element to address motivational issues around getting children through high school. Such measures would be intended to contribute to encouraging a commitment to education on the part of youth." (Cumberland Resources Ltd., 2006, p. 121)

MELIADINE

Positive impact on the funding of the education system. (Golder Associates, 2014, p. 1-C-48)

Data & Trends

Chart 15 shows Agnico Eagle's investments in a range of school-based initiatives from 2010 to 2017. The MOU with the Department of Education expired in 2015. In September 2017, Agnico Eagle and the Government of Nunavut established a Memorandum of Understanding that identifies 10 priority areas for collaboration, including education.

Chart 15. Agnico Eagle investments in school-based initiatives

Agnico Investments	2010	2011	2012	2013	2014	2015	2016	2017	Total
Scholarships	$14K	$14K	$14K	$14K	$14K	$14K	$14K	$30K	**$128K**
MOU with GN Department of Education		$175K	$175K	$175K	$175K				**$700K**
Mining Matters Science Program		$90K	$80K	$70K	$70K				**$310K**
Kivalliq Science Educators Community Programs		$15K	$15K	$25K	$25K	$25K	$25K	$25K	**$155K**
Total	**$14K**	**$294K**	**$284K**	**$284K**	**$284K**	**$39K**	**$39K**	**$55K**	**$1,293K**

(Agnico Eagle Mines, 2017)

Interpretation

Up until 2014, Agnico Eagle has made total annual contributions of approximately $284,000/year to a variety of school-based initiatives with the goals of: building interest in math, science and mining among school-aged children; motivating students with scholarships and career opportunities; and increasing educational outcomes overall in the Kivalliq region. Since the expiry of the MOU with the Department of Education in 2015, total contributions have been significantly lower ($39,000), rising to $55,000 in 2017 due to a doubling of scholarship funding. The Meliadine FEIS predicts a positive impact on the funding of the education system; further insights on whether this prediction is met should be available next year, with the implementation of the MOU between Agnico Eagle and the Government of Nunavut.

4.2 Secondary school graduation by region

Predictions

MEADOWBANK

There are no specific predictions made in the Meadowbank FEIS regarding school attendance or graduation.

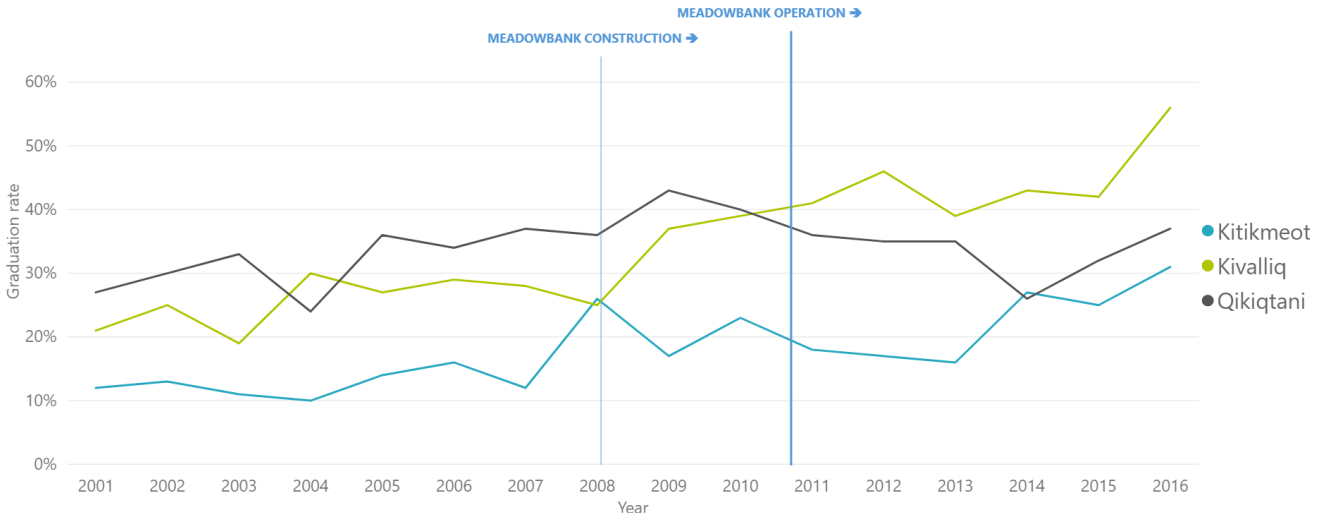
MELIADINE

Positive impact on educational achievement, dropout rates, school attendance. (Golder Associates, 2014, p. 1-C-48)

Data & Trends

Chart 16 provides secondary school graduation rates by region between 1999 and 2016. Graduation rates by region and by Kivalliq community for 2017 were not available at the time of writing.

Chart 16. Secondary school graduation rate by region



(Department of Education, 2017)

Interpretation

The graduation rate in Kivalliq region has fluctuated since the opening of the Meadowbank mine, with an overall upward trend that began in 2008. Graduation rates in Kivalliq region have been at all-time highs for the region, and consistently higher than those in the other two regions, since 2010.

A range of complex and interacting factors affect graduation rates, including the housing shortage, household food insecurity, health status, social problems such as high rates of teenage pregnancy and substance abuse (higher than the rest of Canada), and the legacy of the residential school system (Office of the Auditor General, 2013). Agnico Eagle's projects may have an impact on some of these factors, as described in subsequent sections, but attribution is a challenge due to the multiple and interacting factors.

Graduation rates are useful measures but only provide a partial picture of the state of education in the Kivalliq region. The education system in Nunavut faces a number of policy and operational challenges which may result in students graduating without achieving required competencies (CBC News, 2015; Rohner, 2014). These challenges can lead to students graduating from high school with inadequate literacy, numeracy and problem-solving skills, which can limit their employability and their access to training (e.g. inability to pass apprenticeship

entrance exams). At the time of writing, no public data on student K-12 performance in Nunavut was identified (i.e. performance relative to international standards or those of other jurisdictions).

4.3 Project training and education

Predictions

MEADOWBANK

"Cumberland and KIA will address the need for broader based project education and training initiatives to assist those who wish to develop skills that will position them for project employment." (Cumberland Resources Ltd., 2006, p. 121)

MELIADINE

The Project's "effects on education, training, and capacity in the RSA and LSA should be positive and long lasting." (Golder Associates, 2014, p. 1-120)

"AEM will provide and promote Project-related education and training programs." (Golder Associates, 2014, p. 1-120)

Data & Trends

Chart 17 provides an overview of Agnico Eagle's investments in mine training and education programs.

Chart 17. Agnico Eagle investments in mine training and education programs

Agnico Investments	2010	2011	2012	2013	2014	2015	2016	2017	Total
Kivalliq Mine Training Society (cash & in-kind)				$1,188K	$2,267K	$1,937K	$2,339K		**$7,731K**
Arviat Diamond Drillers & Welders Program	$250K	$60K	$190K	$190K	$190K	$190K	$190K	$195K	**$1,455K**
Total	**$250K**	**$60K**	**$190K**	**$1,378K**	**$2,457K**	**$2,127K**	**$2,529K**	**$195K**	**$9,186K**

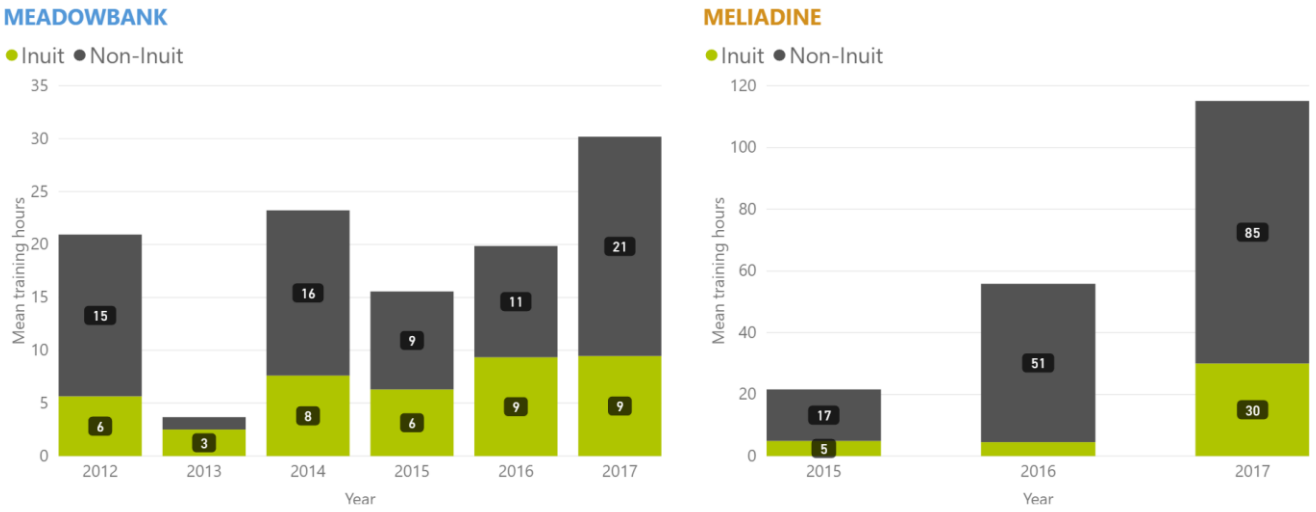
(Agnico Eagle Mines, 2017)

The Kivalliq Mine Training Society (KMTS) has provided support for the development and delivery of community-based Work Readiness to help prepare Inuit for employment opportunities. The KMTS has also supported the Arviat Drillers program, as well as some interesting community-based initiatives, such as the Coping with FIFO (Fly-in-fly-out) program and Community Net-work program, which have provided support to communities to help employees and their families cope with the challenges that come with employment. As of 2017, KMTS lost its federal funding and the future of the organization is currently uncertain.

Chart 18 shows average mandatory training hours provided to Inuit and non-Inuit employees. This is calculated by dividing the total number of training hours by the number of FTE employees. Mandatory training includes:

- **Health and Safety training:** this includes mandatory training related to compliance with the Nunavut Mine Act, as well as training that is mandated according to Agnico Eagle Health and Safety policies. Many of these training sessions are offered via e-learning prior to the employee's arrival on site. Other health and safety training relevant to an individual's job is also provided on site.
- **General training:** this consists of training activities required at a departmental level and covers many employees working in different departments. General training includes training on light duty equipment as well as enterprise software systems and cross-cultural training.

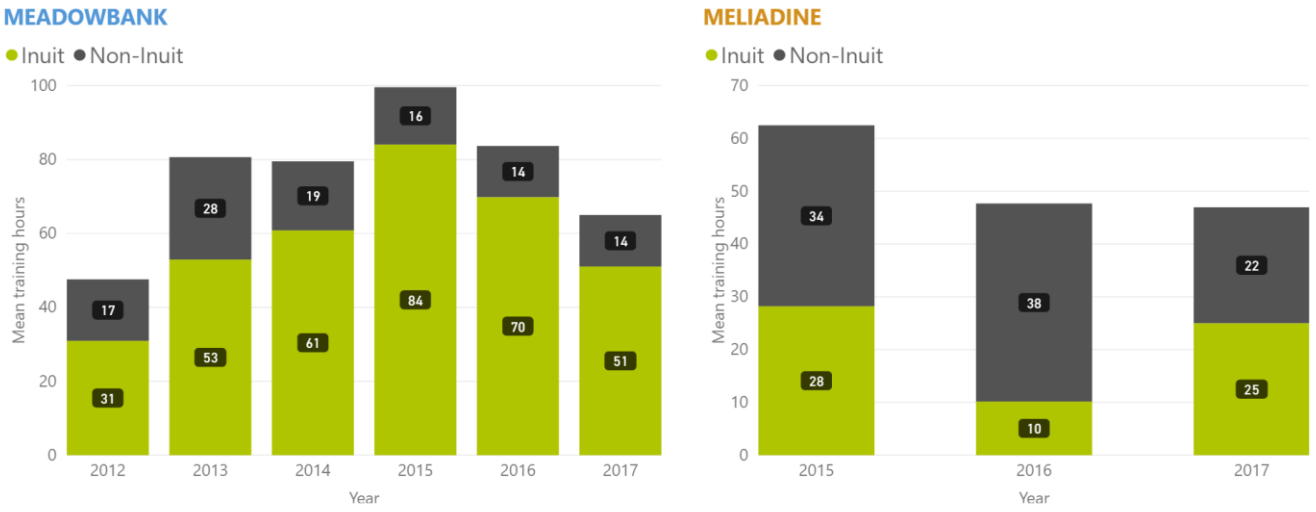
Chart 18. Average mandatory training hours provided to Agnico Eagle Inuit employees



(Agnico Eagle Mines, 2017)

Chart 19 shows the average specific training hours provided to Inuit and non-Inuit employees. Specific training is focused on developing individual competencies related to a specific position. This training qualifies individual workers for promotion following their progression through the Career Path. These training programs are provided through a combination of in-classroom (theory) learning as well as practical (one-on-one) learning.

Chart 19. Average specific training hours provided to Agnico Eagle Inuit employees



(Agnico Eagle Mines, 2017)

Chart 20 shows the participants in and/or graduates of a range of career and skills programs supported by Agnico Eagle, as well the Haul Truck Drivers Program, run at Meadowbank.

Chart 20. Participation in career and skills programs

AGNICO SUPPORTED PROGRAMMING

program	2010	2011	2012	2013	2014	2015	2016	2017	Total
Kivalliq community career fairs (not counted)									**0**
Baker Lake, Arviat & Chesterfield TASK week (participants)			60	65		60	70	58	**313**
Arviat Diamond Drillers & Welders Program (graduates)	12	24	12	24	18	18	15	6	**129**

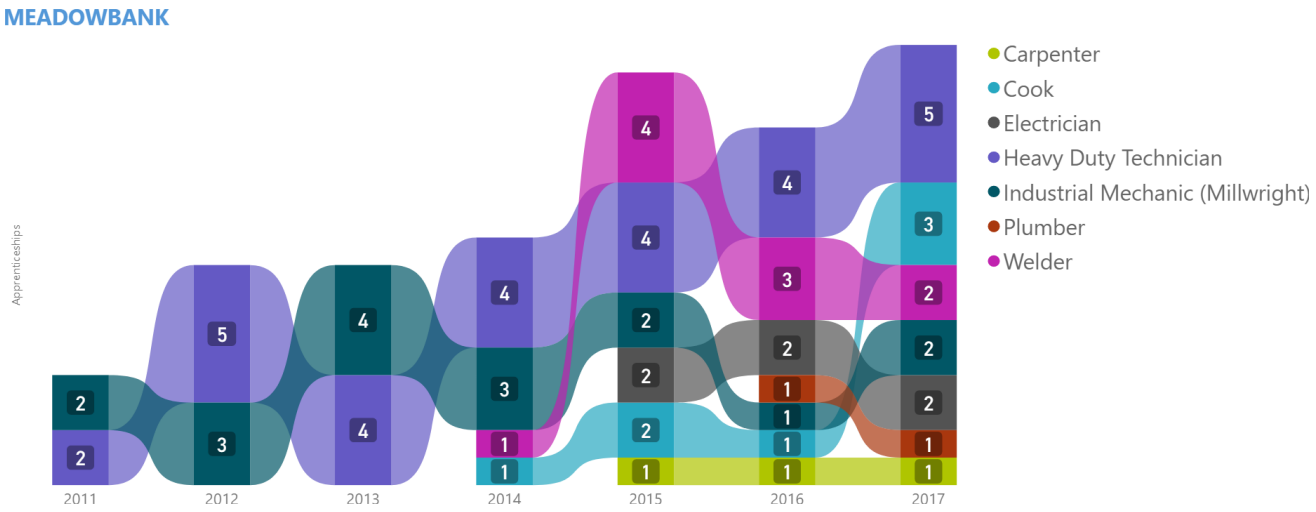
MEADOWBANK PROGRAMMING

program	2010	2011	2012	2013	2014	2015	2016	2017	Total
Haul truck drivers program (participants)	33	55	15	19	33	28	34	26	**243**

(Agnico Eagle Mines, 2017)

Chart 21 shows the number of Inuit employees in pre-apprentice or apprentice roles at Meadowbank, categorized by type of apprenticeship (heavy duty technician, industrial mechanic, and others). Apprenticeship positions are expected to begin at Meliadine in 2018.

Chart 21. Meadowbank pre-apprenticeship and apprenticeship participation by type



(Agnico Eagle Mines, 2017)

Interpretation

Agnico Eagle's financial investments in externally-delivered training programs have dropped substantially in 2017 due to the KMTS' loss of federal funding, and subsequently their loss of funding from Agnico Eagle.

Mandatory training hours (detailed in Chart 18) remain fairly stable at Meadowbank (9 hours per Inuit FTE), and have increased substantially in 2017 at Meliadine. Due to the requirement for greater mandatory training for new employees, this large increase is likely due to the influx of new employees at Meliadine. Similarly, the relatively flat numbers at Meadowbank are likely indicative of steady rates of turnover.

Average specific training hours (detailed in Chart 19) have seen a decline at Meadowbank over the past two years from a high of 84 hours / Inuit FTE in 2015, down to 51 hours in 2017. Average specific training hours provided to

Inuit employees at Meliadine have fluctuated from 28 in 2015 to 10 in 2016 and up again to 25 in 2017. Annual fluctuations in the number of specific training hours largely reflect changing demand at Meadowbank for additional positions for which specific training is provided.

Participation in Agnico Eagle-supported career programming has also fluctuated. The Haul Truck Drivers Program at Meadowbank has seen a decline from 34 participants in 2016 to 26 participants in 2017. Participants in TASK week and graduates from the Arviat Diamond Drillers and Welders Program remained steady until the past year, declining by 12 and 11, respectively. These fluctuations could be explained by the success of each program as well as changing demand for specific skills at Meadowbank.

The number of Inuit apprenticeships increased by three people in 2017 (from 13 to 16). 2015 saw the first two land claim beneficiaries graduate from Agnico Eagle's apprenticeship program, with one receiving a certificate as a millwright and the other as a welder. An additional two Inuit employees completed their apprenticeships in 2016, both graduating as heavy-duty equipment technicians. There were no new graduates in 2017. In addition to the number of Inuit participants, the apprenticeship program has seen growth over the past 4 years in diversity of occupations, moving from two offered programs in 2013 to seven in 2017.

4.4 Project employment by skill level

Predictions

MEADOWBANK

There are no specific predictions in the Cumberland FEIS regarding the skill level of Inuit employees at Meadowbank.

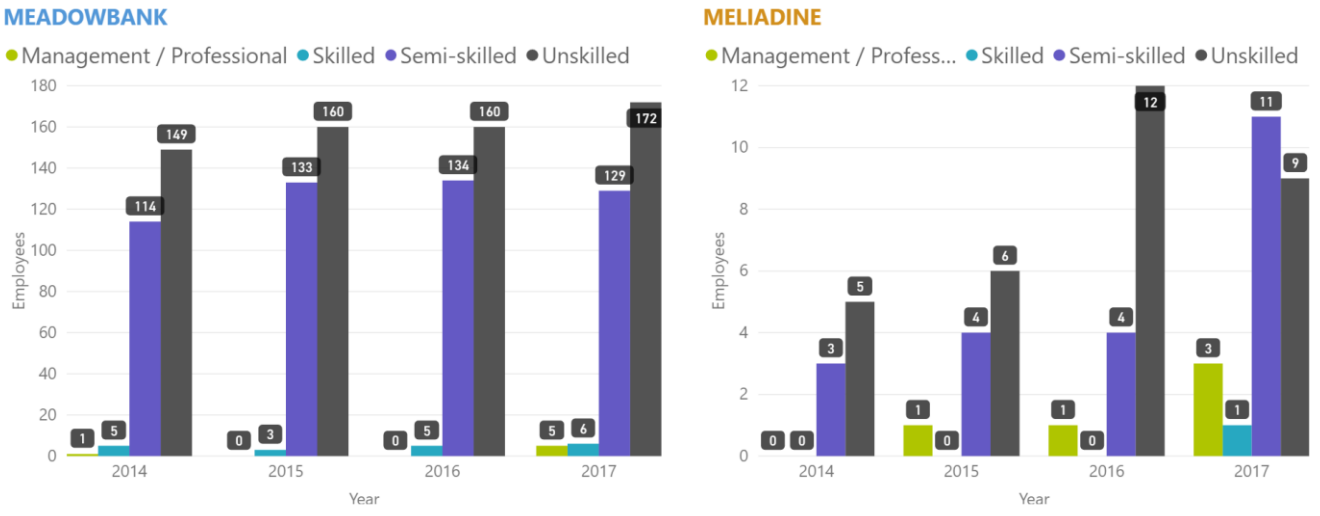
MELIADINE

The Project will have a "positive impact on the skill levels of local labour force." (Golder Associates, 2014, p. 1-C-48)

Data & Trends

Chart 22 shows the number of Inuit employees at each skill level between 2014 and 2017. Note that Agnico Eagle changed how various skill levels are classified in 2013 and 2014. Due to these changes, year over year trends of Inuit employment by skill level cannot be drawn pre-2014.

Chart 22. Project Agnico Eagle Inuit employees by skill-level



(Agnico Eagle Mines, 2017)

Interpretation

Prior to 2017, the data had not indicated significant changes in the promotion of Inuit workers up the skills ladder or the hiring of Inuit into higher skill categories (e.g. professional or management job classifications), despite individual success stories and large investments in training and programming. However, 2017 has seen a substantial increase in Inuit employees at higher levels, with the total number of skilled, management and professional employees rising from six in 2016 up to 15 in 2017. While still relatively few – 95% of Inuit employees at the projects are employed in unskilled and semi-skilled positions – this does represent a positive step.

VSEC 5: Culture and Traditional Lifestyle

IMPACT / GOAL STATEMENT

Respect and support for Inuit culture, language and traditional lifestyle in the workplace and in communities

OVERARCHING FEIS PREDICTIONS

Meadowbank: "There is potential for both negative and positive impacts, of any magnitude, on traditional ways of life, which could be of high significance. Any net impact, since it would be an impact of cultural change, would be long term and continue beyond the life of the project. The impact would be experienced primarily in Baker Lake." (Cumberland Resources Ltd., 2006, p. 123)

Meliadine:

- The "Project may contribute to weakening of traditional culture." (Golder Associates, 2014, p. 1-C-46)
- "The Project may result in a reduction of cohesion due to higher levels of inequality in the family or community." (Golder Associates, 2014, 1-C-50)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
5.1 Perceptions of culture and traditional lifestyle						
Self-reported effect of project on culture and traditional activities	N/A	N/A	N/A	N/A	N/A	Data currently unavailable.
5.2 Culture and traditional lifestyle						
Proportion of total population identifying Inuktitut as their mother tongue by community	→	↓	N/A	↓	N/A	The proportion of the population identifying Inuktitut as their mother tongue has remained relatively stable in the smaller Kivalliq communities from 2006 to 2016, but has declined in Rankin Inlet, Baker Lake, and Chesterfield Inlet (by 10 to 18 percentage points) over this period.
Use of AWAR by community	N/A	↑	↓	N/A	N/A	The Agnico Eagle-owned and operated all-weather access road (AWAR) that connects Baker Lake to the Meadowbank mine is accessible to the communities for hunting purposes. Community members accessed the road 2366 times in 2015, 1874 times in 2016, and 1716 times in 2017.
5.3 Country food use at project						
Country food kitchen usage	N/A	→	→	N/A	N/A	Meadowbank has maintained its practice of offering meals including char, muskox, and caribou (approximately 4,500 meals/year, or one per month per employee, since 2011). At Meliadine, Agnico Eagle offered about 21 meals with Arctic char this past year, twice on a five-week rotational schedule, which was consumed by approximately 50% of the staff.
Country food night events	N/A	→	↓	N/A	N/A	The number of country food events held at Meadowbank decreased from 14 in 2016 to 4 in 2017 – largely due to a lack of country food availability. Turnout for these events has averaged 36 attendees per event in 2016 and 43 in 2017. Agnico Eagle also offered country food at an event as a part of Pakallak Tyme, a cultural festival held in Rankin Inlet to celebrate the end of the Arctic winter and the coming of spring.

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management and Mitigation

To encourage respect and support for Inuit culture at Meadowbank and Meliadine, Agnico Eagle provides cross cultural training, access to traditional foods, and documentation and services in Inuktitut as outlined in Table 5 below.

Table 5: Agnico Eagle Cultural and Traditional Lifestyle Management and Mitigation Initiatives

Program	Purpose / Description / Outcomes
Cross Cultural Training Program	Implemented in 2010 at Meadowbank, the Cross Cultural Training Program has been provided to numerous employees. It is a 5 hour in-class training course. This course allows employees from different cultures and backgrounds to understand each other's culture in order to improve understanding and communication at the workplace. The program was revisited with the assistance of the Nunavut Literacy Council in 2013, and a revised program was initiated in 2014. This program is mandatory for all Agnico Eagle employees and contractors who will be on site for six months or more. Cross-cultural training began at Meliadine in 2017. During 2017, Meliadine had 6 sessions and is planning on providing the training more often as the workforce stabilizes during the transition from Construction to Operations.
Access to Country Food	As described in section 5.3 below, Meadowbank serves country food meals (i.e. char or caribou) as part of the standard menu served by the mine's kitchen, offered once weekly. In addition, employees can bring their own country foods to the mine site and use a separate Inuit kitchen to prepare and share these foods. In 2016, the Meadowbank Human Resources department led by the HR Inuit Agent began holding 'Country Food Nights'. Country food was purchased and provided by Agnico, and employees volunteered to cook dinner for others in the Country Food Kitchen. In 2016, there were 14 Country Food Nights, including an event where elders from the community were invited to attend. It was estimated that approximately 500 people participated in the nights over the course of the year. In 2017, the Human Resources department held 4 Country Food Nights. The number of events held was less than in 2016 because of a lack of human resources (the mine had one HR Inuit Agent for part of the year), but also because of a lack of country food availability. From approximately September until the end of the year the Human Resources department could not secure country food to be able to hold the events. In May 2017, the Human Resources department started tracking the use of the country food kitchen, which included the attendance generated by the Country Food nights. In 2017, there were approximately 170 people who used the Country Food kitchen, but probably more since there was a part of the year that was not tracked. The Meliadine site also serves country food as part of its standard menu (twice on a 5 week rotational menu). Currently there is no country food kitchen at the Meliadine site although there is planned to be one in Operations. In the meantime, country food is incorporated when possible in on-site events, such as at the Pakallak Tyme spring festival.
Inuktitut Use	Agnico Eagle makes efforts to facilitate the use of the Inuktitut language at their sites by providing the following documentation and services in Inuktitut: • Policies, employee handbooks, and other human resource related documents • Recruitment materials (job postings) • Online mandatory training materials that focus on health and safety • Key directional and safety signage posted in and around the mine site • Bilingual human resource counsellors • Bilingual employees based in communities (Community Coordinators) that support recruitment, retention, and other communications

Program	Purpose / Description / Outcomes
	• Religious events (services in Inuktitut or special events at site) Note that the *Nunavut Mine Act* requires, for safety reasons, that all work communications during operating hours use English as the common language. As per the IIBAs, Agnico must provide 'Inuktitut as a second language' training to selected staff. As part of the new Leadership Development Program (LDP) at Meadowbank, a 'Language Passport' was developed. The pocket small booklet contains approximately 175 words and phrases in Inuktitut (roman orthography and phonetic), English and French. The words and phrases include greetings, workplace terms, environmental terms, social phrases, and common words about people, clothing, objects and body parts. The booklet is given out as part of the LDP to help supervisors better communicate with their employees both on and off the job, although the booklet will be made more widely available in the future. The booklet was developed for the program by the Nunavut Literacy Council.
Cultural Events	In order to support cross-cultural understanding and celebration, Meadowbank and Meliadine hold various cultural events on-site, such as Nunavut Day, Pakallak Tyme, and square dances.

5.1 Perceptions of culture and traditional lifestyle

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS specifically related to impacts on the perceptions of culture and traditional lifestyle.

MELIADINE

"Perceptions of [the Project's] effects may lead to mental stress and changes in behaviour (i.e., diet)." (Golder Associates, 2014, p. 1-C-45)

Data & Trends

As part of the revised SEMP, Agnico Eagle has committed to the development of an Inuit employee survey to gather data and insights on the perceptions of the projects' impacts on culture and traditional lifestyle, along with other topics. This survey was not administered during the 2017 reporting year.

5.2 Culture and traditional lifestyle

Predictions

MEADOWBANK

"The project will not significantly restrict access to or productivity of lands used for traditional activity." (Cumberland Resources Ltd., 2006, p. 122)

MELIADINE

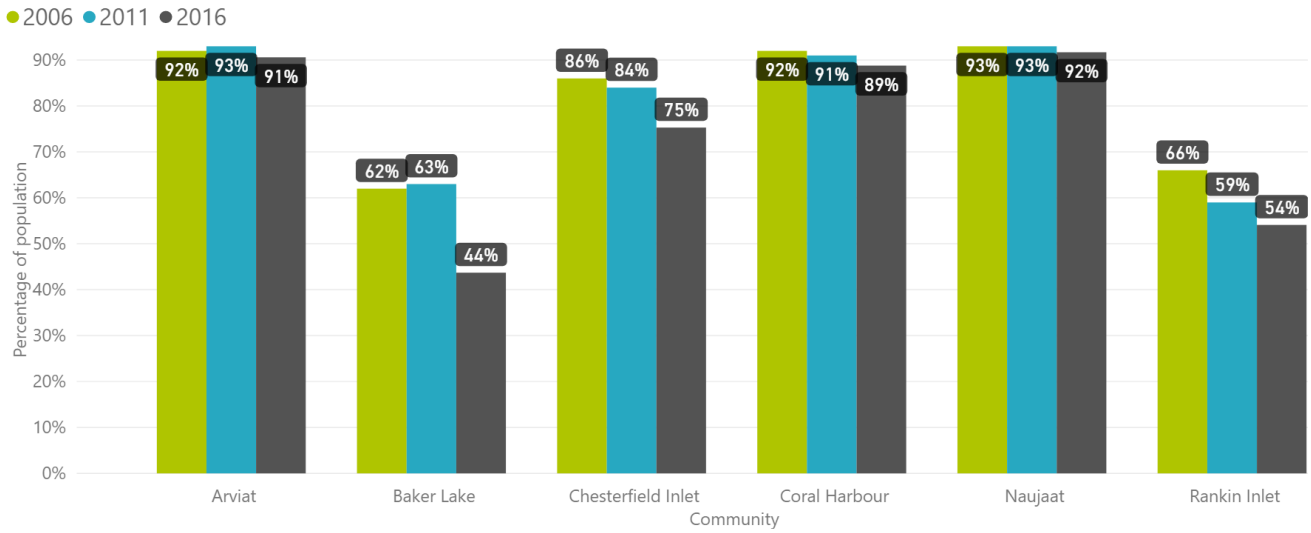
"The construction of the All-weather Access Road (AWAR) may increase access to areas outside of Rankin Inlet by local residents." (Golder Associates, 2014, p. 1-C-52)

"The Project may have a negative impact on the use of culturally important areas." (Golder Associates, 2014, p. 1-C-46)

Data & Trends

Chart 23. Proportion of total population identifying Inuktitut as their mother tongue by community shows the proportion of the total community population that identifies Inuktitut as their Mother Tongue, by Kivalliq community.

Chart 23. Proportion of total population identifying Inuktitut as their mother tongue by community



(Statistics Canada, 2016b; Statistics Canada, 2011b; Statistics Canada, 2006b)

Beginning in 2014, Agnico Eagle has asked its Inuit employees what languages they speak. In 2014, of the 269 Inuit employees, 188 (70%) spoke Inuktitut. In 2015, of the 302 employees, 240 (79%) spoke Inuktitut. In 2016, of the 302 employees, 252 (83%) spoke Inuktitut.

The Agnico Eagle-owned and operated all-weather access road (AWAR) that connects Baker Lake to the Meadowbank mine is accessible to the communities for hunting purposes. Community members accessed the road 2366 times in 2015, 1874 times in 2016, and 1716 times in 2017. Data is not yet available on the community use of the AWAR that connects Rankin Inlet to Meliadine.

Interpretation

Chart 23 demonstrates that the proportion of the population identifying Inuktitut as their mother tongue has remained relatively stable in the smaller Kivalliq communities from 2006 to 2016, but has declined in Rankin Inlet, Baker Lake, and Chesterfield Inlet (by 10 to 18 percentage points) over this period. The decline in Baker Lake is perhaps the most notable, with a decline of 19 percentage points over the past 5-year period.

Agnico Eagle has made efforts to facilitate use of Inuktitut at Meadowbank by translating policies and training materials, offering a number of services in Inuktitut and facilitating social and recreational programs at Meadowbank that encourage and support the Inuktitut language and culture. While the mine offers some services and documentation in Inuktitut, it also enforces the use of English as the standard language for communication in the workplace for safety reasons.

Meadowbank controls traffic on the all-weather access road (AWAR) connecting Baker Lake to the Meadowbank mine road, but it is accessible to community members to provide easier access to hunting trails and participate in traditional activities by ATV. Road users must abide by AWAR rules including following the speed limit, giving priority to heavy equipment, leaving the road after kilometre 85 and not hunting within one kilometre of the road for safety reasons. Hunters may approach the site up to one kilometre. Snowmobile crossings have also been established in consultation with the Baker Lake Hunters and Trappers Organization. There has been a decrease in the number of times the road was accessed since 2015, although there are a number of factors that could explain this trend (e.g. diversion of hunting patterns to other regions).

5.3 Country food use at project

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS specifically related to country food use at the mine site.

MELIADINE

There are no predictions in the Meliadine FEIS specifically related to country food use at the mine site.

Data & Trends

Agnico Eagle estimates meals served featuring country food (arctic char and caribou) at approximately 4,500 per year at Meadowbank, and 4,200 per year at Meliadine. Agnico Eagle also holds country food events at its projects, including 14 events at Meadowbank in 2016 and 4 and 1 events at Meadowbank and Meliadine, respectively, in 2017.

Interpretation

The number of meals served featuring country food has remained steady at Meadowbank since 2011; this number represents one serving of country food per month to all on-site staff. The total number of Inuit employees at the site has also remained relatively steady since it began production in 2010 (approximately 375). The number of country food events held at Meadowbank decreased from 14 in 2016 to 4 in 2017 due to a lack of availability of country food. Use of the country food kitchen – including both independent use and country food events –has averaged 36 attendees per event in 2016 and 43 attendees in 2017.

At Meliadine, Agnico Eagle offered about 21 meals with Arctic char this past year, twice on a five-week rotational schedule, which was consumed by approximately 50% of the staff. Agnico Eagle also offered country food at an on-site Pakallak Tyme event, held around the same time as a cultural festival of the same name held in Rankin Inlet to celebrate the end of the Arctic winter and the coming of spring.

No data or information was available on baseline levels of country food consumption for Inuit workers prior to employment, or on consumption of country food while off rotation.

VSEC 6: Population Demographics

IMPACT / GOAL STATEMENT

Understand what changes are occurring in Kivalliq migration, if any

OVERARCHING FEIS PREDICTIONS

Meadowbank: "The potential impacts of migration are complex and are likely to have both positive and negative components, but of low magnitude. Any effects of migration are long term but are likely to be low significance. It is not likely that migration to any other community than Baker Lake would be significant." (Cumberland Resources Ltd., 2006, p. 126)

Meliadine: "The cumulative effects of the Meliadine, Kiggavik, and Meadowbank Projects on in-migration might be less than the effects of each project individually considering the dampening effects on the volume of in-migration caused by the variation in the current progress of each project, presumed interdependence of certain projects, and resulting estimated labour force growth." (Golder Associates, 2014, p. 1-147)
"Migration impacts were projected only in Rankin Inlet, the closest community to the mine and the only one connected to the Project by road." (Golder Associates, 2014, p. 1-110)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
6.1 Employee migration						
Project Agnico Eagle Inuit employees residing outside Nunavut						There has been a gradual increase in the number of Inuit Meadowbank workers who now reside in outside of Nunavut, from 7 in 2011 to 21 in 2015 (or 7% of the Inuit workforce), though this number has remained stable in 2016 and 2017. The FEIS predicts both "positive and negative components" of migration but does not refer to migration out of Nunavut.
Total Inuit employees	N/A	↑	→	N/A	↑	
Proportion of Inuit to Non-Inuit employees	N/A	↑	→	N/A	↑	
6.2 Population estimates in Kivalliq communities						
Population estimates of Kivalliq communities						Yearly population estimates do not indicate an increase in the population growth rate of Baker Lake or of other communities with significant Meadowbank employment (Arviat, Rankin Inlet) since the mine opened, or relative to other communities in the region. If other factors (births and deaths) are assumed constant, the population data does not suggest significant migration to Baker Lake (or other communities with high Meadowbank employment).
Estimates in communities	↑	↑	↑	↑	↑	
Annual percent change	→	→	→	→	→	

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management and Mitigation

No specific programs are in place to manage or mitigate migration in the Kivalliq region.

6.1 Employee migration

Predictions

MEADOWBANK

The Meadowbank FEIS suggests that in-migration of Southerners to Baker Lake would be the primary concern.

MELIADINE

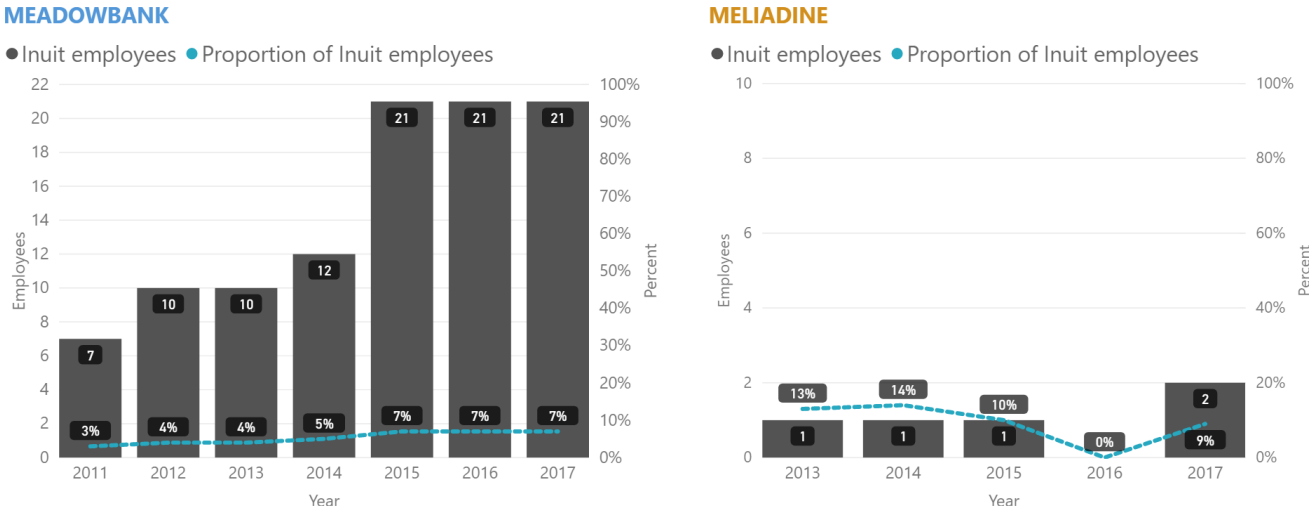
"It is likely that much of the potential in-migration happens when members of Kivalliq resident families return at home in the expectation of employment." (Golder Associates, 2014, p. 1-109)

"In-migration could also happen by out-of-area workers, especially during the operations phase." (Golder Associates, 2014, p. 1-110)

Data & Trends

Chart 24 shows the number and proportion of Agnico Eagle Inuit workers who are currently residing outside Nunavut.

Chart 24. Project Agnico Eagle Inuit employees residing outside Nunavut



(Agnico Eagle Mines, 2017)

Interpretation

2010 to 2013 saw a gradual increase in the number of Meadowbank Inuit workers who reside in outside the territory. In 2015, this number rose more substantially than in previous years, from 12 (4% of Inuit workforce) to 21 (7% of Inuit workforce). This number has remained constant in 2016 and 2017. Other migration data (e.g. Inuit workforce moving to/from Baker Lake following employment) is not available.

Meliadine's Inuit workforce residing outside of Nunavut ranged from 0 to 1 individuals from 2013 to 2016, and rose to 2 individuals in 2017 (9% of Inuit workforce). Given the relatively few Inuit employees at Meliadine, small fluctuations in the numbers can have large impacts on the percentage.

Employment at Agnico Eagle's projects provides Inuit workers with income and skills that may facilitate moving out of the territory. Other factors unrelated to the mines, such as the housing shortage in Nunavut, lower cost of living, and better educational and job opportunities in the provinces, may also contribute to out-migration.

6.2 Population estimates in Kivalliq communities

Predictions

MEADOWBANK

The Meadowbank FEIS states that “it is not likely that migration to any other community than Baker Lake would be significant”, but does not provide any specific predictions on changes to populations in Kivalliq communities.

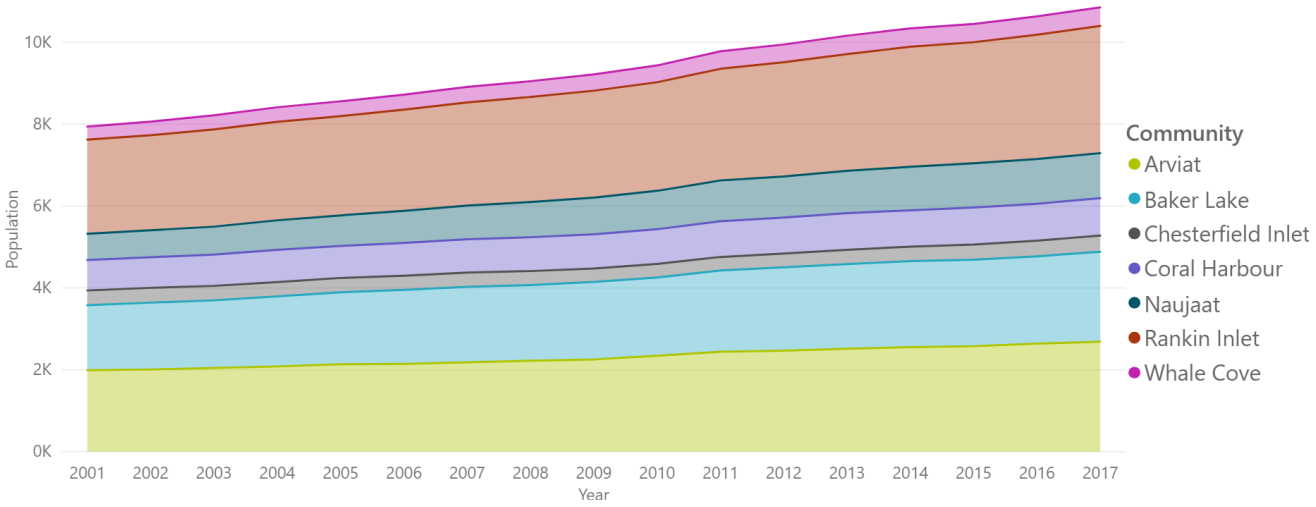
MELIADINE

“A large majority of in-migration is expected to occur in Rankin Inlet where the supply of public services could accommodate for increased demand.” (Cumberland Resources Ltd., 2014, p. 1-125)

Data & Trends

Chart 25 shows population estimates for Kivalliq communities.

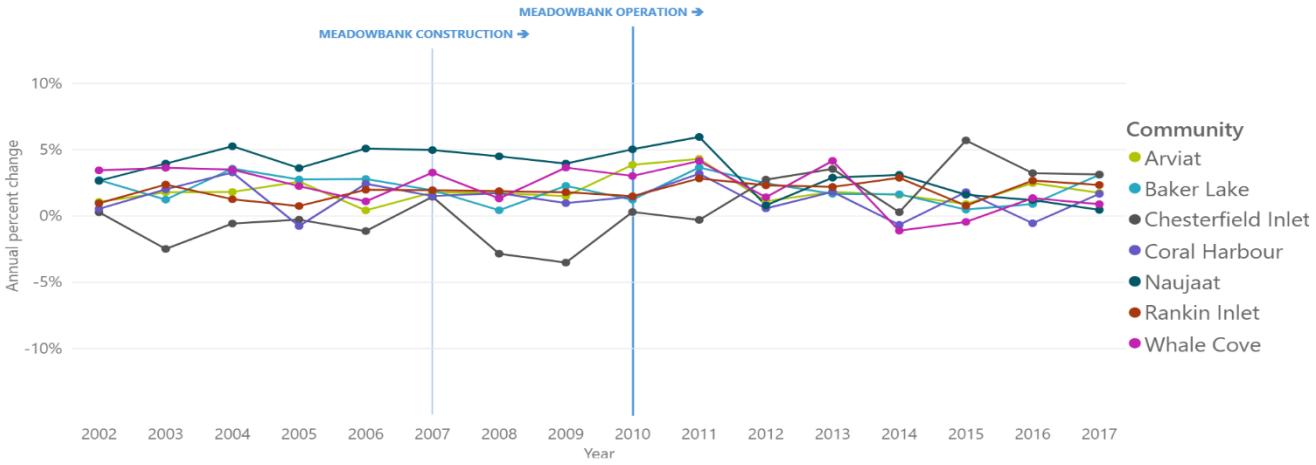
Chart 25. Population estimates of Kivalliq communities



(Statistics Canada, 2018)

Chart 26 shows the annual (year over year) percent change in the population estimates for Kivalliq communiteis.

Chart 26. Annual percent change in population estimates of Kivalliq communities



(Statistics Canada, 2018)

Interpretation

Population change results from the interaction of three variables: births, deaths, and migration. Migration can be for economic or other reasons. The populations of all Kivalliq communities have increased at a relatively steady rate since 2006. The data does not indicate an increase in the population growth rate of Baker Lake or of other communities with significant Agnico employment (Arviat, Rankin Inlet) since Meadowbank opened, or relative to other communities in the region. If other factors are assumed constant, the population data does not indicate any significant migration to Kivalliq communities with high Agnico employment.

The proportion of the Kivalliq population that are Inuit have remained relatively stable over this time (84% in 2016, the latest year for which data is available) (Nunavut Bureau of Statistics, 2016).

At this time, only Agnico Eagle's data on employees residing in outside of Nunavut suggest a possible impact of Agnico Eagle's projects on migration out of the Kivalliq. Without information on how many of these employees now residing outside of the territories originally resided in Kivalliq communities (and which ones), it is not possible to determine the significance of the change.

VSEC 7: Individual and Community Wellness

IMPACT / GOAL STATEMENT

Contribute and collaborate to enhance individual and community wellness

OVERARCHING FEIS PREDICTIONS

Meadowbank: Potential impacts on individual and community wellness are complex, far reaching, and given human nature, difficult to predict with certainty. Individual and community wellness is intimately associated with potential impacts on traditional ways of life as discussed above. In addition, however, individual decisions on the use of increased income, household management in relation to rotational employment, migration, public health and safety, disturbance particularly during the construction phase, and Cumberland's support for community initiatives are being negotiated in the IIBA are [sic] the other drivers that have the potential to effect [sic] individual and community wellness." (Cumberland Resources Ltd., 2006, p. 123)

Meliadine: The "Project may contribute to weakening of traditional culture." (Golder Associates, 2014, p. 1-C-46)
"The Project may result in a reduction of cohesion due to higher levels of inequality in the family or community." (Golder Associates, 2014, 1-C-50)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
7.1 Agnico Eagle Programs						
Agnico Eagle wellness programs offerings & utilization by project employees	N/A	/	/	N/A	/	Meadowbank and Meliadine have a number of ongoing programs that offer readiness, counselling and support services to employees and their families. Due to difficulties in assessing participation in counselling programs (in part due to privacy issues), no trends can be drawn on employee targeted program utilization. Program utilization offered to communities has increased over the past two years – largely due to the new Mandatory Training (Site Readiness) and Work Readiness programs.
Agnico Eagle wellness programs offerings & utilization by community members	N/A	↑	↑	N/A	↑	
7.2 Perceptions of health & wellness						
Self-reported effect of project on health & wellness	N/A	N/A	N/A	N/A	N/A	Data for this metric is currently unavailable.
7.3 Criminal violations						
Criminal violations per hundred people by Kivalliq community	↑	→	N/A	↑	N/A	Total criminal violation rates in Baker Lake and Rankin Inlet reached historic high levels in 2011 and 2012, following the opening of Meadowbank. Recent data (2017) indicates a continuing downward trend (since 2012) in criminal violations in Baker Lake, along with those in Arviat. However, Rankin Inlet and Chesterfield Inlet have seen sharp rises in criminal violations over the past one to two years.
Criminal violations per hundred people by type (Baker Lake, Rankin Inlet, Chesterfield Inlet)						
Baker Lake	→	↓	↓	→	↓	
Rankin Inlet	→	↓	↑	→	↑	
Chesterfield Inlet	↑	→	↑	↑	↑	
7.4 Health centre visits						
Health centre/clinic visits by Kivalliq community by reason for visit	N/A	N/A	N/A	N/A	N/A	Data for this metric is currently unavailable.
7.5 Housing						
Persons on waitlist for public housing by community	/	/	/	/	/	The number of persons on a waitlist for housing has been increasing in Baker Lake and Arviat steadily since 2010. Rankin Inlet has seen a substantial decrease in wait lists over this same period. This may be the result of additional construction of private dwellings as an economic center for the region.
7.6 Food security						
Food security by region or community	N/A	N/A	N/A	N/A	N/A	Data for this metric is currently unavailable.
7.7 Suicide						

Suicides per 10,000 people by region	/	/	/	/	/	There is a persistent and territory-wide suicide crisis in Nunavut. The factors contributing to suicide are numerous and complex, so it is difficult to assess impacts of Meadowbank on suicide rates. Community suicide rates (e.g. for Baker Lake) are highly variable from year to year. Trends are more apparent in long-term and/or regional data.

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management and Mitigation

A number of programs are in place to encourage individual and community wellness in the Kivalliq region, such as site tours for Kivalliq residents, community liaison, and counselling programs, as outline in Table 6 below.

Table 6: Agnico Eagle Individual and Community Wellness Management and Mitigation Initiatives

Program	Purpose / Description / Outcomes
Baker Lake Wellness Report & Implementation Plan	In the 2011 Meadowbank IIBA, Agnico Eagle committed to prepare for the KIA an annual community-driven report on the wellness of the Inuit residents of Baker Lake. Two Wellness Reports and Implementation Plans (for 2015 and 2016) have been developed and submitted. These are posted on the Agnico Eagle website. For the purpose of developing Hamlet wellness indicators that are meaningful to Baker Lake residents, qualitative community-based research was conducted to capture how Baker Lake residents define and perceive their Hamlet's wellness. Statistical information (including the data presented in this report, where community-specific data were available) was also included in the report.
Community Funding Agreements	In 2015, Agnico initiated new community activity agreements (Community Initiatives Fund Agreements) with the Hamlets of Baker Lake, Rankin Inlet, Arviat and Chesterfield Inlet. In 2017, Agnico established or renewed Community Initiatives Fund agreements with all Kivalliq hamlets. The purpose of the funds is to invest in community-based activities that will enrich the cultural and social wellbeing of the community. Each hamlet is responsible for the allocation of the funds in alignment with the purpose and is guided by the Agnico Donations Policy Agreement

Community Coordinators Program	In 2016, the Community Coordinators program expanded to sponsor part-time Agnico Eagle Coordinators in all Hamlets in the Kivalliq Region. Agnico Eagle's offices in the communities of Rankin Inlet and Baker Lake already had Agnico Eagle staff working full and part-time to provide community relations support.
	
	The objective of the community-based Agnico Eagle Coordinators is to provide a point of contact in each community to facilitate communications, provide services, and coordinate activities in the following areas:
	
	- Support to the HR department by:
	  ○ Assisting HR and other Agnico Eagle departments to locate employees or potential employees as required
	  ○ Contact employees in advance of their shift departure times
	- Support to the Recruitment team by guiding interested individuals in the application process outlined by the Labour Pool Process
	- Provide advice and assistance to Agnico Eagle to organize and hold information sessions in the community on Agnico Eagle projects and initiatives, including those Labour Pool and business opportunities initiatives outlined in the IIBAs
	- Provide updates to the Hamlet Council on Agnico Eagle activities

Program	Purpose / Description / Outcomes
	- Distribute Agnico Eagle information and promotional materials The increase of community involvement requirements for Agnico Eagle to achieve recruitment goals and the obligations for the NIRB and IIBA renders the Community Coordinators essential for Agnico Eagle's Nunavut operations. In 2017, the Community Coordinators attended Agnico Eagle training to ensure they have the proper tools and resources to fulfill their responsibilities.
Community Liaison Committee	Agnico Eagle continued to host meetings with the Meadowbank Community Liaison Committee in 2017 to discuss issues of concern or interest. The committee consists of various representatives including the Elders Society, youth, the business community, adult education committee, the Hamlet, Nunavut Arctic College and the Hunters and Trappers Organization of Baker Lake. Meetings are held in both English and Inuktitut and meetings are held at minimum twice per year, ideally four times per year. The Committee brings insight on issues and provides advice to Management on solutions.
Site Tours for Baker Lake Residents	Each year, Agnico Eagle offers a variety of ways for the residents of Baker Lake, as well as various other groups or individuals from the Kivalliq region, to visit Meadowbank Site. The list below outlines the major visits to the site during 2017: - Each year in August, Agnico Eagle invites the residents of Baker Lake to come on a site tour at Meadowbank Mine. In 2017, Meadowbank welcomed four (4) tours, for a total of approximately 100 visitors. - In January 2017, Meadowbank received the MLA and Mayor of Baker Lake - In October 2017, a site visit by the Baker Lake high school was held
Site Tours for Rankin Inlet Residents	In 2017, Agnico Eagle offered tours of the Meliadine site to approximately 100 residents of Rankin Inlet – approximately 100 visitors had the opportunity to visit the site.
Counselling Programs	Agnico Eagle offers a number of counselling programs for its employees and their families. These programs are described in further detail in section 7.1.

7.1 Agnico Eagle Programs

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS regarding community wellness programs and usage at Meadowbank.

MELIADINE

There are no predictions in the Meliadine FEIS regarding community wellness programs and usage at Meliadine.

Data & Trends

Chart 27 provides an overview of wellness programs offered by Agnico Eagle to its employees. Utilization data of Inuit counselling and on-site visits by nurses and doctors are not tracked by Agnico Eagle.

Chart 27. Agnico Eagle wellness programs offerings & utilization by project employees

Wellness program / initiative	2011	2012	2013	2014	2015	2016	2017	**Total**
Coping with FIFO Program				24	64	12		**100**
Employee Assistance Program	2	2	3	6	6	52	57	**128**
Inuit counseling					not measured			**0**
On site visits by nurses & doctors					not measured			**0**

(Agnico Eagle Mines, 2017)

Chart 28 provides an overview of wellness programs offered by Agnico Eagle to Kivalliq community members.

Chart 28. Agnico Eagle wellness programs offerings & utilization by community members

Wellness program / initiative	2012	2013	2014	2015	2016	2017	**Total**
Elder Visition Program / Eld...	12	12	8	4	23		**59**
Site Readiness Program				155	128	193	**476**
Work Readiness Program				155	151	240	**546**

(Agnico Eagle Mines, 2017)

Interpretation

It is difficult to assess participation in counselling programs at Meadowbank, as privacy concerns limit the ability to track or publicize this information. Where data can be and are collected, all counselling programs have seen some usage by their intended audience. The use of the Family Employee Assistance Program increased significantly in 2016 and remained at a high level 2017. The Family Employee Assistance Program consists of two services: one from Consultants BCH and the other from Homewood. Agnico Eagle is reviewing the data to determine if this large increase is due to change in actual program usage or reporting inconsistencies.

The Elder Visitation Program was less used in 2015 than in 2014 (falling from 8 to 4 visits). Although the program was not formally in place in 2016, there were 23 Elder visits on site during the year including 3 elders who attended Country Food Nights and 20 elders attending during Baker Lake Residents Visits. There were no recorded visits from elders to site in 2017, however elders involvement is a major part of Module 0 in the Leadership Development Program, which is held in Baker Lake. During this day visit to Baker Lake, there is a question-answer period between Agnico Eagle staff and a panel of elders, who speak about the history of the hamlet and provide advice on how supervisors can incorporate Inuit Quajimajatunqangit into their supervision practices. Agnico Eagle and KIA are working to have an Elder assigned to work with each IIBA On-Site Working Group (at Meadowbank and Meliadine) in 2018.

The Coping with FIFO (fly-in fly-out) program did not run in 2017, due to the loss of KMTS funding. Previous years had seen program participation fluctuate between 12 and 64 persons per year. While three sessions took place at Meadowbank in 2015-16, Agnico Eagle noted that recruiting participants for this program in its last year was challenging.

7.2 Perceptions of health & wellness

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS regarding the perceptions of health and wellness in the Kivalliq region.

MELIADINE

"Perceptions of Project effects may lead to mental stress and changes in behaviour (i.e., diet)." (Golder Associates, 2014, p. 1-C-48)

Data & Trends

As part of the revised SEMP, Agnico Eagle has committed to the development of an Inuit employee survey to gather data and insights on health and wellness, along with other topics. This survey was not administered during the 2017 reporting year.

7.3 Criminal violations

Predictions

MEADOWBANK

There are no specific predictions in the Meadowbank FEIS regarding criminality in the Kivalliq region.

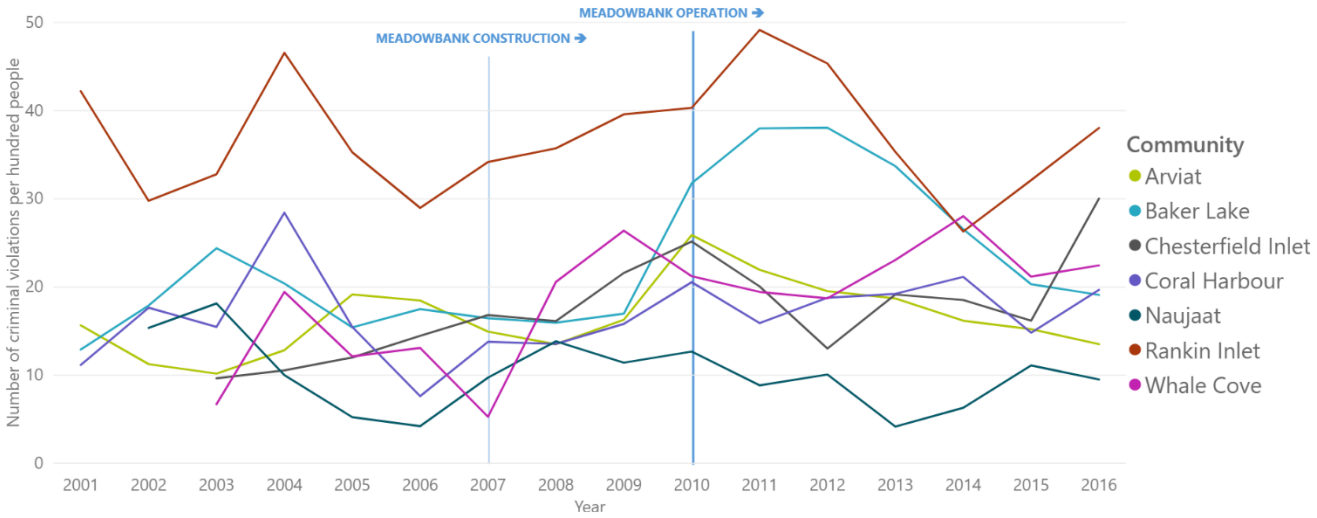
MELIADINE

"The Project may result in increased social inequality leading to higher crime rates." (Golder Associates, 2014, p. 1-C-49)

Data & Trends

Chart 29 shows the criminal violations rate (number of violations per 100 people[6]) for each community in the Kivalliq region from 1999 to 2016, the latest year for which data is available.

Chart 29. Criminal violations per hundred people by Kivalliq community

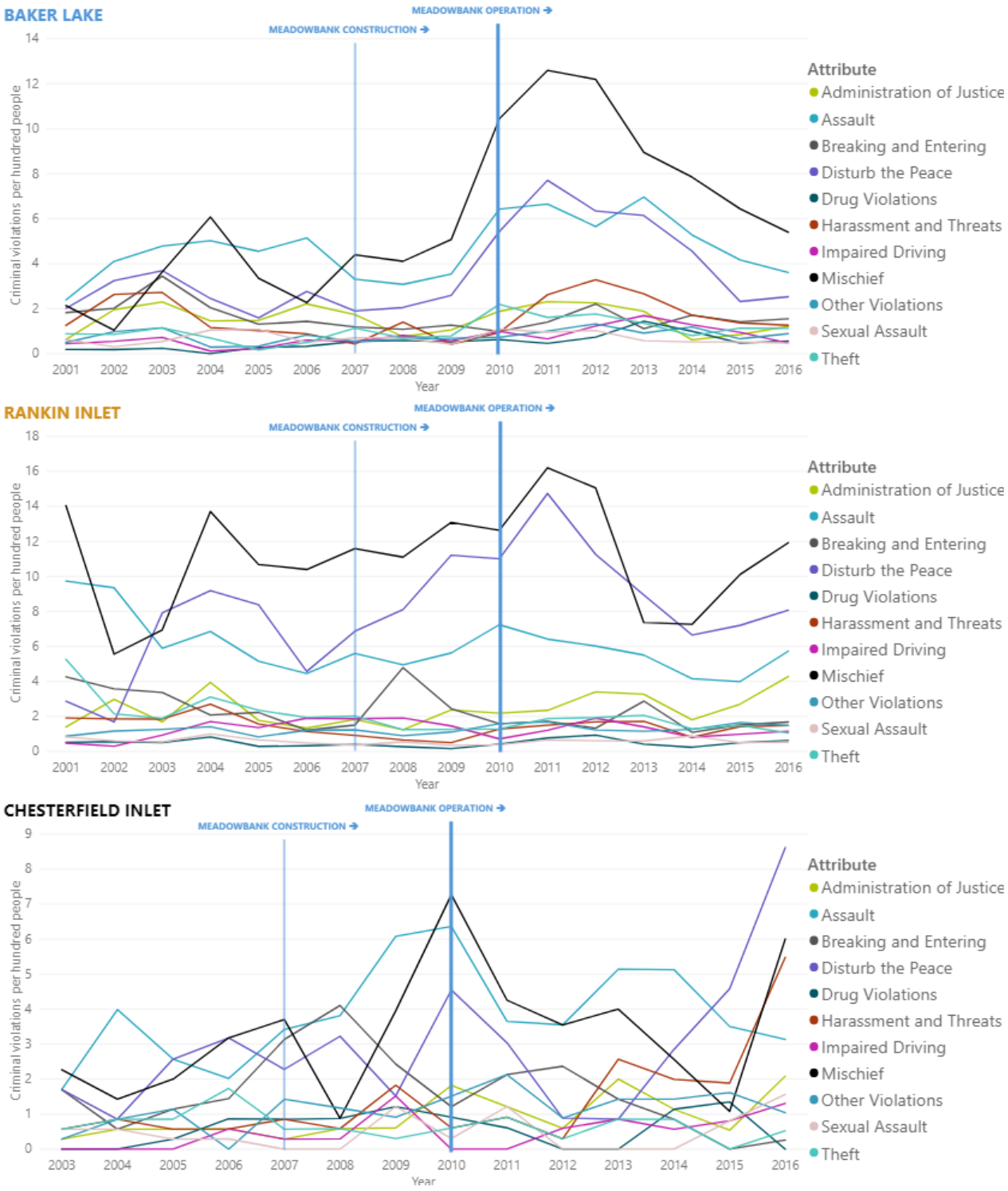


(Statistics Canada, 2017a)

Chart 30 shows the criminal violations rate by type for Baker Lake, Rankin Inlet and Chesterfield Inlet to 2016, the latest year for which data is available.

[6] Note that StatsCan provides criminal violation data per 100,000 people. The report authors use a per 100 people measurement that is more intuitive in a Nunavut context

Chart 30. Criminal violations per hundred people by type (Baker Lake, Rankin Inlet, Chesterfield Inlet)



(Statistics Canada, 2016e; Statistics Canada, 2017b)

Interpretation

With the exception of Rankin Inlet, all communities had fewer than 25 total criminal violations per hundred people in the 2006 - 2009 period (baseline). Baker Lake, Rankin Inlet, and Arviat all experienced significant increases in total criminal violation rates since the Meadowbank mine began production. Additional expendable income can lead to alcohol and drug abuse and intensify existing social problems such as violence; a high percentage of police call-outs are believed to be related to alcohol (Buell, 2006). This is further supported by a recent study, which found that the proximity of mines had a larger impact on an individual's average alcohol consumption per week than proximity to casinos or bars (Godfrey, 2017).

After 2010, the total criminal violations rate in Arviat steadily decreased and returned to approximately 2006-levels in 2013 and continued to decline through 2016. Total criminal violation rates in Baker Lake and Rankin Inlet reached historic high levels of approximately 51 and 47 per 100 people, respectively, in 2011 and 2012. Recent data indicates a downward trend (since 2012) in criminal violations in Baker Lake, with the 2016 number slightly above the 2006-2009 baseline. While Rankin Inlet experienced a similar decline up until 2014, the total number of criminal violations in the community has increased over the past 2 years.

In Baker Lake, rates of harassment and threats, mischief, disturbing the peace, and theft more than doubled or tripled in the early years following the beginning of mine production (2010 – 2012). The rates of more serious crimes, including assault and sexual assault, also increased significantly (by 65% - 95%) during this same period. With the exception of assault, impaired driving, and drug violations, there was a decrease in all types of violations in Baker Lake in 2013, consistent with the decrease in the rate of total criminal violations. 2015 and 2016 saw continued decrease in the most common violations (assault and mischief) and relatively stable levels of other violations.

Rankin Inlet similarly saw a rise in mischief, disturbing the peace and assaults up until 2012, which was followed by a decline in most types of crime in 2013 and 2014. 2015 and 2016 saw a steady rise in these most common violation, though still below their 2011 highs.

From 2015 to 2016, Chesterfield Inlet experienced sharp increases in the rates of mischief, harassment and threats, and disturbing the peace, with the last two violation types reaching all-time highs for the available data. In 2016, the total criminal violation rate in Chesterfield Inlet was the second highest among Kivalliq communities.

7.4 Health centre visits by reason for visit

Predictions

MEADOWBANK

"The potential public health and safety impacts of the project, of unknown magnitude, are negative, and, because there is such high impact at the individual level in the event that a risk is realized, the effects must be considered long term and of high significance." (Cumberland Resources Ltd., 2006, p. 126)

MELIADINE

There are no specific predictions on the use of GN Health services from a wellness perspective in the Meliadine FEIS. (though other relevant predictions are provided in VSECs 8 and 9).

Data & Trends

Data unavailable at this time.

7.5 Housing

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS regarding housing in the Kivalliq region.

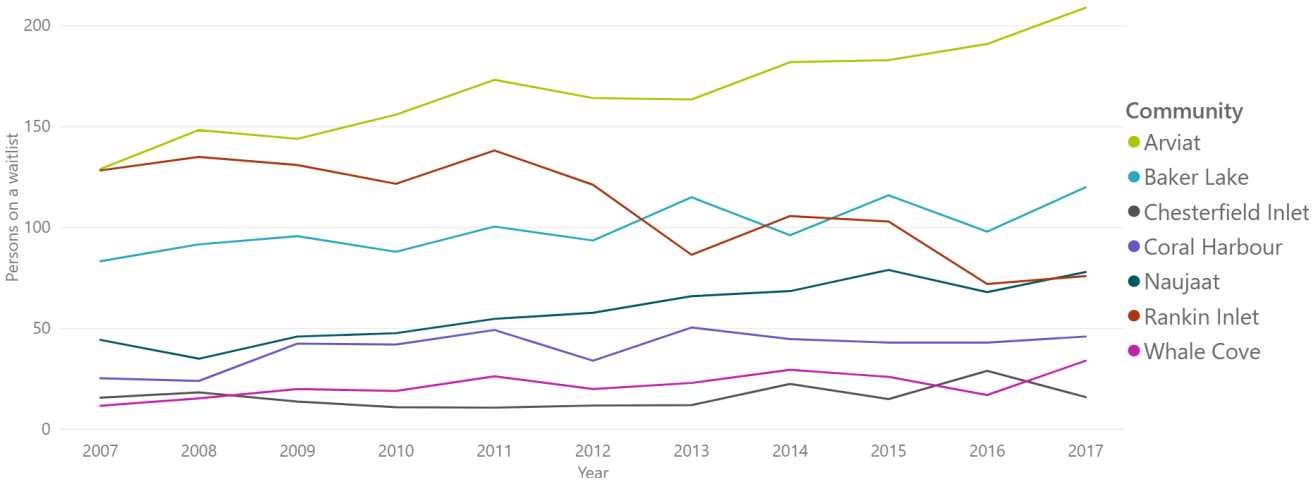
MELIADINE

“Project may induce in-migration to Rankin Inlet leading to overcrowding of housing and detrimental public health effects.” (Cumberland Resources Ltd., 2014, p. 1-C-48)

Data & Trends

Chart 31 shows the number of citizens in the Kivalliq region who were on a waiting list for public housing in 2010, by community.

Chart 31. Persons on waitlist for public housing by community



(Nunavut Housing Corporation, 2018)

At the time of this report, data on overcrowding rates was not available.

Interpretation

Housing in Nunavut is largely government owned and controlled. Therefore, the dynamics of housing supply and demand in response to changes in individual income are different than those one might expect in other housing markets in Canada.

The number of persons on a waitlist for housing has been increasing in Baker Lake and Arviat steadily since 2010. Rankin Inlet has seen a substantial decrease in wait lists over this same period. This may be the result of additional construction of private dwellings as an economic center for the region.

The relationship between housing conditions and mining activity in the Kivalliq region is unclear, but there is a range of potential pathways of effects. For example, increased income may lead to an increase in the construction and purchase of private housing, and a decrease in waitlists or overcrowding rates. However, increased in-migration (as noted as a potential impact to Rankin Inlet in the Meliadine FEIS) could increase overcrowding and waitlists. Currently, the data does not indicate increased in-migration as a result of the mines as a pathway affecting housing outcomes.

While a useful indicator, waitlists only tell a small part of the story of housing in Nunavut. The last comprehensive survey completed on housing in Nunavut was the 2010 Nunavut Housing Needs Survey (NHNS). The survey provided a more comprehensive picture of the state of and attitudes around housing in the territory. For example, the NHNS found that 65% of Kivalliq public housing was below housing standards – either being overcrowded or requiring major repairs or both.

7.6 Food security

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS specifically related to impacts on the consumption of country foods.

MELIADINE

- "The Project will have a negative effect on food security in that perceptions of the Project may lead to mental stress and changes in behaviors (i.e., diet)." (Golder Associates, 2014, p. 113)
- "Project employment may increase time and resources available for harvesting nutritious country foods." (Golder Associates, 2014, p. 1-C-46)

Data & Trends

The Inuit Health Survey reported that nearly 70 per cent of Inuit households in Nunavut are food insecure. This is over eight times higher than the national average and among the highest documented food insecurity rates for an Indigenous population in a developed country. However, there is currently no source of annual government data on food security in the Kivalliq region and for individual Kivalliq communities[7]

7.7 Suicide

Predictions

MEADOWBANK

There are no specific predictions in the Meadowbank FEIS regarding suicide in the Kivalliq region.

MELIADINE

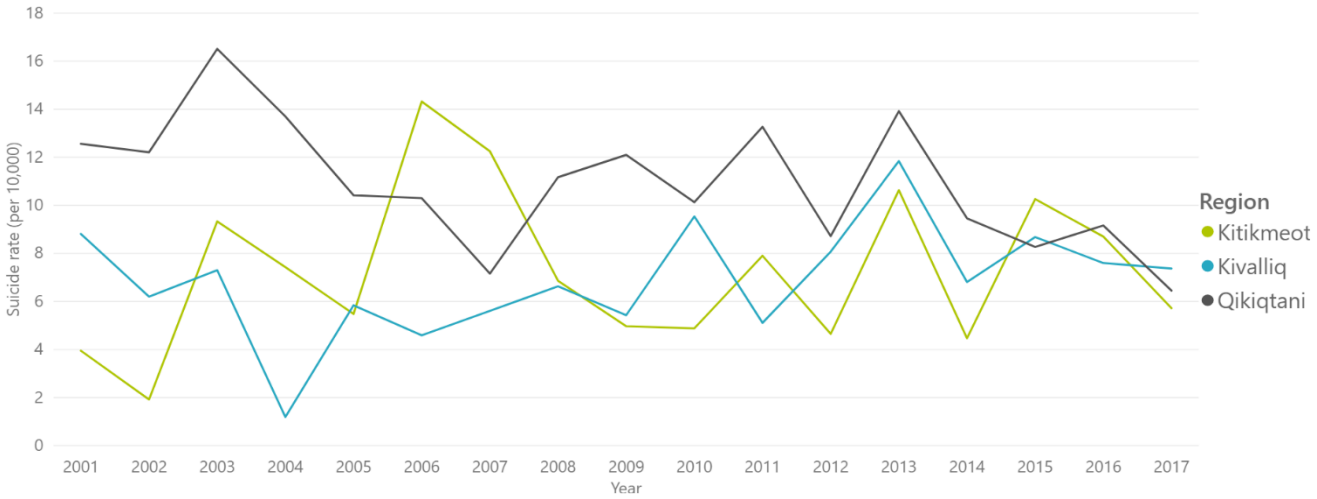
There are no specific predictions in the Meliadine FEIS regarding suicide in the Kivalliq region.

Data & Trends

Chart 32 shows the suicide rate per 10,000 people by region from 2000 to 2017.

[7] http://www.nunavutfoodsecurity.ca/sites/default/files/files/Resources/Strategy/NunavutFoodSecurityStrategy_ENGLISH.pd

Chart 32. Suicides per 10,000 people by region



(Department of Justice, 2018)

Interpretation

Suicide rates in Nunavut remains at crisis levels, ranging from 5 to 25 times the rate of suicide in Canada (NTI, 2016). As shown in Chart 32, the suicide rate in all three regions of Nunavut in 2017 is similar to that in 2000. Underlying risk factors are numerous and long-standing; they range from the effects of historical trauma and its symptoms to the high rates of child sexual abuse, alcohol and drug use, poverty, high school dropout rates, and the cultural losses brought about by residential schools and forced relocations.

Due to the persistent and territory-wide nature of this crisis, it is difficult to assess the impacts of Agnico's projects on suicide rates in Kivalliq communities (Eggerston, 2015). Furthermore, given the small populations of Kivalliq communities and the highly variable numbers of suicides observed in each community, short-term trends are difficult to discern. The number of suicides in the Kivalliq region each year from 2010 to 2017 were: 8, 5, 8, 12, 7, 9 and 8 and 8. These numbers alone do not point to a particular trend since Meadowbank began production.

In July of 2016, NTI released the National Inuit Suicide Prevention Strategy, which sets out a series of actions and interventions to address the high number of deaths by suicide among Inuit. The Strategy promotes a shared understanding of the context and underlying risk factors for suicide in Inuit communities and guides policy at the regional and national levels on evidence-based approaches to suicide prevention (NTI, 2016). Other community level programs – including B.L.A.S.T. (Baker Lake Against Suicide Team) – are working to address the suicide crisis at the hamlet-level.

VSEC 8: Health and Safety

IMPACT / GOAL STATEMENT

Strong health and safety culture. Zero workplace accidents.

OVERARCHING FEIS PREDICTIONS

Meadowbank: The FEIS considers both the health and safety of workers and the public and recognizes that one may affect the other. “Health and safety of workers and the population at large is subject to legislation and perhaps more importantly to best practices. Health and safety training also has applications in personal life – workers often not only use new health and safety training on-the-job, but also at home in the course of daily tasks.” (Cumberland Resources Ltd., 2006, p. 126)

Meliadine: “Project health and safety training may improve health and safety at mine site and outside of the workplace.” (Golder Associates, 2014, p. 1-C-49)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
8.1 Health and safety training						
Average (per FTE) mandatory training hours provided to Agnico Eagle Inuit employees	N/A	/	→	N/A	↑	A steady increase in overall mandatory training hours for full-time employees has occurred at both Meadowbank and Meliadine from 2015 to 2017. Health and safety training increased for Inuit and non-Inuit employees in 2017 at Meliadine. None of the data collected permits an assessment of the impacts of Agnico Eagle’s projects and their programs on the general health status of workers and their families.
8.2 Health and safety on-site						
Average (per-FTE) visits by project Agnico Eagle employees to clinic for work-related or other reasons	N/A	↓	→	N/A	↓	There was a small rise in visits to Agnico Eagle clinics for work-related injuries in 2017, though this is largely accounted for by an increase in employment. Overall, the number of clinic visits has been fairly stable since 2012, and the clinic continues to serve an important function in addressing the health and medical needs of workers.
Project combined lost-time and light duty accident frequency (per 200,000 person-hours)	N/A	↓	↑	N/A	↓	Lost-time and light duty accident frequency decreased for four years in a row up to 2015 but increased in 2016 (from .57 to .72) and in 2017 to 1.62.

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management and Mitigation

A number of training programs are in place to support a strong health and safety culture and minimize health and safety incidents at Meadowbank and Meliadine, as outlined in Table 7 below.

Table 7: Agnico Eagle Health and Safety Management and Mitigation Initiatives

Program	Purpose / Description / Outcomes
Emergency Response Team (ERT) Training	Meadowbank employs an Emergency Response Team (ERT) to assist and help in any type of situation. To join the team, a candidate must demonstrate: an interest in safety, good attendance and good behaviour at work, and be in good physical condition. An ERT practice takes place weekly and each member must attend at least six (6) practices throughout the year. In 2017 there were no Inuit members.
JOH&S Committee Training	Members of the Joint Occupational Health and Safety (JOH&S) committee received training in order to improve their skills related to the management of Health & Safety. The training covered various topics including: Roles & Responsibilities of the JOH&S committee, interpretation of the Mines Act & Regulations, conducting inspections, conducting accident/incident investigations due diligence, part of the Criminal code and Supervision Formula training as well as a coaching phase. Both the Meadowbank and Meliadine JOH&S Committee has Inuit representation.
Employee Health & Safety Training	General health and safety training, as required by the *Nunavut Mine Act*, and in line with Agnico Eagle's Health and Safety policies, is provided in English, French and Inuktitut prior to an employee's arrival on site. Further information is provided in section 8.1.

8.1 Health and safety training

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS regarding health and safety training at Meadowbank.

MELIADINE

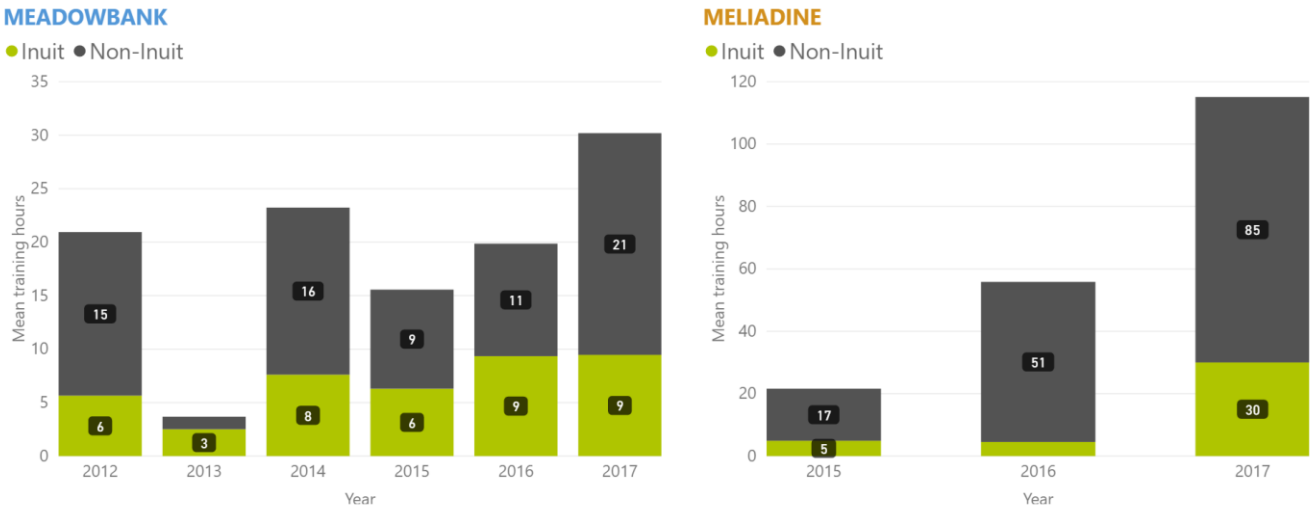
"Project health and safety training may improve health and safety at mine site and outside of the workplace." (Golder Associates, 2014, p. 1-C-49)

Data & Trends

Chart 33 shows average mandatory training hours provided to Inuit and non-Inuit employees. This is calculated by putting the total number of training hours over the number of FTE employees. Mandatory training includes:

- **Health and Safety training** includes mandatory training related to compliance with the Nunavut Mine Act, as well as training that is mandated according to Agnico Eagle Health and Safety policies. Many of these training sessions are offered via e-learning prior to the employee's arrival on site. Other health and safety training relevant to an individual's job is also provided on site.
- **General training** consists of training activities required at a departmental level and covers many employees working in different departments. General training includes training on light duty equipment as well as enterprise software systems and cross-cultural training.

Chart 33. Average (per FTE) mandatory training hours provided to Agnico Eagle Inuit employees



(Agnico Eagle Mines, 2017)

Interpretation

A steady increase in overall mandatory training hours for full-time employees has occurred at both Meadowbank and Meliadine from 2015 to 2017. For full-time Inuit employees at Meadowbank, the average number of training hours was maintained from 2016 to 2017, while non-Inuit hours almost doubled. This is likely due to increased activity at Whale Tail, where the majority of staff are contractors. Additionally, there is a 3-year mandatory refresher for many H&S courses, including e-learning, required by Agnico Eagle. This may partially explain the bumps at Meadowbank in 2014 and 2017 for non-Inuit employees, as the relatively higher turnover for Inuit employees would make this effect less pronounced.

None of the data collected permits an assessment of the impacts of Agnico Eagle's projects and their programs on the general health status of workers and their families outside the workplace.

8.2 Health and safety on-site

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS regarding health and safety on-site at Meadowbank.

MELIADINE

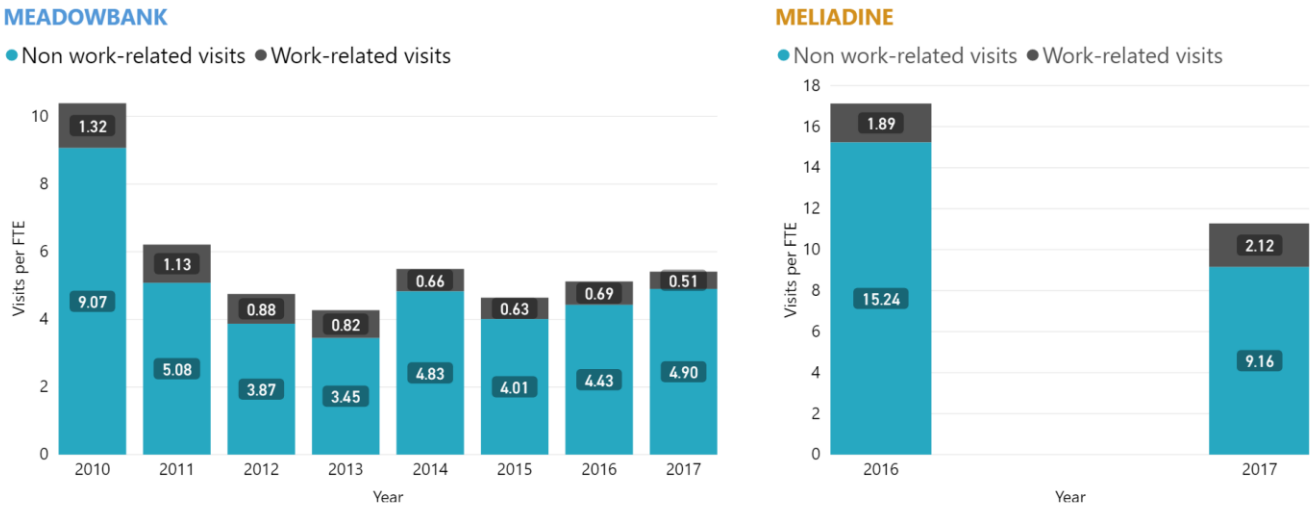
There are no predictions in the Meliadine FEIS regarding health and safety on-site at Meliadine.

Data & Trends

The following charts provide an overview of the health and safety performance for Meadowbank and Meliadine.

Chart 34 shows the visits per FTE to Agnico Eagle clinic for work-related reasons (e.g. injuries) or other reasons (e.g. personal conditions ranging from minor ailments, such as colds, to severe conditions, such as myocardial infection).

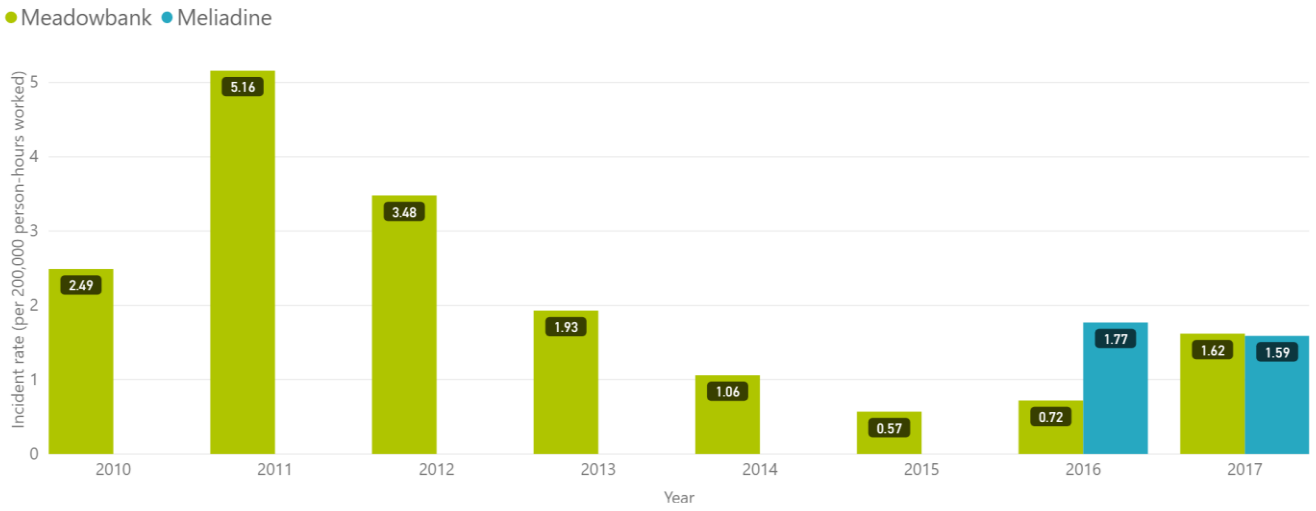
Chart 34. Average (per-FTE) visits by project Agnico Eagle employees to clinic for work-related or other reasons



(Agnico Eagle Mines, 2017)

Chart 35 shows the combined lost-time and light duty accident frequency on site, per 200,000 person-hours worked.

Chart 35. Project combined lost-time and light duty accident frequency (per 200,000 person-hours)



(Agnico Eagle Mines, 2017)

Interpretation

In all years, over 80% of visits to Agnico Eagle clinics, at both Meadowbank and Meliadine, have been for non-work-related conditions. It appears that the clinics serve an important function in addressing the general non-work-related health/medical needs of workers.

Clinic visits at Meadowbank for work-related injuries declined from 1.3 visits per FTE in 2010 to 0.66 in 2014, and have remained stable in the following years – ranging from 0.51 to 0.69 visits per FTE. The decline in visits for work-related injuries is consistent with overall improvements in health and safety performance at the mine that are also reflected in the lost time and light duty accident frequency rate.

Clinic visits at Meliadine for work-related injuries increased from 1.8 visits per FTE in 2016 to 2.1 in 2017, which is somewhat higher than the number of visits per FTE at Meadowbank at the beginning of operation.

The lost time and light duty accident frequency rate (incidents per 200,000 person-hours worked) at Meadowbank decreased from a high of 5.16 in 2011 to 0.57 in 2015. Since then, the rate has increased each year to a level of 1.62 in 2017 but remains historically low when compared to 2010 to 2013. The recent increases may be the result of increased activity at the Whale Tail deposit.

The lost time and light duty accident frequency rate at Meliadine decreased slightly in 2017 to 1.59, which is similar to the rate at Meadowbank.

Beginning in 2012, Agnico Eagle developed and then implemented its Responsible Mine Management System, which includes workplace health and safety management. The current data does not provide any indication of how health and safety training is affecting practices at home and community health and safety outcomes.

VSEC 9: Community Infrastructure and Services

IMPACT / GOAL STATEMENT

- Community infrastructure (transportation, energy, water, services) is maintained
- Social assistance costs are reduced during and beyond the life of the mines

OVERARCHING FEIS PREDICTIONS

Meadowbank: "The impacts on social services and infrastructure, of low to medium magnitude, are considered largely positive in the medium term and of moderate significance. There is some potential for closure to have a negative impact on social service delivery." (Cumberland Resources Ltd., 2006, p. 128)

Meliadine: "The Project will increase demand on various public services, putting additional pressure on resources, and human resources in particular. This would have a negative effect on users. However, increased training of labour force could have a beneficial effect on capacities in the long-term." (Golder Associates, 2014, p. 1-C-53)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
9.1 Use of GN health services						
Kivalliq community health centre visits per capita	↓	↑	N/A	↑	N/A	Per capita health centre visits in communities with the most Agnico Eagle employees (Baker Lake, Rankin Inlet, and Arviat) are beginning to show an upward trend, most notably in Baker Lake and Arviat. The number of employees referred to their community health care centres for personal or work-related reasons ranges from 14 to 58 people per year, though it is difficult to draw a relationship between changes in this indicator and use of GN Health Services.
Persons transported from site to access health services (province & Nunavut)	N/A	↑	↓	N/A	↑	
Incidents requiring use of GN health services	N/A	/	↓	N/A	↑	
9.2 Use of public infrastructure						
Estimates of use of public physical infrastructure directly related to Project (airports, port, meeting facilities, roads)	N/A	N/A	N/A	N/A	N/A	The use of public physical infrastructure by Meadowbank and its employees consists primarily of the use of airports and has been relatively consistent since operation began in 2010. There are no indications of significant positive or negative impacts on this infrastructure. Having just begun construction and development in 2017, it is too soon to conclude what impacts Meliadine may be having on Rankin Inlet's airport or port.
All-weather access road (AWAR)	N/A	/	↓	N/A	N/A	
9.3 Social assistance						
Per capita social assistance expenditures by community	↓	/	N/A	↓	N/A	Despite declines from historical highs, social assistance data does not show a clear correlation between mine-related employment and social assistance requirements in Baker Lake or Arviat. Data suggests that both expenditures and percentage of households receiving social assistance have been declining in Rankin Inlet since Meadowbank opened.
Percentage of households receiving social assistance by community	↓	↓	↓	↓	↓	

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management and Mitigation

Local community infrastructure and services capacity was taken into account in the project design for both Meadowbank and Meliadine, leading to a number of operational decisions, including an on-site clinic at both projects as well as the on-site airstrip at Meadowbank. Further, a number of Agnico Eagle's economic programs are meant to improve community infrastructure and services in the long term. For example, programs which aim to increase local employment, contracting and business opportunities can reduce social assistance expenditures over time. These programs are outlined in the respective sections of this report (see VSEC 1 and 3).

9.1 Use of GN health services

Use Predictions

MEADOWBANK

"Increased employment and business opportunities will result in increased income, a measure of economic security, capacity building that will contribute to employability over the long term, and improved self-image of employees and their families. This could result in reducing dependence on government social services." (Cumberland Resources Ltd., 2006, p. 128)

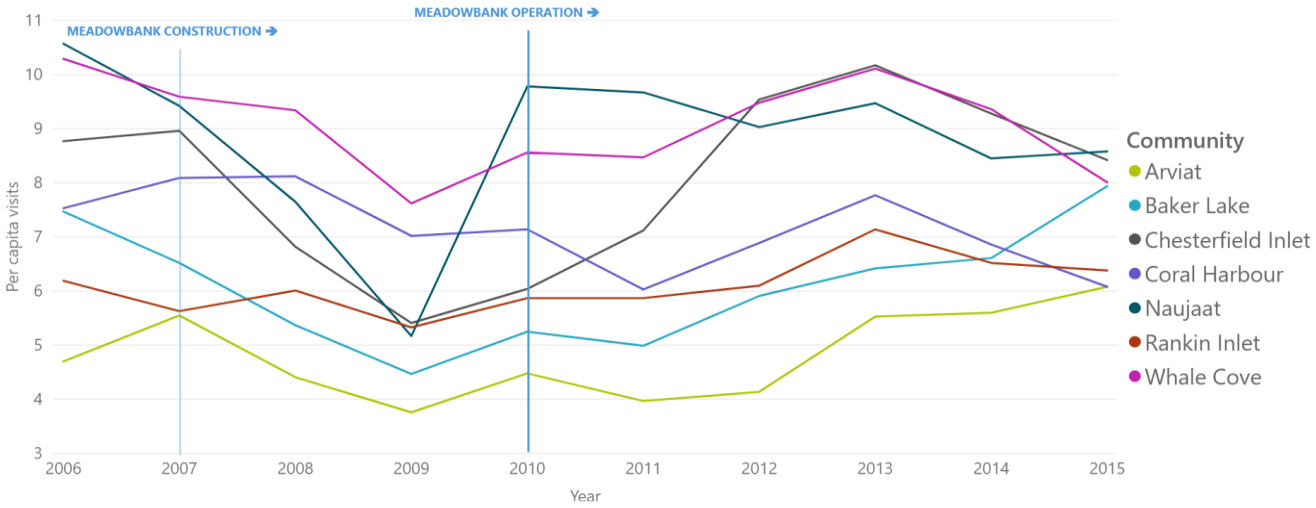
MELIADINE

"Project-induced in-migration may increase demand on health services" (Golder Associates, 2014, p. 1-C-58)

Data & Trends

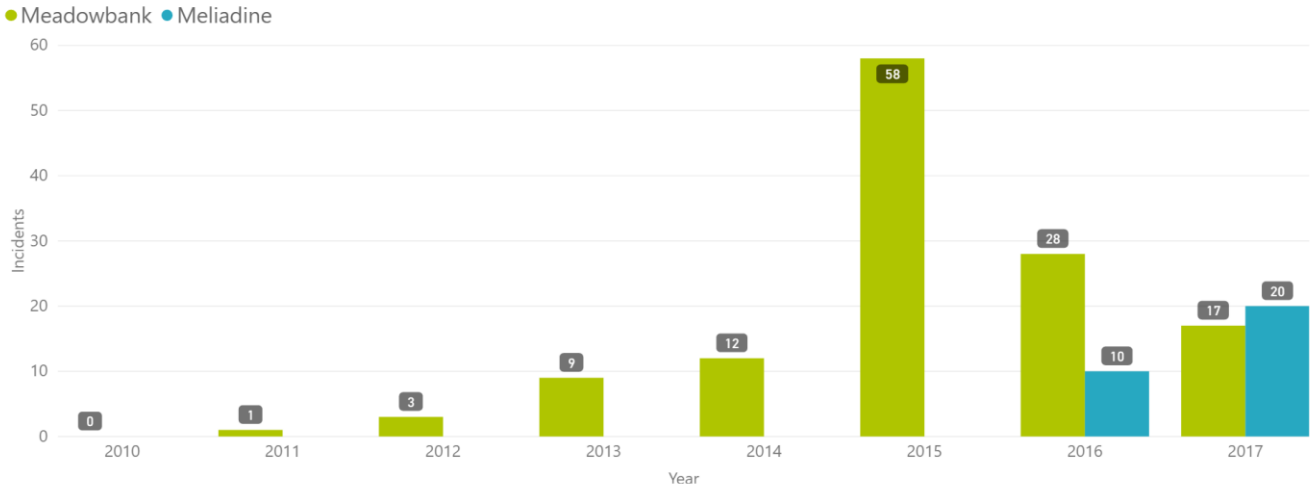
Chart 36 shows the number of per capita visits to community health centres in Kivalliq communities.

Chart 36. Kivalliq community health centre visits per capita



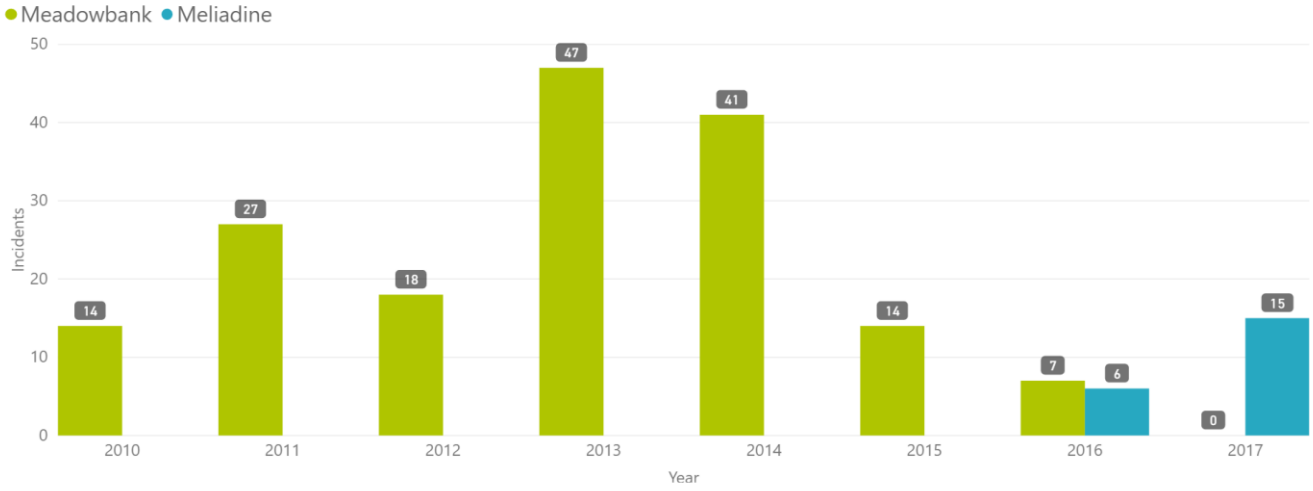
(Department of Health, 2017)

Chart 37. Persons transported from site to access health services (province & Nunavut)



(Agnico Eagle Mines, 2017)

Chart 38. Incidents requiring use of GN health services



(Agnico Eagle Mines, 2017)

Interpretation

Most Kivalliq communities experienced steady or declining community health centre visits up to 2009. From 2009 to 2010, which coincides with Meadowbank's start-up and operation, per capita visits increased in every community except Coral Harbour. However, since 2010, per capita visits have remained relatively steady in most communities with the exception of Chesterfield Inlet and Baker Lake. While per capita visits increased slightly in Baker Lake from 2011 to 2013, the levels remain lower than 2006 and 2007 levels. In 2017, per capita visits increased in Arviat and Baker Lake, and decreased in Rankin Inlet.

Additional information on the reasons for health centre visits and client demographics may provide more insight on the reasons for changes observed in each community, including the noteworthy increase in Chesterfield Inlet and potential linkages to the Meadowbank mine and/or other factors. Currently, this data alone does not indicate:

- whether a Meadowbank worker, on average, is a higher user of health care services than other workers or unemployed people or if there is a counter effect where employees use on-site medical services in lieu of GN health services while on rotation; and

- to what extent these referrals are for work-related reasons.

From 2010 to 2015, there was a continuous increase in the number of persons transported from the site to access health services (provinces and Nunavut), from 0 in 2010 to 58 in 2015. This number has declined in recent years and was 17 persons transported in 2017.

From 2010 and 2016, there have been 7 to 47 incidents per year that have required GN Health Services. The number of these incidents peaked in 2013 and 2014, and have since declined significantly with zero incidents reported for 2017.

9.2 Use of public infrastructure

Predictions

MEADOWBANK

"The impacts on social services and infrastructure, of low to medium magnitude, are considered largely positive in the medium term and of moderate significance. There is some potential for closure to have a negative impact on social service delivery." (Cumberland Resources Ltd., 2006, p. 128)

MELIADINE

There are no specific predictions in the Meliadine FEIS regarding the use of public infrastructure.

Data & Trends

The Meadowbank mine has dedicated energy, water, transportation (airstrip and road), health and communications infrastructure and is therefore largely non-reliant on the public physical infrastructure of Baker Lake. Areas of potential impact on public infrastructure include the use of Kivalliq community airports to transport Nunavut employees between their home communities and the mine site and the use of community meeting spaces for public engagement. The operation also uses the community barge landing facilities, which is located east of the hamlet. Travel through the hamlet is not required to transport sealift materials from the barge to the site.

The all-weather access road connecting Baker Lake to the Meadowbank mine (Meadowbank AWAR) was constructed and paid for by Agnico Eagle. Meadowbank controls traffic on this road, but it is accessible to community members to provide access to hunting trails and participate in traditional activities by snowmobile and ATV. The Meadowbank AWAR community use is measured at 2366 trips in 2015; 1874 in 2016 and 1716 in 2017.

The Meliadine mine also has its own dedicated energy, water and communications infrastructure as well as an on-site health clinic. However, unlike Meadowbank, the Meliadine may use local health care facilities in certain cases. Meliadine also uses community meeting spaces for public engagement. Regarding transportation infrastructure, Meliadine uses the Rankin Inlet airstrip for all employee transport, although the airport itself is not used for chartered flights. Meliadine also uses the community barge landing and boat launch area, with the location of this area is much more central in Rankin Inlet as compared to Baker Lake. Until October 2017, Agnico Eagle also used the community tank farm during the installment and commissioning of its own tanks.

The all-weather access road connecting Rankin Inlet to the Meliadine mine (Meliadine AWAR) was constructed and paid for by Agnico Eagle from kilometer 7, with the addition of a new bridge spanning Char River on the hamlet's section of road. In 2017 Agnico Eagle used the hamlet's roads from the barge lay-down area to kilometer 7, although Agnico Eagle's use of community roads will drop significantly once the by-pass road (currently in construction) is finished in 2018. Meliadine AWAR community use is not yet measured.

2017 estimates of use of this infrastructure directly related to Meadowbank are as follows:

- Use of Baker Lake Airport to access commercial flights (estimates not available)
- Barges received in Baker Lake 9 vessels for 87 000 m^3 (or 4 full vessels)
- Use of Baker Lake Community Centre: Between 5 and 10 times per year
- Use of other Nunavut airports to access commercial/chartered flights: Between 2000 and 3000 times per year (passenger trips)

2017 estimates of use of infrastructure directly related to Meliadine are as follows:

- Use of Rankin Airport to access commercial flights (estimates not available)
- Use of Rankin Inlet airstrip for cargo and passengers: 196 flights
- Barges received in Rankin Inlet: 13 vessels for 176 000 m^3 (or 8.5 full vessels)
- Use of Rankin Inlet Community Hall (estimates not available)
- Use of the community boat launch area for barge landings (estimates not available)
- Use of the hamlet roads to transport goods from the barge to the operations (estimates not available)
- Use of community tank farm during commissioning of Agnico Eagle tank farm (estimates not available)

Available numbers represent best estimates, and do not include use of infrastructure by employees while they are not actively travelling for work related purposes (personal travel) or while they are doing non-work-related activities.

Interpretation

The use of public physical infrastructure by Meadowbank and its employees consists primarily of the use of airports and has been relatively consistent since operation began in 2010. There are no indications of significant positive or negative impacts on this infrastructure.

There is greater use of public infrastructure in Rankin Inlet from Meliadine than in Baker Lake from Meadowbank. This is largely due to the use of the Rankin Inlet airstrip, local roads (as the bypass road has not yet been completed) and the relatively central location of the community boat launch area for barge landings as compared to Baker lake. There are no indications of significant positive or negative impacts on this infrastructure.

9.3 Social assistance

Predictions

MEADOWBANK

"The impacts on social services and infrastructure, of low to medium magnitude, are considered largely positive in the medium term and of moderate significance. There is some potential for closure to have a negative impact on social service delivery." (Cumberland Resources Ltd., 2006, p. 128)

MELIADINE

"Project will also contribute to a better standard of living for the residents of the region as well as reducing dependence on social assistance programs" (Golder Associates, 2014, p. 1-xlviii)

Data & Trends

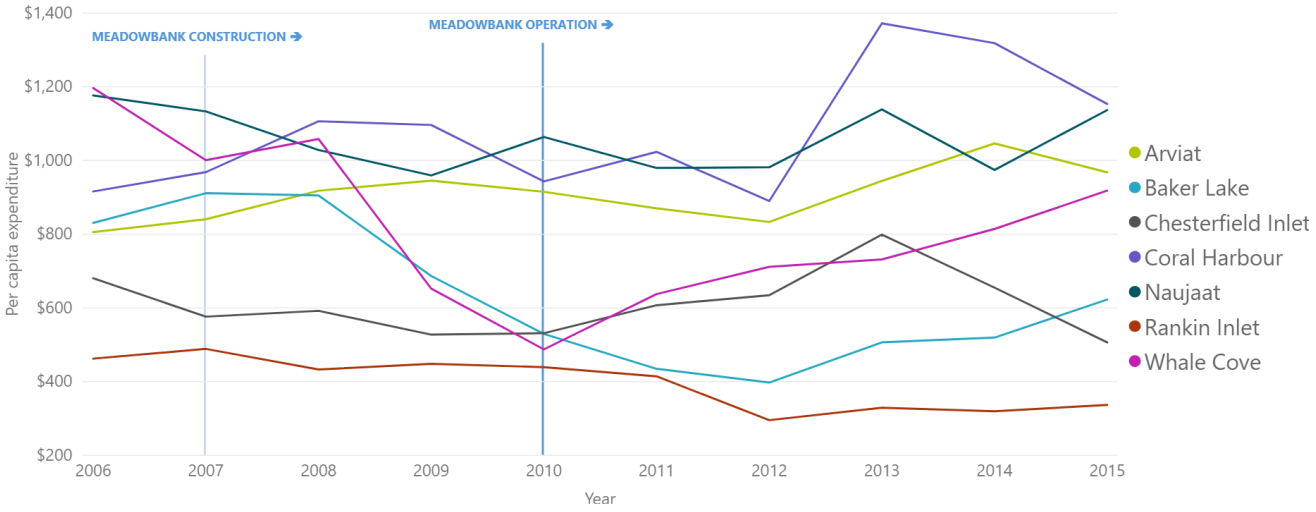
Chart 39 and Chart 40 show social assistance expenditures (in dollars) and the Department of Family Services' social assistance case load (# of cases) by Kivalliq community over time. Data for 2016 and 2017 are not available for either metric at the time of writing this report.

The following definitions are used in interpreting the charts below:

1) **Social Assistance** or income support is a program of last resort for Nunavummiut who, because of inability to obtain employment, loss of principal family provider, illness, disability, age or any other cause cannot provide adequately for themselves and their dependents. Social assistance is provided by the Government of Nunavut in the form of monthly financial payments to help individuals meet a minimum standard of living. All residents of Nunavut between the ages of 18 and 59 can apply for social assistance.
2) **Expenditures** are payments to social assistance recipients for food, shelter, utilities and fuel. This financial support is calculated to meet the basic needs of recipients and their dependents.
3) **Caseloads** refers to a single family receiving social assistance from the Department of Family Services

The Department of Family Services, Government of Nunavut, notes that it uses reasonable efforts to provide accurate and up-to-date information, but that some of the information provided is gathered manually and as a result may not be completely accurate. Since the year 2000, the social assistance program has been delivered without an electronic case management system.

Chart 39. Per capita social assistance expenditures by community

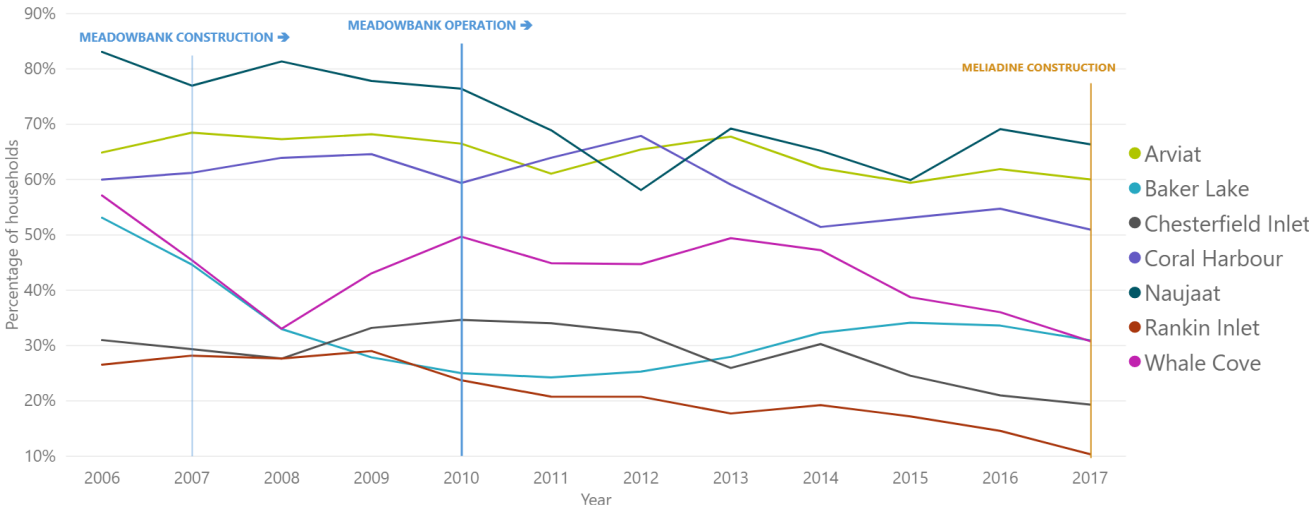


(Department of Family Services, 2018; Statistics Canada, 2011a; Statistics Canada, 2016a; Statistics Canada, 2006a)

A note on methodology

Caseload refers to the number of households receiving social assistance. The percentage of households in a community receiving social assistance was determined by dividing the average monthly caseload by the estimated number of households. The number of households is based on 'private dwellings occupied by usual residents' as reported in the census. Data from the 2006, 2010, and 2016 censuses were used, interpolating the number of households for intervening years by assuming a constant rate of change between censuses, and extrapolating the number of households for 2017 using the rate of change from the previous 5 years.

Chart 40. Percentage of households receiving social assistance by community



(Department of Family Services, 2017)

Interpretation

Per capita social assistance expenditures began to increase in 2010-2011 for several communities (including Baker Lake and Arviat) following a period of declining or steady expenditure in earlier years, including a notable decline in 2007/08 coinciding with construction starting at Meadowbank. There has been a continuous increase in expenditures for Baker Lake since 2011, while those of Rankin Inlet have remained relatively constant. However, per capita expenditures in both Baker Lake and Rankin Inlet are lower in 2015 than historic high levels prior to 2007/08.

For the Kivalliq region as a whole, per capita social assistance expenditures decreased gradually from 2007 to 2011, rose significantly in 2012, and have remained stable since then at a level (~$750) that is slightly lower than what it was in 2007 and 2006 (~$800).

The percentage of households receiving social assistance in Baker Lake declined significantly between 2006 and 2011, from 54% to 24%, coinciding with construction at Meadowbank and the opening of the mine. The proportion households receiving social assistance increased gradually between 2011 and 2015 (from 24% to 34%) but has remained below 2007 levels. In 2015, Baker Lake had the third lowest percentage of households receiving social assistance in the region (after Rankin Inlet and Chesterfield Inlet).

Despite declines from historical highs, social assistance data does not show a clear correlation between Agnico-related employment and social assistance requirements in Baker Lake or Arviat. Data suggests that both expenditures and percentage of households receiving social assistance have been declining in Rankin Inlet since Meadowbank began operation.

VSEC 10: Nunavut Economy

IMPACT / GOAL STATEMENT

Increased economic activity (GDP) and benefits to Inuit organizations and the Government of Nunavut through royalties and taxes

OVERARCHING FEIS PREDICTIONS

Meadowbank: "The economic impacts on the economy of Nunavut, of high magnitude, are positive over the medium term and of high significance, particularly during the construction phase." (Cumberland Resources Ltd., 2006, p. 129)

Meliadine: "The Project would add substantially to the income of government, e.g. through taxes and royalties. However, it will also lead to increased costs, since demand for various services will go up. Given that its fiscal burden (costs) will be smaller than the public revenues it generates, the Project would lead to a better fiscal position of all levels of government." (Golder Associates, 2014, p. 1-C-52)

TRENDS & INTERPRETATIONS

Metric	Meadowbank trends			Meliadine trends		Interpretation
	Pre-dev	Post-dev	Last year	Pre-dev	Last year	
10.1 Royalties and taxes						
Project compensation, royalties and taxes paid	N/A	↑	↑	N/A	↑	Cumulative project royalties, taxes and other payments paid by Agnico Eagle to the GN, GoC, NTI and KIA increased at both Meadowbank and Meliadine in 2017. At Meadowbank this is largely due to IIBA payments to the KIA following 2017 agreements. At Meliadine this is largely due to increases in payroll taxation following the onset of major construction.
10.2 Trade balance						
Nunavut trade balance	↓	↑	N/A	↑	N/A	Nunavut's net exports have increased steadily since 2008, following a dramatic increase in the trade deficit from 2006 to 2008 that was linked to the construction activities at Meadowbank. Since Meadowbank began operations in 2010, Nunavut's net exports have increased by approximately $131M. No trend regarding the impacts of Meliadine on Nunavut's trade balance can be determined with the current available data.
10.3 Nunavut GDP						
Nunavut GDP by all industries and mining, quarrying and oil & gas	↑	↑	↑	N/A	↑	Coinciding with Meadowbank becoming operational, Nunavut's GDP has grown at an average of 6% annually from 2009 to 2017. A sharp increase of 12% occurred in 2017.
Nunavut GDP by all industries and mining, quarrying and oil & gas	↓	↑	↑	N/A	↑	According to the Conference Board of Canada, Meadowbank has been a driver of Nunavut's GDP growth, both during the construction of the mine and since production began in 2010. The 12% increase observed over the past year may in part be attributed to construction activities at Meliadine and Whale Tail, most notably a large increase in contract expenditures for the two construction projects.

Understanding the trends & interpretations table

Time horizon	Direction	Value
Pre-dev: trend prior to the operation / construction phase of the project (2010 for Meadowbank; 2017 for Meliadine) **Post-dev**: trend from the onset of operation of Meadowbank (2010). As 2017 is the first year of major construction at Meliadine, post-development trends are not considered for the current reporting year. **Last year**: movement from 2016 to 2017	↑ Increasing ↓ Decreasing → Remaining stable / No discernable trend **N/A** Not applicable	■ **Positive**: change in indicator towards the achievement of the desired impact or goal ■ **Negative**: change in indicator away from the achievement of the desired impact or goal ■ **Neutral**: no observed change in indicator with regard to the achievement of the desired impact or goal

Existing Management and Mitigation

Maximizing benefits for the Nunavut economy is achieved through Agnico Eagle actions to maximize local employment and local contracting, and ensure community health, safety and well-being – as described under previous VSECs in this report.

10.1 Royalties and taxes

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS regarding royalties and taxes for Kivalliq, Nunavut or Canada.

MELIADINE

"Project would increase public revenues, e.g. through taxes and royalties. Total tax effects during construction might be $27 million. The annual tax effect during operations might be $21 million." (Golder Associates, 2014, p. 1-C-47)

Data & Trends

Chart 41 below presents royalty, taxes and other payments paid by Agnico Eagle to the GN, GoC, NTI, and KIA.

Chart 41. Project payments, royalties and taxes paid

MEADOWBANK

	2010	2011	2012	2013	2014	2015	2016	2017	Total
GN payroll taxes GN (territorial taxes, WSCC)						$3.4M	$2.9M	$2.8M	**$9.1M**
GN property taxes	$1.2M	$1.2M	$1.2M	$1.2M	$1.8M	$1.8M	$1.8M	$1.8M	**$12.0M**
GoC payroll taxes (federal taxes, EI, CPP)						$30.9M	$31.3M	$30.4M	**$92.6M**
KIA IIBA payments (Meadowbank 2017 IIBA)								$2.5M	**$2.5M**
KIA IIBA payments (Whale Tail 2017 IIBA)								$6.5M	**$6.5M**
KIA payments (2011 IIBA) (confidential)				Confidential					
KIA royalties (N/A until Whale Tail)									**$0.0M**
NTI royalties (confidential)				Confidential					
Total	**$1.2M**	**$1.2M**	**$1.2M**	**$1.2M**	**$1.8M**	**$36.1M**	**$36.0M**	**$44.0M**	**$122.7M**

MELIADINE

	2015	2016	2017	Total
GN payroll taxes GN (territorial taxes, WSCC)	$0.3M	$0.2M	$0.5M	**$0.9M**
GN property taxes				**$0.0M**
GoC payroll taxes (federal taxes, EI, CPP)	$1.3M	$1.6M	$5.4M	**$8.4M**
KIA IIBA payments	$1.5M	$1.5M		**$3.0M**
KIA royalties				**$0.0M**
NTI royalties (confidential)		Confidential		
Total	**$3.1M**	**$3.3M**	**$5.9M**	**$12.3M**

(Agnico Eagle Mines, 2017)

Interpretation

Meadowbank's payroll taxes paid to the federal government have held steady over the past three years at approximately $30M. Unfortunately, data is not available prior to 2015, however, we would expect the taxation to remain commensurate to the FTEs at the site, which has remained relatively stable since 2011. Maxes paid to the GN have declined slightly over the same period from approximately $3.4M in 2015 to $2.8M in 2017.

Meliadine's federal payroll taxes to rose by 238% to $5.4M in 2017, commensurate with a similar rise in Agnico Eagle FTEs over the same period (223%). The total Agnico Eagle Meliadine payroll taxation in 2017 (both GoC and GN) was $5.9M. While the construction tax effects predicted in the FEIS is $27M, this number includes both contractor and Agnico Eagle employment. Contractor payroll and taxation data is unavailable; however, we can estimate the total taxation effect (from payroll) based on Agnico Eagle's data and contractors FTE levels for 2017 at approximately $28.7M[8], just above the FEIS prediction. While this relies on a number of assumptions (most notably a similar level of compensation paid to both Agnico Eagle and contractor staff) it does provide an indication that the prediction is being met.

Given the location of the mine on Inuit Owned Lands, all resource royalties flow directly to NTI and the KIA as the Inuit authority. Compensation paid to KIA stems from Meadowbank, Meliadine and exploration activities. Due to confidentiality terms within the various agreements under which payments and royalties are made, not all data can be reported on.

10.2 Trade balance

Predictions

MEADOWBANK

There are no predictions in the Meadowbank FEIS regarding trade balance in Nunavut.

MELIADINE

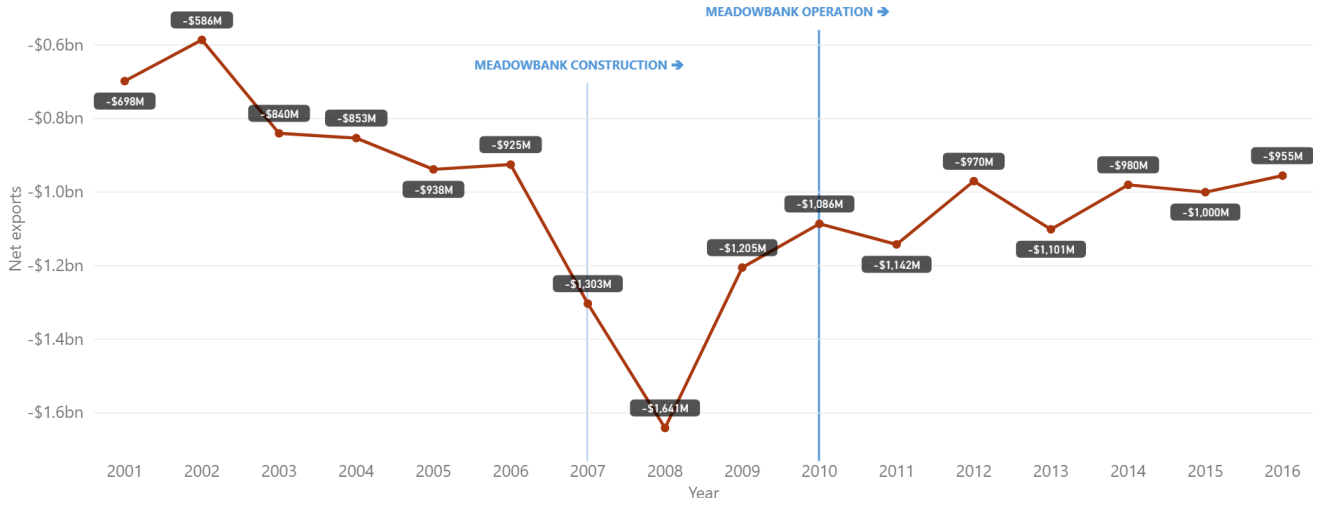
The Project will increase Nunavut's trade deficit to $1866 million from the 2010 deficit of $878 million (in 2002 dollars) during construction phase. (Golder Associates, 2014, p. 1-117)

Data & Trends

Chart 42 depicts Nunavut's trade balance from 2000 to 2016 in chained 2007 dollars. The trade balance is calculated by subtracting the value of total goods imports from total exports.

[8] Calculated by: $\frac{Contractor\ FTEs\ (2017)}{Agnico\ Eagle\ FTEs\ (2017)} * Agnico\ Eagle\ Payroll\ Taxes\ (2017) + Agnico\ Eagle\ Payrol\ Taxes\ (2017)$

Chart 42. Nunavut trade balance



(Statistics Canada, 2016d)

Interpretation

Between 2006 and 2008, Nunavut's trade deficit increased significantly by $338M coinciding with major construction activities at Meadowbank. However, since Meadowbank began operations in 2010, Nunavut's net exports have increased by approximately $131M, bringing the value to $33M above the 2006 figure. There are no predictions in the Meadowbank FEIS regarding the project's potential impact on Nunavut's trade balance, however the Meliadine FEIS predicts that Meliadine will contribute to a large increase in Nunavut's trade deficit during construction phase (down to a deficit of $1,866 million). No trend regarding Meliadine's impacts on the trade balance can be determined with the current available data.

10.3 Nunavut GDP

Predictions

MEADOWBANK

"The results indicate that during the construction phase, the project would contribute $120.3 M to the GDP of Nunavut … During the operations phase, the annual contribution to GDP would be $35.5M…" (Cumberland Resources, 2006, p. 119)

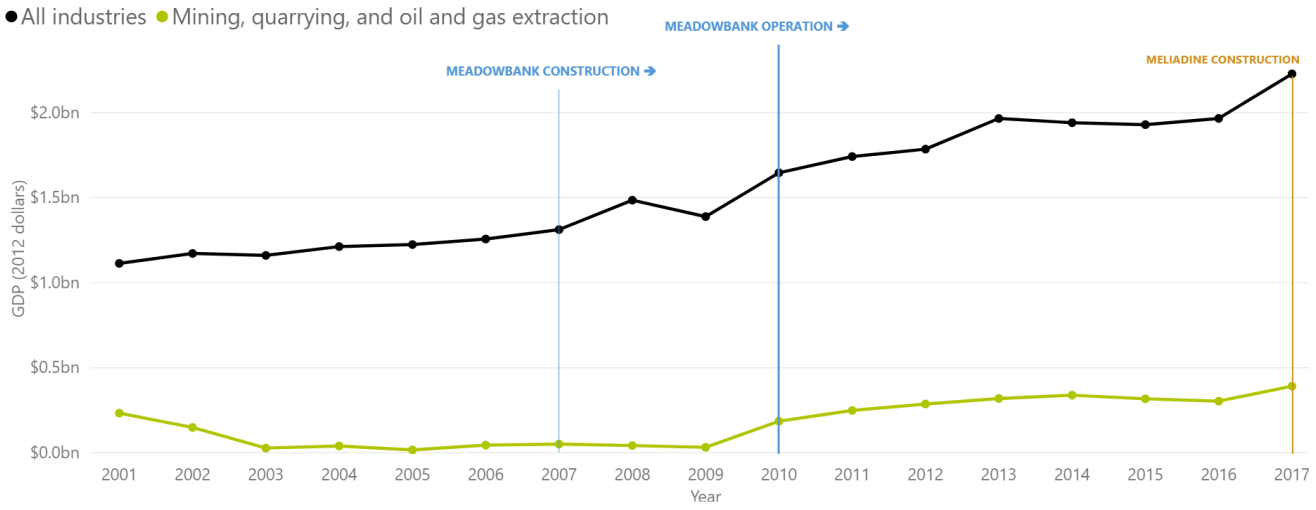
MELIADINE

"Investment and expenditures of [the] Project would temporarily expand the size of the economies of Nunavut and the Kivalliq region. Total effects during construction might be $520 million. The annual effect during operations might be $272 million." (Golder Associates, 2014, p. 1-C-47)

Data & Trends

The following chart shows the value of Nunavut gross domestic product (GDP), in current prices, from 2000 to 2017.

Chart 43. Nunavut GDP by all industries and mining, quarrying and oil & gas



(Statistics Canada, 2017)

Interpretation

Nunavut's GDP steadily increased from 2000 to 2008 at an average annual rate of approximately 4%. Following a decline in 2009 due to the global recession, a sharp increase was seen in 2010, when Meadowbank began production. Coinciding with Meadowbank becoming operational, Nunavut's GDP has grown at average annual rate of approximately 6% from 2009 to 2017. As seen in the chart above, the growth from 2009 onwards can largely be attributed to an increase in mining, quarrying and oil & gas activity. Given that Meadowbank was the only operating mine in Nunavut from 2010 to 2015 (Baffinland's Mary River Project began operations in 2015), the GDP growth data suggest that Meadowbank's contribution to GDP has exceeded the FEIS prediction. Mining industry GDP growth was relatively flat in 2013-2016, reflecting general business conditions in the industry. For Meadowbank, this has been a period of relatively stable operation and reduced total contract expenditures (as described under VSEC 3: Contracting and Business Opportunities). The increase in Nunavut's GDP (12%) in 2017 may in part be attributed to construction activities at Meliadine and Whale Tail, most notably a large increase in contract expenditures for the two construction projects.

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Appendix A: Agnico Projects SEMP Terms of Reference

December 12, 2017

AGNICO EAGLE MINES LIMITED ("AEM") PROJECTS SOCIO-ECONOMIC MONITORING WORKING GROUP

TERMS OF REFERENCE

1 PURPOSE

1.1 This document sets out the terms of reference ("Terms of Reference") for the Socio-Economic Monitoring Working Group (the "Working Group") for AEM Kivalliq Projects in its activities in relation to the Socio-Economic Monitoring Program (the "Program") for AEM Kivalliq Projects. This Working Group aims to support the Kivalliq Socio-Economic Monitoring Committee (the "KvSEMC") in its regional monitoring initiatives, and to support the Program. The Working Group will identify areas of mutual interest to the Parties and socio-economic monitoring priorities of the KvSEMC related to AEM's projects in the Kivalliq region.

1.2 The purpose of the Program, from a socio-economic point of view, is described in Section 135 of the *Nunavut Planning and Project Assessment Act* ("NuPPAA") and Article 12, Part 7 of the *Nunavut Land Claims Agreement* ("NLCA"), the relevant provisions of which provide as follows:

NuPPAA section 135(3):

(a) measure the impact of the project on the ecosystemic and socio-economic environments of the designated area;

...

(d) assess the accuracy of the predictions contained in the project impact statement.

NLCA section 12.7.2:

(a) to measure the relevant effects of projects on…. socio-economic environments of the Nunavut Settlement Area;

...

(d) to assess the accuracy of the predictions contained in the project impacts statements.

1.3 The establishment of the Working Group is to satisfy and to fulfil parts of the terms and conditions set out in the Meadowbank Project Certificate (PC004), the Meliadine Project Certificate (PC006), and the Whale Tail Project Certificate (00X) issued by the Nunavut Impact Review Board (the "NIRB") in respect of AEM projects within the Kivalliq Region (the "Projects") to the extent that these project certificates address socio-economic monitoring.

2 KvSEMC AND REGIONAL MONITORING BACKGROUND

2.1 The KvSEMC is a forum for stakeholders to meet on an annual to semi-annual basis and present data, and consider socio-economic impacts and benefits of mining projects on the Kivalliq region.

2.2 The KvSEMC reviews the Program results annually, including the consideration of areas of mutual interest and socio-economic monitoring priorities as identified by the Working Group.

2.3 The KvSEMC supports a collaborative monitoring framework by providing data to support socio-economic impacts monitoring, recommending the prioritization of identified areas for monitoring and mitigation, and providing recommendations for areas of monitoring and mitigation that have yet to be identified.

3 WORKING GROUP MEMBERSHIP AND MEMBER ROLES AND RESPONSIBILITIES

3.1 The Working Group consists of:

a. At least one AEM representative (who is chair of a meeting if it relates to Projects monitoring)
b. At least one Government of Nunavut representative (who is chair of a meeting if it relates to territorial monitoring); and
c. At least one Government of Canada representative.

3.2 Each member is responsible for the costs they incur to participate in activities of the Working Group.

3.3 AEM will:

a. identify indicators and share Project-specific data that relates to the Program;
b. participate in the collaborative analysis and interpretation of data for reporting purposes;
c. present for review the effectiveness of AEM's socio-economic mitigation measures; and
d. prepare and provide presentations summarizing annual Program report findings and conclusions for the KvSEMC.

3.4 The Government of Nunavut will:

a. identify indicators and share government-sourced data that relates to the Program and other KvSEMC reporting requirements;
b. participate in the collaborative analysis and interpretation of data for reporting purposes; and
c. review the effectiveness of AEM's socio-economic mitigation measures.

3.5 The Government of Canada will:

a. identify indicators and share applicable socio-economic data from the Nunavut General Monitoring Plan;
b. participate in the collaborative analysis and interpretation of data for reporting purposes; and
c. review the effectiveness of AEM's socio-economic mitigation measures.

3.6 Collection, use, and disclosure of information and data under these Terms of Reference, by each member of the Working Group, is subject to any rules governing the collection, use, and disclosure of personal and/or confidential information and data, applicable to each member respectively, in accordance with the provisions of any privacy legislation or corporate policies. This obligation survives the dissolution of the Working Group and the existence of the Projects.

3.7 The Parties acknowledge that:

a. AEM is best able to collect and provide data concerning workforce demographics, employment, training and procurement in relation to the Projects; and
b. the Government of Nunavut and the Government of Canada are best able to collect and provide public statistics on general health and well-being, food security, demographics and other socio-economic indicators at the community and territorial level.

4 WORKING GROUP MANDATE

4.1 The Working Group aims to support the development of the Program framework and to undertake collaborative monitoring in order to identify and access data in relation to the Program. This data will be useful in improving the socio-economic performance of the Projects. Collaborative monitoring will involve combining Project-specific performance data with data generated or provided by other members of the Working Group in order to support adaptive-management measures implemented by the Working Group members and to minimize adverse effects and maximize benefits from the Projects.

4.2 The Working Group shall monitor the Program by analyzing the monitoring data in order to assess the accuracy of socio-economic impact predictions made in the final environmental impact statements of the Projects; assess the effectiveness of current practices to mitigate adverse effects and enhance positive effects of the Projects; obtain early warning should mitigation measures or measures to enhance positive effects not be achieving their intended outcome; and provide timely detection of unanticipated outcomes.

4.3 The Working Group aims to improve understanding of prioritized socio-economic issues in order to increase confidence in socio-economic assessment predictions.

4.4 The Working Group will provide monitoring data and objective analysis in a manner that is focused, efficient and cost-effective.

5 REPORTING AND COMMUNICATION

5.1 AEM will prepare an annual socio-economic report for the Projects (the "Program Report") and provide the Program Report to the Working Group and the KvSEMC for review, prior to its submission to the NIRB. Annual Program Reports are due for submission to NIRB on June 30 of each year, containing data with respect to the previous calendar year (January to December) and presented at the Project- and regional-scale of operations. The Program Report will further describe AEM's participation on the KvSEMC, other collaborative monitoring processes and any activities related to understanding socio-economic processes.

5.2 Annual reporting in respect of the Whale Tail project will only commence following the start of construction activities if AEM decides to proceed with the project after the issuance of a project certificate.

5.3 AEM will prepare and circulate a draft of the Program Report to the Working Group and KvSEMC for review prior to the KvSEMC meeting. The draft Program Report executive summary should be in plain language and translated for potential unilingual community representatives.

6 MEETINGS

6.1 The Working Group will continue to meet for as long as there remains at least one (1) Project in the Kivalliq Region.

6.2 The Working Group will meet at least twice per year for the purposes of reviewing and providing direction on the development of the Program Report.

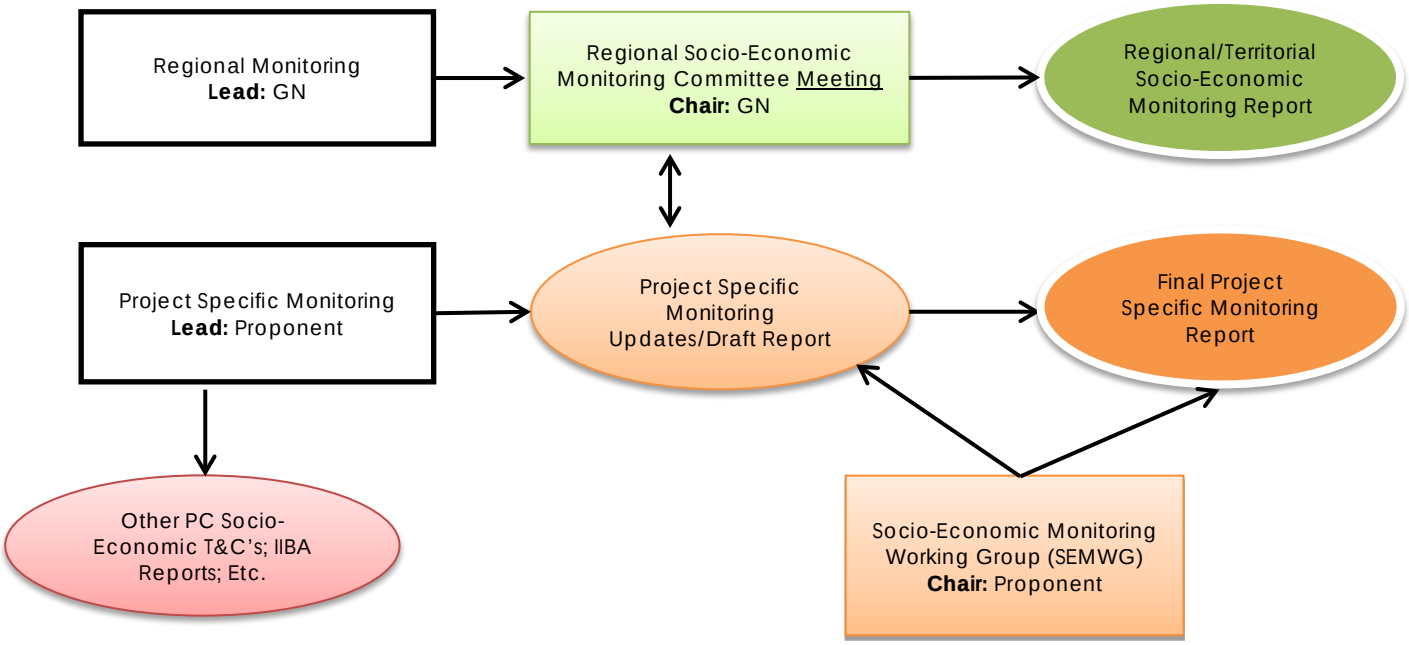
6.3 The Working Group will meet at least once a year for its members to engage in the analysis and interpretation of data to support the SEMC Report.

6.4 The meeting schedule may be changed if agreed to in writing by all members of the Working Group.

6.5 The Working Group will endeavor to meet face to face whenever practical. However, recognizing Nunavut's unique logistical challenges and the competing deadlines involved in reporting, teleconferences and email circulation will also satisfy meeting requirements if agreed to in writing by all members.

7 RELATIONSHIP WITH REGIONAL AND TERRITORIAL MONITORING

7.1 The diagram outlines the relationship between Project-specific monitoring and regional/territorial monitoring, and its respective reporting requirements:



8 PROJECT CLOSURE

8.1 Mine Closure

AEM will consult the Working Group and KvSEMC two (2) years in advance of the expected date of closure for each Project in order to better inform project-specific socio-economic closure planning, and keep the Working Group and KvSEMC informed of the progress of planning leading up to the submission of the project-specific socio-economic closure plan, submitted under the final closure plan. Planning will detail specific measures that may mitigate, at least to some extent, the potential for negative effects as a result of Project closure.

8.2 Premature Mine Closure

In the event of premature (temporary or final) closure of the Project, AEM will consult with the Working Group and KivSEMC before submitting an updated Socio-Economic Management Plan to NIRB.

9 REVIEW OF TORS

These Terms of Reference may be reviewed by the Working Group periodically for any required changes that may be applicable as Projects evolve from construction, through operations and closure. Similarly, as any other exploration or mine development activities of AEM are approved within the Kivalliq Region, these Terms of Reference shall be reviewed and amended as necessary to accommodate additional terms and conditions applicable to the Project that may be issued by NIRB as part of a project certificate(s). Any changes to the Terms of Reference will be in writing.

Appendix N-1

Project Certificate 006 terms and conditions cross-reference table

T&C #	Term and Condition (NIRB Project Certificate No. 006)	2019 status
Air Quality		
1	Prior to commencing construction activities, the Proponent shall update its Air Quality Monitoring Plan, and shall consider installing two real-time air monitoring stations in advance of mining operations. The updated plan shall include, but is not limited to, details regarding the following: a. Description of real-time air monitoring stations including proposed timing of installation, location, and any factors considered with regards to planning for the installation; b. Plans for the collection of total suspended dust samples year round, including sampling for metals content relevant to the Project; c. Description of snowpack surveys and dustfall collectors; d. Description of lichen surveys; e. Identification of near field, far field and reference sites that are located with consideration of ambient wind conditions; f. Baseline data collected prior to significant construction activity; and g. A description of the proposed annual reporting mechanism and response framework.	See: • Air Quality Monitoring Plan, Version 1 (November 2015) • Terrestrial Environment Management and Monitoring Plan (TEMMP), Version 2 (November 2015) and Agnico Eagle's Meliadine Gold Project 2018 Annual Report. Collection of air monitoring started December 2018, snowpack survey to start before 2019 freshet, procedure completed
2	The Proponent shall demonstrate through monitoring of air quality at the aboveground emissions points at the mine site and at the Tiriganiaq site that sulphur dioxide (SO2) and nitrous dioxide (NO2) emissions remain within predicted levels and, where applicable, within limits established by all applicable guidelines and regulations. In cases where exceedances occur, the Proponent shall provide an explanation for the exceedance, a description of planned mitigation, and shall conduct additional monitoring to evaluate the effectiveness of mitigative measures.	See Agnico Eagle's Meliadine Gold Project 2018 Annual Report, in which it is noted that the measured annual average concentrations were well below the Government of Nunavut Ambient Air Quality Standards, and FEIS maximum predicted values.
3	Prior to commencing construction activities the Proponent shall update its dust management and monitoring plan to address and/or include the following additional items: a. Align plan requirements with commitments made in the FEIS and during the Final Hearing to monitor dust along the all-weather access road and associated roads and trails. b. Verify commitments to the utilization of dust suppressants along the all-weather access road including and associated roads and trails, including a description of the type of suppressant to be utilized, the frequency and timing of applications to be made throughout the various seasons of road use. c. Outline the specific adaptive management measures to be considered should monitoring indicate that dust deposition is higher than predicted, specifically where traffic along the all-weather access road is greater than initially predicted.	Refer to dust management plan in Agnico Eagle's Meliadine Gold Project 2018 Annual Report (Appendix I-1). Calcium chloride was used along the entire AWAR in 2018, the alternative chemical supressant (Dust stop) was tested to evaluate the performance in terms of dust suppression but did not shows to be more effective than the calcium chloride. Dust stop also required special equipment for application that was not available at the time the dust suppression was required. Dust supressant will be apply on the entire AWAR in 2019 as well as water. Agnico meet with the Hamlet to ensure effective dust supressant in 2019
4	The Proponent shall develop and implement an Incineration Management Plan that takes into consideration the recommendations provided in Environment Canada's Technical Document for Batch Waste Incineration (2010).	See Incineration Management Plan and Agnico Eagle's Meliadine Gold Project 2018 Annual Report (Appendix I-1)
5	The Proponent shall provide all stack testing conducted on temporary or permanent incinerators operated for the Project to the NIRB in the annual report for that year.	Stack testing was conducted in 2018, see Agnico Eagle's Meliadine Gold Project 2018 Annual Report for results
6	The Proponent shall employ appropriate dust suppression measures when conducting activities in the landfill such as topping or capping.	The landfill is progressively capped and during the activity, visual monitoring occurs and if necessary, water is apply. Please refer to Agnico Eagle's Meliadine Gold Project 2018 Annual Report and the Dust management plan (Appendix I-1)
Climate and Meteorology		
7	The Proponent shall provide within its annual report to the NIRB, calculations of greenhouse gas emissions generated by activities at the Itivia port and other Project sources including mine-related road traffic and aircraft associated with the Project. Calculations shall take into consideration, fuel consumption as measured by the Proponent's purchase and use as well as the fuel use of its contractors and sub-contractors.	Greenhouse Gas are provided in Agnico Eagle's Meliadine Gold Project 2018 Annual Report. The amount is base on the amount of fuel consumed from the project reserves and therefor only project-related traffic is calculated. Please refer to the Greenhouse Gas Reduction Plan in Appendix I for more details. Project related and non-related traffic is discussed in Agnico Eagle's Meliadine Gold Project 2018 Annual Report.
8	To actively engage Inuit in initiatives related to climate change, where it is feasible, the Proponent shall endeavour to include the participation of Inuit from affected communities when undertaking climate-change related studies and research.	Consultation with Inuits occured regarding the windfarm project, continued efforts to engage with inuit and partner in long term sustainable energy sources including wind power and hydroelectricity. In 2019 an education program in association with the University of Saskatchewan will occur and climate change will be part of the discussion to raise the awareness. The MOU signed with the KHTO will also raise the participation in different studies related with climate change

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9	Prior to the commencement of operations, the Proponent shall develop a Greenhouse Gas Emissions (GHG) Reduction Plan which includes, but is not limited to: a. An estimate of the Project's GHG baseline emissions; b. A description of monitoring measures to be undertaken, including the methods, frequency, parameters, and a description of data analysis; and, c. A description of mitigative and adaptive strategies planned, and taken, toward reducing the Project-related emission of greenhouse gases over the Project's life.	Greenhouse Gas Emissions (GHG) Reduction Plan was submitted to the NIRB February 1st 2019 and can be found in Agnico Eagle's Meliadine Gold Project 2018 Annual Report (Appendix I-1). Results are found in Agnico Eagle's Meliadine Gold Project 2018 Annual Report
Noise and Vibration		
10	The Proponent shall further develop and implement its noise abatement plan to protect people and wildlife from mine activity noise, including, blasting, drilling, equipment, vehicles and aircraft. The noise abatement plan will be developed in consultation the Government of Nunavut, Environment Canada and Health Canada as appropriate, and at a minimum is to include: a. Restrictions on blasting and drilling when migrating caribou, birds or local carnivores may be affected; b. The establishment of strict standards for noise levels; use of equipment and vehicles with the best noise attenuation devices; c. When practical, the use of fences or berms around noisy machinery or sites; d. Flight corridor restrictions over sensitive areas with known concentrations of wildlife and birds whenever possible; e. Requiring with the exception of take off and approach for landing, a minimum flight altitude of 300 metres above ground level when flights to and from the mine site are passing near sensitive wildlife and bird areas; and, f. The incorporation of the use of sound metres to monitor sound levels at locations in and around the mine site and local study area. The location and design of the sound metres shall be selected in consultation with EC and set up immediately upon issuance of the Project Certificate for the purpose of obtaining baseline data, and shall be maintained for data collection during and after operations.	Noise Abatement and Monitoring Plan, Version 2 (March 2017) • Terrestrial Environment Management and Monitoring Plan (TEMMP), Version 2 (November 2015)
11	The Proponent shall conduct noise and vibration monitoring at Project accommodations sites located at the Tiraginiaq mine site. Sampling shall be undertaken during the summer and winter months during all phases of Project development, with reporting of results and implementation of associated mitigation measures as necessary reported to the NIRB.	Noise monitoring is presented in Agnico Eagle's Meliadine Gold Project 2018 Annual Report. For the vibration monitoring, due to equipment malfunction and avaibility, no monitoring occured in 2018. Equipment was received in December, surface blasts are monitored since and underground monitoring will start in April 2019
Terrestrial Environment		
12	The Proponent shall conduct further permafrost mapping to document permafrost temperature, thickness of seasonal thaw and amount of ground ice in the Project development area, with such information to be available to inform the detailed design of Project infrastructure (i.e., dikes and tailings storage facility designs and talik predictions for lakes that are to be dewatered or used for saline water storage).	See Agnico Eagle's Meliadine Gold Project 2018 Annual Report – Appendix B (2018 Annual Geotechnical Inspection)
13	The Proponent shall undertake additional geotechnical investigations as required to identify sensitive landforms, modify engineering design for Project infrastructure (i.e., dikes, tailings storage facility, waste rock pile and landfill), and develop and implement preventative and/or mitigation and monitoring measures to minimize the impacts of the Project's activities and infrastructure on sensitive landforms. Plans for the investigations, mitigative and monitoring measures are to be included within an updated Environmental Protection Plan.	See in Agnico Eagle's Meliadine Gold Project 2018 Annual Report a summary of the geotechnical report and the complete report in Appendix B. The updated Environmental Management and Protection Plan is in Appendix I-1
14	The Proponent is encouraged to conduct more detailed thermal analysis to support detailed design of the dikes and the tailings storage facility, including seepage and stability analysis, and shall incorporate the results of the analysis into Project design. Details of the thermal analyses undertaken are to be provided to the NIRB.	See Agnico Eagle's Meliadine Gold Project 2018 Annual Report – Appendix B: 2018 Annual Geotechnical Inspection.

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15	The Proponent shall assess the potential environmental effects of a post closure failure of the geomembrane of the Tailings Storage Facility while tailings are in a thawed state. This assessment shall include, at a minimum: a. A description of the potential environmental effects of such a failure; b. Identification of the monitoring measures employed to detect environmental changes that could result; c. Identification of proposed mitigation measures to address any changes identified during monitoring; and d. Updated Risk Management Plan and Closure and Reclamation Plan reflecting changes which result from the post-closure failure assessment. A summary of the results from this assessment and implications to project infrastructure and operational plans shall be provided to the NIRB.	Mitigation measures are outlined in the Risk Management and Emergency Response Plan, Preliminary Closure and Reclamation Plan. Extensive risk assessment was performed during the trade-off study between conventional slurry TSF and dewatered dry-stack tailings storage. Ultimately, dewatered dry stack facitily was chosen over TSF due to better environmental performance and inherently lower risk
16	The Proponent shall finalize and implement a comprehensive erosion management plan to prevent or minimize the effects of destabilization and erosion resulting from Project activities.	See Freshet Action Plan and • Sediment and Erosion Management Plan Agnico Eagle's Meliadine Gold Project 2018 Annual Report (Appendix I-1)
17	The Proponent shall monitor the effects of the Project on permafrost conditions relative to Project infrastructure, including along the all-weather access road and associated roads, waste rock stockpile, trails and quarries. Through its monitoring the Proponent must demonstrate that permafrost integrity is maintained with implementation of appropriate preventative measures should permafrost degradation be observed.	See Meliadine Gold Project 2018 Annual Report – Appendix B for the thermal monitoring program
18	The Proponent shall provide the NIRB with copies of as-built drawings and final design plans for Project infrastructure as they are developed/finalized to assist with the Board's ongoing monitoring efforts.	Ongoing, as-built drawings and final design plans for Project infrastructure are being submitted to NWB as infrastructure is being built. Construction summary report is also provided monthly
19	The Proponent shall develop and implement a monitoring program for its Tailings Storage Facility and Waste Rock Storage Facility (including dikes). The monitoring program is to include, but shall not be limited to: a. Plans for monitoring the thermal condition and stability of storage facilities (including deformation of the cover) and dikes, including the use of thermistor cables, temperature loggers, and core sampling technology as required to monitor dike stability and tailings freezeback efficiency, including for example, factors such as ice content and stability; and, b. Measures proposed to ensure the safe containment and structural integrity of Project infrastructure, and to prevent contamination of waterbodies. Details of the monitoring program shall provided to the NIRB.	The monitoring program for the Tailing Storage Facility was submitted to the NWB November 15th 2018 and the Waste Rock Facility Storage monitoring program will be submit prior to construction
20	The Proponent shall explore the feasibility and practicality of topsoil/organic matter salvage as part of phased approach to Project development, with updates to its Closure and Reclamation Plan to reflect any changes based on this investigation. The Closure and Reclamation Plan should be updated on an on-going basis as more information becomes available from similar reclamation projects, including experience with implementing closure and reclamation plans at the Meadowbank mine site, as applicable.	Research are ongoing with the University of Saskatchewan for progressive re-vegetation. See Meliadine Gold Project 2018 Annual Report and Appendix I-1. The interim closure and reclamation plan will be updated within six months of commercial operation

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21	The Proponent shall update its Waste Management Plan to include details which explain how the design employed for Project landfills is expected to protect the integrity of the local environment, including permafrost integrity, and water quality for adjacent waterbodies. The Proponent shall demonstrate its consideration for the use of liners at waste management facilities, where feasible.	Landfill and waste Management Plan were submitted in which it notes that based on the proposed design, management and operating procedures, a liner for the landfill is not considered necessary. The Landfill and Waste Management Plan includes the objective of reducing, reusing, and recycling to minimize wastes. The recycling wood option with the community is something Agnico Eagle will investigate in the future
Geology (including Geochemistry)		
22	The Proponent shall report annually to the NIRB on the adaptations it has had made to the Mine Waste Management Plan and practices based on results obtained through monitoring.	See Mine Waste Management Plan in Meliadine Gold Project 2018 Annual Report Appendix I-1.
23	Prior to the commencement of excavation at the Discovery deposit, the Proponent, in consultation with Natural Resources Canada, shall update its Mine Waste Management Plan to assess the potential for acid rock drainage and to identify any monitoring and mitigation measures that may be required in this development area.	Scheduled for 2024
Hydrogeology and Groundwater Quanity and Quality		
24	The Proponent shall, reflecting any direction from the Nunavut Water Board during water licensing, collect new hydraulic data (e.g., from new monitoring wells) in key areas during the pre-development, construction and operation phases to better define vertical and horizontal ground flow in the project development area.	Report submitted Q4 2016, updated reports and/or information will be provided throughout operations
25	The Proponent shall submit a detailed Groundwater Management Plan to the NIRB which includes mitigation measures designed to address the potential for higher-than-predicted volumes of saline water inflows into the underground mine, treatment and disposal methods, and details of its plan to monitor saline water at site. The plan must identify uncertainties pertaining to predictions for groundwater quality and quantity and inform adaptive management strategies for the site. CIRNAC should be consulted with respect to the contents of the Plan and any required mitigation measures.	See Groundwater Management Plan in Meliadine Gold Project 2018 Annual Report Appendix I-1. Also the SWTP OMM done in July 2018 and the design report was sent to the NWB. Discharge saline effluent to the marine environment is also a mitigation measure.
26	To assess the flow of groundwater into the lake the Proponent shall carry out continued analyses over time to confirm and update, accordingly, the approximate fill time for the mine pits as identified in the FEIS.	Estimates of the approximate fill time for the mine pits at closure are provided in the Water Management Plan in Meliadine Gold Project 2018 Annual Report Appendix I-1
27	The Proponent shall update its Aquatic Effects Monitoring Plan (AEMP) to include, at a minimum: a. Details regarding the monitoring of non-point sources of discharge, selection of appropriate reference sites, measures to ensure the collection of adequate baseline data at Meliadine Lake prior to and during construction activities, including information on chemical loading in the snowpack, and the mechanisms proposed to monitor for and treat runoff and sediment; b. A description of measures to be undertaken as relate to dustfall monitoring, designed in accordance with the following: i. To establish Phase 1 all-weather access road baseline data and a description of plans for data collection during Project operations for comparison; ii. To facilitate comparison with existing guidelines; iii. To assess the seasonal deposition (rates, quantities) and chemical composition of dust entering aquatic systems along representative distance transects of the all-weather access road and Rankin Inlet by-pass road; c. A description of water quality monitoring to be conducted at Little Meliadine Lake; and d. Details regarding comparisons of results to be run against predicted values and the analysis of data to be undertaken on an annual basis, or as may be required.	See: Aquatic Effects Monitoring Program (AEMP) Design Plan 6513-REP-03 (April 2015) submitted to the NWB with the Proponent's Type A Water Licence application. Air Quality Monitoring Plan, Version 1 (November 2015). Data are provided in Agnico Eagle's Meliadine 2018 Annual report and Appendix G-1

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28	The Proponent shall develop and implement a sediment and erosion management plan to prevent or minimize the effects of destabilization and erosion that may occur due to Project activities. The plan should also detail sediment control plans to prevent and/or mitigate sediment loading into surface water within the Project area.	See Freshet Action Plan and • Sediment and Erosion Management Plan in Agnico Eagle's Meliadine Gold Project 2018 Annual Report (Appendix I-1) and geotechnical report (Appendix B-2)
29	The Proponent shall develop and implement adequate monitoring and maintenance procedures to ensure that the culverts and other conduits that may be prone to blockage do not significantly hinder or alter the natural flow of water from areas associated with the proposed mine. In addition, the Proponent shall monitor, document and report the withdrawal rates for water removed and utilized for all domestic and industrial purposes.	Existing culverts and road infrastructure are inspected by Agnico on a regular basis, according to the watercourse crossing inspection and maintenance program. Refer to the Road Management Plan and the Freshet Action Plan. In addition, they were inspected during the Annual Geotechnical Inspection, and recommendations on how to prevent blockage are provided in the report (Agnico Eagle's Meliadine Gold Project 2018 Annual Report Appendix B). Water from culverts is not utilized for domestic or industrial purposes.
Freshet Aquatic Environment		
30	The Proponent shall update its Aquatic Effects Monitoring Plan (AEMP) to include, at a minimum: a. Provide details for additional reference lakes to be included within its sampling and monitoring programs; b. Updates to include sedimentation within relevant monitoring programs; and c. Results from additional testing for mercury in fish tissue, and include test results in updated baseline data.	See Aquatic Effects Monitoring Program (AEMP) Design Plan 6513-REP-03 (April 2015) submitted to the NWB with the Proponent's Type "A" Water Licence application. Data are provided in Agnico Eagle's Meliadine 2018 Annual report and Appendix G-1
31	The Proponent shall maintain an appropriate setback distance between project quarries and fish-bearing or permanent water bodies as required to prevent acid rock drainage or metal leaching into such water bodies.	Borrow Pits and Quarries Management Plan mandates maintaining of a setback of at least 31 m from watercourses. All rock, used in construction, is NPAG, as discussed in Agnico Eagle's Meliadine 2018 Annual report and Appendix C-1
32	Prior to the commencement of construction, the Proponent shall submit to the NIRB, a Site Drainage and Silt Control Plan.	See Freshet Action Plan and • Sediment and Erosion Management Plan in Agnico Eagle's Meliadine Gold Project 2018 Annual Report (Appendix I-1)
33	The Proponent shall meet or exceed the guidelines set by Fisheries and Oceans Canada for blasting thresholds and implement practical and effective measures to ensure that residue and by-products of blasting do not negatively affect fish and fish habitat.	Blast monitorng was restarted in 2019. Due to equipment malfunction and avaibility, no monitoring occured in 2018. The 2017 report can be provided if require.
34	The Proponent shall ensure that all Project infrastructure in watercourses is designed and constructed in such a manner that it does not obstruct or limit the natural movement of water in fish bearing streams and rivers.	Not yet applicable
Vegetation		
35	The Proponent shall ensure that Project components and activities are planned and conducted in such a way as to minimize the Project footprint; this should include input from potentially affected communities where applicable.	Minimization of the footprint is one of engineering objectives in the design of the project's components. The estimate of disturbed area (app. 484 ha) was completed and refers to specific plant communities and specific habitat types as requested and can be found in Agnico Eagle's 2018 Annual Report for the Meliadine Gold Mine and Appendix H-6
36	The Proponent shall ensure that equipment and supplies brought to Project sites are clean and free of soils that could contain plant seeds not naturally occurring in the area. Vehicle tires and treads in particular must be inspected, and cleaned if required, prior to transport into Nunavut for use in Project areas.	Vehicle tires and treads were inspected prior to transportation to Nunavut for use in Project areas and no issues were raised. However no inspection sheets were completed. In 2019, a procedure accompanied with an inspection checklist will be provided for inspection.

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37	The Proponent shall incorporate protocols for monitoring for the potential introduction of invasive vegetation species (e.g. surveys of plant populations in previously disturbed areas) into its Terrestrial Environment and Monitoring Plan. Any introductions of non-indigenous plant species must be promptly reported to the Government of Nunavut Department of Environment.	See the TEMMP and the Progressive re-vegetation program report in Meliadine Agnico Eagle's 2018 annual report and Appendix H-6 and Appendix H-1

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38	The Proponent shall conduct sampling to determine baseline levels for metals in soils found in areas with berry-producing plants near the Project area, and shall update relevant vegetation sections within the Terrestrial Management and Monitoring Plan to incorporate ongoing monitoring of these parameters prior to commencing operations.	Please refer to Agnico Eagle's Meliadine 2018 annual report and Appendix H-6. Sampling completed in 2017 and planned for 2019 and thereafter every 3 years
39	The Proponent shall develop and establish an on-going monitoring program to determine the distribution, abundance, and health of vegetation species used as caribou forage (such as lichens) near Project areas, prior to commencing operations.	Loss and disturbance of caribou forage (such as lichen) are provided in Agnico Eagle's Meliadine 2018 annual report and Appendix H-6
40	The Proponent shall review, on an annual basis, all monitoring information and the vegetation mitigation and management plans developed under its Environmental Management Plan and Terrestrial Environment and Monitoring Plan (TEMMP) and adjust such plans as may be required to effectively prevent or reduce the potential for significant adverse project effects on vegetation abundance, diversity and health, taking into account lessons learned at other northern mining developments where appropriate.	Additional reporting in terms of impacts to specific plant communities are provided in Agnico Eagle's Meliadine 2018 annual report and Appendix H-6.
41	Prior to the commencement of operations, the Proponent shall develop a progressive re-vegetation program for disturbed areas that are no longer required for operations, such program to incorporate measures for the use of test plots, reseeding and replanting of native plants as necessary. It is further recommended that this program be directly associated with the management plans for erosion control established for the Project and incorporate lessons learned at Meadowbank.	Please refer to the Progressive re-vegetation program report in Agnico Eagle's Meliadine 2018 annual report and Appendix I-1
42	The Proponent shall include re-vegetation strategies in its Closure and Reclamation Plan that support progressive reclamation and that promote natural revegetation and recovery of disturbed areas compatible with the surrounding natural environment and incorporate lessons learned at Meadowbank	Not yet applicable; the Preliminary Closure and Reclamation Plan will be revised at a later date and will incorporate findings from the re-vegetation study
Terrestrial Wildlife and Wildlife Habitat		
43	The Proponent shall continue to develop and implement Project-specific monitoring for the terrestrial environment through its Terrestrial Environment Management and Monitoring Plan (TEMMP), and will demonstrate appropriate refinements to design, incorporation of analytical methods and elaboration of methodologies. The TEMMP shall contain clear thresholds to allow for the assessment of long-term trends and cumulative effects where project interactions are identified. Coordination and cooperation will be required where data collection, analysis and interpretation, or responsibility for mitigation and management requires the efforts of multiple parties (e.g., government, Kivalliq Inuit Association, communities).	Please refer to Agnico Eagle's Meliadine 2018 annual report and Appendix H-6. The KHTO coordinator will participate in the monitoring and the interpretation of the data and AEM will revise the TEMMP.
44	In consultation with the Government of Nunavut (GN) and other relevant parties, the Proponent shall further develop its Terrestrial Environment Management and Monitoring Plan (TEMMP) to include increased caribou monitoring across the regional study area and additional details on the scope and design of monitoring programs. The Proponent shall also demonstrate consideration for contributing to existing and planned regional monitoring initiatives associated with terrestrial wildlife and wildlife habitat as appropriate. Monitoring should be adequate to test impact predictions, monitor impact thresholds and trends over time, and to support implementation of mitigation measures as proposed in the Final Environmental Impact Statement.	Agnico provides support for the GN caribou satellite-collaring program, support for muskoxen surveys and will collaborate with KHTO to conduct the wildlife surveys on AWAR and do the hunter harvest study now that the MOU is signed between AEM and the KHTO. The GN shared updated caribou data. Please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-6
45	The Proponent shall demonstrate consideration for cooperating with existing and planned regional and/or community-based monitoring initiatives associated with terrestrial wildlife and wildlife habitat that produce information pertinent to mitigating project-induced impacts. The Proponent shall give special consideration for supporting regional studies of population health and harvest programs for Qamanirjuaq caribou which help address areas of uncertainty for Project impact predictions.	Agnico provides support for the GN caribou satellite-collaring program, support for muskoxen surveys and will collaborate with KHTO to conduct the wildlife surveys on AWAR and do the hunter harvest study now that the MOU is signed between AEM and the KHTO. The GN shared updated caribou data. Please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-6

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46	The Proponent shall update its Terrestrial Environment Management and Monitoring Plan (TEMMP) for the Project to include a detailed harvest study prepared in consultation with the Government of Nunavut (GN) and other affected parties. The design of the harvest study should demonstrate consideration for the following:a. Hiring of a dedicated local survey coordinator through local Hunters and Trappers Organizations (HTOs) and provision of adequate resources for the HTOs to run the program;b. The potential effects on caribou populations and on caribou behaviour resulting from increased human access caused by the all-weather access road and associated roads and trails; and,c. Increasing local knowledge of the project development areas, including establishing baseline harvesting levels prior to unrestricted public access on the all-weather access road.	The Hunter Harvest Agreement is incorporated into the funding agreement with the HTO. A work plan is expected to be established in 2019. For effects on caribou populations and on caribou behaviour resulting from increased human access caused by the all-weather access road and associated roads and trails please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-6
47	The Proponent shall share information with the Government of Nunavut (GN) relating to the migration of caribou and include the GN as a party respecting caribou monitoring and movement through Project development areas, including the all-weather access road and associated roads and trails.	Agnico entered the Memorandum of Understanding with GN on March 1, 2017 to share and increase the common knowledge of possible disturbance effects on caribou and muskoxen and their migration
48	In consultation with the Government of Nunavut, the Kivalliq Inuit Association, the Kivalliq Wildlife Board and local Hunters and Trappers Organizations, the Proponent shall develop appropriate monitoring and mitigation measures relating to the harvesting of caribou and improved harvesting access granted by the all-weather access road. These measures shall be included within a Road Access Management Agreement that must be in place prior to construction of phase 2 of the all-weather access road. The Road Management Agreement shall include the following specific measures: • During periods when large aggregations of caribou (greater than 50 individuals) are detected within 1 km of the all-weather access road (AWAR), the road will be closed to public access via car and truck by means of a barrier at the southern gate. Public access using all-terrain vehicles (ATVs) will be allowed. • During periods when large aggregations of caribou (greater than 50 individuals) are observed within 1 km of the AWAR, the road will be closed to public access via barriers at bridges on the AWAR to prevent all vehicle access, including ATVs. This will allow ATVs to enter areas previously accessible along existing trails while not facilitating access via bridges constructed specifically for the Project. • Following consultation with the Nunavut Wildlife Management Board, as required under the Nunavut Wildlife Act, it is recommended that a no-shooting zone (1 km wide) on either side of the road should be established as a condition of public access to the AWAR and compliance with this Agnico Eagle policy should be monitored and reported by the Proponent. • Dedicated 'road monitors' should patrol the road to ensure compliance with the provisions of the Road Management Plan (SD 2-9) relating to public safety and wildlife. Monitoring should be increased during periods of road closure when large aggregations of caribou are present. • All incidents of hunting involving shooting along or across the AWAR should be reported by the Proponent to the GN. • During periods when large aggregations of caribou are detected near the Project, harvest monitoring intensity should be increased to ensure that levels of caribou harvesting are properly documented.	The Road Access Management Agreement to be submitted to the NIRB at least 60 days prior to the commencement of increased traffic related to the marine outflow activities,
49	The Proponent is encouraged to consult with the Nunavut Research Institute (NRI) on the research permitting process as it relates to the Nunavut Scientists Act. The Proponent is encouraged to share monitoring and research study design with the NRI four (4) months prior to the anticipated commencement of research activities to facilitate licensing review.	Not applicable, At present, Agnico Eagle Meliadine has no active NRI permits in its name
50	The Proponent shall develop a strategy for the recovery of terrestrial wildlife habitat in a progressive manner that is consistent with the Nunavut Wildlife Act.	Revegetation study in collaboration with the University of Saskatchewan started in 2018, please refer to Agnico Eagle's annual report and Appendix I-1
51	The Proponent shall not conduct routine helicopter flights over, or land in, Iqalugaaruup Nunanga Territorial Park. The Proponent will communicate this commitment to all helicopter companies contracted by it to undertake work at the Meliadine Project site prior to the start of such contracted work. Emergency flights, specifically medical evacuation flights and/or search and rescue overflights are excepted from adherence to this requirement.	Agnico's Air Traffic Management Plan (part of the Wildlife Protection and Response Plan) imposes restrictions on air traffic
52	The Proponent shall undertake periodic surveys and a habitat assessment for muskoxen in the regional study area by partnering with, or complementing, the existing regional muskox monitoring programs.	Agnico provides support for muskoxen surveys and perform weekly wildlife survey on the AWAR
53	Prior to construction of Project infrastructure and Phase 2 of the all-weather access road, the Proponent shall conduct a survey that is sufficient to locate any dens of foxes, bears or wolverines that could be damaged or destroyed during construction or operation of the Project.	Den survey was completed in 2018 and the report provided to the NIRB in December 2018; no active dens were observed. Discussion for the den survey to be done on the AWAR prior to the commencement of increased traffic associated with the transport of saline water on the all-weather access road was initiated with the NIRB

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54	The Proponent shall ensure that road safety barriers or berms associated with Project infrastructure, all-weather access road and associated roads/trails are constructed to allow for the safe passage of caribou and other terrestrial wildlife while achieving the objective of separating public road use with Project-related mine traffic.	According to the FEIS and TEMMP, roadways are constructed to allow for the safe passage of caribou by using shallower shoulder angles and finer gravel instead of boulders). Observations of unimpeded caribou migration through the site confirm the safety of roadways. The ATV/Snowmobile trail to bypass the mine is still considered and no issues with wildlife crossing was raised during public consultation
55	In consultation with the Government of Nunavut (GN) and other affected parties, the Proponent shall set thresholds for direct mortality of wolf, grizzly bear, polar bear, wolverine, and fox to ensure monitoring and mitigation for the Project is responsive to undesirable rates of mortality. The Proponent shall reach an agreement with the appropriate Designated Inuit Organization regarding compensation or any direct mortality of wildlife resulting from the Project.	Please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-6, Compensation for animal mortalities are set in Appendix 6.1 of the Schedule J of the IIBA (July 2015)
56	The Proponent shall report annually to the NIRB regarding its terrestrial environment monitoring efforts, with inclusion of the following information:a. Description of all updates to terrestrial ecosystem baseline data;b. A description of the involvement of Inuit in its monitoring programs;c. A detailed presentation and analysis of the distribution relative to Project infrastructure and activities for caribou and other terrestrial mammals observed during surveys and incidental sightings;d. Results of the annual monitoring program, including field methodologies and statistical approaches used to support conclusions drawn; ande. An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries.	Wildlife monitoring reports are provided monthly to the GN, KIA and NIRB. Consultations with HTO about its involvement in monitoring programs are ongoing. For all other items, please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-6 for more details
57	Within its annual report to the NIRB, the Proponent shall incorporate a review section which includes:a. An examination for trends in the measured natural variability of Valued Ecosystem Components in the region relative to the baseline reporting;b. A detailed analysis of wildlife responses to operations with emphasis on wildlife behaviour, mortalities and displacements (if any), and responses to operations of the all-weather access road and associated access roads/trails;c. A demonstration and description of how the monitoring results, including the all-weather access road and associated access roads/trails contribute to cumulative effects of the project; andd. Any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program.	In 2018 the project was in construction stage, evaluation and assessment of observed trends in Valuable Environmental Components was not feasible. This will be complete every three (3) years, beginning with the 2019 annual report that will summarize data from 2017, 2018, and 2019.
Birds and Bird habitat		
58	The Proponent shall ensure all employees working at Project sites receive awareness training regarding the importance of avoiding known nests and nesting areas and avoiding large concentrations of foraging and moulting birds.	Please refer to Agnico Eagle's Meliadine annual report appendix I-1 (Wildlife Protection and Response Plan)
59	If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance based on the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.	Please refer to Terrestrial Environment Management and Monitoring Plan (November 2015). A nest was found in 2018 and reported to ECCC (see in Agnico Eagle's Meliadine 2018 annual report Appendix H-6 for details)
60	The Proponent shall ensure that the mitigation and monitoring strategies developed for Species at Risk are updated as necessary to maintain consistency with any applicable status reports, recovery strategies, action plans and management plans that may become available during the duration of the Project.	Agnico periodically checks the Species at Risk Registry of the Government of Canada for changes in endangered, threatened, and special concern species. The shipping management plan Species at Risk table was updated in 2018 to include Harlequin Duck as per the request of the NIRB.
61	Prior to bird breeding season, the Proponent shall either conduct clearing activities or identify and install nesting deterrents (e.g., flagging) to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities. If clearing is to take place during the nesting season, a nest survey should take place to identify nests and any identified nests must remain undisturbed until the young have fledged or left the nest. Any nests identified shall be included as part of the annual reporting for the Terrestrial Environmental Mitigation and Monitoring Plan (TEMMP).	Please refer to Terrestrial Environment Management and Monitoring Plan (November 2015). A nest was found in 2018 and reported to ECCC (see in Agnico Eagle's Meliadine 2018 annual report Appendix H-6)

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62	The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan (TEMMP), until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.	Please refer to Terrestrial Environment Management and Monitoring Plan (November 2015). A nest was found in 2018 and reported to ECCC (see in Agnico Eagle's Meliadine 2018 annual report Appendix H-6)
63	Any incidents of bird mortalities associated with lighting infrastructure, construction activities, and Project vessel operations are to be recorded and reported to Environment Canada (Canadian Wildlife Services). The Proponent shall work with the Canadian Wildlife Services to determine appropriate recording and reporting format and timing.	Agnico is committed to reporting the bird mortalities as specified in the condition. No bird mortalities related to site activities was detected in 2018.
64	The Proponent shall develop a framework for monitoring of marine bird species and their habitat in the event of a major marine fuel spill. Specific details regarding the scope of follow-up monitoring may be further refined if and when such an event were to occur.	Please refer to the Shipping Management Plan n Agnico Eagle's Meliadine 2018 annual report Appendix I-1
65	The Proponent shall maintain reduced speeds to sufficiently ensure that wakes are equal or less than the mean natural seasonal wave height to prevent wake action from negatively impacting migratory bird nests in low lying shoreline habitat.	Please refer to the Shipping Management Plan n Agnico Eagle's Meliadine 2018 annual report Appendix I-1
66	The Proponent shall ensure all Project vessels are checked for bird strikes after a suspected event and include details of its protocol to do so, as well as results, within its updated Terrestrial Environment Mitigation and Monitoring Plan.	Please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-7. Information can also be found in the shipping management plan Appendix I-1
67	The Proponent shall submit an updated Oil Pollution Prevention Plan including measures to avoid adverse effects to species at risk and migratory birds from spills, as well as details regarding monitoring of effects of a spill on species at risk and migratory birds.	The Oil Pollution Prevention (Emergency) Plan and the Shipping Management plan submitted in Agnico Eagle's Meliadine 2018 annual report Appendix I-1
68	The Proponent shall demonstrate consideration for the potential cumulative effects of other development projects and shipping activities (including community resupply) when assessing their cumulative effects on marine birds in the Hudson Strait, in its annual report.	Not yet addressed, will complete the first cumulative effects assessment in the 2019 annual report to allow for three (3) years of data collection.
69	Subject to safety requirements, the Proponent shall require all Project related aircraft to maintain a cruising altitude of at least:a. 650 m during point to point travel when in areas likely to have migratory birdsb. 1100 m vertical and 1500 m horizontal distance from observed concentrations of migratory birdsc. 1100 m over the area identified as a key site for moulting snow geese during the moulting period (July-August), and if maintaining this altitude is not possible, maintain a lateral distance of at least 1500 m from key sites for moulting snow geese.	Please refer to Agnico Eagle's Meliadine 2018 annual report Appendix I-1 (Air Traffic Management Plan, provided with the Wildlife Protection and Response Plan). Modifications were done to ensure compliance with term and condition 69
70	The Proponent shall ensure that pilots are informed of minimum cruising altitude guidelines and that a daily log or record of flight paths and cruising altitudes of aircraft within all Project areas is maintained and made available for regulatory authorities such as Transport Canada to monitor adherence and to follow up on complaints.	Please refer to Agnico Eagle's Meliadine 2018 annual report Appendix I-1 (Air Traffic Management Plan, provided with the Wildlife Protection and Response Plan). Pilots were reminded in 2018 and document were signed
71	The Proponent shall develop detailed and robust mitigation and monitoring plans for migratory birds, reflecting input from relevant agencies, the Kivalliq Inuit Association and communities.	Observations of migratory birds is part of the TEMMP and the MMSO, please refer to Agnico Eagle's Meliadine 2018 annual report Appendix (H-6 and H-7) . Discussion about monitoring for migratory birds will be implimented with the KHTO now that the MOU is signed
72	The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Protection Plan and Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) prior to construction. The key indicators for follow up monitoring under this plan will include upland birds (including migratory birds), waterbirds, raptors, and seabirds including migration and wintering.	Plese refer to the TEMMP and Shipping Management Plan. Monitoring results can be found in Agnico Eagle's Meliadine 2018 annual report Appendix (H-6)
73	The Proponent's monitoring program shall assess and report, on annual basis, the extent of terrestrial habitat loss due to the Project to verify impact predictions and provide updated estimates of the total Project footprint.	Please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-6 (app. 484 ha)

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74	The Proponent's Terrestrial Management and Monitoring Plan (TEMMP) shall include mitigation measures implemented to prevent the use of water attenuation ponds by waterfowl and waterbirds and monitoring that assesses whether the mitigation measures are working or revised or further deterrent measures are required.	Please refer to Agnico Eagle's Meliadine 2018 annual report and Appendix H-6. Monitoring related to bird use of water attenuation pond will continue and other alternatives like kites and owls were bought and will be tested in 2019
75	The Proponent shall implement mitigation measures and monitoring programs to limit the attraction of predators and scavengers to Project facilities in the TEMMP and other plans such as the Landfill and Waste Management Plan as appropriate.	Agnico is working on elimination of attractants to all wildlife, including predators. Please refer to TEMMP, Landfill and Waste Management plans. Weekly inspections are performed at the incinerator, the landfill and other area where attractant can be found. Also toolbox meeting are performed monthly with topics such as waste segregation, wildlife attractantc and other subjects.
Marine Environment		
76	The Proponent shall update all relevant plans including, but not limited to: the Shipping Management Plan, Wildlife Mitigation and Monitoring Plan, and Adaptive Management Plan, in order to address concerns and identify potential impacts of the Project and proposed mitigation measures designed to protect the integrity of the marine environment. The Shipping Management Plan shall also incorporate updates for all Project-related shipping.	Please refer to Shipment Management Plan,, Spill Contingency Plan and Oil Pollution Emergency Plan. Agnico Eagle's Meliadine 2018 annual report and Appendix H-7 also discuss this condition
77	The Proponent shall ensure that it maintains the necessary equipment and trained personnel to respond to all sizes of potential spills associated with the Project in a self-sufficient manner.	See: Spill Contengency Plan and the O.P.E.P. A mock spill training course occured in 2018, see details in Agnico Eagle's Meliadine 2018 annual report Appendix F2
78	Prior to the shipping of Project supplies, the Proponent shall conduct fuel spill dispersion modeling that will, at a minimum, consider: a. Modeling of oil spills in the following areas: i. Pinch points, including: Hudson Strait, Melvin Bay area including Itivia Harbour and Panorama Island; ii. Shallow water and shorelines; and, iii. Areas that have been identified as having high flows and/or high concentrations of marine mammals, marine fish or seabirds; b. Open water and ice-covered conditions; c. Spill volumes up to and including loss of a full tanker cargo; and, d. Differences in the quantity and properties of each type of bulk fuel transported by vessels when they are at, or in transit to, the port of Rankin Inlet.	Please refer to the Shipping Management Plan (Appendix E of the plan)
79	Prior to any Project-related shipping, the Proponent will update its marine baseline information to ensure that it includes the most recent information on marine wildlife abundance and distribution, carefully considers seasonal distribution patterns of marine wildlife, and incorporates western scientific and Inuit Qaujimajatuqangit knowledge sources. The updated marine baseline should be made available to appropriate authorities for feedback, then incorporated into the Proponent's Shipping Management Plan (SMP), with continued updates on a regular basis as new information becomes available.	Please refer to the Shipping Management Plan (Appendix B of the plan)
80	The Proponent shall assess its available baseline information for Melvin Bay and for the area surrounding the fuel transhipment anchorage to ensure that both are adequate for the detection of Project-related impacts, particularly related to contaminants.	Please refer to the Shipping Management Plan.
81	Prior to any Project-associated shipping, the Proponent shall revise and update the Terrestrial Environment Management Plan (TEMMP) and/or the Shipping Management Plan (SMP) to include following information: a. a plan for involvement of local hunters in wildlife baseline studies and monitoring program; b. a plan for coordinating wildlife studies/monitoring activities with other organizations, institutions, government departments and/or individual researchers conducting wildlife studies in the regional study area; and c. measures to be applied to avoid or reduce the disturbance, harassment, injury or mortality of marine mammals due to shipping activities.	Please refer to the Shipping Management Plan.
82	The Proponent shall require all contracted shipping companies to provide full-time marine wildlife monitoring using trained observers and established data collection and recording protocols. Monitoring plans should include provisions for all Species At Risk Act (SARA) and for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed species (birds and mammals).	Please refer to Agnico Eagle's Meliadine 2018 annual report and Appendix H-7. Agnico shared the data with ECCC but encountered issues with ECCC database.

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83	The Proponent shall ensure that, subject to vessel and human safety considerations, all Project shipping adhere to the following mitigation procedures while in the vicinity of marine mammals (including polar bear) and birds: a. Marine mammals will be given right of way; b. Ships will when possible, maintain a straight course and constant speed, avoiding erratic behavior; and c. When marine mammals appear to be trapped or disturbed by vessel movements, the vessel will implement appropriate measures to mitigate disturbance, including stoppage of movement until wildlife have moved away from the immediate area.	Please refer to the Shipping Management Plan
84	Prior to any Project-related shipping, the Proponent will prepare a map of terrestrial walrus haulouts (uglit) in the Project area, and use this information for route planning, fuel spill modeling, and sensitive area identification. The map should include all available sources of information on uglit locations, including scientific knowledge and Inuit Qaujimajatuqangit and shall be updated by the Proponent whenever new information becomes available.	Please refer to the Shipping Management Plan
85	The Proponent shall consider ways to monitor disturbance to walruses at terrestrial haulout sites, including but not limited to remote monitoring (e.g., time-lapse cameras) and community-based monitoring or Inuit Qaujimajatuqangit surveys.	Monitoring for walruses at haulouts is performed by the vessel monitor, please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-7. Now that the MOU is signed, discussion regarding walrusses monitoring will be implemented with the KHTO
86	The Proponent is encouraged to liaise with relevant stakeholders, regulatory agencies and/or forums (e.g. the Marine Environmental Working Group associated with the Mary River Project), that might allow for participation in relevant research and management initiatives and increasing understanding and mitigation of potential cumulative effects associated with the Project's shipping activities through the Hudson Strait.	Monitoring for walruses at haulouts is performed by the vessel monitor, please refer to Agnico Eagle's Meliadine 2018 annual report and appendix H-7. Now that the MOU is signed, discussion regarding walrusses monitoring will be implemented with the KHTO
	Economic Development, Contracting and Business Opportunities	
87	The Proponent is strongly encouraged to participate in the work of the Kivalliq Socio-Economic Monitoring Committee along with other agencies and the communities of the Kivalliq region, and to identify areas of mutual interest and priority for inclusion into a collaborative monitoring framework that includes socio-economic priorities related to the Project, communities, and the Kivalliq region as a whole.	Please refer to Agnico Eagle's Meliadine 2018 annual report and the SEMP report
88	The Proponent is encouraged to work in collaboration with other socio-economic stakeholders including for example, the KIA, GN, AANDC, and communities of the Kivalliq region, to establish a socio-economic working group for the Project to develop and oversee the Meliadine Socio-economic Monitoring Program. The working group should develop a Terms of Reference which outlines each member's roles and responsibilities with regards to, where applicable, project-specific socio-economic monitoring throughout the life of the Project. The Terms of Reference are to be provided to the NIRB upon completion, and within one year of issuance of the Project Certificate.	Please refer to Agnico Eagle's Meliadine 2018 annual report section 12 and the SEMP
89	The Proponent shall develop the Meliadine Socio-economic Monitoring Program to monitor the predicted impacts outlined in the FEIS as well as regional concerns identified by the Kivalliq Socio-economic Monitoring Committee (SEMC). Where possible, the Proponent is encouraged to work in collaboration with all other socio-economic stakeholders such as the KIA, GN, AANDC and the communities of the Kivalliq region in developing this program, which should include a process for adaptive management and mitigation in the event unanticipated impacts are identified. Details of the Meliadine Socio-economic Monitoring Program are to be provided to the NIRB upon finalization, and within one year of issuance of the Project Certificate.	Please refer to Agnico Eagle's Meliadine 2018 annual report and the SEMP
90	Prior to the commencement of operations, the Proponent is required to undertake an analysis of the risk of temporary mine closure, giving consideration to how communities in the Kivalliq region may be affected by temporary and permanent closure of the mine, including economic, social and cultural effects. The results of this analysis are to be provided to the NIRB upon completion.	An analysis of the risk of temporary mine closure was submitted to the NIRB February 1st 2019

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91	Within 3 months of the NIRB's acceptance of the Proponent's analysis of the risk of temporary mine closure referenced above, the proponent is expected to update its Socio-Economic Management Plan or to include within a newly developed plan or framework, a description of its plan to collect and analyze Project-specific and regional data at closure and post-closure phases, as well as its defined measures to help mitigate impacts which may result from Project closure(s), both temporary and final.	Monitoring impacts is typically done within the Socio-Economic Monitoring Plan framework (SEMP), and coordinated with the KvSEMC and SEMWG. In Agnico Eagle's Socio-Economic Monitoring Working Group Terms of Reference section 8, "AEM will consult with the Working Group and KvSEMC two years in advance of the expected date of closure for each Project in order to inform project-specific socio-economic closure planning" and "In the event of premature (temporary or final) closure of one or more of the Projects, AEM will consult with the Working Group and KivSEMC before submitting updated project-specific Socio-Economic Monitoring Plans to NIRB". Additionally, Agnico Eagle completed and submitted to NIRB its Conceptual Socio-Economic Closure Plan, while originally for Whale Tail Project Certificate Condition 51, was extended to include all Projects including Meliadine. Monitoring consideration for closure and post-closure will be incorporated into the ongoing work of this plan.
Employment		
92	The Proponent shall submit a detailed staff schedule to the NIRB and to the Government of Nunavut in the first 6 months following the issuance of a Project Certificate. The schedule should, at a minimum, provide a description of: a. Title of positions required by department and division; b. Quantity of positions available by Project phase and year; c. Transferable skills, both certified and uncertified which may be required for, or gained during, employment within each position; and, d. The National Occupational Classification (NOC) code for each individual position. The Proponent is encouraged to consult the Government of Nunavut during development of the schedule. A new schedule should be submitted following any significant deviation from original predictions.	Requested information sent to NIRB and GN on November 3, 2015
93	The Proponent is encouraged to register all trades occupations, journeypersons and apprentices working with the Project and to register any trades occupations listed in its forecast, as well as to provide the Government of Nunavut with information regarding the number of registered apprentices and journeypersons from other jurisdictions employed at the Project during each year of the Project's life.	Please refer to Agnico Eagle's Meliadine 2018 annual report. As of the end of 2018, there were 4 apprentices and pre-apprentices at Meliadine.
94	The Proponent shall update its labour force analysis utilizing current or the most recent baseline information as may be available from the Nunavut Bureau of Statistics or Statistics Canada. The updated labour force analysis is to be provided to the NIRB within 6 months of the Project Certificate being issued. The Proponent is encouraged to work collaboratively with other stakeholders to monitor any impacts the Project may have on the labour force characteristics of the Kivalliq region during all project phases.	Agnico Eagle submitted the latest staff schedule on May 2, 2018, and will submit an updated version in 2019. Agnico Eagle also submitted the IIBA-required Labour Market Analysis (LMA) to NIRB in March 2019.
Education and Training		
95	The Proponent is encouraged to work with training organizations and/or government departments offering mine-related or other training in order to provide additional opportunities for residents and employees to gain meaningful and transferable skills and certifications.	Agnico Eagle works with training organizations and government departments regularly through the Kivalliq Socio-Economic Monitoring Committee, through the IIBA with the Kivalliq Inuit Association, through the Memorandum of Understanding with the Government of Nunavut, and through one-on-one partnerships and collaboration with organizations such as the Hamlet of Arviat, the Nunavut Literacy Council, Nunavut Arctic College, Aglu Consulting, and more.

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96	Prior to construction, the Proponent shall develop an easily referenced listing of formal certificates and licences that may be acquired via on-site training or training during Project employment. The listing shall indicate which of these certifications and licences would be transferable to a similar job site within Nunavut, and should be updated on an annual basis, and is to be provided to the NIRB upon completion and as may be revised.	A list of training can be found in Agnico Eagle's Meliadine 2018 annual report Appendix L-1
97	The Proponent's project-specific socio-economic monitoring program should be updated to address the potential impacts to education and training which may arise from temporary, final and/or post-closure phases.	Education and training metrics are already included in the current Socio-Economic Monitoring Plan (SEMP) so these will be monitored up until at least 2 years before closure, at which time section 8 of the Socio-Economic Monitoring Working Group Terms of Reference will be triggered. As above, this will be considered also in the Conceptual Socio-Economic Closure Plan work.
98	The Proponent is encouraged to work with the members identified as potential stakeholders in the socio-economic monitoring working group and with the Kivalliq Socio-Economic Monitoring Committee to review and monitor education utilization rate trends on an on-going basis to understand if the Project can be determined to be having an impact on the education system of the Kivalliq region and/or on any communities in particular.	Please refer to Agnico Eagle's Meliadine 2018 annual report and the SEMR
Population Demographics		
99	The Kivalliq Socio-Economic Monitoring Committee and its membership are encouraged to engage in the monitoring of demographic changes including the movement of people into and out of the Kivalliq communities and the territory as a whole. This information may be used in conjunction with monitoring data obtained by the Proponent from recent hires and/or out-going employees in order to assess the potential effects of the Project on migration.	Please refer to Agnico Eagle's Meliadine 2018 annual report and the SEMR
100	The Proponent is encouraged to work with the Kivalliq Socio-Economic Monitoring Committee to design and implement a voluntary survey to be offered to its Nunavummiut employees on an annual basis in order to identify changes of address, housing status (i.e. public/social, privately owned/rented, government, etc.), and migration intentions, while respecting confidentiality of all persons involved. The survey should be designed in collaboration with the Government of Nunavut, the Nunavut Housing Corporation and other relevant stakeholders. Non-confidential results of the survey are to be reported to the Government of Nunavut and the NIRB.	Agnico Eagle is developing the survey in 2019 and will consult with the necessary groups listed above.
101	The Proponent shall include with its annual reporting to the NIRB a summary of employee origin information as follows:a. The number of Inuit and non-Inuit employees hired from each of the Kivalliq communities, specifying the number from each;b. The number of Inuit and non-Inuit employees hired from each of the Kitikmeot and Qikiqtani regions, specifying the number from each;c. The number of Inuit and non-Inuit employees hired from a southern location or other province/territory outside of Nunavut, specifying the locations and the number from each; andd. The number of non-Canadian foreign employees hired, specifying the locations and number from each foreign point of hire.	Please refer to Agnico Eagle's Meliadine 2018 annual report
Traditional Activity and Knowledge		
102	Prior to commencing construction of the Discovery spur road to pass Meliadine Lake, the Proponent shall provide to the NIRB, details regarding the design features for the Meliadine Lake community boat launch, including traffic turnoffs from the all-weather access road, relevant signage, parking areas, considerations for public safety around the boat launch, plans for garbage removal and treatment of other refuse including buildings and equipment which may be stored at the site, as well as plans to monitor and/or maintain the site, including frequency and timing. These details, once finalized, shall also be incorporated, as updates, to various mitigation, monitoring and/or management plans as applicable.	Expected in 2024

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103	The Proponent is encouraged to consult with the Kangiqliniq Hunters and Trappers Organization and the Kivalliq Socio-Economic Monitoring Committee and to make all reasonable efforts to engage Elders and community members of the Kivalliq communities in order to have community level input into updates to its monitoring plans, programs and mitigative measures. This type of engagement will ensure that these programs and measures have been informed by traditional activities, cultural resources, and land use as such may be implicated or impacted by ongoing Project activities. All plans are to include a feedback mechanism for consulting with residents of the Kivalliq, including the provision of results from the Proponent's wildlife monitoring programs to each community. The Proponent shall submit updated plans to the NIRB within 30 days' of their revision and/or finalization.	Please refer to Agnico Eagle's Meliadine 2018 annual report Appendix K1 (public consultations and engagements)
Non-Traditional Land Use and Resource Use		
104	The Proponent is encouraged to consult with outfitting and guiding businesses that operate in the LSA and RSA regarding use of the area, specifically as it relates to hunting, fishing and guiding within proximity of the AWAR. Results of this consultation should be incorporated into updated plans where applicable.	In 2018, Agnico Eagle conducted a phone survey of all Kivalliq businesses, specifically on business information and opportunities, which included outfitting and guiding businesses. During the survey Agnico Eagle asked for general comments or questions from respondents. There were no comments or questions on the interaction of the businesses with the AWAR
105	The Proponent is strongly encouraged to consider incorporating information obtained from local outfitting and guiding businesses into its Hunter Harvest Survey where possible, and to include these organizations as potential respondents to surveys undertaken.	Now that the MOU is signed with the KHTO, surveys and HHS will be discussed and local outfitting and guiding businesses into it
Cultural, Archaeological and Paleontological Resources		
106	The Proponent shall, in consultation with the Government of Nunavut's Territorial Archaeologist, determine a reporting frequency for the provision of inspection reports to the Government of Nunavut regarding the status of the Meliadine River Bridge, the Char River Bridge, and the M5 Bridge Crossing during the spring freshet period (mid-May to June) and during the remainder of the ice-free period to freeze-up (July to October).	Weekly inspections of the bridges during freshet 2018 were sent to the Government of Nunavut.
107	The Proponent shall consult with the Government of Nunavut – Department of Culture and Heritage in developing a mitigation plan to address ice buildup at the Meliadine River Bridge, the Char River Bridge, and the Bridge Crossing at M5. The Proponent shall submit this mitigation plan to the NIRB once finalized.	As part of the Road Management Plan, frequent inspections at the various bridges along the AWAR are done. No significant ice buildup impacting the downstream has been noticed to date. Any issues will be brought to the GN and NIRB's attention.
Individual and Community Wellness		
108	The Proponent is encouraged to consider providing access to counseling and treatment programs for substance and gambling addictions, and programs which address domestic, parenting, and marital issues that could affect employees and/or their families.	Please refer to Agnico Eagle's Meliadine 2018 annual report and SEMR
109	The Proponent is encouraged to work with the Kivalliq Socio-Economic Monitoring Committee to monitor potential indirect effects of the Project, including indicators such as the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases and others as deemed appropriate.	Please refer to Agnico Eagle's Meliadine 2018 annual report and SEMR

T&C #	Term and Condition (NIRB Project Certificate No. 006)	2019 status
110	The Proponent shall provide the NIRB with a description of wellness and cultural diversity/acceptance programming made available to employees and family or community members and shall report the following information with respect to each program to the NIRB annually:a. Language of instruction;b. Uptake by employees and/or family members where relevant,noting Inuit and non-Inuit participation rates;c. Completion rates for enrolled participants, noting Inuit and non-Inuit rates; andd. Issues as may relate to program content which may have been noted or present either on site or in the community and which affect Project employment or employee wellness.	Please refer to Agnico Eagle's Meliadine 2018 annual report and SEMR. The updated SEMR will be provided June 30th, details on the programs are included in the SEMR
111	In its annual reporting to the NIRB, the Proponent is strongly encouraged to provide detailed descriptions of all employee programs and training including:a. Descriptions of the goals of each program offered;b. Language of instruction;c. Schedules and location(s) of when each program was offered;a. Uptake by employees and/or family members where relevant, noting Inuit and non-Inuit participation rates; and,b. Completion rates for enrolled participants, noting Inuit and non-Inuit rates.	Please refer to Agnico Eagle's Meliadine 2018 annual report and SEMR. The updated SEMR will be provided June 30th, details on the programs are included in the SEMR
112	The Proponent is encouraged to investigate measures and programs designed to assist Project employees with pursuing home ownership or accessing affordable housing options.	Please refer to Agnico Eagle's Meliadine 2018 annual report. Agnico Eagle has shared financial literacy materials from its Work Readiness Program as well as details on Agnico's direct rental deduction program with the Nuanvut Housing Corporation in October 2017. Agnico Eagle will reach out again to NHC in 2019 with the intention to collaborate on the topic of home ownership and affordable housing options. Nunavut Housing Corporation is also invited to participate in the Kivalliq Socio-Economic Monitoring Committee.
	Community Infrastructure	
113	The Proponent is encouraged to collaborate with the Kivalliq Socio-Economic Monitoring Committee and the Government of Nunavut – Nunavut Housing Corporation, to design and implement a voluntary employee survey to be completed on an annual basis in order to identify any changes of address, detailed occupancy status (i.e., public/social, privately owned/rented, government, number of people sharing the resident space, etc.), housing preferences, migration intentions, and reasons for migration while respecting confidentiality of all person involved. Non-confidential results of the survey are to be reported to the Government of Nunavut and the Nunavut Impact Review Board.	Agnico Eagle is developing the survey in 2019 and will consult with the necessary groups listed above.
114	The Proponent is encouraged to collaborate with the Government of Nunavut – Nunavut Housing Corporation prior to the development and inception of its programs relating to financial literacy and planning to ensure that relevant and accurate information about housing and home ownership is available and considered for inclusion.	The project plan will be developed by Q4 in order to execute the project in 2019. The Nunavut Housing Corporation and other relevant stakeholders will be involved in the survey design.
115	The Proponent is encouraged to work collaboratively with the Government of Nunavut Department of Health to monitor the impacts of the Meliadine Gold Project on health services within the LSA communities and specifically, Rankin Inlet.	Please refer to Agnico Eagle's Meliadine 2018 annual report and SEMR
	Public and Worker Health and Safety	
116	The Proponent shall update the air quality monitoring aspect of its environmental and health risk monitoring program to include the following parameters for particulate matter: a. An analysis of the metals content of the dust collected in passive monitoring; and b. Discrete samples to be collected on a frequency to be determined in collaboration with the Government of Nunavut, from the camp, and analyzed for acrolein and aldehyde. Results are to be incorporated into the Proponent's annual reporting for submission to the NIRB.	Please refer Agnico Eagle's Meliadine 2018 annual report and Appendix H-5. Aldehyde samples will start in 2019 the monitoring plan was agreed by the GN and stack testing was complete in 2018
	Accidents and malfunctions	
117	Prior to construction Phase 2 of the all-weather access road and the Rankin Inlet bypass road, the Proponent shall consult applicable laws in Canada and Nunavut as well as meet with all regulatory agencies and the public as it finalizes its road operations plans.	Design report for the by pass road, community meeting done in 2018 and inspection with regulators occured for the bypass road.
118	The Proponent shall include in an updated Terrestrial Wildlife Management and Monitoring Plan (TEMMP), plans for increased caribou monitoring efforts including weekly winter track surveying and summer and fall surveys undertaken on foot twice per month. These results shall be reported to the NIRB with the Proponent's annual reporting requirements.	Please refer to Agnico Eagle's Meliadine 2018 annual report and Appendix H-6. In 2018, caribou monitoring efforts included the review of the remote sensing data, ground-based and aerial surveys, caribou behaviour and the winter track survey.

T&C #	Term and Condition (NIRB Project Certificate No. 006)	2019 status
119	The Proponent shall include within its updated Terrestrial Wildlife Management and Monitoring Plan, a commitment to establishing deterrents along the AWAR at any areas where it is observed that caribou are attracted to the AWAR and their presence may present a risk of collisions with traffic along the AWAR (such as areas where caribou are utilizing the AWAR to facilitate movement, areas where caribou may be licking minerals/road salt from the road, areas where caribou are gathering to avoid insects, etc.).	Please refer to Agnico Eagle's Meliadine 2018 annual report and Appendix H-6. At the Meliadine site and on the AWAR, wildlife has the right of way. During caribou migration, the AWAR is close, therefor no deterrant is needed
120	The Proponent shall contract only Transport Canada certified shippers to carry cargo for the Project, and will ensure shippers are aware of the requirements of the Shipping Management Plan, the Risk Management and Emergency Response Plan and the Oil Pollution Emergency Plan (OPEP).	TC certification of shipper was provided to NIRB in December 2016. Shippers letter-commitment to abide by Agnico's Shipment Management Plan was provided to NIRB in October 2017. Project-related shipping activities, including the number and schedule of ships received can be found in Agnico Eagle's 2018 Meliadine annual report
121	The Proponent shall monitor the ingress/egress of Project related ships at Rankin Inlet and report any accidents or spills immediately to the regulatory agencies as required by law and to NIRB's Monitoring Officer.	Please refer to the Shipment Management Plan
122	The Proponent shall ensure that best practices are used at all times during ship to shore and other marine-based fuel transfer events, including implementing measures specifically designed to prevent leaks and spills resulting from ice forming on the hoses during fuel transfers	Please refer to Oil Pollution Emergency Plan. Shipment of fuel to Meliadine is undertaken only during the ice-free shipping season. Dates of marine-based fuel transfer events can be found in Agnico Eagle's Meliadine 2018 annual report
123	The Proponent shall ensure that the necessary spill response equipment and training is available prior to commencing project shipping.	Please refer to the Shipment Management Plan and the OPEP.
124	Prior to construction, the Proponent shall update its Spill Contingency Plan specific to a major spill event occurring on the bypass road and within proximity to (and including potential spills into) Nipissar Lake.	Please refer to Spill Contingency Plan

T&C #	Term and Condition (NIRB Project Certificate No. 006)	2019 status
125	The Proponent shall implement all such measures necessary to protect public and mine traffic on all Project roads. The measures undertaken shall include, but are not limited to: a. Prior to expansion of the AWAR, the Proponent shall update its Roads Management Plan to include a detailed consultation plan specifying the methods the Proponent will use to provide the Kivalliq Inuit Association, members of the Hunters and Trappers Organizations in the area, residents of Rankin Inlet and the Hamlet of Rankin Inlet with information regarding the safety requirements of AWAR use. The updated Plan is to be submitted to the Nunavut Impact Review Board, Kivalliq Inuit Association, Kangiqliniq Hunters and Trappers Organization, and the Government of Nunavut; b. Prior to the opening of the AWAR to the public, and annually thereafter, advertise and hold at least one community meeting in the Hamlet of Rankin Inlet and Chesterfield Inlet to explain to the community the rules for use of the road; c. Prior to the opening of the AWAR to the public, the Proponent shall address enforcement of health and safety rules for the operation of the road (i.e., no shooting zone) and implement necessary communications with the public (i.e., signage and public meetings), which includes, but is not limited to: i. Maintaining manned and unmanned gates as proposed along the all-weather access road; ii. The posting of signs in English and Inuktitut along the road at appropriate intervals (i.e., 10 km and bridge crossings); and iii. Place notices at least quarterly on the radio and television to explain to the community the rules for use of the road; d. Once the AWAR expansion is completed and the road is opened to the public, the Proponent shall conduct a vehicle survey four times annually (once during the weekdays during the winter season, once during the week end days during the winter season, once during the weekdays during the summer season and once during the week end days during the summer season) to record the number and types of mine vehicles and the number and type of public vehicles using the AWAR over a 12 hour period (8:00 am to 8:00 pm). The vehicle survey data shall be collated as indicated above and provided in the Proponent's Annual Report; e. Prior to the development of the Discovery deposit, the Proponent shall update its Road Management Plan for the planned operation of the twinned road which could include additional rules, Project infrastructure, or other measures designed to maintain safety for employees and the public; and f. Report all accidents or other safety incidents on the road, to the Government of Nunavut, Kivalliq Inuit Association, the Hamlet of Rankin Inlet and the NIRB immediately.	a) Expension planned in 2024 b) Meeting held June 13th 2018 at Rankin and one is planned in Chesterfield in 2019. This will be done every year as requested c) Barrier installed at km 8 and is monitored by the gatehouse d) Vehicle survey performed 4 times in 2018 e) Planned in 2024 f) No accident or incident occured on the AWAR in 2018
126	Prior to expansion of the AWAR, the Proponent shall prepare and add to the finalized Roads Management Plan (SD 2-9), a detailed consultation plan specifying the methods the Proponent will use to provide the Kivalliq Inuit Association, members of the Hunters and Trappers Organizations in the area, residents of Rankin Inlet and the Hamlet of Rankin Inlet with information regarding the safety requirements and any limitations on public AWAR use (i.e. the "rules of the road") and to ensure that this information continues to be clearly communicated on an on-going basis while the public has access to the AWAR.	On June 13th, 2018, Agnico Eagle held a Meliadine Project Update public meeting in Rankin Inlet which included information on AWAR use procedure. A pamphlet summarizing the road safety rules was also developed was be mail-dropped to all Rankin Inlet residents. All the information and documentation is available on the website: http://aemnunavut.ca/community/roads/
127	The Proponent shall, in coordination and consultation with the Kivalliq Inuit Association and the Hunters and Trappers Organizations of the Kivalliq communities, provide updates to its Shipping Management Plan to identify adaptive management measures that will be employed if effects monitoring identifies potential for effects on marine mammal populations along the shipping route.	Please refer to the Shipment Management Plan
128	The Proponent shall provide the NIRB with a detailed design for the system that includes the location of the pipeline in relation to the saline effluent storage tank at Itivia, the location of submerged collars supporting the pipeline and the design of the diffuser.	Submitted to NIRB on February 15
128	The Proponent shall conduct and submit to the Board a hazard and operability assessment of the pipeline and marine outfall system as part of the land authorization process.	Land authorization process initiated February 18.
130	To assess the environmental impact of the Project on the seabed and marine environment if the effluent discharge pipeline is abandoned in place or removed.	To be done 12 months prior removal
131	The Proponent shall ensure its Marine Environment Management Plan addresses a procedure for engagement with the Kangiqliniq Hunters and Trappers Organization (HTO) to confirm the commencement and ending of the open water season for marine effluent discharge each year. The Proponent shall also engage with the HTO and the community of Rankin Inlet when developing a program for monitoring saline effluent temperature going into the subsea pipeline, ice thickness on Melvin Bay in the vicinity of the discharge and determining appropriate communication and safety protocols applicable for travel by community members through Itivia and Melvin Bay	Now that the MOU is signed between AEM and the KHTO, AEM intends to engage with the KHTO and the community of Rankin Inlet to: · confirm the commencement and end of the open water season for marine effluent discharge each year · develop a procedure for monitoring of saline effluent temperature going into the subsea pipeline and ice thickness on Melvin Bay in the vicinity of the discharge and determining appropriate communication and safety protocols applicable for travel by community members through Itivia and Melvin Bay.